CQ

August 1975
$1.00

CQ Reviews The Heathkit SB-104 Transceiver Kit

. . . . see page 28

The Radio Amateur's Journal

08240

Heathkit "104"...

...new performance standard for SSB transceivers

A revolutionary "new generation" transceiver. It's completely solid-state and totally broadbanded to eliminate preselector tuning. And the output can be instantly switched from 100 watts to 1 watt. The true digital readout offers resolution down to 100 Hz and outstanding tuning accuracy. Receiver intermodulation distortion has been minimized and there are very few active devices ahead of the highly selective crystal filter. Adjacent channel overload is negligible, yet sensitivity is better than 1 μV (.6 μV typical) and front-end overload is dramatically reduced. The "104" is 12 VDC-powered for mobility and the optional HP-1144 fixed station supply fits inside the SB-604 speaker cabinet. An optional noise blanker can be installed in the "104" and an optional 400 Hz crystal filter improves CW selectivity.

Kit SB-104, 31 lbs., mailable **669.95***
Kit SBA-104-3, 400 Hz CW crystal filter, 1 lb., mailable **36.95***
Kit SBA-104-1, Noise blanker, 1 lb., mailable **26.95***
Kit SBA-104-2, Mobile mount, 6 lbs., mailable **36.95***
Kit HP-1144, Fixed station power supply, 28 lbs., mailable **89.95***

SB-230 — the lowest-cost conduction-cooled linear around

The SB-104's "silent partner." 1200 watts PEP or 1000 watts CW from less than 100 watts drive. It's rated at 400 watts input for slow-scan TV and RTTY. The high-efficiency Eimac 8873 triode is double-shielded to reduce stray RF and a massive heat sink replaces noisy fans and blowers. The "230" assembles in just 15 to 20 hours with no alignment.

Kit SB-230, 40 lbs., mailable **319.95***

SB-634 station console combines 5 convenient accessories

The "634" performs 5 important functions—a 10-minute digital ID timer with visual or visual and audible indicators an RF wattmeter that reads 0-200-or 0-2000 watts with ±10% accuracy, an SWR bridge, a hybrid phone patch that can be used manually or with VOX control, and a 24-hour digital clock that runs independently of all other functions. It's a must for every well equipped station.

Kit SB-634, 14 lbs., mailable **179.95***

SB-614 station monitor shows you how clean your signal is

Highly visible 1½ x 2" CRT detects problems that can reduce the effectiveness of your signal — non-linearity, insufficient or excessive drive, poor carrier or sideband suppression, regeneration, parasitics and CW key clicks. It monitors SSB, CW and AM signals from 80 to 6 meters. Push-pull drive for keystone free trace; automatic sync sweep generator with 3 ranges from 10 Hz to 10 kHz. Can be used as an ordinary oscilloscope from 10 Hz to 50 kHz.

Kit SB-614, 17 lbs., mailable **139.95***

SB-644 remote VFO

Designed exclusively for the SB-104. It provides split transmit and receive control and you aren't frequency-limited in any way — transmit at one end of the band, receive at the other. The "644" even has two crystal positions for fixed-frequency control. The "644" has a linear dial, but the exact frequency is displayed on the "104's" digital readout. The display automatically changes when switching from transmit to receive.

Kit SB-644, 10 lbs., mailable **119.95***

SB-604 station speaker — response-tailored to SSB

Designed to match the SB-104 in styling and performance. The "604" uses a 5 x 7", 3.2-ohm speaker. And there's room inside for the HP-1144 power supply. With connector cable and plug.

Kit SB-604, 8 lbs., mailable **29.95***

New Heath Ham Accessories

New solid state Heathkit Electronic Keyer...49.95

Sending code's easy with the HD-1410 whether you're operating base or portable. The dot and dash paddles' travel and tension are easily adjustable. When the two paddles are treated as one, the HD-1410 operates like a single-paddle keyer with dot and dash memories. Iambic operation forms most characters with reduced wrist movement. Dots and dashes are self-completing and always in proper proportion. During construction, you select the speed range you want up to 35 words per minute or up to 60 words per minute. Operates on 120 VAC or 12 VDC. Adjustable sidetone frequency, built-in speaker, headphone jack, weighted base. Styled to match our famous "SB" line.

Kit HD-1410, 5 lbs., mailable **49.95***

HD-1410 SPECIFICATIONS — Keying Speed: Variable from under 10 to over 35 or from under 10 to over 60 wpm. **Keying Output, Positive Line to Ground:** max. voltage open circuit or spikes — 300 volts. Max. current — 200 mA. **Keying Output, Negative Line to Ground:** max. voltage open circuit or spikes — 200 volts. Max. current — 10 mA. **Audio:** internal speaker or jack for optional hi-Z (at least 500 ohms) headphones. **Sidetone:** adjustable from 500 to 1000 Hz. **Internal Controls:** sidetone frequency, paddle tension, paddle travel. **Rear Panel Connections:** AC power cord, 12-volt power input, keyer out, headphones, receiver audio in, ext. key. **Temperature Range:** 0°C to +40°C (typ. −10°C to +40°C) or approx. 50°F to 105°F. **Power Requirement:** 120/240 VAC (±10%), 60/50 Hz, 3.5 watts or 10-14.5 VDC, negative ground, 150 mA. **Dimensions:** approx. 3″ H x 5″ W x 7½″ D. **Net Weight:** 3 lbs.

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The Radio Amateur's Journal

FEATURES

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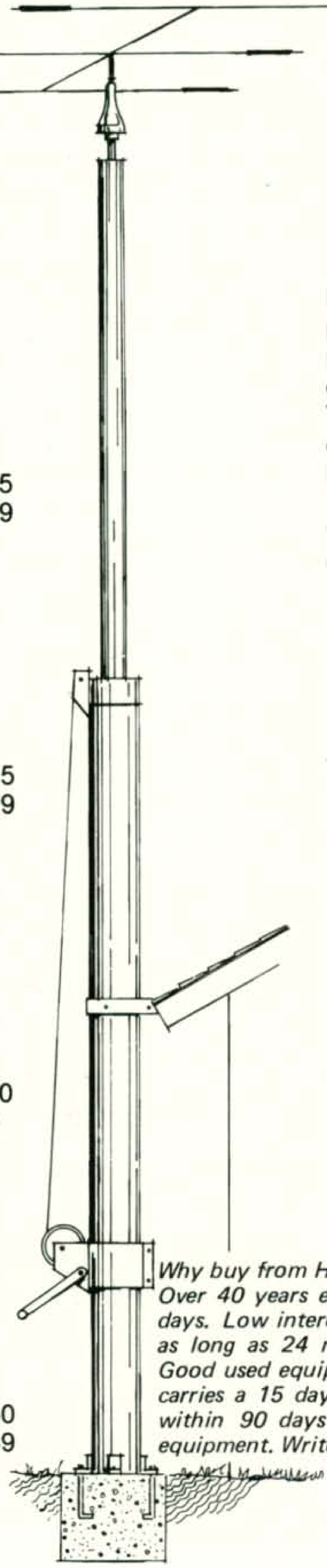

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ZERO BIAS

Amateur radio needs all the friends it can muster from outside its own ranks. A recent editorial by Mr. Mili, Secretary-General of the International Telecommunication Union, seems to us to be in the right direction.

In a signed editorial appearing in the June, 1975 issue of the influential *Telecommunication Journal*, under the title "Fifty Years of International Co-operation and Human Brotherhood," the Secretary-General paid tribute to the International Amateur Radio Union of Region 1 (Europe and Africa) on its 50th anniversary. The Journal is the official organ of the ITU and is distributed to the 144 member countries and to telecommunication officials and organizations throughout the world. While Mr. Mili is not a radio amateur, we feel that his words are "right on," and that they carry special importance coming from such a distinguished figure.

The following are major excerpts from Mr. Mili's editorial.

I am glad to seize this opportunity of paying tribute and offering my best wishes to the International Amateur Radio Union and the national amateur radio societies of France, Poland and Sweden which also are celebrating their fiftieth anniversaries this year.

It is hardly necessary to emphasize the very special place which the amateur service enjoys in the general body of radio services recognized by the ITU or to recall that it is one of the oldest radio services since the very beginnings of radio.

The amateur service is defined in the Radio Regulations as "a service of self-training, intercommunication and technical investigations carried on by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest."

This service is, hence, recognized as having two lofty missions:

First, to instruct, that is to say to take part in the training of those who, in any capacity, bear responsibility for the operattion of radio services.

Second, to engage in disinterested research in order to deepen our knowledge of such matters as the mechanisms of wave propagation.

It is therefore with the greatest satisfaction that we acknowledge the fact—and a most important fact—that radio amateurs have followed very closely the various developments brought about by the use of ever higher frequencies or by new techniques. such as space communications. Several thousand amateur radio enthusiasts have already make use of satellites (in particular, Oscar-6 and Oscar-7) and their observations will undoubtedly help to enhance our knowledge of the phenomena involved.

I will mention briefly, since it is well know (I would even say it is perhaps the aspect best known to the general public), the part played by radio amateurs in emergency communications, especially in the event of natural disasters or catastrophes; the use of high frequencies in this sphere is so much a matter of common knowledge that there is no need to dwell upon it.

But the role of amateurs in technical training seems to be little known for all its great importance. As everyone is aware, the ITU is engaged on a vast programme of tech-co-operation to aid developing countries to expand their telecommunications. In this programme training plays a predominant role. There is no doubt that the development of amateur radio networks in the countries concerned makes a substantial contribution to the execution of this immense task and a contribution, moreover, that costs governments so little.

All this certainly explains the importance of the amateur service in the life of our Union, which, as I imagine all radio amateurs know, has a radio station in the headquarters build-

ing where the International Amateur Radio Club meets.[1]

Also, I have decided that during the world telecommunication exhibition, TELECOM 75, to be held at Geneva from 2 to 8 October 1975, radio amateurs shall be given an opportunity of taking an active part in this world event.

Radio amateurs all over the world are invited to participate in one way or another in this event and I earnestly hope to be able to welcome them in large numbers.

The 4 and 5 October, during the exhibition, will be specially set aside for a worldwide gathering of radio amateurs.

I would not like to conclude this brief list of the activities carried out at ITU headquarters in connection with amateur radio without mentioning that many ITU staff members and a large number of delegates to our Conferences are radio amateurs too.

I have noted with pleasure, when looking through the technical reviews of amateur radio societies, that they have already embarked upon active preparations for the World Administrative Radio Conference to be held in 1979. I feel that we cannot begin too early to give serious thought to the problems which the amateur service, as indeed all radio services, will have to face at that Conference.

This Administrative Conference will be a particularly important one, since it will be the first since 1959 to deal with the radio frequency spectrum as a whole. All the Administrative Radio Conferences since that date have had a limited agenda relating specifically either to space radiocommunications, the aeronautical mobile service, the maritime mobile service or broadcasting.

It will readily be understood that it is impossible to make the slightest forecast as to the way this conference will go. One thing is pretty sure however, namely, that the problems it has to face will be highly complex. It would therefore not be amiss for me to emphasize the care that should be taken to present to national administrations any wish or requirements radio amateurs have to formulate in the most convincing manner possible.

Nobody can tell what will happen: the very most I can say is that more often than not when people describe good regulations or a table or frequency allocations as "good" they mean that the degree of dissatisfaction is roughly the same for the users of all the different services. I trust this will be true of the Final Acts of the 1979 Conference.

But I am convinced that the half-century that has gone by has amply demonstrated the importance of the part played by radio amateurs and that once again they will have the sympathy of the Conference on their side.

I sincerely hope so.

M. Mili

[1]Secretary-General is referring to amateur radio station 4UlITU. The International Amateur Radio Club, which operates the station, has recently undertaken a new worldwide membership drive. For further information write directly to the IRAC, P.O. Box 6, 1211 Geneva, Switzerland.

Announcements

● **Seattle Washington** - The Western Washington DX Club is having the 23rd Annual Northwest DX convention on August 2nd and 3rd. It will be at the Double tree Inn, just south of Seattle and adjacent to Southcenter. For further information contact John Gohndrone, W9IRH/7, 14041 - 159th N.E. Woodinville, WA 98072 (phone) 206 345-7026
● **Oklahoma City, Oklahoma** - The Oklahoma Ham Holiday and State ARRL Convention will be held Saturday and Sunday, August 2 and 3 in Oklahoma City. The program will include a Flea Market, special programs, technical seminars, equipment displays, and MARS meetings. For information and advance registration contact: Oklahoma Ham Holiday, P.O. Box 10567, Oklahoma City, OK 73120
● **Winchester, Virginia** - The Shenandoah Valley Amateur Radio Club will hold its 25th Annual "Hamfest" on August 2 and 3. We will have exhibits for which we will provide space, and manpower to set up displays, at no charge. For more information write to Carl S. Horner, Siler Route, Box 154, Winchester, VA 22601. All PARCELS should be sent to SVARC, 34 West Hart Street, Winchester, VA.
● **Indiana Pennsylvania** - Fisher Scientific Co. and Subsidiaries is attempting to compile a roster of Ham's that are employed by them. Please list your handle, call branch, position held and home address and send it to Fred Shetler, K3VMS at the Instrument Manufacturing Division, Indiana, PA 15701
● **Philadelphia, Pennsylvania** - The Mt. Airy V.H.F. Radio Club, Inc., will hold their Annual Family Day & and Picnic on August 10 at the Fort Washington State Park in Flourtown PA. A big feature of this gathering is the drawing of the door prizes. For more information contact Richard Boyle at 7915 Bayard St. Philadelphia, PA 19150. ● **Carbondale Illinois** - The Shawnee Amateur Radio Assocaition is having their 19th annual hamfest on August 10. It will be in the city Park in De Soto. Contact Don J. Norwood, W9NDF, Rt. 7, Striegel Rd., Carbondale. Il. 62901 for further information. ● **Tacoma, Washington** - The Radio Club of Tacoma presents HAMFAIR-75, August 16th & 17th at the Pierce County Fairgrounds. There will technical seminars, activities, contests, flea market, and swap shop. Contact Bill Morgan, W7GPR, 3421 E. 138th St Tacoma, Washington 98446, for registration. ● **Sedalia, Missouri** - The Warrensburg Amateur Radio Club and the Central Missouri Amateur Radio Club are sponsoring an amateur radio station at the Missouri State Fair, August 15-24. Further information can be obtained by contacting Paul Kemp, WBØCJB,

810 Manor Court, Sedia, MO 65301. • **West Caldwell, N.J.** - The 550 Club Oakland Reperter Assoc. is having their annual Amateur Radio Family PIK-NIK on August 23-24 at Harmony Ridge Camp ground, Branchville, N.J. There will be numerous activities. Write to Bill Buetell, WA2RIU, 50 Fairfield Ave., West Caldwell, N.J. 07006 for more information. • **Laporte, Indiana** - The LaPorte County Amateur Hamfest will be held August 24 at the County Fairgrounds in LaPorte, Indiana, Cold drinks and food will be available. Advanced tickets are $1 and at the gate $1.50. Contact Dave Nicolaus WB9AOU, RR7, Box 275, Valparaiso, Indiana, 46383. • **Springfield, Missouri** - The Southwest Missouri Amateur Radio Club will hold its annual Hamfest, swap meet, and family picnic on August 24 at Lake Springfield Park. For further information contact Joe Hargis, WBØCLW, 3228 N. Wildan, Springfield. Missouri 65803.

• **Cascade, Iowa** - The Iowa 75 Meter Picnic will be August 24 at Riverview Park in Marshalltown. Cofand soft drinks are furnished. There's no registration fee. For information contact Mary Keener, WAØDAG c/o Iowa 75 Meter Net, R. R. 2, Cascade, Iowa 52033. • **San Francisco, California** - The Northern California DXers quarterly gabfest is on Labor Day Weekend at the El Rancho Inn, Millbrae, Calif. There is $1 registration at the door. There will be emphasis on SWL DXing, technical session, displays, etc. For more information contact Norcal, Rick Heald, 17412 Rolando Ave. Castro Valley Ca 94546 • **Newbrunswick, Canada** - The Atlantic Canada Amateur Radio convention will be held on August 29th - September 1st at the Hotel Beausejour, Moncton, Newbrunswick, Can. There will be delegates from Canada and the U.S. Booths can be obtained for exhibits. For further information contact Ron J. Hesler, VE1SH, P.O. Box 115 Moncton, Newbrunswick, Can. • **Mena, Arkansas** - The Queen Wilhelmina Hamfest '75 is Sat. and Sun. September 6 & 7 at Queen Wilhelmina State Park, Rich Mountain, Mena Arkansas. There will be food, door prizes and displays. For information write WB5GZR. • **Malaga, New Jersey** - The 27th annual South Jersey Radio Association hamfest will held on Sunday, September 7 at the Molia Farms Picnic Grounds, Malaga, New Jersey. Advance registration is $2.50 and at the gate. $3.50. For information or tickets write to Bill Brandberg, W2BBN, 322 Lakeview Ave. Haddonfield, New Jersey 08033. • **Whitestone, N.Y.** The Tu-Boro Radio Club will sponsor a Two Meter RTTY Contest on Sunday, September 7, From 6am to Midnight, local time. All inquiries. logs and applications for the Certificate will be accepted by the Club until October 1st Tu-Boro Radio Club, 149-14 14th Ave. Whitestone, NY 11357. • **Melbourne, FL** PCARs 10th annual Hamfest at Melbourne Auditorium on Sat. & Sun. September 6 & 7 9am-5pm in Melbourned, Florida. There will be prizes exhibits, etc. For information contact John P. Weber, Jr K4JW, 102 Southgate Blvd, Melbourne, Fl. 32901 • **Los Angeles California** - The Southern Counties Amateur teleprinter Society is announcing the form ation of a group of interested amateurs in the southern Ca area to promulgate the useage of RTTY on both HF and VHF bands. We want to stimulate interest in this mode of communcation, assist others inlocation, and availabilty of equimpment. Interested individuals should contact Mr. A (Frank) Incersen WA2ZCQ, 1312 Micheltorena Street, Los Angeles, CA 90026, Phone 213 663-1581 - after six.

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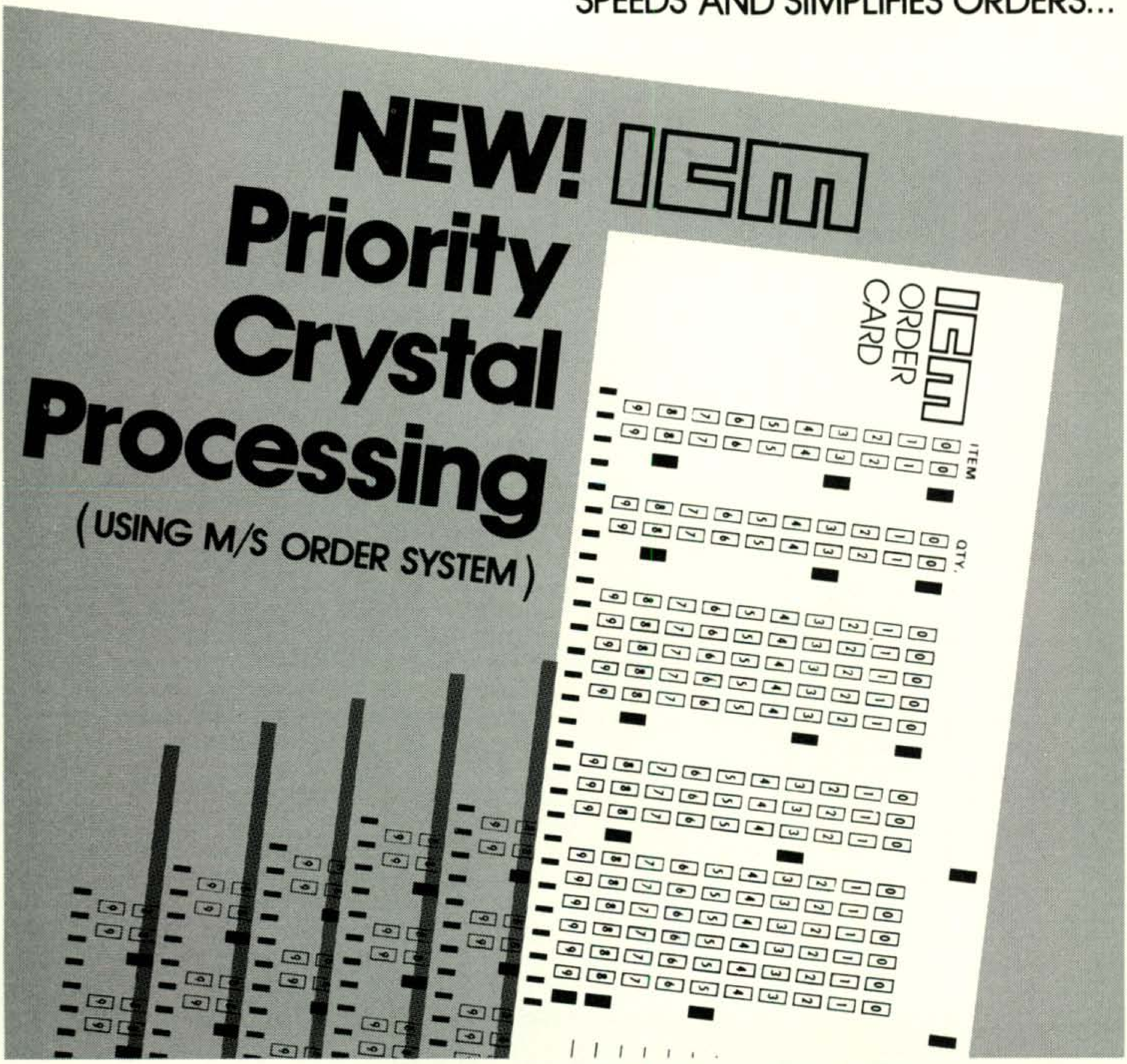

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How To Get Up With The Big Boys
Upgrading Inexpensive Counters

BY HARVEY S. LAIDMAN,* W6MFK

THE frequency, period or event counter is one of the great products of the digital era. It is an invaluable tool for radio work. Watching one of them operate is, basically, akin to the thrill felt by flinging radio signals great distances. We're all Boy Scouts at heart after all.

By selling off an ARC-5 receiver or two, scratching around a bit, filching the quarters from the laundromat money — eventually enough money is set aside to buy an inexpensive counter.

After several months of use, a look inside the machine, several readings of the manual, perusal of the few paragraphs in the *Handbook* on digital logic, you've concluded, as I have, that a counter isn't all that complex.

Maybe you sit and stare at that digit-eyed box and wonder (the initial novelty having worn off), if it couldn't be just a bit easier to read, more accurate, more flexible to use.

Thanks to some excellent engineering and design work by experimenters and manufacturers (see references), modifications can be made cheaply and easily to that inexpensive counter that will stand it right up there with the big boys.

My counter is the Yaesu YC-355D. I will describe my modifications as they apply to that counter, but all TTL counters are basically the same, (fig. 1) so you could easily add them to yours.

My Yaesu counter, out of the carton, had the following specifications:

FREQUENCY RANGE AND INPUT VOLTAGE: 5Hz-200 MHz, 20mv-20v. (Mine did better than that: 100mv average, 5Hz-300MHz. ACCURACY: *Best case* ±.0005%; *Worst case* ±.0025% plus one count. (Mine was so far off, it may have been just inside that .0025% specification. Even a new crystal from Yaesu didn't help.)

GATE TIME: .001 sec., 1 sec.

NUMBER AND TYPE OF DIGITS: 5, neon.

TIME BASE CRYSTAL: 1 MHz.

My Yaesu counter after modification carries the following improved specifications:

FREQUENCY RANGE AND INPUT VOLTAGE: Same.

ACCURACY: One part in 10^{-7} plus one count. Maintains this accuracy if checked against WWV every few months.

GATE TIME: Selectable—.001 sec., .1 sec., 1 sec., 10 sec.

NUMBER AND TYPE OF DIGITS: 8 seven-segment LED's with leading zero suppression.

TIME BASE CRYSTAL: 4 MHz high accuracy type in temperature-compensated oscillator circuit.

Total cost of modifications: under $75.00.

*11740 Wilshire Blvd., West Los Angeles, CA. 90025.

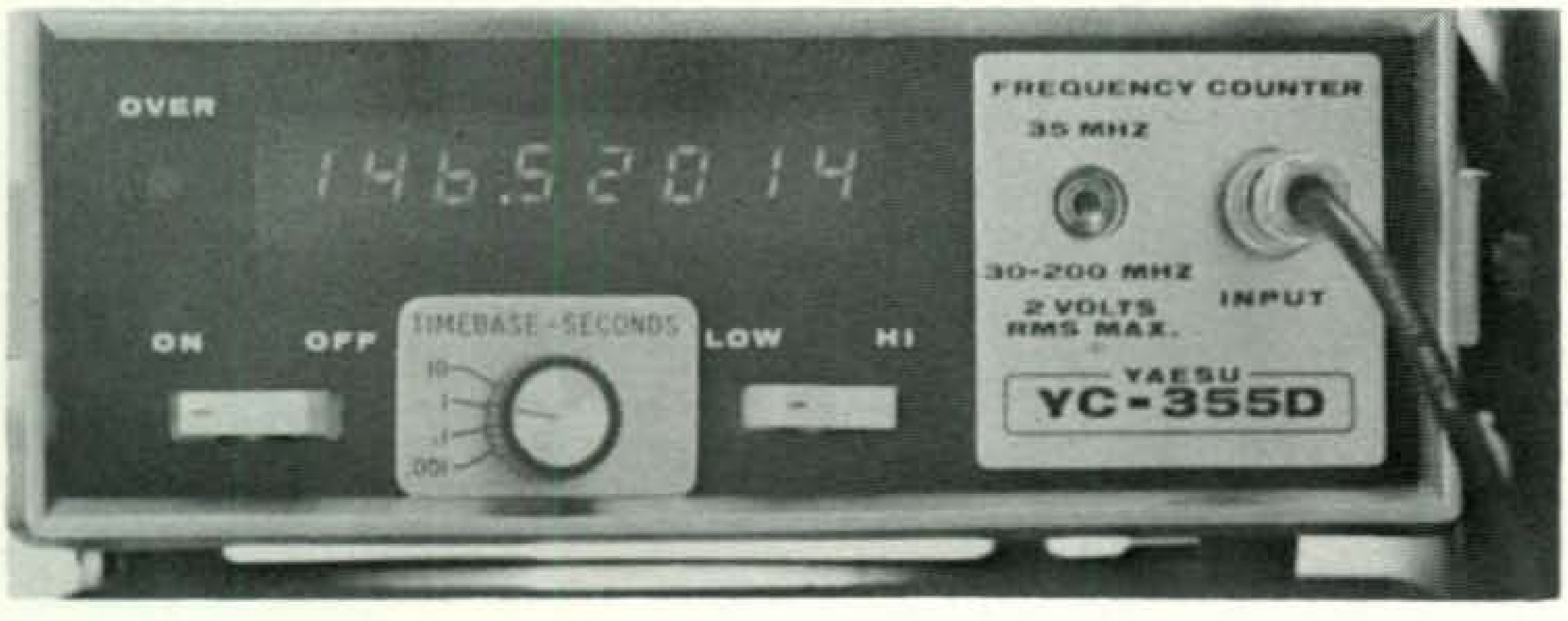
Time Base

This is by far the most important part of your counter. It's accuracy is directly related to the accuracy of your reading.

In the most expensive counters, you can expect time base accuracies (short term) in parts to 10^{-9} or 10^{-10}. These time bases are also most stable over a wide range of temperatures and voltags. Good quality counters have time base accuracies of parts to 10^{-7}. (One part in 10^{-7} puts you within 15 Hz at 150 MHz.)

The plus-minus .0005% best-case specification could put you somewhere around 3 kHz off at 150 MHz, and the worst case specification puts you at an out-of-the-ballpark figure of 15 kHz off!

The Yaesu counter uses a one MHz crystal in its time base oscillator, and the crystal manufacturers will tell you that they can't supply 1 MHz all that accurately. Above 3 MHz, however, you can get crystals in .0005% toler-



Front view of modified counter. The new switch labeled "Timebase-Seconds" could be more accurately called "Gate Time-Seconds." Switch is in the 1 second position allowing 146.52014 MHz to be read with resolution to 10 Hz.

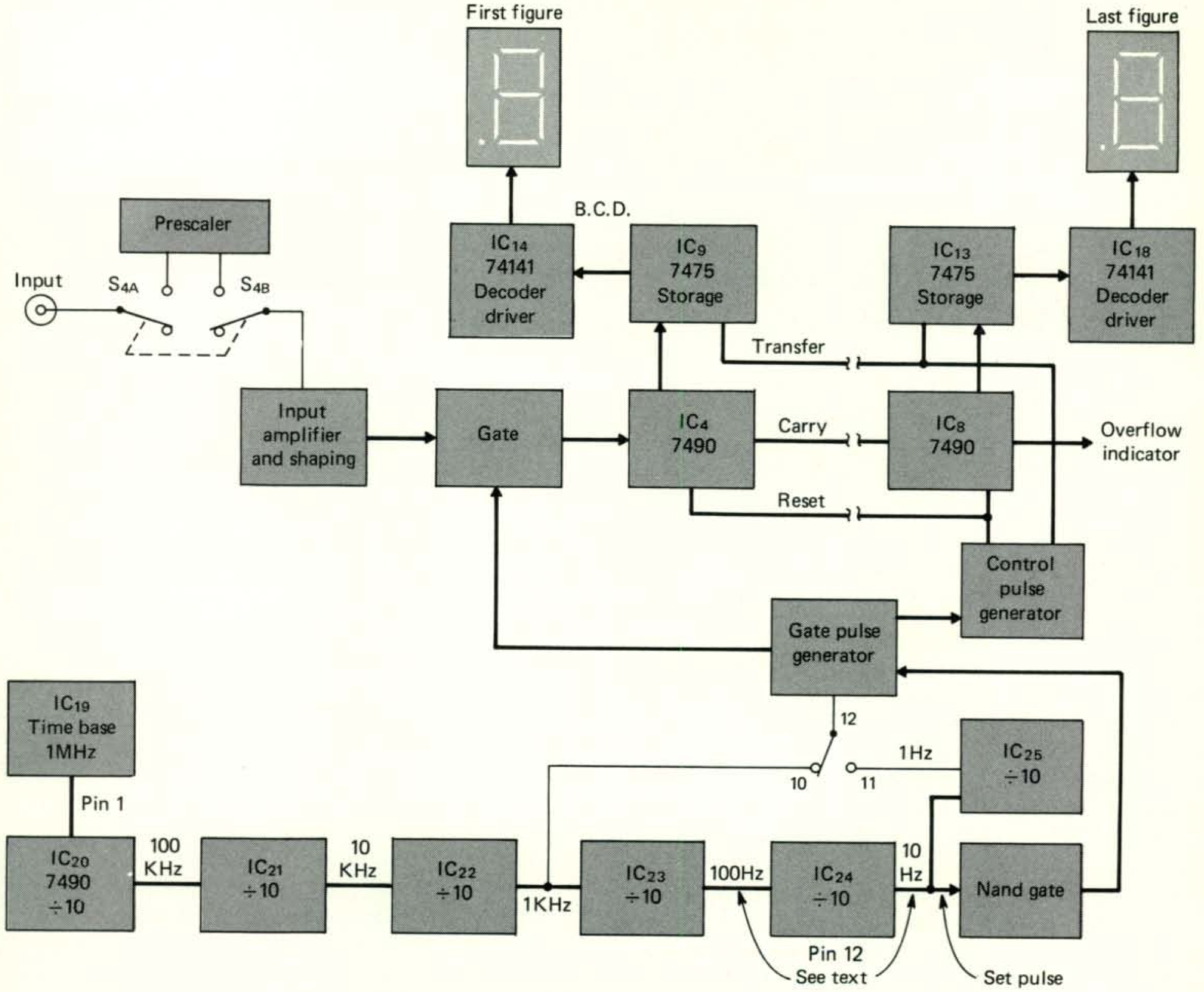


Fig. 1—Simplified block diagram of the Yaesu YC-355D counter. Most inexpensive counters are quite similar in circuit and lend themselves to the modifications described here.

ance —10 to plus 60 degrees Centigrade. By dividing down to 1 MHz, and by careful temperature compensation, you can achieve even greater accuracy.

Removing the crystal and the giant padder in the Yaesu will (obviously) disable the internal time base. I used a drill bit to neatly break the foil on the circuit board where required. See fig. 1. The new time base is run directly into pin 1 of IC_{20}, which is the first divide-by-ten 7490 of the time-base divider chain. The oscillator, fig. 2, designed by Bert Kelley K4EEU[3], fits neatly in the corner of the chassis as shown in the photos. It is carefully temperature compensated by replacing the crystal-series capacitors with NPO, N750, N220, N1500 types, always adding up to thirty pf, until the oscillator stays within a beat of WWV over a long time, with wide temperature variations.

Be sure the crystal is "cooked" for a while before you start the temperature compensation. All measurements are made with the oscillator inside the counter, lids on. The trimmer is a high quality JFD type, and a hole is drilled in the rear panel to allow adjustment of this trimmer with the covers on. The crystal is an International Crystal High-Accuracy 4 MHz crystal, 32pf, in an f-605 holder.

Even without temperature compensation, my oscillator stayed within 2-3 beats of WWV, a very significant improvement.

This modification can be made for under $25.00. Don't skimp on the parts, as this is the "brain" of your counter.

Gate Error

This is the one-count error in the specifications. It occurs when the gate is literally slammed shut on the foot of the last pulse that is counted. I ignored this error, but there are ways to get around it, one of which is "period averaging," where the count is an average of several counts—the error is reduced by the square root of the reciprocal of the number of periods.[2]

Monroe McDonald, K5DUS,[1] reduces this error by making the input pulse very narrow by adding a 9601 one-shot in the input circuit.

For my purposes this error is still very small.

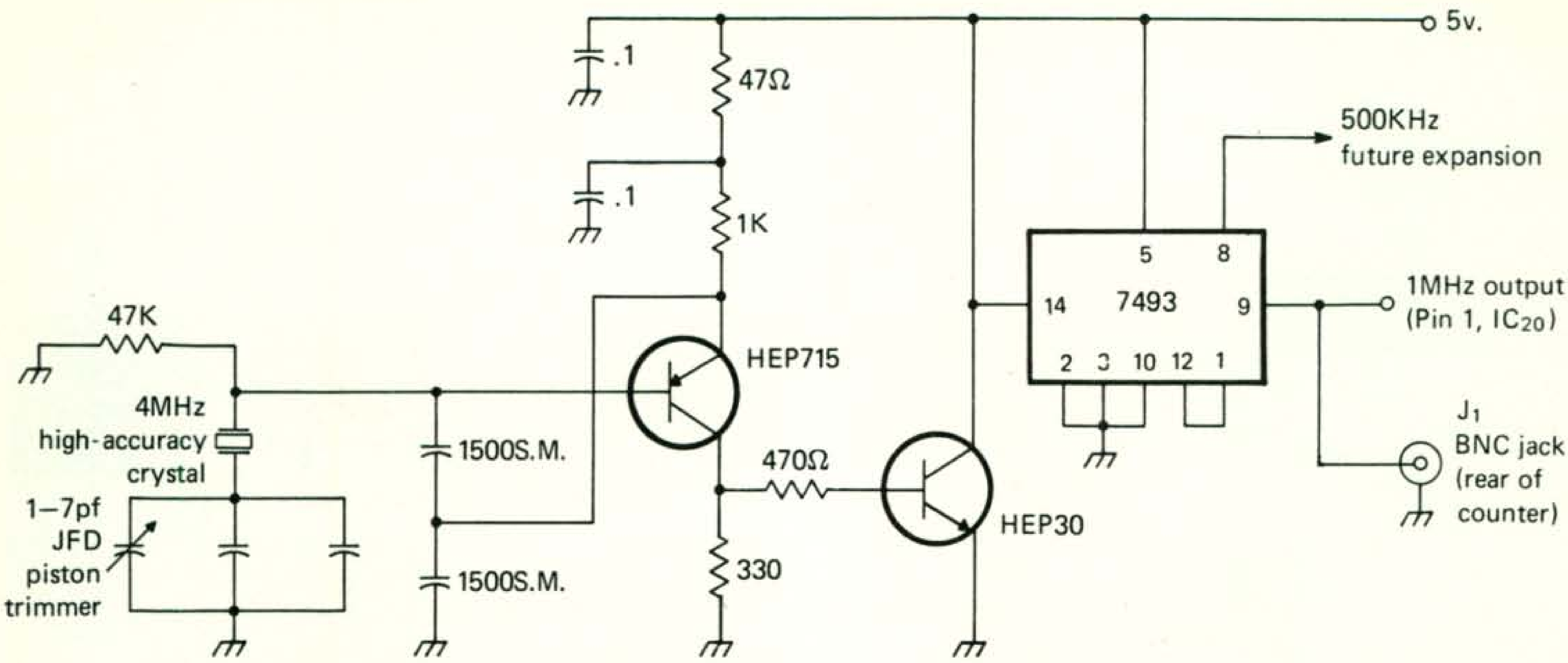


Fig. 2—High accuracy time base oscillator designed by K4EEU uses a high-quality 4 MHz crystal. The three crystal series capacitors should be adjusted and swapped with others having different temperature coefficients, while maintaining 30 pf total capacity, in order to eliminate frequency drift.

Range

In the Yaesu counter, you have only two gate times to select from: The .001 second time, and the 1 second time. With a five-digit readout, this would give you resolution to 1 kHz and 1 Hz respectively. Since the gate resets in the same amount of time it is open, it takes .002 seconds, and 2 seconds to arrive at these readings. A transfer pulse which controls the storage of the count in the 7475 latches holds the display up for .2 seconds in the .001 Hz position to prevent blurring in the neons.

In the prescaled position, the resolution of these readings is reduced by a factor of ten. Thus, when measuring in the 146 MHz range, your fast reading is going to be within 11 kHz, and you have to wait 2 seconds for a count with a 10 Hz resolution. This all makes setting a two meter transmitter on frequency a rather tedious affair.

A more useful gate time would be .1 second. In .2 seconds, you could measure down to 100 Hz, which is convenient for setting a transmitter on frequency. Figure 3 shows the readings for each selected gate time. For five digits, use positions four through eight (a 146.520000 MHz signal would read "6.5200," with overflow).

Non-prescaled 12,345,678.9 Hz

Gate (sec) / Position	1	2	3	4	5	6	7	8
10	2	.3	4	5	6	7	8	9
1	1	2	.3	4	5	6	7	8
.1	0	1	2	.3	4	5	6	7
.001	0	0	0	1	2	.3	4	5

Prescaled 146,520,000 Hz

Gate (sec) / Position	1	2	3	4	5	6	7	8
10	4	6	.5	2	0	0	0	0
1	1	4	6	.5	2	0	0	0
.1	0	1	4	6	.5	2	0	0
.001	0	0	0	1	4	6	.5	2

Fig. 3—Frequency readouts and decimal positions for pre-scaled and non-prescaled operation. Note that for 5 digit readout the first 3 positions should be ignored.

To get the .1 second readout in the Yaesu counter, I disconnected one side of a resistor (R_{40}) that is part of a pulse-forming network that ends up on the "set" input on a flip-flop called the "Gate Pulse Generator." I connected this to the output of the .01 second divider (pin 12 of IC_{23}). This gives you ample storage for gate times of .1 second or slower. If you keep the neon readouts, the last digit will blur in the .001 second position. An additional set of contacts on the gate time selector switch could switch this wire back to the .1 second divider when the .001 second gate time is being used. With an LED readout, this blurring is not objectionable.

To increase the resolution of the counter, I added another divider for a ten second gate time (fig. 4) While it would normally take twenty seconds to accomplish the .1 Hz reading, this 7490 gets a pulse from the reset bus that resets it to a count of nine when the gate is closed. It only takes one second then to initiate another count for a total count time of eleven seconds.

The switch I installed (fig. 5) selects .001, .1, 1, and 10 second gate times. These readings are accomplished in .2, .2, 2, and eleven seconds respectively. The resolution is 1kHz, 10Hz, 1Hz and .1Hz direct, and 10kHz, 100Hz, 10Hz and 1Hz prescaled. Two additional sets of contacts on the three-pole, four position switch place the decimal point. I used all MHz decimal points since I ended up with eight digits, but the decimal point could be positioned for kHz in one reading and MHz in another Part of S_4, the switch that adds the prescaler (fig. 5B) selects the decks of the switch to reposition the decimal point for prescaled readings.

The miniature switch is poked through the gaping hole left by removing the kHz-MHz switch, and an escutcheon 1⅛" by ⅞" placed over it.

When you lift R_{40}, be sure to do it on the side that goes to pin 12 of the 10 Hz divider. Carefully scrape off the pad from the top of the board, poke the wire back through the hole and wire to the correct pin 12 or switch section.

This modification costs less than five dollars and is well worth the time spent to make your counter more versatile.

Display

The display you use is mainly a matter of convenience, and it doesn't mean a thing unless you get the time base accuracy in the 10^{-7} range. Once you've done this, you may want to look into adding digits.

I had a good deal of trouble with the neons in my Yaesu. The 74141 drivers would fail, leaving one or more numerals blurred or blank. When I first replaced these 74141's, I carefully desoldered the IC's from the board and pulled them up. Invariably, some of the plating would come with them. A better technique is to carefully snip each lead with a small pair of diagonals, remove the chip, and remove each lead separately. The IC is then replaced by a sixteen-pin IC socket.

You can get eight DL707 type LED displays into the three and one-half inch opening, so if you want to add digits, this is the way to go.

The diagram (fig. 6) looks more complex than it actually is—it *is* repetitious.

I constructed a cantilevered assembly out of quarter-inch aluminum bar stock and phenolic PC perf board. The neons are removed, and the 74141's removed from their sockets. The front of the cantelever assembly fits over the neon sockets, and is secured with two 4-40 screws into the tapped legs. The DL707 displays are mounted on the front. You will notice that they do not space side-by side on the .1 inch holes in the PC board, but want to go in groups of two's. It takes some careful lead bending to get them to sit side by side.

All connections except V_{cc} are run through flat ribbon cable to platforms that plug into the 74141 sockets. On the underside of the board, the plating that runs to the neon sockets is carefully broken. Don't break ground-pin 12, V_{cc} pin 5, or the BCD connections—pins 3, 4, 6, 7.

You may choose any other pins to run other connections to the new readout assembly. The count input for the additional three digits is taken by breaking the foil at the first 7490 decade counter, pin 14. The carry output of the last 7490 (digit 6) on the new board will run to this pin. The other side of the broken foil is the count input—to pin 14 of the 7490 on the new board. Use Molex pins throughout, especially on this 7490, as it will have to be selected for the highest direct count (34 or so MHz).

All the BCD information is run through the ribbon cable, and ground, and these require no modification of the counter. The transfer pulse

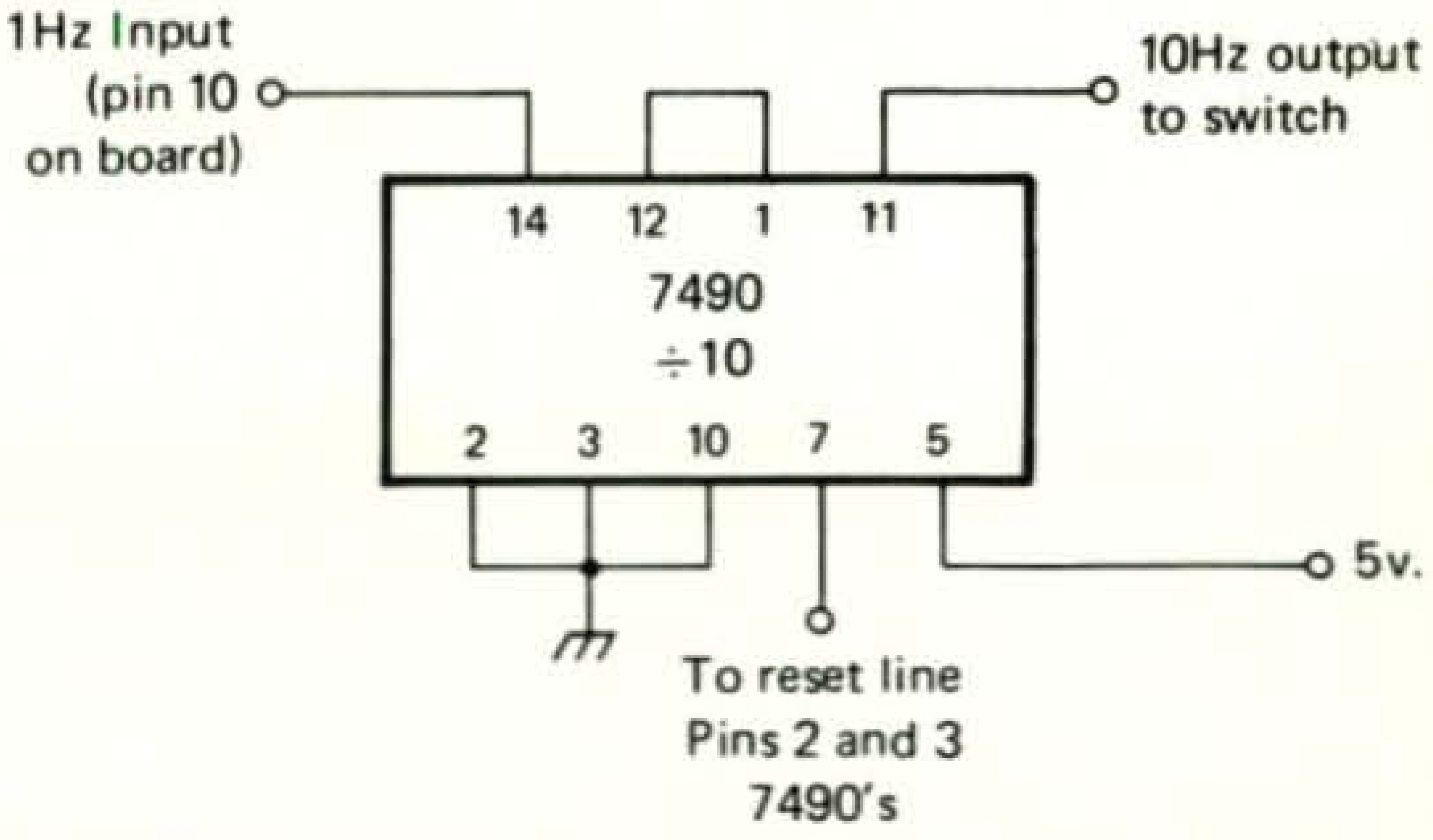


Fig. 4—7490 time base divider (divide by 10).

is run through pin 13 of the number five plug, the reset pulse to pin 15, count input to pin 1, carry output to pin 9. Decimal points to any unused pins.

On the number one digit platform, the 10 second divider input and output are taken, and the blanking input runs to the overflow indicator (Pin 3 of IC_{19}). I color-coded each platform with a wire loop connected to pin 8.

I limited the current in the display segments to 10-14 ma by using 270 ohm resistors. This

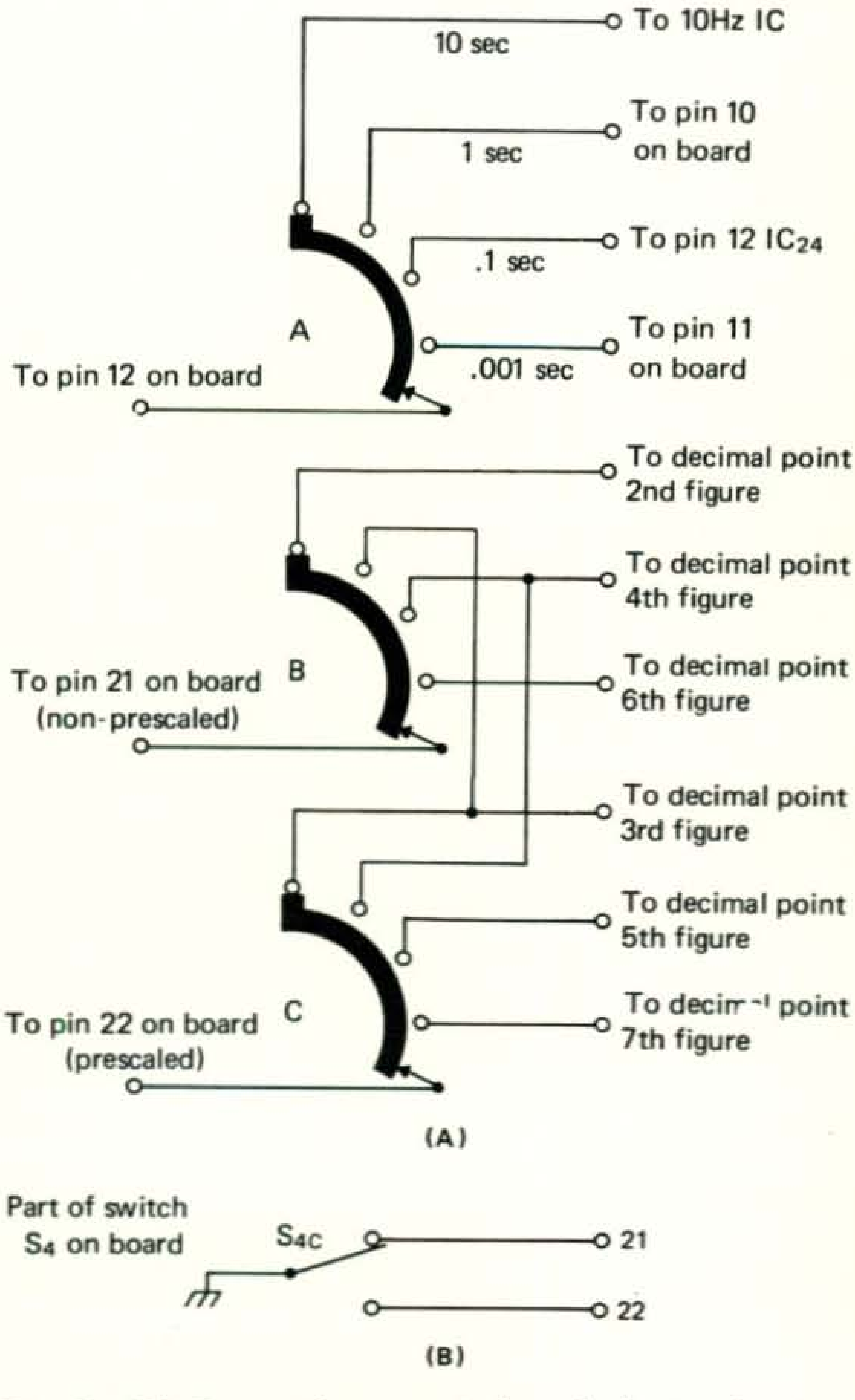


Fig. 5—(A) Gate selector switch with decimal point positioning. (B) Wiring for S4C, a new section of the "Pre-Scaler In-Out" switch, repositions the decimal point in the MHz or kHz ranges.

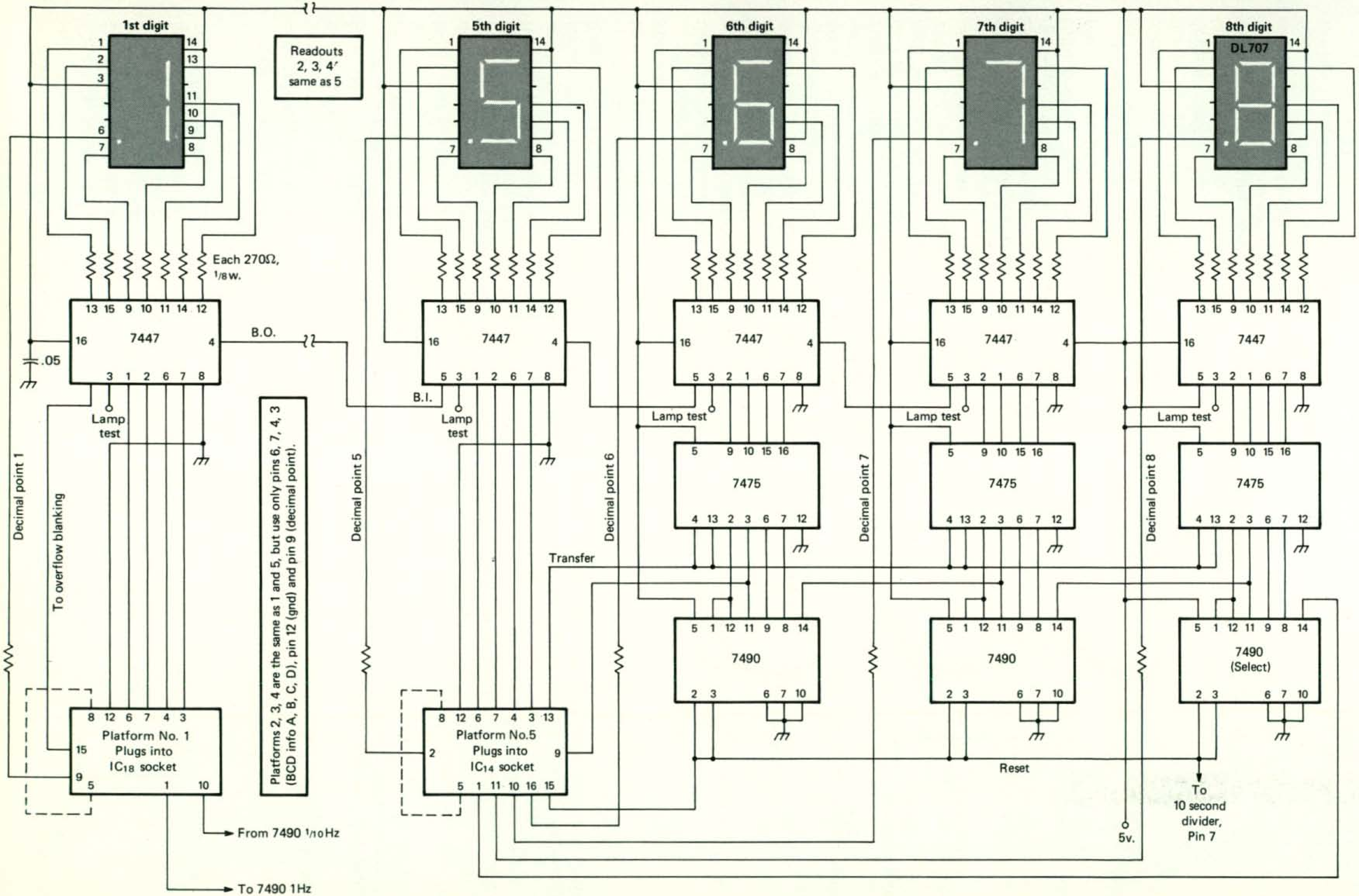


Fig. 6—Schematic diagram of the new readout portion of the Yaesu counter. All wiring shown is new.

gives adequate light from the displays.

The leading zero blanking was an afterthought, but it really makes the pass transistor in the power supply run cool, and the input to it, pin 5 of the first 7447 display driver is connected to a source that is high when there is an overflow. In the Yaesu, this is available at pin 3 of IC_{19}, but this is not latched, and when there is an overflow, such as measuring 103 MHz at the 10 second gate time, the "0" will flash on with the overflow indicator.

Pin 4 of the first 7447 — the blanking output-runs to pin 5 of the next 7447, and so on down the line. The very last digit has the blanking input held high, or open, to give a reassuring "0" when the counter is turned on.

As you build the new decades and readouts, check each one with pin 3 of the 7447 grounded (temporarily). This will light all the segments of the displays.

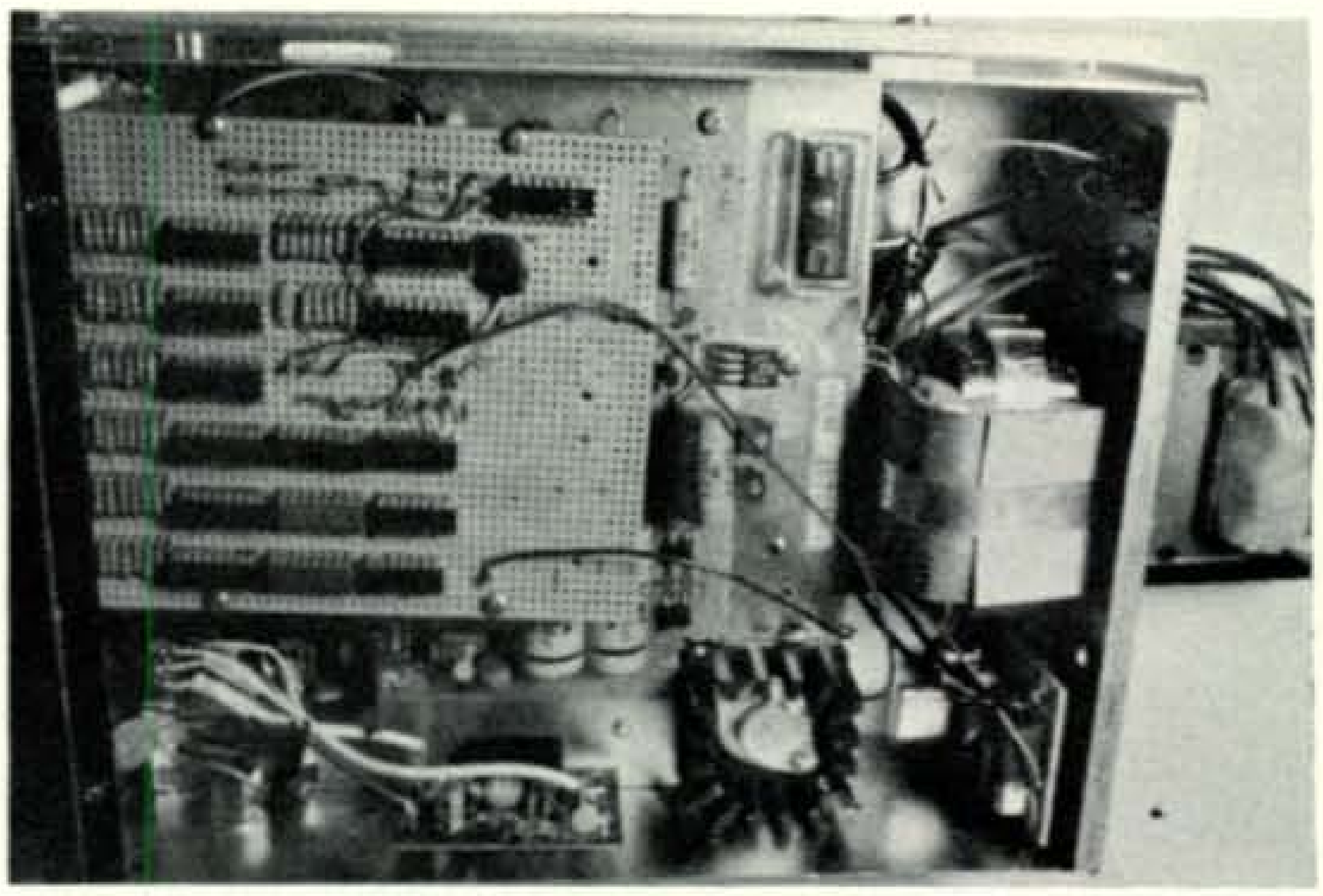
Adding eight digits and LED displays means more current drawn from the five volt supply. You're adding about an amp and a half, and the existing supply won't handle it. I added an LM309 5v. regulator, used to control a 2N3055 pass transistor (fig. 7) in a hefty heat sink. I found a bargain transformer that has two 6.3 volt windings at 3 amps and hung it on the back of the counter. It should be mounted high enough to still allow the counter to be tipped up on its handle. The new supply is just used for the circuit on the cantilevered assembly. To make the counter more compact, the existing transformer could be removed, and the new one mounted in its place. The unused winding could go to the diodes on the board.

Behind the smoked bezel, the LED's are readable from the most oblique angles and in bright, direct light.

The DL707's are the most expensive part of this modification—the price of them varies from $1.75 to $3.50 each. The IC's are a dollar a piece, or less. The entire modification cost about $35.00. There are ready-made decimal counting units available, but the price exceeds what they can be hand wired for.

Future Expansion

As you increase the resolution of your count, you are slowing up the gate time. At audio frequencies, for example, it may be useful to measure down to a tenth or even a hundredth of a Hertz. Measuring to a tenth of a Hertz is possible with the additional divider in the time base chain; it takes eleven seconds. Wiring another 7490 in, cascaded with the ten second 7490, using the "reset to nine" feature, would give you a direct resolution of .01 Hz, and would take 110 seconds.



Top view of the modified Yaesu counter. The new time base board is mounted on the rear panel below the original power transformer. At the bottom of the photo, directly in front of the time base board, is mounted the new 5 v. pass transistor, heat sink mounted.

There are some ways to speed up the reading while increasing the resolution:

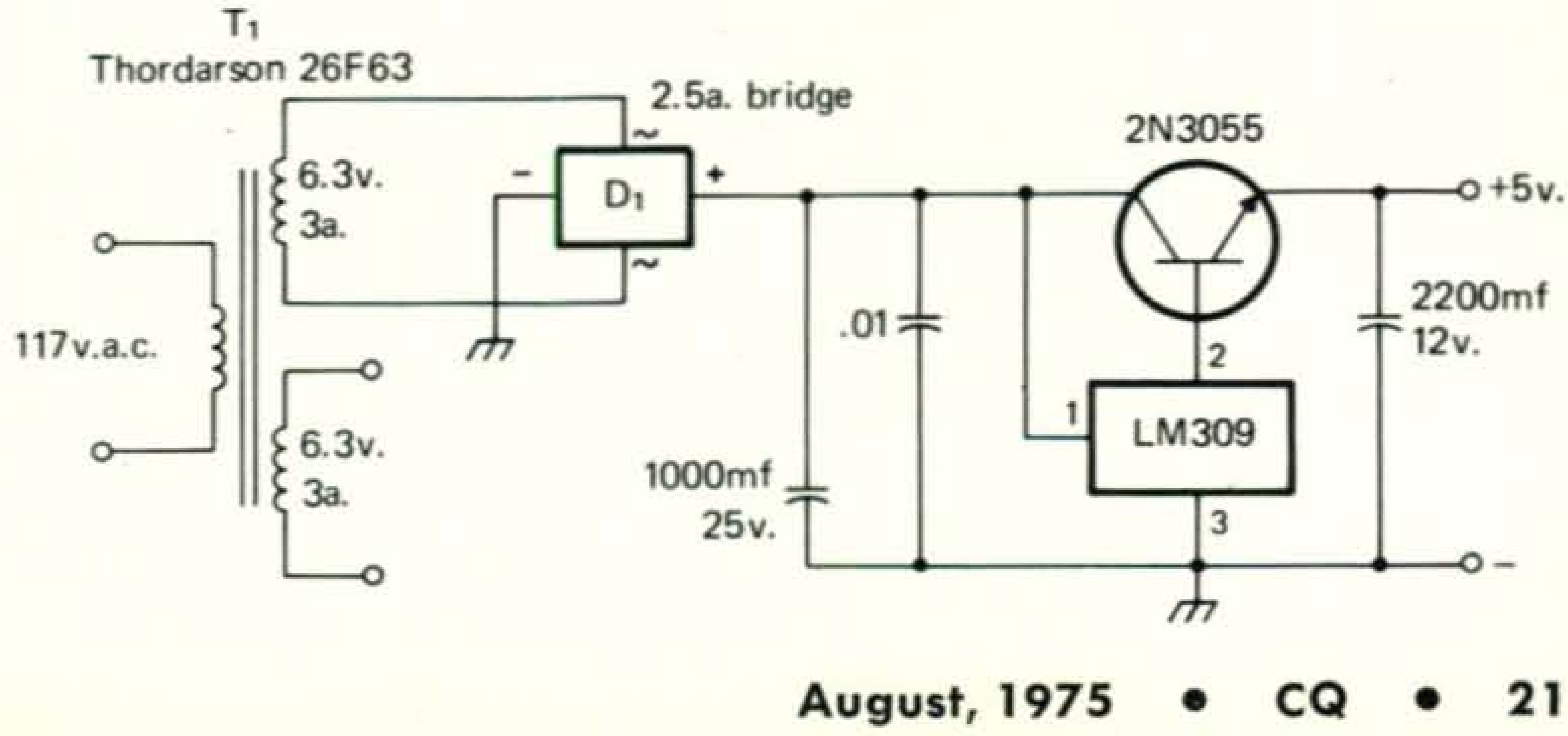
Period counting:[2] This is when the frequency being counted is swapped with the time base. The input frequency now controls the gate time. The higher the time base frequency used, the greater the resolution. The reading on the counter is the reciprocal ($1/f$) of the frequency.

For example: You pump your one MHz time base into the count input, and the unknown into the gate control input. If your transfer pulse is .1 Hz as before, in .2 seconds you get the reading: 19801. The reciprocal of this is 50.5—the unknown frequency. One-tenth Hz reading in .2 seconds (or less.)

There are, of course, other uses for period or event counting. This is just one. With proper switching, any counter could be modified for period counting. The gate-time selector switch could select the period.

Frequency multiplication: This is limited by the upper frequency capability of your counter

Fig. 7—Additional power supply for the modified counter. If desired, the original power transformer may be removed entirely, and replaced with the one shown, using the second 6.3 v. winding to feed the power supply circuitry.



or multiplier, but you could use it up to around 250 kHz.

By multiplying your input of 50.5 Hz by ten, you would get a "505" reading in two seconds. Multiplying by one hundred would give you this resolution in two-tenths of a second. Your resolution in the 10 second gate time range would be .001—a thousandth of a Hertz!

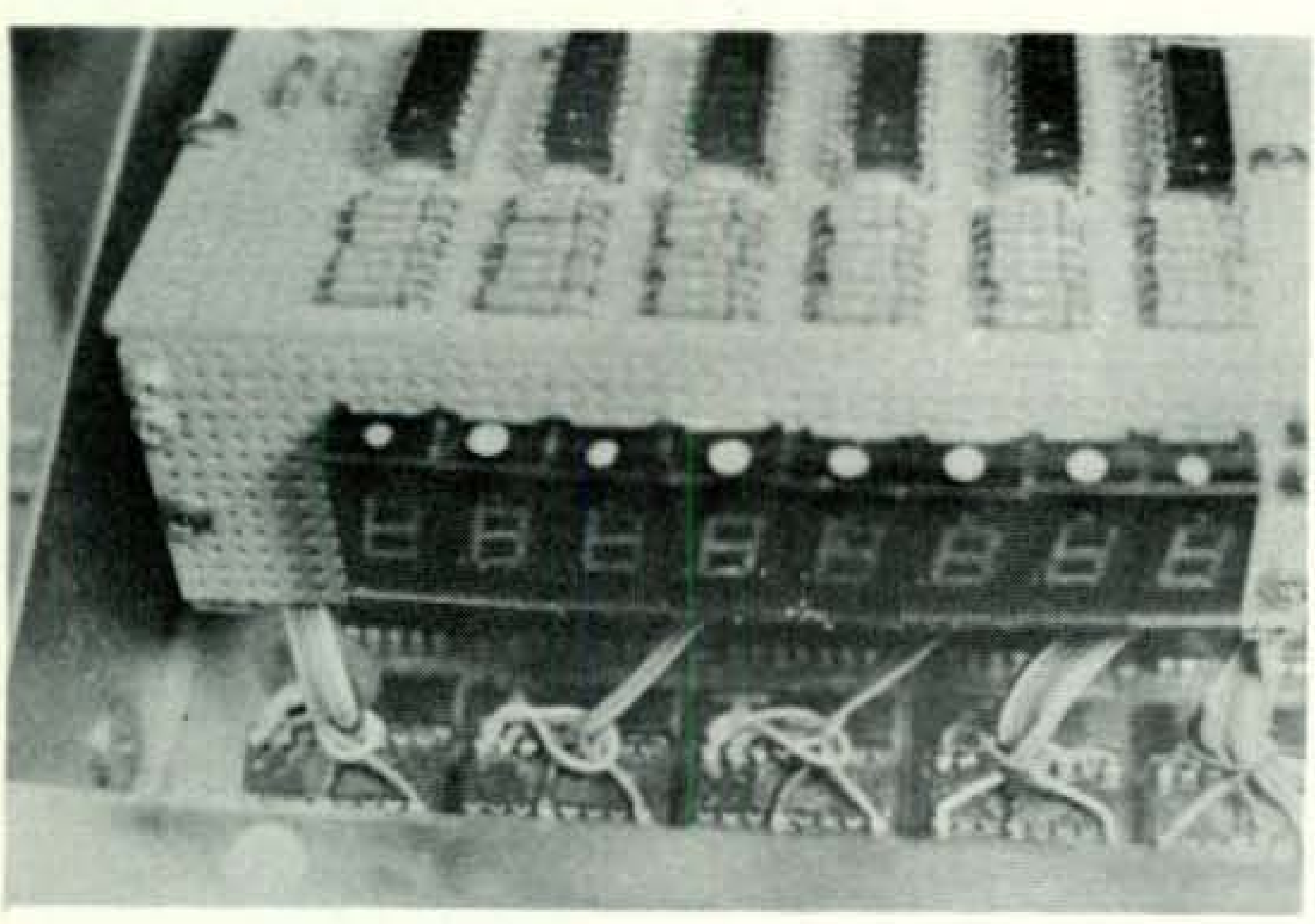
Figure 8 is a phase-locked loop frequency multiplier. Two of them could be cascaded for times 100 operation. Note that both twelve and five volts are required.

It would certainly be useful to expand the response of the counter to cover the 420-450 MHz band, even the 1215 MHz band. With high-speed, emitter-coupled logic, this is now possible, although there is some expense involved.

Counters are now available that will direct count to 500 MHz. The Yaesu counter is limited by that first 7490 in the counting chain to under 35 MHz, so, frequencies greater than 350 MHz must be prescaled by a factor greater than ten.

To get the counter up to the 500 MHz range without waiting too long for a count with 100 Hz or so resolution, an ECL divider chip, such as the Plessy SP862B or Motorola 1690, divide-by-two, 500 MHz divider could be added ahead of the existing prescaler.

When this prescaler is in use, the 500 kHz output of the time base (fig. 2, 7493 pin #8) could be selected. 100 Hz resolution readings would take .4 second. 500 MHz is a typical rating for these ICs, and the counter would probably work to 600 MHz or more. The SP8602B chip sells for $26.82 in single lots.[5] There's plenty of room behind the present prescaler board for another, and the only change to the front panel would be a three-position toggle switch replacing the present toggle switch that brings in the prescaler.



The 7-segment LED readouts are mounted on a cantelever-mounted board behind the smoked bezel. The display board is shown tilted up in this view to allow the platform plugs to be seen. These plugs are inserted into 16-pin IC sockets which have replaced the original 74141 drivers.

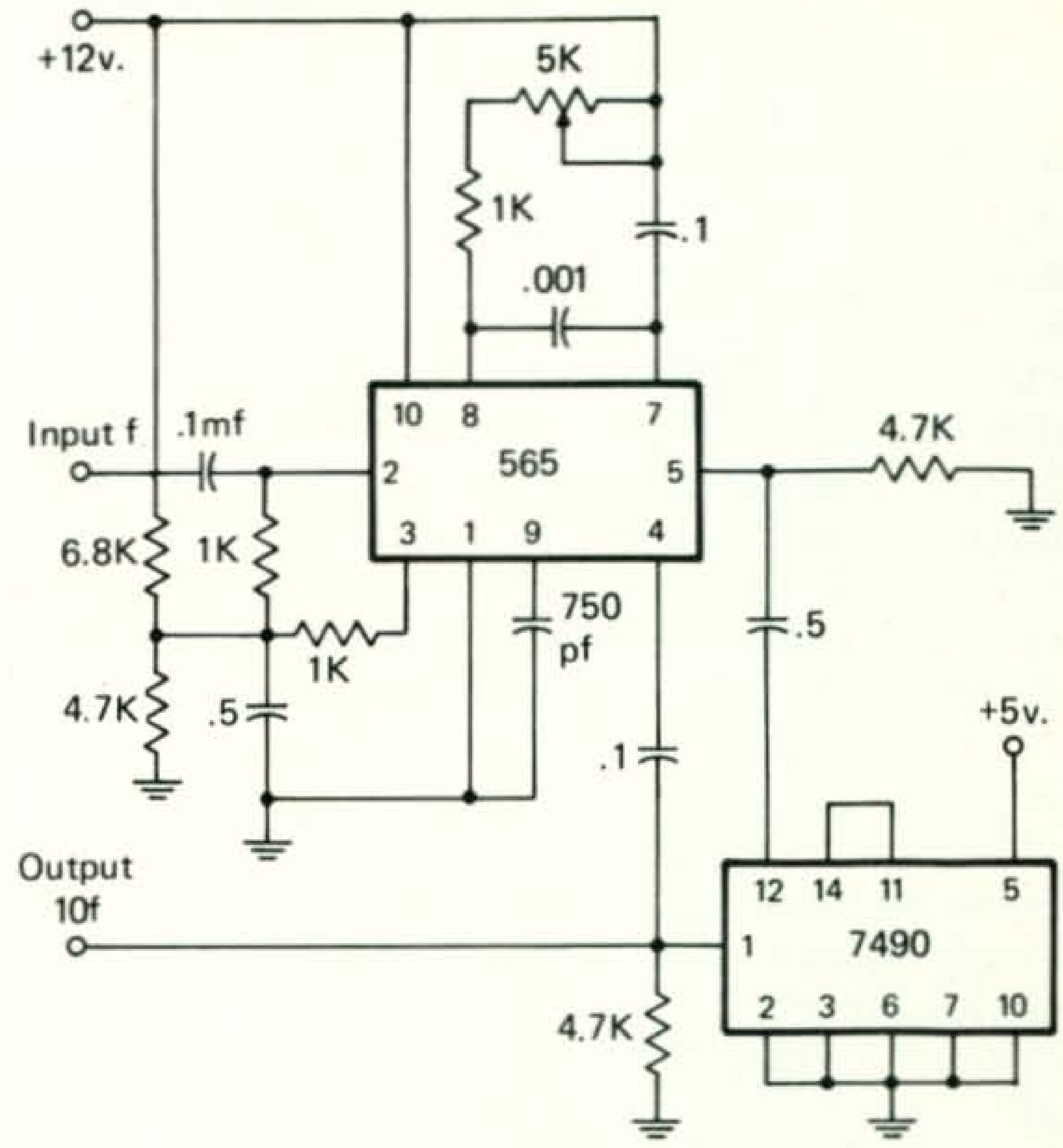


Fig. 8—Phase-locked ×10 frequency multiplier for making quick measurements at very low frequencies.

Conclusion

The counter itself is a simple device. Its complex circuitry is inside the IC's—you should have no reservations about tearing into it. Inexpensive counters using TTL IC's are basically the same. If these methods worked with mine, they should work with yours. ■

References

[1] McDonald, Monroe, K5DUS, "Time-Frequency Measuring System," Part III, *73 Magazine,* March, 1973.

[2] Hewlett-Packard *Electronic Instruments Catalogue,* 1973 Hewlett-Packard, 195 Page Mill Road, Palo Alto, CA 94306.

[3] Kelley, Burt, K4EEU, "Universal Frequency Standard," *Ham Radio,* February, 1974.

[4] National Semiconductor *Linear Integrated Circuits Data Handbook,* 1973, National Semiconductor Corp., 2900 Semiconductor Drive, Santa Clara, CA 95051.

[5] Plessy Semiconductor *Integrated Circuit Handbook,* November, 1974. Plessy Semiconductors, 1674 McGaw Ave., Santa Ana, CA 92075.

[6] Anderson, Ralph V., KØNL, "The Thirty Dollar Counter," *QST,* January, 1974.

Reflections on Maxwell's Reflections

BY SAM E. PARKER,* W6ZWK

This is an update of a critique which was prepared shortly after Part I of M. Walter Maxwell's series, "Another Look at Reflections," appeared in the April 1973 issue of QST. *The original intention was to delay publication until the entire series could be reviewed. This now appears to be impractical. This revised critique was written a short time before part VI appeared in the December 1974 issue of* QST. *The author plans to review part VI and all future installments at a later date.*

WITH apologies to M. Walter Maxwell and the technical staff of the ARRL, I thought at first that this *"QST* Extra" series was the traditional April Fools' joke. I noted the unbelievable by-line "Too Low a VSWR Can Kill You," and of course the author's name suggesting some relationship to old James Clerk. Then I came across the Editor's admonition that "close attention and study of the material, rather than a casual reading, will be rewarding." Consequently, I decided to accept Mr. Maxwell's invitation to critically examine my position on "reflection principles"—along with his.

The Sad State of the Art

We are told at the outset that a major purpose of this series is to clear up misunderstanding of reflection mechanics which "originated with the introduction of coaxial cable after World War II." Mr. Maxwell attributes this sad state of affairs largely to "articles containing explicitly erroneous information and distorted concepts" such as the "following gems of intuitive logic:"

- Always require a perfect match between the feed line and antenna.
- Evaluating antenna performance and radiating efficiency only on the basis of feed-line s.w.r.—the lower the better.
- Pruning a dipole to exact resonance at the operating single frequency and feeding with an exact multiple of a half-wavelength coax—no other length will do.

*3651 Liggett Drive, San Diego, California 92106

Unfortunately, Mr. Maxwell fails to identify any "aforementioned articles" which state that these precise conditions are mandatory. I have reviewed many of the references he has cited and have failed to find one recognized authority who advocates these highly distorted and erroneous concepts. The problem obviously stems from Mr. Maxwell's failure to make a proper distinction between broad design objectives and specific requirements which are inviolate.

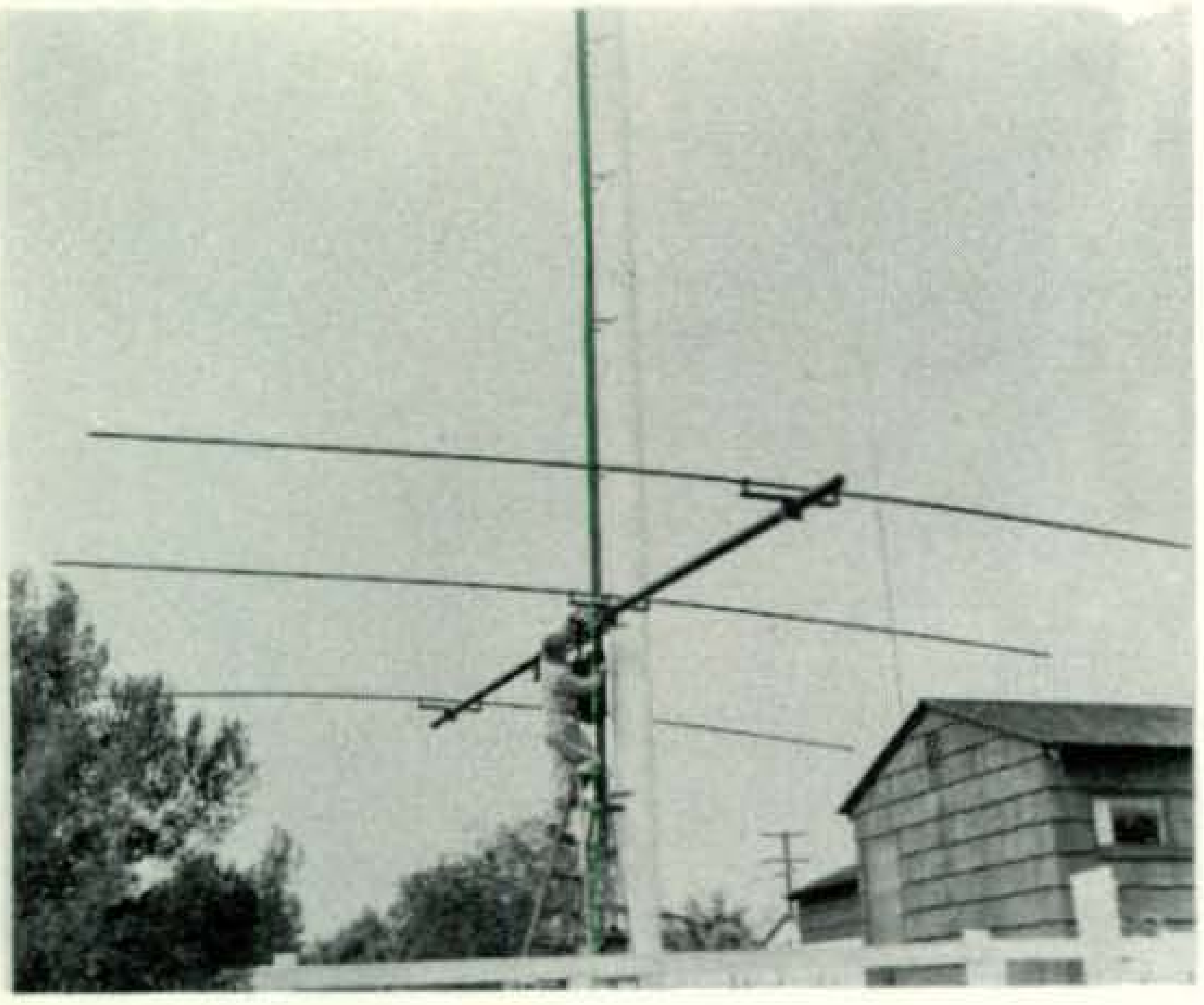
The Case Against Low S.W.R.

To support the amazing sub-title "Too Low a "SWR Can Kill You," Mr. Maxwell cautions against serious injury or death while making unnecessary and time-consuming antenna modifications at dangerous heights. And to support his recurrent theme on the "unimportance of low s.w.r. values," he provides his own gems of intuitive logic:

1. "...properly controlled reflections can be turned to our advantage in obtaining *increased bandwidth* which we are presently throwing away."
2. "... All required matching my be transferred back to the operating position instead of forcing the match to occur at the antenna feed point—without suffering any significant loss in radiated power.

With regard to item 1, any advantages of controlled reflections in obtaining increased bandwidth are even more obscure than the lethal effects of low v.s.w.r. Mr. Maxwell is apparently referring to "the joy of a QSY to the opposite end of the band with only a simple change in transmatch tuning." Except for old timers, he continues, many now even shun the use of open-wire lines, completely missing this joy.

This is indeed a strange use of the term *bandwidth*. In antenna system engineering, bandwidth is usually a measure of the selectivity of an antenna and any associated matching equipment *without subsequent readjustment*. This capability is usually expressed in terms of v.s.w.r., within prescribed limits, as a function of frequency. Laport discusses radiator bandwidth in some detail—and in terms that are quite helpful to the radio amateur. For minimum selectivity (*i.e.,* maximum bandwidth), Laport stresses the importance of minimizing the stored energy in all reactive elements of the



The Author is shown obtaining low v.s.w.r. without undue risk to life or limb.

coupling networks and of using a feeder having a characteristic impedance equal to the actual working resistance of the antenna system at the center frequency of the transmission band. With regard to reflections he states: "Standing waves on the transmission line also represent stored energy and add to the selectivity of the system."[1] In short, *when line terminations cause reflections, the system's bandwidth is reduced.*

Mr. Maxwell's second statement (above) is of course true if line losses are small—assuming that the amateur is not concerned about speed and convenience of operations, tuning and loading limitations of his equipment, the increased risk of stray r.f. energy around the shack and occasional burns (from open-wire feeders) which are quite painful if not fatal. To support this thesis in Part I, Mr. Maxwell gives two examples from v.h.f. space technology and compares results to "typical 80- and 40-meter situations" using rseonant dipoles. On 80-meters, for example, he shows that losses in 100 feet of RG-8/U cable are quite small even at the band edges where the v.s.w.r. is somewhat above 5:1. He does not mention that most modern tube-type transmitters and transceivers along with the newer solid-state equipments (*e.g.*, the Heathkit SB-104) require loads which give v.s.w.r. in the order of 2:1 or less, relative to 50 ohms. It can be shown by simple network analysis, moreover, that the coupling capabilities of conventional Pi networks cannot be extended "with an external capacitor" when excessive v.s.w.r. results from low impedance loads (in spite of implications to this effect in footnote 3 on page 38 of Part I). It should be noted, in passing, that Mr. Maxwell's examples have little bearing on the types of antennas likely to be involved in "unnecessary and time-consuming" modifications at great heights. These adjustments are more likely to involve Yagi-Uda or Quad arrays (or arrays of arrays) installed and adjusted without benefit of a crank-up or tilt-over tower, or perhaps a track on the side of a tall pole.

These are obviously not the types of antennas that were commonly employed with open-wire lines. These feeders were often used with so-called "multiband" wire antennas such as the end-fed "Zepp" or perhaps a two-wire version of the off-center fed "Windom." The 1974 edition of the ARRL *Antenna Book* clearly states, on page 109, "With end feed, the currents in the two line wires do not balance exactly and there is therefore some radiation from the line." For some reason this late edition does not discuss the Windom antenna. However, in discussing this version of the Windom, the 1964 edition of this handbook explains that this feed system is particularly susceptible to parallel line currents because of the unsymmetrical feeder connection and acts in many cases like a single-wire feeder. On page 191, this early edition of the handbook flatly states that, under these conditions, some feeder lengths will lead to "r.f. in the shack."

The relationship of the foregoing to Mr. Maxwell's articles deserves special emphasis. The fundamental method for avoiding radiation from transmission lines is to provide equal and opposite currents close together. Mr. Maxwell is quite correct when he says (in Part I) that high s.w.r. in open-wire or coaxial lines "will not produce antenna currents on the line, or cause the line to radiate, if the spacing is small at the wavelength of operation." However, as every old-timer knows, the problem of maintaining precisely balanced currents on open-wire feeders is often difficult and time consuming if not impossible, depending upon the type of antenna employed. Also, we should not overlook the fact that most transmitter designs included provisions for both balanced and unbalanced outputs *prior to World War II.* Since that time, along with widespread use of coaxial cable, we have seen almost universal adoption of unbalanced Pi and Pi-L output networks for radio transmitters and the development of a whole series of unbalanced system components such as low pass filters, balanced-to-unbalanced (balun) transformers, coaxial switches and reflectometers. Instead of attributing any misunderstanding of reflection mechanics to the introduction of coaxial cable, it is my opinion that the development of the coaxial reflectometer or directional wattmeter by Dr. Oscar Norgorden at the Naval Research Laboratory (and others) shortly after World War II, has been of more benefit in understanding and controlling reflection phenomena than any other single factor.

[1] See Bibliography at end of paper.

Maxwell's Strange Concept of Conjugate Matching

Near the end of Part I, Mr. Maxwell attempts to provide the technical basis for his thesis (No. 2 above) that all required matching may be transferred back to the operating position without suffering any significant loss in radiated power. He claims that:

> "The use of this technique, which may come as a surprise to many, does not contradict any theory. It is actually an embodiment of the fundamental principle of network theory called *conjugate matching,* which is the basis for all antenna tuner, or transmatch operation with either open-wire or coaxial lines..."

He then promises to explain how to obtain proper coupling and loading of a transmitter in subsequent installments. (Unfortunately, as this is being written, this explanation is yet to appear.)

At the beginning of Part II (in the June 1973 issue of *QST*), Mr. Maxwell explains his concept of conjugate matching as follows:

> "A conjugate match exists throughout the entire system when the internal resistance of the source is made equal to the resistive component of the line-input impedance (or vice versa) and all residual reactance components in the source and line-input impedances are canceled to zero."

Later in the same paragraph he adds.

> "It matters not whether a transmitter . . . feeds the line directly or whether an external transmatch is used where additional range is required. If the source generator is now replaced by a passive impedance equal to its internal impedance the line can be opened at any point. And looking in either direction, one will see the conjugate of the impedance seen in the opposite direction."

This is a valid explanation of conjugate matching under the assumption that all dissipation in the transmission system is negligible. However, this is not a valid assumption if the system includes a Pi or Pi-L output network along with a multi-section low pass filter and perhaps a "transmatch." Moreover, as we shall see later, there are even more convincing reasons why neither conjugate nor image matching is applicable to the tuning and loading of typical amateur transmitters.

I emphasized this fact in a letter to the Editor of *QST* dated April 6, 1973, shortly after Part I of this series was published; and I strongly recommended that any future articles in this series be more effectively reviewed. On May 25, 1973, in order to provide a detailed explanation of the technical basis for this recommendation, I sent a copy of a 25-page informal critique* of Mr. Maxwell's first article to the Technical Editor of *QST*.

A few days later I received a letter from Technical Editor Doug DeMaw advising that a copy of my critique had been sent to Mr. Maxwell so that he could respond. Editor DeMaw added, as a matter of passing interest:

> "I would like to mention that all seven members of this technical staff, plus former Technical Editor Grammar, read and approved Mr. Maxwell's manuscript. Thus far, you are the sole reader to find fault with the paper."

Indeed, all correspondence that has been published in *QST* regarding this series has been highly laudatory. In fairness I should add, however, that I requested that my correspondence not be published—in order to permit a more adequate presentation of my divergent technical viewpoint. I might add, also, that I have never heard from Mr. Maxwell.

Why Matched Conditions Do Not Exist

In concluding Part I, Mr. Maxwell asks the reader "to contemplate the conflict between the no-reflection perfectly matched load theory and the conjugate match theory" which he claims is the basis for all tuner or transmatch operation. Frankly, I know of no conflict between these well-known network theorems. A conjugate match between an energy source of impedance Z_s and a load impedance Z_L simply means that Z_s and Z_L are complex conjugates (*e.g.,* R_s equals R_L and jX_s equals $-jX_L$). These are the conditions which give maximum power transfer between a constant-voltage Thevenin's generator and its load. To eliminate or reduce reflections, impedances are matched on an image basis (*e.g.,* R_s equals R_L and jX_s equals jX_L). Note that conjugate and image matching conditions are identical when pure resistances are involved. There are two basic reasons why a linear passive device (such as a transmatch) cannot provide either of these matched conditions between a typical radio transmitter and its antenna feed line.

First, power tubes do not normally operate as constant-resistance energy sources. Whether operating Class AB, Class B or Class C, power tubes usually operate beyond cutoff for an appreciable part of the time. Consequently, the equivalent plate resistance is highly nonlinear and nonanalytic—ranging from relatively low values to infinity during the typical operating cycle. In consequence, it is generally recognized that the equivalent plate resistance r_p of a typical power amplifier tube is much higher than its optimum plate load resistance *RL*. For illustration, in a transmitting coupler study performed for the Navy some years ago, a typical value of r_p was assumed to be 50,000 ohms.[2] While Gray and Graham do not give any typical values, they clearly state that power tubes do not supply any appreciable loading on

[*Continued on page 67*]

MATH'S NOTES

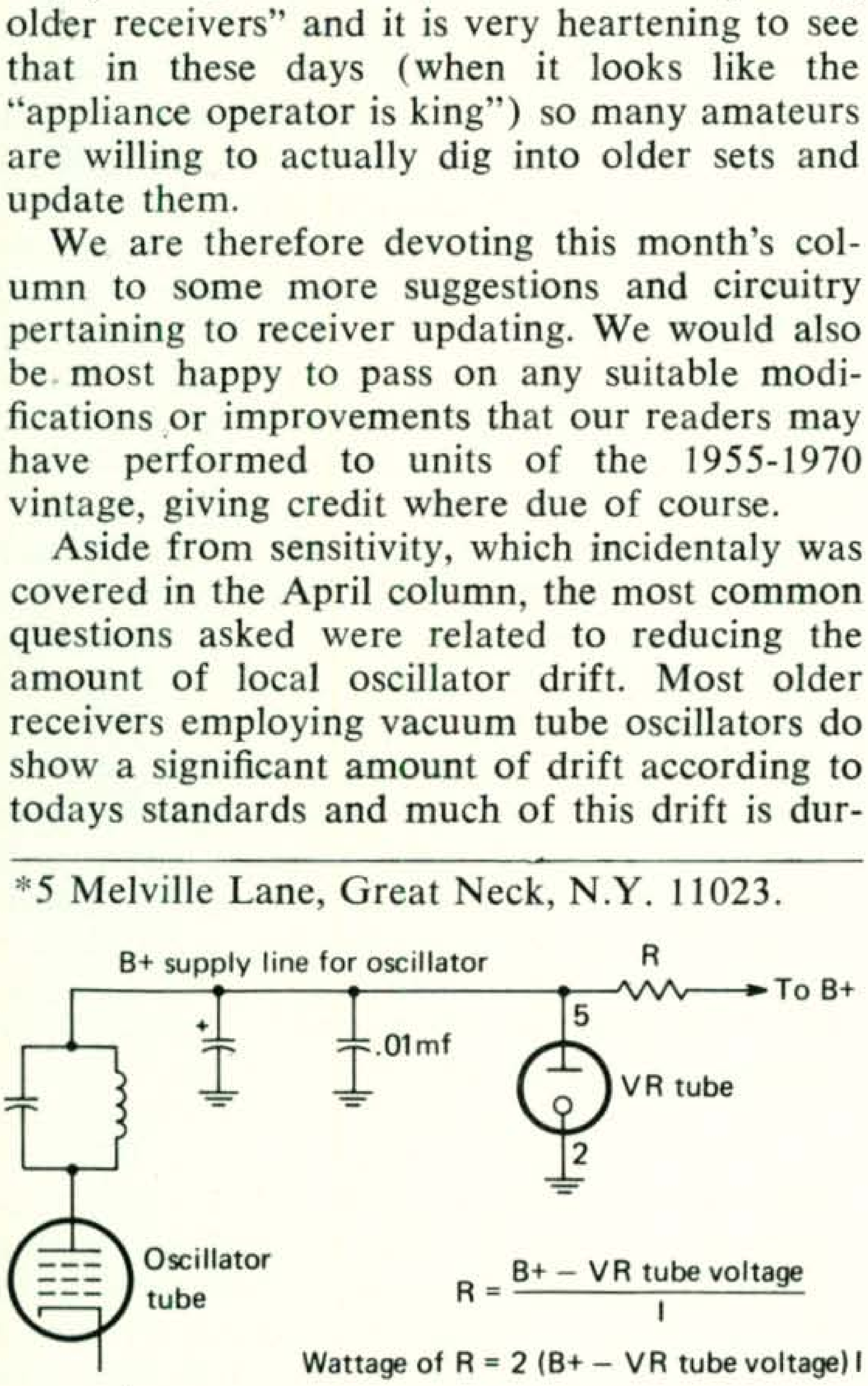
BY IRWIN MATH,* WA2NDM

APPARENTLY we really struck a nerve in our April 1975 column as the letters are still literally pouring in. Our topic then was "improving older receivers" and it is very heartening to see that in these days (when it looks like the "appliance operator is king") so many amateurs are willing to actually dig into older sets and update them.

We are therefore devoting this month's column to some more suggestions and circuitry pertaining to receiver updating. We would also be most happy to pass on any suitable modifications or improvements that our readers may have performed to units of the 1955-1970 vintage, giving credit where due of course.

Aside from sensitivity, which incidentaly was covered in the April column, the most common questions asked were related to reducing the amount of local oscillator drift. Most older receivers employing vacuum tube oscillators do show a significant amount of drift according to todays standards and much of this drift is dur-

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



Tube	Voltage	I	Tube base
OA3/VR75	75v.	.04	Octal
OB3/VR90	90v.	.04	Octal
OC3/VR105	105v.	.04	Octal
OD3/VR150	150v.	.04	Octal
OA2/6073	150v.	.03	7 pin miniature
OB2/6074	108v.	.03	7 pin miniature

Fig. 1—A method of connecting a VR tube to a receiver's local oscillator. Note the addition of a .01 mf ceramic bypass capacitor across the VR tube to suppress the noise generated by these devices.

ing warmup. A solution, employed by Hallicrafters in their SX-101 series, is to simply add a 6.3 filament transformer of the correct current rating directly across the a.c. line cord of the receiver, before the power switch and drive the heater of the tunable oscillator tube in the receiver from it. This way the oscillator tube is always heated (as long as the a.c. line is plugged in) regardless of whether the receiver is on or off, and warmup drift is almost completely eliminated or certainly significantly reduced.

In less expensive receivers, another common cause of drift is the use of poor quality ceramic disk capacitors as padders in tuned circuits. If you see any of these, replace them with high quality mica types such as the popular DM series and choose values as close as possible to the ones you are replacing. Ceramics are OK as bypass capacitors, however, they have no business determining the resonant frequency of an oscillator's tuned circuit (or any tuned circuit for that matter).

When replacing ceramic capacitors, it may be neseccary to re-tune the oscillator stage due to variations in actual capacitance values. This is often a slight readjustment and should be quite easy to do even if elaborate test equipment is not at hand.

Plate and screen voltages to any tunable stage in a receiver—particularly the local oscillator should also be regulated when trying to achieve greater stability. This practice was seldom used in the lower cost amateur receivers of the 50's and 60's but can be added quite easily and inexpensively. To do so, follow this simple procedure:

1. Measure the value of B+ on the oscillator tube's plate pin after the receiver has fully warmed up.
2. Choose the nearest lower value VR tube that will fill the bill as indicated in fig. 1. The tubes shown should cover 95% of all receivers.
3. Mount an appropriate tube socket on the receiver chassis as close as possible to the oscillator tube.
4. Hookup the circuit as shown in fig. 1 and determine the value of the dropping resistor according to the formula's given. Be sure to use a resistor of the correct wattage and mount it so that the heat it produces is far from the local oscillator.
5. Realign the oscillator stage if necessary.

Many of the modifications and additions made by amateurs on vacuum tube receivers often employ transistors or integrated circuits. As a result, it is desirable to have a source of low voltage d.c. available to power these additions. In our very first column, way back in April of 1972, we gave detailed instructions on how to replace the rectifier tubes of older receivers with silicon diodes. These instructions are summarized in fig. 2 and below:

1. Before modifying, turn on receiver and measure B+ at point A in fig. 2A.
2. Turn off receiver, discharge electrolytics and rewire circuit as shown in fig. 2B. For the diodes, any good 1A 600 p.i.v. or better diode should be OK.
3. Using a temporary value of 100 ohms 20 watts for R_d, again apply power and measure the voltage at the new point A. Vary the value of R_d until the voltage is within ±10% of the old value.
4. When the proper value of R_d is determined, decide on its power rating by measuring the voltage drop across it and using the formula
$$P \text{ (in watts)} = \frac{(\text{E across resistor})^2}{\text{R (in ohms)}}$$
5. Permanently install a resistor as close as possible to the value determined in (3) and 1½ times (or more) the wattage determined in (4).
6. Be certain to provide adequate ventillation for the resistor if it dissipates more than a couple if watts.

After making these modifications you will find that you are left with an unused 5 volt winding (from the old rectifier tube filament). This winding is usually capable of supplying a few amperes and fig. 3 shows two typcal methods of obtaining usable d.c. from this source.

As a final comment many of the older receivers employed paper insulated wax impregnated capacitors throughout the entire unit. If you have any of these, run, do not walk, and obtain a supply of newer plastic impregnated or sealed replacement units and change them all. Once these units dry out or get heated a little too much, the damage that they can cause is fantastic.

Have a good summer! See you next month.

73, Irv, WA2NDM

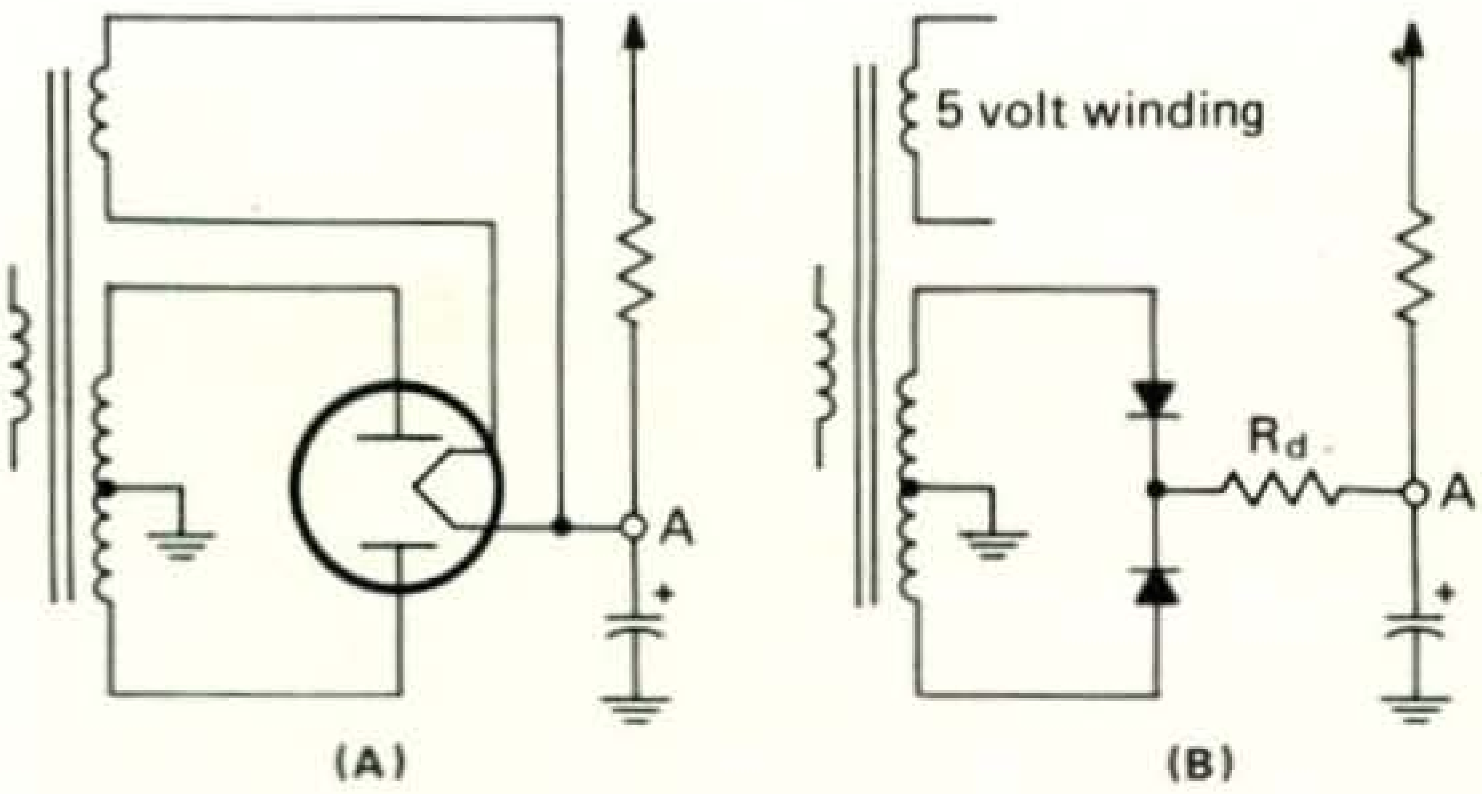


Fig. 2—A silicon diode replacement for a vacuum tube rectifier. See the text for details.

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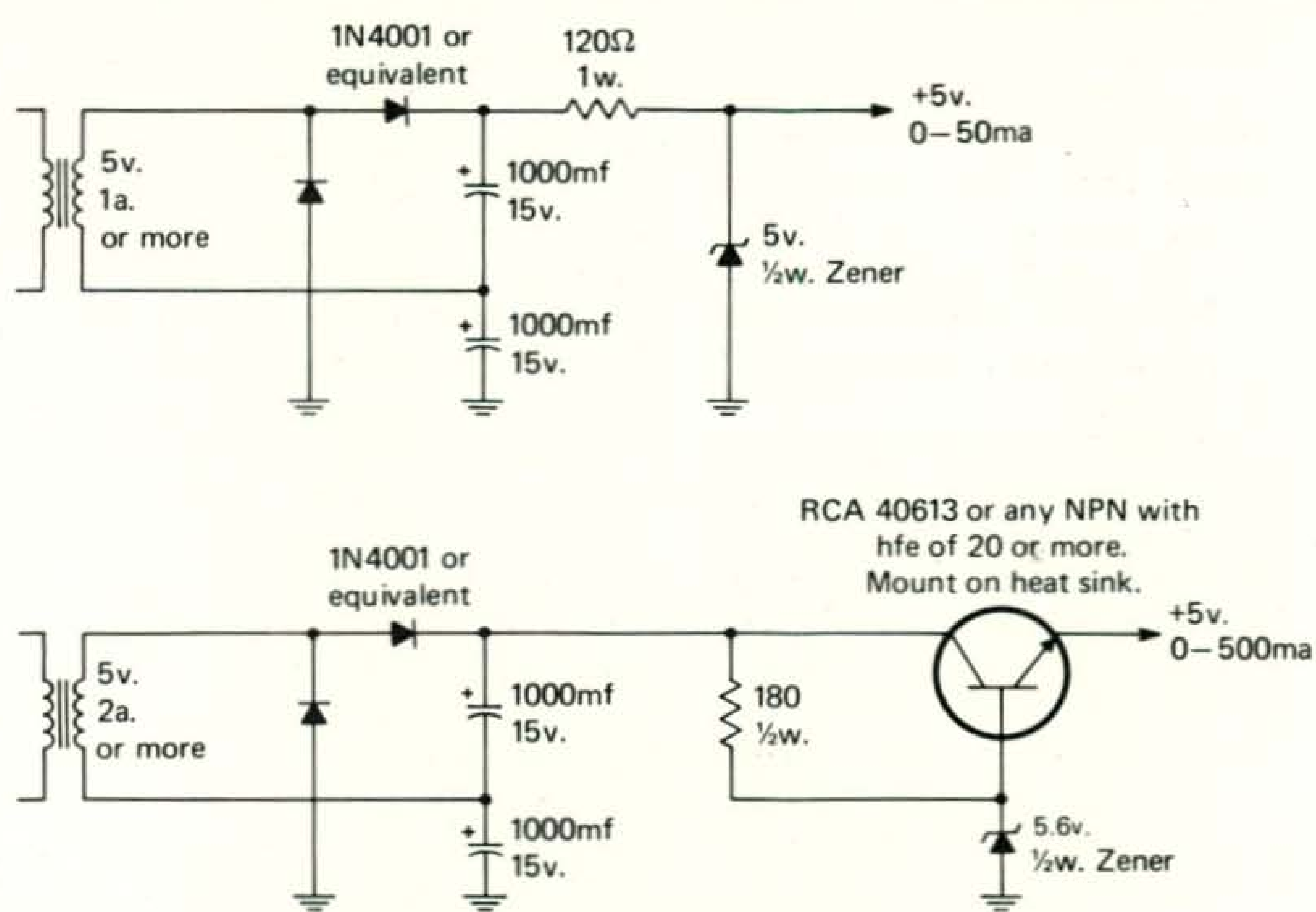


Fig. 3—Two typical 5 v.d.c. sources for IC additions to a vacuum tube receiver.

The SB-104 transceiver presents an attractive front panel appearance. Pushbuttons on the left side of the Main Tuning knob are for Meter Selection (Primary Voltage, ALC/S-meter, R.F. Output), Vox On-Off, 100 HZ Readout On-Off, Optional Noise Blanker On-Off. The right hand grouping is for Mode (USB, LSB, CW and Tune), Hi-Power/Lo-Power, and Power On-Off.

CQ Reviews: The Heathkit SB-104 SSB/CW Transceiver Kit

BY RICHARD A. ROSS,* K2MGA

Over the past few decades amateurs have come to look towards Benton Harbor, Michigan, for many of the new approaches to amateur equipment at reasonable cost. Without question, Heath has raised the technique of "kit-ing" complex electronic equipment to the level of an art form, and more than one hobbyist has gotten hooked on the pure joy derived from transforming a carton of raw components into a smoothly-functioning piece of electronic equipment.

The introduction last fall of the new Heathkit SB-104 transceiver raised more than a few knowledgeable eyebrows in the ham community. Early literature revealed that the SB-104 was a highly complex, sophisticated s.s.b./c.w. transceiver in kit form. Not just another kit, but one consisting of some 2800 individual components which were to be assembled and tested by amateurs of experience ranging from first-time kit builders (not recommended) to knowledgeable, long-time engineers and technicians. What manner of project would the SB-104 turn out to be?

As it turns out, the SB-104 is not a simple project. It is certainly the most complex and time consuming amateur radio kit ever to be produced, and as should be expected in such a case, it is prone to more assembly error and component defects than a lesser kit. A number of experienced SB-104 builders have reported faults in their transceivers, which seem to be about evenly divided between builder errors and defective parts. It is in the Heath tradition, however, that seemingly endless patience and assistance is forthcoming from Heath's Technical Consulting staff, to the extent that every SB-104 can be made to perform to specifications. And when it all clicks, it's all worthwhile. The SB-104 does its job beautifully.

Our own experiences in building the SB-104 may or may not be typical, but it assembled perfectly and performed to specifications immediately—with a single exception—when fired up a board at a time as per instructions. The single exception was that excessive v.f.o. drift was encountered initially, requiring the replacement of some small components in the v.f.o. assembly to settle it down to our satisfaction. Our assembly time for the SB-104, with the optional c.w. filter and noise blanker, was just under 75 hours which included an hour spent fitting printed corrections and additions into the first edition assembly manual (now eliminated by a later edition), meticulously checking and cleaning the soldered sides of the P.C. boards, and aligning. No clearly defective components were encountered beyond the temperature compensating components in the v.f.o. One mica capacitor was missing, another was supplied in the wrong value, and three sheet metal screws were missing; this out of 2800 components.

This builder considers himself an average-speed worker of above average manual dexterity and radio experience. The kit assembly was pleasant and orderly in most areas, and although it's a long project, it is, generally speaking, divided into small enough work segments as to give the builder a solid feeling of progress and prevent boredom. Without reservation, however, we would try to dissuade the beginning amateur and/or the beginning build-

*Editor, *CQ*.

er from attempting the assembly of an SB-104 at this stage of his or her amateur radio experience.

General Description

The SB-104 is a c.w. and s.s.b. transceiver covering all of the 80, 40, 20, 15 and 10 meter amateur bands, and providing receive-only coverage of 15.0-15.5 MHz for WWV reception. It is entirely solid state with the exception of six ½″ high gas-discharge 7-segment readout devices used for the frequency display, which reads directly in kHz with a resolution of 100 Hz or 1 kHz, switch selectable from the front panel. Most transmit-receive switching and band switching at levels of a watt or less is accomplished by solid state diodes. Power output is rated at 100 watts (p.e.p. on s.s.b. and c.w.) with a 1 watt output level available at the touch of a front panel button.

All receiver and transmitter tuning is broadband. The only control which must be touched in normal operation is the frequency (tuning) knob, after having selected the desired band. The receiver front end has been engineered to provide superior resistance to intermodulation in the presence of strong signals while providing ample sensitivity for normal h.f. operation.

Receiver Circuit

Signal input to the receiver is provided through the ALC/Output board and its associated low pass filters when a common antenna is used for receiving and transmitting. When a separate antenna is used for receiving it is coupled directly into the Receiver Front End board which contains six-diode-switch selected band pass filters. As shown in fig. 1, selection of the desired band of operation by the front panel band switch forward biases a corresponding pair of diodes, bringing the appropriate filter into the circuit. Unused filters are isolated by back biasing their corresponding diodes.

These filters, using high-Q toroid inductors, are adjustable by trimmers to provide flat response (within a db or so) across each band. A single filter serves for 14.0-14.5 MHz operation as well as 15 MHz WWV reception. On 10 meters, which is covered in four 500 kHz segments, one filter serves for the 28.0-29.0 MHz, while a second identical filter is adjusted to cover 29.0-30.0 MHz.

On transmit, a reverse bias voltage is applied to all the filter diode switches, effectively reducing the transmitter's feedthrough to the receiver to a very low level.

An effective method of enabling a receiver to perform linearly in a strong signal environment is to exclude all gain-producing stages prior to the introduction of i.f. selectivity. In the SB-104, after passing through the band-

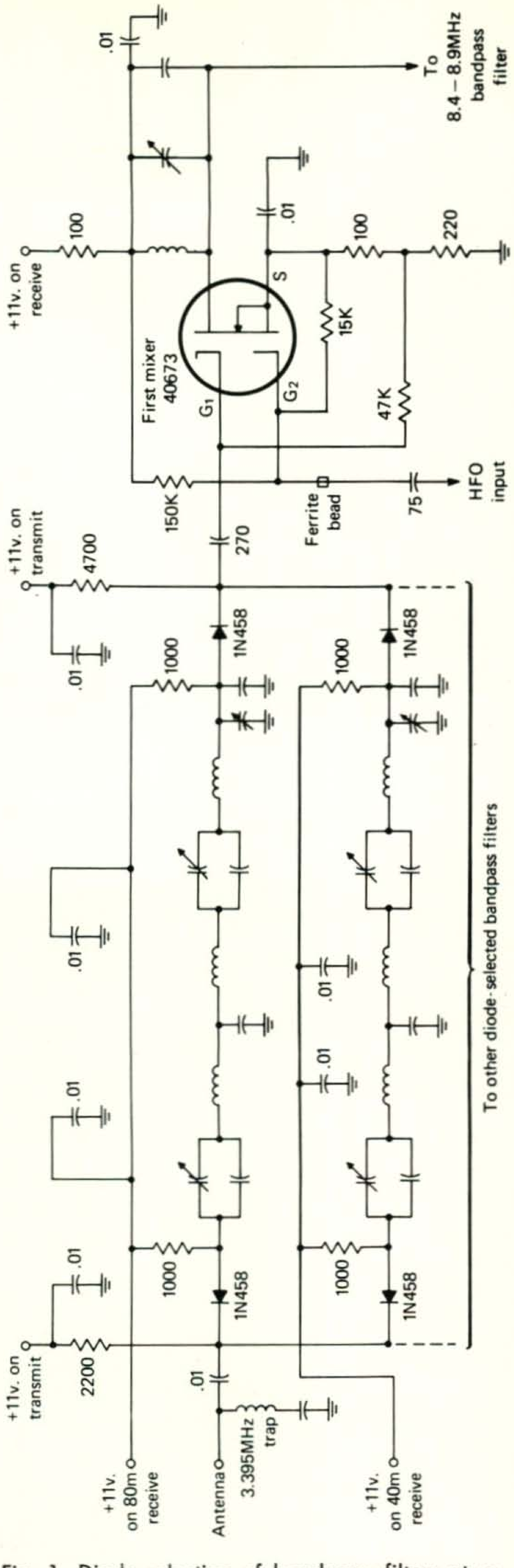


Fig. 1—Diode selection of band-pass filters at receiver front end.

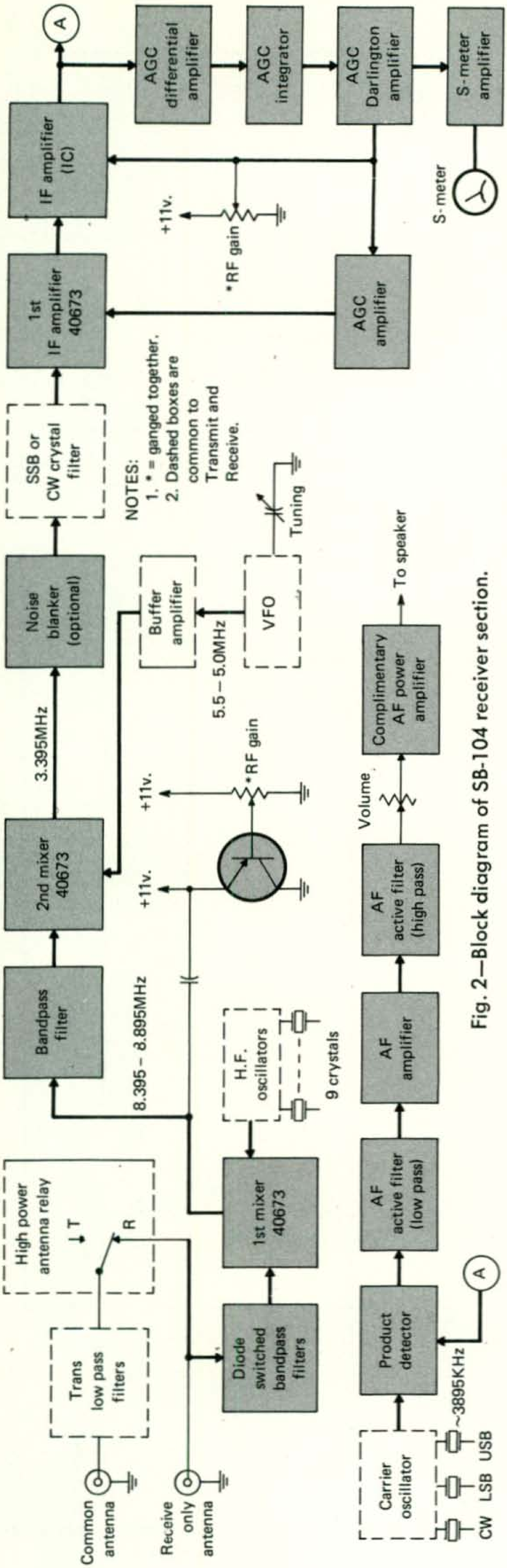


Fig. 2—Block diagram of SB-104 receiver section.

pass preselector filters, incoming signals are fed directly to gate 1 of a 40673 dual gate FET mixer, where they are mixed with the crystal controlled h.f.o. output to produce the first i.f. range of 8.395-8.895 MHz. This first i.f. range is then fed through another bandpass filter to gate 1 of a second 40673 FET mixer where it is mixed with the 5.0-5.5 MHz v.f.o. output to produce the 3.395 MHz second i.f. Note that no amplification of the incoming signal has taken place up to this point.

The 3.395 MHz i.f. signal is fed to the Carrier Generator/Crystal Filter board where it is directed by a combination of transistor and diode switches to either the standard s.s.b. crystal filter or an optional narrow c.w. filter. The signal is then routed to the Receiver I.F./Audio board, still at a low level. The first real signal amplification takes place in a 40673 FET amplifier, followed by a Motorola MC-1350P I.C. amplifier, and amplified further by two bi-polar stages to the level necessary to drive the 4-diode balanced modulator. B.f.o. input to the balanced modulator is obtained from the Carrier Generator board which contains separate carrier oscillators for c.w. (3395.7 kHz), l.s.b. (3393.6 kHz) and u.s.b. (3396.4 kHz). The appropriate carrier oscillator is diode-switch selected along with the i.f. filter by push button Mode switches on the front panel. The c.w. carrier oscillator is used for transmit only, the u.s.b. oscillator functioning for c.w. receive to provide the offset necessary to produce an audible signal while transceiving.

Low level audio output from the balanced mixer is filtered in an active bandpass filter consisting of an op amp operated as a low pass filter, another op amp as an audio amplifier, and third as a high pass filter. The high- and low-pass cutoff points largely determine the a.f. response of the receiver. A fourth op amp (all four are in the same package) further amplifies the a.f. signal. A bi-polar transistor is then used to drive an a.f. power amplifier of the complimentary, transformless, type. Further shaping of the a.f. response is accomplished by controlling feedback to the a.f. driver.

A.G.C. and R.F. Gain Control

A.G.C. voltage is i.f. derived from the input to the balanced mixer. A differential amplifier conducts when positive peaks of the i.f. signal exceed a pre-set level. These peaks are amplified and fed to an integrator which produces a low level d.c. control voltage which is then amplified by a Darlington pair whose output is applied to the i.f. amplifier I.C., thus leveling its output with varying input signal levels. The output of the Darlington pair is also amplified and applied to the first i.f. FET gate 2, while a separate amplifier picks up a.g.c. voltage from the Darlington to operate the S-Meter.

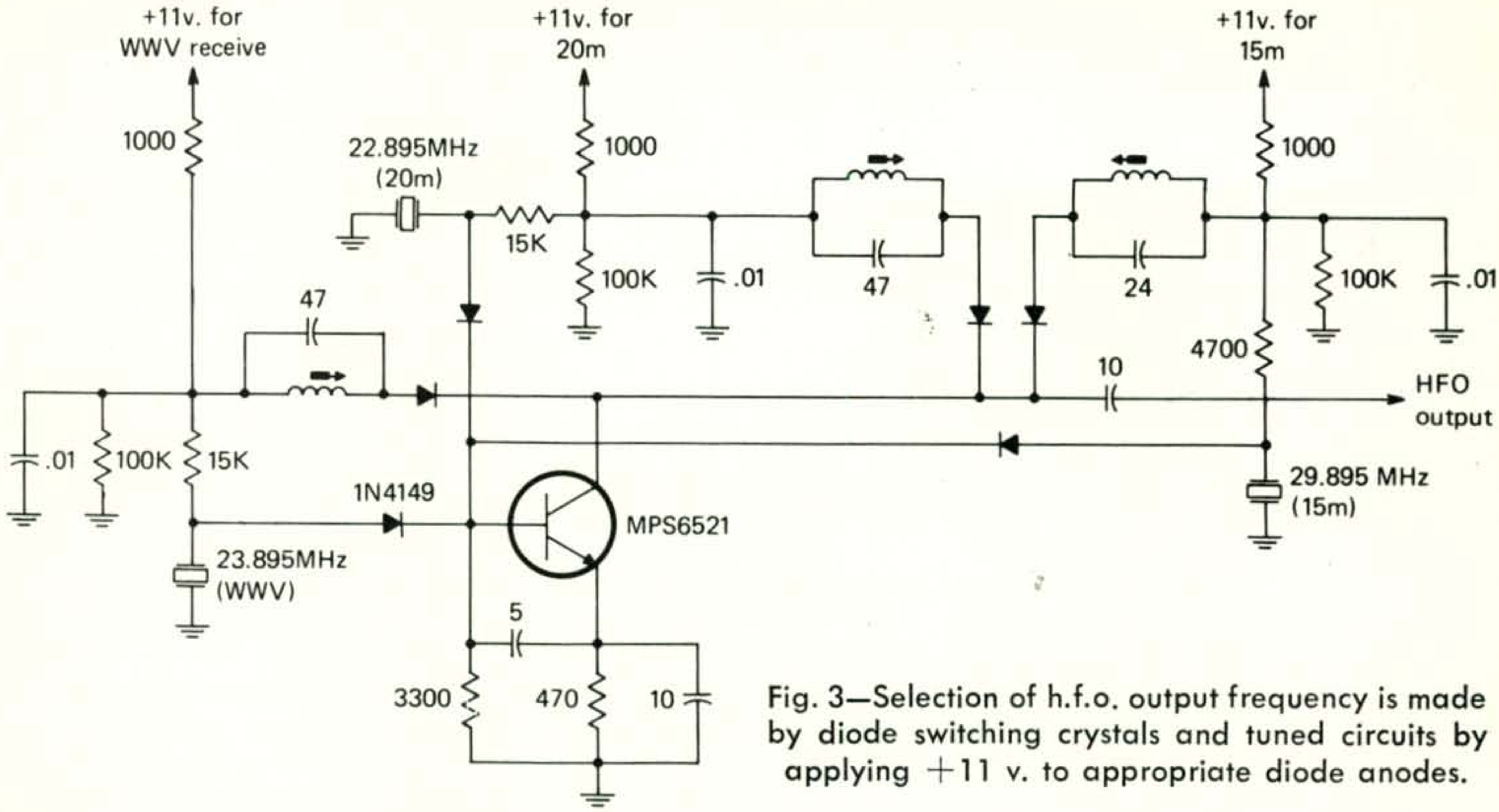


Fig. 3—Selection of h.f.o. output frequency is made by diode switching crystals and tuned circuits by applying +11 v. to appropriate diode anodes.

R.f. gain control is provided by varying the bias to the i.f. amplifier I.C., varying its gain. A second section of the R.F. Gain pot varies the base bias to a bi-polar transistor connected in shunt with the output of the first receiver mixer at the input to the 8.395-8.895 MHz bandpass filter, controlling the signal level to the second mixer.

V.F.O. and Pre-Mixing Scheme

The SB-104 v.f.o. is a rugged builder-assembled package containing two circuit boards, the oscillator coil and the v.f.o. tuning capacitor. One circuit board contains the Hartley-type oscillator using a JFET. The second board contains buffer amplifier circuitry to raise the v.f.o. output to the necessary voltage level, and isolate the oscillator from load changes further on in the transceiver. On 10 meters, an additional v.f.o. amplifier, located below the transceiver chassis, is switched in to further increase v.f.o. output for that band only.

The output frequency of the v.f.o. is shifted via a diode switch/trimmer capacitor combination to permit the indicated frequency of a received signal to remain the same when sidebands are switched. On transmit the output, suppressed carrier, frequency also remains constant when sidebands are switched, but it should be noted that with this system, it is only possible for precise coincidence of u.s.b. and l.s.b. frequencies to occur at one point in the v.f.o. range. In the SB-104 this point is chosen to be 5.3 MHz. At all other v.f.o. frequencies u.s.b./l.s.b. frequency coincidence is not precise, shifting as much as 2.2 kHz at the extreme c.w. end of the tuning range where it is of no consequence.

The crystal controlled h.f. local oscillator signals are generated in the HFO/Premixer board which contains four discrete oscillators, three of which function with either of two diode switched crystals and output tuned circuits, and the fourth of which functions with any of *three* crystals and output circuits for 15 m., 20 m. and 15 MHz WWV reception, as shown in fig. 3. H.f.o. crystal frequencies in all cases are above the low-band-edge operating frequency by 8.895 MHz; that is, on 3.5-4.0 MHz, the h.f.o. crystal frequency is 12.395 MHz. H.f.o. output is amplified before being applied to the first receiver mixer.

Also located on the H.F.O./Premix board is a 4-diode balanced mixer which takes the h.f.o. outputs, and mixes them with the v.f.o. signal to produce a difference frequency. This difference frequency is then filtered in diode selected band pass filters and amplified before being applied to the frequency counter "dial" and the transmitter mixer. On 80 m. for example, the 12.395 MHz h.f.o. output is mixed with the 5.5-5.0 MHz v.f.o. output to yield a pre-mixer output of 6.895 to 7.395 MHz for the counter and the transmitter mixer.

Frequency Display

Instead of a conventional mechanical dial mechanism, the SB-104 employs a special, full-fledged 5½-digit frequency counter to display the operating frequency. The counter is "special" in that it begins counting "early" by an amount equal to the b.f.o. frequency in use. Its input to be counted is the pre-mixed output described in the previous paragraph. Although six digits are displayed, only the last five read counter output. The first display digit (10's of MHz) is controlled directly by the front-panel bandswitch to read "2," "1," or to not light at all as on 80 and 40 m.

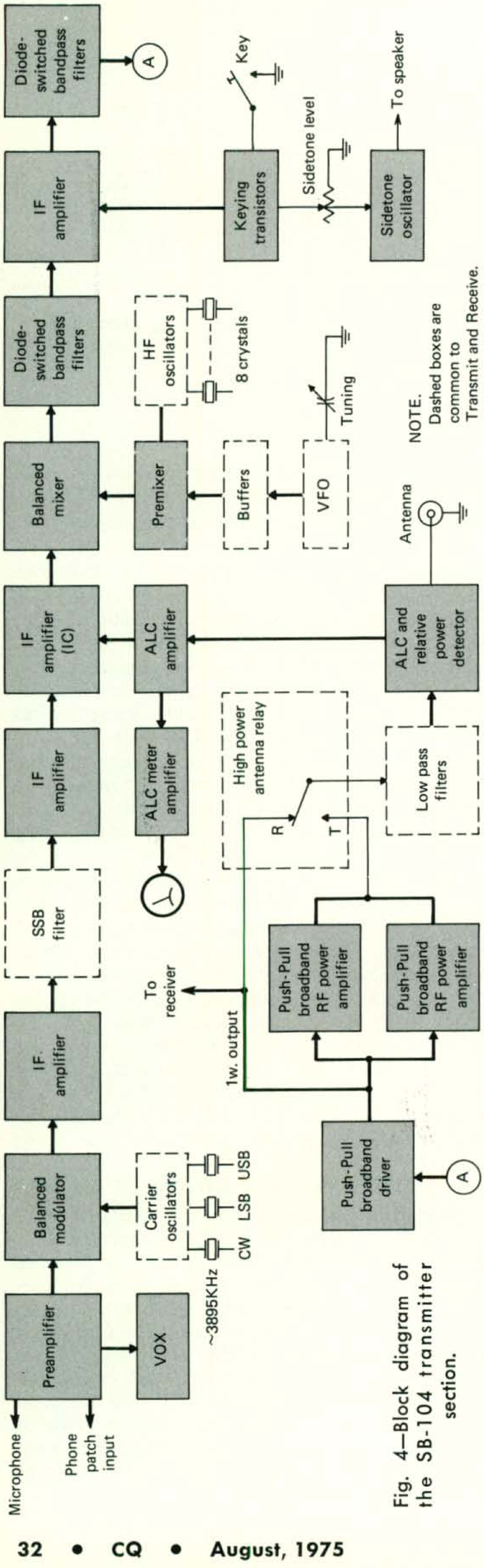


Fig. 4—Block diagram of the SB-104 transmitter section.

Pre-setting the counter to read below the pre-mixed signal frequency by an amount equal to the b.f.o. frequency is accomplished by pre-programming the last five digits with suitable BCD information. For example, let us take the case where the l.s.b. mode has been selected, meaning that the b.f.o. frequency is 3393.6 kHz. Since we are to begin early counting the pre-mixer output by an amount equal to the b.f.o. frequency, 3393.6 kHz must be subtracted from the counter display *before* counting begins. This is accomplished by selecting an arbitrary "zero" point for the counter of 10000.0 kHz, subtracting 3393.6 kHz from that number to yield 6606.4. This number is then loaded into the display, and the counter begins its count there as if it had been displaying all zeros, adding the pre-mix to the pre-set.

In the case of 3.9000 MHz l.s.b., the counter display would have its "artificial zero" set at 6606.4. The Pre-Mixer output (difference between the h.f.o. and v.f.o.) would be 7293.6 kHz. The counter adds the 7293.6 to the artificial zero of 6606.4 yielding 13900.0, but since only the last five digits can be displayed on the counter-controlled display tubes, the readout shows 3900.0. The first (10's of MHz) digit controlled by the bandswitch is set not to illuminate.

For situations where the displayed frequency is midway between 100 Hz points, the last digit on the counter may blink alternately between two readings. Should this become annoying, the last digit may be disabled at will by means of a front panel push button switch.

Transmitter Circuit

On s.s.b., microphone and phone-patch inputs are amplified in TX Audio/Regulator board before being mixed in a ring-type balanced modulator with the output of the selected carrier oscillator to yield a d.s.b. suppressed carrier signal at around 3395 kHz. This d.s.b. signal is filtered by the 2.1 kHz wide crystal filter to produce either a u.s.b. or l.s.b. signal depending on the exact carrier oscillator frequency. I.C. and bi-polar amplifiers raise the 3395 kHz s.s.b. i.f. signal to a level sufficient to drive another balanced modulator where it is mixed with the pre-mixer output. This mixing is subtractive, yielding the desired operating frequency by subtracting the 3395 kHz s.s.b. signal from the pre-mixer signal.

The s.s.b. signal is then filtered in diode-selected bandpass filters, and amplified by a pair of NPN silicon r.f. power transistors (PT-6619's) in a broad band push-pull circuit producing somewhat more than 1 watt output. This low level output is raised to the 100 watt level in a high power broad band transistor amplifier consisting of two push-pull amplifiers in parallel (four 2N6456's or S30-12A's). Hybrid com-

[*continued on page 68*]

DeWitt In Focus

BY BILL DeWITT,* W2DD

LAST month I mentioned the need for a quantitative means of comparing the resolution of SSTV systems. A resolution chart/test pattern designed especially for SSTV use was suggested. Why bother about a chart with all those lines and numbers on it? Why not use some fairly sharp snapshots tacked on the wall to demonstrate the capability of a system? This can be done, but in the end, one would hope to state the results of a measurement rather than attempting a clinical description of a picture detail. After all, the need for quantitative measurements hardly calls for re-statement in our SSTV field where the performance of equipment requires careful adjustment of all circuit parameters.

Some examples of the uses for a resolution chart are: To check for loss of picture sharpness between direct camera output and tape recorded playback; Camera and/or lens comparisons; Camera "set-up" adjustments (adjustment of yokes, vidicons etc.).

*2112 Turks Hill Road, Fairport, NY 14450.

Since no standard SSTV resolution chart exists, I have taken some action intended to stir up interest in this subject. We need a practical working standard that can be used by all slow scanners. I have asked several SSTV amateurs to act as a committee and offer comments on the design of a suitable resolution chart. In addition, I have devised a demonstration chart to indicate what features might be useful.

This chart is *not* being presented as a standard. The values shown should *not* be regarded as precise. Care has been used in producing this demonstration, but the values should not be regarded as NBS precision numbers! With these disclaimers out of the way, let's look at the chart.

Portions of an RMA resolution chart were removed from the original chart and re-assembled to produce the chart shown in the direct photograph of fig. 1. For purposes of comparison fig. 2 shows this chart as reproduced on a Robot Model 70A Monitor (at its original size) using a Robot Model 80A Camera to televise the subject.

Following the general practice of Broadcast Television, all references to the number of lines that can be resolved refer to the number of verticle or horizontal lines *per picture*. (Details of the design and use of charts adjusted to this premise will be discussed in a subsequent article.)

The central square in the chart represents 100 lines per picture. The diverging lines emanating from the sides of the square range from 200 lines at their minimum width to 100 lines at the outer edge of the chart. The mid-range marker represents 150 lines. The circle was included to provide linearity and distortion checks.

Now, let's take a look at fig. 2 and see how

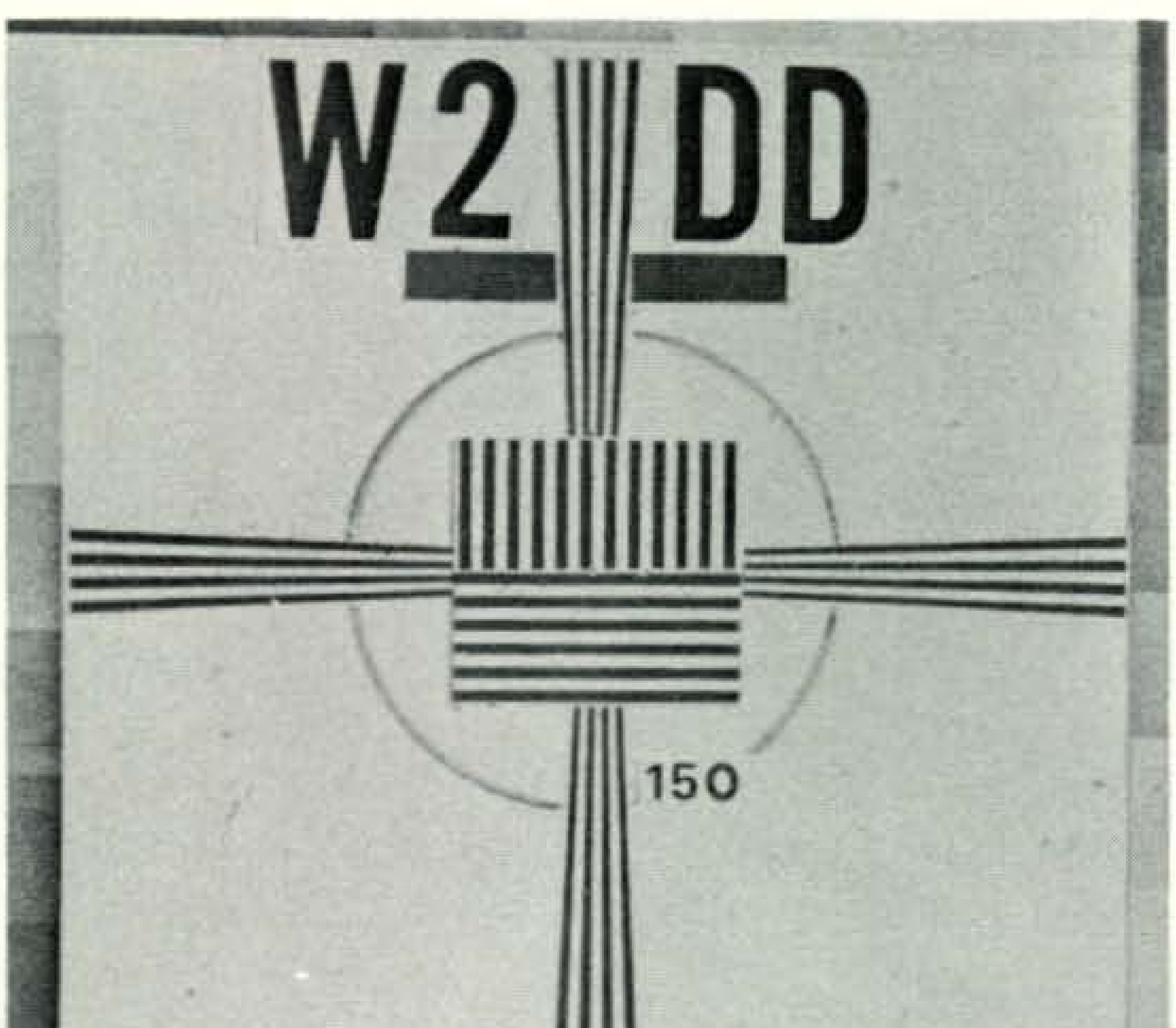


Fig. 1 — Demonstration resolution chart, direct photograph.

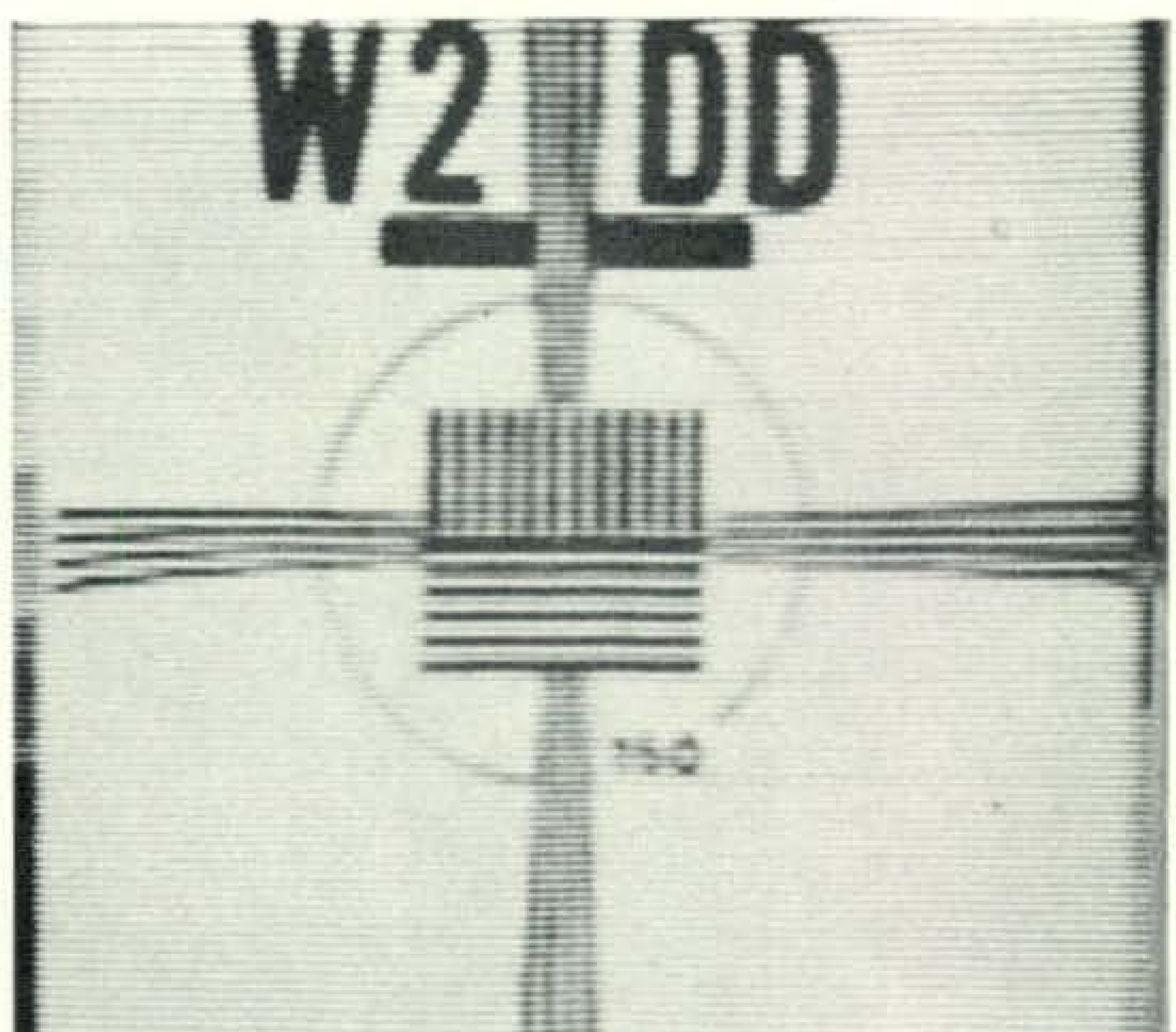


Fig. 2—Resolution chart as reproduced thr the Robot camera/monitor system.

Picture displayed on scan converter designed by W0LMD and built by W2ELF. This photo originally appeared in Worldradio News for April '75.

the system stacks up. As could be anticipated in a 128 line non-interlaced display, the horizontal resolution is better than the vertical resolution. But even with the herring-bone effect (attributable to the lack of interlace), the vertical resolution appears to be around 120 lines. The horizontal resolution appears to be about 150 lines.

OK, you say—"Big deal, I could have predicted a couple of numbers like that!" The point is, not what one could predict, but what one can actually demonstrate, and what one can use to compare. If you wish to compare the sharpness characteristics of two lenses, do you want a prediction, do you want to be able to say that the hair detail (for example) is "a little better," or would you prefer to say that one lens yields 150 line resolution versus 130 for another through your system?

It is my intention to push for the adoption of an SSTV resolution chart. With the help of the "ad hoc" committee it should be possible to devise a good working total for the SSTV amateur. Look for more comments on this subject in the near future—and feel free to offer yours via my home address.

Clown picture supplied by Dr. George Steber, WB9LVI, illustrates the conversion of a 256 line fast scan image derived from an SSTV picture by digital processing and scan conversion.

Scan Conversion

Much of the conversation on the 14230 "Talk Show" each day relates to scan conversion and the display of SSTV on a conventional TV set. The accompanying photographs supplied by Dr. Jim Thomas, WB4HCV; Dr. George R. Steber; Walt Bieda, W2ELF; and yours truly demonstrate (somewhat qualitatively) what you can expect to see in scan converted images, images displayed on a TV set. These photographs represent four modes of scan conversion. Please bear in mind that the original information in each case is derived from 128 line SSTV video.

The first picture was supplied by Dr. Thomas of Sumner Electronics and Engrg. I believe that this is the first published photo of an SSTV image converted for fast scan display by the use of a charge coupled device system aimed at the amateur market. Dr. Thomas kindly supplied this picture to give *CQ* readers a "sneak peak" at the screen of the HCV-2CS scan converter/monitor to be available this Fall. More on this later in the column.

The "Clown" picture was supplied by Dr. George R. Steber, WB9LVI, who is Associate Professor of Electrical and Computer Science at the University of Wisconsin-Milwaukee. Dr. Steber's articles on slow to fast scan conversion using shift registers and PCM techniques appeared in the March and May 1975 issue of *QST*. Dr. Steber describes the clown picture as a fast scan 256 line image derived from a slow scan picture by digital processing and scan conversion. It is displayed on a commercial monitor modified for the purpose.

Walt Bieda, W2ELF, of Kenmore, N.Y. supplied a picture of himself as seen on a 525 line commercial monitor after scan conversion via a WØLMD digital scan converter. Although Walt claims to be retired, I know that he has been hard at work for the last few months debugging his scan converter. The quality of the picture speaks well for the 'LMD design and Walt's diligent efforts.

Another form of scan conversion is represented in the "Girl" picture supplied by yours truly. The slow to fast conversion was in this case performed by the use of a Hughes Storage Tube Scan Converter, Model MSC-1. Details of the operation of this unit were described in the October 1973 issue of *CQ*. To some extent its capabilities are similar to the newly announced Robot Model 300 Scan Converter, but it does not have the simultaneous "Write-in, Read-out" feature since it employs a single-ended storage tube.

Well, there you have four different approaches to scan conversion. It looks like scan conversion is here to stay, and no doubt about it. The sight of bright complete black and white pictures is bound to generate an exponential increase in our SSTV ranks. So what is going to happen to the present system with the P-7 phosphor—will it just disappear? Absolutely not, amateurs owning P-7 monitors can add on scan converters, making use of their present equipment to drive the converters. Those having no SSTV gear at all will now have the choice of using the building-block approach or going the complete scan converter system route á la Robot/Sumner/whoever else decides to manufacture!

The present system without scan conversion is a viable one holding attraction for thousands of hams all over the world. I am certain that it will maintain its position for years to come. Cop MacDonald did a fine job in setting up the basic system. Now we are starting to "build on it"—but don't sell the "basics" short.

More on the new Sumner HCV-2CS. Dr. Thomas expects that availability will be sometime in September. The price range will be in the $850 to $900 range. Owners of the Sumner HCV-2A and 2B will be happy to hear that a kit in the $350/$400 range with pre-wired boards will be available to retro-fit the new scan converter to their monitors. Specification sheets on the HCV-2CS will be available shortly.

Off-screen photo by W2DD showing SSTV image scan converted in a Hughes MSC-1 and displayed on a conventional TV set.

Here and There

A letter from Jerry Foster, WØQWH, of Stanley, Kans. reports a neat system he and a DL friend have been using. Frustrated by poor band conditions, Jerry and Heinz Engelmann, DL3UH of Sievern, Germany have been exchanging SSTV pictures and voice commentaries by tape cassette. This in itself is not an unusual occurrence, but Jerry has added a new twist. He has been re-recording DL3UH's separate voice and video tapes on a stereo machine. By synchronizing the pictures and comments, Jerry creates a kind of "talking picture". Not a real-time system, but a clever approach that adds a bit of "zing" to the playbacks. Well,

Remember that saying, "It's a bird, it's a plane—"? Well, your wrong, it's the Digital Group's Flyer. If you think digital, your name should be on their mailing list. Here's what the Flyer's all about. It will clue you on what's available from the Digital Group and its associated companies. You'll get your news in three flavors, Announcements, Previews, and Currently Available. Translated, this means they'll tell you what's new that's available, what's new that you can't get yet, and what's already been announced that's still available! So much for the Flyer. There is also a Digital Group Clearing House Newsletter (not free) directed at problem solutions and applications work. Write to your friendly Digital Group at P.O. Box 6528, Denver, CO. 80206 for more input on their output.

Poor conditions continue to plague those taking part in the 14 MHz. SSTV Net on Saturdays. Most of the time it's hard to know whether the net is in operation or not! But whatever the conditions, the net should continue because it offers a much needed opportunity for those designing and building SSTV gear to discuss problems of mutual interest, and a chance for newcomers to get acquainted.

[*Continued on page 67*]

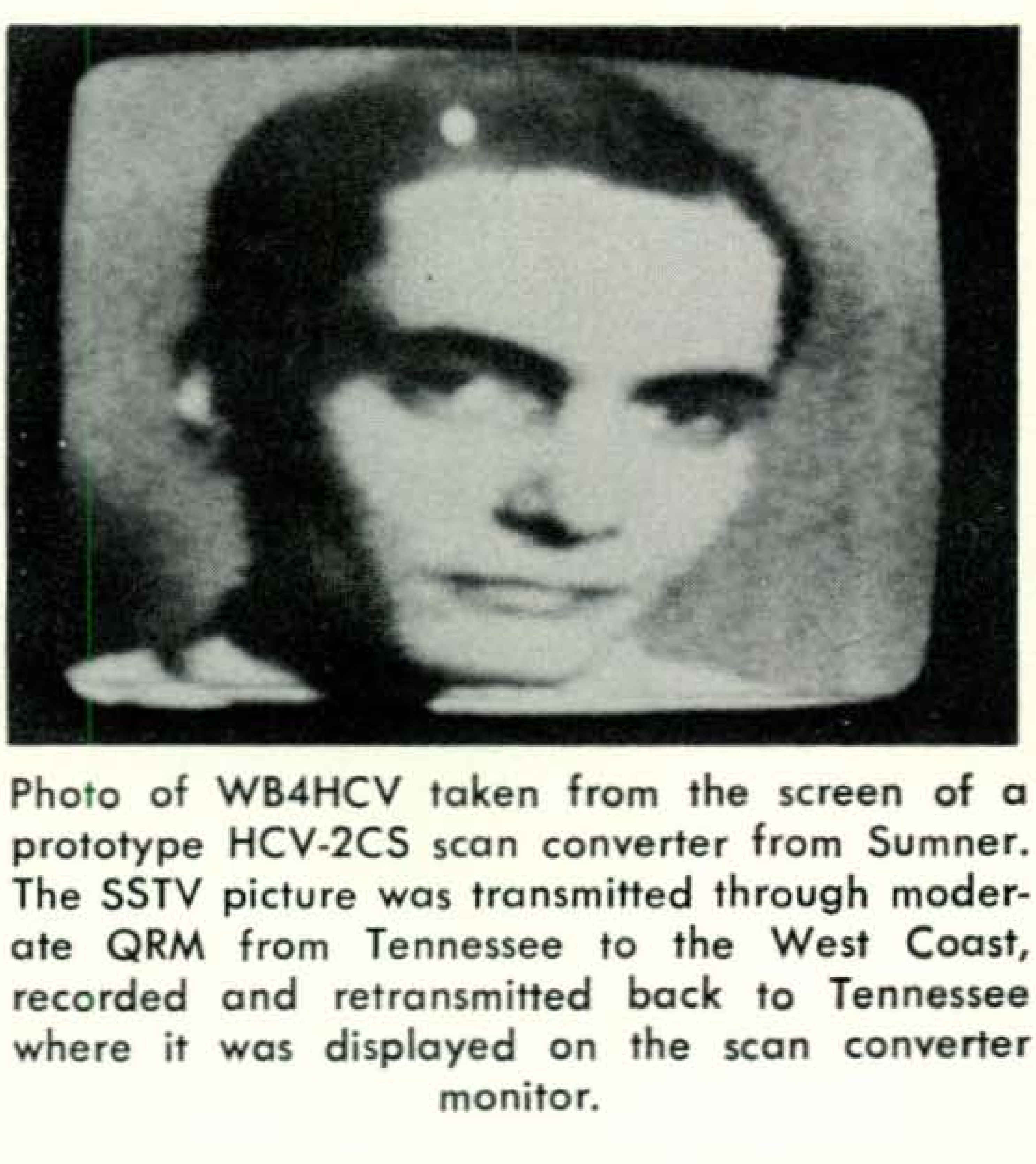


Photo of WB4HCV taken from the screen of a prototype HCV-2CS scan converter from Sumner. The SSTV picture was transmitted through moderate QRM from Tennessee to the West Coast, recorded and retransmitted back to Tennessee where it was displayed on the scan converter monitor.

antennas

BY WILLIAM I. ORR,* W6SAI

THE scratchy voice floated dreamily out of the still night air, an etherial whisper from long ago. It seemed far away and spoke of times past . . .

"The WNEW Dance Parade carries on! Now, from *Frank Dailey's Meadowbrook,* on the Newark-Pompton Turnpike at Cedar Grove, New Jersey, we bring you the music of Larry Clinton and his orchestra with Bea Wain doing the vocals. For their first number . . . "

I walked to the door of the shack and gently opened it. In the dusk I saw the shadow of Pendergast, sitting in his vintage 1939 Ford V-8 roadster in the driveway, listening intently to the car radio.

"Good evening," I said. "I can see how you've recreated the car and the radio, but how did you recreate the old radio program?"

"Easy," said my friend Pendergast. "I have a tape deck in the car. It's easy to get tapes of old radio programs. How would you like to listen to the *Tasty-Yeast Jesters, Uncle Henry's Showboat,* or *Fred Allen's Town Hall Tonight?"*

"No, thanks," I replied. "Nostalgia just isn't what it used to be."

"I'll save a tape of Jean Goldkette's orchestra for you," said Pendergast, snapping off the tape deck, vaulting over the car door, and advancing towards the radio shack. "Since you refuse the past, let's talk about the present. What's doing

*48 Campbell Lane, Menlo Park, CA 94025.

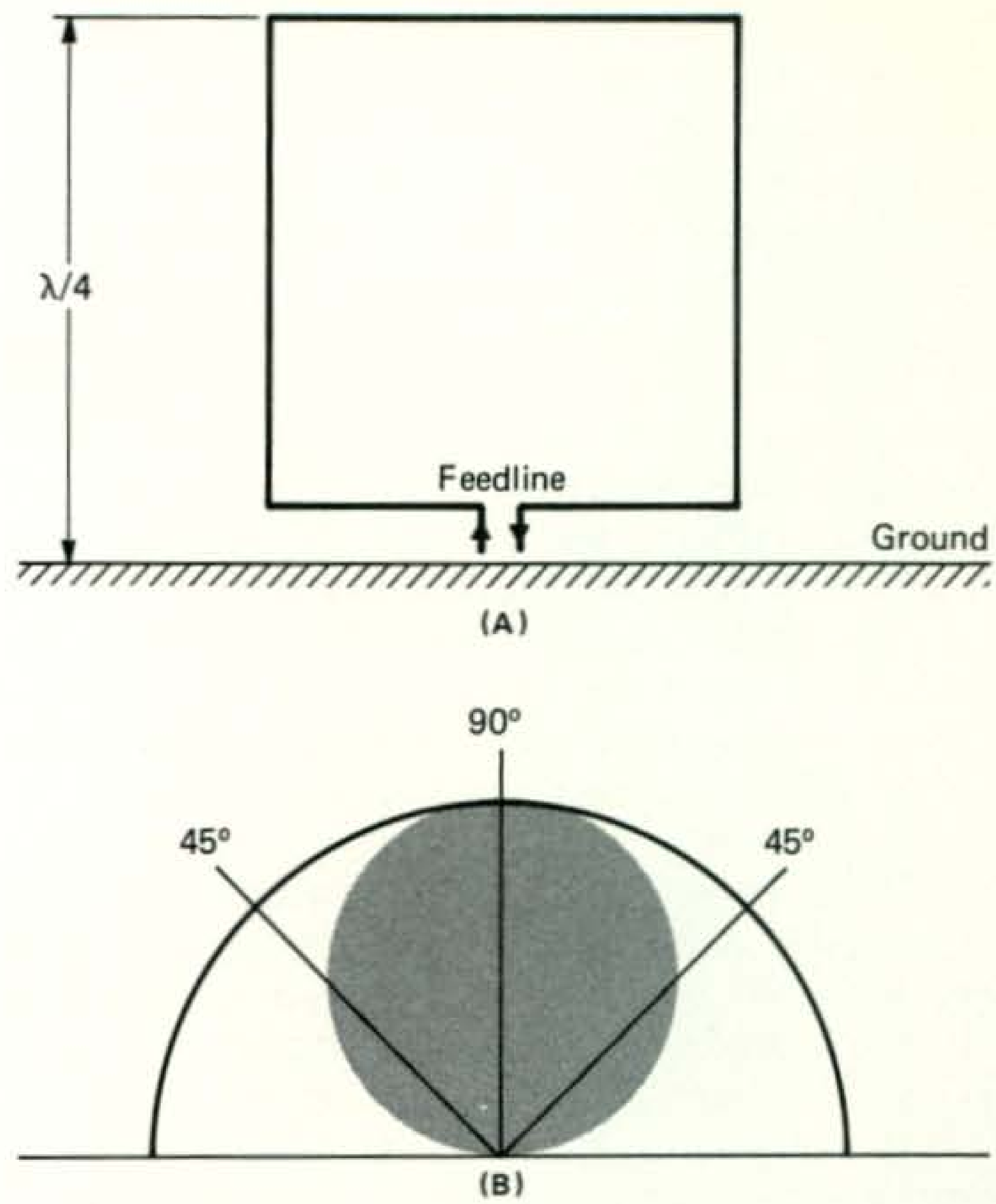


Fig. 2—Pattern test for horizontally polarized 470 MHz Quad loop.

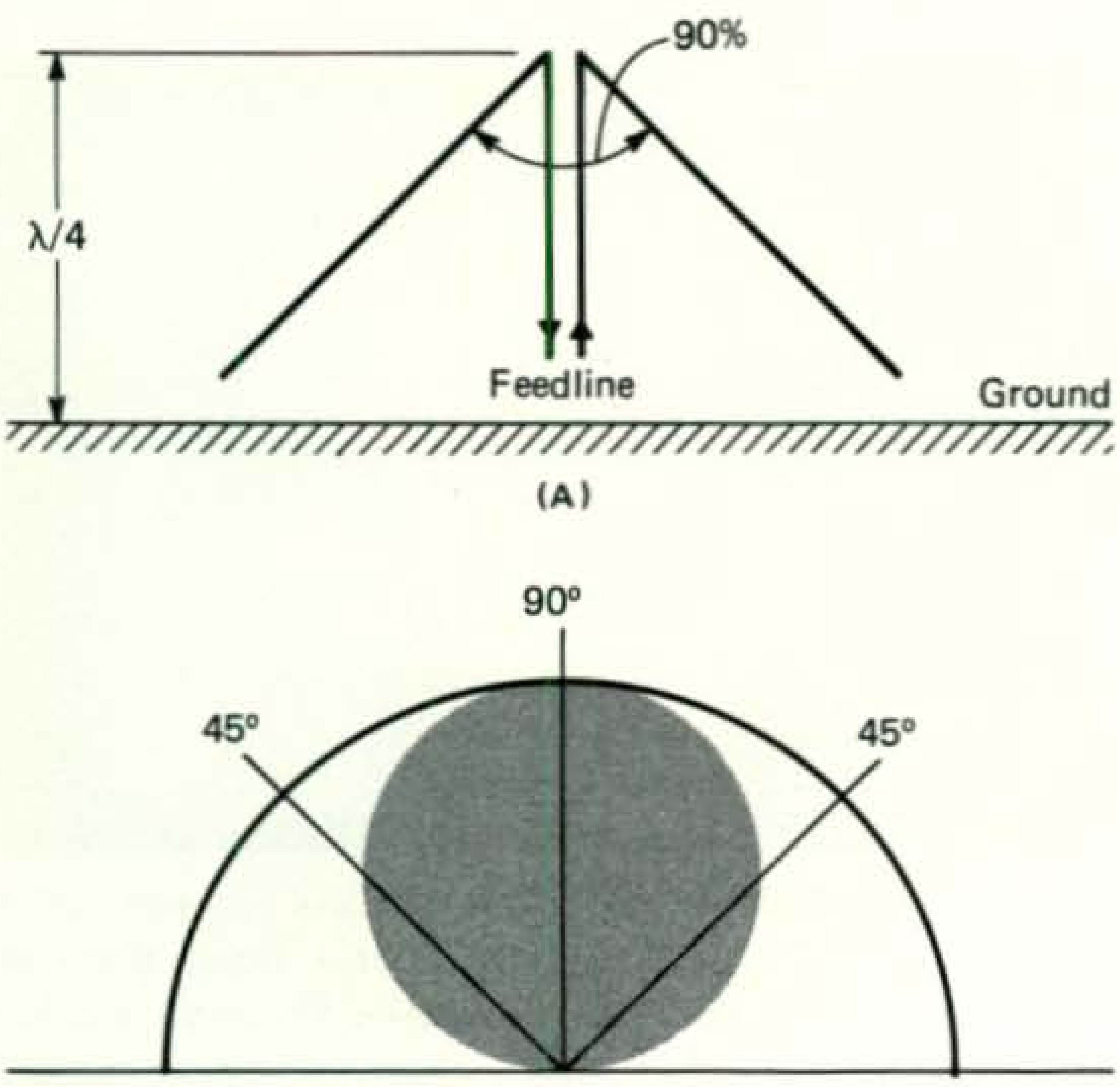


Fig. 1—G3AQC pattern test results for 470 MHz Inverted V.

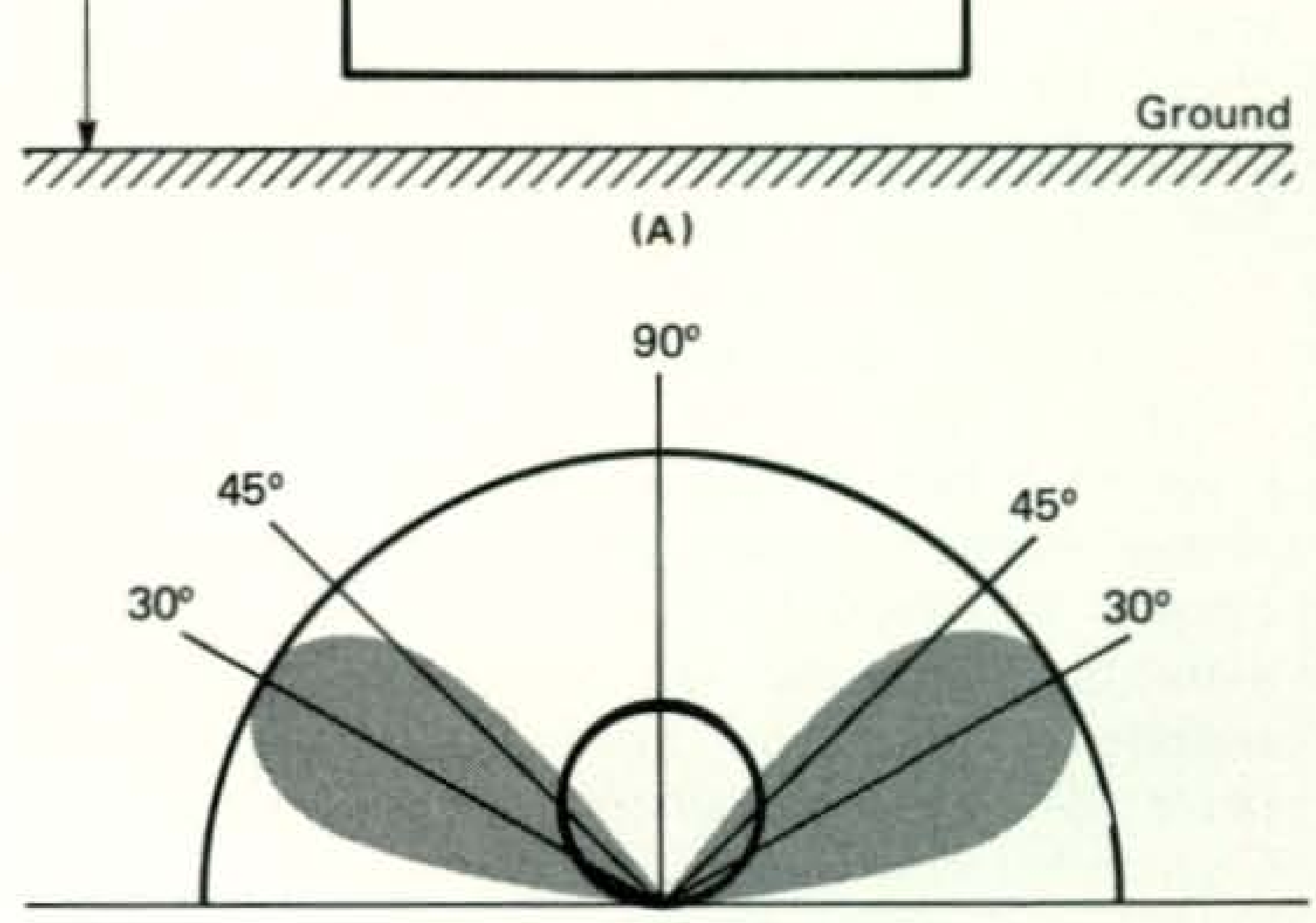


Fig. 3—Vertically polarized Quad loop pattern test.

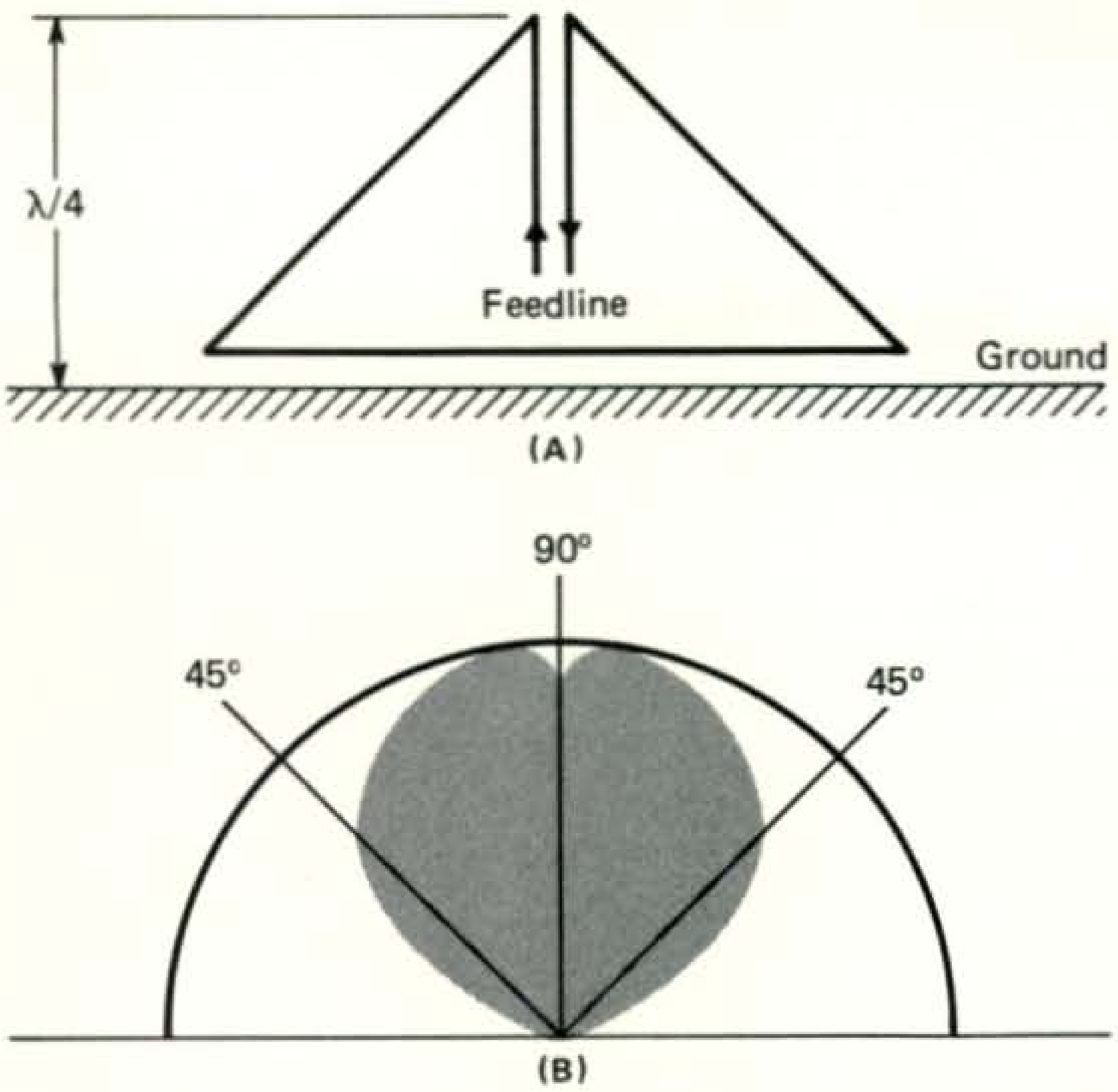


Fig. 4—Pattern test by G3AQC for 470 MHz Delta loop fed at the apex.

in the real-world of today, especially with regard to antennas? I'm particularly interested in antennas for 80 and 40 meters, now that the sunspot cycle is so low. What do you have new and interesting in this field?"

"Well, first of all, the Award-of-the-Month goes to our British friends in the Radio Society of Great Britain, with their fine magazine *Radio Communication*. In a recent issue, Laurie Mayhead, G3AQC, has a first-class article on the use of Quad and Delta loops placed very close to the ground."

"That's *great!"*, exclaimed Pendergast." The big problem on 80 meters is to get a good DX antenna with a low angle of radiation. Since a quarter-wavelength is nearly 70 feet, this is almost an impossible situation. You just can't get the 80 meter antenna high enough in the air for best results. And I don't particularly like the noise pickup of a vertical antenna."

"It's a tough situation," I agreed. "However, G3AQC's tests point out that it is possible to get a reasonably good, low angle signal for 80 meter work with a low Quad, or Delta loop. He conducted a series of experiments at 470 MHz using resonant loops mounted close above a ground plane and plotted the vertical and horizontal field patterns at a distance of five wavelengths. The story is in the May, 1974 issue of *Radio Communications*. His data opens up a whole new insight into the performance of loops at low elevations. It is great information for the 80 meter DX operator.

"G3AQC checked his range by plotting patterns of a vertical quarter-wave antenna and also a dipole placed ¼-wavelength above ground. He got the usual radiation patterns you see in all the Handbooks. The vertical whip had a pattern hugging the ground and the dipole's pattern was at 90 degrees to the earth's

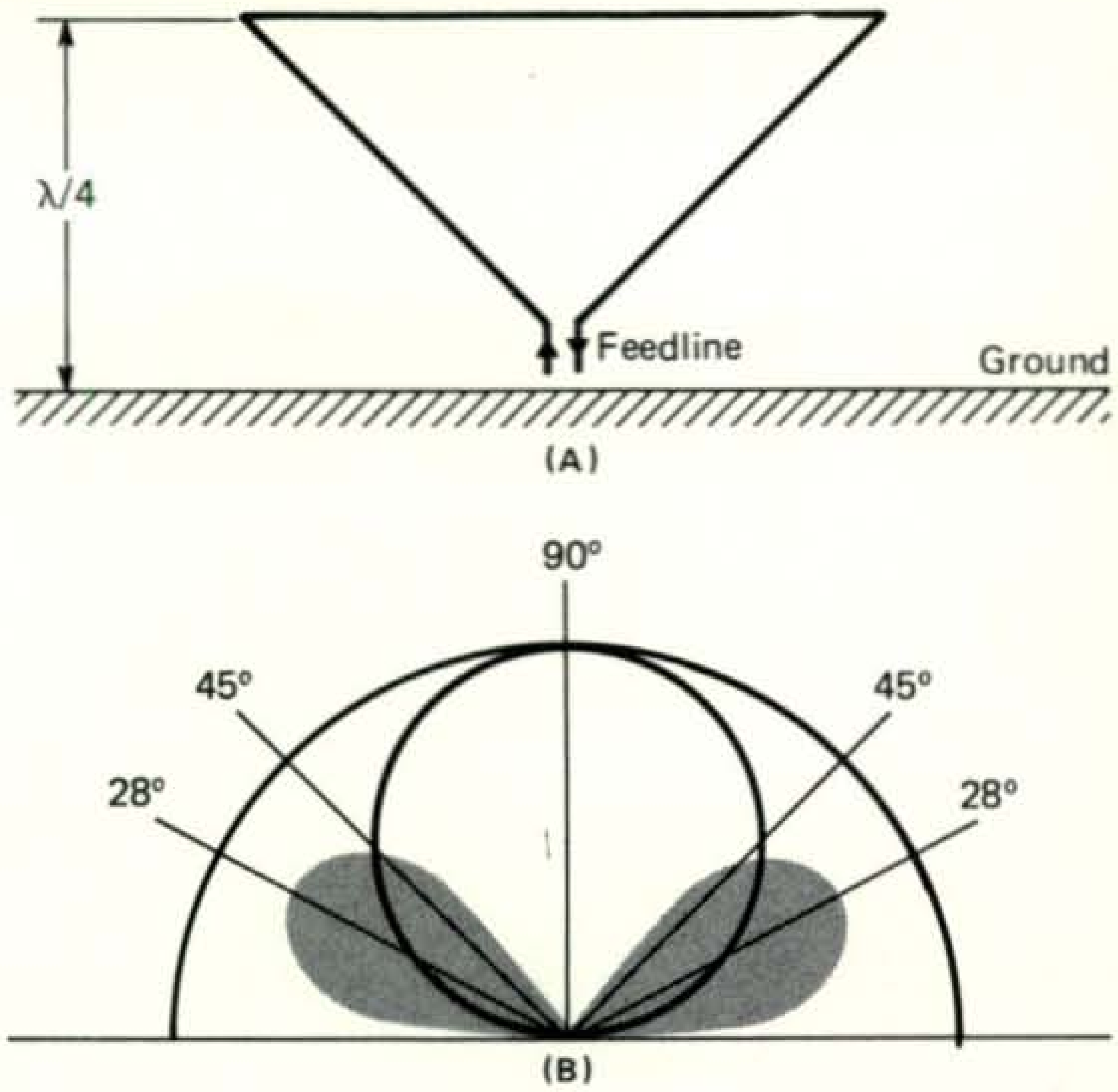


Fig. 5—Upside down Delta loop fed at the apex.

surface . . . in other words, straight up!

"His next test was with an inverted-V dipole with the apex ¼-wavelength high. The included angle of the V was 90 degrees. The radiation pattern resembled that of the horizontal dipole (fig. 1)."

"Ha! That says the inverted-V, close to the ground, is no better than a dipole. That will make a lot of enthusiastic users of the inverted-V unhappy," said Pendergast with a sly grin.

"The next series of tests were run with a loop antenna," I continued. "Look at fig. 2. This is a horizontally polarized Quad loop fed at the base, with the top just over ¼-wavelength in the air. Again, most of the radiation is at 90 degrees with respect to the ground plane. Not a very good antenna for DX. But notice the

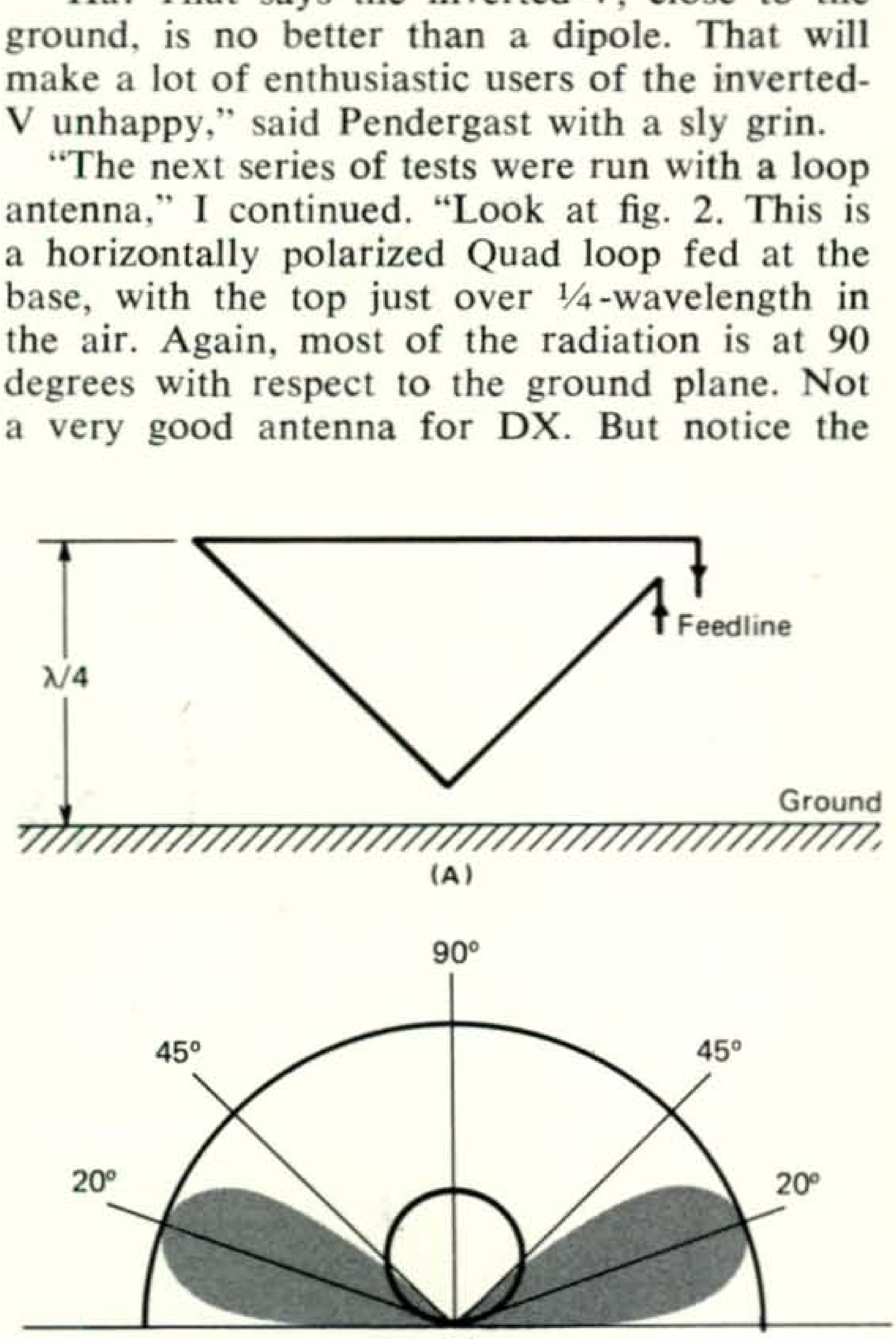


Fig. 6—Pattern test of 470 MHz inverted Delta loop fed at corner.

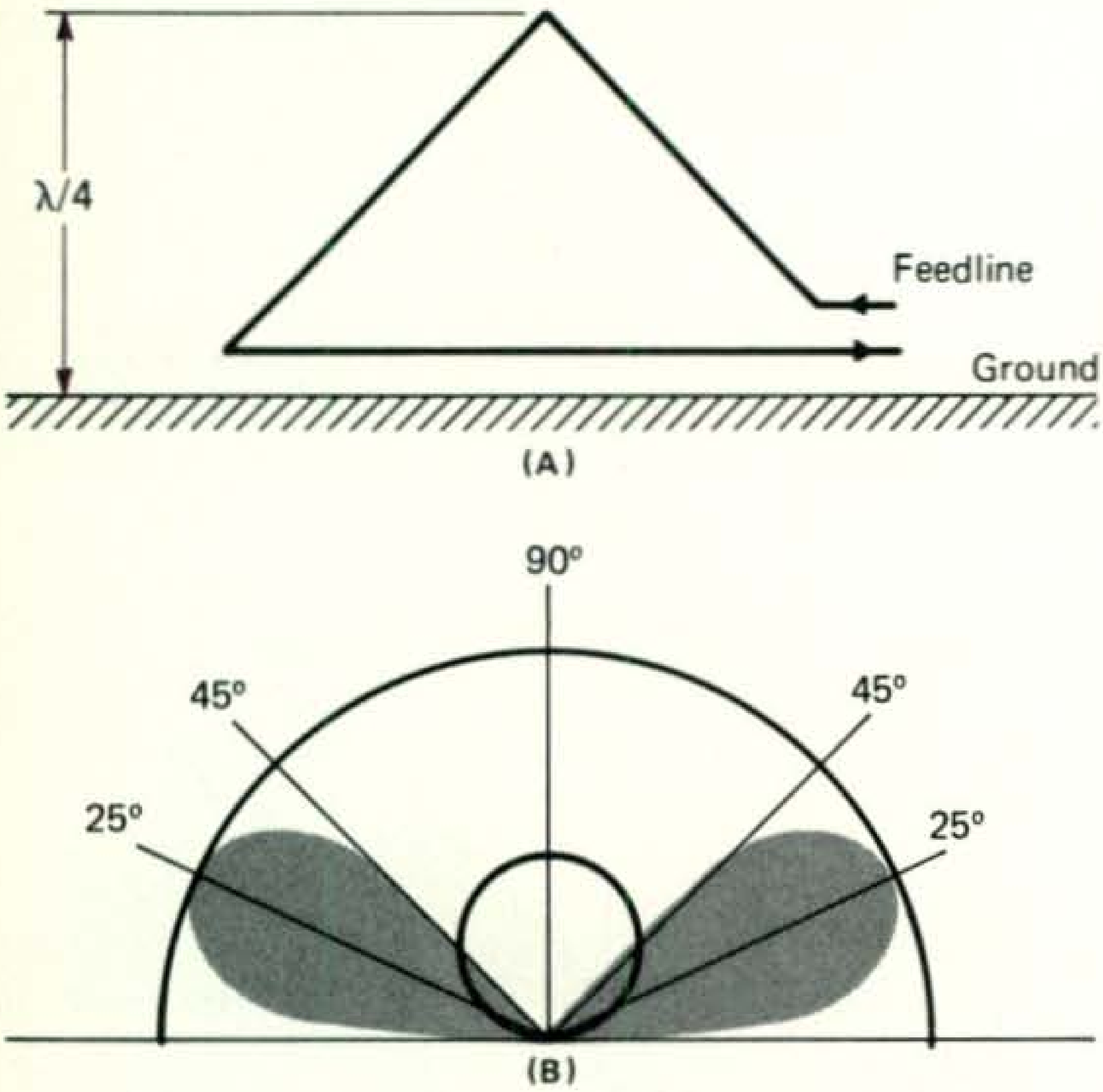


Fig. 7—Right side up Delta loop fed at corner.

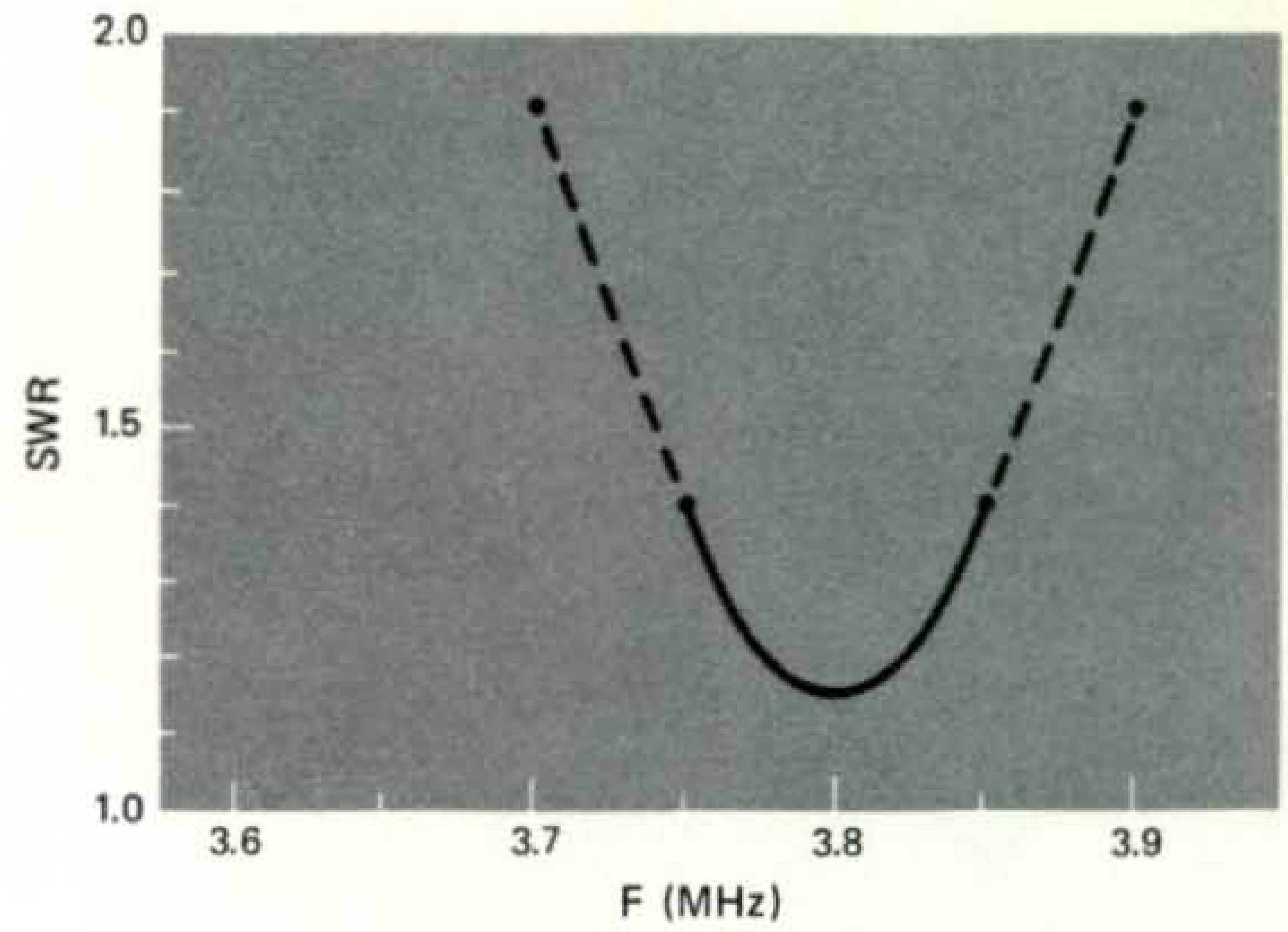


Fig. 8—S.w.r. curve for actual size 80 meter inverted Delta loop fashioned after the 470 MHz model of fig. 6.

improvement when the loop is fed with vertical polarization (fig. 3). The main lobe is at 30 degrees, with an extra high-angle horizontally polarized lobe of radiation."

"That's not a bad antenna pattern for a Quad loop so close to the ground," remarked my friend. "I would guess that it would have less ground loss than a ground-mounted vertical antenna, unless the vertical had a lot of radials under it."

I continued. "G3AQC's next experiment was with a Delta loop fed at the apex (fig. 4). Not so good: all high angle radiation again. So he inverted the loop, placing the apex at the bottom (fig. 5). He now found the usual high angle horizontal lobes, but also very useful lobes of vertically polarized energy at an angle of about 30 degrees above the horizon. His next step was to take the Delta loop of fig. 4 and feed it at the center of the horizontal section. Again, the results were only fair: mostly high angle radiation."

Pendergast studied the drawings. "Well, it looks to me as if the inverted Delta loop may have something going for it," he remarked. "Did G3AQC run any more tests on this design?"

"Yes, he did," I said. "The next test was to feed the inverted Delta loop at one corner (fig. 6). This provided a large, vertically polarized lobe of radiation at about 20 degrees above the horizon, plus a small amount of high angle, horizontally polarized radiation. While these tests were being conducted, G3ZTH reported good results with a similar design (fig. 7), which was a Delta loop fed at a bottom corner. This provided a similar pattern to the inverted loop, but required only a single pole for support."

"That sounds interesting for the 80 meter DX hound," said Pendergast. "Did the G's ever try full-size antennas of this type on the lower bands?"

"Well, they built two antennas for 80 meter operation," I replied. "The first one was the design of fig. 6. The actual s.w.r. curve for 80 meter operation is shown in fig. 8. Design frequency is 3.8 MHz. Two 65-foot-high supports held the loop in the air. A one-to-one balun was used at the feedpoint. This was necessary to prevent radiation from the feedline. G3AQC used 75 ohm coaxial line in his design, but

[*continued on page 71*]

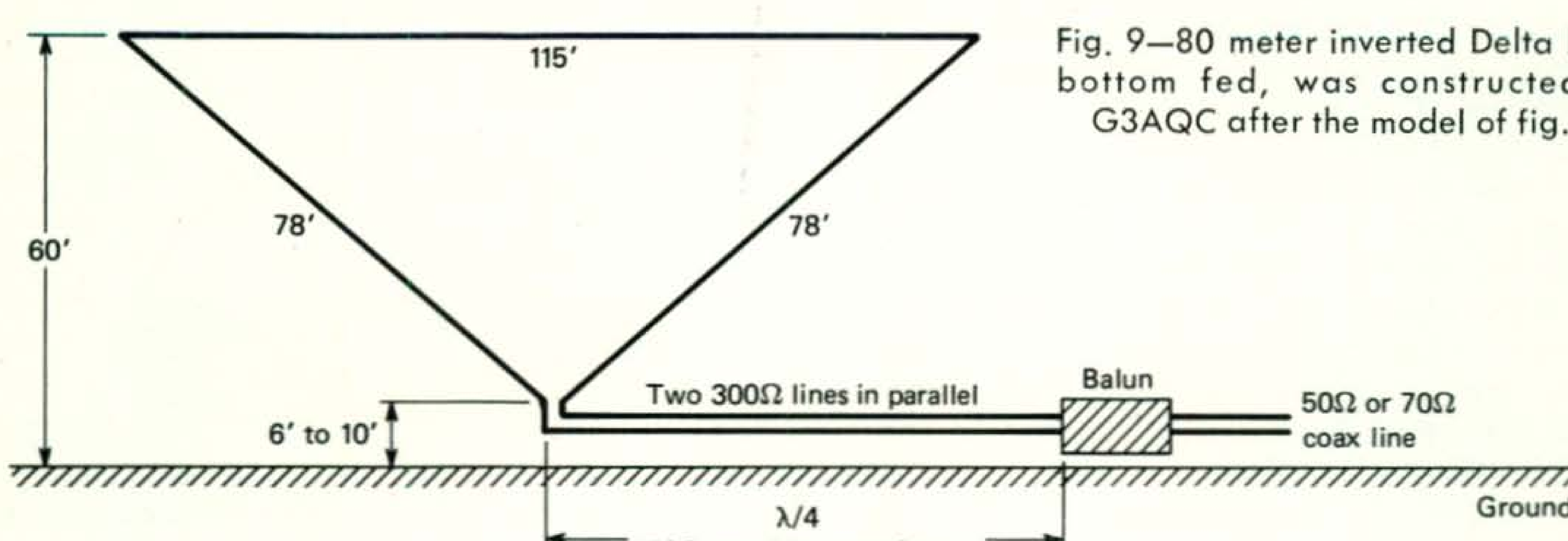


Fig. 9—80 meter inverted Delta loop, bottom fed, was constructed by G3AQC after the model of fig. 5.

QRPp

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG

VFO Switching With PIN Diodes

Every now and then a columnist will stick his neck out and propose a novel idea in print, hoping that the theory will work out in practice. There's always the chance that the idea will turn out a flop with the resultant embarrassment, etc. The intention is always the best—keep that in mind. I engaged in this type of patent foolishness in the v.f.o. design notes column in the April issue when I proposed an untried method of switching the v.f.o. tuned circuits with PIN diodes without first having tried it out in practice. As proposed (see fig. 5, p. 42, April, 1975 *CQ*) the thing won't work in practice—but the theory is still good. Well, we've worked out the bugs and come up with a practical circuit that does what the theory suggests it should. One fundamental change is that the PIN diodes, rather than functioning as isolating switches as suggested, are used as circuit completers.

Practical Circuits

Figure 1 shows the basic circuit developed here with a pair of tank circuits tuned by a Varactor diode. The chief advantage of this approach is that the entire v.f.o. can be completely shielded with no r.f. carrying leads leaving the p.c. board itself, and all mechanical sources of frequency instability, such as intermittent switch contacts, loose leads, and tuning capacitor instabilities, are eliminated. The circuit shown in fig. 1 includes only the part of the v.f.o. circuit under consideration—the rest of the v.f.o. circuit is that developed by MFJ Enterprises (see fig. 2, p. 39, April, 1975 *CQ*).

The PIN diode has the capability of passing an r.f. current without rectification, unlike other types of diodes. It has the capability of dissipating 400mw, so this allows the designer considerable leeway with bias current. The MPN-3401 used in the circuit exhibits a very low junction capacitance when not forward biased (1 pf), a characteristic which enhances its isolation capabilities in an h.f. r.f. circuit. Given the low internal forward resistance of the device, considerable current can be handled before dissipation ratings are exceeded. In this particular application, current is held to a minimum.

*213 Forest Ave., Vermillion, SD 57069.

The crucial question during experimentation was whether changes in bias level on the diode would affect the frequency of this critical part of the v.f.o. circuit. The smallest changes in component values in the v.f.o. tuned circuit result in very noticeable shifts in frequency. The MPN3401 came through with flying colors. However, this is not to say that effects could not be bad. It was discovered that as the bias voltage and resultant current was raised through several threshhold points, the frequency of the v.f.o. would shift upward some 200 kHz as if being tuned by a Varactor. For example, with no resistor between the r.f. choke and ground (see fig. 1), conduction would occur at about 1.1 v. forward bias, and the v.f.o. would stay right on frequency until a forward voltage of about 3.2 v. was reached. At this point, current was about 65 ma. Even above this bias point, stability was again achieved until the next threshhold point was reached. In short, the actual bias voltage on the diode is non-critical for all practical purposes.

The MPN3401 conducts with about 0.8 v. forward bias between cathode and anode. The diode itself may be positioned in a voltage divider anywhere from B+ to ground, but it is advisable that there be a resistor between it and ground as shown. In fig. 1, the 1.2K and 5.6K resistors and the diode resistance form a voltage divider which places 3.0 v. on the anode and 2.1 v. on the cathode, and voltage drop across the diode is about 0.9 v. (the series resistance of the diode decreases with an increase in forward current until about 10 ma, where it levels off). Forward current is about 2 ma. These values and bias level were chosen because standard size resistors did the job. If it is desired to take the bias from the zener regulated v.f.o. B+ source (say 9.1 volts), a bit of math and Ohms law will probably yield standard size resistances, if the diode current is altered to suit the case.

An alternate method of biasing the diode by means of a 1.5 volt cell as indicated in fig. 1. In that case, the voltage divider resistors are simply omitted, and the r.f. choke connected directly to ground. Diode current will be about 6.9 ma.

Absolutely essential to performance of the system in this critical application is r.f. isolation of the switching circuits through the r.f. chokes. The size of the choke depends, of course, on the frequency of operation. At 7 MHz, it was found that about 220 μh is the minimum inductance for isolation. With that size r.f. choke, touching the B+ side of the r.f. choke had no effect on the v.f.o. frequency. A larger size choke will be necessary for 1.8 and 3.5 MHz use, and smaller size will suffice for higher bands. Two options are open: either

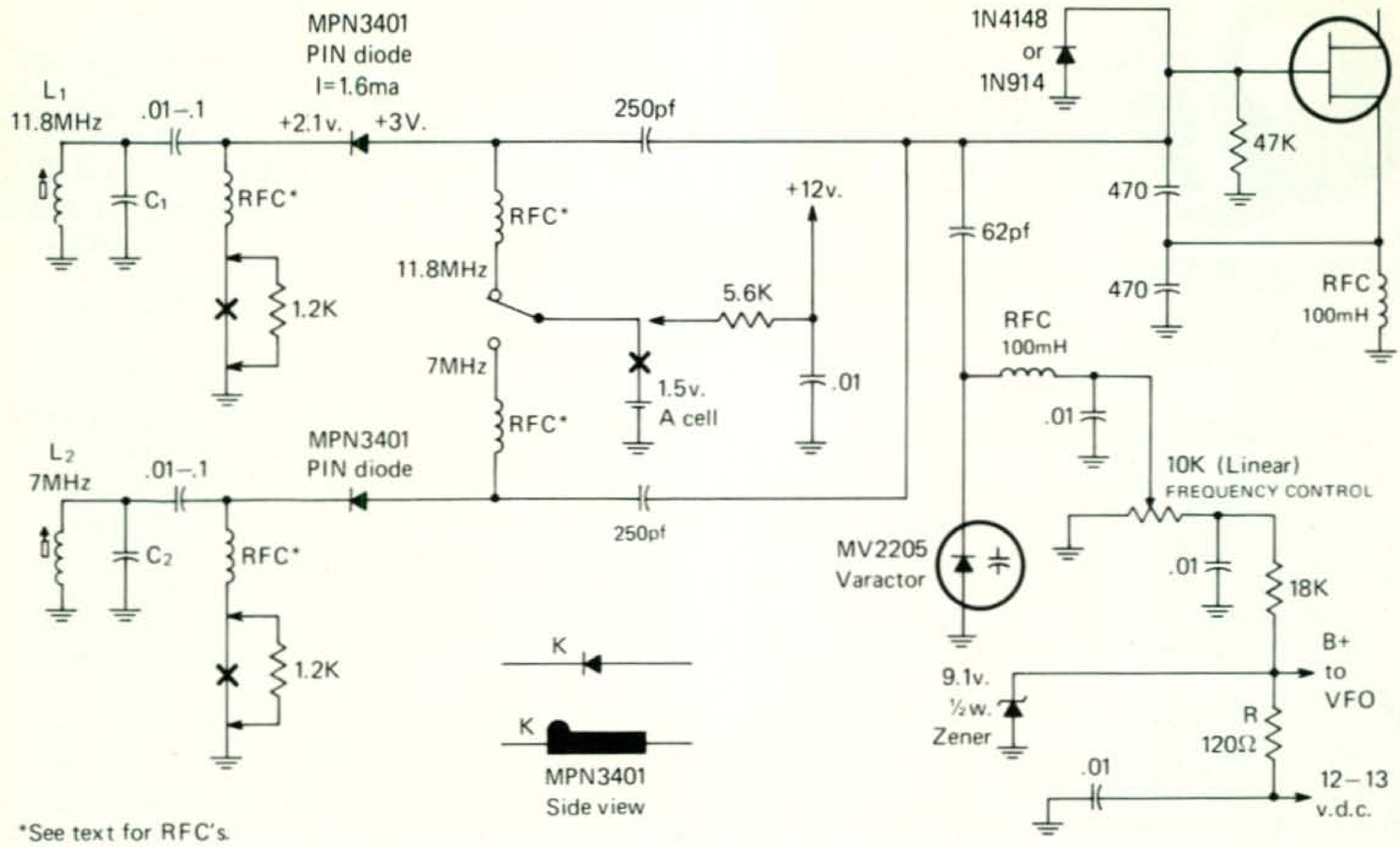


Fig. 1—Schematic of diode switching of v.f.o. tuned circuits. Two alternative diode biasing schemes are shown, one using a single 1.5 v. A cell, the other picking up bias from the 12 v.d.c. v.f.o. supply. When using the 12 v. supply break the three connections indicated by "X" and substitute the components shown. MV2205 (40 pf) and MPS3401 available at $1.00 each from Circuit Specialists, P.O. Box 3047, Scottsdale, AZ 85257.

purchase miniature encapsulated type chokes, or fabricate your own using Amidon jumbo beads.

Amidon Associates[1] has been supplying the amateur market with popular toroid cores for several years, but for some reason has not followed an advertising policy which has really let us know the wide range of toroids and ferrite beads that they market. We'll give a rundown in the next column. For the present, let me note that there are three sizes of ferrite beads available from Amidon Associates in three different ferrite mixes. The "101" size is (in inches) .138-OD × .051-ID × .118-L, the "801" is .295-OD × .084-ID × .297-L, and the "2401" (available only in #43 mix) is .380-OD × .197-ID × .190-L. The 64 mix material has a permeability[2] of 250 (for above 200 MHz applications), the 43 mix material a permeability of 950 (50-200 MHz), and the 73 mix material a permeability of 2500 (50 MHz and below). The r.f. chokes used in fig. 1 are wound on FB-43-801 beads (43 mix). 11t of #28 enameled wire will provide about 220 μh.

[1] 12033 Otsego St., North Hollywood, CA 91607

[2] Permeability is simply the magnification factor of the ferrite material. If an airwound coil has an inductance of 1 μh, when a core with a permeability of 100 is placed inside, the coil then exhibits an inductance of 100 μh.

About 19t of this size wire can be put on the bead for about 600 μh. Permeability is designated by the Greek letter μ. The formula for calculating approximate inductance is given below.

$$\mu h = (.0046\, \mu\, N^2\, h \log_{10} \frac{OD}{ID})$$

where N = number of turns, μ = permeability of core, h = height in centimeters (multiply inches by 2.54), OD = outside diameter in cm, ID = inside diameter in cm.

For FB-43-801, $\mu = 950$, $\log_{10} \frac{OD}{ID} = 0.5328$, $h = .75$ cm.

The beauty of these beads is that the amateur can wind his specialized r.f. chokes for whatever need arises. This is especially a boon with respect to r.f. chokes used high current conditions, such as in the B+ lead to a final amplifier. Using the "801" size, for example, a 8 t. choke can be had with #24 wire whose d.c. resistance is negilgible. More on these applications in a later column. The FB-801-43 beads come at $3.00 per dozen, the "101" $2.00 per dozen, the "2401" $3.50 per dozen.

To return to fig. 1, it appears that any number of tank circuits may be switched in a v.f.o. circuit using the basic scheme shown for two tanks—just add as many arms as are desired and a switch position for each. The arms which are not forward biased are completely isolated from the oscillating tank.

The Varactor tuning scheme shown uses a linear taper potentiometer as the tuning control. Bias voltage is taken from the regulated source. With the values shown, current through the zener is about 20 ma and the oscillator runs at about 8.2 ma. In choosing the series dropping resistor between the B+ and zener, aim for a zener current around the 20 ma figure, which is usually the stability test point for ½ watt sizes. With the Varactor shown, 140 kHz spread on the 40 m. band was achieved with good linearity—not perfect, but good! The scheme is now being used in a transceiver for 7 MHz here where both the direct conversion receiver mixer tank circuit and the v.f.o. tank are tracked closely by using identical values, and biasing both Varactor diode from the same pot. Multi-section air variable capacitors are really a thing of the past, judging from the performance of the Varactor method.

To conclude, the Varactor-PIN diode combination discussed above is really versatile. It seems that the combination makes possible a multiband capability using a bandswitch with a single wafer, and tuning all the tank circuits in a transciever with a single potentiometer without any trade-off whatever. I better qualify that to save my neck—all the tanks in the v.f.o. and receiver section. I haven't tried the system in driver and final amplifiers where the power involved may cause some difficulties. Will report on that when time allows.

News

The Argonaut Club, open to all QRPp operators, is ready to get underway under the direction of Edward Tanton, WA4BAA, 2829 Arden Way, Smyrna, GA 30080, and WA7-OKF, Lance Harmon, 711 E. 3rd North, Lehi, UT 84043. I've kept a sketchy list of all who've dropped me a card indicating a desire to join. Will pass the list on to the above, but go ahead and drop WA4BAA a card anyway—to avoid the usual problems people have with my bookkeeping talents! Plans at this stage include net activities, perhaps an annual QRPp contest in the fall, and a newsletter—at first to be included in *The Milliwatt.* QRPp is organizing world-wide with the appearance of the Argo Club, the G-QRP-C in England (note recent column), the DL-AG-CW in Germany, and PA0GG's organization in Holland. We are hoping that we can coordinate club awards, operating activities, and guidelines based on output power (5 w.) or input (10 w.)

Watch the next column for big news on QRPp DXCC #2!

Until then, 73's, and check-in on the QRPp nets: Saturdays: 14065 kHz, 1600Z; 7040 kHz, 1700Z. Cu there! 73, Ade, K8EEG/0

Spread The Word

An eye-catching bumper sticker encouraging the man in the street to "Talk to the World—Become A Ham Operator" is available from *CQ* for 25¢ plus a legal-size s.a.s.e. Quantity prices upon request. Write to: *CQ*, 14 Vanderventer Av., Port Washington, NY 11050.

For those of you who still want to get only 7½ issues of CQ each year at the newsstand for $7.50 instead of getting 12 whole issues for $7.50 by subscribing, we are thinking of starting sort of a clearing house called "Mix and Match". This way we can put you in touch with the person who has the other half of CQ you will be missing during the eighth month of the year.

You can send in a card listing which half you have and we can match it up, hopefully. It could turn into a club. Or if you really don't have time for meetings or even dues and reading of minutes you could send in $7.50 to CQ, resigning from the "Mix and Match" club and subscribing to CQ thereby getting 12 complete issues of CQ each year.

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

Phone Privileges Recommended For New And Novice Amateurs

Guided by 56,000 replies to its members' opinion poll on the FCC restructuring docket #20282, the response of the American Radio Relay League, Inc., to the docket is carefully tailored to give all presently licensed amateurs something without taking anything away from them—a neat trick. The ARRL proposal approves a new basic class V.F.H. license which will authorize phone (and c.w.), that will also be available to Novices. We will discuss it first.

The Basic class VHF license would authorize phone and code operation on 145 to 145.5 and 222 to 225 MHz using a maximum transmitter power input of 50 watts. The new license would be good for five years and would be available to any applicant who passes its examination under the supervision of two volunteer examiners. The examination would test the applicant's ability to recognize code characters with no speed limit and to pass the standard Novice written examination. Technically, the license would not be renewable but would be reissued indefinitely without a continuity gap if the licensee passes a new examination before his current license expires.

Your Novice Editor is in favor of these ARRL proposals with the proviso that the transmitters be crystal controlled, but strongly recommends that the FCC delete the meaningless code test and limits the written test to amateur regulations and operating procedures to insure that the licensees are familiar with them.

Novice class license. ARRL concurs with the FCC recommendation to make the Novice license term five years and that its by-mail exam be witnessed by two volunteer examiners. ARRL also recommends that it should cover the new Basic license privileges in addition to the present c.w. and 75-watt power privileges. The license privileges would be extended without a break by the licensee passing another test before his current license expires. We like ARRL's ideas.

*Care of 144 Richter, Chesterton, IN 46304

Technician And Higher Class Licenses

Both ARRL and the FCC would include Novice privileges in the Technician class license. That is the only thing they agree on for the license. ARRL wants the Technician license to authorize all amateur privileges above 29 MHz. FCC wants to introduce a new Experimenter class license and split the privileges between it and the Technician license. ARRL proposes that all presently licensed amateurs who obtained their licenses by mail be allowed to renew them forever without taking another test. FCC proposes that all by-mail licensees, except the physically handicapped, would have to pass the appropriate examination before an official FCC representative to renew their operating privileges. ARRL goes along with the FCC on renewing by-mail licenses obtained after the new regulations go into effect. We favor a compromise between the two views. Give affected present by-mail licensees five years after the effective date of the new regulations to comply with them.

ARRL proposes to lower the General class code test to 10 w.p.m. and to increase the Advanced class code test to 15 w.p.m. but not to require present General and Conditional class licensees to take the code test when applying for an Advanced license. Except for other

Paul Terwilliger, WN2QDP, 1921 Bentley Rd., Schenectady, N.Y. 12309, worked 49 states and 41 countries during his Novice career, which is undoubtedly now over, as he took his General/Advanced class exams shortly before sending this picture of his station. His equipment includes a Heathkit SB-401 transmitter and SB-303 receiver and a homebrew electronic keyer. His antennas are dipoles 40 feet high for each Novice band. We are sending Paul a 1-year subscription to CQ for sending us this winning photo in our Monthly Novice Shack Photo Contest. Try your luck by sending a sharp photo, preferably "black anl white," and some details on your radio career to: Novice Shack Photo Contest, c/o Herbert S. Brier, W9EGQ, 144 Richter St., Chesterton, Ind. 46304. Even if you don't win, suitable pictures will be published as space permits.

Work a Novice in each of the 10 U.S. call areas to qualify for the "Novice All American Award," sponsored by the San Rafael, California, High School Radio Club. Send the list of the contacts with dates and times and $1.00 (Four International Postal Reply coupons outside the U.S.A.) to: William A. Pearson, WB6QBJ, Awards Manager, Novice All-American Award, 25 Rudnick Avenue, Novato, California 94947. You may substitute a WH6 (Hawaii) or WL7 (Alaska) for any other call area.

minor changes, ARRL likes the rest of the General, Advanced, and Extra class licenses and tests about the way they are now. So do we. The changes ARRL wants are: allow Advanced licensees to use "preferred" 3-letter call signs, make the Extra class operator license a lifetime license, and substitute a new 14.175-14.200 MHz Extra-class phone band for the present 21.250-21.270 MHz one. We long ago told the FCC and our ARRL director of our opinion that the 14 MHz band was a more logical place for an Extra-class phone band than the 21 MHz band.

Canadian License Changes

It is interesting that the new ARRL proposed code requirements for the General and Advanced class licenses parallel the Canadian 10 w.p.m. requirement for the Amateur grade operator certificate and 15 w.p.m. for the Advanced Amateur grade ceritficate. The Canadian written/oral technical exams have just been up-dated, by the way. The Canadian operator certificates are good for life, but the station license must be renewed before April 1, each year, with a $10.00 annual license fee.

QSL Cards And QSL Managers

Be there a radio amateur with soul so dead whom to himself has never said, "I would like a QSL card, whether it be black or red?" Well, yes. A few—about the same number that send QSL cards to every station they work. Many newcomers start doing the latter until they discover that the mail carrier is carrying away many more cards from their mail boxes than he is delivering. From that point, they may answer every card they receive, but they send their own cards first only to stations from which they particularly want cards, as mementoes of particularly enjoyable or informative contacts or to confirm a new state, county, or country worked.

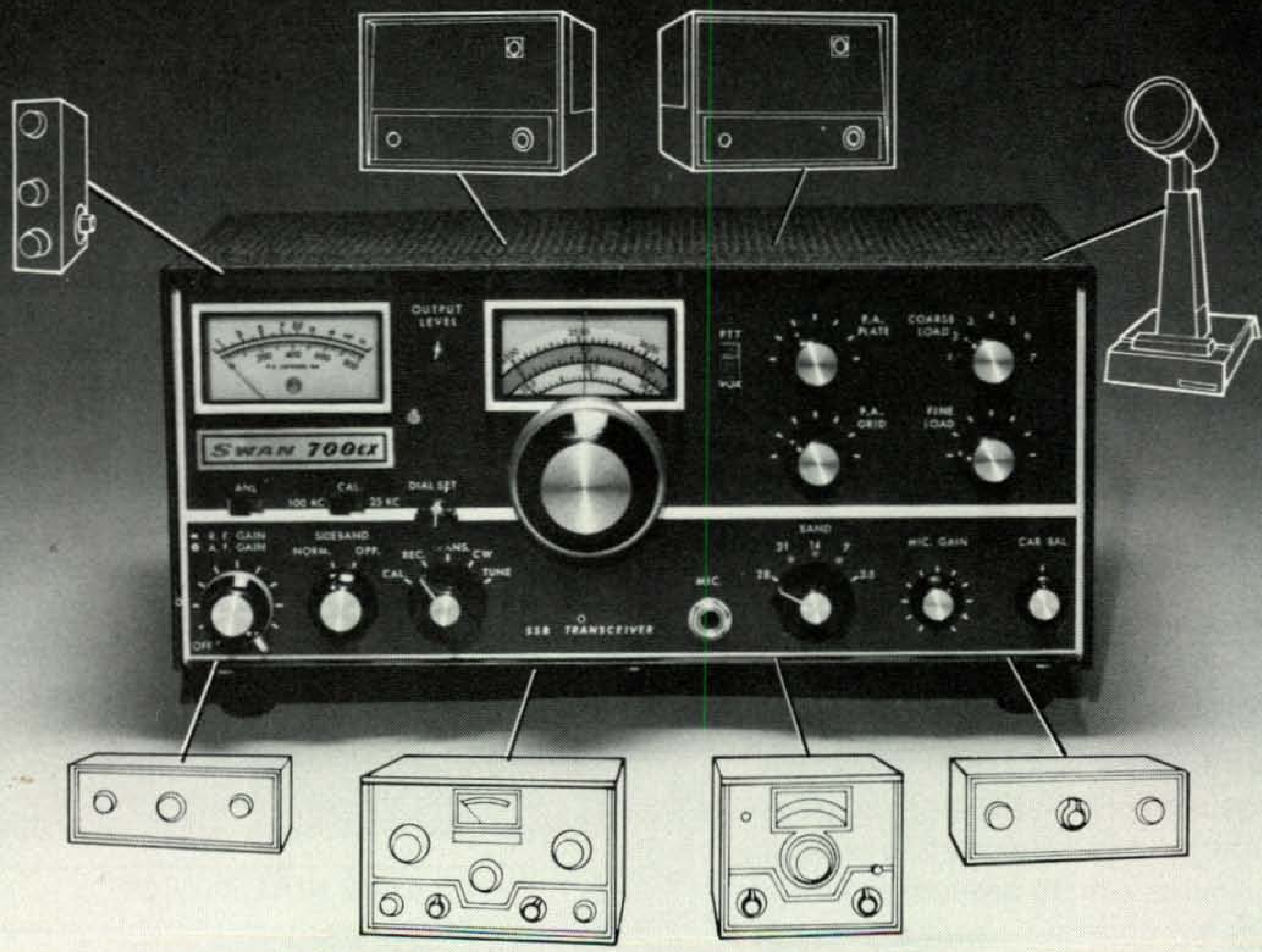
QSL cards from selected stations become very important to an amateur who is striving for an operating award, such as a WAS (Worked All States), USA-CA (USA Counties Award), DXCC (DX Century Club), or WAZ (Worked All Zones) certificates and similar certificates sponsored by *CQ*, ARRL, and other amateur organizations. The major awards require QSL cards confirming each claimed contact to be included with the application for the award. Furthermore, the cards are examined very carefully to insure that they are complete and correct in all respects. If you want your WAS certificate to indicate that you earned it as a Novice by working only Novices in the 50 states, each card must support that claim.

The first thing that you should do with a card that you plan to use as part of the evidence to qualify for an award is answer the card. Next, inspect it thoroughly for completeness and lack of errors. If you find something amiss, immediately return it to the sender with a request for a correction of the error. In making out your own cards, include the following information: the call letters of the station worked, your own call letters, date and time of contact, mode used, signal report, and a definite indication that a 2-way contact is being confirmed. Also, if the contact was made from a temporary location, identify it. If you make a mistake in filling out the card, the best thing to do is to destroy it and make out another one. Sponsors of the better-known awards reject altered cards. Finally, put a complete and accurate address on the card and mail it.

A difficulty faced by new amateurs mailing QSL cards is the time lag before new calls get in the *Call Book*. Consequently, they must send their addresses to each U.S. station they work to have much chance of receiving a card, unless the other station is listed in the *Call Book*. Oddly enough, the newcomer who works DX with unknown addresses has a better chance of exchanging QSL cards with them than with locals. The ARRL sponsors DX QSL bureaus in each U.S. and Canadian call area. Their addresses are listed in *QST* each month, and you are invited to keep a supply of stamped return envelopes with your bureau to receive your incoming foreign cards. QSL Managers and information on addresses are listed in *CQ*'s DX column each month. Foreign ama-

[*Continued on page 70*]

When you start your top-performance ham station, start with our 700CX.



It's the way to grow.

Everybody wants the ultimate ham station, but the only way most of us are going to get it is to start now and grow into it.

And the best way to start is with our 700CX.

Then you'll have an excellent transceiver with 700 solid watts P.E.P. input of SSB power at the lowest cost per watt—about a buck—of any comparable equipment.

And when you're ready to add capability and features, plug in or hook up Swan accessory equipment for easy expandability.

For instance, just plug in our 510-X crystal oscillator when you want extra frequency coverage. If your kind of traffic calls for separate transmit and receive frequencies, our 508 VFO is made for your station. Want VOX? Plug in the Swan VX-2 and start talking. Or hook up our FP-1 telephone patch in minutes.

And when you're ready for that big jump to all-the-law-allows, our 2000-watt P.E.P. input Mark II linear amp is waiting in the wings.

Add our complete selection of power supplies, microphones and other options and you've got everything you need for a full-house rig in matching specs and matching decor.

So your ham station will look and perform like it belongs together.

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(includes Speaker and Cabinet)
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(less Speaker and Cabinet)
510-X Crystal Oscillator .... **$ 67.95**
508 External VFO **$269.95**
VX-2 Plug-In VOX .... **$ 44.95**
FP-1 Telephone Patch .... **$ 64.95**
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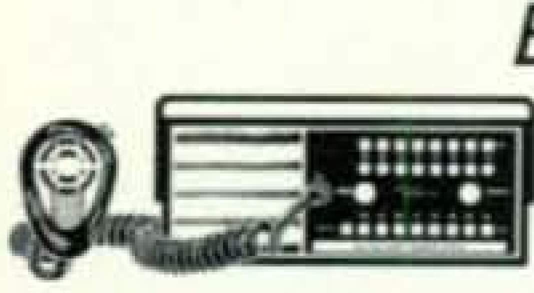
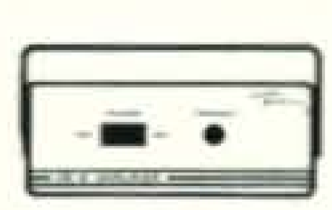


HR-2MS
8 Channel Transcan
2 Meter FM Transceiver

HR-212
12 Channel-20 Watt
2 Meter FM Transceiver



AR-2
2 Meter FM
Power Amplifier

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DX

BY JERRY HAGEN,* WA6GLD

AFTER this issue the DX Editorship will return to John Attaway K4IIF as occupational and other committments have limited my time for preparation of this column. The help of all DXers during the past years is sincerely acknowledged and has made the duties extremely pleasurable.

DXTRA

In the month of May, WPXers were again treated to a period of concentrated activity in commemoration of the International Telecommunications Union Day and the 110th anniversary of the founding of the ITU. As in 1974, the FCC authorized special prefix calls and the bands were filled with "Top Notch" operators. However, this Editor's enthusiasm was dampened by many complaints and criticism about W/K QSL's from the previous years activity. It appears that a number of stations or QSL managers have not sent any 1974 QSL's as of this writing. As special prefixes will be authorized for all amateurs in 1976, DXTRA has the following comment regarding QSLing:

DXers have always prided themselves in generating goodwill among the stations of the world. One of the fitting gestures is the exchange of QSL cards after a DX QSO. Not only do the QSL's count for various awards such as DXCC, WPX and WAZ, but they serve as calling cards and directory information. Longtime DXer Dan Wallace, W6AM, once stated that he always took QSL's received from amateurs in a country on his travels because they "opened" more doors than any other method and provided a genuine personal introduction when abroad. In the case of the ITU week, what better method could one publicize the ITU than by confirming each QSO with a QSL noting the purpose and functions of the ITU?

So fellows, lets don't slack off on the QSL's —They may be costly but the intangible benefit *is* there. DXers should also be careful when volunteering as a QSL manager or obtaining a special call because replying to QSL's is a tedious and time consuming task. Lets see if we can improve the image of the USA amateur with prompt QSLing during our Bi-centennal year of 1976.

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

The WAZ Program
Single Band WAZ

20 Meter Phone

W9YRA......9
K9HMB......10
YU1BCD......11

20 Meter C.W.

7......WA5VDH

S.S.B. WAZ

1264......ZL1SZ
1265......F5JA
1266......VE3AS
1267......I8CPK

C.W.—Phone WAZ

3843......WB5DDI
3844......F6ACD
3845......W6MTJ
3846......CP1EU
3847......K2SHZ
3848......UK5TAA
3849......JA1DIO
3850......6O1ND

Phone WAZ

506......F9IL

Complete rules for the Single Band WAZ Program appear on pgs. 57-58 of the December, 1972 issue of *CQ*. Complete rules for regular WAZ are found beginning on pg. 46 of the April, 1975 issue. Application blanks and reprints of the rules for all WAZ awards may be obtained by sending a self-addressed, stamped envelope to the Assistant DX Editor, P.O. Box 205, Winter Haven, FL 33880.

Fresno DX Convention

The 1975 Fresno DX Convention was again an outstanding event with the Northern California DX Club as Host this year. The banquet speaker was Fred Laun, W9SZR who gave a brief rundown on being kidnapped in Argentina, in 1974. Fred noted the great help of the Radio Club Cordoba and Canal Zone Amateurs while he was recovering in various hospitals. He also thanked all amateurs who had sent him "get well" cards and letters and said that he would personally reply to every one.

Fred was followed by a Kingman Reef slide presentation which told of the large amount of

The Fresno DX Convention Main Speaker, Fred Laun—W9SZR/HS5ABD/LU5HFI is on the right with a smiling W6DQX on the left. Phil, W6DQX was Fred's QSL Manager for his HS5ABD operation. *(Photo by K6KS)*

The "Big Gun's" were ceremoniously blindfolded for the onslaught of the "Little Guns". In the Dark shirt is Marti, OH2BN! *(Photo by K6KS)*

planning for the dxpedition and the sudden storm which curtailed operation after 27 hours and 5000 QSO's.

Prior to the benquet, several lively forum sessions took place. A DX Forum was chaired by ARRL DX Advisory committee member W6NJU. Topics included DXCC Rule 9 which regards DXCC credits when changing QTH's. Receiveing credit for a country when operating there on a DXpedition, and a report on activities by the Northern California DX Foundation. However most of the session centered on the new ARRL DXCC Fee Schedule which went into effect in June. Most DXers felt that DXers were the object of "selective discrimination." An explanation of the basis for the new fees was given by Ellen White, W1YL of the ARRL and Southwestern Division Director, W6KW. A poll of the DXers asked that the board provide further study before implementing the new fees.

The Contest Forum was chaired by Ken Keeler, W6PAA of the ARRL Contest Advisory Committee, Fred Capossela, K6SSS *CQ* Contest Director and Ellen White, W1YL of the ARRL. Subjects discussed were "high band" and "low band" categories, guest operators at "super-stations," and special multiplyers for 10

The Doc with a smile—Jim McCook, K6GLC was honored as the Southern California DXer of the Year for 1974. Jim has recently operated from several Carribbean islands including VP2GLC!

meter QSO's. The subject of large debate was changing of the ARRL DX Contest to one weekend per mode. W6PAA stated that there is some thought into splitting the ARRL Test and sponsoring an IARU Contest designed to promote concern for amateur frequencies. Other subjects discussed were ways to encourage DX station participation in contests, multi-op single transmitter contesting and the possibilities of including OSCAR, SSTV and RTTY.

A presentation of bandwidth was given by Jim Maxwell, K6AQ and he entertained the theory that modern filter technique and IC technology may lead to a breakthru in reducing the bandwidth of voice transmissions in the near future.

The WPX Program

Mixed

488 K5DUT

C.W.

1390 UA3DEA	1394 UT5BW
1391 UW3UO	1395 UK5IAZ
1392 UWØLI	1396 UA4YV
1393 UW3YS	1397 WA5TPO

2 × SSB

849 WB2GUB	853 UA3IE
850 W2EQK	854 UK5ZAI
851 OK1DVK	855 VU2DK
852 I5FCK	856 W4HNW

WPNX

82 WNØMQM	83 WN2LEW

VPX

87 UA1-143-112	88 UA3-142-112

Endorsements

Mixed: W4BQY, DJ7CX-1100, K6ZDL-800, JA4XW-700
CW: DJ7CX-850, WA6JVD-800, K8MFO-750, UK5IAZ-600, UW3UO-500, UA4YV, W1OPJ, K9DDA-450, UC2AS-350
2 × SSB: WB9EBO-550, VU2DK-400
160 Meters: OK1IBF
80 Meters: UD6BW, UA3IE
20 Meters: UD6BW, UA3DEA, UW3UO, UWØLI, W9EVD
15 Meters: UD6BW
Asia: UD6BW
Europe: UD6BW, UW3UO, UW3YS, UA3IE, OK1IBF

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

"DXing via OSCAR" was the title of the program given by Jay Holladay, W6EJJ. The slides of OSCAR I development were shown and a description of the Solar charging batteries in OSCAR VII was given. OSCAR VII was built by amateurs. from the USA, Canada, Germany and Australia and has a 432 MHz to 2 meter link as well as a 2 meter to 10 meter link. Jay stated that East Coast amateurs have worked over 50 countries via OSCAR and that future OSCARS may be in higher orbits which will provide greated DX range.

The Sunday morning activity included a "Little Gun" vs "Big Gun" confrontation where the "Big Guns" including OH2BH, W6RW,

WPX HONOR ROLL

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

Mixed

W4LRN 1400	WB2FMK 1020	WA2EAH 900	WAØKDI 824	K8UDJ 750
F9RM 1187	ON4QX 1017	I6SF 893	SM7TV 822	WØSFU 750
WA6MWG 1171	PAØSNG 1017	K6SDR 887	W3YHR 818	CT1LN 749
VE3GCO 1142	YU2DX 995	YU2OB 881	W6NJU 811	WA5LOB 749
W4CRW 1129	YU1BCD 987	W4WSF 877	W9WHM 811	PY4AP 735
W8LY 1116	W9FD 984	WA5VDH 876	WB4SIJ 808	KØBLT 733
W3PVZ 1113	WB4KZG 980	DL1CF 872	IØJX 803	K7NHG 719
W6TCQ 1106	YU1AG 957	K2AAC 863	SM6DHU 803	WA6EPQ 713
W2NUT 1093	W4IC 950	W4BYU 859	K6ZDL 802	PAØVB 706
W8ROC 1072	DL1MD 940	G3DO 849	K2ZRO 782	W9ZTD 700
W4BQY 1058	K1SHN 934	W6ISQ 847	K4KQB 769	WAØCPX 693
DJ7CX 1058	WØAUB 929	WA6JVD 826	JA1AG 765	WA6TAX 655
W3GJY 1052				

C.W.

W8LY 1101	W2HO 885	WA6JVD 793	K2AAC 736	WA5VDH 664
W8KPL 1064	WA6MWG 845	DJ7CX 782	SM5BNX 706	WA2HZR 650
W2AIW 972	G2GM 820	W4BYU 768	I6SF 702	K2ZRO 649
DL1QT 951	YU1BCD 817	YU1AG 760	W4IC 700	K1LWI 629
W9FD 903	VK3AHQ 809	W6TCQ 758	K6ZDL 699	VO1KE 614
WB2FMK 890	K7ABV 801	K1SHN 746	OK2DB 693	VE4OX 600
ON4QX 885	VO1AW 798	W3ARK 739	W6ISQ 685	OK2QX 600

2 × SSB

W4NJF 1200	W6TCQ 910	IT9JT 833	W6SDO/1 753	CX2CN 702
F9RM 1135	PAØSNG 908	W6RKP 822	DJ7CX 752	WB2KZG 700
IØAMU 1061	I8YRK 900	W3DJZ 818	WA2EAH 750	WA5VDH 663
W9DWQ 987	WØYDB 884	WB2NYM 806	WA5LOB 747	W2EHB 659
I8KDB 985	K2POA 883	W4IC 800	OE2EGL 730	CR7IK 613
IØZV 982	I4ZSQ 882	W3YHR 793	YU1AG 727	I4LCK 608
DL9OH 954	ZL3NS 874	PY3BXW 776	W6YMV 720	
HP1JC 954	DL1MD 858	G3DO 765	WB4SIJ 708	
WA6MWG 930	DK2BI 856	OK1MP 763	WB6DXU 708	
CT1PK 923	F2MO 835	YU1BCD 757	WA6TAX 705	

K6UA, W6NJU, W6AM and W6PTS were blindfolded and expected the worst! The "Little Guns" including Ellen White, W1YL then pelted the "Big Guns" with styrofoam balls!

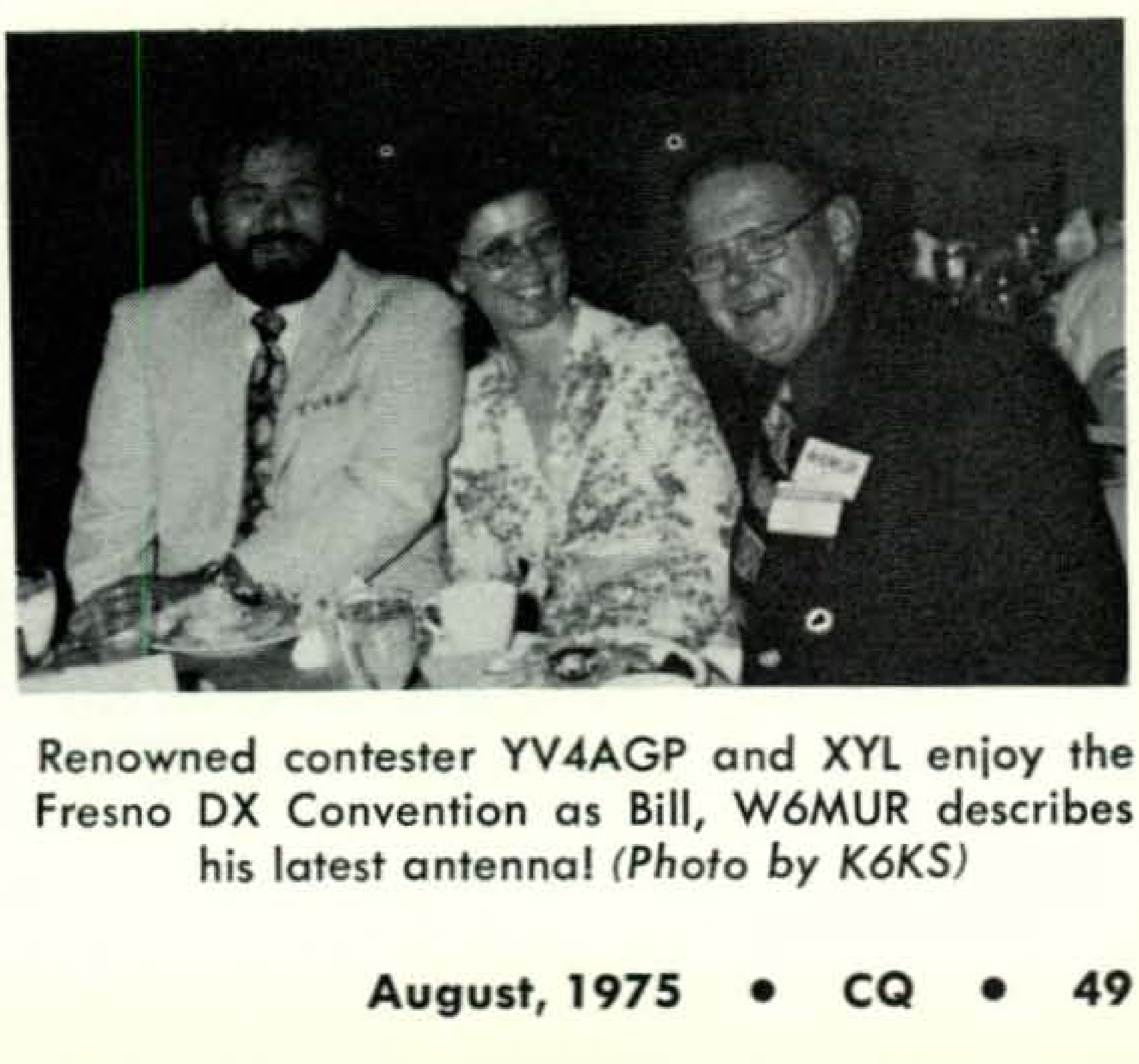
A unique DX quiz featuring tape recordings from DX stations and personalities including *CQ*'s Contest Editor, W1WY, Assistant DX Editor K4IIF, and Propagation Column Editor W3ASK. The convention was concluded by a presentation of W6NJU's operation in the 1974 *CQ* WW CW Contest as YJ8GS. For this operation Gary won the world C.W. trophy denoting the world high score single operation single band station.

Scout Station LC1J

The 14th Boy Scout World Jamboree will be held in Lillehammer, Norway during the first week of August and will feature a special station with the call LC1J. The station will have s.s.b., c.w. SSTV and RTTY capability and a special QSL card will be issued for QSOs or s.w.l. reports. Daily activity on SSTV with scenes from the Jamboree are planned. The station will also be capable of communicating thru OSCAR 6 and 7. A special 2 meter will be installed and use the call LA5JR. A special "scout electronic center" will display modern telecommunications, stereo, digital circuits, voice processing, electro-optics and medical electronics equipment. A simple multi-purpose kit has been developed for workshop construction by scouts at the Jamboree. This fine introduction to amateur radio has been prepared by the Norwegian Amateur Radio Society with special efforts by LA5CH and LA4LN who will be the LC1J station Manager.

DX Achievements

In keeping with our policy of noting outstanding DX operating ability we are pleased to see that Al, W9YRA, has been awarded 20 meter phone WAZ #9 and also to note the



Renowned contester YV4AGP and XYL enjoy the Fresno DX Convention as Bill, W6MUR describes his latest antenna! *(Photo by K6KS)*

On the left is Todd, WØIYP who is Editor of the *National Contest Journal* and on the right is Klaus, DJ6RX. Both appear to be enjoying the Hospitality Hour at the Fresno DX Convention. *(Photo via K6KS)*

W9YRA is now listed on the *CQ* DX Award Honor Roll with a total of 277 countries. The real accomplishment is the fact that it took W9YRA only two years to work and confirm the 277 countries. However, this could be expected as Al was a top west coast DXer as K6YRA and had a total of 317 countries on the *CQ* 2 × SSB DX Award Honor Roll prior to his transfer to Illinois. Congratulations to a fine DXer and gentleman—W9YRA.

QSL Information

Below is our unofficial digest of the ITU Week special prefix QSL information. The listing has been checked, however it is *not* guaranteed to be 100% correct.

KB1ITU—WA1RGW
KE1ITU—W1DAL
KI1ITU—WA1STN
KS1ITU—W1DHZ
KY1ITU—WB9CJS
WO1ITU—WA1POJ
WX1ITU—W1MOJ
WY1ITU—WA1QNF
KC2ITU—K6SE/2
KD2ITU—WB2YQH
KG2ITU—WA2DSA
KJ2ITU—WA2NPP
KL2ITU—WA2DSA
KP2ITU—W2ASR
KR2ITU—WB2FLF
KV2ITU—WA2NEB
KY2ITU—WB2FVO
WD2ITU—W2TUK
WE2ITU—WB2JRX
WM2ITU—WA2AUB
WP2ITU—WA2CCF
WQ2ITU—WB2GGM
KX5ITU—W5SBX
WO5ITU—WA5ZNY
WT5ITU—WA5LES
WW5ITU—WB5HOD
WZ5ITU—W5KHP
KD6ITU—W6LS
KE6ITU—Yasme
KH6ITU—KH6BZF
KK6ITU—WA9UCE/6
KL6ITU—W6DQX
KN6ITU—K6SDR
KQ6ITU—WA6CPP
KT6ITU—WA6KZI
KY6ITU—W6KYA
WI6ITU—WZ6QZJ
WL6ITU—W6NLG
WQ6ITU—WA6PDE
WW6ITU—Yasme
WX6ITU—WA6AUD
WY6ITU—WB6DXU
WZ6ITU—K6VNX
KS7ITU—K7ABV
WX2ITU—WA2DSA
KB3ITU—WA3MBQ
KC3ITU—W3CRE
KD3ITU—WA3PZO
KM3ITU—WA3KSQ
KQ3ITU—W3AZD
WV3ITU—W3TRS
WZ3ITU—WB2EXK
KD4ITU—W2GHK
KH4ITU—KØCMF
KI4ITU—K4YFQ
KJ4ITU—W4WSF
KL4ITU—K4ZA
KM4ITU—WA4BQK
KR4ITU—K4ZCP
KU4ITU—K4DXO
KX4ITU—W4QAW
WI4ITU—WA4HPF
WJ4ITU—W4ARL
WL4ITU—K4KQB
WQ4ITU—KB4KZG
WS4ITU—WB4SIJ
WV4ITU—W4IML
WY4ITU—K4FOK
KC5ITU—K5RLW
KG5ITU—W5RTQ
KJ5ITU—W5TMN
KL5ITU—K5PFL
KW5ITU—WA5WQF
KY7ITU—WA7GWU
WX7ITU—WA7OBH
KD8ITU—K8MFO
KP8ITU—K8DYZ
KT8ITU—WA8TDY
WV8ITU—W8NR
KW8ITU—WA8TNJ
KX8ITU—W8GKM
KZ8ITU—W8BQV
WK8ITU—W8RSW
WS8ITU—W8LY
WV8ITU—W8BT
WX8ITU—W8VHY
WZ8ITU—K8LOU
KF9ITU—WB9BUV
KG9ITU—W9WQM
KH9ITU—W9OHH
KJ9ITU—K9UBF
KM9ITU—WB9LHI
KR9ITU—K9UBF
KS9ITU—WA9ITU
KU9ITU—W9GC
KY9ITU—W9JUV
WD9ITU—K9YXW
WH9ITU—K9WEH
KD0ITU—KØSGJ
KJ0ITU—WAØVDX
WL0ITU—WØHBH
WW0ITU—WAØTLT

73 Jerry, WA6GLD

The CQ DX Award Program

C.W.

179 K6DSK

2 × SSB

398 UK5IBM
399 UK3AAC
400 UB5UAL
401 UA6JAD

Endorsements

2 × SSB: W8SET, WA8TDY-250, WB4OXD, I5XRR-150

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

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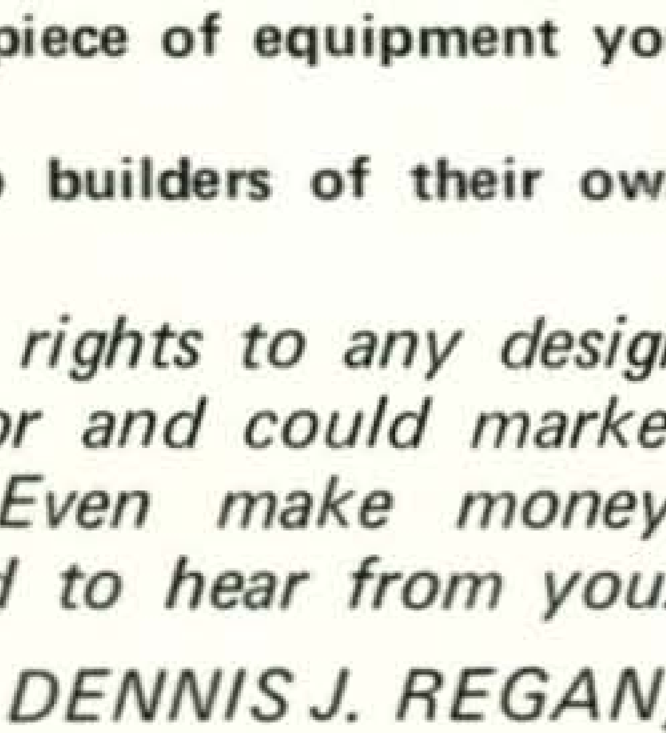

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- Frequency adjust for netting built in.
- $37.50 postpaid USA & Canada. Specify transmitter model. Calif. residents add sales tax. (HC-6/U crystal and 9 volt transistor battery not supplied.)
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Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

*Aug.	2-3	Illinois QSO Party
*Aug.	2-3	Romanian Contest
*Aug.	9-10	European DX C.W. Contest
Aug.	9-10	Argentina Phone Contest
Aug.	16-18	QRP ARCI Contest
*Aug.	16-18	New Jersey QSO Party
*Aug.	23-24	All Asian C.W. Contest
Aug.	23-24	Arizona QSO Party
*Aug.	30-31	SSA 50th Anniv. Contest
Aug.	30-31	MARTS SEANET Contest
Sept.	6-7	ARRL VHF QSO Party
Sept.	6-8	Maryland/DC QSO Party
Sept.	6-8	Four Land QSO Party
Sept.	6-8	Kentucky QSO Party
Sept.	13-14	European DX Phone Contest
Sept.	13-14	Pennsylvania QSO Party
Sept.	13-15	Washington State QSO Party
Sept.	20-21	VE/W Contest
Sept.	20-21	Scandinavian C.W. Contest
Sept.	27-28	Scandinavian Phone Contest
Sept.	27-29	Delta QSO Party
Oct.	4-5	California QSO Party
Oct.	4-5	Rocky Mountain QSO Party
Oct.	4-5	VK/ZL/Oceania Phone
Oct.	11-12	VK/ZL/Oceania C.W.
Oct.	11-12	WADM C.W. Contest
Oct.	18-19	Manitoba QSO Party
Oct.	**25-26**	**CQ WW DX Phone Contest**
Nov.	8-9	European DX RTTY Contest
Nov.	9	Czechoslovakian DX Contest
Nov.	**29-30**	**CQ WW DX C.W. Contest**

*Covered in last month's Calendar

Argentina Phone Contest

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

The object is to work the greatest number of LU provinces and countries as possible, on all bands 3.5 thru 28 MHz. Single operator all band only. Same station may be worked on each band for QSO and multiplier credit.

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

Points: Each LU QSO is worth 3 points, all others 1 point. Own country may be worked for multiplier credit but not QSO points.

Multiplier: Each LU province and country worked on each band. LU provinces are indentified by the letter immediately following the number in the call. Each letter denotes a province except as follows:

A, B, C, D, E are all Buenos Aires. GA-GOZ Chaco, GP-GZZ Formosa, XA-XOZ Santa Cruz, XP-XZZ Tierra del Fuego. Z are Antartic stations.

Final Score: Total QSO points from all bands multiplied by the sum total multiplier from each band.

Awards: First, second and third place certificates in each country and W/K call area. Also first, second and third place Trophies to the overall winners. Also a certificate to each entry with 10 or more LU contacts.

Logs must be received before September 30th and go to: Radio Club Argentino, P.O. Box 97, Buenos Aires, Argentina.

QRP ARC International Contest

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

The contest is open to all amateurs whether or not they are members of QRP ARCI.

Exchange: RS(T), state, province or country. And QRP number for members, power input for non-members. The same station may be worked once per band and mode but for multiplier points only. And it must be with a QRP club member.

Points: Member contacts count 3 points, non-member 2 points. Non-W/VE contacts including Alaska and Hawaii, 4 points.

Multiplier: Each state, VE province and DX country. Counted *once* only.

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

Power Multiplier: Less than 1 watt, × 5; 1—5 watts × 4; 5—25 watts × 3; 25—100 watts × 2; no multiplier for over 100 watts.

Frequencies: C.W. — 3540, 7040, 14065, 21040, 28040. Phone — 3855, 7260, 14260, 21300, 28600, 50350. Novice — 3720, 7120, 21120, 28120.

Awards: Certificates to top scorers in each state, province and country.

Include a summery sheet with equipment description and scoring information and send to: William J. Fallon, W4KFB, 124 Stoll Avenue, Louisville, Kentucky 40602 within 30 days of end of contest. Include a large s.a.s.e. for list of winners.

Arizona QSO Party

Starts: 1700 GMT Saturday, August 23
Ends: 1700 GMT Sunday, August 24

This is the first annual QSO Party sponsored by the Motorola ARC of Arizonia. The same station may be worked on each band and mode for QSO points but the multiplier is counted only once.

Exchange: QSO no., RS(T) and QTH. County for Arizona, state, province or country for others.

*14 Sherwood Road, Stamford, Conn. 06905.

Scoring: One point per QSO. Arizona use states for their multiplier, others Arizona counties. (max. of 14)

There is also a power multiplier, 1.5 if input is less than 200 watts, and 3, if its below 10 watts.

Frequencies: C.W. — 3575, 7075, 14075, 21075, 28075. Phone — 3935, 7235, 14335, 21435, 28535. Novice — 3750, 7125, 21150, 28150.

Awards: Certificates to the top three Arizona stations, and to the top two stations in each W/K and VE call areas. Also winner in each DX country.

Include a summary sheet with **equipment** description and showing the scoring. Also a s.a.s.e. for copy of the results.

Mailing deadline for logs is September 15th to: Motorola ARC, att: Michael T. Wright, 8201 E. McDowell Rd., #1260, Scottdale, Arizona 85252.

MARTS SEANET Contest

Starts: 0001 GMT Saturday, August 30
Ends: 2359 GMT Sunday, August 31

This one was organized to promote friendship and publicize the 5th SEANET Convention to be held in Kuala Lumpur on November 7-9.

Use all bands 1.8 thru 28 MHz, c.w. or phone. One contact per band with same station and no cross band or crossmode.

Classification: Single operator, single and all band; multi-operator all band only.

Exchange: RS(T) plus a progressive QSO no. starting with 001.

Scoring: *For stations outside SEANET*—5 points for contacts with 9M2, 9M6, 9M8, VS5. One point with stations in other SEANET areas. And a multiplier of 3 for each SEANET country worked on each band.

For SEANET Stations—2 points for contacts outside SEANET areas, 1 point if station is within the area. And a multpler of 3 for each country worked outside the SEANET areas, 2 multiplier points if country within the area.

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

Awards: A commemorative certificate to the top scorer in each country. SEANET winners will also receive a medal. Trophies to the two top scorers in and outside the NET area.

Use a separate log sheet for each band and include a summary sheet with the scoring and other pertinent information. Rules and regulations will be strictly enforced.

Postmark deadline is September 30th to: MARTS SEANET Contest Committee, Att: Ismail Razak "Eshee" 9M2FK, 281-C Jalan Pekeliling, Bukit Glugor, Penang, Malaysia.

SEANET Area Countries

A4, A51, A6, A7, A9, AC3, AP, BV, CR9, DU, EP, HL/HM, HS, JA, JD1, JY, KC6, KG6, KH6, KX6, P29, S21, VK, VQ9, VS5, VS6, VS9K, VS9M/8Q6, VU2, VU (Andaman, Nicobar, Laccadive) XU, XV5, XW8, YB, YJ8, ZL, 3D2, 3B6, 3B8, 4S7, 4W1, 5Z4, 9M2, 9M6, 9M8, 9K2, 9N1, 9V1.

All Asian DX Contest

Starts: 1000 GMT Saturday, August 23
Ends: 1600 GMT Sunday, August 24

This is the c.w. section, the phone section took place in June with complete rules and Asian country list in the May CALENDAR, and brief rundown in last month's issue.

Logs must be received no later than November 30th and go to: J.A.R.L. Contest Committee, P.O. Box 377, Tokoyo Central, Japan. Include a IRC and s.a.e. for copy of results.

European DX Contest

C.W.—Aug. 9-10 Phone—Sept. 13-14
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Complete rules and European country list in last month's CALENDAR.

This year W/K and VE stations can not only send their request for log forms to WA3-KWD (large s.a.s.e. please) but also the completed log at the end of the contest. Thus saving time and expense. The address is: Hartwin E. Weiss, WA3KWD, 323 North Street, Millersburg, PA 17061. They should be submitted well before the posted deadline of Sept. 15th for C.W., and Oct. 15th for Phone.

Maryland/D.C. QSO Party

Starts: 2300 GMT Saturday, September 6
Ends: 0100 GMT Monday, September 8

This is the 9th QSO Party sponsored by the Maydale A.R.S. The same station may be worked on each band and mode for QSO points as well as band multipliers.

Exchange: QSO no., RS(T) and QTH. County for MD/DC, ARRL section or country for others. (Baltimore City and Washington separate)

Scoring: Two points for each completed QSO. MD/DC use ARRL sections and countries for their multiplier. Others use Maryland counties and Independent cities. (max. 24 each band)

Frequencies: On c.w. 75 kHz from low end of each band on even hours. On phone 25 kHz from top of each band on odd hours. Try 10 and 15 on half hour.

Awards: Certificates to top scorers in each ARRL section, country and MD county and D.C., both phone and c.w. A Plaque to the Top Scorer combining total score for all bands and modes.

Use a separate log for each band and mode as well as a check sheet for each band and mode with over 100 contacts.

Also a summary sheet showing the scoring, name and address, and a signed declaration

1974 Contest Results
VK/ZL/Oceania Contest

North America

Phone		C.W.	
VE3GCO	1095	* W2LSX/2	1727
VE5RA	189	W4WSF	7464
YS1MAE	630	W5RTQ	3060
YS1JWD	344	K6UA	20425
W1GNC	590	K8CFU	624
W2FCR	1440	W8FJS	245
W2GXD	896	WA2WMT/ø	9044

* Multi-Opr.

OK DX Contest
U.S.A.

All Band		14 MHz	
WA1SCX	1722	W4WSF	1020
WA2ZWH	688	K7NHV	580
W1OPJ	155	21 MHz	
WA2BZX	78	W9LKI	583
K4OLQ	12	W3CBF	88
		WA3PHQ	13

VE/Contest
U.S.A. High Scores

Phone		C.W.	
WA6EPC	7524	W5LUJ	20880
K5SGJ	7020	W4YWX	20000
W6HX	6384	WB4OGW	16482
K0LUZ	6080	W3ATX	13532
WBøGZR	5092	K4IAF	13328

that all rules and regulations were observed.

Mailing deadline October 4th to: Maydale A.R.S., c/o C. E. Anderson, W5TWT/3, 14601 Claude Lane, Silver Spring, MD 20904

Four Land QSO Party

Starts: 1800 GMT Saturday, September 6
Ends: 0200 GMT Monday, September 8

This is the 6th annual party sponsored by the 4th Call District A.R.A. 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 different county. Fourth call area stations may work each other for QSO and multiplier credit.

Exchange: RS(T) and QTH. County and state for 4th district, state, province or country for all others.

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

All Others: Two points for each QSO. Final score, QSO points × (4th district states + 4th district counties. (counted once only)

Frequencies: C.W.—3575, 7060, 14070, 21090, 28090, Phone — 3940, 7260, 14340, 21360, 28600. Novice — 3710, 7110, 21110, 28110.

Awards: Certificates to top scorers in each state, VE province and country, 2nd and 3rd place when warranted. Also county awards to 4th call area states and special awards to Novice, s.w.l.'s and B/H. (Blind and Handicapped) There are also High Honor Awards to top scorers in Four Land, W/K's outside 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, Includes s.a.s.e. for results.

Kentucky QSO Party

(Two Periods—GMT)
1800 Sat. Sept. 6 to 0400 Sun. Sept. 7
1600 Sun. Sept. 7 to 0100 Mon. Sept. 8

The same station may be worked on c.w. and one other mode per band. V.h.f. to be simplex operation only. And Kentucky stations may work each other for QSO and multiplier credit.

Exchange: QSO no., RS(T) and QTH. County for Kentucky; state, province or country for all others.

Scoring: One point per contact. Kentucky use Ky. counties, states, provinces and countries worked for their multiplier. Others Ky. counties. (max. of 120) There is also a power multipliers of 1.5 for stations using 250 watts or less input.

Final Score: QSO's × QTH multiplier × power multiplier.

Frequencies: C.W.—60 kHz up from lower edge of bands. Phone—Lower edge of General Bands. Novice bands. V.h.f. limited to 2 and 6. meter bands.

Appropriate awards will be presented to all winners. Logs and dupe sheets no later than October 11th to: R. van Outer, WB4YQY, 285 Hillsboro Ave., Lexintong, Ky. 40505

Pennsylvania QSO Party

Three Periods: September 13 and 14
Saturday—1600 to 2100 and 2300 to 0500
Sunday—1300 to 2400. (All GMT)

This is the 18th annual party sponsored by the Nittany A.R.C. The same station may be worked on each band and mode for QSO points. Penn. stations may make in-state contacts for QSO and multiplier credit.

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

Scoring: For Penn.—3 point for out-of-state contacts, 1 point for in-state. Multiply total by ARRL sections worked. (inc. EPa. and WPa.) *For Others*—1 point per QSO times the number of Penn. counties worked. (max. 67) There is a bonus of 100 points to mobiles for each county activated.

Frequencies: C.W.—1810, 3560, 7060, 14060, 21060, 28060. Phone—1815, 3980, 7280, 14315, 21380, 28560. Novice — 3715, 7160, 21115, 28115. Try phone on even GMT hours, 160 at 0300 and 10 meters at 1900.

Appropriate awards will be awarded. Include a summary sheet with your entry showing the scoring, equipment description and other interesting information.

Mailing deadline October 15th to: Douglas Maddox, W3HDH, 1187 S. Garner St., State College, Pa. 16801.

Washington State QSO Party

Starts: 2000 GMT Saturday, September 13
Ends: 0200 GMT Monday, September 15

This is the 10th annual QSO Party sponsored by the Boeing Employees A.R.S. (BEARS) The same station may be worked on each band and mode for QSO points and again if it is a new multiplier. Wash. stations may work in-state stations for QSO points.

Exchange: QSO no., RS(T) and QTH. County for Wash.; state, province or country for others.

Scoring: *For Wash.*—One point per contact, multiplied by the number of states, VE provinces and DX countries worked. *For Others*—Two points per contact multiplied by Wash. counties worked. (max. of 39) There is an extra multiplier of one for each group of 8 contacts with the same Wash. county.

Frequencies: C.W. — 3560, 7060, 14060, 21060, 28160. Phone — 3935, 7260, 14280, 21380, 28660. Novice — 3735, 7125, 21150, 28160.

Awards: Certificates to top scorers, both single and multi-operator, in each state, VE province, DX country and Wash. county. Additional awards where warranted. The Worked Five Bears Award is available to anyone working 5 club members before, during or after the party. The Worked Three Bear Cubs is also available for working 3 Novice members.

Mailing deadline October 13th to: Boeing Employees A.R.S. Att: Willis D. Propst, K7RSB, 18415 38th Ave., South, Seattle, Wash. 98188. (Results will be mailed to all entries, no s.a.s.e. required.)

Editor's Notes

The donor of the C.W. Expedition Contest Trophy was incorrectly listed in the C.W. Results in the June issue. The correct listing should read, "Dr. Donald Miller, W9WNV."

I do not go along with the contention that the duplication of contest dates, especially State QSO Parties, is unavoidable. (Just take a look at September)

Since this happens year after year it would seem to me that the organizers of these activties should do a little research and a little corresponding with the involved clubs. I'm sure some of this duplication can be avoided. The confusion is further compounded by the fact that most of the suggested operating frequencies are also duplicated.

As a suggestion, the in-state stations should identify their state at the end of each CQ and transmission. You would then at least know what party you are participating in. Just an idea. 73 for now, Frank, W1WY

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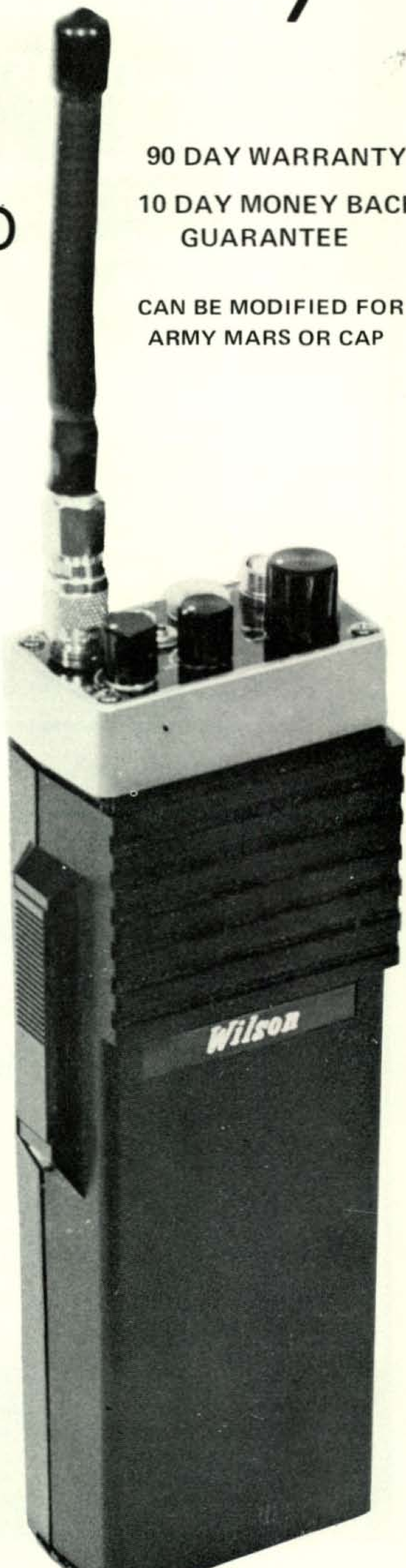

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THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#127—Cletus M. Dunn, W1DIT 4-21-75.
#128—Karl J. Adkins, WA6MAR 5-10-75.

THE "Story of The Month," as told by "Moby Dick" is:

Richard R. Brege, K8ODY

(All Counties #93, 1-19-73)

"Well Bertha, WA4BMC, has twisted my arm to remind me to get something in the mail and while the spirit moves me, I better do it.

"I got started in amateur radio in 1958 and received my Novice license in '59, but didn't get on the air until near the end of that year when I received my Conditional.

"I was attracted to the County Hunting as it was one of the first awards that allowed mobile contacts, and I operated more mobile than from my home base. I have a wonderful wife and two grown-up sons. We enjoy traveling during my time off the ship, so we also have been mobile from land, quite a bit. We have a motor home, but didn't take it to Hawaii with us in 1973.

"I really appreciate the chance to thank all the net controls and mobiles that made All Counties possible. It looked like it would take forever, or that some Counties never would be possible, especially for a weak mobile. I have had a beam antenna, just a wire, and one time in '62 a vertical for more than one band, so you don't need an elaborate set-up.

"I have never met a finer group of people than the County Hunters we have visited in our travels. My last county was Whitley County, Indiana, in fact Indiana was rough due to skip on 20 meters. I found out about a station in Whitley that was on for about 10 minutes every Sunday morning. I missed him several times, then he couldn't copy me, but on the second month we finally made it.

"I'm serving as Chief Engineer on the *S/S John G. Munson* of the Great Lakes Fleet, U.S. Steel and have been with them 30 years. K3YMK and W8PJH are also in our fleet." *(Our records show that "Moby Dick" acquired USA-CA-500-#531, 10-13-65).*

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

USA-CA HONOR ROLL

3000
WA6MAR 149
W9ZHD 148

2500
W9ZHD 186
WA6MAR 187

2000
W9ZHD 219
WA6MAR 220

1500
WA2GLU 260
WAØBMO 261
WA6MAR ... 262

1000
WA2DFC 350
WAØBMO 351
VP9GE 352
WA6MAR 553

500
WB9PLM 1042
W4KFB 1043
WB9MFC 1044
VP9GE 1045
WA6MAR .1046

Awards Issued

As listed under **Special Honor Roll;**

Cletus Dunn, W1DIT did dunn them *all.*

Karl Adkins, WA6MAR took time out from Net Control/working/sleeping to do his paper work and acquired USA-CA-500 through USA-CA-2500, endorsed All 14, All S.S.B. and All Mobiles. Also USA-CA-3000 and *All Counties* endorsed, Mixed. (May I inject a *BIG* thanks to him and the others who do such a wonderful job as Net Control!)

As listed under **Special Honor Roll** in July 75 *CQ,* Lou Wenisch, W9ZHD (ex-WB2AHB) qualified for *All Counties* #126, All S.S.B., dated 4-19-75. But not mentioned was the fact that he naturally also qualified for USA-CA-2000 and 2500 endorsed All 14, All S.S.B.; and USA-CA-3000 endorsed All S.S.B.

Les Jeffery, W8WT, who collected *All Counties* #92, dated 1-3-73, brought his endorsement of this from Mixed to All S.S.B. and All 14 MHz.

Howard Siegel, WA2GLU was issued USA-CA-1500.

Arthur Nelsen, WAØBMO added USA-CA-1000 and USA-CA-1500 to his collection and they were endorsed All 80, All S.S.B.

Fred Lampert, WA2DFC gained USA-CA-1000.

Ed. Kelly, VP9GE acquired USA-CA-500 and 1000 endorsed All 2 × S.S.B., All 14 MHz, All Mobiles. This is #3 Award to VP9, the

Mrs. & Mr. Richard Brege, K8ODY.

The Wacky Wing Dingers Certificate.

others being VP9AK #277 and VP9FK #603.

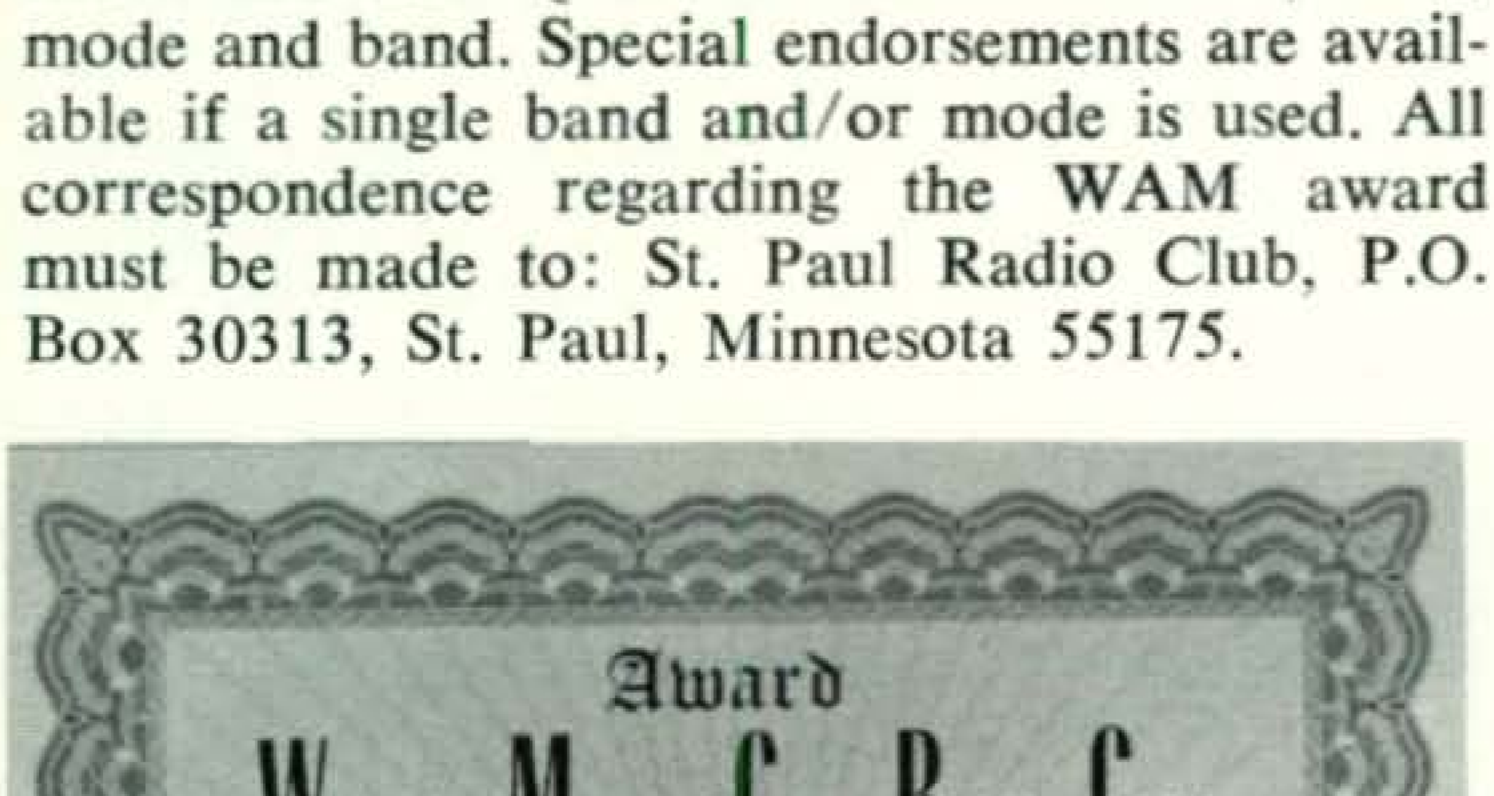
Bruce Makas, WB9PLM received USA-CA-500 endorsed All S.S.B.

William Fellon, W4KFB was issued USA-CA-500 endorsed All 2 × C.W.

Marilyn Lassanske, WB9MFC did her paper work and got USA-CA-500.

Awards

Worked All Minnesota Award (W.A.M.): The St. Paul Radio Club Inc., is soliciting applications for the reinstated W.A.M. The basic certificate issued for two-way, confirmed QSOs with 50 Minnesota Counties, send General Certification List (free form available from the Club for s.a.s.e.), signed by two licensed amateurs or a notary and $1.00 (or 6 IRCs for DX stations). Additional endorsements are available for 60, 70, 80 and 87 counties with the required GCR and s.a.s.e. The list should show call and QTH of station worked, date, mode and band. Special endorsements are available if a single band and/or mode is used. All correspondence regarding the WAM award must be made to: St. Paul Radio Club, P.O. Box 30313, St. Paul, Minnesota 55175.



Worked Motor City Radio Club Award.

The Wacky Wing Dinger Certificate: The North Florida Amateur Radio Society wishes to announce the revival of this Award which was so popular in the late '50s and early '60s. Out-of town amateurs must meet these requirements: U.S. stations must work 7 members of the Wacky Wing Ding Society. Most members live in Jacksonville or it's surrounding area. DX Stations (including KH6, KP4, KL7, etc.) must work 3 members. Send a list of the required number of contacts listing stations worked, time, date, frequency and signal report and $2.00. Free endorsements are offered for 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 contacts. The Wacky Wing Ding Net meets each Tuesday at 0100Z (Monday night local time). During periods of Daylight Saving Time the net meets at 0000. Frequency is 28.690 MHz. Applications go to: Wacky Wing Ding Certificate, North Florida Amateur Radio Society, Billy Williams, WA4UFW, 911 Rio St. Johns Dr., Jacksonville, Florida 32211. Please make checks payable to the North Florida ARS.

Worked Motor City Certificate: This reinstated Award sponsored by the Motor City Radio Club is issued for the following: USA and Canadian stations work 5 MCRC members; all others (DX) work 3. All contacts must be made after November 1, 1974. For the Award, send 75¢ (free to DX) to certificate Custodian, Don F. Curry, W5HVT/8, P.O. Box 3043, Detroit, Michigan 48231 with either (1) list with QSL cards or (2) log data endorsed by officer of local radio club or two licensed amateurs who have verified proof of contacts. Membership list for s.a.s.e.

Notes

Through the courtesy of friends "Digger," WA2DIG and Gius, IT1AGA/IT9AGA, here is some data on IT1AGA, Giuseppe de Luca, 18 via Generale Di Giorgio, 90143 Palermo (Sicily), Italy. He has printed a two page form called *IT1AGA/IT9AGA "STORY"*. He is a retired bank manager, born December 6, 1897 and active (strictly c.w.) since March 1952. He lists his many impressive/important accomplishments, Club memberships, many IT firsts, many contest winnings, 400 Awards (including USA-CA-500-#74, dated 4-10-61, All A-1), about 61,000 QSOs and about 26,000 QSLs received. Yes, his "STORY" could fill my whole column. (I dislike bringing up a very sensitive subject, but for years attempts have been made to have IT count as a separate country in DXCC, like IS, but they have failed. At one point—some years back—all I and IT stations refused to work or QSL to U.S. stations).

Have much more data to add, but my allotted space all used, but remember to write and tell me, How was your month?, 73, Ed., W2GT

Propagation

BY GEORGE JACOBS,* W3ASK

THE Swiss Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 6.2 for April, 1975. This is the lowest mean value reported since October, 1964, as the cycle begins to drop sharply. The highest level of solar activity reported during April occurred on the 27th, with a sunspot count of 26. There were 17 days during the month when the sun's surface was completely devoid of spots and the count was *zero*. The latest 12-month running smoothed sunspot number, upon which the cycle is based, is now 30, centered on October, 1974. A smoothed sunspot number of approximately 11 is predicted for August, 1975.

Twenty meters should continue to be the best band for DX propagation during August. Openings are forecast to most areas of the world between sunrise and midnight. Peak conditions should occur for a few hours after local sunrise, and again during the late afternoon and early evening. Excellent short-skip openings are also expected on 20 from shortly after sunrise to almost midnight. These should range from a few hundred miles out to the one-hop limit of 2300 miles.

Not much DX expected on **10 meters**, but look for frequent short-skip openings between distances of about 500 and 1300 miles.

There's a fairly good chance for **15 meter** DX openings towards South America and other southern areas during the afternoon hours and occasionally into the early evening. Frequent short-skip openings are also expected throughout the daylight hours between distances of about 400 and 1300 miles.

Some fairly good **40 meter** DX openings are forecast to many areas of the world from sunset through the sunrise period. Look for excellent short-skip openings between approximately 250 and 750 miles during most of the daylight hours, and between 750 and 2300 miles at night.

Despite seasonally higher static levels, some fairly good DX openings should also be possible on **80 meters** during the hours of darkness. Expect conditions to peak just as the sun begins to rise on the "light" side of the path. Try 80 meters for short-skip openings up to about 250 miles during the daylight hours, and between 250 and 2300 miles during the hours of darkness.

*11307 Clara St., Silver Spring, MD 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For August, 1975

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: None	A	A	B	C
High Normal: 3, 5, 21, 23, 31	B	B	C	D
Low Normal: 1-2, 4, 7-10, 13-17, 20, 22, 24, 27-30	B	C	D	E
Below Normal: 6, 11-12, 18-19, 25-26	C	D	E	E
Disturbed: None	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, an opening for any day of the month. a *propagation index* of (3) will be fair on Aug. 1 & 2 (C); good on the 3rd (C) and fair again on the 4th (C), 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.

It's still too early for **160 meter** DX openings on a regular basis, but look for the occasional one during the hours of darkness and the sunrise period. Short-skip on 160 looks good during the hours of darkness for distances up to at least 1300 miles, and occasionally beyond.

Since the summer propagation season should end by md-September, this month's *DX Propagaton Charts* cover only a *one month* period rather than the usual two month span. *Short-Skip* Charts for August appeared in last month's column.

V.H.F. Ionospheric Openings

One of the year's most prolonged and intensive meteor showers, the *Perseids*, should take place between August 10 and 14. Maximum intensity is expected during the early evening of the 12th, with an average count of 50 meteors an hour. Ionization produced as these meteors enter the earth's atmosphere should make possible numerous meteor-scatter type openings on the *6* and *2* meter bands. The range of these openings could be up to several hundred miles.

Frequent sporadic-E propagation should continue through August, with a good possibility for *6* meter openings between approximately 750 and 1300 miles. During periods of especially intense sporadic-E ionization, *6* meter "two-hop" openings may be possible up to about 2500 miles. Look for an occasional short-skip openng on *2* meters, over a range of about 1100 to 1300 miles.

There's a possibility for some auroral-scatter propagation on the v.h.f. bands during periods of radio storminess. Check the "Last Minute Forecast" appearing at the beginning of this column for those days during August that are forecast to be BELOW NORMAL or DISTURBED. Auroral scatter type openings can range from a few hundred up to about a thousand miles, and are usually characterized by very rapid flutter fading, and Doppler shift on s.s.b. signals.

73, George, W3ASK

August 15-September 15, 1975
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

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

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Time Zones: CDT & MDT (24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	13-15 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	20-22 (1) 22-01 (2) 01-04 (1) 22-02 (1)*
Northern Europe & European USSR	*Nil*	*Nil*	06-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-17 (1) 21-23 (1)	20-02 (1) 22-01 (1)*
Eastern Mediterranean & Middle East	*Nil*	12-14 (1)	07-12 (1) 12-15 (2) 15-18 (1) 21-23 (1)	20-21 (1)
Western Africa	*Nil*	10-12 (1) 12-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	20-22 (1) 22-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	*Nil*	13-15 (1)	07-09 (1) 15-17 (1) 17-18 (2) 18-20 (1)	21-00 (1)
Southern Africa	*Nil*	10-11 (1) 11-13 (2) 13-14 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-18 (1) 22-01 (1)	20-21 (1) 21-23 (2) 23-01 (1) 22-00 (1)*
Central & South Asia	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-11 (1) 18-21 (1)	06-08 (1) 19-21 (1)
Southeast Asia	*Nil*	17-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 20-30 (1)	06-08 (1)
Far East	*Nil*	16-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-00 (1)	03-06 (1) 06-07 (2) 07-08 (1) 06-07 (1)*

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

Time Zone: PDT (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	*Nil*	*Nil*	06-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1) 22-23 (1)*
Central & Northern Europe & Northern USSR	*Nil*	*Nil*	06-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-15 (1) 21-23 (1)	19-00 (1)
Eastern Mediter-ranean & Middle East	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-14 (1) 20-22 (1)	20-23 (1)
Western Africa	*Nil*	12-14 (1)	07-08 (1) 08-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	21-01 (1)
Eastern & Central Africa	*Nil*	*Nil*	12-15 (1) 15-17 (2) 17-18 (1)	20-22 (1)
Southern Africa	*Nil*	10-12 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (1) 22-00 (1)	20-21 (1) 21-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-20 (2) 20-21 (1)	06-08 (1)
Southeast Asia	*Nil*	16-20 (1)	08-09 (1) 09-11 (2) 11-13 (1) 18-21 (1) 21-23 (2) 23-00 (1)	02-05 (1) 05-07 (2) 07-08 (1) 06-07 (7)*
Far East	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 18-21 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	01-02 (1) 02-06 (2) 06-07 (3) 07-08 (1) 06-07 (1)*
South Pacific & New Zealand	16-18 (1)	12-15 (1) 15-16 (2) 16-18 (3) 18-20 (2) 20-21 (1)	07-08 (1) 08-10 (2) 10-17 (1) 17-19 (2) 19-20 (3) 20-22 (4) 22-23 (3) 23-00 (2) 00-02 (1)	22-23 (1) 23-00 (2) 00-06 (3) 06-07 (2) 07-08 (1) 23-02 (1)* 02-05 (2)* 05-07 (1)*
Austral-asia	*Nil*	14-17 (1) 17-20 (2) 20-21 (1)	17-19 (1) 19-20 (2) 20-23 (3) 23-01 (2) 01-07 (1) 07-10 (2) 10-13 (1)	00-02 (1) 02-03 (2) 03-05 (3) 05-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*

SEE PAGE 76

HOW TO USE THE DX PROPAGATION CHARTS

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

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

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

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

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

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

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

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

[*Continued no page 70*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

LAST year the Army began dumping large quantities of the R-392/URR receiver, and this fine general-coverage set came into surplus channels in a big way. Now the services are getting rid of most of their companion transmitters to the R-392, the T-195/GRC-19.

The T-195 is a pretty solidly built Collins design, rated at 100 watts. Physically, it looks like the R-392, as it comes in a rugged olive drab case, and is designed to be mounted in the back of a jeep or truck. Power required, like the R-392, is 28 volts d.c. at 44 amps.

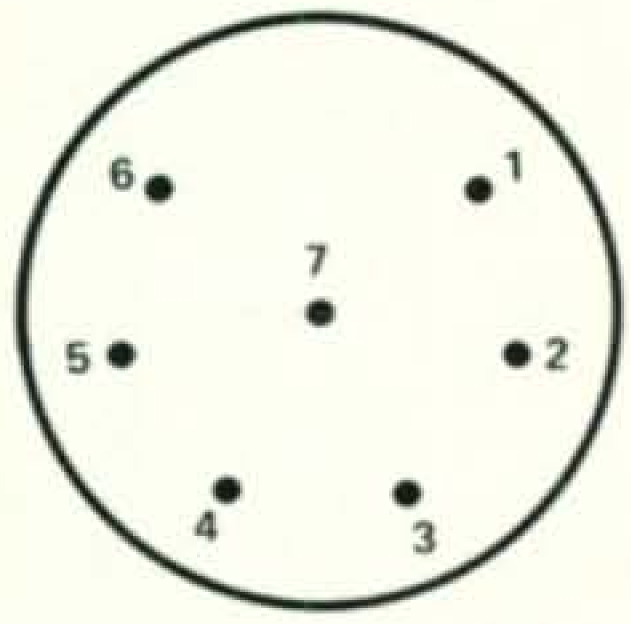
The frequency coverage is 1,500 kHz to 20 MHz in 20 bands. Output is a.m., f.m., or FSK teletype. No sideband provision is made, probably one reason the Army is getting rid of these sets. The other reason of course is that they are fully tube-type, and a directive two years ago ordered replacement of tube equipment with solid-state gear as far as practical.

The AN/GRC-19 comes with a whip antenna, but a half-wave center-fed Hertz array (AN/GRA-12) is made for fixed-base use with the set.

The R-392 can be tied in to the T-195 for antenna relay switching, power supply, and mike functions through front-panel jacks. The units can be operated independently as well. Tuning is either manual or automatic.

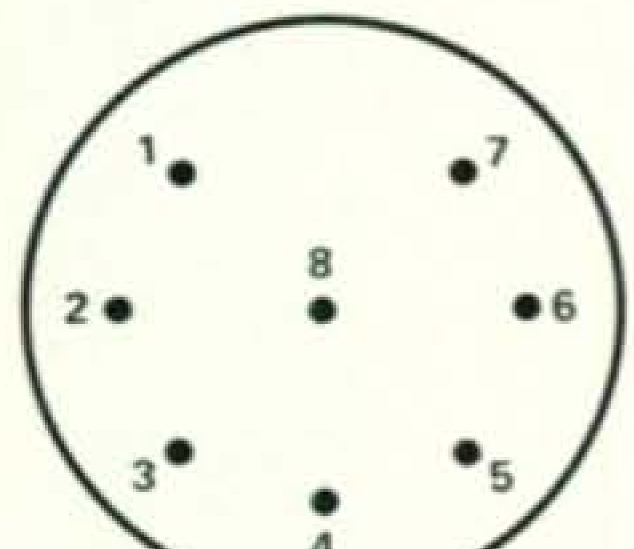
The book on the T-195 is *TM 11-274*. The transmitter weighs 125 pounds. I expect to run more data on this unit as it becomes available.

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



1. Ground
2. Audio output
3. Gain control line (50K pot to ground)
4. BFO shutoff (ground to stop BFO)
5. Screen grid voltage (+)
6. Low voltage in (to J-1 on front of unit)
7. B+ point

J-3 Rear of receiver



1. Gain control line
2. Ground
3. n/c
4. Audio output
5. BFO (or "CW OSC") shutoff
6. Low voltage to receiver
7. Low voltage (12/24 volts) from supply to either front panel switch or jumper to pin 6
8. n/c (B+ in some models)

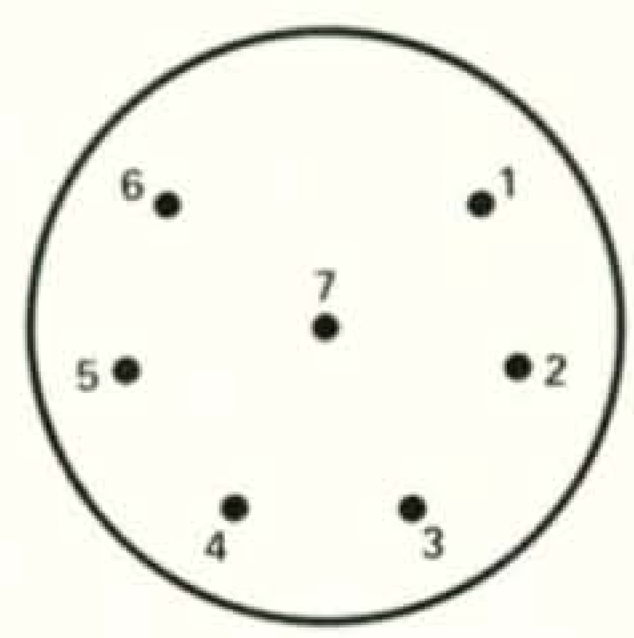
J-1 Cavity at front of receiver

Fig. 1—SCR-274-N, RAV, RAT, ARA receiver pin connections as viewed from the outside.

Q & A

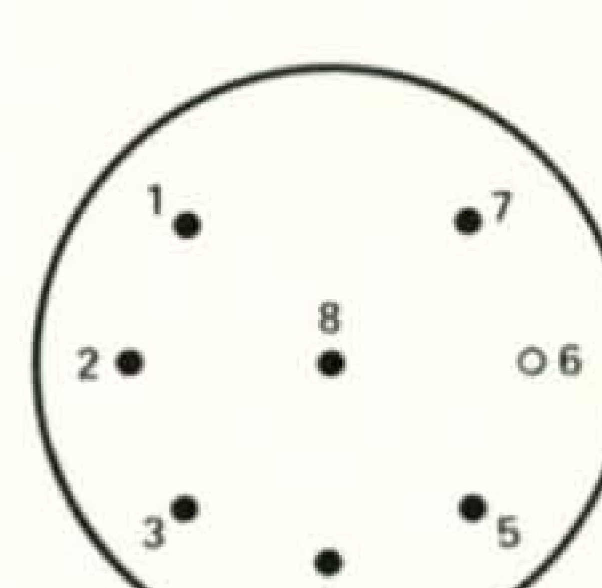
My mail has been heavy this spring and summer, and I want to touch here on some more of the most often asked questions.

First, I get many questions on hookup data for the various Command transmitters and receivers. Although there have been many, many articles on these excellent transmitters and receivers, many of them ran years ago, and many readers do not have access to back issues of *CQ*. *CQ* itself is out of most back issues, so I am running in Figs. 1-5, a complete set of pin connection diagrams for the Command Equipment Receivers.



1. Ground
2. Audio out
3. RF gain control
4. BFO shutoff
5. Screen grid voltage
6. 24v.d.c. in (except R-148/ARC5 which is 12v.)
7. B+ point

J-3 Rear



1. RF gain control
2. Ground
3. n/c
4. Audio output for navigational equipment
5. BFO shutoff (ground)
6. Low voltage to receiver
7. Low voltage from pin 6 J-3 (either jumper to pin 6 or switch used in adapter recess)
8. B+ point for auxiliary equip

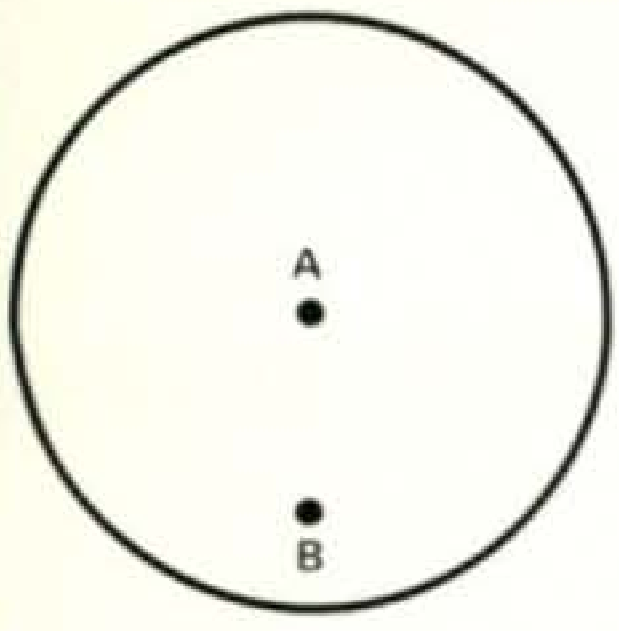
J-1 Front

Fig. 2—AN/ARC-5 receiver pin connections as viewed from the outside. 190-550 kHz, 520-1500 kHz, 1.5-3.0 MHz, 3-6 MHz, 6-9.1 MHz and R-28 (100-156 MHz) sets are identical except that there is no connection to pin 4 of J3 on the R-28.

I also get inquiries for alignment data on these sets. For readers who do not have my alignment article of Dec. 1970, Table I should be of assistance.

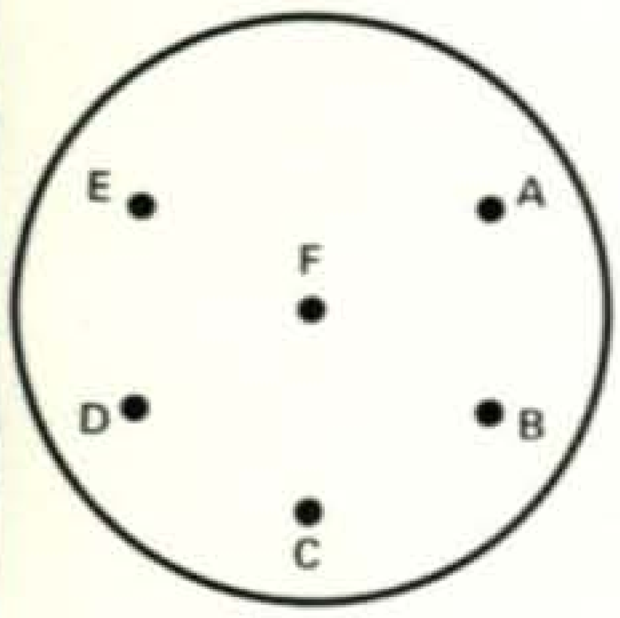
A few other observations from my mail:

WA5LTQ wrote about the BC-AL-430, which he found in like-new condition in a flea market recently. Although he found it in new condition, this is a real antique, having been designed originally in the early 1930's by Aircraft Radio Corp. It was bought early in World War II before the SCR-274-N became avail-



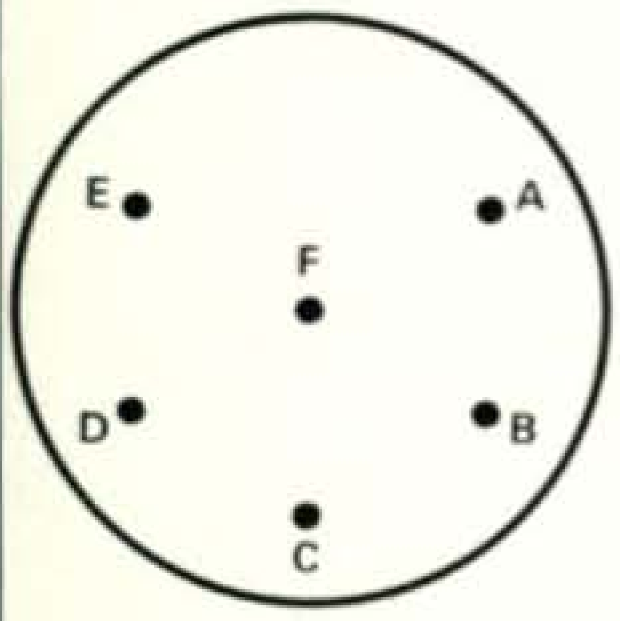
A. 24v.d.c. input (through fuse to pin F of J-102)
B. Ground

J-101



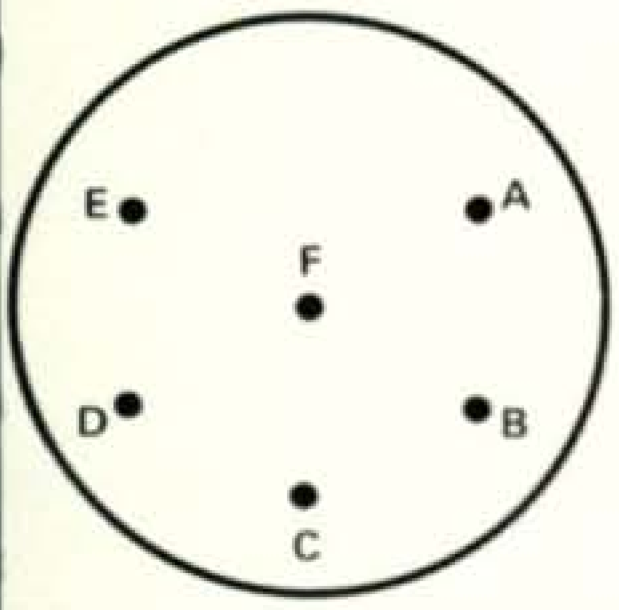
A. Audio output in parallel with front panel phone jacks J-104, J-106 when present
B. Audio cathode (ground)
C. Ground
D. 24v. to dynamotor, pin D of J-103
E. RF gain control (to ground through 50K pot)
F. 24v. input from J-101 (hook switch between F and D)

J-102



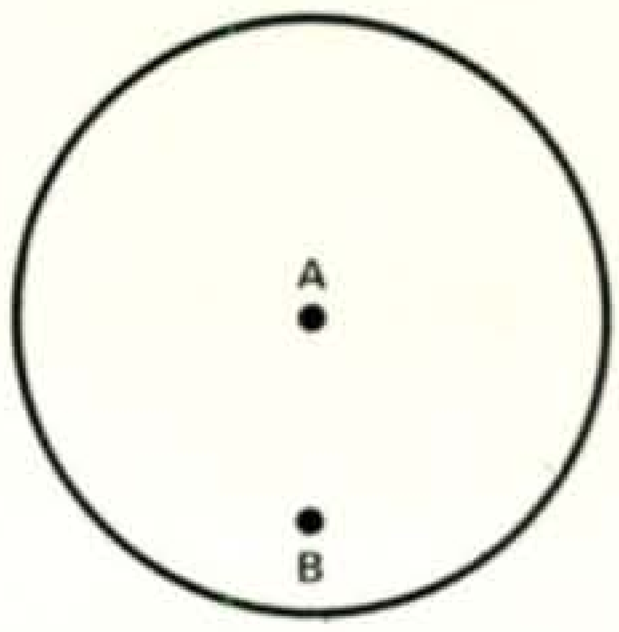
A. B+ from dynamotor
B. Audio output
C. Ground
D. Low voltage (24v.) to pin D, J-102
E. B+ to receiver circuits (jumper required from pin E to A)
F. n/c

J-103



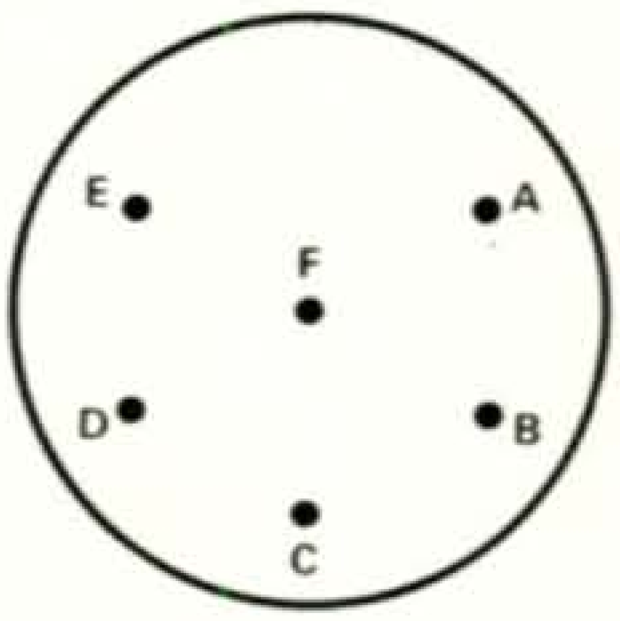
A. B+ 250v.d.c.
B. Audio
C. Ground
D. 24v.d.c. +
E. To indicator lamp from internal relay

J-2702



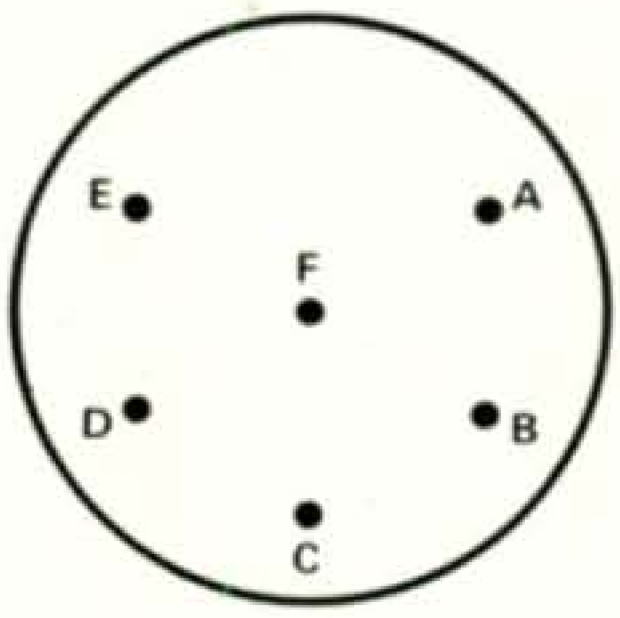
A. 24v.d.c. from supply
B. Ground

J-502



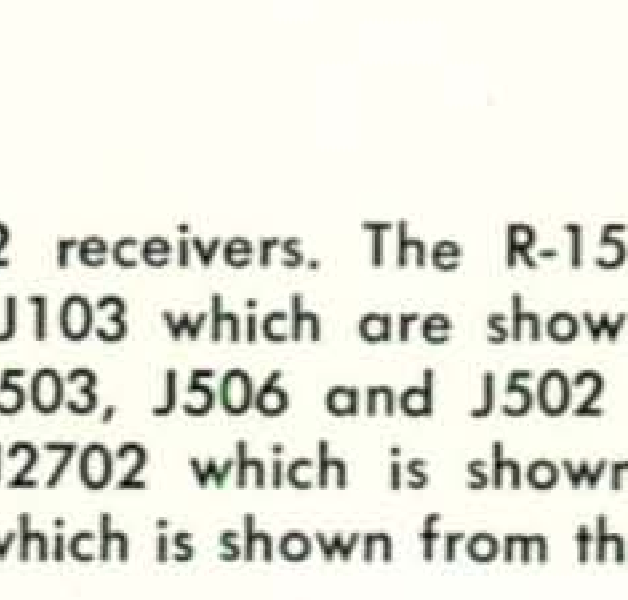
A. Audio
B. Loop relay (ground to operate)
C. Ground
D. 24v.d.c. to receiver
E. RF gain (ground through 50K potentiometer
F. 24v. to supply (to pin A J-502)

J-503



A. B+ 250v.d.c. from dynamotor
B. Audio
C. Ground
D. 24v.d.c. to receiver
E. B+ to receiver (jumper to pin A)
F. n/c

J-506



A. 24v.d.c. +
B. B+ to receiver circuits (250v.d.c.)
C. B+ from dynamotor (jumper to pin B)
D. Ground
E. RF gain
F. To loop relay (ground to operate)
G. Audio
H. n/c
I. n/c
J. n/c
K. Ground
L. n/c

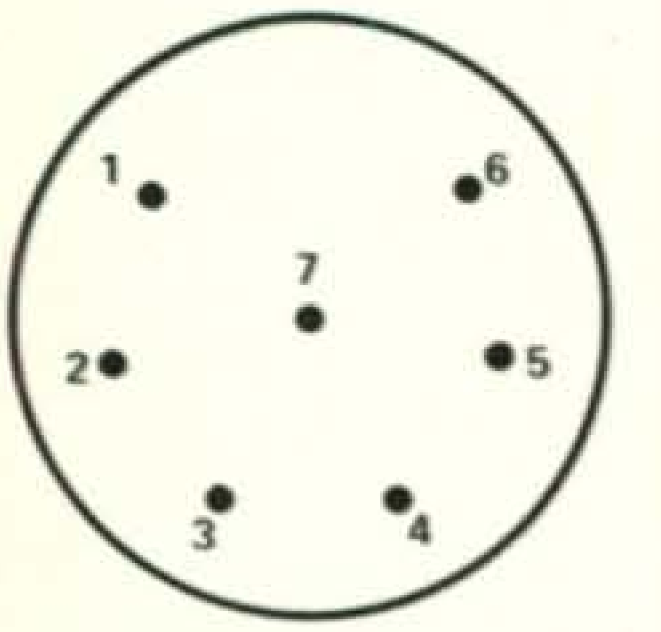
J-4803

Fig. 3—Pin connections for several ARC type 12 receivers. The R-15 (R-509/ARC-60) and R-19 (R-507 and R-508) receivers use J101, J102 and J103 which are shown from the wired side. The R-10A, R-11A/ARC, R-510 and R-511/ARC use J503, J506 and J502 which are shown from the wired side. The 75 MHz fixed-tuned R-20 uses J2702 which is shown from the wired side. The 540-1500 kHz R-22 uses J4803 which is shown from the *outside*.

able, but few saw service, and most ended up as scrap or surplus. These used plug-in coils, and a variable oscillator. My book on the type is dated 1932, although the —430 set is a little later, though not much more modern. The Navy had some virtually identical equipment under RU-1 and GF-1 nomenclature, circa 1934. None of it is actually usable any more except as a curiosity.

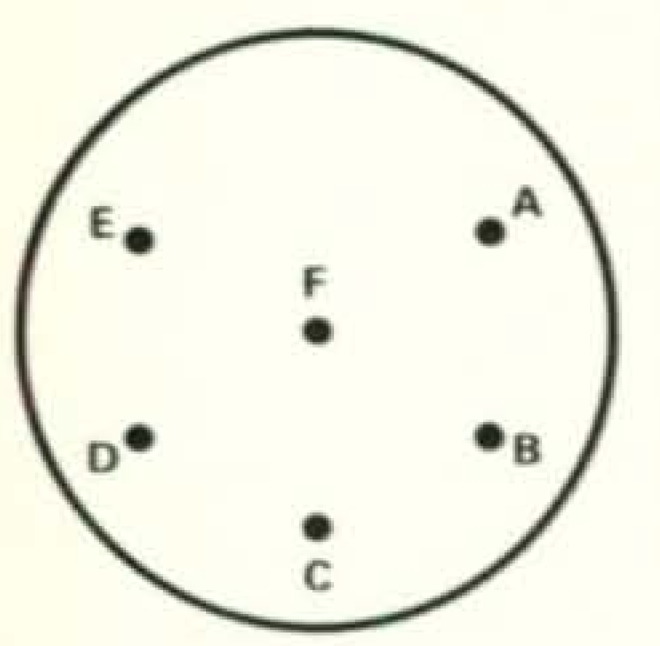
I do not have any up-to-date information on military tube testers. I am looking for manuals and conversion charts, and if anyone can help me, I'd like to do a column on a number of the available units (TV-2 TV-4 etc.)

I have a Collins 51S1 receiver now, on loan for testing, and expect to get the later 651-S1 on which I will do a future column. These are the successors to the 51J-4, R-388, and R-390-A Collins general coverage sets, and they are becoming available in surplus, although they are



1. Ground
2. Audio output
3. RF gain control
4. Audio cathode to tuning meter ("S") meter if used, otherwise grounded
5. Audio to navigation circuits
6. 24v.d.c. input
7. B+

J-103 (Rear panel; same pattern as SCR-274-N, etc.)



A. B+ from dynamotor
B. Audio output
C. Ground
D. 24v.d.c. input (parallel with pin 6 J-103
E. B+ to receiver circuits (jumper to pin A)
F. n/c

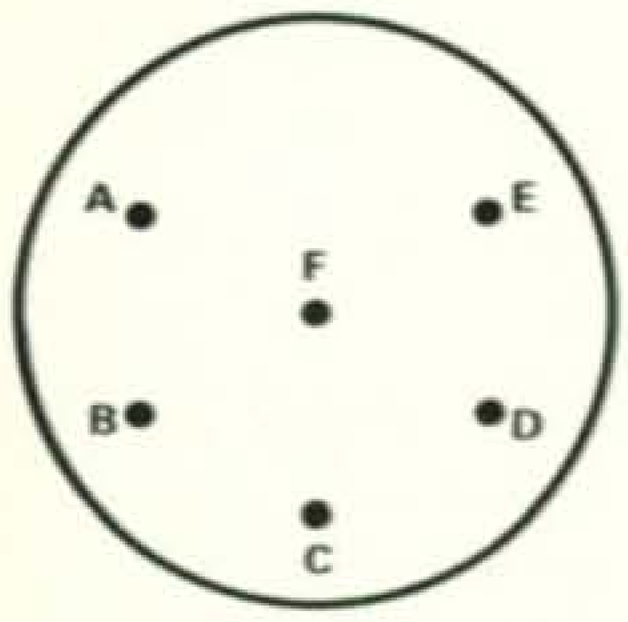
J-105 Front panel

Fig. 4—R-13/ARC type 15, R-445/ARN-30 receiver pin connections shown from wired side. Note that the rear panel connector is the same pattern and connections as the SCR-274N, etc., and that the R-13 does not have a front panel connector.

still rare and costly.

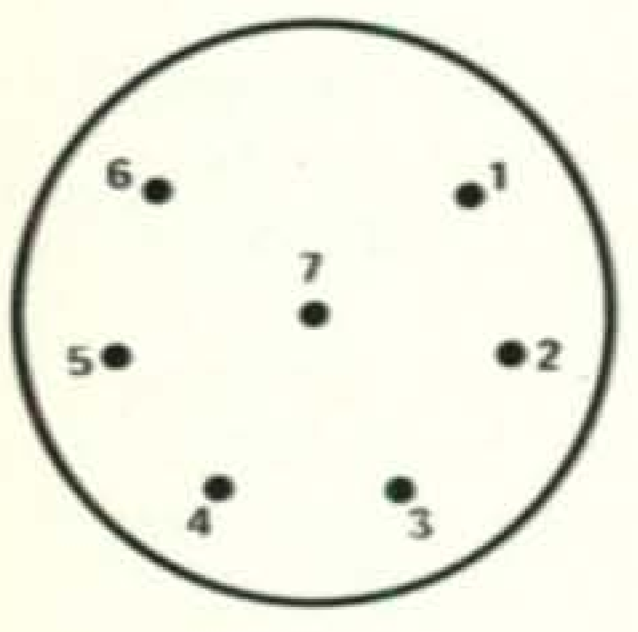
This covers all of the LF-MF-HF and commonly available v.h.f. Command receivers. It omits only the very rare 100-125 and 125-156 MHz and 28-41 MHz units of tuneable equipment.

IFs should be aligned with the core rods in the LF-MF sets pulled *up* for loosest coupling. An exhaustive treatment of the alignment of these receivers was published in *CQ* for December, 1970, p. 77. ■



A. B+ output
B. Audio output
C. Ground
D. 24v.d.c.
E. B+ to receiver circuit (jumper to pin A)
F. Squelch — ground through 50K pot

J-3 Front panel

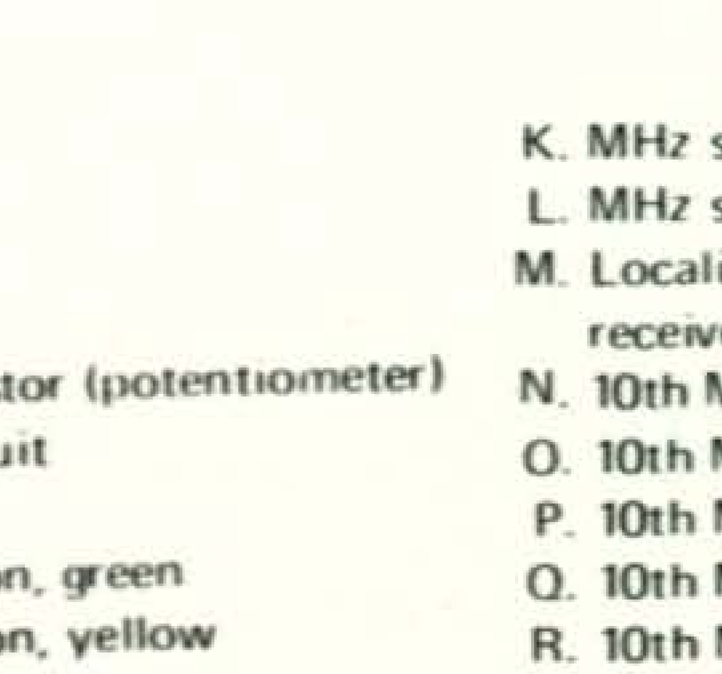


1. Ground
2. Audio output
3. Ground
4. Tuning meter (if used, otherwise grounded)
5. Audio output to navigational units
6. 24v.d.c. input
7. B+ output

J-4 (Rear panel) same pattern as ARN-30A, SCR-274-N, etc.

Band	Intermediate Frequency	High Point	Low Point
190-550 kHz	85 kHz	520 kHz	210 kHz
520-1,500 kHz	239 kHz	1,400 kHz	570 kHz
1.5-3 MHz	705 kHz	2,900 kHz	1,550 kHz
3-6 MHz	1,415 kHz	5.8 MHz	3.1 MHz
6-9.1 MHz	2,830 kHz	8.9 MHz	6.1 MHz
9-13.5 MHz	4,200 kHz	13.3 MHz	9.2 MHz
13.5-20 MHz	4,200 kHz	20 MHz	13.8 MHz
20-27 MHz	4,200 kHz	27 MHz	20 MHz
108-135 MHz	15 MHz	131 MHz	111 MHz
118-148 MHz	15 MHz	144 MHz	122 MHz

Table 1—Command Receiver Alignment data.



A. n/c
B. n/c
C. n/c
D. n/c
E. Squelch resistor (potentiometer)
F. Squelch circuit
G. Spare
H. MHz selection, green
I. MHz selection, yellow
J. MHz selection, orange
K. MHz selection, violet
L. MHz selection, blue
M. Localizer key — to replay in receiver
N. 10th MHz selection, white
O. 10th MHz selection, black
P. 10th MHz selection, orange
Q. 10th MHz selection, blue
R. 10th MHz selection, green

J-2 Front panel

Fig. 5—R-34/ARC type 15, R-1021/ARN-30D receiver pin connections as viewed from the outside. Note that the front panel connections are identical to the SCR-274N, etc.

In Focus [*from page 35*]

Bob McMillen, W3ATV, recently posed a good question regarding net operations. He asked in effect if the present level of slow scan activity perhaps warrants *two* Saturday nets. One devoted to technical discussions, and one for the exchange of pictures. As Bob points out, the technical forum provided by the net is all important to the progress of SSTV—but those whose primary interest is the exchange of pictures should be encouraged to maintain their enthusiasm too. Bob asked a question, but I'm making a suggestion: Starting Saturday September 6th at 1800 GMT on 14245 kHz, let's have an SSTV picture net. Get your camera fired up and join the fun. Any suggestions for a 7 MHz net, time, frequency? Drop me a line and let's see if we can get one going.

W1AW is now in operation on SSTV. Dr. Jim Thomas, WB4HCV has donated a complete set of Sumner Elect. and Engrg. gear to ARRL Headquarters. All SSTVers should be happy to hear that this fine equipment is in use at W1AW. Since I don't happen to have a W1AW QSL card, I'm going to try to pick up one for an SSTV QSO!

Can you top lightning for a smash ending? A lightning strike on the power line serving my home wiped out some dearly cherished gray boxes made in Cedar Rapids. I strongly recommend the installation of surge arrestors on your power mains where they enter the house. Lightning damage is not limited to strikes on your tower or antennas. My household insurance does cover my equipment—I suggest that you check your policy. If in doubt, review it with your insurance agent. Melted parts in a KWM-2 or a 30S-1 are enough to bring tears to your eyes (almost!), but I must say that the sight of a Ham-M control box in flames is even more spectacular than the quick blue glow over Crepes Suzette at your favorite ristorante! Please address tear-stained sympathy notes to Chez-Cliché, the home QTH, OM.

73, Bill, W2DD

Reflections [*from page 25*]

the associated primary circuit, especially when tetrodes and pentodes are involved.[3] The plate load resistance is accurately given by the ratio of the alternating components of plate voltage and current,

$$R_L = \frac{E_p}{I_p}$$

assuming of course, that the tube is operating properly. This resistance is also given to a good approximation by the expression

$$R_L = \frac{E_b}{2 I_{b\,(Max)}}$$

where E_b is the d.c. plate voltage and $I_{b\,(Max)}$ is the peak value of the tube's d.c. plate current. Assuming s.s.b. operation with 3000 volts on the plate, for example, a 3-1000 triode requires a plate load of 2650 ohms while a 4CX1000A tetrode requires about 2500 ohms. This should be convincing evidence that matched conditions do *not* usually exist between a power tube and its plate load. It follows, therefore, that a conjugate or image match is quite unlikely between a transmitter's output and its associated feed line.

Second, power tubes do not operate as constant-voltage or constant current sources. In fact, they cannot even be approximately represented as Thevenin's or Norton's generators. It is clear, therefore, that the maximum power-transfer theorem is not applicable to conventional r.f. power amplifiers. (It is stressed that we are not here considering solid-state amplifier designs which are different from their tube counterparts in several respects.) Most amateurs are quite aware that the essential objective of transmitter operation is *not* to obtain the maximum possible power from their final tube or tubes. Rather, the proper objective is to operate with good efficiency without at the same time exceeding definite constraints on grid and plate dissipation, nonlinearity and d.c. power input.

A Different Countdown To Reality

While many of the foregoing statements conflict with some of Mr. Maxwell's original concepts, they are quite consistent with power considerations associated with reflection phenomena. Neglecting plate circuit losses, the r.f. power delivered by the final tube(s) precisely equals the difference between the incident and reflected powers, as indicated by an accurate reflectometer at the transmitter's output. Power reflected by a mismatched antenna is again reflected at the line's input owing to the large mismatch that exists between the line and the ransmitter's output. This reflected energy is attenuation experienced with mismatched lines. of line losses. This accounts for the increased attenuation experienced iwth mismatched lines.

It should be observed, in closing, that a strange but definite change in Mr. Maxwell's matching concept is perceptible at the end of Part V (on page 164 of the April 1974 *QST*). Referring to the confusion that exists among both amateurs and engineers regarding the meaning of a "matched generator" he explains:

". . . to some it implies being matched in *only one direction,* and to others it means being matched in *both directions.* In transmitter operation, where conjugate coupling is usually used to deliver optimum power to a load through a line, the match is in one direction only—forward. This subject will be treated in Part VI of this series . . ."

It will be interesting indeed to learn what Mr. Maxwell means by conjugate matching in one direction only. ■

Bibliography

[1] E. A. Laport, *Radio Antenna Engineering,* p. 125 *et seq,* McGraw-Hill (1952).

[2] Alpha Engineering Report, *Evaluation of the Naval Research Laboratory Cascade Multi-coupler by Means of Digital Computer Analysis,* Alpha Corporation (a former subsidiary of Collins Radio Company), 23 March 1960.

[3] L. Gray and R. Graham, *Radio Transmitters,* p. 113, McGraw-Hill, New York (1961).

*This critique was delivered at a monthly meeting of the Point Loma Amateur Radio Club in San Diego, California.

CQ Reviews SB-104 [*from page 32*]

biners split the input from the driver to feed the two amplifiers, and combine their amplified outputs.

Since both the driver and PA are essentially flat across the entire 3-30 MHz range, harmonic energy exists in the PA output. This is reduced to acceptable levels by feeding the PA output through bandswitch-selected low pass filters on the ALC/Output board. Four 3-section filters are used with cut-off's above the 80, 40, 20 and 10 meter bands. The 10 meter filter serves also on 15 meters since the second harmonic of 21 MHz falls above 10 meters. Heath's specifications indicate that harmonic radiation is 45 db below 100 watts output.

When desired, the driver output may be routed directly to the ALC/Output board by diode switches actuated by means of a front panel push button switch for instant QRP.

R.f. to the antenna is fed through a directional coupler whose outputs are combined to produce an a.l.c. signal voltage the level of which increases with increasing s.w.r. This a.l.c. voltage is applied to the 3.395 MHz transmit i.f. amplifier I.C. so as to reduce drive to the expensive PA transistors as the s.w.r. into which the transmitter is looking rises. An a.l.c. time constant appropriate for either c.w. or s.s.b. operation is selected by a transistor switch on the ALC/Output board as the operating mode is selected.

A sample of r.f. output is also taken at the ALC/Output board for relative r.f. output metering.

C.w. operation is accomplished by unbalancing the first transmitter balanced modulator to produce a carrier, and keying the emitters of the signal frequency amplifiers which precede the driver. Transmitter audio stages are disabled on c.w. Keying control is through the vox circuits and sidetone output to the speaker or phones is provided with its own level control in addition to being varied by the a.f. gain control. C.w. carrier level is controlled by varying the gain of the i.f. amplifier I.C. by means of a front panel control.

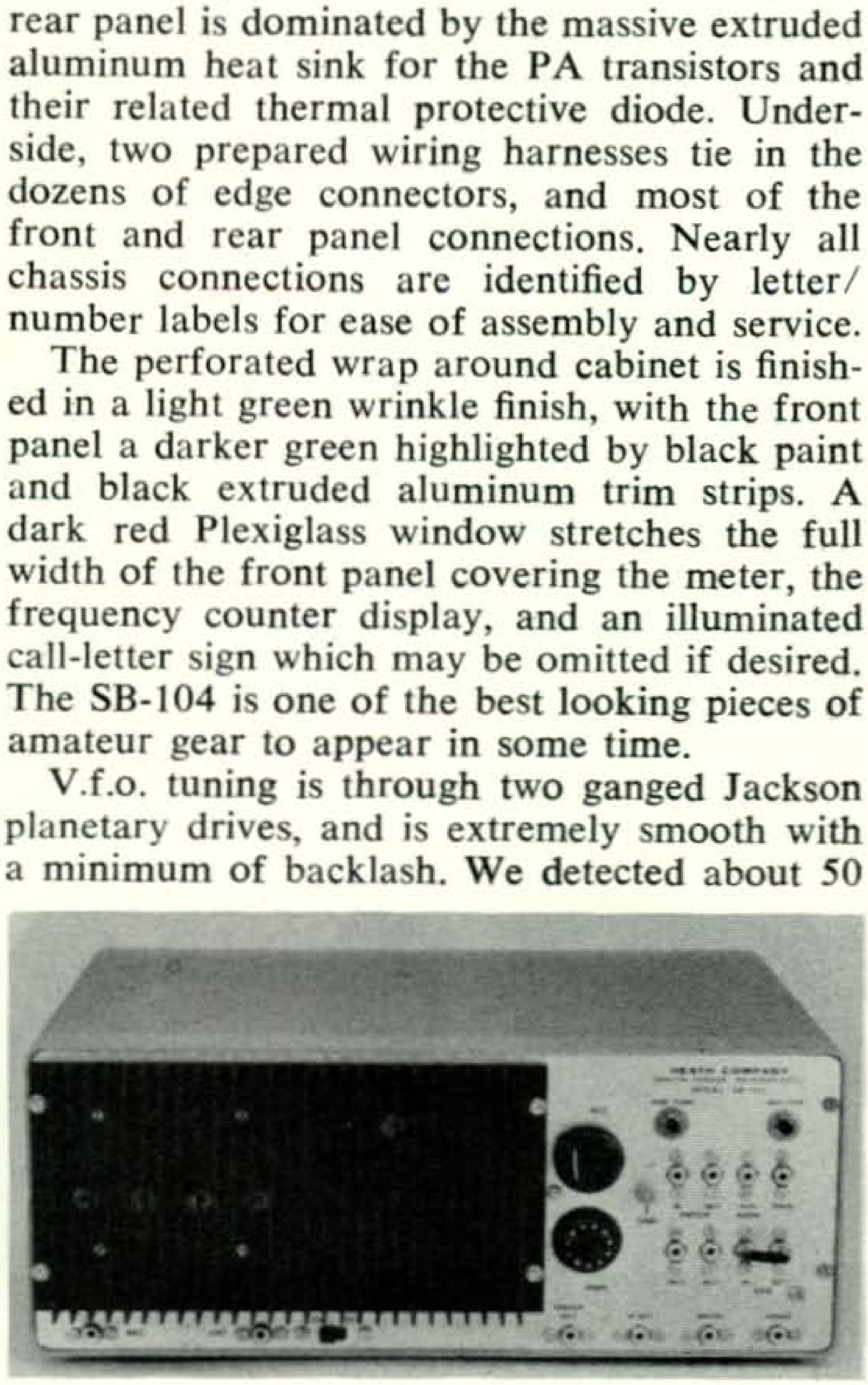
Construction

The SB-104 is constructed mostly on 13 glass-epoxy printed circuit boards, seven of which are similar in size and slide onto multiple contact edge connectors similar to those used in some other recent Heathkits. Each of these seven boards slides neatly into its own shielded compartment on brass slide tracks which also serve as additional grounding points. The remaining circuit boards mount elsewhere in the chassis assembly, some also making their connections through edge connectors; others through hard wiring or push-on wire connectors. With the exception of the v.f.o. and buffer boards which are buttoned up tightly within the v.f.o. enclosure, all circuit boards are easily accessible for maintenance.

Chassis and cabinet are constructed of heavy-gauge sheet aluminum. The chassis itself is a shallow pan type with the extensive top-of-chassis shielding built up from many flat plates fastened together with sheet metal screws. The rear panel is dominated by the massive extruded aluminum heat sink for the PA transistors and their related thermal protective diode. Underside, two prepared wiring harnesses tie in the dozens of edge connectors, and most of the front and rear panel connections. Nearly all chassis connections are identified by letter/number labels for ease of assembly and service.

The perforated wrap around cabinet is finished in a light green wrinkle finish, with the front panel a darker green highlighted by black paint and black extruded aluminum trim strips. A dark red Plexiglass window stretches the full width of the front panel covering the meter, the frequency counter display, and an illuminated call-letter sign which may be omitted if desired. The SB-104 is one of the best looking pieces of amateur gear to appear in some time.

V.f.o. tuning is through two ganged Jackson planetary drives, and is extremely smooth with a minimum of backlash. We detected about 50 Hz at worst, although Heath specifies 100 Hz. Since there is no mechanical readout for the dial, calibration and v.f.o. tuning linearity are of no real importance, but in fact the v.f.o. *is* quite linear. The large comfortable plastic tuning knob is fitted with a molded-in spinner indentation which makes large frequency excursions fast and easy. Twenty turns carries the v.f.o. from end-to-end . . . each 100 kHz requires about 4 turns, but there is no positive mechanical stop for the knob shaft at the end of travel. Instead, the planetary drives just slip, something which may lead to premature wear.



Rear view of the SB-104 shows massive heat sink for the four PA transistors, as well as the numerous phono-type connections.

Performance

In the specifications below, Heath's ratings are followed by our measurements, wherever made.

RECEIVER: *Sensitivity*—>1.0 μv for 10 db S + N/N ratio for s.s.b. (80 m. .9 μv, 40 m. .5 μv, 20 m. 1.6 μv, 15 m. 1.0 μv, 10 m. 1.0 μv, WWV 3.5 μv). *Selectivity*—S.s.b.: 2.1 kHz min. @ 6 db down. 5 kHz at 60 db down (as rated). C.w.: 400 Hz @ 6 db down, 2 kHz @ 60 db down (as rated). *Overall Gain*—1 μv for ½ w. audio output. *Audio Output*—2.5 w. into 4 ohms; 1.25 w. into 8 ohms at 10% THD. *AGC*—1 ms attack, 100 ms and 1 ms release, plus Off. *Intermodulation Distortion*— −60 db (−66 db). *Image Rejection*— −60 db (−61 db). *IF Rejection*— −60 db (−66 db on 10 m., worst; −81 db on 80 m., best). *Internally Generated Spurious Signals*—Below 2 μv equivalent except at 3.65, 3.74, 14.24 and 21.2 MHz (measured 8 μv @ 3.65, 13 μv @ 3.74, >1 μv @ 14.24, 7 μv @ 21.2 MHz).

TRANSMITTER: *R.F. Power Output* — High power, 50 ohm non-reactive load, 100 w. p.e.p. s.s.b. ±1 db, 100 w. c.w. (80-10 m., 140, 150, 140, 105, 105 w. respectively). Low power, min. 1 w. p.e.p. s.s.b., 1 w. c.w. (1.6 w. on 80 m., 1.0 w. on 10 m.). *Output Impedance*—50 ohms, less than 2:1 s.w.r. *Carrier Suppression*—50 db down from 100 w. single tone output, 1 kHz reference (55 db). *Unwanted Sideband Suppression*—55 db down from 100 w. single tone output, 1 kHz reference (50 db). *Harmonic Radiation*—45 db below 100 w. output. *Spurious Radiation*— −50 db within ±3 MHz of carrier, except −40 db at 3.395 MHz. −60 db more than ±3 MHz from carrier. *Third Order Distortion*— 30 db down from 2-tone output of 100 w. p.e.p. (30 db). *Stability*—Less than 100 Hz/hr. drift after 30 min. warmup. Less than 100 Hz drift for 10% change in primary voltage (300 Hz drift during first 30 minutes; 65/hour for next 3 hours).

Note that all the above measurements are made at a nominal primary voltage of 13.8 v.d.c. While on-the-air scuttlebutt has it that improved performance can be had at increased voltage (up to 16 v.d.c.), our measurements could not confirm any change, even in maxi-

[*continued on page 73*]

Novice [*from page 44*]

teur societies, in turn, sponsor similar bureaus to which you can mail your outgoing DX cards. The addresses of the foreign QSL bureaus are listed in the foreign edition of the *Call Book*.

Many DX stations, like CEØAE, have their own QSL bureaus. When you work a station who says, "QSL via——," send your card and a postpaid return envelope to ——. The DX card will usually appear in your mail box in your return envelope in a few days.

News And Views

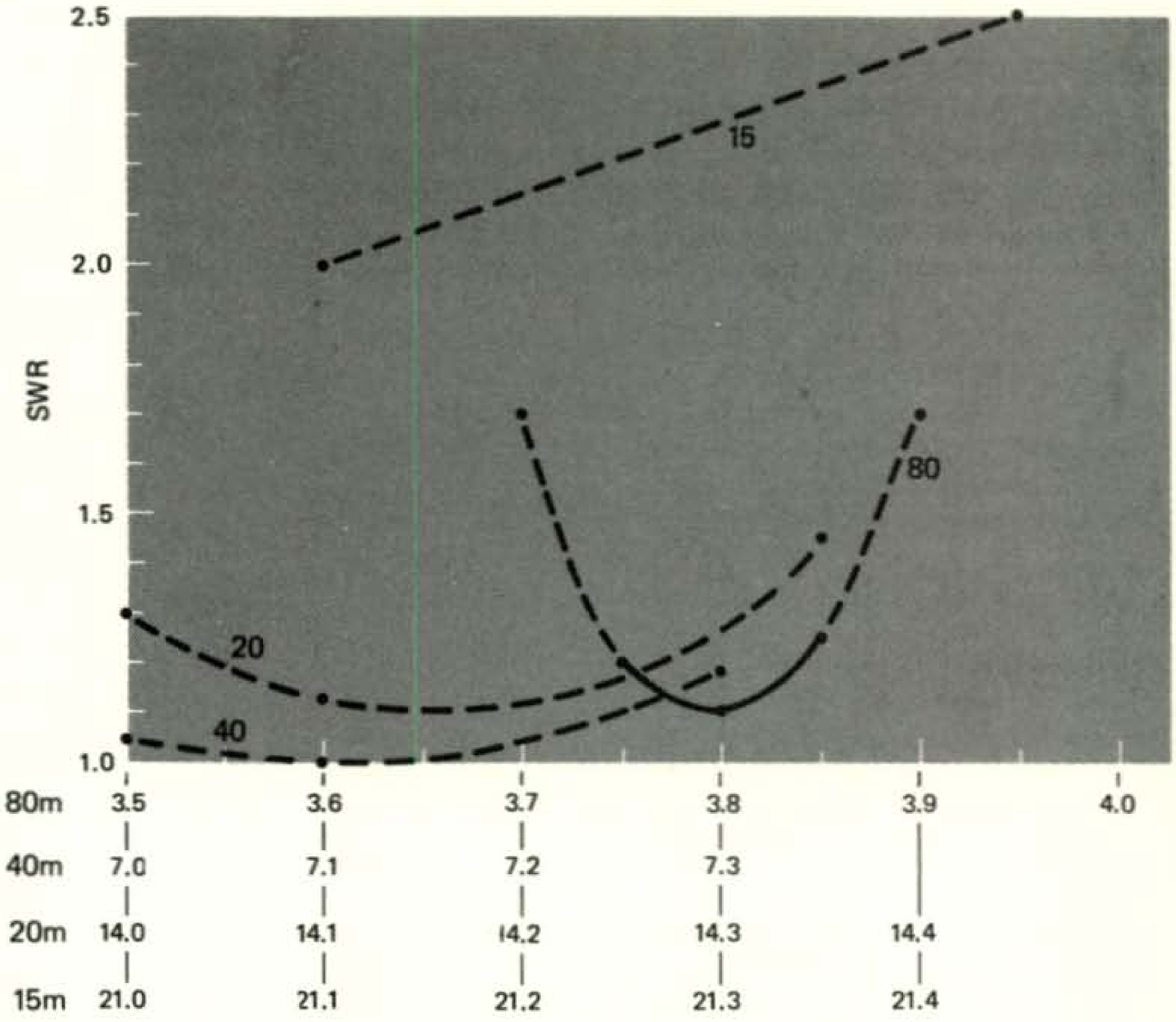
Even your best friends won't tell you! After hearing that the July NOVICE SHACK would talk about amateurs who have been getting FCC discrepancy reports for straying into a band segment not authorized by their license class, a local amateur we see almost every day confessed that the FCC had nailed him for a couple hundred Hz . . . **Dave, CEØAE,** Easter Island, who is devoting two days a month to working Novices as outlined in last month's column offers some encouragement to Novices. He hears them, and they should be able to hear him. Dave has a five-band Worked All States certificate using a "barefoot" Tempo-One transceiver feeding a vertical antenna. He admits, though, that a CEØ call helped. A good location within sight of the ocean has its advantages, too . . . **Howie Weiss, WA2PKL,** 704 Mamor Court, Brooklyn, N.Y. 11235, now has his Advanced class ticket after 15 months as a Novice. He has worked all states and all continents. Howie uses a Drake TR-4C transceiver driving all sorts of antennas from a 3-element beam to a paper clip—with an antenna tuner, of course. But he worked most of his DX with a rotatable 15-meter dipole. WA2KPL has also worked DXCC, although not entirely as a Novice and still needs 20 more QSL cards before he can apply for the certificate. How many countries have you worked?

73, Herb, W9EGQ

Propagation [*from page 63*]

Central America, Caribbean & Northern Countries Of South America	11-13 (1) 13-16 (2) 16-17 (1)	08-09 (1) 09-14 (2) 14-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-20 (1)	18-21 (1) 21-22 (2) 22-01 (3) 01-03 (2) 03-07 (1) 20-22 (1)* 22-02 (2)* 02-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-13 (1) 13-15 (2) 15-16 (1)	08-09 (1) 09-10 (2) 10-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-22 (2) 22-00 (1)	20-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	*Nil*	16-18 (1)	08-10 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	01-06 (1)

Fig. 10—S.w.r. curves for the inverted Delta loop of fig. 9 when used on 80, 40, 20 and 15 meters.



Antennas[*from page 38*]

there's no reason why 50 ohm line can't be used. The radiation resistance of the loop is about 60 ohms so that provides a nice match to either 50 or 75 ohm lines. Incidentally, notice the good bandwidth of this simple antenna."

"What was the second antenna they tried?" asked Pendergast, making drawings in his notebook.

"The second one was an 80 meter inverted delta loop, fed at the bottom with a 150 ohm matching section, balun and 75 ohm line (fig. 9). The radiation resistance of the loop seemed to run about 180 ohms, so G3AQC used a quarter-wave matching transformer made of two lengths of 300 ohm TV ribbon line connected in parallel. Interestingly enough, the loop provided good performance on the 40, 20 and 15 meter bands, as well as on 80 meters (fig. 10).

"Because of the combination of horizontal and vertical radiation, the various loops are practically nondirectional on the fundamental frequency, the maximum variation in front/side ratio being measured as 6 db for the horizontal component and 4 db for the vertical component."

Pendergast studied the drawings, then asked, "I would guess that all of these loop antennas are sensitive as to ground conductivity, are they not?"

"Yes," I replied," Especially in the case of the vertically polarized radiation. However G3AQC reports that the loop configuration provides 5 db to 10 db improvement on long-haul DX on 80 meters as compared to a center-fed dipole, even though his ground conductivity is quite poor".

"Well," said Pendergast, "I hope some of your *CQ* readers try these interesting antennas and report back on how well they perform. Getting a good DX antenna for 80 meter operation is no easy task!"

"That's right," I agreed. "Eighty meter DX is on the increase as the higher frequency bands poop out during the low portion of the sunspot cycle. Since very few amateurs have 80 meter rotary beams on 180 foot high towers, the DXers have to do with what they can rig up, and that usually means wire-type antennas located relatively close to the ground.

"Many 80 meter types favor vertical antennas. But that means an extensive radial ground system. And the vertical antenna is well-known for its noise pickup. It seems to me that some kind of loop is a good alternative, as it provides both horizontal and vertical polarization, it seems to be less dependent upon ground conductivity than does a conventional vertical antenna and it is cheap and easy to erect. Best of all, the loop type antenna is very forgiving: it radiates practically all of the r.f. that you are able to get into it."

Pendergast said, "Eighty meters is an idea band for antenna experimentation. You can build all sorts of wire antennas for a few dollars. They don't cost much, and if they don't work, you can take them down in minutes. And don't forget—a little antenna gain on 80 meters works wonders!"

,NOTE: For those *CQ* readers who would like to subscribe to *Radio Communications,* write to: Radio Society of Great Britain, 35 Doughty St., London WC1N, 2AE, England. In the U.S.A. contact: Communications Technology, Inc., Greenville, N.H. 03048). ■

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FOR SALE: CQ's — Sept., Oct. 1945, March 1946 through December, 1957. All of 1971, 1972, 1973, plus 6 dupes and assorted inbetween issues. Sold as lot only, $75.00. Radio magazine, numbers 212, 218, 219, 220, 234, 248, 263, 264, $5.00. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

HEATH SB-100 and P.S. Mint- $300; Heath Two'er $30. TA-33 Beam, $70. TR-44 rotator, $30. HA-26 two and six mtr. VFO, $25; Clegg 99'er $35. Marvin Lager, 69-23 228 St., Queens, NY 11364. (212) 229-9064.

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FOR SALE: First printing, first edition, A.R.R.L. Antenna Book (George Grammer & Byron Goodman, 1939) $10.00, Fifth Edition (Jan. 1935) of The Radio Amateur's License Manual $10.00, 1934 RCA De Forest Amateur Transmitting Types (tube manual) $5.00. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

FOX-TANGO CLUB NEWSLETTERS 2/72-12/74, $6. ARRL Enameled Emblem, $3. Reference Data for Radio Engineers, 1st Edition, $5. ARRL Hints and Kinks, Vols. 4-8, $9. 30 amp Bifilar Wound Filament Choke, $3. Miscellaneous Handbooks. Write needs. Plus postage. Rulffs, RR2, Box 341, Sebago Lake, Maine 04075.

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CQ Reviews SB-104 *[from page 69]*

mum power output with good waveform. Also suggested by some constructors is increasing v.f.o. injection voltage to near maximum to produce a hotter receiver. While both increased v.f.o. injection and higher d.c. input voltage will raise the receiver background noise level, neither is a worthwhile effort. No improvement in receiver S+N/N ratio was observed at the higher primary voltage, and although higher v.f.o. injection resulted in approximately a 0.1 μv improvement in sensitivity on each band, the higher injection caused intolerable spurious response levels. For instance, to achieve a 0.1 μv improvement in sensitivity on 15 m., the v.f.o. injection had to be so increased that the 21.2 MHz spurious rose from 7 μv equivalent to 65 μv equivalent. That's S-9 plus 15 db! Also increasing proportionally were spurs emanating from the counter which, while normally almost inaudible, became strong enough to swamp many weaker signals. In short, the SB-104 works admirably well as designed. Save the "tweaking" for a less capable rig, and become accustomed to hearing signals rise cleanly out of an unusually quiet background.

Conclusions

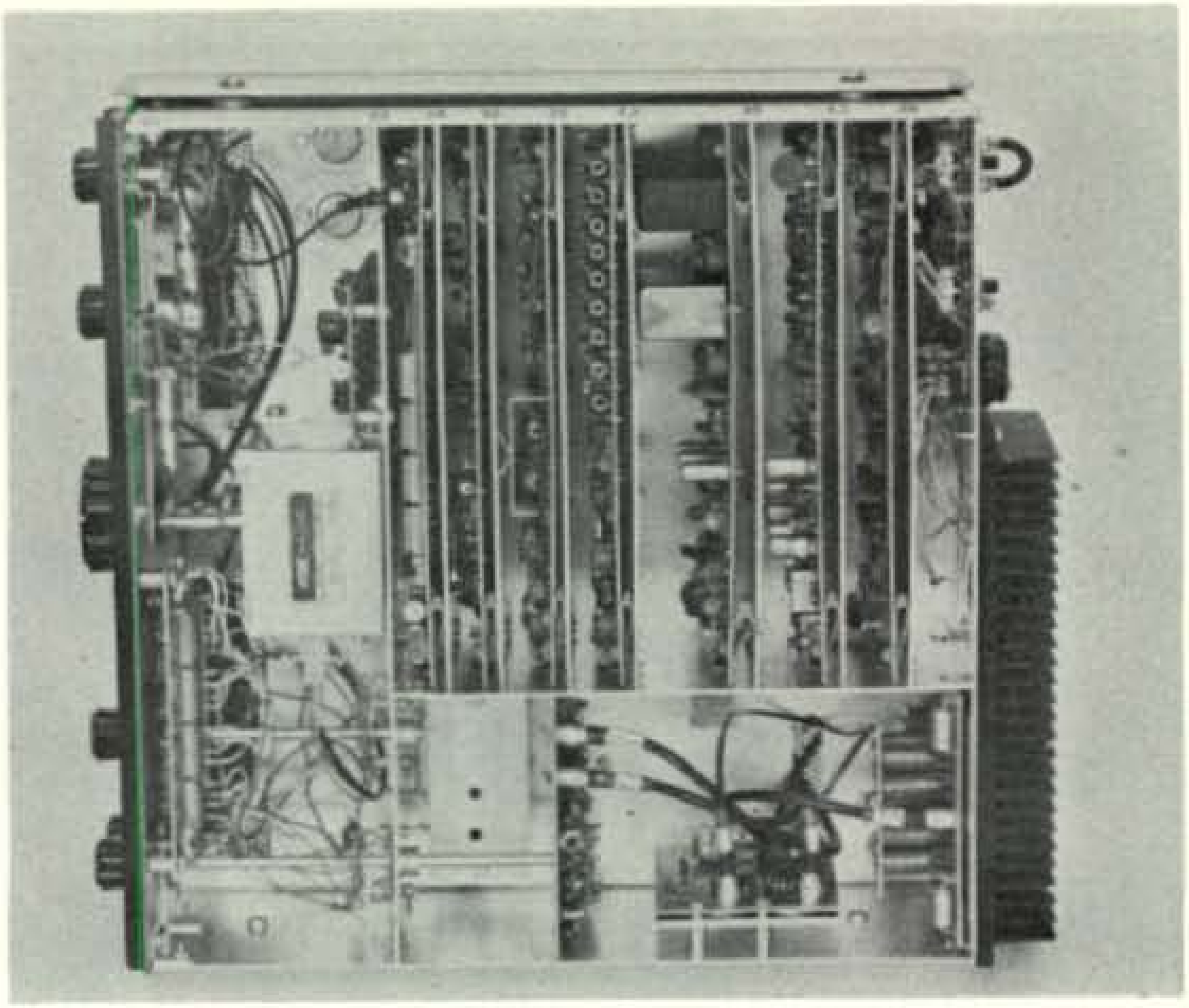
Our impression of the SB-104 is that it is a well engineered, highly-sophisticated piece of Amateur equipment which is probably as complex as a kit is likely to become for years to come. To sit back when it's all together and working, and contemplate the thousands of man-hours of design and engineering time that have gone into this pretty green box is humbling. And it is with this in mind that we respectfully tender a few well-chosen criticisms of the SB-104.

We see no earthly reason why an RIT control could not or should not have been included.

The specified duty cycle of the PA is shorter than many Amateurs, particularly contesters, can tolerate (S.s.b.—2 units on, 1 unit off; maximum continuous transmitting time—1 hour. C.w.—1 unit on, 1 unit off; maximum continuous transmitting time—15 minutes. Tune—1 unit on, 5 units off; maximum continuous transmitting time—30 seconds.).

The inability to receive with the broader sideband filter when operating on c.w. with the optional c.w. filter installed is a complaint common to many current design Amateur transceivers, and it is shared, too, by the SB-104.

The SB-104 is worth the investment of time, effort and money. The experience of no-peaking, no-tuning, broadband transceiving is not quickly forgotten. In fact, there's something almost sinful about turning the bandswitch, dialing up a frequency and just hitting the key or talking into the mike. Amateur Radio operation hasn't been this simple before. I guess that's good, but instinctively, I do occasionally reach for a non-existant antenna trimmer or preselector tuning knob.



Top view of the SB-104. Seven major PC boards slide into individual shielded compartments.

On the air performance is excellent. The receiver audio and transmitted s.s.b. audio quality are as good as one could desire, and for the operator who likes to rattle the shack walls, 2.5 watts of audio are ample and clean. C.w. keying is pleasant to the ear with no clicks or pops, although perhaps the very slightest trace of yoop. The keying waveform shows good rise and fall shaping but a significant amount of overshoot does occur from key down to about halfway through a 30 w.p.m. dash. This is not audibly perceptible, however.

Vox action is very smooth and easy to adjust, facilitated by vox gain and delay controls on the front panel. The two rows of six pushbuttons each, control a multitude of functions, and have good feel, but are a little too small (½" wide) for fast operation with large fingers. The wide assortment of phono type connections on the rear panel is welcome, but the use of even a ceramic insulated phono jack for the antenna connector is unwelcome.

The SB-104 lives up to Heath's reputation of high quality performance for reasonable cost, and although the price of the SB-104 kit is not low ($669.96) it is reasonable for what it provides. Accessories and options for the SB-104 are: 400 Hz C.W. Filter Kit, $34.95; Noise Blanker Kit, $24.95; Mobile Mount, $34.95; Fixed Station Power Supply, $89.95; Station Speaker, $29.95; SB-644 Remote VFO, $119.95; SB-614 Station Monitor, $139.95; SB-634 Station Console, $179.95. The latter two will be reviewed in *CQ* at a later date, as will the new SB-230 Conduction Cooled Linear Amplifier. All are products of the Heath Company, Benton Harbor, Mich. 49022. *—K2MGA*

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