CQ

September 1972
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See page...18

The Radio Amateur's Journal
08240


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GREATEST 2 KW RIG YOU'LL EVER FIND UNDER A GRAND!

Figure it out: the famous Heathkit SB-102 Transceiver, 385.00; SB-600 Speaker, 19.95; SB-220 Linear Amplifier, 369.95; SB-650 Digital Frequency Display, 179.95; HDP-21A Desk Mike, 29.95 (power supplies are additional extras depending on your choice of fixed or mobile operation). It all adds up to a budget pleasing 984.80 . . . and the most fantastic value ever offered in a 2 kW rig (complete with digital readout) for under a thousand dollars. Here's what you get:

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CQ

SEPTEMBER, 1972 VOL. 28, NO. 9

The Radio Amateur's Journal

TABLE OF CONTENTS

DEPARTMENTS

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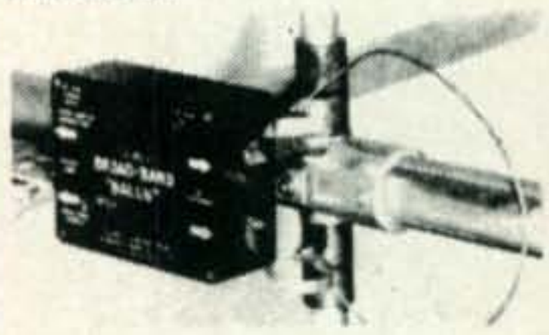

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OUR READERS SAY

Philippine Reciprocity

Editor, *CQ:*

As you, and many of your readers, know there have been efforts to bring about a reciprocal amateur radio operating agreement with the Philippine government for many years. As of the tenth of June, 1972, it was still not a reality.

In the years past, the Philippines Secretary of the Department of Public Works and Communications would allow some few Americans to operate under a DU call. As of September, 1971, the same office took a firm stand and has rejected all American applicants on the basis that no reciprocal agreement exists.

Recently the U.S. Embassy in Manila, through channels, submitted to Secretary Romulo of the Department of Foreign Affairs a proposed reciprocal agreement.

Many thanks are due Philippine amateurs who have endorsed and aided us in reaching this point of our negotiations. As the world of amateur radio operators wait and watch for the results of the Philippine government action we who live here are very anxious to resume our pursuit of the international hobby of amateur radio.

Bob Brown, WA4KHX/NØ5ZK
Subic Bay, Philippines

Enhancing the FTDX-560

Editor, *CQ:*

Richard Yoemans, W2DMK, in his excellent article in the July issue of *CQ* entitled "Further Enhancing Yeasu FTDX-560 Transceiver" states that the screen grid modifications to the final amplifier increase the average power output from 270 watts to 390 watts or by about 28%.

If my calculations are correct, an increase from 270 watts of power output to 390 watts is a 44% increase which is substantially more than 28% and a more desirable improvement.

Keith J. Ackley, W5SQS
Dallas, Texas

Gottlieb and His Filters

Editor, *CQ:*

I have been mighty pleased to note that your graphic arts and editorial people are obviously technically-oriented, and "on the ball." I say this because my articles have all emerged unscathed in scientific and grammatical integrity. This is great because it takes only a slight twist of word or art to alter the sense of the technical presentation. And, filter articles, in particular, are vulnerable to otherwise benign typos and booboos. . .

Irv Gottlieb, W6HDM
Menlo Park, CA

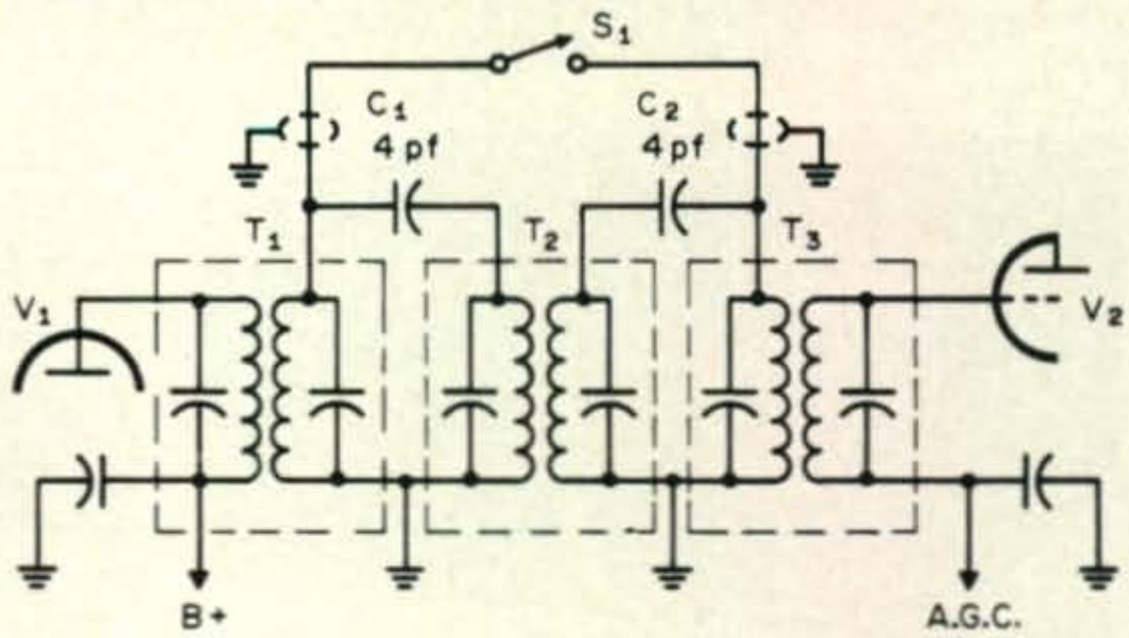
Editor, *CQ:*

In reference to the June, 1972, CQ, I enjoyed the excellent article "A High Selectivity I.F. Filter" by Irving M. Gottlieb, W6HDM. The article stimulated thought and contributed encouragement to another experimentation. I offer the three following questions in the interest of information as a fellow experimenter and not in any way as a questioning of the results Mr. Gottlieb received from his particular experiments.

1. Referring to suggestion No. 4, grounding of the inner circuitry of the filter, I have as a general observation noticed a drop in signal on a meter when a coupling link is grounded, but I believe the loss is due to reduced capacitance coupling that is not shunted to ground. I have seen no evidence that the band-pass is degraded since capacity coupling is untuned and can be out of the band-pass frequency, I would recommend grounding all floating links. Your comments would be appreciated.

2. In Reference to fig. 3 this adaptation of a constant-Kπ section filter there would appear to be a second resonant frequency that might load part of the circuitry until the i.f. stages eliminated it. This band-pass frequency equals 455kHz $C^1 L^1$, $C^2C^4L^2$, $C^4C^5C^7L^3L^4$, $C^4C^7L^5$, L^6C^8. The second frequency (higher) is $L^2L^3L^4L^5C^3C^5C^6$. In this second frequency actually a reality and how would it affect the band-pass.

3. Does Mr. Gottlieb's adaptation of a constant-Kπ filter have any advantages over two 3-element π filters back-to-back that can be constructed from three i.f. transformers:



The above would have 6 tuned circuits, would require no additional transformers or transformer alterations. Coupling can be adjusted by C_1 and C_2 and (usually a twisted wire gimmick) and switched out by S^1. The circuit, of course, is not original, however, I have used it in three-receivers with a 2-transformer version and have had good results and no problems.

I would appreciate your views on the above. If transformer alteration is an old ham area of experimentation and Mr. Gottlieb has added some fresh views on the subject. If his efforts have produced a better i.f. filter; his work has had a real pay off for "home brew" fans.

James M. West, WØNKI
Englewood, Colorado

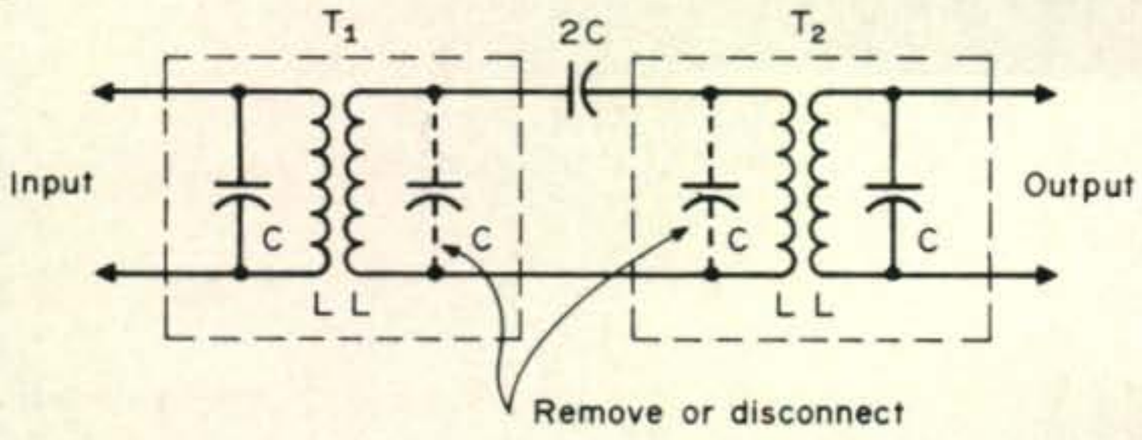
The suggestion of Mr. West is an excellent one. I am very sure that it would be advantageous to be able to *ground* the inner circuit. If one could do this, the bandwidth should become even narrower because all signal transfer would then

necessarily be via the intended inductive-coupling, and none would get through by means of stray capacitance. I was unable to implement such a technique because of various second-order influences apparently stemming from proximity effects, leads, and perhaps radiation-coupling. I feel sure, however, that a bit of experimenting with component positioning, orientation, and packaging, could lead to the successful grounding of the inner circuit.

The possibility of a higher-frequency resonance within the inner circuitry is very intriguing. I would have to concede that in, all probability, it must exist. However, I do not think it finds itself in a very-favorable environment. Note, that the junction of L_3 and C_3 would constitute a high-impedance point for such a series-resonance. The presence of C_4, which also connects to this junction, must impose heavy loading on such a resonance. (Similar logic would apply to the effect of C_7). If this resonance does exist, its effect must also be rendered negligible by the fact that there are, at the same time, five tuned-circuits simultaneously favoring passage of the i.f. frequency, and discouraging the passage of this higher frequency. In any event, I have detected no practical manifestation of the high frequency. (Maybe, if you lived next door to a 10 kw broadcast station on that frequency, the fact that the filter would reject it by 70 db rather than 85 db might pose a problem.)

I initially experimented with the back-to-back arrangements of i.f. transformers. My objective was to use a very-high transconductance tube, and maybe eliminate a couple of i.f. bottles. This scheme is good. It does, however, incur attenuation pretty rapidly as you cascade the transformers. And, I was not able to get the sought-after response shape from this technique. Of course, its salient feature is that it is relatively easy to implement. (My best results came about from removing the "inner circuit" parallel resonating-capacitors and then connecting a series capacitor of 2C in place of Mr. West's 4pf units.)

—W6HDM



Editor, *CQ:*

I wanted to write a small letter of praise for your magazine and mention that I intend to subscribe in the near future for almost one reason: the column being done by Irwin Math. It is exactly the kind of thing an old tube-type man such as myself really needs. Mr. Math has a knack for writing about things that I have of late been interested in but "was afraid to ask" about, and he has been doing it in a manner I have had little trouble understanding.

I am also glad to see the slow-scan-TV column. It is needed. Let me close by pleading for more articles on construction—it isn't an entirely lost part of the hobby—and by going on record against the 220 mHz CB thing. I personally believe that when the FCC makes it prohibitively expensive to be *flagrantly* illegal and actually makes a few examples of the violators that people might begin to realize what it's all about —and more important, what it is NOT about.

Keep up the good work and thanks for the Reader Service.

Edward T. Tanton, WA4BAA
Atlanta, Georgia

Editor, *CQ:*

I have never seen fit to write any magazine in answers to LETTERS until I received the July issue of *CQ*. Two of the letters just didn't set right with me and I just gotta yell out.

Our friend Verne, WA9VLK, seems to feel like a lot of hams did when they outlawed spark —remember? There was lots of crying and some hams just let their licenses drop because they were just not going to use those new-fangled tube transmitters. Same thing when we all went to s.s.b. Well, I'm proud to say that I got my first license in 1922 and that I have operated spark, arc, tube and solid state, c.w., a.m. and s.s.b. I'm for progress 100%.

Now Roger, W6RW, old buddy, you have hurt my feelings. I will be 65 in October and I will sit down with you any time you say, and with my arthritic hands and all, I will copy 20 with pencil and 40 on mill and haven't operated c.w. in quite a number of years. Boy, my mind hasn't slowed down that much—some other faculties mayhaps but not my mind. You remind me of my doctor. About 10 years ago he had his nurse call me and tell me that he wanted all of his elderly patients to take flu shots. Well, I just don't consider that I fall in that category.

Count me as one *young* vote for progress.

Charles F. Johnson, W51E
Denison, TX

Phase Out A.M.?

Editor, *CQ:*

It appears to me that the time is right to propose the phasing the a.m. method of broadcasting out of ham radio. For about ten years s.s.b. has been gaining favor as the best method to use and at the same time the best method for conserving spectrum space. During this same span of time the modern manufacturing techniques have produced transmitting and receiving equipment that excells in quality and capability.

Enough new and used s.s.b. equipment is now available so that no operator should be compelled, because of price, to maintain an a.m. station. I'm not going into the merits of a.m. vs. s.s.b. except to say that s.s.b. is the superior method just as jet engines outperform piston types.

The need to conserve spectrum space is sufficient justification to phase out a.m. broadcasting on the amateur bands. I'd like *CQ* to suggest a proposal that would set a future date, 1975 or so, after which to prohibit the use of a.m.

This thought is not new. Maritime mobile is going s.s.b. Aviation is almost entirely s.s.b. or f.m. as well as nearly every other form of two-way communication except amateur radio which —while striving for perfection in RTTY, f.m.,

[*Continued on page 93*]

Announcements

Announcements

Announcements for pending events that are to appear in this column should be at CQ at least THREE months prior to the date of the event. For example, this column (September) is prepared in June. Please submit material as early as possible to assure publication.

Contest Logs

Please send in *early* for all contest logs. Last minute requests are filled in order, those with an s.a.s.e. accompanying the request going out first. Allow enough time for delivery in time for the contest.

Memphis, Tennessee

The Greater Memphis ARC will hold a Hamfest September 17 at the State Technical Institute, located on Interstate 40 east of the city. Prizes, Flea Market, Tech talks, MARS meeting, XYL activities, food. The event will start at 8 A.M. until 5 P.M. Talk-in on 2 meters .34-.94, .22-.76, 75 meters 3.980. For information write: Evin Perdue WB4VDH, 239 Kenilworth, Memphis, Tenn. 38112.

Edmonton, Alberta, Canada

The Golden Jubilee Hamfest of the Northern Alberta Radio Club will take place September 16 and 17 at the Silver Slipper Saloon on the Edmonton "Klondike Days" Exhibition grounds. Registration, which will begin at the Hamfest side on the evening of Friday, September 15, to the Sunday morning breakfast in the park will be $1.00 per child. Activities include technical and social events, bunny hunts, technical contests, a banquet and a casino in the saloon, plus valuable prizes. Bring along the kiddies and the XYL. Camping facilities available. Listen on 80, 40, 20, 15 and 10 and on 2 meters for VA6NC, the special Hamfest station. We'll have special QSLs for all contacts.

Peoria, Illinois

The Peoria Area Amateur Radio Club, Inc. will hold its 15th annual Hamfest Sunday, September 17, at Exposition Gardens, located on the northwest edge of Peoria. Lunch will be available. There will be activities for the entire family, beginning with the campsite opening the preceding evening and a banquet. Free coffee and donuts from 9 to 9:30 A.M. (CDT). Free swap section, parking, contests, cartoons for the kiddies. Advance registration $1.50, at the gate $2.00. For further details and advance registration write: Wendell McWilliams, WN9DVJ, Box 1, Rome, Illinois 61562.

Melbourne, Florida

The 7th Annual Melbourne Hamfest sponsored by the Platinum Coast A.R.S., will be held September 16 and 17 at the Melbourne Civic Auditorium. The time for the Hamfest

will be from 9 A.M. to 4 P.M. Bring your gear to sell or trade. Plenty of paved parking. Registration is $1.50 for adult, children free. For more information write: Donald E. Sanders, W4BWS, 1422 Virginia Drive, Melbourne, FL 32935.

Walla Walla , Washington

The Walla Walla Valley Radio Amateur Clubs 26th Annual Family Picnic and Hamfest will be held September 23 and 24 at Jefferson Park Field house in Walla Walla. Swapshop, contests, homebrew and antique radio display. Annual meeting of MINOW and NW SSB groups. Lunch at 12:30 Sunday will be potluck. Coffee and punch furnished both days. Free registration. Talk-in on 3.960 and 146.76 mHz. For more information write Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WN 99362.

Malaga, New Jersey

The South Jersey Radio Association (K2AA) will hold its annual Hamfest Sunday, September 10, at Molia Farms, located just off Route 47 at Malaga Lake, Malaga, N.J. Activities will start at 10 A.M. and there will be a variety of contests, games and displays, plus prizes for amateurs, wives and children. A protected pavilion and tables will be provided for Swap Shop participants and special parking for those who prefer to display their surplus gear and parts in the trunks of their cars. Picnic and protected swimming facilities will be available. Advance registration is $2.00 per family or $3.00 at the gate. Write to Fred Holler, W2EKB, 348 Bortons Mill Road, Cherry Hill, NJ 08034 for tickets and Swap Shop reservations.

Environmental Net

The Midwest Conservation Net meets at 1500 GMT (10 A.M. CDT) on 7180-7181 mHz. The members will discuss environmental problems of all kinds and what can be done about them. All amateurs are welcome to check in.

Stolen Equipment

On June 4, 1972 a Variotronics IC-2F with mike was stolen from a motel in Kansas City, Kansas. Call, WØFWY and social security number (515-05-9029) engraved on back of chassis and microphone. Vinton G. Johnson, WØFWY, P.O. Box 151, Farmington, Mo. 63640.
A Swan Cygnet Model 270, Ser. #313022 and a Collins mic Model MM2, Ser. #4294 were stolen from the car of Saul A. Cohen, K4ACJ, on June 4, 1972 while he was in San Francisco, California. If you have any information on the units. Contact Saul at 4524 N. Michigan Ave., Miami Beach, Florida 33140.

Santa Maria, California

This year's Southwest Division ARRL Convention will take place October 21-22 at the Santa Maria Convention Center. Camping space available on the grounds plus free parking areas. Convention headquarters will be the Vandenburg Hotel. For additional information write: Robert W. Tauxe, Box 695, Santa Maria, CA 93454.

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Q AND A

WILFRED M. SCHERER, W2AEF

Loading With Antenna-Matching Coupler

QUESTION: I recently obtained a Drake MN-4 Antenna-Matching Coupler. It worked out very well with my Tri-Band Beam and Galaxy Transceiver, but now I'm having a loading problem with an inverted-V trap antenna for 40 and 80 meters. I can't get the rig to load properly. The Galaxy manual says that unless the first plate-current dip is below a certain point, the impedance is below the transmitter's matching capability and some change must be made at the antenna.

I thought that by quickly dipping the p.a. and then adjusting the coupler for a minimum s.w.r., this would change the impedance to 50 ohms, but apparently this is not the case as the plate current remains excessively high with the loading control set at minimum. It seems that whenever I adjust the MN-4 for minimum s.w.r., the plate current goes up. This was with the initial dip at no loading at all.

ANSWER: The problem with obtaining the proper operation with the MN-4 in the above case evidently is simply a matter of the adjustment procedure. We suggest that you start tuning up with a small amount of drive (detune the exciter-drive control), adjust the p.a. plate for resonance (dip) or, better still, for maximum output; then adjust the MN-4 coupler for a minimum s.w.r. reading. Now retune the p.a. and further reduce the s.w.r. if possible. Then increase the drive somewhat and recheck the s.w.r. or try to bring it lower if need be. When it is 1.5:1 or better, apply full drive; load and tune the p.a. for maximum output. Don't worry about the plate

Q & A is a free technical assistance program offered by **CQ** to its readers. We ask your cooperation to enable us to assist as many amateurs each month as possible. Always include a self-addressed stamped envelope with your question. Only one question per letter, please. Before writing to ask where a published article appeared, try to find it yourself by consulting the annual indexes of the various amateur magazines. Mail questions to: **CQ** Q & A, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

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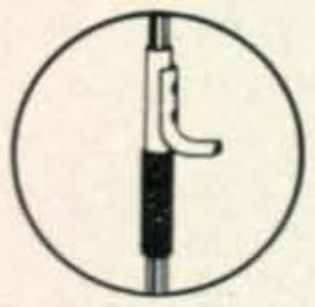

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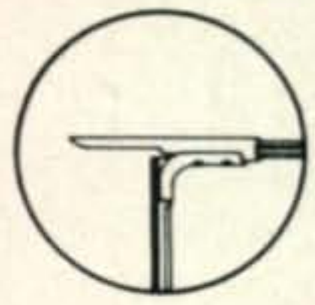

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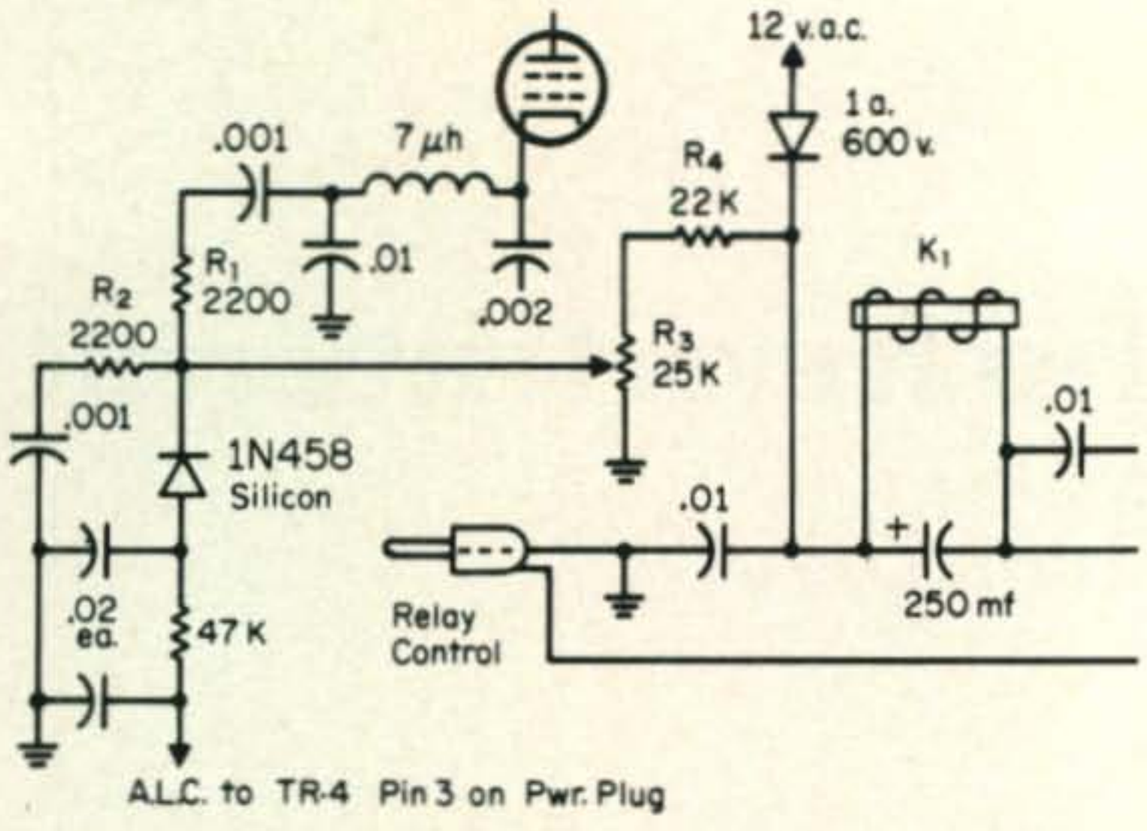


Fig. 1—Suggested circuitry for installing a.l.c. in Swan 1200 for use with Drake TR-4. R_3 is the threshold control to be adjusted for desired degree of a.l.c. R_1, R_2 and R_4 may have to be juggled somewhat in value for proper operation.

current. As long as you're adjusted for the maximum possible output with full drive, the plate dissipation should be okay. Note that when the s.w.r. is high (which it may be before you get the coupler adjusted) it will affect the p.a. plate tuning, so you have to recheck the p.a. tuning each time you significantly change the s.w.r. Also use a short cable between the MN-4 and the transmitter. On 80 meters, try either the 80A or 80B positions on the coupler. If the above suggestions do not help, either the coupler is defective or the antenna system is way out of whack.

Also note, that the coupler does not change (or improve) the s.w.r. on the antenna transmission line. It only makes the line *look* like a low s.w.r. to the transmitter.

Transceive With NC-300 And Central Electronics 20-A

QUESTION: Never quite believing in transceivers, when I received my Advanced license I stayed with separates. A National NC-300 and a Central Electronics 20-A have given me good performance, but now I should like to build an adapter that would give me transceive operation with them. I'd like to use the crystal oscillator, amplifier, etc., modules offered by International Crystals. Could you refer me to any back issues of magazines or give suggestions on this project?

ANSWER: Combining the NC-300 and CE 20-A for transceive operation would require taking the outputs from all the NC-300 oscillators, mixing them along with crystals in an adapter to provide an output frequency equivalent to that normally used at the oscillator for the 20-A. A touchy problem here might be getting rid of spurious mixing products which could get you in trouble with the FCC! I therefore do not recommend such a course, unless you have the know-how and the proper test gear for setting up such an affair.

A basic idea on combining gear for transceive work is written up in *CQ*, April 65, p. 30 under the title, "A 75A-4/HT-32 Transceiver."

A.L.C. With Swan 1200 Linear and Drake TR-4 Exciter

QUESTION: Can you devise an a.l.c. circuit for the Swan 1200-watt linear amplifier for use with a Drake TR-4?

ANSWER: A suggested setup for incorporating an a.l.c. system with the Swan 1200 and the Drake TR-4 is shown at fig. 1.

Keying Monitors

QUESTION: Have you any articles on c.w. keying monitors?

ANSWER: Articles on c.w. keying monitors may be found in past issues of *CQ* as follows:

"Beeper—A Keying Monitor," (r.f.-actuated), February 1960, p. 45.

"A C.W. Monitor for Grid-Block Keyed Transceivers," April 1965, p. 62.

"A Self-Powered C.W. Monitor," August 1965, p. 36.

"Keying Relay and Monitor," October 1965, p. 45.

"A Cheap and Simple C.W. Monitor," February 1966, p. 58.

"C.W. Monitor with a Switch," (r.f.-actuated code practice oscillator), May 1966, p. 62.

"A Keying Monitor in the Key," (several designs of transistorized keying monitors for use with grid-block or cathode keying of transmitters), September 1967, p. 87.

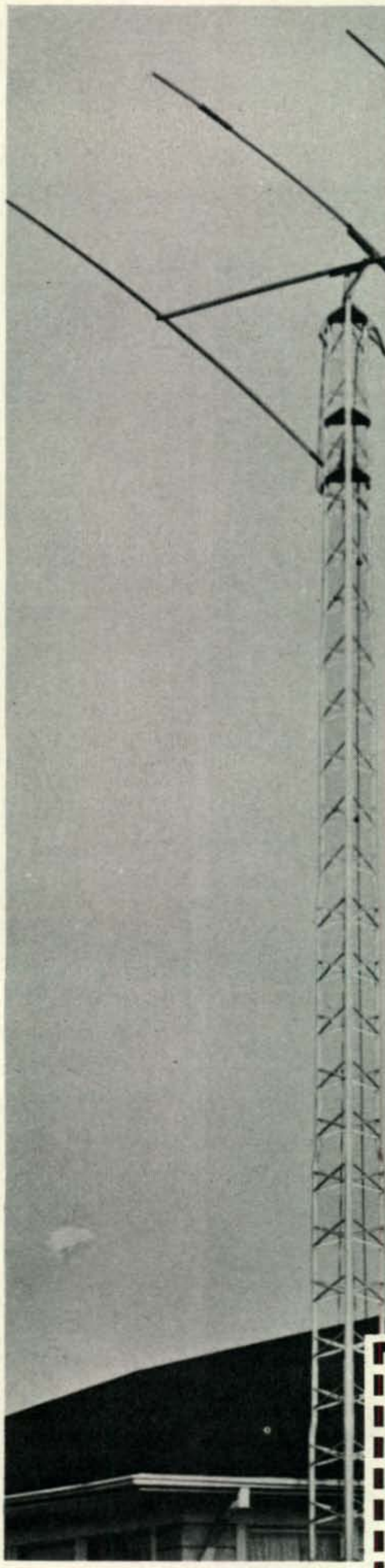
"A Side-Bridge C.W. Monitor," (built into s.w.r. bridge by which it is activated), August 1971, p. 31.

D.S.B. Data

QUESTION: Where can I obtain technical data and some construction information on d.s.b. gear?

ANSWER: 133 pages of data relating to d.s.b. gear will be found in the "New Sideband Handbook" by Don Stoner. It is obtainable for $3.00 from the *CQ* Circulation Department.

73, Bill, W2AEF



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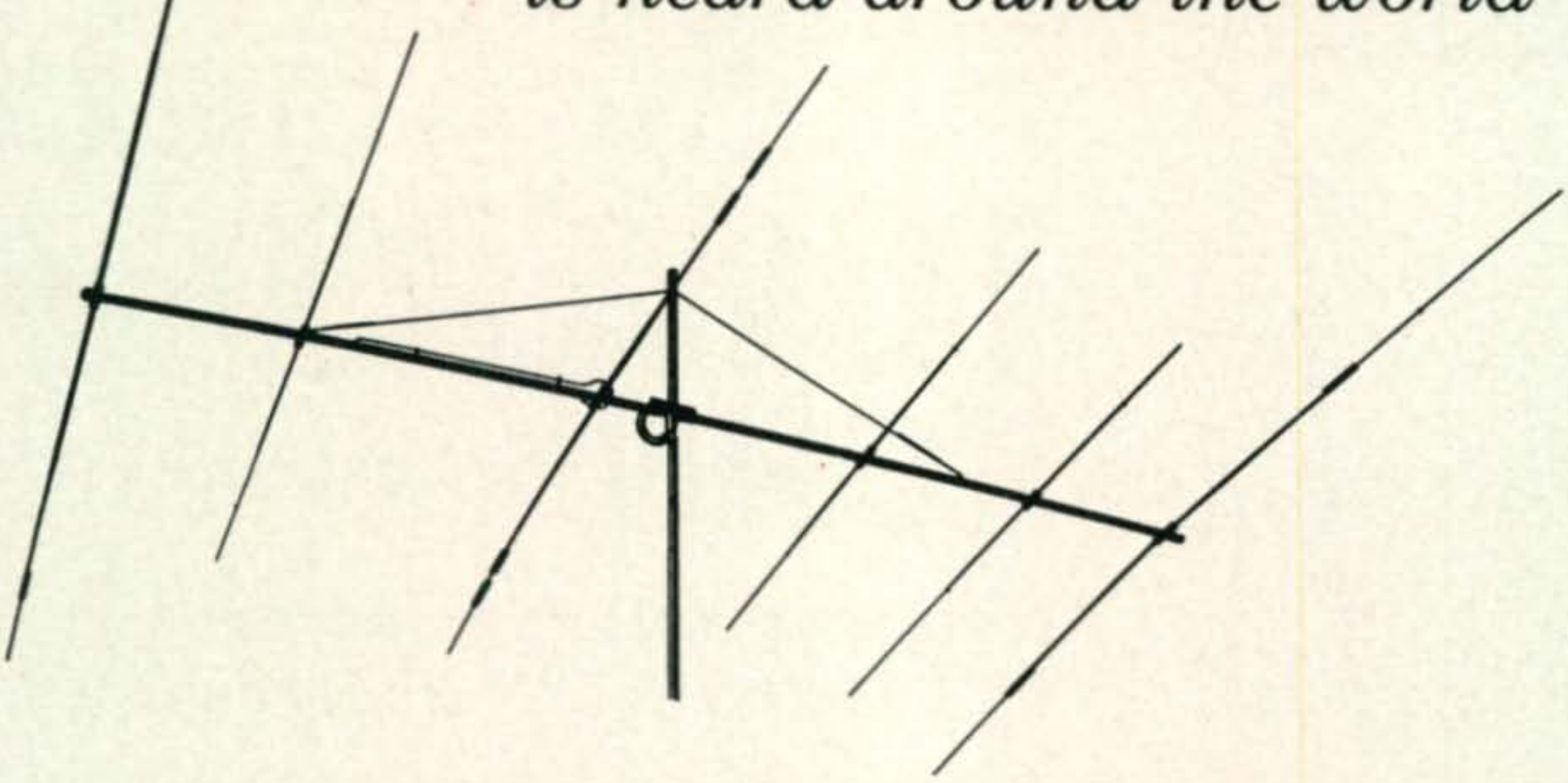

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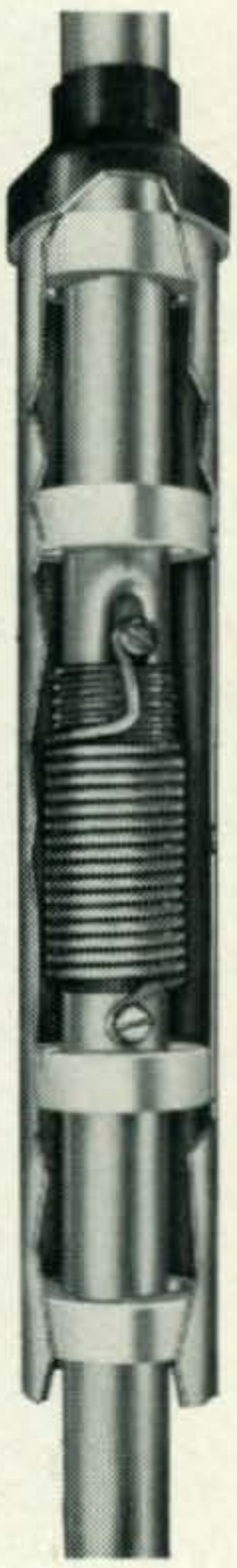

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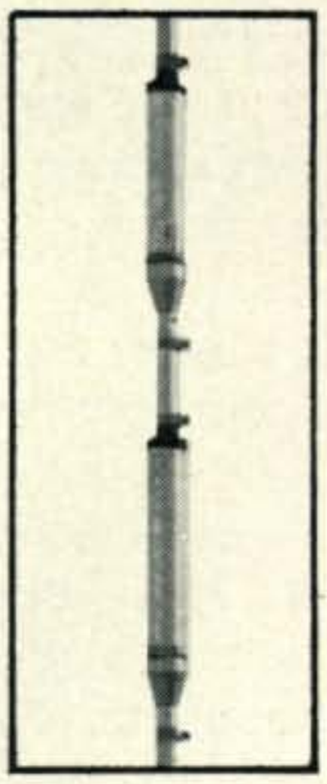

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Slow-Scanning COLOR

BY W. H. DE WITT,* W2DD

Color Adds A New Dimension To Slow-Scan Television

DURING the past year the writer has had the pleasure and the excitement of transmitting color photographs to several other amateurs, including what is believed to be the first intercontinental slow-scan television color picture transmission to (simultaneously) ZS5PP and ZS6UR. In addition to the South African contact, other color photos have been sent to VK3LM, GW3DZJ, and WA6RNG. Color photos have been received from PAØLAM, VK3LM, and WA6RNG. Color prints documenting these contacts are on hand.

The system used in these contacts combines principles of color photography over a hundred years old with state-of-the-art SSTV. Anyone who is experienced in slow-scan operation, has a film camera, a few filters, and a tape recorder can join the fun. Some knowledge of photography is helpful but not necessary. The results? Careful effort yields good pictures! But let me warn you, the fascination of your first slow-scan color picture may leave you chained to a new phase of amateur television!

Everyone (well, almost everyone!) knows that you can't see color pictures on an SSTV monitor. All you can see are those black-to-greenish-white images which we choose to call monochromes. How does this system work? A color subject is televised through three primary color filters. The camera output is tape-recorded. Recordings of several frames (per color) are played back to create monochromes representing the three colors on the monitor screen. These monochromes are photographed onto daylight-balanced film through the corresponding color filters to produce exposures in the red-, green-, and blue-sensitive layers in the film equivalent to a direct camera exposure to the subject. Upon processing, the film produces a color photograph.

On the cover of this issue are several reproductions of color SSTV subject material, transmitted images and the intermediate stages which combine to produce a color photograph. These reproductions are lettered A through H, and will be referred to in the following text. Simulations of photos C, D, and E are also reproduced within this article for convenience and comparitive purposes.

Now let's take a look at the block diagrams at fig. 1 to get a little more detail. ("How-to-do-it information" appears at the end of this article.)

For practical reasons it's best to make up a color tape for transmission rather than to try to make lens adjustments and filter changes "live" as they say on TV. Let's consider the generation of a local or "closed circuit" picture. First, the subject is illuminated evenly with two photoflood lamps in reflectors. Several slow scanned frames are then tape recorded from the camera with a red filter over the TV camera lens. This sequence is followed by similar sequences of frames with a green, then a blue filter. By using these three filters, we have separated the total color information in the subject into its red, green, and blue components—and now we have a color picture on tape. Having separated the picture into its color components, our problem is to put it back together again. So let's rewind the tape!

*Photographic Technology Division, Eastman Kodak Company, Rochester, N.Y. Correspondence should be addressed to Mr. DeWitt at 2112 Turk Hill Road, Fairport, N.Y. 14450

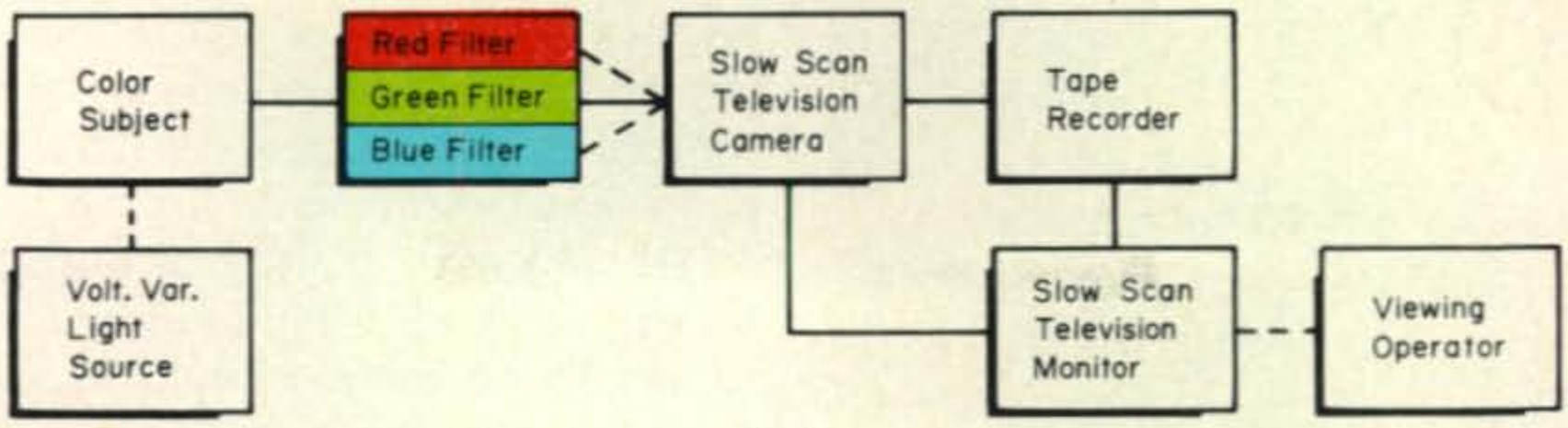

Fig. 1—(A) Block diagram of tape recording cycle to produce a color tape from a color photograph. (B) Tape playback cycle to produce color photograph from recorded tape.

While playing back the "red information" on the station SSTV monitor, the monitor screen is photographed onto daylight-balanced color film using a red filter over the camera lens. Without moving the camera or advancing the film, two more exposures are made using a green, then a blue filter as the appropriate color information is played back from the tape. This triple exposure puts all of the color information back together again. The film really doesn't care whether it sees all three sets of color information at once or separately. It just puts all of the exposures together, and when it's processed, produces a color picture like those on the cover.

If this all seems at bit complicated, take a look at fig. 2(A), 2(B), and 2(C). These closed-circuit photos show how the three separate exposures produce images in the red-, green-, and blue-sensitive layers of the film. However, when all three layers are exposed, the dyes combine to produce a full color print (or slide) as seen in Photo B on the cover. This approach to color photographic printing has been in use for years in motion-picture and photofinishing color printing systems.

Now let's see how the pieces of this system affect the quality of the results. And just to keep everything in perspective, let's remember that commercial TV is said to have about 250,000 visible picture elements. Our slow-scan TV system gives us about 16,500 visible picture elements! With this kind of built-in limitation, the need for good control of all system elements is all the more important.

A test object that includes a gray scale, saturated colors, and flesh tones will make it easier to estimate color balance and density adjustments. The writer's choice of the red cardinal shown in Cover Photo G (which established new migratory patterns for this colorful bird) was made because of expected red reproduction problems. However, as you can see in Photo A, the photogenic Ms. Gail Fox makes color SSTV even more fascinating.

Cover Photographs

Photo A—Direct photo of W2DD color test chart. (Female model photo courtesy of Eastman Kodak Co.)
Photo B—Photo of closed-circuit display on monitor screen made by color separation exposures as described in the article.
Photos C, D, E—Single color exposure resulting from photographing the red, green, and blue playbacks through corresponding filters. Closed-circuit.
Photo F—Color transmission by PAØLAM as tape recorded by W2DD.
Photo G—Original W2DD color test chart. (Courtesy of *Wildlife Magazine*. Photograph by Thase Daniel).
Photo H—W2DD transmission tape-recorded by ZS6PP.
All photography by W.H. DeWitt, W2DD unless otherwise noted.

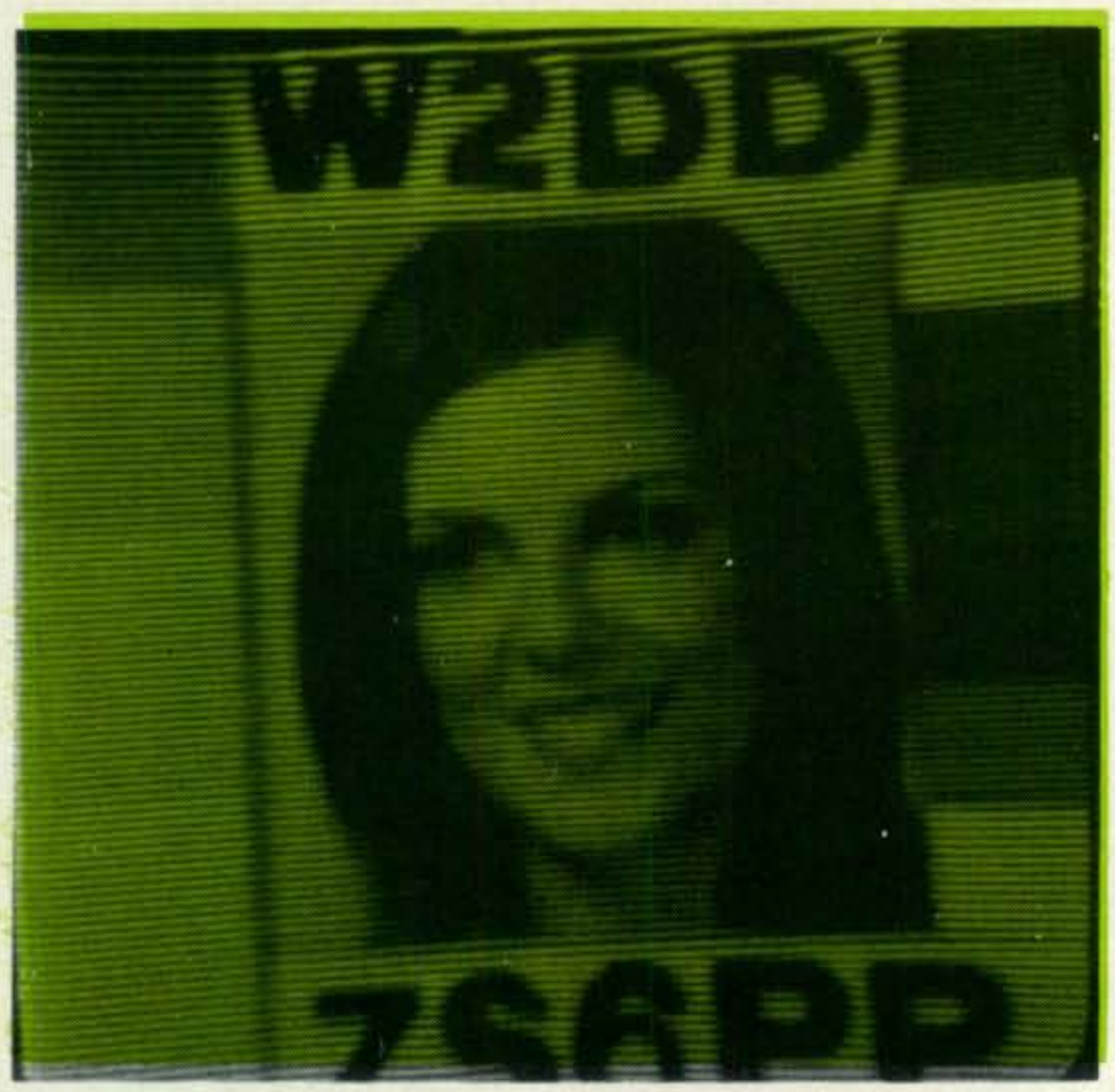

Fig. 2—Single color exposures produced by photographing the red, green and blue. Tape playbacks through corresponding filters. Closed circuit.

The problem of getting a satisfactory color balance can be greatly reduced by using photofloods or movie-lamps to illuminate the subject. High-wattage tungsten lights or floodlamps have insufficient blue and green output.

The physical stability of both the TV and film cameras must be good or sharpness will suffer. The cameras should be supported by a rugged tripod or clamped to a firm support like a desk or counter-top.

To simplify the task of making triple exposures, use a film camera with a bulb setting on the shutter. Cameras with interlocking shutter-cocking and film-advance mechanisms present a problem, but the bulb exposure setting will permit you to open the shutter and time the exposure with a lens cap. If your camera has an electronic shutter you can put a piece of black tape over the photocell sensor and time the exposure by holding down the shutter release.

All of the prints shown on the cover and within this article were made from Kodak Ektachrome-X film 35mm slides. We used this daylight-balanced film because it makes it easier (than would be the case for tungsten-balanced film) to obtain similar exposure times for all three colors when photographing the monitor screen. The shortest possible time for exposing a color picture in this system (24 seconds) is attainable by using Kodak High Speed Ektachrome film (Daylight) in a camera with an $f/1.9$ lens. However there is an advantage to be gained in multi-frame exposures, which we will discuss next.

Sometimes it's all too obvious that the signal-to-noise ratio is a visible thing in television pictures. But the signal-to-noise ratio of pictures received in the slow-scan system under conditions of intermittent noise or QRM can be improved by a technique that might be called signal integration. Signal integration is accomplished by photographing a several-frame playback. If the noise or interference is not continuous or cyclical, the repeated exposure of the film will result in at least partial elimination of the noise in any one frame. The film captures information that your eye cannot store. The net result is a photo that is considerably better than would be expected from viewing the individual frames.[1] This is graphically illustrated in fig. 3A, 3B, and 3C which show the average quality of the red, green, and blue frames received from W2DD by ZS6PP. The final

[1]This technique can also be used in black-and-white photography.

picture quality resulting from these frames is shown on the cover in Photo H. A picture of equal quality was made from a tape recorded by ZS6UR. Completely hopeless frames were eliminated in making the pictures from signals received by ZS6PP and ZS6UR, but you can see that the average quality of the frames was not very good. This technique worked beautifully in a two-way picture exchange with WA6RNG, but was effective with continous QRM on PAØLAM's signal (see Photo F on cover) The information storing capability of the tape and the information integrating capability of the film are certainly very useful tools! The image sharpness speaks well for the Robot Monitor design.

We determined by measurement that the color separation filters mentioned earlier reduce the amount of light reaching the Vidicon target sufficiently to lower the contrast as well as the brightness of the picture. To insure that the three monochromes will appear on the monitor screen with equal and correct contrast, the TV camera lens must be opened up by differing amounts for the three filters. (What we're trying to do is to make the film "think" it has seen the original subject instead of three greenish monochromes!) The direct photos of the W2DD color charts and their SSTV equivalents (see cover) illustrate how well this can be done.

The typical exposure conditions for SSTV color photos shown in Table 1 were determined using a Robot Research Monitor with the amber-colored filter in place. If you have a homebrewed monitor it is important that you use a Plexiglas No. 2208 (as used by Robot) or equivalent filter over your monitor screen. As an alternative you can use the Kodak Light Balancing Filter No. 85B over your camera lense. It will be much easier to get a good color balance in your pictures if you use either of these filters, however you will find that adjustments of the Table 1 values will be necessary. If you do not use a filter, your pictures will probably turn out rather blue and over-exposed.

VK3LM, John Wilson, reports that many VKs are using tubes that have been re-phosphored. The E-26 phosphor used in these "Down-Under" tubes is apparently a dual type, with output across the entire visible spectrum even though the screen as viewed has a predominantly orange color. From the limited data at hand we would expect these tubes to be satisfactory for the color system

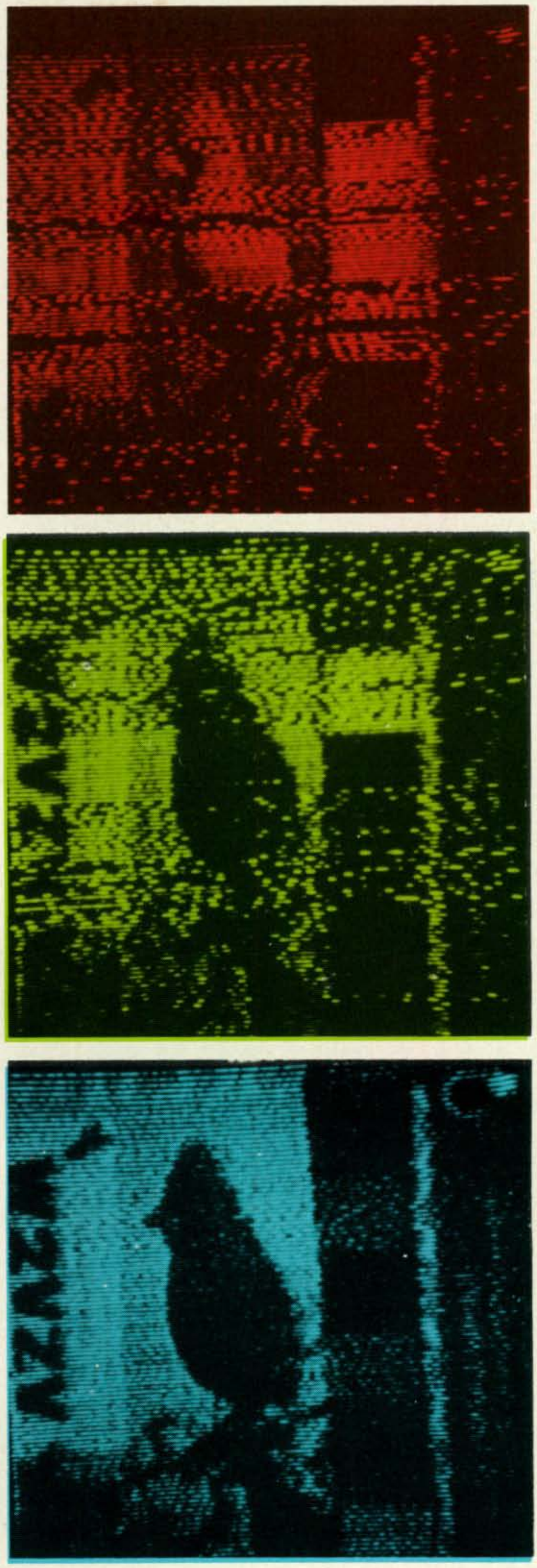

Fig. 3—Typical frames of red, green, and blue. W2DD transmission tape-recorded by ZS6PP used in producing cover photo H. Note the strong presence of noise interference which is minimized in the composite cover photo H.

Table 1—Typical Exposure Conditions for SSTV Color Photos

	Red Filter		Green Filter		Blue Filter	
	Frames	f Stop	Frames	f Stop	Frames	f Stop
Ektachrome—X Film	12	8.0	5	8.0	10	8.0
	6	5.6	2	4.5	5	5.6
	3	4.0	3	6.0	3	4.5
	3	4.5	1	3.5	2	3.5
High Speed Ekta—Chrome Film	12	11.0	5	11.0	10	11.0
	2	3.5	2	4.5	2	4.0
	6	8.0	2	6.3	5	8.0
	1	2.8	1	3.5	1	2.8

These are average values based on normal viewing brightness and contrast settings on a Robot Monitor (with the amber filter in position). Adjustments in these values will be required to accommodate for differences in CRT screen brightness, contrasts and phosphor characteristics.

described here. (However, adjustments will have to be applied to Table 1.) No amber-colored filter should be used with the E-26 phosphor. We recommend reducing the red exposure and increasing the blue exposure from that suggested for the P-7 phosphor.

If your CRT has an orange-colored (single) phosphor, don't expect this system to work. Color films require exposure in all three color sensitive layers. With no blue emission from that orange phosphor you will get a two-color picture. There is an alternate method of producing color photos via slow-scan that will work with any color phosphor, but we have avoided using it so far because it is more complicated.

A few suggestions based on experience and correspondence with other color SSTV addicts:

1. Keep a record of lamp voltage, TV camera, monitor and film camera settings.
2. Identify each color segment on your tapes by voice, counter number, or marker in the scene.
3. Avoid small detail in the subject.
4. Use a close-up attachment or auxiliary lens on your film camera to optimize image size.
5. When photographing the monitor, work in a darkened room. Stray light will ruin the color balance of the picture. Avoid reflections off the monitor screen.
6. Take precautions to avoid camera movement or vibration. Although we have already described the steps of recording and playback for this system in some detail, the "How-to-do-it" section listed below should make it apparent that the system is not too complicated after all.

How To Make A Color Tape

1. Illuminate the subject evenly and adjust the TV camera lens to produce a sharp picture of good brightness and contrast on your monitor. (Normal monitor setting.)
2. Place a Kodak Wratten filter No. 25 (red) over the camera lens. Open the lens one stop.
3. Record twelve frames on tape.
4. Replace the red filter with a Kodak Wratten filter No. 58 (green). Open the lens another stop.
5. Record five frames on tape.
6. Replace the green filter with a Kodak Wratten filter No. 47 (blue). Open the lens an additional one-half stop.
7. Record ten frames on tape.
8. Rewind the tape to the start, and you're ready to make (or transmit) your first slow-scan TV color picture.

Photographing A Color Tape Playback

1. Set the film camera lens at *f*/8.0, shutter at B (or bulb exposure).
2. Place the red filter over the camera lens.
3. Open the shutter and play back twelve frames of the red recording. Close the shutter.
4. Re-cock the shutter *without* advancing the film. Replace the red filter with the green filter.
5. Open the shutter and play back five frames of the green recording. Close the shutter.
6. Re-cock the shutter *without* advancing the film. Replace the green filter with the blue filter.
7. Open the shutter and play back ten

[*Continued on page 93*]

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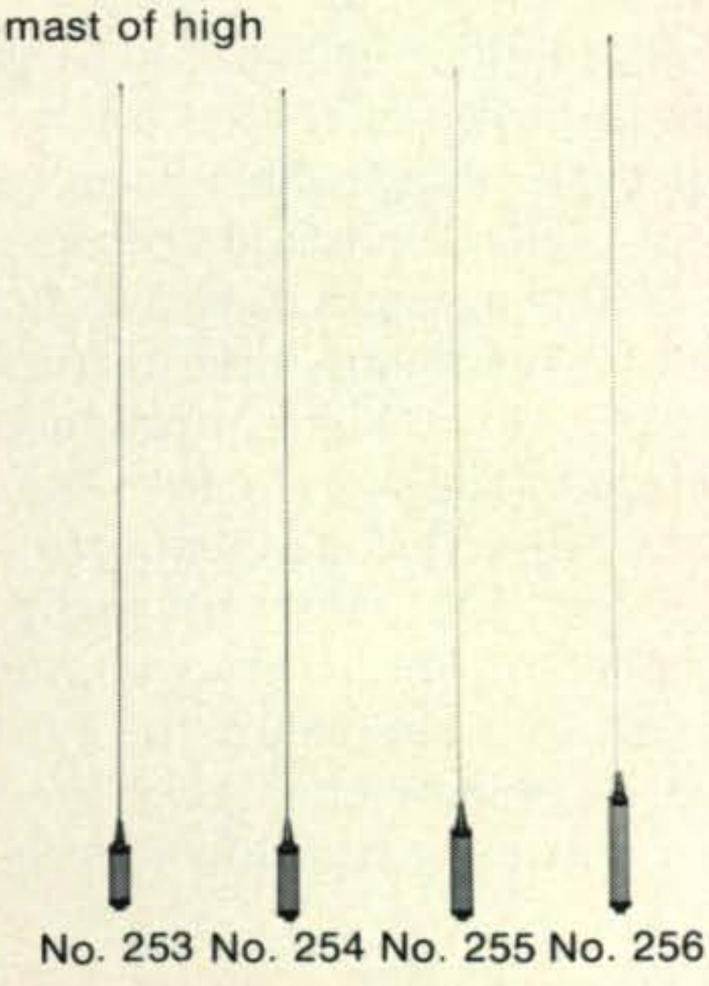

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No. 499

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P.O. Box 5407-FI, Lincoln, Nebraska 68505

Slow Scan TV

BY COPTHORNE MACDONALD,* WA2FLJ

THIS month we will continue our look at the problem of making electrostatically deflected CRT's perform. We will examine a deflection amplifier design, and the problem of keeping 60 and 120 Hz ripple out of the picture.

E.S. CRT Deflection

Because of the very low frequencies involved, direct, or d.c. coupling is necessary in many slow-scan circuits. Back in the days of vacuum tubes, problems of voltage drift due to tube aging and component heating, and poor devices for coupling between d.c. levels (*i.e.*, neon bulbs) made direct coupling the approach of last resort. With today's I.C. op amps and silicon transistors for amplification, and with zener diodes to couple between d.c. levels, stable direct coupled circuits can be readily designed.

Figure 1 illustrates a transistor deflection amplifier suitable for either horizontal or vertical deflection with the electrostatic CRT and power supply circuit shown in last month's column. Two of these amplifiers are required in order to supply both H and V amplification. This amplifier will supply over 500 volts of peak-to-peak deflection voltage (250 volts p-p at each plate). This is more than enough to fully deflect most electrostatic CRT's. The MJE-340 transistors have a V_{CEO} rating of 300 volts. This means that even if the base is connected to a high impedance circuit or open circuit (the worst case situation) the transistors will withstand a collector-to-emitter voltage of 300 volts. Actually, since the 150K collector load resistors limit the collector current to a low value, the supply voltage could be somewhat higher than 300 volts without causing breakdown problems.

Since the normal deflection plate current is in the low microamp range or below, an average collector current (I_C) of 1 ma is sufficient and was selected for this amplifier. At this current level the transistors require no heat sinks, and 1 watt collector load resistors are adequate. You will recall that approximately balanced push-pull voltages are desired to drive the deflection plates, and that these voltages should have the same average value with respect to ground. This is accomplished in the circuit shown through the action of the 36K resistor returned to −75 volts which acts to keep the sum of both collector currents at an almost constant 2 ma. When the voltage at the base of Q_1 is the same as the voltage at the base of Q_2 the collector currents will be equal at 1 ma each, and the voltage at each deflection plate will be +150 volts. Since the voltage between the plates is zero, the spot should be near the center of the screen. If the Q_1 base-to-ground voltage is raised, the Q_1 I_C will go up. Since the sum of the two collector currents is maintained at a constant 2 ma, the I_C of Q_2 drops by the same amount as the Q_1 I_C increase. This gives push-pull output while maintaining the same average voltage at the pair of plates.

While a 0 to +8 volt sawtooth drive is shown, the actual d.c. level can be slightly different (−4 to +4 volt swing for example) provided that the centering pot circuit will deliver a voltage to the base of Q_2 equal to the midpoint voltage of the sawtooth. Since the base current of a transistor equals rough-

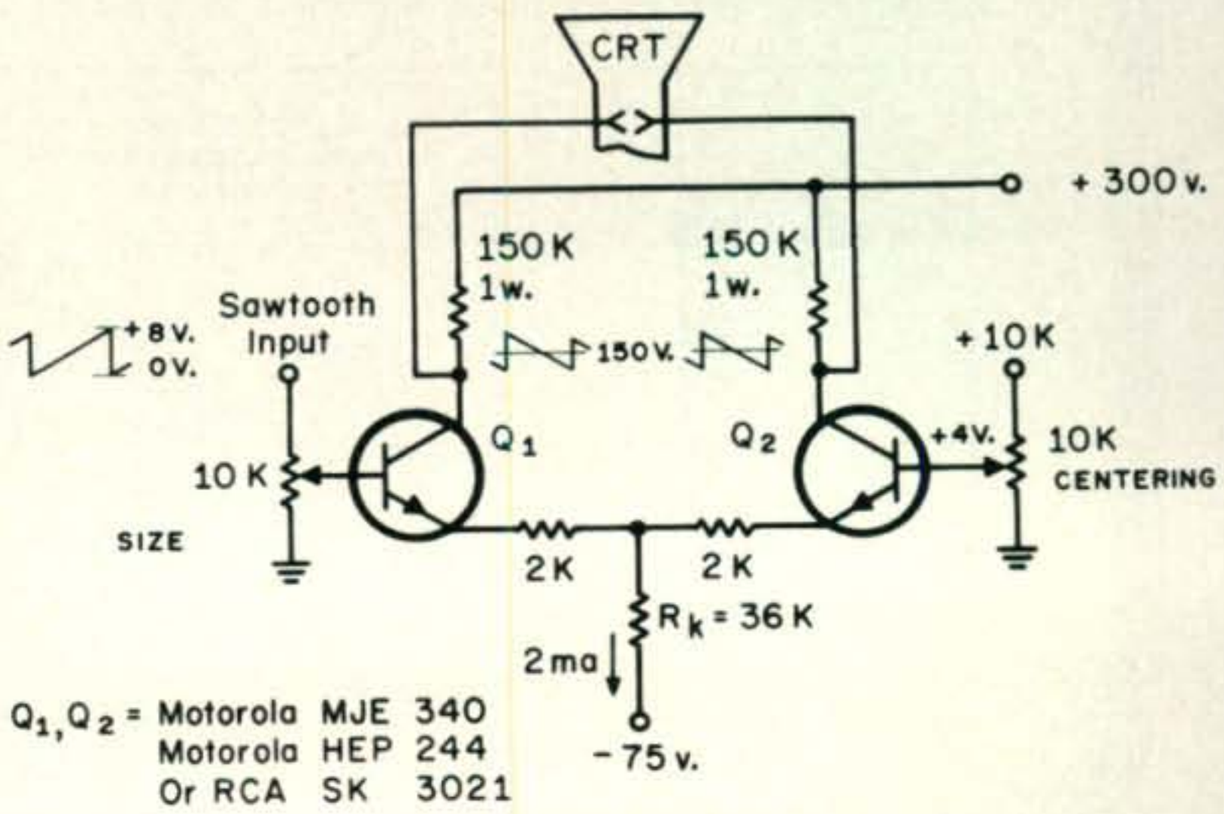

Fig. 1—D.c. coupled deflection amplifier for electrostatic deflection CR tube.

*P.O. Box 261, Forest Park Station, Springfield, Mass. 01108.

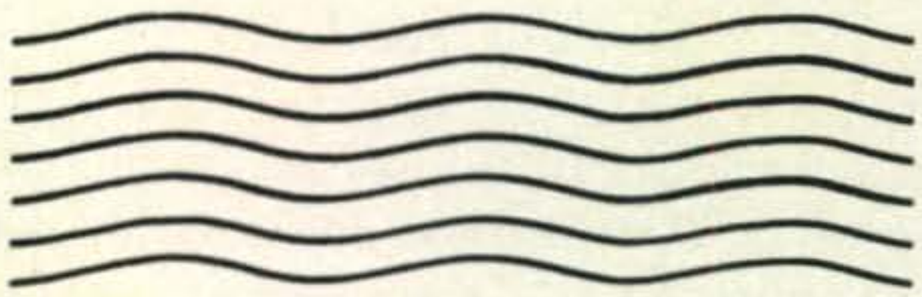

Fig. 2—Exaggerated representation of 60 Hz spurious y-axis deflection of scan lines (synchronized with monitor scan).

ly $I_C \div H_{EE}$ (collector current divided by the large signal d.c. current gain) the base currents may run as high as 40 microamps. Keep this in mind if you change the centering circuit. No problems should be encountered if the resistance of the centering control is kept at 10K or less to ground. If a different negative supply voltage is available, select a value of R_K that will give a current through R_K of 2 ma. (R_K=negative supply voltage/.002). If the negative supply voltage is too low, the linearity will suffer. The negative voltage should be at least −15 volts for good results.

60 Hz Bars and Ripple

So you think you're pretty good at tracking down hum in your audio equipment? Then you're probably ready for the challenge of getting deflection ripple and bars out of your pictures! The first step is to separate the effects of intensity modulation of the beam (which produces vertical black and white bars superimposed on the picture), from a 60 or 120 Hz modulation of the beam deflection (which shows up as a "waviness" of what should be straight scan lines).

To check for intensity (z-axis) modulation, turn the BRIGHTNESS control down almost to cutoff while viewing a blank raster. If wide black and white vertical bars do not show even at very low screen brightness levels, then there is no z-axis problem. If there is a z-axis problem plus a y-axis problem, clean up the z-axis problem first. If a z-axis problem exists, temporarily tie the CRT cathode to the C_1 with a capacitor of several mf. If the bars go away, ripple is being externally coupled into the G_1/cathode circuit. If the bars remain, ripple on the CRT accelerating potential (−2000 volt supply, or ASTIG. supply) is the probable cause.

The y-axis problem is much tougher to isolate and cure. Very few monitors, commercial or home-brew, are totally free of this effect. Figure 2 shows an exaggerated case where the monitor sweep is locked to the interfering power line frequency. When the sweep is locked to the line, spurious deflection of as much as one or two percent is tolerable since the scan lines are parallel and the peaks and valleys in all the lines go up and down together. The real problem occurs when the transmitted signal is not in sync with the monitor power frequency. This will happen when receiving SSTV signals from a part of the world using 50 Hz power, when playing back a tape on an off-speed tape recorder, or even if one of the power line frequencies is slightly off 60 Hz. Figure 3 is a portion of an image that illustrates a mild case of this off frequency problem. A spurious deflection of only 0.2% or thereabout—1/500 of full vertical deflection—is sufficient to cause the degree of "waviness" seen here.

There are three primary causes of this spurious deflection: 1. Ripple on the deflection plates. (60 or 120 Hz ripple just one volt in amplitude will cause visible deflection). 2. Ripple on the −2000 volt accelerator supply. (This modulates the deflection sensitivity slightly so that even if the voltage on the plates is constant, the deflection is modulated.) 3. A.c. magnetic fields penetrating into the CRT.

The peak-to-peak ripple on the deflection plates is easy to check with an a.c. coupled scope or a.c. v.t.v.m. since the ripple will pass through the coupling capacitor, but the 8 second sawtooth does not. Likewise, power supply voltage can be checked for ripple by coupling the scope to the power supply with a .01 mf 3000 volt ceramic capacitor. CAUTION: short the scope input while connecting the capacitor, and when turning on or off the power supply. Failing to do this will subject your scope to a 2000 volt transient.

Assuming that power supply and deflection ripple voltages are below 0.1%, any remaining spurious deflection probably has a magnetic source. A.c. power transformers, and sometimes filter chokes, radiate large 60 Hz

Fig. 3—Enlarged section of monitor photo showing 60 Hz spurious deflection when not synchronized with picture scan rate.

magnetic fields. If you have this problem and are not using a CRT shield, the only solution is to get the CRT several *feet* from the nearest transformer. If you are using a shield, and have the power supply mounted on the same chassis, there are three approaches to lessening the problem:

1. Get a better shield. Some surplus shields are very poor. The shield should be fabricated of .020" or heavier Mu-metal or other 80% nickel high permeability alloy. It should be hydrogen annealed after fabrication for maximum permeability. James Millen and JAN Hardware are in this business and sell to hams through distributors. Find out if the shield you are considering is made to the above specs.

2. Re-orient or shield the offending transformer or choke to minimize the radiated field in the direction of the CRT.

3. Move the power supply to a separate chassis.

Are your changes really improving things? The best way to check is with a search coil mounted temporarily where the CRT normally is, and connected to a sensitive scope or a.c. v.t.v.m. The coil should be some sort of solenoid—a relay coil, a transformer winding off its core, or a telephone pickup coil of the type sold to record telephone conversations. The more turns, the more sensitive. Orient the coil so that it gives the highest possible output in the presence of the offending field. Next, try your modifications and look for the change in coil output. I should point out that the magnetic fields need not be near the deflection plate region of the tube to cause trouble. Check the whole volume from electron gun position to screen position with your search coil.

One last ditch fix to consider is the ancient practice of "hum bucking." In radios before the days of Alnico magnets, the magnetic field was often supplied by a large "field coil." To save money this coil often doubled as the set's filter choke. The hum that would appear in the sound as a result was eliminated by feeding a.c. through another coil in opposite phase to "buck out" the hum. I'm not suggesting extra coils in this instance, but rather the feeding of a small amount of 60Hz, of the proper amplitude and phase to cancel the unwanted magnetic deflection, directly into the deflection amplifier. Naturally, the spurious deflection amplitude would have to be the same over the entire screen for this technique to completely eliminate the waviness.

Finding Goodies

I hope as a continuing part of this column to pass along bits of information given to me about where to find those unusual things that slow-scanners need. Here are a couple of items.

RCA publishes excellent data sheets on their tubes (5UP7, 5ABP7, 3RP7A, and many others). These sheets give lots of information that is extremely useful if you are using an E.S. CRT for the first time. Write to Tube Division, RCA, Harrison, N.J. requesting data sheets on the specific types that interest you. If you are planning a flying-spot scanner, better ask for a 931-A multipler phototube sheet at the same time.

Fair Radio Sales, P.O. Box 1105, Lima, Ohio 45802 lists surplus CRT's, power transformers, and high voltage filter capacitors in their latest catalog. The K1235P7, 5½" square face E.S. CRT they list is a real gem —a number of hams have already built monitors around it.

Pass along your sources of supply for generally needed items, as well as your technical contributions and technical news. Please do not submit any confidential or proprietary information. Send only such information as you are willing to release to the public.

Q & A

Q. I have had little experience with photography. How can I photograph my monitor screen without buying an expensive camera, lenses, etc.?

A. The basic essentials for black and white work are a camera with a shutter that will operate in the "B" or "T" (Bulb or Time) mode, a close-up lens, and a mounting arrangement that will hold the camera in the right position and motionless for the 8 second time exposures required. A variable iris is desirable but not absolutely essential. For several years I took all of my monitor photos with a 1930's vintage Kodak 620 folding camera having a magnifying glass lens taped on the front. The secret is knowing just what that image looks like right at the film plane. To do this get a piece of ground glass (*not opal* glass) from a photo shop. Have a glass cutter trim the glass to the width of the film that your camera uses. Open the camera back and temporarily tape the ground glass in the film plane directly behind the lens; ground side of the glass toward the lens. You can now

[*Continued on Page 94*]

Sixth International YLRL Convention

YLRL's 33rd Anniversary

BY LOUISA B. SANDO,* W5RZJ

"JOIN the Crew in '72!"—This was the invitation enticing YLs to Long Beach, Calif. for YLRL's 6th International Convention. Originally planned for aboard the *Queen Mary*, when the *Queen* was not yet ready the site was moved to the Edgewater Hyatt House, a luxurious motel with the Pacific Coast Highway at its front entrance and at the rear the Long Beach Marina with its hundreds of sail and power boats.

Over 140 YLRLers, plus numerous OMs and guests, did "Join the Crew in '72" for the gala weekend of May 26-28. Upon registering, each YL received a "memory booklet" and for the remainder of the weekend these was a great hustle of book exchanging for autographs and photos, which most YLs had brought, from postage-stamp paste-in size to larger colored ones. Many YLs also brought cute and useful swap souvenirs.

First activity of the weekend was a 3-hour tour of the *Queen Mary* Friday afternoon. That evening W6NAZ, Lenore, treated us to a color slide show, "Apollo Splashdown," put together by her OM, W6VGQ, an NBC engineer assigned to recovery missions. They were behind the scenes shots and gave us a vivid look at some of what goes into making possible the smooth TV space craft recovery presentations.

Throughout the weekend the hospitality rooms were open to all YLs and OMs, club scrapbooks were on display, and two rigs were on the air using the L.A. YLRC call W6MWO/6. (This was the call of Helen Cook, president of YLRL in 1946-47, who became a Silent Key in 1950.) Equipment was courtesy of Swan Electronics and Henry Radio, with antennas put up by the Long Beach Radio Club.

Adjoining the hospitality rooms members of BAYLARC held open house with all invited to their version of a "splashdown" following the pictured ones. This Mermaid "happy hour" was enjoyed by most of the conventioners, many of whom returned for a "rerun" the following night.

On Saturday, while the OMs made a tour of Swan Electronics, the YLs gathered in the Riviera Room for the Forum. We were welcomed by chairman K6ELO, Roxie, and L.A. Club President WB6DFN, Roberta, who turned the meeting over to YLRL President K7QGO, Mae. All were presented with lovely orchid leis from Hawaii by W7NJS, Beth, and K7BED, Bettie. Enid, W6UXF a founding member as W9NBX and YLRL's president in 1941-42, gave us a few ideas for positive thinking.

Mae described the Stateside YLs to DX YLs program and asked for suggestions for increasing YLRL membership. There also was discussion of life membership, publication of "YL Harmonics," DX contests (and the need for a slow-speed c.w. period in contests to develop more c.w. ops). Hope was expressed that the next convention could be held somewhere on the East Coast. Treasurers

Convention chairman K6ELO, Roxie, opening the YLRL Forum.

*4417 — 11th St., N.W., Albuquerque, N.M. 87107

Presidents of YLRL gather at Long Beach Convention. L. to r., back: W6UXF, Enid (1941-42); W6CEE, Vada (1954-55); W3OLY, Helen (1949-50); WA6AOE, Maxine (1968); W3PVH, Betty (1957); W7HHH, Bea (1952-53); KØEPE, Marte (1969). Front: W3CDQ Liz (1944-45); K7QGO, Mae (1972); W7NJS, Beth (1958); K5BNQ, Doris (1961). W3CDQ was congratulated for her 50 years as a ham (she began in radio 5 years earlier, in 1917, with a commercial ticket).

W6YKU, Jackie, and K6HHD, Jan, gave financial reports. Messages were read from DX YLs and YLs present were recognized, including Frances Lacebal, who operated DU1GSP in the Philippines and now resides in the L.A. area; W3CDQ, Liz who has held her ham license for 50 years and always operated c.w. (!); youngest YLs WN7OXZ, Laura (13) and WA1NHK, Kelly (11): WB6BBO, Louise, YL Editor of *QST*, and your reporter.

At 12:30 we gathered in the Empire Room for the YL luncheon, which was graciously MC'd by W6NAZ, another of our founding members (as W9CHD). This convocation was convened to celebrate YLRL's 33rd anniversary, since "33" is an important symbol to YLRL members. Innovated by W2RUF, Clara, it means "Love sealed with friendship between one YL and another YL." In honor of our 33rd birthday all tables were decorated with lovely 3-tiered blue and white birthday cakes topped with large silver 33 numerals, all the work of members of the North County YL Radio Club. (Non-edible, but one YL at each table could take a "cake" home for a souvenir.) Also, for each YL there was a lovely ceramic pin, bearing "33" and flowers, the work of W6YZV, Mable, and her daughter Judy. Mounting the pins was another contribution of the North County YLs.

Sister Charlotte K6VFE, offered the invocation and W6UXF, Enid, read some selections from her books of verse. More YLs were recognized, including W6WSV, Carol, who was one of YLRL's founding members as W9WWP. At this time, also, K6ELO started a basket around for contributions to up-date our book, *CQ YL*, and when it reached W5RZJ it contained $85.10! (Book pages should be available by early winter; if you wish a set, mail an SASE to W5RZJ, QTH as shown.)

Our afternoon entertainment was a color slide show, "Perils of Christine & Her Antennas," with most of the FB photography and all of the antenna raising by WB2YBA, Chris (an M.D. on the staff of several N.J. hospitals). The pre-registration prize was drawn and was won by WA6ERS, Ruth—a beautiful hand-hooked rug in blue and white "girl-on-the-globe" design, the work of W6QGX, Harryette.

Following an Aloha Hour, evening found us again gathered in the Empire Room for a gala luau—and what a colorful sight, with YLs in bright flowing mumus or long dresses; OMs in gay shirts, and leis, of either live

flowers or plastic, on one and all. Tables were decorated with huge bright paper flowers. Mistress of ceremonies was K6KCI, Irma, of "Sunny Santa Barbara" fame. To complete the Hawaiian atmosphere, we were lead in Songs of the Islands by W6BDE, Esther; W6-CBA, Vi, and WA6GQC, Elsie. Further entertainment was a fast-paced world tour in color slides by W7QYA, Flo, titled "Beyond Box 88, Moscow," in which we met on the screen many DX hams.

Prize drawing completed the evening and prize chairman WA6ISY, Myrtle, with members W6MWU, Mary, and WN6's FUT, Shirley, and FUU, Candace, had done a noble job of rounding up so many prizes that each YL present received at least one. Many individual YLs and clubs donatd prizes and/or stamp books with which to obtain them. The main prizes, a Swan transceiver, was won by K7ESA, Dottie, and a Bear Cat 3 by WA6-BNS, Meta. Other prizes included handmade afghans and shawls, silver bowl, painting, ceramic pieces, trays, dried flower arrangement, *Callbooks*, magazine subscriptions and many many more. Special OM prizes were drawn for, also.

On Sunday L.A. YLRC members provided a Continental Breakfast in the hospitality rooms with coffee and sweet rolls for all.

In the souvenir program, designed by WA6AOE, Maxine, the YLRC of Los Angeles expressed its appreciation to all who helped make this 6th International Convention possible, and added: "Our affectionate thanks to you all for joining us. We hope your pleasure has been as great as ours." Surely it *was* a "jolly cruise" of YL fellowship and fun and all "shipmates" are grateful to the YLs who labored long and hard to make it the success it was!

Assisting chairmen K6ELO were program co-chairmen K6KCI and W6CEE and members W6NAZ, WA6QKC and W6BDE. Registration was handled by W6VDP, WA6UBU and W6JZA. W6PJU assisted W6YZV with table decorations and publicity was handled by WA6AOE, W6JMC and W6LBO. Tours were scheduled by WB6DFN and W6UHA. Posters were handled by WN6IGG and responsibility for the hospitality rooms rested with WA6QKC, with all members of L.A. YLRC giving a big assist. Special thanks go to W6IOK, Eddie, OM of W6MWU, and to Mary for all the photographic coverage.

Among those attending were several sightless YLs—W7NJS, Beth; WA7LTN, Harlene, and WB6SSZ, Mary Lou. Mary Lou is not only sightless but deaf as well, but copes beautifully by using a very small typewriter on which persons type messages to her and she "reads" them by the vibrations received on her sensitive fingers as the typing is in progress.

Pre-registration prize, hand-hooked rug in blue and white, was made by W6QGX, Harryette (left), and won by WA6ERS, Ruth.

[*Continued on page 87*]

The Luau was a happy affair, as evidenced by the smiling faces of MC K6KCI, Irma; W6NAZ, Lenore, and W6UXF, Enid.

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F. M.

BY GLEN E. ZOOK,* K9STH/5

MANY readers have probably noticed that this column tries to avoid direct confrontations with other publications, especially on trivial matters. However, at times it is necessary to comment on things of national importance. Most f.m. operators are, by now, familiar with the fact that the ARRL published its 220 mHz and 420 mHz band plans in the June issue of QST. It is the opinion of this columnist that the 420 mHz band plan has much lacking. Maybe I've been seeing too many old cowboy movies on Channel 33, but I seem to remember something about "Squatters Rights." That is, one who occupies a piece of land has at least some legal claim to ownership. The same can be said about portions of the 420-450 mHz band. For example, most ATV activity known to this columnist is between 435 mHz and 440 mHz for a video carrier frequency. Since the 435 mHz to 438 mHz segment is now for amateur space allocations, the logical place for the ATV'ers to move to is the 440 mHz center carrier frequency. The same thing can be said for control links, audio links, and other usage. Some of the arguments given by the ARRL for high in/low out repeater operation can be used by other operations, for many of those operations use the same f.m. units modified for their particular use. In the case of ATV, u.h.f. TV convertors will come down to 440 mHz with little difficulty, but require much more work to get down to 420 mHz.

The 220 mHz band plan violates the ARRL's own request that the segements 220.0 to 220.5 mHz and 222.0 to 222.5 mHz be left open. The matter of 3 mHz input/output spacing is a moot point, for this columnist is on record favoring 1 mHz spacing. However, 3 mHz spacing does have its merits, and no contention is made on this behalf.

Fifteen years ago most f.m. operation was by a relatively few on 147.3 mHz, 147.5 mHz, and a very few on 146.94 mHz and other Technician band portions. Since that time f.m. has become the largest user of the v.h.f./u.h.f. bands. However, is it fair to other operators to virtually take over all the v.h.f./u.h.f. bands for f.m. Think what f.m. would be like now if band plans were for a.m. or s.s.b. Sure, we need room for f.m., and band plans are a must to avoid problems. However, must we expand f.m. with little or no regard for existing operations? I think not! Take a look at all operations in your area (a.m., c.w., s.s.b., ATV, f.m., etc.) and let the ARRL, *73*, *Ham Radio*, and *CQ* know just what's going on. Be objective, but let us know how you feel about the proposed plans.

*410 Lawndale Drive, Richardson, Texas 75080.

News

There is scads of news this month, with ham-fests which have taken place and more to come.

Boston: This columnist was privileged to speak at the FM Forum of the Region 1 Air Force MARS Convention May 19-21 in Boston, Mass. Although originally billed as a MARS convention, an attempt to expand the activities to include the non MARS amateur was undertaken. Unfortunately only a handful of non MARS members were present. However, the FM Forum went very well, with a virtually full room. Since Boston was this columnist's first visit into the New England area, a good part of the discussion was to familarize me with some of the facets of local f.m. activities. One thing which favorably impressed me was the efforts by the Air Force MARS training director in the area of f.m. projects. For example, Region 1 Air Force MARS has a home brew 2 meter f.m. transmitter in both tube and transistor formats for construction by members. Printed circuit boards are available along with schematics and other technical

Dallas, Texas, 449.0/444.0 repeater now operational from the Telephone Toll Building. (photo courtesy WA5KHU)

Uplink equipment for the Laurel Mountain repeater. Equipment is RCA.

data. Performance is said to be excellent. Of the people attending the FM Forum, not one had gotten on f.m. with one of the amateur only f.m. rigs. Everyone got started with obsolete commercial gear! One thing somewhat detracted from the overall meeting, namely the lack of exhibitors. I understand that many amateur manufacturers and distributors were invited, but only a handful came. Possibly the conflict with the Orlando (Fla.) Hamfest was the reason. Anyway, the convention was quite good for a MARS meeting, and maybe next year a good group of non MARS members will give it a try.

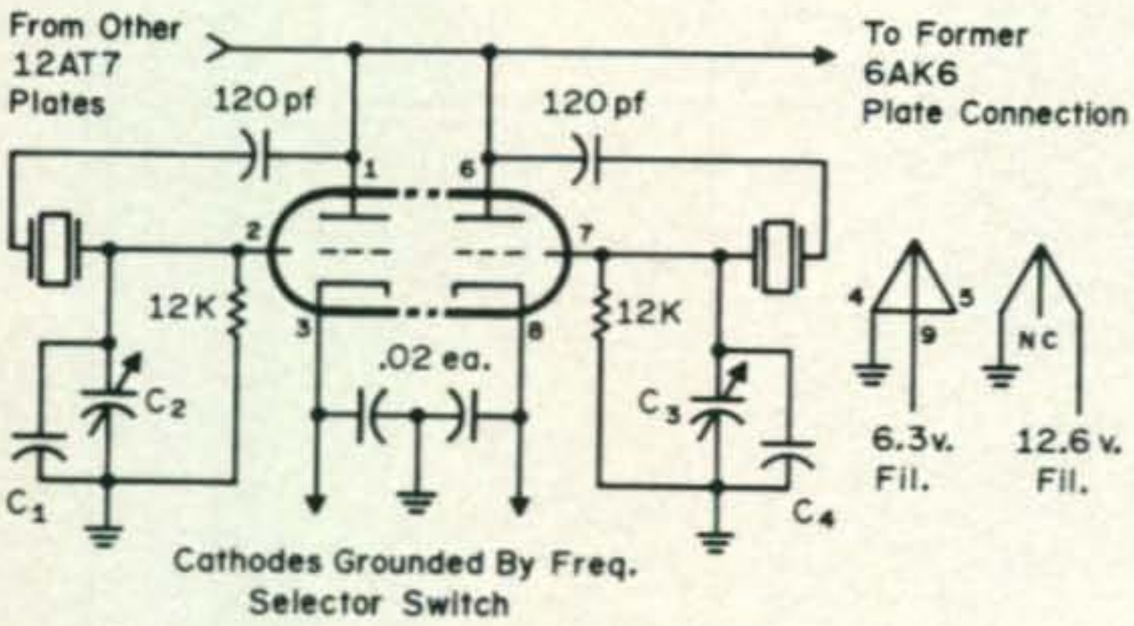

Fig. 1—Schematic of an 8 frequency oscillator deck. A total of 4 tubes are used. Frequency selection is by grounding the cathode of the oscillator tube. It was designed for Motorola RO3 crystals. "A" and "K" transmitters were designed for 6 mHz. However, 3 mHz (fc/48), 4 mHz (fc/36), and 12 mHz (fc/12) will work satisfactorily and can be mixed within the same transmitter. All resistors are 1/2 watt.

C_1, C_4—10 pf NPO or dipped mica 5%.
C_2, C_3—Johnson 160-110-9.

Orlando: On the way back from Boston, Ye Olde FM Editor stopped off in Atlanta to pick up XYL and daughter. The real reason was to get with K4VJM and K4JGK to see what happen at Orlando. First of all, there was no FM Forum this year, but there was a good SERA (South Eastern Repeater Association) meeting. There were about 150 persons present with all 8 voting member associations present. Several things were discussed including the following: A 450 mHz band plan was discussed but tabled for the purpose of gathering more information from around the country; A plan for suggested control link frequencies was also tabled; The Texas 2 meter plan was adopted with the exception that 146.940 mHz be used as a direct frequency and 146.340 mHz be used as an alternate tone-coded input for all repeaters in SERA and for 146.520 mHz to be used for direct work; and it was decided that the association and member groups would write dealers, importers, and manufacturers of the amateur only f.m. units to encourage making the units meet state-of-the-art performance. The next SERA meeting is scheduled in conjunction with the Melbourne, Florida, Hamfest September 16 & 17.

Melbourne: As just mentioned the SERA meeting will be at the Melbourne, Florida, Hamfest. This festive occasion will include the East Coast FM Convention as well as many other activities. As it now stands, this columnist will be one of the speakers at the convention, so if you can stand me, come on down. Registration is $1.50 for each adult, an f.m. banquet (don't know cost at this writing), prizes, etc. For more information contact Convention Committee, PCARS, 1422 Virginia Drive, Melbourne, Florida 32935.

Fresno: FM West was held in Fresno, California, June 2 and 3. Unfortunately this columnist was unable to attend, but a large number of other f.m. notables were present. According to usually reliable sources about 200 persons attended, not too bad for a first effort. Of course the CARC (California Amateur Relay Council) meeting was held with FM West. Although full details were not available as of this writing, it was learned that v.h.f. band plans were adopted for 144, 220, and 450 mHz bands. The 2 meter band plan is identical to the Texas 2 meter plan with the exception that repeater inputs and outputs in the 147-148 mHz region are flip-flopped. That is, high in/low out.

Photos: The roving f.m. cameraman, Tom Riley, WA5KHU, was on the move again, with his polaroid catching the Dallas 449.0 mHz input /444.0 mHz output machine just before its installation on the Bell Telephone Toll Building in Dallas, Texas. Also, K3SIS furnished photos of the Laurel Mountain VHF Society Repeater (Pennsylvania), and the associated remote receiving and link equipment. Well, fellows, how about some photos of **your** repeater.

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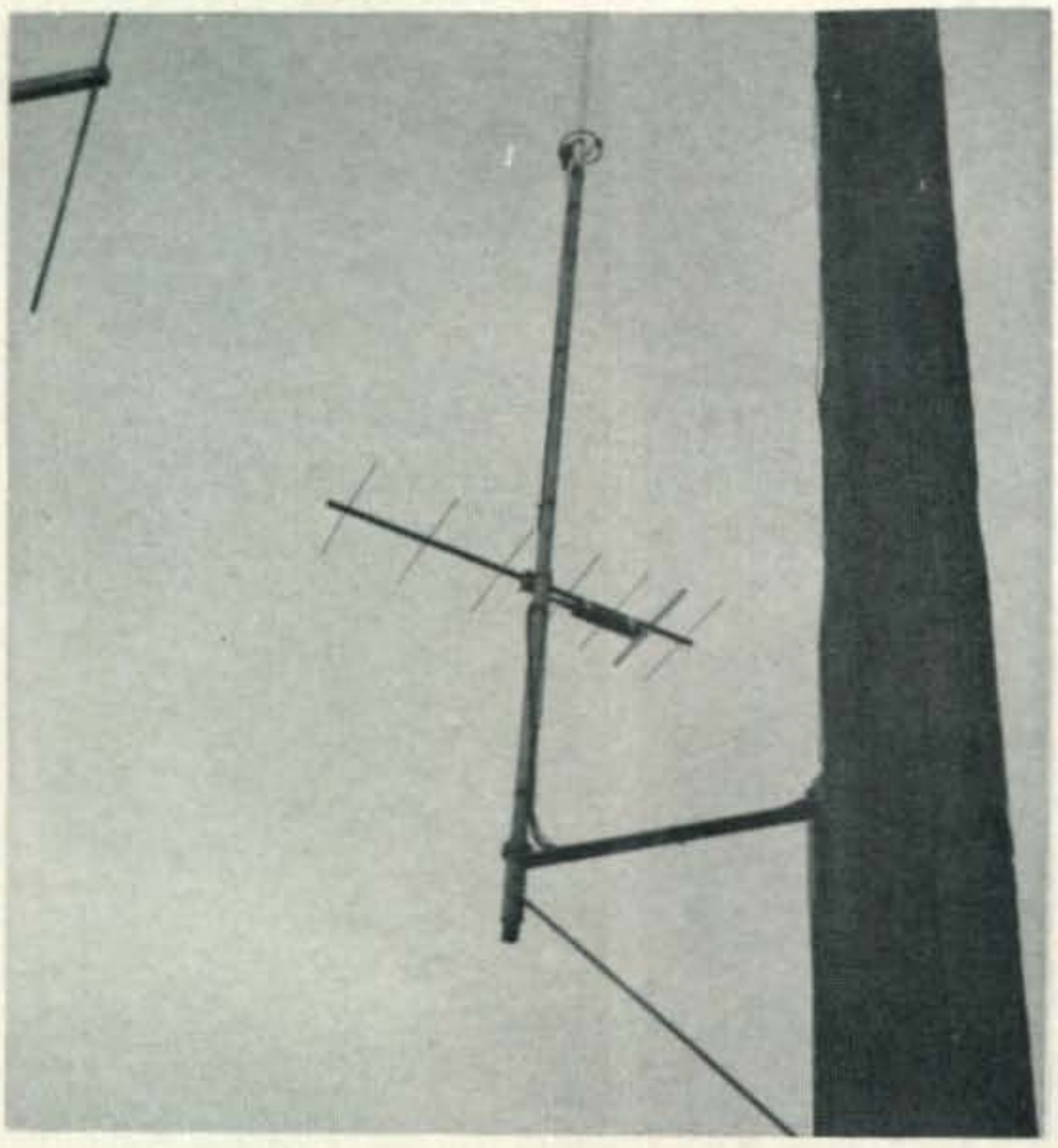


Remote receive site antenna system for Laurel Mountain VHF Society Repeater.

Down link and 146.940 mHz transmitter of Laurel Mountain Repeater. A total of 3 remote 146.340 mHz receivers feed the 250 watt output base. Antenna gain is 5.8 db and location is 2750' above sea level.

Technical Talk

As promised, this month's Technical Talk is back to a construction project. For September we have a multiple frequency deck originally designed for the Motorola "A", "J", and "K" transmitters by this columnist. However, it can be made to work with other transmitters with a bit of experimenting with the fixed capacitors in parallel with the warping capacitor. The deck was designed to physically put 8 frequencies in the space originally designed for three separate oscillator decks in the Motorola high band (2 meter) "A" and "K" units. The low band "A" and "J" transmitters use the same basic original oscillator, so the circuitry works without modification on those transmitters also. On the "J" transmitter the narrow dimension will have to be enlarged.

The idea behind the deck was to be able to use the original type RO3 crystals in the new oscillator. Quite a bit of experimenting was necessary to get the component values just right, but the final result was all eight channels pulling right on frequency. Each channel has its own oscillator, 1/2 of a 12AT7. Since the 12AT7 is a triode rather than a pentode as in the original decks using a 6AK6 ("A" transmitters) or 6AK5 ("K" transmitters) quite a lot of circuit changes were needed in the design of the new oscillator. Getting eight channels into such a small space requires a bit of doing, but it is possible. A total of four double crystal sockets are used (similar to the oven type sockets on the existing decks), and the ovens eliminated from the crystals. Four 9 pin tube sockets with shields are used for the 12AT7's, and the eight trimmer capacitors finish the mounting hardware. The prototype was built on doublesided copper-clad board for several reasons: First of all, the tube sockets could be soldered in place reducing crowding under the plate; ground connections can be easily soldered directly to the copper; and copper-clad is quite easy to work with using hand tools. Care must be taken to lay out the board just as the diagram, for things get a bit tight. However, with a bit of patience everything goes on the board, and then fits nicely into the hole on the transmitter chassis.

[*Continued on page 86*]

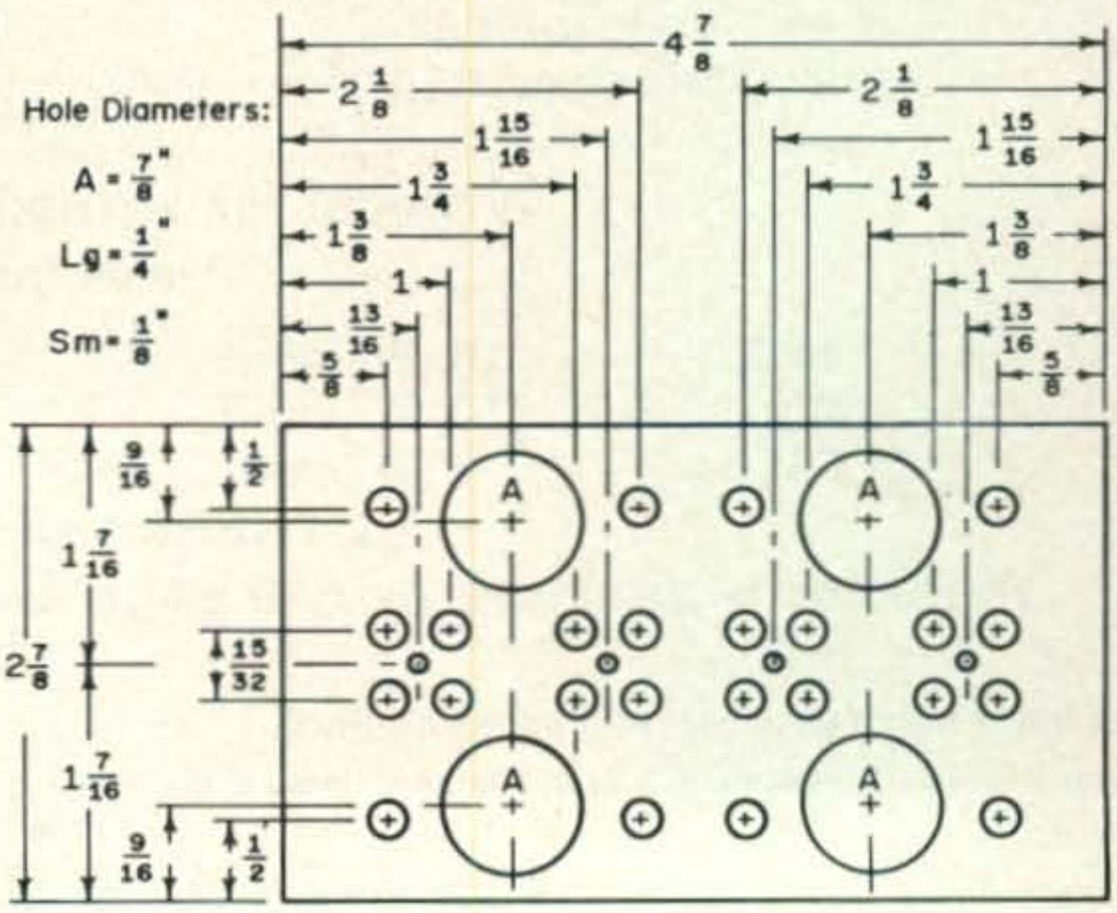
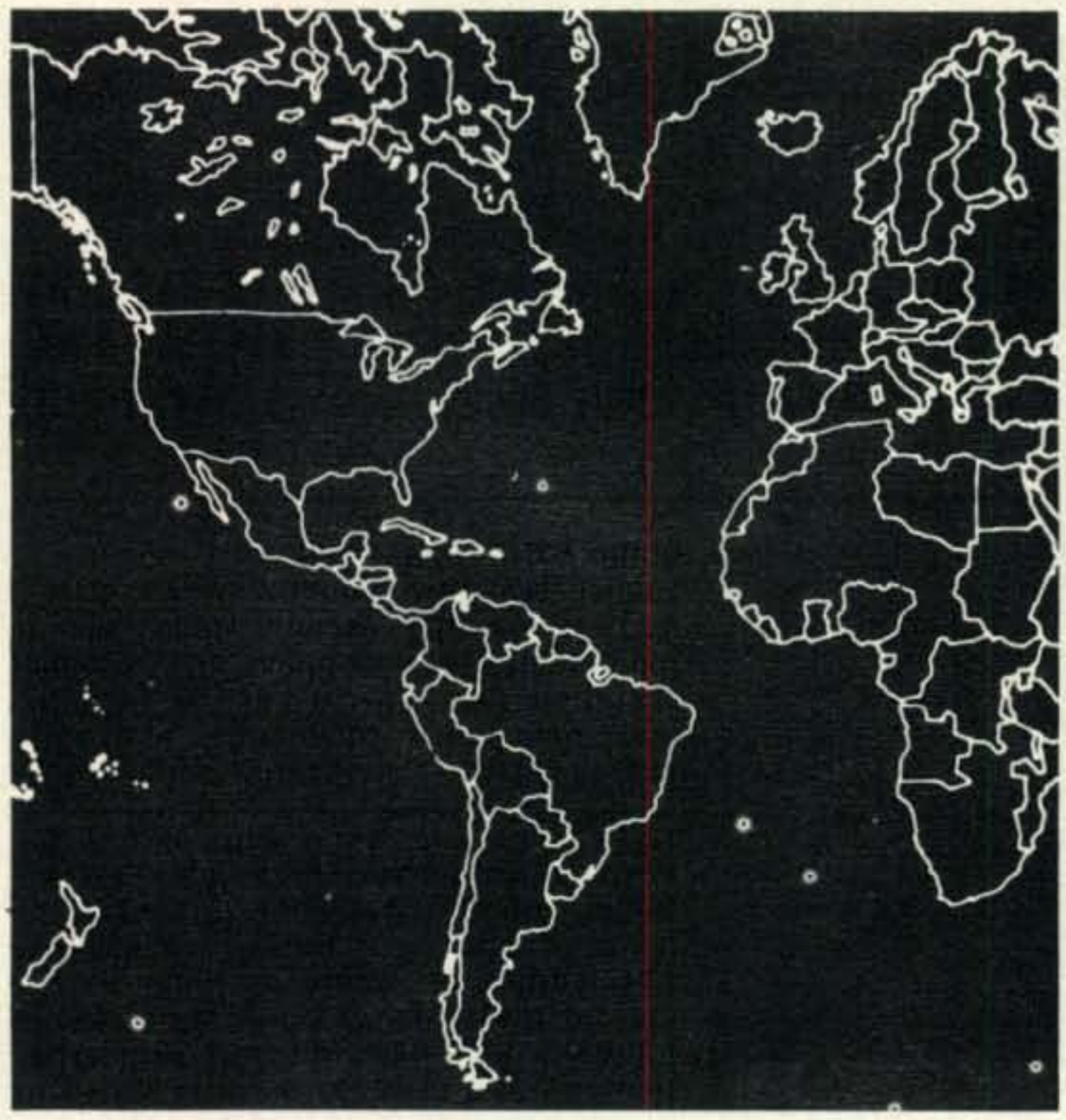
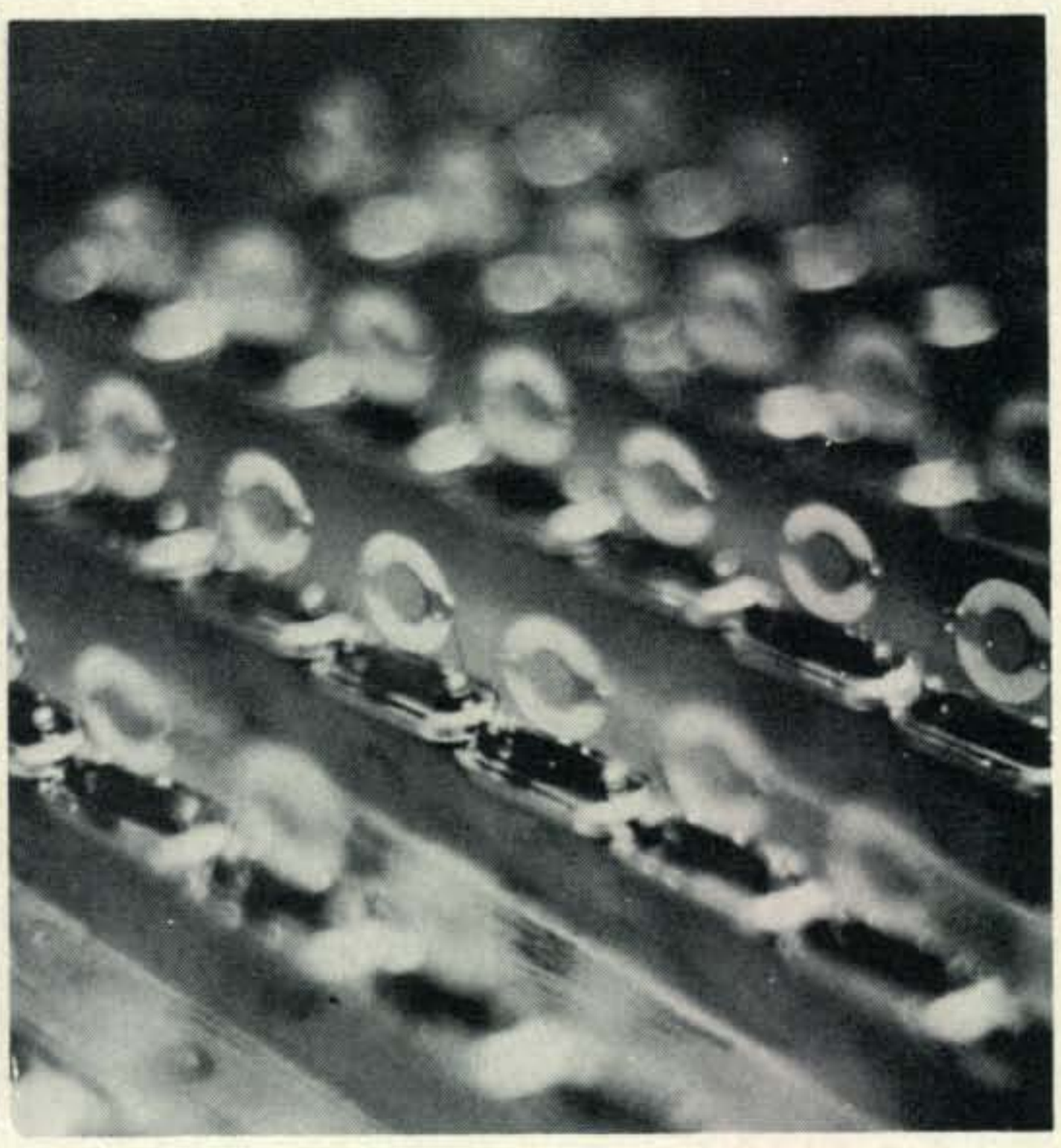


Fig. 2—Layout for the 8 frequency transmit deck. Dimensions are critical. See text for note on tube pin placement.

People who know about quality know about Sentry





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MATH'S NOTES

BY IRWIN MATH,* WA2NDM

It looks like the day of the IC has finally arrived for the communications industry. We don't mean just "partial circuits," we mean, in the words of that TV commercial, "the whole thing."

Lithic Systems, Inc., 10010 Imperial Avenue, Cupertino, Calif., 95014, have recently announced their LP-2000 "transmitter on a chip".[1] This integrated circuit, capable of producing and delivering 100 mw of r.f. power to an antenna, contains an oscillator, driver, output stage, audio pre-amplifier, and a.m. (or pulse) modulator, all in a TO-100 10 pin package, (.370" dia. by .185" high). According to the manufacturer, the device is intended for service in the h.f. and low v.h.f. regions for such applications as hand-held, mobile, airborne and marine two-way radios. Figure 1 is a block diagram of the LP-2000.

The oscillator section is designed for use with an external overtone-type crystal. Also required are two simple LC tanks, tuned to the operating frequency. Two buffer amplifier stages isolate the oscillator signal and drive a unique output stage. This output stage raises the r.f. level to the desired amount and delivers it to the antenna. Connected to the driver and final stages is a dual purpose a.m. or pulse modulator capable of 90 to 100% modulation.

Also present on the chip is a latching system that enables the transmitter to be connected to a power supply and draw any current (or operate) until a signal to the latch turns it on. This feature is quite useful of course, for push-to-talk applications.

To fully appreciate the contents of this transmitter-on-a-chip, a look at a typical circuit (as supplied by the manufacturer) is in order.

Figure 2 is a 27 mHz a.m. transmitter with a fully modulated output of 50 mw into a 50 ohm antenna. This circuit can easily be used for other frequencies by suitable changes in tank circuit and crystal values. B+ for the circuit is 12 volts at 28 milliamperes and only a few millivolts of audio are required for the modulator.

A suitable dynamic microphone for this transmitter would be a standard 3" PM type loudspeaker which could also be used for a companion receiver. The actual component values were not specified by the manufacturer. I must regretfully state that Lithic Systems, Inc. has specifically indicated that the LP 2000 is intended for volume users only and will not be available to individual experimenters at this time. As a result, you will probably have a hard time obtaining one for your own use. It is interesting to note, however, just how far the development of IC's for communication work has progressed. Incidentally, to original equipment manufacturers, this chip is available at a cost of $12.50 in quantities of 100 and up.

To continue along the line of complete transmitter packages, we have received word this month from International Signal and Control Corp., 3050 Hempland Road, Lancaster, Pa., 17601, about a line of FCC type-accepted transmitter boards originally intended for commercial public service use.

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

[1]*Electronic Products Magazine*, March 1972, p. 28.

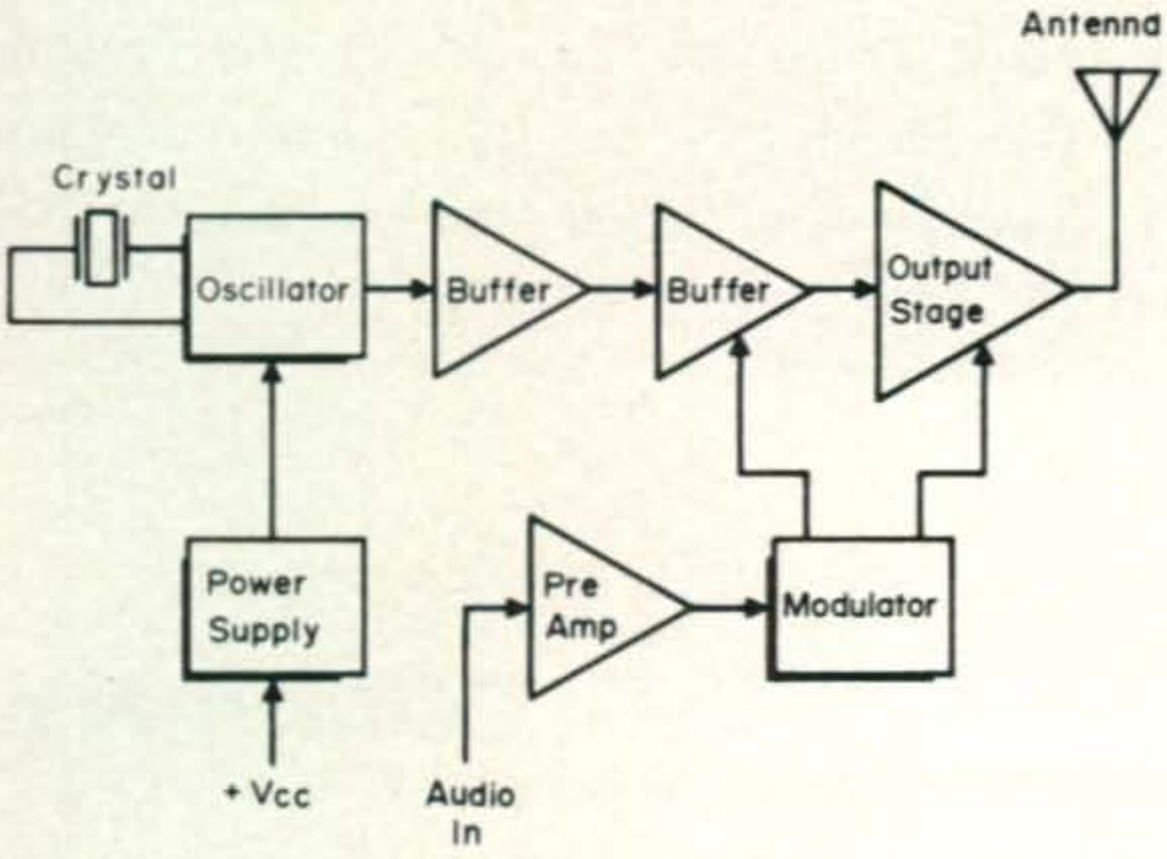


Fig. 1—Block diagram of LP 2000 transmitter IC.

They are very simply modified for use in the ham bands and full instructions as well as necessary components are supplied.

There are 3 fully solid state units available, a 2-meter unit, a 6-meter unit, and a 10-meter unit. All units are fully f.m. with ±5kHz deviation, and measure 3" high × 2½" wide × ½" high. The 2-meter unit delivers 100 mw to an antenna with 8.1 v. of B+ and 70 ma of drain and is supplied with a 146.34 or 146.94 mHz crystal as well as a crystal microphone. Crystals are 8 mHz fundamental units, multiplied 18 times.

The 6- and 10-meter units supply 200 mw to an antenna with an 8.1 v. supply and only draw 60 milliamperes. Crystals are multiplied 6 times for 6 meters and 4 times for 10. All units have built in speech processing circuitry and exhibit normal room temperature stabilites of ± .0025%.

Costs for the units are: For 2 meters, $22.77 each 1-4, and $15.95 each, for 5 or more. All three can be purchased together for only $53.95 and extra crystals are $1.95 each.

With all of this talk about transmitters, we just want to indicate a real clever circuit for a crystal-controlled super-regenerative receiver we have obtained from an old issue of *Electronic Design Magazine* in their "Ideas for Design" column.

Figure 3 is a schematic of the circuit which contains two high frequency transistors connected as a multivibrator with a period of about 20 kHz. The switching action of the circuit causes the r.f. oscillations generated in the crystal feedback path in the tank of Q_2 to also switch on and off at the 20 kHz rate. A received a.m. signal induced into the tank circuit will "modulate" the exact switching point of the circuit at a rate directly proportional to the modulation component of the received signal. All that is now necessary is a simple 20 kHz filter and a high gain audio amplifier and a complete receiver results.

We have built such a receiver at 10 mHz to receive standard time broadcasts from WWV and it works perfectly.

An enterprising experimenter could then use a little transmitter board, a hearing aid integrated circuit audio amplifier, and a uL914 chip to build a *really* small IC transceiver.

In conclusion this month, we would like to indicate some exceptionally good buys we have become aware of from M. Weinschenker, K3DPJ, Box 353, Irwin, Pa., 15642.

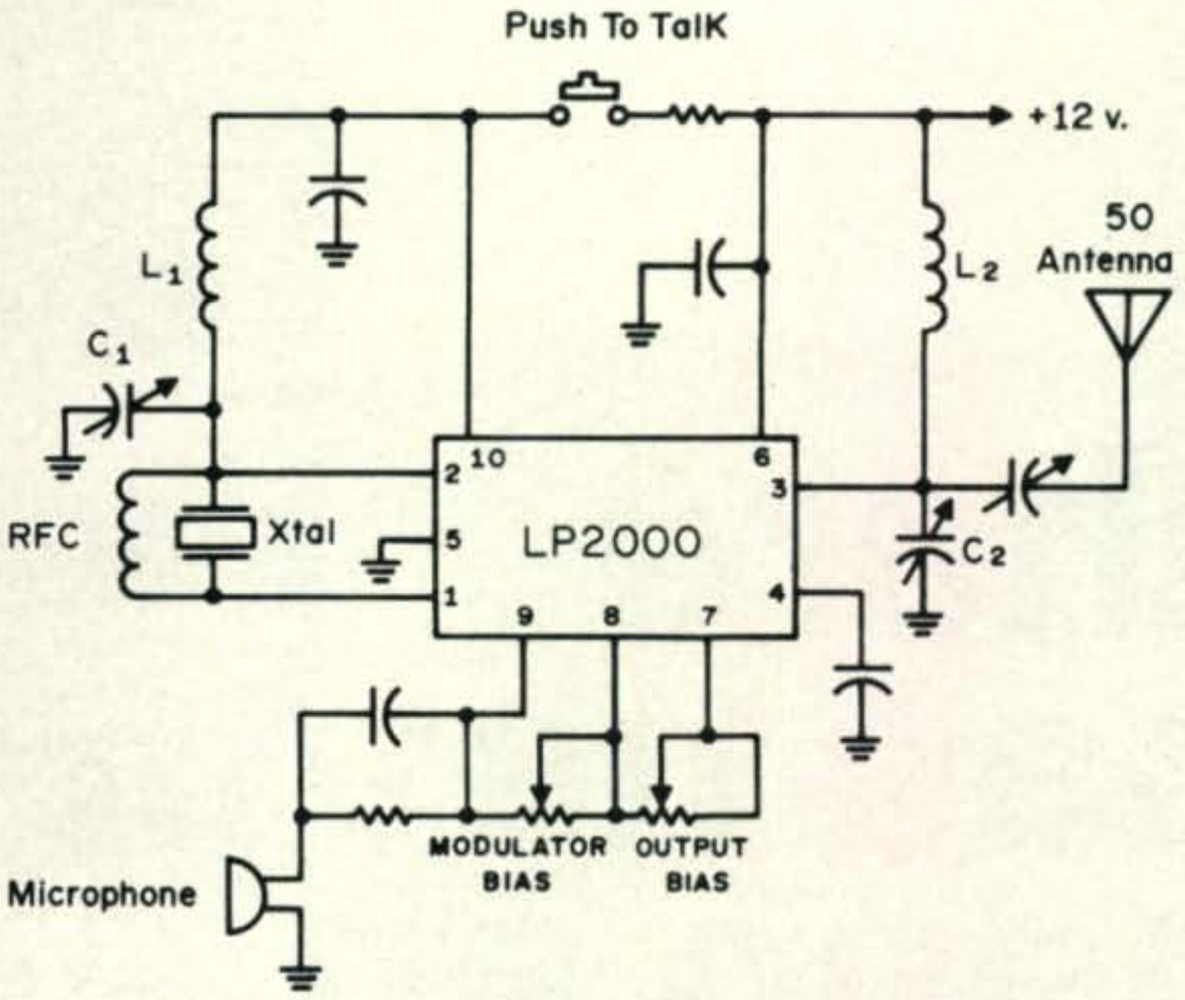


Fig. 2—Simple transmitter described in text.

For the semiconductor enthusiast, zeners are available in all standard values from 3 volts to 27 volts for 400 milliwatt units and 9.1 volts to 180 volts for 1 watt units. Price for any unit is 4 for $1 (10% tolerance). All units are fully tested and guaranteed—try to beat this one! Also available are many other diodes, particularly high current rectifiers for very attractive prices. If you need a 300 PIV 125 ampere unit for only $5 (4 for $18.50), a solid state 5U4 plug-in replacement for $1.50, or a bunch (16) of 1N914's for a dollar, you should have K3DPJ's catalog.

See you next month.

73, Irv, WA2NDM

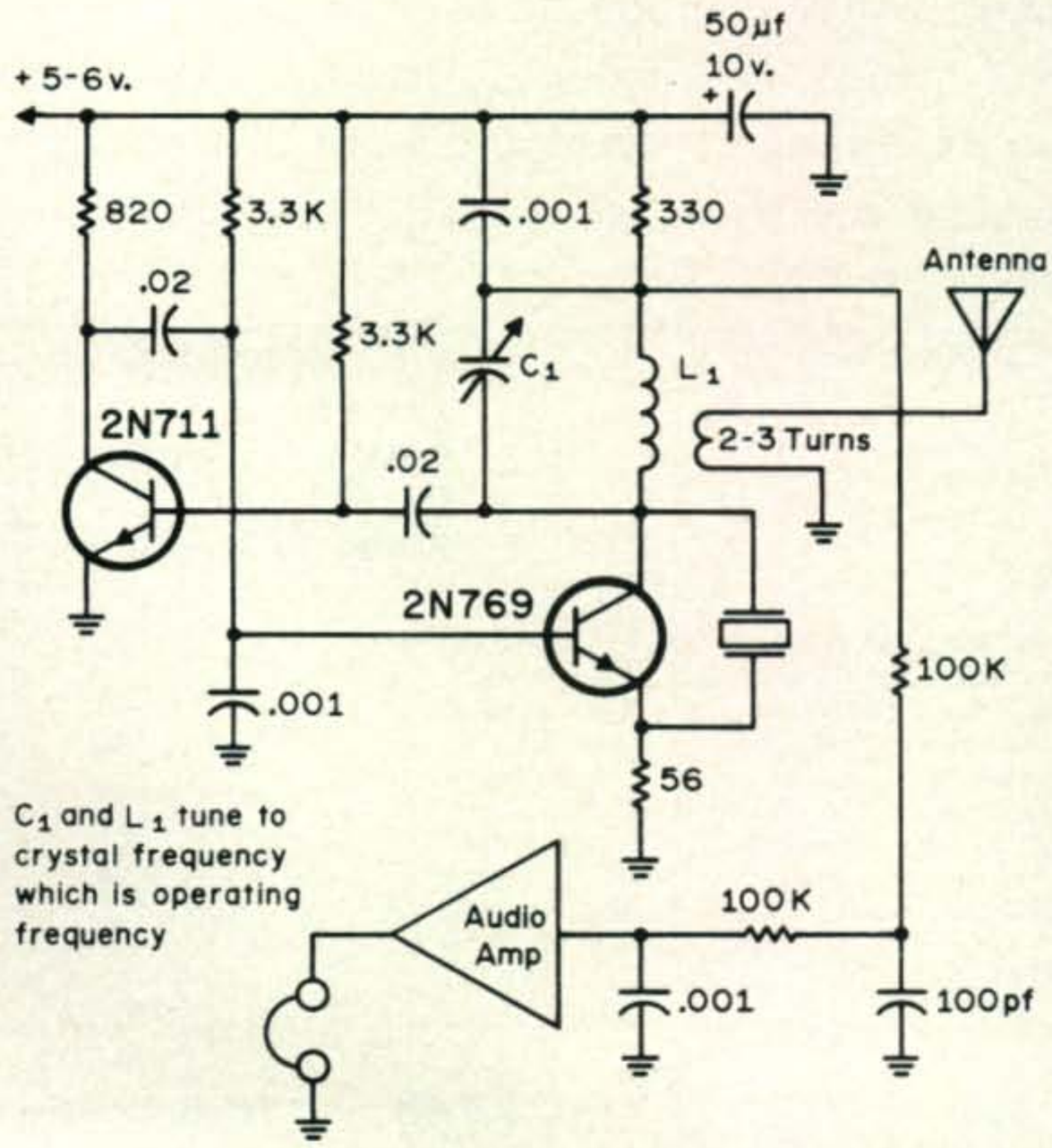
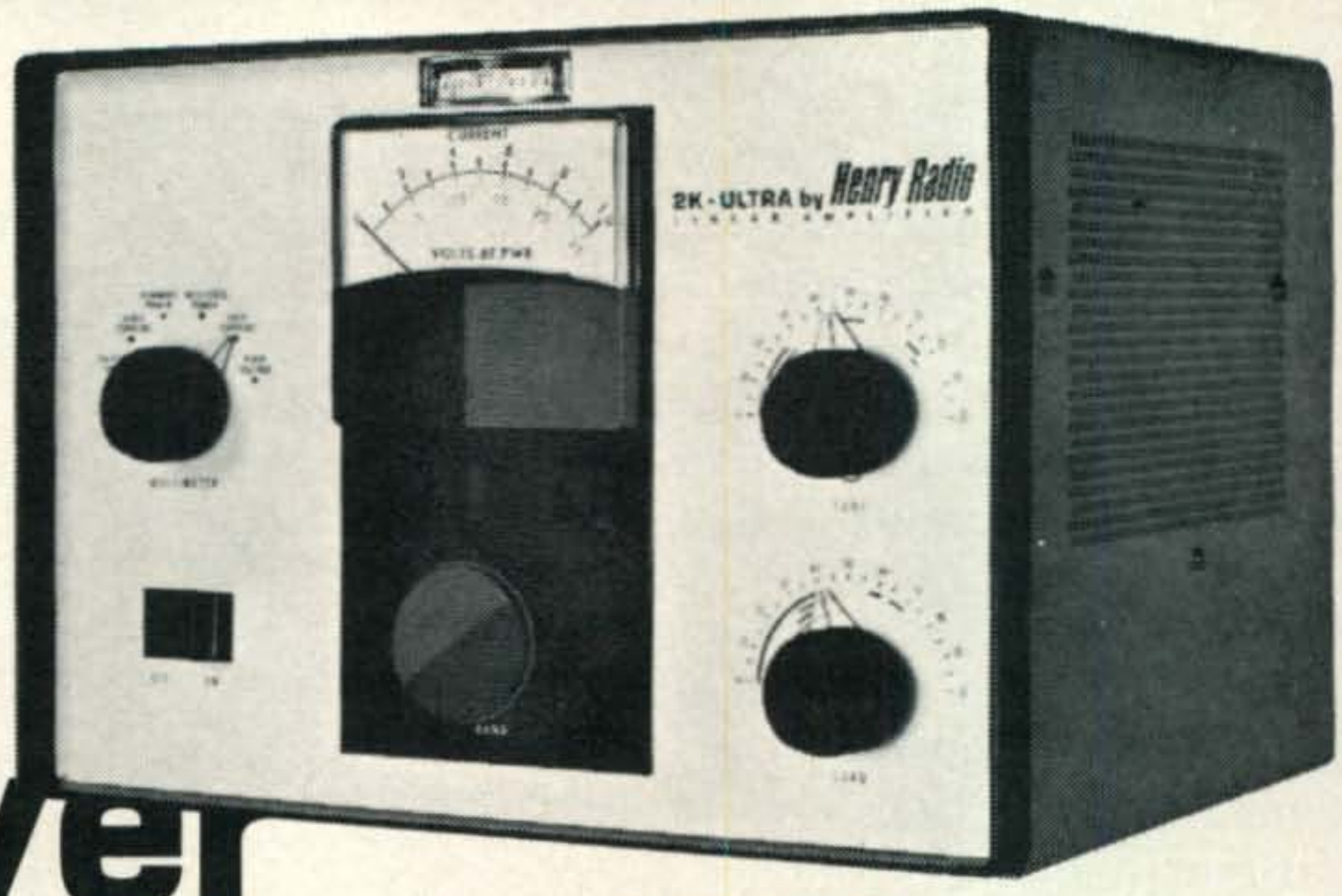


Fig. 3—Schematic of crystal controlled superregen receiver.



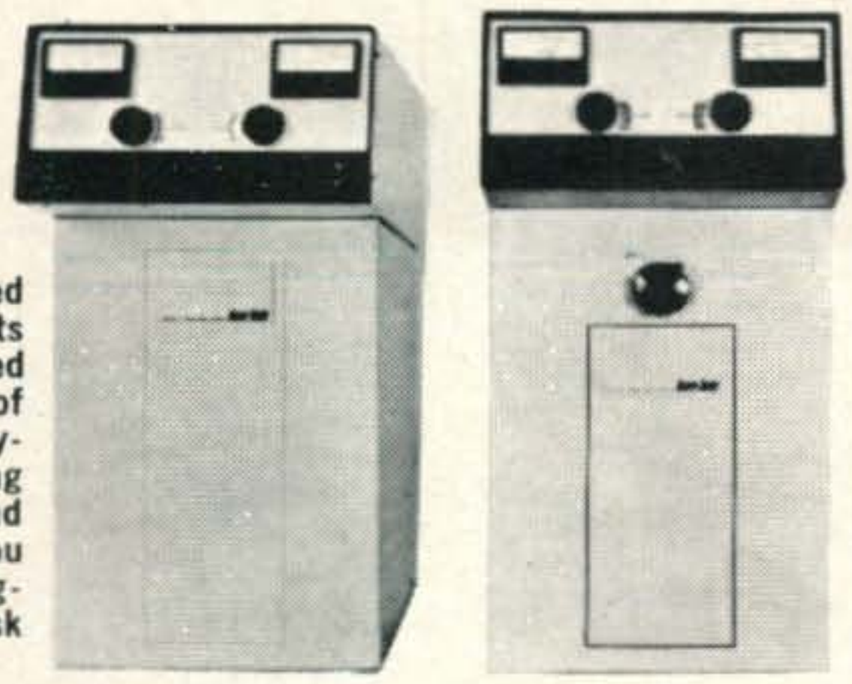
there has never been an amplifier like the 2K ULTRA

You have never seen or heard anything like it . . . it's totally unique. The 2K Ultra loafs along at full legal power . . . quiet, cool and with a linear wave form that is superior to that of other amateur amplifiers. Its anode heat is silently and efficiently conducted to a heat sink . . . no more blower noise. Truly, the Ultra is a miniature powerhouse of R.F. energy. Every component used in the Ultra is the finest quality obtainable . . . assuring the cleanest, clearest, strongest signal and years of trouble free, dependable service. More than three thousand 2K owners can't be wrong.

SPECIFICATIONS: ☐ TUBE COMPLEMENT: Two Eimac 8873 grounded grid triodes. Conductively cooled with a thermostat controlled fan for high dissipation modes. ☐ TYPE OF EMISSION: SSB, CW, and RTTY. ☐ DUTY CYCLE: Continuous duty in all modes. ☐ POWER REQUIREMENTS: 230 VAC, 50/60 Hz, 15 amps or 115 VAC, 50/60 Hz, 30 amps. ☐ DRIVE POWER REQUIRED: SSB, CW, and RTTY — 75 watts. ☐ INPUT POWER: 2 kilowatts PEP SSB — 1 kilowatt CW and RTTY. ☐ OUTPUT POWER: 1 kilowatt PEP nominal. ☐ OUTPUT IMPEDANCE: 52 ohms unbalanced with SWR not to exceed 2:1. ☐ INPUT IMPEDANCE: 52 ohms. ☐ HARMONIC AND OTHER SPURIOUS RADIATION: Second Harmonic: -50 db. Third Order Distortion: -30 db at full power output. ☐ NOISE LEVEL: -40 db or better below one tone carrier at 1 kilowatt. ☐ ALC CIRCUIT: Prevents overdrive from today's high power exciters and boosts average talk power. ☐ DIMENSIONS: RF Deck: 8¾" high x 12" wide x 11" deep. Power Supply: 7½" high x 12½" wide x 10½" deep. ☐ WEIGHT: RF Deck: 20 lb. Power Supply: 61 lb, Shipping Weight: 100 lb. ☐ PRICE: $845.00

2K-4

True to its heritage, the 2K-4 is destined for a future of even greater achievements than its predecessor 2K's. Its rugged construction guarantees a long life of reliable performance. The 2K-4's heavy-duty components allows it to loaf along even at full legal power. You can spend more for an amateur linear, but you can't buy better. The 2K-4, the big signal amplifier . . . floor console or desk model: $795.00



3K-A MILITARY/COMMERCIAL LINEAR AMPLIFIER

The 3K-A employs two rugged Eimac 3-500Z grounded grid triodes for superior linearity and provides a conservative three kilowatts PEP input on SSB with efficiencies in the range of 60%. This results in PEP output in excess of 2000 watts. In addition, the 3K-A provides a heavy duty power supply capable of furnishing 2000 watts of continuous duty input for either RTTY or CW with 1200 watts output. $995.

The 4K Ultra is specifically designed for the most demanding commercial and military operation for SSB-CW-FSK or AM. Using the magnificent new Eimac 8877 grounded-grid triode and vacuum tune and load condensers, One hundred watts drive for 4000 watts PEP input.

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CQ Reviews:
The Yaesu Musen FTdx 570 S.S.B./C.W. Transceiver

BY WILFRED M. SCHERER,* W2AEF

It is pretty difficult to make a good piece of gear even better, except to add a few extra facilities. This is what the Yaesu Musen people have primarily done with the FTdx-570 transceiver, the successor to the popular FTdx560. Since the latter has been reviewed in a previous issue of *CQ*,[1] we shall not go into all the details on the normal features, technical aspects and performance which also apply to the FTdx570. For these it is therefore suggested that reference be made to the earlier review. Nevertheless, a recap of the main things to be expected of these transceivers might be in order as follows:

Transceive operation with s.s.b. (u.s.b. or l.s.b.) or c.w. is provided with full coverage of the 3.5-28 mHz amateur bands, each over a 500 kHz range with the identical linear-tuning rate calibrated in 1 kHz steps. The transmitter input power is rated at 560 watts p.e.p. with s.s.b. and 500 watts d.c. for c.w. on all bands.

Other features include: 2.4 kHz selectivity (with extra position for an optional 600 Hz c.w. filter); 10 mHz WWV band; provisions for two additional auxiliary 500 kHz segments between 3.5 and 30 mHz; 25 and 100 kHz calibrating markers; high-ratio tuning control with spinner-type knob; fast- or slow-a.g.c.; built-in v.o.x. with panel-located sensitivity control; manual or v.o.x.-type c.w. break-in; adjustable c.w. sidetone oscillator; ±5 kHz receiver off-set tuning; front-panel switch for changing between internal or external v.f.o.'s (external v.f.o. is optional accessory) to permit quick change between common or independent frequency control of receiver and transmitter sections; a.l.c.; full metering for receiver S-units, transmitter a.l.c. level, p.a. cathode current or relative power output; 8- and 600-ohm a.f. outputs; phone-patch input; socket for 6-meter transverter accessory; built-in 117/220 v.a.c. power supply. The b.f.o., v.f.o. and calibrating setups are transistorized; otherwise, vacuum tubes are used throughout.

In addition to these the Model FTdx570 incorporates a built-in speaker, a cooling fan and a true transistorized noise blanker.

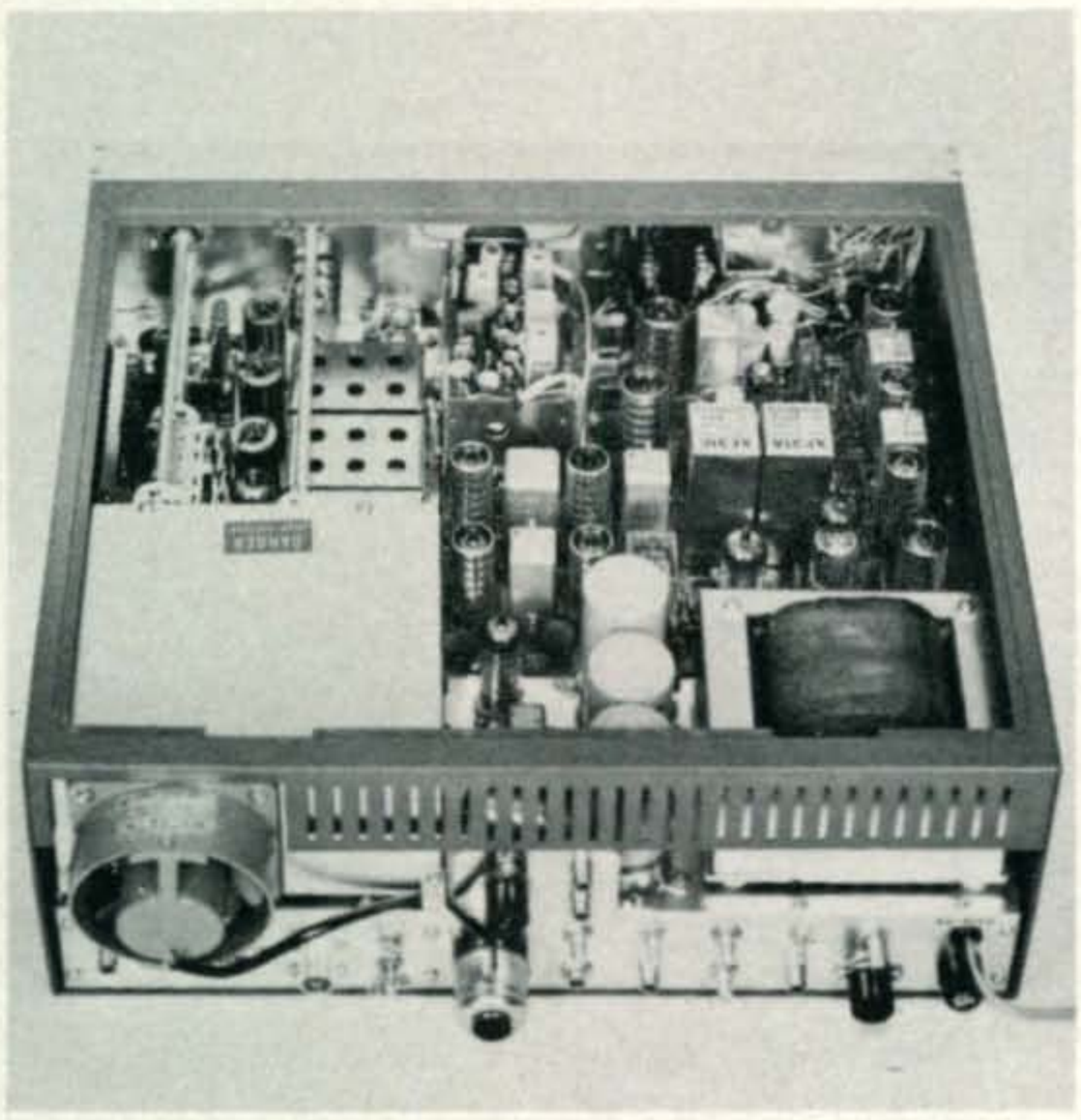
New Details

The built-in speaker, which eliminates the

*Technical Director, *CQ*.

[1]"*CQ* Reviews the Yaesu Musen FTdx560 Transceiver," *CQ*, May 1970, p. 34.

The Yaesu Musen FTdx570 s.s.b./c.w. transceiver.



Rear top view of the FTdx570 showing the exhaust fan at the back of the p.a. enclosure the only openings of which are at the interior sides to enable heat to also be drawn from the entire unit. The noise blanker is installed on a circuit board at the top of the v.f.o. at the upper center.

need for an additional unit, faces downward at the bottom of the cabinet. Such an arrangement normally might impair intelligibility, but due to the tilt-up type case for the transceiver and the particular response characteristics of the speaker, easy and excellent readability is maintained.

The cooling fan is located at the rear of the p.a. compartment. It is an exhaust type that draws out warm air from not only the p.a., but also from other sections of the unit for which strategically located slots are provided at the p.a. enclosure. At the same time the fan draws cool air into the unit.

The noise blanker supplants the original

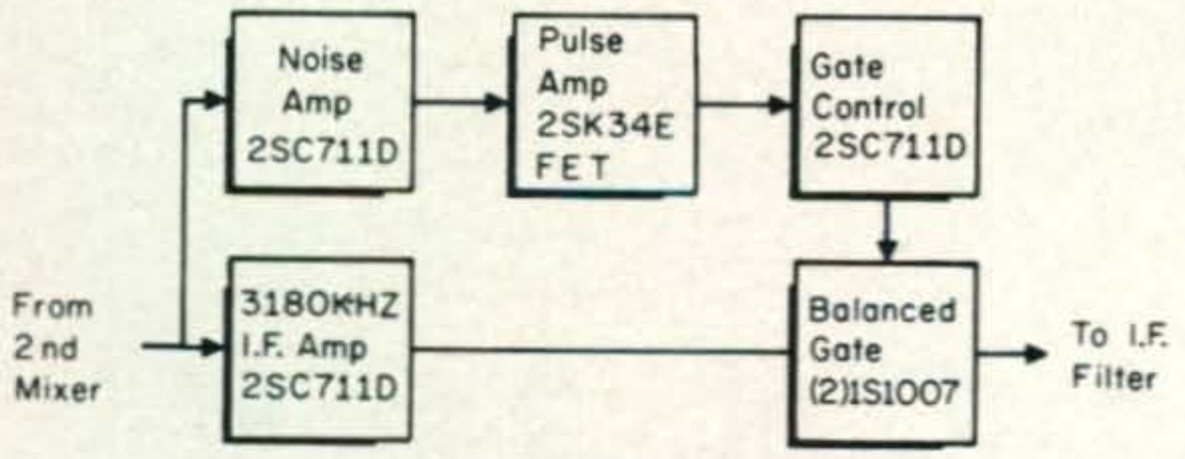


Fig. 1—Block diagram for the noise blanker used in the FTdx570. Noise pulses, obtained from the mixer output, are amplified, detected and appropriately shaped to operate the gate at the filter input. The gate employs two diodes in a balanced setup that eliminates switching transients. This provides quieter operation.

a.f.-type noise limiter. A block diagram of the setup is shown at fig. 1. Although it is a somewhat conventional lineup, the actual circuitry and constants are such that make it one of the most superb performing jobs we've run across, not only fantastically eliminating impulse noise, but also preventing desensitization of the receiver by noise pulses that otherwise would decrease the receiver gain through the a.g.c. action created by the noise pulses.

An improvement over early FTdx560 models is a change at the product detector whereby cleaner audio quality is obtained with high input-signal levels. A change also has been made in the c.w. wave-shaping that produces more desirable keying characteristics.[2]

The 600 Hz (@ 6 db) c.w. filter is exceptionally sharp for one of its type, since it has very steep skirts that result in a 2:1 shape factor with a 60 db bandwidth of only 1.2 kHz. Its overall effectiveness is thus better than some of the 400-500 Hz fiilters we've encountered with shape factors usually in the order of 4.1. The filter is automatically switched in when the transceiver is set up for c.w. operation. This filter is an optional factory-installed accessory; however, it can be supplied for installation as a do-it-yourself kit.

With a receiver sensitivity of 0.3 μv or better for 10 db S+N/N on all bands, an unwanted-sideband suppression of at least 50 db (at 1 kHz), the excellent selectivity with the optional c.w. filter, an output of at least 300 watts p.e.p. on s.s.b. and 260 watts on c.w., plus all the other features of the FTdx-570 make it a transceiver that gives you a high-performing and flexible setup to meet the essential needs of today's amateur-radio communications.

The FTdx 570 is priced at $549.95, complete, including all crystals for complete coverage of the 28 mHz band. All you need to get on any band is a mic (or key) and antenna. The optional c.w. filter, factory-installed or as a kit, is $39.95. These are products of Yaesu Musen, Ltd., Tokyo, Japan, and are marketed in the U.S.A. exclusively by Spectronics, 1491 E. 28th Street, Signal Hill, California 90806. —*W2AEF*

[2]The given changes also are included in later models of the FTdx 560.

It Is Better To Receive....

BY GLENN HAUSER,* SWL

You hams really have it made. You're to be congratulated not only on your accomplishments, public service and otherwise, but also on your public relations. You have succeeded in making the words "shortwave" and "amateur radio" virtually synonymous to the general public.

If even *you* don't see the contradiction in this, perhaps amateur PR has gone too far. You're forgetting the "one-way" people—the shortwave listeners and DX listeners.

"Oh come off it," you say, " I was an s.w.l. once, but that was just when I started in the radio hobby, before I got my ticket. I'm a full-fledged amateur now, and I've put childish things like s.w.ling behind me."

Take another look, brother. Today's SWL/DX listeners deserve full respect as an equal.

"How can he?" you say. "He isn't licensed. He doesn't have to take any test. He doesn't even have to know anything about the technical end of radio."

That's true. We'll concede, that as a group hams have an edge over DX listeners on the technical side of things. Still, our recent DX Census shows that 50% of us build some of our own equipment, and 76% repair and maintain it. But there's a lot more to DX listening than this!

More and more DX listeners are attaining what we might call *proficiency* in broadcast reception. And that isn't easy. It can't be learned out of a manual; it requires many hours of careful tuning, observations, record-keeping, language study, a sensitive ear, and a multitude of reference publications. And our census shows that 6 out of 7 s.w.l.s and DX listeners use communications receivers.

With all deference to amateur communication, you must admit a great proportion of it is just friendly gab, nothing very deep. In fact, your own written or unwritten laws prevent really significant discussions on the ham bands—politics and religion, for example.

Yet on the shortwave *broadcast* bands, everything said is intended as a meaningful statement for reception by a wide audience. While the weather conditions at a distant place, or your contact's equipment may be of some passing interest, let's face it: more important things are happening in the world. And the best way to keep in touch with the *real* world is through shortwave broadcasts.

The proficient DX listener can tune across a band at any given time, and name off each station, one by one, just by remembering which station goes with which frequency—or even without knowing the exact frequencies. The few he can't pin down right away constitute the challenge of DX listening.

The proficient DX listener doesn't limit himself to the English language. English is far from being *the* language on the shortwave broadcast bands. Many of us are bi-, tri-, or multilingual. And proficiency on shortwave means being able to *recognize* a large number of languages *without* necessarily understanding them.

Could *you* listen to a broadcast for five seconds, and says "That's in Hungarian?" Could you tell the difference between Hungarian and Hindi? Or Czech and Slovak? The proficient DX listener can.

You think QRM is bad on the ham bands? You lucky people—you've got single sideband. Of necessity, the broadcasters continue with a.m....and this means DX listeners need just as much skill, or more, to tune in the DX as hams do.

"What about DXCC?" Because fewer countries broadcast than have ham stations at one time or another, no DX listener will ever pass the three hundred mark. But of the countries which do broadcast on shortwave, some of the most experienced DX listeners have heard over 200. This is certainly on a par with 300 on the ham bands.

Top men in the field have been known to tune in every day, month after month, waiting for that one opening that will bring them a new country. They can't pick and choose among the bands or ask a station to move to a clear frequency. Instead, they must go after the stations where they happen to be transmitting, no matter how unfavorable conditions may be at that frequency. Nor can they

---

*PSC Box 42309, Kelly AFB, Texas 78241.

send expeditions to rare countries. Thus building up a country total is an even greater challenge for the DX listener than for the ham.

And QSLing! While virtually every ham in the world knows what a QSL means, and exchanging cards is routine practice . . . many remote shortwave broadcasters rarely receive reports and have no idea what a QSL is and means. They don't know the Q code, and reports must be written in the local language. Yet through perseverence the proficient DX listener somehow manages to get a verification back from these stations. Sometimes it takes several tries before the station comes through.

Multicolored cloth pennants are a bonus to the DX listener specializing in Latin America. Many stations issue these pennants, which from an artistic standpoint, invariably outshine QSL cards.

"Just who are these proficient DX listeners?" Chances are you think most s.w.l.s are teenagers. Our Census does show that 41.5% are under 21, and we're mighty proud of our new blood. But the leaders in the hobby are mature individuals from all walks of life, just as in ham radio. Among them are university professors, engineers, lawyers, and blue-collar workers.

"But you s.w.l.s are disorganized, aren't you? How can you accomplish anything being a bunch of isolated knob twiddlers?" Well, if you'll pardon the comparison, we too have our national organization equivalent to the ARRL. It's the Association of North American Radio Clubs, ANARC.[1]

"Oh, you have clubs, too?" Certainly. Some of them have been in business 40 years. The ANARC Census shows that about 1900 people are members of affiliated clubs. Several of these clubs publish hefty information-packed bulletins, some weekly, some monthly, intelligently edited and professionally printed.

By the way, s.w.l.s have in the past copied hams in making up "callsigns" . . . but there seems to be a trend away from this. Many of us are satisfied to be known by our names alone.

"Well, if DX listening is so great, why are you so few compared to the ham population?"

[*Continued on page 87*]

[1]ANARC, 2110 West 74th Terrace, Prairie Village, KS 66208, publishes a monthly newsletter @ $2.00 per year; and a free information sheet is available for a s.a.s.e.

RELATIVITY

WHAT is an S meter? Does it measure anything? Can it be calibrated? Is it reliable? Can field intensity (strength) be measured with an S meter? What does it really do? Do all manufacturers calibrate S meters in the same manner? And, we could go on and on and on with questions like this!

In fact an S meter is only a relative indicator of relative signal strength. The design of receivers used by the greater majority of amateurs is such that it is impossible to calibrate an S meter at other than *one* frequency. Amazed? Well, it's true! There are so many variables ahead of an S meter circuit in the amateur receiver that it is impossible to predict any constancy of amplification over the entire frequency range of the receiver. Oh sure, you can build a beautiful i.f. amplifier system that has a constant gain; but what about all the circuitry that precedes the i.f. chain? Is the gain of the r.f. amplifier/mixer circuit the same across the complete spectrum of one band (from the low end to the high end)? At least those receivers whose bands are increments of 500 kHz have a better chance of constant amplification of a given signal strength than those of 1 mHz or greater. Have you ever thought of the cost of a receiver that would give a constant gain of a given signal strength over its entire range? Radio Interference and Field Intensity (RIFI) receivers, used to measure signal strength in microvolts per meter cost in excess of $3500 and it takes a very special facility with some very special equipment to calibrate them, requiring a period of better than 40 hours by a very well trained and qualified technical person.

Have you ever really analyzed the directions given in your instruction book to "calibrate" the S meter in your rig? In most cases:

a. Disconnect the antenna.

b. Tune the receiver to a given frequency on a given band.

*5620 Alta Vista Road, Bethesda, Md. 20034

AND THE S-METER

BY JOSEPH P. FINCUTTER,* K3STU

c. Make sure that no local signal is getting thru the receiver front end.

d. Set the r.f. gain control to the full clockwise position.

e. Set the S meter adjustment control for a zero indication on the meter.

Great!—You have now *Calibrated* (what an abuse of what the word "calibrated" stands for!) your S meter! Better than nothing but not much! And this is what determines the report you give to your friend when you work him.

Now you tell the fellow at the other end of a QSO, "You're S-9 on my scotch meter OM." You said 'scotch' because the signal really sounded better than that. Let's establish a point of reference on which to base further reports. Let's assume that when the meter indicates S-9 the signal level at the input of your receiver is 100 microvolts. (We could establish the level at 50 microvolts just as well. One manufacturer has been known to readjust the S meter circuits to this level of input for S-9 when the owner complains that he has a "scotch S meter.") Now we have an additional problem because in the old days of a.m. (Amplitude Modulation for those of you who don't remember) the S meter could be used as a tuning indicator because when the receiver was tuned to the center of the signal the S meter was being driven by a voltage (current) that was directly proportional to the strength of the carrier frequency. But with s.s.b., the S meter attempts to read the peaks of the audio signal. But the basic design of the meter movement in an S meter precludes its indicating "peaks" with any reasonable degree of certainty. So we not only have a problem of an overall signal amplification factor in the set, (constant gain at all frequencies), but also the uncertainties of the indications of peak amplitudes on the S meter.

Now what does it mean when you tell an operator of another station that he is 60 db over S-9? (Remember the point of reference mentioned before with S-9 being an indication of a 100 microvolt signal across the input to the receiver?) Well, 60 db represents a voltage ratio of *1000*. So you have told the other operator that there is 100 millivolts (0.1 volts) at the input to your receiver. For further amazement:

S-9 +	*Voltage Ratio*	*Signal Level*
10	3.162	316 μv
20	10.0	1 mv
30	31.62	3.16 mv
40	100.0	10 mv
50	316.2	31.62 mv
60	1000.0	100 mv
70	3162.0	316.2 mv
80	10000.0	1 volt

Even if S-9 was an indication of 50 microvolts at the input the signal levels in the chart above would only be divided by 2. I've heard many amateurs report a "real bodacious" signal; well, it must come from a "real bodacious" transmitter, with antennas of very high gain, a transmission path of very minimum attenuation and not too much distance between the transmitter and receiver locations!

So, what can an S-meter be used for? Maybe some uses would be:

a. An ego-inflator! Gives the other guy a big report and maybe you'll get one in return.

b. Seriously, it can be used as a relative indicator of signal strength. By this I mean that if you are working on an antenna system with a friend (either him adjusting his on transmit or you adjusting yours on receive) changes in indications on the S-meter are proportional to the results of the adjustments. A higher reading indicates better tuning adjustment; but, of course this depends upon several factors such as a good transmission path with no QSB and a constant level of signal from a transmitter, etc. The S-meter will indicate meaningful results if properly interpreted.

c. In making some r.f. bridge type measurements you can use a receiver as a de-

[*Continued on page 87*]

Identifying Unmarked Surplus Digital IC's

BY GENE BRIZENDINE,* W4ATE

MANY bargain surplus IC's go unappreciated, because they are unidentified. Hesitation to invest our time in the unknown is understandable, however the simple identification method described here may increase your enjoyment and knowledge in this area. If you are uninitiated into the digital world, a nude IC-5 IC, with not a single identifying symbol or a topless flat pack can be the most logical training aid imaginable. Or you may simply wish to identify and utilize some digital IC's you now have on hand.

First of all, let us learn how the package usually becomes unidentified. The metal case and wire leads of the highest-quality devices are often plated with pure gold. Along the manufacturer-to-surplus dealer route, someone processes the unit to recover the precious metal. Presto! our IC went incognito. Happily, the identification of many digital types is easy, and in fact can be a fun game. Let us start with the older, but hardy RTL family—it is harder to damage by improper connections.

The equipment requirements are simple, essentially a voltmeter and an inexpensive battery. A production-type IC test socket will speed up the process, but it is not mandatory. It *is* important to know the manufacturer of the IC's being identified so that the applicable logic diagrams and pin numbering system are on hand and understood for each IC to be tested.

An experience from real-life may best illustrate the method. Construction of an advanced, 16-IC digital keying system was considered many years ago, but almost abandoned, when the cost of the solid-state devices toted up to a sobering figure.

A review of the contents of digital packages shows that mostly gates prevail. In fact a complete computer may be assembled, utilizing gates alone, although IC's tailored to specific tasks generally provide a more direct and economical approach. So, the first efforts were to sort out those devices which contained only gates, in order to become acquainted with the simpler IC's first. References to the terms NAND, "high," "low" and truth tables will be avoided for clarity.

A hundred unmarked Fairchild RTL's were obtained from a very reliable surplus source[1] for about five dollars, and spread out for inspection. These were sorted into groupings by number of leads: 10-lead, 8-lead, 6-lead etc.

Next, all other physical differences in packages were carefully examined: color of the potting material, finish of the potting material (glossy or dull), color and shape of the "island" centered between the leads, the lead length and finish, color and finish of the bottom rim of the case. The IC's were sorted into sub-groups, according to these additional differences. Clearly, packages having all of the same outside appearances will not automatically be the same electrically. However, this easy sorting greatly reduced the time required to identify sixteen perfect 914 dual 2-input gates and 923 flip-flops for the project.

Inspection of the 914 and 913 outline drawings showed that both were packaged in 8-pin packages. Therefore, all packages having 10 or more leads were set aside for any future needs, and attention was focused on the 8-pin devices.

Before the simple electrical tests were made, one more important weeding-out process was performed. Leads are usually omitted when not required in a device. (The leads are numbered in the same order as found in octal vacuum tubes.) For examples, the 902 flip-flop has pins 2 and 6 missing and the 903 three-input gate is minus pins 5 and 7.

The outline drawings further showed that all 8 pins were present in the 914 and 923 IC's. All TO-5's not passing this "physical" were likewise set aside. At this point, the search had been narrowed down to only 30 of the original 100 units. It was encouraging

*600 Hummingbird Drive, S.E., Huntsville, AL 35803

[1]Mike Quinn Electronics, Bldg. 727 Langley Street, Oakland Airport, Calif. 94614.

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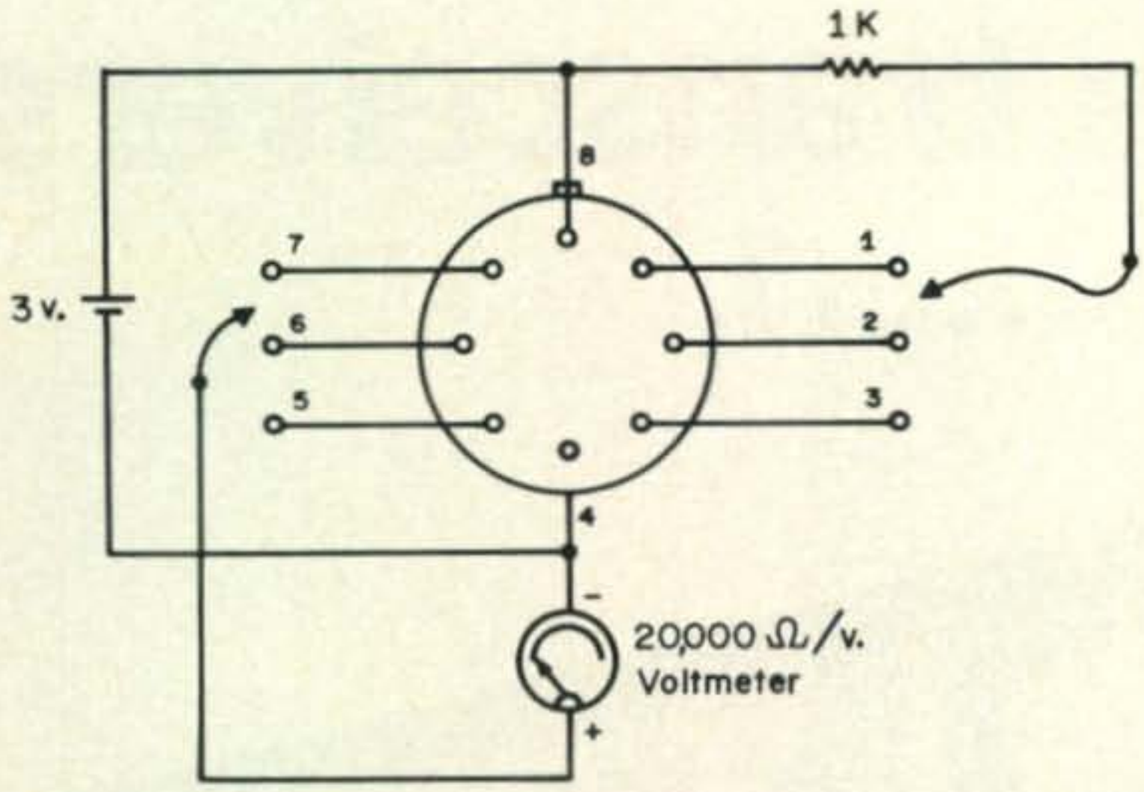

Fig. 1—Simple tester for sorting unknown digital ICs and determining the internal configuration. Bottom of IC socket is shown.

that 70 per cent of the units had been eliminated as candidates, by visual inspection alone.

The simple test arrangement in fig. 1 applies normal power to the IC under test, and brings out the remaining pins to any type of convenient terminal point. Use of selector switches will limit flexibility and is not recommended.

The testing philosophy is to assume the device plugged in is the type sought and to test it accordingly. This allows quick rejection, when the proper responses are not received. Identifying the 914 gates consisted of connecting the meter to monitor pin 7 (known to be an output pin), while applying positive switching bias to pin 1 or 2 (known to be the corresponding input pins). The same process was repeated for the remaining half of the device, using output pin 6 and input pins 3 and 5.

Referring to fig. 2, with plus bias applied to an input pin, the related transistor would conduct and a low value of voltage would be measured between emitter and collector. Conversely, with no bias applied to any base, a much higher voltage would appear between emitter and all collectors.

The meter indications when a 914 was discovered were over 1 volt at pins 6 and 7, with no input bias applied. With the meter connected to pin 7, the reading dropped to an average 0.2 volts, when the bias probe was applied to either pin 1 or 2. Moving the meter to pin 6, the same indications were noted when touching the probe to pin 3 or 5. Occasionally a 914 was identified, but would fail to switch from one particular input terminal. Such gates are useful in many applications not requiring all four input terminals.

The method employed for identifying a 923 flip-flop was unorthodox and incomplete. However, it proved to be simple and effective for this purpose.

Output pin 7 was monitored with the voltmeter's positive lead. The probe in this case was a clip lead connected to the negative pin 4. Touching the probe momentarily to pin 5 flipped the device to a meter reading of over 1 volt. Probing pin 7 similarly, flopped the reading to around 0.3 volt.

Of course, the initial indication depends upon the state in which the flip-flop was left before it was acquired. Therefore, at least two probings of pins 5 and 7 were made to insure that the IC was exposed to all trigger conditions. The voltmeter was then connected to output pin 5. Probing pins 7 and 5 again produced a reverse of the above indications.

No damage resulted to the IC by connecting the negative probe to the positive pins 5 and 7, because 640-ohm load resistors are connected within the device between the positive supply and output pins 5 and 7.

The significant clue that a flip-flop had been identified was that a switched voltmeter reading remained *after* removing the probe. A further test was made to confirm that a 923 had been identified, by testing the preset function which is activated through pin 6. While monitoring the over 1 volt on pin 7, pin 6 was momentarily touched with the positive probe and the voltmeter reading dropped and *remained* at the familiar 0.3 volt level.

After eliminating the 914 and 923 devices, many other RTL types were identified, including 902, 903, 907 and 910 devices. Some IC's were not identified by those methods but responded to an exploratory approach. Pins were monitored until a voltage of about 0.3 or over one volt was noted. The remaining pins were biased (or grounded) until the

[*Continued on page 93*]

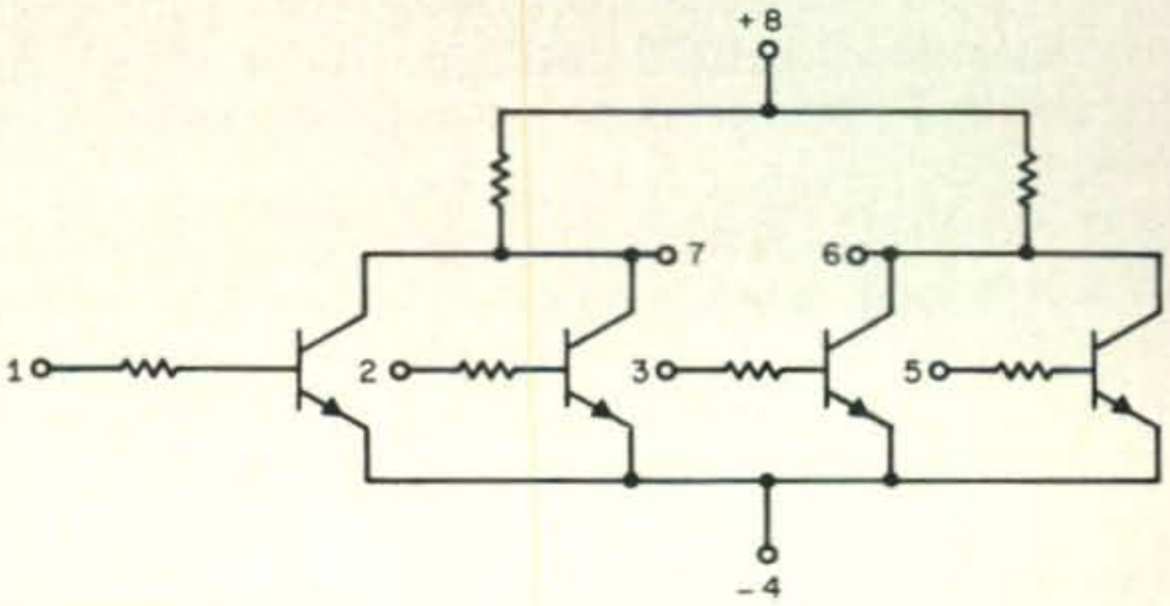

Fig. 2—914 2-input gate RTL, 8-lead, TO-5 package IC. Typical base resistors are 450 ohms; collector resistors are 640 ohms.

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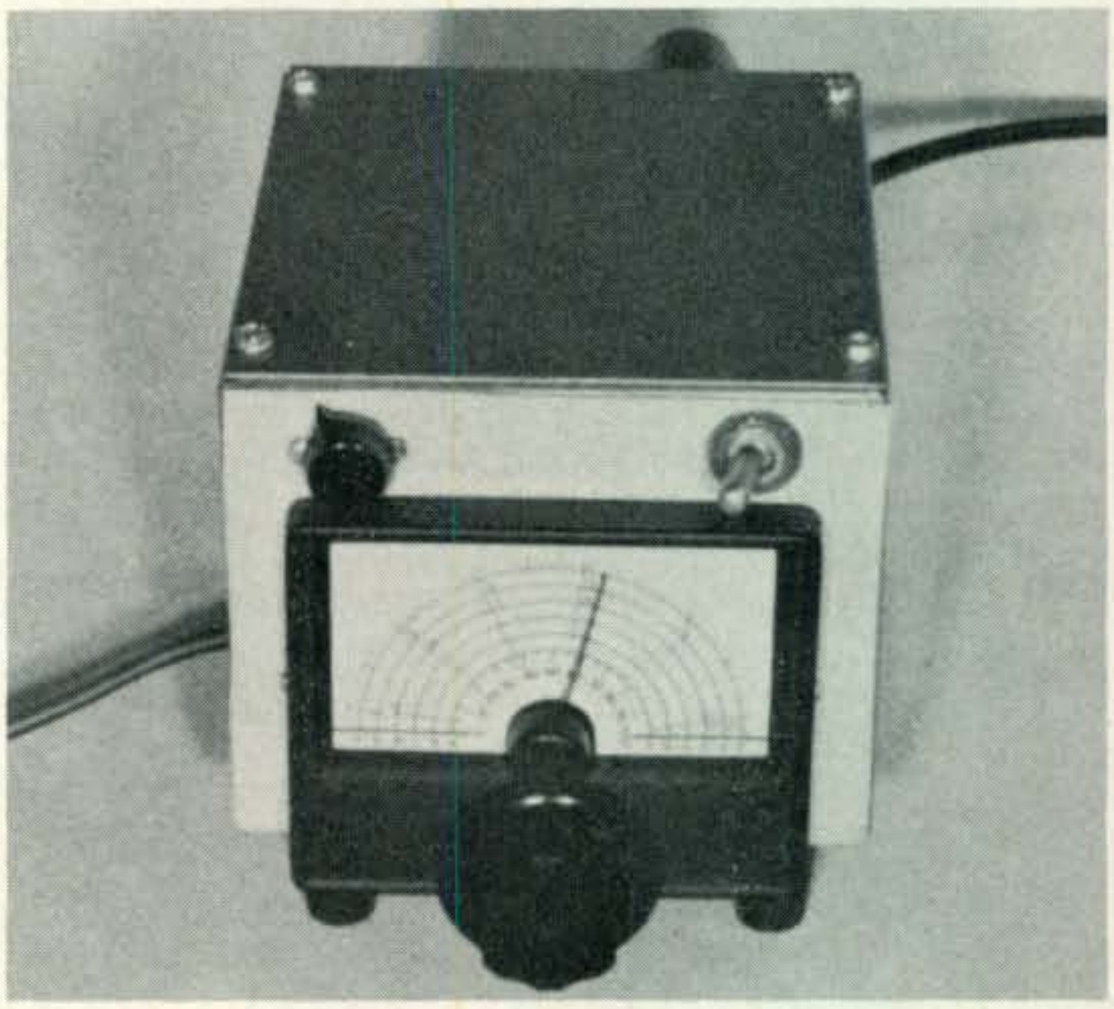
An External VFO for the Heathkit SB-102 Transceiver

BY ARTHUR S. GILLESPIE, JR.* K4TP

SEVERAL months ago I purchased and constructed an SB-102 transceiver. The choice of this unit was based to a large extent on the capability for use of this transceiver with a number of external adjuncts such as external v.f.o., phone patch, transverters, etc. A transistorized external v.f.o. was built but it proved to be unstable both mechanically and electrically. The v.f.o. project was then shelved until several days before the last ARRL DX competition. It was then decided that an external vacuum tube v.f.o. would be built for use in the contest. The parameters laid down were that the unit must be very stable electrically, mechanically, and thermally and could be constructed from components available from the basement junk box or from the local TV parts house. A search through many years of amateur journals did not produce such a circuit but did reveal a number of constructional hints for building an extremely stable unit.

The unit shown was constructed in a single evening. A second evening was spent substituting padding capacitors, adjusting inductances, etc. in getting the unit to cover 5.0 to 5.5 mHz with about 10 kHz excess at each end of the dial and in calibrating the unit. The result is a very high performance v.f.o. that when used with the SB-102 permits transceive operation with the internal LMO, transceive operation with the external v.f.o. or separate transmit and receive operation using the LMO for receiving and the v.f.o. for transmitting.



Overall view of the 5.0 mHz v.f.o. Above the calibrated dial is the on-standby switch (r.) and the calibrating trimmer (l.). The unit is constructed in a 4 x 5 x 6 inch aluminum cabinet.

*618 Hillcrest Ave., Gastonia, NC 28052

Circuit Details

The circuit is shown in fig. 1. One half of a 12AU7 double triode is used as a Colpits oscillator. The other half is used as a tuned isolating amplifier. Power may be supplied from the SB-102 by running connecting wires between the available voltage points in the transceiver and unused connecting pins on the rectangular socket on the back of the SB-102. I chose instead to draw the filament

[*Continued on page 90*]

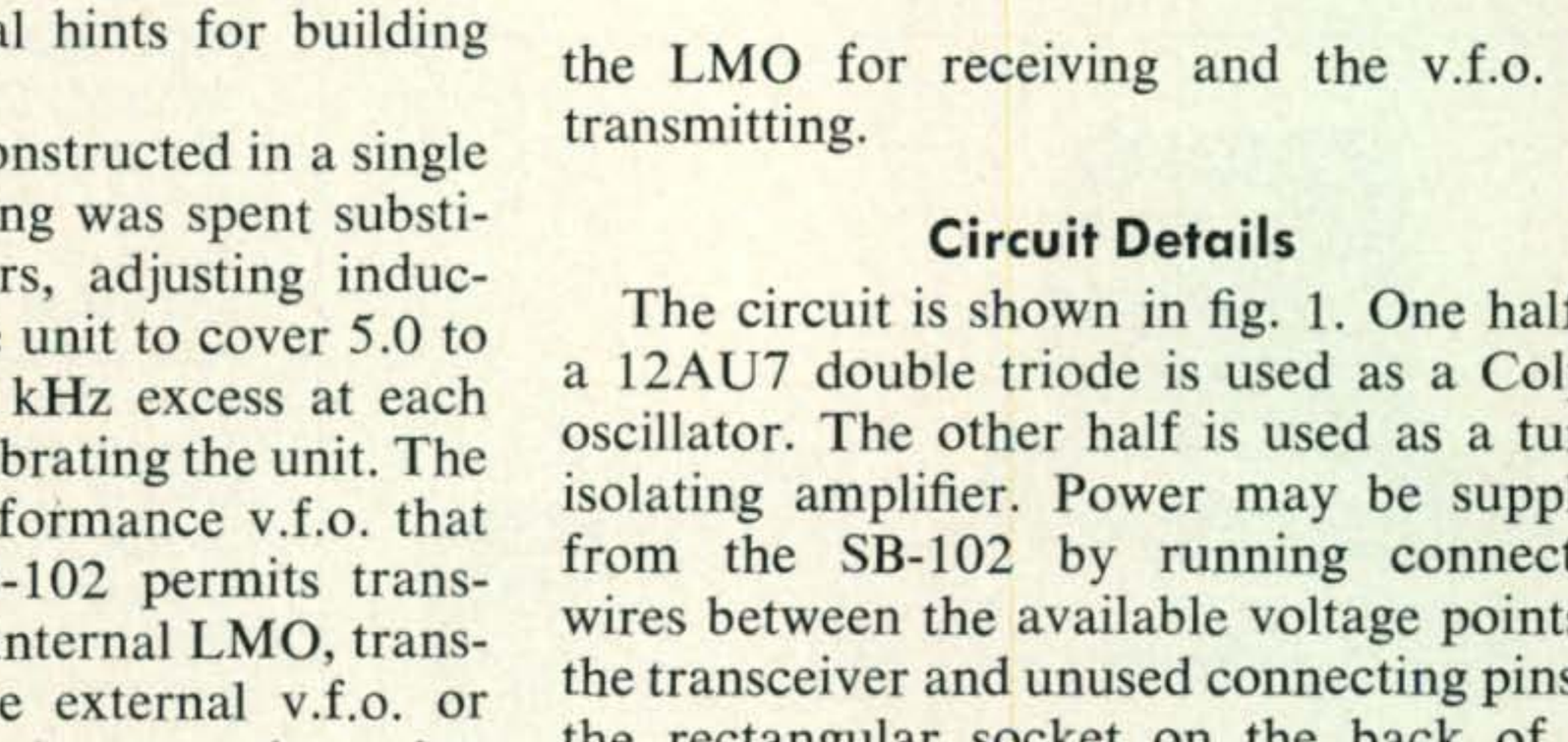


Fig. 1—Circuit of the 5.0—5.5 mHz v.f.o. suitable for use as an external v.f.o. with the Heathkit SB-102 or any other rig requiring a 5.0 mHz v.f.o. C_0 is the capacitance of the 4500 pf output coupling capacitor in series with the capacitance of 21" of RG-58/U. C_0 resonates with L_2 at about 5.25 mHz. L_1 is 20 turns of Air Dux #510, 5/8" dia., 10 t.p.i. L_2 is a 20-40 μh slug tuned coil (Miller 20A335RBI).

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1971 CQ WORLD WIDE DX CONTEST: C.W. RESULTS

BY FRANK ANZALONE,* W1WY

WE didn't fare too badly in this one (Nov. '71). Returns were about 5% lower than last year, which was to be expected for a couple of reasons. The emphasis is gradually swinging to s.s.b., and the lower sunspot cycle has definitely lowered the activity, especially for the Generals who no longer have 10 meters open to Europe.

But with the slight increase in the returns from the phone section, we were still able to break the 3000 mark.

George Jacobs had predicted that conditions would vary between fair and good, and that's about what happened, depending on the location and bands used.

So all in all I would say we didn't do too badly and we were all happy.

However all the news is not on the pleasant side. We found it necessary to disqualify the following stations: ZD3Q, 4M5AAS, DLØWU, UA3RH, SM5BPJ, K6LOM and W8VSK.

It would be so much easier to stop right here and go on to more pleasant reporting, but I think the time has come to call a spade a spade and stop sweeping a distasteful subject under the rug.

Here are the line scores on three Multi-Operator, Single Transmitter entries that were unacceptable because credit was taken for an excessive number of duplicate contacts.

ZD3Q	3,245,638	3193	101	240
4M5AAS	3,059,380	2820	119	261
DLØWU	1,483,012	1461	130	322

Station ZD3Q had 157 dupes, just under 5% of the total made; 4M5AAS had 129, over 4½%, and DLØWU had 55, just under 4% of the total.

What a pity to see all that operating effort go down the drain, either due to negligence in not checking the log when it was recopied or trying to create a much higher score by taking credit for every contact made.

In the case of ZD3Q, here was a well-planned expedition to Gambia, a relatively rare spot, by a couple of good operators from Denmark. Their claimed score would have set a new world's record for their category, but even without these extra points they still would have won and still set a new record.

We realize that it is next to impossible to keep out duplicate contacts and maintain a rapid exchange. But we do insist that a log be thoroughly checked before it is submitted, and all duplicate contacts be crossed out and *no credit taken*. You see what can happen if we have to do it for you.

And we are also cognizant of the fact that the station showing up as a dupe should also bear a certain amount of responsibility. However we find that it's generally a non-contest station who probably made a second contact to insure that he would be in the DX station's log.

The rules are very specific regarding taking credit for duplicate contacts, and we feel that the 3% margin has been more than liberal. I use the wording "has been" because in the future the wording will be "excessive duplicates" and the Committee will use its

*Chairman, *CQ* Contest Committee

Yuri, ex-OK5BU, now VE3BMV high man for Canada in both sections of the contest.

PLAQUE & TROPHY WINNERS

Single Operator, Single Band

WORLD—North Jersey DX Association. Earl Lucas, W2JT Memorial Trophy. Won by Hipacio Marra, PY4AP. (14 mHz)

Single Operator, All Band

WORLD—Larry LeKashman, W9IOP Trophy. Won by KH6RS (Opr. William Myers, K2SIL)

U.S.A.—Frankford Radio Club Trophy. Won by W1FBY (Opr. David Sumner, K1ZND)

EUROPE—W3AU Operators' Trophy. Won by A. J. Slater, G3FXB.

CARIB./C.A.—Harold Fox, W3AA Plaque. Won by Richard Limebear, 8P6DR.

AFRICA—Gordon Marshall, W6RR Plaque. Won by P. B. Buckley, ZS2RM.

ASIA—Japan CQ Magazine Trophy. Won by Alfred A. Laun III, HS5ABD.

OCEANIA—Maui Amateur Radio Club Trophy. Won by Katashi Nose, KH6IJ.

Multi-operator, Single Transmitter

WORLD—Dr. Anthony Susen, W3AOH Trophy. Won by Station 4Z4HF. (Oprs. 4X4WN, 4X4XX, 4Z4AG, 4Z4BR, 4Z4DZ, 4Z4NKX)

Multi-operator, Multi Transmitter

WORLD—Hazard Reeves, K2GL Trophy. Won by Station PJ9JT (Oprs. W1-BIH, W1SG, W1TX, K4BAI, W4BNU, WB4RAU

Contest Expedition

WORLD—Dr. Donald Miller, W9WNV Trophy. Dr. Harold Megibow, K2HLB Memorial. Won By James Neiger, VRIW (W6BHY).

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Frankford Radio Club

own judgement as to what it considers excessive.

In the case of UA3RH on all bands, W8VSK on 28 mHz, K6LOM on 14 mHz and SM5BPJ on 3.5 mHz, the disqualification was because of "creative logging." Taking credit for excessive contacts and multipliers that could not be justified in a process of cross-checking logs and written reports from stations that were claimed.

Their claimed line scores were as follows:

UA3RH	A	1,782,473	1666	147	392
W8VSK	28	49,486	186	27	82
K6LOM	14	228,657	647	34	89
SM5BPJ	3.5	84,816	450	34	90

I am sure all would still have had very impressive scores with a smaller but more accurate multiplier.

Especially UA3RH with his elaborate antenna farm. 3-el. on 3.5, 3-el. on 7, 5-el. on 14 mHz. All rotary beams with variable polorization. Also 2-el. Quads on 21 and 28 mHz. A very impressive layout indeed.

Future disqualification of this type can mean being barred from participation in our contests for a period of up to 2 years.

I expect that we will be receiving a lot of flak for this drastic action but things are getting out of hand and must be stopped, even at the expense of losing future participation from stations who do not agree with us.

Enough of that. Let's go to more pleasant happenings. This should make a lot of fellows happy. The Frankford Radio Club finally did it, beat out their arch rivals, the Potomac Valley Radio Club for club honors and the *CQ* Plaque. That breaks the PVRC's consecutive string dating back to 1964. This victory was achieved by a large turn-out of the membership and the club finally coming up with a couple of "Big Guns" and a number of score-producing Multi Singles. (Expedition stations, or the lack of them had nothing to do with it, Jessie!)

Picking the winner of the Contest Expedition station presented no problem. Jim

The two man team that put KH6HCM in the #4 spot in the Multi Single category. That's Gary with the stripes, Pat KH6GQW, the other half of the team.

Single Operator - All Band

Station	QSO's						Zones						Countries					
	1.8	3.5	7	14	21	28	1.8	3.5	7	14	21	28	1.8	3.5	7	14	21	28
KH6RS	6	301	733	797	753	387	2	16	26	31	25	18	2	19	28	59	28	26
VR1W		65	312	600	839	601		13	22	34	28	23		15	29	68	40	38
6D1AA		259	554	689	714	461		14	24	35	28	21		25	49	69	65	43
VP2A	31	227	377	425	514	252	7	16	21	30	23	17	9	39	54	74	53	49
KH6IJ		105	213	556	565	263		9	13	32	27	18		8	17	60	38	29
3B8CR		3	38	511	554	270		3	15	33	30	19		3	21	75	65	47
HS5ABD		55	200	296	591	202		12	25	31	34	21		19	44	77	80	50
W1FBY	5	85	187	288	395	56	3	13	24	31	30	18	4	38	63	73	72	36
W1BPW	3	106	151	335	280	58	2	21	27	32	28	20	2	50	67	78	65	39
W3WJD		125	174	283	233	76		20	26	32	30	20		52	64	79	72	42
Multi-Operator — Single Transmitter																		
UK9ABA		432	543	478	289	234		12	27	30	29	22		51	65	65	70	48
4Z4HF		207	376	521	365	326		13	18	24	21	23		36	44	59	49	49
UK3AAO		220	225	534	407	98		11	32	36	34	21		48	75	82	86	45
KH6HCM	7	154	407	426	667	255	3	12	17	31	20	17	2	13	21	59	33	23
PJ2HT		160	382	543	478	155		10	15	24	15	13		17	30	47	40	36
VE1ASJ	54	286	300	308	216	118	4	17	21	30	27	19	5	39	45	101	58	33
Multi-Operator — Multi-Transmitter																		
PJ9JT	59	484	604	1295	1290	731	5	15	16	33	29	25	7	35	40	87	71	53
W4BVV	22	195	451	676	611	143	11	24	32	36	32	27	16	70	93	116	94	60
W7RM	36	172	648	709	535	173	11	22	34	37	33	21	13	36	76	100	75	39
K6RU	29	118	649	633	576	176	11	23	34	37	32	18	13	38	75	111	79	41
W3AU	17	118	453	760	552	134	8	18	29	37	32	23	11	40	81	106	84	59
YUØN		800	824	807	690	171		12	24	34	32	23		47	63	92	76	53

Band-by-band breakdown of top scores.

Neiger, W6BHY who has turned in some very impressive scores from other areas of the world in previous contests, made a trip to the British Phoenix Islands for this one and will be rewarded with the Don Miller, W9WNV Trophy. His all-time single operator record from 9Y4AA made in 1969 still stands however. If he hadn't taken time out to go over to Canton Island and make those 50 QSO's he might have ended up as "top banana" instead of second place.

If we were handing out awards for the neatest and most accurate log it would have to go to VP2A. John Beck (ZD8J, remember him?) sent us 72 pages of the most beautiful log we have ever seen. Cross index by contacts, zones and countries. Computerized of course, and a pleasure to check.

The Multi Multi operation by PJ9JT ran into equipment problems and with a much smaller crew than in previous years their score reflected their problems. However it

[*Continued on page 88*]

KG4CS's score on 160 should be a new record (check "All Time Records" next month). Barry put up a 1400 ft. long wire over salt water for the contest. Worked everything he heard except KH6HCM.

TOP SCORES

SINGLE OPERATOR

ALL BAND

KH6RS	**2,382,520**	3B8CR	1,221,297
VR1W	**2,164,110**	**HS5ABD**	**1,169,336**
6D1AA	2,125,354	**W1FBY**	**1,163,160**
VP2A	1,741,480	W1BPW	1,154,215
KH6IJ	**1,267,801**	W3WJD	1,107,332

SINGLE BAND

28 mHz

7Q7AA	412,143
YV5CVE	194,835
ZE1BT	188,354
VK3XB	66,216
9H1CH	35,313
UG6GAF	26,509

21 mHz

VK6HD	531,354
9F3USA	474,351
VK5NO	269,010
OB4PF	241,491
ZL1IL	226,195
G3HCT	205,989

14 mHz

PY4AP	**836,250**
XX6IK	499,820
ET3DS	402,360
SM4CMG	367,356
VK2APK	321,720
UA9DN	306,446

7 mHz

KV4FZ	420,546
K6ERT	180,222
LAØAD	177,450
UG6AD	140,868
UA1DZ	138,160
OH2QV	131,868

3.5 mHz

W3MFW	61,243
DJ6RX	58,717
YV5AW	52,608
LZ1DX	52,104
K1DIR	51,591
DJ5DT	48,209

1.8 mHz

KG4CS	7,884
DL1CF	4,968
K1PBW	2,914
HB9NL	2,440
GM3YOR/a	1,582
OK1ATP	1,560

MULTI-OPERATOR

SINGLE TRANSMITTER

UK9ABA	**2,335,506**	KH6HCM	1,405,249
4Z4HF	**1,771,056**	PJ2HT	1,296,750
UK3AAO	1,646,880	VE1ASJ	1,260,840

MULTI-OPERATOR

MULTI TRANSMITTER

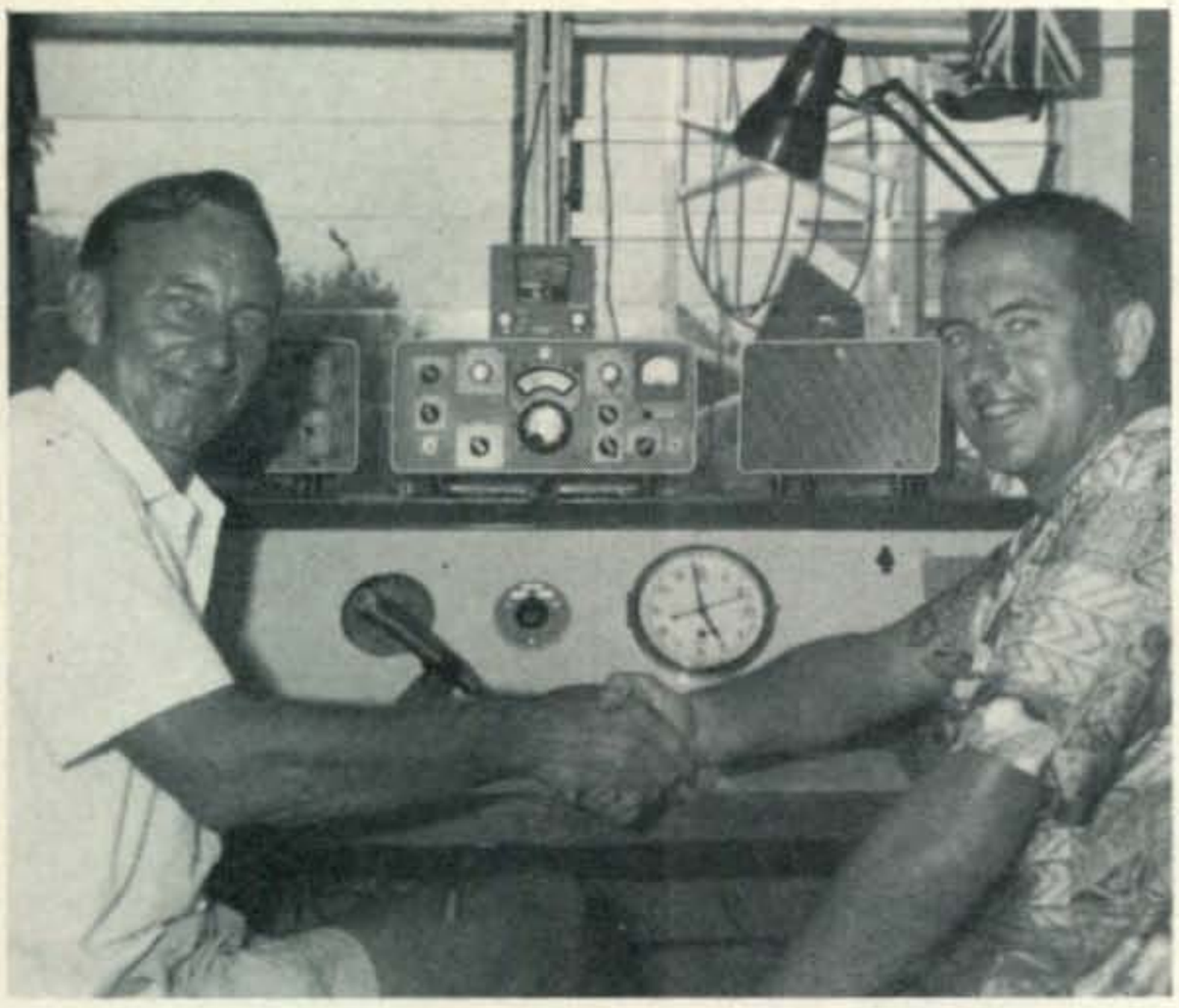
PJ9JT	**5,517,824**	K6RU	3,133,952
W4BVV	3,655,613	W3AU	3,009,544
W7RM	3,192,728	YUØN	3,003,216

Number groups after call letters denote the folowing: Band (A-all), Final score, Number of QSO's, Zones and Countries. Certificate winners are listed in bold face.

C. W. RESULTS
SINGLE OPERATOR
NORTH AMERICA

United States

W1FBY	**A**				
		1,163,160	**1016**	**119**	**286**
			(opr. K1ZND)		
W1BPW	**A**				
		1,154,215	**933**	**130**	**301**
W1FEG	"	808,852	801	99	242
K1VTM	"	210,210	329	77	154
W1EZD	"	161,700	292	68	128
WA1LKU	"	141,834	268	68	134
WA1ABW	"	128,898	254	72	117
G3XPM/W1					
	"	114,632	245	67	111
W1OR	"	105,040	183	71	131
W1WY	"	92,748	194	66	111
W1CNU	"	60,588	148	43	89
W1FLN	"	56,994	143	67	94
WA1ANR	"	41,760	124	46	74
W1RML	"	7,191	57	17	30
K1OME	"	6,903	43	24	35
K1HVV	**21**	**137,312**	**421**	**30**	**82**
WN1ORL	"	2,310	43	8	15
W1PLJ	"	260	11	5	5
K2LQQ/1					
	14	**38,280**	**153**	**28**	**60**
K1NOL	**7**	**78,234**	**267**	**29**	**73**
K1EUF	"	36,855	141	26	65
W1WMH	"	432	12	7	11
K1DIR	**3.5**	**51,591**	**210**	**21**	**66**
W1WAI	"	8,736	71	13	35
K1PBW	**1.8**	**2,914**	**36**	**11**	**20**
W1BB	"	987	18	7	14
K2KUR/2					
	A	**1,003,632**	**855**	**129**	**277**
W2DXL	**A**	**636,048**	**676**	**110**	**236**
K2QIL	"	302,871	424	91	168
K2FL	"	138,890	241	82	133
W2DT	"	130,326	230	77	126
W2UI	"	126,380	268	68	110
WA2LQZ	"	93,378	217	57	101
WA2BYJ	"	90,080	202	67	93
			(Opr. WB2PGG)		
K2MFY	"	87,360	238	43	87
WA2LOG	"	53,692	153	46	78
K2CPR	"	46,472	127	61	87
WA2RQH	"	36,207	158	27	54
W2CKR	"	24,840	100	34	56
W2CVW	"	18,584	71	38	63
K2DW	"	9,453	52	31	38
W2UJ	"	4,740	45	19	33
WB2PCM	"	121	6	5	6
WB2VYA	**21**	**100,548**	**350**	**28**	**70**
VE2MW/W2					
	"	65,281	232	30	67
WA2ZEZ	"	53,940	214	24	63
WA2BPH	"	26,130	144	21	44
W2EUQ	"	4,312	39	18	26
WN2PWS	"	1,701	30	7	14
K2INP	**14**	**73,000**	**257**	**30**	**70**
WB2IQF	"	31,493	149	27	50
K3MBQ/2					
	"	8,771	66	18	31
K2LWR	**7**	**115,200**	**334**	**31**	**89**
			(Opr. K2DJD)		
PY7AOD/W2					
	"	3,003	35	15	24
W2YT	**3.5**	**26,703**	**154**	**17**	**52**
W2HO	"	4,872	47	13	29
W2HUG	"	3,328	42	11	21
K2VGR	"	2,750	46	9	16
WA2KWB/2					
	"	1,100	25	8	12
W2EQS	**1.8**	**924**	**23**	**8**	**13**
W3WJD	**A**	**1,107,332**	**891**	**128**	**309**
K1LPL/3	"	**788,840**	**750**	**116**	**254**
			(Opr. WA3HRV)		
W3GRF	"	**708,327**	**678**	**117**	**256**
W3MWC	"	447,720	512	99	213
W3VT	"	407,640	476	109	186
W3NZ	"	400,156	498	98	186
W3OV	"	384,474	490	98	180
W3CRE	"	364,260	499	91	169
W3MFJ	"	342,324	470	88	169
W3NX	"	303,050	392	97	178
W3VEQ	"	285.417	389	99	180
W3KT	"	222,704	321	83	165
K3AIG	"	202,100	326	72	143
W3GRS	"	194,964	236	77	131
W3AXW	"	178,782	276	90	159
W3YCI/3	"	169,800	297	66	134
WA3NQJ	"	136,796	273	68	116
W3BYX	"	122,176	257	54	112
W3AIZ	"	114,696	229	66	111
W3GHD	"	99,000	212	59	106
K3TGM	"	80,409	194	55	92
W3FA	"	71,214	194	52	91
W3ZJ	"	70,942	189	66	92
K3YVN	"	59,268	162	46	86
W3GID	"	58,880	138	63	97
WA3HMM					
	"	56,304	159	64	80
W3HVM	"	47,520	127	54	81
W3DRD	"	27,621	98	37	62
W3EVW	"	22,321	82	44	57
W3EAN	"	19,388	92	25	49
W3ARK	"	19,028	101	23	44
W3CAA	"	11,368	67	20	38
K3RDT	"	8,365	44	27	40
WA3NNA	"	7,050	52	16	31
W3CBF	"	3,936	41	10	22
W3QLW	"	2,800	27	15	20
WA3QFN	"	777	14	9	12
WA3ONZ	"	156	7	6	6
WA3JYB	**21**	**36,579**	**144**	**27**	**63**
W3GRM	"	23,270	127	22	43
W3PG	**14**	**116,039**	**333**	**32**	**89**
W3AFM	"	76,000	208	34	91
WA3EFH	"	43,316	165	29	69
W3APO	7	4,440	40	12	25
W3MFW					
	3.5	**61,243**	**239**	**23**	**68**
W3QOR	"	10,560	90	17	31
K4TIG	**A**	**763,070**	**711**	**118**	**267**
W4JDR	**A**	**621,414**	**631**	**118**	**224**
K4PQL	**A**	**549,687**	**634**	**119**	**208**
WA4MSU					
	"	235,382	352	83	155
W4PGW	"	209,076	341	83	145
W4ZSH	"	196,650	306	76	154
W4BJ	"	178,920	292	72	139
K4EZ	"	170,375	269	94	141
K4FW	"	159,174	260	75	147
W4GGU	"	147,750	274	71	126
K4OD	"	146,792	245	91	145
K4OV	"	143,620	244	77	138
W4OZF/M4					
	"	140,694	306	67	112
W4DM	"	138,312	251	78	126
WB4GRN	"	127,908	245	76	128
W4NQA	"	119,394	216	71	127
W4DQS	"	114,409	244	71	120
K4ZA	"	104,075	212	68	113
W4KFC	"	103,680	201	72	120
K4NE	"	90,454	181	72	110
K4LDR	"	84,552	195	54	102
W4OMW	"	70,840	174	56	98
WB4UYD	"	69,296	177	55	87
K4JM	"	63,474	173	60	89
W4TMR	"	62,678	167	68	86
K4CL	"	59,670	156	52	83
W4HOS	"	53,284	134	57	97
K4KQ	"	44,770	144	45	76
WB4UKA	"	38,640	139	36	69
WA4LDM	"	36,636	101	56	86
W4WHK	"	32,294	93	53	81
W4WBC	"	30,910	109	49	61
K4LRX	"	21,600	88	37	53
W8BZY/4					
	"	21,527	82	48	55
K4PR	"	20,615	84	41	54
K4ORQ	"	19,500	75	46	54
W4DXI	"	13,612	60	35	47
W4JHK	"	12,696	62	25	44
K4JYM	"	8,635	58	21	34
W4YZC	"	8,413	63	16	31
W4GTS	"	5,650	40	21	29
K4AUA	"	5,250	42	22	28
WB4DRV	"	5,170	39	23	33
W4GF	"	4,200	31	21	29
W4WRY	"	3,754	31	21	27
W4OJI	"	2,496	27	18	21
W4KMS	"	2,240	20	20	20
W4WSF	**28**	**12,474**	**77**	**22**	**41**
W4AAV	**21**	**121,652**	**376**	**30**	**82**
W4ORT	"	107,910	342	28	81
K4KQS	"	31,441	143	23	50
K4DGJ	"	6,118	46	15	31
WB4SJE	"	5,500	50	19	25
W4RNL	"	2,088	26	11	18
WB4PQC	14	6,732	58	19	25
W4KNW	"	3,280	30	17	23



Trev, 5W1AR congratulating Phil, 5W1AU upon completing his first contest. This was the team that put 5W1AR in the Multi Single competition in the phone section of the contest. Trev has returned to New Zealand but Phil has promised to put Samoa on the air in the next one.

K4CYU	**7**	**50,100**	**192**	**28**	**72**
W4CRW	**3.5**	**28,804**	**144**	**21**	**55**
K4CKJ	"	10,205	58	20	45
W4QCW	**1.8**	**1,269**	**29**	**11**	**16**
K4IXC	"	805	17	8	15
WA5JMK	**A**	**196,095**	**282**	**93**	**162**
W5OSJ	"	121,360	231	85	120
W5LUJ	"	110,349	218	67	116
W5OB	"	86,210	185	71	114
W5QGZ	"	37,264	106	59	78
W5RKT	"	33,966	116	42	60
WB5AAR	"	29,808	104	47	61
W5QBM	"	23,158	88	46	56
W5HIC	"	4,089	31	20	27
W5RSZ	"	1,080	21	16	14
WA5YFQ	"	945	16	13	14
K5ABV	**28**	**19,738**	**104**	**24**	**47**
K5TFG	"	17,612	98	23	45
W5WMU/5					
	21	**165,880**	**523**	**30**	**80**
W5GO	"	77,662	256	30	73
W5TKB	"	44,200	178	26	59
WB5BHN	"	24,245	136	23	42
W5EQT	**14**	**107,985**	**356**	**33**	**82**
WB5DYY	"	89,281	246	36	91
W4GHV/5					
	"	7,714	49	25	33
W5WZQ	**7**	**111,510**	**374**	**30**	**75**
K5LWL/5	"	46,812	211	29	54
WA5RXT	"	25,179	122	24	53
W5RTQ	**3.5**	**8,673**	**75**	**17**	**32**
W5KC	"	4,068	52	13	23
K5PFL	"	3,200	43	11	21
W6MAR					
	A	**1,051,072**	**1070**	**124**	**228**
K6SDR					
	A	**883,086**	**1016**	**115**	**203**
WA6IVN					
	A	**790,993**	**955**	**105**	**184**
W6DGH	"	784,320	869	119	201
W6RR	"	765,716	855	115	207
WA6DKF	"	400,461	500	111	188
W6DQX	"	347,130	450	107	178
W6AM	"	207,480	376	88	126
K6QPH	"	188,410	424	71	95
K6AN	"	186,120	312	104	116
K6SSJ	"	177,840	305	89	119
			(Opr. W6JHV)		
K6HIH	"	164,174	363	74	92
W6CYX	"	125,064	239	81	112
K6OC	"	122,760	238	73	107
W6CS	"	117,660	233	81	104
W6CNA	"	110,055	271	57	88
K6TP	"	104,562	235	72	85
W6OKK	"	84,390	225	68	77
W6NKR	"	84,360	184	83	102
WB6CQY	"	83,486	179	74	95
K6YGS	"	73,746	186	63	90
K6DR	"	72,520	184	66	74
W6EYY	"	69,231	194	68	73
K6MP	"	55,622	154	59	78
K6CYX	"	54,162	139	68	85
W6CLM	"	52,767	168	59	64
W6ITD	"	49,022	141	56	67
G3DPX/W6					
	"	46,979	155	50	59
WA6LLY	"	44,850	136	45	70
W6EJ	"	35,990	117	51	67
WB6WAV	"	34,916	147	42	44
W6OL	"	34,155	124	42	57
W6UFJ	"	29,972	102	58	60
W6JKJ	"	25,338	95	49	54
W6EJJ	"	22,792	105	35	42
WA6BVY	"	19,788	106	33	35
W6KYA	"	16,465	68	41	48
WB6GFJ	"	12,732	62	33	43
WB6EXW/6					
	"	10,350	62	34	35
W6GBY	"	10,120	76	21	25
W6JKR	"	8,073	48	31	38
W6MED	"	4,059	35	18	23
W6RQZ	"	2,262	68	19	20
W6EJA	"	1,976	27	12	14
W6BIL	"	1,550	19	16	15
WA6NGG					
	28	**13,365**	**102**	**17**	**28**
K6QZ	**21**	**78,584**	**314**	**29**	**59**
WA6GLD	"	45,280	200	29	51
K6VL	"	19,440	127	22	32
W6HJ	"	16,980	105	22	38
WA6JKK	"	9,243	88	18	21
W6PMU	"	1,586	28	12	14
K6NA	**14**	**132,888**	**410**	**34**	**79**
W6BH	"	127,260	352	35	91
W6UA	"	111,384	320	36	90
K6IH	"	43,254	193	26	55
K6ERT	**7**	**180,222**	**632**	**31**	**67**
K6YFZ	"	1,980	34	10	12
K6AHV	**3.5**	**11,825**	**89**	**20**	**33**
W6ITY	"	9,154	80	18	28
W7IR	**A**	**610,332**	**604**	**123**	**239**
W7PHO	"	170,918	326	78	109
W7NP	"	168,264	342	64	107
W7YBX	"	143,616	305	75	101
W7OF	"	138,726	273	78	111
WA7JCB	"	119,394	270	71	91
W7LZF	"	52,140	167	43	67
W7GKF	"	46,696	155	45	59
WA7MJJ	"	40,139	172	42	47
W7QK	"	26,390	120	51	79
WA7OXQ	"	15,385	89	41	44
W7UBA	"	13,376	73	27	37
WN7RUY	"	117	17	7	6
WN7RVA	"	55	8	6	5
WA7CGR					
	28	**18,309**	**129**	**19**	**32**
K7UWT	21	510	20	6	4
W7YTN	**14**	**66,430**	**261**	**28**	**63**
W7DV	"	38,423	169	27	50
W7APN	"	34,725	163	27	48
W7ETZ	"	25,970	140	22	43
K7CHT	"	18,150	126	19	31
K4ZDK/7	"	17,940	140	18	28
W7LAV	"	5,320	49	16	22
K7JYE	"	1,917	36	12	15
W7CMO	"	210	7	4	6
W7JLU	**7**	**18,240**	**119**	**25**	**32**
W7AYY	"	10,944	108	16	20
K7IDX	1.8	70	20	4	3
WA8NYB	**A**	**276,885**	**350**	**102**	**191**
WB8FNE	"	111,618	246	61	101
K8YQW	"	62,883	163	60	93
W8DSO	"	42,619	138	43	66
W8GOC	"	30,388	107	41	66
WA8MEM	"	24,985	103	38	57
W8BJ	"	3,168	26	23	25
W8KOI	28	128	6	4	4
WA8QIY	**21**	**129,720**	**399**	**31**	**84**
W8SRK	"	82,038	257	33	80
WB8EAS	"	14,848	92	20	44
K8ULU	"	7,714	78	13	25
W8CGD	"	4,182	41	18	22
WN8IOT	"	1,586	25	11	15
WB8HAT	**14**	**62,055**	**214**	**31**	**74**
W8UMR	"	30,260	123	29	60
WB8IJI	"	15,718	96	18	40
W8EW	"	6,996	55	19	25
K8EHU	**7**	**44,462**	**172**	**30**	**64**
WA8JUN					
	3.5	**11,067**	**91**	**15**	**36**
WA8CAL	"	5,945	68	15	26
W8IBX	"	126	6	5	4
K8UDJ	1.8	36	3	3	3
W9YT	**A**	**800,544**	**779**	**125**	**247**
			(Opr. K9LBO)		
W9LKJ	**A**	**551,565**	**644**	**106**	**203**
K9KDI	**A**	**547,566**	**574**	**117**	**230**
W9RER	"	495,130	538	116	219
K9CUY	"	326,937	408	115	188
W9IRH	"	237,237	370	92	145
W9OHH	"	211,844	316	95	156
W9SFR	"	184,465	311	83	131
WA9AUM/9		182,208	329	70	122
W9LVT	"	165,204	264	92	142
W9WYB	"	93,456	194	67	109
W9DWQ	"	78,888	191	61	91
W9MMH	"	67,680	171	67	93
W9PJT	"	43,952	135	52	82
W9HE	"	29,610	116	35	55
W9TKV	"	25,650	100	36	59
K9WTS	"	23,256	92	47	55
K9UIY	"	13,090	81	36	41
W9AZP	"	4,717	33	25	28
WA9UMH	"	689	18	4	9
WB9DRE	28	2,046	32	14	17
WB9FJX	**14**	**183,714**	**479**	**35**	**99**
K9CLO	"	32,548	160	29	50
K9UON	"	7,140	49	20	31
WB9BWU	**7**	**42,228**	**166**	**24**	**68**
W9ZTD	"	23,976	133	24	48
W9LVH/9					
	"	1,984	24	14	18
W9KYZ	**3.5**	**3,648**	**53**	**10**	**22**
WB9BUV/9					
	1.8	**527**	**20**	**8**	**9**
W9PNE	"	121	6	5	6
WØHP	**A**	**456,323**	**516**	**119**	**210**
WØJYE	"	22,413	83	38	55
WAØJBX	"	18,067	82	41	4P
WAØYEF	"	8,448	53	31	3F
WØGYH	"	7,897	53	19	34
KØARS	28	6,300	49	21	29
WNØAMD					
	21	735	21	6	9
WNØCTQ	"	12	2	2	2
KØEKR	**14**	**52,380**	**199**	**29**	**68**
WØNQQ	**7**	**55,610**	**248**	**28**	**5F**
WAØVJF	"	12,320	92	20	3F
WAØVBV	"	4,680	44	15	2F
WAØEMS	**3.5**	**5,461**	**57**	**15**	**28**
WØJU	"	3,520	42	11	21

Alaska

KL7HIK	**A**	**344,829**	**1019**	**54**	**83**
KL7MF	"	95,692	484	42	52
KL7EWA	"	55,100	318	39	37
KL7UM	"	9,185	77	27	28
KL7JDO	"	5,550	94	16	14
KL7HGA	14	3,360	105	9	6

Antigua

VP2A	**A**	**1,741,480**	**1826**	**114**	**280**
VP2AAP	**7**	**61,460**	**381**	**21**	**47**

Bahamas

K4BZH/VP7					
	A	**27,740**	**185**	**33**	**40**
VP7CQ	"	17,739	324	13	14

Barbados

8P6DR	**A**	**199,716**	**519**	**75**	**103**

Bermuda

VP9BY	**14**	**14,756**	**303**	**10**	**14**
VP9BO	**1.8**	**812**	**59**	**3**	**4**

Canada

VO1HH	**14**	**102,714**	**368**	**31**	**71**
VE1AIH	**A**	**58,421**	**201**	**44**	**69**
VE1EK	"	18,150	97	31	44
VE1AE	**14**	**10,149**	**73**	**18**	**33**
VE2AYU	**A**	**345,059**	**733**	**73**	**136**
VE2WA	"	57,820	153	57	83
VE3BMV	**A**	**874,650**	**1055**	**120**	**237**
VE3UOT	"	99,244	216	69	103
VE3GCO	7	2,856	51	11	13
VE5XC	**A**	**26,980**	**175**	**37**	**34**
VE5RA	**21**	**17,976**	**192**	**19**	**23**
VE5XU	**1.8**	**1,218**	**91**	**4**	**3**
VE6MZ	**A**	**19,470**	**137**	**31**	**35**
VE6APJ	**14**	**10,730**	**134**	**14**	**23**
VE6APN	"	1,330	33	8	11
VE7FU	**7**	**53,950**	**485**	**19**	**31**
			(Opr. VE7IG)		
VE8BB	**A**	**173,746**	**743**	**42**	**67**

Canal Zone

KZ5PN	**21**	**38,352**	**234**	**21**	**47**

Costa Rica

TI2WX	**A**	**184,338**	**902**	**45**	**55**

Dominican Rep.

HI3XAM	**A**	**33,087**	**398**	**19**	**22**
HI8LC	**3.5**	**18,690**	**259**	**14**	**21**

Guantanamo

KG4CS	**1.8**	**7,884**	**143**	**10**	**17**

Greenland

OX3YY	**A**	**125,715**	**626**	**58**	**87**
OX5AT	A	32,760	260	26	30
OX3WQ	**14**	**55,890**	**475**	**18**	**36**

Guatemala

TG9YN	**A**	**123,478**	**573**	**47**	**60**

Honduras

HR1AT	**A**	**30,100**	**187**	**26**	**44**

Mexico

6D1AA					
	A	**2,125,354**	**2677**	**122**	**251**

Puerto Rico

KP4DJI	**A**	**216,006**	**923**	**43**	**68**

St. Pierre

FP0CA	**A**	**754,509**	**1879**	**61**	**122**
			(Opr. K2OJD)		

Virgin Islands

KV4AM	**28**	**24,725**	**269**	**18**	**25**
KV4FZ	**7**	**420,546**	**1440**	**28**	**91**

AFRICA

Angola

XX6IK	**14**	**499,820**	**1267**	**35**	**90**
CR6AI	**7**	**49,533**	**299**	**17**	**40**

TOP U.S.A. SCORES

Single Operator

All Band	**W1FBY**	**1,163,160**
28 mHz	K5ABV	19,460
21 mHz	W5WMU/5	165,880
14 mHz	WB9FJX	183,714
7 mHz	K6ERT	180,222
3.5 mHz	W3MFW	61,243
1.8 mHz	K1PBW	2,914

Multi-Operator

Single Xmtr	K6EBB	1,000,282
Multi Xmtr	W4BVV	3,655,613

Cameroun

TJIAW	A	3,304	42	14	14

Canary Islands

EA8BK	A	150,384	400	36	90

Ethiopia

9F3USA					
	21	**474,351**	**1217**	**33**	**98**
		(Opr. K3BSY)			
ET3DS	**14**	**402,360**	**1129**	**34**	**86**
ET3USD	"	204,768	647	32	77
		(opr. K9JXW)			
9E3USA	**7**	**51,569**	**328**	**16**	**37**
		(opr. WB8JAK)			

Madeira Islands

CT3AS	**A**	**234,956**	**524**	**49**	**102**
DJ6QT/CT3					
	"	27,432	133	30	42

Malawi

7Q7AA	**28**	**412,143**	**1248**	**26**	**85**

Mauritius Island

3B8CR					
	A	**1,221,297**	**1376**	**100**	**211**
3B8DA					
	14	**76,440**	**321**	**23**	**61**

Republic of South Africa

ZS2RM	**A**	**383,328**	**666**	**65**	**133**
ZS2CW	"	84,260	265	40	70
ZSIACD	**21**	**12,875**	**175**	**10**	**15**
ZS61W	**14**	**296,880**	**841**	**33**	**87**
ZS2HI	**7**	**24,843**	**182**	**20**	**29**

Rhodesia

ZE1BT	**28**	**188,354**	**770**	**23**	**59**
ZE2KV	**14**	**255,411**	**781**	**32**	**79**
ZE8JN	"	150,040	581	28	60
ZE1CY	**7**	**35,420**	**184**	**24**	**46**
ZE5JJ	**7**	**34,980**	**214**	**21**	**39**

Spanish North Africa

EA9EO	**A**	**261,000**	**605**	**43**	**107**

Swaziland

3D6AX	**A**	**154,628**	**315**	**63**	**109**

Tanzania

SH3LV	**A**	**359,196**	**532**	**68**	**154**

Zambia

9J2TR	28	7,740	73	10	26

ASIA

Ceylon

4S7AB	**A**	**344,148**	**583**	**83**	**155**

India

VU2AAA					
	A	**1,005,869**	**1426**	**88**	**205**
			(opr. K4CTY)		
VU2CP	"	68,700	195	38	62
VU2RM	**14**	**77,164**	**342**	**30**	**71**

Iran

EP2DL	A	11,946	69	24	42
		(opr. VK2AOO)			

Japan

JA2JW	**A**	**738,943**	**984**	**101**	**168**
JAINPV	"	**197,676**	**375**	**91**	**113**
JA6CLO	"	**168,150**	**348**	**78**	**112**
JA7YAA	"	116,874	315	68	83
JA1ANG	"	106,576	266	72	87
JA7AD	"	101,618	255	66	83
JA7CDV	"	100,062	258	66	87
JA3MGY	"	97,782	282	58	71
JA2TH	"	83,956	220	58	81
JAIAYO	"	67,680	226	57	63
JAINLX	"	60,200	254	42	58
JAIDQT	"	58,410	183	53	65
JAIFGB	"	52,496	149	62	74
JA8FBM	"	47,874	223	37	42
JA7YDJ	"	47,328	169	57	59
JAIITX	"	45,353	137	60	73
JAIQML	"	38,512	136	57	59
JHIORA	"	33,504	145	40	56
JA3CKR	"	23,375	127	42	43
JA5CEK/3					
	"	19,618	118	34	33
JR1TMG	"	12,768	106	22	26
JH1LKH	"	11,084	75	33	35
JA2ZBG	"	8,996	76	22	30
JA9AMJ	"	8,478	66	28	26
JA5YCS	"	7,488	64	22	26
JA7DSQ	"	4,554	47	21	25
JA1XFB	"	2,944	42	16	16
JA1YAQ	"	2,760	53	21	19
JA2COO	"	1,512	24	13	15
JA1SMA	"	1,242	26	11	12
JA4GXS	"	1,092	24	11	10
JH1HTK	"	987	21	11	10
JH3FOR	"	629	15	9	8
JA2AJA	"	473	29	7	7
JA1SR	**28**	**9,900**	**87**	**19**	**25**
JA7J1	"	9,592	80	20	24
JA1OCA	"	8,282	75	18	23
JH1WIX	**21**	**95,732**	**390**	**30**	**61**
JA3JRI	**21**	**70,384**	**299**	**28**	**55**
JA2IU	"	31,808	181	26	38
JA1WYZ	"	28,944	146	27	45
JA2ITH	"	28,520	170	25	37
JA3MVI	"	26,585	162	24	41
JA1CXW	"	13,338	91	22	32
JA0SC	"	6,372	63	18	18
JA3PGV	"	6,292	58	17	26
JA3FV	"	5,950	63	17	17
JR1ODI	"	3,151	49	11	12
JA1XGI	**14**	**198,555**	**735**	**28**	**65**
JA2HNP	**14**	**104,762**	**394**	**31**	**67**
JE1CKA	"	78,930	322	32	58
JA1BNW	"	17,640	112	24	36
JA5FS	"	12,483	98	23	34
JAIKNZ	"	9,516	71	21	31
JA2HFB	"	8,772	77	22	29
JA5BLF	"	7,920	82	20	24
JA1PTI	"	4,940	53	17	21
JE1CUA	"	3,658	53	14	17
JA1BWS	"	2,822	35	17	17
JAIACA	"	2,407	39	12	11
JA8GR	"	2,268	44	14	13
JA4BTD	"	2,088	39	14	15
JA1OHV	**7**	**80,668**	**354**	**31**	**55**
JA1CWZ	**7**	**54,110**	**280**	**27**	**43**
JA1GDN	"	49,653	231	31	50
JA3BKC	"	35,325	190	26	49
JA1PPW	"	30,366	183	26	37
JA6FFV	"	21,712	139	22	37
JA1DUH	"	16,720	112	25	30
JA3ERG	"	7,320	68	20	20
JA2EG	"	663	21	6	7
JA3BCT	"	405	17	5	4
JH3FTQ	"	40	4	2	2
JA2AAQ					
	3.5	**15,040**	**131**	**19**	**28**
JA5DQH	"	429	22	5	6

Korea

HM1EJ	A	14,278	140	29	30

Lebanon

OD5GS	A	8,547	79	10	27
OD5LX	3.5	6,156	80	7	20

Ryukyu Islands

KR6AY					
	A	**1,075,728**	**1674**	**115**	**192**

Thailand

HS5ABD					
	A	**1,169,336**	**1344**	**123**	**269**

U.S.S.R.

Asiatic

UW9WB					
	A	**1,082,972**	**1182**	**87**	**239**
UW9WL	"	707,996	967	74	189
UA9CT	"	328,454	693	60	143
UA900	"	265,680	490	63	142
UW9WD	"	31,752	242	15	34
UA9CAY	"	24,205	132	19	49
UA9MQ	"	12,702	99	24	34
UK9CAQ	"	12,555	110	14	31
UA9WO	**28**	**17,028**	**153**	**11**	**32**
RA9FCA	"	14,570	118	14	33
UA9CAL	"	11,900	132	6	19
UV9DO	"	4,176	50	8	21
UA9QD	**21**	**37,611**	**250**	**19**	**44**
UA9TT	"	32,832	238	12	36
UA9NN	"	28,340	171	22	43
UA9HM	"	13,635	131	8	33
UV9CO	"	11,920	119	11	29
UA9CN	"	11,100	120	10	27
UA9DN					
	14	**306,446**	**1047**	**28**	**78**
UA9BL	**14**	**142,400**	**658**	**25**	**55**
UA9JH	"	123,574	523	21	61
UA9JO	"	72,048	339	23	56
UA9OS	"	68,448	311	29	63
UW9AT	"	61,641	277	24	57
UV9OC	"	45,552	254	25	53
UA9MK	"	42,770	243	22	48
UA9UF	"	34,921	265	17	40
UA9CAT	"	28,800	193	17	43
UK9YAA	"	22,880	160	14	41
UW9PJ	"	22,302	152	18	41
UA9CAA	"	11,835	103	17	28
UA9CBF	"	11,438	102	13	30
UA9IF	"	7,194	80	10	13
UA9DU	"	3,944	51	8	21
UA9XV	"	260	18	5	8
UA9WAL	**7**	**3,051**	**56**	**9**	**18**
UA9CM	**3.5**	**41,085**	**330**	**9**	**36**
UA9QAA	"	37,843	324	8	33
UW9PT	"	6,560	60	11	30
UV9DB	"	630	54	5	10
UW0AF	**A**	**264,516**	**577**	**66**	**122**
UA0YT	**A**	**127,086**	**506**	**34**	**84**
UA0LJ	"	71,910	327	42	60
UA0YD	"	59,436	236	40	77
UA0GF	"	40,105	368	33	32
UA0MI	"	35,815	252	42	53
UA0BAC	"	20,577	141	19	38
UA0CAK	"	14,360	229	18	22
UA0CE	"	5,394	140	15	14
UA0ZAM	"	2,592	70	8	8
UA0TP	**21**	**52,668**	**404**	**20**	**46**
UA0YAE	**14**	**84,796**	**391**	**26**	**60**
UA0ZI	"	46,592	405	24	28
UK0CAE	"	23,716	294	22	22
UA0VG	"	10,304	109	17	39
UW0LI	"	10,140	190	17	22
UA0CAV	"	9,360	153	17	19
UA0SA	"	7,755	109	11	22
UA0TD	"	6,336	105	15	18
UA0ABC	**7**	**43,230**	**297**	**23**	**43**

Armenia

UG6GAF	**28**	**26,509**	**199**	**14**	**35**
UG6JJ	**14**	**41,580**	**262**	**18**	**42**
UK6GAE	"	13,035	142	10	23
UG6AD	**7**	**140,868**	**637**	**24**	**60**

Azerbaijan

UD6CN	**A**	**324,480**	**630**	**64**	**144**
UD6AM	"	201,664	446	61	123
UD6BW	"	50,467	187	36	73
UD6DGX	**7**	**61,671**	**427**	**17**	**44**

Georgia

UK6QAA	**14**	**50,652**	**364**	**17**	**37**

Kazakh

UL7CT	**A**	**307,714**	**596**	**59**	**138**
UL7YP	"	45,216	195	30	66
UL7TA	**28**	**9,087**	**112**	**12**	**27**

The crew of the "Big Gun" 4M1A, Multi Multi winner in the Phone contest. L. to R. back row: Leslie, YV1PP; Gianni, YV1TP; Bruno, YV1IV; George, YV1BI, Fafa, YV1FQ. Front row: Anestis, YV1SA; Charles, YV1OB; Rafael, YV1WY; Ruben, YV1WH; Janusz, YV1LA. That explains why there were no other YV1 entries. (Photo rec'd too late to use last month.)

UL7LAW	"	816	17	5	11
UL7XE	**14**	**46,144**	**279**	**20**	**44**
UL7NG	"	31,650	239	14	36
UL7WI	"	10,395	109	15	30
UL7BL	**7**	**78,300**	**396**	**22**	**53**
UL7NAF	"	42,273	253	17	44
UL7JE	"	37,107	290	21	42
UL7CAB	"	1,488	36	6	10
UL7GW	**3.5**	**17,985**	**170**	**15**	**40**

Kirghiz

UM8FM	**A**	**227,852**	**616**	**53**	**119**
UM8FJ	"	15,496	140	19	33
UM8FZ	**14**	**115,533**	**464**	**29**	**70**

Tadjik

UJ8AB	**A**	**93,824**	**333**	**46**	**73**
UJ8AW	"	18,432	109	23	41
UJ8JAS	**7**	**20,167**	**176**	**11**	**32**

Turkoman

UH8CS	**A**	**278,045**	**632**	**42**	**117**
UH8BD	"	148,212	286	69	138
UH8CJ	"	70,896	235	35	77
UH8DL	**14**	**85,836**	**386**	**28**	**64**

Uzbek

UI8BL	**A**	**25,452**	**160**	**20**	**43**
UI8OJ	**14**	**95,942**	**431**	**26**	**63**
UI8AI	**7**	**10,792**	**112**	**14**	**24**

EUROPE

Aland Islands

OH0NI	**A**	**358,020**	**711**	**76**	**179**
OH0NJ	**7**	**3,729**	**100**	**8**	**25**

Austria

OE1ZGA	**A**	**121,758**	**254**	**78**	**145**

Belgium

ON4XG	**A**	**141,300**	**434**	**62**	**118**
ON4CE	21	480	15	6	10

Bulgaria

LZ2RF	**A**	**120,320**	**532**	**44**	**116**
LZ2KPD	"	77,532	409	41	101
LZ1LI	"	54,908	388	26	80
LZ2RH	"	943	43	9	14
LZ1KSV	**21**	**156,464**	**560**	**33**	**94**
LZ2KKZ	"	38,016	304	24	42
LZ1AQ	**14**	**38,480**	**253**	**22**	**58**
LZ2GS	"	5,840	101	8	32
LZ1NJ	**7**	**36,360**	**393**	**17**	**43**
LZ1KBG	"	27,948	370	13	38
LZ1QR	"	9,933	168	10	33
LZ2KBI	"	2,964	66	10	16
LZ1DX	**3.5**	**52,104**	**593**	**23**	**55**
LZ1KKZ	"	18,000	375	6	39
LZ1AG	"	17,800	298	11	39

Czechoslovakia

OK2BYW	**A**	**700,422**	**1112**	**97**	**224**
OMØIQ	**A**	**558,090**	**947**	**100**	**218**
OM2QX	**A**	**491,344**	**817**	**90**	**197**
OMØOM	"	401,926	873	81	185
OMØWC	"	226,116	603	63	135
OK1AHZ	"	104,208	273	65	102
OK1ARZ	"	91,728	324	45	99
OMØCES	"	90,480	402	49	107
OMØBMF	"	83,050	323	49	102
OK3ZBU	"	61,680	383	30	90
OK1MSP	"	58,608	226	53	91
OK2BBI	"	52,593	200	48	93
OMØKZ	"	50,507	336	37	84
OK3TBY	"	35,956	253	26	63
OK2BEC	"	34,126	246	30	83
OM2TB	"	25,740	127	37	53
OK2LN	"	21,084	197	26	58
OK2BDM	"	19,964	102	37	55
OMØPAB	"	17,476	166	27	41
OMØBKL	"	16,600	190	31	52
OK3TCV	"	14,439	138	41	46
OMØPBM	"	11,988	124	21	33
OK1MIN	"	8,220	92	31	46
OM1AEH	"	7,800	87	21	39
OK2BBJ	"	6,324	38	30	32
OMØZAK	"	6,016	165	9	29
OK2PDL	"	5,546	78	17	30
OK2BEF	"	5,432	61	18	38
OK1AQR	"	5,290	98	13	33
OK2PAC	"	4,116	68	12	37
OK2PAF	"	2,331	29	17	20
OK1MAS	"	1,984	28	15	17
OK1DZS	"	1,326	64	6	7
OK2BIP	"	1,218	22	13	16
OK1AOU	"	1,107	36	9	18
OK2ALC	"	714	44	4	13
OMØBOB	**28**	**10,860**	**74**	**23**	**37**
OMØEE	"	9,295	68	20	35
OMØAGQ	"	2,144	26	14	18
OK2ABU	"	72	6	2	2
OK1TA	**21**	**68,310**	**285**	**33**	**57**
OK1ICM	**21**	**60,333**	**280**	**32**	**59**
OK2BKU	"	44,880	248	24	42
OK1DN	"	33,345	196	25	40
OK3AS	"	32,718	221	25	32
OMØACF	"	29,172	156	27	39
OK3CHK	"	25,856	155	23	41
OK1ZL	"	20,215	121	23	42
OMØEA	"	10,947	93	20	21
OK3UN	"	3,201	48	13	20
OK1EG	**14**	**54,320**	**408**	**25**	**55**
OK1APJ	**14**	**35,405**	**263**	**23**	**50**
OK1AOV	"	29,250	196	24	51
OK3ALE	"	27,202	198	23	44
OMØBHK	"	24,428	206	21	41
OK3TAZ	"	19,832	141	23	51
OK2BNA	"	18,972	195	18	44
OMØBFS	"	12,150	102	19	35
OMØATZ	"	8,950	108	16	34
OK2BDH	"	7,084	102	10	34
OK1APS	"	5,796	78	15	27
OK3TAD	"	3,030	73	10	20
OK1DBM	"	846	21	8	10
OK2BBQ	"	384	28	5	7
OK3CGT	"	48	8	2	4
OK1NR	**7**	**35,259**	**427**	**14**	**55**
OM3YAX	"	10,440	220	9	31
OK1AES	"	9,735	180	7	21
OK2BOL	"	3,168	58	9	23
OK2BOV	"	544	26	5	12
OK1AIA	"	252	8	7	7
OK1ALW	**3.5**	**35,588**	**446**	**15**	**47**
OMØHI	**3.5**	**14,663**	**297**	**7**	**36**
OK3TJI	**3.5**	**14,309**	**288**	**9**	**32**
OK1XJ	"	9,100	251	6	29
OK3TQQ	"	8,388	225	7	29
OK3CGI	"	5,928	138	8	30
OK3TOA	"	4,380	126	7	23
OK1AVN	"	2,951	109	5	22
OM3YCA	"	2,808	106	5	21
OK1ATX	"	2,673	89	6	21
OMØBCI	"	2,668	88	6	23
OK2BSA	"	2,629	83	6	26
OK1IAL	"	2,520	87	5	23
OK1FAI	"	2,482	44	8	26
OK3KPN	"	2,128	114	5	19
OK1JDJ	"	1,750	72	5	20
OK1AVY	"	1,716	57	5	17
OK1IAR	"	1,242	53	5	18
OK1HAF	"	1,000	39	5	20
OK3TBC	"	924	44	4	17
OK1ICJ	"	760	33	4	12
OK3QA	"	680	44	5	12
OK1MAA	"	528	33	2	8
OK1HBD	"	429	34	3	10
OK1AYG	"	416	26	4	12
OK3TBR	"	176	24	2	6
OMØARH	"	80	8	4	6
OK1ATP	**1.8**	**1,560**	**104**	**3**	**12**
OL1AOH	**1.8**	**715**	**68**	**2**	**11**
OL5ANJ	"	671	63	2	9
OL5AOY	"	650	63	2	11
OK1DJK	"	546	43	2	11
OK1AYY	"	495	51	2	9
OL7AMK	"	481	49	2	11
OL1APC	"	408	37	2	10
OK1FTC	"	341	37	2	9
OLØANU	"	300	39	2	8
OL1API	"	286	35	2	9
OK3TAO	"	230	27	3	7
OK1KUT	"	220	41	2	8
OL4AMU	"	180	21	2	8
OK2BJG	"	170	21	2	8
OK1KBC	"	104	40	2	6
OK1MHS	"	72	12	2	6
OK2PDN	"	30	11	2	4
OL8CAG	"	24	11	2	4

Denmark

OZ2NU	**A**	**51,352**	**306**	**31**	**100**
OZ4H	"	28,820	158	48	62
OZ6HS	"	28,611	177	30	69
OZ3PO	"	27,459	116	42	71
OZ5ME	"	27,257	188	33	64
OZ4HW	"	26,480	221	22	58
OZ8HC	"	21,372	195	24	54
OZ7JZ	"	15,040	126	22	72
OZ9OI	"	5,986	108	13	28
OZ7XG	"	2,774	33	18	20
OZ2X	"	2,336	25	16	16
OZ8BN	14	2,336	41	9	23
OZ5CI	"	1,128	40	10	14

England

G3FXB	**A**	**833,519**	**1056**	**102**	**211**
G3KWK	"	522,158	950	85	162
G2DC	"	174,492	372	64	158
G2AJB	"	77,945	353	41	90
G3JKY	"	41,664	260	35	77
G3XTT	"	34,441	245	29	72
G3ZOQ	**28**	**24,000**	**150**	**21**	**39**
G2BOZ	"	19,668	133	23	43
G3CWL	"	1,508	23	12	17
G3HCT	**21**	**205,989**	**691**	**32**	**87**
G3RUX	"	79,390	451	27	58
G3YCT	"	8,775	169	10	17
G3RZI	**14**	**110,510**	**605**	**26**	**60**
G3PVA	"	34,880	294	21	43
G3KDB	**7**	**33,600**	**272**	**21**	**54**
G4ANR	**1.8**	**1,316**	**81**	**3**	**11**

Finland

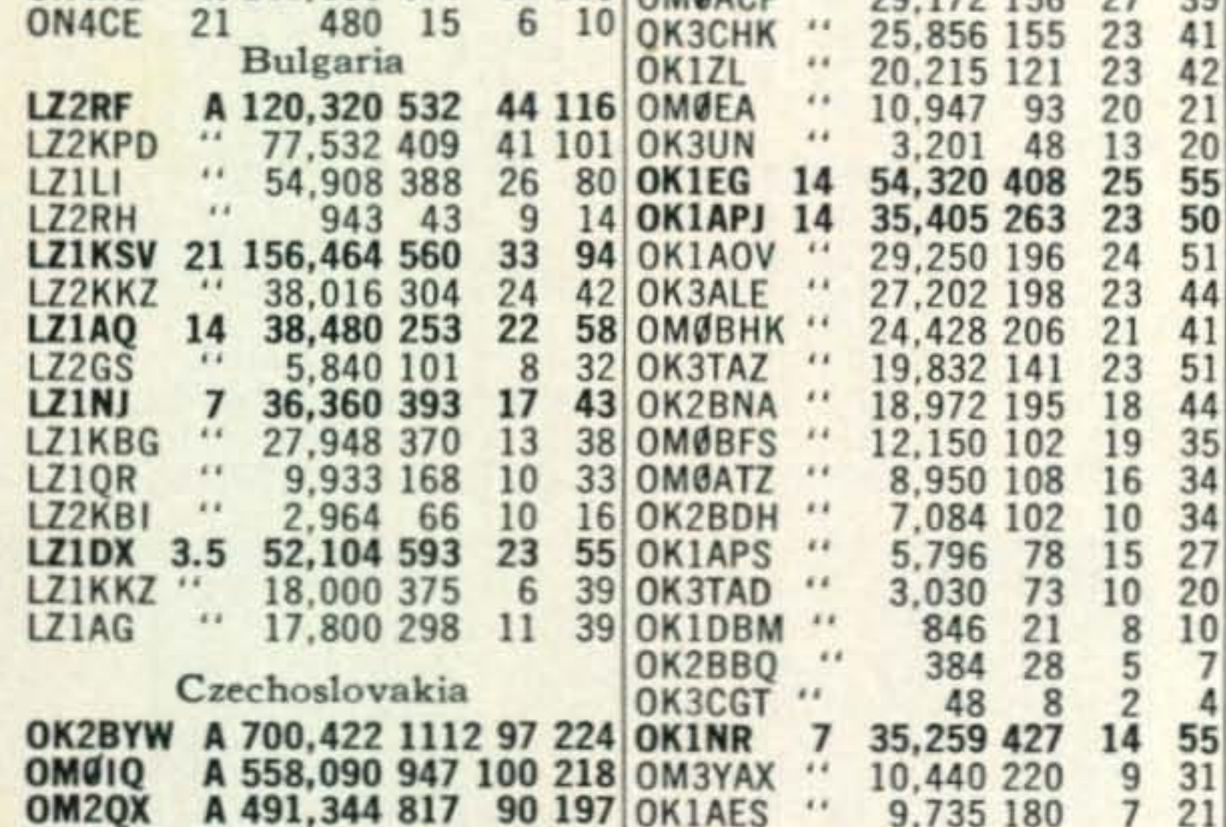
OH8RC	**A**	**791,574**	**1098**	**100**	**229**
OH3MK	**A**	**112,194**	**297**	**66**	**141**
OH4NM	"	85,383	294	56	123
OH9RJ	"	53,055	230	43	88
OH2LU	"	51,072	301	37	96
OH7NW	"	36,480	202	34	94
OH7SQ	"	23,904	203	24	72
OH2VZ	"	22,680	130	36	54
OH6AK	"	19,422	170	25	53
OH2YL	"	19,116	134	32	49
OH3NR	"	10,804	68	25	49
OH5OD	"	7,776	70	20	52
OH2BJY	"	6,912	67	26	38
OH5XO	"	6,420	75	22	38
OH1PG	"	5,408	62	16	42
OH8SN	"	5,076	95	18	29
OH3KT	"	3,360	50	17	25
OH6ZH	"	3,124	53	14	30
OH4SO	"	1,824	57	8	24
OH6KH	"	1,102	36	8	21
OH4RV	"	980	23	8	12
OH3MU	"	525	25	6	15
OH2KU	"	272	10	7	9
OH2ZP	**21**	**10,808**	**102**	**20**	**36**
OH6RC	"	8,960	94	19	37
OH5PZ	"	8,424	83	17	37
OH6NH	"	4,108	40	19	33
OH8SP	"	3,780	140	5	22
OH2BCD	"	1,150	28	11	14
OH1XA	"	736	20	7	16
OH9TD	"	600	20	6	14
OH6LV	"	584	30	4	14
OH2BW	**14**	**230,560**	**951**	**31**	**79**
OH8OB	"	25,312	284	15	41
OH7OV	"	17,340	130	18	50
OH6RX	"	7,245	126	13	32
OH7OQ	"	5,192	57	15	29
OH5YF	"	3,045	43	13	22
OH3BMH	"	2,006	26	14	20
OH2DN	"	42	3	3	3
OH2QV	**7**	**131,868**	**582**	**31**	**68**
OH1VA	"	63,360	471	26	62
OH3LA	"	4,773	70	13	30
OH3BMG	"	2,407	75	7	22
OH1XX	**3.5**	**29,700**	**361**	**14**	**52**
OH1SH	**3.5**	**29,120**	**403**	**16**	**48**
OH1VJ	"	11,088	238	11	33
OH2XM	"	6,012	145	7	29
OH3NB	1.8	248	31	2	6

France

F8TQ	**A**	**156,512**	**564**	**45**	**89**
F8TC	"	152,152	524	42	91
F8TM	"	90,218	326	51	107
F6BBJ	"	60,489	240	44	73
F6AOZ	"	58,072	242	44	75
F6API	"	21,846	167	21	45
F6AAS	"	6,256	60	22	24
F2QQ	**7**	**61,845**	**435**	**24**	**69**
F9RO	3.5	6,232	133	8	30

Germany

DJ2HH	**A**	**741,776**	**957**	**100**	**196**
DJ7HZ	**A**	**682,992**	**1022**	**100**	**224**
DJ6LV	**A**	**627,054**	**988**	**96**	**190**
DL1MD	"	213,246	520	66	132
DJ4ZR	"	192,203	489	59	114
DL1JF	"	167,256	377	70	137
DJ4UF	"	160,822	394	63	128
DJ6BW	"	152,733	483	51	96
DJ9JF	"	136,192	416	52	76
DL7EN	"	131,516	297	70	126
DL9PE	"	104,719	359	49	108
DL8YR	"	102,422	301	63	103
DL1GN	"	92,853	340	52	119
DJ2GG	"	90,684	448	40	59
DK1YK	"	81,506	248	53	113
DJ4EJ	"	73,080	280	49	96
DL8IH	"	64,452	233	40	83
DL1YA	"	64,368	227	48	96
DJ5AVA	"	58,667	304	36	83
DL9PO	"	45,798	191	42	60
DJ4HR	"	39,528	173	42	80
DJ1LD	"	37,400	164	36	64
DL6GB	"	34,770	141	47	75
DL9MP	"	33,660	170	34	56
DL8PG	"	30,020	158	33	62
DK4EX	"	28,449	237	22	65
DL6BP	"	19,019	128	30	61
DK3KD	"	18,318	151	31	55
DL8HA	"	10,902	71	32	47
DJ5QK	"	7,140	82	19	51
DL1LD	"	5,408	51	19	33
DK5JA	"	4,770	72	18	35
DJ7CX	"	726	11	11	11
DK2BJ	28	1,472	29	10	13
DL7AV	**21**	**154,923**	**522**	**36**	**77**
DL7AA	"	102,714	355	35	71
DJ3YU	"	41,245	227	27	46
DL1RB	"	38,678	197	29	54
DL9EY	"	30,144	192	26	38
DK5PI	"	25,854	183	22	40
DL2JO	"	25,449	200	20	31
DL6EN	**14**	**110,344**	**454**	**29**	**75**
DL1IP	"	16,317	174	21	42



W9LVT, all bander out of Illinois and a member of the Rockford A.R.A. team, is set-up for phone as well as c.w. (Get some of the other boys in there next year, Pete!)

DL2JX	"	9,366	128	12	30
DJ5PA	**7**	**60,787**	**394**	**22**	**67**
DJ5JH	"	32,880	274	21	59
DK5PD	"	21,735	283	17	46
DJ8FF	"	21,352	266	16	52
DJ9EG	"	10,860	155	16	44
DJ6RX	**3.5**	**58,717**	**571**	**-16**	**55**
DJ5DT	**3.5**	**48,209**	**459**	**17**	**54**
DL1KS	"	13,700	223	9	41
DL1CF	**1.8**	**4,968**	**279**	**3**	**15**
DJ8WD	"	816	68	2	10
DM2BJD	**A**	**297,959**	**520**	**90**	**199**
DM2BTO	"	68,376	260	48	106
DM3SUH	"	41,700	225	37	63
DM2CHM	"	39,339	105	58	83
DM4WFF	"	24,984	305	15	57
DM3OML	"	23,100	154	29	46
DM4SFF/P	"	20,097	150	29	58
DM2CYO	"	17,860	91	35	41
DM3BE	"	16,356	121	30	64
DM4EL	"	11,534	50	37	42
DM5YVL	"	6,084	104	12	40
DM2CCM	"	4,320	37	20	25
DM3LOG	"	3,741	45	12	31
DM4CM	"	3,465	53	18	27
DM4SPL	"	1,247	33	8	21
DM2CXN	28	420	10	7	7
DM2BYE	**21**	**5,940**	**36**	**23**	**32**
DM3UE	"	5,508	41	24	30
DM2BUN	**14**	**16,074**	**180**	**16**	**41**
DM2AOL	"	10,675	96	21	40
DM2ATL	"	5,336	56	14	32
DM2AVD	"	528	37	6	11
DM4WL	**7**	**5,635**	**148**	**8**	**27**
DM5ZVL	"	1,701	60	7	20
DM3TRF	**3.5**	**3,724**	**136**	**4**	**24**
DM4XKL	"	2,492	92	5	23
DM3OGB	"	2,241	79	5	22
DM3XHF	"	1,404	52	5	21
DM4WWL	"	987	47	4	17
DM4ZTH	"	920	40	4	19

Hungary

HA7LF	**A**	**178,285**	**593**	**52**	**129**
HA8UD	**A**	**147,352**	**584**	**47**	**116**
HA3GF	"	135,930	410	63	134
HA3GJ	"	109,047	429	51	112
HA1SB	"	81,176	336	47	99
HA7LU	"	64,152	320	37	95
HA7LO	"	29,584	314	21	65
HA7MC	"	14,079	221	16	41
HA8VC	"	13,838	160	25	49
HA1ZG	"	13,616	102	20	54
HA5BH	"	10,125	73	31	44
HA9PB	"	9,372	116	17	54
HA1SX	"	7,482	112	20	38
HA7MD	**14**	**11,008**	**185**	**11**	**32**
HA1SN	"	5,338	124	8	26
HA6NC	"	2,726	82	8	21
HA1VA	"	1,326	33	7	17
HA1VJ	"	340	16	5	12
HAØDH/5	**7**	**27,272**	**372**	**16**	**40**
HAØDD	"	2,552	77	8	21
HA5HN	"	1,078	41	7	15
HA3GD	**3.5**	**4,290**	**145**	**6**	**24**
HA9OV	"	140	20	3	7

Iceland

TF3OJ	**14**	**6,583**	**105**	**10**	**19**
TF3RF	"	336	24	3	11
WA6EGL/TF	**3.5**	**18,200**	**203**	**14**	**36**

Ireland

EI5F	A	1,550	24	12	13
EI4CF	**14**	**22,908**	**302**	**14**	**32**

Italy

I6MAT	**A**	**73,950**	**363**	**42**	**60**
IP1SOP	"	43,659	273	22	55
I2RTI	**21**	**5,518**	**86**	**12**	**19**
IP1SBU	**14**	**24,816**	**214**	**19**	**47**
I5ZCN	**7**	**28,250**	**341**	**14**	**36**
I4AUM	"	966	40	6	15

I.T.U.

4U1ITU	**A**	**281,316**	**753**	**70**	**134**

(Opr. W5QNY)

Malta

9H1CH	**28**	**35,313**	**218**	**25**	**54**

Monaco

3AØFN	7	1,056	41	6	16

Netherlands

PAØABM	**A**	**178,076**	**445**	**66**	**126**
PAØTA	A	40,194	149	35	91
PAØVB	"	33,912	215	45	63
PA0NMH	"	16,968	101	16	40
PAØUV	"	7,056	58	14	28
PAØSNG	**14**	**115,139**	**590**	**29**	**68**
PAØMIR	**3.5**	**13,623**	**218**	**9**	**48**

Norway

LA6GF	**A**	**232,366**	**530**	**69**	**154**
LA4EJ	"	40,548	215	33	91
LA2Q	"	33,417	209	56	65
LA2KD	"	28,938	188	25	53
LA9OI	"	15,912	122	27	51
LA9JD	"	12,013	166	11	30
LA1P	"	9,709	110	18	55
LA2YG	"	8,684	148	16	36
LA3LC	"	2,623	49	16	27
LA1NP	"	2,079	25	11	16
LA8WG	**14**	**22,092**	**267**	**13**	**29**
LA1H	"	1,406	42	6	13
LAØAD	**7**	**177,450**	**851**	**31**	**74**
LA6U	"	5,940	46	8	36

Poland

SP9CTW	**A**	**208,280**	**724**	**62**	**143**
SP6ASD	**A**	**150,898**	**389**	**66**	**143**
SP9ABE	**A**	**147,117**	**440**	**58**	**121**
SP2AJO	"	80,445	327	51	104
SP8AWP	"	60,672	304	39	89
SP9AGS	"	44,232	276	35	79
SP8AFS	"	35,300	221	29	71
SP3ACB	"	34,132	302	22	70
SP5AFL	"	28,314	183	32	85
SP3AIJ	"	23,108	130	35	71
SP8ARU	"	16,074	115	33	61
SP9APF	"	16,038	94	32	49
SP2AHD	"	10,064	127	17	51
SP7CKF	"	8,832	121	16	48
SP9ASS	"	8,448	136	13	35
SP8AIS	"	5,805	110	13	30
SP1AFU	"	4,200	62	16	34
SP1DZ	"	3,564	69	15	29
SP2LV	"	2,100	50	11	24
SP8ASP	"	1,984	57	11	21
SP5ATO	"	620	11	10	10
SP8EMO	"	108	10	4	8
SP1AGE	**28**	**16,146**	**95**	**24**	**45**
SP9ADU	**21**	**51,678**	**250**	**28**	**53**
SP1BHX	**21**	**37,668**	**169**	**30**	**56**
SP2AIB	"	24,140	135	27	41
SP5ACN	"	22,649	117	28	43
SP5PIL	"	17,727	130	21	36
SP2APA	"	9,546	82	20	23
SP8EDQ	"	8,225	71	19	28
SP7AOD	"	7,560	79	15	21
SP3BGD	"	5,115	76	12	19
SP7DTP	"	4,814	67	11	18
SP3AK	"	3,480	47	13	16
SP1BSY	"	3,192	64	9	10
SP9EEE	"	1,426	35	9	14
SP2PCX	"	407	17	5	6
SP9KZ	**14**	**59,220**	**331**	**28**	**75**
SP9EFP	**14**	**55,319**	**321**	**31**	**76**
SP9CTY	"	51,418	364	28	66
SP5SIP	"	46,176	333	25	53
SP8AG	"	21,014	142	26	53
SP3BES	"	20,178	243	17	40
SP8HR	"	13,158	172	15	36
SP6DMJ	"	12,116	107	14	39
SP5DRH	"	9,744	108	14	34
SP5DOX	"	8,924	102	15	31
SP7ASZ	"	7,452	104	16	30
SP9FEX	"	4,280	60	15	25
SP9BIS	"	3,072	53	11	21
SP8EST	"	1,320	44	6	16
SP5ARN	**7**	**49,590**	**382**	**23**	**64**
SP3CB	"	17,920	180	17	53
SP3AUZ	"	14,900	281	11	39
SP2BMX	"	6,132	118	10	32
SP5ELX	"	3,904	100	7	25
SP7DQN	"	2,158	81	6	20
SP3CDQ	"	1,188	38	6	21
SP9DH	**3.5**	**40,020**	**566**	**14**	**46**
SP6TQ	**3.5**	**25,480**	**429**	**10**	**42**
SP7OX	"	18,768	374	8	38
SP5KGT	"	16,036	383	7	31
SP5HS	"	14,850	320	9	36
SP9BNY	"	14,220	302	9	36

We would hardly consider Finland as the ideal spot to work 40 meters but OH2QV made 6th World High, which is a nice accomplishment.

SP8KAF	"	7,860	236	6	24
SP9AAB	"	7,525	210	5	30
SP2BRZ	"	6,324	169	6	28
SP8SR	"	6,300	205	6	24
SP6UK	"	5,704	200	5	26
SP9ENV	"	4,236	153	5	23
SP1DMK	"	3,198	125	5	21
SP6AZT	"	2,449	75	5	26
SP9EES	"	2,288	102	5	17
SP8ALC	"	1,260	74	4	14
SP4ETO	"	1,200	60	4	16
SP6SD	"	1,058	46	5	18
SP7FAD	"	216	25	3	6
SP6GB	"	90	10	3	6
SP7DQR	"	88	16	2	6

Romania

YO9APJ	**A**	**194,579**	**659**	**62**	**147**
YO7DO	**A**	**165,119**	**521**	**55**	**108**
YO8FZ	"	154,451	346	72	137
YO7DL	"	100,815	406	47	96
YO8DD	"	21,728	162	28	69
YO2RA	"	19,740	187	25	59
YO9GP	"	16,896	141	24	64
YO3AC	"	15,824	85	33	59
YO2AVP	"	13,104	134	22	50
YO5BQ	"	10,500	112	21	49
YO2QY	"	6,490	64	22	37
YO3YZ	"	5,145	135	11	24
YO8GF	"	1,104	36	8	15
YO3JW	**21**	**15,048**	**140**	**20**	**37**
YO8AVB	7	720	35	5	15

Scotland

GM3CFS	**3.5**	**25,193**	**270**	**13**	**46**
GM3YOR/A	**1.8**	**1,582**	**115**	**3**	**11**

Spain

EA2IA	**A**	**220,774**	**533**	**61**	**106**
EA2FA	"	11,968	127	19	45
EA2CR	"	4,838	54	18	23
EA2HR	28	640	25	7	9
EA5BS	**21**	**52,000**	**514**	**16**	**36**
EA2JJ	**7**	**2,354**	**107**	**4**	**18**

Sweden

SM7EAN	**A**	**221,116**	**573**	**69**	**143**
SM7ID	"	199,260	549	60	145
SMØBDS	"	89,806	360	49	117
SM3BNA	"	44,010	224	49	86
SM7BUG	"	21,084	130	30	54
SM5BKI	"	19,738	116	26	45
SM6BZE	"	12,994	69	39	50
SM6PF	"	5,289	57	19	24
SM5CLE	"	2,156	25	19	25
SM6AFH	**21**	**123,855**	**392**	**34**	**81**
SM6APQ	"	105,630	393	31	74
SM5DRW	"	37,064	197	26	56
SMØFY	"	8,946	55	24	47
SM4WQ	"	6,148	104	10	19
SM2BLY	"	5,103	174	5	22
SM5QU	"	4,176	73	12	24
SM2CEW	"	2,736	112	6	18
SM4CMG	**14**	**367,356**	**1172**	**38**	**100**
SM4CNN	"	129,577	621	30	77
SM2EKM	"	88,960	630	24	56
SM5BRS	"	39,072	314	23	51
SMØCGO	"	23,450	198	23	47
SM6JY	"	8,505	154	11	34
SM5UQ	"	6,683	133	10	31
SM4CJY	"	5,754	125	12	30
SM6ADW	"	5,220	121	9	20
SM6AEK	**7**	**67,425**	**336**	**25**	**62**
SM3CXS	"	18,396	102	24	60
SMØTW	"	14,641	175	14	39
SMØQQ	"	9,700	157	13	37
SM5BNX	"	3,690	103	7	23
SM7AIL	"	1,860	62	5	15
SM7EVM	"	1,475	54	6	19
SMØDSF	**3.5**	**7,380**	**199**	**5**	**31**

Switzerland

HB9ZY	**A**	**126,144**	**237**	**89**	**130**
HB9QA	"	47,872	245	35	93
HB9KC	"	2,775	32	19	18
HB9UD	"	1,512	30	11	17
HB9DX	**21**	**39,193**	**192**	**28**	**49**
HB9NL	**1.8**	**2,440**	**106**	**6**	**14**

Wales

GW3SYL	**A**	**172,330**	**564**	**63**	**127**
GW3NJW	**14**	**77,095**	**527**	**25**	**60**

Yugoslavia

YU3JS	**A**	**46,543**	**250**	**38**	**71**
YU3ER	**28**	**18,018**	**102**	**27**	**39**
YU3NBO	**21**	**34,254**	**202**	**26**	**40**
YU1NVT	"	7,332	102	14	25
YU1BCD	**14**	**188,892**	**673**	**36**	**96**
YU1PCF	**7**	**32,406**	**321**	**16**	**50**
YU4FDE	"	21,440	259	16	48
YU1SF	"	6,669	166	8	31
YU1OAX	**3.5**	**30,888**	**506**	**12**	**42**

U.S.S.R.

European

UW3HV	**A**	**572,208**	**910**	**97**	**239**
UA3QO	**A**	**275,502**	**838**	**62**	**160**
UK6AAB	**A**	**162,048**	**336**	**76**	**180**
UV3WT	"	73,984	368	38	98
UA4BI	"	52,390	256	33	97
UW1LW	"	43,505	215	37	76
UW3UH	"	42,930	255	24	57
UA3RO	"	39,324	211	32	81
UA4MA	"	34,749	251	30	69
UW6CV	"	34,402	178	32	71
UK1OAA	"	30,749	310	29	68
UA3XN	"	28,320	200	26	70
UA3TA	"	24,012	150	28	64
UA6HBF	"	23,287	301	20	53
UA1BM	"	21,658	170	28	63
UA3DAO	"	17,388	186	14	40

Scott Redd, 6D1AA/XE1IIJ/KØDQI, almost made a clean sweep in this year's contest. (He was #1 on phone) Scotty is going to blame his #3 spot in the c.w. brawl on our 2 point rule. But think of it this way, we could still be giving only one point for all those W/K contacts.

UA1DF	"	17,298	80	35	58
UW3HY	"	14,974	91	29	53
UA1CE	"	14,608	102	29	59
UA3DD	"	5,886	74	20	34
UA3WZ	"	4,408	77	19	39
UW3RE	"	4,233	56	18	33
UW6AO	"	3,861	72	13	26
UV3HD	"	2,881	56	14	29
UK6LAQ	"	2,516	52	10	24
UA1MV	"	1,425	38	9	16
UZ3RV	"	342	16	5	13
UW6FZ	**28**	**11,664**	**134**	**19**	**35**
UA3LAB	"	7,844	61	20	33
UA3QAC	"	3,564	49	13	20
UA4HBR	"	2,728	60	11	20
UW3EH	**21**	**45,440**	**306**	**25**	**55**
UA3YI	"	23,010	169	25	53
UA4MX	"	14,600	176	14	36
UA3ET	"	12,256	74	25	42
UW1BT	"	9,312	138	17	31
UW3YC	"	9,073	94	16	27
UA1MA	"	4,624	98	13	21
UA1ADZ	"	2,200	70	7	18
UA4RZ	**14**	**149,952**	**675**	**37**	**95**
UW1CX	**14**	**126,984**	**544**	**31**	**80**
UW6NM	"	73,900	437	30	70
UK4HAA	"	57,660	317	29	64
UK3XAA	"	56,217	462	23	56
UA4AN	"	55,195	396	27	56
UA1AAW	"	51,660	321	28	62
UA3NP	"	47,090	294	27	58
UK4LAB	"	46,904	351	22	60
UV3GW	"	42,788	334	23	53
UA6UO	"	29,452	256	23	51
UA1CZA	"	28,248	261	20	46
UW4AD	"	26,455	280	17	48
UV3NS	"	24,684	241	19	49
UA1NR	"	22,743	199	16	41
UA3TAM	"	19,208	187	17	39
UA6XAE	"	18,850	253	15	36
UV3NN	"	16,414	165	16	42
UA3ST	"	14,763	148	17	40
UW1DX	"	12,040	211	18	25
UA6VT	"	7,003	96	14	33
UW3AX	"	6,045	95	10	29
UA3AJ	"	5,952	128	7	25
UK3WAA	"	1,378	53	6	20
UA1OAE	"	1,365	47	5	16
UA1DZ	**7**	**138,160**	**709**	**32**	**78**
UA6LAH	"	10,672	143	15	46
UA4PU	"	7,020	161	9	27
UA4LR	"	1,975	49	8	17
UA1ACX	"	1,150	35	6	19
UK3QAT	"	722	29	7	12
UW6AT	"	336	20	5	11
UA3DAK	**3.5**	**23,436**	**344**	**13**	**41**
UA6AL	"	22,197	371	9	40
UA3LM	"	20,115	403	9	36
UW6LC	"	14,784	312	8	34
UA1WAR	"	11,653	271	8	35
UK1ABB	"	8,052	222	5	28
UA4RT	"	2,507	95	7	16
UA3UK	"	2,187	81	7	20

Estonia

UR2QI	**A**	**170,190**	**641**	**48**	**138**
UR2JW	"	43,775	272	33	70
UR2FU	28	1,107	17	12	15
UR2QD	**21**	**38,715**	**235**	**27**	**60**
UR2GT	"	15,840	163	14	30
UR2NP	**14**	**13,653**	**251**	**12**	**29**
UK2RAA	**7**	**9,760**	**186**	**11**	**29**
UR2LL	"	300	14	5	10
UR2FQ	**3.5**	**18,050**	**328**	**10**	**40**
UR2RX	"	8,855	245	5	30
UR2ZN	"	7,293	218	5	28

Kaliningrad

UA2DM	**A**	**190,680**	**517**	**65**	**145**
UA2EC	"	93,500	360	51	119
UA2BI	14	432	12	8	10
UK2FAS	**7**	**30,418**	**397**	**19**	**48**

Latvia

UQ2CR	**A**	**21,258**	**252**	**15**	**54**
UQ2MU	A	15,825	160	23	52
UQ2GW	**21**	**32,574**	**174**	**30**	**59**
UQ2GQ	"	22,176	159	24	42
UQ2PN	**3.5**	**13,338**	**320**	**7**	**31**
UQ2GBG	"	2,599	104	5	18
UQ2HK	"	1,428	71	4	17

Lithuania

UP2NK	**A**	**782,652**	**1104**	**108**	**235**
UP2OX	"	533,566	1034	89	218
UP2MC	"	132,825	578	47	118
UP2BL	"	95,509	470	40	109
UP2SA	"	92,400	504	31	101
UP2OQ	"	65,743	350	39	100
UP2BAA	"	26,568	261	20	62
UP2BAR	"	11,658	196	14	44
UP2AG	**21**	**5,699**	**58**	**17**	**24**
UK2BBB	**14**	**221,836**	**939**	**36**	**88**
UK2PAR	"	60,137	467	24	53
UP2BZ	"	38,480	296	23	51
UP2BV	"	16,048	153	16	43
UP2OU	"	8,058	53	6	17
UP2AW	**7**	**6,930**	**193**	**8**	**27**
UP2GF	"	5,160	100	8	32
UP2PAP	"	1,368	56	6	18
UP2CT	**3.5**	**38,674**	**546**	**13**	**48**
UP2BAS	"	36,288	568	11	45
UP2MB	"	11,914	280	7	31

Moldavia

UO5OAN	**A**	**164,968**	**826**	**37**	**94**
UO5BM	"	21,250	117	35	50
RO5OAO	28	3,255	35	11	20
UO5GR	**7**	**8,400**	**92**	**11**	**37**
UO5OAL	**3.5**	**8,820**	**242**	**5**	**30**

Ukraine

UT5BP	**A**	**360,963**	**872**	**79**	**182**
UY5CW	"	78,057	331	43	104
UY5TE	"	63,340	372	39	95
UY5VA	"	45,784	321	25	72
UY5OO	"	24,617	107	40	63
UY5DV	"	21,414	134	27	56
UT5XD	"	17,395	189	22	43
UB5LR	"	16,362	96	38	63
UB5QC	"	10,950	153	12	38
UB5ZBB	"	8,958	105	19	39
UY5TH	"	6,489	65	22	41
UB5IU	"	6,102	63	20	34
UT5DF	"	3,600	97	8	28
UB5VK	"	3,116	30	19	22
UY5HB	**28**	**6,486**	**63**	**18**	**29**
UB5WF	**21**	**66,248**	**245**	**30**	**74**
UB5EM	"	42,194	314	24	49
UB5SL	"	32,873	229	25	46
UB5ND	"	31,640	252	24	46
UB5RS	"	15,812	98	23	54
UT5BX	"	14,229	134	17	34
UB5EF	"	8,240	88	16	24
UY5DP	**14**	**140,070**	**603**	**39**	**99**
UT5PB	"	76,230	476	27	63
UB5VY	"	38,325	295	27	46
UT5BW	"	34,320	254	24	56
UY5EM	"	20,515	141	17	38
UB5VAA	"	16,860	160	18	42
UB50E	"	13,716	143	10	44
UB5HN	"	6,468	92	10	32
UB5LL	**7**	**100,050**	**675**	**27**	**60**
U5ARTEK	"	50,240	497	18	46
UB5TQ	"	30,744	317	15	48
UK5WAS	"	11,430	196	12	33
UB5WJ	**3.5**	**30,615**	**385**	**15**	**50**
UT5MD	"	28,028	483	11	41
UK5VAA	"	27,195	496	11	38
UB5MZ	"	27,170	404	11	44
UT5DL	"	21,744	382	9	39
UB5UAS	"	5,249	167	6	23
UB5SG	"	3,052	96	6	22

White Russia

UC2WP	**A**	**312,744**	**797**	**77**	**172**
UC2TA	"	49,032	302	28	80
UC2SE	"	8,064	100	10	46
UK2WAS	"	2,074	51	12	22
UC2OAA	**21**	**32,700**	**238**	**25**	**50**
UC2RO	**14**	**27,852**	**248**	**21**	**45**
UC2WAE	"	7,605	177	13	32
UC2WJ	**3.5**	**13,912**	**252**	**11**	**36**
UC2RZ	"	3,692	132	6	20
UC2XW	"	1,850	67	6	19

OCEANIA

Australia

VK2BKM	**A**	**836,511**	**1092**	**93**	**174**
VK3KX	**A**	**471,240**	**973**	**65**	**100**
VK2EO	"	367,500	651	92	104
VK6WO	**A**	**147,280**	**371**	**59**	**81**
VK5FM	**A**	**134,352**	**425**	**41**	**67**
VK2WD	"	18,960	91	27	52
VK4KX	"	7,080	46	26	33
VK3XB	**28**	**66,216**	**366**	**21**	**41**
VK6HD	**21**	**531,354**	**1576**	**32**	**82**
VK5NO	**21**	**269,010**	**930**	**29**	**69**
VK2APK	**14**	**321,720**	**915**	**35**	**85**
VK3AHQ	**14**	**178,020**	**530**	**35**	**80**
VK4AK	"	14,430	76	29	45
VK3APN	**7**	**81,288**	**388**	**25**	**47**
VK2BQQ/2	**7**	**42,347**	**282**	**20**	**33**
VK6CT	**3.5**	**4,257**	**52**	**15**	**18**
VK3RJ	"	56	7	5	3

British Phoenix Islands

VR1W	**A**	**2,164,110**	**2417**	**120**	**190**

(opr. W6BHY)

Canton Island

KB6DA	A	4,440	50	17	13

(opr. W6BHY)

Fiji Islands

VR2GE	**A**	**137,428**	**532**	**41**	**53**

French Oceania

FOØGO	**A**	**98,095**	**321**	**51**	**64**

(opr. W6HJP)

Gilbert and Ellice Islands

VR1AA	**A**	**365,400**	**637**	**93**	**177**

Guam

KG6JAR	**A**	**537,176**	**1153**	**71**	**95**

(opr. W3CHH)

Hawaii

KH6RS	**A**	**2,382,520**	**2977**	**118**	**162**

(opr. K2SIL)

KH6IJ	**A**	**1,267,801**	**1702**	**99**	**152**
KH6GJY	**21**	**49,324**	**462**	**18**	**20**
KH6HGL	"	1,785	42	8	7

Marshall Islands

KX6EB	**A**	**277,689**	**648**	**64**	**87**

(opr. W3KVQ)

New Guinea

VK9JV	**A**	**386,680**	**968**	**37**	**103**

New Zealand

ZLIAMM	**A**	**110,253**	**276**	**56**	**87**
ZL1IL	**21**	**226,195**	**811**	**32**	**63**
ZL2AH	"	6,061	107	10	19

SOUTH AMERICA

Argentina

LU3FG	**A**	**431,892**	**836**	**74**	**98**
LU9FAN	"	319,806	675	62	101
LU6FA	**14**	**166,608**	**538**	**34**	**70**

Bolivia

CP1EU	**A**	**67,795**	**260**	**39**	**52**

Brasil

PY2FIQ	**A**	**333,792**	**487**	**99**	**145**
PY7SR	"	147,441	423	47	72
PY7GAI	"	77,832	368	33	39
PY7IE	"	72,600	285	29	59
PY1CKV	"	5,738	52	20	18
PY7BOW	"	1,190	20	7	7
PY4AP	**14**	**836,250**	**1874**	**37**	**113**
PY2GGO	"	76,443	318	29	54
PY2FCA	"	55,440	309	23	43
PY7BDX	"	37,400	233	17	38
PY2EWZ	"	22,176	106	23	49
PY4ABH	**7**	**84,899**	**398**	**23**	**50**

Chile

CE3YO	**A**	**116,035**	**348**	**50**	**65**
CE2CR	21	11,895	106	19	20

Peru

OB4PF	**21**	**241,491**	**833**	**29**	**72**

Trinidad & Tobago

9Y4VU	**A**	**325,080**	**610**	**61**	**119**

Venezuela

4M5BPG	**A**	**66,885**	**258**	**41**	**50**
YV5CVE	**28**	**194,835**	**709**	**27**	**66**
YV5AW	**3.5**	**52,608**	**372**	**14**	**34**

Multi-Operator Single Transmitter

NORTH AMERICA

U.S.A.

WA1NRV	**329,364**	**469**	**83**	**169**
WN1NDJ	84	56	9	5
K2BMI	**498,568**	**572**	**102**	**205**
W2YD	369,020	521	92	178
W2MB	32,262	103	43	71
WA3HGV	**481,271**	**508**	**111**	**238**
K3YUA	398,712	495	97	199
W3SS	266,454	376	90	172
W3YIK	206,108	315	92	146
W4JK	**155,820**	**287**	**67**	**129**
K6EBB	**1,000,282**	**1050**	**114**	**217**
W6NJU	751,224	794	125	214
W6DOD	474,240	645	98	162
W6AFI	377,880	573	90	145
K6LY	74,094	254	52	54
W7SFA	**969,960**	**970**	**123**	**231**
W8FAW	**570,850**	**623**	**112**	**238**
W8BVF	260,500	383	91	159
K9HDP	**70,300**	**154**	**83**	**102**
W9EXE	53,924	167	43	79
K9GSC	51,667	187	51	70
W9DY	5,060	34	25	30
WAØPRS	**59,885**	**158**	**61**	**84**

Alaska

KL7AIZ	**183,676**	**1052**	**45**	**49**

Canada

VE1ASJ	**1,260,840**	**1282**	**118**	**281**
VE1FO	156,695	612	46	75
VE6AWW	**17,034**	**157**	**26**	**25**

ASIA

India

VU2IN	**24,720**	**133**	**28**	**52**

Japan

Club Stations

JA3YBF	**901,112**	**1221**	**103**	**171**
JA9YBA	705,732	974	105	171
JA6YAD	195,024	389	85	119
JA6YAI	23,780	112	41	41
JA2YEF	8,932	77	20	24

Israel

4Z4HF	**1,771,056**	**1795**	**99**	**237**

U.S.S.R.

Club Stations

Asiatic

UK9ABA	**2,335,506**	**1976**	**120**	**299**
UK9AAD	655,368	926	69	180
UK9QAA	577,980	800	71	189
UK9HAD	561,927	989	69	168
UK9CAE	540,855	798	72	183
UK9AAA	439,782	708	61	161
UK9AAG	316,206	569	52	146
UK9CAM	162,435	399	52	105
UK9HAC	72,816	349	23	59
UK9AAC	41,082	206	24	58
UKØCAB	**155,295**	**678**	**47**	**72**
UKØZAA	108,324	506	37	65
UKØOOO	56,939	357	30	67
UKØSAB	43,125	326	31	44
UKØCAQ	38,340	445	29	31
UKØCAA	17,197	321	24	25
UKØCAJ	6,897	175	17	16
UKØCAG	2,524	67	15	13

Armenia

UK6GAA	2,484	38	10	17

Azerbaijan

UK6DAU	**130,302**	**352**	**36**	**78**

Georgia

UK6FAX	3,864	62	6	17

Kazakh

UK7GAA	**432,612**	**810**	**74**	**170**
UK7EAA	167,384	495	39	83
UK7JAA	132,923	566	39	80
UK7PAA	74,293	289	30	67
UK7TAA/p	36,608	248	17	35

Kirghiz

UK8NNN	3,605	103	16	19

Uzbek

UK8IAA	**437,844**	**762**	**66**	**158**
UK8AAI	254,721	495	64	133

EUROPE

Austria

OE1XRA	**359,053**	**788**	**73**	**160**

Azores

CT2BC	**22,088**	**186**	**20**	**24**

Bulgaria

Club Stations

LZ1KDP	**226,154**	**658**	**39**	**107**
LZ1KDZ	188,490	711	53	130
LZ1KSP	172,236	644	54	132
LZ2KCS	137,030	467	51	142
LZ2KSK	105,432	593	45	95
LZ1KEZ	97,811	467	47	110
LZ2KSQ	75,992	388	35	83
LZ2KSB	32,799	286	22	65
LZ2KGB	29,820	316	14	46

Czechoslovakia

Club Stations

OK3KAG	**380,038**	**789**	**87**	**187**
OK1KOK/p	279,314	455	95	186
OMØKAS	261,877	749	66	143
OK1KSO/p	164,186	537	61	126
OK1KKH	65,516	246	49	99
OK1KZD	34,347	236	32	75
OM3RKB	34,316	267	26	66
OK1KVS	17,654	106	30	61
OK2KMB	9,516	177	11	41
OK1KCI	8,738	108	13	21
OK1KUF	1,886	41	11	30

Denmark

OZ5QU	**23,845**	**199**	**31**	**64**

England

G3SSO	**794,220**	**1188**	**97**	**213**
G4ALE/A	378,750	879	69	133

Faroe Islands

OY6FRA	**255,680**	**1073**	**49**	**139**

Finland

OH1VR	**603,306**	**884**	**102**	**261**
OH5UX	85,064	290	56	140
OH3AG	63,504	333	39	105
OH7AA	59,060	329	40	90
OH7RC	26,525	154	37	78
OH2BMB	17,922	235	25	62

Germany

DL8CM	**556,698**	**1010**	**81**	**165**
DLØWW	263,781	610	78	159
DK2PH	212,856	624	58	138
DK3MG	170,368	432	65	111
DLØIH	2,997	43	16	21
DM2BJF	**35,934**	**263**	**30**	**76**
DM2AIC	1,404	39	14	22

Hungary

Club Stations

HA5KDQ	**814,524**	**1240**	**97**	**212**
HA4KYH	139,500	549	46	90
HA3KNA	107,134	556	42	95
HAØKHP	104,850	495	53	97
HA8KVG	74,752	423	43	85
HA3KMA	72,078	398	43	80
HA9KOB	70,920	354	40	80
HAØKDA	64,976	322	42	89
HA8KWG	51,240	353	25	95
HA4KYB	41,944	270	33	74
HA9KOZ	29,700	140	41	67
HA8KQX	26,775	250	25	60
HA8KCI	25,818	291	20	58
HA3YGC	25,478	523	8	38
HA9KOV	11,529	163	18	45
HA3KGC	11,178	188	11	35
HAØKLE	10,004	148	18	43
HA7KLF	8,094	80	22	35

Netherlands

PI1PT	**45,900**	**265**	**35**	**73**

Poland

SP2PAH	**148,407**	**586**	**57**	**134**
SP9KBH	70,560	334	40	100
SP9KAD	7,450	171	14	36
SP5PEK	3,492	75	17	19

Sweden

SK5AL	**750,375**	**1084**	**112**	**263**
SK6AW	387,091	621	87	182
SK7CE	91,685	318	64	101

Wales

GW3UCB	1,408	128	2	9

Yugoslavia

YU5JQR	**235,503**	**772**	**60**	**131**
YU1EXY	198,548	478	72	124
YU2CBM	130,662	540	46	107
YU4ECJ	3,102	76	11	22

U.S.S.R.

Club Stations

European

UK3AAO	**1,646,880**	**1484**	**134**	**336**
UK6LAZ	**759,895**	**975**	**112**	**267**
UK1AAA	542,620	935	90	205
UK3UAA	525,231	990	91	220
UK4LAA	374,793	906	78	193
UK3LAD	258,940	738	68	152
UK1AAG	247,800	651	81	155
UK6UAA	162,240	780	56	152
UK6WAA	145,260	637	50	130
UK4FAA	124,992	516	53	115
UK4WAB	118,590	460	50	127
UK1ZAB	115,056	498	36	100
UK1AAQ	88,480	382	49	111
UK4HAK	51,786	286	29	97
UK4YYY	40,698	294	30	72
UK3YAB	36,068	117	53	74
UK3MAA	35,460	277	21	69
UK1CUA	32,204	245	27	70
UA3EAA	22,533	197	24	63
UK1ABA	19,890	255	18	47
UK3RAC	9,300	102	18	44
UK3XAM	8,946	115	19	44
UK3XAI	7,923	87	19	38
UK3TAG	5,456	78	12	32
UK1ABE	3,680	97	10	22

Kaliningrad

UK2FAA	**693,718**	**1008**	**99**	**222**
UK2FAH	69,376	424	37	90

Latvia

UK2GAA	**346,731**	**878**	**73**	**164**
UK2GAY	317,025	944	58	167
UK2GBY	193,830	623	63	147
UK2GBJ	48,043	361	26	81

Lithuania

UK2PAF	**595,614**	**980**	**99**	**214**
UK2PAN	31,066	249	29	69

Ukraine

UK5IAZ	**1,152,315**	**1354**	**124**	**311**
UK5MAA	533,390	1033	87	199
UK5JAZ	309,505	707	73	166
UK5EAG	251,853	808	58	143
UK5QAA	170,442	773	40	113
UK5ICA	99,085	528	35	98
UK5MAG	82,360	413	39	103
UK5EAQ	76,120	496	30	80
UK5EAC	31,042	258	24	55
UK5JBK	14,514	189	19	63
UK5MAB	11,682	143	17	42

White Russia

UK2ABC	**283,003**	**872**	**73**	**128**
UK2OAA	78,720	482	31	92
UK2AAA	2,454	104	6	11

CLUB SCORES

United States

Frankford Radio Club	**25,652,712**
Potomac Valley Radio Club	24,698,644
Southern California DX Club	20,812,130
Western Washington DX Club	14,921,435
Northern California DX Club	14,781,018
Golden Triangle DX Club (Fla.)	8,555,373
Richardson Wireless Klub (Tex.)	7,869,971
Murphy's Marauders (Conn.)	6,612,839
Northern Illinois DX Assoc.	4,548,699
Mad River Radio Club (Ohio)	4,445,574
Virginia Century Club	1,590,743
North Jersey DX Assoc.	1,337,373
Rockford Amateur Radio Ac. (Ill.)	1,244,202
Twin City DX Association (Minn.)	867,987
Ohio Valley Amateur Radio Assoc.	861,111
128 Contest Club (Mass.)	618,934
Florida DX Club	528,457
Southeastern DX Club (Ga.)	480,977
West Park Radiops (Ohio)	383,023
Blossomland A.R.A. (Mich.)	286,414
Central Virginia DX Club	281,455
Delta DX Association (La.)	277,427
Dallas Amateur Radio Club (Tex.)	44,197

Canada

Edmonton DX Club	579,497
Calgary DX Club	366,046

Foreign Clubs

Rhein-Ruhr DX Assoc. (Germ.)	14,813,626
Radio Club Venezolano	12,037,908
Honolulu DX Club	10,549,054
Saar-Pfalz DX Club (Germ.)	7,550,712
Chelyabinsk Radio Club (USSR)	7,524,657
Kaunas Polytechnik R.C. (Lith.)	3,283,469
YU DX Club (Yugoslavia)	3,003,216
Suddeutsche DX Group (Germ.)	2,187,653
SP DX Club (Poland)	1,796,830
Lampertheim DX Group (Germ.)	1,678,387
Kiel Canal Radio Club (Germ.)	1,332,320
Vasteras Amateur R.C. (Sweden)	1,100,020
Leningrad Radio Club (USSR)	1,034,952
Chubu Institute A.R.C. (Japan)	1,025,655
SK5AJ Contest Club (Sweden)	860,802
Dubrovnik A.R.C. (Yugoslavia)	814,332
Musashi Instute A.R.C. (Japan)	272,805
Swiss DX Club	99,966

Not many YL's in this year's contest, but Leela put the mic. aside for the c.w. weekend and put VU2CP on the air in her first contest. Hope to see you again next year Leela.

OCEANIA

Hawaii

KH6HCM	**1,405,249**	**1916**	**100**	**151**

SOUTH AMERICA

Netherlands Antilles

PJ2HT	**1,296,750**	**1718**	**77**	**170**

Multi-Operator Multi Transmitter

NORTH AMERICA

W4BVV	**3,655,613**	**2098**	**162**	**449**
W7RM	**3,192,728**	**2273**	**158**	**339**
K6RU	**3,133,952**	**2181**	**155**	**357**
W3AU	**3,009,544**	**2034**	**147**	**381**
W3GM	**2,733,675**	**1865**	**152**	**373**
W4WS	1,773,948	1340	131	322
W3GPE	1,663,875	1266	132	327
K4CG	1,631,232	1236	136	336
K3JYZ	1,231,186	1130	115	267
W3TV	1,098,170	1000	116	270
K3HTZ	1,047,572	918	129	275
WA3ATX	918,372	870	112	265
W5KFL	404,128	530	105	181
W4KXV	388,512	480	101	187
WA3LRN	343,398	475	85	178

ASIA

JA2YEF	**421,968**	**700**	**98**	**138**
JA3ZBE	**416,990**	**654**	**98**	**147**
JA1YAG	272,805	541	81	114

EUROPE

YUON	**3,003,216**	**3292**	**125**	**331**
DLOPG	**2,282,779**	**2592**	**127**	**317**
SK5AJ	**1,810,708**	**2211**	**126**	**310**
OH1AA	**1,761,876**	**2176**	**122**	**314**
OH3AA	**1,528,130**	**1855**	**128**	**317**
DLOKF	**1,332,320**	**2199**	**110**	**242**
PE2EVO	**1,187,259**	**1830**	**115**	**258**
OH1VQ	633,596	1259	94	208
SK5AA	513,229	1197	78	179
DLOII	93,936	432	48	104

SOUTH AMERICA

PJ9JT	**5,517,824**	**4463**	**123**	**293**

The following were submitted as check logs.
DJOTA, DL9EY, DM2ACL, DM2ADC, DM2AXC, DM2CGH, DM2CJJ, DM2DEO, DM2DGO, DM2DRO, DM2DZH, DM2EML, DM2EXH, DM3MMA, DM3RM, DM3UE, D3MUSG, DM3XUE, DM4FG, DM4XNL, DM4ZEL, DM5VBN, G3MWZ, HA1ZU, HA2KRB, HA3KGJ, HA3KMF, HA3PE, HA4KXG, HA5FA, HA5JI, HA5YAH, HA8KVB, HA8UX, HA90X, LA2QI, LA8NC, OH2BHU, OH2BMC, OK1FAR, OK3CEA, OK3EQ, OL1ASE, OM0HR, OM0SKU, 0Z3Q, PY1BTX, SM3AT, SM5RH, SM7TQ, SP1BLE, SP1CTN, SP1EFU, SP2DVA, SP3CMX, SP3DWE, SP5ENA, SP6BFK, SP6RT, SP8AQN, UA1DX, UA3DL, UA3GO, UA3VA, UA3VAS, UA4AY, UA4PAG, UA6HZ, UA910, UA0UU, UB5NAG, UB5PS, UB5QAP, UB5VL, UC2AI, UJ8AL, UK3XAG, UK3XAU, UK4NAA, UK5EAP, UK5WAA, UK6HBA, UK9LAY, UL7-0285, UO5AP, UQ5AP, UQ2CC, UR2HB, UT5HP, UV9DU, UV9DX, UV9VC, UW3VV, VE1DB, VP2GLE, VU20MR, W3CTE, W4UDS/0, W9IWX, YO7NA, ZE1BL.

Station Operators

Multi-operator Single Transmitter

CT2BC: 2 oprs. **DK2PH** & DK3BO. **DK3MG** & DJ9MH, DK1KC, DK6NJ. **DL8CM** & DL8CH. **DL0IH:** DK4VY, DK5HP. **DL0WW:** DK7FC, DK7FO, DL2LW, DL3ZA. **DM2AIC** & DM3RGC. **DM2BJF** & DM3WYF. **G3SSO:** G2HDU, G3IFB, G3PEO, G3SNN, G8KG, **G4ALE/4:** G3SJX, G3UFY, G3VYI, G3WRR. **GW3UCB:** G3WKH, G3WXS. **HA5KDQ:** HA5DE, HA5FI, HA5FM, HA5HO. **KH6HCM** & KH6GQW. **KL7AIZ:** K3OAR, K7RHN, K8JHW, WB2WGX, WB5DJU, WB9HRQ. **OE1XRA:** OE1JBA, OE1ZK, OE3LI, OE3TL. **OH1VR** & OH3YI. **OH2BMB:** OH2BDM, OH2BIG. **OH3AG:** OH3HA, OH3HC, OH3IF, OH3IN, OH3KZ, OH3MN, OH3YC. **OH5UX** & OH2IC, OH5VK. **OH7AA:** Club. **OH7RC** & OH7RH, OH7SX. **OY6FRA:** OY2H, OY2J, OY3B, OY3H, OY4R, OY5NS, OY5Q. **OZ5QU** & OZ4OV **PI1PT:** 3 oprs. **PJ2HT** & PA0LOU, PJ2ARI. **SK5AL:** SM5BGK, SM5DFM, SM5DKH, SM0CER, SM0DSG, SM0GM. **SK6AW:** SM6CDG, SM6CJK, SM6CMU, SM6CNX, SM6CVE. **SK7CE:** SM7ACN, SM7OSD, SM7DBV, SM7DCW, SM7DNL, SM7DXX, SM7EBC, SM7ECM. **SP2PAH:** SP2AVE, SP2BKF. **VE1ASJ** & VE1ACV, VE1DH. **VE1FO:** VE1AFN, VE1AGX, VE1AI, VE1MX, VE1OM, VE1TG, VE1XW. **VE6AWW** & VE6ANE. **VU2IN** & VU2UR. **YV5JQR:** YU5CX, YU5CZ, YU5NCF. **WA1NRV** & WA1KZE, WA1LAK. **WN1NDJ** & WN1OQT. **K2BMI** & WA2KHL, WB2RWY, WB2WID, WB2ZER. **W2MB** & WB2YEW. **W2YD** & W2BHM, W2HZY, K2AIO. **WA3HGV** & K3NEZ, WA3KZQ, WA3OVC, WA3RAP. **K3YUA** & WA3MHD. **W3SS** & K3JLK, K3LJZ, W3EVW. **W3YIK** & K3JLI. **W4JK** & WB4FTI. **K6EBB** & W6RGG, WA6SII, WB6KIG. **W6NJU** & WA6EPQ. **W6DOD** & W6KG. **W6AFI** & K6LQA, W6UZX, W6YUS. **K6LY:** WB4LEK, WB6ZSB, WB9BXV. **W7SFA** & W7DL, W7VY, VE7ZZ. **W8BVF** & K8VTO. **W8FAW** & WA8YVR. **W8BVF** & K8TVO. **K9GSC** & K9PKQ. **K9HDP** & WB9BPG. **W9DY:** W9DWQ, WA9OMN, WA9VOL. **WA0PRS** & WA0VPN. **4Z4HF:** 4X4WN, 4X4XX, 4Z4AG, 4Z4BR, 4Z4DZ, 4Z4NKX.

Multi-operator Multi Transmitter

DL0II: DJ2YE, DJ4TJ, DJ5PE. **DL0KF:** DJ3UM, DJ0VH, DJ8FR, DJ4FZ, DJ7SW, DL2ZT, DJ5AZ, DJ3JB, DJ6TN, DL1FL. **DL0PG:** DK3BJ, DK5KM, DK1QV, DL6WE, DJ6TK, DJ9IE, DJ1FC, DJ9TQ, DJ6AU. **JA1YAG:** Club. **JA2YEF:** JA2NUO, JA2UJC, JA5FUC, JA2QJG, JH2FMK, JA2KKA, JA2QOF, JA2HKR, JH2IJS. **JA3ZBE:** JA3AA, JA3IW, JA3AUQ, JA3BRD, JA3GAC, JA3JEW. **K3HTZ** & VE3BAW, WA3LNM, K3KPV. **K3JYZ** & WA3HTQ, W3FZV, WA3GUI, WA3MJF. **K4CG:** WA4KJR, K3WUW, K2QBW, WA3QGV, K6OZL, W4HIR. **K6RU** & K6UA, W6MUR, W6NAD, K6BCE, K6MQG, K6SEN, K6VZA, WA6OHJ, WB6VEJ. **OH1AA:** OH1NK, OH1SS, OH1NH, OH1SY, OH1WR, OH1RG, OH1KF. **OH1VQ** & OH1VT, OH1PS, 0H1QP, OH2BO. **OH3AA:** OH2BGD, OH2DT, OH3IR, OH3IU, OH3JR, OH3KW, OH3PE, OH3TQ, OH3UO, OH3WZ, OH3XT, OH3XZ, OH6TI, OH9OR. **PE2EVO:** PA0AAC, PA0BE, PA0BW, PA0GD, PA0IB, PA0JVM, PA0KVN, PA0MS, PA0PAZ, PA0PFW, PA0RCT, PA0RE, PA0TY. **PJ9JT:** W1TX, W1SG, W1BIH, W4BNU, K4BAI, WB4RUA. **SK5AA:** SM5ACQ, SM5BFJ, SM5DUL, SM5ENP, SM5EOO, SM5EOS, SM5ESP, SM5ESL, SM5EUL, SM5WI. **SK5AJ:** SM5AD, SM5BNZ, SM5CAK, SM5CBN, SM5CEU, SM5CNQ, SM5DJZ, SM5DUS, SM5EXE. **W3AU** & K3EST, W3ZKH, W3MVB, WA3IAQ, WA3CVU, K3RUQ, DJ1US. **W3GM** & W3NOH, W3GHM, W3KV, W3FHR, WA2WLN, W3JSX, K3WJV. **W3GPE** & W3GLY, W3YUW, WA3DSZ. **W3TV** & W3AOH, W3VW, W4GIV. **WA3ATX** & WA3COJ, WA3MPH. **WA3LRN** & WA3LRO, WA3NNA, WA3JLT, WA3CRN. **W4BVV** & K2UFT, K2UYG, K3GJD, K3NPV, W3BQV, W3WZL, K4GKD, K4VDL, W4YHD. **W4KXV** & W4HIR. **W4WS** & W4ETO, W4LCP, K2UME, W4ZCB, K4THA. **W5KFL** & WA5OCN, K5LZO, WA5LES, W5IVN. **W7RM** & K7VPF, K7HTZ, K7JCA, W7YGN, K6JQJ, WA7FDL, K7JJL, W5QQQ. **YU0N:** YU3BU, YU3CV, YU3EJ, YU3EO, YU3EY, YU3TFU, YU3TVP, YU3TWW, YU3TYX, YU3CAB.

We were happy to see a few Novices in this year's contest. DX contacts are hard to come by on the novice frequencies, but WN8IOT managed to scare-up 15 countries on 21 mHz. Ed said he will be in there fighting it out with the Generals next year.

Voltage Independent Ramp Generator

BY JOHN J. NAGLE,* K4KJ

THE following circuit has proven to be convenient when one needs a free-running ramp generator having excellent linearity and a repetition frequency independent of supply voltage variations.

The circuit consists of a capacitor, C_2 which is charged through a PNP transistor, Q_1, with an unbypassed emitter resistor, R_1. The combination of the normally high output resistance of Q_1 and the unbypassed emitter resistor causes Q_1 to act as a constant current generator with an output resistance of several megohms. Because of this very high charging resistance the linearity of the ramp is very good.

The capacitor, C_2, is discharged by the uni-junction Q_2. A small resistor in the B_1 lead, R_2 provides a synchronizing pulse during retrace.

In operation C_2 is charged by the constant current through Q_1 causing a linear increase in the voltage across C_2, when this voltage reaches the threshold voltage of Q_2 the uni-junction conducts thereby discharging C_2 and the cycle begins again. The discharge current flowing through the 39 ohm resistor R_2 supplies a synchronizing pulse for external use. The valve of 39 ohms for R_2 is a compromise between the ramp retrace time and the sync pulse amplitude. Increasing the resistance will increase the sync pulse amplitude but will also increase the capacitor discharge time, thereby limiting the high frequency operation of the circuit. There is little to be gained however, by making the value of this resistor much smaller than the intrinsic resistance of the uni-junction.

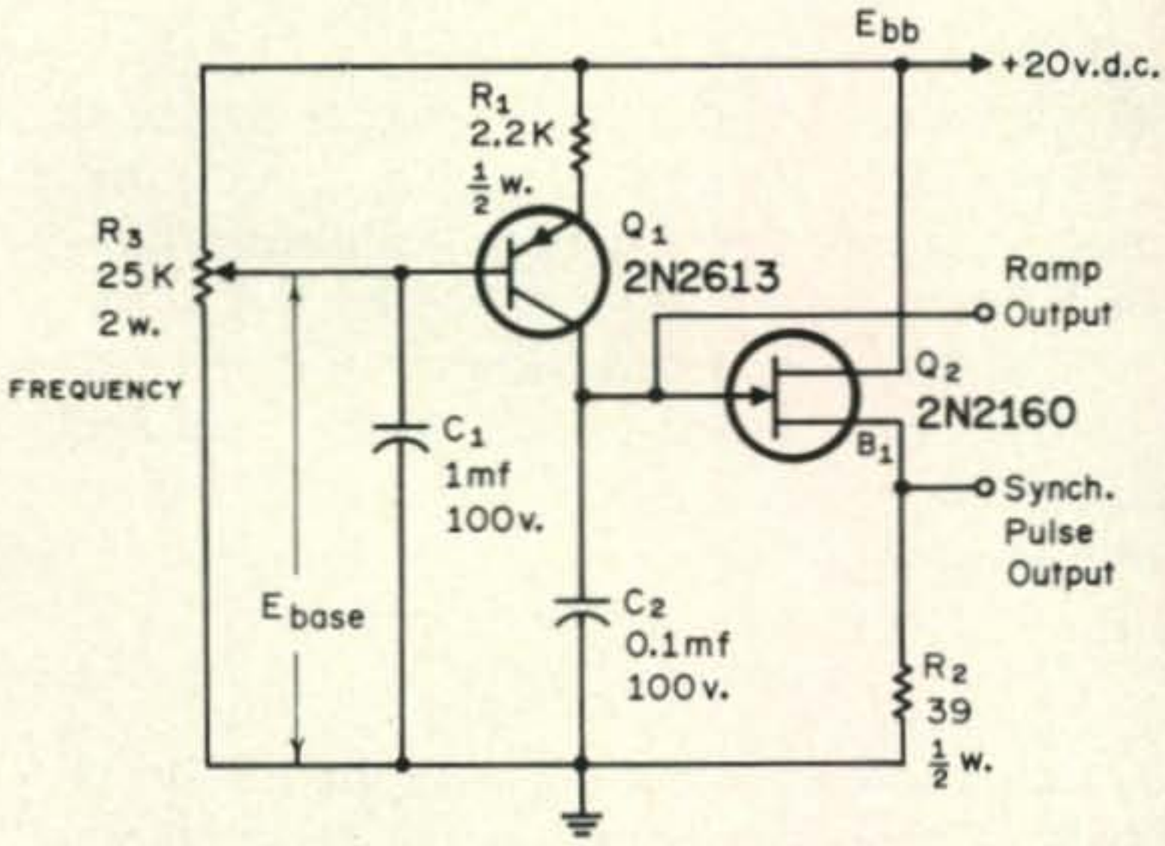


Fig. 1—Circuit of a simple linear ramp generator. Repetition frequency is controlled by R_3 and is independent of supply voltage.

The output wave-forms are shown in fig. 2 while fig. 3 shows one possible mounting configuration using a 5-pair terminal board. The circuit readily lends itself to p-c board construction.

[*Continued on Page 98*]

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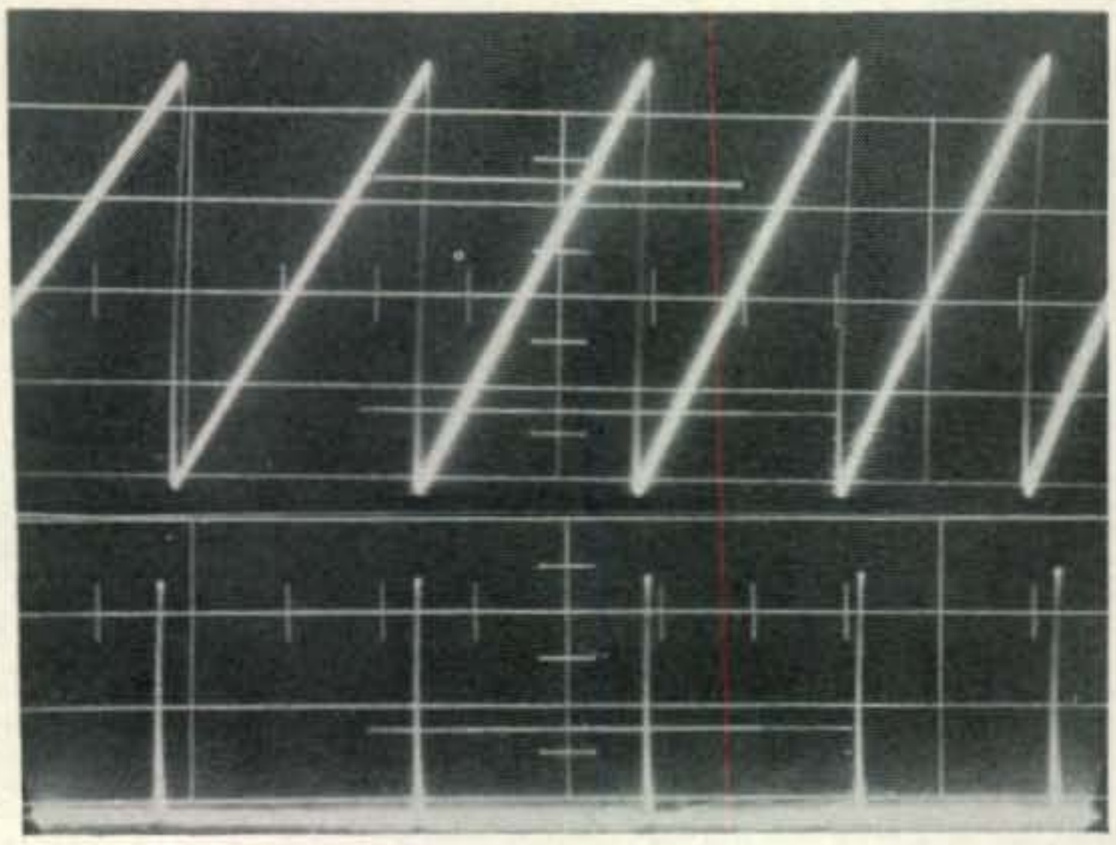


Fig. 2—(Top) Scope photograph of ramp generator output waveform. (Bottom) Synchronizing pulse output. The vertical scale is 2.5 volts per centimeter and the horizontal scale is 1.4 v./cm.

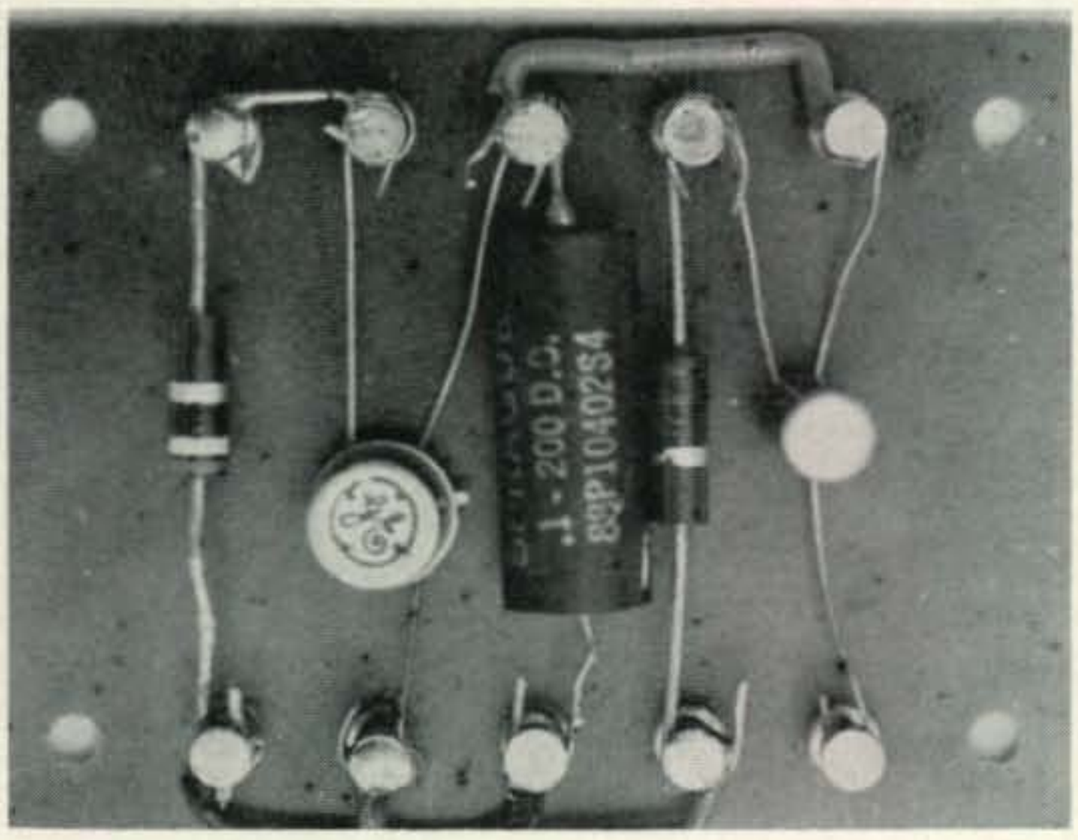


Fig. 3—The ramp generator is shown mounted on a 5-pair terminal board. The variable resistor R_3 is not shown since it is remotely mounted.

Considerations For Solid State Linear VFO's

BY JACK PEROLO,* PY2PE1C

THE v.f.o. is undoubtedly one of the most critical pieces of any station. This article discusses various construction techniques consistent with current state of the art.

The theoretical expression relating the frequency f of a tuned circuit with its capacitance C and inductance L is a second degree affair, reading:

$$f = \frac{1}{2\pi\sqrt{LC}} \qquad (1)$$

By definition, a second degree equation is not linear. Consequently, if one wants a linear frequency output from a tuned circuit, it will be necessary to introduce the correcting (non-linear) compensation either into the L or the C of the system.

Such compensations are basically empirical, and require some precautions to be performed properly. In any event, be the L or the C the parameter chosen as a variable, one cannot expect to come up with a first class v.f.o. unless, at design time, all the essential aspects of the circuit were duly taken into consideration. The notes that follow are the summary of the observations made on the 16 linear v.f.o.'s I have built up to this date.

*P.O. Box 2390, Sao Paulo, Brazil

Initial Design Criteria

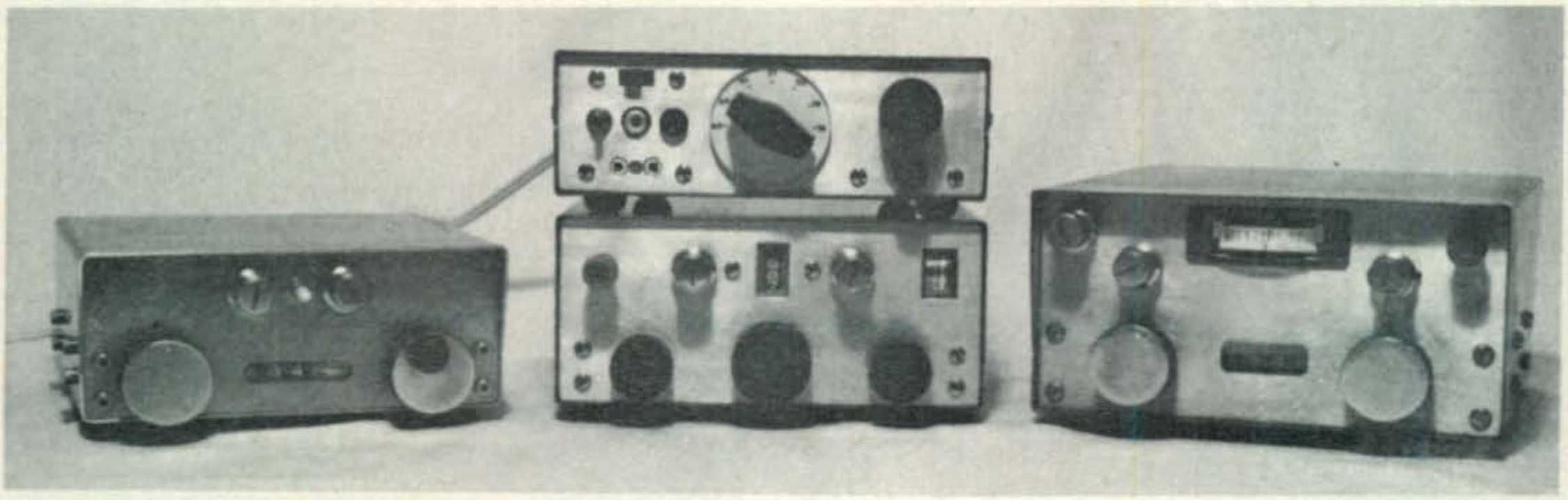
Depending on the overall project requirements it is often wise to jot down the basic characteristics that the v.f.o. should have; this is particularly important when the overall system design requires some sort of compromising, either because of component availability, space, cost, frequency coverage, etc.

The main items to consider are:

1. Mechanical facilities available.
2. Frequency (or band) of operation.
3. Frequency coverage (range).
4. Components available.
5. Stability and repeatability requirements.
6. Output power.

I put in first place the availability of mechanical facilities as this is a basic limit in building a top notch v.f.o. In case convenient mechanical facilities are not available, one can remedy relying more heavily on commercial components, but at a sacrifice of cost and, quite often, of size and shape of the finished v.f.o.

An alternate solution will be to hunt around for surplus components that suit themselves to a particular project. When it comes to gears, it will be almost a necessity to rely on surplus; in fact commercial miniature gears



All these receivers have built in linear v.f.o.'s with mechanical digital frequency read-out. The receiver at left uses a single gang variable capacitor driven by a home built loaded worm gear. The receiver at center (with its converter on top) uses a single gang variable driven by a surplus SCR-274N loaded worm gear. The receiver at right uses again a surplus loaded worm gear and a 4-gang variable, being a monocontrol affair. In all cases, v.f.o. capacitors were filed, the linear coverage being 500 to 700kHz, with a linearity of 0.5 kHz or better. Warm up drift is negligible, being only detectable with a frequency counter.

(offered by Boston Gear, Sterling, and others) are extremely expensive by amateurs standards, and the possibility to home-build quality gears is beyond reach for the most.

The frequency of operation will be a function of the system coverage and design. As a general rule, I would recommend as first choice a frequency between 2.0 and 8.0 mHz. Below 2.0 mHz a wide coverage can only be obtained at the expense of bulky components, and even so, with limitations. An additional source of trouble are the smaller increments at which harmonics are generated that may lead to internal spurious in the overall system.

On the other end, problems do appear as the frequency is increased: stability deteriorates and mechanical tolerances become quite severe. A further source of headaches is at times the fact that, depending on the conversion schemes used, by mixing frequencies below and above the v.f.o., one may have dial readings of different directions (*i.e.* in one case the frequency goes up by turning the dial in a clockwise direction, whereas for another band the opposite occurs). In any case, I do recommend some frequency analysis before starting construction, to make sure the combination of frequencies chosen is the best for a given situation, and also to know in advance where to look for spurious and how to handle them. Articles on this matter have already appeared on *CQ*.[1]

The frequency coverage must be selected as a function of the overall system in which the v.f.o. is going to operate. No matter whether a capacitance tuned or a permeability tuned unit will be chosen, design, construction, and linearization difficulties increase with wider coverage. A v.f.o. linear over 200 kHz offers only moderate problems of linearization; a coverage of 500-600 kHz already poses substantial difficulties, whereas a v.f.o. spanning linearly 1.0 mHz or more is a formidable undertaking, both mechanically and electrically.

In fact, as the coverage increases, the frequency linearization of the unit becomes more delicate and time consuming; the r.f. output may vary from one end to the other of the band, and the need for a buffer becomes imperative. In spite of these difficulties, if one were to build a continuous coverage communication receiver with mechanical digital frequency read-out, a 1.0 mHz coverage v.f.o. would be a necessity, to take real advantage of the counter direct reading capabilities.

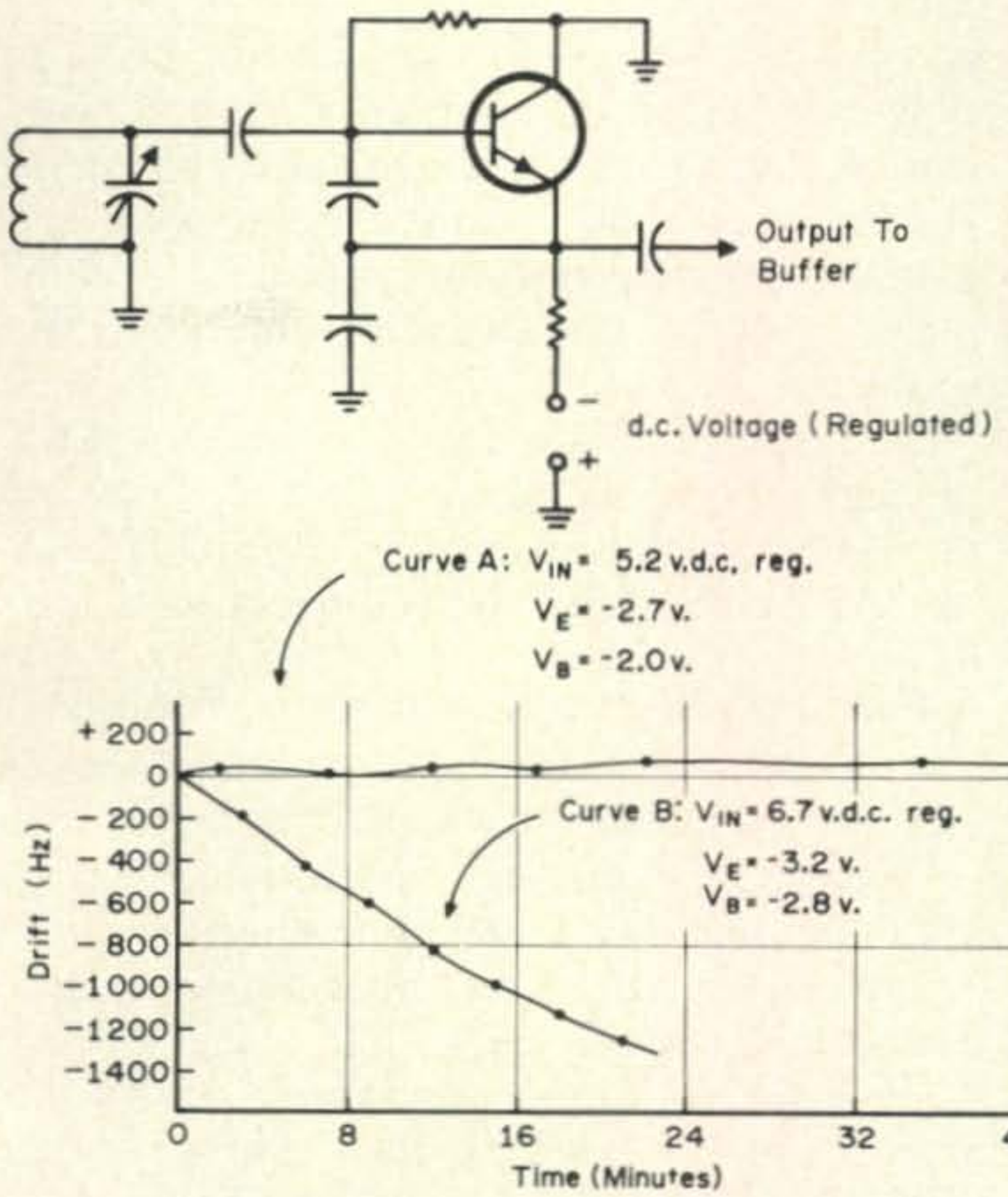


Fig. 1—Basic v.f.o. circuit, covering 2,955-3,955 kHz.

V.f.o. stability is generally an essential requirement. The supply voltage must be regulated and the v.f.o. components must be mechanically sturdy and firmly secured in place. Silver mica capacitors are a must, too. Factors that at times do not receive the attention they deserve are feedback level and overdriving. The amount of feedback necessary to keep any oscillator running reflects on the circuit stability and should be object of careful observations prior to attempting the linearization of the v.f.o.

Overdriving, even at an insignificant level, does contribute to instability as shown by the curves accompanying the circuit of fig. 1.

In both cases the readings were taken with a frequency meter. One can observe that after 40 minutes of operation, as per the conditions of Curve A, the v.f.o. had drifted about 50 Hz from a cold start, whereas when the conditions were changed to those at Curve B, in about 15 minutes the v.f.o. had already drifted 1 kHz, without slowing down. Consequently, if more output power from the v.f.o. is needed, one should consider adding amplifiers, properly cascaded, after the v.f.o., but never even think about overdriving it.

Shielding must also be thought of beforehand, as a minimal parasitic capacitance (as

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[1]Lee, J. G., "Mixer Spurious Frequency Analysis," *CQ*, September 1965, p. 42.
Perolo, J., "An Analytical Approach to Mixer Spurious Evaluation," *CQ*, August 1971, p. 24.

caused, for instance, by the shield on the v.f.o. coil) may throw off hours of work on linearization. The parasitic capacitance effect on the v.f.o. coil is often caused by the receiver's metallic cabinet, and only a careful preliminary study of the situation minimizes the problem.

The repeatability of the v.f.o. is also known as backlash, being essentially a function of the mechanical construction. Spring loaded set-ups are necessary to keep backlash down.

Permeability vs. Capacitance Tuning

After the preliminary considerations above, one has to decide on whether his v.f.o. will be permeability or capacitance tuned.

I enjoy linearizing (by plate filing) a capacitance tuned v.f.o., but must admit that a permeability tuned affair has some advantages. I discuss some pros and cons below. Should one consider a wide coverage v.f.o. (600 kHz or more), I would definitely recommend a capacitance tuned affair. In such a case, it is mandatory to use a high quality variable capacitor of the low torque variety with bearings at both ends. Wide plate spacing is also helpful, as tiny, almost invisible burrs from the filing are less likely to short the capacitor. Filing is to be done gently, starting from the high (in frequency) end, proceeding slowly, and using a fine file. After filing, all burrs are removed with steel wool and with a brush; then the v.f.o. can be energized and checked against a frequency counter or any other suitable means. One should then mark with a pencil on the lateral plates where more filing is needed, and start over. By filing, I generally bring my units to within 1 kHz from the desired frequency, and then I stop filing and proceed to fine adjustment by slightly bending the rotor lateral plates; this procedure has the advantage of being a reversible one, whereas filing is not.

As a matter of precaution, I always set all screws of the v.f.o. with nail lacquer prior to start filing to make sure that nothing will go loose in the process. A small cardboard tray, located below the variable, will help to avoid having metallic filings all over, a potential cause of short circuits. The linearization of a v.f.o. will typically take 5-8 hours, depending on circumstances.

A permeability tuned v.f.o. is generally less mechanically involved and, consequently, it is more economical and can be made smaller. Series coils[2] are necessary to achieve the proper L/C ratio during linearization.

Also important is to use a coil of high length-to-diameter ratio, so that the movement of the slug will not have a noticeable effect on the coil end that is, evidently, a non-linear spot. An additional precaution, in this respect, is to have the slug of the series coil far away from the main coil, as to minimize secondary effects and interaction of the series coil slug over the main coil and vice versa.

Among the techniques used for linearizing the v.f.o., one can try to move the coil winding or to rewind the whole coil at a different spacing. The major problem here is that (in opposition to capacitor filing) any coil modification will require starting all over from the beginning, as any prior work is lost. A dose of patience is necessary to achieve results.

Backlash-wise, a permeability tuned v.f.o. can often be made to stricter tolerances than a capacitance tuned one.

[*continued on page 90*]

[2]That is, in series with the main coil. For more details, refer to the article, "A Solid State Permeability Tuned V.F.O. with Digital Frequency Read-Out," J. Perolo, *CQ*, October 1970, p. 18.

Table I—Characteristics Comparison of Capacitance and Permeability Tuned VFO's

Characteristic	*Capacitance tuned*	*Permeability tuned*
Electrical stability	Good	Excellent
Mechanical stability	Good	Excellent
Aging	Excellent	Good
Linear Frequency Coverage	Up to 1.0 mHz or more	Difficult if more than 600 kHz
Repeatability (Backlash)	100-200 Hz, typical	Below 100 Hz, typical
Cost	High	Low
Size	Large	Small

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SAVE $40.00

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Now you can hear about all the exciting events in your town as they happen. Traffic jams, robberies, dangerous criminals at large. Exact details of the latest fire. Hazardous storm warnings . . . before it's too late.

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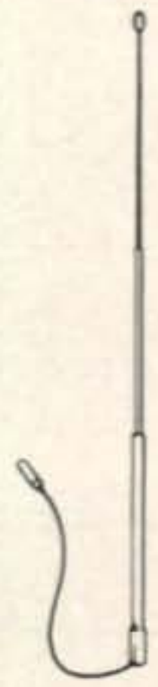


DX

BY JERRY HAGEN,* WA6GLD

ANOTHER fall season of DX is just around the corner so it is time to finish up the antenna projects for the DX and contest season. DX emphasis should shift to 20 and 40 meters, however, after an outstanding spring on 28 mHz, 10 meter buffs are hoping for another good fall.

De Extra

During the past year there has been much comment on sportsmanship in DXing, especially relative to QRMing of DXpedition stations operating in the region of 14195 kHz where W/K s.s.b. operation is not authorized. During some DXpeditions the constant chatter and uncomplementary remarks of W/K's on the frequency is simply disgusting. Needless to say, this operation has arroused the attention of all, including the FCC. Our FCC Chief, W4BW has urged the amateur to voluntairly clean up this activity or measures such as automatic ID equipment might become necessary for all amateur radio equipment. There is much that can be said about this subject and others relating to sportsmanship in DXing, however, one editorial comes to mind. The following editorial was written by WA5LES in the WGDXC Bulletin in 1967 and is particularly timely: "You know, I have heard some pretty discouraging talk among DXers around the country lately. Everyone seems down and out because of DXpedition controversy, because there aren't many expeditions going, or because they can't work the DX on the first call. DXing and Ham Radio in general is the greatest fraternal organization in the world. Ham radio is built on a premise of unselfish dedication to furthering the state of the art and the state of worldwide fellowship. When we let selfishness, bigotry and politics start hindering our judgement and marring our image, we can cook our own goose in a big hurry. Let's stop resigning from DXCC, ARRL and DXing in general and either voice our opinion constructively or keep quiet until things get back to normal. We have some tremendous DXpeditions coming up and conditions are good, so *smile!*" So, when you have the urge to flip the transmitter v.f.o. down to 14195 kHz and put in your two cents worth, be sure to *think* of the value of a penny!

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

Luis, CE3AG operates from the QTH of W5QBM. He was the first amateur to operate from Easter Island and was very active in Contests from CE3AG.

Country Status

The following note on the countries list appeared in the International DX Association Newsletter in February 1971. The author, Bud, K3RLY humorously but concisely states his objection to proposed DXCC list changes:

Joe Hiller, W4OPM

With great sadness we report the death of Joe Hiller, W4OPM, July 2, 1972 at Portsmouth Naval Hospital in Virginia. Joe was one of the worlds most active and respected DXers. He was a member of the original CQ DX Awards Advisory Committee formed in 1967, and had led the *CQ* WPX Honor Rolls in the SSB, CW, and Mixed categories since their inception. He will be sorely missed by his friends all over the world.

"I gather from talking to a member of the DXCC advisory committee that the countries list is going to get a face lifting, with the unclaimed rocks getting the axe. One member told me that the mail was three to one in favor of such deletion. My vote was one against. It is so very difficult to set up criteria and the ink is not dry on the proclamation until you have started making exceptions. For example Spratly is not claimed by one country—its claimed by half a dozen. If you wait until some country clearly has jurisdiction established none of us may ever work it. Governments have been harassed by DXers to do all kinds of things—if we do this thing we will have to start working on them to claim wet rocks. I have already written Tonga to get them to claim Minerva reef. I'm kidding of course, but on second thought—why not? Then there is the old saw about individuals setting themselves up as the sole ruler of a piece of mother earth. Who wants Banc du Geyser? As I have said it before—let it alone —it's bad enough now."

Bud's belief is quite popular with many DXers and represents the best argument for *not* changing the DXCC list—namely it is established and well known, so why make a change. As reported in the June *CQ* DX Column, this stand was unanimously concluded by the DX Forum at the California DX Conference. The other position advocates eliminating countries which are not claimed or do not meet present mileage or governmental administration requirements.

Gerard, operator of FB8XX in 1970 provided snappy operation on both s.s.b. and c.w. The QSL manager is F2MO who kindly provided this photo.

In 1971 the ARRL DX Advisory Committee asked for comments by DXers and the results appear to have been a recommendation to give the Countries list the "face lifting" as outlined in K3RLY's comment. As of this date, *no* changes have been made to the DXCC List and no announcement of recommendations have been made by the DXCC Advisory Committee. In view of the time lapse since the Committee began their survey, it could be concluded that any changes have

The CQ DX Award Program

C.W. DX

93.....WA3NQJ

2XS.S.B. DX

†151.....OH2VZ
211.....W5QBM
212.....ZL4CR
213.....ZD8HAL
214.....9V1PM
215.....K4AEH
216.....UWØIE
217.....WA2HSX
218.....I2ADN

CQ DX Endorsements
2XS.S.B.

310—IT9JT; 300—WA2HSX; 275—OK1-MP; 200—WA4HHW, WA6TAX; 150—G3-TLV, ZL4CR, I2ADN.
28 mHz—K41UV, W5QBM, WA2HSX.

Complete rules for the CQ DX Award Program may be found on page 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a business size self-addressed stamped envelope to the Award Manager, P.O. Box 1271 Covina, Ca. 91722 or to the DX Editor.
†Omitted from the December 1971 listings.

W6EJJ takes a turn at Armed Forces Day Station KD6USA while WA6GLD observes. Operation was conducted from the South El Monte Army Reserve Center and 2927 QSO's with 73 different countries were made.

CQ DX AWARD HONOR ROLL

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmations with 274 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Effective with this listing all scores reflect the deletion of the Ryukyu Islands (Okinawa). This country was deleted from the DXCC Countries list effective 15 May 72 and after this date QSO's with the Ryukyu Islands will count as Japan.

C.W.

W6ID 318	W4IC 307	WA6EPQ 293
K6EC 317	WØAUB 305	W4BQY 290
W8LY 310	DL3RK 303	W6NJU 290
VK3AHQ 307	ON4QX 300	WA6MWG 279
W4OPM 307	W6ISQ 295	WA8DXA 278
K6LEB 307	K1SHN 294	

2XS.S.B.

TI2HP 320	W4IC 311	K4RTA 299
W2TP 320	W6NJU 311	YS1O 299
W9ILW 320	ZS6LW 311	ZL3NS 299
DL9OH 319	W9JT 310	F9MS 298
WA2RAU 319	XE1AE 310	WA6MWG 297
K2FL 318	IT9JT 309	VE3GMT 294
W3NKM 318	VE2WY 309	XE2YP 293
K6LGF 318	G3DO 308	WB2RLK 291
W6REH 318	F2MO 307	ZL1AGO 289
IØAMU 317	VE3ACD 307	WØYDB 288
K6YRA 317	I1AA 306	HP1JC 284
G3FKM 316	K6EC 305	W9KRU 283
SM5SB 316	I1ZV 303	WAØKDI 281
W6RKP 316	W6KZS 303	OE2EGL 279
W3DJZ 314	W6FW 301	K8GQG 279
W4OPM 314	W9QLD 301	WAØCPX 277
W6EUF 314	K4HJE 300	WA3IKK 275
I8KDB 313	WA2HSX 300	WØSFU 275
W6KTE 313	KH6BB 300	DL1MD 274
W9DWQ 313	G3RWQ 299	G3WW 274
W6YMV 312	OZ3SK 299	K9LUI 274
WA2EOQ 311	K1SHN 299	OK1MP 274

The WAZ Program

S.S.B. WAZ

1000.....W5QBM	1003.....UQ2AN
1001.....UA9EU	1004.....UA3HB
1002.....UW6LC	

C.W.—Phone WAZ

3370.....I1SZE	3378.....K4CKA
3371.....5H3LV	3379.....VK3HE
3372.....W6CLS	3380.....UA4AN
3373.....KP4BJD	3381.....UK5EAG
3374.....SP5ATO	3382.....UA6UO
3375.....GI6YM	3383.....UK5VAA
3376.....PY2BCQ	3384.....UK5IAI
3377.....WB4DOY	3385.....UQ2GW

Phone WAZ

478.....LA4CM

Complete WAZ rules are shown on pgs. 64-66 of the June, 1970 issue of *CQ*. 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, FL 33880.

been stifled for one reason or another. So Bud, don't worry!

From West Africa

The OM/XYL team of WB2AQC and WB2BAV have completed a trip to West Africa and perhaps OM George will prepare another article such as the "Hams Vacation Guide to the Caribbean" which appeared in the March and April issues of *CQ*. In the meantime the following notes were received from George. "In Nouakchott, capital of Mauritania we operated as WB2AQC/5T5 and WB2BAV/5T5. In Dakar, Senegal, we got some upside calls, 6WØ/WB2AQC and 6WØ/WB2BAV which caused some confusion on the bands! (But good for WPX!) When we got to the airport in Dakar to fly to Bathurst, Gambia we were told that the flight was cancelled and that the next flight *might* be tomorrow or after! So we took a taxi to Gambia where we were assigned ZD3R and ZD3S. In Sierra Leone we signed 9L1GP and

The WPX Program

2XS.S.B. WPX

690.....WA5VDH
691.....WB2MQI
692.....WØUCK
693.....SV1GA
694.....VE7TL
695.....UWØIE
696.....UM8FM

C.W. WPX

1173.....OK3CEK
1174.....WA5VSL
1175.....K5ABV
1176.....K1DEK
1177.....G3JZV
1178.....UK9HAB
1179.....UC2WG
1180.....UQ2DB
1181.....UA1HY
1182.....UK5EAG
1183.....UA3VA
1184.....UK3AAC
1185.....UV3AP

Mixed WPX

335.....K2HWF
336.....UWØIE
337.....ZD8HAL
338.....EP2DX
339.....DJ2WF

VPX

42.....UA3-170-45

WPX Endorsements

SSB: I1ZV—700, W6AOI, WA2HSX—500, KC6WS—450, WA9VGY, WA4TMP—400, UWØIE—350.

CW: W4IC—700, W9IRH—600, K5ABV, W3URE—500.

Mixed: DL3RK, W2NUT—1000, W4BQY—850, W9IRH, WB4KZG—650, W2MB—550, PY2BCQ—500, DJ2WF—450.

80 Meters: OK3CEK.

20 Meters: SP5HS, OK3BT, K5ABV, UC2-WC, UWØIE, KC6WS.

15 Meters: K5ABV, YU1AG.

10 Meters: K5ABV.

Asia: K4IEX, KC6WS.

Europe: SP5HS, OK3CEK, K5ABV, UK9-HAB, UC2WC, UQ2DB, UK3AAC, WA5-VDH, UWØIE.

Oceania: KC6WS, K5ABV, UWØIE, W4-CRW.

Complete rules for WPX, WPNX, and VPX may be found on page 67 of the February, 1972 issue. 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. 19722 or to the DX Editor.

9L1RP, Ross, 9L1GC and Mike, 9L1MF. In Liberia we operated from the QTH of Robert, EL2DF on a rubber plantation signing EL2AV and EL2AU. The Ivory Coast operation signing TU4AB and TU4AC was made from the QTH of Sully, TU2BX. Operation in Togo was from the QTH of 5VZYH using the calls 5VZAA and 5VZBB. We are taking lots of photos and having a great time!"

Akira, JA1AG is the holder of WAZ, WPX, DXCC and Japans top DXers with 328 countries confirmed.

DXer Comment

The following comments were received from Bob, W6HUR, relative to this editors comment on operation from WA6GLD/-6Y5L: "I must disagree with your comments in the March issue. You say "little was to be

Milos, OK1MP is one of Europe's foremost DXers and holds WAZ, WPX, 5BDXCC and is on the CQ 2XSSB DX Award Honor Roll

This member of the c.w. WPX Honor Roll is Bill, W8KPL. The rig is Collins with a 400 watt home-made final.

gained by list, split frequency or call area operation." This conflicts with your own statement later in the article which states "East Coast signals were ear-shattering on all bands with second layer of mid-west right behind." How about us West Coast boys and low power stations in all districts? I am heartily in favor of split frequency operation and call area operation of all DXpeditions. If necessary, by K, W, WA & WB if pileups are too great. It is my understanding that the main purpose of a DXpedition is to clear up the area for all DXers who need that particular area."

In reply, it must be stated that Bob has a valid argument, and that perhaps the comments should have been more specifically oriented to contest operating rather than to DXpedition operating. For the contest period the objective was to compile the maximum number of contacts rather than work a particular area of the world. With good signal strength such as from 6Y5 to W land, the West Coast was not at a great disadvantage because proper timing of calls can make a big difference. When operating in Germany, DA1JP commented that K6YRA was usually one of the first thru a pileup with well timed calls even though his signal was two to three S units *down* from other W6's. However, when signals are poor or pileups large, split frequency and call area operations would be advantageous to obtain contacts with a particular area of the world.

WPX News

The Dade County Amateur Public Service Corps will sponsor special event stations during the Presidential Election Conventions. The call WD4USA will be used for the Democratic Party Convention and WR4USA will be used for the Republican Party Convention. QSL's will be handled via the Dade County APSC, W4EHW.

QSL Information

A2CRD—Via WA2CRD
A51KV—Via W6KNH
CR3RY—Via CT1RY
EL2AU—Via WB2AQC
EL2AV—ViaWB2AQC
ET3DS—Via VE2DCY
ET3DS—Via VE2DCY
ET3GK—Via W2BCU
ET3JH—Via WB8ICL
ET3USA—Via W4NJF
ET3USE—Via K8IRC
EA5LA/FC—Via EA5CV
FM7AA—Via K4CDZ
FO0RV—Via G5RV
FO0WR—Via DJ5RT
FP8CW—Via VE5NW
FP0VQ—Via W2NQ
HB0XJL—Via DJ5BV
HB0XJQ—Via K3SSC
HI8XGM—Via W3HIZ
IM0BGJ—Via I1BGJ
JD1ACF—Via JA1OAF
JD1ADK—Via JA1KSO
JD1YAA—Via JA1WU
JY9EA—Via SM5EAC
JY9GR—Via DK4PP
KB6DA—Via W6CUF
KD6USA—Via W6ANN
OD5FM—Via WB2ISL
OJ0SUF—Box 1, Mariehamm, Finland
PJ8DX—Via K2FJ (W2TMI)
TG9NJ—Via K4UQC
TN8BK—Via JA4BLY
TU4AB—Via WB2AQC
TU4AC—Via WB2AQC
U4L—Via UA4LN
VB2KOC—Via VO2AI
VP2LY—Via VE3BMV
VP2VAN—Via K2FJ (W2TMI)
VP2MQ—Via KV4AM
VP2GAE—Via K3NEZ
VS5JA—Via K3RLY
YB3AAY—Via W3BRB
YJ8RV—Via G5RV
YJ8BO—Via I0IS
YJ8GH—Via W6ANN
YV7AV—Via W6TCQ
ZD3R—Via WB2AQC
ZDL3S—Via WB2AQC
ZD8JK—Via WA3FNK
QZF1AA—Via K2MUB
3D2FM—Via W7YBX
3D6AK—Via KP4DKY
4M7AV—Via W6TCQ
WB2AQC/5T5—Via WB2AQC
WB2BAV/5T5—Via WB2BAV
5VZAA—Via WB2AQC
5VZBB—Via WB2BAV
7X2BK—Via W5LUJ
8P6AH—Via VE3GMT
9J2HI—Via WA2CRD
9L1GP—Via WB2AQC
9L1EP—Via WB2BAV
3A0AM—Not Via W4NJF
WD4USA & WR4USA—Via W4IYT, P.O. Box 501 Miami Springs, FL 33166

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

Propagation

BY GEORGE JACOBS,* W3ASK

THE plateau in solar activity reported in last month's column continues. The Swiss Federal Solar Observatory reports a monthly mean sunspot number of 78 for May, 1972. This results in a 12-month running smoothed sunspot number of 68 centered on November, 1971. The solar cycle is based upon smoothed sunspot numbers, which take into account solar activity over a 12-month period.

The present solar cycle has remained practically constant between May and November, 1971. The following are the recorded smoothed numbers for this period:

Month—1971	Smoothed Sunspot Number
May	68
June	67
July	66
August	65
September	66
October	67
November	68

This plateau should result in a propagation bonus to radio amateurs during the next several months. If solar activity had declined as originally expected, there would have been little likelihood for world wide DX openings on 10 meters and there would have been a significant reduction in 15 meter DX openings. As a result of the plateau, solar activity is expected to be high enough this fall and winter to support a large number of DX openings on 10 meters, and 15 meters should be the optimum DX band during most of the daylight period. DX propagation conditions are expected to favor 20 meters during the sunrise period and again during the late afternoon and early evening, while 40 meters should provide optimum DX propagation conditions during most of the hours of darkness.

*11307 Clara Street, Silver Spring, Md. 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For September, 1972

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: Sept. 4-5, 14, 23, 25-26	A	A	C	C
Normal: Sept. 2-3, 10-13, 16-17, 19-20, 22, 24, 27, 29-30	B	C	D	E
Below Normal: Sept. 1, 6, 9, 15, 18, 21, 28	C	D	E	E
Disturbed: Sept. 7-8	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 (3) will be excellent on Sept. 14, but only fair on Sept. 9, etc.

Seasonal propagation changes usually take place on the h.f. amateur bands from about mid-September through mid-October. During this period, an increasing number of DX openings can be expected during the daylight hours on 10, 15 and 20 meters, although these bands will close somewhat earlier than during the mid-summer months. Improved nighttime DX propagation conditions are also forecast for 40, 80 and 160 meters, with considerably *lower* static levels and with these bands remaining open somewhat longer in the northern hemisphere as the hours of darkness increase.

A seasonal improvement on *long* DX openings between the temperate regions of the northern and southern hemispheres is also expected from mid-September through at least mid- October. This should result in more frequency openings between the USA and such areas as South America, Australasia, South Asia and South Africa, on all bnds between 10 and 40 meters, with some long DX openings also possible on 80 and perhaps 160 meters as well.

Because of the marked changes in propagation conditions expected during September, this month's column contains both DX and Short-Skip Propagation Charts. The Short-Skip Charts are valid for both September and October, while the DX charts are valid from September 15 through October 15.

How To Use The Short-Skip Charts

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

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

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

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

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path mid-point*. For example, on a circuit between Maine and Florida, the times shown would be EST; on a circuit between NY and Texas, the time would be CST since the path mid-point falls in this time zone. Determine the path mid-point, and use the appropriate standard time. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones, *add* 2 hours in the PST zone, 3 hours in MST zone; 4 hours in CST zone; and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart are given in GMT. To convert to *standard* time in Alaska and other areas of the USA, subtract 10 hours in the Alaskan Standard zone; 9 hours in the Yukon zone; 8 hours in PST zone, 7 hours in MST zone, 6 hours in CST zone, 5 hours in EST zone. For example, at 20 GMT it is 12 Noon in Juneau and 15 or 3 P.M. in NYC.

4. The Short-Skip Chart is based upon a transmitter power of 75 watts c.w. or 300 watts p.e.p. on sideband; The Alaska and Hawaii Charts are based upon a transmitter power of 250 watts cw or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10 db loss, it will lower by one level.

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

V.H.F. Ionospheric Openings

Conditions for trans-equatorial, or TE-scatter should peak during September and October, and 6-meter openings between parts of the USA and South America should be possible during most nights. The optimum time for TE openings is between 8 and 11 P.M., local standard time. While most openings will last for an hour or two, some may continue for several hours. As a rule, signals levels during TE openings are relatively weak, and there may be considerable flutter fading. While TE propagation favors the southern half of the United States, during September openings should be possible from almost all areas of the country.

Although summertime sporadic-E ionization is expected to fall off considerably during September, some 6-meter short-skip openings may still be possible over distances ranging between approximately 1000 and 1300 miles. While these openings may take place at anytime, they are more likely to occur before noon and during the early evening hours.

Auroral activity often increase during September, and this could produce some 6 and 2 meter openings resulting from the ionization associated with auroral displays. Check the "Last Minute Forecast" at the beginning of this column for periods that are forecast to be disturbed or below normal, as these are the days on which auroral type openings are most likely to occur during the month. Auroral-scatter openings last from several minutes to an hour or so, and are usually characterized by weak to moderately strong signals often badly distorted by flutter fading.

No major meteor showers will occur during September, and few, if any meteor-scatter openings are likely on the v.h.f. bands.

CQ DX Contest Special

This year's *CQ* Worldwide DX Contest will be held on the following dates:

October 28-29	Phone section
November 25-26	C.w. section

Following the practice of the past 21 years, next month's Propagation column will be devoted to a special, comprehensive forecast which will cover both sections of the Contest.

73, George, W3ASK

CQ Short-Skip Propagation Chart

September and October, 1972

Local Standard Time At Path Mid-Point

(24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	09-13 (0-1)	07-09 (1) 09-13 (1-2) 13-14 (0-2) 14-21 (0-1)	07-09 (1-0) 09-12 (2-0) 12-14 (2-1) 14-16 (1-2) 16-18 (1) 18-21 (1-0)

15	*Nil*	07-09 (0-1) 09-13 (0-2) 13-21 (0-1)	07-09 (1) 09-11 (2) 11-13 (2-3) 13-16 (1-4) 16-17 (1-3) 17-19 (1-2) 19-21 (1) 21-07 (0-1)	07-08 (1) 08-09 (1-2) 09-11 (2) 11-13 (3) 13-16 (4) 16-17 (3) 17-18 (2-3) 18-19 (2) 19-20 (1) 20-07 (1-0)
20	11-21 (0-1)	07-09 (0-1) 09-10 (0-2) 10-11 (0-3) 11-16 (1-4) 16-17 (1-3) 17-21 (1-2) 21-07 (0-1)	06-09 (1-2) 09-10 (2-4) 10-11 (3-4) 11-16 (4) 16-17 (3-4) 17-18 (2-4) 18-21 (2-3) 21-23 (1-2) 23-06 (1)	06-07 (2) 07-09 (2-3) 09-13 (4-2) 13-15 (4-3) 15-18 (4) 18-19 (3-4) 19-21 (3) 21-23 (2) 23-00 (1) 00-05 (1-0) 05-06 (1)
40	07-09 (0-2) 09-11 (2-4) 11-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-06 (0-1) 06-07 (0-2)	07-09 (2-3) 09-11 (4-3) 11-16 (4-2) 16-18 (3) 18-20 (2-4) 20-22 (1-4) 22-00 (1-3) 00-03 (1-2) 03-05 (1) 05-06 (1-2) 06-07 (2)	07-09 (3-2) 09-11 (3-1) 11-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-22 (4) 22-00 (3-4) 00-03 (2-3) 03-05 (1-2) 05-07 (2-4)	07-09 (2-1) 09-15 (1-0) 15-16 (1) 16-17 (2-1) 17-18 (2) 18-20 (3) 20-00 (4) 00-03 (3-4) 03-05 (2-3) 05-07 (4-2)
80	06-08 (3-4) 08-11 (4) 11-18 (4-3) 18-22 (4) 22-04 (3-4) 04-06 (2-3)	06-08 (4-2) 08-11 (4-1) 11-16 (3-1) 16-18 (3-2) 18-20 (4-3) 20-04 (4) 04-05 (3-4) 05-06 (3)	06-08 (2-1) 08-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-21 (4-3) 21-03 (4) 03-05 (4-3) 05-06 (3-2)	06-08 (1) 08-16 (0) 16-18 (1) 18-20 (2) 20-21 (3-2) 21-03 (4-3) 03-05 (3-2) 05-06 (2-1)
160	16-18 (1-0) 18-20 (2-1) 20-05 (4) 05-07 (3-2) 07-09 (2-1) 09-11 (1-0)	17-19 (1-0) 19-20 (1) 20-02 (4-3) 02-05 (3-2) 05-07 (2-1) 07-09 (1-0)	19-20 (1-0) 20-22 (3-1) 22-02 (3) 02-05 (2-1) 05-07 (1)	20-22 (1-0) 22-02 (3-2) 02-05 (1) 05-07 (1-0)

HAWAII

Openings Given in Hawaiian Standard Time‡

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	09-10 (1) 10-13 (2) 13-14 (1)	07-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	11-13 (1) 13-15 (2) 15-17 (3) 17-20 (2) 20-22 (1) 00-02 (1) 02-06 (2) 06-08 (1)	**18-20 (1)** 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Central USA	09-10 (1) 10-14 (2) 14-15 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	09-13 (1) 13-15 (2) 15-17 (4) 17-19 (3) 19-21 (2) 21-02 (1) 02-07 (2) 07-09 (1)	18-20 (1) 20-22 (2) 22-01 (3) 01-03 (2) 03-04 (1) **21-22 (1)*** 22-00 (2)* 00-02 (1)*
Western USA	09-10 (1) 10-15 (2) 15-16 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	02-04 (1) 04-06 (2) 06-10 (3) 10-12 (2) 12-14 (3) 14-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 21-22 (1)* 22-23 (2)* 23-02 (3)* 02-03 (2)* 03-04 (1)*

How To Use The DX Propagation Charts

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 call 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 that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *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 GMT, etc.

5. The Charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10 db loss, it will lower by one level.

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

ALASKA

Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	*Nil*	18-21 (1) 21-23 (2) 23-00 (1)	12-15 (1) 21-23 (1) 23-02 (2) 02-04 (1)	08-12 (1)
Central USA	22-00 (1)	19-21 (1) 21-01 (2) 01-02 (1)	13-17 (1) 21-23 (1) 23-01 (2) 01-03 (3) 03-04 (2) 04-06 (1)	08-14 (1)
Western USA	22-01 (1)	18-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-03 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-03 (4) 03-04 (3) 04-05 (2) 05-07 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

SEND IN EARLY FOR ALL CQ CONTEST LOG AND SUMMARY SHEETS
include an s.a.s.e. or sufficient IRCs for prompt delivery

September 15-October 15, 1972

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

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

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

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-11 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-13 (2) 13-16 (3) 16-19 (2) 19-22 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Northern Europe & European USSR	*Nil*	07-09 (1) 09-11 (2) 11-13 (1)	05-06 (1) 06-08 (2) 08-11 (1) 11-14 (2) 14-16 (1) 22-00 (1)	19-22 (1) 22-00 (2) 00-01 (1) 21-00 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	07-09 (1) 09-12 (2) 12-13 (1)	05-06 (1) 06-08 (2) 08-14 (1) 14-17 (2) 17-20 (1) 20-22 (2) 22-23 (1)	19-22 (1) 20-22 (1)*
West & Central Africa	10-12 (1) 12-14 (2) 14-16 (1)	06-09 (1) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	04-05 (1) 05-07 (2) 07-14 (3) 14-16 (2) 16-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	19-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
South Africa	09-10 (1) 10-12 (2) 12-13 (1)	06-08 (1) 08-11 (2) 11-12 (3) 12-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	05-07 (2) 07-13 (1) 13-15 (2) 15-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	19-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*
East Africa	11-14 (1)	08-10 (1) 10-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-20 (2) 20-21 (1)	20-23 (1)
Central & South Asia	08-10 (1) 17-19 (1)	08-10 (1) 18-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	05-07 (1) 18-20 (1)

Southeast Asia	09-11 (1) 17-19 (1)	08-10 (1) 13-16 (1) 16-18 (2) 18-20 (1)	05-07 (1) 07-09 (2) 09-12 (1) 15-20 (1) 20-23 (2) 23-01 (1)	04-07 (1)
Far East	17-19 (1)	09-11 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-12 (1) 16-20 (1) 20-23 (2) 23-01 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	08-12 (1) 12-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	06-07 (2) 07-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-21 (3) 21-23 (4) 23-00 (3) 00-02 (2) 02-06 (1)	23-00 (1) 00-06 (3) 06-07 (2) 07-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Australasia	13-15 (1) 15-18 (2) 18-19 (1)	08-10 (1) 12-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	15-17 (2) 17-20 (1) 20-22 (2) 22-02 (3) 02-03 (2) 03-06 (1) 06-08 (2) 08-10 (3) 10-12 (2) 12-15 (1)	01-03 (1) 03-07 (2) 07-08 (1) 04-07 (1)*
Northern & Central South America	08-09 (1) 09-10 (2) 10-12 (3) 12-15 (4) 15-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-12 (3) 12-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-09 (4) 09-11 (3) 11-14 (2) 14-16 (3) 16-21 (4) 21-00 (3) 00-02 (2) 02-04 (1) 04-06 (2)	18-19 (1) 19-20 (2) 20-00 (3) 00-04 (4) 04-05 (3) 05-06 (2) 06-07 (1) 19-22 (1)* 22-04 (2)* 04-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-15 (1) 15-17 (2) 17-19 (3) 19-22 (4) 22-01 (3) 01-03 (2) 03-05 (1) 05-07 (2)	20-23 (1) 23-03 (2) 03-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	14-17 (1)	10-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	07-09 (1) 16-18 (1) 18-19 (2) 19-22 (3) 22-00 (2) 00-02 (1)	23-06 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

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

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Aug. 26-27	All Asian DX C.W. Contest
Aug. 26-28	Delta QSO Party
Aug. 26-27	Ohio QSO Party
Sept. 9-10	European DX Phone Contest
Sept. 9-11	Four Land QSO Party
Sept. 16-17	Pennsylvania QSO Party
Sept. 16-17	SAC C.W. Contest
Sept. 16-18	Washington State QSO Party
Sept. 20-22	YLRL "Howdy Days"
Sept. 23-24	VE/W Contest
Sept. 23-24	S A C Phone Contest
Oct. 6-9	Massachusetts QSO Party
Oct. 7-8	RSGB 21/28 mHz Phone
Oct. 7-8	California QSO Party
Oct. 8-9	LU American Contest
Oct. 7-8	VK/ZL/Oceania DX Phone
Oct. 14-15	VK/ZL/Oceania DX C.W.
Oct. 14-15	WADM C.W. Contest
Oct. 14-16	CARTG RTTY Contest
Oct. 18-19	YLRL Anniv. C.W. Party
Oct. 21-22	RSGB 7 mHz C.W. Contest
Oct. 21-22	Boy Scouts Jamboree
Oct. 28-29	**CQ WW DX Phone Contest**
Nov. 1-2	YLRL Anniv. Phone Party
Nov. 3-6	CHC/HTH/FHC QSO Party
Nov. 4-5	RSGB 7 mHz Phone Contest
Nov. 12	Czechslovakian Contest
Nov. 11-12	ARRL Phone Sweepstakes
Nov. 18-19	ARRL C.W. Sweepstakes
Nov. 25-26	**CW WW DX C.W. Contest**

All Asian DX C.W. Contest

Starts: 1000 GMT Saturday, August 26
Ends: 1600 GMT Sunday, August 27

In scoring your log remember that non-Asians use country prefixes of Asian countries as their multiplier. Complete rules in last month's CALENDAR.

Logs must be received no later than Nov. 30th and go to: J.A.R.L. Contest Committee, Central Post Office, Box 377, Tokyo, Japan. Include one IRC and s.a.e. for copy of results.

Delta QSO Party

Starts: 2000 GMT Saturday, August 26
Ends: 0200 GMT Monday, August 28

Complete details in last month's CALENDAR. Mailing deadline is Sept. 25th and logs go to: Malcolm P. Keown, W5RUB, 213 Moonmist, Vicksburg, Miss. 39180

*14 Sherwood Road, Stamford, Conn. 06905.

European Phone Contest

Starts: 0000 GMT Saturday, September 9
Ends: 2400 GMT Sunday, September 10

The c.w. section took place last month. Details covered last month. Mailing deadline for logs Oct. 15th to: DARC European Contest, D-895 Kaufbeuren, Postbox 262, Germany.

Ohio QSO Party

Two Periods: (GMT)
1900 Sat. Aug. 26 to 0300 Sun. Aug. 27
1500 Sun. Aug. 27 to 2300 Sun. Aug. 27

This year's party is sponsored by the Ohio Council of Amateur Radio Clubs.

Each station may be worked once per band and per mode, and Ohio stations may contact in-state stations for credits.

Exchange: QSO no., RS(T) and QTH. County for Ohio, ARRL sections for others.

Scoring: 1 point per QSO, 2 points if its on 160 or v.h.f. As a bonus, contacts with the Ohio State Fair special events station WO8HIO are worth 5 points. DX may be worked but for QSO points only.

Ohio will use ARRL sections worked for their multiplier, others, Ohio counties. (max. 88)

Frequencies: 1805, 3575, 3975, 7075, 7275, 14075, 14285, 21075, 21375, 28075, 28575, 50.15, 145.10. (Try 160 at 0200 on Aug. 27)

Awards: To the 3 top scorers in Ohio and out-of-state. And to the winners in each ARRL section and Ohio county. (min. of 10 QSO's)

Portable operation from rare Ohio counties is encouraged and a 1.5 multiplier to the final score may be used by these stations.

Logs must be received by Sept. 28th and go to: Ohio QSO Party, c/o R. T. Bennett, K8EHU, 6470 Penick Dr., Reynoldsburg, Ohio 43068

Four Land QSO Party

Starts: 1800 GMT Saturday, September 9
Ends: 0200 GMT Monday, September 11

This is the third annual QSO party sponsored by the 4th District Chapter #79 of the CHC International to make the many counties in the eight 4th District states available for the county hunters.

The same station may be worked on each band and mode fixed, and again if operating portable or mobile. Fourth District stations may work other in-district stations.

Exchange: QSO no., RS/RST and QTH. County and state for 4th district; state, province or country for others.

Scoring: *For 4th District:* Total QSOs × states × countries × continents. *All Others:* QSOs × 4th Dist. states × 4th Dist. counties. Count states and counties once only.

Frequencies: C.W. — 3575, 7060, 14075, 21090, 28090, Phone — 3940, 7260, 14343, 21360, 2860. Novice — 7150, 21100.

Awards: Certificates to top scorers in each state, province, country and continent, 2nd and 3rd place awards when warranted. Also county awards to 4th Dist. states and special awards to Novices and s.w.l.s.

Mailing deadline Oct. 31st to: CHC Chapter #79, att.; Bob Knapp. W4OMW, Rt. 7, Box 187, Greenville, N.C. 27834.

Pennsylvania QSO Party

Starts: 2300 GMT Saturday, September 16
Ends: 0200 GMT Monday, September 18

The 15th annual QSO party is again sponsored by the Nittany ARC. The same station may be worked on each band and mode for QSO points.

Exchange: QSO no., RS/RST and QTH. County for Penn., ARRL section or country for others.

Scoring: *For Penn*—3 points for out-of-state contacts, 1 point with other Penn. stations. Multiply total by ARRL sections and countries worked. *Others*—1 point per QSO multiplied by Penn. counties worked. (max. of 67).

Frequencies: On c.w. activity will be found 72.5 kHz in from lower edge of each band. Phone activity on even GMT hours on 3990, 7290, 14290, 21390, 28590.

Awards: 1st place certificates in each ARRL section and country, 2nd and 3rd place awards where activity justifies. Stations qualifying for the Penn. Counties Award will be issued the certificate free. (Min. of 30 counties).

Mailing deadline October 16th to Nittany ARC QSO Party, P.O. Box 60, State College, Penn. 16801.

Washington State QSO Party

Starts: 2000 GMT Saturday, September 16
Ends: 0200 GMT Monday, September 18

The seventh annual QSO Party sponsored by the Boeing Employees' A.R.S. will be held on the final week-end of the Washington State Amateur Radio Week.

All bands and modes may be used and the same station may be worked on each band and mode for contact points. Wash. may work in-state stations for QSO points.

Exchange: QSO no., RS/RST and QTH. County for Wash. stations, state, province or country for others.

Scoring: Wash. stations score one point for each QSO, all others 2 points for each Wash. contact. Multiplier for Wash. is states, provinces and countries; others total Wash. counties worked. (max. of 39).

Frequencies: C.W. — 3560, 7060, 14060, 21060, 28060. Phone—3935, 7260, 14280, 21380, 28660. Novices—3735, 7175, 21204.

Awards: Certificates to top scorer in each state, province, country and Wash. county. Worked Five Bears Award is available to anyone working five club members before, during or after the party. Three Bear Cubs Award for working three novice members.

Results will be mailed to all entries, s.a.s.e. *not* required.

Mailing deadline October 16th to: Boeing Employees' A.R.S., Att: Willis D. Propst, K7RSB, 18415 38th Ave., South, Seattle, Wash. 98188.

Scandinavian Activity Contest

C.W.—Sept. 16-17 **Phone**—Sept. 23-24
Starts: 1500 GMT Saturday
Ends: 18000 GMT Sunday

It's the world working the Scandinavians on all bands, 3.5 thru 28 mHz. Country prefixes are: LA, JW, JX, OH, OHØ, OHØ, OX, OY, OZ, SM/SK/SL.

Both single and multi-operator operation is permitted. Simultaneous operation on more than one band is permitted but the exchange must be in chronological order. Multi-transmitter stations will use separate series of serial numbers for each band.

Exchange: Five or six figures, RS/RST plus a progressive QSO nr, starting with 001.

Scoring: Each completed QSO counts 1 point. The multiplier is the SAC prefix countries above, max of 10 per band. Scoring is for all band operation only.

Awards: Certificates to the two top scorers, both phone and c.w., in each country and each US call area.

A summary sheet showing the scoring is requested, your name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed.

This year the logs go to: SSA Contest Manager, SM5CEU, Rydsvagen 120 C, 582 48 Linkoping, Sweden.

"YL Howdy Days"

Starts: 1800 GMT Wednesday, September 20
Ends: 1800 GMT Friday, September 22

This is a YL activity only, OMs keep out. Scores will be based on contacts between licensed women operators only. All bands and modes may be used, but cross-band and net contacts do not count.

Score 2 points for each YLRL member worked and 1 point for each non-member. Only one contact with the same station permitted, There is no multiplier.

The top scoring YLRL member will receive her choice of a YLRL pin, charm or stationery. The highest non-member will receive a year's membership in the YLRL.

Logs go to: Betty Marsh, KL7FJW, 2411 King Road, Fairbanks, Alaska 99701.

VE/W Contest

Starts: 2300 GMT Saturday, September 23
Ends: 0200 GMT Monday, September 25

The Montreal Amateur Radio Club once again announces its annual VE/W contest.

Its the VE/VO's working the W/K's in the "General" portion of the US bands. Phone and c.w. are considered different contests and must be scored separately. There are two classifications, single and multi-operator.

Only 20 hours of operating is allowed during the 27 hour contest period. The minimum off period is 15 minutes, and on and off times must be indicated on the log.

Exchange: QSO no., RS/RST and QTH. ARRL section for W/K's; geographical areas for the VE/VO's. (Provinces, plus Newfld., Lab., Yukon and N.W.T. total of 13.)

Scoring: Each completed QSO counts 2 points. W/K's use sum of VE sections from each band for their multiplier. (13 on each band) VE/VO's will use ARRL sections.

Awards: Certificates to the highest scoring stations, both phone and c.w., in each section. (min. of 25 QSOs) Awards to multi-operator stations will only be issued when there are at least 3 entries per section. And two Trophies to the highest scoring Canadian and U.S. station.

Summary and check sheets are a must, as is a signed declaration that all rules and regulations have been observed. Also a dupe check sheet for logs with 200 or more contacts.

Improved log forms and summary sheets are available by sending a s.a.e. and IRCs to address below.

Mailing dealine for logs is October 31st to: VE/W Contest Committee, Att: MARC Secretary, 535 Lansdown, Westmount, Quebec, Canada.

RSGB 21/28 mHz Phone Contest

Starts: 0700 GMT Saturday, Oct. 7
Ends: 1900 GMT Sunday, Oct. 8

It's the world working the British Isles on 21 and 28 mHz, single operator only, in this one. (G, GC, GD, GI, GM, GW).

Exchange: The RS report plus a progressive contact number starting with 001.

Scoring: Each complete QSO with a British Isle station counts 5 points. In addition a bonus of 50 points may be claimed for the first contact with each B. I. prefix. i.e., G2, GC3, GM4 and etc., a maximum of 36. (no bonus for GB). There is no multiplier, just total your QSO and bonus points for your final score.

Awards: Certificates to the leading entry in in each continent. (Rather meager pickings).

There is also a s.w.l. section. Only British Isles stations are to be logged, and the scoring is same as above.

Logs must be received not later than Dec. 11th and go to: RSGB HF Contest, c/o R. J. Polley, G3PYC, 81 Beech Road, Horsham, Sussex RH12 4 NW, England.

CQ World Wide DX Contest

Phone: Oct. 28-29 **C.W.:** Nov. 25-26
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Rules are the same as previous years and will be given in detail next month. Following is a brief break-down for the benefit of our friends in remote areas.

1. All bands may be used, 1.8 thru 28 mHz.
2. Exchange, RS/RST plus your *CQ* Zone.
3. QSO point value, (a) 3 points between stations on different continents. (b) 1 point between stations on the same continent but in different countries. (c) Contacts between stations in the same country are permitted for Zone and/or Country multiplier but have no QSO point value. (d) *This is for North American stations only*: Contacts between stations within the North American (WAC) boundaries count 2 points.
4. Your multiplier is determined by the sum of Zones and Countries *worked* on each band. (*CQ* Zone list and ARRL and DARC country list.)
5. Final score: (a) Single band, Zones plus Countries multiplied by QSO points. (b) All band, sum of Zones plus sum of Countries from all bands multiplied by total QSO points.
6. Competition: Three divisions. (a) Single operator, single band or all band. (b) Multi-operator, single transmitter. (c) Multi-operator, multi transmitter. Multi-operator stations are judged on all band operation only.
7. Definition of a multi-operator station: Single transmitter, only one transmitter and *one* signal permitted within the same time period. Multi transmitter, several transmitters may be active, but *only one* signal per band is permitted
8. Use a separate log sheet for each band, 40 contacts to the page. Indicate the zone and country *only the first time* it is worked on each band.

Official rules including a list of over 25 Trophies donated by prominent hams and clubs all over the world will appear in next month's issue. These rules as well as official log forms and summary sheets are available from *CQ*. Include a large s.a.s.e. or IRCs to cover your request. Our address: CQ World Wide DX Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

[*Continued on page 85*]

THE awards PROGRAM

BY ED HOPPER,* W2GT

USA-CA Honor Roll

3000		1500		500	
VE6ABP	98	VE6ABP	185	WA1FOO	896
2500		W3LDD	186	K9HVL	897
VE6ABP	132			K7RSB	898
W3LDD	133	**1000**		WA4VAP	899
		K7RSB	267	WA7NEV	900
2000		VE6ABP	268	W3LDD	901
VE6ABP	154	W3LDD	269	W4UYC	902
W3LDD	155	W4UYC	270	W5RDV	903
		W5RDV	271		

THE September, "Story of The Month" by Doc himself, is:

Captain J. M. Blasi, W5ROP

(All USA Counties #30, 4-14-70)

"My interest in amateur radio started in the seventh grade when I retrieved an all band receiver from the trash heap of one of my neighbors. I almost wore out my ears being an s.w.l. for the next few years. In 1955, at the age of 15, I became KN2PSX in Highland Park, N.J. and fired up with a Globe Scout 65A and a Super Pro receiver. About a year later, I dropped the "N" and operated on 20 c.w. as K2PSX.

"After a decade of education, I was back on the air as W4NXD in Gainesville, Georgia. During my W4NXD days I was fortunate to have short stories published in *QST* (October and December 1966, and March 1968), *Ham Radio* (two stories during their first six months of publication) and *The DXER'S Magazine* (about 20 short stories over a two year period).

"In December 1968 I was in the U.S. Army at Ft. Sill, Oklahoma and signing W5ROP. I have Dave, W5PWG, to thank for getting me interested in County Hunting and hopefully, someday he'll finish them all too. After one year and five months of very constant operating, W5ROP finished all 3079 counties and received Plaque #30. All operating was done with a Swan 350 and dipole antennas. During this time, I teamed with Jules, K7ZJP, for several mobile trips that gave out many counties in Texas, Oklahoma, Mississippi and Arkansas.

"July 1970 found me signing KR6IX on Okinawa. My dipole and Swan 350 were good for 200 countries worked in nine months. The present count is about 230 countries with a WAZ (SSB) also on the wall.

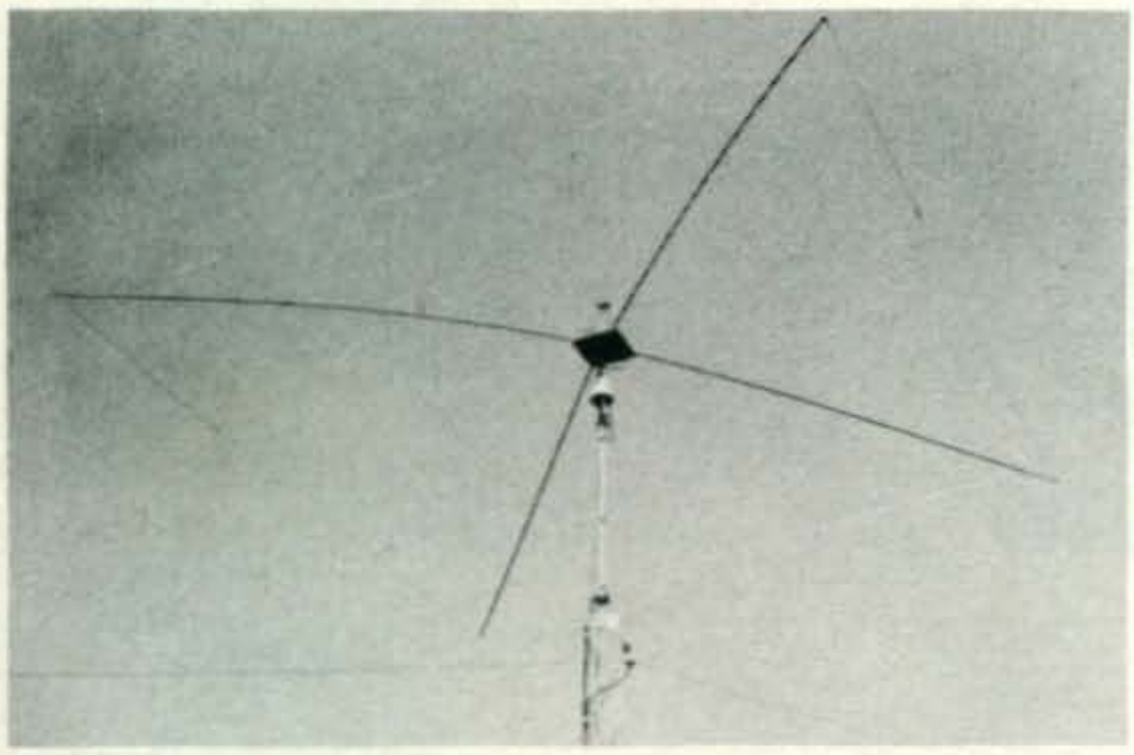
"Once a week I had a sked with KA5EE (W4ZLE), Jay, on 14 mHz s.s.b. so we could swap lies about chasing counties back in the U.S. One evening, ZL2AH, Joe, broke the QSO and asked if I would be interested in working New Zealand counties? Up to this time, no one outside of ZL Land had worked all 112 of their counties.

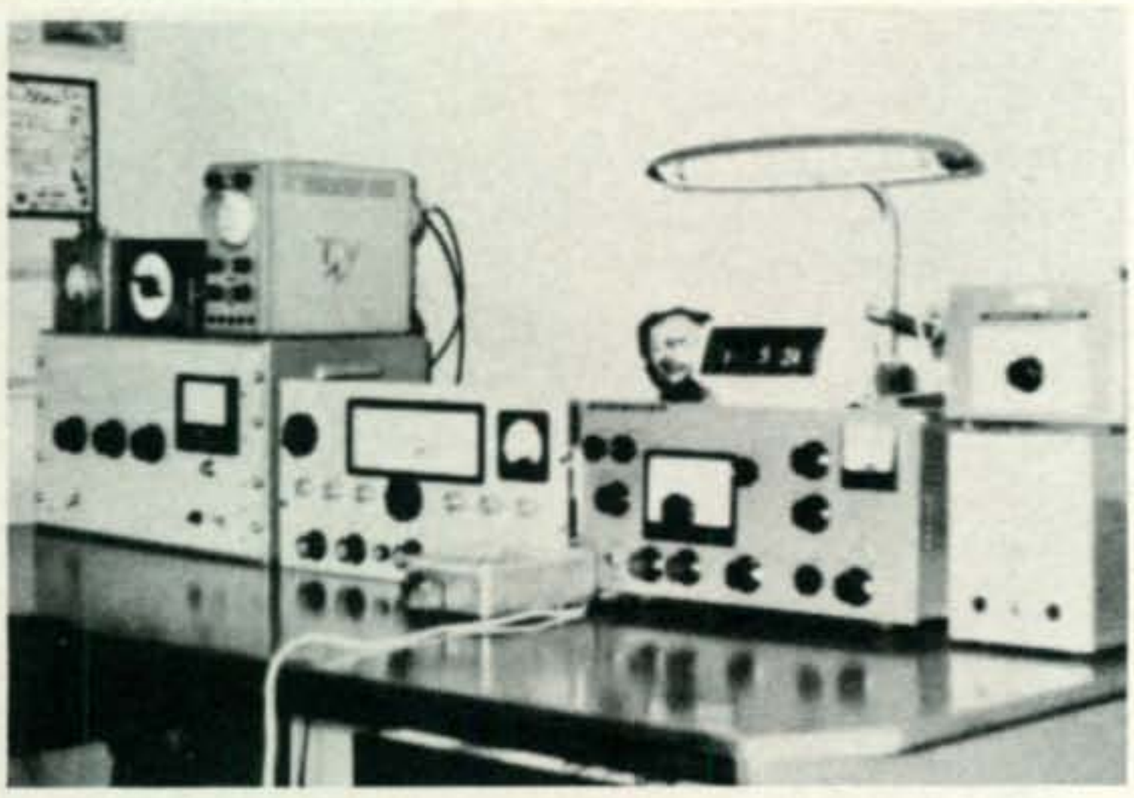
"ZL2AH became my QSL manager and I was off and running. Only about 60 or 70 of the ZL Counties have permanent active operators, so I had to beg and plead to get ZL mobile and portable stations to help me get the counties.

"On March 11, 1972, ZL4GA made a portable trip to Fiord County to give me #111. Only one to go! On April 15, 1972, ZL4MY hired a boat and made a special DX-pedition to give me the last one. Stewart Island County. I had finally worked all ZL Counties, the first one outside of New Zealand. My county hunting pals VK2ZA

Doc, W5ROP/KR6IX catching that last county—US or ZL, Hi.

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





The homebrew station of that "down-under" County Hunter Dan Tanner, VK5QB.

and VK4LZ were right on my heels and worked their last one a few minutes after me.

"On May 15, 1972, with Okinawa being returned to Japan, my call became KA6IX. As this is being written (May 1972), I'm getting ready to take a month's leave and visit New Zealand and Australia. I want to thank all the fellows that helped me work the ZL Counties.

"Whether they are in the USA, ZL or VK, I found County Hunters to be the most helpful and all around great guys (and Gals) that ham radio has to offer." (His present address is Captain J. M. Blasi, U.S.A. Medc. Ryukyu Is., Box 46, APO San Francisco, CA 96331).

Missouri QSO Award.

Awards Issued

Nice to hear from Margaret Tettelaar, VE6-ABP after all these years, who has a new QTH, Anglemont, B.C., Canada, and she qualified for USA-CA-1000, 1500, 2000, 2500 and 3000.

Walter Carr, W3LDD, waited until he had over 2500 before sending in for USA-CA-2500 Mixed and 2000, 1500, 1000, and 500 endorsed All A3.

Willis Propst, K7RSB applied for Mixed 1000 and USA-CA 500 endorsed All 14 mHz, All s.s.b.

Bill Blaine, W4UYC was issued USA-CA-500 and 1000 endorsed All 2 × SSB, All 14 mHz, All Mobiles.

Herb Skidmore, W5RDV complied with the rules to receive USA-CA-500 and 1000 endorsed All 14, All S.S.B., All Mobiles.

Peter Kilbourn, WA1FOO sent application for Mixed USA-CA-500.

Other Mixed USA-CA-500 Certificates went to: Mr. Lynn Benjamin, WA4VAP; Rod Hallen, WA7NEV; and Terry Bachmann, K9HVL.

Awards

The New Zealand Association of Radio Transmitters, Inc., N.Z.A.R.T., issue some fine Awards (at least 12). Some were listed in my column of December 1970. Data on all these may be obtained from ZM2GX/ZL2GX, Contest and Awards Manager, 152 Lytton Road, Gisborne, N.Z. Be sure to send s.a.s.e. or s.a.e. and IRCs. As you must have noticed, the ZM prefix is again being used in honor of the British Commonwealth Games being held in Christ Church. An Award will again be issued for working 50 ZM stations (at least one from each of the four districts). Send full log data with 3 IRCs to ZM2-GX. By the time many of you read this, the ZL/ZM Contest will be near, see full details in, CONTEST CALENDAR by Frank Anzlaone, W1WY.

Missouri QSO Award: Sponsored by the Saint Louis Amateur Radio Club, Inc., KØLIR to the winners who participate in the Missouri QSO Party. 38 were issued last year and the ninth annual Missouri QSO party will be held the latter part of October. For full details read CONTEST CALENDAR by Frank Anzalone, W1WY.

Diplome Louis Braille: Issued for two contacts with stations operated by blind radio amateurs, any band, any mode, any country. Send data with 12 IRCs to Diplome manager, F2FV, 76 Grand-Couronne, France. Presumably any profits are used to help the blind amateurs.

Olympia Diplom 1972: Will be awarded to licensed amateurs and s.w.ls all over the world for working or hearing amateur stations from at least 50 different nations sending competitors to the 1972 Olympic Games. All contracts must be made between January 1, 1972 and Decem-

ber, 31, 1972. There are no restrictions as to bands or modes of operation. Certificate holders will be published in *CQ-DL*, the club magazine of DARC. After the final ceremonies of the Olympic Games in Munich, applicants may send a GCR (certified list) with the service charge of 6 IRCs, 1 US-Dollar or equivalent to: DARC Olympia Diplom 1972, P. Box 262, D 8950 Kaufbeuren, Germany.

Europa Diplom: Issued by DARC for QSOs with different European Countries (Also issued to s.w.ls). As the rules are a bit complicated and a special application form is required, I suggest you send a large size s.a.e. (at least 9 inches by 6½ inches) and 3 IRCs to obtain the form and a 16 page checklist/rules by air mail to: RARC Europa Diplom, Box 262, D-895 Kaufbeuren, Germany.

Paris Award: Presented by the Paris Section of The Reseau Des Emetteurs Francais (R.E.F.). It is a very beautiful award, printed and hand-painted on silk. First Class for a contact with 20 areas of Paris. Second Class for a contact with 15 areas of Paris. Third Class for a contact with 10 areas of Paris. With First Class Award a nice silk scarf is sent for your YL/XYL. Send QSLs with log data and 12 IRCs to Award Manager, F6AZN, Andre Noel, 31 rue Deparcieux, Paris XIVe. 7343602. As yet, no W station has qualified for this award.

Jean-Marie Cibot, F5XA, B. P. 50, 78 Rambouillet, France is the Awards Manager for another Award sanctioned by the R.E.F. It is issued for working the required number of members of their certificate hunters club. May I suggest you send him a s.a.e. and a couple of IRCs for the complete rules and list of members.

Notes

Through the kindness of Rich, K1OME here are the results of the 1972 County-Hunters Contest sponsored by MARAC. Top ten scores:

W4YWX	1,376,342	WA9GMK	325,260
WA6PGB	1,258,296	TG9UZ	274,516
WAØTKJ/Ø	878,080	WBØDPD/M	177,280
WA5ZNY	370,120	W9BF	159,894
K7LTV	365,070	W5ILR/TF	80,275

MARAC plaque winners: *Fixed*-W4YWX. *Mobile*-W4OZF/M, *DX*-TG9UZ. Certificate winners: Fixed-K1GUD, W1VPY, WA2CWX, WA2LBT, WB2FJX, WA3NQX, K4KZP, W4KMS, W4OZF, W5VNW, WA5ZNY, W6LWM, WA6PGB, K7LTV, K7SQD, W8KOI, K9KKX, WA9GMK, KØGSV, WAØTKJ/Ø, WBØDSL. Fixed, multi-op-W9BF.

Mobile-W4UYC/M, K9KKX/M, KØPFV/M. Mobile, multi-op-WBØDPD/M. DX: CR7FR, G4JZ, GW3NWV, OE2EGL, PY1DBE, SM5EAC, W5ILR/TF, VE4SK, VE6AGV.

[*Continued on page 84*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

I have had a number of inquiries on RTTY units which the military may be offering in surplus. Chiefly, readers would like to know what the military numbers mean. The following list gives the more common converters and comparators, with a brief remark based on my experience if any, with the units:

CM-14/URR—Diversity comparator for CV-57, CV-60, CV-71 demodulators. This unit is seldom used by amateurs because of difficulty in setting up diversity reception of brief amateur-type contacts.

CM-22/UR8-A—Virtually identical to CM-14, but used with CV-89 demod.

CM-42/URR — Similar to CM-14, used with URA-12 set.

CV-116/URR—I.F. FSK demod used with R-390 receiver.

CM-185/UGC—Part of FGC-60 set, compares two FSK signals and selects the best one for receiver output.

CV-57/URR — Intermediate — frequency type RTTY demod. Rack or tabletop mounted, has tuning scope, local controls. Input may be tuned from 400-500 kHz. Excellent i.f. T.U., but may be slightly broader in tuning than audio demods. May be used with any modification. 117 v.a.c. power.

CV-60/URR—Audio-type RTTY demod. Externally identical to CV-57, but requires FSK audio input. Has scope, easy to use. This set is electrically identical to the CV-89 demod.

CV-71/URR—I.F. type demod, identical to the CV-57, but input is 50 kHz. This was used with older Navy receivers.

CV-81/FGC-5—"code converter" from FGC-5 time-division multiplex system. Of virtually no use to amateur RTTY.

CV-89/URA-8—Audio type RTTY demod, with tuning scope, 117 v.a.c. power.

CV-94/FGC-5 — MUX retransmission set, of little amateur interest.

CV-97/UX — Facsimile receiving demod, for 400 kHz i.f. from receiver. May be convertible to 455 kHz. Otherwise requires no modification for amateur FAX use.

CV172/U — Older standard Navy FAX demod. Has "eye" tube to tune FAX signals. Very simple circuit; easy to use.

CV-172A/U—Identical in use to CV-172 but has minor improvements.

CV-182/GRC-26 — FSK demod, i.f. type, 440-510 kHz input. An older, but still usable T.U. requiring non conversion.

CV-205/FGC-1 — Data converter from the old, very heavy, FGC-1 set.

CV-223/URR — Audio frequency-shift demod, by Northern Radio, variable input (shift) may be tuned. Has 2" tuning scope. No conversion required.

CV-227/URR—I.F. type, 200 kHz input demod.

CV-243/FCC-3—Tone translator for tone-division MUX. Of little amateur use.

CV-244/FGC-3 — Similar to CV-243 but transmitting side of MUX set.

CV-278/GR—I.F. type demod, 450-500 kHz input, d.c. output, 28 v.d.c. power required.

CV-291/GXC-3 — FAX f.m. to a.m. converter. May be used to demodulate FAX FSK for amateur purposes.

CV-292/GXC-3—FAX a.m. to f.m. transmitting converter.

CV-305/U—RTTY demod, audio type, dual diversity type.

CV-357/A—FSK demod, 300 kHz i.f. type, for AN/ARC-21 or ARC-65 aircraft transceiver, 28 v.d.c., 115 volts, 400 Hz a.c. required. Has FSK keying for transmitter as well.

CV-384/U—FSK demod/keyer, also used, like CV-357, with ARC-21, ARC-65, ARR-36 aircraft sets.

CV-395/U—RTTY signal level monitor. Used with CV-116/URR.

CV-398/UG—RTTY to c.w. transmitting converter. Used punched RTTY tape to send keyed audio Morse signals for transmission.

CV-407/UGC-1—Time-division MUX converter, solid state. Not usable for any known amateur RTTY signals.

CV-408/UGC-1—Similar to CV-407.

CV-432/UG—Morse to RTTY receiving converter.

CV-435/FGC-44—R.F. frequency mixer unit (not RTTY).

CV-436/FGC-44—Synchronous TTY receiving component. Not usable for amateur stop-start TTY.

CV-437/FGC-44—see CV-436.

CV-438/FGC-44— " "

CV-439/FGC-44— " "

CV-483/URA-17—Solid-state RTTY audio demod, similar to the tube type CV-89. Has tuning scope, 117 volt power input.

CV-584/FG—Two-channel MUX demod, possibly usable on 2 meter RTTY.

CV-587/GX—FAX f.m. to a.m. converter, used in receiving.

CV-588/GX—FAX a.m. to f.m. transmitting keyer.

CV-663/A—RTTY keyer: converts d.c. loop pulses to tones for transmission via AFSK, or demodulates FSK for operation of the printer. Used in airborne systems.

---

*1502 Stonewall Rd., Alexandria, Va. 22302.

CV-717/U—FSK demod, audio type.
CV-763/URR—Audio type FSK demod. Similar to TMC Corp. model PSP-1.
CV-766/TRC-75—Collins FSK demod, 850 Hz shift (1575/2425 Hz tones).
CV-865/URC—AFSK demod, 24 v.d.c. power required.
CV-972(P)/UGC—Solid-state FSK demod, 117 volts 60 Hz power required; 16 MUX channels available by paralleling units.
CV-1052/GGA—Serial to parallel converter, Crypto set, part of GGA-11.
CV-1053/ARC—Demod, input audio FSK, output d.c. loop, used with AN/ARC-38 aircraft h.f. receiver.
CV-2C/TX—FAX demod/keyer, interfaces receiver and transmitter with FAX recorder/transmitter set.
CV-31/TRA—RTTY diversity demod, i.f. type, 400 kHz to 510 kHz input.
CV-292/TRA-7—RTTY diversity control/combiner, transceiver.
CV-62/U—Audio-type, variable shift RTTY demod, 100-1,000 Hz shift available. 117 v. a.c. power required.
Boehme 5-C—Dual-diversity audio type RTTY demod. Has tuning scope. An old but still excellent unit, one of the easiest to use in amateur diversity. Variable-shift tuning.
Northern Radio type 107 model 2—FSK converter, audio type dual channel, fixed-shift, has tuning 'scope. Tube type.
Type 174 Model 1—Dual diversity audio type FSK demod, has tuning 'scope. Plug-in units determine shifts.
Type 174 Model 3—Similar to 174 model 1 but solid-state circuit, tuneable shift control.
Type 328 model 1—AFSK demod, solid state.
Type 125 model 1—FAX converter, AFSK to a.m.
Type 178 model 1—Twinplex converter, for twinplex RTTY signals, audio to d.c. loop.
Type 104 model 3—Tone-demodulator, audio to d.c. loop. Not suited for FSK.
Type 152 model 3 — Tone-demodulator (two complete units per section) not suited for FSK work.

USA-CA [*from page 81*]

Sad to report the passing of a radio pioneer who worked with famous people like Marconi. Dr. Mario Santangeli, I1ER, an ole friend who recently celebrated his 50 years in amateur radio. He received #1 USA-CA-500 Award to Italy, November 11, 1962. Seems like only a few weeks ago that I received a couple of nice letters from him, but is was some time ago as he passed away in April.

Hope you had a wonderful summer (or what ever your season has been) with lots of Mobiling and catching new counties. Write and let me know, How was your month? 73, Ed., W2GT.

Contest Calendar [*from page 78*]

Editor's Notes

A few reminders and special points to observe regarding the rules:

Par. 3 (d) The North American boundaries extend all the way from Greenland to the Canal Zone and Panama. And Newfoundland and Labrador are not separate countries but count the same as Canada.

Par. 4. See the July CALENDAR for the DARC country list for Europe.

Par. 7. Using an "octupus" transmitter set-up is not considered as meeting the requirements of single transmitter operation. And the "same time period" should be an interval of approximately 10 minutes or more.

And watch those duplicate contacts. An excessive number will mean disqualification. If you recopy your log it must remain in its original form, including dupes, but they are to be crossed out and no credit taken.

Log sheets do not necessarily have to be the official *CQ* forms, but the prescribed format should be followed. It is strongly recommended however that the official *CQ* summary sheets are used. Indicate the total number of QSO's made, less duplicates, and Countries.

Remember, we have over 3000 logs to check, you have only your own.

73 for now, Frank, W1WY

F.M. [*from page 34*]

Of course if the deck is used on a different transmitter, then it can be made somewhat larger. Note the placement of pins 1 and 9 parallel with the edge of the copper-clad material. Also, use of tube sockets without the center solder lug makes things a bit easier. The connections are made to the terminal board from which the original oscillator deck was removed. The screen connection from the 6AK6 is not used. The hole drilling drawing and top pictorial appear this month. A photo of the prototype will be forth coming next month (dark room is still not in full swing after moving). Not to brag, but the prototype works like a champ!

LOCATION	CALL	PRIMARY Input	PRIMARY Output	SECONDARY Input	SECONDARY Output	TONE	AUTO PATCH	OPR. TIME	NOTES
CONNECTICUT									
Avon D	WA1KHK	146.280	146.880						
Bridgeport L	WA1JTB	146.295	146.895				X		
Bristol D	K1OHE	146.340	146.940						
Meriden D	WA1KGB	146.370	146.970						
New Haven D	WA1KGD	146.010	146.610						
New London D	K1IGF	146.190	146.790						
Trumbull D	WA1KGK	146.100	146.700						
Vernon D	WA1KGQ	146.190	146.790	52.760	52.525				
Vernon D	WA1KGQ			443.300	448.300				
MAINE									
Gray D	W1EFF	146.340	146.940						
Sanford D	WA1KGP	146.130	146.730	447.250	444.250				
MASSACHUSETTS									
Boston D		146.010	146.610						
Framingham D	K1AIU	146.070	146.670		147.150				
Falmouth D	W1VAK	146.340	146.940						
Holyoke D	WA1KGR	146.340	146.940						
Marlboro D	W1QFD	147.030	147.870	52.525	52.525		X		
North Adams D	K1FFK	146.310	146.910	52.760	52.560				
North Grafton D	WA1KRJ	146.370	146.970						
Oxford D	K1AOI	146.280	146.880						
Pelham D	WA1NEU	146.220	146.760						
Salem D	W1RJS	146.280	146.880						
Somerville D	WA1MHN	146.070	147.670						
Waltham D	WA1KGS	146.040	146.640	444.050	449.050				
Westfield D	W1MTV	146.100	146.700						4
Weston D	WA1KHB	146.220	146.820				X		
NEW HAMPSHIRE									
Concord D	W1ALE	146.340	146.940	52.525					
Concord D	W1ALE		146.940	146.460	52.525				
Derry D	K1MNS	146.250	146.850	444.250	447.250				
Peterborough D	WA1KGO	146.190	146.790						
RHODE ISLAND									
Cranston D	K1ABR	146.100	146.700				X		
Lincoln D	W1HQV	146.160	146.760						
VERMONT									
Ascutney D	WA1KGM	146.160	146.760						
Killington D	W1ABI	146.280	146.880	146.340	146.940				
Mt. Mansfield D	W1KOO	146.340	146.940						
Mt. Snow D	WA1KFX	146.310	146.910						
ALABAMA									
Mobile L	WB4QEV	146.340	146.940				X		
Mobile L	W4QEE	146.220	146.820						
FLORIDA									
Jacksonville L	WB4QFL	146.160	146.760	146.340		TT7-11(5)	X		
MICHIGAN									
Detroit L	K8VLN	146.040	146.640			PL12	X		26
MISSISSIPPI									
Biloxi L	K5TYP	146.340	146.940			1950	X		
Gautier L	WA5RMS	146.280	146.880				X		
NEW YORK									
Fishkill C	W2CVT	146.370	146.970						
OREGON									
Lagrande L		146.340	146.940						
Pendleton L		146.340	146.940			2000			
SOUTH DAKOTA									
Brookings L	WØBXO	146.340	146.940			2100		X	
Sioux Falls L	WAØVVG	146.340	146.940			1800		X	
VIRGINIA									
Charlottesville L	WB4KNX	146.280	146.880						
ONTARIO									
Goderich L	VE3GOD	146.460	147.060						

Update of Repeater Directory Information.

Repeater Directory Update

The remaining space for this month's column will be dedicated to another major updating of the *CQ* FM Repeater directory. The major holes in New England have been filled with data furn-

ished by the Northeast Repeater Association (Inc.) Other areas have been filled in with letters and cards from f.m. operators in those areas.

Finale'

Docket 18803 was supposed to be out during the middle part of June, but didn't make it. Probably by the time this is in print the reporting order will be out. Word is that the docket was in legal department when Prose Walker left for vacation in June. Here's hoping that the final word was good. Just as soon as the report and order is available it will be published in *CQ*, with a "Stop the Presses" cry if necessary!

See you in Melbourne, and keep the news, photos, and suggestions coming in. ■

It is Better to Receive [*from page 41*]

Good question. Of course there are many more of us than the Census shows; fortunately, the federal government doesn't have the power to register every last one of us.

Perhaps the best answer is that it's human nature to prefer talking to listening. But for us, we're convinced that DX listening is twice as fulfilling as ham radio, since we're not talking half the time. Only 8% of the Census respondents also hold a ham ticket, and only 12% are CBers.

So there you have a portrait of those of us who believe it is better to receive.

The next time a budding young radio man asks you for advice, please remember that hamming isn't the only worthwhile aspect of the radio hobby, OK? Thanks and 73! ■

Relativity and the S Meter [*from page 47*]

tector to indicate bridge balance and then the S meter will give you a "peak" or a "null" indication as desired in the measurement.

Suppose we didn't use the S meter and gave out "arbitrary" signal reports such as S-1 to S-9. Could we gain anything in our own shack? I believe we could gain a lot. In order for the S meter to operate "as designed" we have to have the r.f. gain control in the maximum gain position; and, we use the a.f. gain control to adjust to a comfortable listening volume. Why not set the a.f. gain control to about "3 o'clock" and adjust the r.f. gain control for good listening volume? What have we accomplished? Well, I think we could listen to weak signals more easily because we wouldn't have the stronger signals on either side trying to activate the a.g.c. We could adjust the r.f. gain control for "best reception" of the weak signal and very probably copy the weak signal 100%. For the last 6 years I used a transceiver that didn't have an S meter. I used the above method of tuning, giving an S-9 when the r.f. gain control was at "12 o'clock;" between "8 and 12" it was an S-9+ and after "12" it was something less than S-9, arbitrarily interpolated.

I found this a very satisfactory method of tuning the transceiver to a weak signal; and it was amazing how quiet the band was when I was working a station with a really strong signal—almost like he was the only one on the band. Try it sometime—you'll be amazed. Don't worry about the report. Give him a 5 and 9+15—he'll be happy and you'll enjoy a good clear signal from him. After all, we only want to establish and maintain good communications—not try to drive one another's speakers out of the cabinet! ■

YLRL Convention [*from page 29*]

Not all call districts were represented at this convention, no 4's or 9's being present. Two VE's made it, however, as well as a former op in Samoa. Here they are by calls: WA1-NHK, NHL; W2EEO, OWL, WB2YBA; W3AAU, CDQ, OLY/6, PVH, K3FYS; K5BNQ, ECP, JFJ, MXO, WA5WZF, WB5-AYK/6, W5RZJ.

W6ALL, BDE, BIS, CEE, KHM, MFP, JZA, NLM, PJU, UHA, NAZ, JCA, DOY, YKU, QGX, YZV, JEP, CBA, TDL, JMC, MWU, WSV, LBO, UXF, VDP, K6ELO, HOI, DLL, BUS, JCL, AYJ, KCI, QPG, MWK, YOA, IHD, VFE, HHD, MQS, KLN, INK, JPY, EXQ, HEY, EXV, PRN, JSN; WA6GQC, ERS, ISY, LRW, UBU, ZTU, LWE, EOT, AOE, QKC, KKQ, BNS; WB6-PJL, GID, BDO, DFN, BYL, SSZ, ERF, QVD, BAC, CGA, OSP, KVG; WN6HTH, PYN, IGG, FUT, FUU.

W7HHH, NJS, LIZ, QYA, RVM, GGV, LXQ, WLX; K7BED, ESA, QGO, UBC, UJV, OSF, TLP; WA7FFG, NRY, FLC, LTN; WN7OXZ, KN7GDO; KL7FPM/7; KS6DZ/7.

W8RZN, UAP; K8ITF, TYK; WA8EBS, IJW; WOMFW; KOEPE, SPW; WAOFSK, PYZ, SLX, TNI; VE3CLT; VE4ST; DU1-GSP. ■

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

was still good enough to win the K2GL Trophy for which they were eligible this year. Future operation from that spot will be sharply curtailed due to management changes at the Coral Cliff Hotel.

John was critical of some of the operating practices, especially DX stations who work 15 to 20 contacts without signing. We agree, and question the legality of this type operation but naturally have no control over it.

Another problem as pointed out by Dick, 8P6DR is the indiscriminate calling by W/K's while he was trying to pick-up a few new multipliers. Hope the W3AA Plaque will soothe his frustration and he will join the fray again next year. Those 160 contacts he handed out will surely be appreciated by Top Banders.

Our old stand-by up Alaska way, KL7JDO was limited in time and power this year. Tony was only able to put in a couple of hours with a home brew 10 watter. "Try breaking through the W6/W7 iron wall that way," remarked Tony.

You can thank a friendly supply sergeant for your Fiji multiplier. Bob, VR2GE was supposed to have his gear packed in time to make a plane leaving the island on November 28th, however he was able to finagle the sergeant into shipping it on the last plane out a few days later. Look for Bob from VK4 in the next one.

If you don't see your club score listed it may be because there were not sufficient entries from your club. We require a minimum of at least three logs, and also a list of participating members and their claimed scores. It is also advisable to include a membership roster. Many member stations neglect to include their club affiliation and the club does not receive credit for their score. The above information would help avoid this loss.

That's about it for this one as I am running out of space. Committee same as we had in the Phone section of the contest. Fred Caposella, W2IWC, Bob Cox, K3EST; Bob Entwistle, W1MDO, Andy Malashuk, W1-GYE, Ralph Nichols, W1CNU, Gene Walsh, K2KUR and Bernie Welch W8IMZ. And Joan of the *CQ* office staff, who I am sorry to say will not be with us for the next one. We are going to miss her.

73 for this one, Frank, W1WY

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- Meets space problems
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- Two elements
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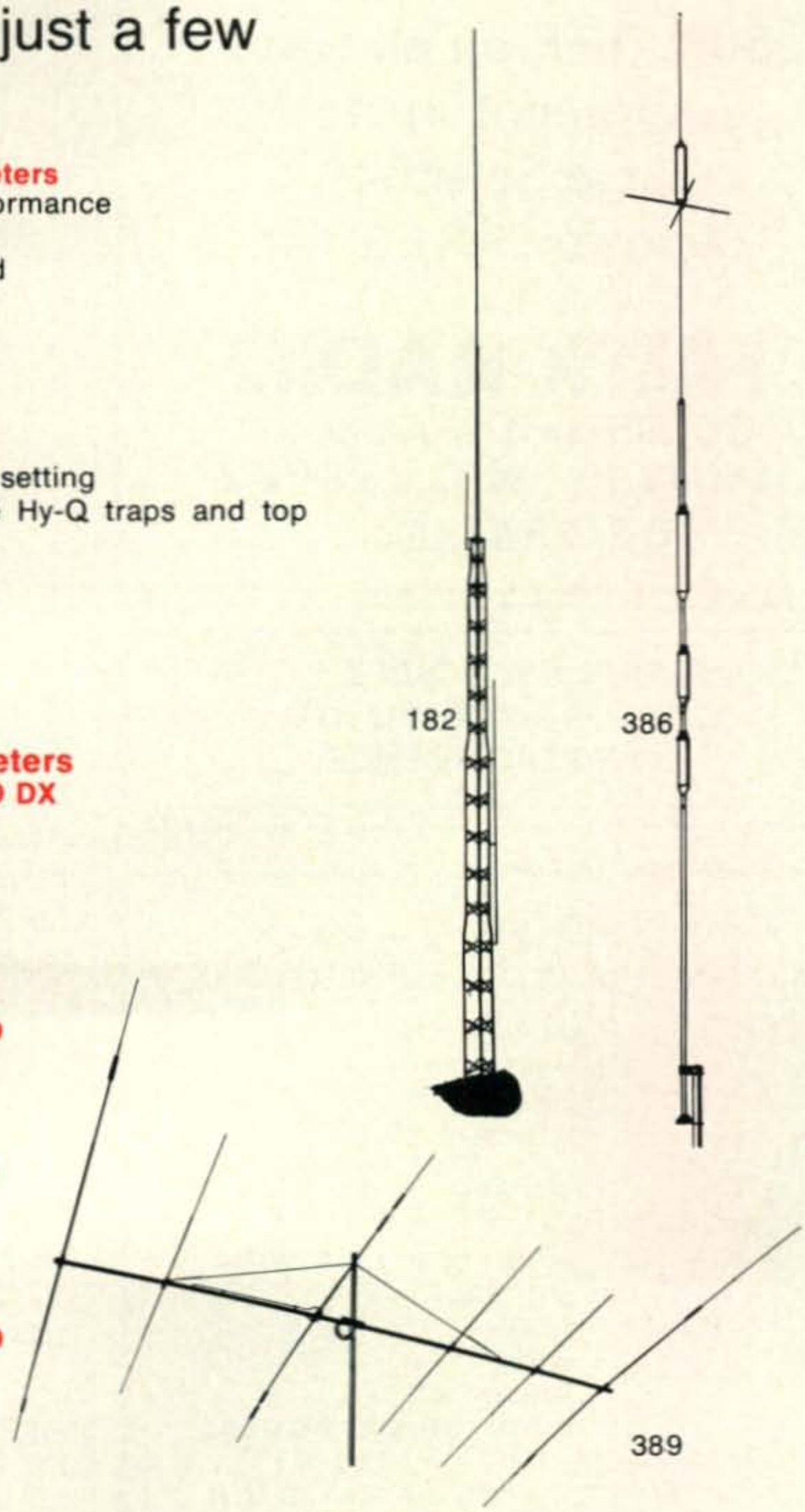

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Linear VFO's [*from page 64*]

Based upon the experience gathered in the field, I summarize in Table I the performance one can expect from a v.f.o., depending on whether it is capacitance or permeability tuned.

A circuit that with some variations, I have consistently used over the years, is a modified Colpitts, reported in fig. 2.

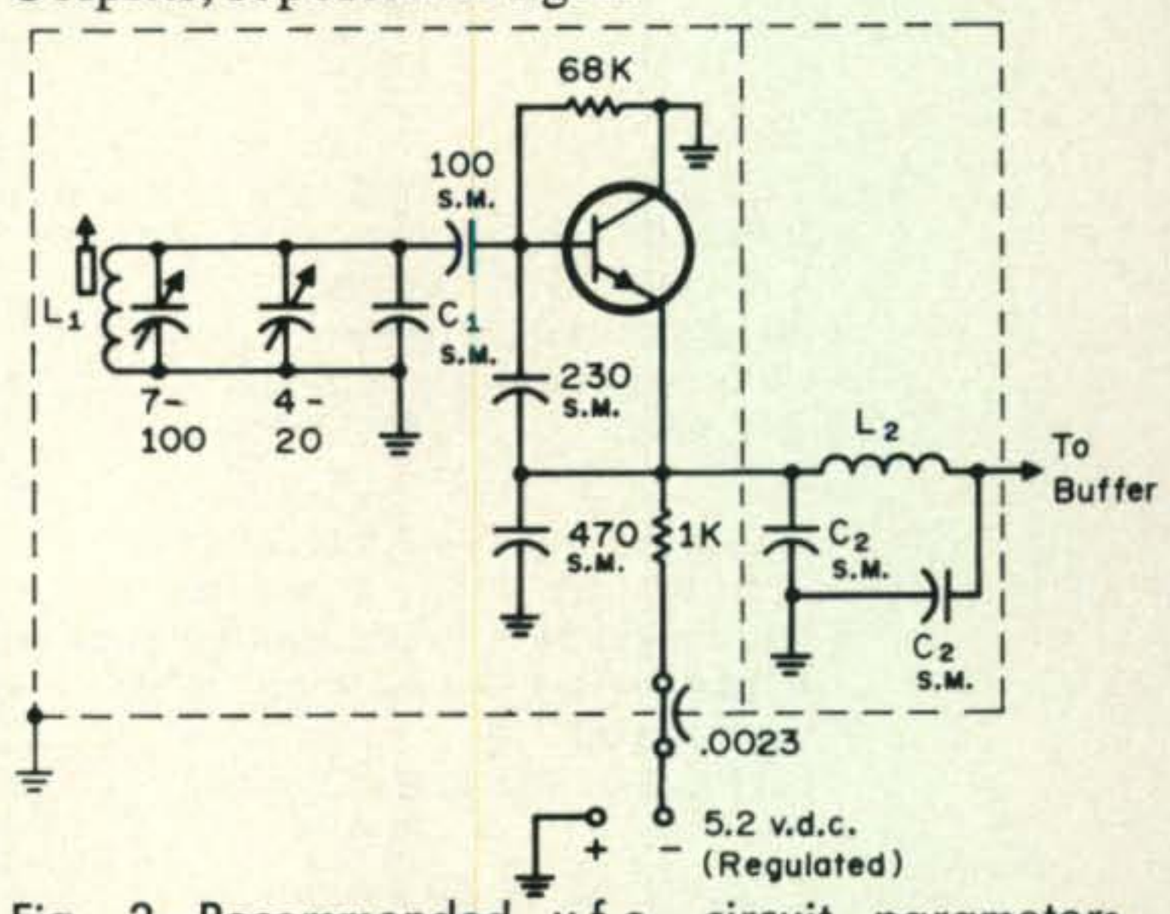


Fig. 2—Recommended v.f.o. circuit parameters (capacitance or permeability tuned).

L_1 and C_1 will be calculated for the desired frequency of operation. The low pass filter parameters vary depending on the load offered by the next stage, and will be calculated from Eq. (2) and (3):

$$L_2 = \frac{Z_{LOAD}}{\pi f_C} \qquad (2)$$

$$C_2 = \frac{1}{2\pi f_C Z_{LOAD}} \qquad (3)$$

where f_C is the cut-off frequency for the low pass filter. ■

VFO for Heath SB-102 [*from page 48*]

and regulated B+ voltage from the home made power supply that is used with the SB-102.

Construction Details

The stability of any v.f.o. is directly related to the care taken in building mechanical rigidity into the unit. This v.f.o. was built in a 4 × 5 × 6 inch aluminum utility cabinet. One of the two covers was reinforced by bolting to it a 5 × 6 inch aluminum sheet. To this reinforced side the tuning capacitor was firmly bolted. The capacitor was a well constructed double bearing unit with 150 pf maximum capacitance taken from old command set equipment. A no-backlash flexible coupling and short shaft was used to connect the

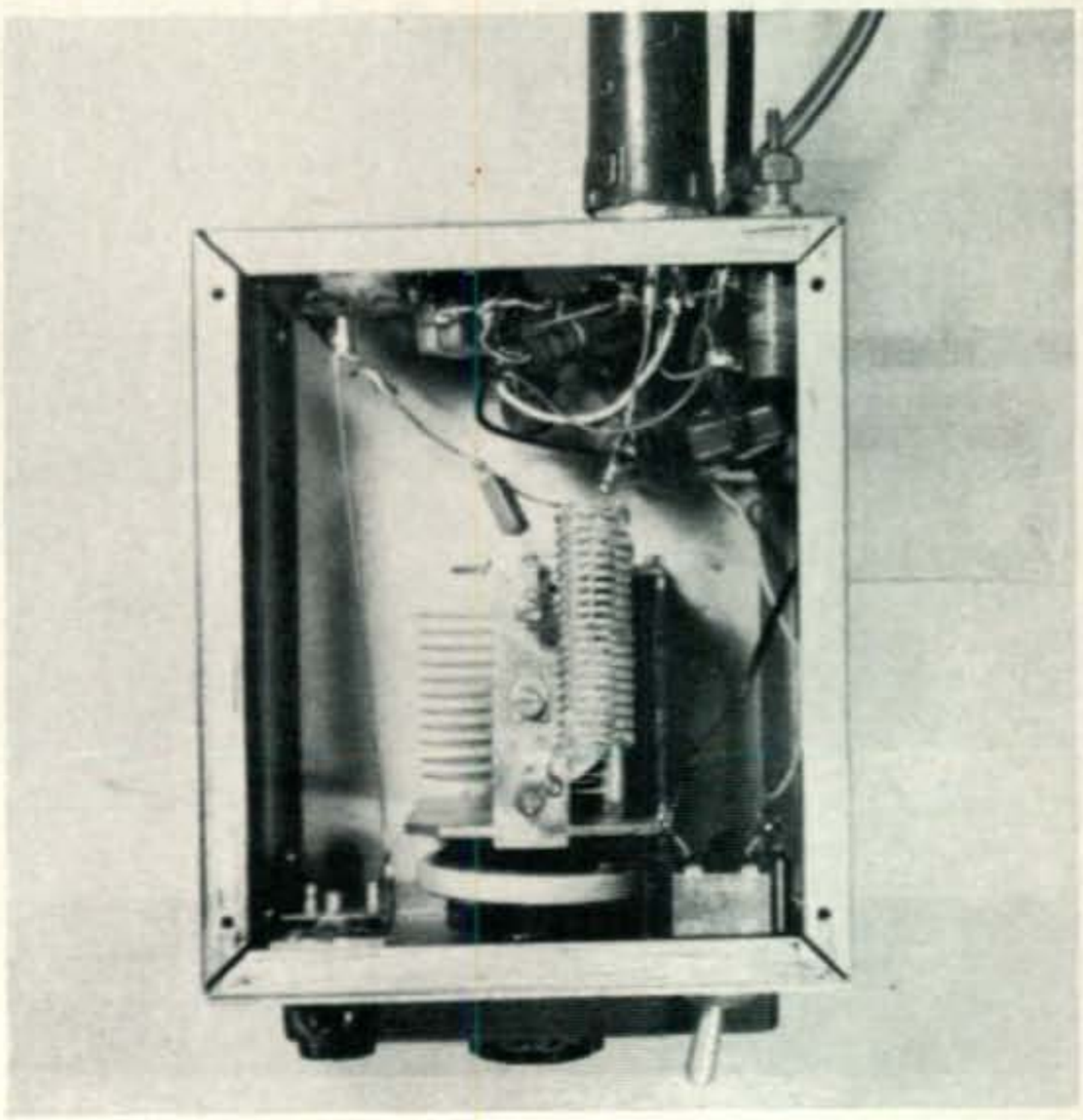
capacitor to the Millen 10039 vernier dial. The small air inductor, L_1, was rigidly mounted to avoid mechanical movement. The 12AU7 was mounted "out back" and well away from the tuned circuit components to minimize heating effects.

The values of capacitors C_4 and C_5 were arrived at by experimentation. The capacitors pictured were made up from several odd value silvered mica units parallelled to make the values indicated. The output tuning inductor, L_2, was fabricated from junk box components, however, commercially made slug tuned coils are available for those who don't wish to roll their own. This inductor is adjusted to resonate at 5.25 mHz with the cable capacitance of the 21 inch length of RG-58 coax used to connect the v.f.o. to the transceiver. Changing the length of the cable will require readjustment of the inductance. No touching up of this tuning is necessary when going from one end of the band to the other.

The completed unit was mounted on high rubber feet made from four no. 1 rubber stoppers.

Connection to Transceiver

The v.f.o. signal is fed to the crystal socket input of the SB-102. The coax may be simply run into the cabinet and plugged into the crystal socket. We chose to run a short length



Interior of the v.f.o. shows the double bearing tuning capacitor firmly mounted to the reinforced bottom plate with L_1 mounted by its leads to the capacitor. At the rear is the 12AU7 and output coil L_2.

of coax cable from the bottom of the crystal socket to one of the two "spare" phone jacks on the back apron of the transceiver. The coax from the external v.f.o. was then fitted with a phono plug which was inserted in this spare jack.

The v.f.o. was initially aligned by adjustment of the 60 pf trimmer so that the main tuning capacitor tuned the v.f.o. from 5.0-5.5 mHz. A crystal calibrator with 10 kHz markers was used to calibrate the dial at 10 kHz intervals. When switching from band to band it is only necessary to switch on the SB-102 internal 100 kHz calibrator and adjust the 5 pf band set capacitor to calibrate the unit at the nearest 100 kHz point. The frequency can then be read directly to the nearest 10 kHz and eyeball interpolated to the nearest 1 kHz. The calibration is nearly linear.

This external v.f.o. proved to be very satisfactory in every respect. It should be useful with any of the Heathkit SB-100-series transceivers or for that matter any transceiver designed to use a 5.0 to 5.5 mHz external v.f.o. The unit can be constructed from all new parts for about fifteen dollars. ■

Surplus IC's [*from page 46*]

monitored voltage switched its level. Some devices required the application of bias to two pins simultaneously.

Seventy-five percent of the original 100 IC's were identified by type. The remainder were assumed to be defective or of a special purpose design. DTL, TTL and later IC families and package types may be identified similarly. Only the appropriate supply voltage, socket and connection information need be substituted. ■

Letters [*from page 7*]

satellites, and SSTV—clings to the old fashioned notion that a.m. sounds better as it eats up 10 kHz for every station on the air.

And as a concluding thought I'm sure your readers are aware that even standard broadcasting commercial stations are experimenting with side band as a method of improving the use of the 550 to 1600 kHz.

Paul S. Abbott, WA2RJV
Camp Hill, PA.

Color SSTV [*from page 22*]

frames of the blue recording. Close the shutter.

8. Re-cock the shutter and advance tthe film to the next frame.

For closed-circuit conditions, open up the lens and reduce the number of frames per color.By using Table 1. as a reference, you can choose the number of frames and camera setting to fit the quality of the recorded frames. If the picture quality is poor on each frame, the final picture quality can be greatly improved by using several frames. The writer recommends the multi-frame recording and playback method because it offers the greatest probability of sucess in DX contacts.

These instructions are intended to provide "starting conditions" from which you can trim-in your own results. If you make some variations in the number of frames per color, or lens diaphragm settings (and record them) you will have the basis for any additional adjustment. Until you find out the effect of each change, be sure to make one change at a time! In other words, don't combine adjustments for color and density until you learn how the film reacts to each in your system.

The writer would like to thank several SSTV Hams who have cooperated with him in making color tests; ZS6PP, ZS6UR, PAØLAM, VK3LM, VK3TE, VK3BAK, PY1DCB, ON4DN, and WA6RNG have all been extremely helpful in making tapes or supplying needed information. Byron Paul, WA6RNG, practically took the writer by the hand and dragged him into his first encounter with color SSTV. The early work of Ralph Taggert, WB8DQT, and Jim Bland, K4YPX as reported in the December 1969 issue of *Ham Radio Magazine* also provided some inspiration.

This article includes certain material from the paper "Experiments in Long Distance Amateur Color Television in the HF Bands" presented by the writer at the 111th Technical Conference of the Society of Motion Picture and Television Engineers at New York, N. Y. in May of this year. The permission of the Society to use this material prior to publication of the Conference Proceedings is gratefully acknowledged. ■

Slow Scan TV [*from page 26*]

see what the film will see. Mount a handy magnifying lens, a lens from Grandma's old reading glasses, or a borrowed +3 or +4 diopter closeup lens directly in front of the camera's regular lens.

In a darkened room open the shutter in the "B" or "T" mode while watching the CRT

image on the ground glass. Move the camera forward and back until the image focus is sharpest. Check the image size on the ground glass. If it fills at least half the width of the ground glass, but does not exceed the full width, your trial lens is OK. If the image is too small you need a convex lens with greater curvature, or a closeup or spectacle lens of greater diopter rating. If the camera lens has variable *f* stops, set the iris at the lowest *f* number while making these tests so that the image on the ground glass will be brightest, and focusing most critical.

The final steps are mechanical ones. Mount the supplemental lens. Camera shop closeup lenses can be bought that will slip over, or screw onto the old lens. The magnifying glass will have to be epoxied or taped on. If you don't often take pictures, a tripod or stack of books will do to hold the camera; provided you check the positioning and focus each time with the ground glass before you load film into the camera. (And of course you must not change the camera position while loading the film.) To avoid doing the ground glass bit every time, you need to make some sort of mechanical frame that will hold the camera. You're on your own here. One small help is that a standard 1/4"-20 screw from the hardware store is the right size and thread to fit the camera's tripod mounting socket.

In photographing the screen, the object is to take a one frame time exposure. The easiest procedure is to set the shutter to "B." Use a cable type shutter release, if possible, to avoid moving the camera, and darken the room or shield the CRT face from external light. Press the shutter release just as the vertical retrace occurs, and release it just as the scan reaches the bottom of the picture. This gives uniform exposure to the entire picture. If the camera has a variable iris setting try test exposures at *f*8, *f*11, *f*16, and *f*22 using Tri-X film. If the negatives are too dense even at *f*22, switch to Plus-X film and repeat the trial. If the camera has no iris adjustment the lens is probably *f*11 or *f*16. Try some shots with Tri-X and some with Plus-X. One or the other should give satisfactory results.

A point on costs to ponder while you're visiting rummage sales and second hand shops looking for your $2 special camera. Most sizes of black and white film costs a bit under a dollar per roll; about $.25 per roll to get the negatives developed; and $.10 per print. You

get 8 exposures on a roll of 620; 12 on a roll of 127; but 36 on a large roll of 35 mm film, and 72 exposures if used in a half frame 35 mm camera. Since you will have many bad pictures because the ionosphere or QRM does not cooperate during the particular frame you're taking, it is cheapest to use 35 mm. To get the savings, however, have the negatives developed but not printed. Look the negatives over and have prints made of only the most promising exposures. Most photo dealers will make a large "contact sheet" print of an entire 35 mm roll for about $1.50 which will help sort the good from the bad and can be cut up to provide small prints for QSLs.

73, Cop

Ramp Generator [*from page 61*]

The repetition frequency is independent of the supply voltage since both the uni-junction threshold voltage and the charging current are proportional to the supply voltage (neglecting the constant base-emitter voltage drop in Q_1). The output of the ramp is proportional to the supply voltage, of course. Increasing the supply voltage will increase both the ramp and sync pulse amplitudes.

With the constants shown the repetition frequency can be varied from approximately 100 to 4000 Hz; the output voltage is 10 volts pk-pk and the synchronizing pulse has an amplitude of 5 volts pk.

The equations of the circuit are very simple: The capacitor charging current is equal to the current through R_1.

$$I_C = \frac{E_{R1}}{R_1} \cong \frac{E_{bb} - E_{base}}{R_1}$$

The charging time of the ramp, t_r, is given by

$$t_r = \frac{C_1 E_{th}}{I_{ch}} \cong \frac{C_1 E_{th} R_1}{E_{bb} - E_{base}}$$

where E_{th} is the threshold voltage of the uni-junction transistor.

Operation of the circuit over frequency ranges other than the one given above can be accomplished by changing the capacitor C_2 by switching or otherwise.

This circuit has the advantage that frequency control is accomplished by varying a d.c. voltage; signal currents do not flow through variable resistor R_2 Thus remote frequency is convenient. ■

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Heath IM-16 Solid state voltmeter, $35. Dave Cook, W8JQY, 674 Oakridge Dr., Youngstown OH

Sell: HQ110, clock, matching spkr, manual; Ranger II, ptt mic, manual. R. Oras, W9ZEW, 3636 S. 59th Ave., Cicero, IL 60650

Sell QST's from 1915, CQ's from 45, Call books from 1923, 73 from 61, Ham Radio and other old mags. Want old rcvrs, xmts, parts, catalogs. Will trade. Erv Rasmussen W6YPM

Linear builders, send SASE for lo priced list of Hi Power parts & goodies. W6RW, 8600 Skyline Blvd., Hollywood, CA 90046

Wanted: low cost 6 mtr xcvr, Drake T-4XB. Must be good condx, WA9HEU, Rt. 2, Box 284, Marinette, WI 54143

For sale: BC-453 "Q" fiver rcvr 200-500 KC built with new parts for pwr supl and output xformer, $30, W6BLZ, 528 Colima St., La Jolla, CA 92037

Sell: Caringella ACP-1 audio compressor. Mint, $15 pp. Went to R-F clipping. W2EHB, 32 Bryant Rd., Blackwood, NJ 08012

Sell: Cubex Mk III-PT4 quad antenna 10-15-20 meters w/TS-4 tenna switch. W2IV, Richards, Argyle, NY 12809

Mass-Complete sta. Ranger I, Hall. SX111 transmatch triband dipole manuals, books, more. Deliv. New Eng, $200. 27 Crocker St., Hyannis, Mass.

S-20 Sky Champ, $25; BC-312N 12 Vdc $40; BC-221 w/charts & pwr $50; CBY 2.1-3Mhz Cmnd lk new $10; ARC-4 2 mtr AM trcvr $25; J E. Short, Sheldon, Iowa 51201

Worked South America Certificate: Work all 13 countries. Send $1 & confirmation list: HC1TH, 4805 Willowbend Blvd., Houston, TX 77035

Heath eqpt: twoer, keyer, VTVM, etc. best offer. SASE, Jurow, Box 183, Olympia Fields, IL 60461

Wanted: reconditional Gonset tribander model 3220 K2CX, Rt. 1, Box 173, Ancram NY 12502

Sell: Knight TR108 two meter trcv kit, unpacked-in original carton, $95. W6HJ, 243 Ocean View, Newport Beach, CA 92660

Complete new station for sale. FRDX400, FLDX-400, FLDX2000, rotobrake, military 60" crank tower, patch TH6DXX, more, $1300. W4EUB

Trade: RTTY models 15&19 for model 28. Also want t/19 ARC-5. WN6POA, Box 127, Santa Ana, CA 92705

Sell: HW-32 with ac/dc pwr supply M-1070. $80. Receiver BC-312 N (12vdc) $40. Collins 455kc filter $12. Marauder HX-10, mint, $160. J.E. Short, Sheldon, IA 712-324-2664

2 Meter FM 2-freq HT-200, univ. complete, w/vehicular charger, $350, D33AAT dispatcher, $75, T33BAT dispatcher, $75, Knight R-100A, $55. L. Pfleger, 208-2575 S. Calhoun Rd., New Berlin, WI

Cleaning shack - extra electronic parts at give-away prices, W2EZM, P.O. Box 323 Maple Shade, NJ

Wanted: Heath AT-1 transmitter, must be mint condx w/no modifications. W8TXX, Box 1111, Benton Harbor, MI 49022

Heath DX-100 xmtr 150w, $55. HP-13 mobile DC pwr sup. $40 both w/manuals. K3BGZ, Rt 2, Box 20-A, Leonardtown, MD 20650

Wanted: Johnson matchbox suitable for Swan 500 c, G. Foerster, 4304 SW Anthony Wayne Dr, Fort Wayne, IN 46806

Sell: GSB-1 SSB adapter for GPR-90 rcvr $45; FR-38D/u 100 Mhz counter $250; both w/manuals. Robert Ireland, Pleasant Valley NY 12569

Sell: HA-750, mint; radiosonde modulators, new; radio control eqpt; radio mags, 1920s; WB2FKA, 28 Bridlemere Ave., Interlaken, NJ 07712

Will buy your unusable gear if it suits my experimental needs. State details. E Erickson, 13 Robert Circle, South Amboy, NJ 08879

Sell: 2 Sullivan galvanometers. 1 vertical 1 horiz. approx 70 yrs old, best offer, KZ5PW, Box 2821, Balboa, Canal Zone.

National 200 xcvr/AC 200 sply $250. Gonset G-28, 10m xcvr $150. W2GMA, 1762 Larkspur Rd., Cherry Hill, NJ 08003. Ph 609/795-3294.

Beckman counter plus 2 sclalers read to 100 mhz. Exc cond, 7 digits, measures freq, per., time, counts etc. Rack mount. $150. Mendelson, 27 Somerset, Murray Hill, NJ 07974.

Sociedad Intal. de Radio Aficionados $3 admision y $10 al ano. Pdte. WA4ZZG, Vice-Pdte. YN1AEO, Sect. HK3CEM, Fiscal HP1FH, Box 71, Miami, FL.

Gonset 6M communicator $50. Walter Davis, K6KZT, 4434 Josie Av., Lakewood, CA 90713.

For sale: RTTY console, RO28, 3-speed gears, exc cond $110. Will ship. WA4OPW, Rt 1, Box 434 Ashland, VA 23005.

NCX-3 w/AC sply & 100KC calib. Like new, $150. K.C., MO. Tel. 353-5222.

Collins 75A4 rcvr w/orig box $300. Hammarlund HQ170-AC $250. Both good condx. WA4AUF.

Wanted: Millen grid-dip mtr state price & cond first letter. Sell: Mosley TA-36 $85 & Hy-Gain TH-4 $70 Fob Jerry Vanaskey, 4540 Foster Drive N.E., Louisville, OH 44641.

Want: HRO-50T coils AC, E, B; 7" National TV w/ metal cab; AMPICO piano rolls. Thompson, 45-671 Kuahulu Place, Kaneohe, Oahu 96744.

Sell: Scanner - Robyn hi-bander for 2 mtrs. Xtals for 52, 61, 76, 79, 88, 94, NMARS, AFMARS, 8 channels, exc cond ac/dc $125. Smith, WA1NDX, 12 Dale St., West Hartford, CT 06107.

Copper clad epoxy board, both sides. 3X18" $1.00 postpaid. Fitzpatrick, WA8OIK, McLain Park M203 Hancock, MI 49930.

Standard 2m handy talkies 5 ch w/94 & 34-94 & case. New in carton $225 fob 7047 Plateau, San Antonio, TX 78227. Ph 512/674-2849.

AIL Model 74 automatic noise figure indicator, capable 10 mhz-40ghz $125; Jones (Bendix) 0-120w vhf/uhf terminal wattmtr $55; Swap vhf/uhf gear, list sase. W4API, Box 4095, Arlington, VA 22204.

Wanted: Instruction manuals for older commercial fm sets. Link, Bendix, Westinghouse, RCA. L Folger, 8215 Water, Garrettsville, OH 44231.

Sell: QST 1922 thru 1959. M.C. Zervantian, W6-DIS, 6561 Dohrn Cir., Huntington Bch, CA 92647.

For sale: Lafayette ham band rcvr HA-500, 80-6 mtrs $50. WN8LSV, RD 1, Bloomingdale, OH.

Free teletype: Models 14 & 100. Kilowatt amplifiers $25 each. You pick up. Marty Feeney, K1OyB, 38 Howard St., Portland, Maine 04101.

Sell: Hy-Gain 204BA, like new, up less than 1 yr. will deliver w/in 100 miles $95. DX-60 $50. W8-CUT, 1776 Walnut, Coshcoton, OH 43812.

Antique radio collectors, send 10 cents for a copy of Antique Radio Topics. James Fred, Cutler, IN.

Sell: Collins 75S-1, NC-190, SX-11, GPR-90, Galaxy V, HQ-180C, HQ-200, SX-100, SX130, BC-348Q, BC-639A. S. Kullmer, Dysart, IA 52224.

2M FM, brand new, Inoue IC-20, 1&10 watts, 12 channels, w/mike, cable, mobile mt $259.50. Bob Brunkow, 15112 S.E. 44th, Bellevue, WA 98006.

Munston "Nassau" marine radio telephone with 5 marine channels installed, manual included - $60. Western Electric push-to-talk telephone-type handsets, brand new, original price was $35 each, will sell $15 each. Marine Electronics, 76 New York Av., Halesite, L.I., N.Y. 11743. Ph. 516/427—7199.

NO QRM-QRN. Wild horses, antalope, deer, elk, 10 acres Wyoming ranch land - $20 down, $20 month. Owner - Mike Gauthier, K6ICS, 9418 East Florence Av., Downey, CA 90240. Phone (213) 923-0131.

TOROIDS 88, 44, and 22 mhy. Can of five two dollars ($2.00) postpaid. M.L. Buchanan, Box 74, Soquel, CA 95073.

WANTED: Collins 312B-5, K2QDE, S. Martin, 2011 Ocean Ave., Bklyn, NY 11230. 212-998-2029.

FOR SALE: Hallicrafters HT-37, mint condition - $200. Hallicrafters SX-111 - $145. Marine Electronics, 76 New York Ave., Halesite, L.I., N.Y. 11743. Ph. 516/427—7199.

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

FOR SALE: Like new, Swan FM2X2 - meter complete w/antenna $160. C.T. Clark, 155 Chelsea Av., Long Branch, NJ 07740.

NATIONAL NCX500, NCX-B P.S., mike, New - $300. Collins 75A-1 mint $100. 40-ft Rohn tower, hinged base. AR-22R $85. Barry Gross, 36 Gerhard Rd., Plainview, NY 11803.

DISCOUNTS! Standard, Sonar, Clegg, Robyn, Mosley, Cush-Craft, Others. Also Marine gear. Write stating needs. Arena Communications, Dept. C, 1169 N. Military Hwy., Norfolk, VA 23502.

Excellent Beta-Gamma GM Survey Meter, Victoreen 493 with 491-40 probe; sell for $190, swap for similar value general coverage receiver. W9MIA, 43 Maplewood Dr., Urbana, IL 61801.

FOR SALE: Drake 2B w/Q-mult $165, HQ180 AC w/blanker $335, Alden 319EA 3-speed fax w/ paper $550. Wanted: 51J or R390. WA2DVU, 609/465-5363.

SELL: Knight KG-686 RF Gen & KG-687 sweep/ marker gen ex cond with cables, crystals, manuals, etc. Both $100 plus ship. Swap? K6RGY, 1077 Grand Teton, Pacifica, CA 94044.

FREE: To settle friend's Estate, am offering his 10-80 CW-AM xmitter; 125WI; pr/s; 13 tubes. Pick up only. Will demonstrate. Request you contribute $75 (Tax Ded.) to his Minister Daughter's Church Building Fund. W2HPN.

Signal One CX-7 less than two years old. Excellent condx. $1400 or best offer — K7GRE, 2315 N.E. 104 Way, Seattle, WA 98125.

WANTED: Collins mechanical filter 455-FC-60 or 6 KHZ BW equiv for HQ215 rcvr. W1FOT/KV4, box 3374, St. Thomas, USVI 00801.

Any reasonable offer accepted SSB HW32 and Eico 753 both with 115 volt ac power supplies & mike solid state vfo in excellent condx, no modifications. Box 8352, Savannah, GA 31402.

Eleven Station Dial Telephone Intercom System - Barnes, Rouillard & McPherson, Inc., 131 Broad St., Claremont, N. H. 03743.

WANTED: Rack type one KW peak AM xmtrs, or high power class C plate mod amps in the 700 w or higher output range, 80-10M or 80-15M, homebrew or commercial, description & price. WB8BES, 1208 South Grant, Bay City, Mich. 48706.

CINCY STAG HAMFEST: The 35th Annual STAG Hamfest will be held on Sunday, September 24, '72 at the ALL NEW Stricker's Grove, on State Rt. 128 one mile west of Ross (Venice) Ohio. Check local area map for new location. Door prizes each hour, raffle, lots of food, flea market, model aircraft flying, and contests. Identify Mr. Hamfest and win prize. $5.00 cost covers everything. For further information, contact: John Bruning, W8DSR, 6307 Fairhurst Avenue, Cincinnati, OH 45213.

QSL's — Second to None. Same day service. Samples 25 cents. RAY, K7HLR, Box 331, Clearfield, Utah 84015.

FOUNDATION for Amateur Radio Annual Hamfest Sunday 22 October 1972, at Gaithersburg, Maryland Fairgrounds.

RTTY Wanted: Any model 28ASR or KSR parts to complete station, Model 32ASR; TV camera, Drake AC-4 p.w, high power, multi-freq Motrac. L Pfleger, 2575 S. Calhoun Rd., 208, New Berlin, WI

Protest! Picket! Write your congressman! Let nothing prevent you from attending the ARRL Hudson Division Convention, Oct. 21-22, Hilton Motor Inn, Tarrytown, NY. Exhibits, 2-meter FM, RTTY, lectures, contests, gabfests, banquet, NY City sightseeing. Fun! Free gifts for early registrants. Plenty of free parking. Write Dave Popkin, WA2CCF, 303 Tenafly Road, Englewood, NJ 07631.

Teletype 28ASR. Excellent condition. 6 manuals. TT/L-2 TU. $1,100 for lot. Pick-up only. Henry Rainville, 106 S. Cornwall Ave., Ventnor, NJ 08406 609-822-0098.

MARINE ELECTRONICS of HALESITE: Sales & Service - Pearce Simpson, Konel, Sonar, Citizens Band. 76 New York Ave., Halesite, L.I., New York 11743. Phone: 516/427—7199.

TECH MANUALS--for Govt surplus gear, only $6.50 each: R-388/URR, R-389/URR, R-390/URR, CV-591A/URR, TT-63A/FGC, TS-403/U, URM-25D. Hundreds more. W3IHD, 4905 Roanne Drive, Washington, D C 20021.

Sell: Heath kit SB-610 monitor scope for $65. S. Powers, 25 Milton Ave., Dorchester, Mass. 02124

Sell: like new Yashica lynx-5000 with case, 1:1.8 lens with speed to 1/1000 sec., $35. W5BB, 1808 W. Brockett St., Sherman, TX 75090

Mechanical filters, 455 kHz for Solid State, $12.95 w/instr. E. Jeltrup, Box 361, Mamaroneck, NY 10543

Wanted: Collins 302C-3, Directional watt meter. Heath metal locator for sale. M. Ludkiewicz, 143 Richmond Road, Ludlow, Mass. 01056

Wanted: Old oak triangular box to mount WU. telegraph sounder in N.C. Mosley, Beechwood Dr., Tarboro, NC 27886

Amateur museum wants EIMAC 750T, 1500T, 2000T and other antique tubes and foreign types. W9LGH, 610 Monroe Ave., River Forest IL 60305

Wanted: SB-220, 30LI or equal, SSB 10-80 mobile rig, T. O. Keyer or equal. Best price & condx, W8IHT, Parma Hts, OH

Sell: Globe Chief deluxe xmtr, $35. Eico 730 modulator, $35. WB2BQF, 89 E. 1st St., Corning, N.Y. 14830

HB Linear, 1500 W PEP, 10-80, $100. Free photos, Mort Caldwell, W8IFN, 1068 Windsor, Morgantown, WV 26505

Sell: SB-100 with cw filter, P.S., and matching spkr, will ship, $275. WB9FZX 4 N. Wisconsin St., Janesville, WI 53545

Wanted: B&W 51SB-B or Heath 9B10 or central electronic 10B, no junk. G. M. Mondrush Jr., W8GIV, 600 Beechmont Dr., Dearborn Hills, MI 48124

CB Manuals, new 2, 5, 11, 13, 14, 15, 17, $2. Tubes, 3E29, $4, 717A, $1. meters galore, W5SYB, 5000 Hall, Amarillo TX 79109

Wanted: National SW-3 & FB-7 recvrs, coils, pwr supplies. Describe condx, Dick Nebel, W2DBQ, 31 Whitehall Blvd., Garden City, NY 11530

Sell: YAESU FT DX400, with matching spkr & external VFO. Excl condx, $495. W2DEW, 70 Basswood Tr., Wayne, NJ 07470

Sell: Advanced and extra-class Amateur License Handbook, by H. S. Pyle. Like new, $3 pp. WA4KCN, 4921 Edenshire, Memphis, TN 38117

1 Hammarlund SP-600 JX6 recvr, $250 or trade on CV-89/URA-8A and 2 metr gear; 1-15 RTTY w/table, $100 or trade for ham gear. R. Bridwell, K4VWL, Box 206, Startex, SC 29377

Triplett 0-4 RF amps panel metrs, new w/built-in thermocouple 2/$5, 807's, 866A's, 50¢ ea. asstd nuvistors 50¢ ea. add shipping. SASE for listings. Samkofsky 4803 Brenda Dr., Orlando, FL 38206

YAESU FTDX400, $299. FL2000 amp, $199. Both mint & new tubes. 213-472-2413 Box 1975, Beverly Hills, CA 90213

Rubber stamp making outfit, $466 new, only $245 FOB or trade. Bob Dufon, 4114 Northcote, East Chicago, IN 46312

Henry 2-K, $425, KWM2-A, 516F2, N. B., $1000. KWM-1, AC or DC), $250. MP-1, 351D-2, $75 ea. Dumont 332 scope, $100. 75S1, 3251, 516F2, 312B4, $750. James W. Craig, 29 Sherburne Ave., Portsmouth, NH 03801. 603-436-9062

Need 12 volt VIB for G66B rcvr. Mallory G659, G859 or Cornell Dub. 6326. J. Nelson, 9614 N.E. 3rd St., Vancouver, Wash. 98664

Novice xmtr 40M 35W wid internal T/R switch, 4 xtals., $16 I ship. WA3LPK, 2300 Louise Ave., Baltimore, MD 21214

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Aviators-Airmen: For info on Int. Flying Hams Club, FHC, write IARS, Inc., Box 385, Bonita, CA 92002

World's only copyrighted directory of certificates & awards, $5. Write IARS, Inc., Box 385, Bonita, CA 92002

Sale: Johnson 124-323-complete pwr pack, Peyton, P.O. Box 487, Lindale, TX 75771

TUBES—Have over 1,000 plus boxed electron tubes. Best offer over $35 takes. You ship. WB8IAY, 1740 Shiloh Springs Road. Dayton, OH 45426

Wanted: low pass RF filter, price and specs first letter WA1PNQ, 5 Cook Close, Ridgefield, Conn. 06877

Bargains: Dual R.C. Cap. Ea. Sec. 260 pf 1600 v dc, 95¢, Hammarlund type MC cap. 6-35 pf 1000v dc. 80¢, add postage. Ken Maas, Burlington, WI 53105

Sell surplus electronic parts at give-away prices, W2EZM, P.O. 323, Maple Shade, NJ 08052

Ham transformers rewound. Jess Price, W4CLJ, 507 Raehn St., Orlando, FL 32806

Sell: Model 327-PL Tripolett D.C. Milliamperes meter, new-Scale 0-200 M., $15, K3YMN, 2185 Sampson St., Pgh, PA 15235

Wanted: old 50 watt transmitting tubes before 1925. Leo L. Gibbs, W8BHT, 701 Brookfield Rd., Dayton, OH 45429

Swap: Hy-Gain TH6DX triband beam for Collins phone patch-wattmeter unit. WB4PUD, P.O. Box 805, Springfield, Tenn. 37172

Wanted: Gonset 111 2 & 6 mtr VFO late ser. model cream color dual vfo, in perfect condx, must be reasonable, W3TEC, 215-JE5-2358

National Fan—want immaculate & functioning NCL-2000. Also National Xcvr Cabinet from NCX-3, 5, 500 or 1000. W1WQH Ryder, 14 Casco, Falmouth, Maine 04105

Sale: test, ham, audio, photo gear, computer, junk prices, free long list. Tom Perera, 410 Riverside Dr., NYC, NY 10025

Wanted—One or two Eimac 3-500z tubes. W. Heckman, W1AA, 45 Andrew Ave., Hull, Mass. 02045

Heathkit model HD-19 phone patch $12, B&W No. 425, 52 ohm low pass filter, $12. Very good. K1PNL, 226 E. Main St., Bristol, Conn. 06010

DX Callbook, spring 71, mint condition, $4. George Clark, 123 Davis Ave., Hackensack, NJ 07601

Wanted—Johnson RF attenuator for use with Thunderbolt amplifier. Richard Schweizer, 240-27-145 Ave., Rosedale, LI, NY, 11422, 212-528-6124

Sell: Hallicrafter HT32A new finalls, excellent condx, $169. Will trade for 35 mm camera, Ben Frish, RR 3, Bloomington, IL 61701

Sell: 3 ham books, 101 ways to use your Oscilloscope and ham test equup; How to use your grid-Dip osc. $2. WA5KZE, 1108 Radam Cir., Austin, TX 78745

Sell: Swan 500, 117xc pwr supply, 410 external VFO, $500; Johnson Thunderbolt KW lineal, $250; HyGain DB-10 & 15 Antenna, $50. Have manuals, pickup only. W. Heckman, W1AA, 45 Andrews Ave., Hull, Mass. 02045

Sell: Heath SB102—400 cycle filter, EV-927 microphone-speaker A.C. pwr supply, $450, with manuals, will ship. Andros Thomson WB8GJE, Box 326, Parsons, WVA 26287

Wanted—PL172A, 8295, 8432. Pace, 13604 Doty, Hawthorne, CA 90250

AC-Adaptors, 6V DC 150 ma standard plug, brand new. $3.50 postpaid. K2MFY, 2 Nutley Court, Plainview, NY 11803

Want - 6 meter converter, any condx. WA3QWW, 123 S. 4th Ave., Lebanon, PA 17042

Heath Seneca $75; URR-13A, UHF RCVR $90; Dumont OBL 3" Scope $25; SASE for more, Jim Throop, W1FLN, 99 Sand Hill Dr., N. Kingstown, RI 02852

TEAC 1500D Tape Deck - Auto reverse, SOS, echo, Mint. $225 shipped. WN4UCC, 96 Hallmark Estates, Athens, GA 30601

Regency ATC-1 80-10 meter converter with batteries, cables, manual. Good condx. I.F. 1200 kHz. Best offer over $20. WB2JYM, 699 Linden Av., Teaneck, NJ 07666

Many old (new) type tubes at the right price. Send postcard to W9FKZ, 217 Hayes, Northlake, IL 60164

Need the schematic or manual of Modulator Radiosonde MD-317A/AMT-12(VIZ). George Kapsokavadis, 23 Kolokotroni St., Corfu, Greece

Mechanical Filters 455 kHz. 2.1 kHz, $18.95. 300 Hz, $22.95. J.A. Fredricks, 314 South 13th Ave., Yakima, Wash. 98902

Wanted-Hallicrafters SR160. Must be good condx with manual. Currin Skutt, W8FSZ, 119 N. Foster Ave., Lansing, Mich. 48912

Digital 500D SSB, $750 or swap for FM gear; Standard Ht $225; TR-22 $165; Drake ML-2 $249; Dumont Transicom $65; HIGLEY, 1196 Elberon Ave., Elberon NJ 07740

Sell: HP522B not working, mechanically excellent. $20 Marty WB6NWW. 5349 Abbeyfield, Long Beach, CA 90815

Johnson Viking 500 transmitter, manual, spare tubes. Best offer over $200. Write George Nichols, W1MFJ, 57 Main St., Lewiston, ME 04240 or 207-782-8642.

Want-Swan 405X MARS XTAL OSC & SWAN 420 VFO. Assaiante, 213 St. James Pl., Merchantville, NJ 08109. 609-770-4391 or 609-662-7103.

Heath Twoer, keyer, test eqpt. Best offer. SASE Jurow, Box 183, Olympia Fields, IL 60461

Sell-Standard Com SR-C 826M. A.C. pwr supply. Mint condx. 6&2 Ant. $245. Jacobson, 21010 Anza Ave., Torrance, CA 90503

BC342, xclnt 1.5-18 mHz rcvr with manual and matching LS-3 spkr. AC pwr. $85. Silbert, Wh. Sulphur Spgs. NY 12787

Have RCA model 121 radio. If you know where to get parts or info, please write Bill Conwell, 62 Colchester Rd., New Providence NJ 07974

Expert service, prompt repairs and reasonable prices by ex-Signal/One technician. Also repair Collins, Drake, etc. Write Pace, 13604 Doty, Hawthorne, CA 90250

Sell; Hy-Gain TH3 beam, TR-44 rotator and cable, 10 ft top section, Rohn tower, $100. Robert S. Kerner, WB2LYC, 35 Fairview Ave., Verona, NJ 07044

Sell: BTI-LK2000, perfect condx, only $390 FOB, J. Savonis, W1DBS. 410 Blake Rd., New Britain, CT 06053

Wanted: Johnson Match Box with SWR. Good condition. W.J. Dee, 860 Maple Tree Lane, Wadsworth IL, 312-662-2354

Wanted: 1922 or 1923 Callbooks, W8MJ, 4704 Bragdon, Cleveland, OH 44102

KWM2 Fever? Price an obstacle? Write only and let me help. W0BNF, 2606 N. 11 St., Omaha, Neb. 68110

Meters-2"sq. wide assortment. Write Art Johnson, K2POA, Box 132, Bethpage NY 11714

Sell: Morrow Falcon receiver, AC P.S. & spkr, ham band with B.C. conv. $45 W6DJZ, 3748 Floresta Way, Los Angeles, CA 90043

Wanted: CQ 1945 thru 1952 and 1966, 67, 68, and 1970. Also need QST 1965.; Must be perfect condx, WA7PPN, 13615 N. 17th. Phoenix, AZ 85029

Random Noise Generator-GR1390-B S/N 7270, exc. condx, 1st $60 takes it., postpaid. L. Hamilton, K6JVE/3 9019 St. Andrews, College Pk, MD 20740

Sell: National 200 xcvr, AC supply, $250. Gonset G-28 (10 meters). $150. W2GMA, 1762 Larkspur Rd., Cherry Hill, NJ 08003. 609-795-3294

D104, W/G STD. $20; Vibroplex $15; HP13 $45; Simpson 260 $20; HT45 $190; MN4 new $60; SR150 w/DC pwr, mount & mobile ships, $295; PS500-120V $75 FOB A. Ford, 56 Gildare Dr.. E. Northport, NY 11731

KWM-2 w/matching AC supply. Good condx. $650. Keith O'Brien. 8401 N. Atlantic L-15, Cape Canaveral, FL 32920

FM Gonset G151A communicator, 146.94 mc, like new. 12vdc/110AC. $110. GE FM 100/w remote repeter w/all controls. $150. K6KZT, 4434 Josie Ave., Lakewood, CA 90713

Linear Builders send SASE for lo-priced list of hi-pwrs part plus goodies. W6RW, 8600 Skyline Dr., Hollywood, CA 90046

Big "Q" Antenna Balun/Center insulator, 1:1, coax receptacle, eye hooks, rugged. $8.95 ea or 2 for $17. VR Murrell, K4HHA. 712C Rich Rd.. Newport. TN 37821

Wanted: W8FYO paddle, details to J. Fleming, K9FRZ, 7528 W. Bryn Mawr. Chicago, IL 60631, 312-775-8179

Student needs 2m FM trancvr under $50, state model, condx, pwr requirements & price. S. Antosh, WB5BNM, 1524 N. Okla.. Shawnee, OK 74801

Want Collins mech. filter F455F81. Miller CBI coils 41A-105, 106, 156, 355, 336, 43A475, #1727. Kennedy, 791 Greenwich St.. NYC 10014

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128 Contest Club seeks new members in northeast. No dues, contact Pete Butler, W1BPW 3 Elizabeth Dr., Merrimack, NH 03054

Sell: DX-60, $50; HR-10B with calibrator, $60; HG-10 VFO, $25: all for $125 or make offer. Fox, Box 805, Greeley, CO. 80631

Wanted: 75A-2 or SX100T Handbooks, CQ & QST for the fifties, P. K. Outlaw, Bethune, SC 29009

Sell: Heath Mohawk recvr, make offer. W7INR/6, 360 Sharry Lane, Santa Maria, CA 93454

Sell: Millen Ant. Bridge, $45, Kwick Patch, $10 both items new. 75A-4 filters, 500Hz, 6kHz, $40 each. W9PIH, 4433 Holton Ave., Ft. Wayne IN 46806

Wanted: mint condx SSB-CW xcvr, late model; pwr supply, AC & /or DC. send details, Brian Frazen, 725 Florida Ave., York, Neb. 68467

Measurements VTVM 0-100VDC, $15 Hartman model 1500 150mHz xcvr, 12V w/mike, trans., P.S., $30, LaBella, 1100 Clove Rd., Staten Island, NY 10301

HRO 60 with ABCD Ac & Ad coils, $200; tower, $30. E. Casey, 500 Norway Ave., Cincinnati, OH 45229

LDS hams interested in a NET write to David H. Horne, 2229 Laird Way, Salt Lake City, UT 84108

Never unpacked Heath HP-23 AC supply, $50. unused Heath SB-600 spkr, $20. R. K. Vonier, W6ISV, 866 N. Westmount Dr., W. Hollywood, CA 90069

Must sell KWM2A/516F2/312B5, $1050 as package, WA1OQC, call 203-377-3157.

Sale: Heath SB-101 xcvr, pwr supply & spkr, good condx, will ship, $325. Tom Fitzpatrick, KP4DJI, P.O. Box 219, APO New York 09845

Sale: Hallicrafters 12vdc supply model MT-2, $20 pp, ARC-5 80m novice transmitr w/schematics, $12.50 pp., ARC-5 modulator, $8.50 pp, Meissner 2-CW novice transmitr with 20, 40, 80 coils, $12.50 pp, ARC-5 (3-6 mHz) recvr, transmitr w/racks, both for $20 pp. DM 35-D 12V dynamotor (625V), $8 pp. T. Coddington, 7825 Scotts Valley Rd., Lakeport, CA 95453

One Midland CB SSB base & 3 Midland CB SSB units. Excl. condx, $800,-Norman Neel, W0QOT, Box 705, Rangeley, CO 81648

6 meter 500 watt Gonset Linear, $200. also HX30 transmitr, $150 for purchaser, both like new, J. P. Luke, 215 Shea, Portsmouth, VA 23701

DX engineering speech processor for KWM-2, $60 or best offer. Wanted: W8FYO keyer paddle. K9WEH, 201 E. Marion, Prospect Heights, IL 60070

Wanted: Radio Boys/Radio Girls books, state condx and price. K6ARE, R. Randall, 1263 Lakehurst Rd., Livermore, CA 94550

Sell: advanced and extra-class Amateur License Handbook. Like new, $3 pp. WA4KCN, 4921 Edenshire, Memphis, TN 38117

Wanted: Atwater Kent radio w/external spkr, local only, will pick up. J. Schwartz, 43-34 Union St., Flushing, NY 11365

Sell: CQ's from 1945, QST's from 1915, Callbooks from 1923, Handbooks and misc magazines. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, CA 94062

Swap my 110 Polaroid Pathfinder, r.f., 1/400, f4.5, M-X sync, ultima strobe, GE meter; Want: SBE34 & cables or SSTV monitor. W2HPN

Southeastern Wisconsin: The West Allis Radio Amateur Club meets 2nd & 4th Tues; 8 pm at 1000 S. 72nd St., West Allis, Wis.

Want: Battery operated radios made before 1930. James Fred, Rt. 1, Culter, IN 46920

Sell: Highest bidder, Radio News, 1930-10; 1931-12; 1938-8; 1934-11; 1936-6; 1938-6; 1939-10; 1940-11; 1941-1; 1947-11; 1948-1; 1949-11; Douglas, 2254 Pepper Dr., Concord, CA 94520

Lampkin 105B, Serial 3269, calibration sheet and CB readouts, $135. K8ASG 2618 Beecher St., Findlay, OH 45840

QST mags October 1926 to present. Many others. Best offer. SASE for list. W6AG. 213-786-1214

Heath HW-17 w/8 xtals & 2 mtr Squalo $135 or trade for comparable 6 mtr xcvr. WB2DDT, 201-782-3295 evenings.

Heath HW-32A, HP-23A, HP-13. $199. EICO 717 keyer, $45. All pp. F. Beyer, 15426 Comstock, Grand Have, MI 49417

Remote xtal switching unit, 10ch recvr & transmitr. 12 volt relays & xtal sockets wired comp, $20. H. Mohr, K8ZHZ, 886 Taylor Rd., Gahanna, OH 43230

Nice Galaxie III with Galaxie DC supply, $135. WB6VNR, 213-346-5871

4 mo. old Collins 32S-3, 75S3-B w/200 & 500 cw filters. 30L-1, 516F-2, 312B-3. Whole S-Line $1450. WA2RJV/3, 301 Blacksmith Rd., Camphill, PA 17011

Wanted: Ryder radio manuals vol. 1-23; SAM's Auto Radio Manuals AR-1 to AR-18. State price and condx. W1ELB, 8 Florence Rd., Marblehead, MA 01945

Sell: National NCX500 with matching AC supply. $280. Wanted: Heath HA HA14 Linear & PS. Tom Dornback, K9MKX, 2515 College Rd., Downers Grove, IL 60515

Galaxy V transcvr, AC 35 p/s w/custom volt & ammeter, superex headphones, Knight P-2 SWR/pwr metr. EV 719 mike, $200 comp w/manuals and cartons. 516-489-5899, M. Bohdan, 379 Adams Ave., W. Hempstead NY 11552

Crank-Up tower 40' with CDR Rotator; self-supporting. 201-8273568. K2CBK

Swap gud HQ-110C for gud HQ-100. Sell: Knight T-150, AM, CW, VFO, $40. Knight, KG-221, 152-174 mc FM recvr, $25. BC 342, excl condx, $55. Garrison, Box 604 VHFS, Warrentown, VA 22186

Sell: HA-460 w/Halo, $80. W3FGE

Sale: HW-32, HP-13A, mobile mt., Hustler ant., $125 plus shipping. Accessories: spkr, mike, extra ant. mount, $8 each. H. Corbin, 301-881-7571, 11704 Ibsen Dr., Rockville MD 20852

Hammerlund 145X matching spkr, $140. National HFS/p.s. recent retubed & alined, $60. Carl L. Horton, 3753 Kanawha St., N.W. Washington, DC 20015, 202-244-6942

Sell: Balun, W2AU Model 1:1 ratio, 52 Ohm, exct, SWR/pwr metr, Knight P-2, Ted Chartrand, W8PRL, 3504 Snowglen Lane, Lansing, MI 48917

Sell or trade: new Lafayette HA-750 (6m); R/c system with 5 servos; want HA-144 WB2FKA, 28 Bridlemere Ave., Interlaken, NJ 07712

EICO 730 modulator-driver w/manual. U pay shipping, $30 or best offer. WA9PQM, 1101 W. Ridge Rd., Hobart, IN 46342

Jennings vacuum variable, 20-1000 pf 10 kv with 100 turn counter, $50 ppd; Marty WB6NWW, 5349 Abbeyfield, Long Beach, CA 90815, 213-597-2631

Wanted: Motorola 115VAC pwr supply on 3" x 15" strip-TU 189-TU467, etc; need 2. Curt Foltz, WA7KNL, 234 Richmond, Carson City, NV 89701

Drake 2-C, 2-NT, 2-CQ, 16xtals, SWR meter and timer. Excellent, $300. Tappehorn, 2536 Kings Hwy, Louisville, KY 40205

Sell: Hammarlund SP-600 Diversity recvr, mint condx. Reasonable. Paul Uhlig, 1342 Estate Court, Wichita, Kans. 67208

2, 40 meter, 2, 80 meter ARC-5 Xmtrs, (one has novice crystal adapter) 2. 80 meter ARC-5 rcvrs. All converted. $5 ea, K8OUQ, 268 Annis Ct., Chillicothe, OH 45601

Wanted: Name and calls of Hams working full or part time in Local Law Enforcement for possible club. Arthur Schur, P.O. Box 238 Ryder Station, Bklyn, NY 11234

Core ARRAY, 32KX9 Bits only one, $150. IKX8 bits only one, $25. Send SASE for confirmation of sale, T. L. Ringate, 7639 10th Ave., So., Richfield, MN 55423

Wanted: Crown graphic or Koni-Omega with roll back. Also 50' tower, relay racks. Colbert, 1008 Englewood, Parma, OH 44134

LAMPKIN Model 205A FM Modulation Meter with Quad Scale like new, $125, Steve Cserpnyak, 5619 Robinhood Rd., Charlotte, NC 28211

EICO 324 sig gen, $25. B&K 400 CRT tester, rejuv., $12. Both exc with manuals. P. Carron, 205 Ridgewood Rd., Easton, PA 18042

Sale: SB-301, SB-401 w/crystals & filter, very clean, $425 or best offer. WA3GVP, 13204 Taney Dr., Beltsville, MD, 20705

Teletype, test, ham, camera, audio gear & RCA computer for sale. Low prices, free list, Perera, K2DCY, 410 Riverside Dr., NYC, NY 10025

Wanted: RME 4301 Sideband Selector in gud operating condx. WA9GYF, 348 W. Main St., Reedsburg, WI 53959

Crystals Wanted: Lge numbers of 80/40 and low end of 6/2 ft-243. Also 6/8 mHz that multiply to 220 mHz. W6DOR, 2921 E. Loyola Dr., Davis, CA 95616

Sell: QST 1922 thru 1959; MC Zervantian, W6DIS, 6561 Dohrn Circle, Huntington Beach, CA 92647

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Military Hams, active or vets, join Int. Military Pers. AR Assn of IARS, Inc. write HQ, Box 385, Bonita, CA 92002

Sell: Heathkit HX-10 $125, "LM" freq mtr, similar to BC221 w/book & modul $35; Hughes memo-scope $95, Dumont 304 scope $70, pu or FOB c/o W2YCW

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Sell: Scanner Robyn Hibander, xtals for 52,61,76, 79, 88, 94, afmars, nmars, xlnt condx $115. Will ship; HX-50 xmtr, xlnt pickup only, WA1NDX, 12 Dale St., W. Hartford, CT 06107

G77A $25; G66 $80 Realistic DX120 $65; HE61A VFO $10, FRDX400 all options 6m2m etc, mint $350, Viking Adventurer $25 W7UD 3637 W. Grandview, Tacoma, WA 98466

Wanted: 160 mtr kit for Hammarlund HX-50 xmtr Lakeshore 9MC VFO- J. Shank 21 Terrace Ln, Elizabethtown, PA 17022

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Want: 432Mhz conv 1.F on 28Mhz or 50Mhz, also 432Mhz xmtr 10-50 watts input 2C39 preferred. K8LJQ, 351 Mower Rd., Pinckney, MI 48169

B&W 6100 xmtr, crystal lattice filter, crystal contr freq synthesizer $200, Dan McPherson, 419 Fair-view, Abbeville, LA 70510

Heath HW-101, HP-13-A, HP-23A: $295, Swan 250, HB/AC $250; Collins 75S3-B, $435. Abbott, Box 2775, Harrisburg, PA 17105

Hallicrafters FRM-200 transcvr w/ac suply/spkr & mobile mount. All transistor excpt 2-6146 final tubes. DC & VFO built in, 80-10 mtrs, orig $2695, $550. J. Shank, 21 Terrace Ln, Elizabethtown, PA

Sell: Johnson Navigator w/manuals $75. Sever, 8464 Cleveland Ave NW, N. Canton, OH 44720

APL computer programmer - QSO or start net. Dick W2FGL. 19 Mango Ln, Liverpool NY 13088

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1 HT37 and 1 HT41 Hallicrafters, good condx, built in pwr supl, books, first money order or certified check for $300 takes both. K3KBG, K Cregar 3411 Stoud's Ferry Rd, Reading, PA

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Collectors: RCA 55X AM broadcast receiver, re-conditioned, refinished wood cabinet, WB4SPT, 240 Colony Rd., Jupiter, FL 33458

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Wanted: Help with circuit diagrams, comment on restoring Pilot Super Wasp. Need coils, etc., will airmail replies. ZL2GX, 152 Lytton, Gisborne NZ

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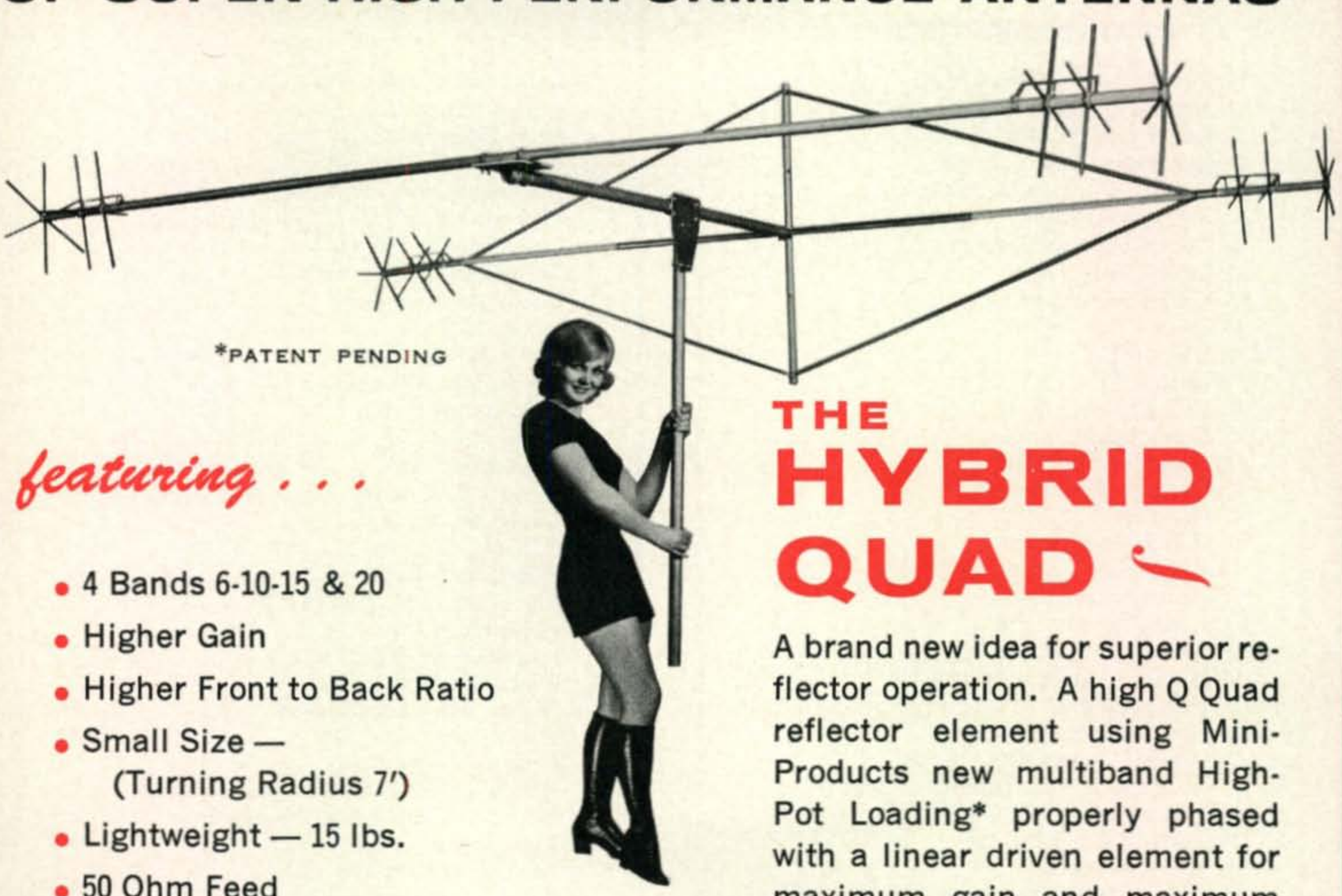

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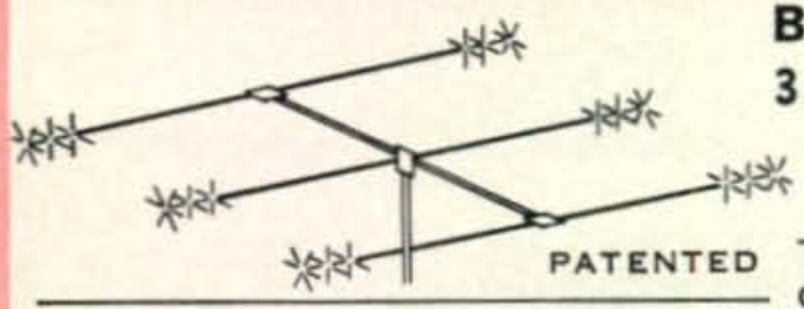

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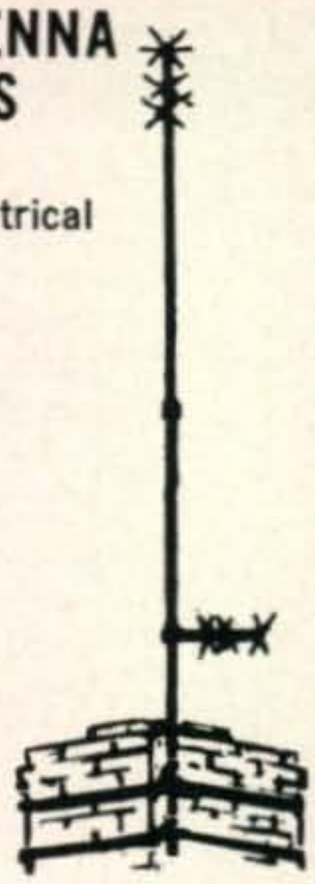

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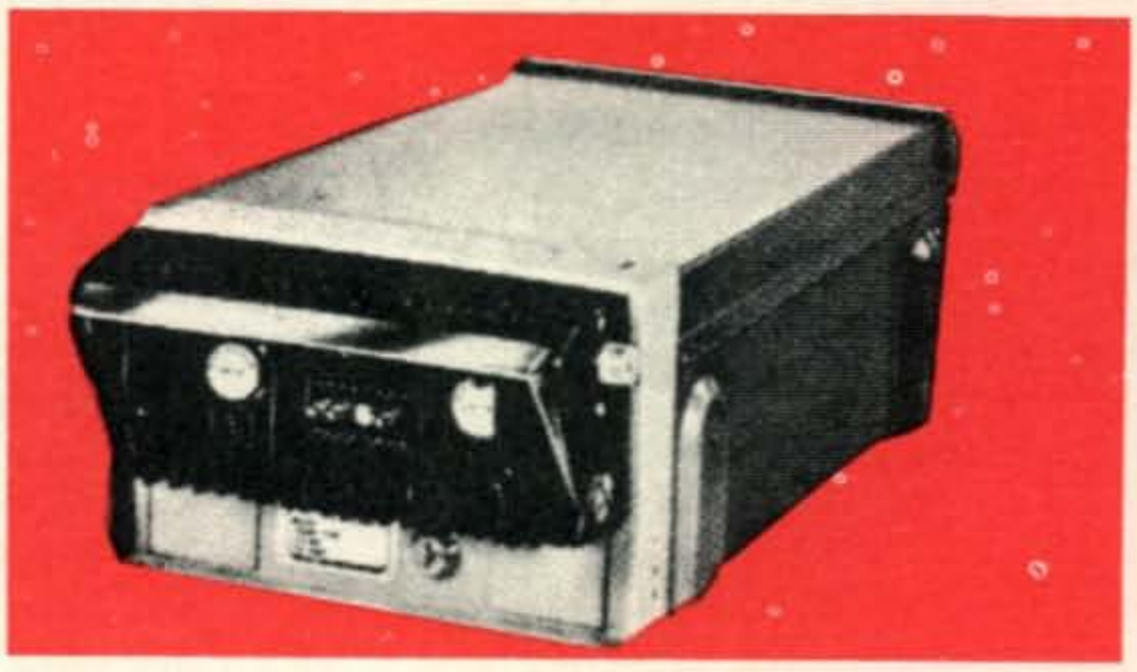

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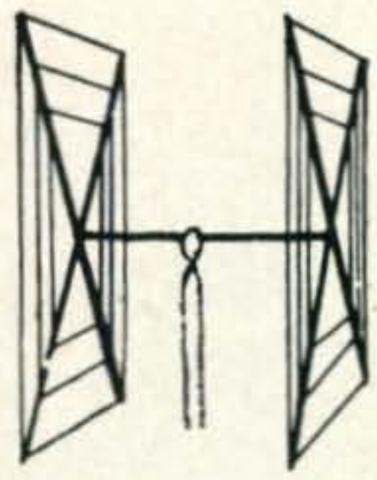

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10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

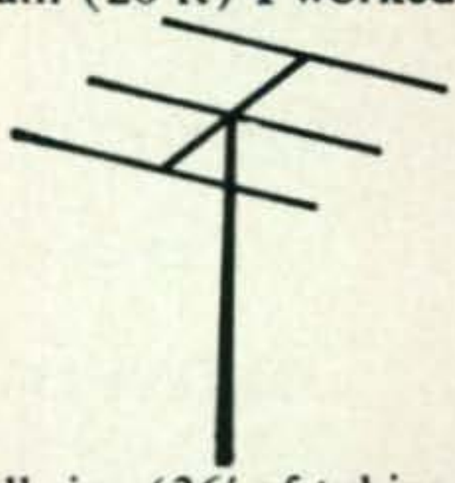
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
3 EL 20	27	7 EL 10	34*
4 EL 20	34*	4 EL 6	20
2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
4 EL 15	27*		
5 EL 15	30*		

***20' Boom**

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

GOTHAM
1805 Purdy, Dept. CQ,
Miami Beach, Fla. 33139

"HOW TO ORDER: Send money order (bank, store, or United States) in full. We ship immediately by best way, charges collect. DEALERS WRITE."

Yaesu presents the great two-meter leap forward

Since Yaesu makes and sells more factory-assembled amateur rigs than any other company in the world, it follows that we'll only place dependable, fully-perfected products on the market.

So now, after more than two thoughtful years of development, here are our entries in the two-meter FM field:

YAESU FT-2 AUTO

Great new features — like Auto-Scan and a special Priority-channel — place the FT-2 AUTO in a class by itself. These unique capabilities are achieved with advanced digital-logic circuits. Here's how they work:

With Auto-Scan on, the receiver scans all 8 channels at 20 channels per second, indicator lights provide a visual channel display, stopping on receipt of a signal. At the end of each transmission, the receiver continues to scan. (Just push a channel button to skip over any channels you wish eliminated from the scanning cycle.) To lock on any frequency being received, simply depress the mike button momentarily. The lock light then glows indicating that transmitter and receiver are working together. To unlock, you again hit the mike button and the receiver continues to scan.

Only Yaesu offers this type of remote, one-handed control of the scanning function.

The Priority-channel feature allows automatic monitoring of a pre-selected frequency. When the receiver stops on a frequency other than the Priority-channel, Auto-Scan will check every two seconds to determine if the Priority-channel is busy. If it is, the receiver reverts instantly to the Priority-channel. Manual or Auto-Scan mode of operation is instantly selectable on front panel. In manual mode, the push buttons function as channel selectors.

The FT-2 AUTO will operate from either 117 V AC or 12 V DC power sources.

Receiver/transmitter specifications include: selectable 10 Watt or 1 Watt power-output levels: a frequency-adjustable tone-burst generator for repeater activation: 0.3 uV sensitivity for 20 db quieting; 10.7 MHz crystal filter, in addition to a 455 kHz ceramic filter, for superb adjacent channel rejection; adjustable deviation and mike gain controls; Hi-Q slot-coupled resonators used in receiver front end; all solid-state construction, with diode-protected MOSFET input stage.

This exciting new rig is available now. Just send your check for $329.95 — or use Master Charge or BankAmericard. We'll even include a free anti-theft mounting bracket that locks up your rig when its going mobile.

YAESU FT-2FB

This new unit features the same receiver/transmitter specifications listed above for the FT-2 AUTO (without the scan feature), but in a compact 6⅝ x 2½ x 10-inch package that weighs only 4 lbs. The FT-2FB has 12-channel capability, with illuminated frequency readout. It operates directly from a 12 V DC source. This rugged, handsomely-styled transceiver is yours for only $229.95. (A matching AC power supply with rechargeable batteries for emergency operation is available for $79.95.)

Both units come with a one-year warranty and are backed by Spectronics' fast, dependable service system. Act today, and be glad you waited for the finest in two-meter FM.

SPECTRONICS WEST

1491 E. 28th, Signal Hill, Ca. 90806 / (213) 426-2593

SPECTRONICS EAST

Box 1457, Stow, Ohio 44224 / (216) 923-4567

☐ Send FT-2 AUTO. Enclosed find $329.95* "C-9"
☐ Send FT-2FB. Enclosed find $229.95.*
☐ Send more data.

Name_____

Address_____

City_____ State_____ Zip_____

*California residents add 5% sales tax.

NOTE: Both units are supplied with crystals for simplex operation on 146.76 MHz, 146.82 MHz, and 146.94 MHz. Additional crystals are $5.00 ea.

2

Longer Life for an Old Timer

Introduced in 1947, the EIMAC 4-400A quickly became the mainstay for the majority of broadcast, shortwave and FM transmitters. Still popular today, this power tetrode design is now available as the improved long-life 4-400C.

Get an EIMAC 4-400C — the new generation tetrode specifically designed for long-life, high-performance broadcast and FM service. This premium quality tetrode is directly interchangeable with the 4-400A in existing equipment and is recommended for new equipment design.

The EIMAC 4-400C features a low temperature filament structure which retains its initial high level of electron emission for an extended period of time, greatly reducing frequency of tube replacement. This improved filament structure, plus strict processing and quality control, combines with improved current division and low drive requirements to provide a high-quality, long-life product.

Reduce down-time and replacement cost with the EIMAC 4-400C when you re-tube. And use this improved tetrode in your new equipment design. With a maximum plate dissipation of 400 watts, the EIMAC 4-400C provides long-life and consistent performance as an amplifier, oscillator or modulator. Another example of EIMAC's continuing program of quality, reliability and service.

For further information, contact EIMAC, Division of Varian, 301 Industrial Way, San Carlos, Calif. 94070. Or any of the more than 30 Varian/EIMAC Electron Tube and Device Group Sales Offices throughout the world.

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