CQ

July 1976
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JAMES MADISON
[1751–1836]

I believe there are more instances of the abridgment of the freedom of the people by gradual and silent encroachments of those in power than by violent and sudden usurpations.

Speech in the Virginia Convention
[June 16, 1788]

The Radio Amateur's Journal

3240

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[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-021 with the HA-201 2-meter amplifier. thstands infinite VSWR without failure—es together in an hour or two.

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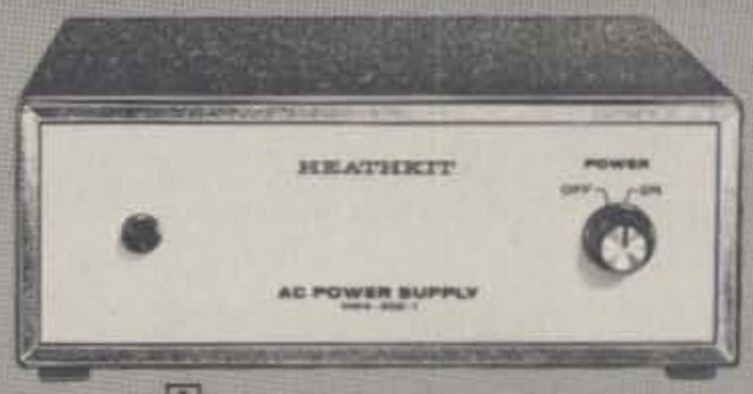

[1]


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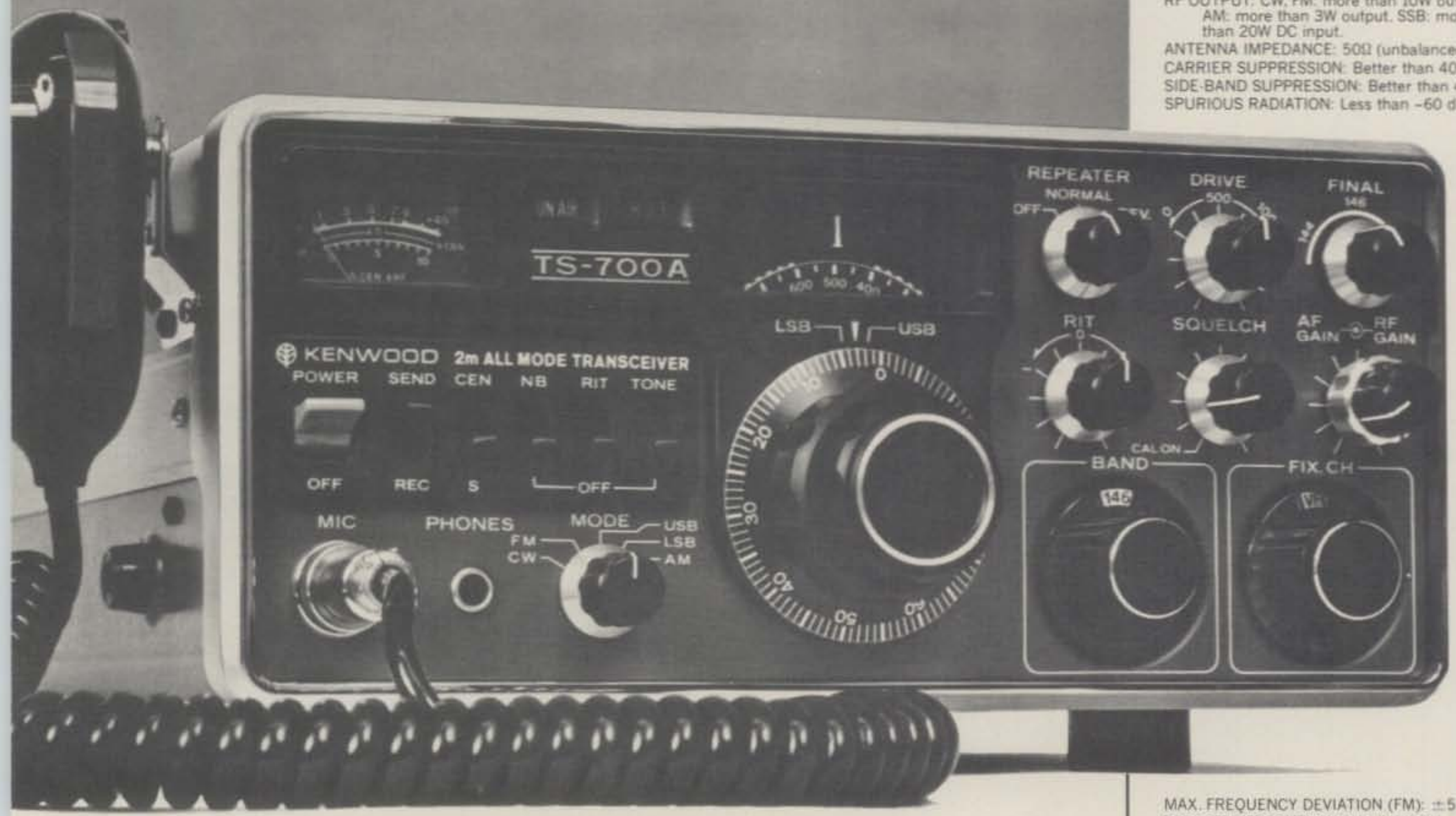

TS-700A *Specifications*

TRANSMIT/RECEIVE FREQUENCY RANGE: 144-148 MHz
MODE: SSB, FM, CW, AM
RF OUTPUT: CW, FM: more than 10W output. AM: more than 3W output. SSB: more than 20W DC input.
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.
RECEIVING SENSITIVITY: SSB, CW: S/N = 10 dB or better at 0.25μV. 20 dB noise quieting = Less than 0.4μV. AM: S/N = 10 dB or better at 1μV.
IMAGE RATIO: Better than 60 dB
IF REJECTION: Better than 60dB
PASS-BANDWIDTH: SSB, CW, AM: More than 2.4 kHz at -6 dB. FM: More than 12 kHz at -6 dB.
RECEIVER SELECTIVITY: SSB, CW, AM: Less than 4.8 kHz at -60 dB. FM: Less than 24 kHz at -60 dB.
SQUELCH SENSITIVITY: 0.25μV
AUDIO OUTPUT: More than 2W at 8Ω load (10% distortion)
RECEIVER LOAD IMPEDANCE: 8Ω
FREQUENCY STABILITY: Within ±2 kHz during one hour after one minute of warm-up, and within 150 Hz during any 30 minute period thereafter.
POWER CONSUMPTION: Transmit mode: 95W (AC 120/220V), 4A (DC 13.8V), max. Receive mode (no signal): 45W (AC 120/220V), 0.8A (DC 13.8V).
POWER REQUIREMENTS: AC 120/220V, 50/60 Hz. DC 12-16V (13.8V as reference).
DIMENSIONS: 278 (W) x 124 (H) x 320 (D) mm
WEIGHT: 11 kg
SUGGESTED PRICE: $700.00

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JULY, 1976 VOL. 32, NO. 7

CQ

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Max. power input	1 KW AM 2 KW PEP	1 KW AM 2 KW PEP (1 KW PEP on 80)	1 KW AM	1 KW AM	250 watts AM 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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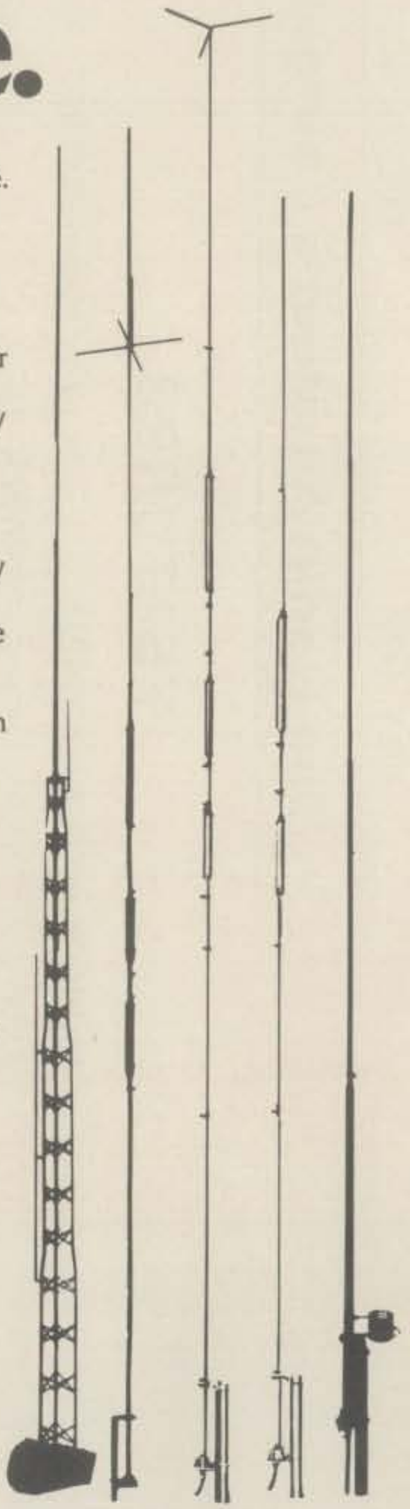


Zero Bias

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.

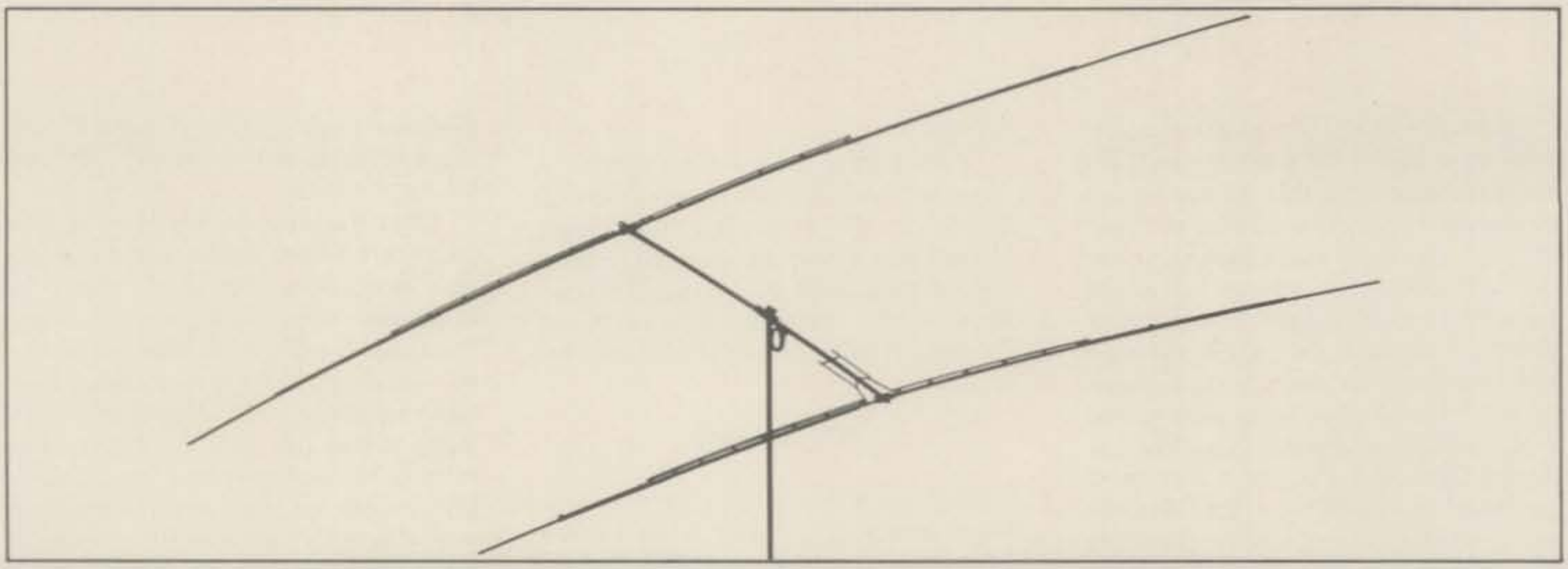
On the other hand, the FCC gives and taketh away. This past June the FCC announced (without the usual time for comments) that it had approved a tacit agreement between themselves and the ARRL to literally hand over authority to ARRL to give classes and grant upon completion of the class, a bona fide 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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Our Readers Say

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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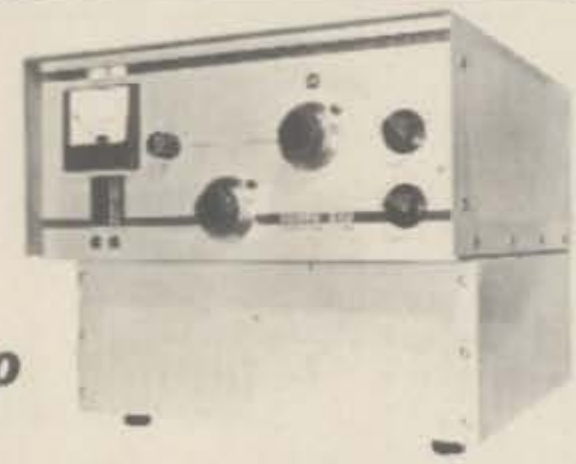

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10W	80W	80A10	$149
30W	80W	80A30	$159

UHF (400 to 512 MHz) Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
10W	70W	70D10	$250
30W	70W	70D30	$210
2W	40W	40D02	$180
10W	40W	40D10	$145
2W	10W	10D02	$125

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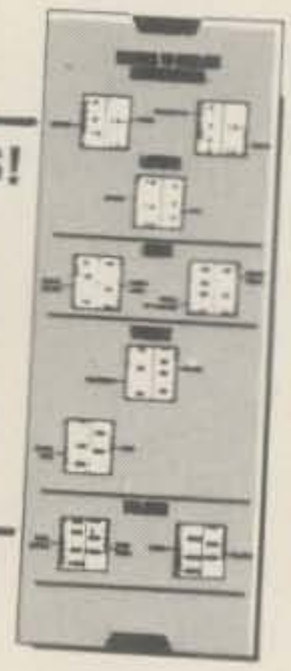

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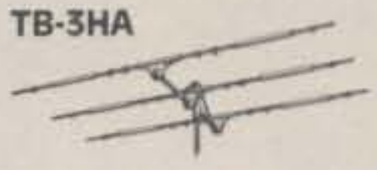

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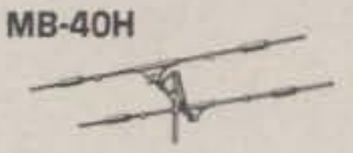

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Announcing

● **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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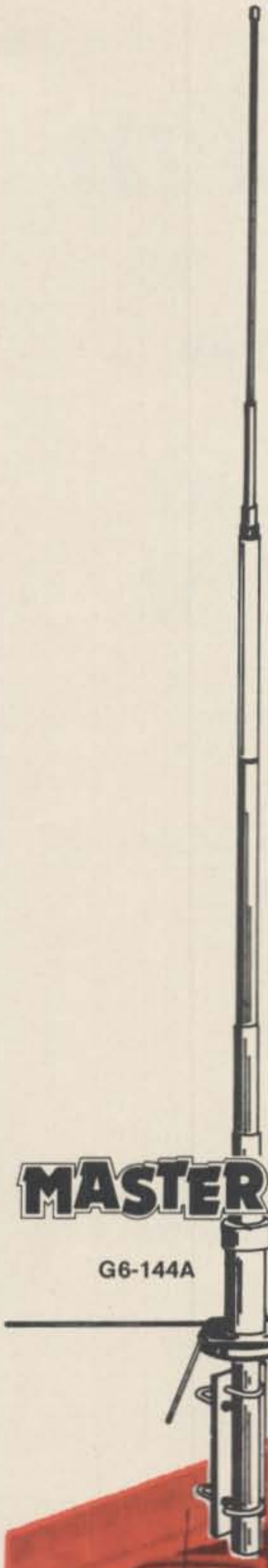

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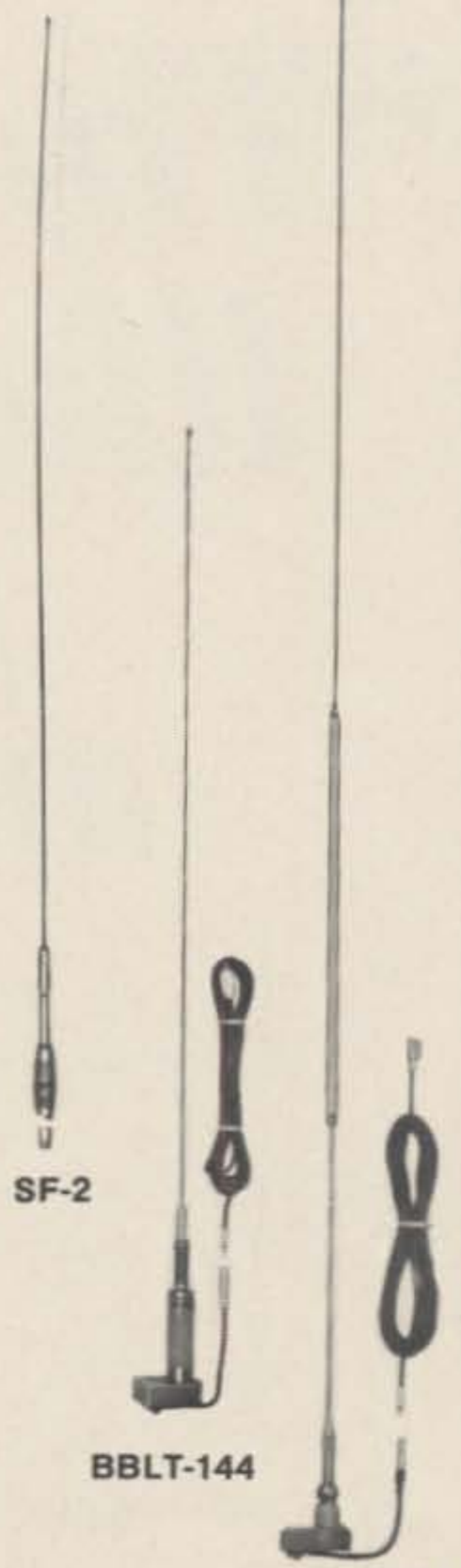

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DXING IN BAJA CALIFORNIA

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.

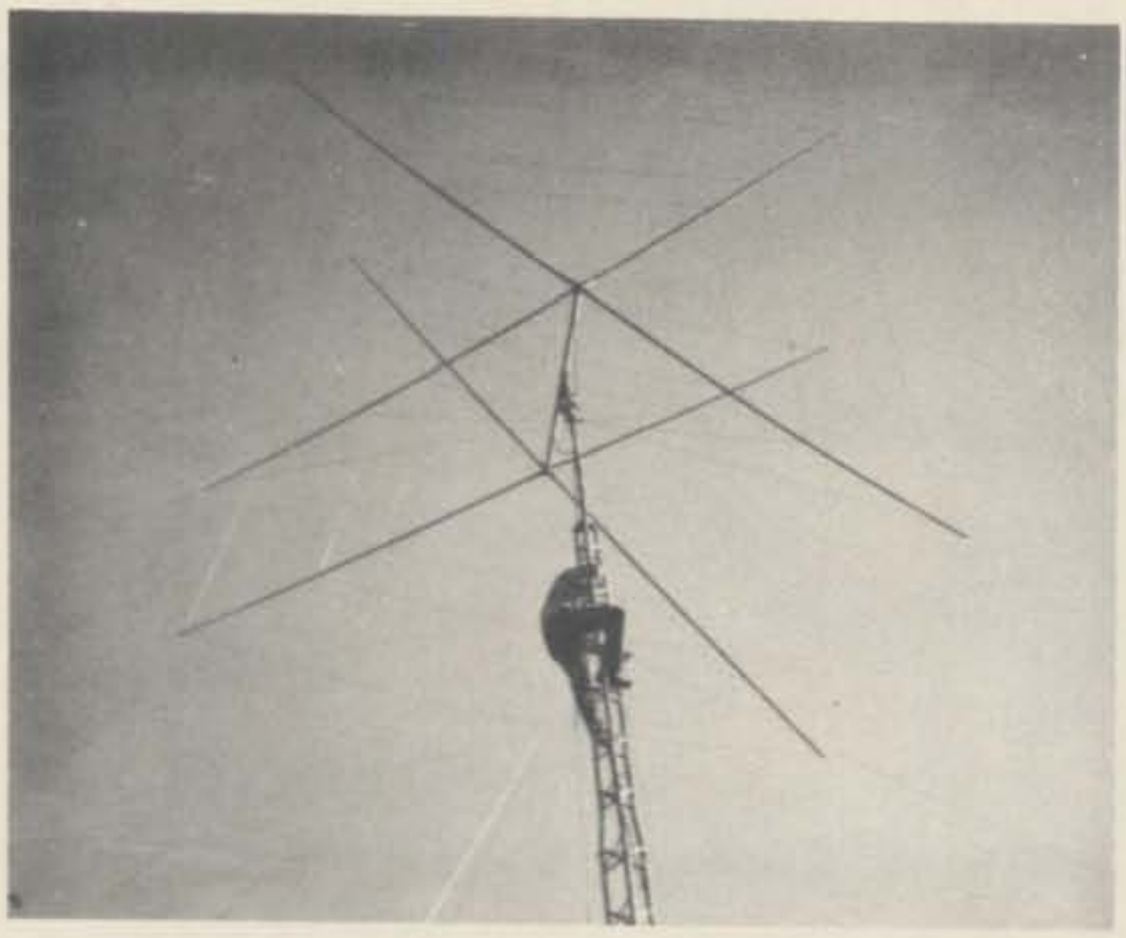
In 1974, Jose was given some cubex quad spiders, however bamboo is difficult to obtain in Ensenada, so he obtained an old 2 element tribander from another XE amateur but was very unhappy in the performance as it was difficult to work Europe. When Jose mentioned his disappointment with the triband Yagi 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)

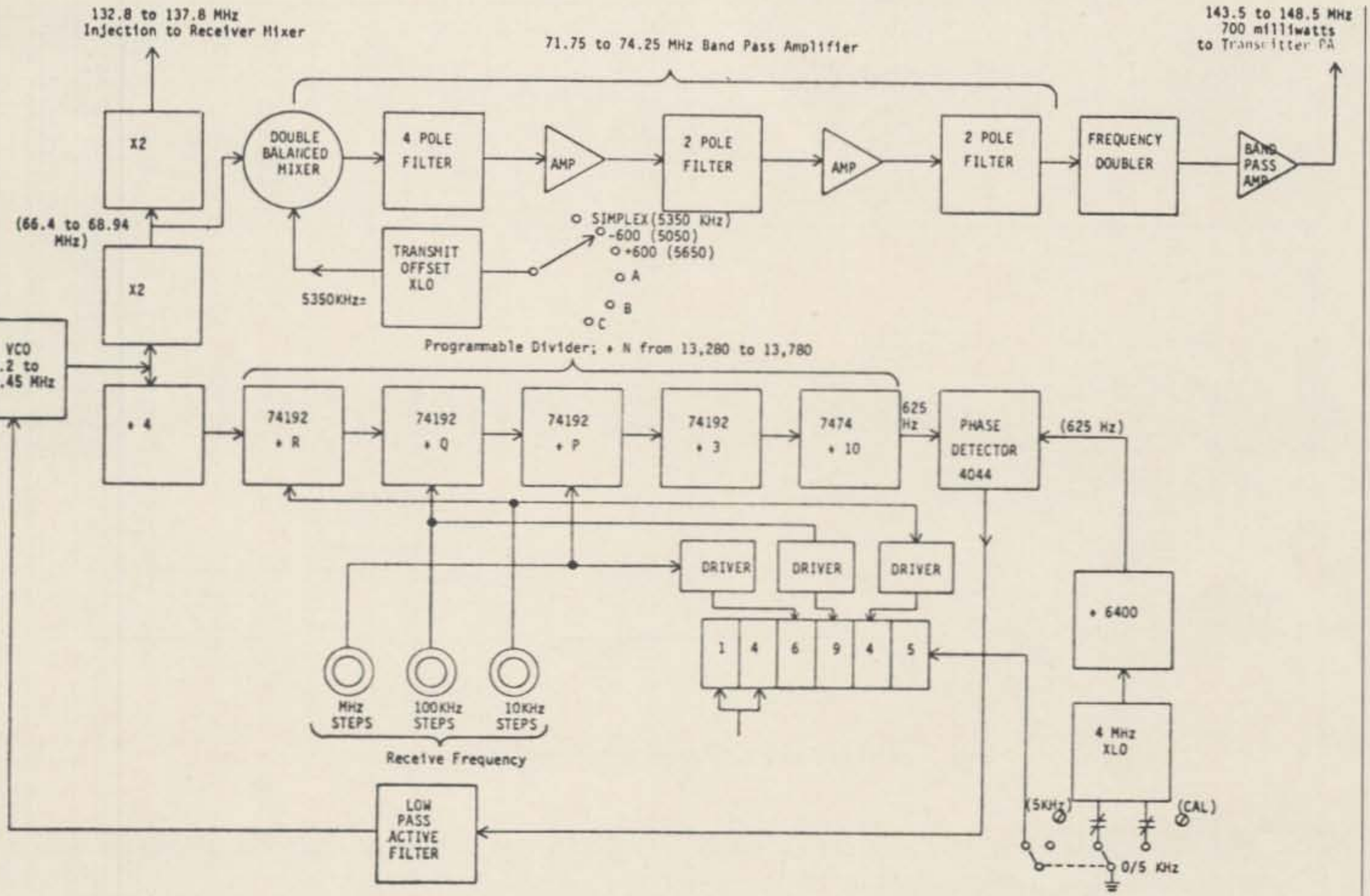


Fig. 1—Block diagram of the Clegg FM-DX frequency synthesizer.

Receiver

The receiver is of a single conversion design, with an i.f. frequency of 10.7 MHz. Dual gate MOS-FET'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

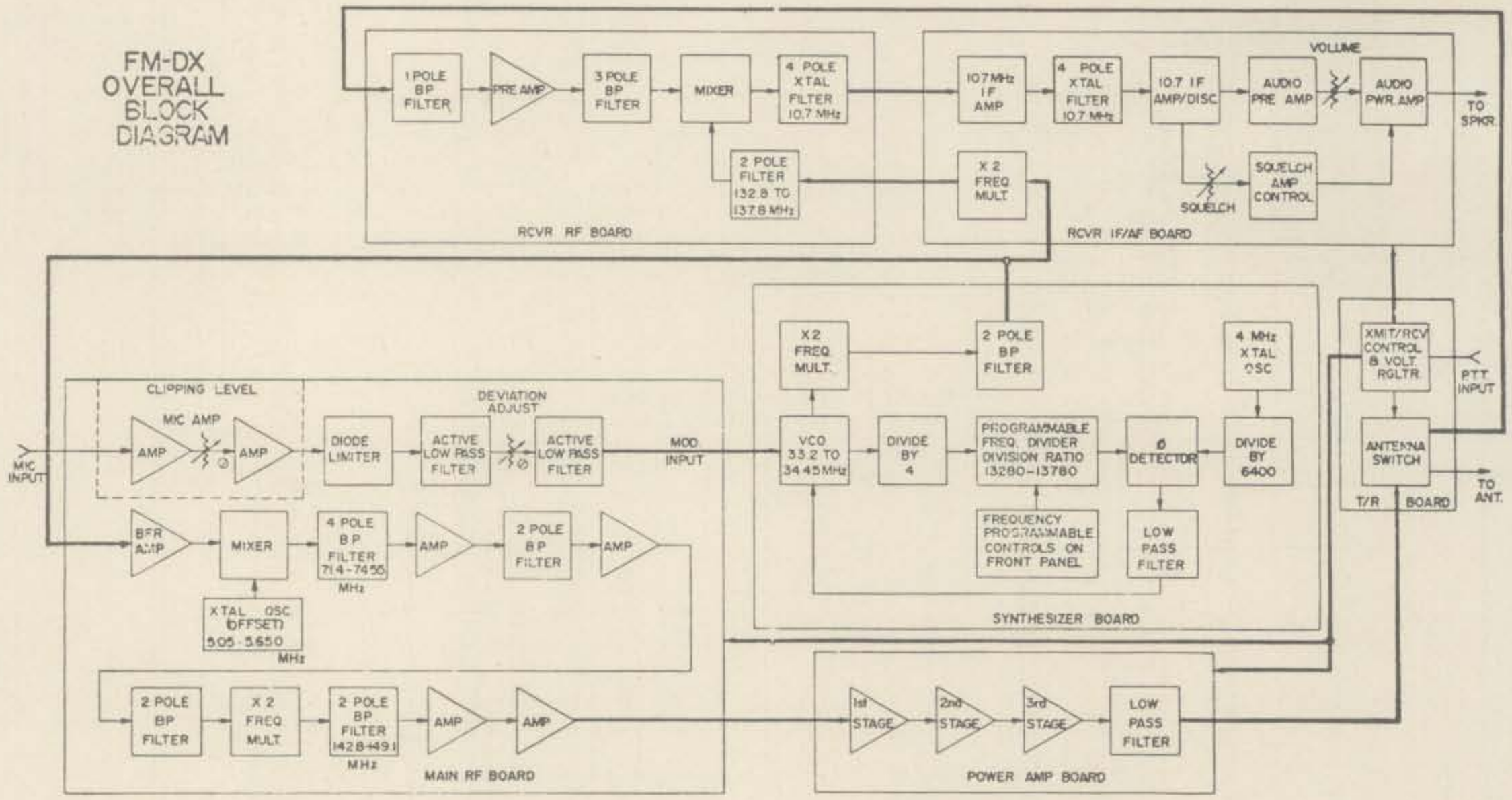


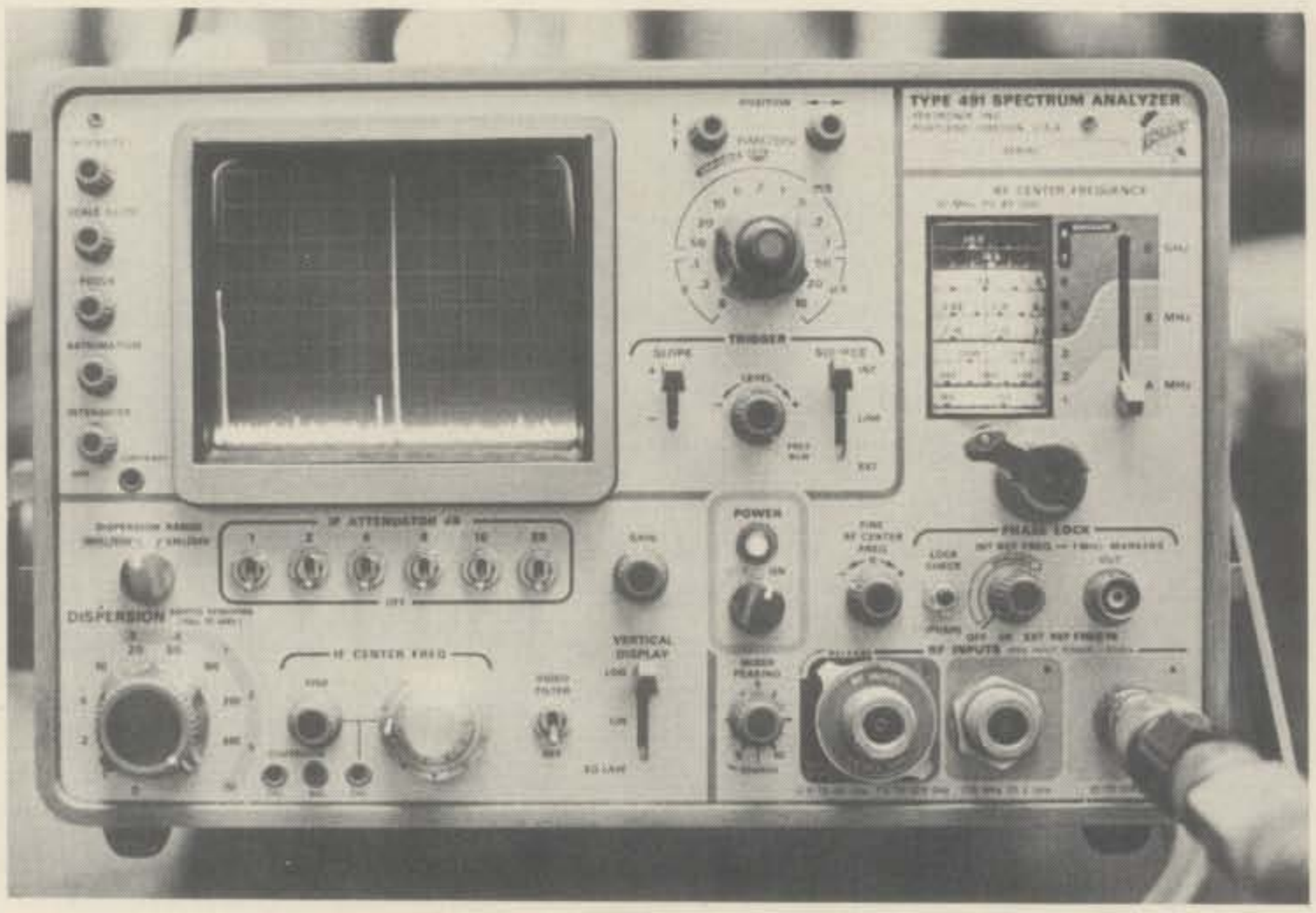
Fig. 2—Overall block diagram of the FM-DX transceiver.

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.

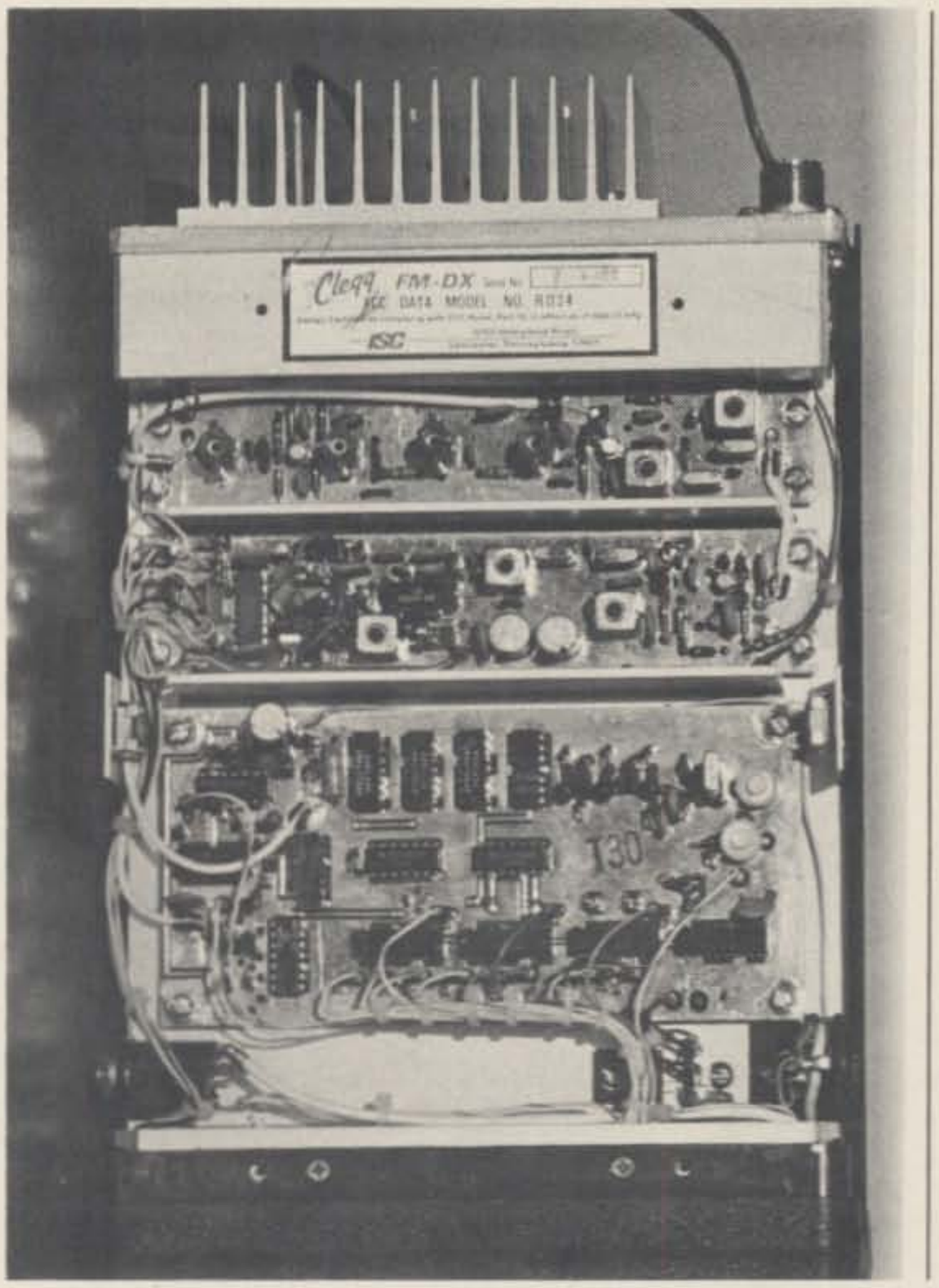
In the low power mode the transceiver draws about 4 amps, which is pretty high for such a small amount of power output. Obviously you won't want to run the transceiver on a Ni-Cad battery pak. In the high power mode, current is 10 amps or more.

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? ■



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.

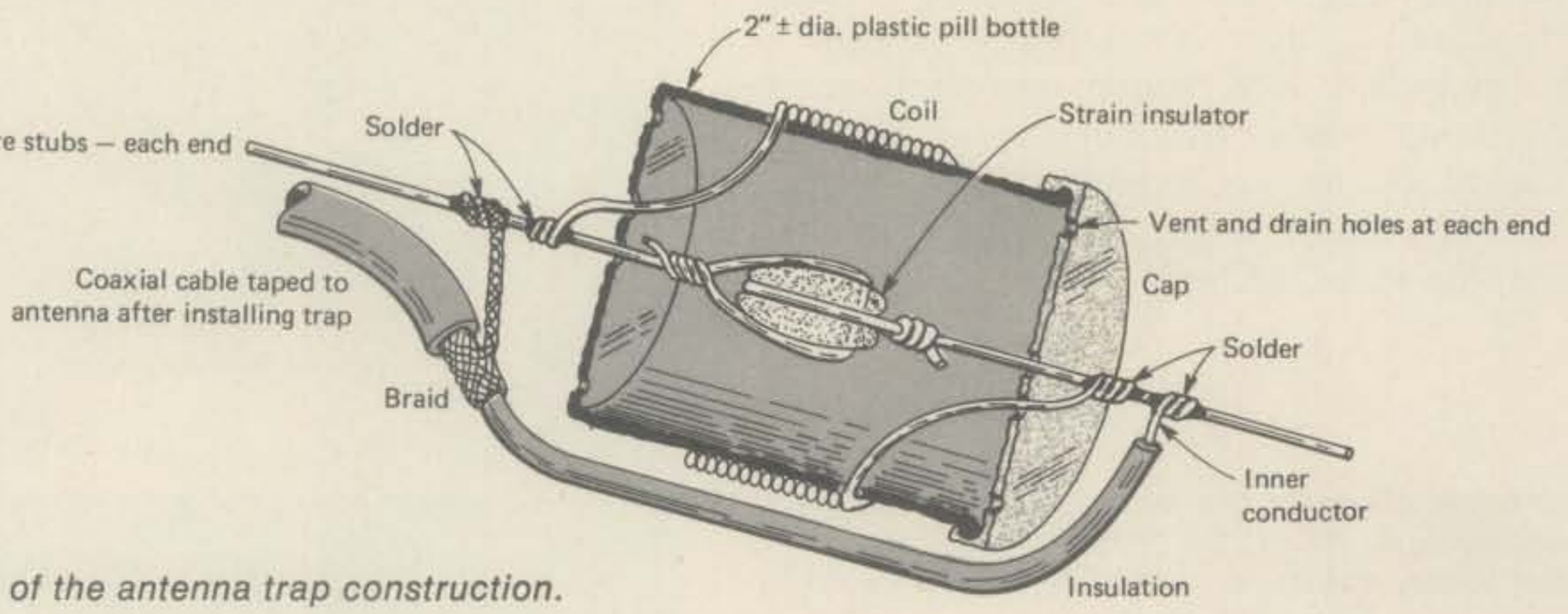


Fig. 1—Details of the antenna trap construction.

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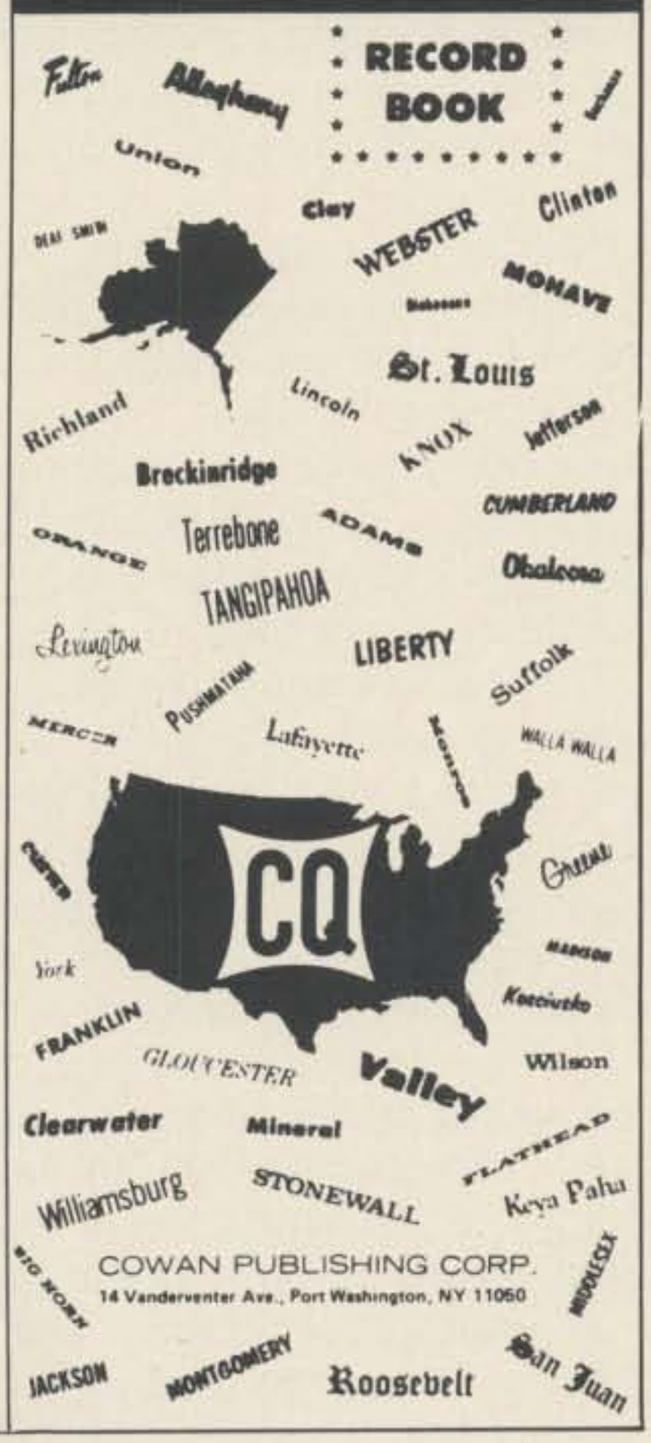

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A trap is nothing more than a coil with a capacitor across same, and when placed in an antenna it will act as an insulator at its resonant frequency. Most all of the commercial tri-band beams and multi-band verticals use traps in one form or another.

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

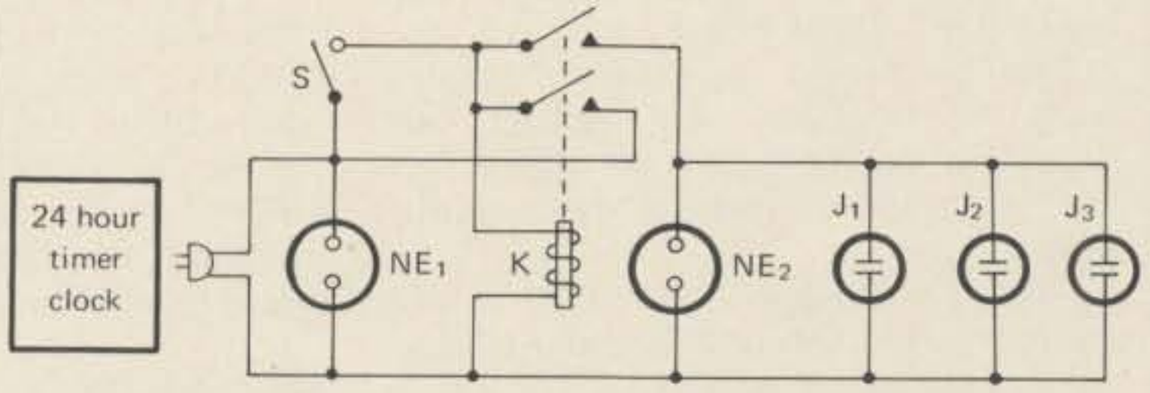


Fig. 1—Circuit of the battery charge monitor. K is a d.p.s.t. a.c. relay. S is a s.p.s.t. momentary push button switch and J1-J3 are chassis mounted a.c. outlets.

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.

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.

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

OK2BLG

JA8IEV/JD1

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 32 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
W2HMH 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
W2ZHN 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
WB4WHE A 10,336 65 29 44
K4ZA A 7,938 51 21 42
WA4HPF A 3,871 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 31,472 118 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
W8GOC 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
W8BDO 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

WAØONL A 273,710 488 66 136
WAØVDX 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 33
WBØGRJ A 5,508 46 22 29
WAØFBQ A 2,722 43 23 32
WØMUH A 1,976 32 12 14
WBØPCO 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 " 44,330 269 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 A 163,840 597 40 88
VE2WA " 87,450 208 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
CM2VG A 5,600 201 8 6
CO2KP 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
FPØBG 7 15,351 160 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 25 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 67,782 293 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
JA2JXI " 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
JA4AQR/3 " 168 7 6 6
JH4CPF " 126 8 4 5
JA1X2F 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
JAØCUV/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
JAØSC " 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
UA900	"	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
UD6DJT	**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**
UL7OF	"	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
OK2BTW	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
OK1DAQ	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

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					
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					
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					
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					
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					
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					
ZB2X	**3.5**	**114,540**	**865**	**18**	**65**
(Opr. OH3XZ)					
Greece					
SVØWEE	**21**	**2,838**	**70**	**7**	**26**
SVØWTT	**7**	**9,180**	**133**	**12**	**39**
Hungary					
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					
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					
GD5BOY	**A**	**469,116**	**1196**	**61**	**188**
GD4BEG					
	1.8	**8,932**	**253**	**7**	**22**
Italy					
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					
9H1CH	**21**	**102,300**	**579**	**24**	**69**
Netherlands					
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					
GI3JEX	**A**	**158,725**	**629**	**44**	**131**
Norway					
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					
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					
CT1QN	**7**	**21,892**	**291**	**9**	**43**
Republic of Ireland					
EI5F	**14**	**744**	**27**	**6**	**18**
Romania					
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					
ISØBDO	**A**	**71,400**	**442**	**29**	**91**
Scotland					
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					
IT9LMK	**21**	**55,520**	**434**	**23**	**57**
IT9KZW	"	27,608	270	17	41
IT9RAN	**14**	**65,592**	**501**	**18**	**54**
Spain					
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					
JW5NM	**7**	**376**	**17**	**5**	**3**
Sweden					
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
SM0CGO	"	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					
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					
GW3XNS					
	1.8	**792**	**66**	**2**	**10**
Yugoslavia					
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.					
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.

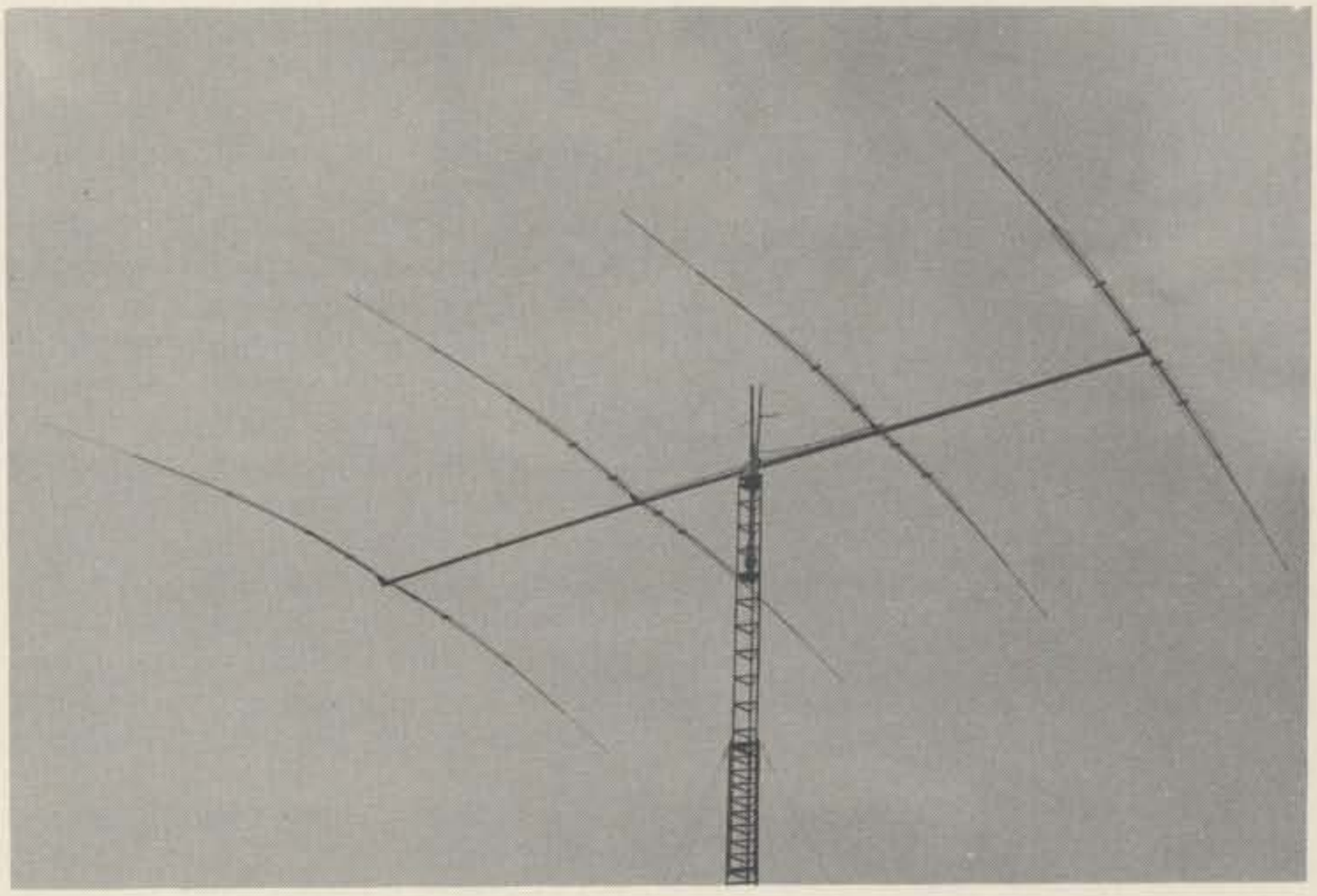


Fig. 1—The KLM bandpass beam antenna for 40 meters. This 4-element array makes use of a log-periodic pair of driven elements to achieve a passband characteristic and a low value of s.w.r. across the whole 7 MHz band. Elements are mounted on a 42 foot boom, made of 3" diameter tubing. The longest element 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.

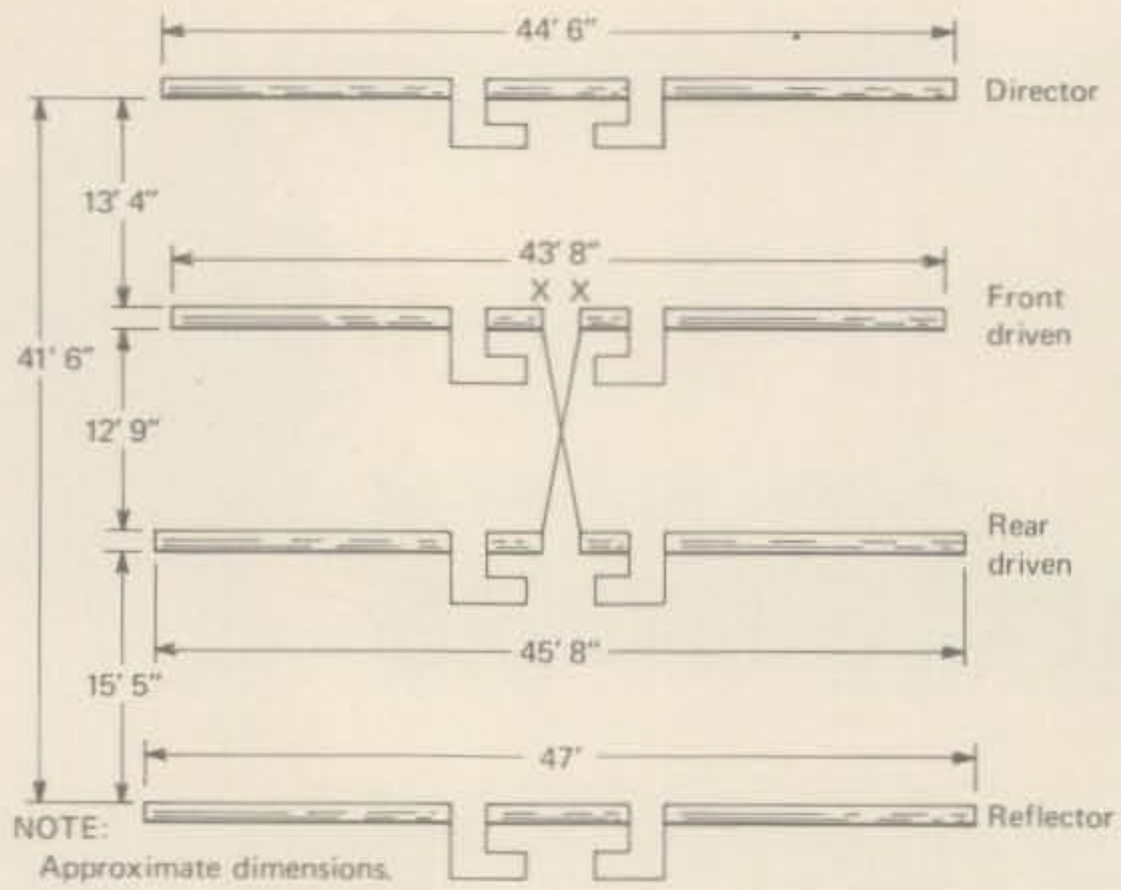


Fig. 2 — Layout of the KLM 40 meter beam. All elements are fixed in length, but the director may be varied a few inches to lower the s.w.r. at either the 7.0 MHz or the 7.3 MHz end of the band. The linear loading sections are made of ⅜-inch diameter tubing mounted alongside the element. A 200 ohm balun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

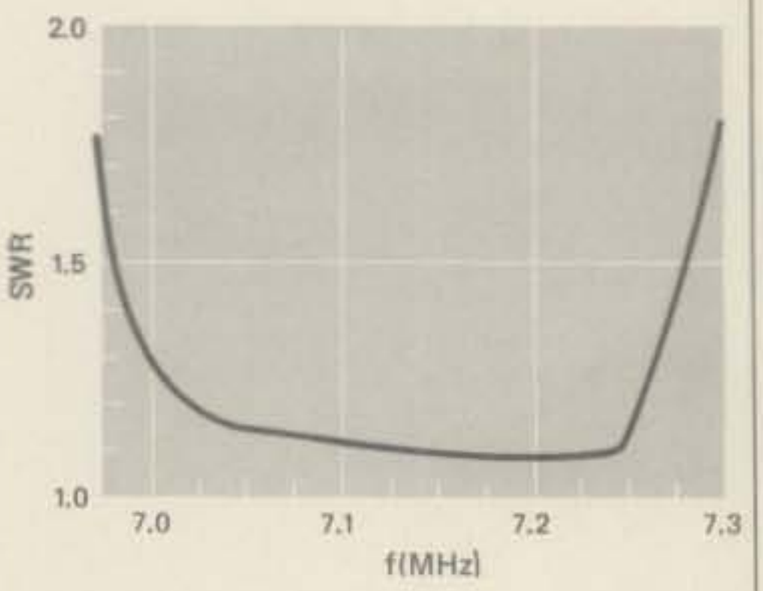


Fig. 3—The s.w.r. curve of the KLM beam when adjusted for low s.w.r. at the 7.0 MHz end of the 40 meter band. S.w.r. remains below 1.4-to-1 across the band, except for the top 30kHz of the phone section. A slight adjustment to the reflector drops the s.w.r. at the high end of the band, and raises it 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!"

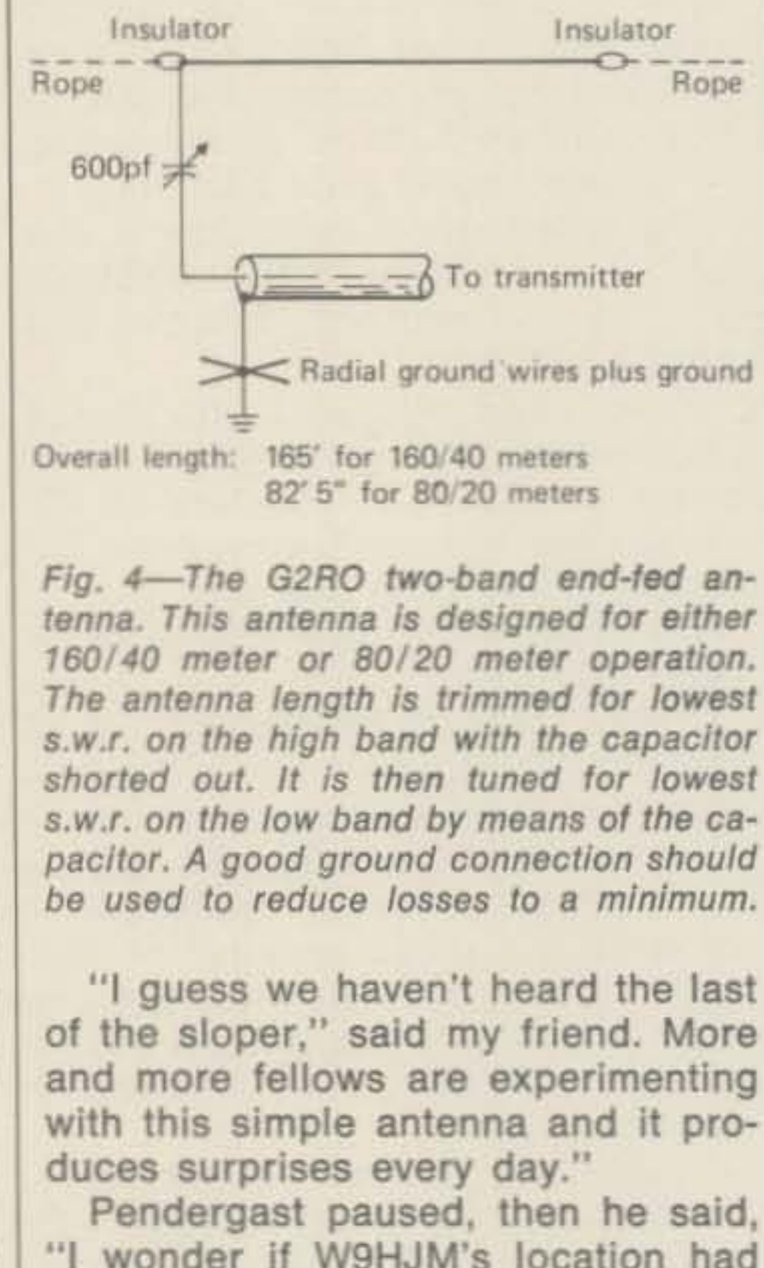


Fig. 4—The G2RO two-band end-fed antenna. This antenna is designed for either 160/40 meter or 80/20 meter operation. The antenna length is trimmed for lowest s.w.r. on the high band with the capacitor shorted out. It is then tuned for lowest s.w.r. on the low band by means of the capacitor. A good ground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

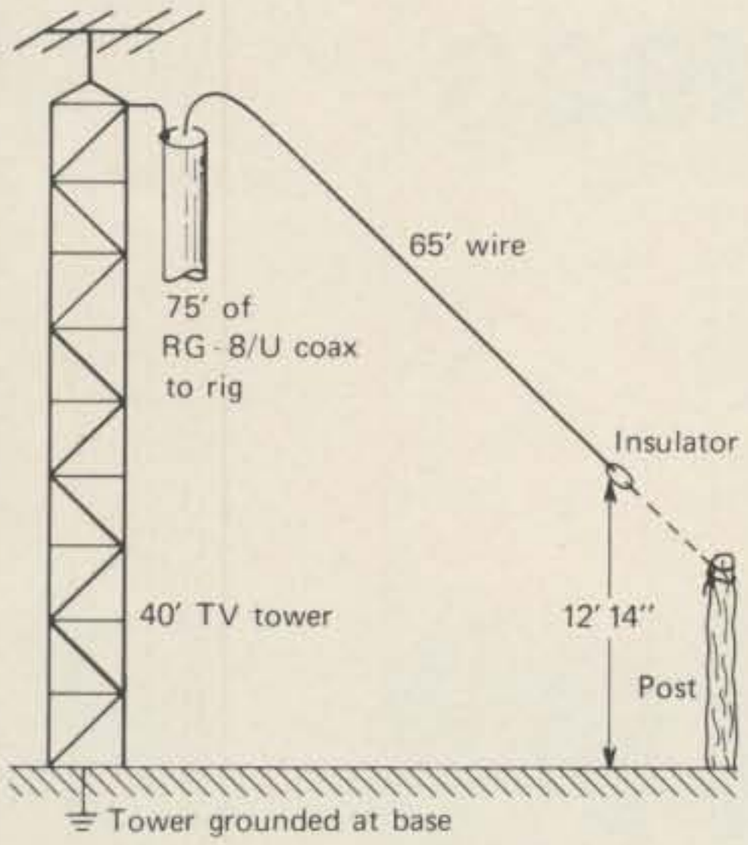


Fig. 5—The W9HJM Sloper antenna for 80 meters is made up of a TV tower, with the sloper wire running off to a nearby post. It was found by W9HJM that the sloper works equally well on 10 meters as it does on 80 meters!

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."*

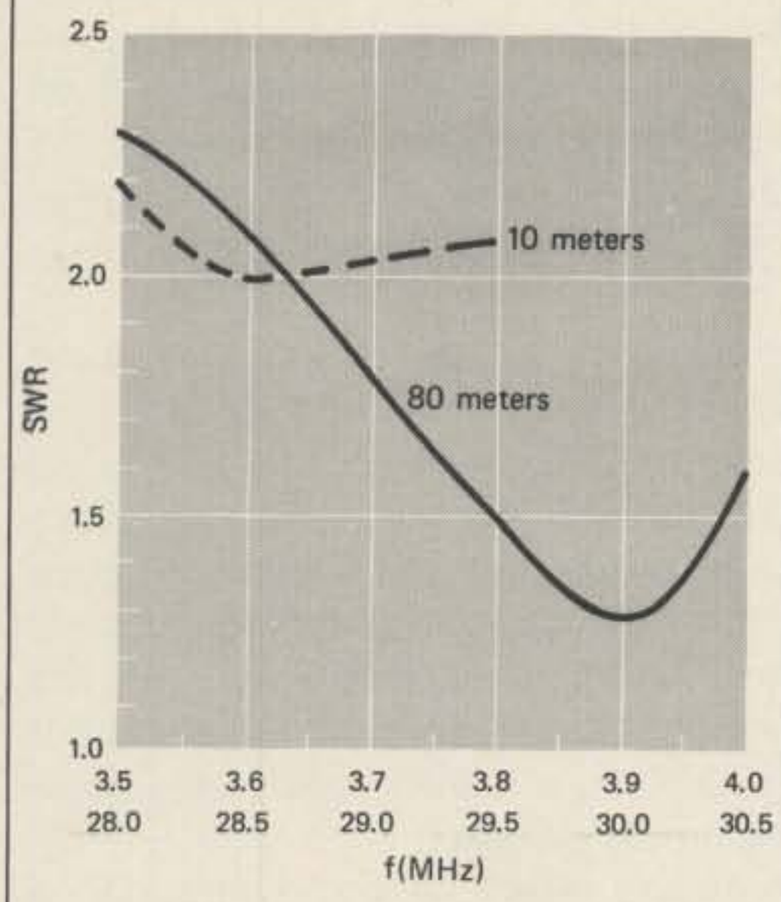


Fig. 6—The s.w.r. plot for 80 and 10 meters for the W9HJM sloper antenna. The sloper is resonant at 3.9 MHz on 80 meters and at 28.6 MHz. on 10 meters.

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)

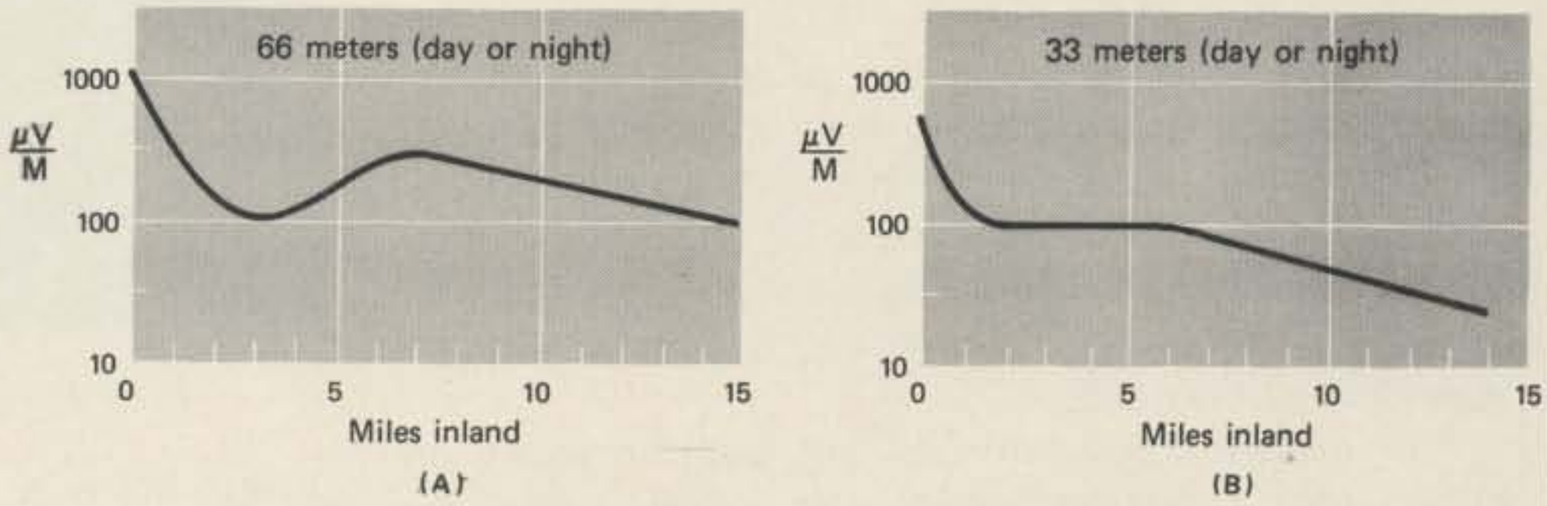


Fig. 7—The plot of many readings taken over a period of time on 66 meters (A) and 33 meters (B) for a ship-to-shore radio path. Signals were attenuated 8 dB to 12dB only one mile inland at both frequencies. Location near the water is to be preferred for over-water transmission.

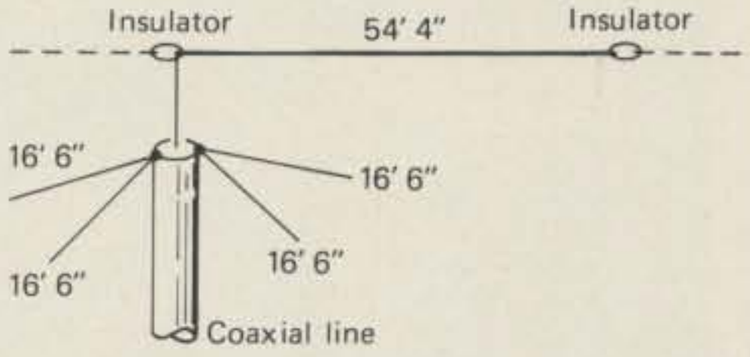


Fig. 8—The so-called SP5AY "all-band" antenna. Does it work? How does it work? W6SAI would like to know. Has anyone tried this unusual antenna?

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.

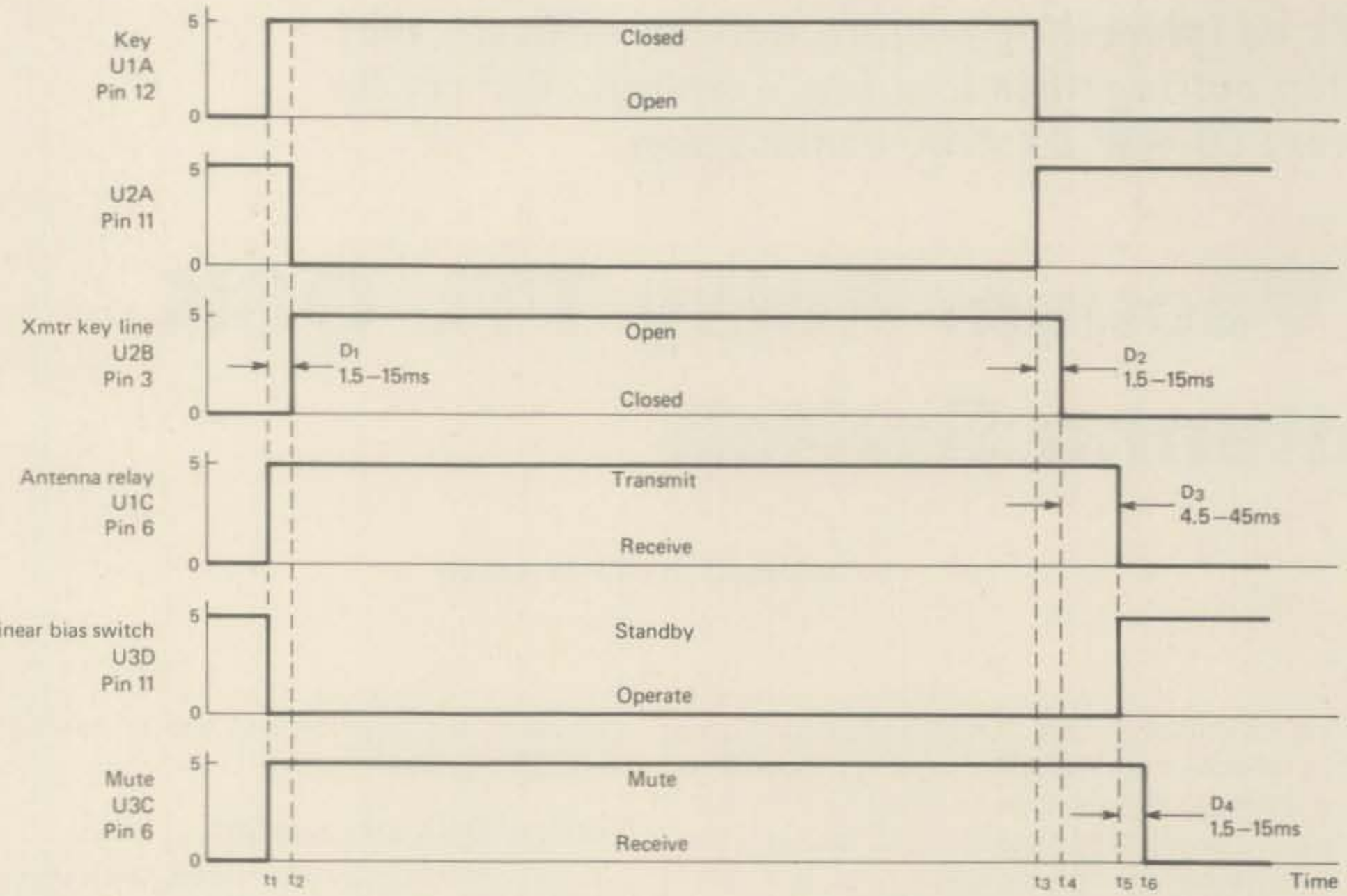
To achieve QSK antenna switching and meet this requirement a high speed relay that is keyed along with the transmitter is required. Relays are available with switching times sufficient to allow operation at most reasonable morse code speeds. For low power installations dry reed relays or mercury wetted 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

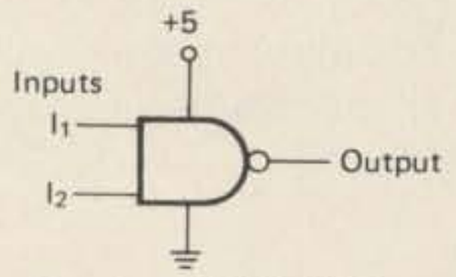
remove cut-off bias applied to a linear amplifier is provided in synchronous with the switching of the antenna relay. At a keying speed of 40 w.p.m., all the above steps occur in about 30 milliseconds and are repeated on the average of 560 times each minute.

Logic Circuit Description

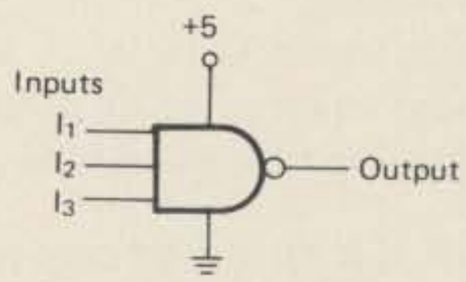
In order to achieve the timing sequence just described, the family of 74 hundred, transistor-transistor, or TTL, integrated circuit logic is used. These circuit components are readily available, inexpensive, reliable and extremely immune to interference from noise and r.f. Only two fundamental types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



Two input NAND 7400



Three input NAND 7410

(A)

7400

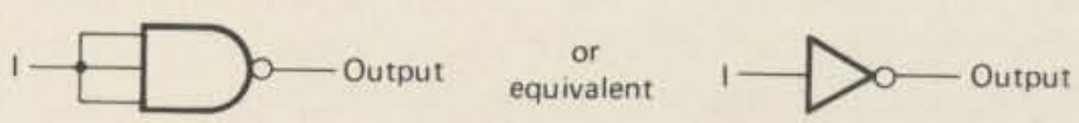
I_1	I_2	Output
0	0	1
0	1	1
1	0	1
1	1	0

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

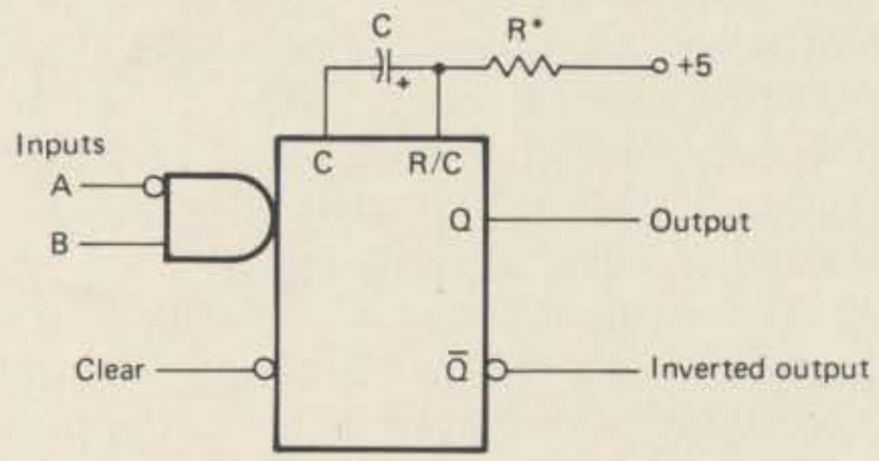
(B)



Input	Output
0	1
1	0

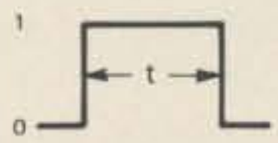
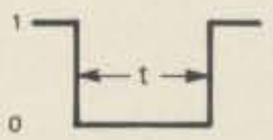
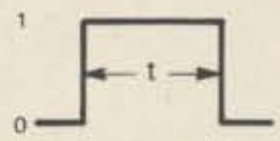
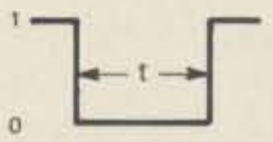
(C)

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		Output	
A	B	Q	$\overline{Q}$
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:

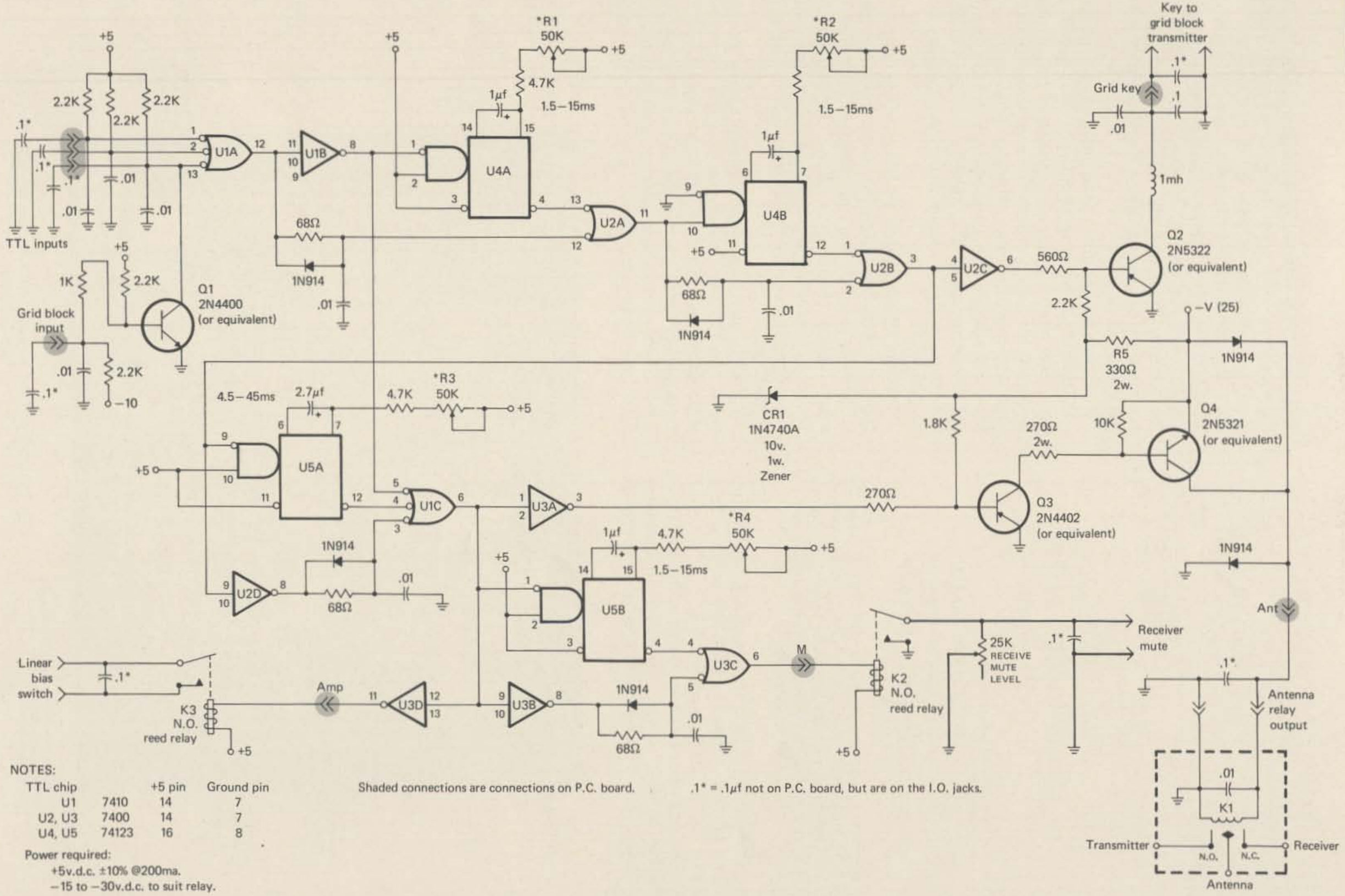
1 — 12 v.a.c. at 500 ma.
1 — 25 v.a.c. at 1 amp.

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.

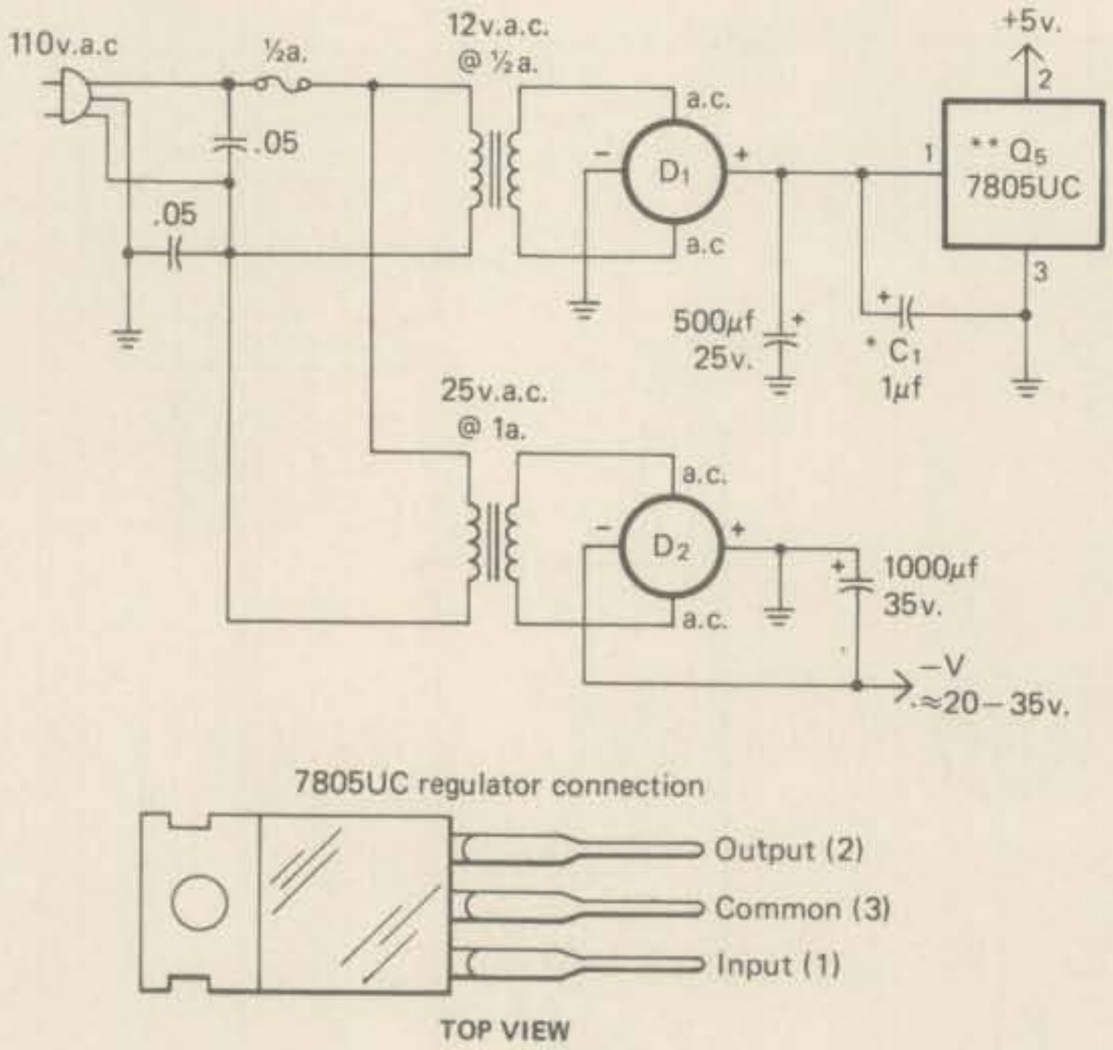


Fig. 5—Power supply schematic. D1 and D2 are 50v piv 1 amp bridge rectifiers. C1 is 1 uf, 25 volts, electrolytic, soldered directly on the regulator input and common pins. Q5 is a fairchild 7805UC, +5 volt regulator in a TO-220 case.

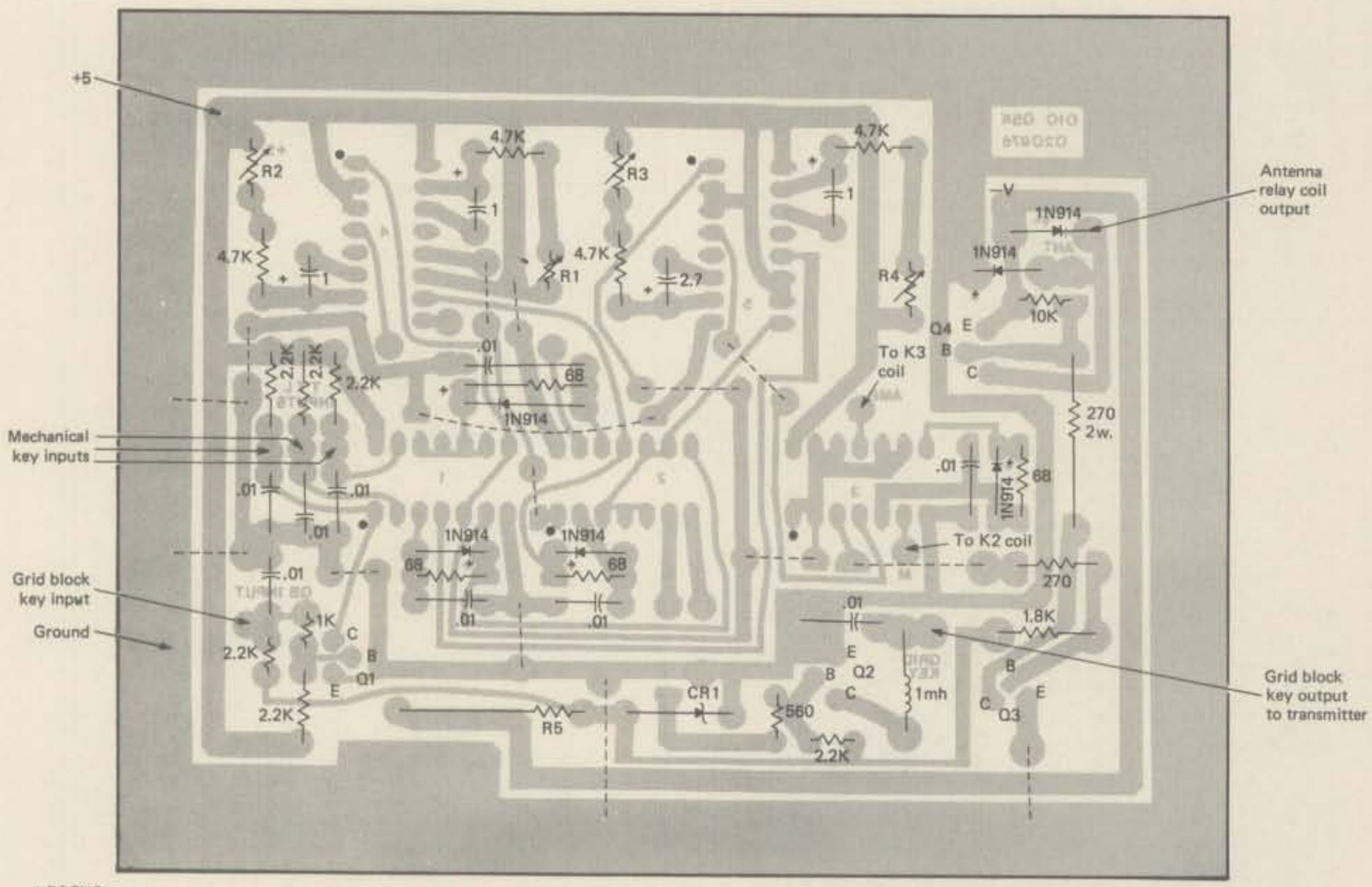
relay. Inverter U3-A, and transistor Q3 and Q4 provide the correct voltage to drive the antenna relay coil K1.

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.

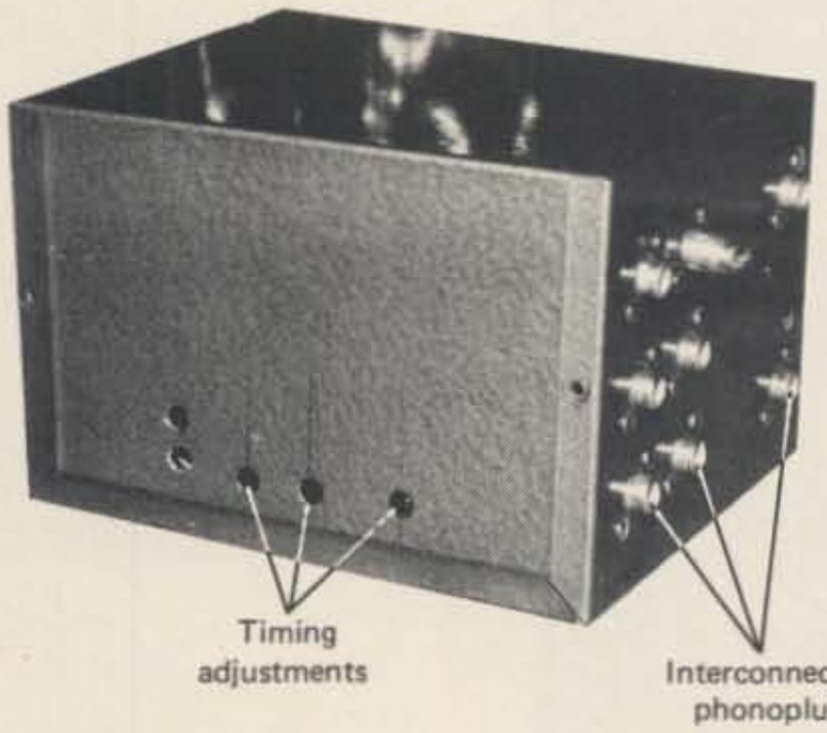
A simple and conventional power supply is used, fig. 5. The TTL logic chips require +5.0± 10% d.c. at about 250 ma. The 7805 UC 5 volt voltage regulator is perfect for this application, is easy to use, and is inexpensive. No heat sink is required, but the case tab of the regulator should be firmly bolted



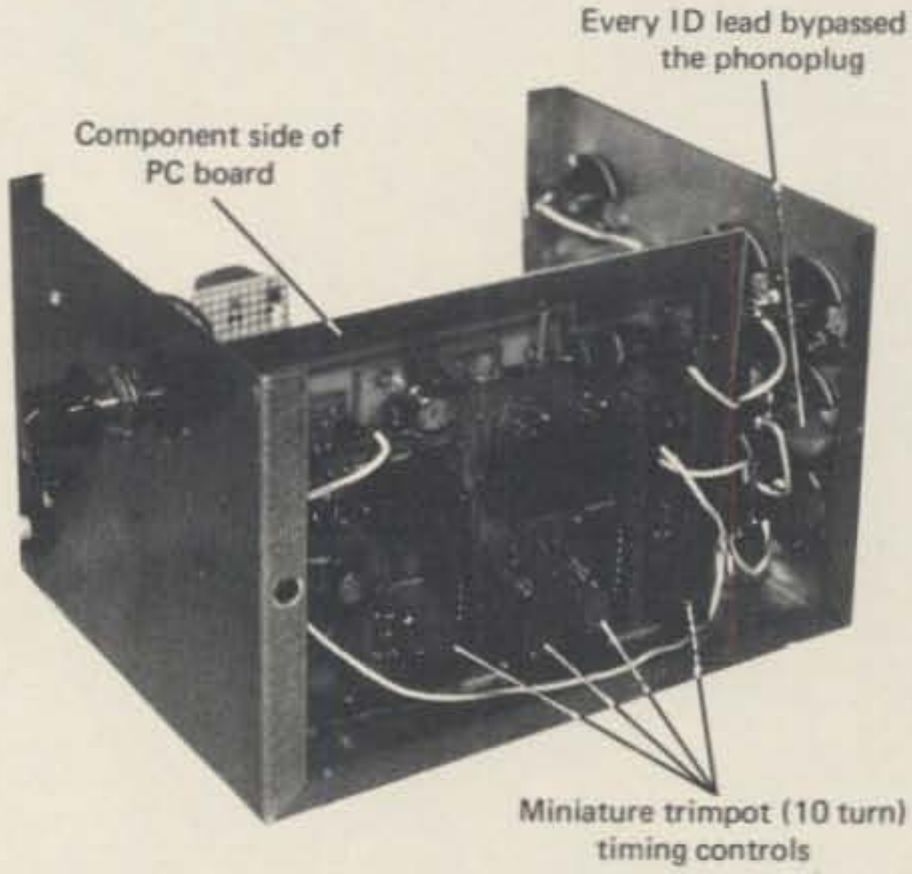
LEGEND:

* Denotes cathodes of diode or "+" side of capacitor.
– – – – Denotes jumpers.
• Denotes pin 1 of IC.

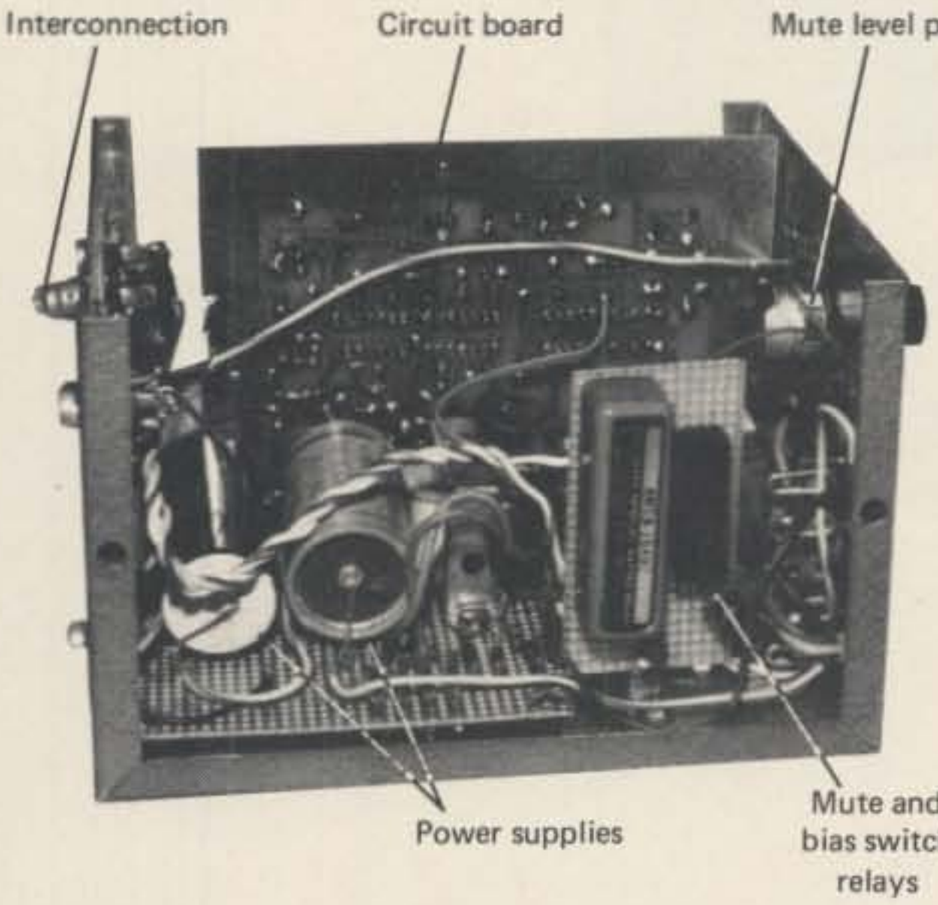
Fig. 6—QSK printed circuit board shown from the component side.



CONTROL BOX

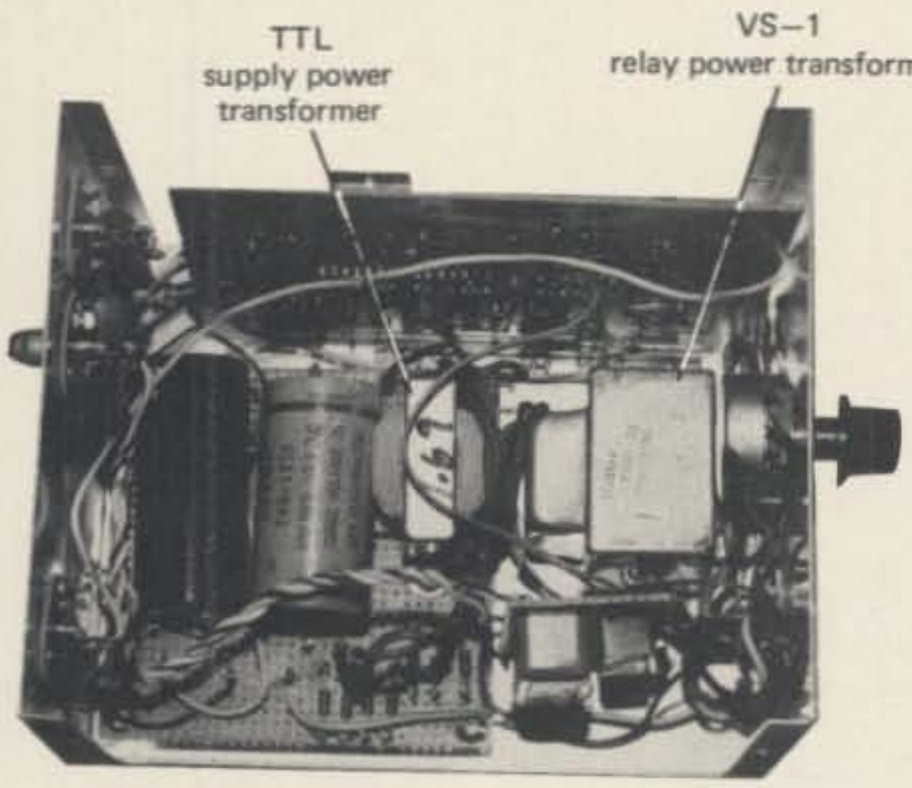


CONTROL BOX

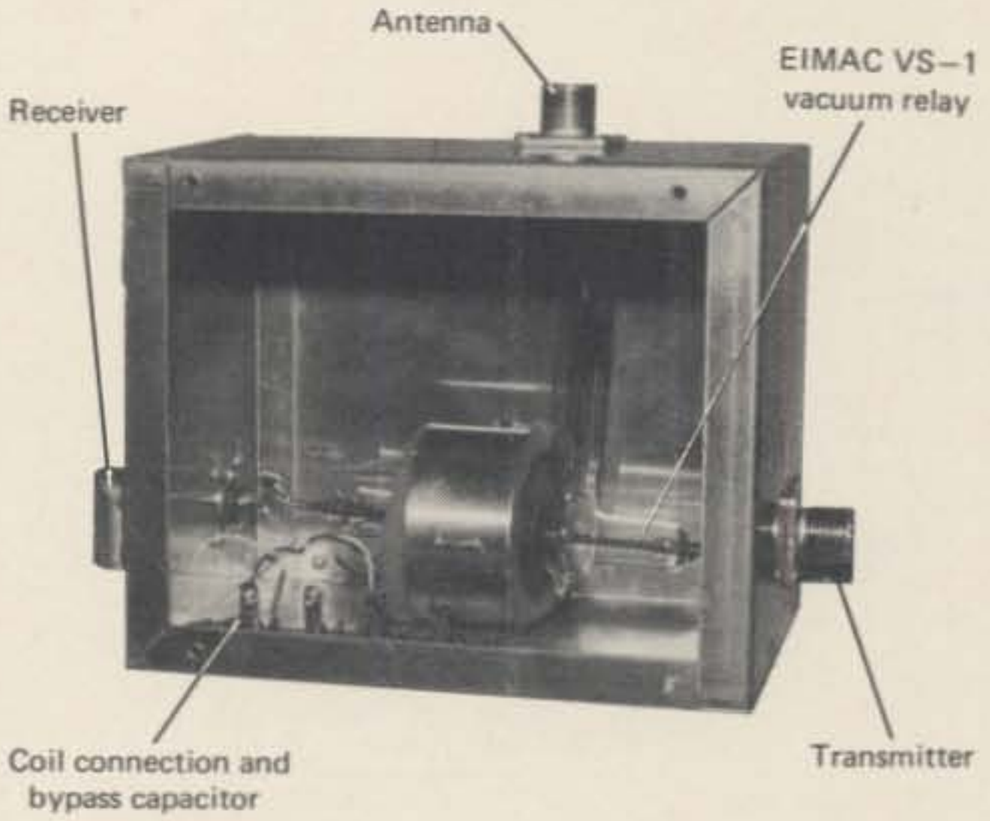


CONTROL BOX

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

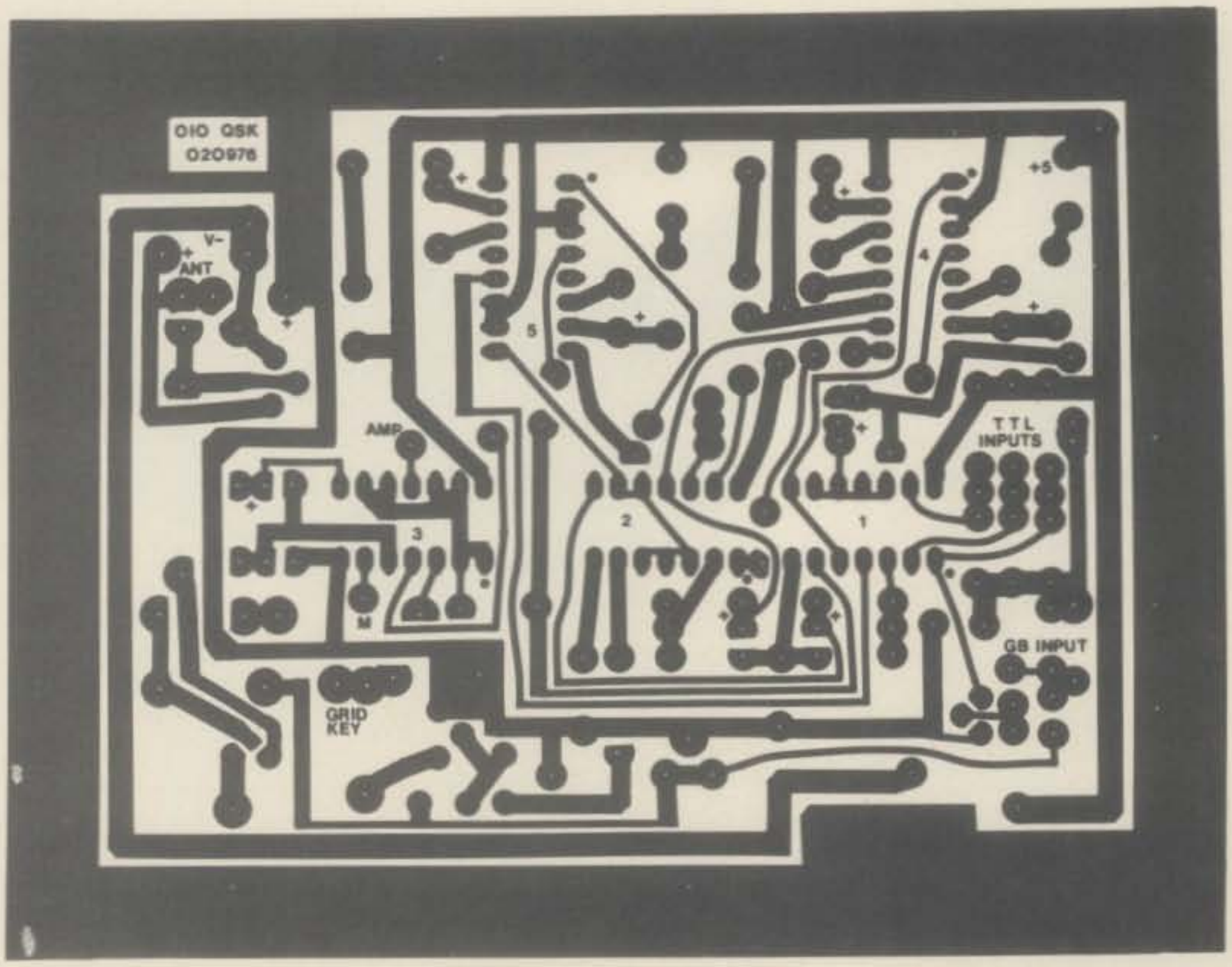


Fig. 7—Full size art for QSK pc. board.

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)

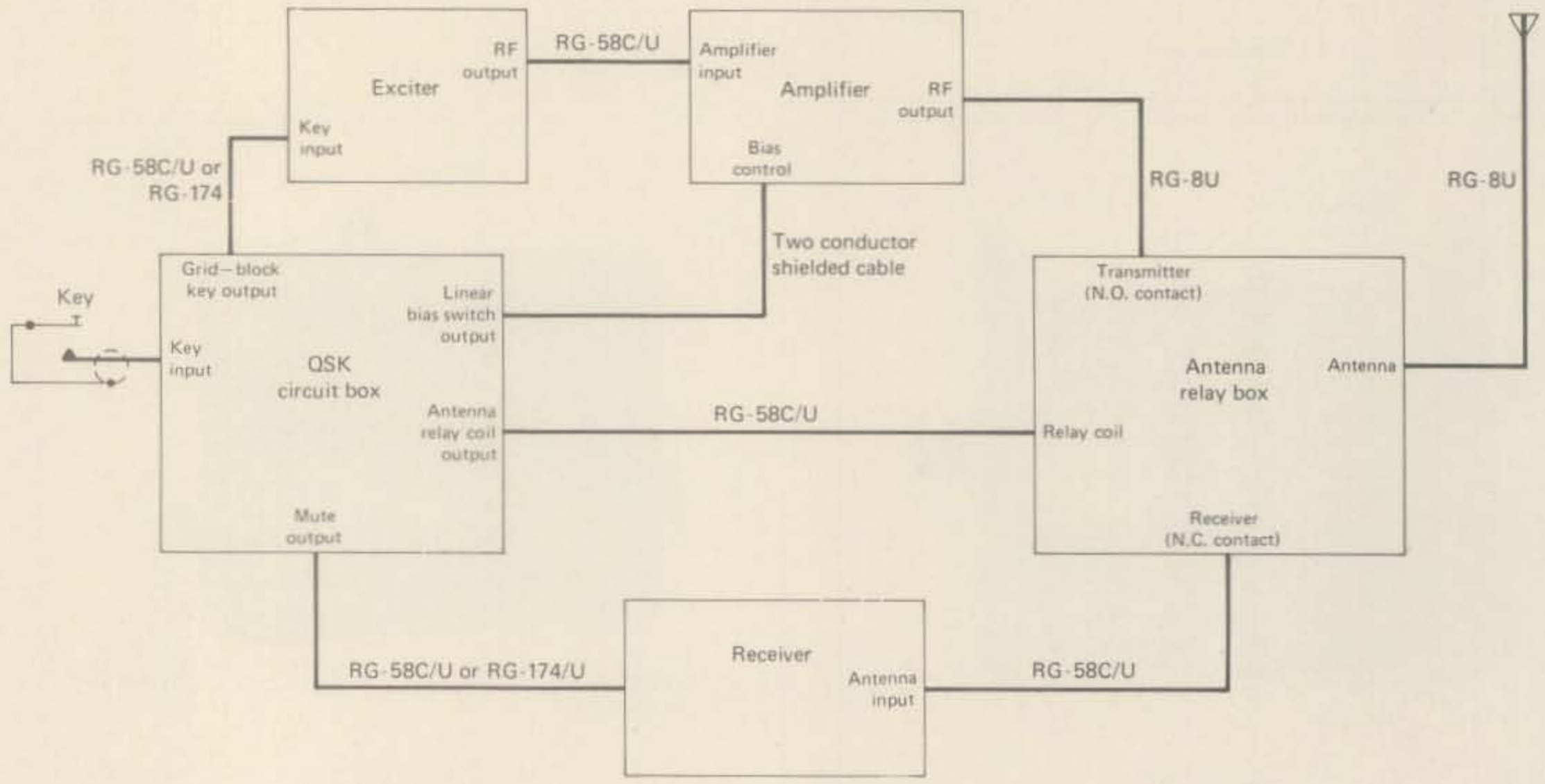


Fig. 8—QSK station interconnection design.

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.

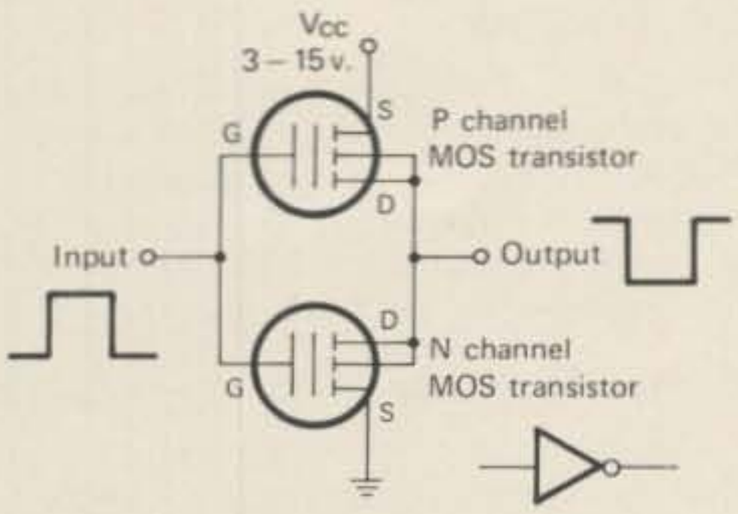


Fig. 1—The basic CMOS inverter discussed in the text.

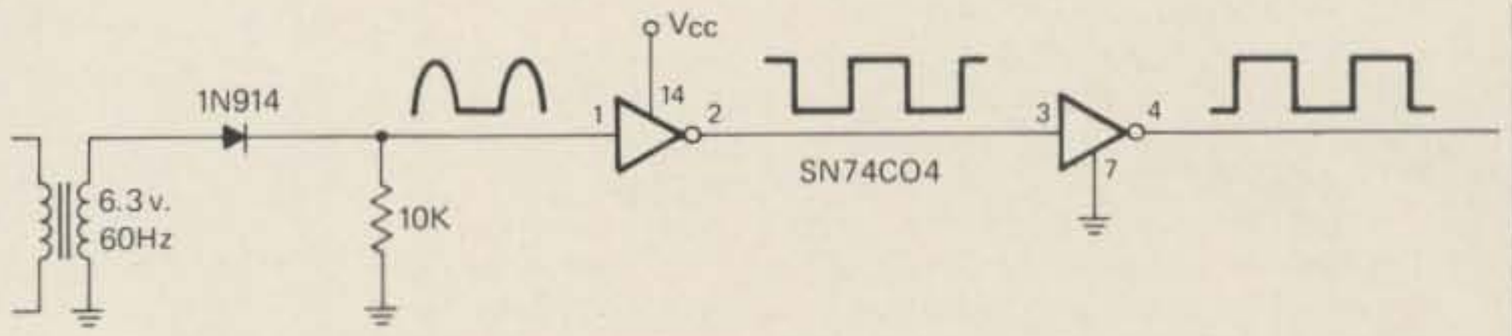


Fig. 2—A CMOS a.c. line synchronized trigger. The value of V_{cc} should be adjusted for best results with the amplifier of the 60 Hz input.

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.

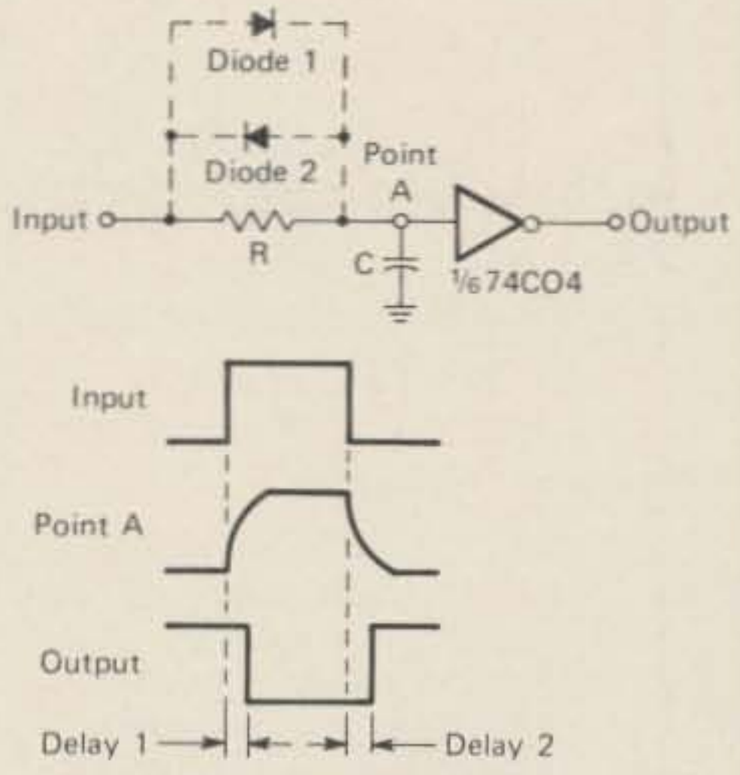


Fig. 3—Delay circuit. See text for operation of the two diodes.

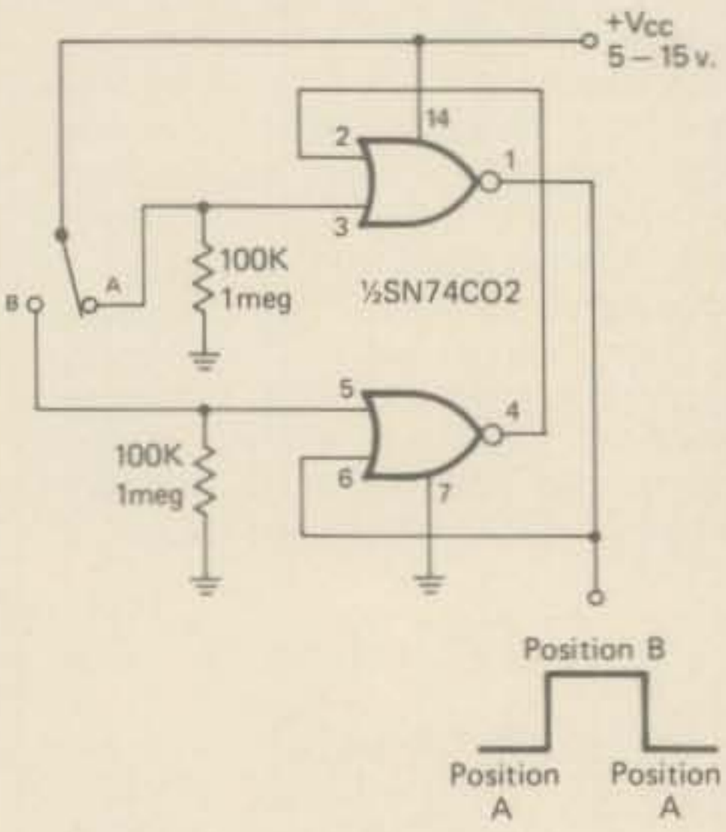


Fig. 4—A "Bounceless Switch", only the first bounce in each switch position affects the circuit.

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 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.

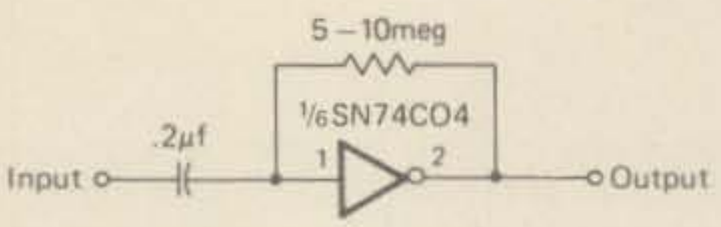


Fig. 5—A simple CMOS linear amplifier.

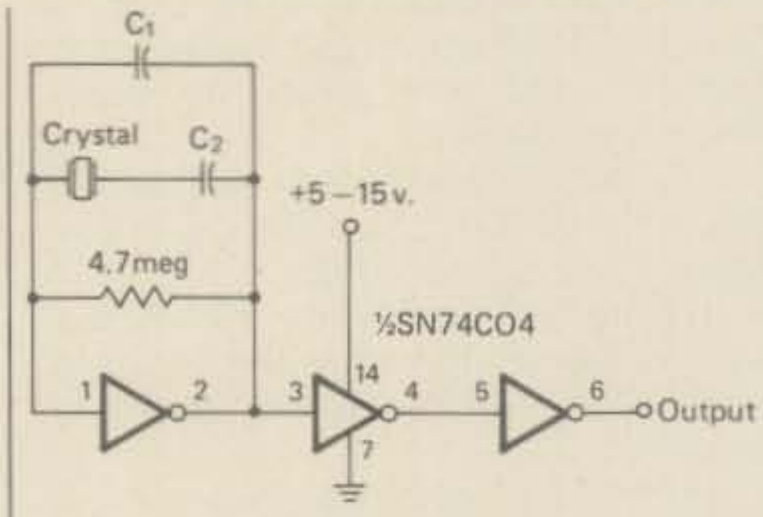


Fig. 6—The CMOS crystal oscillator decribed in the text.

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.

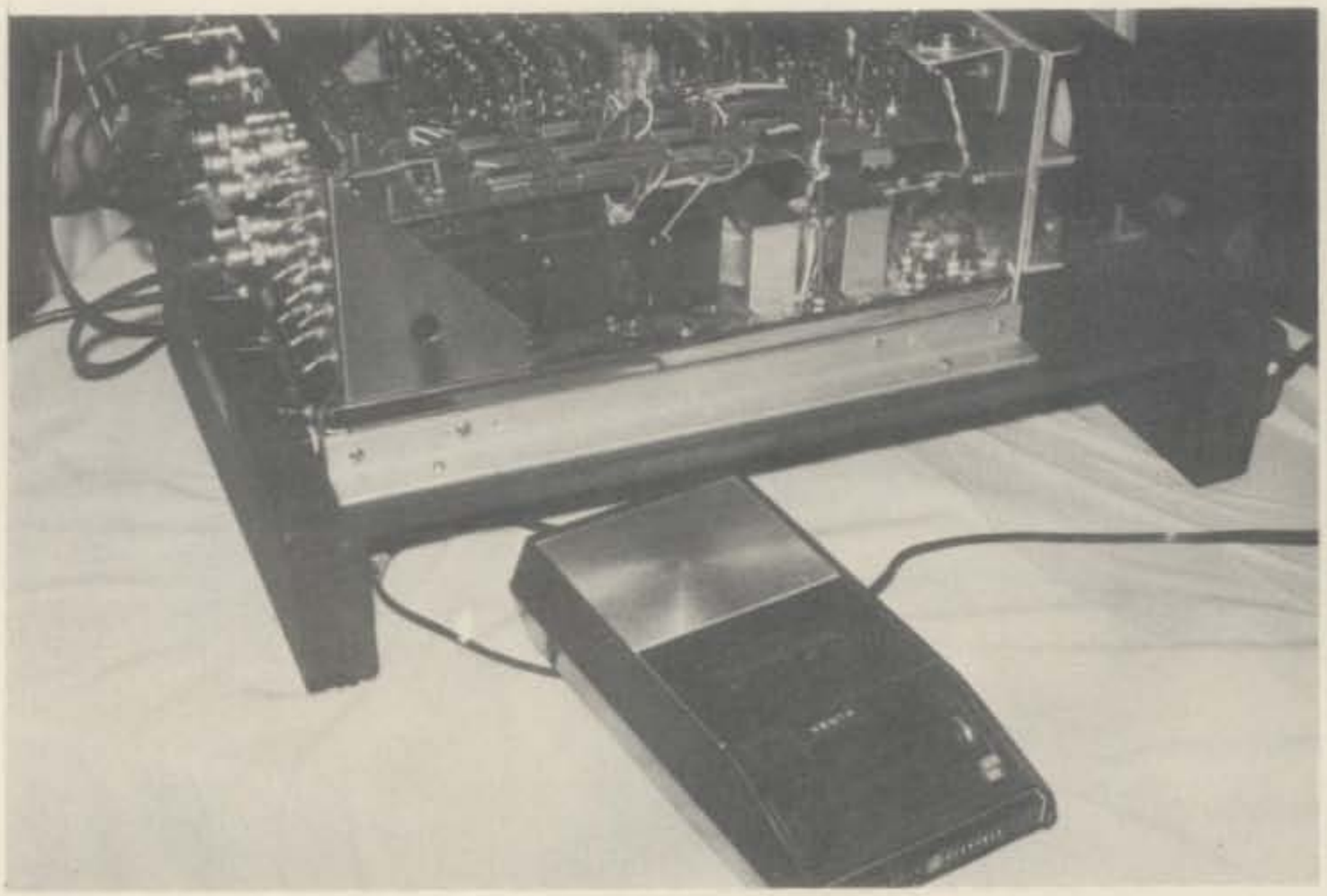
Hope, Faith And Better SSTV?

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?



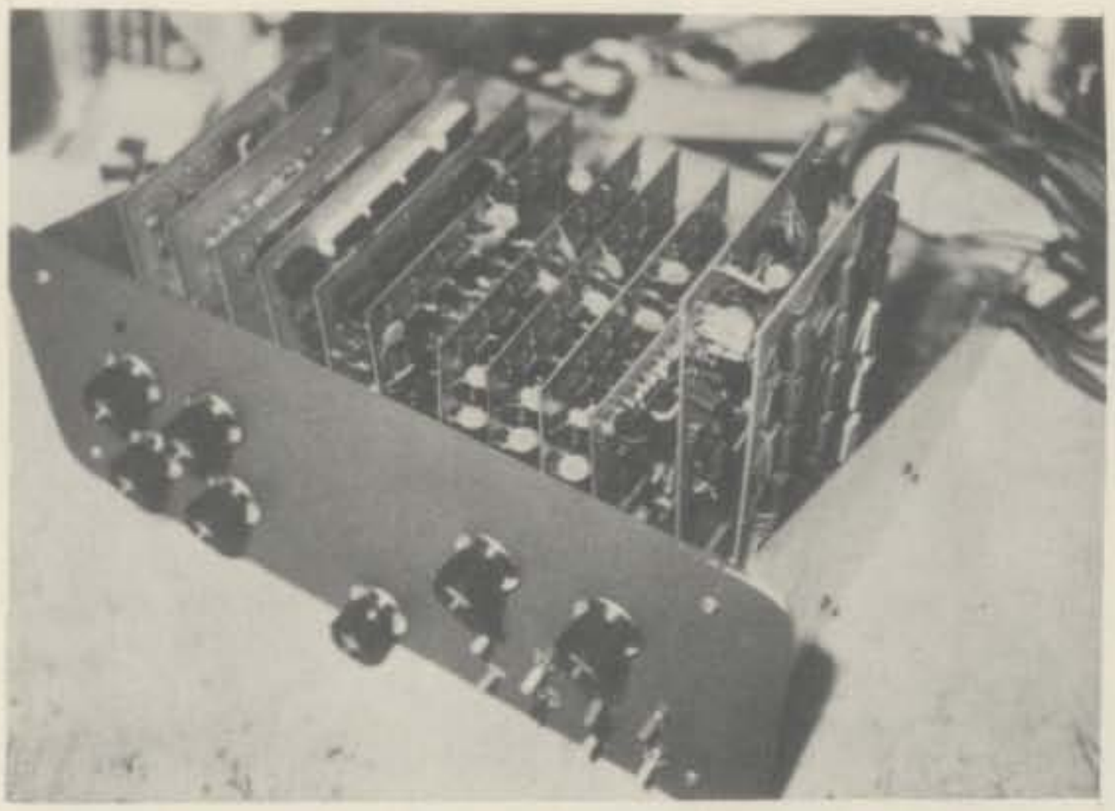
A closer look at W9NTP's color scan converter. Note the high density packaging!

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.

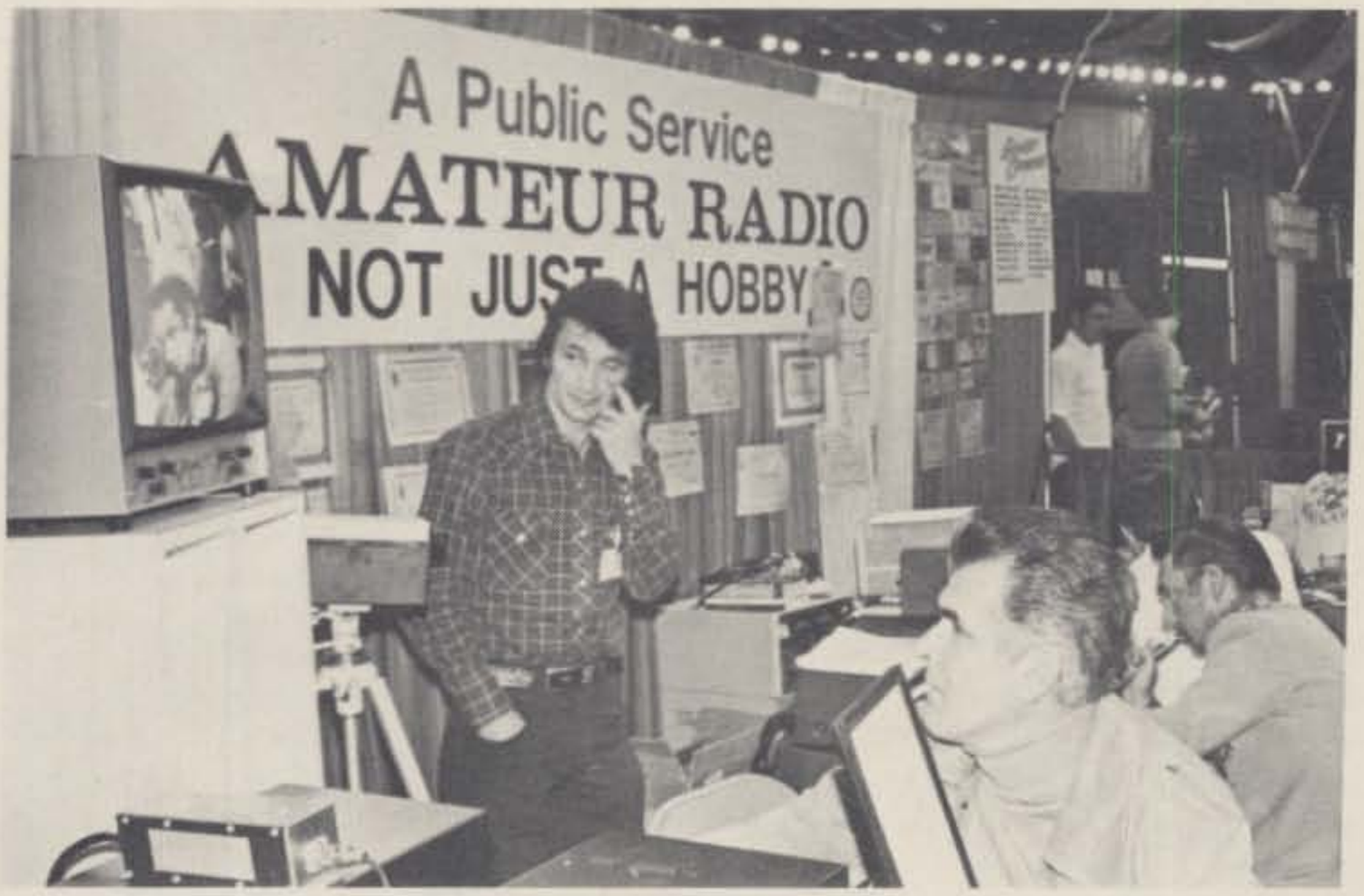
Here's a nifty P-7 monitor packaged in a transceiver-sized cabinet by Larry Pryor, WA9MFF. Larry has boards for this monitor (WØLMD design) available. Practically the perfect answer for anyone wanting to get started in slow scan.

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?

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.

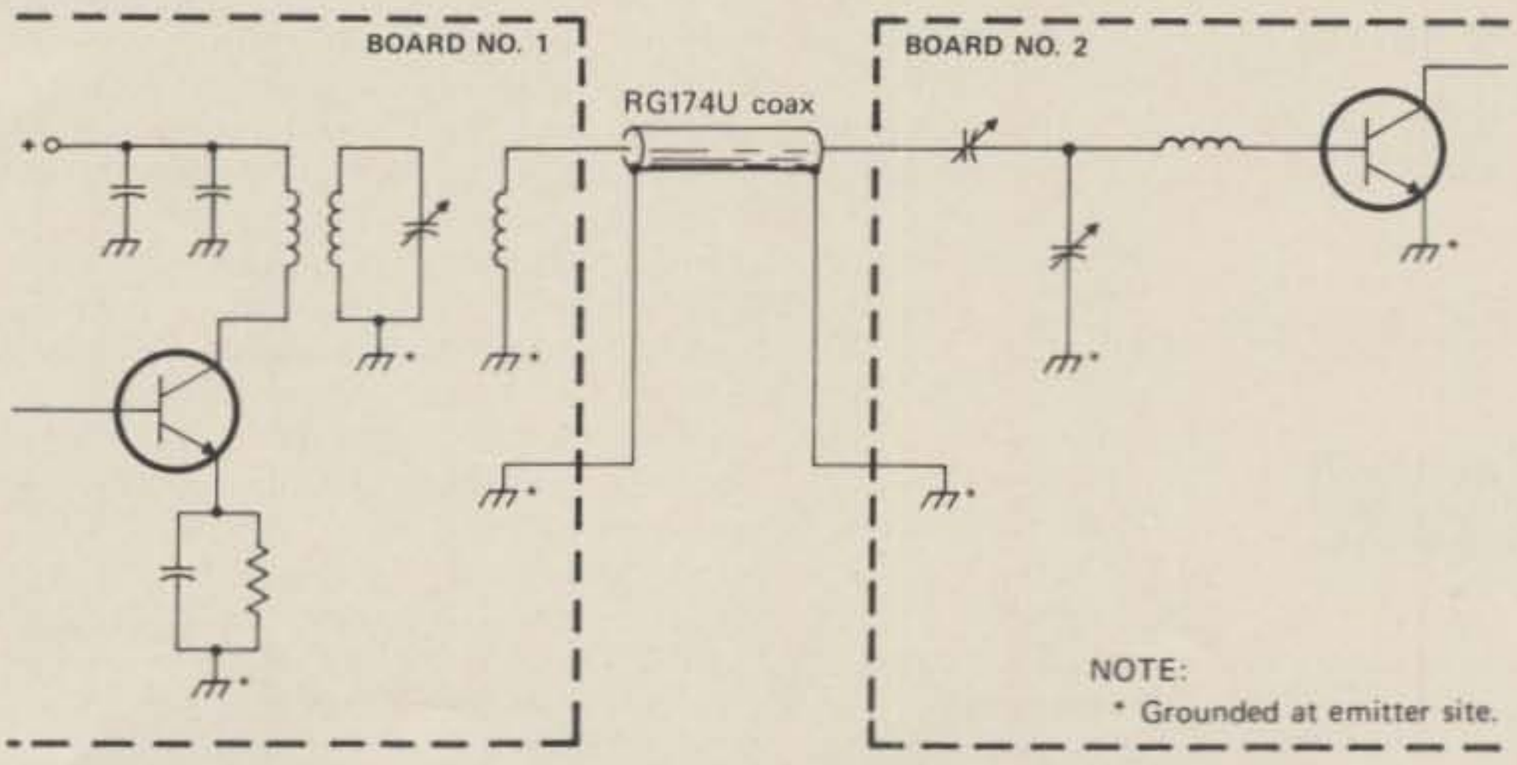


Fig. 1—Double-tuned interstage matching circuit used between amplifier stages which are on two different p.c. boards.

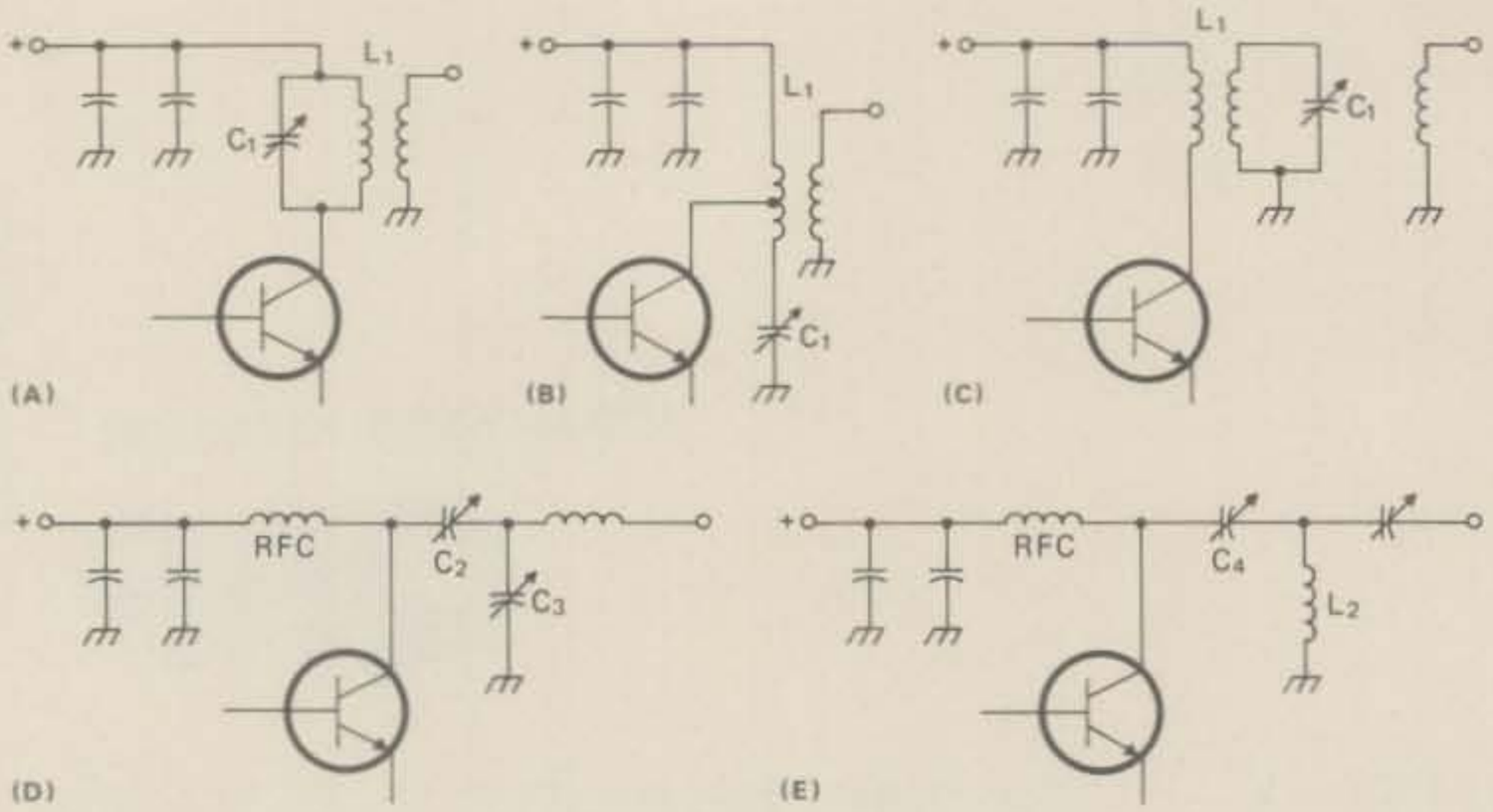
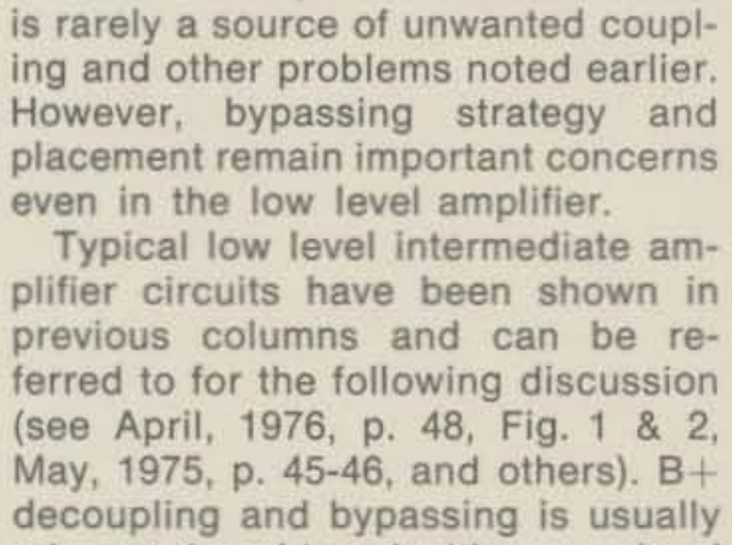


Fig. 2—Typical major r.f. loop circuits.

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. (20-100μh) 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.

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 (by-passed 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...YO6AGZ
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.

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
WA0UPL	167	WA0UPL	295	VE7JU	1098
2500		**1000**		W7ULA	1099
WA7GMX	206	WA6WCG	390	WA6WCG	1100
W2RPZ	207	WA7GMX	391	WA7GMX	1101
WA0UPL	208	W2IAM	392	WA0UPL	1102
2000		WA0UPL	393		
VE1AHG	246	WA3QNT	394		
WA7GMX	247				
WA0UPL	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.

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.

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 approximately 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

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) 10-14 (0-3) 14-18 (0-1) 18-22 (0-2) 22-08 (0-1)	08-10 (1) 10-14 (3) 14-18 (1-2) 18-22 (2-3) 22-08 (1)	08-10 (1-0) 10-14 (3-0) 14-18 (2-0) 18-22 (3-0) 22-08 (1-0)
15	*Nil*	08-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2) 10-14 (3) 14-18 (2) 18-20 (3) 20-22 (2) 22-00 (1-2) 00-08 (1)	08-10 (2-0) 10-14 (3-0) 14-16 (2-0) 16-18 (2-1) 18-20 (3-1) 20-21 (2-1) 21-00 (2-0) 00-08 (1-0)
20	10-00 (01)	00-07 (0-1) 07-10 (0-2) 10-16 (1-4) 16-21 (1-3) 21-00 (1-2)	21-00 (2-3) 07-10 (2) 10-16 (4) 16-19 (3) 19-21 (3-4) 00-07 (1-2)	21-23 (3-2) 07-10 (2) 10-16 (4-2) 16-19 (3) 21-23 (3-2) 23-00 (3-1) 00-05 (2-0) 05-07 (2-1)
40	08-12 (1-2) 12-16 (1-4) 16-20 (2-4) 20-23 (1-2) 23-08 (0-1)	08-10 (2-3) 10-12 (2) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-23 (2-4) 23-08 (1-3)	08-10 (3-1) 10-16 (2-0) 16-18 (3-1) 18-21 (4-3) 21-23 (4) 23-06 (3-4) 06-08 (3)	08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-21 (3-2) 21-06 (4) 06-08 (3-1)
80	07-12 (3-4) 12-17 (4-3) 17-22 (4) 22-05 (3-4) 5-07 (3)	08-10 (4-1) 10-12 (4-0) 12-17 (3-0) 17-19 (4-1) 19-21 (4-2) 21-23 (4-3) 23-05 (4) 05-07 (3) 07-08 (4-2)	08-10 (1-0) 10-17 (0) 17-19 (1-0) 19-21 (2-1) 21-23 (3-2) 23-05 (4) 05-07 (3) 07-08 (2-1)	08-19 (0) 19-21 (1-0) 21-23 (2-1) 23-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (3-0) 07-08 (1-0)
160	18-19 (1-0) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 09-10 (1-0) 09-10 (1-0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 08-09 (1) 08-09 (0-1)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0) 06-08 (2-1)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0)

ALASKA
Openings Given In GMT

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

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.

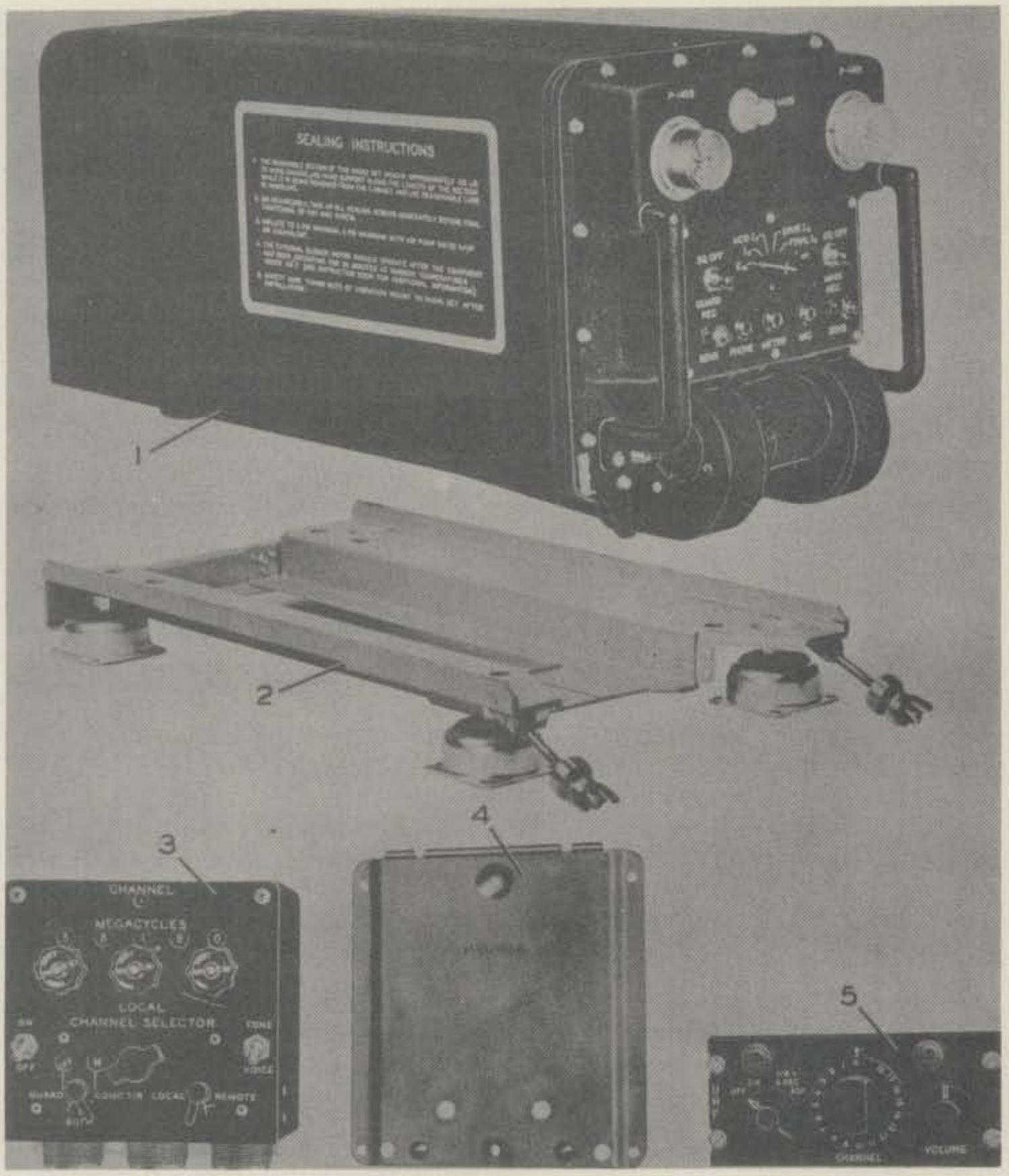


Fig. 1—The AN/ARC-27 transceiver. (1) is the receiver-transmitter RT-178/ARC-27, (2) mounting plate MT-882, (3) control box C-626, (4) mounting plate MT-821, (5) control box C-628.

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.

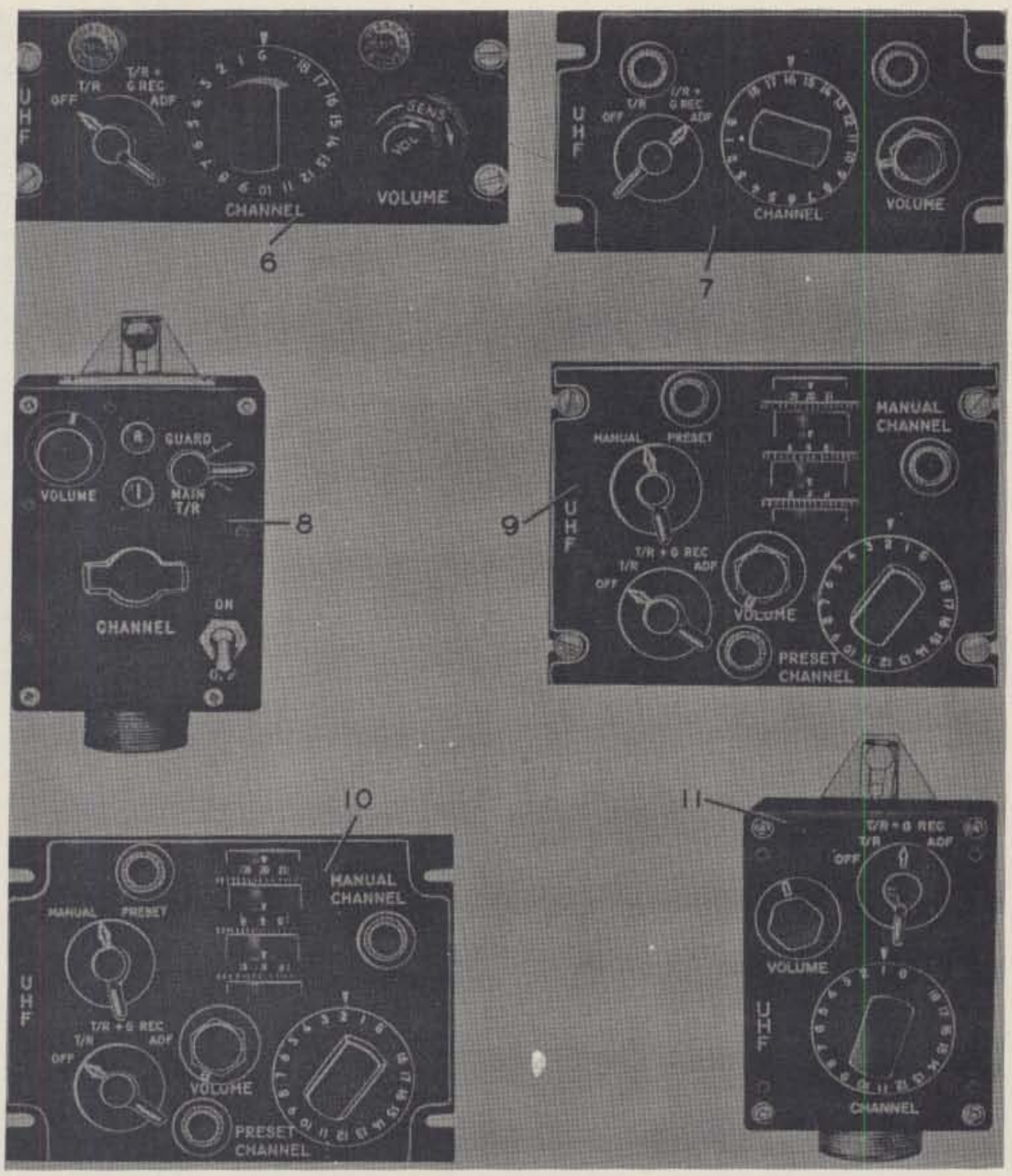


Fig. 2—Various control boxes for the AN/ARC-27. From 6 thru 11 they are; C-628A, C-868, C-627, C-905, C-906, C-911.

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. ■

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

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
WV8ITU—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
UK4FAA	"	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
UA3IBT	"	240	8	6	6
UA4AY	"	180	15	5	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	"	6,160	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
VK3APN	**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
OK3KXC	161,880	598	38	152
OK3RKA	124,405	470	47	132
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**
HA0KLE	**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
SP2KBA	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
YZ4EJC	268,061	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
UK3SAJ	"	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
W4QQN		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

Single-Op. All Band

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

Single-Op. Single Band

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	PA0HIP	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	3,474,000	OC4A	2,382,350
4M5ANT	2,813,925	PJ9JT	2,272,846

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
DL0KF	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

Single-Op. All Band

W3LPL	1,003,055	K6CQF	708,295
W6MAR	956,848	W3BGN	704,054
K3GJD	829,836	K6OVJ	702,800
W2GXD	829,062	W6ANN	682,158
W1ZM	724,815	W2DXL	663,762

Single-Op. Single Band

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	W4QQN	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:** DJZEH, DK7NM, DK6NN, DK9NU, DK9NV, DL4NY, DC2NJ. **DK7SU** & DK5SF, DK5SI, DJ3TU, DJ7PR, DF1SV. **DM2ATD** & DM3YQO. **DM3GM:** DM3KGM, DM3MGM. **EI1AA:** EI2BB, EI2CA, EI2CL, EI2CN, EI3CP, EI6CW. **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, HA0OGY, H0OO5, HA0HW. **HA6KUB:** Toth Janos, Szuromi Istvan, Pap Laszlo, Varro Peter, Kulcsar Zsuzsa. **HA0KHS:** Club. **HA6KVC:** Toth Arpad, Kiss Tibor, Szucs Istvan. **HA6KNH:** HA6NM, HA6OA, HA6OE, Kovacs Gabor, Horvath Dezso. **HA6KNB:** 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. **LZ2KKK:** Dimiter Gentcher, Dimo Mintchev, Jordan Dimov. **LZ2KNI:** Lubomir M. Hajlow, 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. **OK3RMW:** 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:** SPZGRT, 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, UB5MCI, 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, DK50S, 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:** JA2SWH, 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** & W5SCO. **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, 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.

UA0BBR, UA0FBZ, UA0IBB, UA0-JCA, UA0JCE, UK0CAW, UK0LAD, UV0BB, UA9AAB, UA9AJ, UA9C-AM, UA9CHT, UA9FCI, UA9FDW, UA9LBQ, UA9MK, UA9UAR, UK9-AAQ, UK9HAC, UK9LAA, UW9PT, UK1NAF, UK3XAB, YU4ELS.

(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. ■

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.

HAM SHOP

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SELLING my collection of old telegraph instruments of yesteryear. No list — Write your own Wants. 312-752-1000. Charlie Goodman, 5454 South Shore Dr. Chicago, IL 60615.

SELL: Sylvania All-Wave Receiver and Ant. Analyzer. Acts as Calib. Sig. Generator, VSWR, and Noise Figure, 500 KHz thru 50+ MHz, cost $3000, only $95. SASE for list shack cleanup. W4API, Box 4095, Arlington, VA 22204.

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.F.O., 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.

WANTED: Used QF-1 audio filter by Autek. Don Erickson, 6059 Essex St., Riverside, Ca. 92504. (714) 687-5910.

"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.

FREE CATALOG. LEDS, Strobe Lights, UARTS, Memories, RF transistors, Microphones, IC's Relays, Ultrasonic Devices, Precision Trimmer Capacitors, Digital Thermometers, Unique Components. Chaney's, Box 15431, Lakewood, Co. 80215.

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.

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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.

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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. Lisalus 116 Orton Rd., Caldwell, N.J. 07006.

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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.

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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 75SI 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.

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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, 0.1μf 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 0.1μf 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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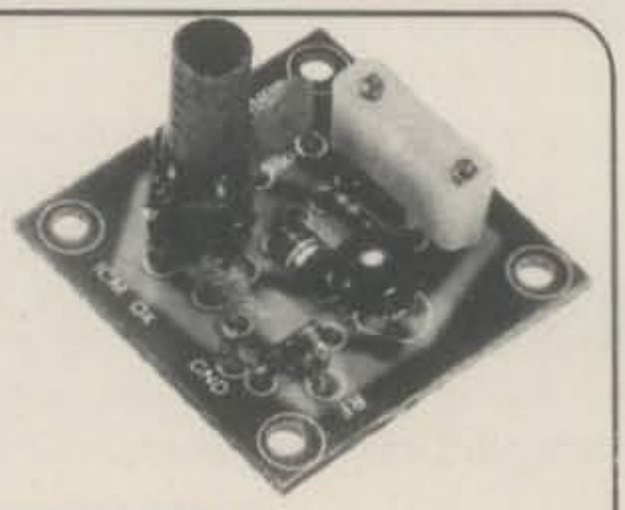

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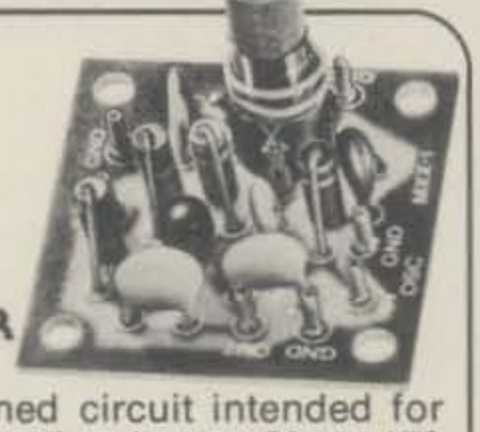

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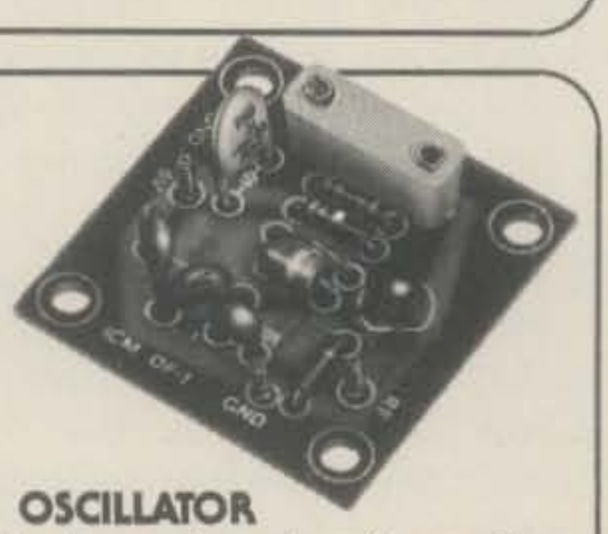

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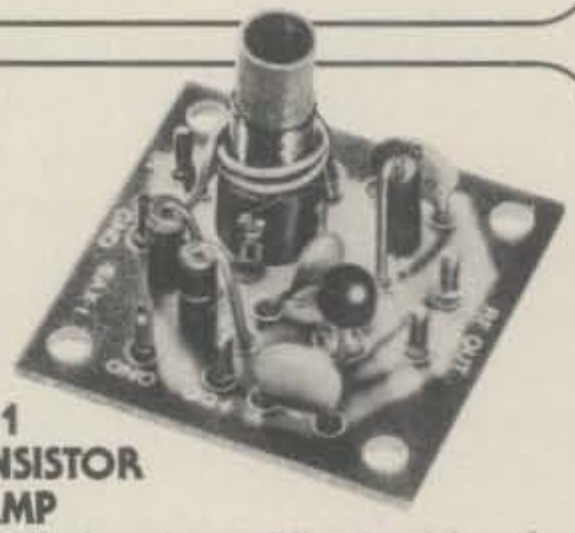

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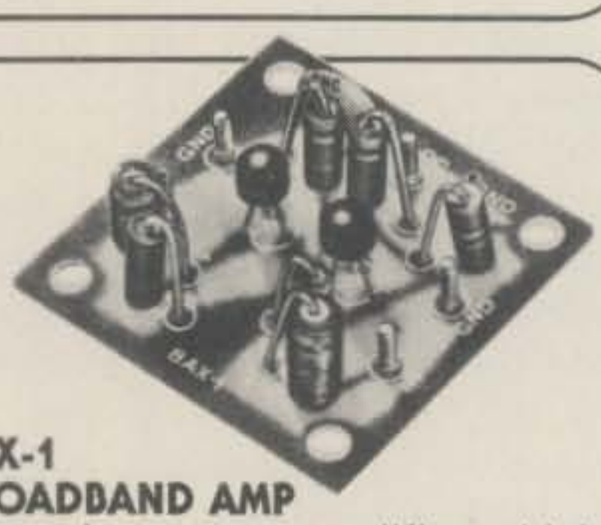

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The *Radio Handbook* features a deluxe amplifier using the 3-1000Z for HF service plus other HF or VHF designs built around the 3-500Z, 4CX1500B, 8877 and the 8874. The *ARRL Handbook* describes a multiband HF amplifier using the 8877, plus other designs featuring the 3-500Z, 8873, 4CX250B and 3CX100A5. And there's plenty of information about design and construction of transmitting equipment using EIMAC power tubes in both handbooks.

For tube information, contact Varian, EIMAC Division, 301 Industrial Way, San Carlos, California 94070. Or contact any of the more than 30 Varian Electron Device Group Sales Offices throughout the world.

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