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**[1751–1836]**

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*Speech in the Virginia Convention*
*[June 16, 1788]*



The Radio Amateur's Journal

08240

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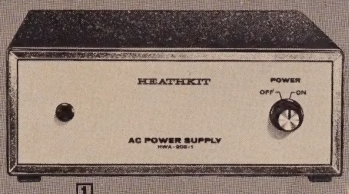
2 HM-2102 VHF Wattmeter helps you know how you're getting out with your HW-202. Has built-in SWR bridge, adjustable sensitivity.

3 HW-2021 hand-held 2-meter transceiver. 1 watt out, 5 receive and 10 transmit channels get you on 2 while you're walking, working, outdoors, anywhere. There's even the HWA-2021-3 auto-patch encoder you can build right in, as shown.

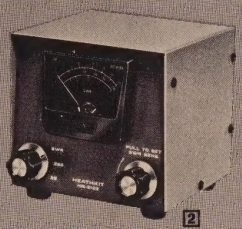
4 HW-202 crystal-controlled 2-meter transceiver. The one used by thousands because of its reliability, performance and low kit-form price!

5 Add up to 8 watts power to your HW-2021 with the HA-201 2-meter amplifier. Withstands infinite VSWR without failure—goes together in an hour or two.

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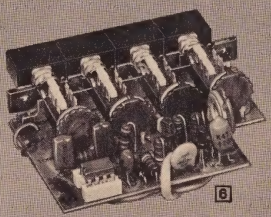
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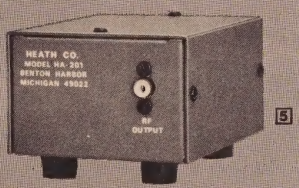

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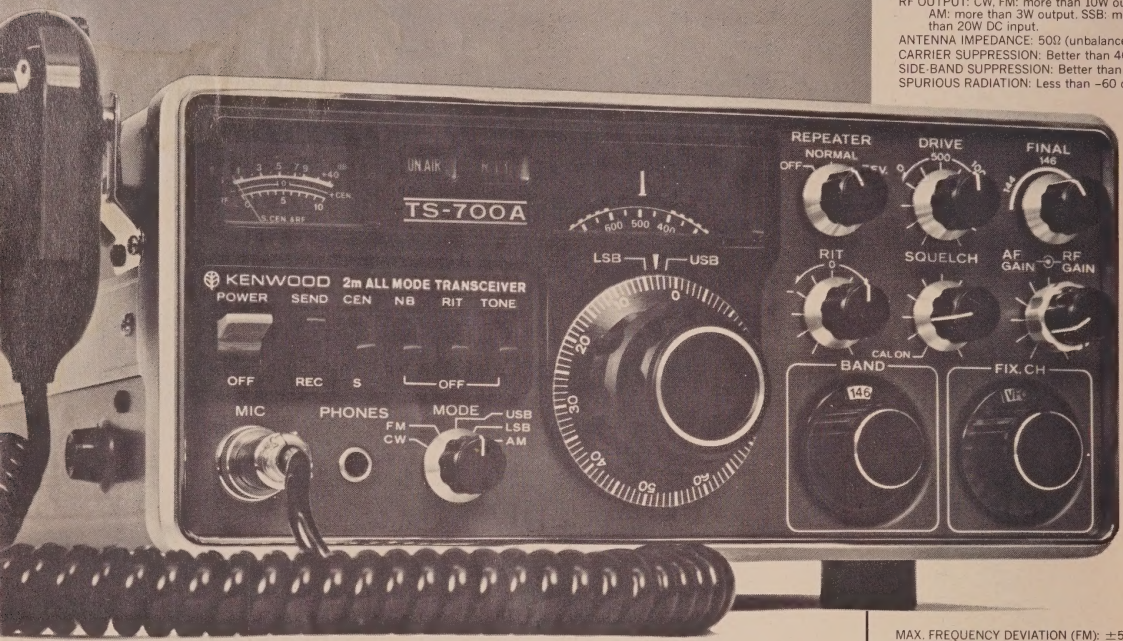
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ANTENNA IMPEDANCE: 50Ω (unbalanced)
CARRIER SUPPRESSION: Better than 40 dB
SIDE-BAND SUPPRESSION: Better than 40 dB
SPURIOUS RADIATION: Less than −60 db
MAX. FREQUENCY DEVIATION (FM): ±5 kHz
REPEATER FREQUENCY SHIFT WIDTH: 600 kHz
TONE BURST TIME: 0.5-1.0 sec.
MODULATION: Balanced modulation for SSB. Variable reactance frequency shift for FM. Low power modulation for AM.
MICROPHONE: Dynamic microphone, 500Ω
AUDIO FREQUENCY RESPONSE: 400-2600 Hz, within −9 db
RECEIVING SYSTEM: SSB, CW, AM: Single-superheterodyne. FM: Double-superheterodyne.
INTERMEDIATE FREQUENCY: SSB, CW, AM: 10.7 MHz. FM: 1st IF: . . . 10.7 MHz. 2nd IF: . . . 455 kHz.
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IF REJECTION: Better than 60dB
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RECEIVER SELECTIVITY: SSB, CW, AM: Less than 4.8 kHz at −60 dB. FM: Less than 24 kHz at −60 dB.
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RECEIVER LOAD IMPEDANCE: 8Ω
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WEIGHT: 11 kg
SUGGESTED PRICE: $700.00

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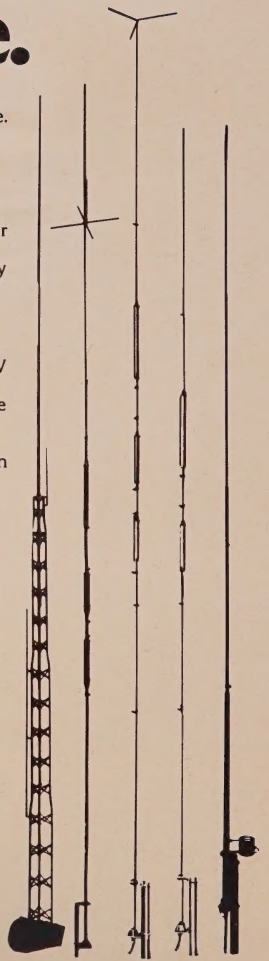
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| | 18HT | 18AVT/WB | 14AVQ/WB | 12AVQ | 18V |
|---|---|---|---|---|---|
| **Electrical** | | | | | |
| Max. power input | 1 KW AM<br>2 KW PEP | 1 KW AM<br>2 KW PEP<br>(1 KW PEP on 80) | 1 KW AM | 1 KW AM | 250 watts AM<br>500 watts PEP |
| **VSWR** | 2:1 or less | 2:1 or less | 2:1 or less | 2:1 or less | 2:1 or less |
| Impedance | 50 ohms | 50 ohms | 50 ohms | 50 ohms | 50 ohms |
| **Mechanical** | | | | | |
| Height | 50′ | 25′ | 18′ | 13′6″ | 18′ |
| Shipping Weight | 96.7 lbs. | 10.7 lbs. | 8.2 lbs. | 7 lbs. | 4.6 lbs. |
| Mast Diameter | None required | 1⅝″ | 1⅝″ | 1⅝″ | 1⅝″ |

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# Zero Bias

With America's (if not the world's) awakening to the CB craze it is curiously amusing to find that several of our publishing confreres are rising to "cash in" on a very large viable market. If one can still believe in altruism, it would seem that a guiding light will now shine and show the CBer the error of his ways and convert him to amateur radio. From most of what I hear I can only gather that the average amateur has little use for the CBer and that most comments are generally hostile. What the CBer will then face is the propaganda attracting him to join the ranks of amateur radio and take part in some really exciting, interesting and worthwhile endeavor while in reality he meets the scoffers, the jeerers, and put-down artists who represent amateur radio's elitist group.

The typical CBer is not responsible for being where he is. He did not rob amateur radio of spectrum space nor is he blatently anti-amateur radio. He *has* taken advantage of an existing situation and has begun to enjoy a hobby. His ranks do number in the millions and he does support a very healthy market. He is highly organized, publicity orientated, and takes full advantage of all media. Basically he enjoys.

The only way I can describe my reaction to a lot of the feelings amateurs vent towards CBers is to liken it to old-time missionaries who feel a call to enlighten some primitive group. Whether by Puritan ethic or other moral code, the missionary is compelled to make the primitive stop his unwholesome activities. Perhaps it's envy of a freer life style or the threat that one's own life style leaves a lot to be desired. Regardless, it means that if we are to be right they must be wrong.

Amateur radio has a lot to offer on its own *not* at the expense of CB. If we take as fact that CBers like to communicate, buy equipment, put up antennas, engage in public service, seek out awards and QSL cards and intellectually disregard the ethics or legality of the situation, we can see the possibility of presenting an augmentation to their hobby rather than a replacement. What we have to offer and how we offer it may or may not be better; this is debatable from where you stand. What is true is that what we offer is different and unique. If you knock what somebody has or believes just to improve your own position you are in fact calling him a fool. Why should he continue to listen to you?

I think that if we are not careful in our goals we might wind up like General Custer at the Little Big Horn. Even though *he* believed *he* was right, that he was better trained and equipped militarily to handle the situation he still failed to convert enough Indians to help *his* situation.

### FCC Anomaly

By now most of you have seen or heard about the action taken by the FCC on parts of Docket 20282. For the new Novice this action is especially fortuitous as with the increased power limitations the new Novice does not have to buy one rig for Novice use and another when he hopefully upgrades his status. The new Novice is also in a better position to compete for DX, compete in contests and in general is more flexible in day to day operating. He is also protected by the provision that all higher class licensees operating within the Novice bands are also restricted to 250 watts input. Technicians will now be able to use the Novice frequencies and it is hoped that many of them will take advantage of this new provision to increase their code speed in the least painful manner and perhaps broaden their enjoyment of amateur radio while working towards their general.

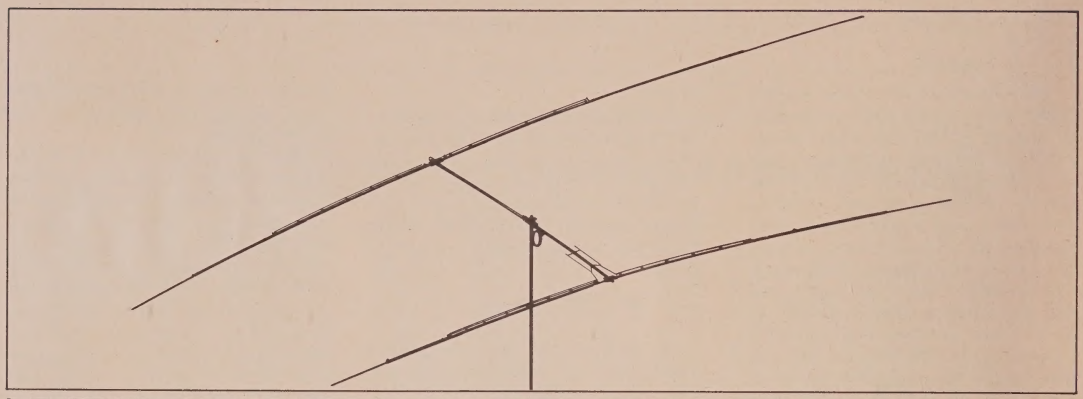
On the other hand, the FCC gives and taketh away. This past June the FCC announced (without the usual time for comments) that it had approved a tacit agreement between themselves and the ARRL to literally hand over authority to ARRL to give classes and grant upon completion of the class, a bona fide amateur radio license. This is the Federal Government delegating its responsibility and authority to a private agency. What this means is that the ARRL will be able to publish (with commercially paid advertising) a series of license manuals and/or lesson plans to be used in teaching courses in amateur radio. This will then become the "official" FCC sanctioned amateur radio course. Indirectly this is also restraint of trade in the most blatent sense. The courses are to be given presumably by affiliated clubs and overseen somehow by League officials to maintain some sort of integrity. There is a proviso that other publishers will be allowed to submit their publications for approval as instructional material but it does put a crimp in the chances of such material being either approved or used by many groups.

What this does hurt is many smaller publishers whose books and pamphlets have been alternative study guides for many years. I am not trying to disparage the Leagues manuals as they are generally good and serve a very useful function in amateur radio. What I am objecting to is that this gives the ARRL some form of quasi-official government status that it does not deserve and along with that, makes *QST* an official extension of the FCC. This thereby has a simple economic effect on the other amateur publications: it puts us at disadvantage with regard to advertising revenue and potential sales to new amateurs. When all you will be seeing is League material it is unlikely that you will hear of other periodicals and books.

This is not exactly sour grapes or grumblings about competition in the normal sense but rather my questioning of what is and isn't normal competition. In early June when talk of the ARRL FCC plan was heavy I went to Washington D.C. with Martin Schwartz of Ameco to discuss the legality of this FCC action with Sen. Buckley of N.Y. Just one week prior Sen. Buckley's assistant had called the FCC to question what was going on only to be told that this idea would not be resolved for several months. One week later when Martin and I arrived it had not only been resolved but in fact became reality.

In early March, the ARRL sent out letters to their advertisers including a March 4th telegram letting them know that this "idea" was, in reality, a fact that would go into effect in June without precedent or comment. In March the League knew this was going to go through in June, and still the FCC lied to Sen. Buckley's assistant just one week before it actually went through. It seems to be a very neat package, a strange set of coincidences that I guess would normally be described as collusion but it couldn't obviously apply here. After all, what can the league possibly gain by selling 100,000 new license manuals. And at the FCC we are dealing with honorable men and as with other government agencies today, above reproach . . . . of course.

73, Alan, K2EEK



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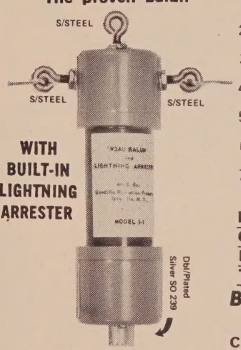
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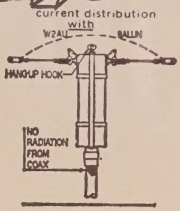
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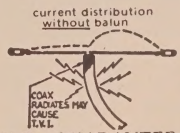
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### Wake Up . . . Before It's Too Late

Editor, *CQ*:

Having obtained no direction from the Federal Government, local communities are now taking action on their own to stem the radio-frequency interference (RFI) problem. Unfortunately, their actions serve to penalize the radio operator rather than to address the design deficiencies in home-entertainment products which are at the heart of most problems. More specifically, 47 states now have one or more communities with laws which can be used to cite radio operators for causing interference to a neighbor's television receiver, radio, or other home-entertainment device. The laws attack the problem from the standpoint that the radio operator is creating noise or is a public nuisance.

Lest you think the communities will not enforce these laws, consider the case of CB'er Don Underwood of Arlington, Texas. Mr. Underwood was convicted and fined $100 for violation of Arlington's anti-noise ordinance. The presiding judge ruled that his calls interfered with a neighbor's television reception.

At present, we have learned that the Arlington court decision has been appealed, and that Mr. Underwood has gone into Federal Court asking for an injunction against Arlington. But it should escape no one that if the court permits Arlington to continue enforcing its noise ordinance against radio operators, it will set a precedent that will affect all Amateur and Citizens Radio Service operators across the country.

Isn't it time we pressed the Federal Government and the electronics industry to take steps necessary so as to insure that the consumer is offered home-entertainment products which will operate in today's rf environment?

After all, we have everything to lose!

Theodore J. Cohen, W4UMF
Alexandria, VA

Editor, *CQ*:

I was told once by the ARRL that they never keep any records of what is going on in the world of CB. Maybe they should for they have neglected to mention how the CBers are picking up the ball where the hams dropped it. I am talking about the House Bill in Congress now refered to as the RFI Bill.

As you may know, the bill was introduced originally by Barry Goldwater a couple of years ago. This was publicized and still is in QST. However, if it does pass and becomes law it will be thanks to the CBers by the looks of things.

Missouri Senator Eagleton is supporting this bill on behalf of CB.

This year there has been several TVI cases against CBers fought in local courts based on a city's Anti-Noise Ordinance. This could well be hams. In all

*(continued on page 78)*

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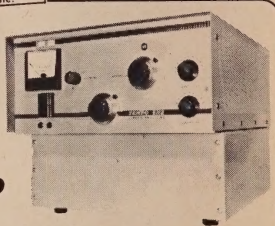
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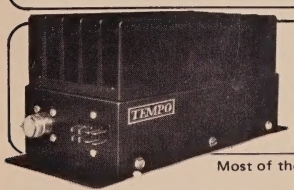


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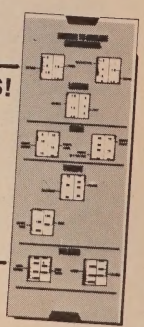
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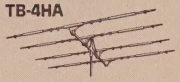


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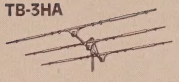
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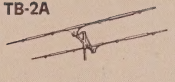
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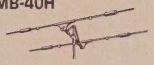
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# Announcing

● **East Rutherford, N.J.** — The Knight Raiders VHF Club's auction and flea market will be held on Saturday, August 14th, at St. Joseph's Church of East Rutherford, Hoboken Rd., East Rutherford. Free admission, free parking, refreshments available. Talk-in will be on 146.52. Doors will open 10 AM. Flea market tables: $6.00 for a full table, $3.50 for a half table. Reserve your tables in advance by writing to the Knight Raiders VHF Club, K2DEL, P.O. Box 1054, Passaic, N.J. 07055.

● **New Castle, DE** — The Delmarva Hamfest will be held on Aug. 15, at 8:00 am at Wilmington College New Castle, (Intersection of US Rts. 13, 40, and Del 141 - 3 miles south of Wilmington). Easy to get to from I-95. Talk-in on 146-13/73, 94/94, 147-75/15, and 3905 Ladies program, reasonable food and beverages available. Tickets $1.75 in advance, $2.50 at gate. Tailgating $2.50. Inside tables $5.00. Great prizes. For more information write: John Low, K3YHR, 11 Scottfield Dr., Neward, DE 19713 with SASE.

● **Oklahoma City, OK** — The Oklahoma Ham holiday will be held on August 7 and 8th in the Southgate Inn, in Oklahoma City. For more information write: Oklahoma Ham Holiday, Box 20567, Oklahoma City OK 73120.

● **Spokane WA** — The Spokane Amateur Radio Council will sponsor their second annual hamfest on July 17 and 18, on the campus of Eastern Washington State College. For more information write: Spokane Amateur Radio Council, c/o Larry Rasmussen, W7FYU, W. 4132 Kathleen, Spokane, Wa., 99208.

● **Reno, NE** — The Nevada Amateur Radio Association will host the "Sierra Nevada Hamfest" on August 28, at the California Building, Idlewild Park in Reno, Pre-registration is $10, until August 21, For further information write: P.O. Box 2534, Reno, Nevada 89505.

● **Charlotte, NC** — The Charlotte Amateur Radio Club and the Mecklenburg Amateur Radio Society will be operating special events amateur radio station NC4CM from Freedom Park in Charlotte, on July 4, 1976. Special certificates will be used as QSL confirmation of contacts with other amateur stations Special limited edition bronze coins will be awarded to the first amateur radio station in each state and foreign country contacted by NC4CM. QSL cards confirming contact with NC4CM will be handled through W4CQ, Charlotte Amateur Radio Club, 101 West Twenty-Third St., Charlotte, North Carolina 28206.

● **St. Cloud, MN** — The St. Cloud Radio Club's annual hamfest will be held on August 8, from 10:00 a.m. till closing, at the Sauk Rapids Municipal Park. Free parking and overnite parking, hot dogs and pop available. Swapfest and ham gear sale. Talk in on 34/94 and 3925. For further information contact Bill Zins WAØOTO, St. Cloud Radio Club, P.O. Box 752, St. Cloud, MN 56301.

● **Flourtown, PA** — Friends of WR3ABE Picnic. Bring Family and Food. Fort Washington Park, Flourtown, on Sunday July 18, noon. Rain date, 1 week later.

● **Washington, MO** — The Zero-Beater ARC will hold their annual hamfest on Sunday August 1st at Washington's city park. Free parking auction, and bingo for XYL's. No admission fee or fee for parking in the traders row. Many prizes including station accessories, books and a handmade quilt. For info or tickets contact Al Lanwermeyer WNØQBS, or Zero-Beaters ARC WAØFYA, Box 24, Dutzow, Mo. 63342.

● **Ft. Washington, PA** — The Mt. Airy VHF Radio Club (the Packrats) are holding their annual family picnic on August 8th in the Flourtown area of Ft. Washington State Park (rain date: August 15). Talk-in via W3CCX/3 on 52.525 146.52, and 222.98/224.58 MHz.

● **Vancouver, B.C. Canada** — The British Columbia DX Club will host the 1976 Pacific Northwest DX Convention August 7th and 8th at the Hotel Georgia in Vancouver. Registration $20.00 includes the DX Banquet, and DX Breakfast on Sunday morning. An excellent DX oriented program is assured. Advance registration and further information can be obtained from VE7BVH - 7110, 232 St. Langley, B.C.

● **Petoskey, MI** — The Straits Area Radio Club Swap and Shop will be held on August 14th at 8:00 to 4:00, at the Emmet County fairgrounds on US 31, ½ mile west of southern junction of US 31 and US 131, in Petoskey Michigan. All amateurs, CBers, SWLs, $1.00 admission 50 cents per table, door prizes, lunch counter, free parking. Talk-in on 3.920 MHz., Channel 1, 146.52 MHz. For more information write: Newell D. Saigeon, W8HKL, Route 1, Box 425A Petoskey, Mi. 49770.

● **La Porte, IN** — The La Porte County Amateur Radio Clubs will hold their fall hamfest on Sunday August 29th, at the La Porte County Fairgrounds in La Porte, beginning at 7 AM Chicago time. Overnight camping available. Indoors in case of rain. No table or set-up charge. Paved Mid-way good food and drink. $2.00 donation at the door, for info write: P.O. Box 30, La Porte, IN 46350. Talk-in on 01-61 and .94 simplex.

● **Norfolk, N.Y.** — The St. Lawrence Valley Repeater Assn. is holding their St. Lawrence Amateur Radio Picnic on Sunday, July 25 at the Norfolk Rod and Gun Club in Norfolk. Activities include an Auction, exhibits, door prizes, Raffle and more. Tables and snack bar available. Tickets $2.00 in advance $2.50 at gate. Talk in on .31-.91, .52-.52, .16-.76 For more information contact Herb, K2TPB at 2 Randall Drive, Massena, NY 13662.

● **Puyallup, WA** — The Radio Club of Tacoma is holding Hamfair '76 on August 21st and 22nd at the Pierce County Fairgrounds, 11 miles South of Puyallup. Activities include: technical seminars, women's and children's activities, contests, flea market, Saturday evening dinner and entertainment, Sun-

*(Continued on page 74)*

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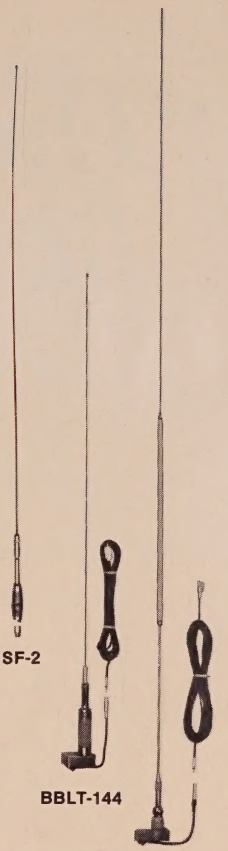
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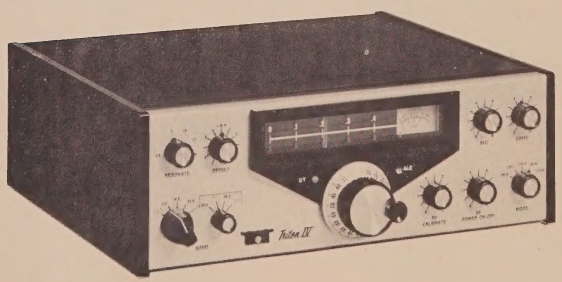
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***South of the border down Mexico way is a veritable amateur radio paradise.***

# DXING IN BAJA CALIFORNIA

BY JERRY HAGEN, AA6GLD

During the past several years, a number of Southern California Amateurs have been involved with amateur radio in Baja California, Mexico. A group of XE2's and six landers have provided communication for the various road races including the famous *Baja-1,000* which originally ran the length of the peninsula. Another group, called the "Collegas Y Amigos" includes the "Radio Club de Ensenada" and the Southern California Amateur Radio Mobile Group. Each year this group has one meeting in Ensenada, one in San Diego and one in the Los Angeles Area. The meetings are predominantly social, however the Southern California group has provided food and clothing for several schools for the handicapped in Ensenada. While on the 1973 trip to Ensenada, I suddenly realized how little most W's knew about amateur radio in Mexico.

The "Radio Club de Ensenada" has approximately 20 members, who are mostly business men in Ensenada. They have weekly meetings for dinner at their nice club house and participate in many other events. The club call is XE2EBC and a Swan transceiver and 2 element triband yagi make up the club station. As is the case in many Latin American countries, most activities are social, however a 2 meter repeater (XE2EBC 146.22/82) was just installed in Ensenada by club members including Erique Garcia, XE2RH.

Another Ensenada group, called "Radio Club Corsarios" has approximately 20 members including some s.w.l's, experimenters and commercial operators. In Mexico those interested in radio are called "radio aficionados" which means "radio enthusiasts" in English. Most clubs include all "radio aficionados" which would be synomous to having USA amateur and citizen band operators in the same club.

During the 1973 trip, Tom, K6KS, Mike, WA6ISP and myself met Jose, XE2MX who is the sole DXer in Ensenada. In fact, he appears to be the only serious DXer in Baja California at this time. Jose is an elementary school teacher who has been licensed since 1968.

According to Jose, there are 3 classes of operator tickets in Mexico. They are the First Class for engineers, the Second Class for operators and the Third Class for Novices. The exam for the Second Class license includes a theory exam and an international morse code test of 10 words per minute in sending and receiving. The operator license does *not* denote call sign or mention amateur radio but does contain a photo of the licensee. It is possible that the operator license would also be used for commercial purposes and that the First Class ticket is similar to the registered professional engineer in the US. In addition to his Second Class operator license, Jose has a station license which denotes amateur radio, lists his name, address, call sign and maximum power which is 250 watts.



*The Coronado Islands off of the Baja California Coast, provided a spectacular reflection through the clouds and filtered sunlight.*

Mexico is divided into 3 regular call areas which are XE2 for Northern Mexico and Baja California, XE1 for Central Mexico and XE3 for Southern Mexico. The Revilla-Gigedo Islands which are remotely located in the Pacific Ocean about 500 miles from the Central Pacific Coast of Mexico, are considered a separate country for DXCC and is the fourth district. All islands apparently are assigned the XF prefix as the Radio Club of Ensenada operated from "Todos Santos" Island at the entrance to Ensenada Harbor in 1973 using the call XF1EBC and in the past year Sam, XF1A, has been active from Santa Margarita Island which is on the Pacific Coast of Southern Baja California.

The ARRL equivalent in Mexico is the LMRE or Liga Mexicana de Radio Experimenters. The LMRE has a bureau, monthly magazine called *Onda Corta* (Shortwave) and a call book of Mexican amateurs. The dues are 200 pesos a year which is approximately $16 US. As Ensenada is almost 1,500 miles from Mexico City and separated by the Sea of Cortez, LMRE activities are limited, however, there is a Mexican Net each night on 75 meters which provides information similar to our ARRL official bulletins. Each year an LMRE National Convention is held in some part of Mexico which is attended by many of the Radio Club of Ensenada members.

Being a DXer, XE2MX works 80 thru 10 meters and has over 200 countries worked. During the past year, Jose has been applying for many DX Awards and as of this date has received DXCC, WPX, CQDX-SSB, AJD, WAS, and several other awards. He has also become very active in the CQWW and ARRL DX contests, particularly on c.w. which is not as popular as s.s.b. in Latin American Countries.

In 1974, Jose was given some cubex quad spiders, however bamboo is difficult to obtain in Ensenada, so he obtained an old 2 element tribander from another XE amateur but was very unhappy in the performance as it was difficult to work Europe. When Jose mentioned his disappointment with the triband Yagi during one of our 75 meter schedules, I told him that I would be glad to obtain some bamboo and bring it down on my next trip to Ensenada. Meanwhile several DX bulletins reported the 6D prefix being used in Mexico for the 1975 Pan American Games, so, I asked Jose if he could use the 6D2 prefix and noted that it would be good for the CQ WW Contest. Upon inquiry, Jose determined that the 6D2 prefixes would be used through the month October. About this time Phil, W6DQX called on the phone and asked what I was doing for the CQ WW Contest which really got me thinking about a trip to Ensenada. On our next schedule I asked XE2MX if it would be ok to bring the bamboo, put up the quad and do a bit of operating in the CQ WW Test. Jose replied that he was not busy that weekend and would be glad to have visitors.

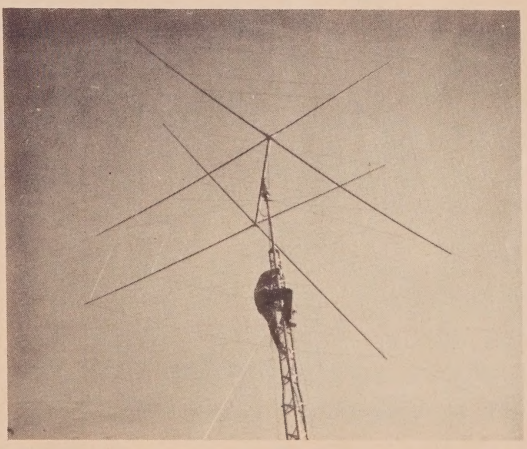
Immediately, I began to gather material for the



*The "Radio Club de Ensenada" Clubhouse with 2 element triband Yagi.*

quad which included 500 feet of scrounged #14 wire, bamboo which was obtained from Cubex, a 7 foot mast, an old AR-22 rotator which had been repaired by WA6ISP.

On Saturday morning of the CQ contest, Phil and W6DQX and I left West Covina at 6 a.m. and about 8:30 a.m. we crossed the border and started down the Baja California highway which now runs nearly 1,000 miles to the southern tip of the arid but beautiful peninsula. The coastline is rugged barren cliffs with many beautiful beaches. A peculiar cloud formation over several close islands reflected and filtered the sunlight in a spectacular manner as we traveled down Mexico Highway #1. This "cuenta" or toll road is well maintained and has a



*"El Gran Simio" descending from XE2MX's tower after installation of the Triband Quad.*




*Jose, XE2MX and the new Quad. At one time separate Mobile Callsigns were issued in Mexico, and Jose held XE2PMY.*

110 km (68 m.p.h.) speed limit which made the $2.40 toll well worth while. About 10 a.m. we arrived in Ensenada, a coastal town of about 30,000 population which has an exceptional harbor. The surrounding area is fairly rugged with agriculture including the vineyards of Santo Thomas, cattle and truck crops grown in the mild arid climate. The city's industry is rounded out by fishing and the tourist trade from Southern California.



*CQ Contest Committee Member W6DQX (r) presents XE2MX the certificate for the high XE score in the 1974 CQ WW CW Contest.*

Upon entering the city the observant amateur is surprised by the maze and variety antennas which are present. They include Quads, Yagis and lengthy coax fed dipoles which are probably used for low frequency (2 MHz) ship to shore communication. Several 4 element Yagis approximately a Hy-Gain 204BA were placed on buildings which are most likely utilized for government and commercial communication to Mexico City. After finding our way through the busy streets we arrived at the home of our host Jose, ZE2MX.

After exchanging greetings with Jose and his family, we began assembly of the quad elements. We also relocated his tower from the ground to the top of a small detached building which will eventually be Jose's ham shack. We mounted the 25 foot tower on a pair of old hinges from the junk box and installed the mast and rotator on the tower. We raised the tower and secured it with one set of guys. With the additional mast the tower was approximately 35 feet high and was quite sturdy.

Assembly of the quad became difficult as the space was quite confining, but after several tries we got it together on top of the small building beside the tower. Phil suggested we place the boom across the guywire and pull the quad up with rope. This proved to be an excellent suggestion and it did not take long to get the quad bolted to the mast. While this work was in progress, Phil managed to grab his polaroid camera and got a shot of WA6GLD on the tower which Jose quickly entitled "el gran simio" which translated to English means "the big monkey"!

By then it was late afternoon and we were anxious to see if the quad worked and to find out if the contest conditions had improved on saturday afternoon as had been predicted by Dial-a-Prop. Upon tuning up Jose's Swan transceiver we found the s.w.r. approximately 2.7 to one on all three bands (10, 15 & 20). This was not shocking as we had not employed any matching and had used a single feedline for all three elements. After rotating the quad we could see that the front to back ratio was outstanding and that reception appeared to be excellent.

Jose then called CQ on 15 meter and our doubts about the s.w.r. were dispelled when an immediate pileup of JA's called. Phil hurridly brought out the log sheets which had been provided by CQ's contest director, K6SSS and 6D2MX was quickly in the thick of the contest action. Of course operating at 21240 MHz provided a frequency absent from "W" QRM and QSO's at over 100 per hour were made until the band closed. Just before dark Jose and I moved the mast with the 75 and 40 meter dipoles as it was very close to the quad.

We then took time out for a fine Mexican dinner

prepared by Jose's XYL Hilda; which was quickly inhaled by the "hungry Gringo's." About 0300, GMT QSO's on 14 MHz slowed down so we spent the evening on 40 and 75 meters. The best rate of QSO's was on 75 where over 300 contacts were made in a little over 2 hours. As we hit the sack after a long day we were anxious to see how the quad worked on the long haul from the west coast of Mexico to Europe.

When dawn came the 14 MHz band opened with a bang to Europe and the previous days work seemed well worth the trouble as quite a few nice European Multipliers such as OH0NI, HV3SJ, YZ, UB5 and many Western Europeans were worked.

During this opening we had difficulty getting the 6D2 call through to several Europeans. It seemed that the number 6 was often ommited or misunderstood by the Europeans. Of course we were asked the country many times, despite the fact that our zone 6 report indicated a Mexican or Revilla Gigedo Island station. We had a fine breakfast while enthusiastically discussing the nice opening and the good performance of the quad. Phil and I chuckled as Jose said that during the night he had dreamed about "working Africans on Long Path".

After breakfast, we QSYed to 15 meters and worked W'/K's, the Carribbean, and Latin America. The only African worked was 5L2A, however several EA8's and one EA1 in Spain were heard on 21 MHz. At the outset of the operation Jose stated that he had received notice of a temporary ban on EA contacts due to diplomatic problems between the countries, so these stations were not called. About 1830 GMT, Jose listened on 28 MHz and worked some South American stations with fine signals. The quad was then rotated to the East Coast US, but no W's were heard except for the 5-9 signal of W3AU! Later on one W4 was worked and W6RR broke in apparently copying on backscatter over a distance of about 160 miles.

About noon Jose and myself went to the local supermarket for some soda and cerveza. I was surprised to receive a combination of dollars and pesos for my $20 bill as in the normal tourist areas a separate drawer is kept for dollars. A quick calculation showed the amount to be right and it was back to Jose's with refreshments to finish the contest.

The best period for a high rate of contacts was in the early afternoon when W/K's were worked at a rate of over 150 per hour for several hours. This run was followed by another good JA run as the contest closed. The 17 hours operation had resulted in 1385 QSO's or 81 an hour which made the effort well worthwhile. A special Pan-American Games QSL was sent by the bureau to all those who worked 6D2MX. It was interesting to note that the W3ASK Dial-A-Prop prediction which called for poor conditions at the beginning of the contest with an improvement to good conditions on Sunday was quite accurate. The European openings on both 40 and 20 meters were outstanding on the West Coast.

At the close of the contest Phil, a member of the *CQ* Contest Committee presented Jose with his certificate for high Mexico score in the 1974 CQWW CW Contest. We then began the trip up the beautiful Baja California coastline to the California border where we crossed after a short wait at the US Customs Inspection Station. All in all the performance of the quad, the band conditions and the hospitality extended by Jose and his family had provided a most pleasurable weekend. Once again, I was impressed with the spirit of mutual enthusiasm and fellowship experienced between amateurs of all countries. ■

# Amateurs Work With Superwalk '76

**Twenty-seven** amateurs of the Chicago FM Club, WA9ORC, recently provided communications for the Metropolitan Chapter March of Dimes Superwalk. The walk was originally scheduled May 2, and walkers got as far as the half-way point before the trek was halted because of inclement weather.

The reschedule date, May 23, was brighter and 6,000 plus walkers completed the twenty mile trek to help raise vital funds for programs in birth defects prevention. Three separate routes started in the Northwest, South, and Southwest portions of the city, and converged on Grant Park near downtown. CFMC set up net control at the park in WA9LRI's van, and posted amateurs at each of twelve checkpoints along the three routes. In addition, an amateur was assigned to each of the route chairmen, and several amateurs were assigned as "floater"cars along the routes. The WR9ABY 146.16/76 and 448-.75/443.75 repeaters were used, as well as several two meter, and 220 MHz channels, for coordination.

CFMC Public Relations chairman, Jay Greenwald, WB9KNN, worked full-time to get the story out on the amateur radio assistance, and PR appeared on both local television, and film footage was shot for a nationally distributed movie on Superwalk.



*Bernard Wortham, March of Dimes poster child, listens in as Jay Greenwald, WB9KNN, of the Chicago FM Club, radios checkpoints along the Superwalk route.*

# CQ Reviews: The Clegg FM-DX 2 Meter F.M. Transceiver

BY HUGH R. PAUL, W6POK

The Clegg FM-DX 2 meter f.m. transceiver is the latest offering since that company went to a factory direct marketing program. I finally managed to get my hands on one of the units and satisfy the curiosity aroused by all the advertisements. I can tell you right now that the Clegg FM-DX is the Cadillac of the f.m. only, tow meter transceivers.

The physical construction can only be described as rugged. All of the circuit boards are mounted on an extremely heavy extruded aluminum frame, which accounts for a good percentage of the total weight of 6½ pounds.

The circuit boards themselves are the best. Heavily clad glass epoxy is used for all seven of the boards used in the unit. Heat sinking for the amplifier circuit board has been improved over earlier production units, by the use of a sink with greater fin area.

Operating features include a six digit LED frequency display that is large and bright enough to be read in extremely high ambient light. The sixth digit is illuminated only when the plus 5 kHz frequency select switch is thrown. This switch is located next to the LED readout on the front panel and is of the toggle type, which is more convenient to throw when going to or from a split channel repeater then is the rotary type switch used on some transceivers.

The three knobs below the digital readout, labeled receive frequency, select from left to right 1 MHz steps, 100 kHz and 10 kHz steps. Frequency coverage is from 143.5 to 148.5 MHz, an important point for MARS and CAP operators.

The transmit offset knob in the lower right corner of the front panel selects simplex and plus or minus 600 kHz offset for standard repeater operation. If you have non-standard frequency splits employed by repeaters in your area, there are three additional switch positions for which crystals may be purchased.

A seven pin miniature socket is provided on the side for connection of tone generators and remote control functions. Provision for an external speaker is provided at the back of the unit.

An indication of "state of the art" design is the use of 18 digital integrated and 5 linear integrated circuits. In addition to the 6 display LED's are 3 field effect transistors and 28 Bipolar transistors.




*The Clegg FM-DX 2 meter f.m. transceiver. (Photo by Sandra K. Paul)*

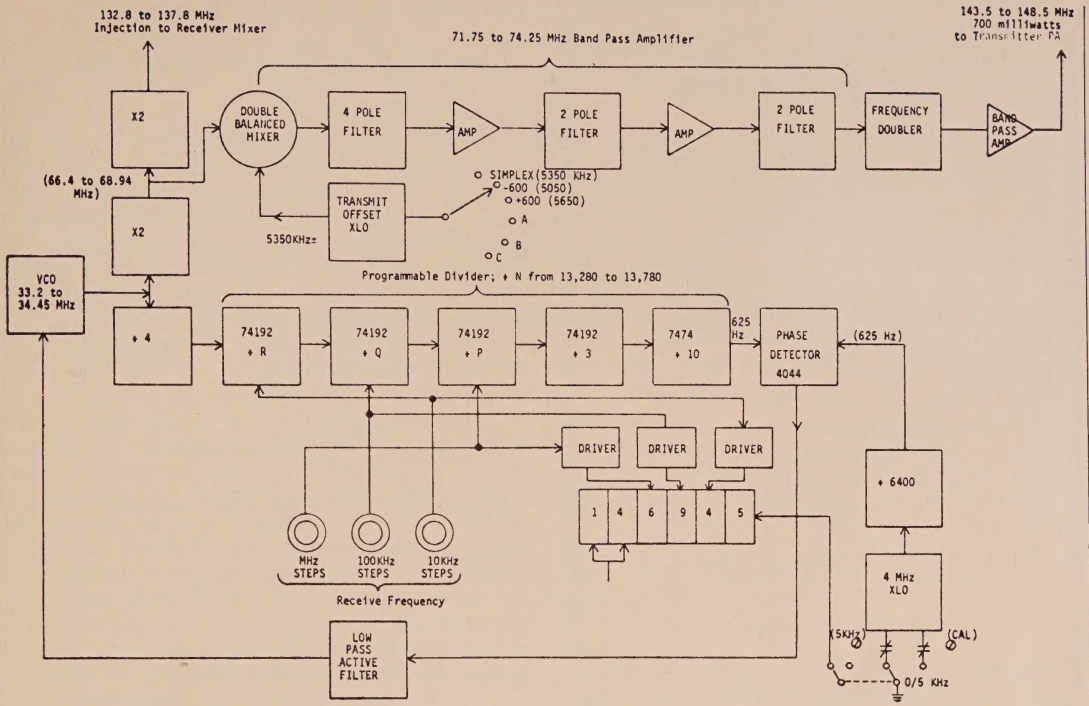



*Fig. 1—Block diagram of the Clegg FM-DX frequency synthesizer.*

## Receiver

The receiver is of a single conversion design, with an i.f. frequency of 10.7 MHz. Dual gate MOSFET's are used in the r.f. and mixer stages. Following the mixer is a four pole crystal filter. Another 4 pole crystal filter is between the first and second i.f. amplifier stages. Clegg has a "better idea" with the availability of optional i.f. crystal filters for those of you who may be operating in particularly troublesome areas. The FM-DX may be ordered with either six pole or eight pole filters in place of the two four pole filters used in the standard production unit. The additional cost is $35 and $54 respectively.

If you already own one of the earlier Clegg FM-DX transceivers and would like to change filters, no problem. The more selective filters are the same physical size as those supplied as standard, thus retro-fit is easy. As to cost, I would suggest that you call Clegg direct via the toll free number listed in their advertisements.

Two integrated circuits are employed in the receiver section. One serves as the last i.f. amplifier/discriminator and the other as the audio power amplifier. The latter supplies a minimum of 1.3 watts to a large 4 inch speaker mounted on the bottom cover of the transceiver. Needless to say, audio is more than sufficient for mobile use.

Receiver sensitivity is rated by Clegg as a maximum of .35 microvolt for 20 db of quieting. The unit tested reached a 20 db quieting figure with .24 microvolts applied. Squelch threshold is positive and tightens up slowly over a wide arc of control rotation. Squelch at threshold opened with .1 microvolt applied.

Performance of the receiver proved to be tops in both fixed and mobile operation. No intermodulation was experienced at any time, but in all fairness I must state that I did not have the opportunity to test the rig in one problem location, which seems to get the best of receivers, regardless of design.

## Synthesizer

Frequency stability on both transmit and receive is determined primarily by the stability of the synthesizer. This one would appear to be pretty much standard in design, but in performance is outstanding for its stability. A simplified block diagram of the synthesizer is illustrated here, see fig. 1, and is self explanatory as to the frequency division, comparison and mixing scheme.

If you are not familiar with the theory behind phase locked loop synthesizers, you will find more theoretical descriptions of their operation in reviews published in January and February issues of *CQ*.

Clegg claims calibration accuracy of plus or minus .0005% after 15 minutes warmup starting at

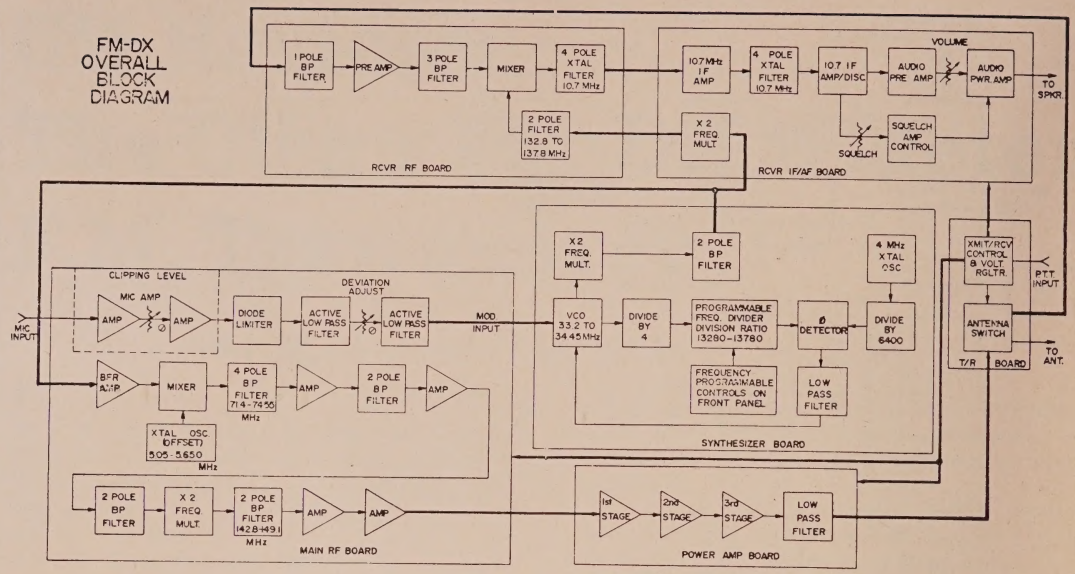


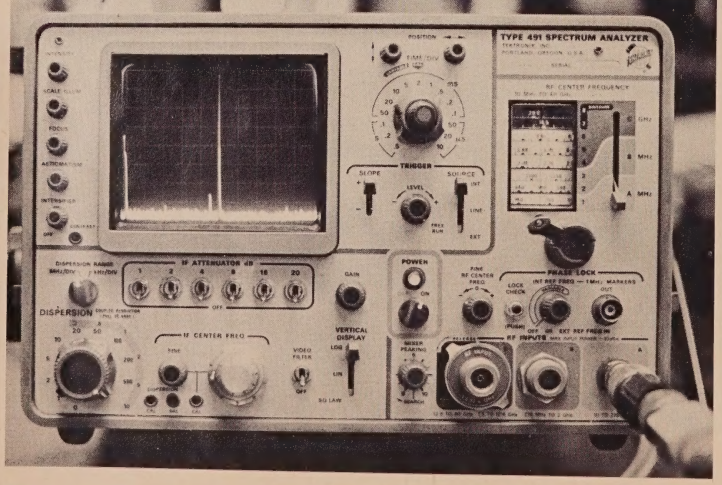

*Fig. 2—Overall block diagram of the FM-DX transceiver.*

25 degrees centigrade. The unit tested was within that tolerance figure and after warm up, long term drift was negligible. Internal trimmer capacitors are provided to permit periodic calibration against an external standard.

### *Transmitter*

Modulation of the transmitter is direct f.m. achieved by a single four stage IC operational amplifier and a pair of clipper diodes. Clipping level is adjustable with a 10 K pot, following the first stage. Deviation adjustment is by means of another 10 K potentiometer following the third amplifier section. Maximum deviation available is about 8 kHz. Audio is applied to a varicap diode across the tank circuit of the voltage control oscillator.

The multiplication and mixing scheme employed to reach the 146 MHz region is illustrated in the block diagram, fig. 2. The power amplifier module consists of a three stage, fixed tuned microstrip band pass amplifier. The power output capability of this module is 35 watts or more. The power amplifier is a CTC-B40-12. This device is used a great deal in commercial service where continuous duty and high reliability are required. Special circuits to protect against mis-matched loads are not a neces-




*Spectrum analyzer photograph of the FM-DX. In band spurious was better than 60 db down from the carrier level and the second harmonic measured 44 db down from the carrier level. (photo by Sandra K. Paul)*

sity with this device and are not included in the Clegg design.

Modulation quality of the transmitter is excellent if on the air reports are to be believed. I have no reason to doubt the comments received, since waveform analysis of the modulated carrier looks FB.

In band spurious was better than 60 db down from the carrier level and the second harmonic measured 44 db down from the carrier level. If you have been observant up to this point you are now asking, "What is that spur I see in the spectrum analyzer photograph that is only about 34 db down and approximately 5 MHz removed from the carrier?" The answer is a 30,000 watt f.m. broadcast station located about a block from the lab where the spectrum analysis was run. Some changes were made in the lab setup that resulted in this signal beating into the front end of the analyzer. This same signal showed up last month in the test of another piece of gear and we did not discover the error until the article had gone to press. Our problem will be corrected within the next month, when the broadcast station begins operation from a new location. In the meantime, please accept my apologies.

Power output in the low power mode measured 600 milliwatts and in the high power mode measured from 35 to almost 40 watts, depending on applied primary voltage.

In the low power mode the transceiver draws about 4 amps, which is pretty high for such a small amount of power output. Obviously you won't want to run the transceiver on a Ni-Cad battery pak. In the high power mode, current is 10 amps or more.

### *Conclusions*

The Clegg FM-DX comes with a Turner dynamic microphone and a mobile mounting bracket as standard equipment. I like the microphone, but not the mounting bracket.

The bracket is very sturdy, but the two knurled knobs that slip through the bracket and screw into a threaded hole on each side of the transceiver are a rip-off artists dream. I'm not picking on Clegg alone. Most manufacturers seem to loose their imagination when it comes to the design of their transceiver mounting brackets. I'm going to keep complaining until a good theft proof bracket is standard equipment with every manufacturer. It would help if you would complain also.

Performance of the rig is really a joy. It does everything Clegg claims it will. If price is no object, why not step up to a Cadillac? ■


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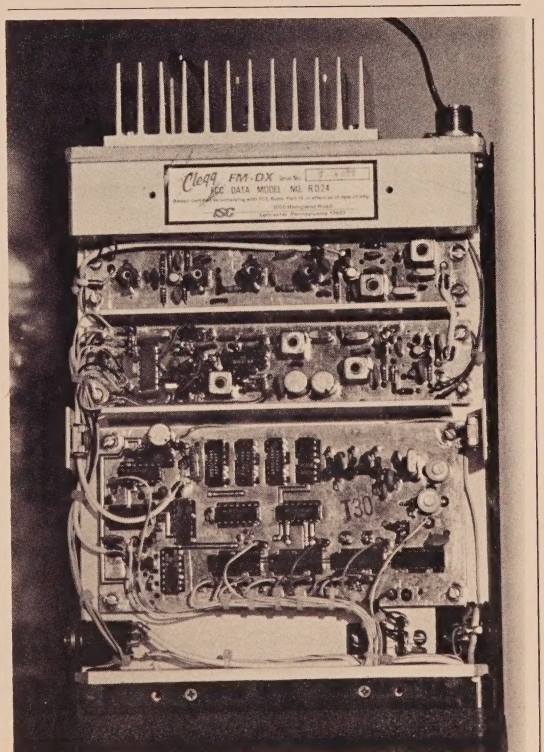
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*An interior view showing the circuit boards and very rugged construction. All of the circuit boards mount on an extremely heavy extruded aluminum frame. (Photo by Sandra K. Paul)*

***Here's an easy way to put out a signal from a small piece of property using unique trap construction.***

# A Mini Multi-Band Antenna for Mini Real Estate

BY KEN CORNELL, W2IMB

The following article will not reveal any revolutionary new ideas for an antenna design, as it is only a description of how one amateur solved his antenna problems living in a bungalow on a small lot, and obtaining a fairly efficient multi-band antenna, including 160 meters, using practical and proven means of construction.

Many amateurs are faced with the problem of wanting to operate on the lower frequency bands, but have insufficient property to contain the normal type of doublet or inverted "V" antenna configuration, and quite often end up using a vertical.

A vertical can be an excellent antenna, but if not located over an efficient "ground plane," the results can often be quite disappointing. A ground plane is normally formed by installing wire radials, like the spokes of a wheel, with the antenna located at the hub. The length of these radials should be slightly over a ¼ wavelength at the lowest frequency, so this could be an insolvable problem for small property sizes.

After 40 years as an active amateur living with property sizes that offered no serious problems as to antenna lengths, I suddenly found myself living near the ocean where property prices dictate that a 50 by 100 foot lot is a sizeable estate.

The first item of importance after getting settled, was to string up an antenna. Since 160 meters is one of my favorite bands, an antenna for same, was most important, as well as using the antenna on the other bands.

My first thought was to put up the longest piece of wire that the propery would accommodate and use this with an antenna tuner. The simplicity of just stringing up a piece of wire was offset by the complications involved with purchasing or constructing a good tuner, plus the nuisance value of constantly "fussing" with the various L/C functions to obtain proper transmitter loading and minimum s.w.r. when changing bands or moving around in same. This gave me reason to think otherwise.

Using a tape measure and an eye-ball estimate of the house size, garage and their relationship, I figured that if I started the antenna at the basement shack window at the front of the house and ran it up to a stick mounted on the front roof eave, then over the roof to a stick on the garage peak and down to the far side of same, I could get up about 120 feet of wire in an inverted "U" shape.

This length is close to a ¼ wave on 160 meters and I could use it working against the town water supply system for a ground. To eliminate the need for an antenna tuner for multi-band operation, I decided to install traps for 40 and 80 meters.

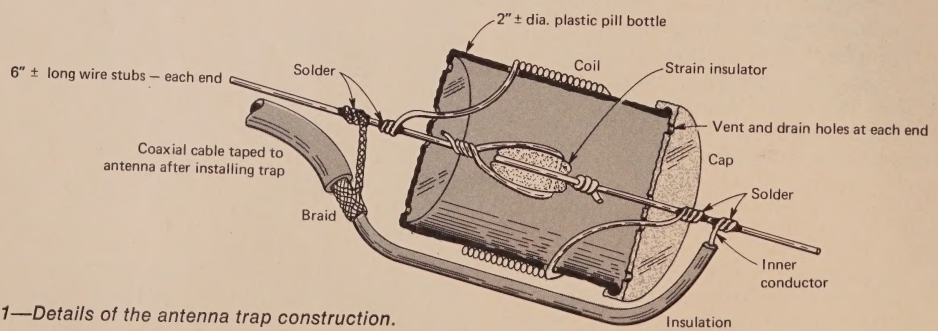



*Fig. 1—Details of the antenna trap construction.*

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A trap is nothing more than a coil with a capacitor across same, and when placed in an antenna it will act as an insulator at its resonant frequency. Most all of the commercial tri-band beams and multi-band verticals use traps in one form or another.

An antenna trap in an antenna when operated off its resonant frequency will act as a loading coil and this will shorten the total antenna length required for its lowest frequency, which in my case was desirable.

My experience with trap-type antennas in the past, was eventual trap failure, due to weathering, so the first order of business was to build a durable trap for 40 and 80 meters. Since a trap operated at its resonant frequency is located at the highest r.f. voltage point in the antenna, the construction of same is most important to eliminate chances of arc-over, leakage and general deterioration from the weather.

I decided to wind my trap coils on 2" diameter plastic pill bottles that I obtained from a local drug store and wind the coils with #18 wire that had a heavy Teflon insulation. This would take care of possible wire corrosion as well as providing dielectric stability.

The next problem was the selection of a durable (weather-wise) capacitor, that could stand up to high r.f. voltages. I decided to use coaxial cable for the capacitor for several reasons. There have been many articles published in the past on making home-brew traps, but as I recall, they used a fixed capacitor and the coil required pruning and fussing with, to achieve resonance. All coaxial cables exhibit a capacity between the inner conductor and the shield and by using the proper length of cable to provide the necessary capacity, the inner conductor is connected to one side of the trap coil and the shield to the other. The cable also offers ideal weathering constants as well as being able to stand up to high r.f. voltages.

Approximate capacity value per foot for common Coaxial cables are as follows:

RG-58.....28 pf
RG-59.....21 pf
RG-8.....29 pf
RG-11.....20 pf

Structural construction of the traps is most important. I used a common egg shaped strain insulator and fashioned two 6" long antenna wire stubs, that would permit soldering the finished traps into the antenna.

I drilled a hole in the center of the pill bottle cap and bottom to pass the antenna wire stubs, and a few extra small holes around the periphery of same for drainage. With the cap removed, the insulator with its stubs was inserted into the bottle and the cap replaced.

My ARRL L/C/F slide rule calculator, based on a capacity of 75 pf, indicated that I would need some 24 turns for 80 meters and 10 turns for 40 meters. The coils were wound in normal fashion and the wire ends were dressed thru appropriate holes and soldered to the antenna wire stubs. I checked the finished coils using a fixed capacitor and my grid dip meter indicated I was in "target" range.

I don't run high power, so I decided to use RG-58 cable for the capacitor, and cut a piece of cable about two feet longer than required. The attachment of the cable to the trap is important, as we don't want it to hang down from the trap and fly around in the wind. I removed the cable jacket and peeled back the shield to suit the length of the coil form. The inner conductor is now placed on the outside of the coil parallel with the coil axis and is soldered to the antenna wire stub. The shield is now trimmed and is soldered to the other wire stub. When the traps are inserted into the antenna, the loose end of the cable is taped to the antenna to secure same.

The next step is to trim the cable length to provide the proper capacity for each trap to resonate it at the desired frequency in the 40 and 80 meter bands. If a grid-dip meter is available, this is no problem, however another method can be used. The antenna trap can be installed in series with the receiver antenna, as close as possible to the receiver, and it will act as a "wave trap" and attenuate a received signal at its resonant frequency. By tuning the receiver to the desired portion of the band for trap resonance, the cable is trimmed to achieve maximum attenuation. If a strong signal or background noise is not present, a signal generator can be used.

Since the cable length, to start with, is cut deliberately longer than required, it is a simple process of nibbling away to achieve the necessary capacity. After each cut, be sure that the shield does not short-circuit the inner conductor. The final trimming is done by pruning the shield only, as this will leave an insulated space to prevent arcing. The cable ends are then protected with coil dope.

I used #14 copper-weld wire for the antenna and starting at the transmitter feed point, I soldered the 40 meter trap into the antenna at 32 feet and the 80 meter trap at 60 feet, and then added another 50 feet, making the total length 110 feet. After I installed the antenna, I used a length of coaxial cable to feed same and grounded the shield.

I fired-up the transmitter and checked the s.w.r. on all bands. 80, 40 and 15 meters looked very good and for some reason, 10 and 20 meters were acceptable, but 160 meters was high. I clipped a 4 foot length of wire on the end of the antenna, but the s.w.r. indicated that I was going the wrong way. I finally ended up removing several feet and ended up with the best s.w.r. on 1815 kHz with some 108

total feet of antenna.

I have been using this antenna for over a year and while I do not consider it a "DXer", it does keep me on the air and permits me to keep in touch with many friends and various Nets. Considering the fact that the horizontal portion averages only some 25 feet high and only consumes 70 feet of real estate, I am very pleased with its performance. By increasing the height of the vertical portions at each end, this will in turn reduce the horizontal length requirement. The inverted "U" configuration that I use was only to suit my particular situation. Other arrangements such as an inverted "L" or "V", etc. can be used.

In conclusion, I would like to mention that several months after erecting this antenna, I put up a 47 foot vertical with a trap for 40 meters at 32 feet. I use the same ground system and for 80 and 160 meters, I use base loading. Using both antennas in many contacts, the inverted "U" won almost 90% of the time as to signal strength.

A final note, is to mention the fact that there are many occasions where a capacitor is required in an antenna feed circuit that is exposed to the weather such as a beam antenna driven element using a "gamma" or "T" match, etc., where coaxial cable could be used instead. ■

***No more overcharging***
***Longer battery life***
***Simple to make***

# Battery Charge Monitor

BY MITCHEL KATZ, W2KPE

With so much electronic, photographic and other equipment using Nicad batteries for power these days, keeping the batteries fully charged can become quite a nuisance. Most instruction manuals specify a 14 to 16 hour charge time to fully revitalize these batteries. They also caution against overcharging them.

At first a G.E. Automatic Timer clock was used and set up for a 16 hour on-off duty cycle. This worked fine but once due to unavoidable circumstances the a.c. was not disconnected from the charger during its off time. Later the batteries went on charge for another 16 hour period! To prevent a recurrance of this the Charge Monitor was built and now this problem has been resolved.

The Monitor plugs into the a.c. socket on the timer clock, however three outlets are provided on the monitor unit so that you can plug in your 2 meter transceiver, electronic flash gun, and whatever else may require charging all at one time. To operate the battery charge monitor, advance the clock dial so that you just trigger the clock *On* switch. One of the monitor neon lamp indicators should light at this time indicating the presence of a.c. into the unit. To start the charge cycle press the *Start* button on the monitor. This will pull in the control relay and charging will begin. A set of latching contacts on the relay will hold it in position until the 16 hours are up and the clock switches *Off.* Once the clock has switched off this will break the latching circuit of the relay causing it to drop out. No further charging can take place until the *Start* button is pressed again. During the charge period a second neon lamp on the monitor will be lit indicating that a.c. is being fed through to the equipment plugged in for charging. Setting the timer clock for *On* at 12 noon and *Off* at 4 a.m. (16 hours) provides a convenient method to tell how much time remains until a full charge is reached.

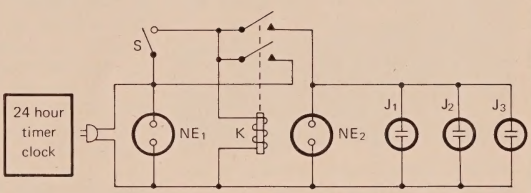



*Fig. 1—Circuit of the battery charge monitor. K is a d.p.s.t. a.c. relay. S is a s.p.s.t. momentary push button switch and J1-J3 are chassis mounted a.c. outlets.*

Construction of the monitor is straightforward. Precautions should however be taken to prevent shock due to the potential involved. The use of a plastic enclosure is recommended but if a metal case is used, do not permit any wiring to come in contact with the case. If a ground lead is available on the a.c. line this should be attached to the case.

This very simple unit has proven a great convenience in caring for all those Nicad battery devices ■

# 1975 CQ World-Wide DX Contest CW Results

BY FREDERICK CAPOSSELA, K6SSS, DIRECTOR

The 1975 World-Wide DX Contest turned out to be the largest in history — with a record-breaking 3,802 logs received (1858 Phone/1944 C.W.). Which makes the annual Fall event more than twice as big as any other DX contest in the world.

And, leading the way on c.w. last November was EA8CR operated by former winner OH2MM who came mighty close to breaking the Single Op-All-Band record.

Single Band honors went to CX4CR keyed by CX9BT who inched closer to becoming the first to break the one million point barrier on c.w.

The battle for top USA All-Band went to W3LPL who nosed out W6MAR. Interestingly, all USA Top Ten used 160 meters for extra multipliers.

The big news in the Multi-Single category was the new world's record set by the gang at FY7AK with a 4-million plus effort.

In the Multi-Multi division, that Potomac powerhouse, W3AU, led both the USA and the World. While the Club Competition once again went to the invincible PVRC contingent. Congratulations on another grand effort!

### *Eleven New Marks Set*

In addition to the FY7AK Multi-Single record, world marks were also established by CX4CR on 14 MHz. and by KV4FZ on 3.5 MHz. Congratulations are in order too to new record holders W5WZQ, ZL3GQ, CT3/OZ5DX, YV1OB, CV4DL, VK6HD, UT5BP and 4X4NJ.

### *Doesn't Anybody Stay At Home Anymore?*

Or at least at the same place they operated from last year. The way contesters move around from year to year, you can't tell the players without a scorecard. For example, remember VS5MC? Well this year Maurice wasn't in VS5, he was in G-land. While last year's 3D2DD was this year's VE3EZM; HS2AIG turned out to be KA6DX; VK2BKM became OE1AKA/3; even yours truly caught a jet for the alumni reunion at WA2ZAA. Somebody who surprised everyone by not going anywhere was OH2BH — he stayed home and set a new European 20 meter phone record. Being at home, however, can have its drawbacks. WB4KSE had more trouble creating a pile-up this year than last when he was 28 MHz. world top from WB4KSE/KW6. K4KQB had the same problem, in 1974 he signed KG6SX. But one guy had the best of both worlds, he got to operate both W0BWJ and KH6IPY on phone during the *same* weekend. His secret? He's a pilot for Western Airlines.

### *Your-Secret-Is-Safe-With-Me Dept.*

Once again I promise not to reveal the call of the European who decided that this year nothing would be left to chance with his log. So, using the "Belt and Suspenders Technique", he proceeded to mark a neat "X" in both the Phone and the C.W. box of his summary sheet.

Nor will I identify the K6 with 13 dits at the end of his call who spent a fruitless hour at sunrise Sunday morning (14 to 15 GMT) calling OH1XX, UA1DZ and 4J3A on 3.5 MHz long path without getting so much as a QRZ from them.

### *Busted Callsigns—A Revelation*

Busted callsigns. Where a valid contact has been made, but the callsign gets logged incorrectly because of human error. Due to phonetic and language difficulties, it's easy to assume that the problem is confined exclusively to phone.

However, analysis of tape recordings and logs over several years shows that the problem is just as prevelant on c.w.—believe it or not—as on phone. But how can that be since c.w. is a much more precise method of communication?

What creates the problem is improper technique — not sending the callsign of the station being worked so as to give him the opportunity to challenge and correct it if you've got it wrong. It cost a lot of people points this year. And, so, a word to the wise before it might cost you more dearly.

### *Doing It The Hard Way*

Congratulations to the steadfast contestants who triumphed over some murderous callsigns. Like the gang at CT3/OZ5DX whose inverted call insured that nobody would pass them by thinking "just another OZ." And also to WL7IBP/WN7 who had to do it all in the QRS segment of the Novice band.

The scores turned in by OA8V and VK5HP are truly astounding, too, considering all they had to punch their way through was super-sharp operating technique — and 2 w. out.

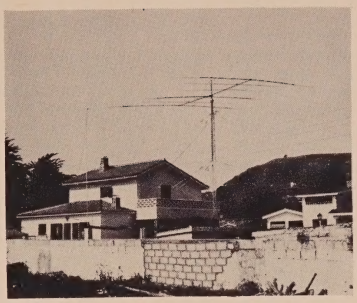
### *From One Extreme To Another*

The signal you heard from DJ3KR/OA4 came from a QTH up at 11,000 feet where Jurgen was conducting equatorial experiments at the Observatorio de Huancayo in the High Andes. Meanwhile, down at sea level on the other side of the globe, the Multi-Single operation at G4EOK took place aboard the historic cruiser, *HMS Belfast,* anchored permanently in the River Thames opposite the Tower of London. It's now a floating museum and visitors are welcome, contact G3HZL.

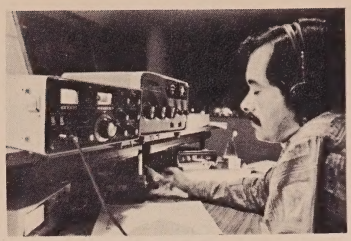
### *Oops*

The trophy for Single Operator/All Band Phone operation in the Caribbean/Central America will be





Single Op/All Band Champ OH2MM who operated from EA8CR. QTH is 2,000 ft, above sea level, but surrounded by mountains.





CX1AAC and OA4AHA operating OC4A. Their 40 meter quad sure helped boost their score.



The FY0BHI team broke both the Multi-Single record and the 4-million point barrier, KP4TIN, F5QQ, F2QQ. They also placed first in the unofficial colorful shirt competition.



VP5AH with some of the gear that helped him make 100 K on 21 MHz.



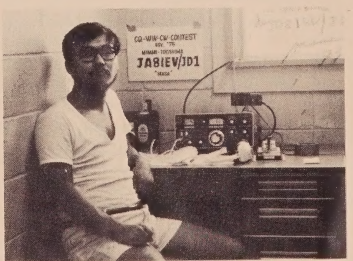
The 40 meter full-size 2 el. at DJ5PA.

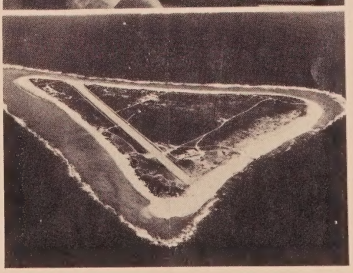


Overcoming a jawbreaker callsign, CT3/OZ5DX ran up 3.4 million to take second Multi-Single. Congrats to OZ5DX (above) and teammates OZ1LO and OZ6XT who hauled nearly 300 lbs. of gear to a spot on the east coast of the Island, 600 ft. above the water.



Third place Multi-Single YV5ANT operated by YV5AAQ (l.) and YV5ANT (r.) plus YV5AAS, YV5BNR, YV5BZT.



JA8IEV/JD1



4X4UH piloted 4X4RD to second place on 21 MHz.



OK2BLG

**U.S.A. Club Scores**

| | |
|---|---|
| Potomac Valley Radio Club | 43,519,660 |
| Frankford Radio Club | 37,018,285 |
| Western Washington DX Club | 14,931,280 |
| Southern California DX Club | 12,333,516 |
| Richardson Wireless Klub | 12,237,462 |
| Murphy's Marauders | 10.525,825 |
| San Diego DX Club | 8,312,849 |
| Indy DX'ers | 6,025,327 |
| North Florida DX Association | 5,525,969 |
| Central Ohio DX Association | 4,243,055 |
| Northern California DX Club | 4,229,684 |
| Central Virginia Contest Club | 3,691,286 |
| Buffalo Area DX Club | 2,966,932 |
| South Florida DX Association | 2,958,076 |
| Southeastern DX Club | 2,971,492 |
| Texas DX Society | 2,940,249 |
| Delta DX Association | 2,752,937 |
| Northern California Contest Club | 2,694,316 |
| Arizona DX Club | 2,457,171 |
| Connecticut Wireless Association | 2,422,350 |
| Wireless Institute of the Northeast | 2,161,562 |
| Southern New England DX Association | 1,711,960 |
| Willamette Valley DX Club | 1,639,274 |
| Order of Boiled Owls of New York | 1,288,329 |
| Northern Illinois DX Association | 1,265,052 |
| Eastern Iowa DX Association | 1,178,574 |
| Michigan DX Association | 821,805 |
| Bluegrass ARC | 803,406 |
| Alamo DX Amigos | 528,393 |
| Four Lakes ARC | 521,502 |
| North Alabama DX Club | 303,592 |
| Knights of the Round Table | 298,692 |
| West Palm Beach ARC | 271,882 |
| Canton ARC | 255,115 |
| Rockford Amateur Radio Association | 221,441 |
| Southeastern Virginia Wireless Ass'n | 205,110 |
| Joliet Amateur Radio Society | 193,510 |
| Colorado Contest Conspiracy | 151,018 |
| Ohio Valley Amateur Radio Association | 110,318 |

**DX Club Scores**

| | |
|---|---|
| Rhine Ruhr DX Association | 21,923,910 |
| Kaunas Polytechnik Institute R.C. | 9,498,461 |
| DX-Club SAAR-PFALZ | 8,312,211 |
| Chelyabinsk Region Radio Club | 8,114,918 |
| Suddeutsche DX-Gruppe | 5,760,452 |
| Lampertheim DX Group | 4,204,565 |
| Danish DX Group | 4,094,305 |
| Channel Contest Group | 3,716,500 |
| YU DX Club | 3,503,771 |
| Canadian DX Association | 3,322,611 |
| Moscow Radio Club | 3,194,646 |
| SP DX Club | 3,087,636 |
| Voroshilavgrad Radio Club | 2,999,384 |
| Lvov Radio Club | 2,946,641 |
| Exeter Contest Group | 2,488,990 |
| Toronto DX Club | 2,000,986 |
| Kiel Canal Activity Group | 1,371,216 |
| Uruguay DX Club | 1,174,412 |
| Radio Club of Bukhara | 1,109,634 |
| Vasteras Radio Klubb | 756,754 |
| Imperial College ARS | 718,788 |
| Calgary ARA | 656,623 |
| Univ. of Southampton Radio Club | 648,456 |
| Radio Club Varna | 617,865 |
| Club SK5AJ | 494,693 |
| Tallinn Radio Club | 401,785 |
| Sezioni A.R.I. Cesena | 375,550 |
| L.A.B.R.E. | 335,535 |
| Leningrad R.C. | 294,591 |
| Winnepeg DX Club | 191,769 |
| YV CW Club | 112,484 |
| Shizuoka DX Radio Association | 105,110 |
| Royal Navy ARS | 104,280 |
| Swiss DX Club | 78,953 |
| Greater Peterborough ARC | 73,503 |
| Tesla Val. Mez. Radio Club | 62,443 |

awarded to Louis C. Skoczek, WB9AJF/6Y5. Inadvertantly, the name of TI2WX appeared as the winner in last month's Phone results. Apologies to both contestants.

### *A Plea In Writing*

I'm making it again this year because nobody took me seriously last year. My plea about not recopying logs. I guess not everybody agrees with me that recopying a log is a pain in the neck. Because this year we still got hundreds and hundreds painstakingly re-printed line by line from a dedicated band of re-copyists. Fellas, please, please just make a readable photocopy or carbon of your log, rewrite any illegible calls, take out your dupes, score it and drop it in the mail. Contests are supposed to be fun. Spend your time on antennas or getting ready for the *CQ* 160 or ARRL Tests.

### *Capossela's Farewell Address*

It isn't going to be easy. But with this year's Contest Results, I must reluctantly announce my retirement as Director of the World-Wide DX Contest.

38 isn't exactly retirement age, but the press of business and family responsibilities makes it necessary at this time. Amateur radio has been an important part of my life for 25 years. But it has never meant more to me than during the 10 years that I have served on the Contest Committee. For I've had the priceless opportunity to meet and visit with hams around the world and been able—no matter what language we speak—to share our common passion: DX contests.

As Director of the DX Contest, I've served with a dozen of the most talented and dedicated men I know — the members of the Contest Committee. I don't say that because they agree with me. They often don't. But I know that whatever is said is said with only one thought in mind — a heartfelt conviction to do what's best for the Contest. Not only are they good men. They're experts. The number of contests they've won is staggering. As is the number of callsigns they've operated from all over the world. The Contest is in very good hands.

Before I close, I would like to thank some special people. First, the man who taught me everything I know about running a DX contest, Frank Anzalone, W1WY. And Dick Ross, Al Dorhoffer and Dick Cowan of *CQ* whose unswerving commitment to the Contest made a tough job a lot easier. And to contesters everywhere who have given me your opinions and your support over the years. Thank you. It's been an extraordinary experience. And a pleasure. I'm going to miss it.

### *Credit Where Credit Is Due Dept.*

No one deserves your thanks more than the 12 tireless members of the Contest Committee who produced the 1976 Results from more than 545 lbs. of logs we received this year. Our Chairman, Frank Anzalone, W1WY; and members Gene Walsh, K2KUR; Bob Cox, K3EST; Bernie Welch, W8IMZ; Dave Donnelly, WB2SQN; Dick Norton, W6DGH; Larry Weaver, W6JPH; Glenn Rattmann, W6MAR; Jim Neiger, W6BHY; Phil Goetz, W6DQX; Larry Brockman, WA2EPQ and Fred Laun, W9SZR. And to Kim Smith at *CQ* who made sure all logs got to California to start with. And our special thanks to Daryl Kiebler, WB8EUN, and his wife, Olga, for all their help.

That's it for now. Good luck with your antenna work over the summer. Just remember, if it didn't fall down last year, it probably wasn't big enough. The C.W. Contest this year is November 27 & 28 (Thanksgiving weekend).

73, Fred, K6SSS

## USA QRM

A beam 6 feet off the roof doesn't do too well . . . WB2NDR. Disappointed not to hear even 1 watery JA on 21 MHZ . . . WA2MBP. After a fantastic 20M Pacific opening, I went down to catch an hour's sleep at 4AM. The next thing I knew it was 5 hours later. Why me? . . . WA2AJN. Wkd longest string ever of JA's, but not one VK or ZL or LA or KL7 . . W3AFM. Condx El Stinko! . . . WA4UAZ. P29MO sure had nice signal on 40 meters . . . WB4KSE. Not as busy as when I was KG6SX last year! . . . K4KQB. Ever heard of isometrics? Excercising in opposition to an immovable object. In my case, that object being the east and west coasts! . . . WA5VDH. Usual terrific thunderstorm on Saturday night . . . W5QKR. Worked 81 JA's during one hour; lost one hour the second morning when rain noise rose to 20 db over S9 during the passage of a cold front . . . W5WZQ. Wish more DX stations were aware of long path openings on 40 mtrs, 4J3A was 20 over 9 here Sunday morning . . . WB5DTX. Long path 40 into Europe - receiving much louder than they receiving us . . . K6QW. Operated portable in Santa Cruz mtns. Used 6 gal of gas for MG set . . . K6QZ/6. I don't want to talk about it . . . K6DC. Two new countries on 80 made the "Suffering" worth while . . . VE3DXV/W6. Was my first contest, didn't score a lot of points but had a lot of fun! Will do better next year!! . . . WL7IBE/WN7. Awful conditions but I didn't have enough sense to quit . . . W7APN. Working EJØA in Ireland on the long path. He peaked at 30DB over S9 when he QSO'ed W6CQF before me and faded to S8 Hi Hi . . . W7JLU. Finished building my WB4VVF Accu-memory keyer day before contest. Found it a tremendous help . . . W8KFL. Believe it or not we had thunderstorms in Illinois in Nov.! Sure didn't help the static level any . . . K9UQN. Lynch George Jacobs! or Somebody . . . W3YIK. When W5's and WØ's take me into Europe on 80, you can be sure all is not well on 3.5 MHz. . . W1ZM (opr. WA2CLQ). 80M. produced many exotic zones on long path . . . W6PVB. Yawn! Hope condx pick up or I'm going to sit home and listen to the dial tone . . . WA3ATX. New antennas and no homework made operating this one a pleasure . . . WØEEE. Biggest thrill by far was the long path JA's on 40; Although they were not strong, they were much easier to work than Europeans - - What does that mean? . . . WA1STN.

## DX QRM

On the whole, fun to participate . . . TF3IRA. On Monday after the contest I had an examination in my medical course . . . I1EFC. My first CQ WW Contest was in 1952 as G2BW. Still the best contest and hope to make many more . . . 9H1CH. Big thrill working JA3ONB (on 1.8 MHz) for first ever PA-JA QSO . . . PAØHIP. QRP operation is fun but contest operation is diffeicult . . . SP1CQN. Yuggghhh!! . . . GM3WRN. Went single band because I broke both shoulders some months ago and did not think I could manage to operate the whole time. Now 69 years old and 45 years a ham! . . . GM6RV. Like your contest but hate rewriting these logs, so this year I have made copies. Hope you will accept that . . . SM5BRS (Amen - - we prefer copies of your original logs, fellas . . . Ed.). Took part in the multi-op from SMØPX but couldn't resist doing a bit from home as well . . . SMØBDS. The pileups are still a big thrill. . . HB9AJY. It was a pleasure to climb up on the pole of the beam at 0200 GMT because the weight of the snow was doing strange jokes! . . . HB9ZE. First morning operated 10/15 with the 80M dipole by mistake . . . but it worked anyway! . . . YU3EY. The only station worked on 20 long path was W7NQ . . YZØSRJ. Reduced my dupe count by signing after every QSO; Still 83 stations with very bad memories . . . EA8CR (OH2MM, Opr.). Ethics leave something to be desired. W's used to observe "KN" better in former times. Nobody knows what "5 Up" means, many didn't know where C5 was located, etc. . . C5AJ (Opr. DL7AH). Never called one station, relied on CQ's. Had beam NNW all the time (turn by Armstrong method AM62 and have a peg leg, so keep beam in one position!) . . . ZE3JO. 80 meter band clear of traffic and jamming until 2200Z on 30th. . . ZE1KV. Most all good DX drowned out here by Europe. Very little heard from South America . . . EP2OD. Last time I worked the CQ WW Contest was in 1967 when I was world high on 7 MHz. ew . . . 4X4RD (Opr. 4X4UH). Would have done better if some Russian stations were not afraid to QSO. Evidently my call was pirated on 160 m. during the contest, although I was not on that band . . . 4X4NJ. The good news: Worked PJ9JT on 40; the bad news: Missed JT1AT on 80 . . . 9V1SH. I suggest that contests be limited to the lower 30 or 50 kHz of each band. This would ease tune-ups and allow room for non-contestants . . . 9V1SO. Enjoyed the contest much more than last year. Will be on again next year . . . 9M2FK. Have been off the air for 35 years . . . VK4RU. Just a token appearance. Was too busy for full participation . . . VR1AA. Between work and sleeping, had almost no time for the contest. Will do my best not to work this weekend next year, but won't be in Guam then, either . . . KG6JEU. Biggest non-thrill was when linear gave up the ghost . . . KG6JAR. Much more difficult to find multipliers this year . . . KH6CF. Conditions were either too bad or too good for my QRP . . . KH6IFU/KH6. Put up 5/8 wave vertical but 2 days before contest it blew down, so cut out bent section and back up to ½ wave. It works! . . . KH6HSW. Operated for many hours without contacts on 160. Seems last two years interest has dropped off . . . KH6CHC. Had hoped to be back multi-band this year, but my quads get blown down in a 100+ mph wind . . . ZL3GQ. The trip to Gibralter was a troublesome one, through 12 customs via EA7, CN8, to ZB2 . . . OH3XZ (Opr. of ZB2X). Two hours before the contest started, a storm wind decided for me to go single band on twenty. I'm still searching for my 80/40 delta loop antennas . . . ON4XG. The only W6 stations worked (and heard) here were on 40 meter long path . . . LZ1QO. I got my thrill to work EA8CR on six bands . . . DL7AV. The first time since 1948 that I heard no signals on 10 meters during the CQ WW CW contest. . . G3DYY. If nothing else, the slow rate of scoring demonstrated how uncomfortable my operating position is, so I took time out to re-arrange the shack . . . G3JKY. I had the feeling quite often that I was working a memory keyer, rather than real operator, those perfectly sent but monotonous reports . . . G3TXF. Ever see ¼ - inch guy wires grow to 1¼ - inch in freezing fog? . . . G3GRL. Second day alarm clock failed to awaken me at 0400. Missed 3 hours 14 MHz opening . . . G3PVA. Still king of the



HB9KC

contests . . . OH6DX. Great long path opening on 40 meters to USA on Sunday afternoon . . . OH1VR. Called YV1OB for 3 hours on 160 . . . OK1ATP. My apologies to the W and JA gang. Mountains killed all signals from these areas. . . OE1ELW/3. This is the result of 48 hours of concentration and of bringing 125 kg. of radio gear and antennas from Denmark to Madeira . . . CT3/OZ5DX. Sorry to disappoint many who had hoped that we were portable on Kure Island . . . KH6RS/KH6. This contest has shown me amateur radio from a new and interesting point of view . . . TF3KX. Thought I had new one (4J2A) until I read DX bulletin. . . VP5AH. I haven't much time to operate because only 1 week has passed from my marriage! . . JA9BOH. Saturday I could not work in my shack but I did work at my company. Hi! . . . JH1JGX. Leider ging 15M. Beam wieder kaputt!. . . DLØII. Took part to give Sicily multiplier to DX operators and we found much fun . . . IT9TAI. 80 meter antennas between the two 360 foot towers of old and well-known Motala Longwave Station . . . SK5AJ. 73 for American boys . . . UK2BBE. Enjoyed the contest using a special call this year though old one, UK3AAO, sounds better. . . 4J3A. We are optimists and are looking for good condx in CQ WW contest in 1976 . . . UK5MAF. I got much pleasure from talking on the contest. . . UL7OAO, I am sorry about the bad operating from some stations in Europe on 80M . . . UA3LM. 73 and much success in umpiring this contest . . . UA3YH. I heard many W/K stations on 80 but with my power I couldn't get through . . . UA6LLT. His call was CT3XOZ, or was it CT3/OZØ Maybe CT3OZ? How about CT3/OZ5 DX? What was it? . . . UT5BW. Had to climb tower in a rainstorm in the middle of contest to turn the beam, almost became a silent key . . . PY2FRW. Greatest thrill when 9M8HB called me . . . CE0AE. KA2WM, KA2AC, KA2USF live less than 3 city blocks away. Much QRM!! . . . KA2WF. Had planned to operate multi-band with Quad, dipoles and vertical but typhoon June winds wiped us out! . . . KA6DX. Boy, it is great being on the other end! When the rare ones call you. That's living! . . . VP2MIR (W7IR Opr.) Biggest thrill was not replacing a diode in the L-4B power unit at midnite, but having the diode at all! . . . VP5GS (W4BRB opr.). Lost about 12 hrs - - next year I'm not going to bowl or sleep. 73 . . . WA1RFM/VP9.



JA6SVP

**Number groups after call letters denotes following Band. (A-all) Final Score, Number of QSOs, Zones and Countries. Certificate winners are listed Bold Face.**

## SINGLE OPERATOR ALL BAND NORTH AMERICA

### SINGLE OPERATOR U.S.A.

**W1ZM A 724,815 746 96 955**
(Opr. WA2CLQ)
W1DAL A 525,210 610 85 220
W1CMH A 428,876 530 79 210
K1AGB A 202,008 338 72 156
W5DUK/1 A 201,079 316 70 163
WA1STN A 160,035 280 69 158
W1JFL A 129,580 254 65 124
W1PL A 117,200 220 63 137
WA1NRF A 100,625 221 57 118
K1TZQ A 61,950 157 51 99
W1WY A 47,336 147 40 82
W1HX A 44,968 138 51 103
W1CNU A 44,506 134 35 84
W1GPK A 39,312 128 38 79
WA1SKV A 21,825 102 22 53
W1SD A 19,320 82 30 62
WA1UAD A 12,160 62 22 48
WA1UAW A 5,459 44 22 31
WA1HAA A 3,910 41 17 29
W1OPJ A 3,219 29 14 23
**WA1HFN 28 2,380 35 9 19**
K1LWI " 231 10 4 7
**W1YG 14 112,312 403 28 73**
WA1SCX " 37,960 148 20 53
W1HDN " 37,146 161 22 60
K1LMS " 13,514 83 17 41
W1PLJ " 2,660 35 7 21
**W1YN 7 50,034 198 25 68**
WA3NAF/1 " 1,104 19 9 14
W1MX 3.5 41,616 217 17 55
(Opr: WA8WNU)
W1OR " 8,216 61 16 36
W1SWX " 7,296 56 18 30
**K1PBW 1.8 6,948 73 12 24**
W1BB " 2,574 34 8 18

**W2GXD A 829,062 849 103 248**
**W2DXL A 663,762 703 94 245**
K2TQC A 479,895 555 94 227
W2GGE A 468,990 483 73 197
W2LYL A 229,272 362 73 160
W2HNO A 201,588 357 63 151
K2FL A 186,912 302 72 164
W3HBJ/2 A 149,952 364 40 102
W2FVS A 146,970 274 65 148
W2MHH A 107,562 224 60 122
W2DT A 82,080 212 41 94
K2JOC A 79,895 197 48 97
WA2UOO A 70,760 183 55 90
WB2HZH A 69,204 184 48 98
WZ2HN A 64,239 155 51 110
W2ZZ A 52,109 172 31 76
WA2VYA A 39,697 134 39 68
WA2LJM A 36,387 125 39 78
WB2RJJ A 28,860 102 40 71
WA2EAH A 22,590 92 29 61
W2HUG A 20,482 93 36 62
W2EUO A 15,980 75 29 56
K2MFY A 13,572 73 29 49
WB2ROX A 9,198 55 22 41
K2QIL A 7,208 52 19 34
WA2CXQ A 5,559 41 19 32
WB2RKK A 4,815 40 16 29
WA2EJZ A 4,089 35 18 29
WB2FNS A 1,525 23 10 15
WB2NDR 28 273 10 5 8
**W2HBT 21 61,160 247 22 66**
WA2MBP " 27,720 143 20 52
WB2MMR/2 " 23,040 135 16 48
WA2PAT " 1,482 23 8 18
WA2LCC " 4 1 1 1
W2NIN " 47,564 517 24 68
**W2AO 14 172,020 483 30 92**
W2AX " 145,464 439 26 88
W2CKR " 19,176 100 21 47
WA2AJN " 100,572 349 26 76
WA2ZWH " 22,839 117 19 50
**K2LWR 7 58,752 208 28 74**
(Opr: WA2BCK)
K2IGW " 16,932 105 21 47
WA2AUB " 3,441 40 11 26
**W2LWI 1.8 1,302 27 7 14**
W2BP " 900 22 6 12

**W3LPL A 1,003,055 861 112 303**
**K3GJD A 829,836 816 105 251**
**W3BGN A 704,054 745 99 239**
W3GRF A 564,852 651 90 219
W9SZR/3 A 525,600 650 83 209
K3EF A 467,874 561 87 219
W3VT A 319,634 402 82 207
W3JSX A 256,515 386 76 169
W3NZ A 250,711 386 75 164
W3MFJ A 212,288 413 67 147
W3FA A 205,320 334 70 162
K3BW A 200,046 322 70 161
W3GRS A 187,498 293 72 169
WA3RBN A 186,684 353 58 130
WA3SZI A 185,152 378 52 124
W3OV A 158,388 289 64 137
W3KFQ A 157,716 361 42 114
W3YIK A 150,015 265 65 154
W3KT A 149,599 262 63 148
W3ZJ A 105,350 238 56 119
K3TGM A 86,762 217 42 100
W3BB A 84,582 230 39 88
WA3WRD A 84,102 237 41 90
W3GL A 78,894 195 57 105
K3ZOL A 64,186 179 45 89
W3DBT A 55,742 151 47 91
W3BIP A 50,025 129 53 92
K3ZAW A 48,000 132 44 81
WA3YQW A 47,375 146 38 87
W3ARK A 40,184 144 48 88
W3HVM A 35,400 116 42 76
W3CGS A 33,500 119 30 70
W3EVW A 28,836 100 40 68
W3GID A 22,515 77 39 56
WB9BXX/3 A 17,199 83 35 56
W3KA A 12,139 71 19 42
WA3SZV A 10,472 58 22 46
K3BNS A 8,850 58 20 39
W3AEL A 8,396 75 19 39
W3ML A 726 19 10 12
**WA3SWF 14 149,270 432 32 86**
W3AFM " 79,502 210 28 99
K3JGJ " 59,400 230 24 66
W3CRE " 35,500 171 19 52
(Opr: WA1RGW)
K3DR " 9,408 68 18 30
K3NEZ 7 2,738 30 15 22
**K3AV 3.5 6,680 67 11 30**

**WB4AEX A 547,032 711 78 198**
**W4YWX A 505,440 599 95 217**
WA4LZR A 436,320 651 67 173
(Opr. WA4FCT)
W4MYA A 344,760 494 75 180
W8FAW/4 A 303,592 401 89 188
W4RX A 252,266 361 82 177
W4BV A 211,653 322 76 167
K4CL A 190,323 498 62 129
K4II A 179,868 314 85 171
K4HWW A 172,598 309 68 143
W4ZSH A 169,332 311 61 145
WA4TLB A 163,400 286 68 147
WB4BVY A 117,648 258 54 117
W4DM A 115,230 261 53 114
K4BAI A 89,362 194 65 117
W4YZC A 89,232 193 53 116
W4HOS A 82,216 173 58 114
W4LVM A 74,724 189 50 106
K4JM A 64,014 158 52 89
W4KNW A 63,245 163 50 89
WB4FOT A 60,248 158 48 88
WB4YPT A 56,855 180 42 95
K4AUL A 53,040 150 43 93
W4NQV A 49,700 141 47 93
W4GF A 47,580 135 41 89
K4DTD A 46,698 135 45 84
K4KA A 45,126 138 50 88
W4NQA A 34,505 125 34 69
W4HJ A 34,375 109 47 78
WB4RUA A 33,417 102 58 83
K4FOK A 29,184 118 33 63
W4OZF A 28,512 106 37 62
W4RW A 22,794 111 27 60
K4ZT A 19,688 82 34 58
WA4EWX A 19,440 86 27 63
W4WBC A 17,679 82 28 55
WB4IUX A 17,010 78 34 56
K4TBN A 13,920 65 29 51
K4UEE A 10,672 64 36 56
WB4BWHE A 10,336 65 29 44
K4ZA A 7,938 51 21 42
WA4HPF A 3,192 32 21 28
WA4EPM A 2,993 26 18 23
K4EJG A 2,580 25 20 23
WB4NDR A 2,410 51 19 26
WA4GQJ 21 6,157 49 17 30
**K4VX 14 207,909 617 29 88**
W4AAV " 177,014 453 32 92
W4WSF " 186,876 560 30 86
W4EEO " 4,320 32 14 31
WA4UAZ " 455 13 5 8
**W4QCW 7 83,904 267 29 85**
WB4KSE " 54,648 203 26 73
K4KQB " 27,390 125 23 60
WB4QKE " 25,315 115 24 59
WA4APG " 7,050 59 16 31
**K4DBZ 3.5 27,072 144 17 55**
K4EZ " 8,648 75 12 35

**WA5RTG A 305,892 448 87 174**
W5RTX A 230,300 363 74 161
W5SBX A 163,520 269 76 148
W5OB A 85,635 189 61 112
W5HIC A 65,852 182 56 107
K4KEW/5 A 55,096 144 52 90
W5OSJ A 51,475 146 60 85
K5FVA A 48,384 142 54 90
W5PLO A 31,472 115 46 66
W5EJT A 27,639 103 44 67
W5JC A 20,516 94 37 55
K5PFL A 5,184 38 24 30
WB5OOW A 3,913 36 19 24
K5LZJ A 2,470 26 17 21
K5PXV A 55 5 6 5
**WA5VDH 14 112,437 377 32 85**
K5BGB " 99,123 326 30 81
W5QKR " 92,505 327 31 74
**W5WZQ 7 229,548 722 31 80**
WB5DTX " 135,900 473 29 71
WB5DDI " 3,567 50 11 18
**K5JVF 1.8 420 13 7 8**

**W6MAR A 956,848 1096 111 205**
**K6CQF A 708,295 1016 95 150**
**K6OVJ A 702,800 971 98 153**
**W6ANN A 682,158 870 107 175**
(Opr. W6DQX)
W6PLH A 400,158 691 83 115
WA6EPQ A 367,346 501 95 171
W6RR A 356,349 484 85 154
WB6KBK A 306,179 504 81 142
W6YX A 164,865 437 57 88
(Opr. WA7MQX)
W6HJP A 160,268 289 82 124
K6DR A 133,224 306 69 87
K6YYQ A 125,951 339 59 74
W6OKK A 112,632 273 63 89
W6UA A 101,067 201 65 112
W6NKR A 87,039 186 64 107
W6YKS A 78,360 239 52 68
W6JPH A 75,350 207 57 80
W6BZE A 67,044 217 46 65
G3DPX/W6 A 34,272 126 41 55
K6WD A 33,620 143 36 46
WA6GFY A 30,597 129 46 47
(Opr. WB6EXW)
W6JOT A 28,362 120 38 49
K6MA A 18,626 107 34 33
WA6TKT A 17,286 68 42 44
K6PI A 16,512 92 29 35
K6OZI A 13,916 73 29 42
W6YMH A 13,504 85 28 36
W6CLM A 11,776 68 26 38
W6AM A 10,240 89 20 20
(Opr. W6BHY)
W6SC A 6,444 65 16 20
K5MHG/6 A 5,733 46 20 29
K6SSS A 3,700 30 23 27
WA6UFY A 3,542 37 21 25
W6FUZ A 2,030 24 12 17
W6KYA A 1,701 26 11 16
WA6ORJ A 775 21 14 11
**K6SDR 14 156,618 488 30 83**
WA6IQM " 110,295 414 32 63
K6AO " 46,102 228 27 47
W6FF " 8,100 61 20 30
**W6MUR 7 196,730 660 32 71**
K6QW " 105,070 456 29 50
W6ITY " 103,269 412 30 57
K6QZ/6 " 70,280 347 25 45
K6DC " 32,396 213 23 69
K6CU " 6,726 63 17 21
**VE3DXV/W6 3.5 22,040 215 15 23**
**W6RW 1.8 1,050 29 8 7**

**W7TML A 410,960 665 83 137**
W7YTN A 156,215 364 65 92
W7ZMD A 91,466 216 68 98
W7YBX A 61,525 210 52 55
W9IRH/7 A 46,652 164 49 60
W7LR A 40,767 148 49 58
W7NP A 38,874 156 38 55
W7WMY A 36,888 127 51 65
W7LZF A 35,232 138 39 57
WA7JCB A 29,264 171 29 33
WA7HRE A 23,088 100 47 64
W7HAD A 18,816 106 31 33
K7MOK A 12,506 87 35 39
W7GYP A 5,250 45 18 24
W7VRO 21 4,680 54 14 22
WL7IBE/WN7
" 697 20 8 9
W7MH " 144 6 4 5
**W7APN 14 46,023 242 23 46**
W7KAR " 8,964 61 19 35
**WB7ABK 7 31,941 180 23 40**
W7AYY " 6,900 85 13 17
**W7JLU 3.5 21,648 182 19 25**
WA7OAU 1.8 90 12 5 4

**WA8YVR A 491,910 624 84 201**
K8MFO A 255,115 371 72 187
W8RSW A 84,168 178 52 115
WA8JUN A 55,350 159 56 94
W8DSO A 28,301 112 31 60
W8TWA A 26,344 107 28 61
WB8FOS A 20,000 121 36 74
K8IRC A 17,724 80 28 56
W8GQC A 6,150 48 20 30
WB8SVW A 5,880 40 24 36
W3GN/8 A 4,420 40 20 32
WA8TDY A 2,701 53 20 41
**W8WPC 28 2,784 46 10 22**
W8VSK " 1,250 30 7 18
W8KPL " 1,032 20 9 15
**WA8KCX 21 30,300 146 21 54**
**K8IDE 14 220,345 598 33 94**
W8KFL " 170,232 483 34 89
**K8HLR 7 54,200 214 27 73**
K8LUU " 33,000 146 25 63
K8UQA " 389 18 8 13
**WB8DO 3.5 6,422 80 13 25**
**W8LRL 1.8 6,055 70 12 23**

**W9RER A 320,568 495 76 152**
K9KGA A 181,902 363 64 119
W9DWQ A 124,256 261 57 119
WA9RJI A 119,196 238 67 131
K9OTB A 117,902 261 48 119
W9OHH A 93,956 219 56 110
W9SFR A 62,020 159 44 96
K9UTN A 57,218 160 40 82
WB9EBO A 50,375 155 45 80
W9PJT A 48,492 172 36 72
K9UBF A 40,061 148 34 63
WA9BWY A 3,132 32 16 20
**WA9LZA 21 23,779 115 23 56**
W9LKI " 10,441 72 18 35
WB9MDB " 8,532 59 19 35
K9DAF " 1,313 35 14 25
**W9MEM 14 197,316 594 31 85**
**WB9LHI " 195,644 578 31 87**
K9CLO " 72,576 274 29 67
W9GIL " 55,581 200 24 73
K9TZH " 39,221 138 24 67
K9KWK " 24,768 125 24 48
K9UQN " 24,017 115 22 51
K9FRZ " 1,534 23 11 15
W9YYG " 288 9 5 7
**W9GTA/9 7 18,104 100 23 50**
**W9LT 3.5 11,718 97 17 37**
K9UKM/9 " 1,975 40 7 18
W9UDK " 1,235 34 7 12

**WA9ONL A 273,710 488 66 136**
WA9VDX A 157,806 308 69 129
WØIUB A 106,741 239 61 112
KØFLY A 80,682 235 39 80
WAØCPX A 77,352 213 50 82
WØJU A 53,064 152 48 84
WBØANT A 42,051 141 41 66
WØFHE A 34,238 129 39 67
WAØWCR A 22,496 113 26 48
WBØFCY A 6,674 50 18 29
WØMJN A 6,016 47 31 34
WBØGRJ A 5,508 46 22 29
WAØFBQ A 2,722 43 23 32
WØMUH A 1,976 32 12 14
**WØPCO 14 169,218 508 33 86**
KØIEA " 60,864 225 24 72
WAØEMS 3.5 462 19 5 9
WØMOQ " 204 8 5 7

### SINGLE OPERATOR NORTH AMERICA

Alaska
**WA3GHC/KL7 A 85,932 482 32 31**
KL7HIK " 68,912 354 31 42
KL7IDH " 44,330 263 31 34
**KL7HCN 14 25,327 200 15 28**
**KL7JDO 3.5 1,722 54 7 7**
Bermuda
**WA1RFM/VP9**
**A 417,944 1071 58 120**
VP9BY " 155,206 483 46 96
**VP9IB 14 7,100 173 9 11**
**VP9HP 3.5 21,624 307 10 24**
Canada
**XN1KE A 628,761 1095 59 178**
VO1AW " 5,040 56 7 23
VO1AW " 5,040 56 7 23
VE1EP A 2,814 29 16 26
**VE2AYU 7 163,840 597 40 88**
VE2WA " 87,450 508 50 109
**VE3BS A 97,028 321 46 81**
XJ3EJK " 64,448 272 39 67
**VE3KZ 21 80,304 418 21 63**
**VE3BBH 7 53,703 521 17 34**
**XJ3EDC 3.5 4,693 123 7 12**
**XJ3BMV 1.8 7,860 200 8 12**
VE3ECP " 1,680 89 5 5
**VE6WX 14 52,729 321 25 42**
**VE7IG 3.5 23,940 254 15 27**
Cayman Islands
**ZF1TW A 1,595,550 2700 85 190**
Costa Rica
**TI2WX 21 61,860 480 20 40**
**TI2BGA 14 31,447 367 15 26**
Cuba
**CMZVG A 5,600 201 8 6**
**COZKP 1.8 350 35 3 2**
Dominican Republic
HI8CNT 7 125 12 3 2
Greenland
**OX3RA A 17,000 165 24 26**
**OX3AB 14 36,984 253 21 46**
Guadeloupe
**FG7AQ A 95,914 455 29 62**
Honduras
**HR1DH A 80,070 763 20 31**
**HR1AT 7 7,623 177 9 12**
Mexico
**XE2MX A 145,170 758 40 50**
Montserrat
**VP2MIR**
**A 1,980,423 2,172 97 272**
Puerto Rico
**KP4EAJ**
**A 1,410,207 2,298 87 190**
**KP4DKX 14 140,220 613 25 70**
St. Lucia
**VP2LAW A 82,434 613 31 35**
St. Pierre et Miquelon
**FP0BG 7 5,351 160 12 31**
**FP8AA 3.5 109,056 688 17 54**
Turks & Caicos
**VP5AH 21 100,980 896 16 39**
**VP5GS 7 269,472 1,242 23 73**
U.S. Virgin Islands
**K4JWD/KV4**
**A 372,480 890 69 123**
**KV4AA 14 59,796 396 22 44**
**KV4FZ 3.5 190,082 789 24 77**

### AFRICA

Angola
**CR6IK 14 727,424 1,914 35 93**
Canary Islands
**EA8CR**
**A 3,295,997 2,847 102 287**
(Opr. OH2MM)
Gambia
**C5AJ A 1,042,124 1,433 68 176**
(Opr. DL7AH)
Liberia
**5L2T A 271,755 675 42 93**
Madeira Islands
**DJ6QT/CT3 A 109,072 276 46 90**
Mauritania
**5T5CJ 7 24,510 192 13 30**
Rhodesia
**ZE1JV A 1,011,375 1,513 73 152**
ZE2JH " 114,460 328 38 80
ZE3JO " 68,640 263 22 66
**ZE8JN 21 307,125 1,131 55 66**
ZE4JS " 181,482 719 26 61
**ZE1CU 7 14,448 119 16 27**
**ZE2KV 3.5 8,400 86 15 20**
South Africa
**ZS2CW A 40,095 173 31 50**
**ZS6BNF 7 14,940 115 16 29**
Maritime Mobile
**YO4WO/MM A 150,930 439 30 87**

### ASIA

Cyprus
**5B4YK A 97,728 293 19 60**
**5B4CD 21 22,274 174 11 32**
Hong Kong
**VS6BL 21 37,504 368 24 40**
India
**VU2GO 14 40,922 211 23 56**
Iran
**EP2OD A 205,653 526 40 107**
Israel
**4X4RD 21 274,647 1,201 23 60**
**4X4NJ 3.5 103,572 584 14 49**
Japan
**JA2JW A 749,760 950 104 180**
**JA2AAQ " 480,008 749 94 138**
**JA1BWA " 347,571 683 76 113**
JA7DAH " 124,740 349 58 77
JA2CMM " 123,896 337 59 77
JA6AKW " 97,356 288 57 76
JH7BRG " 84,966 266 53 66
JA6CNL " 64,493 214 49 72
JA2BNN " 60,060 237 49 61
JA7CDV " 51,168 175 57 66
JA1NLX " 47,758 207 46 46
JA5MOU " 45,120 188 44 50
JA1CMD " 44,800 164 54 58
JA3EQC " 37,920 160 46 50
JA1CFJ " 34,720 154 38 42
JA2JKI " 32,760 158 42 42
JA9JBK " 32,078 151 40 46
JA7HRF " 28,476 133 38 46
JA1KFH " 27,690 146 33 38
JH2YJZ " 25,925 120 41 44
JA5NNF " 24,300 114 41 40
JA9LX " 17,342 112 24 34
JA9BKU " 16,317 101 28 35
JF1NCT " 15,190 107 32 30
JA7JNF/1 " 14,076 108 25 21
JA4DZ " 13,865 100 21 26
JA1BNW " 13,780 94 27 26
JA1BSU " 12,792 90 28 24
JR2FNL " 11,913 77 28 29
JA5AF " 11,180 80 30 35
JH3UBF " 10,465 78 33 32
JA4GXS " 9,028 61 31 30
JA9CWJ " 8,800 60 27 28
JA1CVP " 8,624 71 24 25
JG1UTR " 7,958 73 22 24
JE1KDM " 5,964 60 22 20
JF1TFC " 5,856 75 17 15
JE3SEN " 5,253 48 26 25
JH6EFF " 2,772 36 16 17
JA9BOH " 2,556 29 18 18
JH7IPR " 2,400 35 17 15
JF1QJD " 2,205 30 18 17
JH8AJU " 2,162 40 11 12
JA3OLI " 637 17 7 6
JF1RBP " 345 11 7 8
JA9KQR/3 " 168 7 6 6
JH4CPF " 126 8 4 5
**JA1XZF 28 1,134 28 7 7**
JH1CKE " 580 26 5 5
**JR6RRD 21 58,534 297 26 48**
JE1JKL " 28,980 164 29 41
JA5XX " 24,357 143 26 43
JR3PYW " 17,984 118 25 39
JR1SQU " 10,904 89 21 26
JA8GQ " 10,879 98 20 23
JR1XFT " 9,284 87 20 24
JH6RIM " 7,990 65 17 30
JH6ESS " 6,031 64 16 21
JE3MWB " 3,564 45 16 17
JA9MCX " 2,320 40 14 15
JA1RLR " 624 17 8 8
**JA2DOU 14 164,670 548 35 75**
**JA@CUV/1 " 137,568 523 31 65**
**JA9AG " 124,894 582 26 51**
**JA2MGE " 123,420 443 33 69**
JH1JGX " 113,653 457 33 56
JA8SW " 96,220 431 28 57
JA2BY " 80,800 359 27 53
JA1CG " 75,966 413 24 42
JA2INS " 53,770 203 32 63
JA2EIV " 47,586 235 28 49
JA2FW " 46,506 253 24 45
JA2IU " 33,670 203 25 40
JH3HRW " 32,256 209 22 34
JH1MTR " 31,232 203 24 37
JA4CTL " 29,450 183 23 39
JA1DFQ " 26,112 147 25 43
JR1FVW " 22,971 153 23 34
JA6ANT " 19,951 105 29 42
JA1SJV " 15,840 123 19 25
JA@SC " 13,650 124 19 23
JA1KW " 11,172 86 19 30
JR2BDG " 11,025 98 20 25
JA5BLF " 10,865 105 20 21

| | | | | | |
|---|---|---|---|---|---|
| JA1VP | " | 10,030 | 102 | 16 | 18 |
| JA7YOJ | " | 9,867 | 93 | 17 | 22 |
| | | (Opr. JA7GQB) | | | |
| JA9SV | " | 8,988 | 89 | 21 | 21 |
| JA1PAQ | " | 8,750 | 71 | 22 | 28 |
| JA6AP | " | 8,330 | 64 | 21 | 25 |
| JA9AQE | " | 8,184 | 73 | 19 | 25 |
| JE3EEJ | " | 6,900 | 138 | 20 | 30 |
| JA5NAF | " | 6,683 | 71 | 18 | 23 |
| JA1WL | " | 6,293 | 87 | 14 | 15 |
| JA7GAX | " | 4,848 | 68 | 12 | 12 |
| JA1HEV | " | 4,224 | 52 | 14 | 19 |
| JA1HP | " | 4,104 | 46 | 16 | 22 |
| JH2NYZ | " | 3,576 | 53 | 13 | 11 |
| JA2BI | " | 3,306 | 40 | 14 | 15 |
| JA2AJA | " | 3,094 | 49 | 13 | 13 |
| JA3ARM | " | 3,040 | 49 | 15 | 17 |
| JA0GZ | " | 2,813 | 44 | 14 | 15 |
| JH3BRC | " | 2,379 | 62 | 20 | 19 |
| JA2EG | " | 1,482 | 23 | 14 | 12 |
| JA1BBZ | " | 1,152 | 28 | 9 | 7 |
| JA2HLX | " | 891 | 14 | 13 | 14 |
| JR3HLY | " | 608 | 16 | 9 | 7 |
| JG1EEE | " | 432 | 16 | 5 | 4 |
| JA1AAT | " | 96 | 4 | 4 | 4 |
| JH3BJN/4 | " | 77 | 5 | 3 | 4 |
| **JA5BJC** | **7** | **60,225** | **302** | **27** | **48** |
| **JA1CWZ** | **"** | **50,100** | **254** | **28** | **47** |
| JH1RFM | " | 39,833 | 242 | 25 | 36 |
| JA2EKR | " | 38,178 | 225 | 23 | 40 |
| JA2INO | " | 34,209 | 190 | 22 | 41 |
| JA1GDN | " | 33,715 | 232 | 22 | 33 |
| JA1MCU | " | 31,672 | 159 | 26 | 48 |
| JA2HO | " | 24,310 | 161 | 22 | 33 |
| JA7DLE | " | 24,084 | 188 | 20 | 34 |
| JA2AIR | " | 22,734 | 159 | 22 | 32 |
| JI1DWW | " | 17,390 | 141 | 19 | 28 |
| JA1ISA | " | 17,061 | 135 | 20 | 27 |
| JA2CG | " | 17,050 | 129 | 20 | 30 |
| JA3VOV | " | 12,996 | 127 | 18 | 20 |
| JH4ADF | " | 8,569 | 83 | 18 | 23 |
| JA1HOM | " | 8,560 | 80 | 18 | 22 |
| JA6GPR | " | 4,150 | 66 | 13 | 12 |
| JA7AJU/1 | " | 3,000 | 48 | 13 | 11 |
| JA4JIG | " | 1,504 | 34 | 9 | 7 |
| JA6DC | " | 1,092 | 28 | 8 | 6 |
| JA2UHY | " | 1,088 | 26 | 8 | 8 |
| JH2NDJ | " | 845 | 26 | 7 | 6 |
| JA0CN | " | 660 | 19 | 6 | 6 |
| JA3BCT | " | 450 | 18 | 4 | 5 |
| JA2RER | " | 364 | 15 | 7 | 6 |
| JA2SUG | " | 192 | 12 | 3 | 3 |
| **JA6SVP** | **3.5** | **12,720** | **114** | **19** | **29** |
| JA8DNV | " | 6,000 | 69 | 18 | 22 |
| JA1DQT | " | 5,808 | 85 | 14 | 19 |
| JA2HNP | " | 4,340 | 52 | 15 | 20 |
| JA3AA | " | 3,024 | 57 | 13 | 14 |
| JA3ONB | " | 555 | 14 | 7 | 8 |
| **JA7NI** | **1.8** | **444** | **15** | **6** | **6** |
| JH1LKH | " | 42 | 3 | 3 | 3 |
| JH2IRH | " | 4 | 2 | 2 | 2 |
| **KA2WM** | **A** | **31,416** | **159** | **37** | **40** |
| KA2WF | " | 22,570 | 134 | 29 | 45 |
| **KA6DX** | **14** | **40,040** | **214** | **26** | **51** |
| Ogasawara Island | | | | | |
| **JR1INZ/JD1** | **28** | **168** | **14** | **4** | **4** |
| Republic of Singapore | | | | | |
| **9V1SH** | **A** | **106,678** | **465** | **61** | **82** |
| **9V1SO** | **14** | **19,890** | **175** | **21** | **44** |
| West Malaysia | | | | | |
| **9M2FK** | **A** | **90,145** | **506** | **46** | **75** |
| **9M2AX** | **1.8** | **26** | **13** | **1** | **1** |

## U.S.S.R

### Asiatic Russia

| | | | | | |
|---|---|---|---|---|---|
| **UW9WL** | **A** | **643,808** | **982** | **60** | **176** |
| UA9ND | " | 574,320 | 949 | 73 | 167 |
| UA9FAJ | " | 406,782 | 821 | 43 | 143 |
| UA9OO | " | 322,790 | 692 | 51 | 140 |
| UA9UDR | " | 102,240 | 420 | 39 | 81 |
| UA9XS | " | 76,339 | 293 | 29 | 68 |
| UA9CGL | " | 28,864 | 138 | 26 | 62 |
| UA9FAR | " | 19,890 | 214 | 12 | 39 |
| UA9LAC | 21 | 240 | 28 | 4 | 4 |
| **UA9JH** | **14** | **118,118** | **465** | **24** | **67** |
| UA9JAA | " | 91,875 | 522 | 22 | 53 |
| UA9CES | " | 59,346 | 365 | 16 | 49 |
| UA9OS | " | 51,280 | 285 | 26 | 54 |
| UA9UGA | " | 2,000 | 70 | 6 | 10 |
| UA9MY | " | 180 | 11 | 4 | 5 |
| **UA9AAP** | **7** | **88,652** | **454** | **21** | **53** |
| UA9CFV | " | 24,990 | 213 | 10 | 32 |
| UA9WL | " | 13,695 | 147 | 7 | 26 |
| **UA9CM** | **3.5** | **67,466** | **392** | **12** | **49** |
| UA9WS | " | 49,078 | 327 | 13 | 40 |
| UK9ADT | " | 40,033 | 339 | 8 | 35 |
| | | (Opr. UA9ADQ) | | | |
| UA9VK | " | 12,280 | 131 | 10 | 30 |
| UA9ODY | " | 9,021 | 104 | 8 | 23 |
| UA9NP | " | 3,198 | 50 | 6 | 20 |
| UA9UR | " | 55 | 6 | 2 | 3 |
| **UA0AG** | **A** | **209,385** | **586** | **49** | **116** |
| UA0DV | " | 50,492 | 270 | 44 | 58 |
| UA0JAY | " | 19,512 | 158 | 30 | 42 |
| UA0KAN | " | 17,904 | 159 | 23 | 25 |
| **UA0VF** | **14** | **61,273** | **413** | **21** | **50** |
| UA0JAD | " | 31,740 | 303 | 21 | 39 |
| UA0BBC | " | 2,032 | 45 | 4 | 12 |
| UV0EX | " | 1,426 | 44 | 11 | 12 |
| **UA0FBF** | **7** | **13,314** | **202** | **20** | **22** |
| UA0CBH | " | 1,568 | 82 | 7 | 7 |
| **UA0UBA** | | | | | |
| | **3.5** | **12,519** | **208** | **15** | **24** |
| UW0FB | " | 3,762 | 145 | 9 | 10 |
| UA0FCK | " | 992 | 114 | 4 | 4 |

### Armenia

| | | | | | |
|---|---|---|---|---|---|
| **UG6AG** | **A** | **33,372** | **233** | **14** | **40** |

### Azerbaijan

| | | | | | |
|---|---|---|---|---|---|
| **UD6BW** | **A** | **113,436** | **378** | **42** | **96** |
| UD6DHC | " | 858 | 13 | 10 | 12 |
| **UD6DJF** | **14** | **170,892** | **675** | **26** | **68** |
| **UD6CN** | **3.5** | **18,960** | **183** | **7** | **33** |
| UD6DHU | " | 7,800 | 108 | 5 | 20 |

### Georgia

| | | | | | |
|---|---|---|---|---|---|
| **UF6DZ** | **A** | **74,529** | **303** | **26** | **65** |

### Kazakhistan

| | | | | | |
|---|---|---|---|---|---|
| **UL7LAW** | **A** | **376,188** | **705** | **51** | **137** |
| **UL7BAB** | **"** | **126,882** | **474** | **33** | **81** |
| UL7OAM | " | 117,124 | 440 | 24 | 70 |
| UL7OAO | " | 88,265 | 313 | 41 | 86 |
| UL7PQ | " | 36,512 | 132 | 34 | 78 |
| UL7QF | " | 11,346 | 80 | 21 | 40 |
| UL7TAM | " | 4,929 | 45 | 23 | 30 |
| UL7EAH | " | 728 | 30 | 7 | 6 |
| UL7TA | " | 512 | 12 | 6 | 10 |
| **UL7QH** | **21** | **159,192** | **838** | **26** | **73** |
| UL7WF | " | 4,836 | 100 | 13 | 18 |
| **UL7PA** | **14** | **125,904** | **643** | **26** | **60** |
| UL7GAA | " | 72,080 | 339 | 21 | 59 |
| UL7PAO | " | 46,310 | 300 | 15 | 40 |
| UL7CT | " | 46,190 | 268 | 15 | 47 |
| UL7XE | " | 17,248 | 140 | 10 | 34 |
| UL7TAK | " | 4,928 | 60 | 16 | 28 |
| UL7TBF | " | 544 | 12 | 7 | 10 |
| UL7PBY | " | 405 | 9 | 6 | 9 |
| **UL7BAN** | **7** | **81,508** | **502** | **21** | **51** |
| UL7QF | " | 39,204 | 325 | 9 | 35 |
| UL7JAW | " | 37,895 | 296 | 18 | 47 |
| **UL7PBM** | | | | | |
| | **3.5** | **46,980** | **369** | **12** | **42** |
| **UL7JG** | **"** | **38,016** | **293** | **12** | **42** |
| UL7GAV | " | 16,297 | 153 | 10 | 33 |
| UL7NAF | " | 11,840 | 124 | 10 | 27 |
| UL7LA | " | 7,050 | 92 | 8 | 22 |
| UL7BAG | " | 5,248 | 87 | 8 | 24 |

### Kirghiz

| | | | | | |
|---|---|---|---|---|---|
| **UM8FM** | **A** | **529,620** | **1030** | **57** | **153** |
| **UM8NNN** | | | | | |
| | **14** | **73,700** | **580** | **11** | **39** |
| **UM8MBA** | **7** | **16,687** | **156** | **10** | **31** |
| UM8MBL | " | 136 | 9 | 3 | 5 |
| **UM8MAS** | | | | | |
| | **3.5** | **7,456** | **109** | **9** | **23** |

### Tadjik

| | | | | | |
|---|---|---|---|---|---|
| **UJ8AE** | **A** | **64,005** | **303** | **27** | **58** |
| UJ8AQ | 21 | 3,700 | 60 | 11 | 14 |
| **UJ8JAS** | **14** | **175,667** | **774** | **27** | **70** |
| UK8JAS | 3.5 | 992 | 32 | 7 | 9 |

### Turkoman

| | | | | | |
|---|---|---|---|---|---|
| **UH8BAU** | **A** | **79,414** | **478** | **15** | **44** |
| UH8BO | 7 | 4,978 | 58 | 12 | 26 |
| UH8CJ | 3.5 | 2,020 | 40 | 5 | 15 |

### Uzbek

| | | | | | |
|---|---|---|---|---|---|
| **UI8LAG** | **A** | **1,085,280** | **1393** | **80** | **205** |
| UI8IZ | " | 59,312 | 256 | 28 | 60 |
| **UI8ACZ** | **14** | **37,664** | **192** | **25** | **63** |
| **UI8LAM** | **7** | **11,629** | **146** | **8** | **21** |

## EUROPE

### Aland Islands

| | | | | | |
|---|---|---|---|---|---|
| **OH0NJ** | **7** | **6,440** | **64** | **11** | **35** |

### Austria

| | | | | | |
|---|---|---|---|---|---|
| **OE1ELW/3** | **A** | **81,675** | **522** | **33** | **102** |
| **OE1ZGA** | **21** | **49,276** | **208** | **27** | **70** |
| **OE1AKA/3** | **14** | **78,624** | **448** | **29** | **67** |

### Belgium

| | | | | | |
|---|---|---|---|---|---|
| **ON4XG** | **14** | **52,875** | **390** | **21** | **54** |
| ON6NL | 14 | 462 | 17 | 6 | 8 |

### Bulgaria

| | | | | | |
|---|---|---|---|---|---|
| **LZ1QO** | **A** | **216,746** | **538** | **60** | **142** |
| **LZ1KBG** | **A** | **197,718** | **769** | **53** | **133** |
| LZ1WI | A | 111,740 | 383 | 48 | 137 |
| LZ1VW | A | 102,102 | 306 | 50 | 137 |
| LZ1MH | A | 43,792 | 302 | 31 | 81 |
| LZ1TD | A | 26,765 | 132 | 36 | 75 |
| LZ1CY | A | 21,158 | 197 | 16 | 55 |
| **LZ2GS** | **21** | **14,250** | **93** | **20** | **55** |
| LZ1FI | 21 | 12,180 | 126 | 15 | 45 |
| LZ2AR | 21 | 3,193 | 68 | 8 | 23 |
| LZ2KSQ | 21 | 1,265 | 19 | 10 | 13 |
| **LZ2ZA** | **14** | **111,192** | **637** | **27** | **86** |
| LZ1LL | 14 | 32,274 | 328 | 19 | 47 |
| LZ2KSB | 14 | 29,842 | 217 | 21 | 65 |
| LZ2UG | 14 | 29,240 | 298 | 18 | 50 |
| LZ2XW | 14 | 2,484 | 71 | 6 | 21 |
| **LZ1KSM** | **7** | **27,030** | **428** | **13** | **38** |
| LZ1FJ | 7 | 4,148 | 112 | 5 | 29 |
| **LZ2KPD** | **3.5** | **56,800** | **646** | **19** | **52** |

### Czechoslovakia

| | | | | | |
|---|---|---|---|---|---|
| **OK2QX** | **A** | **277,014** | **630** | **64** | **210** |
| **OK1ALW** | **A** | **269,951** | **480** | **71** | **182** |
| **OK2SFS** | **A** | **241,816** | **649** | **52** | **129** |
| OK2BLG | A | 236,256 | 834 | 54 | 160 |
| OK1TA | A | 221,094 | 589 | 60 | 153 |
| OK1ONF | A | 82,460 | 460 | 35 | 105 |
| OK3CGH | A | 75,988 | 272 | 43 | 114 |
| OK3CGG | A | 43,440 | 274 | 30 | 90 |
| OK2BEF | A | 35,075 | 224 | 23 | 92 |
| OK1MSP | A | 33,345 | 113 | 46 | 89 |
| OK3EA | A | 32,912 | 121 | 50 | 86 |
| OK1FJS | A | 29,393 | 266 | 21 | 70 |
| OK3YCV | A | 28,943 | 255 | 20 | 83 |
| OK1MKU | A | 28,514 | 185 | 28 | 78 |
| OK1AMI | A | 28,035 | 323 | 21 | 68 |
| OK2BEC | A | 27,451 | 229 | 24 | 73 |
| OK1MAA | A | 25,298 | 240 | 17 | 74 |
| OK1MIN | A | 24,411 | 111 | 36 | 67 |
| OK2BSA | A | 23,760 | 137 | 28 | 60 |
| OK2PAW | A | 21,483 | 201 | 26 | 67 |
| OK2PBBG | A | 15,450 | 153 | 17 | 58 |
| OK3TFH | A | 11,816 | 192 | 11 | 45 |
| OK3YCA | A | 10,695 | 155 | 13 | 56 |
| OK3TCK | A | 10,318 | 97 | 21 | 46 |
| OK1KZ | A | 8,946 | 119 | 18 | 53 |
| OK2ZU | A | 8,704 | 107 | 17 | 47 |
| OK2SWD | A | 7,620 | 115 | 17 | 43 |
| OK1AIA | A | 7,381 | 104 | 18 | 43 |
| OK2BDH | A | 7,242 | 124 | 14 | 37 |
| OK1ATZ | A | 4,655 | 37 | 21 | 28 |
| OK2BCI | A | 4,264 | 32 | 21 | 31 |
| OK1AEH | A | 3,905 | 58 | 13 | 42 |
| OK2BBJ | A | 2,480 | 24 | 20 | 20 |
| OK3CWU | A | 1,652 | 62 | 6 | 22 |
| OK3TRP | A | 1,456 | 48 | 8 | 20 |
| OK2SLL | A | 630 | 36 | 5 | 16 |
| OK2KZR | A | 500 | 15 | 7 | 13 |
| OK1FBH | A | 132 | 6 | 5 | 6 |
| **OK3WM** | **28** | **1,701** | **33** | **10** | **17** |
| OK1TW | 28 | 468 | 16 | 7 | 11 |
| **OK3UQ** | **21** | **68,262** | **350** | **26** | **67** |
| OK1ATT | 21 | 24,080 | 139 | 24 | 56 |
| OK2RO | 21 | 18,156 | 121 | 24 | 44 |
| OK1XN | 21 | 10,660 | 91 | 16 | 36 |
| OK1ASQ | 21 | 3,492 | 56 | 13 | 23 |
| OK2PEQ | 21 | 2,480 | 33 | 13 | 18 |
| OK2KRT | 21 | 1,092 | 30 | 7 | 6 |
| OK2SMO | 21 | 285 | 10 | 7 | 8 |
| OK2ABU | 21 | 84 | 4 | 3 | 4 |
| **OK1ASS** | **14** | **39,680** | **227** | **22** | **58** |
| OK2KR | 14 | 34,344 | 178 | 23 | 58 |
| OK1DVK | 14 | 33,048 | 269 | 22 | 46 |
| OK3CAU | 14 | 19,152 | 121 | 24 | 52 |
| OK3TCD | 14 | 13,282 | 99 | 20 | 38 |
| OK1DAV | 14 | 12,512 | 76 | 21 | 47 |
| OK1AJN | 14 | 8,772 | 119 | 12 | 39 |
| OK3YDP | 14 | 4,028 | 56 | 11 | 27 |
| OK2BOV | 14 | 3,136 | 99 | 12 | 20 |
| OK1PCL | 14 | 1,272 | 21 | 9 | 15 |
| **OK1DWA** | **7** | **83,931** | **594** | **24** | **77** |
| OK1MPP | 7 | 38,080 | 334 | 19 | 61 |
| OK1DKR | 7 | 36,736 | 305 | 17 | 65 |
| OK2LN | 7 | 17,248 | 307 | 7 | 42 |
| OK2YAX | 7 | 8,624 | 139 | 9 | 40 |
| OK2SGW | 7 | 3,608 | 56 | 9 | 35 |
| OK1FSM | 7 | 3,399 | 92 | 5 | 28 |
| OK1DDS/P | 7 | 1,464 | 61 | 4 | 20 |
| **OK3OM** | **3.5** | **50,180** | **625** | **15** | **50** |
| **OK1DIM** | **3.5** | **46,992** | **604** | **10** | **56** |
| OK1DOK | 3.5 | 26,800 | 293 | 14 | 53 |
| OK2HI | 3.5 | 24,461 | 330 | 11 | 50 |
| OK2BEM | 3.5 | 20,625 | 390 | 10 | 45 |
| OK3YDZ | 3.5 | 17,766 | 214 | 12 | 51 |
| OK1EV | 3.5 | 16,338 | 418 | 8 | 34 |
| OK1NR | 3.5 | 16,225 | 262 | 9 | 46 |
| OK2BOX | 3.5 | 15,989 | 226 | 12 | 47 |
| OK2BKT | 3.5 | 12,291 | 205 | 9 | 42 |
| OK3CJK | 3.5 | 9,360 | 165 | 8 | 40 |
| OK1DFF | 3.5 | 9,243 | 228 | 7 | 32 |
| OK3TDO | 3.5 | 6,251 | 103 | 8 | 39 |
| OK1AOV | 3.5 | 6,012 | 163 | 6 | 30 |
| OK2PGR | 3.5 | 5,792 | 192 | 5 | 27 |
| OK3YCL | 3.5 | 5,600 | 149 | 6 | 29 |
| OK1AJY | 3.5 | 4,641 | 111 | 7 | 32 |
| OK1AZI | 3.5 | 4,000 | 120 | 5 | 27 |
| OK1MZO | 3.5 | 3,364 | 116 | 5 | 24 |
| OK1EP | 3.5 | 2,808 | 70 | 5 | 31 |
| OK1BLC | 3.5 | 2,460 | 68 | 5 | 25 |
| OK2BQL | 3.5 | 1,652 | 58 | 5 | 23 |
| OK3RRC | 3.5 | 1,628 | 75 | 4 | 18 |
| OK1MRA | 3.5 | 1,368 | 58 | 4 | 20 |
| OK3CIU | 3.5 | 1,053 | 32 | 7 | 20 |
| OK1JDJ | 3.5 | 697 | 42 | 4 | 13 |
| OK1MIZ | 3.5 | 500 | 25 | 4 | 16 |
| OK1FRF | 3.5 | 204 | 7 | 5 | 7 |
| **OK1ATP** | **1.8** | **6,351** | **177** | **8** | **21** |
| **OK1MMW** | | | | | |
| | **1.8** | **4,848** | **187** | **5** | **19** |
| OK2PGF | 1.8 | 3,080 | 140 | 4 | 18 |
| OK1HAS | 1.8 | 2,480 | 139 | 4 | 16 |
| OK2KTW | 1.8 | 2,394 | 136 | 4 | 15 |
| OK1AXD | 1.8 | 2,064 | 131 | 2 | 14 |
| OK2PGU | 1.8 | 1,805 | 93 | 4 | 15 |
| OL5ATG | 1.8 | 1,782 | 122 | 3 | 15 |
| OK3CWQ | 1.8 | 1,241 | 73 | 3 | 14 |
| OK1OFD | 1.8 | 1,185 | 82 | 2 | 13 |
| OK1DKW | 1.8 | 1,110 | 78 | 2 | 13 |
| OK1DXW | 1.8 | 1,095 | 85 | 2 | 13 |
| OL8CCH | 1.8 | 976 | 59 | 3 | 13 |
| OK1IAR | 1.8 | 780 | 53 | 2 | 13 |
| OK1DJK | 1.8 | 705 | 49 | 2 | 13 |
| OL3ASW | 1.8 | 312 | 44 | 2 | 10 |
| OK3CFT | 1.8 | 286 | 26 | 2 | 9 |
| OL8CCG | 1.8 | 270 | 30 | 2 | 8 |
| OK1MAQ | 1.8 | 240 | 27 | 2 | 8 |
| OL4ASZ | 1.8 | 189 | 23 | 2 | 7 |
| OL9CFM | 1.8 | 162 | 24 | 2 | 7 |
| OK2KBA | 1.8 | 42 | 6 | 1 | 6 |

### Denmark

| | | | | | |
|---|---|---|---|---|---|
| **OZ7HT** | **A** | **320,385** | **1038** | **65** | **130** |
| OZ5ME | A | 87,642 | 377 | 44 | 118 |
| OZ7BQ/A | A | 68,000 | 216 | 43 | 117 |
| OZ3PO | A | 53,392 | 206 | 42 | 100 |
| OZ1VY | A | 49,000 | 257 | 32 | 66 |
| OZ1AMP | A | 30,600 | 160 | 33 | 67 |
| OZ2NU | A | 24,282 | 141 | 27 | 87 |
| OZ9LH | A | 22,387 | 216 | 18 | 43 |
| OZ7HX | A | 50,76 | 75 | 14 | 40 |
| OZ4HW | A | 3,128 | 32 | 19 | 27 |
| OZ7JZ | A | 1,120 | 20 | 9 | 19 |

## TROPHY WINNERS

### Single-Operator All Band

EA8CR (Opr. Ville Hiilesmaa, OH2MM
**World C.W. Trophy**
Donor: Larry LeKashman, W2AB

Glenn Rattmann, W6MAR
**USA C.W. Trophy**
Donor: Frankford Radio Club

Inaki Alcorta, EA2IA
**European C.W. Trophy**
Donor: W3AU Operators

Chester Moore, KP4EAJ
**Carib./C.A. C.W. Trophy**
Donor: Harold Fox, W3AA

Jim W. Jack, ZE2JH
**African C.W. Trophy**
Donor: Grodon Marshall, W6RR

Alex M. Konnikov, UI8LAG
**Asian C.W. Trophy**
Donor: Japan CQ Magazine

Katashi Nose, KH6IJ
**Oceania C.W. Trophy**
Donor:Maui A.R.C.

### Single-Operator Single Band

CX4CR (Opr. Manuel Castelo, CX9BT
**World C.W. Trophy**
W2JT Memorial Trophy (NJDXA)

Anssi Pekkanen, OH2QV
**European 14 MHz C.W. Trophy**
G2LB Memorial Trophy

David R. Blaschke, W5WZQ (7 MHz)
**U.S.A. C.W. Trophy**
N. ILL. DX Club

### Multi Operator Single Transmitter

FY7AK (Oprs. KP4TIN, F2QQ, F5QQ)
**World C.W. Trophy**
Donor: Anthony Susen, W3AOH

### Multi Operator Multi-Transmitter

W3WJD (Oprs. W3WJD, K3YUA, WA3LRO, W3DQG, K3JGI, WA3MHD)
**World C.W. Trophy**
Donor: Hazard Reeves, K2GL

### Expedition Trophy

CT3/OZ5DX (Oprs. OZ1LO, OZ5DX, OZ6KT)
Donor: Stuart Meyer, W2GHK

| Call | | | | | |
|---|---|---|---|---|---|
| OZ9ZS | A | 728 | 18 | 10 | 16 |
| OZ4SJ | A | 117 | 12 | 5 | 8 |
| OZ3Y | 28 | 168 | 9 | 5 | 7 |
| **OZ1AJL** | 21 | 3,040 | 62 | 9 | 23 |
| **OZ7YL** | 14 | 19,136 | 138 | 20 | 44 |
| **OZ6XR** | 7 | 16,928 | 339 | 9 | 37 |
| OZ8VL/A | 3.5 | 110 | 9 | 4 | 6 |

England

| Call | | | | | |
|---|---|---|---|---|---|
| **G3LNS** | A | 893,784 | 1247 | 88 | 246 |
| G3MXJ | A | 759,780 | 1227 | 85 | 230 |
| G3FXB | A | 714,875 | 1042 | 75 | 226 |
| G3ESF | A | 170,016 | 624 | 48 | 136 |
| G3DYY | A | 119,646 | 316 | 61 | 146 |
| G3ZQW | A | 106,264 | 489 | 41 | 107 |
| G4ALG | A | 105,165 | 455 | 43 | 128 |
| G4BUE | A | 71,374 | 326 | 38 | 89 |
| G3XBN | A | 51,054 | 350 | 32 | 102 |
| G2AJB | A | 26,244 | 169 | 31 | 77 |
| G3JKY | A | 16,684 | 134 | 27 | 59 |
| G3ZDD | A | 15,132 | 161 | 22 | 56 |
| G3MWZ | A | 11,470 | 104 | 23 | 51 |
| **G2BOZ** | 28 | 2,442 | 49 | 11 | 26 |
| **G3RZI/A** | 21 | 87,340 | 407 | 29 | 81 |
| G4CNY | 21 | 52,360 | 340 | 23 | 65 |
| G3LCJ | 21 | 22,673 | 144 | 21 | 58 |
| **G3HCT** | 14 | 247,294 | 928 | 29 | 93 |
| G3RUX | 14 | 172,700 | 846 | 25 | 75 |
| G3KDB | 14 | 164,754 | 710 | 27 | 86 |
| G3TXF | 14 | 113,715 | 623 | 26 | 79 |
| G3GRL | 14 | 107,930 | 567 | 25 | 61 |
| G3SXW | 14 | 104,312 | 558 | 26 | 78 |
| G3PVA | 14 | 63,583 | 430 | 21 | 52 |
| G8DI | 14 | 10,665 | 200 | 11 | 34 |
| G6NK | 14 | 5,312 | 102 | 10 | 22 |
| G3CWL | 14 | 320 | 21 | 4 | 12 |
| **G3HTA** | 3.5 | 72,917 | 730 | 15 | 56 |
| **G4BXT** | 1.8 | 2,071 | 96 | 4 | 15 |
| G3YMC | 1.8 | 1,700 | 99 | 3 | 14 |

France

| Call | | | | | |
|---|---|---|---|---|---|
| **F8VJ** | A | 84,185 | 226 | 56 | 93 |
| F5IN | A | 79,360 | 390 | 35 | 93 |
| F6DDP | A | 23,904 | 186 | 30 | 67 |
| F8TM | A | 10,744 | 87 | 26 | 53 |
| F6AMF | A | 5,040 | 58 | 15 | 25 |
| **F6ARC** | 21 | 17,248 | 146 | 13 | 31 |
| **F6BFH** | 14 | 41,633 | 272 | 23 | 56 |
| F5UL | 14 | 5,502 | 84 | 10 | 32 |

Finland

| Call | | | | | |
|---|---|---|---|---|---|
| **OH6DX** | A | 742,074 | 1032 | 94 | 243 |
| OH7OK | A | 209,348 | 680 | 49 | 150 |
| OH7UE | A | 83,108 | 327 | 41 | 117 |
| OH7NJ | A | 21,402 | 173 | 23 | 64 |
| OH9PH | A | 17,480 | 113 | 33 | 59 |
| OH2BPC | A | 14,260 | 107 | 25 | 67 |
| OH3FW | A | 11,400 | 114 | 18 | 57 |
| OH5TM/2 | A | 8,607 | 131 | 14 | 43 |
| OH9TD | A | 2,072 | 30 | 12 | 25 |
| OH2DN | A | 1,085 | 22 | 12 | 19 |
| OH2BN | A | 575 | 18 | 9 | 14 |
| OH7SC | A | 540 | 16 | 9 | 9 |
| **OH4SL** | 21 | 35,014 | 195 | 27 | 55 |
| OH5PZ | 21 | 20,670 | 144 | 24 | 54 |
| OH2BNC | 21 | 17,204 | 131 | 22 | 46 |
| OH2BZ | 21 | 16,119 | 110 | 22 | 59 |
| OH5PA | 21 | 11,970 | 97 | 19 | 38 |
| OH7NW | 21 | 525 | 18 | 7 | 8 |
| OH3NR | 21 | 243 | 10 | 5 | 4 |
| OH1VP | 21 | 90 | 5 | 3 | 3 |
| **OH2QV** | 14 | 191,862 | 695 | 31 | 83 |
| OH6KN | 14 | 154,440 | 702 | 27 | 72 |
| OH6MM | 14 | 54,284 | 370 | 19 | 63 |
| OH7QU | 14 | 31,691 | 271 | 19 | 48 |
| OH2BJH | 14 | 26,730 | 227 | 20 | 46 |
| OH6UC | 14 | 22,852 | 165 | 17 | 41 |
| OH3AG | 14 | 18,228 | 218 | 10 | 21 |
| | | (Opr. OH3HC) | | | |
| OH8SI | 14 | 8,607 | 75 | 18 | 39 |
| OH2VZ | 14 | 7,696 | 75 | 13 | 39 |
| OH2BOQ | 14 | 4,598 | 78 | 10 | 28 |
| **OH1VR** | 7 | 76,630 | 532 | 22 | 57 |
| OH1PS/2 | 7 | 62,050 | 489 | 23 | 62 |
| OH2LU | 7 | 25,216 | 302 | 16 | 48 |
| OH3PF | 7 | 3,658 | 58 | 7 | 24 |
| OH2BPA | 7 | 2,418 | 75 | 5 | 26 |
| OH6RC | 7 | 1,148 | 35 | 6 | 22 |
| **OH1XX** | 3.5 | 66,134 | 571 | 20 | 66 |
| OH1VQ | 3.5 | 41,464 | 462 | 16 | 55 |
| OH3PE | 3.5 | 34,510 | 426 | 16 | 54 |
| OH8OB | 3.5 | 17,702 | 267 | 10 | 43 |
| OH5PT | 3.5 | 9,744 | 113 | 11 | 45 |
| OH3GX | 3.5 | 1,944 | 82 | 5 | 19 |
| OH8SP | 3.5 | 416 | 25 | 4 | 12 |
| **OH2BO** | 1.8 | 1,674 | 91 | 3 | 15 |

German Democratic Republic

| Call | | | | | |
|---|---|---|---|---|---|
| **DM2DUK** | A | 652,036 | 1408 | 72 | 220 |
| DM3YBF | A | 168,210 | 619 | 51 | 138 |
| DM3NKF | A | 92,852 | 505 | 30 | 109 |
| DM2DEO | A | 68,640 | 251 | 39 | 121 |
| DM4TEK | A | 62,712 | 381 | 29 | 88 |
| DM5UUL | A | 49,608 | 172 | 52 | 104 |
| DM2CHM | A | 43,061 | 134 | 48 | 149 |
| DM2CMF | A | 42,245 | 171 | 38 | 81 |
| DM3WMJ | A | 30,375 | 128 | 29 | 106 |
| DM6VAH | A | 28,424 | 300 | 21 | 67 |
| DM3OML | A | 24,395 | 130 | 30 | 55 |
| DM3ZC/P | A | 23,184 | 239 | 20 | 64 |
| DM3EA | A | 17,765 | 73 | 37 | 48 |
| DM2CCM | A | 11,250 | 84 | 20 | 70 |
| DM2CKD | A | 8,576 | 117 | 16 | 51 |
| DM3CF | A | 8,100 | 152 | 12 | 38 |
| DM2ABE | A | 6,344 | 114 | 13 | 39 |
| DM6UAO | A | 5,656 | 77 | 18 | 38 |
| DM2FIL | A | 4,464 | 75 | 12 | 36 |
| DM3BE | A | 4,350 | 80 | 10 | 40 |
| DM3GC | A | 3,780 | 50 | 14 | 28 |
| DM3SBM | A | 3,087 | 36 | 17 | 32 |
| DM2CRJ | A | 2,788 | 59 | 10 | 24 |
| DM2DJH | A | 1,628 | 34 | 14 | 23 |
| DM2ACL | A | 1,628 | 30 | 13 | 24 |
| DM3PQO | A | 1,443 | 21 | 16 | 21 |
| DM2AHE | A | 1,050 | 36 | 7 | 23 |
| **DM2BML** | 21 | 2,376 | 32 | 12 | 21 |
| DM3UE | 21 | 1,860 | 24 | 30 | 62 |
| DM5YVL | 21 | 180 | 7 | 12 | 15 |
| **DM2FWL** | 14 | 30,912 | 245 | 20 | 49 |
| DM3PCK | 14 | 28,035 | 274 | 17 | 46 |
| DM2FDO | 14 | 5,300 | 53 | 14 | 36 |
| DM2ARD | 14 | 4,050 | 52 | 10 | 20 |
| DM2CYE | 14 | 3,956 | 40 | 15 | 28 |
| DM2BUB | 14 | 3,458 | 37 | 16 | 22 |
| DM2CKJ | 14 | 3,360 | 98 | 9 | 21 |
| DM2DYH | 14 | 144 | 18 | 3 | 5 |
| DM2FDM | 7 | 10,340 | 226 | 6 | 38 |
| DM4UEE | 7 | 10,176 | 150 | 13 | 40 |
| DM2CXE | 7 | 3,569 | 67 | 8 | 35 |
| DM2BMN | 7 | 2,210 | 61 | 7 | 27 |
| DM2CJN | 7 | 738 | 33 | 6 | 12 |
| **DM3VMJ** | 3.5 | 1,995 | 51 | 5 | 30 |
| DM2FSO | 3.5 | 1,824 | 77 | 4 | 20 |
| DM3TNA | 3.5 | 1,705 | 48 | 5 | 26 |
| DM4XIG | 3.5 | 1,536 | 66 | 4 | 20 |
| DM5SHN | 3.5 | 1,440 | 72 | 3 | 17 |
| DM3PML | 3.5 | 1,116 | 62 | 5 | 13 |
| DM2ACC | 3.5 | 288 | 27 | 3 | 9 |

German Federal Republic

| Call | | | | | |
|---|---|---|---|---|---|
| **DL7AV** | A | 866,346 | 1001 | 109 | 274 |
| DK3GI | A | 507,160 | 941 | 76 | 234 |
| DK4PH | A | 354,835 | 743 | 74 | 191 |
| DLØJRA | A | 328,487 | 674 | 71 | 192 |
| | | (Opr. DL7ON) | | | |
| DJ9MH | A | 310,068 | 624 | 68 | 193 |
| DJ2TI | A | 249,856 | 600 | 67 | 177 |
| DK3KD | A | 209,241 | 735 | 55 | 146 |
| DL8YR | A | 180,815 | 503 | 59 | 156 |
| DJ4UF | A | 151,493 | 502 | 54 | 143 |
| DJ9JF | A | 149,600 | 509 | 47 | 123 |
| DL1YA | A | 144,522 | 391 | 59 | 163 |
| DL8AN | A | 132,225 | 339 | 61 | 154 |
| DL1KS | A | 132,090 | 301 | 61 | 161 |
| DK8KD | A | 125,668 | 465 | 49 | 129 |
| DL1JF | A | 114,023 | 350 | 50 | 129 |
| DK2SI | A | 94,752 | 418 | 43 | 101 |
| DL2HQ | A | 76,950 | 245 | 47 | 115 |
| DJ5GG | A | 75,240 | 245 | 49 | 122 |
| DK5MP | A | 67,050 | 244 | 39 | 110 |
| DJ4AN | A | 56,017 | 312 | 32 | 107 |
| DL2JO | A | 45,890 | 267 | 38 | 92 |
| DL1ES | A | 39,345 | 207 | 33 | 96 |
| DL1GN | A | 39,262 | 206 | 37 | 97 |
| DK8KC | A | 35,853 | 22 | 29 | 82 |
| DFØAFZ | A | 34,485 | 134 | 41 | 80 |
| DJØYZ | A | 32,780 | 212 | 30 | 80 |
| DJØIV | A | 32,130 | 127 | 47 | 88 |
| DK8BI | A | 30,888 | 232 | 30 | 74 |
| DK6EJ | A | 29,380 | 220 | 21 | 44 |
| DF3QN | A | 26,904 | 204 | 23 | 91 |
| DJ1YH | A | 25,555 | 146 | 27 | 68 |
| DJ1LD | A | 20,720 | 11 | 35 | 77 |
| DL7BQ | A | 20,496 | 160 | 28 | 56 |
| DL6BP | A | 13,527 | 128 | 22 | 59 |
| DK6CS | A | 10,400 | 74 | 29 | 51 |
| DL1EA | A | 2,408 | 30 | 18 | 25 |
| **DJØXT** | 21 | 61,348 | 273 | 28 | 70 |
| DJ5NR | 21 | 55,361 | 311 | 22 | 61 |
| DK6IS | 21 | 25,636 | 180 | 23 | 45 |
| DL1RB | 21 | 7,872 | 84 | 19 | 45 |
| **DJ4PX** | 14 | 145,827 | 618 | 26 | 73 |
| DK9FY | 14 | 109,728 | 563 | 28 | 68 |
| DJ7RJ | 14 | 62,820 | 316 | 26 | 64 |
| DJ7PT | 14 | 62,062 | 317 | 22 | 69 |
| DL2JX | 14 | 35,100 | 227 | 22 | 56 |
| DK5BI | 14 | 15,162 | 174 | 18 | 39 |
| DL3CW | 14 | 14,012 | 98 | 17 | 45 |
| DK7XT | 14 | 11,835 | 132 | 16 | 29 |
| DJØVO | 14 | 10,872 | 150 | 11 | 25 |
| DL7FY | 14 | 3,660 | 98 | 9 | 21 |
| **DJ5PA** | 7 | 152,220 | 654 | 29 | 89 |
| DJ8FF | 7 | 6,816 | 122 | 12 | 36 |
| **DJØUJ** | 3.5 | 59,364 | 704 | 13 | 55 |
| DJ2AA | 3.5 | 36,890 | 378 | 15 | 55 |
| DK1FQ | 3.5 | 30,120 | 441 | 10 | 50 |
| DK6PY | 3.5 | 29,268 | 464 | 12 | 42 |
| DK4EX | 3.5 | 13,892 | 259 | 8 | 38 |
| DJ5JH | 3.5 | 10,428 | 94 | 11 | 55 |
| **DJ4KW/P** | 1.8 | 2,178 | 100 | 4 | 14 |

Gibraltar

| Call | | | | | |
|---|---|---|---|---|---|
| **ZB2X** | 3.5 | 114,540 | 865 | 18 | 65 |
| | | (Opr. OH3XZ) | | | |

Greece

| Call | | | | | |
|---|---|---|---|---|---|
| **SVØWEE** | 21 | 2,838 | 70 | 7 | 26 |
| **SVØWTT** | 7 | 9,180 | 133 | 12 | 39 |

Hungary

| Call | | | | | |
|---|---|---|---|---|---|
| **HA3HH** | A | 116,022 | 385 | 52 | 131 |
| HA7PQ | " | 68,134 | 272 | 45 | 118 |
| HA1ZD | " | 38,076 | 240 | 28 | 86 |
| HA8CH | " | 35,250 | 142 | 43 | 82 |
| HAØHN | " | 29,800 | 222 | 27 | 73 |
| **HAØKLU** | 21 | 30,705 | 160 | 27 | 62 |
| HA7PM | " | 2,280 | 38 | 11 | 19 |
| **HA5BA** | 14 | 57,870 | 380 | 23 | 67 |
| **HA9RB** | 7 | 33,390 | 365 | 17 | 53 |
| HA3PT | " | 16,536 | 285 | 8 | 45 |
| HA7TQ | " | 2,418 | 49 | 9 | 30 |
| **HA9RU** | 3.5 | 58,857 | 705 | 13 | 56 |
| **HA1YA** | 3.5 | 56,160 | 701 | 14 | 58 |
| HA4XP | " | 13,410 | 264 | 8 | 37 |
| HA1TI | " | 8,534 | 249 | 5 | 29 |
| HAØDE | " | 5,445 | 165 | 6 | 27 |
| HA3HK | " | 2,760 | 149 | 4 | 20 |

Iceland

| Call | | | | | |
|---|---|---|---|---|---|
| **TF3IRA** | A | 77,503 | 335 | 35 | 62 |
| TF3AW | " | 72,270 | 319 | 32 | 58 |
| **TF3KM** | 21 | 448 | 20 | 5 | 11 |
| **TF3SE** | 14 | 56,100 | 457 | 20 | 48 |

Isle of Man

| Call | | | | | |
|---|---|---|---|---|---|
| **GD5BOY** | A | 469,116 | 1196 | 61 | 188 |
| **GD4BEG** | 1.8 | 8,932 | 253 | 7 | 22 |

Italy

| Call | | | | | |
|---|---|---|---|---|---|
| **I2XXG** | A | 485,887 | 959 | 57 | 182 |
| I1FGT | " | 88,963 | 306 | 51 | 128 |
| I0EMV | " | 63,112 | 435 | 28 | 70 |
| I4VN | " | 28,152 | 198 | 25 | 67 |
| **I6POY** | 28 | 3,960 | 58 | 14 | 26 |
| I1GXR | " | 2,052 | 35 | 9 | 29 |
| **I3AWK** | 21 | 10,488 | 107 | 15 | 31 |
| I4KRF | " | 7,191 | 88 | 16 | 31 |
| **I1QJC** | 14 | 18,700 | 150 | 18 | 50 |
| IØSKK | " | 14,841 | 219 | 11 | 40 |
| **I3AWW** | 7 | 43,960 | 471 | 16 | 54 |
| I3EFC | " | 11,515 | 202 | 10 | 37 |
| **I3GNQ** | 3.5 | 57,102 | 725 | 14 | 48 |
| I2BVS | " | 20,736 | 345 | 11 | 43 |
| I2DMK | " | 14,400 | 360 | 7 | 29 |
| I3HL | " | 3,074 | 100 | 7 | 22 |

Malta

| Call | | | | | |
|---|---|---|---|---|---|
| **9H1CH** | 21 | 102,300 | 579 | 24 | 69 |

Netherlands

| Call | | | | | |
|---|---|---|---|---|---|
| **PAØTAU** | A | 224,000 | 630 | 65 | 159 |
| PAØVB | " | 47,320 | 246 | 37 | 93 |
| PAØMBD | " | 41,132 | 268 | 31 | 82 |
| PAØDIN | " | 29,568 | 133 | 36 | 96 |
| PAØWRS | " | 770 | 13 | 11 | 11 |
| **PAØATY** | 14 | 4,968 | 57 | 13 | 33 |
| PAØWAC | " | 855 | 21 | 8 | 13 |
| PAØNIC | " | 756 | 18 | 8 | 13 |
| PAØLJ | " | 6 | 2 | 1 | 2 |
| **PAØHIP** | 1.8 | 8,652 | 260 | 7 | 21 |
| PAØQRP | " | 360 | 48 | 2 | 6 |

Northern Ireland

| Call | | | | | |
|---|---|---|---|---|---|
| **GI3JEX** | A | 158,725 | 629 | 44 | 131 |

Norway

| Call | | | | | |
|---|---|---|---|---|---|
| **LJ2S** | A | 44,190 | 380 | 24 | 66 |
| LA5SH | " | 16,443 | 93 | 29 | 58 |
| LA2Q | " | 11,418 | 145 | 17 | 49 |
| LA7EO | " | 5,760 | 152 | 9 | 27 |
| **LA9TI** | 21 | 7,350 | 82 | 15 | 35 |
| **LA8CJ** | 14 | 26,488 | 245 | 16 | 40 |
| LA4PQ | " | 1,702 | 46 | 7 | 16 |
| LA7HJ | " | 874 | 40 | 4 | 15 |
| **LA6U** | 7 | 4,644 | 76 | 9 | 45 |
| LA1VL | " | 1,344 | 56 | 5 | 19 |
| LA6XI | " | 228 | 19 | 2 | 10 |

Poland

| Call | | | | | |
|---|---|---|---|---|---|
| **SP8ECV** | A | 310,880 | 838 | 61 | 171 |
| **SP7CTY** | A | 263,120 | 586 | 65 | 188 |
| **SP9AI** | A | 226,568 | 589 | 57 | 166 |
| SP9BPF | " | 204,974 | 596 | 57 | 168 |
| SP2KFQ | " | 129,591 | 675 | 34 | 119 |
| | | (Opr. SP2HGG) | | | |
| SP8EDQ | A | 96,481 | 287 | 55 | 124 |
| SP2FAP | " | 62,400 | 399 | 28 | 92 |
| SP3GCT | " | 45,147 | 298 | 26 | 75 |
| SP8AIS | " | 37,151 | 322 | 20 | 77 |
| SP6AYP/9 | " | 30,705 | 195 | 32 | 83 |
| SP9BBH | " | 25,270 | 177 | 23 | 72 |
| SP1ALK | " | 19,512 | 122 | 28 | 44 |
| SP8GUV | " | 16,524 | 134 | 21 | 60 |
| SP6DNS | " | 15,309 | 143 | 25 | 56 |
| SP2GUB | " | 11,250 | 85 | 25 | 50 |
| SP2ZT | " | 10,626 | 70 | 21 | 56 |
| SP9CEM | " | 10,212 | 105 | 23 | 51 |
| SP1FIC | " | 9,776 | 163 | 15 | 37 |
| SP7IFM | " | 9,300 | 134 | 11 | 49 |
| SP4PBI | " | 9,238 | 121 | 15 | 47 |
| SP3GBJ | " | 8,664 | 143 | 11 | 46 |
| SP7KBI | " | 8,000 | 84 | 21 | 43 |
| SP2BIK | " | 7,998 | 67 | 22 | 40 |
| SP6UK | " | 4,189 | 65 | 14 | 45 |
| SP3AGE | " | 2,240 | 22 | 14 | 21 |
| SP3JER | " | 1,410 | 48 | 9 | 21 |
| SP9EVP | " | 1,044 | 30 | 9 | 20 |
| SP4FWI | " | 943 | 35 | 8 | 15 |
| SP9DH | " | 176 | 10 | 7 | 9 |
| **SP5GH** | 28 | 144 | 7 | 5 | 7 |
| **SP8AWL** | 21 | 3,276 | 43 | 12 | 27 |
| SP6DB | " | 2,052 | 30 | 13 | 23 |
| SP6BFK | " | 2,048 | 32 | 12 | 20 |
| SP8AQN | " | 1,052 | 25 | 8 | 16 |
| SP9DTH | " | 42 | 4 | 3 | 4 |
| **SP7HT** | 14 | 100,280 | 491 | 29 | 80 |
| SP2AVE | " | 79,170 | 429 | 29 | 76 |
| SP9CTW | " | 78,477 | 410 | 27 | 74 |
| SP8YA | " | 70,992 | 385 | 25 | 62 |
| SP8GQU | " | 47,081 | 280 | 23 | 66 |
| SP9DWT | " | 22,208 | 199 | 17 | 47 |
| SP2HNF | " | 20,894 | 214 | 15 | 47 |
| SP5FLA | " | 17,485 | 123 | 18 | 47 |
| SP6BPY | " | 13,747 | 146 | 14 | 45 |
| SP8HXN/8 | " | 12,567 | 149 | 16 | 43 |
| SP1CQN | " | 10,450 | 106 | 18 | 37 |
| SP3HC | " | 9,856 | 163 | 10 | 34 |
| SP9AMH | " | 5,000 | 90 | 10 | 30 |
| SP8FNA | " | 4,700 | 55 | 13 | 34 |
| SP6PH | " | 2,160 | 55 | 8 | 19 |
| SP6IXH | " | 1,566 | 38 | 8 | 19 |
| SP3DOI | " | 1,530 | 30 | 10 | 7 |
| **SP4BGR** | 7 | 75,516 | 563 | 26 | 67 |
| SP5ARN | " | 50,336 | 394 | 21 | 67 |
| SP1ETC | " | 21,861 | 317 | 13 | 50 |
| SP9ABU | " | 20,770 | 219 | 15 | 52 |
| SP5IFU | " | 14,906 | 170 | 15 | 43 |
| SP9NH | " | 11,160 | 221 | 9 | 36 |
| SP5AFL | " | 5,240 | 119 | 7 | 33 |
| SP5HHV | " | 4,066 | 77 | 8 | 30 |
| SP4GHT | " | 3,948 | 71 | 7 | 35 |
| SP5FL8 | " | 2,958 | 93 | 6 | 23 |
| SP3IPB | " | 2,430 | 80 | 6 | 21 |
| SP6IGE | " | 2,407 | 65 | 7 | 22 |
| SP5EMK | " | 1,550 | 54 | 6 | 19 |
| SP2BMX | " | 1,161 | 21 | 10 | 17 |
| SP3FYX | " | 1,134 | 53 | 5 | 16 |
| **SP2AJO** | 3.5 | 32,886 | 480 | 11 | 52 |
| **SP2GVN** | 3.5 | 32,391 | 524 | 11 | 48 |
| SP5ELA/5 | " | 30,296 | 463 | 12 | 44 |
| SP2BBD | " | 23,777 | 344 | 11 | 48 |
| SP9BDQ | " | 10,998 | 261 | 7 | 32 |
| SP9AAB | " | 8,892 | 213 | 6 | 34 |
| SP9HWN | " | 7,710 | 286 | 5 | 25 |
| SP7FI | " | 7,602 | 160 | 7 | 35 |
| SP9AKD | " | 7,585 | 197 | 6 | 31 |
| SP1HXC | " | 3,591 | 136 | 4 | 23 |
| SP3HRN | " | 2,088 | 100 | 5 | 19 |
| SP2DVH | " | 1,953 | 44 | 7 | 24 |
| SP2HHS | " | 1,540 | 67 | 5 | 17 |
| SP9ZD | " | 1,525 | 58 | 5 | 20 |
| SP8KGQ | " | 1,452 | 64 | 5 | 17 |
| | | (Opr. SP8IOD) | | | |
| SP1HAQ | 3.5 | 882 | 40 | 5 | 16 |
| SP7IVO | " | 726 | 33 | 5 | 17 |
| SP9EMI | " | 612 | 33 | 5 | 13 |
| SP2JJC | " | 520 | 40 | 3 | 10 |

Portugal

| Call | | | | | |
|---|---|---|---|---|---|
| **CT1QN** | 7 | 21,892 | 291 | 9 | 43 |

Republic of Ireland

| Call | | | | | |
|---|---|---|---|---|---|
| **EI5F** | 14 | 744 | 27 | 6 | 18 |

Romania

| Call | | | | | |
|---|---|---|---|---|---|
| **YO6EX** | A | 185,922 | 632 | 52 | 146 |
| YO7DL | " | 154,198 | 605 | 40 | 123 |
| YO6KAF | " | 125,856 | 370 | 51 | 120 |
| YO5AVN/3 | " | 48,462 | 251 | 33 | 90 |
| YO7NA | " | 22,989 | 219 | 19 | 60 |
| YO7NM | " | 21,115 | 150 | 28 | 75 |
| YO8GF | " | 1,887 | 53 | 14 | 23 |
| YO6BLU | " | 1,200 | 50 | 7 | 18 |
| YO2BIW | " | 1,020 | 50 | 8 | 12 |
| YO8BCE | " | 180 | 10 | 6 | 9 |
| **YO2BEO** | 14 | 1,000 | 37 | 7 | 13 |
| **YO3JW** | 7 | 46,988 | 513 | 21 | 47 |
| YO2BLO | " | 36,432 | 385 | 17 | 52 |
| YO8BIG | " | 10,290 | 208 | 10 | 32 |
| YO9BGV | " | 6,762 | 93 | 11 | 35 |
| **YO5KDL** | 3.5 | 2,888 | 76 | 4 | 15 |
| YO6AYX | " | 1,140 | 57 | 4 | 16 |
| YO6AHP | " | 1,007 | 51 | 5 | 14 |

Sardinia

| Call | | | | | |
|---|---|---|---|---|---|
| **ISØBDO** | A | 71,400 | 442 | 29 | 91 |

Scotland

| Call | | | | | |
|---|---|---|---|---|---|
| **GM3CFS** | A | 48,000 | 275 | 31 | 94 |
| **GM3WRN** | 14 | 15,533 | 224 | 12 | 37 |
| GM3SSB | " | 4,060 | 84 | 9 | 26 |
| **GM6RV** | 7 | 10,340 | 181 | 11 | 36 |
| **GM3YOR** | 1.8 | 2,679 | 136 | 4 | 15 |

Sicily

| Call | | | | | |
|---|---|---|---|---|---|
| **IT9LMK** | 21 | 55,520 | 434 | 23 | 57 |
| IT9KZW | " | 27,608 | 270 | 17 | 41 |
| **IT9RAN** | 14 | 65,592 | 501 | 18 | 54 |

Spain

| Call | | | | | |
|---|---|---|---|---|---|
| **EA2IA** | A | 1,169,583 | 2,291 | 70 | 219 |
| EA1MC | " | 55,566 | 326 | 28 | 70 |
| EA5BS | " | 37,400 | 277 | 21 | 67 |
| EA2HB | " | 110 | 8 | 4 | 6 |
| **EA2CR** | 21 | 3,026 | 59 | 10 | 24 |
| EA4BV | " | 3,025 | 59 | 8 | 17 |
| **EA2LY** | 14 | 4,440 | 95 | 8 | 29 |

Svalbard

| Call | | | | | |
|---|---|---|---|---|---|
| **JW5NM** | 7 | 376 | 17 | 5 | 3 |

Sweden

| Call | | | | | |
|---|---|---|---|---|---|
| **SM0BYD** | A | 152,944 | 566 | 46 | 130 |
| SM0GMG | " | 72,808 | 280 | 45 | 107 |
| SL5CS | " | 43,815 | 247 | 35 | 80 |
| | | (Opr. Pettersson) | | | |
| SM4AZD | A | 30,576 | 224 | 24 | 80 |
| SMØCCE | " | 27,084 | 128 | 32 | 79 |
| SM5RE | " | 15,732 | 177 | 20 | 49 |
| SMØCGO | " | 13,572 | 122 | 23 | 64 |
| SM3FSK | " | 6,566 | 57 | 22 | 45 |
| SM5DLR | " | 3,010 | 52 | 17 | 26 |
| SM7TV | " | 2,640 | 46 | 13 | 20 |
| SMØFY | " | 2,262 | 32 | 16 | 23 |
| SM7CYP | " | 1,800 | 30 | 14 | 22 |
| SMØGMJ | " | 1,508 | 37 | 11 | 18 |
| SM7FSV | " | 1,012 | 30 | 9 | 14 |
| SM5FUG | " | 638 | 11 | 11 | 11 |
| **SM2COR** | 21 | 47,802 | 267 | 26 | 67 |
| SMØKV/0 | " | 39,618 | 273 | 26 | 67 |
| SM5DRW | " | 16,776 | 140 | 21 | 51 |
| SM5EOS | " | 8,580 | 102 | 17 | 35 |
| SLØDR | " | 6,222 | 75 | 15 | 36 |
| SM5ACQ | " | 6,174 | 69 | 15 | 34 |
| **SM2EKM** | 14 | 122,452 | 680 | 22 | 70 |
| SM5EXE | " | 104,082 | 440 | 30 | 84 |
| SM5BRS | " | 73,692 | 415 | 24 | 65 |
| SM6DJI | " | 42,636 | 408 | 16 | 39 |
| SMØDJZ | " | 24,512 | 210 | 17 | 47 |
| SMØCCM | " | 23,927 | 203 | 19 | 52 |
| SM6CMU | " | 22,875 | 133 | 22 | 53 |
| SM6CNX | " | 12,400 | 206 | 19 | 43 |
| SM2GET | " | 7,200 | 82 | 16 | 24 |
| SM5UQ | " | 6,720 | 116 | 11 | 29 |
| SM6FKF | " | 6,601 | 73 | 13 | 28 |
| SM7FYM | " | 4,028 | 46 | 14 | 24 |
| SM6JY | " | 2,175 | 61 | 8 | 9 |
| SK7IJ | " | 1,188 | 18 | 13 | 14 |
| **SMØTW** | 7 | 34,237 | 348 | 16 | 57 |
| SM5BRG | " | 28,470 | 333 | 18 | 47 |
| SMØDSF | " | 11,046 | 225 | 8 | 34 |
| SM6ID | " | 9,246 | 184 | 7 | 39 |
| SM3EP | " | 5,184 | 141 | 6 | 30 |
| SMØOY | " | 5,130 | 42 | 6 | 19 |
| SM5DYC | " | 4,350 | 143 | 5 | 24 |
| **SM5BKI** | 3.5 | 17,010 | 234 | 11 | 52 |
| SM2DMU | " | 15,759 | 257 | 9 | 42 |
| SM5CCT | " | 14,858 | 307 | 8 | 38 |
| SM7CMV | " | 5,490 | 98 | 8 | 37 |
| SM5AMF | " | 4,824 | 120 | 6 | 30 |
| SMØBDS | " | 3,317 | 104 | 5 | 26 |
| SMØGNV | " | 2,075 | 80 | 5 | 20 |
| SM3FWK | " | 1,188 | 43 | 5 | 22 |

Switzerland

| Call | | | | | |
|---|---|---|---|---|---|
| **HB9AJY** | A | 354,754 | 972 | 50 | 128 |
| HB9ZE | " | 197,268 | 533 | 55 | 149 |
| HB9AHA | " | 79,386 | 300 | 41 | 90 |
| HB9QA | " | 34,314 | 179 | 37 | 92 |
| **HB9DX** | 21 | 8,906 | 57 | 22 | 51 |
| **HB9KC** | 3.5 | 23,088 | 304 | 10 | 42 |

Wales

| Call | | | | | |
|---|---|---|---|---|---|
| **GW3XNS** | 1.8 | 792 | 66 | 2 | 10 |

Yugoslavia

| Call | | | | | |
|---|---|---|---|---|---|
| **YU3EY** | A | 921,285 | 1175 | 94 | 253 |
| YZ2OB | " | 315,715 | 758 | 62 | 171 |
| YU1OFT | " | 240,329 | 844 | 50 | 161 |
| YZ3TFB | " | 90,528 | 305 | 50 | 114 |
| YZ1NZW | " | 85,164 | 283 | 44 | 144 |
| YU1INO | " | 81,216 | 297 | 42 | 146 |
| YZ3TJA | " | 61,740 | 198 | 50 | 97 |
| YU1AAO | " | 6,068 | 92 | 8 | 33 |
| YU3TDP | " | 3,827 | 48 | 16 | 27 |
| YZ3NBM | " | 589 | 13 | 7 | 12 |
| **YU3ER** | 28 | 7,128 | 68 | 16 | 38 |
| **YU3ZV** | 21 | 156,211 | 521 | 32 | 89 |
| YZ1QBC | " | 131,216 | 460 | 30 | 88 |
| YZ4VBR/4 | " | 10,314 | 97 | 18 | 37 |
| YZØSRJ | 14 | 225,000 | 861 | 31 | 94 |
| | | (Opr. YU1PCF) | | | |
| YZ4VCA | 14 | 175,500 | 779 | 28 | 80 |
| YZ2BOP | " | 109,056 | 571 | 26 | 70 |
| YU1DO | " | 6,720 | 118 | 10 | 32 |
| **YU3BO** | 7 | 180,400 | 910 | 29 | 81 |
| YZ1BCD | " | 153,120 | 751 | 25 | 91 |
| YU4FRS | " | 117,312 | 753 | 25 | 79 |
| YU3EYZ | " | 69,000 | 506 | 21 | 71 |
| | | (Opr. YU3TXT) | | | |
| YZ1SF | " | 12,582 | 221 | 9 | 45 |
| **YU1OCZ** | 3.5 | 21,285 | 428 | 10 | 35 |

**European S.S.R.**

| Call | | | | | |
|---|---|---|---|---|---|
| **UW3HV** | A | 501,534 | 938 | 79 | 219 |
| **UA3QO** | " | 472,124 | 1166 | 67 | 195 |
| **UA3VAQ** | " | 230,607 | 619 | 56 | 163 |
| UK6LGA | " | 137,241 | 465 | 43 | 110 |
| UA3FT | " | 119,682 | 385 | 50 | 133 |
| UW6DR | " | 105,210 | 537 | 35 | 91 |
| UA3ST | " | 88,949 | 369 | 38 | 93 |
| UA4MX | " | 73,566 | 403 | 28 | 94 |
| UA3PCA | " | 44,400 | 295 | 25 | 75 |
| UA3SAG | " | 37,296 | 195 | 30 | 96 |
| UA4YAT | " | 36,579 | 248 | 26 | 63 |
| UA4ZA | " | 36,515 | 205 | 33 | 76 |
| UA1CAI | " | 34,030 | 271 | 22 | 60 |
| UA3WAK | " | 32,663 | 224 | 25 | 64 |
| UA4SAK | " | 26,394 | 193 | 24 | 59 |
| UA1CAQ | " | 25,536 | 200 | 24 | 60 |
| UA4BI | " | 24,644 | 156 | 34 | 67 |
| UA1FJ | " | 23,205 | 219 | 22 | 63 |
| UW3WZ | " | 22,800 | 194 | 23 | 52 |
| UV3DN | " | 22,035 | 264 | 17 | 48 |
| UA3LM | " | 20,488 | 97 | 36 | 68 |
| UA3ET | " | 20,381 | 99 | 32 | 57 |
| UW6MP | " | 16,132 | 116 | 26 | 48 |
| UA3TAM | " | 13,340 | 162 | 17 | 41 |
| UA1AJ | " | 13,260 | 179 | 13 | 47 |
| UA4PAV | " | 10,990 | 117 | 21 | 49 |
| UA3QAA | " | 10,140 | 111 | 16 | 44 |
| UA3EAY | " | 10,017 | 140 | 14 | 39 |
| UA3TCH | " | 9,954 | 80 | 21 | 42 |
| UA3EAL | " | 9,425 | 110 | 21 | 44 |
| UA6LLR | " | 6,171 | 69 | 21 | 30 |
| UK3XAM | " | 5,928 | 84 | 13 | 39 |
| UK3LAC | " | 4,488 | 35 | 24 | 27 |
| UA3DQ | " | 4,140 | 46 | 19 | 26 |

*(Continued on page 71)*



WILLIAM I. ORR, W6SAI, ON

# Antennas

"Tell me all about your 40 meter DX," I suggested to Pendergast, as he slid the earphones from his head and turned down the receiver.

"Forty has been pretty good these days," he admitted, as he glanced back through his logbook. "There's almost as much coming through on that band as there is on 20 meters . . . if you have a good antenna."

I glanced over his shoulder at the log. "Well. VR4CW, ZD9GF, UK6LAZ, a bunch of Europeans, Africans, and Asians to boot!"

"Yes," said my friend, "But it is a real hassle. You really need a good beam to be able to compete on 40. Sometimes you can't even *hear* the stuff until you have a beam."

"So your next project is a 40 meter beam. Right?"

"Yes," replied Pendergast. "And the one I am interested in is the new four element *KLM Bandpass* antenna. That should do a really good job."

"It is quite unique," I admitted. "I know of no other antenna of this type. In fact, I just received a letter from a DX'er who has one up. Would you be interested in what he has to say about it?"

"Certainly," replied my friend.

"Well, as you know it is a 4 element job using a pair of log-periodic bandpass driven elements, plus a reflector and a director (Fig. 1). The boom length is about 42 feet and the longest element—the reflector—is about 47 feet. Before we go into details, the letter from my friend says he's been using the 40 meter KLM beam for about six months. He's had a daily sked with South Africa every day and has never missed a schedule due to band conditions. He's worked his schedule as late as 1320 PST, which is *amazing!*

"Sometimes he gets other W6 stations into the schedule on the long path opening. While he's usually S9+, the boys with the dipoles and verticals are just barely out of the noise in South Africa! That performance really separates the men from the boys!"

"Wow," said Pendergast. "A good beam certainly helps on 40."

I looked at the letter again. "He closes by saying that he can't overemphasize the usefulness and consistency of 40 meters. The foreign broadcast signals off the side and back of the beam are reduced and the DX signals really pour in. He's worked a VK5 on sideband who was running *one watt* PEP input and gave him S7. So there you are."

"What's the configuration of the beam?" asked Pendergast, as he pulled out his notebook and pencil, prepared to make notes.

"The layout is shown in fig. 2. The boom is 3 inches in diameter, with top guys fore and aft. All elements are insulated from the boom. The elements are foreshortened by *linear loading,* that is, the elements are folded back on themselves to conserve space. The two driven elements are cross-connected to form a single cell log-periodic structure having a passband of 300 kHz. Feedpoint impedance is about 200 ohms, so a 50 ohm line and a 4-to-1 coaxial balun make up the feed system.

"The passband of the antenna is shown in fig. 3. The log-periodic design acts as a sort of bandpass filter providing a good match and good bandwidth over the whole 40 meter band. Observe that the s.w.r. is less than 2 over the whole range, and less than 1.5 over nearly 260 kHz."

"Most small 40 meter beams have a very narrow operating bandwidth," observed Pendergast.

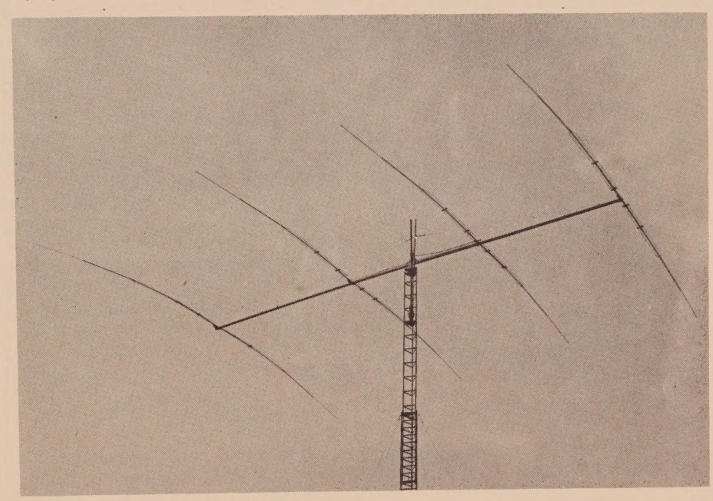


*Fig. 1—The KLM bandpass beam antenna for 40 meters. This 4-element array makes use of a log-periodic pair of driven elements to achieve a passband characteristic and a low value of s.w.r. across the whole 7 MHz band. Elements are mounted on a 42 foot boom, made of 3" diameter tubing. The longest element is about 47 feet. Each element makes use of linear loading, that is, a portion of the element is folded back against itself to conserve length. Tuning straps at the center of each element permit adjustment to be made. Each element has a butt diameter of 1¼ inch, tapering to ½-inch at the tip.*

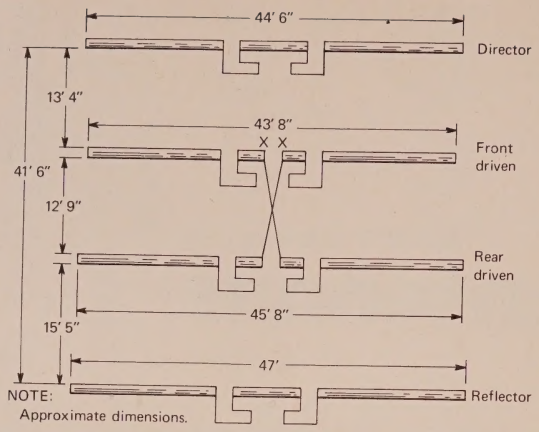



*Fig. 2 — Layout of the KLM 40 meter beam. All elements are fixed in length, but the director may be varied a few inches to lower the s.w.r. at either the 7.0 MHz or the 7.3 MHz end of the band. The linear loading sections are made of ⅜-inch diameter tubing mounted alongside the element. A 200 ohm balun is attached to the log-periodic section at points X-X.*

"Right," I replied. "This antenna combines good bandwidth with compact, linear loaded elements. Of course, it isn't a small antenna. It's a big one. But it takes a beam antenna of this size and power gain to do the job on 40 meters. I would certainly be interested in reports from other users of the 40 meter KLM antenna, as it is an unusual design, and it certainly seems to perform well."

Pendergast sighed. "How about the little fellow who doesn't have the money, space or a big tower to put up a 40 meter beam? What can he do?"

"Cheer up," I replied. "All is not lost. Plenty of DX can be worked with simple antennas. The April, 1976 issue of *Radio Communication,* the great magazine of the Radio Society of Great Britain, has a description of a simple and effective antenna used for 40 and 160 meters by my good friend, G2RO."

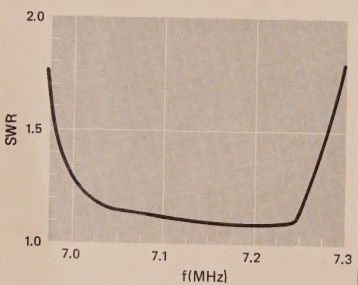



*Fig. 3—The s.w.r. curve of the KLM beam when adjusted for low s.w.r. at the 7.0 MHz end of the 40 meter band. S.w.r. remains below 1.4-to-1 across the band, except for the top 30kHz of the phone section. A slight adjustment to the reflector drops the s.w.r. at the high end of the band, and raises it slightly at the low end. This plot was run with the beam 68 feet above the ground.*

"Forty and one-sixty. That's an odd combination," observed Pendergast.

"It is," I admitted. "Here's the design (fig. 4). G2RO put up an end-fed wire tahat was 5/4 wavelength long at 7 MHz—that's 165 feet. He worked it against a good ground system. He trimmed the wire length a few inches at a time until he got a satisfactory match across the whole 7 MHz band. He then realized the antenna was slightly longer than one-quarter wavelength for 160 meters. So he inserted a tuning capacitor and series-resonated the wire to 1.8 MHz. It took about 600 pF to do the job. He then found out that the capacitor had a very negligible effect on 40 meters. So he left it in the circuit all the time and ended up with a two-band antenna that is very effective on both 40 and 160 meters."

Pendergast looked at the sketch thoughtfully, then said, "It seems to me that if you cut the length of the antenna in half, you would have a simple antenna that would work well on both 80 and 20 meters."

"That's right," I exclaimed. "A wire about 82'6" long would work on both 80 and 20 meters. And that's not a bad antenna for communication within the United States on both bands! You won't knock 'em dead in a pile-up with this antenna, but it is a solid performer. I would suggest two or more quarter wave radial ground wires, plus a good ground connection for either the 160/40 meter or 80/20 meter antenna."

"Any other dual-band antennas?" asked Pendergast, as he made a quick sketch of the G2RO antenna in his notebook.

"Well, yes," I replied. "I received a note from Jack, W9HJM, about his sloper antenna. He has a 40 foot tower with a TV antenna atop it and he decided to make it into a sloper for 80 meters (fig. 5). He ran out a 65 foot wire to a 12 foot post and fed the wire at the top end with about 75 feet of 50 ohm coaxial line. He grounded the shield of the line to the top of the tower and grounded the base of the metal tower to a 10-foot ground rod, as well as to several copper water pipes. Interestingly enough, he found out that the antenna worked well on 10 meters in addition to good performance on 80 meters. Here are his s.w.r. measurements on the two bands (fig. 6)."

"Well, I'll be dipped," said Pendergast. "That's the first time I've ever heard of the sloper antenna working on two bands!"

"Yep," I replied. "W9HJM works all over the country when 10 meters is open, so it looks as if he has a "freebie" with his simple 80 meter sloper!"

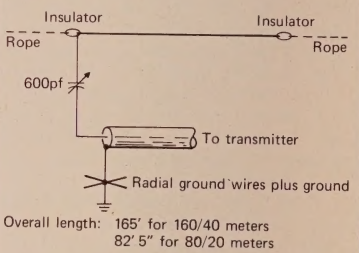



*Fig. 4—The G2RO two-band end-fed antenna. This antenna is designed for either 160/40 meter or 80/20 meter operation. The antenna length is trimmed for lowest s.w.r. on the high band with the capacitor shorted out. It is then tuned for lowest s.w.r. on the low band by means of the capacitor. A good ground connection should be used to reduce losses to a minimum.*

"I guess we haven't heard the last of the sloper," said my friend. More and more fellows are experimenting with this simple antenna and it produces surprises every day."

Pendergast paused, then he said, "I wonder if W9HJM's location had anything to do wtih his results?"

"I don't know," I replied. "But location seems to have a lot to do with it. Some guys have good locations, and some have bad ones. And I still really don't know how to pick the good one from the bad one!"

"Look at this," I continued. "Here are signal strength plots made by the *Bell Telephone Laboratories* in 1932 (fig. 7). This is part of a study BTL made to determine the best location for a shore station in ship-to-shore radiotelephone service. Signals from a ship were recorded at various land locations while the ship cruised about, out to as far as 2500 miles from the shore station. The results

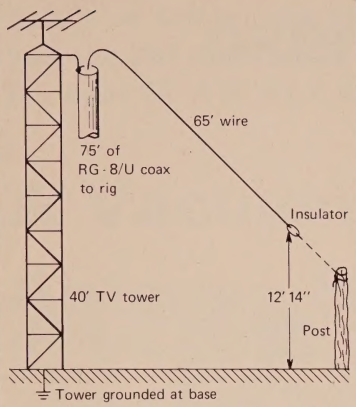



*Fig. 5—The W9HJM Sloper antenna for 80 meters is made up of a TV tower, with the sloper wire running off to a nearby post. It was found by W9HJM that the sloper works equally well on 10 meters as it does on 80 meters!*

strongly indicated that for an over-water path, the closer the shore station was to the water, the better were the results. Measurements were made at 66 meters and 33 meters, for both day and night conditions. The blunt statement was made that "attenuation of 8 dB to 12 dB is observed at a distance of one mile inland for both 33 and 66 meter transmission." That seems to indicate that a location near the water is to be preferred for over-water transmission.

"The whole subject is written up in the *Proceedings of the IRE* for January, 1932 under the title, *"Effect of Shore Station Location Upon Signals,"* by R.A. Heising, of the *Bell Telephone Laboratories."*

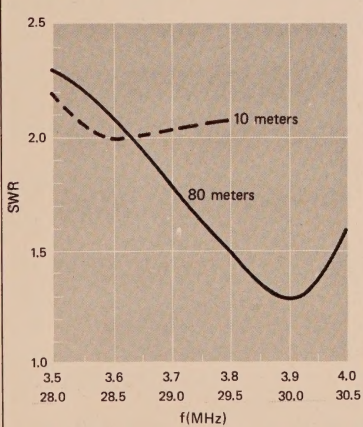



*Fig. 6—The s.w.r. plot for 80 and 10 meters for the W9HJM sloper antenna. The sloper is resonant at 3.9 MHz on 80 meters and at 28.6 MHz. on 10 meters.*

Pendergast said, "This is one of the things that makes amateur radio so interesting. There's still mysteries in long distance transmission and antennas and all the answers aren't known. I guess station location is one of the big unknowns, because you can't account for the exceptional results some amateurs seem to have from rather mediocre locations."

"Yes," I replied. "The ionosphere is a great leveller of signals. Working DX, in the long run, teaches you humility, if nothing else."

"Speaking of humility," I continued. "Here's a little problem for you. Have you ever heard of the SP5AY antenna? No? Well, I read about it in an issue of *CQ-Ham Radio,* the Japanese publication. Now since my Japanese and my Polish are on a par with each other—namely, zero—all I could go by was the drawing. Look at it. (fig. 8). The SP5AY antenna, I gather, is an all-band antenna in the sense it is supposed to work from 3.5 to 29 MHz. It consists of a horizontal wire 54'4" long, fed at one end, plus four radials, each 16'6" long. The radials run down at a 45 degree angle from the antenna."

Pendergast squinted at the drawing for a long time, then said, "I don't see how in the world it functions."

"Neither do I," I admitted. "According to the article, the s.w.r. averages 1.5-to-1 on the 80 meter band, 1.4-to-1 on the 40 meter band, and 1.5-to-1 on the 20, 15 and 10 meter bands."

Pendergast looked at the drawing in the Japanese magazine.

"It all looks terribly simple," he admitted. "The only thing I notice is that the mounting arrangement for the radial wires places a certain amount of capacitance across the end of the coaxial line. I would guess about 20 pF. I wonder if that has anything to do with the system?"

"I don't know," I replied. "I can't read Japanese, so the whole thing is Greek to me, as the saying goes."

"Ask your readers," exclaimed Pendergast. *"Somebody* out there must know about the SP5AY antenna! I'd like to know how the darn thing works, if it does."

"Agreed," I said. "I'll donate one of my antenna handbooks to any reader who knows something more about this interesting antenna. Does it work? Is this the correct information? Any multi-band antenna is interesting, and I enjoy mysteries. And the SP5AY antenna, at this stage of the game is a *real* mystery.

For the sake of the record, the article about this antenna was in the June, 1974 issue of *CQ-ham radio,* so the antenna has been around for a few years."

"Any closing remarks?", asked Pendergast, as he prepared to close down his station.

"One more thing", I replied. "I got a quick note from Joe, WA7GSM, who just got an Atlas 215 for mobile work. He had an old Webster Band-Spanner mobile antenna and the Atlas didn't want to load the whip, even when the Atlas matching transformer was used. So Joe bought a 102-inch CB whip and machined the bottom end to fit into the spring and fitting of the lower end of the original whip. Then, he slipped the whole works into the Webster Band-Spanner base coil. Finally, he placed a 1000 pF capacitor from the base of the whip to the body of the car. By adjusting the length of the whip, he

*(Continued on page 70)*

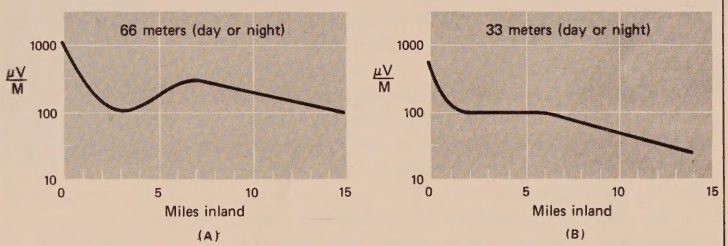



*Fig. 7—The plot of many readings taken over a period of time on 66 meters (A) and 33 meters (B) for a ship-to-shore radio path. Signals were attenuated 8 dB to 12dB only one mile inland at both frequencies. Location near the water is to be preferred for over-water transmission.*

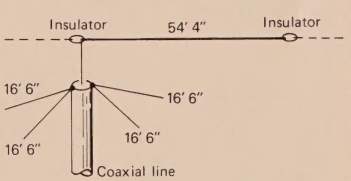



*Fig. 8—The so-called SP5AY "all-band" antenna. Does it work? How does it work? W6SAI would like to know. Has anyone tried this unusual antenna?*

# WAY BACK IN 1920

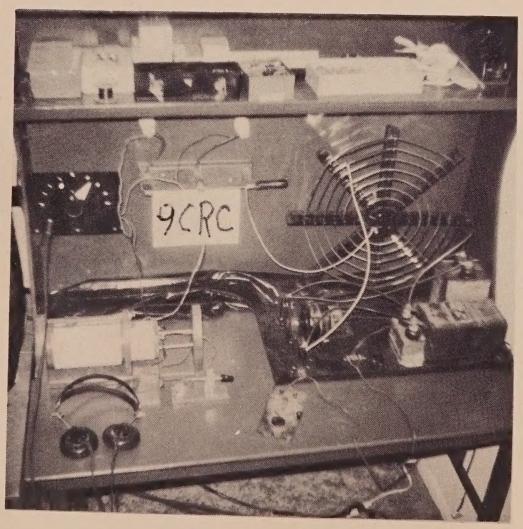
BY RUSS RENNAKER, W9CRC

What did a ham radio station look like way back in the 1920s? Few of the thousands of hams on the air today have any notion what the state of the art was like back in those days. A "spark" transmitter? What's that?

Here is a picture of 9CRC in 1920. The "W" had not yet been assigned to US amateur call letters at that time. The FCC was still unheard of. The U.S. Department of Commerce assigned call letters.

9CRC was located on a farm in rural Grant County, Indiana, and operated by a then twelve year old Russ Rennaker. The receiver consisted of a crystal detector (cat whisker and all), a loose coupler made from winding wire on rolled oats boxes, one inside another for coupling. The transmitter was a ½ kw transformer with 20,000 volts driving a rotary spark gap. The antenna inductance was made from ¾ inch copper ribbon helixal coil. The six inch knife switch was used to ground the antenna when the set was not in use as a precaution against lightning.

The antenna consisted of six copper wires on twelve foot end-spreaders strung between 60' telephone poles 200 feet apart. Sometimes when the sunlight struck the wires swaying in the breeze the reflection could be seen from the main road a mile away. Many a curious Model T driver diverted his *fliver* the mile to see what was causing the reflections. There was no BCI — for there was no broadcast receivers. DX was raising another amateur in the adjacent state. The only band was 200 meters. Surrounding farmers shook their heads in dismay but were fascinated by the screech of the rotary gap as it spun up or down as the switch was turned on or off. The hand telegraph key may be seen in the lower center of the picture. The crystal detector is between the key and the head phones at the lower left.




*Amateur radio station 9CRC in 1920.*



*Amateur radio station W9CRC in 1976.*

I eventually graduated to a tube transmitter using a 201A receiving tube. Then came the 210 tube and high power came to 9CRC — and the "W" was added. Plate power for the 210's was a home made battery consisting of some 300 test tubes with copper and zinc electrodes in copper sulphate solution. The plate battery took up the entire space on the floor beneath the operating table. Until a rubber sheet was employed many a brown spot mysteriously appeared on Mamma's carpet.

I got ambitious in the late 1920s and obtained a commercial operator's license and took my first job

*(Continued on page 73)*

***Here's an interesting project, not too difficult, that you can put together in a few evenings. Get set for the next CQ WW DX C.W. Contest now.***

# A Vacuum Relay TTL QSK Antenna Switch

BY RICHARD KLINMAN, K3OIO

Nothing motivates the art of home-brewing more than the absence of appropriate commercially available equipment. One such area is equipment for full break-in c.w., or QSK operation. QSK means that the receiver is capable of reception whenever the transmitter key is open. With QSK, reception is possible between each and every dot or dash. The use of VOX circuits to automatically transfer the antenna between receiver and transmitter is not QSK. Operation in the QSK mode with the same antenna for both receiving and transmitting requires a rapid and precise method of transferring the antenna between receiver and transmitter. Rapidity is required to allow the antenna transfer switching to follow the distinct key closures, and precision is required to avoid damage to the radio equipment. In the past it was common to accomplish this through the use of an electronic TR switch, but this technique should now be considered obsolete and unacceptable. It makes no sense to place a noisy, broad band, poorly designed isolation amplifier with limited dynamic range between the antenna and the front end of a modern, quality communications receiver. After all, part of the cost of the receiver is for a clean, sensitive, front-end as free of intermodulation products as possible. The only thing to place between the antenna and the receiver front-end is a wire or a resistive attenuator.

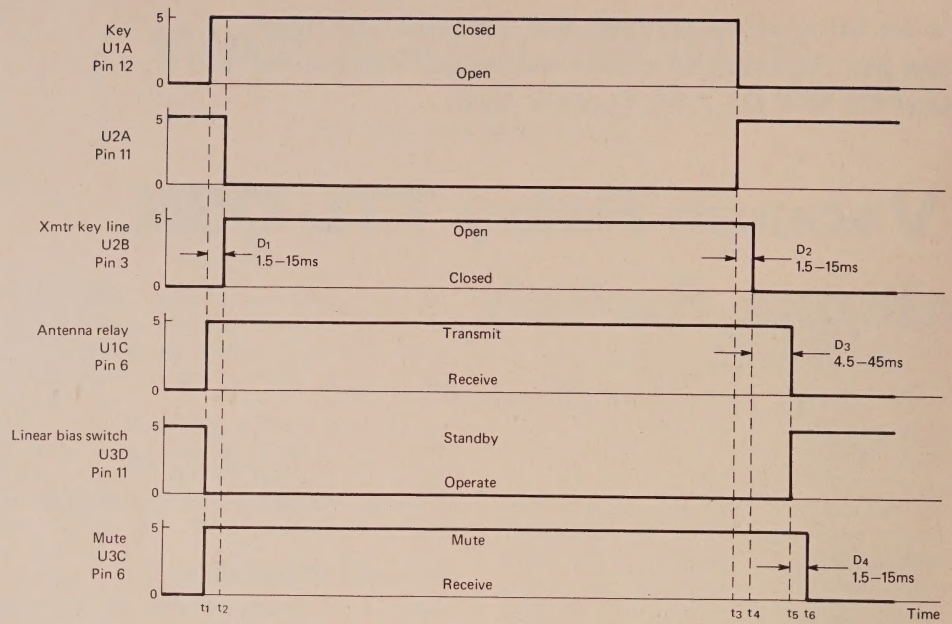
To achieve QSK antenna switching and meet this requirement a high speed relay that is keyed along with the transmitter is required. Relays are available with switching times sufficient to allow operation at most reasonable morse code speeds. For low power installations dry reed relays or mercury wetted relays can be used, but high voltage vacuum power relays are usable at the full legal power limit to 30 MHz.[1]. These relays are available new or surplus at reasonable cost. This article describes the design, operation, construction and use of such a vacuum relay QSK system.

[1]Examples are the Eimac VS-1, or VS-6, Kilovac HC-1, or Jennings RJ-1A.

## General QSK Description

Great care must be exercised when using a relay to switch r.f. circuits carrying appreciable power. Relay contacts are rated for two distinct types of service, the maximum continuous current they can carry while closed and the maximum current they can either interrupt or establish. In addition, they are rated for breakdown voltage while open and the overall insulation strength. The maximum continuous current rating generally greatly exceeds the maximum interruptable current rating. With 1kw of r.f. power flowing into a 50 ohm resistive transmission line, 1:1 s.w.r., the peak voltage is approximately 313 volts and the peak current is approximately 6.3 amps. These values are much larger under increased s.w.r. conditions. Few relays can switch this power at the millisecond speeds required to follow c.w. sending. However, if the relay is always switched when no r.f. power is present, either before the transmitter is keyed or after the output has decayed following the opening of the key, the relay contact rating requirements are greatly reduced. Several high speed vacuum relays are available that can carry the r.f. current and withstand the r.f. voltage of high power amateur transmitters.

Switching a circuit carrying large r.f. current, or "hot-switching," is to be avoided for several reasons. Hot-switching of an antenna feed line will force the transmitter to be momentarily loaded into an open circuit. The resulting high voltage and s.w.r. condition may damage the transmitter, receiver, or relay. Breaking or connecting an energized high power transmission line will most likely overstress the relay contacts and either burn them up or weld the relay contacts together. Even if the relay contacts can withstand such repeated abuse, the resulting key clicks being radiated, that origi-




a. $D_1 = t_2 - t_1$: Time for the antenna relay to close and stop bouncing.
$D_2 = t_4 - t_3$: Extension of character length to make up for lost character time caused by $D_1$. Corrects for transmitter keying characteristics. $D_2 \approx D_1$.
$D_3 = t_5 - t_4$: Time to allow transmitter output to decay to zero before the antenna relay is opened.
$D_4 = t_6 - t_5$: Time delay before receiver is un-muted.

b. At $t_1$: Key is closed; receiver is muted; antenna relay switched to transmit; linear cut-off bias removed.
$t_2$: Transmitter is keyed
$t_3$: Key is opened.
$t_4$: Transmitter is unkeyed.
$t_5$: Antenna relay is switched to receive; Linear cut-off bias is restored.
$t_6$: Receiver is un-muted.

*Fig. 1—QSK timing diagram. The cycle begins when the key is closed.*

nate from instantly interrupting the power flow, will cause severe interference to other amateurs and are, of course, illegal.

It is the function of the electronic circuitry of the QSK to control the timing sequence of the antenna transfer and transmitter keying to insure the antenna relay is switched only when no r.f. power is present. The logic assures that Morse characters are not shortened by the time delays caused by the limited switching speed of the antenna relay. Correctly sequenced outputs are provided to mute the receiver and control a linear power amplifier. The key, mechanical bug, or electronic keyer output is connected to the QSK input, and it is the QSK that actually keys the transmitter and activates the antenna relay.

The sequence of events during keying must occur in the following order, illustrated in the timing diagram of figure 1. The cycle begins when the key is closed. Immediately thereafter the antenna relay coil is energized and a high-speed reed-relay coil is activated to partially mute the receiver for monitoring the transmitted signal. The antenna relay requires a small time, a few milliseconds, to stop bouncing of the contacts and settle into the transmit position. The logic allows a time, D1, for the contacts to settle and positively connect the transmitter to the antenna. Until this time interval, D1, has occured no other event can take place. At the conclusion of settling delay D1 the transmitter may be keyed. A dot or dash is sent and may be comfortably monitored on the muted receiver. At the conclusion of the dot or dash the key is opened. At this point all that occurs is that time delay interval D2 is initiated. This delay keeps the transmitter keyed for its duration. The additional key down time, D2, exactly makes up for the fraction of the Morse character chopped off because of the pause, D1, between the initial key closure and the keying of the transmitter. Ideally, D1 and D2 will be of equal duration. At the conclusion of the additional key down time, D2, the transmitter is unkeyed. It takes a definite time, a few milliseconds, for the transmitter r.f. output to decay to zero. This behavior is designed into quality transmitters to avoid key clicks or "break," or opening of the key. The antenna relay must remain in the transmit position while this energy is decaying. Delay D3 provides this interval, between unkeying of the transmitter and return of the antenna to the receiver. A short time after the antenna is returned to the receive mode, the receiver is un-muted. A control signal to

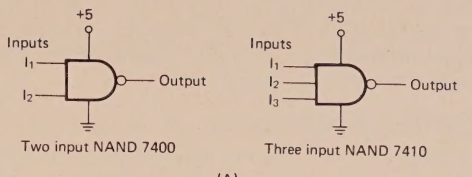
remove cut-off bias applied to a linear amplifier is provided in synchronous with the switching of the antenna relay. At a keying speed of 40 w.p.m., all the above steps occur in about 30 milliseconds and are repeated on the average of 560 times each minute.

### *Logic Circuit Description*

In order to achieve the timing sequence just described, the family of 74 hundred, transistor-transistor, or TTL, integrated circuit logic is used. These circuit components are readily available, inexpensive, reliable and extremely immune to interference from noise and r.f. Only two fundamental types of logic circuits are used in the QSK. These are NAND gate and the one-shot, or monostable multivibrator.

The NAND gate is shown schematically in Fig. 2A. Figure 2B gives the logic "truth-table" for these devices. Truth-tables describe the output of the gate for all possible combnations of input signals. Since the circuits are digital logic gates, only two signal levels are possible at either input or output. These are defined as the logical "O," corresponding to any voltage between O (ground) and +0.8 volts, and the logical "1," corresponding to any voltage between +3.0 and +5.0 volts. As can be seen from Figure 2B, the NAND gate operates so that when any one of the inputs is at the logical O level, then the output will be at the logical 1 level. Only if all inputs are at the logical 1 level will the output be a logical O. The gates are constructed such that inputs not connected to anything are automatically at the 1 level. Figure 2C shows how the NAND is converted to a logical inverter by simply connecting all inputs together. An inverter simply presents at the output the opposite logic level of that appearing on the input. The 7400 package contains four independent, double input NAND gates with a common power supply, and the 7410 package contains three independent, triple input NAND gates with common power supply connections.

The time delay functions are produced by using the 74123 retriggerable, monostable multivibrator, commonly called a one-shot. The 74123 package contains two independent one-shots with common power supply connections. Each one-shot requires only one external resistor and one external capacitor, which determines the time delay period. A schematic representation and logical truth table for the 74123 is given in Fig. 3. In the untriggered state the Q output is a logic O. Initiation of a delay period occurs by logical transitions on the input lines. If the A input is held at the O level, only a transition from a O to a 1 on the B input will trigger the one-shot. If the B input is held at the 1 level, only a transition from a 1 to a O on the A input will trigger the one shot. Once triggered the Q output becomes and remains at the 1 level for a time interval determined only by the external resistor R and capacitor




(A)

7400

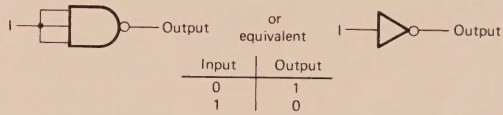
| $I_1$ | $I_2$ | Output |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

7410

| $I_1$ | $I_2$ | $I_3$ | Output |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

A logic "0" is defined as any voltage between 0 and +0.8 volts
A logic "1" is defined as any voltage between +3 and +5 volts

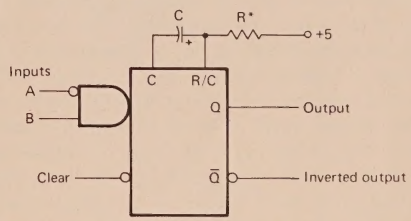
(B)




| Input | Output |
|---|---|
| 0 | 1 |
| 1 | 0 |

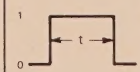
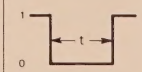
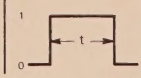
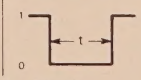
(C)

*Fig. 2—(A) NAND logic gates. (B) A Truth Table for NAND gates (C) Inverter and Truth Table.*




* R must be between 5KΩ and 50KΩ

SCHEMATIC REPRESENTATION

| Input A | Input B | Output Q | Output Q̄ |
|---|---|---|---|
| 1 | Any level | 0 | 1 |
| Any level | 0 | 0 | 1 |
| 0 | 0 to 1 transition |  |  |
| 1 to 0 transition | 1 |  |  |

Where t(ms) ≈ 0.32 × R(KΩ) × C(μf) × [1 + 0.7/R(KΩ)]

LOGIC TRUTH TABLE

*Fig. 3—A 74123 one-shot multivubrator.*

C. This time, t, in milliseconds is approximately equal to $t=0.32\times R\times C\times(1+0.7\div R)$, when R is in K ohms and C is in uf. The $\overline{Q}$ output is simply the logical inverse of Q. Both TTL packages require a single +5 volt power supply.

## QSK Circuit Description

Armed with this general knowledge of what the QSK is required to accomplish and how the integrated circuit components operate, the actual QSK circuit, fig. 4, should not be difficult to understand. The timing diagram, fig. 1, will be of great value in following this description.

The input to the QSK is the key. A straight key, mechanical bug, or keyer with a relay output may be connected directly between the inputs of U1-A and ground. Any one of the inputs may be used, and various keys can be wired in parallel by connections to different input lines. A key-up condition places a logic 1 on the input line, and key-down condition places a logic 0 on the input line. Keyers having outputs for grid block keying require an additional interface stage provided by Q1. When any one of the key lines is grounded, or closed, the output of gate U1-A becomes a 1 and the output of U1-B becomes a 0.

The transition of U1-B output from 1 to 0 as the key is closed triggers one-shot U4-A and starts time delay D1, of between 1.5 and 15 milliseconds. At the conclusion of delay D1 and $\overline{Q}$ output of U4-A returns to the 1 level. What is required to key the transmitter is a level that changes a time D1 after the key is closed. Such a signal is formed by using the $\overline{Q}$ output of U4-A and the output of U1-A as inputs to NAND U2-A, as shown in fig. 1. The output of U2-A becomes 0 a time D1 after the key is closed and remains 0 until the key is opened. The output of U2-A is fed to one input of U2-B through a diode and resistor. The other input of U2-B is connected to the $\overline{Q}$ output of one-shot U4-B. Since U4-B has not been triggered its $\overline{Q}$ output is a 1. Therefore, the output of U2-B is exactly that signal needed to key the transmitter. Inverter U2-C and transistor Q2 produce the proper levels for grid block keying.

When the key is released the output of U2-A goes from a 0 to a 1 level, triggering one-shot U4-B. Once the one-shot is triggered the $\overline{Q}$ output remains 0 for a period D2, of between 1.5 and 15 milliseconds. Since the $\overline{Q}$ output of U4-B is connected to one of the inputs of U2-B, the transmitter key line will be held closed and additional time equal to D2 as desired.

The function of holding the antenna relay in the transmit position for a short time after the transmitter has been unkeyed is provided by U5-A. After delay D2 has ended, the output of U2-B goes from a 1 to 0. This triggers one-shot U5-A and initiates delay D3, of between 4.5 and 45 milliseconds. The $\overline{Q}$ output of U5-A, the key closure indication from U1-B, and the transmitter key closure signal from U2-B are all combined as inputs to U1-C. The output of U1-C, shown in fig. 1, becomes a 1 when the key is first closed, remains at a 1 while it is held closed, and continues to be at a 1 during delays D2 and D3. At the conclusion of D3 it becomes a 0. This signal is exactly that required to switch the antenna

## QSK Parts List

### QSK Unit

**Resistors**

*¼ watt 10%*
4 — 68
1 — 270
1 — 560
1 — 1K
1 — 1.8K
6 — 2.2K
4 — 4.7K
1 — 10K

*2 watt 10%*
1 — 270
1 — 330

*Adjustable*
4 — 50 K multiple turn Trim-Pots (TRW 961-20, CTS 190 PC, Bourns 3006, or equiv.)
1 — 10 K Linear Taper pot.

**Capacitors:**

*Ceramic disc 100 v.d.c.*
10 — 1.0 μf.
10 — .1 μf.

*Tantalum miniature electrolytic, 25 v.d.c.*
3 — 1.0 μf.
1 — 2.7 μf.

**Inductors:**
1 — 1 mh choke (Miller 70F103A1 or equiv.)

**Semiconductors:**
1 — 2N4400 or equiv.
1 — 2N4402 " "
1 — 2N5321 " "
1 — 2N5322 " "
6 — IN914
1 — IN4740A (CR1)
2 — 7400 NAND
1 — 7410 NAND
2 — 74123 one-shot

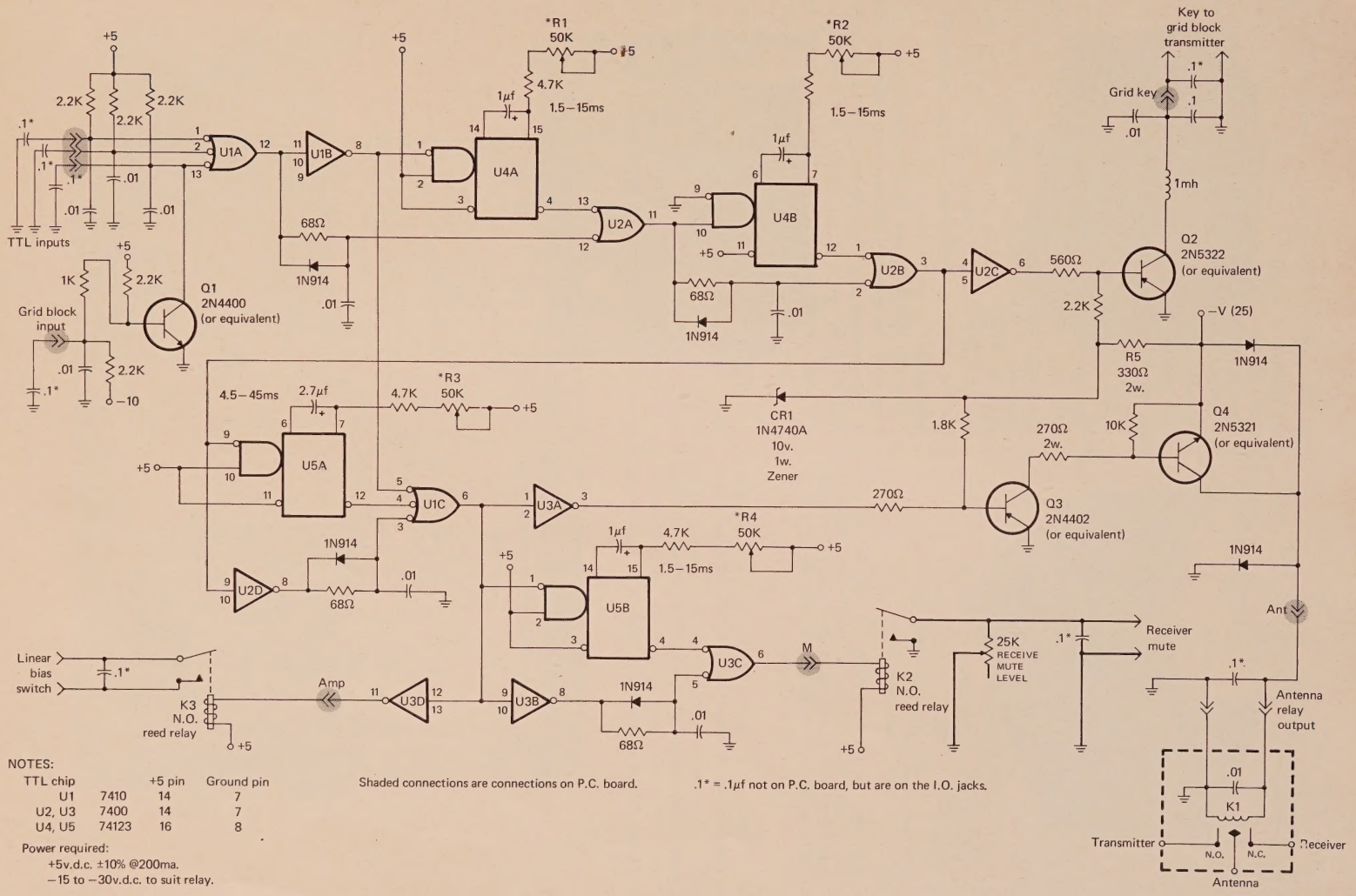
**Relays:**
2 — Reed relay, 4 v. 20 ma. (IR RR505 or equiv.), K2, K3.
1 — Vacuum relay, Eimac VS-1 or VS-6 (Kilovac HC-1, Jennings RJ-1A or equiv. may be used if appropriate value of −V is used).

### Power Supply

**Transformers:**
1 — 12 v.a.c. at 500 ma.
1 — 25 v.a.c. at 1 amp.

**Capacitors:**
1 — 1 μf., 25 v.d.c. Tantalum electrolytic
1 — 500 μf, 15 v.d.c. electrolytic
1 — 1000 μf., 35 v.d.c. electrolytic
2 — .05 μf., 100 v.d.c. disc ceramic

**Semiconductors:**
1 — 7805UC (Fairchild +5 volt regulator, TO-220 Case).
2 — 50 p.i.v., 1 amp bridge rectifier.




NOTES:

| TTL chip | | +5 pin | Ground pin |
|---|---|---|---|
| U1 | 7410 | 14 | 7 |
| U2, U3 | 7400 | 14 | 7 |
| U4, U5 | 74123 | 16 | 8 |

Power required:
+5v.d.c. ±10% @200ma.
–15 to –30v.d.c. to suit relay.

Shaded connections are connections on P.C. board.

.1* = .1μf not on P.C. board, but are on the I.O. jacks.

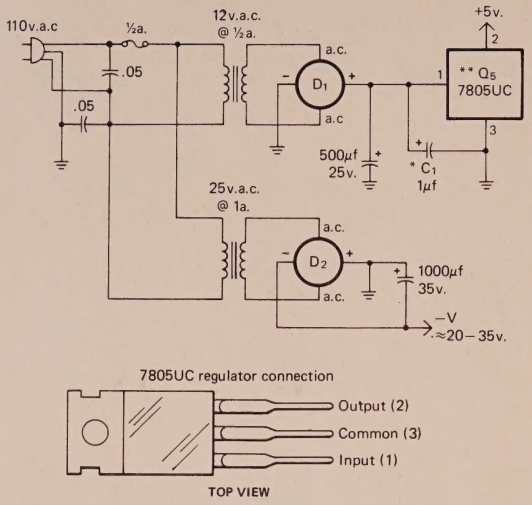



*Fig. 5—Power supply schematic. D1 and D2 are 50v piv 1 amp bridge rectifiers. C1 is 1 uf, 25 volts, electrolytic, soldered directly on the regulator input and common pins. Q5 is a fairchild 7805UC, +5 volt regulator in a TO-220 case.*

relay. Inverter U3-A, and transistor Q3 and Q4 provide the correct voltage to drive the antenna relay coil K1.

Finally, one-shot U5-B is triggered by the 1 to 0 transition of U1-C output providing an additional time delay, D4, of between 1.5 and 15 milliseconds. This time delay interval must be completed before the receiver is un-muted. Relay K2 is normally energized by the output of gate U3-C, and with the key open the contacts are grounded. During the mute condition the relay is deenergized, which opens the contacts and places the 10K potentiometer between the receiver mute line and ground. With most receivers the 10K resistor gives ample range for any desired mute level.

The logic signal driving the antenna relay is feed into gate U3-D wired as an invertor. This gate controls reed relay K3. Some means must be provided to cut-off the idling current of any linear amplifier used with the transmitter. The contacts of this relay short out additional bias applied to the final amplifier. Conventional VOX circuits can be used to control the amplifier if desired, but this technique is less elegant.

The four IN914 diodes, 68 ohm resistor, and .01μf capacitor networks in certain logic lines are used to compensate for the internal limited switching speed called propagation delay, characteristic of any logic circuit element. The networks insure that the propagation delay can play no part in operation of the logic.

A simple and conventional power supply is used, fig. 5. The TTL logic chips require +5.0± 10% d.c. at about 250 ma. The 7805 UC 5 volt voltage regulator is perfect for this application, is easy to use, and is inexpensive. No heat sink is required, but the case tab of the regulator should be firmly bolted

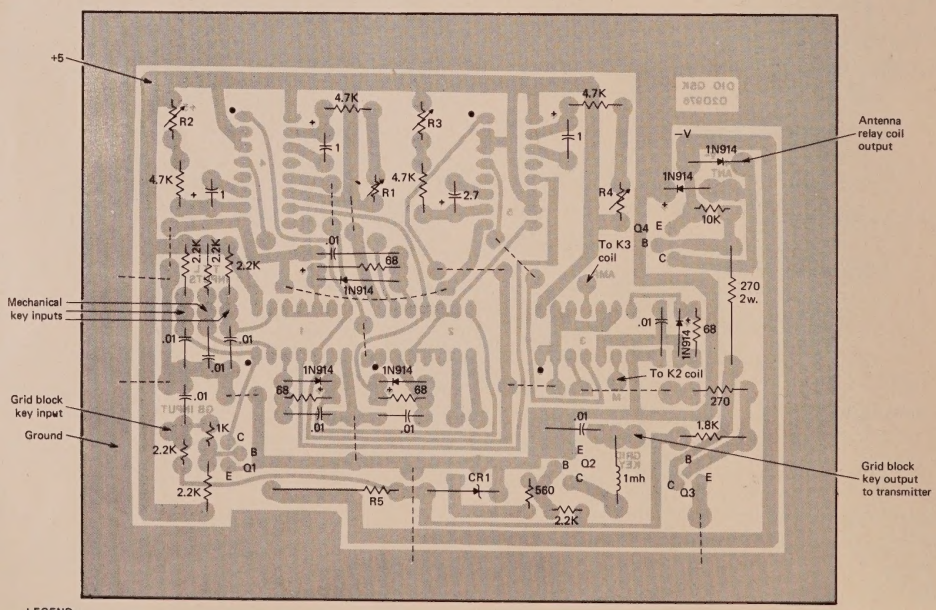
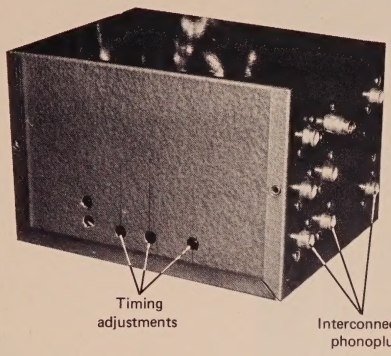
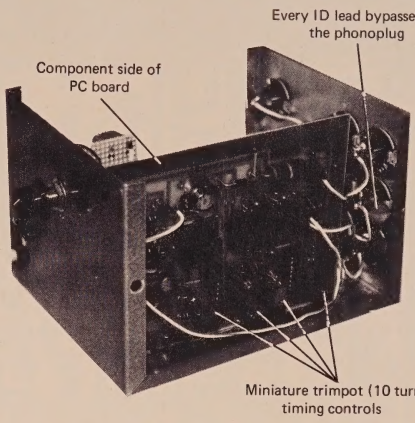


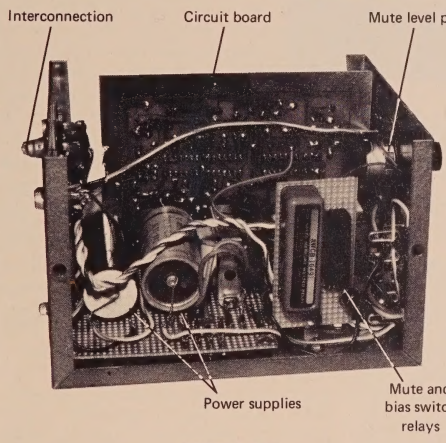

*Fig. 6—QSK printed circuit board shown from the component side.*




CONTROL BOX

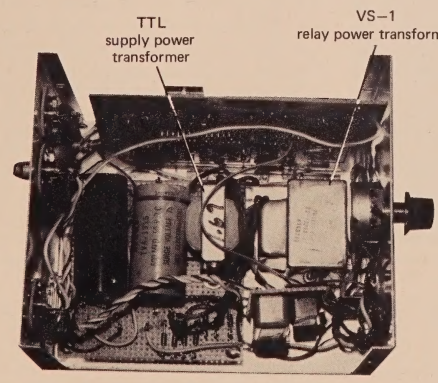



CONTROL BOX

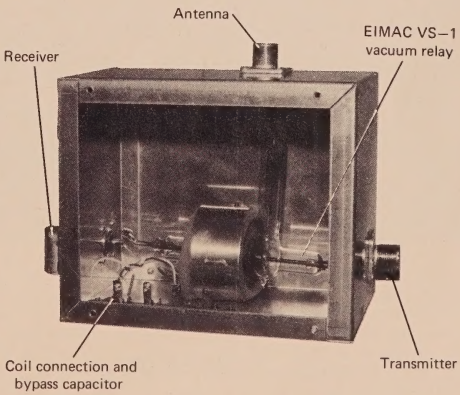



CONTROL BOX

Several views of the QSK relay and control box. It's really not that complicated and will surely improve your c.w. score.




CONTROL BOX




RELAY BOX

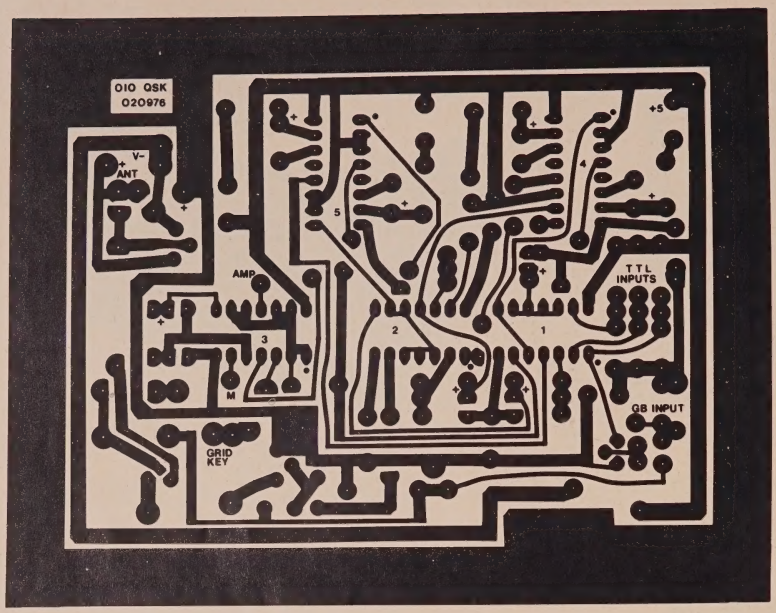



*Fig. 7—Full size art for QSK pc. board.*

to the case of the QSK. The antenna relay requires a voltage, V, depending upon the exact relay type used. The VS-1 requires about 20 volts at 700 ma. This is supplied by a negative, unregulated, power supply. Dropping resistor RJ is used in conjunction with zener diode CR1 to produce −10 volts for the transistor circuits. The value of R5 is determined by the closest standard resistor to R5=[V−10]/45, where R5 is in KΩ, and V is in volts. At least a 2 watt resistor should be used for R5.

## *QSK Construction*

The QSK is contained in two separate metal miniboxes. One contains only the antenna relay, and the other contains the power supply and logic circuits. Since the antenna relay carries considerable r.f. energy, this division helps to keep r.f. out of the logic circuits. Only a single coax cable, carrying the antenna relay coil current, connects the two boxes.

*(Continued on page 78)*

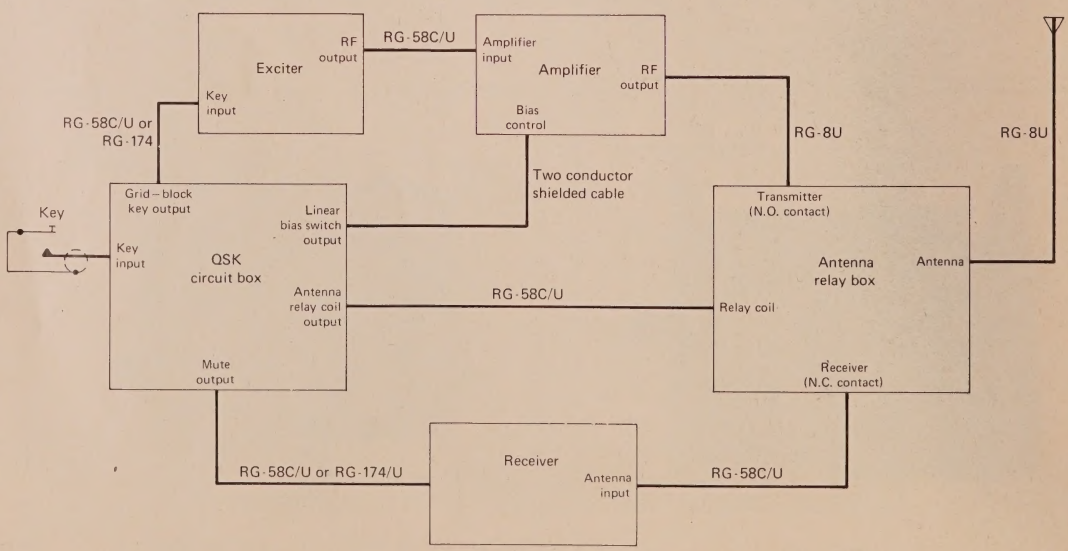



*Fig. 8—QSK station interconnection design.*

# Novice

BY HERBERT S. BRIER, W9EGQ

Many of the recent actions of the Federal Communications Commission to simplify Amateur regulations are of little immediate interest to Novices and many other Amateurs. They are not too concerned about fast-scan TV repeaters in the 420 MHz band or that Technicians cannot legally use v.h.f./u.h.f. to 29.5 MHz repeaters, because their licenses do not authorize 29 MHz operation. They can use OSCAR-6, the orbiting 146 MHz to 29.5 MHz satellite repeater, however, by special arrangement. The hearts of few Novices beat faster at the news that any qualified applicant can now get an Extra class license without any previous amateur experience. All he has to do is to pass the General, Advanced, and Extra class code and written exams in one sitting. But the news that the traditional FCC method of testing the code-copying ability may soon be a thing of the past should bring most amateurs and prospective amateurs to a full stop.

The traditional method of testing code-copying ability is to send a 5-minute message in the International Morse Code at the prescribed speed. The applicant must copy the message for a continuous period of at least one minute without omission or other error to pass the test. Under a new "message content" method released by the FCC on March 16, 1976, the applicant will listen to a 5-minute, plain-language message sent in the International Morse Code. He will then be given a multi-choice quiz of what he heard. Scoring 80 percent or higher on the quiz will be a passing grade.

The FCC says that the new format "would relieve the applicant of the extremely tedious burden of copying one minute of mixed text without error, yet would provide an accurate gauge of his competency in the reception of Morse code message content." It would also satisfy international regulations governing amateur code tests.

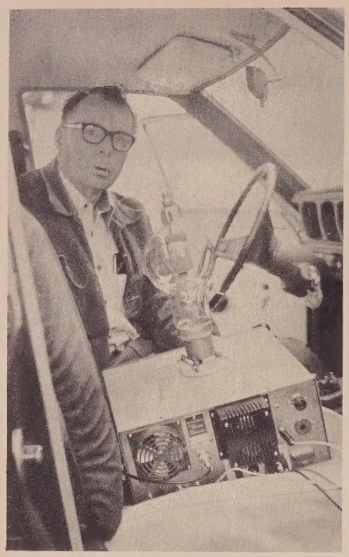
The new code test will soon be administered experimentally at a few selected FCC offices. Applicants will have no choice of the type of test they will face. The applicants who are given the new test will be given a passing grade if they score 80 per cent or higher on a multiple-choice quiz of what they heard. Applicants who are given the conventional code-receiving test will have to copy one minute without omission or error to pass. "Any change in this policy will be announced in advance."

### *New Study Guides*

As mentioned in our last column, the FCC released new Novice (element 2) and General, Conditional, Technician (element 3) study guides in late March. Careful comparison of the new and old study guides leads us to believe that prospective Amateurs without previous electronic experience should reach their goal quicker and have a firmer grasp of fundamentals following the new guides rather than the old ones. In our opinion, the superiority of the new study guides is that they specify the




*Tom Gannon, WN4HHJ, 291 S. Lorraine Dr., Mary Esther, Fla. 32569, first learned the code and amateur theory back in 1935 but did not get his first license until 40 years later. He has worked all states, and 54 countries in all continents using a Heathkit HW-16 and a Heathkit HG-10 v.f.o. in conjunction with a home-built, 3-element beam. Tom is a retired USAF and airline navigator and is waiting for his General class license. His ultimate goal is the Extra class license and expects to remain on c.w. mostly until he achieves it. We are sending Tom a 1-year subscription to CQ for submitting the winning picture in our Monthly Photo Contest. If you would like to enter the contest, send a clear photo (preferably black and white) of you at the controls of your amateur station with some details about your radio career to CQ Novice Photo Contest, care of Herbert S. Brier, W9EGQ, 409 S. 14 St., Chesterton, Ind. 46304. Suitable non-prize winners will be published as space permits.*



*That 250TH tube will never fit! Rob, WN7-CDU, Raymond, Washington, works c.w. mobile in the Novice bands with his Kenwood TS-520 on the car seat beside him.*

type of information covered by the examinations and then tell the student, almost item by item, what he should study to acquire the information. Publishers of license manuals are already working on updated versions of the manuals, which should be available before the FCC starts handing out new written exams.

The FCC log jam at Gettysburg that has made many prospective amateurs wait a month or more to take their Novice or Technician/Conditional class examination papers after the volunteer examiners requested them and an additional 12 to 14 weeks to receive their licenses after passing the exams may be broken before the summer is over. The first step of the breakup is expected to be opening all mail within 24 hours of arrival, instead of laying around up to a month before it could be opened. The next step is a high-speed licensing system that is hoped to be in operation by the end of July. If all goes as planned, a license application will be processed and the new license on its way within 10 days.

### *Short Skip on 21 and 28 MHz*

One of the most thrilling experiences of the operators of the 21, 28 and 50 MHz amateur bands is to be listening to a "dead" band and hear it suddenly explode with strong signals from unpredictable directions and distances up to 2500 miles for periods between a few seconds and many hours. The cause is sudden "sporadic" intensely ionized patches in the E layer of the *ionosphere* that refract signals that normally sail through the *ionosphere* into limitless space, returning the signals to earth many miles from the transmitting antenna. Several things can be said about these "short-skip" or "sporadic-E" signals: They are unpredictable, although they occur more often in the summer between mid-morning and late afternoon than at other times of the year. Also, simple antennas do as well or better for short-skip contacts as elaborate antennas. Try a few CQ's on an apparently dead 21 or 28 MHz band. You may be surprized by who answers you.

"Short skip" or "sporadic-E radiation" is the result of intense patches of ionization at the height of the normal E layer of the ionosphere (approximately 70 miles or 45 kilometers above the earth). Normal E layer ionization follows the sun—maximum at noon, minimum at night—and is seldom intense enough to affect signals above 14 MHz. But during periods of sporadic-E conditions, patches of the region are so highly ionized that 21, 28, 50, and (rarely) 150 MHz signals striking them are refracted back to the earth 200 to 2500 miles from the transmitter. The current theory is that high-speed sheer winds bunch the free electrons always present in the region into the patches — sometimes small, sometimes large, but always changing.

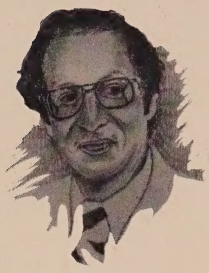
The big thrills of "short skip" are its unpredictability, the strength of signals from low-power transmitters, and the opportunity it gives operators of bands such as 21, 28, and 50 MHz, to work distances and states that they normally have difficulty in working. The trick of taking advantage of the phenomena is to check the band of interest at every opportunity, day or night. Do not merely listen for a few seconds and give up if you do not hear signals. Call "CQ" a few times. It often happens that a band is open between operators who never know it, because they both only listened. My new neighbor, John, WB9JOV, worked a new country—Panama—while tuning up his new 10-meter beam mounted on boxes, two feet from the ground last weekend. He thought the band was "dead!"

### *News And Views*

**Ken Bales, W7VCB,** Rt. 2, Box 300B, Raymond, Washington 98577, has been working towards getting photos and tape recordings of all amateurs in Pacific County, Washington, as a Bicentennial project. There are three active Novices in the county. One is **Rob, WN7CDU,** who now works mobile c.w. on the 7 and 21 MHz Novice bands using a Kenwood TS-520 transceiver exciting a Hustler mobile antenna. He has made over 500 contacts all over the USA and in Japan and Alaska since getting on the air . . . **Casey, WN7HDE,** also uses a Kenwood TS-520. He drives a home-built, 15-meter, 2-element Quad with it. He has worked some fine DX with his set up, Ken says. Casey's station is set up in a small corner of his mobile home. Back to W7VCB. Ken is actively promoting more activity on the 10 and 15 meter bands, including the Novice segments. Pacific county amateurs use 10 meters for local ragchews and sometimes hear and work good "skip" DX. Ken suggests "QFU?"—"Is this frequency busy?" as an unofficial "Q" signal. (Many DX men already send a snappy "QRL?" before opening up on a new frequency.)

Charles Whited reports in the *Miami Herald* **that Bob Vest, WA4JVN,** fell from the horizontal bars 10 years ago while a freshman in college. The accident left him paralyzed from the neck down. Later, an amateur friend introduced him to our hobby and helped him study for the exam. The FCC office was not exactly geared for an applicant who copied code with a pen clinched in his teeth. But, after improvising with a couple of phone books, Bob passed the 13 w.p.m. General code test and written test. He sends c.w., tunes his equipment, changes bands, dials phone numbers to run phone patches, turns pages in his bible and in technical books with sticks held in his teeth. . . . **John Mitnick, WN2CMX,** 7 Stafford Dr., Madison, N.J. 07940, thanks VQ9R for coming into the 15 meter Novice band to work Novices and wishes that more DX operators would emulate him. **CEØAE,** *Easter Island, is another rare one who invades the Novice bands regularly—usually on the 15th and 30th of the month.* . . . **Bob, WN6CSO,** 22917 Vose St., Canoga Park, Calif. 91304, advocates letting Novices who pass the 13 w.p.m. General code test but fail the written exam operate in the General-class c.w. bands. Later, when they pass the written exam, they would be authorized to operate in the General phone bands. This is an interesting idea with no chance of being adopted at this time, if for no other reason than the FCC Amateur division already has too much to do. There is some chance, however, that applicants who pass the code test

*(continued on page 70)*



# Math's Notes

BY IRWIN MATH, WA2NDM

This month we would like to discuss a relatively new form of logic slowly making its appearance on the amateur scene. Unlike its predecessors, this logic family uses extremely little power, is insensitive to power supply variations from 3 to 15 volts, and is almost burn-out proof. What we are talking about is, of course, complementary metal oxide silicon IC's or CMOS as it is called.

The basic parameters of CMOS that make it different from other forms of logic are as follows:

1) Most units operate perfectly well from around a 3 volt to 15 volt supply (unregulated is ok as long as it doesn't exceed these limits).

2) Input impedance to a chip is very high, $10^{12}$ ohms typically so input currents are very small, 10 pico-amperes typically.

3) Output impedances are small, around 400-500 ohms so they can drive many similar chips.

4) Internal dissipation within the chip is around 10 nanowatts per gate so power supply current drain is minimal.

5) Speed of operation is around 5 MHz or so although CMOS elements with frequencies of 20 MHz are available.

6) Rise and fall times are much slower than other forms of logic minimizing stringent driving requirements.

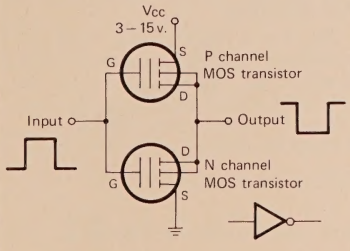



*Fig. 1—The basic CMOS inverter discussed in the text.*

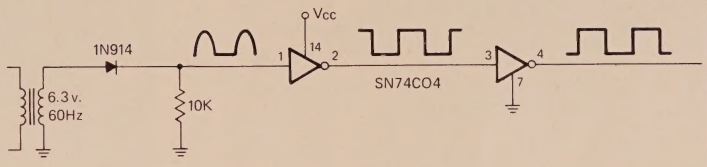



*Fig. 2—A CMOS a.c. line synchronized trigger. The value of $V_{cc}$ should be adjusted for best results with the amplifier of the 60 Hz input.*

7) Finally noise immunity is excellent approaching ½ the total logic swing.

To visualize what goes on in a CMOS chip we will briefly look at the simplest unit, the inverter. Fig. 1 shows the basic circuit of this element. The device consists of two MOS transistors, a P channel and an N channel.

With the input grounded, it can be seen that the P channel transistor conducts (saturates) and becomes the equivalent of a 400-500 ohm resistor from $V_{cc}$ to output. The N channel is cut-off and offers only $10^{12}$ ohms from output to ground. The output is therefore high.

When the input is now raised to $V_{cc}$, the P channel transistor cuts-off effectively offering $10^{12}$ ohms between $V_{cc}$ and output and the N channel transistor comes on producing a 400-500 ohm resistance from output to ground. The output is therefore low.

That in brief is the operating principles of CMOS. Now for some good news. When CMOS was first introduced, there were specialized chips and functions offered by RCA and Motorola in their CD-Series. Recently, a new series, pin-for-pin replacements of most TTL chips in the famous SN7400 series, and called the SN74C00 Series, has been introduced.

Since all logic operations of these chips is the same as the older TTL chips, the digital designer does not have to relearn much to use these devices.

But, what better way to learn than to actually use some of these devices. What follows is a compilation of basic circuits that should serve to introduce and teach the amateur a little more about CMOS logic.

Before building or even handling CMOS chips be certain you are using a grounded soldering iron. The high impedance inputs can easily be damaged by leakage currents or even static electricity such as produced by Styrofoam®, nylon or the equivalent. Always keep the CMOS in its conductive package and never plug a chip into a live circuit. Always apply power last. Don't get too scared however, there are internal protective diodes and the chips are quite rugged—just don't abuse them.

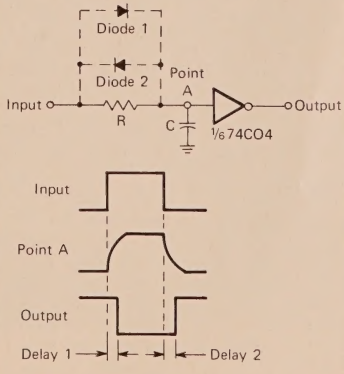
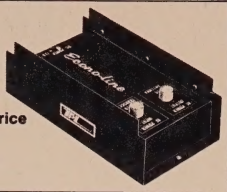



*Fig. 3—Delay circuit. See text for operation of the two diodes.*

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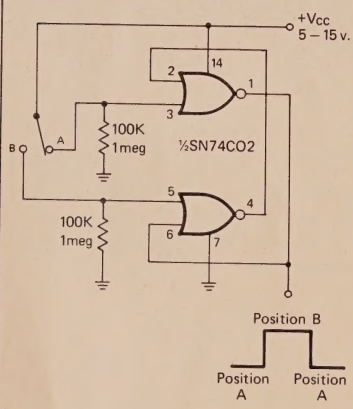



*Fig. 4—A "Bounceless Switch", only the first bounce in each switch position affects the circuit.*

### 60 Hz Pulse Generator

Fig. 2 is a schematic of a simple 60 Hz pulse generator made of two SN74C04 hex inverter sections. This inverter simply switches as the rectified input sine wave varies from 0 to its peak. The second inverter cleans up the wave shape. Such a circuit can serve as a useful source of a.c. line synchronized pulses.

### Delay On Operate

Fig. 3 is a simple delay circuit implemented by a CMOS inverter. As the input pulse rises from 0 to $V_{cc}$, the RC network must first charge to the trigger level of the inverter to cause it to invert.

Similarly as the input delays to zero, the capacitor must first discharge through the resistor before it can revert back to its original state. Values of R can be up to a megohm and C, up to the microfarad region.

By adding diode 1, delay #1 can be eliminated since the capacitor will immediately charge. Adding diode 2 will eliminate delay #2 since the capacitor can now immediately discharge.

### Bounceless Switch

Fig. 4 shows the circuit for a typical bounceless switch made up of ½ of a SN74C02 quad 2 input nor-gate. This is a typical latching circuit and

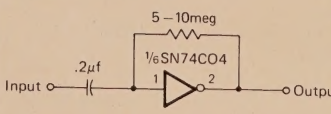



*Fig. 5—A simple CMOS linear amplifier.*

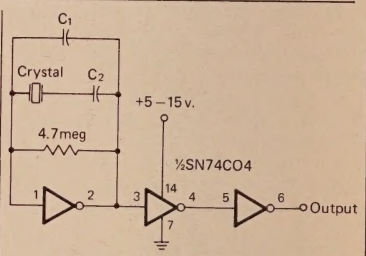



*Fig. 6—The CMOS crystal oscillator described in the text.*

the first noise pulse as the switch moves latches the circuit. This type of circuit could be used as the input to a Keyer or some other such project.

### A.C. Amplifier

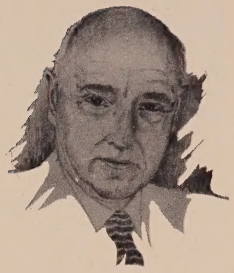
Fig. 5 is a simple, high input impedance a.c. amplifier made of a hex inverter. The unit is self biased by the resistor from input to output and will exhibit again in the area of 10-50. It could be used as a low level stage.

### Crystal Oscillator

After building an a.c. amplifier, what is more natural than a simple crystal oscillator useful to up 5 MHz or so. The 5 megohm resistor "linear-

*(continued on page 70)*

# In Focus



BY BILL DEWITT, W2DD

### *Dayton '76, The Biggest*

Congratulations to the Dayton Amateur Radio Association for another job well done! This year's Hamvention was again a record-breaker with its 12,500 attendance. What a collection of Hammanity!

Although slow scanners represent only a miniscule portion of that gross figure, we were there in double last year's number I am sure.

Those attending the Friday night Seminar seemed in agreement that much larger facilities for that affair are a must. It was standing room only for those not present when the doors opened. The Saturday slow scan forum sessions were jam-packed too.

### *SSTV Seminar Highlight*

An informative highlight of the just mentioned seminar was Dr. Suding's description of the Digital Groups new product line. They are offering the mini-computer minded amateur a broad spectrum of possibilities for not only amateur station functions but home computer operations as well. For example, Dr. Suding demonstrated a mathematics teaching technique using a combintaion of the Digital Group's products such as a TV keyboard, monitor, and a microprocessor programmed by cassette input for the math project.

It is my understanding that a variety of programs will be offered. In addition, upon request, programming steps for various functions will be available for a number of vendor's CPUs. This feature in combination with plug in boards insures that hardware changes can be held to a minimum and that the user can choose the CPU best suited to his particular needs.

### *Microprocessors—Quo Vadis?*

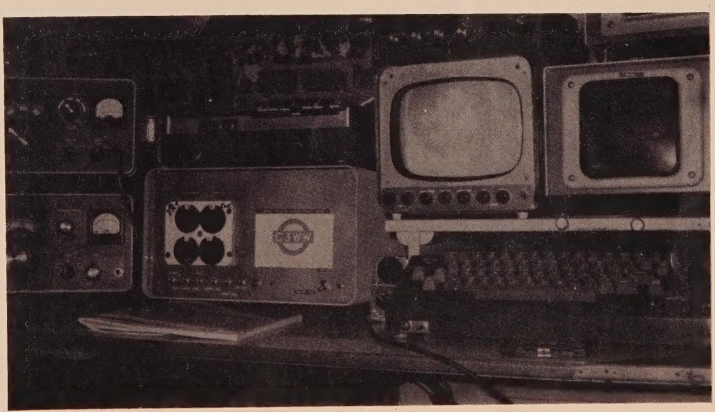
It will be interesting to see how slow scanners adapt the use of microprocessors to their needs as time goes on. My feeling at this point is that a microprocessor will do very little for the amateur who has *"one of everything"* anyway! BUT, for the chap who doesn't have a camera, monitor, scan converter, keyboard, RTTY, video read-out c.w., etc., here is something to look forward to. For the average amateur, it's going to take some time, because not every amateur can handle the computer approach to signal handling and the complexities of debugging kit-built gear with 12 or 15 boards. Digital's gear however, is beautifully designed and system engineered for step by step acquisition of one functional capability after another. Interest at Dayton indicates that many slow scanners will soon be making use of Digital's multi-purpose equipment array.

### *Hope, Faith And Better SSTV?*

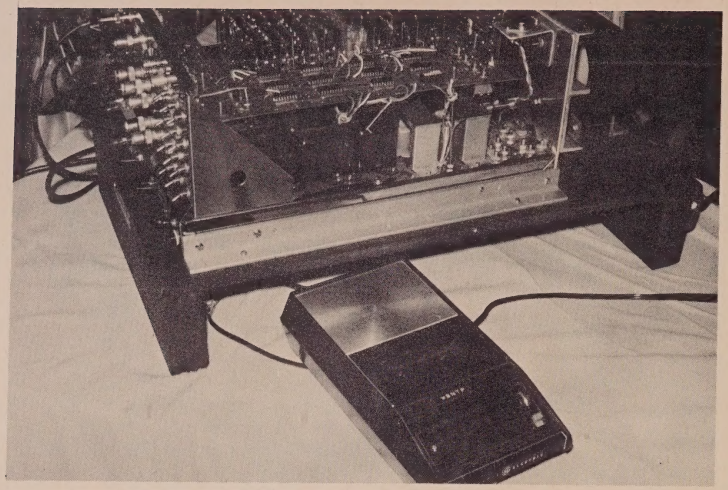
Let's hope that we will soon see the use of microprocessors extended to the business of enhancing the quality of transmitted and received slow scan video and increasing the picture transmission capabilities of the system.

It seems to me that so far as SSTV is concerned, the ultimate value of having a computer at hand would be to use it to improve sharpness, to improve quality by recognizing the difference between noise and picture information—and signal processing based on this information, to introduce motion, to add color to the system, and to produce special effects such as combined pictures and graphics.

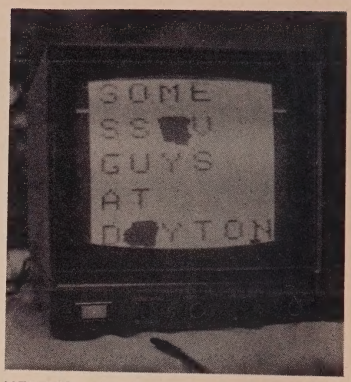
The bandwidth limitations of our present h.f. and v.h.f. allocations make realization of order-of-magnitude improvements a tough assignment. However, there's no doubt that microprocessors will speed their achievement. As mentioned in this column earlier, Dr. George Steber, WB9LVI, is working on signal processing method beyond his already published results. At Dayton, Dr.



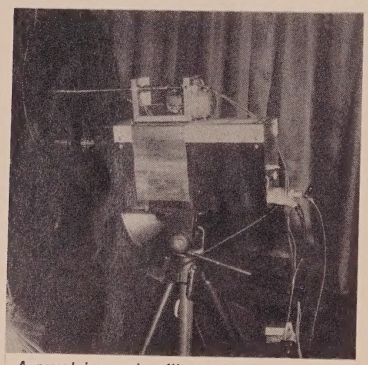
*Richard Thurlow, G3WW, is getting excellent results with this scan converter all packaged up in a Heath cabinet (with separate PSU). Built by Howard Waton, G3GGJ to WB9LVI's design, it uses PC boards supplied by W3LY and W3GKW. Not pictured, but doing a fine job too, is a hand-wired LVI job built by Ron Johnson, G3GRJ. How about a photo for "In Focus" reader Ron?*



A closer look at W9NTP's color scan converter. Note the high density packaging!



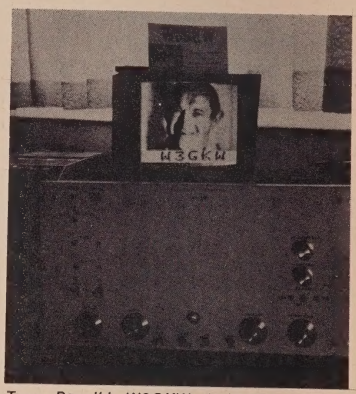

VE3DVV's "light pen" can be used to create images on the monitor screen, or to block out parts of images as shown in this picture. John demonstrated this feature with both black and white backgrounds.



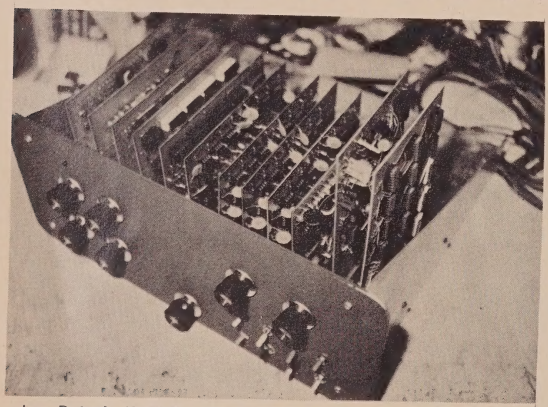
A revolving color filter wheel attached to W9NTP's camera provides sequential red, green, and blue video information.



John Vanden Berg, VE3DVV had great fun demonstrating his hand-wired scan converter and "light pen" device at Dayton.



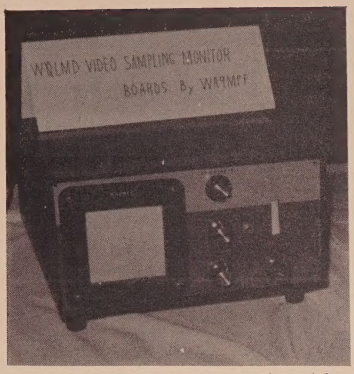

Tony Pessiki, W3GKW, built this version of WB9LVI's design. Picture quality resulting from this unit at Dayton was really tops.



Len Butsch, K4CNP, gave me this excellent picture of his commercial looking scan converter when we met at the Dayton 'vention. I LOST the picture, and out of 12,500 souls in attendance, Eddie Collins, W4MS, FOUND it and recognized it as Len's gear! I'll skip further details, but via the long arm of coincidence and the sharp eyes of a good friend, you are seeing a beautifully built piece of SSTV gear. Len added two hand-wired boards for frame grabbing and fast-to-slow conversion to the ten boards he obtained from W3GKW.




W3GKW chose to separate "the works" and the power supplies, as seen in this "exposed plumbing" view.



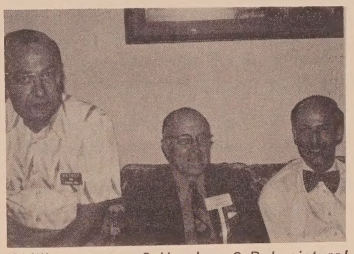

*Here's a nifty P-7 monitor packaged in a transceiver-sized cabinet by Larry Pryor, WA9MFF. Larry has boards for this monitor (WØLMD design) available. Practically the perfect answer for anyone wanting to get started in slow scan.*



*Here's Bob Stone, W3EFG, looking very happy about the response to his Sampledot demonstration. The pensive chap in the background is Ralph Taggart, WB8DQT, who was probably dreaming up the next innovation for weather picture reception.*



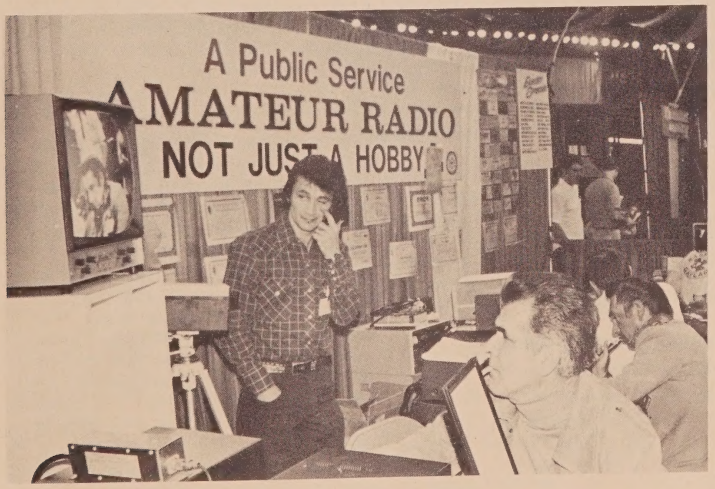
*Scan converter designed and built by Dr. George Steber, WB9LVI. George believes in a minimum number of controls.*



*Shillings anyone? Here's a 3 Bob picture! Bob Zimmerman, W8DPW, Editor of DARA's RF Carrier Magazine, is shown here with Bob Schloeman, WA7MOV on the left, and Bob Suding, WØLMD. (But nobody ever calls HIM Bob!)*




*Dr. Don Miller, W9NTP, demonstrates his new and improved color scan converter at Dayton.*




*Tom Holmes, W5RCZ at the left, and Bob King, WB5IXK, watching a closed-circuit quality picture on the B & W monitor via scan conversion. See further details in column text.*



*I'm still hoping that SOME DAY, Nick Stavrou will write an article on how his little Trick Box works! One of "Nick's Tricks" is shown here. Wouldn't you like to be able to superimpose your call sign on an electronically generated cross-hatched background?*

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Suding mentioned that he expects to have signal enhancing programs available for his equipment at some future date. The color and motion demonstrations of Dr. Miller, W9NTP, have been seen for the last few years at Dayton.

So, summing up, there are new tools at hand, and there is an avalanche of effort being applied. That brings up another question, "How soon will the total impact of microprocessors on slow scan picture systems be seen by the average amateur?" The answer to that question requires the use of a computer program that hasn't been written!

### *Scan Converters Are A Now Thing!*

Elsewhere in this column are pictures of six scan converters, five of which employ the WB9LVI designed circuitry. My thanks to Tony Pessiki, W3GKW, Len Butsch, K4CNP, and Richard Thurlow, G3WW for supplying photos of their converters.

Note the hand-wired boards in the light-pen scan converter gear designed and built by John Vanden Berg, VE3DVV.

### *Ten-Tec's Triton IV Runs Full Bore On Slow Scan*

A month or two ago, I mentioned that before you run slow scan on your solid state rig it would be well to read the instruction book.

Ten-Tec's specifications for their Triton IV (200 watt) Transceiver say that you can run a 100% duty cycle at FULL power on all bands. The Triton IV Instruction Book, includes the following paragraph in the list of operating hints: "When operating RTTY, SSTV, or other high duty-cycle modes, it is recommended that a small fan be directed on the heat sink. The sink temperature may reach as high as 200F., still within the rating for the transistors but certainly hot enough to cause a serious burn if touched."

With Ten-Tec's 200 watt/100% duty cycle spec and their guarantee (pro-rata warrant the output transistors AFTER the first year of unconditional guarantee) anyone who wants to run 200 watts of slow scan on a Triton IV has nothing to worry about!

### *Excellent Amateur Radio Public Relations Job*

Amateur radio clubs of Houston, Tex. did a fine PR job at an "Outdoor Sports" show held in the famous Astrodome this Spring.

Several amateur stations were in operation at the show using the special call sign, KS5CVS. Visitors were offered an opportunity to sign up for club membership and license classes. One club signed up 28 applicants.

Slow scan pictures displayed on a 14 inch monitor were an important part of the amateur radio demonstration seen by thousands attending the show. That's Tom Holmes, WA5RCZ, NOT Columbo, in the picture with Bob King, WB5IXK, elsewere in this column!

### *First Albatross SSTV Contest*

From the British Amateur Television Club and Advance Electronic, s.r.l. of San Lazzaro, Italy comes word of a contest to promote interest in the SSTV mode of operation. The B.A.T.C. and the Italian firm are the co-sponsors of this new contest. This sounds like a lot of fun, AND, the entrant with the highest score will receive an SSTV Scan Converter from Advance Electronics. Second and third prizes will be a year's subscription to *CQ-TV* the official B.A.T.C. publication.

Save the dates September 4th, 1500 to 2200 GMT, for Part 1, and September 5th, 0700 to 1400 GMT for Part 2. Complete rules and further details in our August issue. Ah, the sheer joy of having an SSTV contest to start a wee counter-measure to Field Day, Sweepstakes, and the lot! (I'll hear from that!)

### *A Pictorial Tour Of Slowscanland!*

Just in case you haven't noticed *CQ* Magazine has published more SSTV related photographs in this column than can be found in any other publication in the world. If you're enthusiastic about the large number of pictures, send yours to "In Focus" too!

### *Final-Final*

Many thanks for the interest shown in this column during its first year of existence. The response of slow scanners all over the world has been most rewarding. Letters, photographs, and helpful hints from so many amateurs indicate a great willingness to share. This is what makes it worthwhile to have a column on slow scan. *Your* letters, *your* photos, and *your* information are what make this column of interest to others. I am grateful for your help and hope that "In Focus" will continue to be on your regular reading list.

Same old address for your correspondence: 2112 Turk Hill Road, Fairport, N.Y. 14450. Regards, Bill DeWitt, W2DD.



ADRIAN WEISS, K8EEG, ON

# QRP

### *Getting The Thing To Work: V Minor And Major Current Loop Completion*

Let's continue the discussion of the May column about completing the major and minor r.f. current loops in amplifier stages.

Difficulties can arise if the completion of the minor current loop is via an interboard connection when several p.c. boards are used in an amplifier chain. For example, assume that the buffer/multiplier/predriver stages are mounted on board #1, the driver/final stages on board #2, and that link coupling is used between the output of the predriver and input of the driver stages. The coupling link of necessity will be on board #1, because that is where the predriver collector tank inductance is located. It will be impossible to apply the usual strategy of completing the minor loop (link winding to base, to emitter ground) by grounding it at the emitter site on the predriver stage. Two options exist for the interboard connection: (1) connect the output of the predriver (ungrounded side of the link winding) to the base of the driver stage (on board #2) through a short piece of hookup wire; (2) make the connection via a short piece of RG-174U miniature coax. With option #2, the link winding can be grounded at the emitter site of the predriver stage on board #1, and the braid of the coax also grounded at that point, as well as at the emitter site of the driver stage on board #2.

Both methods have been used by this writer with success, and the method used has been determined by the individual circuit being developed. At times, the simple hookup wire plus common chassis ground will prove adequate, otherwise, the coax method is necessary in order to eliminate various problems outlined earlier in this series. If the coax method is used, it may be necessary to experiment with the size of the coupling link in order to offset the effects introduced by the length of coax. In any event, the coupling link should be grounded on board #1, and not "floated" to the emitter ground site on board #2 through the coax. (The major advantage of the coax method is the elimination of r.f. pickup that can occur when a simple hookup wire is used. As noted earlier, such a lead can pickup r.f. generated in a later, higher power stage, leading to self-oscillation among other problems; coax automatically takes care of the problem. In a couple instances, I've used double-tuned interstage matching between stages which are on different p.c. boards. The basic circuit is shown in Figure 1. The double-tuned matching method eliminates all problems, and has the added advantage of much greater selectivity in comparison to a single tank-link matching approach.

(4) **Major R.F. Current Loop.** Treatment of the major r.f. current loop depends in part on whether we are dealing with a low or high power amplifier stage (above about 4 watts input). Slightly different conditions requiring a variation in treatment occur when we get into the higher power bracket. This is due in part to the d.c. and r.f. current levels present, and to the magnitude of the r.f. field generated, in either category.

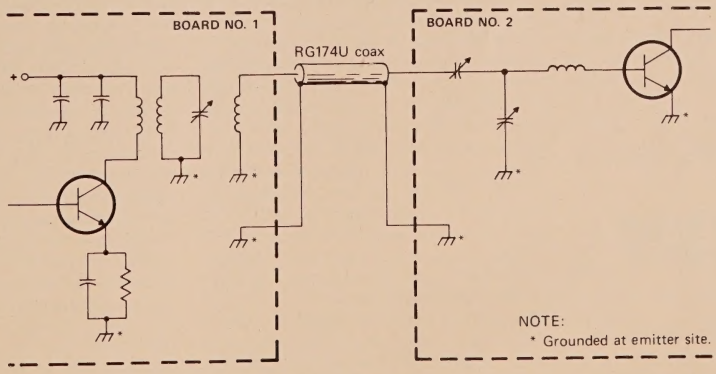



*Fig. 1—Double-tuned interstage matching circuit used between amplifier stages which are on two different p.c. boards.*

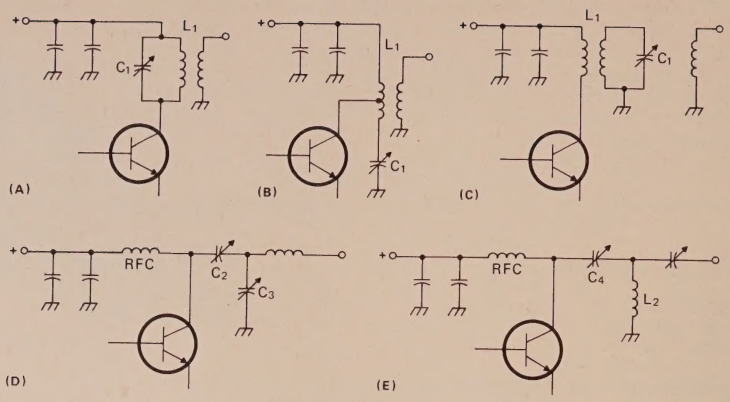
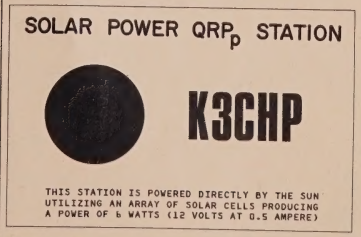



*Fig. 2—Typical major r.f. loop circuits.*

While it may seem unnecessary to pay attention to the major r.f. current loop in a low level stage, this is not the case, as power gain and efficiency are a concern at any power level and in part depend upon the close attention to detail that this series suggests. Usually one does not have to be especially concerned with problems caused by the r.f. field generated in a low level amplifier, since this field is rarely a source of unwanted coupling and other problems noted earlier. However, bypassing strategy and placement remain important concerns even in the low level amplifier.

Typical low level intermediate amplifier circuits have been shown in previous columns and can be referred to for the following discussion (see April, 1976, p. 48, Fig. 1 & 2, May, 1975, p. 45-46, and others). B+ decoupling and bypassing is usually adequately achieved with a couple of bypass capacitors shunted to ground, bearing in mind the bypassing strategy covered in an earlier column. In some cases, such as a driver stage running above one watt or so, it may be necessary and adviseable to insert a small r.f. (20-100$\mu$h) choke in the B+ lead to insure complete isolation.




*Joe Mikuckis's QRPp QSL. It is aptly done in yellow and red.*

The major components which complete the major r.f. current loop are the collector tank inductance and capacitance (see Figure 2a, b, c), or the two impedance transforming capacitors ($C_2$, $C_3$) of Figure 2d, or the capacitance and inductance ($C_4$,-$L_2$) of Figure 2e. In all cases, the grounding point should be at the emitter site through the shortest possible leads. This is a simple task when the tuning capacitors are trimmers mounted right on the p.c. board at the transistor site. The trimmer approach is practical in transmitters designed for narrow band operation (about 40 kHz on 80m, double for each higher band). However, in transmitters where wider frequency excursions are desired, as would be the case in an 80m rig covering 200 kHz, it is usually necessary to retune each stage after a wide frequency excursion is made. Otherwise, the output will drop off considerably as one moves away from the "peak" resonant frequency. This is the case with the MFJ 40T transmitter module, where peak output is maintained only over a bandwidth of about 40 kHz. By paralleling a small variable capacitor with the fixed driver tank circuit capacitance, it is possible to move the 40T across the entire band with only a little variation in output. The Pi-net halfwave filter in the 40T final output also enters into the picture and can be peaked for a given part of the band, although its effect on output during wide excursions is much less noticeable than is the driver stage's effect.

Several strategies can be used in attaining frequency flexibility in a transmitter designed to operate over a large part of the 80 and 40m bands. The primary objective is to avoid r.f.-bearing leads leaving the p.c. board from a major current loop. First, the buffer/driver amplifier stages can be mounted on a single p.c. board, with board-mounted trimmer capacitors for each stage, and then the board can be mounted on one of the panels of the transmitter enclosure with holes providing easy access for screwdriver adjustments of the trimmer capacitors. Similarly, several boards can be mounted on different walls of the chassis box. In this approach, the trimmer capacitor is mounted on the *underside* of the p.c. board, while all other components are mounted topside. A good practice to follow in mounting trimmer capacitors on a p.c. board is to ground the set of plates which is electrically common with the adjusting screw. This is an important precaution, since one side of the trimmer capacitor usually will be at B+ potential, or at high r.f. potential (see fig. 2 circuits), and an accidental slip of the adjusting screwdriver will result in a direct short to ground if the trimmer plates which are electrically common with the adjusting screw happen to be connected to the B+ side of the tank circuit. Once the trimmers are mounted on the underside of the p.c. board, the board is mounted on the panel using metal spacers just long enough to provide clearance for the trimmers. Holes are drilled in the panel to match up with the adjusting screws. Retuning is then a matter of a simple screwdriver adjustment.

Second, variable capacitors can be mounted on a front panel with minimum lead length by laying out the p.c. board carefully. In this approach, the board is designed so as to bring the tank circuit as close as possible to the variable capacitor. This requires that the position of the p.c.

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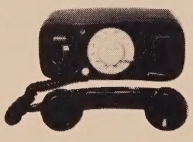
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board with respect to the variable capacitor be foremost in the mind of the designer. It is possible to achieve quite minimal lead length if proper care is taken.

Third, varactor diodes can be used in the tank circuits and mounted on-board right at the transistor, with only the varactor d.c. bias leads (bypassed for r.f.) leaving the board. If proper care is taken in designing the tank circuits of several stages, those stages can be tracked using a single potentiometer which provides d.c. bias for all the tuning varactors in an amplifier chain.

The above approaches will allow one to achieve frequency flexibility in low level amplifier stages while meeting requirements for effective completion of the major current loops. One further note on the use of trimmer capacitors: it is possible to solder a small diameter, light guage copper tube to a trimmer adjusting screw, creating an extension shaft which eliminates the need for screwdriver adjustments. It is a tricky operation, but worth it if ease of retuning is an objective.

A final comment while we're on the subject of frequency flexibility. Both published designs and commercial products have made the "broadband" claim for circuits which utilize tuned tanks in the amplifier stages. This is not "broadband" in the usual sense. As long as a circuit has inductances and capacitances lumped together, it is frequency resonant. If such a circuit exhibits no variation in output over a wide frequency excursion, then it probably isn't working anywhere near peak efficiency.

We'll continue this discussion in a future column.

### *News*

Dayton was the usual hectic monstrosity. The QRPp Forum suffered from defective audio-visuals and an incredible noise level. But those attending were treated to an excellent talk on speech processing, a taped talk about Coherent c.w., and a color slide show by me. Met quite a few fellows at the *CQ* booth and picked up some interesting news. Joe, K3CHP, filled me in on his solar-powered Argonaut operations, and obliged with a short note, which follows: "I have been active in QRPp for less than a year with an Argonaut. I work 10, 15, and 20 meters with a 3 element beam at 27 ft., and 40 and 80 meters with a random long wire. For the past several months I have limited my operation to sunny days because I am trying to make WAS and DXCC with solar power! The supply is an array of solar cells producing 12 v.d.c. at 0.5 amps and fed directly to the Argonaut through a 12 volt regulator. For such contacts, I use a special QSL card (see enclosed). So far I have 33 states confirmed and 19 countries worked. I expect an excellent return on my DX QSL's since I have collected a number of sentences in 54 languages and transcribe them on my outgoing cards to impress the recipient in his own language." According to Joe, the array of solar cells is about 24 × 48 inches or so, and output goes up to about 17 volts, hence the need for the regulator. Cost of the unit is high and availability limited—one source is Edmund Scientific. But Joe claims that there is nothing like working directly from the sun's power—entirely self-sufficient operation. Clouds kind of mess things up though! A couple more panels would permit cloudy day operation also. Joe is very interested in hearing from other QRPp'rs who are using solar power (Joseph S. Mikuckis, K3CHP, 6913 Furman Parkway, Riverdale, MD 20840).

Due to my lack of organizaton, I've messed up the QRPp, WAS and DXCC listings for 1975. We'll hold off till 1976 listings time.

Until next month, 73, Ade, K8EEG/Ø



HUGH CASSIDY, WA6AUD, ON

# DX

Though the bottom of Sunspot Cycle may be in the next few months, the first half of 1976 has not lacked for DX activity, even at the bottom of the cycle.

Bill Rindone, WB7ABK, was preparing to head out again in late June to pick up where illness slowed him in Asia, Bill having to return home from Nepal. Bill was planning to work in the Persian Gulf, the Red Sea areas and down through Africa. Along the way he has plans for an operation which he figures to be a rather definite 'new one' and this to be in the Africa area.

The Colvins have continued to supply activity, in recent months operating from FK-New Caledonia, YJ-New Hebrides and more recently they were aiming for FW8-Wallis.

The JARL Anniversary Country, 7J1RL from Oki-no Tori Shima (Parece Vela) is a matter of history now. Some JA DX groups fought the whole concept bitterly and even though they were not able to reverse things, they were unwavering in their opposition, carrying their arguments into many other areas seeking to gain support for their stand.

SMØAGD and K6AHV along with HKØBKX were gathering gear for their planned Baja Nuevo effort as this is being written and if all went well they should have opened early in June. There were also reports that a HK-group may activate Serrana Bank in June.

All this might help convince many a weary DXer that there is still a lot of DX activity. W4UMF has repeatedly pointed up that even at the bottom of the cycle there can be periods of intense solar activity and good though often brief band conditions.

While a number of different sources have come up with a number of different predictions as to when we will bottom with Cycle 20, many of them have overlapping predictions which aim at the period in the latter part of 1976 or the first part of 1977. Things will improve rapidly when the Cycle 21 starts up but in between there will still be good days and good periods. This is hardly the time to give up and those working eighty and one-sixty should find this Fall and Winter with superb conditions.

And while the high-latitude spots for Cycle 21 have yet to put in much of an appearance, DX still thrives at times and often with some good DX. Stick close.

### *FRESNO 1976*

The annual West Coast gathering of DXers was in mid-May this year and there were well over 300 in attendance. There were VEs and CXs . . . there were ZLs and VKs and VU. There was 7Z3AB (ex) and a lot of miscellaneous DXers. And there were JAs to present their objections to the Oki-no Tori Shima being accepted for a new country by bending the DXCC Criteria a bit.

The DX Forum preceded the cocktail hour which started at 1730 PDT. It was ruled that no discussion of the Oki-no Tori Shima matter would be had until 1700Z at which time there would be presentations pro and con.

At 1700 Dick Baldwin, W1RU took the podium to explain the events. Without equivocating one bit, W1RU stood and reviewed the events, from the request from JA1AN of JARL to his decision to approve the 'new country' for the JARL 50th Anniversary.

Kiyoshi Mizoguchi, JA1BK, presented the arguments for the JAs who oppose the naming of Oki-no Tori Shima a new country though it does not meet the DXCC criteria. Using slides to introduce maps, correspondence and related material. The JAs opposed it on the basis of ethics, they opposed in on the basis that it was a political deal and they opposed it on the basis that it did not meet the DXCC criteria. The list of the prominent JA DXers who favored or opposed the 'new country' decision was presented.

Some interesting items surfaced during the arguments. One was that JA1AN was up for reelection and was not happy about any possible withdrawal of Oki-no Tori Shima as it might hurt his chance for re-election. He was re-elected late in April.

Another was that only one member of the Awards Committee was in opposition. All the rest of the headquarters people who make up the Awards Committee apparently went along with the General Manager after he *outlined* his views and desires to them.

Also, with the Board of Directors of the ARRL adopting a resolution at the January meeting that the DXAC would be consulted on the question of any 'new country' proposals, there appears to have been silence on the part of the headquarters staff during the January Board meeting with regard to Oki-no Tori Shima and some indignation on the part of some ARRL Directors over being kept in the dark. There is a good possibility that this might be discussed at this July meeting of the ARRL Board.

After W1RU said that he had done

**The WAZ Program**

**Single Band WAZ**

**20 Meter C.W.**

11...SV0WTT

**20 Meter Phone**

26...DJ9ZB

**S.S.B. WAZ**

1313...DL8NC
1314...DK3GK
1315...W2EHB
1316...WB9HAK

**C.W.—Phone WAZ**

3952...DL7JY
3953...DJ6AU
3954...YU1NGO
3955...WA1NZT
3956...UC2WG
3957...JA1FGW
3958...K9KWK

The complete rules for all WAZ rules are found in the May, 1976 issue of *CQ*. Applications and reprints of the rules may be obtained by sending a business size, self-addressed stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

it and that any responsibility was his. And JA1BK had stated the JA case that it should not have been done in the first place, there was a short period of questioning from the floor and the meeting was adjourned for the cocktail hour. Those who attended had learned a bit more about what had happened to bring Oki-no Tori Shima about, and why some of the JA DXers were vociferously objecting to the whole thing. But nothing was changed, yet things may never be the same again.

There are those who think that Oki-no Tori Shima may be a landmark incident. There probably will always be those who will question whether the DXCC criteria should be violated on the basis of political expediency. Some will object when it is used to reward a faithful supporter then in a election campaign as it seems to be in the case with JA1AN. And others will note that it was done with 4U1ITU in the past.

There is also evident that deep down inside many DXers feel that the DXCC should not be tampered with and that there is scant attention or inquiry given to the DX group when such decisions are made. No one seems to be especially happy over the route these actions have taken but at this point no one seems to be wrought up enough to raise the issues contained in this action. Undoubtedly should there be more incidents like Oki-no Tori Shima there may come some different reactions.

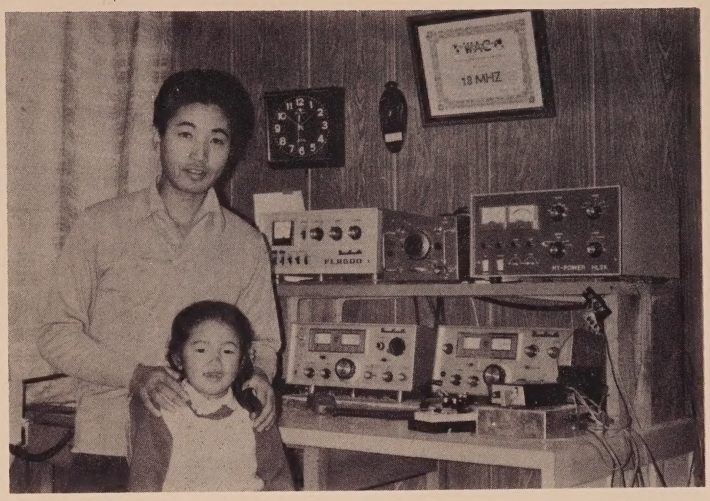
All in all, it is a funny situation in a funny world. Learn what you can about Oki-no Tori Shima and what brought it about for you will hear a lot about it in years to come.

### *Those Needed Ones*

Some months back there was a review of those needed countries, some of which have not been on the air for up to close to twenty years, and what the possibilities may be for early activity from any of them. Undoubtedly all of these will show—again—on the air some day but there are an awful lot of DXers asking: "When?"

**IRAQ**—DL7FT was aiming for a YI-operation in mid-May but this plan was postponed as time for the operation neared. A SP6-group also announced that they were heading that way not up to late May when this report was being prepared, nothing has been heard on their plans.

Armin Meyer, W3ACE, a former U.S. Ambassador to Iran, Japan and once an operator from YI-land, was due to visit Baghdad in early June according to reports and would follow up on previous attempts to obtain a license. Whether something developed on this should be a matter of record by now. SMØAGD who was heading for Baja Nuevo in early June has also sought the help of the Swedish minister in Baghdad to get a license but this is yet to bear any fruit of success.




*The neat 160 meter DX station of Kuny Togashi, JA7NI, Akita, Japan, and YL/Jr. Op. Using a dipole antenna he has worked 31 Countries, 1.8 MHz WAC!!, W4EX, W5SUS, W5RTO, W5RTQ, plus being the top JA station in the CQ/160/WW '76 Test. QRV especially for W/VEs!! (photo via W1BB).*

**Clipperton** — FO8-Clipperton breeds rumors like July breeds mosquitoes in New Jersey. Each month brings a new crop . . . but one of these days it won't be a rumor but the real thing.

In April two Frenchmen were reported as having the inside track for some documentation and were ready to go as soon as they could get some support. The support was pledged if solid and credible documentation would be displayed but after a six week wait, nothing was showing on that one. In May it was a group of four Frenchmen who had the license, wanted no support and girded with 'Vite Elan' would be heading for FO8-Clipperton around this time or in August.

When you dig around a bit you can come up with a number of plans for an FO8-Clipperton operation. We have come across one group that has enlisted the aid of a fishing vessel to make photographs of the island so they can do their planning. Another group has all their plans, transportation and logistical problems worked out and they are waiting for the time when the French will authorize an operation.

The stories of difficulty in making a landing on Clipperton can often be rewarded by a jeer from those who have been in the area. There are recurrent reports of fishermen landing numerous times on Clipperton just to look around. One who has been in the area was pressed to name what it would take to make a landing. "An outboard motor on a rubber dinghy" was his answer.

While the problem has been cited of having to rescue people who get in trouble at Clipperton, this being cited by the French as a reason for refusing landing permission, it might be noted that when an overseas passenger plane reported seeing what appeared to be International Distress signals on Clipperton last year, it was a U.S. Coast Guard plane out of Alameda, California which flew to Clipperton to check things out.

Some say that Clipperton will not come until France has completed its atomic testing in the South Pacific. Others say that if France wants to land the Concorde in the U.S. under reciprocal agreements, that U.S. amateurs should be allowed to land and operate on Clipperton . . . under reciprocal agreements.

**South Sandwich**—There have been some internal problems in Argentina which apparently have been worked out or are being worked out. While there is no late word on any LU-plans, there may still be a good possibility for something this winter from South Sandwich.

**Malpelo**—Things are starting to stir again on this one with a number of inquiries coming through. Some serious plans are starting to form in some areas though it is expected that




*Angelo Brandolini I6BQI, has been a prominent call in contests out of Italy as well as for WPX activity.*

any action will involve HK amateurs. Something might come on this in the future months.

**China**—Every couple of months a BY-station will show . . . and almost look like the real thing. But not quite the real thing . . . yet. Internal problems may be a strong factor here but there is also a feeling that a true-blue BY-station will be heard one of these days in the future. And it is also felt that it will be a Chinese national who will be doing the operating and no one else.

**Burma**—There have also been internal problems within Burma. Some travelers will report that the Rangoon Airport is closed, others will say that it is open. Student demonstrations during last Spring was said to be the reason for the closing. W6YY passed through the area earlier this year and his feeling was that any XZ-operation was still some years in the future. However, a number of XZ-amateurs are still waiting for things to open so they can get back on the air.

**Bouvet** — There are still a number studying this one but nothing has been announced in their plans. This will always be a tough one to get to and you can figure that any operation will depend on available transportation and this probably will come from either a naval vessel or a scientific vessel working in the area.

In most instances any operations from the majority of these areas will come with considerable advance announcement. Maybe China will not . . . or maybe Burma will not send forth banners to mark the return of amateur radio, but most of the others should. All you have to do is to be patient.

### *Short Notes*

W8IMZ is handing out a good number of the CQ Bicentennial Awards and there are only six months left to gain the award. With this winter expected to be prime time for the lower frequencies . . . like eighty and one-sixty, it will be helpful to send a s.a.s.e. with 24¢ postage to W1BB for his *160 Meter Bulletin.* Stew always has a good bit of interesting information and help on the top band.

William Porter, the U.S. Ambassador to Saudi Arabia, has been heard operating 7Z1AB. The question of the status of the Comoros is often asked with three of the major islands voting for independence and the fourth, Mayotte, voting to stick with France. While the situation may appear to be clear cut, no decision on DXCC status will be made until there is a determination on the permanent status of Mayotte. Under the French constitution, France has to retain jurisdiction unless Mayotte votes for independence. While on that DXCC line, there have been some portents that there may be some changes in October for some enclaves or autonomous regions. With the Seychelles going independent this month, a couple of the other islands in the area which used to count as separate countries are no longer good for counters. This will involve Fraquhar, Desroches and Aldabra.

There have been reports that the Coast Guard is considering sealing off Navassa, it apparently being used as a trans-shipment point in the narcotics trade. Navassa may show up with another government agency next year to be used for some other project.

Those looking for DX information should check the Arkansas DX Net which meets Mondays and Fridays at 3815 kHz from 0100Z. The Southern California DX Club has its DX Bulletin-Of-The-Air on Thursdays at 14265 kHz from 0200Z. W6TI bulletins are broadcast by the Northern California DX Club at 1800Z on Sundays and 0200Z on Mondays at 14002 kHz. Often late breaking information can be found by listening to these nets or broadcasts.

Some VKs have been talking about a possible Mellish and Willis operation sometime this summer, late July being mentioned as a possible period. Also the possibility of a 'new country' is hinted. Those who have studied the charts say it might be Fredericks Reef. Others say it may not be possible at all. However, with some of the changes in the DXCC in recent years, one will learn that skepticism will not get one on to the Honor Roll. It is a case of believing all things as possible.

The U.S. Postal Service is reported as retreating from its position that

*(continued on page 86)*

## The WPX Program

### Mixed

522...YU1ODS
523...W6HRB
524...YU2CBM
525...HA4KYH
526...WB4ASV

### 2×SSB

901...YU1ODS
902...K9HLW
903...I5XRR
904...IT9KZW
905...W9YRA
906...F2YT
907...LU8DB

### C.W.

1475...YU1ODS
1476...YO8AGZ
1477...WA3LHH
1478...ZD8TM
1479...WA1FCN
1480...HA4KYH
1481...HA4XX

### Endorsements

350 F2YT, HA4KYH, OK1DH, SP:5SIP, SP9EEE, JA1VZ, VP9GE, W9YRA, PY1FI, JA2AH, YU1-ODS, LU8DB, IT9KZW, I0MBX.
400 F2YT, I0MBX, IT9KZW, LU8DB, JA2AH, PY1FI, OK1DH, SP5SIP, VP9GE, YU1ODS, W9YRA.
450 F2YT, I0MBX, IT9KZW, JA1MTR, JA2AH, LU8-DB, OK1DH, PY1FI, W9YRA, YU1CDS, YU2-CBM.
500 F2YT, I6BQI, I0MBX, JA2AH, OK1DH, K8YQW, VK3SM, YU2CBM, WDX2OBU, W9YRA.
550 F2YT, I6BQI, K9UQN, OK1DH, OK3BT, W1OPJ, W9YRA.
600 F2YT, I6BQI, OK1DH, PY2CAB, YU2CBM.
650 F2YT, OK1DH, PY2CAB, YU2CBM.
700 F2YT, JA1BN, OK1DH, YU2CBM, WB2ANO.
750 WDX5FEB
800 WA6TAX.
1100 W2AIW.
Forty Meters: OK3BT
Twenty Meters: JH1MTR
Asia: F2YT, OK3BY, VK3SM
Africa: K3EH
EUrope: HA4XY, I5XRR, JH1MTR, OK1APS, SP9EEE, WA1FCN
South America: F2YT, K3EH

Complete rules for WPX may be found on Page 67 of the February 1972 issue of *CQ* Magazine. Application forms may be obtained by sending a business size envelope, self-addressed and stamped, to "CQ DX/WPX Awards, Box 3388, San Rafael, Calif. 94901.

## The CQ DX Award Program

### SSB

435 ..UT5RT
436...UB5VAZ
437...K7RSB
438...K7LAY

### C.W.

200...ON4KK
201...UM8FM
202...UA2DP
203...UK9HAC
204...UA6APP
205...UW9AI
206...DL1NC

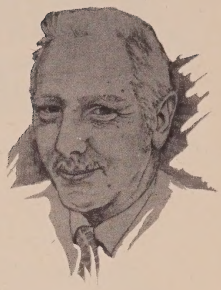
### Endorsements

320...K2FL
320...KH6BB

Complete rules and application forms for the *CQ* DX Awards program may be obtained by sending a business size No. 10 envelope, self-addressed and stamped to: "CQ DX/WPX Awards", Box 3368, San Rafael, Calif. 94902.

A. EDWARD HOPPER, W2GT, ON

# Awards



Here is the July, "Story of The Month":

***H. Arthur Dechent, WA4WQG***
***All Counties #124, 3-6-75***

Arthur, WA4WQG, who has been a Baptist Pastor since 1953, was born in 1922. He is the Pastor of the Hermitage Baptist Church of Churchview, Virginia. He received BA graduating from Wake Forrest College; and Crozer Seminary, Chester, Pa.

Novice license came as WN4JPM in 1963 and then later WA4WQG. Arthur is a member of ARRL, EC, O.P.S., Net Control USSBN, UF Net, RCC, Masonic Lodge 83 and ex-Lion.

Rigs include HX11 Heath c.w. transmitter, TRITU Eldico a.m., Heath HW12, Heath SB101, Home-brew linear GG 2 4X125s. All antennas home-brew inverted Vees.

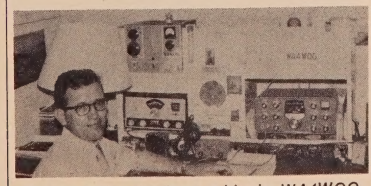
Special time of his life when he married Anne Jones in 1946. They have three children: Mrs. Patricia Reed, Sidney Arthur who was scheduled to get out of the U.S. Army a year ago, and Lorane Alysia.

Arthur waited until he had them *all* and then received USA-CA-500 through *All* on March 6, 1975.

Future projects: Advanced license and erection of 14 AVQ antenna.

Prognosis: Slow, but still interesting.

Results: Many friends, lots of contacts, lots of sleep lost, but well worth it all—Many thanks to all the wonderful County Hunters. Special thanks to W9KIL/M7 for last county, Sweetgrass, Montana on February 7, 1975 in a snow storm.



*Pastor Arthur Dechent at his rig, WA4WQG.*

**Special Honor Roll**
**(All Counties)**
#144—Patricia L. Smith, WA7GMX 4-5-76.
#145—Gordon L. Avitt, WAØUPL 4-20-76.

***Awards Issued***

As noted in the Special Honor Roll, two more made it to the *TOP:*

Pat Smith, WA7GMX waited until she had them *all* and caught USA-CA-500 and 1000 endorsed All 14; All S.S.B.; All Mobiles and All YLs. And USA-CA-1500 through them *all,* endorsed All 14; All S.S.B.; All Mobiles.

Gordon Avitt, WAØUPL also waited until he had them *all* before applying for USA-CA-500 and 1000 endorsed All S.S.B., All Mobiles, All 20, All 75; USA-CA-1500 endorsed All S.S.B.; All Mobiles; All 20; USA-CA-2000, 2500, 3000 endorsed All S.S.B., All Mobiles and All Counties endorsed All S.S.B.

Edgar Newman, W2RPZ added to his collection, USA-CA-2500 endorsed All 2-Way c.w.

"Bugs" Grundy, VE1AHG increased his collection with USA-CA-2000 endorsed All A-1 (Who sez c.w. is dead?).

Don Ronk, WA6WCG (name sounds like one that a movie star would pick) was issued USA-CA-500 and 1000 endorsed All S.S.B.; All Mobiles.

Don Priebe, W2IAM gained USA-CA-1000.

Bob Lamberton, WA3QNT was issued USA-CA-1000.

John Bright, G3TJW collected USA-CA-5000 endorsed All S.S.B.

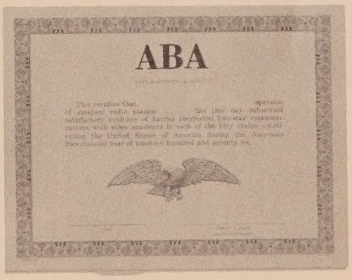
Mixed USA-CA-500 Awards went to:
Tom Wardrope, VE7JU and
Don Skaife, W7ULA.

***Awards***

**Cairns Centenary Award:** Sponsored by the Cairns ARC of Cairns, North Queensland, Australia and is available to all stations outside the Cairns area. For the purpose of this Award, the Cairns area is a radius of 100 miles of Cairns. VK and ZL stations must QSO with three (3) Cairns area stations. Overseas stations must QSO with two (2) Cairns area stations. Send a copy of log details of QSOs to CARC VK4HM, P.O. Box 1426, Cairns 4870 QLD., Australia. Awards will be forwarded in bulk via Bureaus unless the cost of post and packing is remitted. The Award will be available for the whole of 1976, Cairns Centenary Year. Cairns area stations are the following VK4s: AE, AMO, CI, DB, DJ, HK, HM, KV, MH, NF, NI, NU, QX, RY, SU, TL, VI, VT, YG, YT, ZBU, ZCS, ZIB, ZIP, ZNZ, ZY.

**New Certificate Manager** for **Lone Star Members:**—Mike, WB5JCG unable to continue (moving) so new manager is Tom Hoot, WB5HIG, (A County Hunter and Mobileer) 2907 Healey, Dallas, Texas 75228.

**Dallas County Ten Meter Net VIP Award:** Available to anyone for working fifty (50) Lone Star stations. Send $1.00, data on stations worked, including call, QTH, 10-10 number and Lone Star number. Oh yes, The Lone Star Award is also available to anyone for working 10 holders of the Lone Star Award and also sending $1.00, data on stationst worked, including call, QTH, 10-10 number and Lone Star number. Applications for both go to: Tom Hoot, WB5HIG, 2907

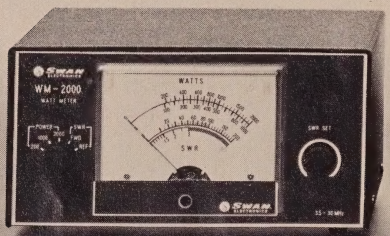


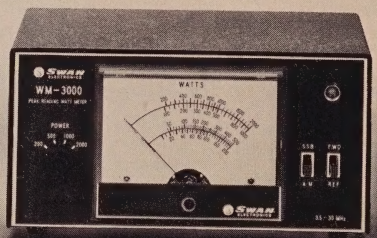

*American Bicentennial Activities Award.*

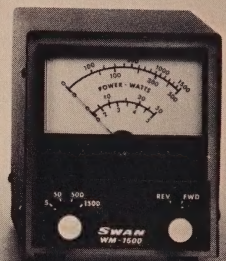
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Healet, Dallas, Texas 75228. A list of members may be obtained by sending s.a.s.e. to Tom.

**Bicentennial Awards:** Three are offered by ARS WB9GLQ and all applications, comments, and suggestions should be sent to: Bicentennial Awards, P.O. Box 981, Oakbrook, Illinois 60521. Profits will be donated to the American Radio League.

**#1—American Bicentennial Activities Award:** All amateurs and clubs are eligible. Applicant must establish and confirm two-way communications with amateurs in each of the fifty states of the U.S.A. U.S. amateurs must use the special Bicentennial "A" prefixes. QSL cards must be in the possession of the applicant and log data must be submitted and certification that QSLs are in hand. Send one dollar (cash, check or money order) to cover costs. DX applicants may send 7 IRCs.

**#2—Bicentennial Prefix Award:** All amateurs and clubs are eligible. You must establish and confirm two-way communications with amateur stations in the United States or U.S. possessions. U.S. amateurs must use the special Bicentennial "A" prefixes. You must have at least 40 different special "A" prefixes confirmed. Send certified copy of log data, also stating you have necessary QSLs in your possession. Cost $1.00 and DX may send 7 IRCs.

**#3—American Bicentennial Districts Award:** All radio amateurs and clubs are eligible. You must QSO and confirm contacts with other amateurs in each of the ten American call districts (1-0) U.S. amateurs must use the special "A" prefixes. QSL cards must be submitted as proof of contacts. They must show QSOs were made between 0500 UTC January 1, 1976 and 0500 UTC January 1, 1977. QSLs will be returned promptly. Send $1.00, DX may send 7 IRCs: to: Bicentennial Awards, P.O. Box 981, Oakbrook, Illinois 60521. Top qualifiers for #1 were—WØBXM, WB7AYN, WA1EUO, AB4VBL. For #2—AB9EBO, WA4NID, WN9RMG, WØBXM. For #3—AB9EBO, WN9RMG, AD9UQN, WØBXM.

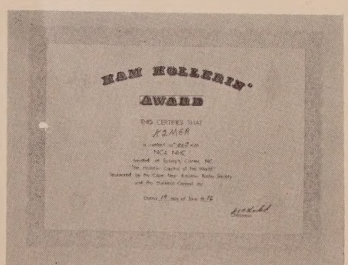
### USA-CA Honor Roll

| 3000 | | 1500 | | 500 | |
|---|---|---|---|---|---|
| WA7GMX | 166 | WA7GMX | 294 | G3TJW | .1097 |
| WAØUPL | 167 | WAØUPL | 295 | VE7JU | .1098 |
| **2500** | | **1000** | | W7ULA | .1099 |
| WA7GMX | 206 | WA6WCG | 390 | WA6WCG | 1100 |
| W2RPZ | .207 | WA7GMX | 391 | WA7GMX | 1101 |
| WAØUPL | 208 | W2IAM | .392 | WAØUPL | 1102 |
| **2000** | | WAØUPL | 393 | | |
| VE1AHG | 246 | WA3QNT | 394 | | |
| WA7GMX | 247 | | | | |
| WAØUPL | 248 | | | | |

### *Notes*

Due to reliable/documented information received, no credits can be

*(Continued on page 70)*




*Ham Hollerin' Award issued for QSOs with NC4NHC 19 June 1976. Arrived too late.*




*Dallas County 10 meter Net VIP Award. (NOTE new Manager, WB5HIG.)*

GEORGE JACOBS, W3ASK, ON

# Propagation



With longer hours of daylight and the sun high in the northern sky, h.f. propagation conditions should be considerably more stable during July than they were during the radio-storm ridden spring months.

*Twenty* meters should continue to be the best band for DX propagation during the month. When conditions are at least LOW NORMAL the band is expected to remain open to one area of the world or another from sunrise through the early evening. Peak conditions are expected for a few hours after local sunrise, and again during the late afternoon and early evening, when the band should open in almost all directions. When conditions are at least LOW NORMAL, expect *20* meter openings towards South America, the South Pacific and Oceania until as late as Midnight. When conditions are HIGH NORMAL or better, the band should also remain open to most other areas of the world until as late as Midnight.

Considerably fewer DX openings are expected on *15* meters and very few on *10* meters during July. This decline results from a combination of changing seasonal conditions and the present period of very low sunspot activity. When conditions are at least LOW NORMAL, *15* should occasionally open towards the south. Look for some short-skip openings into the Caribbean area and Central America as early as 10 a.m., with a peak expected to all areas of Latin America between 3 and 5 p.m., local daylight time. When conditions are HIGH NORMAL or better, the band may also open to Africa during the late afternoon from the eastern half of the country, and to Australasia and the South Pacific area during the late afternoon and early evening from the western half of the country.

Don't expect much DX on *10* meters during July, but some short-skip openings should be possible from time-to-time towards the Caribbean and possibly Central America as a result of sporadic-E ionization. When conditions are HIGH NORMAL or better, an occasional opening deeper into South America may be possible, especially during the afternoon hours.

During the hours of darkness, *40* meters should open to many areas of the world, but seasonally high static levels may at times make DX reception difficult. Higher static levels are also expected to hinder DX on *80* meters, but the band should open to some areas of the world during the hours of darkness. Not many DX openings are expected on *160* meters during July, because of higher static levels and the increased hours of daylight. Best bet for *40, 80* and *160* meter DX openings is an hour or two *before* Midnight for openings towards the north and east, and just *before* local sunrise for openings towards the south and west.

*DX Propagation Charts* for July appeared in last month's column. For an assessment of day-to-day conditions expected during the month, see the "Last Minute Forecast", which appears at the beginning of this column. This month's column contains:

*Short-Skip Propagation Charts* for July and August, as well as Charts centered on Hawaii and Alaska. The Short-Skip Chart contains band predictions for one-hop openings between distances of approximately 50 and 2300 miles from your transmitting location.

### Peak Sporadic-E Propagation

Optimum short-skip propagation conditions are expected during July as a result of a seasonal peak in sporadic-E ionization. During the daylight hours, considerable short-skip openings are forecast for *10* and *15* meters over distances ranging between approximateiy 400 and 1300 miles, with openings occasionally 400 and 1300 miles, with openings occasionally extending out to beyond 2000 miles. Around-the-clock short-skip openings should be possible on most days on *20* meters, with the skip often as short as 300 miles and as long as 2300 miles. Short-skip conditions on *20* should peak during the later afternoon and early evening.

Good daytime short-skip conditions are expected on *40* meters, with openings between distances of approximately 100 and 750 miles. During the hours of darkness the skip should lengthen, with openings possible between 250 and 2300 miles. Conditions on *80* meters are also expected to be good during the daylight hours, with openings up to approximately 300 miles. During the

**LAST MINUTE FORECAST—JUNE**

*Day-to-Day Conditions Expected For July, 1976*

| | *Expected Signal Quality* | | | |
|---|---|---|---|---|
| *Propagation Index* ..... | (4) | (3) | (2) | (1) |
| *Date* | | | | |
| Above Normal: 9-10 | A | A | B | C |
| High Normal: 6-8, 11, 18, 26 | B | B | C | D |
| Low Normal: 1-2, 4-5, 12, 15-17, 19-22, 27, 29-31 | B | C | D | E |
| Below Normal: 3, 13-14, 23, 25, 28 | C | D | E | E |
| Disturbed: 24 | D-E | E | E | E |

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, a path shown in the Charts with a propagation index of (3) should be a *fair* opening (C) July 1-2, *poor* (D) on July 4, and *fair* (C) again on July 4-5, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768, or check WWV at 14 minutes past each hour.

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hours of darkness, good openings should be possible on this band up to the one-hop limit of 2300 miles, but the band could be quite noisey. While no short-skip openings are likely on *160* meters during the daylight hours, some should be possible up to about 1300 miles during the hours of darkness. When static levels are low, longer distant openings may also be possible.

### *V.H.F. Ionospheric Openings*

Intense sporadic-E ionization expected during July should result in numerous *6* meter openings and an occasional *2* meter opening. Fairly frequent *6* meter openings should be possible over distances ranging between approximately 600 and 1300 miles, with some openings extending out to 2000 miles, and possibly beyond. When *2* meters opens, it may be possible to work stations between 1000 and 1300 miles away. While sporadic-E short-skip openings can take place at just about any time of the day or night, statistics indicate that conditions should peak for a few hours before noon and again during the late afternoon and early evening. During July, you can expect *6* meter sporadic-E openings on at least 3 out of every 4 days. Openings may last from a few minutes up to hours.

The *Delta Aquarids* meteor shower is expected to peak at about 8 p.m. EDT on July 28, with an hourly meteor count of about 20. This should make possible meteor-scatter type openings on the v.h.f. bands from late on July 27 through the early hours of July 29.

While little, if any auroral activity is expected during July, it may pay to check the vhf bands during those days that are expected to be BELOW NORMAL or DISTURBED.

73, George, W3ASK

## CQ Short-Skip Propagation Chart

### July & August, 1976

### Local Daylight Savings Time At Path Mid-Point

| Band (Meters) | Distance Between Stations (Miles) | | | |
|---|---|---|---|---|
| | *50-250* | *250-750* | *750-1300* | *1300-2300* |
| 10 | *Nil* | 08-10 (0-1)<br>10-14 (0-3)<br>14-18 (0-1)<br>18-22 (0-2)<br>22-08 (0-1) | 08-10 (1)<br>10-14 (3)<br>14-18 (1-2)<br>18-22 (2-3)<br>22-08 (1) | 08-10 (1-0)<br>10-14 (3-0)<br>14-18 (2-0)<br>18-22 (3-0)<br>22-08 (1-0) |
| 15 | *Nil* | 08-10 (0-2)<br>10-14 (0-3)<br>14-18 (0-2)<br>18-20 (0-3)<br>20-22 (0-2)<br>22-08 (0-1) | 08-10 (2)<br>10-14 (3)<br>14-18 (2)<br>18-20 (3)<br>20-22 (2)<br>22-00 (1-2)<br>00-08 (1) | 08-10 (2-0)<br>10-14 (3-0)<br>14-16 (2-0)<br>16-18 (2-1)<br>18-20 (3-1)<br>20-21 (2-1)<br>21-00 (2-0)<br>00-08 (1-0) |
| 20 | 10-00 (01) | 00-07 (0-1)<br>07-10 (0-2)<br>10-16 (1-4)<br>16-21 (1-3)<br>21-00 (1-2) | 21-00 (2-3)<br>07-10 (2)<br>10-16 (4)<br>16-19 (3)<br>19-21 (3-4)<br>00-07 (1-2) | 21-23 (3-2)<br>07-10 (2)<br>10-16 (4-2)<br>16-19 (3)<br>21-23 (3-2)<br>23-00 (3-1)<br>00-05 (2-0)<br>05-07 (2-1) |
| 40 | 08-12 (1-2)<br>12-16 (1-4)<br>16-20 (2-4)<br>20-23 (1-2)<br>23-08 (0-1) | 08-10 (2-3)<br>10-12 (2)<br>12-16 (4-2)<br>16-18 (4-3)<br>18-20 (4)<br>20-23 (2-4)<br>23-08 (1-3) | 08-10 (3-1)<br>10-16 (2-0)<br>16-18 (3-1)<br>18-21 (4-3)<br>21-23 (4)<br>23-06 (3-4)<br>06-08 (3) | 08-10 (1-0)<br>10-16 (0)<br>16-18 (1-0)<br>18-21 (3-2)<br>21-06 (4)<br>06-08 (3-1) |
| 80 | 07-12 (3-4)<br>12-17 (4-3)<br>17-22 (4)<br>22-05 (3-4)<br>5-07 (3) | 08-10 (4-1)<br>10-12 (4-0)<br>12-17 (3-0)<br>17-19 (4-1)<br>19-21 (4-2)<br>21-23 (4-3)<br>23-05 (4)<br>05-07 (3)<br>07-08 (4-2) | 08-10 (1-0)<br>10-17 (0)<br>17-19 (1-0)<br>19-21 (2-1)<br>21-23 (3-2)<br>23-05 (4)<br>05-07 (3)<br>07-08 (2-1) | 08-19 (0)<br>19-21 (1-0)<br>21-23 (2-1)<br>23-04 (4-3)<br>04-05 (4-2)<br>05-06 (3-1)<br>06-07 (3-0)<br>07-08 (1-0) |
| 160 | 18-19 (1-0)<br>19-20 (1)<br>20-22 (3-2)<br>22-00 (4-3)<br>00-06 (4)<br>06-08 (3-2)<br>09-10 (1-0)<br>09-10 (1-0) | 19-20 (1-0)<br>20-21 (2-0)<br>21-22 (2-1)<br>22-00 (3-2)<br>00-04 (4-2)<br>04-06 (4-3)<br>08-09 (1)<br>08-09 (0-1) | 21-22 (1)<br>22-01 (2-1)<br>01-04 (2)<br>04-06 (3-2)<br>06-07 (1)<br>07-08 (1-0)<br>06-08 (2-1) | 21-23 (1-0)<br>23-01 (1)<br>01-06 (2-1)<br>06-07 (1-0) |

## ALASKA

### Openings Given In GMT #

| *To:* | *15 Meters* | *20 Meters* | *40 Meters* | *80 Meters* |
|---|---|---|---|---|
| Eastern USA | *Nil* | 12-15 (1)<br>22-01 (1)<br>01-03 (2)<br>03-05 (1) | 07-10 (1) | *Nil* |
| Central USA | 00-03 (1) | 13-16 (1)<br>23-01 (1)<br>01-04 (2)<br>04-05 (1) | 08-12 (1) | *Nil* |
| Western USA | 02-05 (1) | 14-16 (1)<br>16-18 (2)<br>18-00 (1)<br>00-02 (2)<br>02-05 (3)<br>05-06 (2)<br>06-08 (1) | 07-09 (1)<br>09-13 (2)<br>13-15 (1) | 10-13 (1) |

# See explanation in "How To Use Short-Skip Charts" which appears in the box at the beginning of this column.
* Indicates best time for 160 Meter openings.
** Indicates best time for 10 Meter openings.

### 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 (15 through 80 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:
(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; The Alaska and Hawaii Charts are based upon a transmitter power of 250 watts 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 10db loss, it will lower by one level.

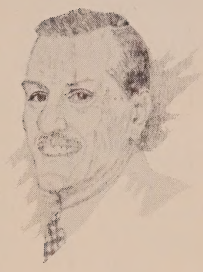
5. Propagation data contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

## HAWAII

### Openings Given In Hawaiian Standard Time #

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

Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.



# Contest Calendar

BY FRANK ANZALONE, W1WY

Once again it was my pleasure to attend the Dayton Hamvention this year. This event gets bigger and better every year, attracting amateurs from all over the world. There are Exhibitors by the scores and a Flea Market you have to see to believe.

If you're meeting anyone the place to go is downtown where all the action is, at the hotels where you will find the "Hospitality Room" of your choice.

It's impossible to attend all the Forums at the Arena Center so you pick out the one of interest to you. Naturally ours was the Contest Forum, again moderated by our own Bernie Welch, W8IMZ, *CQ* WPX Contest Director.

We had a full house, around 400 in attendance, and a very interesting and sometimes spirited program. The following gave topical talks.

Bob Epstein, K8HLR and members of the ARRL Contest Advisory Committee with questions and answers.

Fred Capossela, K6SSS, *CQ* WW DX Contest Director, "The Madison Avenue Approach to Contesting."

Jim Cain, WA1STN represented ARRL Headquarters.

Ron Blake and George Werner narrated a slide show of the VP5B operation in the '75 WPX Contest.

And Yuri Blanarovich, VE3BMV (ex-OK3BU) gave what was probably the highlight of the whole program, "Contesting Behind the Iron Curtain."

I don't know how successful I was in getting the message across in "How to Plan a Contest." I do know that I had no problem in presenting Trophies to K4VX, PJ0JR, W2PV, VE3BVM and the VP5B multi group. All winners in the *CQ* 1975 WPX SSB Contest.

Contest Forums are becoming very popular at Hamventions, plan to attend the next one in your area if you are looking for an interesting program.

73 for now, Frank, W1WY

## Calendar of Events

| | | |
|---|---|---|
| **July | 3-4 | Venezuelan Phone |
| *July | 3-4 | QRP Activity Contest |
| **July | 3-25 | Space Net VHF Contest |
| †July | 17-18 | Colombian Contest |
| *July | 24-25 | ARRL Bicentennial |
| July | 24-25 | Danubien Activity |
| **July | 31- | |
| Aug. | -1 | Venezuelan CW Contest |
| *July | 31- | |
| Aug. | -1 | Illinois QSO Party |
| *Aug. | 7-8 | 10-10 Net Summer Party |
| *Aug. | 14-15 | European C.W. Contest |
| Aug. | 21-22 | SARTG RTTY Contest |
| Aug. | 21-22 | Big 15 QSO Party |
| Aug. | 21-23 | New Jersey QSO Party |
| Aug. | 21-23 | QRP ARCI Contest |
| Aug. | 28-29 | All Asian C.W. Contest |
| Aug. | 28-29 | Arizona QSO Party |
| Sept. | 4-5 | Albatross SSTV Contest |
| Sept. | 4-6 | Four Land QSO Party |
| Sept. | 11-12 | European Phone Contest |
| Sept. | 11-12 | Pennsylvania QSO Party |
| Sept. | 11-12 | Washington QSO Party |
| Sept. | 18-20 | Maryland/DC QSO Party |
| Sept. | 18-19 | Scandinavian C.W. |
| Sept. | 25-26 | Scandinavian Phone |
| Sept. | 25-27 | Delta QSO Party |
| Oct. | 2-3 | VK/ZL/Oceania Phone |
| Oct. | 9-10 | VK/ZL/Oceania C.W. |
| Oct. | 16-17 | Boy Scouts Jamboree |
| Oct. | 17-18 | Manitoba QSO Party |
| Oct. | 30-31 | CQ WW DX Phone Contest |
| Nov. | 27-28 | CQ WW DX CW Contest |

*Covered last month.
**Covered in May.
†Not official.

### *Danubien Activity Contest*

C.W.
0000-2400 GMT Saturday, July 24
Phone
0000-2400 GMT Sunday, July 25

This is a new one organized by the Radio Amateur Society of County Pest to increase activity in achieving the Dunakanyer Diploma. There are also contest certificates both for c.w. and phone.

**Classes:** Single operator, single and all band. Multi-operator all band only.

**Exchange:** RS(T) plus a progressive QSO number starting with 001.

**Scoring:** Contacts with own country 1 point, with other countries same continent 2 points, and other continents 5 points. Work a HA7 and its worth 10 points.

Multiply total by number of DXCC countries worked on each band for your final score.

**Awards:** Certificates to the three top scorers in each country, in each class, both c.w. and phone.

The Dunakanyar Diploma is available to all applicants submitting proof of having contacted HA7 stations as follows: DX 5 QSOs, Europe 20 QSOs and HA's 40 QSOs. Extract from your contest log is acceptable. Include 6 IRC's with your application. (Contacts can be made at any time and not limited to the contest.)

Deadline for your contest log Sept. 1st and go to: P.R.A.Sz, H-1387, Budapest, P.O. Box 36, Budapest, Hungary.

### *European DX Contest*

C.W.: Aug. 14-15 Phone: Sept.11-12
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Complete rules were given in last month's Calendar. Following a more detailed awards list.

In addition to the certificates listed under Awards, the following Plaques will be awarded.

1. Single operator, continental leaders.
2. Multi-operator, continental leaders.
3. To stations in the Top Ten/Six who have been in the list for at least five times.

North American residents may send their logs to: Hartwin E. Weiss, WA3-KWD, 323 North St., Millersburg, PA 17061. All others to: European DX Contest, D-895 Kaufbeuren, P.O. Box 262, West Germany. Mailing deadline is Sept. 15th for c.w. and Oct. 15th for phone.

### *S.A.R.T.G. RTTY Contest*

Three Periods (GMT)
000-0800 and 1600-2400 Sat. Aug. 21
0800-1600 Sunday, August 22

This is the 6th annual contest sponsored by the Scandinavian Amateur Radio Teleprinter Group. Use all bands 3.5 thru 28 MHz. The same

## All Asian 1975 C.W. Results

### Continental Winners

| Single Opr. | | Multi-Opr. |
|---|---|---|
| C9MIZ 16,428 | Africa | — |
| UA4HAL 43,662 | Europe | UK4WAC 80,772 |
| W7RM 129,804 | No. Am. | W6OKK 92,232 |
| UA9TS 115,420 | Asia | UK9OAD 60,450 |
| KH6IJ 92,000 | Oceania | — |
| LU8BOA 10,855 | So. Am. | — |

### Single Opr.

**ALASKA**

**14 MHz**

KL7HMO ..... 11,484
KL7ICL ..... 10,535

**CANADA**

**14 MHz**

VE3EJK ..... 42

**All Band**

XN1AW ..... 1,008
XN1KE ..... 120

**U.S.A.**

**1.9 MHz**

W7QID ..... 28

**3.5 MHz**

K6AQ ..... 3,105

**7 MHz**

K6OVJ ..... 20,755
WA6EPQ ..... 16,957
K5ZJP ..... 1,748

**14 MHz**

WB6AIN/6 ..... 26,450
W6AM ..... 17,673
WB2JYM/6 ..... 17,520
WA6NGG ..... 15,920
W5WZQ ..... 15,204
W6RGG/6 ..... 12,520
K6ZM ..... 9,540
WA7JCB ..... 9,339
WA1PID/7 ..... 6,012
W8CQN ..... 5,624
W5WMU ..... 5,115
W2HZY ..... 4,216
WA1STN ..... 1,562
WA1NKK ..... 1,364
K9UIY ..... 1,178
W6DGH ..... 1,116
K6CL ..... 220
WA3DMH ..... 216
W1HX ..... 212
K4RDU ..... 161
K6DSK ..... 120
W4WSF ..... 8
WB4WHE/4 ..... 4

**21 MHz**

K6SDR ..... 1,694

**All Band**

W7RM ..... 129,804
W6PAA ..... 106,362
W6MAR ..... 79,570
W9IRH/7 ..... 74,620
W6ZT ..... 14,355
W2GHD ..... 6,327
K8IDE ..... 3,416
W4UPJ ..... 2,968
WA2IDM ..... 990
K5MHG/6 ..... 120
W6KYA ..... 117

**Multi Opr.**

W6OKK ..... 92,232
K6HIH ..... 83,304
W1ARR/6 ..... 77,832
K3MNT/7 ..... 66,134
K6SG ..... 5,380

station may be worked on each band for QSO and multiplier credits.

**Classification:** Single operator. (a) Less than 100 watts input. (b) Over 100 watts input. (c) Multi-operator single transmitter, no power restrictions. And s.w.l.'s.

**Exchange:** QSO no. and signal report.

**Points:** QSOs with own country, 5 points. With other countries on same continent, 10 points. With other continents, 15 points. U.S., Canada and Australia call areas count as separate countries in scoring.

**Multiplier:** Each DXCC country and each W/K, VE/VO and VK call area.

**Final Score:** Sum of QSO points from all bands times the multiplier from each band.

**Awards:** Certificates to top scoring station in each class in each country and U.S., Canada and Australia call areas.

Mailing deadline is Sept. 18th to SARTG Contest Manager, C. J. Jensen, OZ2CJ, Meisnersgade 5, 8900 Randers, Denmark.

### *Big 15 QSO Party*

Starts: 0001 GMT Saturday, August 21
Ends: 0400 GMT Sunday, August 22

This is the 2nd annual contest organized by the Big 15 Club to increase membership in the Club and to stimulate activity on the 21 MHz band, especially for the Novice. Contacts are limited to 15 meters, phone and c.w., and you need not be a member to participate.

**Exchange** RS(T), state, province or country. Members include membership number.

**Scoring:** Contacts with stations in same country 1 point. Other countries in same continent 2 points. (inc. KL7) DX on other continents 3 points. (inc. KH6) QSOs with members count 10 points. Triple your points if QSO is with Zone 15 and 5 times your points on your 15th contact.

**Multiplier:** Total of states, provinces and DX countries worked.

Certificates, membership card and results to all top scorers. Include a s.a.s.e. for copy of the results.

Mailing deadline Sept. 30th to: Pete Palsen, WN9PIC, 622 East 2nd St., Carlinville, Ill. 62626

### *New Jersey QSO Party*

2000-0700 GMT Sat./Sun. Aug. 21/22
1300-0200 GMT Sun./Mon. Aug. 22/23

This is the 17th party sponsored by the Englewood ARA. Phone and c.w. are considered separate bands. The same station may be worked on each band and mode, and N.J. may work other N.J. stations for QSO and multiplier credit.

**Exchange:** QSO. no., RS(T) and QTH. County for N.J., ARRL section or country for others.

**Scoring:** Out -of-state stations multiply N.J. QSOs by N.J. counties worked. (max. of 21)

N.J. stations score 1 point for W/K, VE/VO contacts, 3 points for DX. Multiply total by ARRL sections. (max. of 75) KP4, KH6, KL7, KZ5 are 3 point contacts and section multiplier.

**Frequencies:** 1810, 3535, 3905, 7035, 7135, 7235, 14035, 14280, 21100, 213335, 28100, 28600, 50-50.5, 144-146. Phone on even hours, 15 on odd hours, 160 at 0500 GMT.

**Awards:** Certificates to the top scorers in each N.J. county, ARRL section and DX country. 2nd place awards if four or more logs received from that section. Also Novice and Technician awards.

Use GMT, indicate multiplier first time it is worked and include a summary and QSO check sheet. A large s.a.s.e. if results are desired.

Stations planning activity in N.J. are requested to advise EARA by Aug. 7th so that coverage off all countries may be planned.

Logs must be received no later than Sept. 18th by the Englewood ARA, 303 Tenafly Road, Englewood, N.J. 07631

### *QRP ARC International Contest*

Starts: 2000 GMT Saturday, August 21
Ends: 0200 GMT Monday, August 23

The contest is open to all amateurs whether or not they are members of QRP Amateur Radio Club International.

The same station may be worked once per band and mode for QSO and multiplier credit.

**Exchange.** RS(T), state, province or country. Members include their QRP number, non-members their power input.

**Points** Member contacts count 3 points, non-member 2 points, and contacts with stations other than W/K or VE count 4 points.

**Multiplier:** Each state, VE province and DX country worked on each band.

**Final Score:** Total QSO points × state (max. 48) province and country multiplier × power multiplier.

**Power Multiplier:** Less than 1 watt input × 5, 1-5 watts × 3, 5-25 watts × 2, 25- 100 watts × 1.5, no multiplier for over 100 watts.

**Frequencies:** C.W.—3540, 7040, 14065, 21040, 28040. Phone—3855, 7260, 14260, 21300, 28600. Novice—3720, 7120, 21120, 28040.

**Awards:** Certificates to top scorers in each state, province and DX country. A certificate to the station using the lowest power and showing three "skip" contacts. Additional awards depending on the activity.

Include a summary sheet with scoring information and equipment description, and a large s.a.s.e. for copy of results. Logs must be received by Sept. 30th and go to: E. V. Sandy Blaize, W5TVW, 417 Ridgewood Drive, Metairie, La. 70001

### *All Asian C.W. Contest*

Starts: 1000 GMT Saturday, August 28
Ends: 1600 GMT Sunday, August 29

The official rules for this contest were received too late for the May issue when the contest was announced. There are three major modifications which fortunately only slightly affect the Phone section which took place last month. They are as follows:

**Classifications:** Single operator, each single band, 1.9 thru 28 MHz, and all band. Multi-operator, all band only. (no multi xmtr.)

**Awards:** Certificates to the top scorers in each classification in each country as follows: First place only if entries are less than 10, 2nd place if 11 to 20, 3rd place if 21 to 30, and 4th and 5th place if over 31 entries received .

The top scorers in each continent, single operator, all band and multi-operator classes will also receive medals.

Each call area in the U.S. single operator, all band class will also receive certificates.

**Dates:** Note that the c.w. date has been moved to a week later than previously announced.

Mailing deadline for the phone logs is September 30th, and November 30th for c.w. They go to the J.A.R.L., P.O. Box 377, Tokyo Central, Japan. Include a s.a.e. and one IRC if you wish a copy of the results.

### *Arizona QSO Party*

Starts: 1700 GMT Saturday, August 28
Ends: 1700 GMT Sunday, August 29

This is the second annual QSO Party sponsored by the Motorola ARC of Arizona. The same station may be worked on each band and mode, and Arizona may work other in-state stations. All stations are encouraged to use their Bicentennial calls.

**Exchange:** RS(T) and QTH, county for Ariz., state, province or country for others.

**Scoring:** One point per s.s.b. QSO, 2 if on c.w., and 4 if with a Novice. An additional 50 s.s.b. QSO points to Ariz. stations operating outside their home county.

**Final Score:** For Arizona, QSO points + any bonus × states/VE provinces/DX countries worked. For others, QSO points × total Ariz. counties worked on each band. (14 per band possible).

**Frequencies:** CW—3560, 7060, 14060, 21060, 28060. Phone—3935, 7235, 14285, 21360, 28575. Novice—3725, 7125, 21125, 28125.

**Awards:** Certificates to the top three Arizona stations and to the top station in each state, VE province and DX country. (Min. of 5 QSOs).

Include the usual summary sheet showing the scoring, equipment descrpition and signed declaration. And a large s.a.s.e. for results.

Mailing deadline Sept. 30th to: Motorola Amateur Radio Club, 8201 E. McDowell Road, Scottsdale, Ariz. 85252

### *Albatross SSTV Contest*

1500-2200 GMT Saturday, Sept. 4
0700-1400 GMT Sunday, Sept. 5

This is the first SSTV contest sponsored by the British Amateur Television Club and the Advanced Electroic organization of Bologna, Italy. Entries will be classed in two sections, send/receive and receive only. (s.w.l.)

**Exchange:** Picture with callsign, signal report and contact number.

**Scoring:** One point for contacts on 14 MHz, 5 points on other bands, and 15 points via Oscar. Multiplier, 5 points for each country, 10 points for each continent. W/K and VE call areas are considered as separate in scoring.


# STEP UP TO TELREX

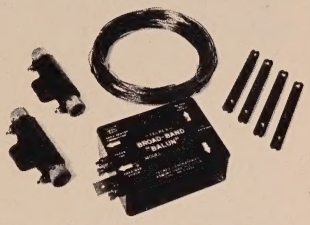
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**Final score:** Total exchange points multiplied by sum of multiplier. (counted once only).

**Frequencies:** 3754, 7040, 14230, 21340, 28670.

**Awards:** The overall winner will receive a SSTV Converter from Advance Electronics, 2nd and 3rd place winners a year's subscription to *CQ TV* magazine. There are s.w.l. awards too.

Include a dollar or its equivalent with your entry to cover mailing expenses and etc.

Logs must be received no later than Oct. 2nd and they go to: Prof. Franco Fanti, I4LCF, Via Dallolio n 19, Bologna, Italy.

### *Four Land QSO Party*

Starts: 1800 GMT. Saturday, Sept. 4
Ends: 0200 GMT Monday, Sept. 6

This is the 7th annual party sponsored by the 4th Call District ARA of the I.A.R.S. The same station may be worked on each band and mode, fixed and again if operating portable or mobile, and from each county change. 4th call area stations may work each other for QSO and multiplier credit.

**Exchange:** RS(T) and QTH. County and state for the 4th district; state, province or country for all others. CHC and FHC should include their membership number to give additional QSO points to stations worked.

**Scoring:** 4th Call Area—One point for W/VE contacts, 3 points if its DX. (inc. KH6 & KL7). Final score, QSO points × states and VE provinces worked. (counted once only).

All Others—Two points per QSO. Final score, QSO points × (4th district states + 4th district counties). For this Bicentennial year add 2 QSO points for each CHC or FHC station worked.

**Frequencies:** CW—3575, 7060, 14070, 21090, 28090. Phone—3940, 7260, 14350, 21360, 28600. Novice—3710, 7110, 21110, 28110.

**Awards:** Certificates to top scorers in each state, VE province and DX country, 2nd and 3rd place when warranted. Also county awards to 4th call area states and special awards to Novices, s.w.l. and B/H. (Blind and Handicapped). There are also High Honor Awards to leaders in Four Land, outside the 4th district, VE and DX countries.

Mail logs within 30 days of end of party to: Fourth Call District A.R.A., Att: Bob Knapp, W4OMW, 105 Dupont Circle, Greenville, N.C. 27834. Include a large s.a.s.e. for results. ■

# Surplus Sidelights

**BY GORDON ELIOT WHITE**

The AN/ARC-27 transceiver (225-400 MHz) is one of those post World War II units that had a very long life with the military, and after it largely passed from the scene aboard first-line U.S. Air Force planes, was much used overseas. Virtually all of the military-assistance countries have used the ARC-27, and its frequency coverage is still the tactical standard.

Age and a shortage of usable spares has forced the ARC-27 out of general use, except aboard a few older aircraft, and some overseas. Its price in surplus has declined, and it could be attractive today for certain amateur uses, either for parts, or for 220 MHz work.

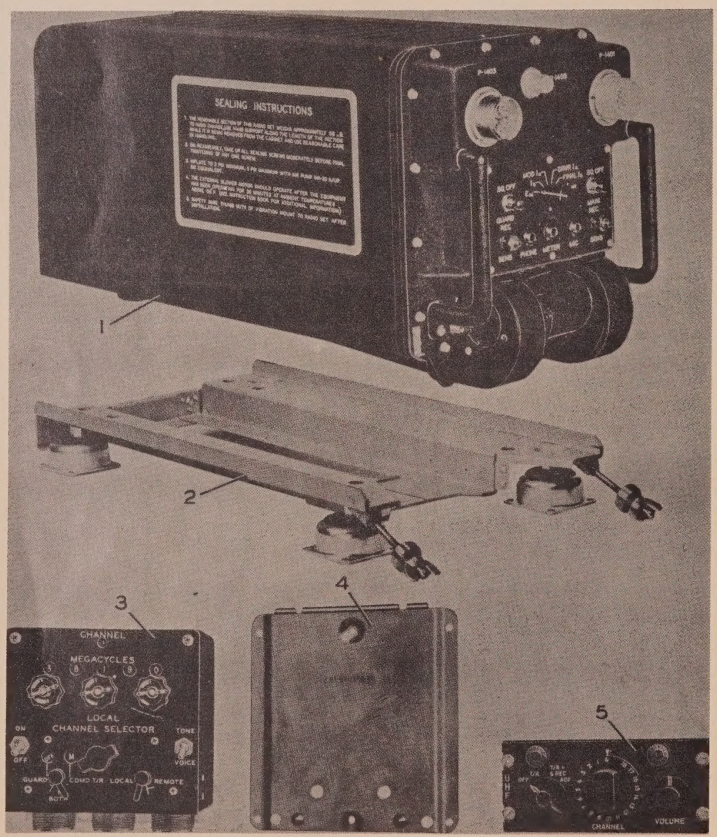



*Fig. 1—The AN/ARC-27 transceiver. (1) is the receiver-transmitter RT-178/ARC-27, (2) mounting plate MT-882, (3) control box C-626, (4) mounting plate MT-821, (5) control box C-628.*

The major unit is the receiver-transmitter, RT-178/ARC-27 (fig. 1) which contains everything except the antenna and control circuits. The receiver portion is a nice triple-conversion tube design providing 1750 channels on 100 kHz spacing. A separate "guard" receiver module is provided, in the 238-248 MHz portion of the band designed to cover the 243 MHz universal emergency channel.

There are a number of control units designed for use with the ARC-27—C-626, C-628, C-868, C-627, etc. (fig. 2), depending on the application of the particular transceiver and the aircraft it was used in. There are several other controls, and mounts, but they are not of great interest to the amateur.

The AN/ARC-27 was another Collins' design like too many of the period. It had competitors, the Bendix AN(ARC-33, the RCA AN/ARC-34, and the Admiral AN/ARC-55. The AN/ARC-33 is interchangeable with the ARC-27 and is virtually identical in characteristics. The ARC-34 is a "miniaturized" ARC-33, and was originally designed by RCA, and Magnavox produced the last production run of that set. The AN/ARC-55 is still in service in many older aircraft, and seems to hold a bit of a premium on the dealers' market. Obviously, this proliferation of almost-identical 225-400 MHz designs was one more case of military duplication of effort. Military strength is necessary, but some of the cost, at least in the past, has been indefensible.

All of the AN/ARC-27 type designs were set up to work with the AN/ARA-25 direction finder group, although such use was rare.

An automatic relay operation could be set up using a pair of RT-178/ARC-27 or RT-394/ARC-55 transceivers and appropriate control units so that an incoming signal received on one unit will be automatically relayed and re-transmitted from the second unit.

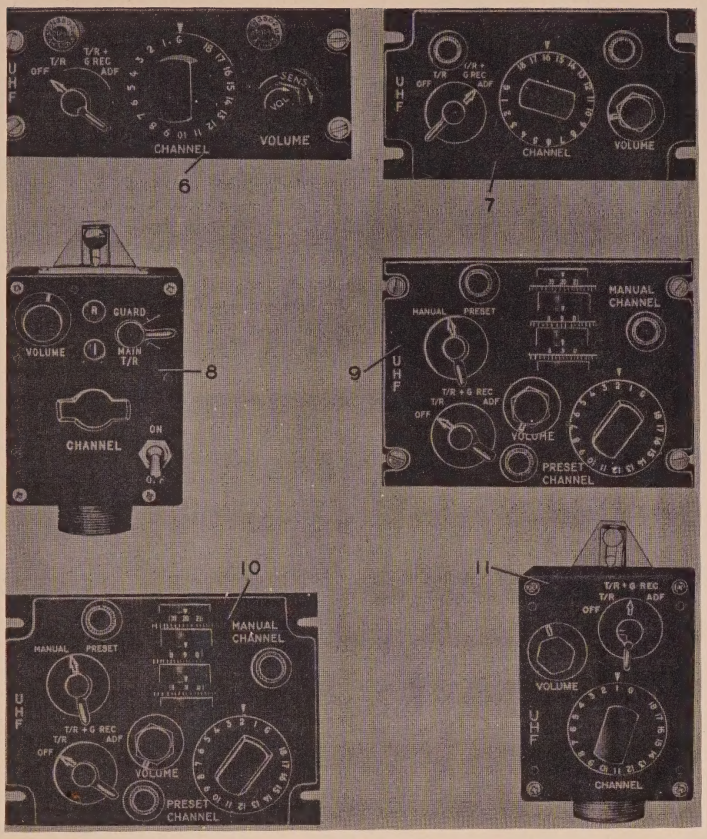



*Fig. 2—Various control boxes for the AN/ARC-27. From 6 thru 11 they are; C-628A, C-868, C-627, C-905, C-906, C-911.*

The specs on the AN/ARC-27 type units indicate an output in the 8-10 watt area. Weight of the RT-178/-ARC-27 is 70 pounds. The RT-349/-ARC-55 is a bit more lean, weighing 57.5 pounds. Power drain in receive is 12.7 amps at 27.5 volts d.c. and 20.25 amps in transmit mode.

The recommended antenna is the AT-141/ARC, a 50 ohm, broadbanded type giving an s.w.r. of 2:1 or less over the entire 225 - 400 MHz band. Coax feed line is RG-8/U (52 ohms).

B+ power is provided by a dynamotor in the AN/ARC-27 design. The ARC-27 is pressurized, with cooling obtained in a heat-exchanger consisting of an inner and outer shell between which air is passed by front-panel cooling blowers. The AN/ARC-55 is not pressurized. The pressure feature was an early way to offset the effect of low ambient pressures at high altitude which led to transmitter flashovers. ■


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Remote control commercial type navigational receiver

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DM-36 24V Power Supply, Exc. Used..... $ 2.25
Technical Manual..... $ 3.50
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**Where Are You Now?**

The following people have been issued certificates for various contests, however due to incorrect addresses we have been unable to send them. If you know the whereabouts of any of these people please drop a line to CQ Magazine, 14 Vanderventer Ave. Port Washington, N.Y. 11050.

**WWDX - 1967**

KL7FRY, SVØWP, HA2MM, ZD5M

**WWDX - 1968**

DM4SLG, 8P6CV, VU2DKZ, DM2BOG DL4FB, 2D8Z, OM1ADP, VE2BV

**WWDX - 1969**

I1NU, OX5BLV, KA2RH, PAØXPQ FG7XX, CR6GO

**WWDX -1971**

WØNQQ, KR6AY, WA3HGV, W7UI, FY0NA, VK6WO, WB2RLK/VE1

**WWDX -1972**

K8WWU

**WW Side Band DX - 1967**

GM5ACE

**WW Side Band DX - 1969**

GD3AIM, HS3RT, VK6HJ, OD2ABV KR6KN, VK1GD

**WW Side Band DX - 1970**

DM6AO, XW8DX

**WW WPX - 1972**

OX5BA

**160 Meter Contest - 1973**

8P6DR


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Address_____
City_____ State____ Zip____
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**Awards** *(from page 61)*

issued for any future QSOs with WB6CKU, for USA-CA.

Sorry to report the loss of two more County Hunters:

J. F. Wemmlinger, W2JGY.

James Farris, Jr., WA4MGC, *All Counties,* #90, 12-22-72, and Story/Foto January 1975 *CQ.*

Also sad to report the loss of an old friend, Chas. Porter, K2ER, ex-2OA (back in the early 1920s and before that), ex K6JT and K4OA. Chas had been associated with Loew Theatres/MGM Pictures, Col. in the OSS, and also with NBC on the west coast before he retired some years ago.

How was your month?

73, Ed., W2GT.

**Math's Notes** *(from page 50)*

izes" the inverter and the two capacitors are used to trim the crystal. Increasing $C_1$ pulls the frequency down while decreasing $C_2$ pulls it up. The other two inverters simply shape up the output so it will drive other circuitry.

This circuit would be the ideal starting point for a marker generator.

73, Irwin, WA2NDM

**Novice** *(from page 48)*

and blow the written test will eventually be given credit for the code, if they pass the written test within a given amount of time. . . . **Charles McDonald, WN3FYM, AK3YBM,** 312 Penna Ave., Dowingtown, Pa. 19335, needs three states for his WAS (worked all states) certificate. His country total is 37, including ZF1AG, who is Art, K8SWW, at home and K4BR/VP9. He worked ZF1AG on both c.w. and phone (Art on phone), and K4BR/VP9 on both 80 and 40 meters. . . . The Maple Hills HS Amateur Radio Club, Castleton, N.Y. (WB2YCR) graduated four Novices from its spring Novice course conducted by John, WA2UON, with more expected before the summer is over.

All readers are invited to send "News And Views," pictures, and suggestions to your *column,* no matter what the class of their licenses. Address all mail to: Herbert S. Brier, W9EGQ, Novice Editor, "CQ Magazine," 409 S. 14th St., Chesterton, Indiana 46304.

73, Herb, W9EGQ

**DX** *(from page 60)*

the old style IRCs will no longer be good after 1976. It seems that there was a possible conflict with ITU regulations and when the matter was taken up with L'Enfant Plaza Headquarters of the Postal Service that a change of mind ensued.

A Bulgarian oceanographic expedition is expected to be drifting towards Polynesia until September and may be heard signing LZOG/mm. Apparently they are retracing the path of the Kon Tiki and they have a low-power transceiver with them. They are expected to operate at 14073 kHz or 14273 kHz around 1830Z. LZ1KBG has asked for reports from anyone working them as this is the only way they can determine how the effort is going. WN3SHX operated from St. Brandon in April . . . the whole operation was only a couple of hours under difficult conditions. BQ6AB is reported as heading back to Sri Lanka and with the VS9-stations going QRT, the activity from the Maldives may be scarce. AI4ARU was at the Region II IARU meeting and QSLs to W4WYR. During the Spring the DXAC have been mulling over some proposals to change the DXCC criteria . . . like reducing that criteria which calls for 225 miles down to 150 miles. This was not the one in question for Okino Tori Shima, that was Rule 2B which called for 500 miles of separation.

Andre Saunders, ex-5Z4KL, is teaching school at Cockermouth in Cumbria. He heads the Science Department. There has been a report that KP6-Palmyra is being leased by a chemical company which may pretty well seal up the lagoon there. Tihs may bring some regular operation from KP6 as a side benefit.

***QSL Information***

**A6XR**—Via G4CHP
**EP2OD**—Via K4OD
**FK0KG**—Via YASME
**KC7LBH**—Via WA7OBH
**N1ITU**—Via W1GNC
**NE1ITU**—Via ARRL
**NZ1ITU**—Via K1HRV
**N2ITU**—Via WA2EAH
**N3ITU**—Via W3DOS
**N4ISC**—Via W4IMP
**NQ4ITU**—Via WB4FDT
**NU4ITU**—Via K4ZA
**NS4ITU**—Via WB4FLW
**N6ITU**—Via K6ILM
**NA6ITU**—Via W6UFJ
**NV6ITU**—Via WA6TAX
**NE6ITU**—Via WA6PDE
**NK8ITU**—Via W8RSW
**N8MI**—Via K8IDE
**N9ITU**—Via K9GSC
**VP5SF**—Via WB4SHB
**VE1APY/SU**—Via VE1APY
**VR3AH**—Via K2BT
**KR3AK**—Via KH6AHZ
**VU2ACD**—Via WB7ACD
**WU4ITU**—Via K4YFQ
**WV9ITU**—Via W8BT
**WI9ANG**—Via WA9DZL
**XJ3ZZ/1**—Via VE3BMV
**UN1FI1**—Via VE3BWY
**YJ8KG**—Via YASME
**5B4BK**—Via OE2SJL
**7J1RL**—Via JARL
**9Y4AC**—Via VE7BZC
**VP5MD**—Via Rt. 1, Box 365B, Valrico, Fla. 33594

**Antennas** *(from page 37)*

was able to achieve unity s.w.r. at any point in either the 80 or 40 meter bands, and signal reports were excellent.

"Joe mounted the whip on the left front fender of his 1970 4 ×4 Chevy pickup truck. He says he hasn't brushed the whip on any low overpasses yet!"

"It doesn't sound like a thing of beauty", observed Pendergast, "But I bet it works. Adding several feet to a loaded 80 or 40 meter whip often works wonders". ■

## C.W. Scores

*(from page 34)*

UA3DFK " 3,360 60 13 29
UA3EAT " 1,638 31 7 19
UW6OE " 945 15 10 11
UW3DR " 165 6 5 6
**UW6CV 21 25,456 344 21 53**
UA1QBE " 10,682 133 12 37
UA3ZP " 10,230 95 18 44
UW4AK " 8,890 144 12 23
UA3PAW " 5,490 73 12 33
UA4HAN " 2,387 51 9 22
UA4QQ " 1,380 26 9 11
UA3YR " 1,176 23 8 16
UK4CAA " 140 10 3 7
**UA3QAQ 14 80,960 546 23 69**
**UA3PBD " 43,056 298 22 56**
UA1ADN " 40,530 371 20 50
UA4LAW " 38,982 295 17 56
UA3ACD " 38,592 312 20 52
UA4BP " 31,920 234 22 48
UA4SM " 27,302 219 18 55
UA3NB " 25,392 220 20 49
UA3IBR " 23,986 223 17 50
UK3VAC " 23,925 331 13 42
UA3WAQ " 21,888 268 13 44
UV3FL " 19,312 137 19 49
UA3GM " 19,118 118 23 56
UA3IAR " 16,640 145 17 48
UA6APY " 12,483 165 17 40
UA3AAU " 11,403 91 19 44
UA3TA " 7,904 72 15 37
UA1ACO " 6,578 99 13 33
UA3IAT " 5,928 90 11 28
UA3DCX " 2,670 81 9 21
UW4AN " 2,450 34 13 22
UA4CCB " 2,277 45 11 22
UA4CAM " 1,870 25 14 20
UA1ABC " 1,674 24 15 16
UA3DDF " 1,029 24 8 13
UA4CAK " 576 16 5 7
UA6AJF " 380 12 7 12
UV3CQ " 288 8 5 7
UA3IAT " 240 8 6 6
UA4AY " 180 15 3 7
**UA6LAH 7 18,907 167 17 56**
UW6OG " 2,544 102 5 19
UA3EAH " 1,440 52 5 19
UA4PGR " 686 37 4 10
UA3YH " 594 23 6 21
UA3DL " 572 29 4 9
UZ3RV " 204 7 6 6
**UA1DZ 3.5 88,908 716 23 70**
**UA4PNW " 46,875 427 18 75**
UA6CQ " 45,954 472 16 53
UA3PCW " 33,426 439 12 42
UA3AEZ " 16,830 232 11 44
UA6LLT " 14,592 238 11 37
UA3GEA " 7,035 138 8 27
UA3XAW " 6,264 117 8 28
UW3UO " 5,115 110 7 26
UA3DFG " 1,898 52 7 19
UV3NG " 1,824 56 6 18

### Estonia

**UR2QI A 319,500 804 60 190**
**UR2RJ 21 17,936 156 21 55**
**UR2RDI 14 135,000 711 28 80**
UR2NP " 9,720 142 13 32
UR2TBG " 6,681 77 14 37
**UR2QD 7 64,032 554 21 66**
**UR2REN " 50,881 485 18 55**
UR2RER " 38,080 400 17 53
UR2TAX " 12,284 96 18 56
**UR2RDQ**
**3.5 18,760 282 10 46**
UR2CR " 3,795 100 7 26
UR2OI " 3,051 96 5 22
UR2DW " 527 31 4 13

### Kalingrad

**UA2DM A 115,635 296 55 140**
UA2FAT " 33,372 205 28 75
UA2DP 21 1,568 24 11 17
**UA2EC 3.5 17,388 254 10 44**

### Latvia

UQ2OP A 16,077 180 18 51
UQ2GFA " 1,242 52 8 15
UQ2OC 21 6,250 65 16 34
UQ2CR 14 4,692 78 11 23
UQ2AO " 391 23 4 13
UQ2GDN " 154 6 5 6
**UQ2GCN**
**3.5 30,894 482 11 46**
UQ2GEA " 14,964 300 6 37
UQ2GW " 4,100 54 10 40
UQ2GEC 7 18 2 1 2

### Lithuania

**4J2A A 812,062 1505 91 255**
**UP2SA " 446,040 881 72 208**
UP2CY " 342,387 905 59 184
UP2BAR " 241,920 807 53 157
UP2OM " 211,331 746 50 138
UP2OU " 209,000 675 56 153
UP2BAO " 149,342 577 46 132
UP2BAT " 141,602 519 50 152
UP2NC " 117,602 727 27 100
UP2MC " 35,400 253 24 76
UP2BAA " 31,371 333 17 62
UP2BDO " 12,100 209 12 43
UP2BBR " 8,635 103 21 34
UP2BAZ " 5,593 94 15 32
UP2BDE " 2,706 62 9 32
UP2PAP 21 1,248 19 11 15
UP2BAD 14 7,110 82 15 30
**UP2DV 7 32,708 349 18 56**
**UP2BAS**
**3.5 41,541 587 13 48**
**UP2PAQ " 40,170 517 12 53**
UP2PCH " 2,047 89 4 19
UP2GM " 592 35 4 12
UP2BBC " 360 19 4 14

### Moldavia

UO5OWB A 10,098 173 11 43
UO5OWK " 5,358 74 14 33
**UO5AP 14 28,512 169 26 70**
UO5OWN " 784 26 6 8
**UO5OBD 7 40,392 452 14 52**
UO5GR " 8,772 106 12 39
UO5OGU " 2,400 76 6 26

### Ukraine

**UB5WF A 689,832 1302 77 235**
**UB5AAF " 245,016 617 62 184**
**UB5ICS " 111,895 434 38 123**
UT5LF " 109,190 414 51 128
UY5TE " 108,500 518 31 124
UB5MET " 89,740 425 35 105
UB5AAQ " 84,888 470 32 99
UB5AAL " 80,868 450 31 107
UB5WCU " 67,410 484 26 81
UY5DV " 48,276 294 29 79
UB5FBQ " 39,870 358 19 71
UB5TAO " 36,344 416 24 64
UB5ECH " 36,084 248 26 71
UT5SI " 35,280 256 22 76
UB5TAG " 20,900 132 28 67
UB5LR " 19,980 95 35 73
UB5TAM " 16,720 141 21 67
UB5KAH " 10,349 51 36 43
UB5VK A 8,246 65 19 43
UB5XU " 7,656 84 21 45
UB5UAL " 7,398 53 21 33
UB5LAY " 7,085 57 25 40
UB5UAW " 5,995 41 26 29
UT5HP " 3,696 31 21 27
UB5QCK " 999 22 11 16
UT5BN " 432 9 7 9
RB5IOV 28 99 8 4 5
**UY5HV 21 7,436 88 16 36**
**UB5IDL 14 167,670 698 30 85**
**UT5XW " 140,790 635 30 84**
UB5VAA " 35,100 236 24 54
UB5VAF " 22,644 193 21 53
UB5OD " 19,728 167 20 52
UB5EAX " 12,740 178 14 35
UT5BW " 5,100 57 13 38
UB5UBU " 4,797 77 11 30
UY5GG " 1,674 20 9 18
UB5VY " 930 22 7 8
UB5KAK " 738 15 8 10
**UT5BP 7 200,720 903 33 97**
**UB5IF " 114,933 733 23 68**
UB5LL " 76,472 623 18 61
UB5UAU " 7,020 157 9 27
UB5GCR " 2,100 54 7 23
**UB5BAZ**
**3.5 50,328 555 14 58**
**UY5DP " 23,817 372 12 39**
UB5WCW " 18,354 358 8 38
UB5DBA " 5,530 130 7 28
UB5MDD " 5,160 128 7 23
UB5LCV " 2,312 52 9 25
UB5EF " 2,200 90 5 17

### White Russia

**UC2AAD A 17,819 109 27 76**
UC2OAK " 9,016 173 9 37
UC2ABT " 2,145 25 16 23
UC2AAK " 864 16 12 15
UC2BF " 6 3 3 3
**UC2AF 14 98,896 507 30 82**
UC2WP " 40,128 299 18 58
**UC2WG 7 3,024 78 6 22**
UC2AW " 748 32 5 7
**UC2RG 3.5 28,176 583 10 38**
UC2OBT " 20,339 405 8 35

## OCEANIA

### Australia

**VK3MR A 507,870 857 78 120**
VK2GW " 333,336 838 56 80
VK4FH " 95,284 400 36 46
VK4UR " 49,700 254 33 38
VK3XB " 23,511 162 27 24
VK5LU " 15,255 113 13 32
VK4RU " 7,774 102 13 13
**VK4XA 28 2,448 58 8 8**
**VK3RJ 21 7,107 107 13 10**
**VK6HD 14 469,320 1325 32 88**
VK5HP " 24,376 188 19 25
**VK3MPN 7 48,804 334 18 31**

### Gilbert Islands

**VR1AA A 113,280 342 54 66**

### Guam

**KG6JEU A 8,323 74 21 20**
**KG6JAR 21 28,418 373 13 13**
**KG6JFY 7 175,848 877 26 42**

### Hawaii

**KH6IJ A 1,115,277 2106 83 94**
KH6CF " 541,500 1227 71 79
KH6AKX " 82,225 248 55 60
**KH6IFU/KH6**
**14 2,548 66 6 7**
**KH6HSW 7 105,570 668 22 32**
**KH6GQW**
**3.5 20,076 245 14 14**
**KH6CHC**
**1.8 630 24 4 5**
KH6BZF " 24 4 1 1

### Indonesia

**YB9ABX 14 2,044 33 14 14**

### Minami-Torishima

**JA8IEV/JDI**
**7 52,358 381 21 26**

### New Zealand

**ZL1AFW A 73,633 371 36 31**
ZL1AMM " 65,048 240 38 56
**ZL1BJH 7 5,355 107 9 8**
**ZL3GQ 3.5 52,218 331 21 33**
ZL1AMO " 40,204 300 21 25
ZL2BCO " 27,821 222 19 24

### Antarctica

**KC4AAC A 71,248 398 28 33**
(Opr. WB6KIL)

## SOUTH AMERICA

### Argentina

**LU5DVO A 129,210 597 34 39**
LU8BAO " 64,570 203 45 65
**LU6EF 28 23,406 498 17 30**
**LU3DSI 21 126,768 569 22 54**
**LU9FAZ 7 5,730 191 13 17**

### Brazil

**PY1BOA A 216,323 542 48 89**
PY7AZQ " 156,083 415 44 83
PY6AHU " 125,208 385 35 76
PY3CFP " 34,344 166 29 43
**PY2FXU 21 19,600 140 19 30**
PY1ZBJ " 6,318 82 10 16
**PY7AKQ/8**
**14 305,200 1131 24 76**
PY2FRW " 157,920 635 24 60
PY1TC " 2,068 35 11 11
**PY7BXC 7 15,949 389 12 29**

### Chile

**CE8AA A 64,310 192 46 72**

### Easter Island

**CE0AE 14 5,522 251 10 12**

### Peru

**DJ3KR/OA4**
**A 1,630,976 2160 87 169**
OA8V " 15,196 91 29 29

### Trinidad

**9Y4LA A 89,723 375 27 56**

### Uruguay

**CX4CR 14 935,025 2303 34 103**
(Opr. CX9BT)
CX7BV " 506,520 1598 30 78
(Opr. CX1EK/W4)
**CV4DL 7 230,040 1020 24 57**
(Opr. CX1BBL)

### Venezuela

**YV4AGP**
**A 2,816,094 2752 101 245**
(Opr. W6DGH)
**YV4AMG 21 90,116 592 16 36**
YV4IR " 55,398 450 15 27
**YV5CVE 7 170,164 883 15 61**
YV4NQ " 112,484 652 16 45
**YV4CI 3.5 23,001 159 14 37**
**YV1OB 1.8 10,860 127 10 20**

## Multi-Op, Single Xmtr.

## NORTH AMERICA

### United States

**W2YD 1,011,358 1053 100 246**
W2UI 137,416 271 66 127
W3NX 185,913 306 72 155
WA3YHT 131,016 302 50 109
W3YFV 9,570 56 27 39
**W4QQN 711,144 819 88 218**
**K4YFQ 626,133 661 89 250**
K5YMY 188,856 304 79 165
**W6OUN 1,033,518 1283 108 173**
**WA6NGG 788,697 993 99 174**
W6BIP 259,311 509 74 109
K3MNT/7 324,071 624 77 110
W7FR 232,000 518 67 93
WA8ZDF 134,940 296 68 127
**W9ZTD 716,672 781 106 246**
WØEEE 210,392 368 71 150

### Canada

**XJ1AI 578,584 992 71 177**
CY6NQ 79,023 553 34 37

### Curacao

**PJ9JT 2,272,846 2578 95 203**

### Dominica

**VP2DX 2,120,904 3135 98 226**

### Grand Cayman

**ZF1AL 1,166,830 2588 71 140**

### Sint Maarten

**PJ8CM 619,398 1185 74 160**

## AFRICA

### Madeira

**CT3/OZ5DX**
**3,474,000 3023 94 292**

## ASIA

### Japan

**JA9YBA 376,056 696 87 129**
JA6YTU 262,140 501 83 121
JAØYAN 72,263 243 53 74
JA5YCS 45,144 194 49 50
JA7YAA 36,120 149 51 54
JA3YEJ 3,150 41 19 16

### Minami-Torishima

**JD1YAA 44,100 418 17 19**

## ASIA

### Asiatic Russia

**UK9AAN 2,525,628 2159 117 311**
**UK9ABA 1,260,050 1523 80 210**
UK9SAY 890,799 1395 67 184
UK9CBD 507,760 881 58 162
UK9QAA 420,980 801 54 140
UK9QAG 256,538 685 37 120
UK9FER 206,264 488 38 114
UK9WBD 171,840 518 23 97
UK9LAB 30,378 169 24 59
**UKØAAC 669,366 1122 75 171**
UKØLAB 554,600 1160 81 155
UKØFAA 346,752 1185 71 97
UKØCBE 67,308 573 26 45
UKØFAD 65,250 561 35 52

### Azebaijan

**UK6DAU A 516,230 970 55 154**

### Kazakhistan

**UK7JAA A 399,789 880 68 153**
UK7GAA " 373,368 711 51 137
UK7PAU " 47,730 246 26 48
UK7LAF " 3,567 43 8 21

### Turkoman

**UK8HAA A 895,251 1308 71 196**

## EUROPE

### Bulgaria

**LZ1KDP 542,570 928 89 248**
LZ2KKK 260,400 1003 46 154
LZ2KNI 227,979 687 60 159
LZ2KDI 186,921 791 40 121
LZ1KSF 185,952 585 53 155
LZ2KBA 179,707 654 55 132
LZ1KCM 174,760 743 38 132
LZ1KOZ 168,480 767 38 122
LZ2KWR 107,568 544 34 110
LZ2KSU 83,360 321 51 109
LZ2KAD 38,625 406 16 59

### Czechoslovakia

**OK1KSO/P**
**421,555 727 82 213**
OK3KAP 384,384 696 75 211
OK1KCI 286,770 778 67 170
OK1KVK 171,456 514 56 136
OK1KSL 169,041 564 53 148
OK2KYK 112,495 575 39 112
OK3KTY 104,499 528 43 110
OK1KRS 85,768 467 37 105
OK3KTD 67,165 392 35 98
OK1OFK 51,255 227 43 110
OK3RMW 36,920 280 25 79
OK3RJB 33,578 263 29 74
OK1KYS 28,024 125 38 75
OK2KOO 23,850 134 26 49
OK2KWL 3,565 101 6 25
OK2KHD 2,059 80 7 22
OK3KPN 1,392 40 9 20

### Denmark

**OZ1HX 230,490 682 57 140**

### England

**G3RAC 361,108 715 84 199**
G3GJL 187,748 508 61 190
G4EOK 104,280 503 42 116
G3YEC 87,368 483 34 100

### Federal Republic of Germany

**DLØWU 1,136,832 1438 87 285**
DKØTU 937,818 1374 95 283
DLØAA 690,992 1166 84 220
DL8CM 559,062 861 74 232
DLØKL 406,890 725 80 217
DK7SU 225,453 1011 61 162

### Finland

**OH7RM 400,731 1010 59 164**
OH7SX 72,996 358 39 93

### German Democratic Republic

**DM2ATD 564,300 1348 73 202**
DM3GM 2,256 94 4 20

### Holland

**PI1PT 75,078 354 37 92**

### Hungary

**HA5KFN/5 676,042 1127 87 227**

**HAØKLE 621,372 1098 89 229**
**HA3KMA 546,840 1100 74 206**
HA8KCK 372,999 815 72 195
HA1KSA 349,428 1103 59 163
HG8U 338,832 1010 69 165
HA5KKC/7 297,306 725 67 182
HA4KYH 271,908 635 75 174
HA7KLG 251,680 816 52 156
HA5KFZ/7 217,971 716 56 151
HAØKHW 205,499 664 51 166
HA6KVB 160,104 745 42 126
HAØKHS 148,925 595 44 131
HA6KVC 122,636 542 43 129
HA6KNH 119,316 386 58 125
HA6KNB 104,167 410 45 116
HA1KZZ 97,056 552 39 105
HA2KMB 93,922 466 45 106
HA5KFV 70,179 311 41 116
HA7KMW 66,062 380 28 106
HA7KMS 53,997 379 31 92
HA3KGJ 44,555 222 35 98
HA3KHC 17,202 397 10 37
HA7KMY 3,618 141 5 22

### Iceland

**TF3KX 13,104 148 19 37**

### Ireland

**EI1AA 817,704 1585 78 250**

### I.T.U.

**4U1ITU 648,720 1565 66 199**

### Poland

**SP9KRT 108,476 584 40 113**
SP5PSL 77,688 579 20 97
SP9KBY/9 75,108 458 30 102
SPØZHB 74,789 368 39 104
SP9KCB 35,343 300 28 71
SPZKGR 25,560 286 25 47
SPZKBA 11,036 140 12 50
SP6PAV 7,191 93 18 33

### Romania

**YO8KAN/P**
**220,941 816 54 135**
YO4KBJ 162,658 683 50 117
YO6KBM 44,160 300 34 81

### Scotland

**GM3ZRC 51,040 353 32 78**

### Sweden

**SM5AOE 779,072 1297 90 239**
SK6JA 562,400 896 84 220
SK7CE 362,850 1120 54 151
SMØPX 254,130 708 51 146
SK2AU 226,560 771 48 129
SK5DB 171,000 533 48 123
SLØCB 69,412 387 31 103

### Switzerland

**HB9AYZ 115,209 521 41 112**

### Yugoslavia

**YZ1AFQ 861,720 1225 94 250**
YZ2CBM 469,710 994 71 184
YU1ABF 430,218 941 69 210
YZ2CBV 277,560 620 70 187
YZ4EIC 264,061 906 46 135
YZ2CMS 202,768 709 48 136
YZ2ACF 177,184 516 61 163
YU3DBJ 18,696 242 15 42

## U.S.S.R.

### European Russia

**4J3A A 1,858,857 2052 106 323**
**UK6LAZ**
**" 1,078,388 1342 105 291**
**UK1AAA " 774,692 1344 79 214**
**UK3WAA " 402,702 1040 58 188**
UK4HAA " 318,472 1098 49 139
UK4WAB " 310,368 936 47 165
UK6AAJ " 201,210 747 47 143
UK3DAA " 182,624 610 52 156
UK3AAC " 174,087 466 57 150
UK1APA " 156,032 562 47 137
UK3TBF " 149,842 592 38 116
UK3EAK " 144,832 733 36 110
UK6LWW " 123,172 528 41 125
UK1TAB " 105,266 465 36 111
UK1NAA " 97,875 414 33 112
UK4PAE " 93,726 520 29 98
UK6AAU " 80,640 804 20 52
UK4FAV " 62,540 410 26 80
UK4PAA " 57,222 459 25 77
UK3DCF " 52,503 332 27 84
UK1TAA " 33,660 289 27 63
UK6AJA " 26,926 206 28 68
UK3DCC " 23,250 204 21 54
UK1ABC " 9,945 140 20 45
UK3SAF " 7,500 101 17 33
UK3RAD " 6,844 76 20 39
UK4YYY " 6,350 57 21 29
UK3DAU " 3,657 70 15 38
UK3ABQ " 2,480 77 7 23
UK3SAA " 684 12 7 12
UK3RAA " 380 19 6 13

### Estonia

**UK2RAH A 171,680 736 35 125**
UK2RAX " 115,542 658 31 116
UK2RIL " 50,096 362 29 72

### Latvia

**UK2GKW A 687,525 1360 64 203**

# BAND-BY-BAND BREAKDOWN — TOP ALL BAND SCORES

**Number groups indicate: QSO's/Zones/Countries on each band.**

### WORLD TOP SINGLE OPERATOR — ALL BAND

| Station | 1.8 | 3.5 | 7 | 14 | 21 | 28 |
|---|---|---|---|---|---|---|
| EA8CR | 47/ 5/14 | 323/14/48 | 512/19/53 | 932/26/ 70 | 922/24/71 | 111/14/31 |
| YV4AGP | 34/ 5/ 6 | 251/15/39 | 661/19/61 | 807/25/ 70 | 657/23/52 | 342/13/23 |
| VP2MIR | 19/ 5/ 8 | 313/13/50 | 369/17/54 | 606/23/ 68 | 669/23/61 | 196/16/31 |
| DJ3KR/OA4 | | 67/10/12 | 93/13/21 | 819/30/ 60 | 960/22/57 | 221/12/19 |
| ZF1TW | 1/ 1/ 1 | 352/14/31 | 516/17/37 | 847/22/ 58 | 826/19/46 | 148/12/17 |
| KP4EAJ | 13/ 3/ 4 | 191/13/26 | 580/15/41 | 612/24/ 55 | 709/17/43 | 193/15/21 |
| EA2IA | | 455/12/49 | 469/11/42 | 919/23/ 59 | 423/22/63 | 25/ 2/ 6 |
| KH6IJ | 38/ 5/ 4 | 241/10/ 9 | 327/18/19 | 774/26/ 33 | 691/26/33 | 35/ 9/ 7 |
| UI8LAG | | 376/15/46 | 251/11/36 | 458/27/ 63 | 304/24/57 | 4/ 3/ 2 |
| C5AJ | | 31/ 9/16 | 209/11/26 | 627/19/ 56 | 500/18/53 | 66/11/25 |

### USA TOP SINGLE OPERATOR — ALL BAND

| Station | 1.8 | 3.5 | 7 | 14 | 21 | 28 |
|---|---|---|---|---|---|---|
| W3LPL | 19/ 7/13 | 56/14/36 | 174/27/69 | 393/31/ 96 | 188/22/66 | 31/11/22 |
| W6MAR | 10/ 7/ 7 | 90/18/24 | 524/27/54 | 241/25/ 61 | 182/23/47 | 22/11/12 |
| K3GJD | 9/ 4/ 4 | 111/17/49 | 111/22/53 | 451/30/ 82 | 113/25/54 | 21/ 7/14 |
| W2GXD | 12/ 5/ 5 | 71/13/36 | 91/23/50 | 504/29/ 82 | 149/22/59 | 22/11/16 |
| W1ZM | 17/ 6/ 9 | 96/15/43 | 120/22/51 | 338/24/ 77 | 157/21/60 | 18/ 8/15 |
| K6CQF | 1/ 1/ 1 | 57/13/20 | 504/15/33 | 315/27/ 51 | 118/20/34 | 21/ 9/11 |
| W3BGN | 3/ 3/ 3 | 60/15/35 | 106/23/53 | 430/30/ 80 | 125/19/51 | 21/ 9/17 |
| K6OVJ | 4/ 3/ 2 | 47/16/21 | 587/27/49 | 156/22/ 39 | 152/20/30 | 25/10/12 |
| W6ANN | 9/ 7/ 8 | 52/14/20 | 368/25/40 | 178/25/ 52 | 240/25/41 | 23/11/14 |
| W2DXL | 17/ 6/10 | 59/13/34 | 109/22/52 | 334/24/ 76 | 162/21/57 | 22/ 8/16 |

### WORLD TOP MULTI-OPERATOR — SINGLE TRANSMITTER

| | | | | | | |
|---|---|---|---|---|---|---|
| FY7AK | 2/ 2/ 2 | 248/17/51 | 825/18/56 | 992/24/ 73 | 1382/22/73 | 221/15/33 |
| CT3/OZ50X | | 421/15/55 | 764/21/70 | 1022/24/ 74 | 767/22/69 | 49/12/24 |
| 4M5ANT | 15/ 6/ 6 | 189/19/53 | 414/23/69 | 861/28/ 81 | 603/27/77 | 152/12/24 |
| UK9AAN | | 554/19/61 | 588/35/87 | 655/33/ 93 | 356/26/65 | 6/ 4/ 5 |
| OC4A | | 69/11/13 | 957/22/48 | 661/20/ 38 | 143/20/52 | 218/16/25 |
| PJ9JT | | 312/17/39 | 669/19/35 | 728/27/ 65 | 678/22/49 | 191/10/15 |

### USA TOP MULTI-OPERATOR — SINGLE TRANSMITTER

| | | | | | | |
|---|---|---|---|---|---|---|
| W6OUN | 8/ 5/ 4 | 64/15/20 | 636/27/49 | 307/31/ 59 | 256/24/36 | 12/ 6/ 5 |
| W2YD | 3/ 2/ 3 | 76/16/37 | 145/24/62 | 649/30/ 85 | 170/21/50 | 10/ 7/ 9 |
| WA6N66 | 3/ 2/ 2 | 42/15/23 | 572/25/45 | 203/25/ 54 | 155/21/38 | 18/11/12 |
| W9ZTD | 2/ 2/ 2 | 62/12/25 | 226/29/70 | 361/31/ 81 | 104/22/50 | 26/10/18 |
| W4QON | | 65/13/36 | 165/21/52 | 433/30/ 71 | 147/21/56 | 4/ 3/ 3 |
| K4YFR | | 47/13/31 | 250/25/83 | 204/24/ 66 | 135/19/55 | 25/ 8/15 |

### WORLD TOP MULTI-OPERATOR — MULTI-TRANSMITTER

| | | | | | |
|---|---|---|---|---|---|
| W3AU | 35/ 9/17 | 174/19/51 | 343/27/86 | 1021/34/114 | 378/25/82 | 54/15/31 |
| W3WJD | 31/ 8/14 | 126/15/47 | 397/29/88 | 1005/35/104 | 288/25/74 | 33/11/22 |
| W4BVV | 38/ 9/15 | 183/18/56 | 440/29/87 | 794/32/109 | 301/24/77 | 65/12/26 |
| W3GPE | 46/10/19 | 148/18/48 | 372/29/89 | 833/33/106 | 255/25/79 | 53/14/27 |
| WA2ZAA | 32/ 9/16 | 136/17/39 | 353/29/89 | 986/33/115 | 328/23/82 | 27/ 8/17 |
| W6PVB | 32/ 8/ 8 | 291/25/38 | 852/30/70 | 444/31/ 76 | 355/24/43 | 83/12/20 |

### USA TOP MULTI-OPERATOR — MULTI-TRANSMITTER

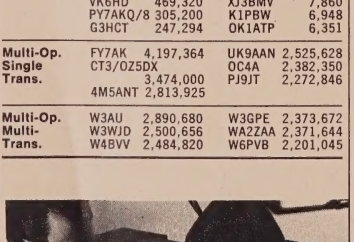
| | | | | | |
|---|---|---|---|---|---|
| W3AU | 35/ 9/17 | 174/19/51 | 343/27/86 | 1021/34/114 | 378/25/82 | 54/15/31 |
| W3WJD | 31/ 8/14 | 126/15/46 | 397/29/88 | 1005/35/104 | 288/25/74 | 33/11/22 |
| W4BVV | 38/ 9/15 | 183/18/56 | 440/29/87 | 794/32/109 | 301/24/77 | 65/12/26 |
| W3GPE | 46/10/19 | 148/18/48 | 372/29/89 | 833/33/106 | 155/25/79 | 53/14/27 |
| WA2ZAA | 32/ 9/16 | 136/17/39 | 353/29/89 | 986/33/115 | 328/23/82 | 27/ 8/17 |
| W6PVB | 32/ 8/ 8 | 291/25/38 | 852/30/70 | 444/31/ 76 | 355/24/43 | 83/12/20 |

## WORLD TOP SCORES

| | | | | |
|---|---|---|---|---|
| | EA8CR | 3,295,997 | KP4EAJ | 1,410,207 |
| | YV4AGP | 2,816,094 | EA2IA | 1,169,583 |
| **Single-Op. All Band** | VP2MIR | 1,980,423 | KH6IJ | 1,115,277 |
| | DJ3KR/OA4 | 1,085,280 | UI8LAG | 1,085,280 |
| | | 1,630,976 | C5AJ | 1,042,124 |
| | ZF1TW | 1,595,550 | ZE1JV | 1,011,375 |

| 28 MHz | | 7 MHz | |
|---|---|---|---|
| LU6EF | 23,406 | VP5GS | 269,472 |
| YU3ER | 7,128 | CV4DL | 230,040 |
| I6POY | 3,960 | W5WZQ | 229,548 |
| W8WPC | 2,784 | UT5BP | 200,720 |
| VK4XA | 2,448 | W6MUR | 196,730 |
| G2BOZ | 2,442 | YU3BO | 180,400 |
| **21 MHz** | | **3.5 MHz** | |
| ZE8JN | 307,125 | KV4FZ | 190,082 |
| 4X4RD | 274,647 | ZB2X | 114,540 |
| ZE4JS | 181,482 | FP8AA | 109,056 |
| UL7QH | 159,192 | 4X4NJ | 103,572 |
| YU3ZV | 156,211 | UA1DZ | 88,908 |
| LU3DSI | 126,768 | G3HTA | 72,917 |
| **14 MHz** | | **1.8 MHz** | |
| CX4CR | 935,025 | YV1OB | 10,860 |
| CR6IK | 727,424 | GD4BEG | 8,932 |
| CX7BV | 506,520 | PAØHIP | 8,652 |
| VK6HD | 469,320 | XJ3BMV | 7,860 |
| PY7AKQ/8 | 305,200 | K1PBW | 6,948 |
| G3HCT | 247,294 | OK1ATP | 6,351 |

| | | | | |
|---|---|---|---|---|
| **Multi-Op. Single Trans.** | FY7AK | 4,197,364 | UK9AAN | 2,525,628 |
| | CT3/OZ5DX | | OC4A | 2,382,350 |
| | | 3,474,000 | PJ9JT | 2,272,846 |
| | 4M5ANT | 2,813,925 | | |
| **Multi-Op. Multi-Trans.** | W3AU | 2,890,680 | W3GPE | 2,373,672 |
| | W3WJD | 2,500,656 | WA2ZAA | 2,371,644 |
| | W4BVV | 2,484,820 | W6PVB | 2,201,045 |



OE1ELW

| | | | | |
|---|---|---|---|---|
| UK2GAY | " | 368,000 | 1033 | 55 175 |
| UK2GAB | " | 138,467 | 698 | 40 111 |
| UK2GAT | " | 123,266 | 628 | 35 108 |
| UK2GAG | " | 113,099 | 488 | 39 112 |
| UK2GBY | " | 13,050 | 144 | 18 57 |

**Lithuania**

| | | | | |
|---|---|---|---|---|
| **UK2PAF** | **A** | **756,010** | **1261** | **87 259** |
| **UK2PAP** | **"** | **504,127** | **1219** | **58 189** |
| UK2BAS | " | 476,560 | 868 | 70 210 |
| UK2BBE | " | 322,422 | 1124 | 49 169 |
| UK2PAO | " | 172,135 | 645 | 47 152 |
| UK2PBK | " | 138,321 | 805 | 30 111 |
| UK2PAT | " | 128,885 | 553 | 44 129 |
| UK2BAV | " | 37,066 | 341 | 22 64 |

**Moldavia**

| | | | | |
|---|---|---|---|---|
| UO5RO | A | 12,738 | 139 | 19 47 |

**Ukraine**

| | | | | |
|---|---|---|---|---|
| **UK5JAA** | **A** | **1,204,706** | **1902** | **97 289** |
| **UK5MAF** | **"** | **749,488** | **1259** | **86 251** |
| **UK5MAA** | **"** | **454,665** | **1099** | **63 192** |
| UK5IAA | " | 358,278 | 1062 | 76 207 |
| UK5GBE | " | 347,760 | 904 | 52 155 |
| UK5UAC | " | 259,650 | 731 | 58 167 |
| UK5QAC | " | 59,631 | 314 | 32 111 |
| UK5ZAK | " | 58,195 | 236 | 19 48 |
| UK5WAL | " | 47,292 | 409 | 25 59 |
| UK5ICD | " | 46,182 | 259 | 35 94 |
| UK5MBP | " | 34,860 | 346 | 21 62 |
| UK5JAO | " | 24,206 | 156 | 26 65 |
| UK5SAA | " | 15,064 | 246 | 11 45 |
| UK5IAD | " | 12,950 | 109 | 24 50 |
| UK5MAG | " | 10,240 | 63 | 26 38 |
| UK5JAM | " | 9,075 | 101 | 17 38 |

**White Russia**

| | | | | |
|---|---|---|---|---|
| **UK2WAF** | **A** | **387,250** | **951** | **67 183** |
| UK2AAB | " | 254,824 | 818 | 55 157 |
| UK2ABC | " | 141,282 | 787 | 30 111 |
| UK2WAE | " | 87,561 | 366 | 38 103 |
| UK2AAP | " | 43,610 | 203 | 31 67 |
| UK2OAK | " | 11,856 | 178 | 13 44 |

## OCEANIA

**Australia**

| | | | | |
|---|---|---|---|---|
| **VK6DS** | **566,010** | **1003** | **64** | **126** |

**Hawaii**

| | | | | |
|---|---|---|---|---|
| **KH6RS/KH6** | **407,468** | **1331** | **53** | **50** |

**Johnston Islands**

| | | | | |
|---|---|---|---|---|
| **KJ6BZ** | **166,581** | **731** | **36** | **47** |

## SOUTH AMERICA

**Argentina**

| | | | | |
|---|---|---|---|---|
| **LU1DZ** | **1,746,052** | **1916** | **101** | **207** |

**Columbia**

| | | | | |
|---|---|---|---|---|
| **5K4AOY** | **640,320** | **1343** | **53** | **107** |

**French Guiana**

| | | | | |
|---|---|---|---|---|
| **FY7AK** | **4,197,364** | **3670** | **98** | **288** |

**Peru**

| | | | | |
|---|---|---|---|---|
| **OC4A** | **2,382,350** | **3048** | **89** | **176** |

**Venezuela**

| | | | | |
|---|---|---|---|---|
| **4M5ANT** | **2,813,925** | **2218** | **115** | **310** |

## MULTI-OPERATOR MULTI TRANSMITTER

### NORTH AMERICA

| | | | | |
|---|---|---|---|---|
| **W3AU** | **2,890,680** | **2005** | **129** | **381** |
| **W3WJD** | **2,500,656** | **1880** | **123** | **349** |
| **W4BVV** | **2,484,820** | **1821** | **124** | **370** |
| W3GPE | 2,373,672 | 1707 | 129 | 368 |
| WA2ZAA | 2,371,644 | 1862 | 119 | 358 |
| **W6PVB** | **2,201,045** | **2057** | **130** | **255** |
| W3FRY | 1,903,448 | 1538 | 122 | 336 |
| K6RR | 1,607,984 | 1751 | 119 | 224 |
| W3BWZ | 1,060,668 | 1006 | 108 | 270 |
| W3TV | 416,161 | 533 | 83 | 198 |
| WA3ATX | 339,448 | 429 | 90 | 212 |

### ASIA

| | | | | |
|---|---|---|---|---|
| **JA3YKC** | **1,139,277** | **1383** | **112** | **195** |
| JH1YDT | 672,055 | 980 | 96 | 161 |
| JA3YBF | 436,445 | 801 | 84 | 121 |
| JA2YEF | 432,761 | 772 | 87 | 124 |
| JA3YDS | 51,597 | 174 | 53 | 64 |

### EUROPE

| | | | | |
|---|---|---|---|---|
| **DL0PG** | **2,033,108** | **2586** | **110** | **341** |
| **OH1AA** | **1,773,555** | **2540** | **104** | **295** |
| OH2AW | 1,612,032 | 2262 | 102 | 282 |
| DLØKF | 1,371,216 | 2137 | 102 | 290 |
| **SK5AJ** | **1,326,000** | **2077** | **102** | **288** |
| **YZ2ARS** | **690,666** | **1558** | **72** | **186** |
| **IT9TAI** | **214,092** | **589** | **56** | **172** |
| DL0II | 194,700 | 714 | 45 | 132 |
| OH3AA | 99,160 | 356 | 44 | 141 |

**Note:**

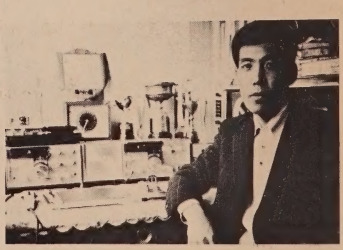
The phone and c.w. results were rapidly assembled this year and errors have cropped up. We will have an update with corrections in a month or two.

## USA TOP SCORES

| | | | | |
|---|---|---|---|---|
| | W3LPL | 1,003,055 | K6CQF | 708,295 |
| | W6MAR | 956,848 | W3BGN | 704,054 |
| **Single-Op. All Band** | K3GJD | 829,836 | K6OVJ | 702,800 |
| | W2GXD | 829,062 | W6ANN | 682,158 |
| | W1ZM | 724,815 | W2DXL | 663,762 |

| 28 MHz | | 7 MHz | |
|---|---|---|---|
| W8WPC | 2,784 | W5WZQ | 229,548 |
| WA1HFN | 2,380 | W6MUR | 196,730 |
| W8VSK | 1,250 | WB5DTX | 135,900 |
| W8KPL | 1,032 | K6QW | 105,070 |
| WB2NDR | 273 | W6ITY | 103,269 |
| K1LWI | 231 | W4QCW | 83,904 |
| **21 MHz** | | **3.5 MHz** | |
| W2HBT | 61,160 | W1MX | 41,616 |
| W2NIN | 47,564 | K4DBZ | 27,072 |
| WA8KCX | 30,300 | VE3DXV/W6 | |
| WA2MBP | 27,720 | | 22,040 |
| WA9LZA | 23,779 | W7JLU | 21,648 |
| WB2MMR/2 | | W9LT | 11,718 |
| | 23,040 | W1OR | 8,216 |
| **14 MHz** | | **1.8 MHz** | |
| K8IDE | 220,345 | K1PBW | 6,948 |
| K4VX | 207,909 | W8LRL | 6,055 |
| W9MEM | 197,316 | W1BB | 2,574 |
| WB9LHI | 195,644 | W2LWI | 1,302 |
| W4WSF | 186,876 | W6RW | 1,050 |
| W4AAV | 177,014 | W2BP | 900 |

| | | | | |
|---|---|---|---|---|
| **Multi-Op. Single Trans.** | W6OUN | 1,033,518 | W9ZTD | 716,672 |
| | W2YD | 1,011,358 | W4QON | 711,144 |
| | WA6NGG | 788,697 | K4YFQ | 626,133 |
| **Multi-Op. Multi-Trans.** | W3AU | 2,890,680 | W3GPE | 2,373,672 |
| | W3WJD | 2,500,656 | WA2ZAA | 2,371,644 |
| | W4BVV | 2,484,820 | W6PVB | 2,201,045 |



JA2AAQ

## STATION OPERATORS

### Multi-Operator, Single-Transmitter

**CT3/OZ5DX:** OZ1LO, 0Z6KT. **CY6NQ:** CY6AB, CY6AVO, CY6AYX, CY6CCB, CY6CEC. **XJ1AI:** VE1AI, VE1MX. **DL0WU:** DJ4AX, DJ8SW, DK4AP, DK5EZ.**DK0-TU:** DK1PD, DAZQC, DK5GB, DK6QI, DL7QU. **DL0AA:** DJ4XG, DJ7PW, DL3BK, DL6KB, DL8NU, DF5SM, DK5SZ, DK4ST, DJ5SF. **DL8CM:** DL8CH, DL8FR. **DL0KL:** DJ2EH, DK7NM, DK6NN, DK9NU, DK9NV, DL4NY, DC2NJ. **DK7SU** & DK5SF, DK5SI, DJ3TU, DJ7PR, DF1SV. **DM2ATD** & DM3YQO. **DM3GM:** DM3KGM, DM3MGM. **EI1AA:** EI8BB, EI2CA, EI2CL, EI2CN, EI3CP, EI6GW. **FY7AK:** KP4TIN, F2QQ, F5QQ. **G3RAC:** G4BRK, G3ZZI, GM3XVR, G3NCN, G4AVC. **G3GJL:** G3RLF, G3RMF, G3TQD, G3TQZ, GW4CXM, G4BXS, G4DXD, G4DXE, G3LQB. **G4EOK** & G3KP. **G3YEC** & G3XKR, G4DUQ, G3ZRJ, G3WDS. **GM3ZRC:** GM3DOD, GM3LRG, GM3LYI, GM3XNJ. **HA5KFN/5:** HA5GF, H5-503, H5-513. **HA0KLE:** HA0LZ, HA0MK, HA0LD, HA0LJ, HA0MJ. **HA3KMA:** HA3MG, HA3PG, HA3PI, Gulyas L., Tacsi E. **HA8KCK:** Csaky Tamas, HA8DZ. **HA1KSA:** HA1SV, HA1TO, HA1TJ, K. Nemeth, L. Kursits. **HG8U:** HA8UD, HA8UI, HA8UW, HA8VL, HA8ZP. **HA5KKC/7:** HA5MA, HA5MD, HA5MO. **HA4KYH:** HA4YO, HA4YQ, H4-090, H4-091, H4-096. **HA7KLG:** HA7MC, H-7062, H-7032, H-7031, HA7MK. **HA5KFZ/7:** HA5GN, HA5KF, HA1SY, Molnar Miklos. **HA0KHW:** HA0IF, HA0IG, HA0GY, H0OO5, HA0HW. **HA6KUB:** Toth Janos, Szuromi Istvan, Pap Laszlo, Varra Peter, Kulcsar Zsuzsa. **HA0KHS:** Club. **HA6KVC:** Toth Arpad, Kiss Tibor, Szucs Istvan. **HA6KNH:** HA6NM, HA6OA, HA6OE, Kovacs Gabor, Horvath Dezso. **HA6KBK:** HA6NP, HA6NA, HA6NT, Hollandi, Nagy A. **HA1KZZ:** Club. HA2KMB: HA2NI, Ferencz Sandor. **HA5KFV:** Martincsek Idnos, Kullos Miklos. **HA7KMW:** HA7MW, Antal Tari, Laszlo Fodor. **HA7KMS:** Club. HA3KGJ, HA3HE, HA2RM, H3-117, H3-118. **HA3KHC:** Borsfoldi Ferenc, Toth Zoltan, Kardos Zoltan. HA7KMY: H-7072, H-7073, H-7076, N. Ferenc. **HB9AYZ** & R. Schuetz. **JA9YBA:** JH1GUO, JA2NXK, JH2GSU, JH2FKX, JA3VEN, JA9GLL, JA9GOE, JA9PAB, JA9DZS. **JA6YTU:** JA6QW, JA6AAB, JA6QET, JA6RLM, JA6JVK, JA6BPA. **JA0YAN:** JA0EMS, JH0CJD, JA0IDF, JA0MVC, JE1NFN. **JA5YCS:** I. Yagi, Y. Ooka, M. Tomita, Yoshio-Nosokaloa. **JA7YAA:** JH2DVX, JA7KEL, JA7KPK, JA7LKH, JA7LUR, JA7MYY, JA8FTW. **JA3YEJ** & JR3STC, JR3STD, JE3EVZ. **JD1YAA:** F. Sato, M. Yokoyama. **KH6RS/KH6:** KH6EXR, KH6HHG, KH6HNT, KH6ILA, KH6BTH. **KJ6BZ:** WB4KVF, W4RHF. **LU1DZ** & LU8DQ. **LZ1KDP:** LZ1F-37, LZ1E-114, LZ1A-513, LZZH-57, LZ1F-84. **LZ2KKC:** Dimiter Gentcher, Dimo Mintchev, Jordan Dimov. **LZ2KNI:** Lubomir M. Hajiev, Petxr Antonow, Conno Kolew. **LZ2KDI:** Kzossymyz Jozanoo, Oleg Wladimizov, Rumen Wladimizov. **LZ1KSF:** Oleg Choolev, Plamen Slavov, Boby Stoilov. **LZ2KBA:** Nikola Atanasov, Nikola Karalakova, Stefan Iliev. **LZ1KCM:** Gencho Boshrov, Marin Tenev. **LZ1KOZ:** A. Petrov, K. Petrov, T. Petrov. **LZZKWR:** W. Ivanov, S. Dimitrov, B. Petkov. **LZ2KSU:** M. Shopov, V. Ivanov, I. Petkov. **LZ2KAD:** A. Natchev, H. Nenov, D. Runtcher. **OC4A:** OA4AHA, CX1AAC. **OH7RM** & OH6JG, OH6KI, OH6RC, OH6RI. **OZ1HX** & OZ1SC, OZ7BW. **OK1KSO/P:** OK1TS, OK1SF, OK1AMF, OK1AXK, OK1ADH, OK1AOC. **OK3KAP:** OK3TFN, OK3TPV, OH3CHR, OK3CTW, OK3CGI, OK3CLK. **OK1KCI:** OK1DK, OKIND, OK1MHS, OK1AVD, OK1DQ, OK1WC, OK1MAS. OK1KVK: OK1IAL, OK1GP, OK1IAP, OK1AFQ, OK1IAS, OK1IVR. **OK1KSL:** OK1AHG, OK1FAF. **OK3KXC:** OK3ZCL, OK3ZWA, OK3CKQ, OK3-26587. OK3RKA: OK3TAM, OK3TDP, OK3TCJ, OK3-26015. **OK2KYK:** OK2BGH, OK2PBM, OK2BPI, OK2BPH. **OK3KTY:** OK3ZGA, OK3ZFB. **OK1KRS:** OK2PEG, OK1AYY. **OK3KTD:** OK3TCF, OK3CES, OK3TCV, OK3TBA. **OK1OFK:** OK1-5068, OK1-17409, OK1-20405. **OK3MWW:** OK3ZTW, OK3YCM, OK3CGK. **OK1KYS:** Club. **OK2KOO:** OK2BIP, OK3TBC. **OK2KWL** & OK2BGR. **OK2KHD:** Club. **OK3KPN:** OK3CJN, OK3ZMJ. **PJ8CM** & PJ8YCQ. **PJ9JT:** PJ2VD, W1FTX, W1BIH. **SM5AOE** & SM6BJI, SM2CXU. **SK6JA:** SM6CKU, SM6DHU, SM6FYJ, SM3EVG **SK7CE:** SM7RN, SM7DXX, SM7EBC, SM7ECM, SM7EQL, SM7GBM, SM7GQR. **SM0PX:** SM0BDS, SM5CLE, SM0GBB. **SKZAU:** SM2DQS, SM2BJE, SM2BMS, SM2FQG. **SL0CB:** SM0EFY, SM0ESY, SM0FAL, SM4FIV, SM4FLK. **SP0ZHB:** SPZQRT, SP2FHY, SP2FQT. **SP9KCB:** Club. **SP2KGR:** SP2FOV SP2GPR, SP2JGY. **TF3KX** & TF3UA. **UK9AAN:** UA9AN, UA9AEN, RA9AFC, UA9-165512, UL7-02671. **UK9ABA:** UV9AX, UA9ADU, UA9ABA, UA9-165472, UW9BC, UV9AK. **UK9SAY:** UA9SCT, UA9SAX, UA9TS, UA9SBF, UA9SBO, UA9SCJ. **UK9CBD:** UA9CBM, UN9DW, UA9CT, UV9DO. **UK9QAA:** UA9RR, UA9QDX, UA9-134006, UA9QAX. **UK9QAG:** UA9QE, UA9RE, UA9QAG, UA9QAC. **UK9FER:** UA9FDW, UA9FBA, UV9FN, UA9140005. **UK9LAB:** Club. **UK0AAC:** UW0AF, UA0AAK. **UK0LAB:** UW0LT, UA0NR, UA0LS, UA0107-65, UA0107-211, UW0NE. **UK0FAA:** UA0EH, UW0FM, UA0FBE, UW0FZ, UA0FBA, UA0FCD. **UK9WBD:** N. Rahimov, A. Korpachev, B. Isvolsky. **UK0CBE:** F. Yuzi, T. Alexandz, K. Gazzy, B. Victoz, V. Vladimiz. **UK0FAD:** V. Konstantin, B. Vlad, V. George. VK6DS & VK3OP. **VP2DX:** W3ADT, WA3HRV, K4GKD. **UK6DAU:** UD6001220, UD6DHG. **UK7JAA:** Alex, Vic, Bob. **UK7GAA:** UL701899, UL7GBN, UL7018136. **UK7PAU:** UL7PBG, UL702368, UL7023131. **UK7LAF:** UL7026207, UL7026232, UL7026203. **UK8HAA:** UH8HAS, UH8BY, UH8HAT, UH8DC, UH8BU, UH8DH. **UK2RAH:** JAAK, HEINAR, HEIKI, HEIKKI. **UK2RAX:** UR2FU, UR2REE, TOOMAS, AAVO, NEIL. **UK2GKW:** UQ2ON, UQ2PJ, UQ2GBJ, UQ203783, UQ2GDQ, UQ203728. **UK2GAY:** SERGEJ, ARTUR, TOM. **UK2GAB:** UQ2GFN, UQ2GDN, UQ203781. **UK2GAT:** Club. **UK2GAG:** Val, Vlad, Alex. **UK2GBY:** UQ2037118, UQ2DR, UQ2GGM. **UK2PAF:** UP2BCI, UP2BCR, UP2PCY, UP2038549, UP2BCO, UP2BCW. **UK2PAP:** UP2PX, UP2PAX, UP2OX, UP2PCN, Alek, Romas. **UK2BAS:** UP2PAJ, UP2PAO, UP2038609. **UK2BBE:** UP2038517, UP2MB, UP2BDK, UP2PBZ, UP2BDM. **UK2PAD:** UP2PAV, UP20381527. **UK2PBK:** UP2BBT, UP2BCQ, UP2PCI, UK2PAN. **UK2PAT:** UP2BCT, UP2BCU. **UK2BAV:** UP2BBX, UP2038211, UP2038622. **UO5RO:** Rusak, Nikolaj, Ykowlewic. **4J3A:** UA314719, UA3EAI, UA6150363. **UK6LAZ:** UB50731024, UA6150262, UA6101252, UB5073470. **UK1AAA:** UA1ALZ, Oleg. **UK3WAA:** UV3WT, UA3WBA, UA3XJ, UA3WAH, UA4CCG. **UK4HAA:** UA4HHH, UA4HDV, UA413335, UA4HBP. **UK4WAB:** Boris, Gene, Vlad. **UK6AAJ:** UA610160, UA6101945, UA6ADU, UA61011152. **UK3DAA:** Yuri, Alex, Vitaly, Serge. **UK3AAC:** UA3170999, UA3ACE, Vlad. **UK1APA:** Alex, Gene, Sergei. **UK3TBF:** Club. **UK3EAK:** Alex, Leo, Igur. **UK6LWW:** UA6LWG, UAG150509, UA6150531. **VK1TAB:** UA1144226, UA1144298, UA1TAF. **UK1NAA:** Club. **UK4PAE:** UA4PAU, UA4PWU, UA4PWT. **UK6AAU:** Val, Alex, Alex. **UK4FAV:** UA4148277, UA4148273, UA4148275. **UK4PAA:** UA4PAO, UA9QAO, UA4PAZ. **UK3DCF:** Club. **UK1TAA:** UA1TAI, UA1TAP, UA1TAC. **UK6AJA:** UA6AJO, UA6AJE. **UK3PCC:** Club. **UK1ABC:** UA16938, UC200782. UK3SAJ: Sergei, Slava, Konstantin. **UK3RAD:** Victor, Yuri, Vlad. **UK4YYY:** Club. **UK3DAU:** Club. **UK3ABQ:** Boris, Alex, Vlad. **UK3SAA:** UA3SBF, UA3SAL. **UK3RAA:** Ed, Yuri, Slava. **UK5JAA:** Club. **UK5MAF:** UY5LK, UB5MAK, UB5MDC, UB502922. **UK5MAA:** UB5MYL, UB5MOI, UB5MFT, UB5MCZ. **UK5IAA:** Val, Val, Nick. **UK5QBE:** Club. **UK5UAC:** Club, **UK5QAC:** UB5QA, UB5064831, UB5064835. **UK5ZAK:** UB5ZAL, UB5ZAW, UB5ZBM. **UK5WAL:** Club. **UK5ICD:** Vitaly, Serg, Viktor. **UK5MBP:** Vic, Ivan, Alex. **UK5JAO:** Club. **UK5SAA:** UB5074111, UB5NS, **UK5IAD:** Vlad, Sergey, Nikolay. **UK5MAG:** UB5059610, UB5059121, UB505924. **UK5JAM:** Vlad, Anatol, Wadim. **UK2WAF:** UC2XT, UC2XW, UC2006-60, UC200612, UC200681, UC200680. **UK2AAB:** Vitali, Serge, Al. **UK2ABC:** Serge, Leo, Val. **UK2WAE:** Club. **UK2AAP:** Al, Serg, Marg. **UK2OAK:** Igor, Valery, Svetlana. **W2YD** & WB2RKK, WA2SRQ, W2HZY, WA2UOO. **WA3YHT** & WA3YGH. **W3YFV** & WA3KRD. **W4QQN** & W4LKG. **K4YFQ** & WB4WHK. **K5YMY** & WB5DIZ. **WA6NGG** & K6PJY, WA6FWJ, WB6HDH. **W6OUN:** WB5IZN, WB6OLD, WA6TLV. W6HX. **W6OIP** & WA6DJI. **WA8ZDF** & WA8RWU, WN8RIJ. **W9ZTD** & WB9IVC, WB9LTY, WB9BUV. **W0EEE:** WB9FAT, WB0GQP. **YO8KAN/P:** YO8ME, YO8MI, YO8GV, YO8AGZ. **YO4KBJ:** YO4WU, YO4CT. **YO6KBM:** YO6ADP, YO6OO, YO6EY,YO6OB. **YZ1AFQ:** Club. **YZZCBM:** E. Koljatic, M. Velat, V. Andrija, G. Grubisic. **YU1ABF** & YU1OBK, YU1OBH, YU1OET, YU3TCA, YU1OFJ, Milosh, Zoran. **YZ4EJC:** S. Slobodan, L. Mirko, K. Zoravko. **YZ2CMS:** Club. **ZF1AL:** WB4PUX, K4SHB, WA4SVH, WB4TAF. **4M5ANT:** YV5AAS, YV5AAQ, YV5BNR, YV5BZT. **4U1ITU:** DJ60Z, DJ90N, DK5OS, W3WZL. **5K4AOY:** HK4AOY, HK4ALE. **W2UI** & WA3KRD. **W3NX** & K3NEZ, W3DRD. **K3MNT/7** & WA1KKM, WA7TLK, WA7UQG. **W7FR:** W7LAV, W7PHO. **OK3RJB:** OK3TCL, OK3TCN, OK3CTW, OK3-18190, OK31862, OK326692. **PI1PT:** Jan, Ton. **SP9KRT:** SP9ZW, SP9HMF, SP3FYI. **SP5PSL:** SP5-2120, SP3FAS, SPDQN. **SP9KBY/9:** SP5GRM, SP9ICA, SP9-6161. **SP2KBA:** Club. **SP6PAV:** SP6FRE, SP6HES. **SK5DB:** SM5UO, SM5API, SM5CUI, SM5DGA, SM5DSE, SM5DCQ, SM5ERK, SM5GEB, SM5GTE. **YZ2CBV:** YU2RTG, YU2RKE, YU2RS331, Pilat. **YZ2ACF:** Petar, Tino, Tom.

## STATION OPERATORS

### Multi-Operator, Multi-Transmitter

**DL0II:** DJ2YE, DJ8JP, DK8EY, DJ4TJ. **DL0KF:** DJ8FR, DL7OY, DJ4FZ, DJ5AV, DJ7SW, DK8LD, DK6LG, DJ6TK, DK7LN, DL2ZT, DK5TI, DL2BO. **DL0PG:** DK2QL, DK3BJ, DJ9IE, DJ6AU, DK3HA, DF1QQ, DK7QC, DJ1FC, DJ9TQ, DK1QV, DK5KY, DF5QJ, IT9TAI & IT9ZGY. **JA2YEF:** JA2SVH, JA2TAP, JA2TCA, JA2VHO, JH2IRH, JH2NTZ, JH2XQY, JA0FKM, JA0TJT. **JA3YDS:** JH2AZY, JA9EBA, JA9FOR, JA9GLT, JA5HHM. **JA3YKC:** JA2VUP, JA3ODC, JA3QOG, JA3REU, JA3UPK, JH3AIU, JH3ARL, JH3BBQ, JH3GLP, JH3HBF, JH3KVX, JH3KWQ, JH3LIJ, JH3NYM, JH3PLE, JH3VES, JR3BVX, JR3PKG, JR3WLK, JA5GZB. **JH1YDT:** JA1UKS, JH1AGH, JH1BBT, JH1GNU, JH1SBE, JA1EYB, JR1IMM, JH1GNV, JR1IJV, JR1LYT, JH1MDJ, JA1QER. **K6RR** & W5TES, K6PDA, WB6LTJ, WA9UCE, K7VPF, W6IRD, WA6TLV, WB6ZVC, K9LBQ, WA1LUA. **OH1AA:** OH1NH, OH1NK, OH1SS, OH1SY, OH1TV, OH1HU, OH1WR,OH1MD, OH1XB, OH1JP, OH2FS, OH3ZE, OH5NG. **OH2AW:** OH2BGM, OH2BPJ, OH2BPN, OH2CG, OH2EO, OH2KA, OH2RL, OH2SB, OH3YI, OH5UX. **OH3AA:** OH3IO, OH3JR, OH3TQ, OH3TV, OH3FN, OH3WS. **SK5AJ:** SM5AD, SM5AYY, SM5BNZ, SM5CAK, SM5CBN, SM5CNQ, SM5DLR, SM5DPS, SM5EQW. **WA2ZAA:** W1GYE, W1MDO, W1HFB, K2GL, W2GLM, K2KUR, K2BQO, WB2SQN, K2TXC, K2UYG, K2UQT. **WA3ATX** & W5SOO. **W3AU** & K3EST, WA2LQZ, W3IN, WA3UTA. **W3BWZ** & WA3AFQ, WA3NGS, W3GL, W3RRX, K4CFB, K4WVT. **W3FRY:** K3HTZ, K3DZB, WA3LNM, W3KFK, W3GLR, WA3JYB, W6MWJ. **W3GPE** & K3CY, K3OIO, K3WJV, W3GM, W3KV, WN3VYD, WA3GNL, WA3WIM. **W3TV** & W3AOH, W3VW. **W3WJD** & K3YUA, WA3LRO, W3DQG, K3JGI, WA3MHD. **W4BVV** & K3NPV, K3OAE, K4PQL, K5AP, K5CIT, K6UA, K0DDA, W1BGD, W1NJL, W3BQV, WB4BGY. **W6PVB** & WB6PXP, WB6YBL, K6SEN, K6BCE, K6QPH, K6RU, WA6LBP, K6EVR. **YZ2ARS:** YU2RPW, YU2-RGH, YU-RS530, YU2RTC, YU2RPS, YU2RCW, YU2RZV.

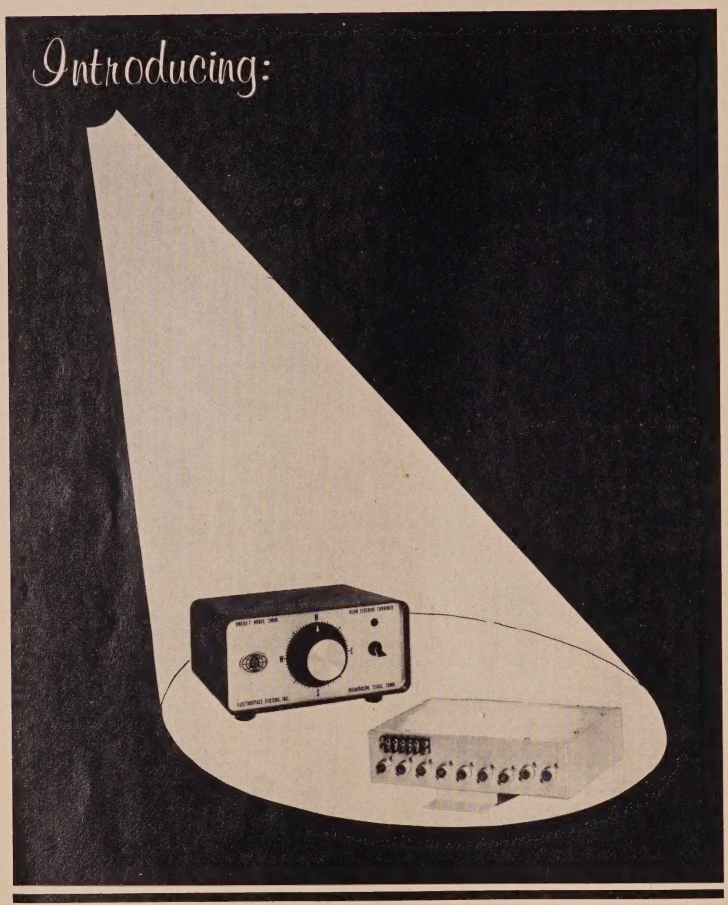
Our deep thanks to the following stations who sent in check logs, and to those whose logs we solicited for checking purposes: OK2BPL, OK2BGR, OH6JW, DM2-BJD, DM4WPF, DM2ABL, DM2AIC, OHSYF, OH5MJ, OK3TBC, OK2-BKI, OK2BON, OK1KGS, OK3EQ, OK2BOB, F6KHB, OK2KPS, OK1-MWN, OK3BDE, OK3KAP, OZ8BN, FE2457, OZ8QW, OK2BJR, OZ7-YY, DL9ZE, DM3XMD, DM3XM, DM4WJA, DM4CF, DM3ZVF, DM4-YEL, DM5PUL, DM4ZDA, DM3-LMD, DM2CUJ, DM3BB, DM2YLO, DM2FTL, DM2DZG, DM2DTG, DM2DGO, DM3XBB, DM2BJD, DM2BTO, DM2BYO, DM2COJ, UA0BBR, UA0FBZ, UA0IBB, UA0-JCA, UA0JCE, UK0CAW, UK0LAD, UV0BB, UA9AAB, UA9AJ, UA9C-AM, UA9CHT, UA9FCI, UA9FDW, DM2AXC, DM3XTL, OK1MIX, OK3-KFF, OZ3LF, DM4ZEL, DM5ODL, LZ1KWF, OK3CFA, LB5J, LA4KQ, PA0PLM, SM2COR, SM4CTO, SM5BFJ, SM5GFO, SM7DBD, SM0DJZ, SP1CTN, SP1EFU/2, SP2AVE, SPLGMH, SP2IW, SP2-KJH, SP2UU, SP3ACB, SP3FMF, SP3KPN, SP4ETO, SP4FAO, SP4-KKV, SP5DDJ, SP5EZI, SP5GOL, SP5IXI, SP5TT, SP6DMJ, SP7-ATY, SP7EJS, SP9AVZ, SP9CAV, SP9CCA/9, YO2BK, YO4SI, YO6-AFP, YO6LV, YO7NA, YU1PQ/2, YZ2CDO, YU3AE, YU3AE/X, YU3-DOX, YU4ELS, W1SK, W1YS, W2CJX, W2LKH, W4RAL, W5EIJ, K6DSK, K5MHG/6.

UA9LBQ, UA9MK, UA9UAR, UK9-AAQ, UK9HAC, UK9LAA, UW9PT, UK1NAF, UK3XAB, YU4ELS.

**1920** *(from page 38)*

at a small 100 watt broadcast station in my home town of Marion, Indiana. Then to WFBM in Indianapolis and finally to CBS and WBBM in Chicago, WABC in New York and WJSV in Washington, D.C. by the time the war came in 1941. After the war I went with IT&T and spent the next thirty years in the radio and telecommunications field. I'm now semi-retired and run an engineering consulting firm plus operate the modern W9CRC in Kokomo, Indiana. ■






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The exciting performance of broadband, steerable HF phased array antennas can now be yours. This product offers a means of combining two or four antennas into a phased array with 360-degree beam steering in 30 azimuth steps. Applicable to any type antennas, the device is frequency-independent and can be used to phase multiband verticals. Write direct to the factory for details, or see your local amateur radio dealer.

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## Announcements *(from page 12)*

day morning loggers breakfast, and free camping with electrical hookups. First prize is an ICOM IC-230. Contact W7GPR, 3421 E. 138th St., Tacoma, Wa. 98446.

● **San Francisco, CA** — A $1776 grand prize will be awarded in the Bicentennial Poetry Contest sponsored by the World of Poetry. Poems of all styles and on any subject are eligible to compete for the grand prize or for 49 other awards. Rules and official entry forms are available by writing to: World of Poetry, 801 Portola Dr., Drawer 211, San Francisco, CA 94127.

● **Dayton, OH** — Stolen 1 Genave GTX-1T Handheld Transceiver, Serial No. 13-07. at the Dayton Hamfest. If you have any information please write: Claude L. Henderson, Genave, 4141 Kingman Dr. Indianapolis, IN 46226.

### Stolen Equipment

Genave GTX 200 SN 22-03 SS Number inside 031-28-9354. Crystalled for 157.63-03, 147.06, 156.37-97, 34-94, 94-94 and MARS freq. BNC on back for duplex operation. Extra relay inside for sw. mike and motor control head., Early vintage set. Stolen from Gus McKinney, WB0OPR, 807 Holmes Drive, Colorado Springs, Co. 80909. (303) 473-1397.

Regency HR2A SN 04-10422 Crystalled for 94/94, 34/94, 16/76, 52/52. Has bracket attached and cigarette lighter plug on power cord. Stolen from Don Billings, W0GOH, 2838 N. Prospect St. Colorado Springs, Co. 80907. (303)636-1661.

Regency HR2B SN unknown, Crystals for; 34/94, 34/34, 16/76,19/79, 22/82, 28/88, 88/88, 145.80/80, 58/58, 25/85 Stolen from Glenda Butler, WB0OCH, 1509 E. 12th St. Pueblo, Co. 81001. (303) 544-7777.

Motorola Two Freq, Control head, Motorola T-power mike, Moto. speaker, 16 button TT pad with light mounted in Bud Box. Stolen from; Jim Best WA0RZI, 1923 Alpine Drive, Colo. Springs, Co. 80907. (303) 471-1486.

Regency HR2 SN. unknown Crystals for 34/94, 17/67, 25/85, 88/88, Has owners name inside. Stolen from Dwane Barber, WA0WWO, RFD 3 Box 353, Greeley,

Co. 80631.

EBC 144 Jr. SN. 50108 Synthesized rig. Stolen from; Dick Sucher WAØZLY, 27 Leaming Rd. Colorado Springs, Co. 80906.

Icom IC22A Sn. 3401802 Crystals for 94/94, 34/94, 22/82, 28/88, 52/52, 16/76, 37/97, 87/27, 19/79. Call is engraved on back, Accesory plug wired for TT, PTT, and 455KC output. Stolen from; Bill Croghan, WBØKSW, 1030 W. Colorado, Colorado Springs, Co. 80905. (303)471-7504.

Regency HR-2 Sn. 04-02604 with Nicad battery pack attached, sn. 7157; with microphone. Crystals for 94/94, 16/76, 22/82, 19/79, 52/52, 58/58, 34/94, 13/73, 01/99 (Army Mars) 78/18, 265/865, 31/91. Stolen from, A.D. Abercrombie, W2GJS, 1002 Merrymount N., Turnersville, NJ 08012. (609) 227-1383.

Icom IC-22A transceiver, sn. 1216, crystals for 16/76, 31/91, 01/61, xtals also in radio besides standard xtals from Icom. Motorola type microphone. Stolen from Stephen E. Martin, WA3SAD, 12115 Northwood Drive, Upper Marlboro, MD 20870. (301)627-4933.

Realistic Pro-11 Scanner, sn. 08370930 There were xtals for 155.79 and 155.-685 mHz in the unit. Stolen from Stephen E. Martin, WA3SAD, 12115 Northwood Drive, Upper Marlboro, Md. 20870. (301) 627-4933.

Sanyo FT-867 AM/FM/8 trk in dash car radio sn. 87661611. Stolen from Stephen E. Martin, WA3SAD, 12115 Northwood Drive, Upper Marlboro, Md. 20870. (301) 627-4933.

Realistic MPA-10 PA Amplifier, Manufacturer did not put sn on unit. Non stock mike. Stolen from Stephen E. Martin, WA3SAD, 12115 Northwood Drive, Upper Marlboro, Md. 20870. (301) 627-4933.

HW-202 Transceiver sn 09512, crystals for 07/67, 34/94, Had WB0QGF engraved on outside and inside. Stolen from Joel Humpke, WBØQGF, 516 Zion St., Aurora, Co.

Drake TR22 sn 640995 crystals for 146.34/94, 146.94/94, 146.16/76, 146.76/76, 146.22/82, 146.52/52. Contact Kansas Mo. Police Dept. (816)842-6525.


# How You Can Convert Your Rohn 25G Tower to a FOLD-OVER

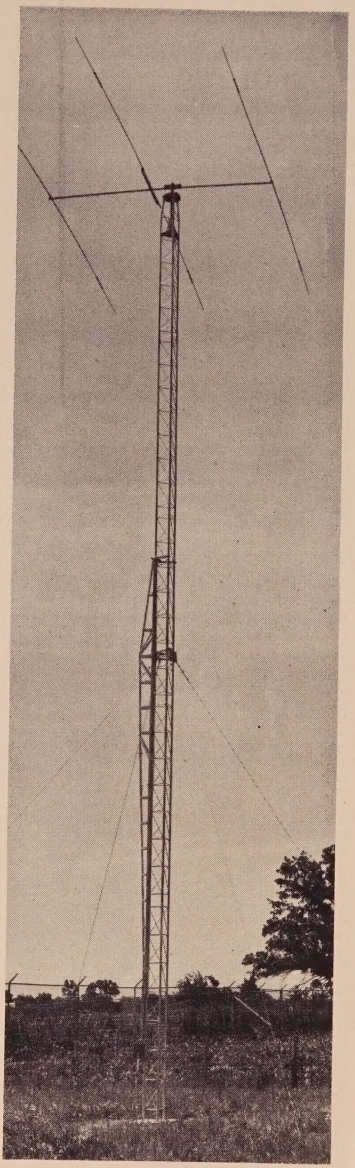
**CHANGE, ADJUST OR JUST PLAIN WORK ON YOUR ANTENNA AND NEVER LEAVE THE GROUND.**

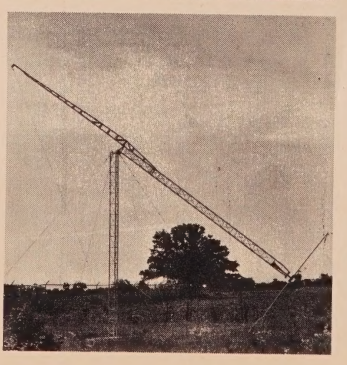
If you have a Rohn 25G Tower, you can convert it to a Fold-over by simply using a conversion kit. Or, buy an inexpensive standard Rohn 25G tower now and convert to a Fold-over later.

Rohn Fold-overs allow you to work completely on the ground when installing or servicing antennas or rotors. This eliminates the fear of climbing and working at heights. Use the tower that reduces the need to climb. When you need to "get at" your antenna . . . just turn the handle and there it is. Rohn Fold-overs offer unbeatable utility.

Yes! You can convert to a Fold-over. Check with your distributor for a kit now and keep your feet on the ground.

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TEKTRONIX 514AD Oscilloscope, working perfect $125. Also HP Electronic Counter Model 5240 $100. Todd Gorlin, 4829 Buchanan St. Hollywood, FL 33021.

INSTRUCTOGRAPH code machine for sale with 13 tapes and small speaker. Excellent condition. $50.00. G.F. Norton, W4EEE, 250 Milledge Terr. Athens, Ga. 30601.

URGENTLY NEED National Model C-SRR cabinet. approx. 7 1/2" cube. Charles Manning, 2305 N. Moreland, Indianapolis, Ind. 46222.

FERRITE BEADS: Lowest Price in the Country. 15 for $1.00. Todd Gorlin, 4829 Buchanan St. Hollywood, FL 33021.

NAVY A-202 Telegraph Keys, $3.25 postpaid Need Lysco Gear, any condition. W8KAJ, 2386 Queenston, Cleveland, Oh. 44050.

ANTENNA: Mini-products HQ-1 Coils new in carton. $85 WB9MKL Ted Carlus 459 Park, Lake Bluff, IL 60044.

FOR SALE: Factory alligned mint Heath HW-HW-7 QRP transciever with AC Supply. $60. Tom Dornback, K9MKX, 2515 College Downers, Grove, IL 60515.

MILITARY GENERATOR Hand Crank Mod. G8/GRC complete, make offer sell or trade, D. Grimmett, 824 1/2 E. Riverview Belle, WV 25015.

FOR SALE Advanced Class Posi Check $2.00 also posi check for element 1,2 and 9 $4.00. Both postpaid. J. S. Looney-WB4RBE, Rt. 1 Box 260A, Grundy Va, 24614.

WANTED: Manual or Schematic for G.E. Sweep Generator 4ST-4A1. A. Bielenda, W2IDA, 43 Chestnut Ridge Rd. Saddle River, N.J. 07458.

SELL: Heath SB-303 SB-401, SB-620 All cables, manuals all mint cond. Best offer, P. Feely, 15 Locust Hill, Yonkers, N.Y. 10701.

HP-525-B Frequency Converter, 100-200 mc w/book $30., Motorola quick call decoder unit $15, K6KZT, 2255 Alexander Ave. Los Osos, Ca. 93402.

WANTED: Ford model "T" parts. Will swap ham gear or cash. Mike Ludkiewicz, 143 Richmond Rd, Ludlow, MA 01056.

Pro 16 Scanner Full of Crystals $100.00. J.P. Johnson, P.O. Box 26037, Jacksonville, FL 32218.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO, issues at 20 cents each (including USA 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: FET V.FO., and power supply 8-8-9 MHz, extremely stable, as per QST article, Dec. 1966, p. 11. All high quality components used throughout. $35.00. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

FOR SALE: CQ magazines solid, 1947 through 1958, each year in heavy binder. $95. Ed. Hopper, P.O. Box 73, Rochelle Park, N.J. 07662.

WANTED: Antique Glass, Looking for old milkglass, purple slag, carmel and greentown too. Tell me what you have — I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing, 14 Vanderventer Ave., Port Washington, LI, N.Y. 11050.

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

SELL: 4-1000 A used, $30. 1,000 pf loading cap. $7, Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch $16. UTC S-50 6kv c.t. 300 ma, new pick-up only, $75. 7200 v.c.t. 1 a. 115/230 v. pri. $35. Pick-up only. OZ PAKS: Large (several kw) $30; small (2 kw) $20. R. Ross, 95 Norwood Ave., Northport, N.Y. 11768.

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

SELL: Hammarlund HC-10 Sideband adapter and audio filter $45, Plate Xfmr 3600 at 1 amp with 110/220 Pri $40. Want Johnson 250 W. Matchbox. Paul Bittner W0AIH, 304 W. 17th, Grand Island, Nebr. 68801.

SELL: Tempo one and AC one also cooling fan and vertical ant. mint cond. $250. firm. Carl Rubin, 6 Kitchawan Dr. Chappagua, N.Y. 10514.

COLLINS 75S1, 32S1, 516F-2, $725. General Radio Type 916A Radio Frequency Bridge $245. Heath SB-200 $215. Rohn No. 25, new never used, complete - 90 ft., my cost $635, now $450. Copper jacket, low loss 50 ohm Coax 280 feet $95. Ham-M rotor complete $100. 4 el. 10 meter beam HB (20' boom) $40. TA-33Jr. tri-band beam $70. Small prop-pitch rotor - items for complete system $175. "Large" prop-pitch rotor $75. QST, 29 years (328 issues) $65. 73 Magazine, 14 yrs. (167 issues) $30. U Ship. Moving to W6. M.M Kovar, W2ZN, 3 Puddingstone Ct., Morristown, N.J. 07960 (201) 386-2512 day (201) 267-0657 eve.

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"Compact Fan, 4 1/4 X 4 1/2" open blade with mounting bracket, 115 vac, $4.95 shipped. Need 837 tubes, any Lysco Gear. W8KAJ, 2386 Queenston, Cleveland, OH 44118.

TRIPOLE New! 80-6 plus 160 antenna! 80 to 120 feet. Guaranteed. $54.95 kit. Sase for information. Universal Radio Co. Dept. C2, Box 26041, El Paso, TX 79926.

SWAP or SELL: Federal Co. SRT-14 250 watt xmtr, for RTTY, Phone and CW, with frequency synthesizer. Manual spare 100kc xtal in oven want decent receiver such as Collins, late HRO, or sideband heath or cash offer K2YPR (516) IV6-0809.

HAMFEST - July 25, Stark County Fair Grounds, Canton, Oh. Call (216) 455-4449 or write WA8SHP Box 3 Sandyville, Oh. for information.

WYOMING RANCH LAND. Wild horses, antalope, deer, elk. 10 acres $30 down, $30 month. Owner K6ICS, Mike Gauthier, 9550Q Gallatin, Downey, Ca. 90240.

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RADIO MUSEUM now open. Free admission. 15,000 pieces of equipment from 1850 telegraph instruments to amateur and commercial transmitters of the 1920's. Amateur station W2AN. Write for information. Antique Wireless Assn. Main St., Holcomb, N.Y. 14469.

UNSCRAMBLE POLICE CODE with decoders. Works on all scanners and receivers. For prices and brochure, write: Don Nobles, Route 7, Box 265B, Hot Springs, Ark. 71901. (501)623-6027 (Dealers Wanted)

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council) Contact: Stan Carp, M.D. K1EEG, 44 Main St Saugus, MA 01906. (617) 233-1234.

FOR SALE: URM-25D Signal Generator $125.00. URM-26B $130.00, TS-510 $250.00 Also receivers, transmitters, components and test equipment. Catalog 15 cents. E. French, P.O. Box 249, Aurora, IL 60507.

TECH MANUALS for Govt. surplus gear $6.50 each: SP-600JX, URM-25D, SG-3/U, TS-173/UR, TS-174/U, LM-21, OS-8B/U. Thousands more available. Send 50 cents (coin) for 22 page list. W3IHD, 7218 Roanne Dr., Washington, DC 20021.

MINT DRAKE 2-NT, manual, 8 novice xtals in rack $80. F.O.B. Art Ford, 56 Gildare Dr. East Northport, NY 11731.

Link 1905 Rcvr., 1906 Xmtr. 2 meter FM with control head, spkr. and manual needs P.S. $30. Sam Carter 8530 E. 34th St., Indianapolis, IN 46226.

WANT: Old Weston or Jewell 0-100 or 0-200 MA DC, metal or bakelite case ok. Clarence E. Filley 1109 S. 2nd St. Hamilton, Mt. 59840.

W.E. 701A tubes with W.E. Sockets and Spec. sheet, new like 4/400A $15.00 W/RW (213) 654-3714.

BUY-SELL-TRADE. Write for free mailer, give name address and call letters. Complete stock of major brands. New and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB & FM. Associated Radio 8012 Conser, Overland Park, Ks. 66204. (913) 381-5901.

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COLLINS LINEAR. 208U-3 with 310V-1 Exciter. 2-30 MHz autotune, 3 kW peak/average. USB, LSB, ISB, AM. 230, 3-phase. $6000.00 FOB Dallas. Miscellaneous transmitter components used in development. SASE. Husbands, 3814 Marquis, Suite 107, Garland, TX 75042.

NOVICES STOP! Rent equipment instead of buying. Full details, SASE. Brad's Ham Rentals, Box 502, Placitas, New Mexico 87043.

FOR SALE: Hammarlund HQ-110 w/some modifications $80, Heath HR-10R never used, unaligned $60, Johnson Viking Adventurer, needs filter choke $20. Will consider trades. John H. Burns, WN7OOU Route 2 Box 554, Ontario, Oregon, 97014.

ELMIRA, New York Hamfest Sept. 25, 1976, Chemung County Fairgrounds. Flea Market, Dealer Displays, Technical Talks Talk in 10/70 - 146.52. $2.00 advance sale tickets $2.50 at gate. Write WA2SMM, 320 W. Ave., Elmira, N.Y. 14904.

FOR SALE: HP-13A DC Sup. $35.00, Lampkin 105-B Excellent $50. K3FOD. P.J. Serafinas, 925 Coleridge Rd. Baltimore Md. 21229

2 Meter Motorola HT220, 94/94 and 135/735 Charger A-1 $250. Rubber Duckie. WB6VNR, 213-346-5871.

FOR SALE: Robot SSTV, 70B monitor (factory mod), 80A camera with macro lens, $550. Mike LUdkiewicz, 143 Richmond Rd, Ludlow, Ma. 01056.

WANTED: AC Power Supply (ie, NCXA) for NCX-3 Transceiver. D. Bamford, K4ENL, 5001 Rampart St. Raleigh, N.C. 27609.

SELL: Plate transformer, 2500 volt at 1000 mils, $15.00. B. Nastoff, 320 W. 56th Place, Merrillville, Ind. 46410.

NEED 75A-3 manual or copy also wand prod. det/agc info for 75A3. Joel Thurtell, K8PSV, Rte 1, Box 325, Paw Paw, MI 49089.

WANTED: Mint Collins 32S with Power Supply, WA4HHJ, 291 S. Lorraine Dr., Mary Esther, FL 32569.

71' Triexguer tower HS471, 50/1 winch, torque arms, guywires. $499. Or trade for Drake Line/linear parts. Jim Stevenson, 18634 Tulsa St. Northridge Ca. 91324. (213) 360-7227.

MINOX IIIs, mtr, flash: New RCA cassette recorder and new WT501A; 3" PCAT20 Panadapter; Globe VHF 6 and 2 xmtr. Best offer. Want Galaxy FM210. Chester Benson, 732 So. 14th, Richmond, In. 47374.

WANTED: Bearcat 101 scanner, Heath HA-202, HWA-202, HD-1410, SB610, HD-1234, Hustler 10 and 15 resonators, MN2000, F.H. Kauppi, Rt. 1, Box 171, Gilbert, MN 55741.

TRADE OLD RADIO programs on tape. For info write Tape Trade, 1705 Kaywin Ave., Bethlehem, PA 18018.

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

WORKED CENTRAL AMERICA certificate. Work all 7 countries. Send list and $1. HC1TH, 4805 Willowbend Blvd., Houston, TX 77035.

COLLINS: 3 Receivers control moniter, C1012/FRR, Builders delight, fully aluminum enclosed, 3 meters, 2 crystals 455-456 KH, 11 tubes, P.S. no. 15 plus shipping. J. Lisaius 116 Orton Rd., Caldwell, N.J. 07006.

WANTED: Pre-1927 QSTs and Pre-1950 CQs W6RVB, 529 Kevin Way, Placentia, Ca. 92670.

WANTED: Heathkit RX-1 Mohawk Recvr. in good to excellent condition. Will pay between $50 and $75. W/companion speaker. S.L. Ballinger, WN2BSS, 102 Garden St. Poughkeepsie, N.Y. 12601.

WANTED: (2) 6146B's and I do caining and rushing. Reasonable rates. Please call (914) 452-2482 Sat. and Sun. only and 126 zip area only please.

NCX-3, NCX-A in mint condition. All factory improvements. New tubes. Will deliver w/in 120 miles of Boston. $200. W1NJL, 68 Avalon Rd., Waban, MA 02168. 617/354-1025.

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WANTED: Hunter 2000B Linear. Collins 30L1 Linear. Clean SBE-34. Old large hand key. Ralph Sieloff, RD 2, Lagrangeville, N.Y. 12540.

PRO-16 SCANNER, full of crystals $125.00. GR-78 Heathkit receiver in good condition $75.00. J. P. Johnson, P.O. Box 26037, Jacksonville, FL 32218.

WANTED: National SW-3 receiver, Lonny V. White, P.O. Box 96, Poca, WV 25159.

WANTED: Radio and electronics magazines 1945 and earlier. Don Erickson, 6059 Essex St., Riverside, CA 92504. (714) 687-5910.

WANTED: QST Jan. 1917, Aug. and Sept. 1919, Jan. thru Sept. 1916, CQ all 1945, Inoperative KWM-1, Pse airmail Jock ZL2GX, 152 Lytton, Gisborne, New Zealand.

SALE: Globe Chief 90A 160-10m, Heath sixer, HE-45 6m AM. C.F. Milazzo, 716 Calhoun Ave., Bronx, N.Y. 10465.

SWAP: CIE Electronic Tech. course 1971 complete 73 lessons orig. cost $490. Swap for matchbox, VFO, What have you? Larry Kellough RR 2 Smith Add'n. Robinson, IL 62454.

RADIO AND ELECTRONIC COLLECTOR Magazine, monthly trade-buy sheet for collectors of keys, insulators, books, tubes, vintage radio, etc. $3.00/ year, 3 month trial, $1.00. 2374 Queenston, Cleveland Heights, OH 44118.

WANTED: VFO for Johnson Viking Adventurer. DeNormandie, 210 Fifth Avenue, NY, NY 10010.

NEED technical manual I-130-A signal corps VHF generator. Will buy or exhange with current Greek stamps. George Kapsokavadis, 23 Kolokotroni St. Kerkyra, Greece.

WANTED: Heathkit HP-14 Mobile power supply for HA-14 Heath Linear. Any condition working or not. K5DUT, 6080 Anahuac, Ft. Worth, TX 76114.

DRAKE VHF: TC-2, TC-6, SC-2, SC-6, SCC-1 CPS-1 and CC-1, $800. K8HWW Clem Duval, 33727 Brownlea, Sterling Hts., MI 48077.

WANTED: Pi Network illumitronic PiDux no. 195-1 State Price. J. A. Kretchmer, WA9WIG, 1332 Praire Lawn Rd., Glenview, IL 60025.

SWAN 500C, 117XC, Excellent, $365, BC 221-F, AC and book $38. B. Pollock, Box 215, Ironia, N.J. 07845.

2.5 Amp. 1KV Diodes - 4/$1, 140" of 3/16" Heat Shrink tubing - $1.50. Send Large SASE for list. Roland Guard, 235 Nelson Dr., Lavergne, TN 37086.

WANTED: Johnson Thunderbolt 80-10 mtr. amp. also CB rig. C. Duval, 33727 Brownlea Sterling Hts., MI 48077.

WANTED: Broadcasting Yearbooks and World Radio Handbooks. Don Erickson, 6059 Essex St., Riverside, CA 92504. (714) 687-5910.

FOR SALE: DX-60 and VF-1 perfect shape. $80. Bob Borello, 505 Thompson no. D, Mt. View, CA 94040.

NEED: Service manual Bendix RT-221AE-28 aircraft transceiver. Will exchange with current Greek stamp series or buy. George Kapsokavadis, 23 Kolokotroni St. Kerkyra, Greece.

B&W 5100 $125. 80, 75, 40, 20, 15, 11, 10 m. Built in V.F.O. or Crystal Control. John Kaser 6 Logan St. Lemont, IL 60439.

DXers! Get QSLs by writing in 54 languages on your card. It works! K3CHP's DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Pkwy. Riverdale, Md. 20840.

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WANTED: Waters Q Multiplier notch filter 337-SIA for 75S1 Cash for repairable gear state price ect, Henry Macaro, 125 Dunedin St. Cranston, R.I. 02920.

FOR SALE: Second edition British Amateur Handbook with suppliment. 1927 ARRL handbook. mint condition (2nd edition) 3/21 QST mint. Radio Engineers 41 Handbook. Fine. Make offer. M.J. Douglas, 2254 Pepper Dr. Concord Ca. 94520.

WANTED: Drake MN-2000. Midland 13-505, Heath 1410 Bearcat 101 scanner, and Hustler 15 meter resonator. F.H. Kauppi, Rt. 1, Box 171, Gilbert MN 55741.

For Instructions repairs, Tune ups to get on air write K4FCR box 8352 Savannah, Ga. 31402.

UNIQUE Antenna Tuner with coupled SWR meter, 1 kw. Brand new w/manuel. Value $125.00. Sell for $80.00 plus shipping. 671-762-5252.

SELL: CQ/73/QST. Send S.A.S.E. for list. E. Guimares, RFD 2 Box 480, Middleboro, Ma. 02346.

WANTED: Galaxy V without power supply. J. Schwartz, 43-34 Union St. Flushing, N.Y. 11355.

HEATHKIT HW-10 6 meter AM-CW transceiver with manual $90.00 or trade for Drake MN4. Sam Carter, 8530 E. 34th St. Indianapolis, IN 46226.

WANTED: Heathkit MP-10 DC-AC Power Inverter. Quote W9DDL, 5006 N. 2nd St., Loves Park, IL 61111.

NEED: Manuel or Schematic for R-105A/ARR-15. A. J. Mony, 6392 Hwy. 5, Douglasville, GA 30135.

WANTED: Ranger II w/manual. SWAP: three VHF xmtrs, 50,144,220 w/pwr supply modulator for what-have-you? R. Voelker, WA2PCL, 101-23 Lefferts Blvd. Richmond Hill, N.Y. 11419.

WANTED: Old tubes 212-D, 204, 203, WD-11, Electron relay, Audiotron. W9LC, 6272 N. Cicero, Chicago 60646.

COLLINS 75S1 Receiver, Collins 3221 transmitter with Collins 516F2 Power Supply $750. F.P. Heinemann, Brockway Landing, Lyme, Ct. 06371.

WANTED: Heath IB-1100 counter. Will consider other counter. Give details. K9UKX, 51625 Chestnut Rd. Granger, IN 46530.

WANTED: Used keyer with sidetone. Must be in good working condition. K0FPM, Gerald McKay 2201 Van Buren St., Bellevue, NE 68005.

FOR SALE: Univac PS 12-48 VDC @ 1 A cost $400. sell $30.00 Knight Cap ckr $10. New W2AU 4:1 balun $8. New Janel 2 mtr cnvtr. $65.00 Variac $15.00 J. Kramer, WA9DJR, Box 246, Earlville, IL 60518.

ROTARY INDUCTOR WANTED: Johnson no. 229-201, 10 uH. will Swap 202, 20 uH. W. S. Hornbaker, WA4TJJ, 5204 Penelope Lane, Knoxville, TN 37918.

1933 Hallicrafters sky Challanger rcvr. good condition make offer. Hammurlund HQ 110 C $90. WN2AZG, 1919 Shore Rd. Linwood, NJ 08221. (609) 927-3483

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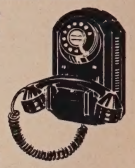
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### Our Readers Say *(from page 7)*

cases the CBer was found guilty and fined.

Now a CB group in Texas is starting Operation Bleed Over and actually raising funds to help pass the RFI Bill. Yet the ARRL probably does not know about this because they do not keep records. Yet the head of their RFI Task Force presented the details of this bill to a meeting of CB councils last year in Washington, D.C. to get their support. Looks like the CB groups are really going to town on trying to pass this bill.

I may add that one of the Anti Noise court cases against a CBer was in the home state of the ARRL earlier this year. The ARRL should start telling the hams about how they too can find themselves in court on a local Anti Noise law.

Lawrence I. Cotariu, WA9MZS
Skokie, IL

### QSK *(from page 46)*

Layout of the logic circuit is not critical. Fig. 6 shows parts placement. The only thing to keep in mind is that the lead length between the 74123 one-shots, timing capacitor, and timing resistor should be as short as possible, and are not to exceed a few inches. All components except relays K2, K3, and the power supply components are mounted on a 3 1/2" X 4 1/2" printed circuit board, fig. 7. *Every lead entering or leaving the control box must be by-passed directly on the connector.* Phono-jack connectors are easy to use and allow coax to be used for all interconnections. The power line is of the three wire grounded type. It is grounded directly to the case, and the hot leads are well by-passed immediately upon entering the case. To play it safe and insure that no false triggering of the one-shots occur through transients on the power supply lines, 0.1$\mu$f disc capacitors with leads as short as possible are soldered directly across pins 16 and 8 of U5 and U4 on the foil side of the board.

To allow adjustment of the miniature multi-turn timing potentiometers, R1, R2, R3, and R4, are mounted standing up on the board. Small holes are drilled in the box for access with the box closed.

The box containing the antenna relay uses phono-jacks for the relay coil and receiver antenna con-

nections. The coil drive jack is by-passed with a 0.1$\mu$f capacitor. Antenna and transmitter connections are via SO-239. The relay box is light and may be mounted directly on the output of the transmitter with a double male connector.

### *QSK Operation and Adjustment*

Before connecting the QSK, it is a good idea to check for correct voltage from the power supply. If these are correct, make sure the two boxes are not connected together, and connect a key to one of the inputs and the transmitter to the grid block key output. Closing the key should switch K2 and K3, and key the transmitter. Measure the voltage across the antenna relay coil output jack if possible. With the key open it should be zero, and with the key closed it should be equal to −V. Connect the antenna relay coil lead from the antenna relay box. Closing the key should switch the antenna line from receive to transmit.

The only remaining step is to adjust the time delays to match your particular equipment. While this is best done with a triggered oscilloscope, on-the-air adjustment requiring no equipment other than your radio station will be described. Connect the QSK as shown in fig. 8. Use a dummy load on the antenna connection of the QSK. Disconnect the receiver mute line and place the receiver in the operate mode so that you can monitor your signal. Turn off the receiver a.g.c. Remove the amplifier from the circuit and feed the exciter directly into the QSK antenna relay. If your amplifier has a built in feed-through relay simply turn off the amplifier. Set all time delays to their maximum by setting R1, R2, R3, and R4 to their maximum resistance value. Finally connect a manual key to an input of the QSK control box.

At this point closing the key should place the exciter r.f. output into the dummy load and opening the key will connect the receiver to the dummy load. Close the key and tune up the exciter for about 100 or less watts output. While keying the exciter you should be able to hear the sending in the receiver.

While slowly keying the exciter, decrease the value of R1, shortening delay D1, until the slightest key click on the "make" of the key closure is heard in the receiver. To listen for key clicks, tune several kHz away from the carrier frequency. Try not to confuse receiver overload or desensing with key clicks. The instant clicks are heard time delay D1 has been set equal to the time it takes the antenna relay to close. Slightly increase the value of R1 until no click can be discerned on "make." Having too large a value of R1 will only insure that the antenna relay K1 is closed before r.f. appears on its contacts, which is safe. However, too little a value of R1 will mean the relay is hot-switching the r.f. If a very fast relay, such as the HC-1 or RJ-1A is used, it is possible that R1 may be decreased to zero with no clicks occurring.

The next step is to set R2 to the same resistance value determined for R1 above. Either count the number of turns from maximum resistance taken off of R1, or turn off the power to the QSK and measure the resistance of R1 with an ohm meter. Place the positive lead of the ohm meter on the +5 supply line while make this measurement. In any case, set the value of R2 as close as possible to R1. Key the exciter at a reasonable speed and adjust R2 for a faithful reproduction of the keying weight. If the characters are too light, or short, increase R2; if they are too heavy, or long, decrease R2. This adjustment is not critical.

Decrease the value of R3 while listening with the receiver for key clicks on the "break" of the key opening. The instant a key click is detected, delay D3 has been set equal to the time necessary for the r.f. output to decay to zero. Increase R3 until no clicks are discernable on break. The antenna relay is now opening after all r.f. has disappeared from the contacts.

Increase the exciter to maximum output and make sure no clicks can be detected. Clicks on make are removed by increasing the value of R1, and clicks on break are removed by increasing the value of R3. Connect the amplifier and slowly increase power while keying and checking for clicks. If all clicks are absent connect on antenna and make sure nothing changes. Trim R2 for proper keying weight if necessary.

Lastly, connect the receiver mute line and decrease R4 while sending until smooth un-muting no longer occurs. Increase R4 for smooth transition between receive and mute on the receiver Adjust the mute level control for the desired monitor volume.

If the station exciter, amplifier, or antenna relay is changed, it may be necessary to go through this adjustment procedure again. At some high keying speed it is characteristic of the QSK for the antenna relay to be unable to follow the keying. This is due to the relay switching speed and circuit fixed delay times. For the QSK using the VS-1 relay, this occurs at over 60 w.p.m.

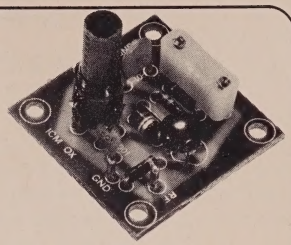
In order to achieve true QSK operation there must be no backwave heard in the receiver between dots and dashes. The transmitter must be ready to go all the time. Drake and older c.w. equipment meet these requirements. Collins and Heath equipment must be placed in the operate mode by closing the p.t.t. line and some modification must be made to eliminate the backwave and the final amplifier idling current. Such changes are minor and are given by Wade and Hallock[2]. The QSK may be used to transfer the antenna on phone by using the VOX relay contacts to close the key line during transmit. ■

[2]C. W. Wade and D. B. Hallock, QST, Vol. LIV, No. 9, PP 47-49, Sept. 1970

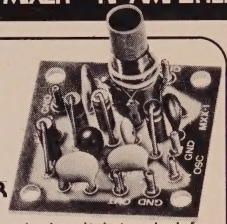
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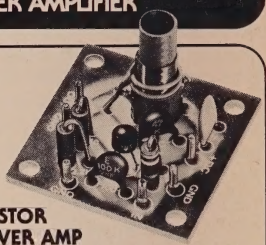
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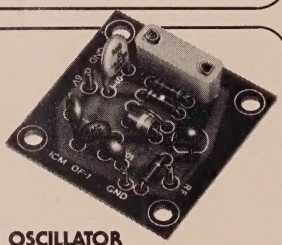

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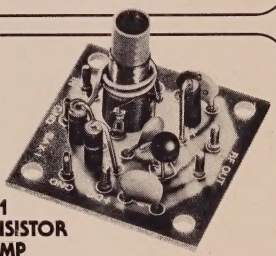

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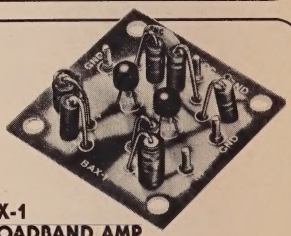

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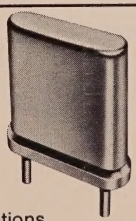

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