EIA Proposes Code-Free Novice License PAGE 5

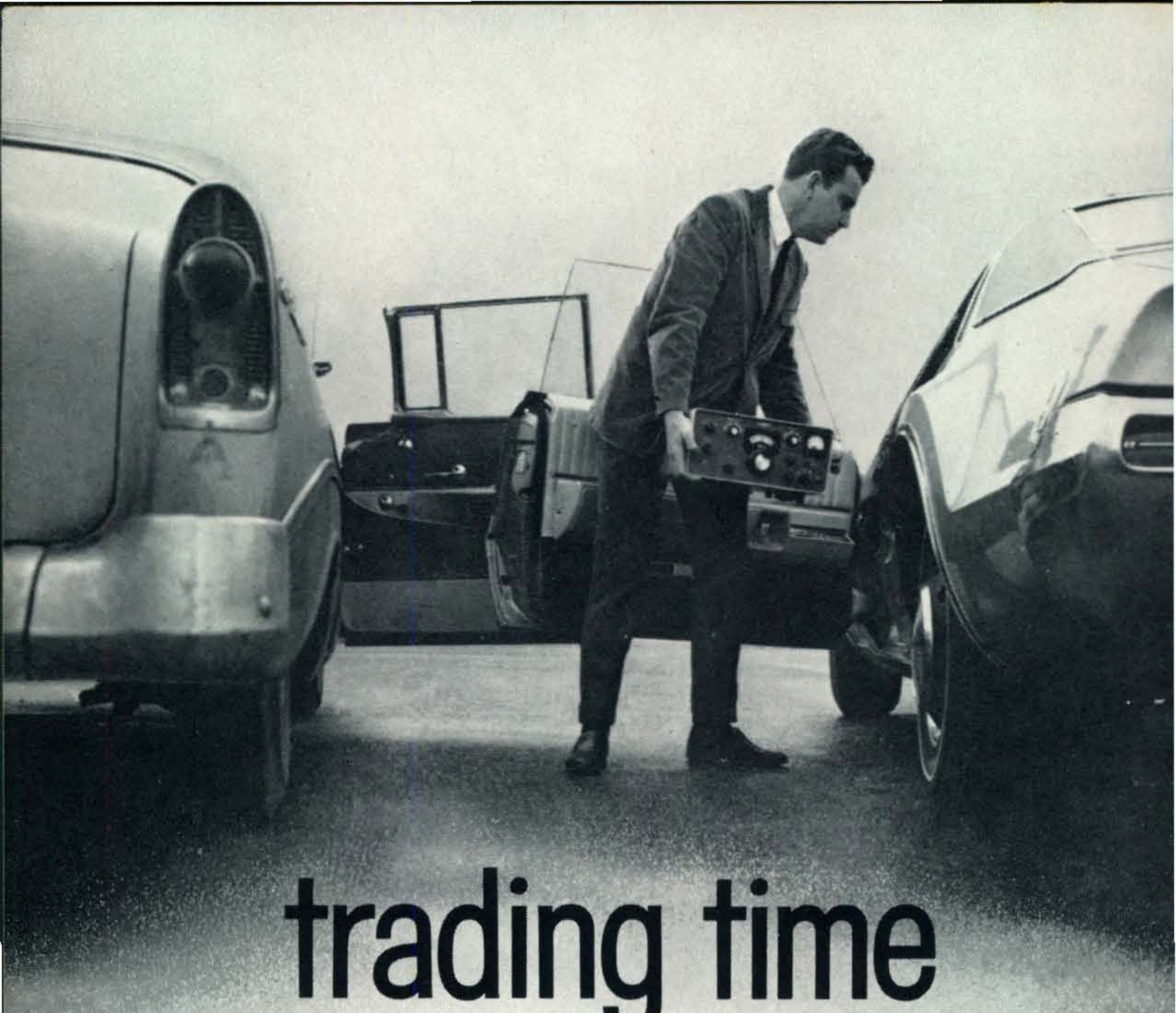
CQ
ICD

May 1968
75¢

Improved Dual-Band Mobile Antenna

PAGE 58

The Radio Amateur's Journal



trading time
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At 100,000 miles, it's still the liveliest rig on the road.

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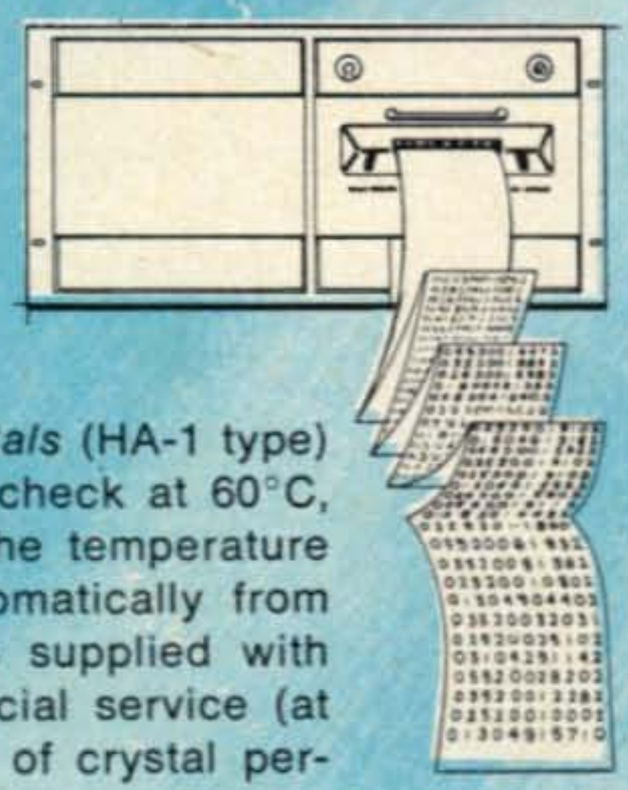
TEMPERATURE CERTIFICATION

FOR INTERNATIONAL

HIGH ACCURACY CRYSTALS



International High Accuracy Crystals (HA-1 type) receive a five-point temperature check at 60°C, 25°C, 0°C, –10°C and –30°C. The temperature vs frequency test, recorded automatically from an electronic readout printer, is supplied with each individual crystal. This special service (at no extra cost) is your assurance of crystal performance at tested temperatures. We will furnish additional temperature readings (on request) for a nominal charge. *Note: Our calibration service is available to customers desiring temperature run on other crystal types and oscillators.*

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See page 126 for New Reader Service

10 reasons to buy Hallicrafters' new SR-400 Cyclone

FEATURE	Hallicrafters SR-400	Collins* KWM-2	Drake* TR-4
Power Input	SSB=400 watts CW=360 watts	SSB=175 watts CW=160 watts	SSB=300 watts CW=260 watts
Accessory "dual receive" VFO available	**Yes**	No	No
Noise Blanker	**Yes**	$135.00 Accessory	No
Receiver Incremental Tuning	**Yes**	No	No
Built-in notch Filter	**Yes**	No	No
Sharp CW Filter	**Yes** 200 cycles	No	No
Sensitivity	.3 uv for 10 db S/N	.5 uv for 10 db S/N	.5 uv for 10 db S/N
1 kHz dial readout	**Yes**	Yes	No
Carrier Suppression	60 db	50 db	50 db
Unit Price	**$799.95**	**$1,150.00**	**$599.95**

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Now: can you think of one reason why you shouldn't?

Superb sensitivity, 400 watts RF, 200 cycle CW selectivity, receiver incremental tuning, 1 kHz readout, amplified automatic level control, exclusive notch filter! There's even the HA-20 dual receive VFO for sensational, award winning DX operation. No matter what specifications or features you choose as a standard of comparison, the exciting new SR-400 fixed/mobile transceiver is unsurpassed. Unsurpassed feature for feature. Unsurpassed for rugged dependable performance in all environments. Unsurpassed in value and versatility. Prove it to yourself. Write for complete specifications in a four page brochure. See your Hallicrafters' distributor today.

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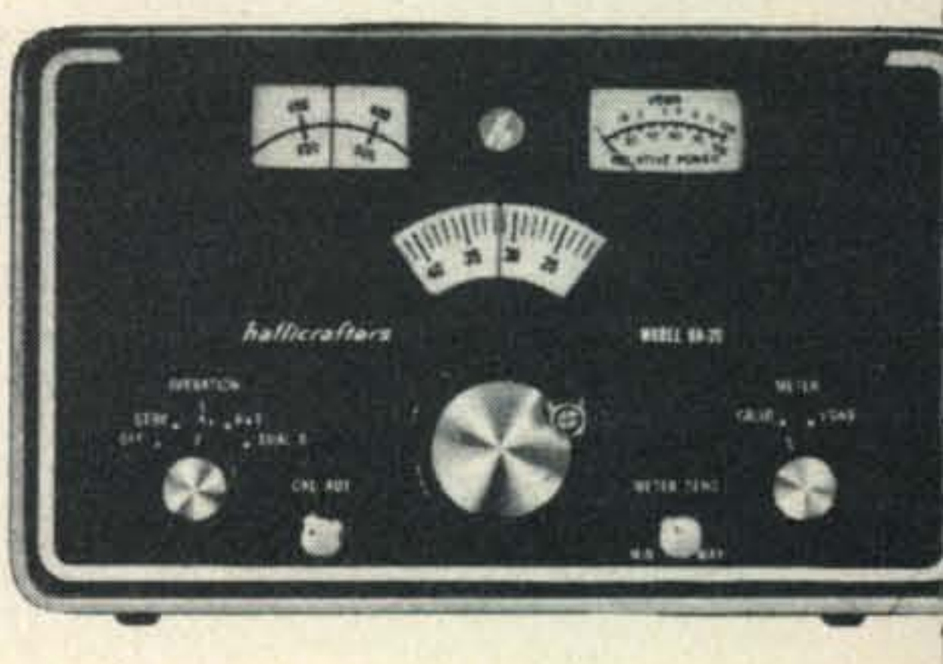

Export: International Dept. *Canada:* Gould Sales Co.

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MAY, 1968 VOL. 24, No. 5

CQ The Radio Amateur's Journal

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DEPARTMENTS

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Third Order Intermodulation Distortion	—36	—38	d
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Filament Current	10.0	10.0	A
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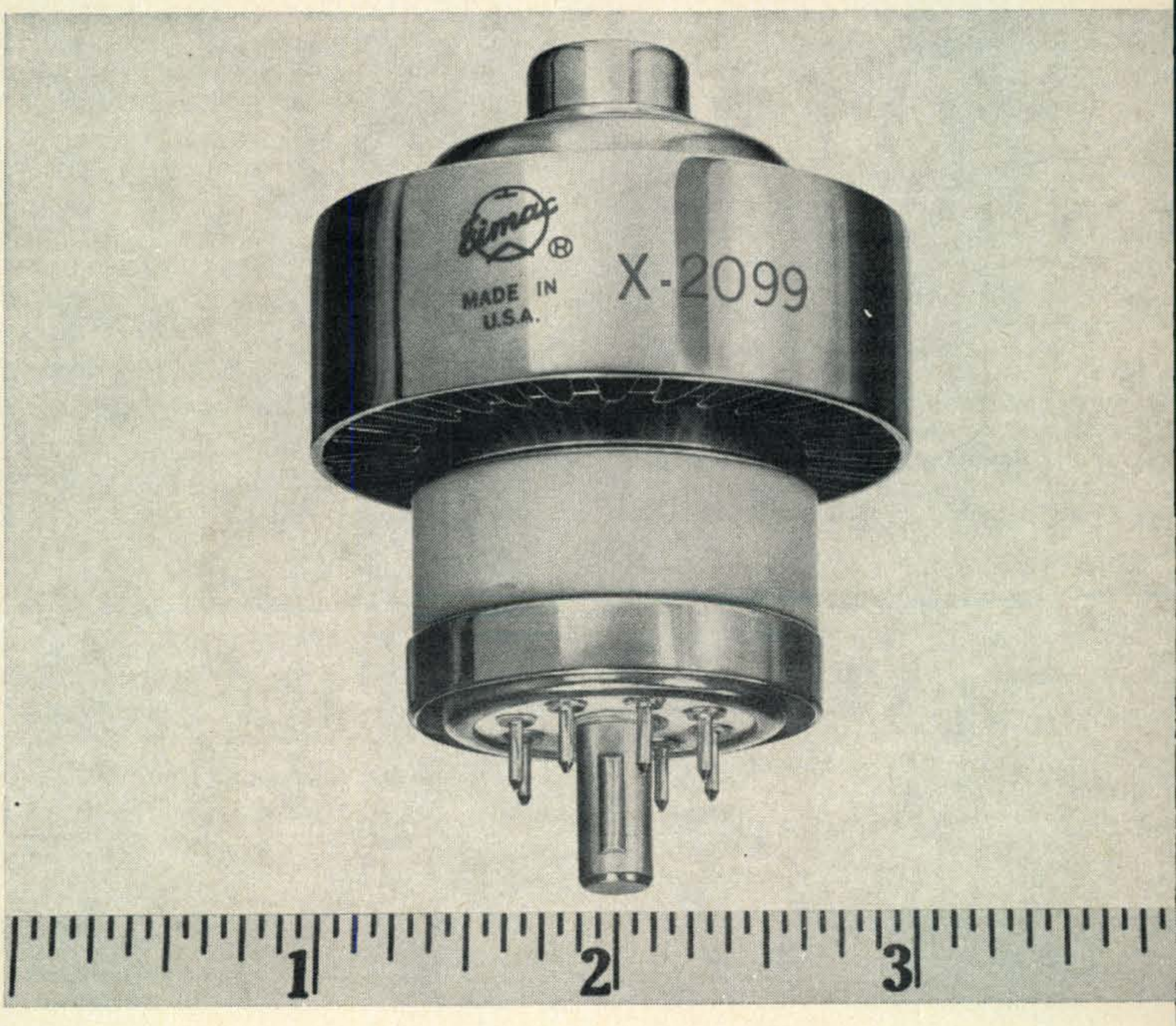

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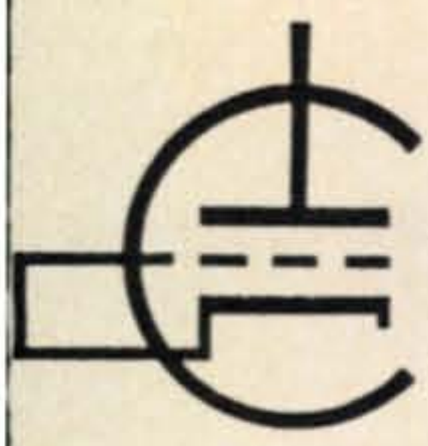

ZERO BIAS

IN the wake of Docket 15928, bringing incentive licensing back to American amateur radio, the Amateur Radio Section of the Electronic Industries Association has proposed still further amendments to the amateur rules hoping to smooth the path into amateur radio for many more newcomers. What EIA has proposed would in some ways undo what has been achieved by the adoption of Docket 15928. Specifically, EIA would 1—Practically eliminate a code requirement for Novices; 2—Restore 2-meter phone privileges to Novices; 3—Allow Novices both phone and c.w. in the 29.4—29.6 mc portion of 10-meters; 4—Extend the term of the Novice license to 5 years, on a renewable basis; and 5—Make the Novice license available to previously licensed applicants.

Of these five points, *CQ* is in wholehearted agreement with only one, and that is number five. We are on record as having made just such a suggestion many months ago. On the remaining four points, we have mixed feelings of enthusiasm and disappointment.

It is the opinion of EIA that liberalizing Novice license requirements is an effective way to attract large numbers of potential amateurs many of whom are presently being diverted into CB radio where their interest withers and dies. On this point we agree, but EIA's suggested program fails by offering only a transplant of would-be CB operators and CB-type operations to amateur frequencies with only pie-in-the-sky hope of eventually transforming these sub-Novices into amateurs who will be able to blend smoothly with the rest of the amateur population.

The EIA proposal makes no provision for the advancement of these sub-Novices into the higher license grades. Instead, it gives an easy to obtain, perpetually renewable, wide-privilege license which could, all to easily, turn 200 kc of 10-meters, as well as 2 mc of 2-meters, into a carbon copy of CB chaos, but now with legal sanction.

Our position is this: a "code-free" pre-Novice license could go a long way towards attracting new blood to amateur radio. However, where and how this new blood is utilized will determine whether or not it will ultimately be in the best interests of the hobby. We feel that if a "code-free" license is inaugurated, it must be in addition to the Novice license; it must be non-renewable after a maximum of two years; and licensees must be located in the v.h.f. spectrum to preclude international interference with other more advanced types of amateur operation. In this way it is possible to attract large numbers of new amateurs, allow them the maximum freedom of operation and at the same time, introduce them to the only area of amateur operation which can still accommodate large numbers of amateurs: the very high frequencies.

Alien Operators—Progress

In January, we did a little editorializing on the sad state of affairs regarding immigrants to the U.S. It seems that when a foreign amateur from any one of 32 countries visits the U.S., he can, upon proper application, obtain permission to operate an amateur station here. However, if that same foreign national *immigrates* to the U.S. for whatever reason, and upon arrival, declares his intent to become a U.S. citizen, he *cannot* operate an amateur station until the naturalization process is complete—a delay of several years.

As sometimes happens, our editorial indignation did not fall on deaf years. Through the efforts of George Pataki, ex-YO2BO, now an engineer in New York, a Bill is being introduced in the House of Representatives by Congressman Theodore R. Kupferman of New York, which will "amend the Communications Act of 1934 to make certain aliens admitted to the United States for permanent residence eligible to be radio station operators." As presented, the Bill covers both amateur and commercial operation.

Until it is actually introduced, the Bill will have no number to which one may refer in writing to your own Congressman, but just as soon as it is duly "christened," we'll pass the word along.

This is something which deserves our earnest support. Reciprocal Licensing was one big step in the direction of universal international amateur radio operation. Here's the next step which will make it all a little more meaningful for hundreds of future U.S. citizens.

V.H.F. Breakthrough

On April 12 and 13 historic tests were conducted on 1296 mc aimed at determining if the ordinary amateur operating with non-professional-size parabolic antennas could make moonbounce a practical mode of communication. The Crawford Hill VHF Club, W2NFA in New Jersey, using a 60′ dish and 300 watts was able to establish two-way FSK c.w. contact with G3LTF (17′ dish, 100 w.), HB9RG (16′ dish, 300 w.) and W6IOM (10′ dish, 500 w.) proving the practical possibility of moonbounce. Even more exciting, W6IOM *heard* G3LTF both using backyard-size parabolas! More details later.

73, Dick, K2MGA

See page 126 for New Reader Service

RELIABILITY QUALITY VALUE

SWAN 410C FULL COVERAGE EXTERNAL VFO

The Model 410C Frequency Control Unit is designed for full coverage of 80, 40, 20, 15 and 10 meters. It is intended for fixed station operation and plugs directly into Model 500C. It may also be used with Model 350C. Eight ranges, 500 kc each, 5 kc calibration.

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Five band, 520 watts for home station, mobile and portable operation.

The new model 500C is the latest evolutionary development of a basic well proven design philosophy. It offers greater power and additional features for even more operator enjoyment. Using a pair of the new heavy duty RCA 6LQ6 tetrodes, the final amplifier operates with increased efficiency and power output on all bands. PEP input rating of the 500C is conservatively 520 watts. Actually an average pair of 6LQ6's reach a peak input of over 570 watts before flattopping!

The 500C retains the same superior selectivity for which Swan transceivers are noted. The filter is made especially for us by C-F Networks, and with a shape factor of 1.7 and ultimate rejection of more than 100 db, it is the finest filter being offered in any transceiver today.

For the CW operator the 500C includes a built-in sidetone monitor, and by installing the Swan VOX Accessory (VX-2) you will have break in CW operation.

Voice quality, performance and reliability are in the Swan tradition of being second to none.

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Complete A.C. supply for 117 vo 50-60 cycles, in a matching cabi with speaker, phone jack, and i cator light. Includes power ca with plug for transceiver, and line cord. Ready to plug in operate.

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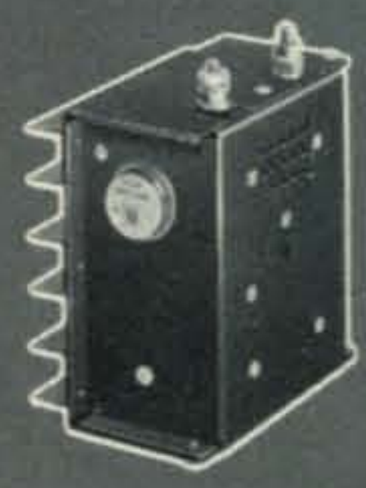

SWAN 14C DC CONVERTER

Converts the above 117XC A.C. pov supply to 12 volt D.C. input mobile, portable, or emerger operation.

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Two Eimac 3-400Z Triodes provide the legal power input: 2000 Watts P.E.P. in SSB mode or 1000 Watts AM or CW input. Planetary vernier drives on both plate and loading controls provide precise and velvet smooth tuning of the amplifier. Greatly reduced blower noise is provided by a low RPM, high volume fan.

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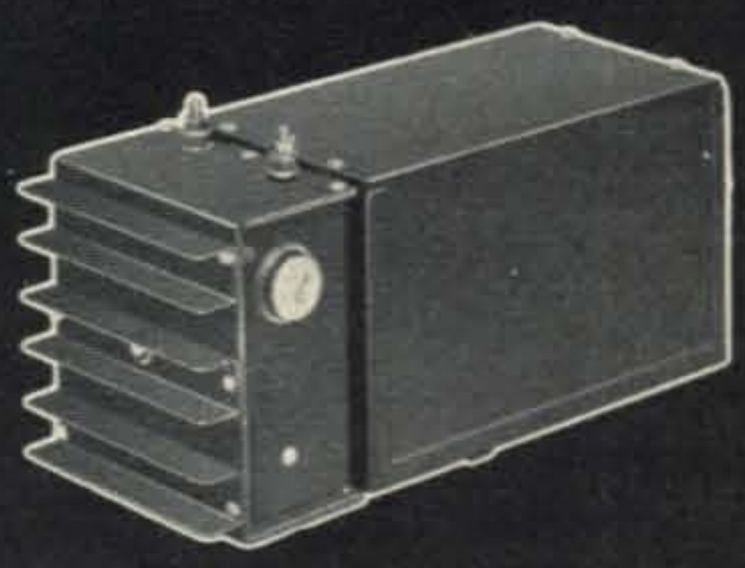

SWAN 14-117 12 VOLT DC SUPPLY

Complete D.C. supply for 12 volt mobile or portable operation. Includes cables, plugs, and fuses. Will also operate from 117 volt A.C. by detaching the D.C. module & plugging in 117 volt line cord. Negative ground standard. Positive ground available on special order.

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OUR READERS SAY

Type-Approved

Editor, *CQ:*

In the March edition of *CQ* magazine, Mr. Grady B. Fox, W2VVC, categorized as "foolish thinking" a statement I made at a recent convention to the effect that I expect performance standards would be established for amateur equipment and that only type tested equipment would be allowed on the air.

As an invited guest at various conventions, I, and other speakers with commercial affiliations attempt to avoid commercialism and speak as hams. The opinions expressed are my own and based on experience gathered from some fifteen years as a ham; in these years, I have come to believe that the "operator behind the microphone" is not the cause of the majority of the troubles as Mr. Fox would like us to think. I do not refer to bad manners, poor operating techniques or just plain failure to follow the rules of the road as laid down by the FCC. These problems will always be with us regardless of the type of equipment being used!

My comments in reference to performance standards for equipment is very much in line with what I expect from the Amateur Equipment Section of the EIA. Until a basis is laid down by somebody, manufactured equipment specifications will be what the manufacturer feels is the "proper spec." Until, performance specifications are spelled out, "home brew equipment" will be what the builder is capable of building into his gear. I like to build as much as—and possibly more—than the average ham; but I do not want to operate on a band full of rigs with poorly suppressed carriers, untamed distortion products and ambulatory signal frequencies. If we are to permit, and accept, this concept of building without regard to an acceptable standard of performance, we are asking for the FCC to step in and demand regulation that would be onerous to the spirit of ham radio. The automobile industry is a fair example of what would be generated by failure to keep our house in order by setting up and following state-of-the-art techniques and standards.

Whether or not amateur radio equipment will eventually be treated as has Citizen Band equipment by the FCC, will depend in large part on just how we accept the idea of creating and following the standards which should be generated for all of us, manufacturer and "home-brewer" alike. My crystal ball says that this could happen but, unhappily, it does not say when. I do believe that this depends on the hams.

So, Mr. Grady, your right to think my statements "foolish" is certainly unchallenged; your thinking most emphatically is.

Irving Strauber, W4KXD
Asheville, N. C. 28804

Bent Towers

Editor, *CQ:*

I was intrigued by the article, "Straightening A Bent Tower," which appeared in your February issue. Your motives for publishing such a thing *before* the April issue completely escapes me.

Since you seem to be in the market for the output of fearless authors, I am preparing an article on The Process of Rejuvenating Rotten Parachute cords. Please advise if you are willing to publish my article.

Bud Frohardt, W9GFF
Chicago, Illinois

Next time a stiff wind brings your $200-plus tower tumbling down, let me know. Few tower owners can easily afford to simply order a brand new replacement, and anyone who has lived through a similar experience as W8LZE has almost surely grappled with the problem of salvaging what was left. We think that's reason enough for publishing the article.—*K2MGA*

Ten-Year Apprentices?

Editor, *CQ:*

This letter is in reference to the letter from W4ORT who had the idea of forming an apprenticeship for the amateur bands. It seems to me that anyone, especially the radio amateur who has most likely worked hard to get his license, should take the outlook that was expressed in his letter, which was published in the January, 1968 issue of *CQ*.

True, Mr. Werner's idea might clear the bands considerably. I seem to think, however, that he wants to have his pick of the frequencies with no competition. Each individual has his own likes and dislikes in ham radio!

I believe since the recent change in the length of the Novice Class license that the incoming General Class will be much better prepared if he takes full advantage of the extended time.

As for the operating habits heard daily, there are always a few who need much improvement. There are also many who deserve commendation for following excellent operating procedures. Many on the air today with very, very little experience have picked up fine operating techniques quickly. Some of these out-do many old timers with 20 and 25 years experience on the amateur bands. Experience is not what makes a good amateur but the following of proper operating procedures does!

The incentive licensing program will slow many up, but if the real hams come through as they usually do, there will soon be many Extras in a short time.

I have had my license now for eight years and I feel that I am still new to the hobby and thus wanted to express my views on this matter.

Tom Harrell, K4TSJ
Norfolk, Virginia

Editor, *CQ:*

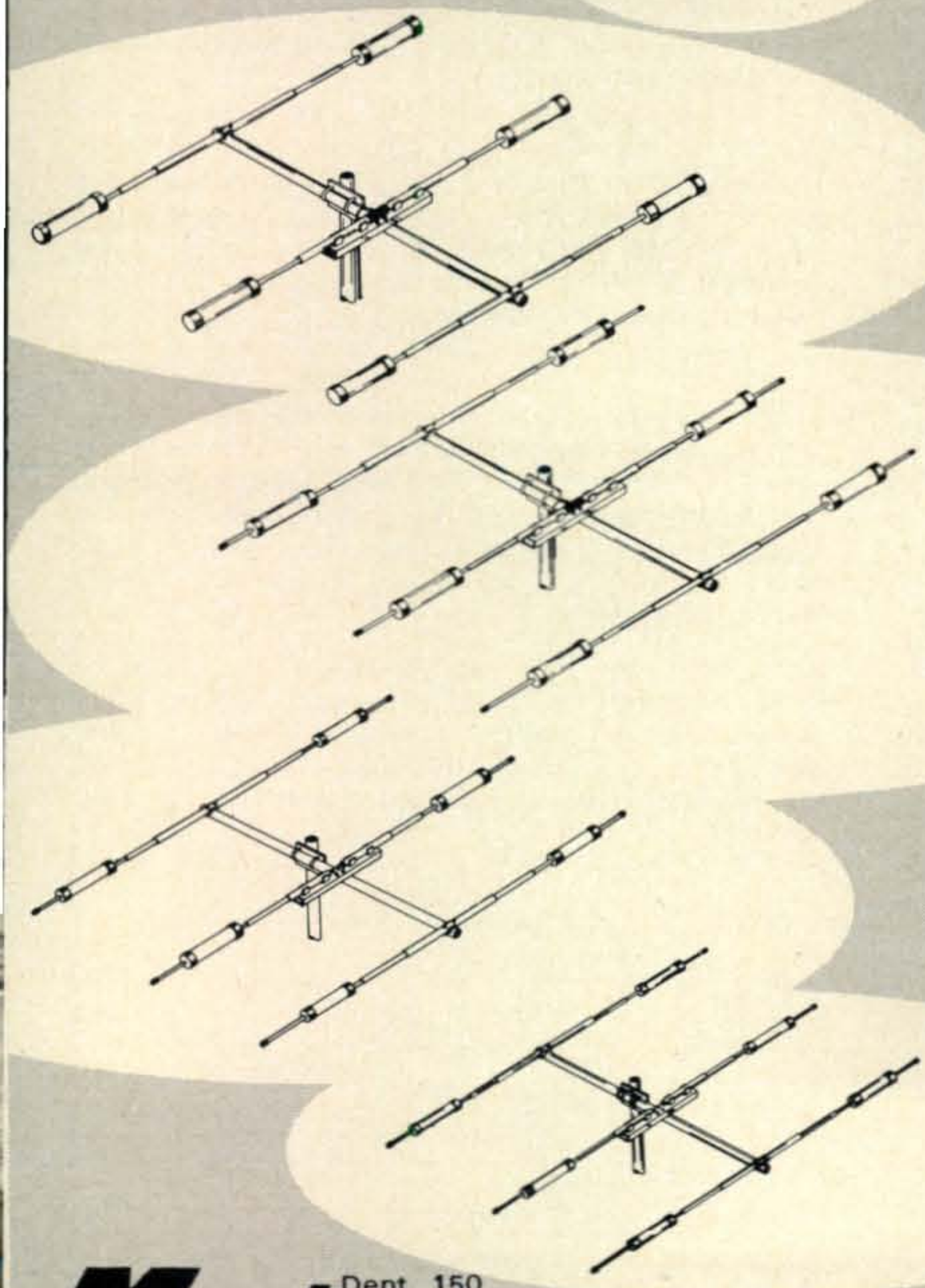
Since I read the letter of Mr. Werner, W4ORT, I have become more and more upset. This ruined the entire December issue, at least for me.

Apparently, Mr. Werner does not really fathom this problem. There are actually two reasons for the number of poor operators and "lids":

See page 126 for New Reader Service

TRAP MASTER

Select Quality.... ...Specify Mosley



Classic 10–15

A new beam for 10 and 15 meters. Revolutionary broad band capacitive matching.* Full power rated. Weatherproof metal encased traps. Lightweight: 27.5 lbs. assembled. May be stacked with 20 and/or 40 meter beams. *(Pat. Pend.)

Classic 33

Hard working for extra gain on 10, 15 and 20 meters. Wider element spacing and improved clamping. Broad band capacitive match.* Full power rating. Weatherproof traps for constant frequency stability. *(Pat. Pend.)

TA-33

Excellent results for full ham bandwidth. Full power rated for 10, 15, and 20 meters. Strengthened center sections of the 28' maximum length elements. Weatherproof traps for constant frequency stability. May be converted to 40 meters.

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A low power beam with "authority." Rated at 300 watts AM/CW, and 1000 watts P.E.P. on SSB. May be converted to MP-33 for higher power rating. Max. element length is 26' 8".

For more information on these, or any of Mosley antennas see your nearest authorized Mosley dealer, or write.

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See page 126 for New Reader Service

(1) We're human and we have human traits. The guy who does not give a darn is the most serious threat to our hobby. This class is not restricted to any group, including the old, old timers. In fact, the only hams who have been extremely rude to the writer were a W6 and a W2. Unfortunately, no one but a good psychiatrist can cure this group. No apprenticeship program can change the human personality. With any large group there will be some undesirables.

(2) Nobody seems to bother to teach good operating procedures to new hams. It would be interesting to find out how many Novices W4ORT has instructed in his career. Local hams instructed the writer in code and theory, but no operating practice, except for some MARS procedure. Available printed material helps some, but it's not enough. Other amateurs *should* take some of the responsibility.

Even the FCC does little aside from monitoring the bands. On the General exam that the writer took there was not one question connected with operation. It seems that everyone is a little bit at fault.

So, Mr. Werner, instead of complaining, teach a class of Novices tomorrow. And while you're at it, explain to them why they should be restricted for ten years. I'm sure they'll understand.

Jim Berry, WA5QPI
N. Little Rock, Ark.

Announcements

Greenville, South Carolina

The Blue Ridge Radio Society, Inc. will sponsor their 8th annual Hamfest on Sunday, May 5 at the Cleveland Park, Greenville. For further information write Don Robertson, WA4KLT, 202 Charing Cross Road, Taylors, S.C. 29687.

Ontario, Canada

The Northshore Radio Club is sponsoring their annual banquet at the Annandale Country Club, Church St., Pickering at 5:30 P.M. on May 11th. All are invited to attend, tickets are $3.75 each from Peter Solly, VE3DFD, 118 Allan St., Whitby, Ontario, Canada.

Burbank, California

The Lockheed A.R.C. will sponsor a Ham Radio Convention on May 18 and 19 at 2814 Empire Ave., Burbank, California. Full particulars are available to those who request it by writing to Wm. G. Welsh, W6DDB, Publicity Coordinator, 2814 Empire Ave., Burbank, Cal. or by calling 848-9340.

Hazel Park, Michigan

The Hazel Park Amateur Radio Club, of Hazel Park, Michigan, invites all hams, to participate in their 2nd Annual Ham Fest on May 19, beginning at 10 A.M. and ending at 5 P.M. Location is at the Hazel Park High School. Contact William R. Irwin, 1714 East Harry, Hazel Park, Michigan 48030.

Topeka, Kansas

The Kaw Valley Radio Club will hold its annual Ham Picnic at Garfield Park Shelterhouse, Topeka, Kansas on Sunday May 19, 1968 from 9 A.M. to 5 P.M. No registration fee, the club will furnish the drink, bring a covered dish and your family. Write WAØQKY Charles T. Deitrick, Jr., 645 Vesper St., Topeka, Kansas 66606.

St. Petersburg, Florida

On May 19th, the St. Petersburg A.R.C. will hold their annual Hamfest at Lake Maggiore Park, 9th Street and 38th Avenue, South. For information, contact Naomi R. Spence, W4TDK, Secretary–St. Petersburg A.R.C., P.O. Box 4026, St. Petersburg, Florida.

Birmingham, Alabama

The Birminghamfest, an annual family affair will be held on Saturday, May 4 and Sunday, May 5 this year. For further information, contact any member of the BARC or write to Birmingham A.R.C., P.O. Box 603, Birmingham, Alabama 35201.

Vinton, Virginia

The Roanoke Valley ARC holds its annual Hamfest May 25-26 at the Vinton War Memorial in Vinton, Virginia. An open house Saturday at 7 P.M. will be followed by a dance till midnight. Advance registration–$1.00. At the door–$1.50 or four for $5.00. Buffet ticket–$1.25. Write Roanoke Valley ARC, Box 2002, Roanoke, Virginia.

Mobile, Alabama

The Annual Hamfest sponsored by the Mobile Amateur Radio Club will be held on May 25 and 26 at Mobile, Alabama. For further information and reservations call or write: Ham Wentworth, W4IAX, General Chairman, P.O. Box 7232, Mobile, Alabama, Telephone #473-8561.

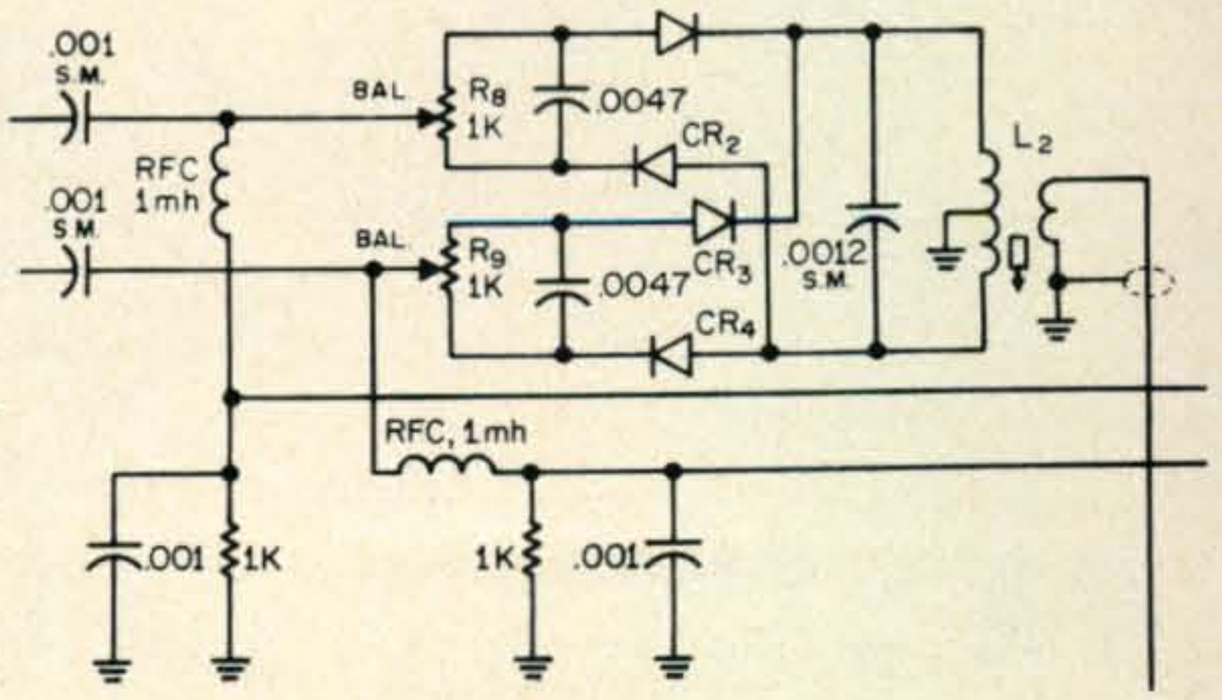
Quincy, Illinois

The Western Illinois Radio Club is sponsoring a hamfest at Eagles Alps in Quincy, Illinois on Sunday, May 26, 1968. For further information contact John Weigand, K9VFF, Western Illinois Radio Club, 919 Anne, Quincy, Illinois 62301.

Correction

Please make note of an error in one of the drawings accompanying the Mini 145 mc. Antenna article which appeared in the March 1968 issue, p. 29, fig. 3. The inner conductor of the *Q* matching section is connected to the driven element. This should be the outer conductor, as mentioned in the text directly below the drawing.

In February *CQ*, "An 80 Meter Transistorized S.S.B. Exciter" by I1TDJ contained a wiring error in the balanced modulator portion of fig. 1. Below is a corrected schematic for that part of the circuit which may be cut out and pasted over the erroneous circuits.



See page 126 for New Reader Service

—THE NEW 500 WATT MASTERPIECE

It takes a lot of guts to do something *like this*...but we did it!

Changes aren't accidental at Galaxy...we make them on purpose. It takes a lot of guts (and know-how) **to improve an already great product and still sell it for the same price...$420.00**...*but we've done it!*

That's why we're putting a new name plate on our masterpiece. Those classic lines remain the same . . . but it's now the improved **GALAXY V Mark 3!**

We use two of the specially designed GE 6LB6's—the most efficient tube of this type. That means a 30% increase in plate dissipation...less heat...more reliability, and longer life!

A new grid/cathode design, coupled with easier-to-drive tubes, means greater protection against TVI. **A new, improved ALC circuit design** insures positive control of flat-topping and spurious signal emission.

New "horsepower"! The all-new power capability is greater. We're rating the new Mark 3 with a **conservative 500 Watt PEP input.** Any questions?

See your nearest Dealer—or write us for Free Brochure.

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SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

Stopping the presses, stopping the presses—Scratchi having big problem. Needing you to quicklike putting free Hon. Classy Fried ad in magazine. Making it reeding something like this:

IMPORTANT NOTICE—Will Arizona amchoor who winning first prize reseever at Hashafisti Scratchi's hamfesty convenshun pleese contacting Hon. Scratchi on acct. amchoor having something else coming to him. Writing airmale posthasty.

Hon. Ed., making sure this getting in next issue, as right now Scratchi are lower than evening dress on lady rattlesnake.

What happening is this. Cupple weeks ago taking stroll thru desert and catching smell of Hon. Spring, desiding it time to having another of Scratchi's personal hamfesty convenshuns.

You remembering about these, Hon. Ed., as I having one every yeer or so when running short of bux I inviting amchoors from all over the state to come.

I offering free refreshments—cacktus jooce—lotsa contests with prizes, and we all having big old time on Hon. Brother Itchi's ranch.

So, I starting planning. My XYL-to-be, Lil O. Watanabe, are looking thru callbook and addressing invitayshuns. Brother Itchi making up signs to directing amchoors to the ranch. I personally making up cupple tubs full of cacktus jooce. Making it early so can having good stuff that aging at least to weeks.

Also sending away for surplus grab-bags so can having lotsa prizes to giving away. Yes indeedy, when Scratchi holding hamfesty convenshun he going first class!

Buying some new things like xmitting toobs to raffling off, and arranging to printing raffle tickets. Selling them at one bux apiece. Usually netting hundred bux on this deal alone.

Spending spare time thinking up contests like "Bilding An Xmitter." This is where amchoors see who can bilding a rig the fastest out of junk-box parts I supplying. It costing one bux to enter, and also costing one bux to renting soddering iron in case they not bringing one with them.

Having lotsa spare soddering irons, as they just hunk of copper in wooden handle that you heeting in fire. Whatever amchoor first getting RF indicayshun on test lamp are declared winner. This kind contest usually puts thirty or forty bux in Scratchi's wallet.

"Who's the Dee-X See-W Contest" are also popular event I putting on. To doing this, I listening on twenny meter band until heering big pile-up on some dee-x stayshun, with W's coming thru like Mac's truck, then I recording same.

For hamfesty I playing this back, and first feller that coming up with correct call of dee-x stayshun getting first prize. This is QSL card of some rare dee-x—blank—so winner can fill in his own call. You can seeing this is very popular contest. Local printer friend making up cards for me. Costing only one bux to enter this contest.

This year are planning extra-speshul grand door prize—amchoor reseever. It's one I've been using, and it complete with full set of plug-in coils.

Reason I giving it away are I resently buying new reseever at local supplier—Joe's Amachoor Radio, Hi-Fi and Used Comic Book Emporium. I offering to trade in my old reseever, but Joe laffing so long and hard when I suggesting it, I figuring he not wanting it, so I making it the grand door prize.

So, day of hamfest convenshun, sun are shining britely. (I have to saying this, Hon. Ed., or Chamber of Commerce are holding necktie party in my honor).

Crowds of peeple are coming in early, and Lil are raking in mucho dinero collecting one bux parking fee for cars. Contestes going over grate, especially on acct. not starting them until everybuddy making at least to trips to partake of free cacktus jooce.

Hole thing are huge success. Amchoors enjoying themselves, and Scratchi are seeing that he making cupple hundred bux. So, just as daylight and cacktus jooce are running out, I drawing grand prize-winning ticket for reseever.

Feller who winning are coming up, so I telling him to pick up his prize in my ham

[*Continued on page 112*]

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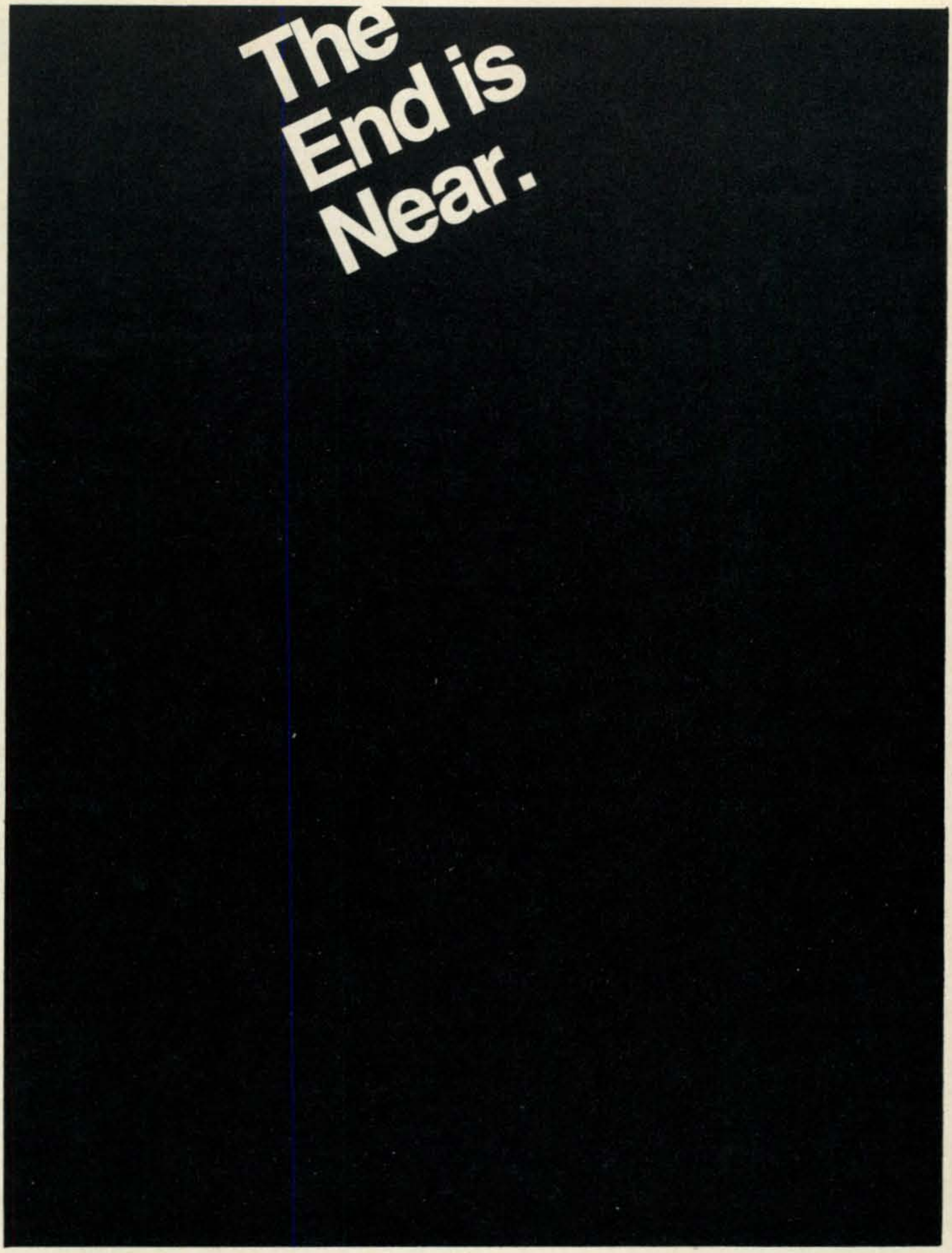


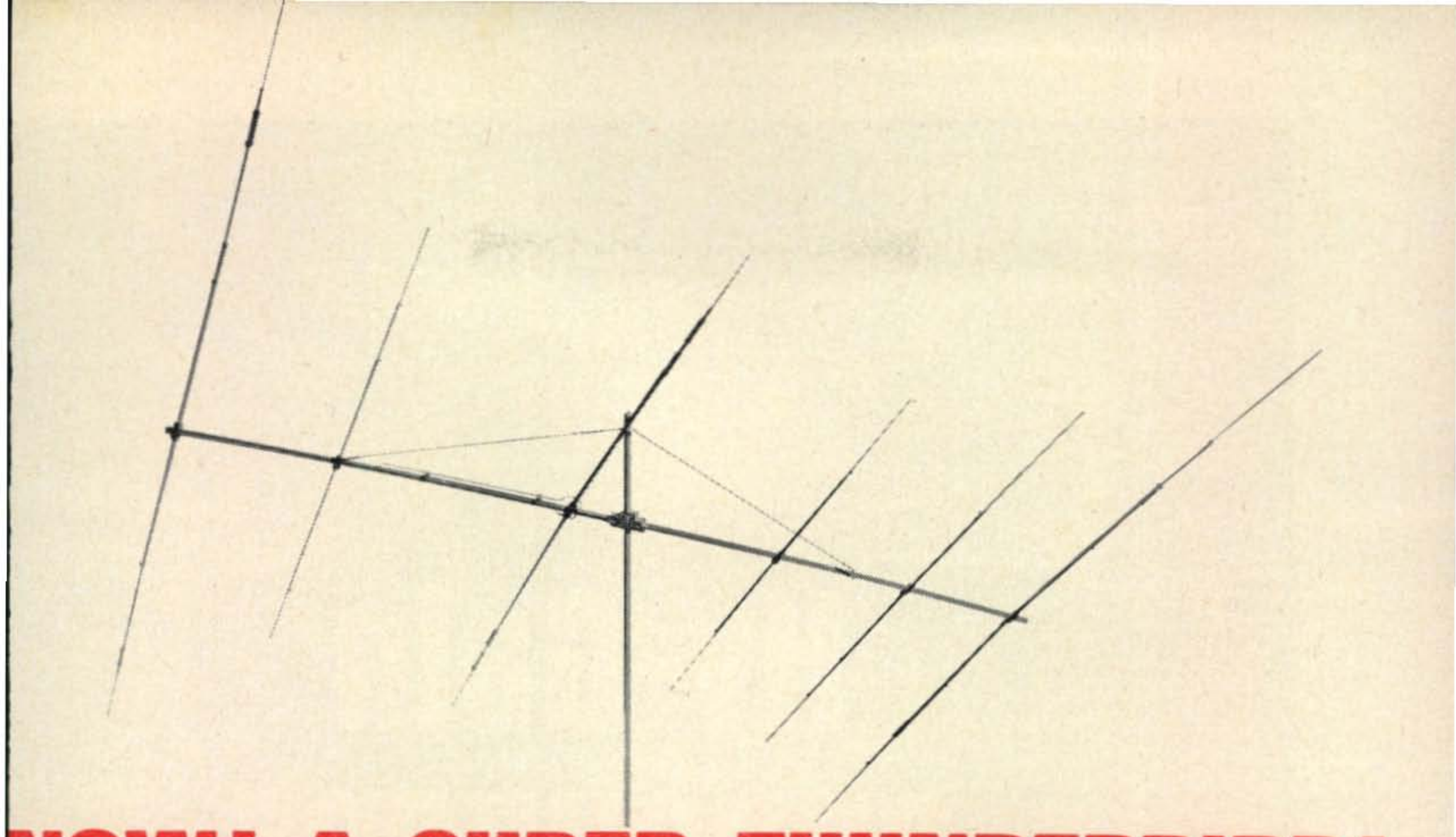
QST! QST! QST! QST! QST!

If you're going mobile this spring, don't buy your antenna YET!

Watch for our announcement on the new Hy-Gain mobile antenna line.

HY-GAIN ELECTRONICS CORPORATION
N.E. Highway 6 at Stevens Creek
Lincoln, Nebraska 68501

See page 126 for New Reader Service



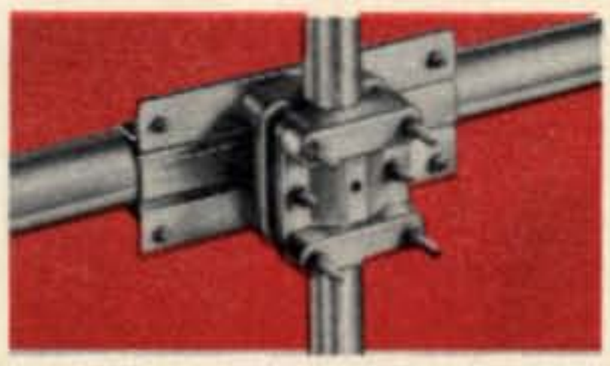
NOW! A SUPER THUNDERBIRD!

ALL NEW 6-ELEMENT SUPER THUNDERBIRD TH6DXX

The new Super Thunderbird TH6DXX offers the ultimate in tribander performance, with mechanical and electrical specifications unsurpassed for 10, 15 and 20 meters. This newest of Hy-Gain's amateur antennas is superb on DX and other long haul contacts, and gives peak performance on each band whether you're working phone or CW. Check the many features at right; you'll see why you should be using the new Super Thunderbird!

PLUS THESE OTHER GREAT THUNDERBIRDS

- New, improved 3-element Thunderbird—Model TH3MK3.
- Fabulous, 3-element Thunderbird Jr.—Model TH3JR.
- Popular 2-element Thunderbird—Model TH2MK3.



Tilt-head, universal boom-to-mast bracket—all new, cast aluminum bracket accommodates masts from 1¼" x 2½". Allows easy tilting for installation, maintenance and tuning, provides mast feed-thru for beam stacking.

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

Hy-Gain Beta Match—Advanced design from company that invented the Beta Match, achieves balanced input, optimum matching on all 3 bands, and provides DC ground to eliminate precipitation static.

OUTSTANDING HY-GAIN FEATURES

- Tilt-head, universal boom-to-mast bracket (see details at left).
- Taper swaged, slotted tubing with full circumference compression clamps (see details at left).
- Hy-Gain's exclusive Beta Match (see details at left).
- New, improved "Hy-Q" traps... separate traps for each band.
- Up to 9.5 db forward gain.
- 25 db front-to-back ratio.
- SWR less than 1.5:1 on all bands.
- 24-foot boom...none longer in the industry.
- High-performance element spacing.
- Extra heavy gauge, machine formed element-to-boom brackets, with plastic sleeves used only for insulation. Bracket design allows full mechanical support.

Buy one today at your favorite Hy-Gain distributor.

Hy-Gain Super 10-15-20 **Thunderbird**

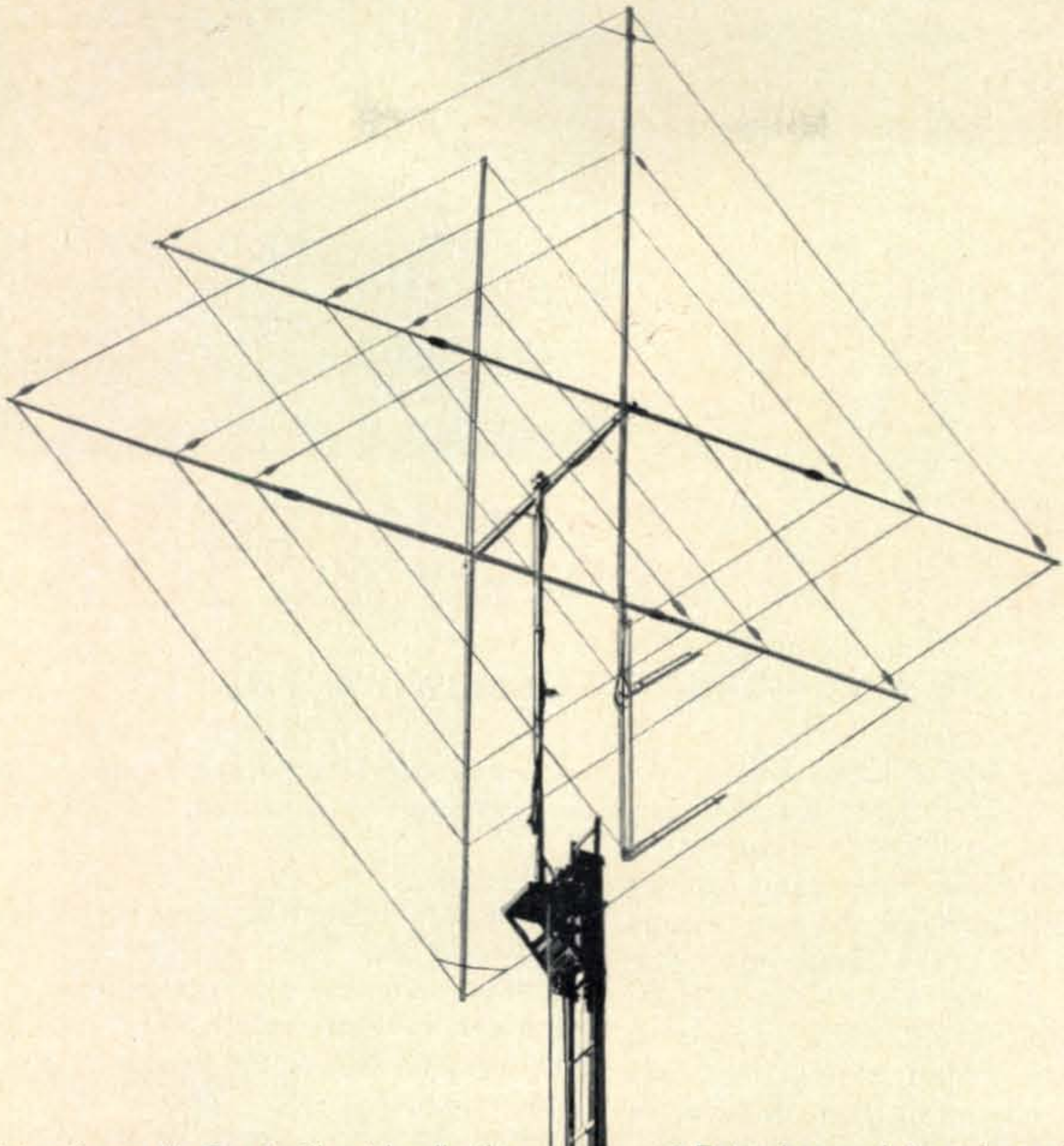
The most advanced antennas under the sun.

Hy-Gain Electronics Corporation
N.E. Hwy. 6 at Stevens Creek
Lincoln, Nebraska 68501

See page 126 for New Reader Service

Hy-Gain announces The Quad to make all other Quads obsolete!

See page 126 for New Reader Service



Hy-Gain's all new Hy-Quad will outdo all other quads because it's engineered to do just that. The Hy-Quad is new, it's superior, it's complete. It's the first quad to have everything.

- The Hy-Quad has all parts including those not supplied by others, like a boom, wire and all hardware.
- The Hy-Quad is constructed of aluminum. Spreaders are broken up at strategic electrical points with cycolac insulators.
- Tri-band 2 element construction with individually resonated elements with no inter-action.
- Hy-Quad requires only one feed line for all three bands.
- Individually tuned gamma matches on each band with Hy-Gain exclusive vertex feed.
- DC grounded elements to drain off precipitation static. Provides low-noise operation.
- Full wave element loops require no tuning stubs, trays, loading coils, or baluns.
- Heavy duty mechanical construction of strong swaged aluminum tubing and die formed spreader-to-boom clamps.
- Extra heavy duty universal boom-to-mast bracket that tilts and mounts on any mast 1¼" to 2½" in diameter. So get in Hy-Gear to get a Hy-Quad from the best distributors under the sun—he's the one that stocks Hy-Gain!

Specifications

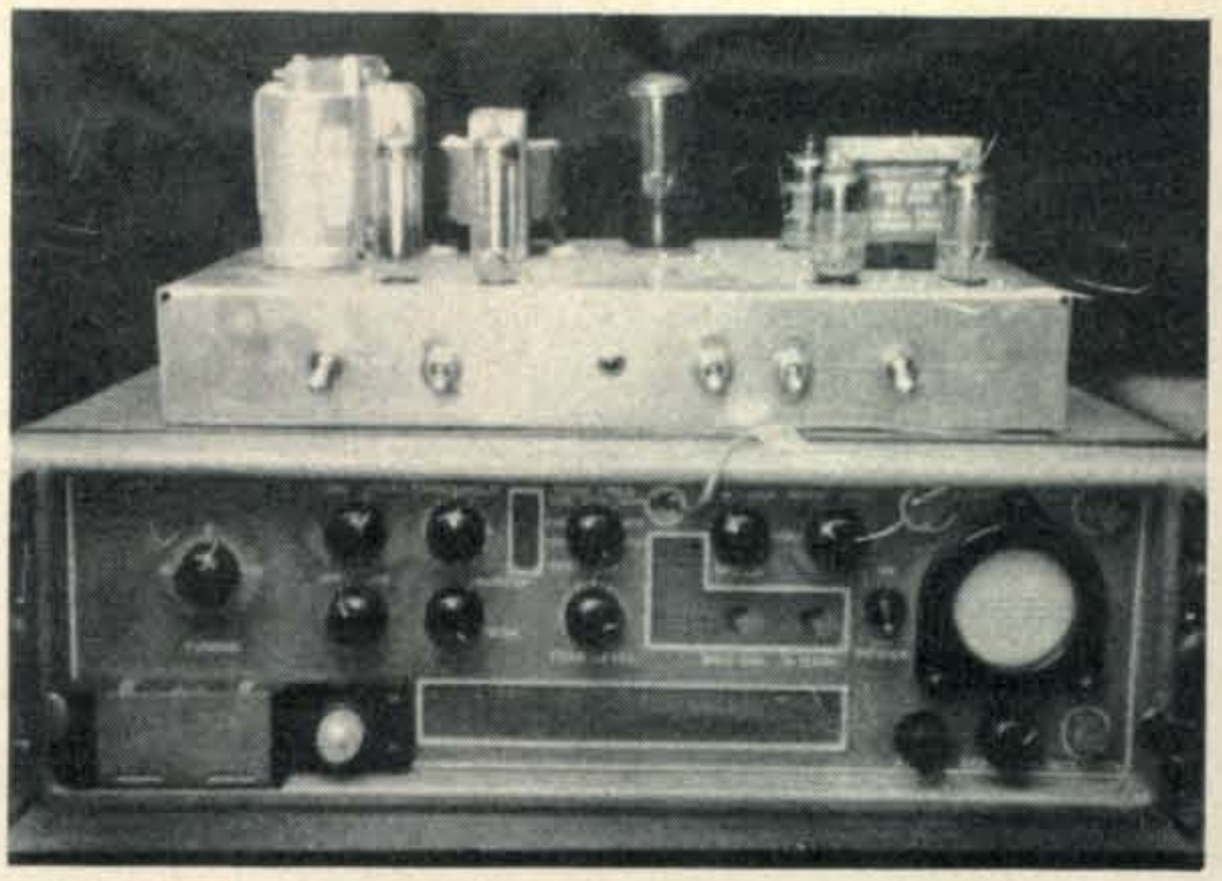
Overall length of spreaders	305"
Turning radius	13'6"
Weight	42 lbs.
Boom diameter	2"
Boom length	8'
Mast diameter	1¼" to 2½"
Wind survival	100 mph
Forward gain	8.5 db
Input impedance	52 ohms
VSWR	1.2:1 or better at resonance on all bands.
Power	Maximum legal
Front to back ratio	25-35 db depending upon electrical height

The Ham Quad from Hy-Gain

HY-GAIN ELECTRONICS CORPORATION
Highway 6 at Stevens Creek,
Lincoln, Nebraska 65501

FOR THE STRONGEST SIGNAL UNDER THE SUN!

See page 126 for New Reader Service



Front view of the Mainline adapter placed atop a CV-57 TU. (Photo courtesy WA2NWW.)

AN RTTY MAINLINE ADAPTOR

BY RAY POPKIN-CLURMAN, *W2LNP

THE Mainliner RTTY Demodulator described in *QST*[1] by Irvin Hoff, K8DKC, is a superior unit and well worth constructing. However, the cost of the components can run as high as $130.00 or more and that is quite a bite for many RTTYers. Those of us who have equipment like the CV-57, the W2AJV transistorized TU, the SGC-1A (converted to 850/170 cycle operation) and the Twin Cities TU need not scrap them in favor of the Mainliner. It is possible to build an adapter for any of these TUs which possesses the important features of the Mainliner and will improve the performance of the existing TUs tremendously. The block diagram of the adaptor is shown in fig. 1. The circuits deleted from the original Mainliner, for our purpose, were the autostart, filters, limiters, drivers and detector stages as these functions are common to most other converters.

Adapter Circuit

The circuit for the Mainliner adapter is shown in fig. 2. It includes V_1, a 12AT7 cathode coupled d.c. preamplifier with a NORMAL-REVERSE switch. The switch feeds the input to one of the two grids grounding the remaining grid. The preamplifier is needed since the output of the CV-57 detector is no more than 10 or 11 volts for an 850 cycle shift, and the Mainliner needs a level of at least 35 volts at the input to its low pass filter. The addition of V_1 brings the 10 volt signal from the CV-57 up to at least 45 volts at the maximum swing.

Some of the adapters built omitted V_{3A}, one half of a 12AT7, resulting in some small degradation of the ATC/DTC performance. When this was done to one of the adapters built, it developed an incurable parasitic which persisted until V_{3A} was returned to

* 134 Wheatley Road, Brookville, Glen Head, L.I., N.Y. 11545.

1 Hoff, I., "The Mainline TT/LF.S.K. Demodulator," *QST*, August, 1965, p. 27.

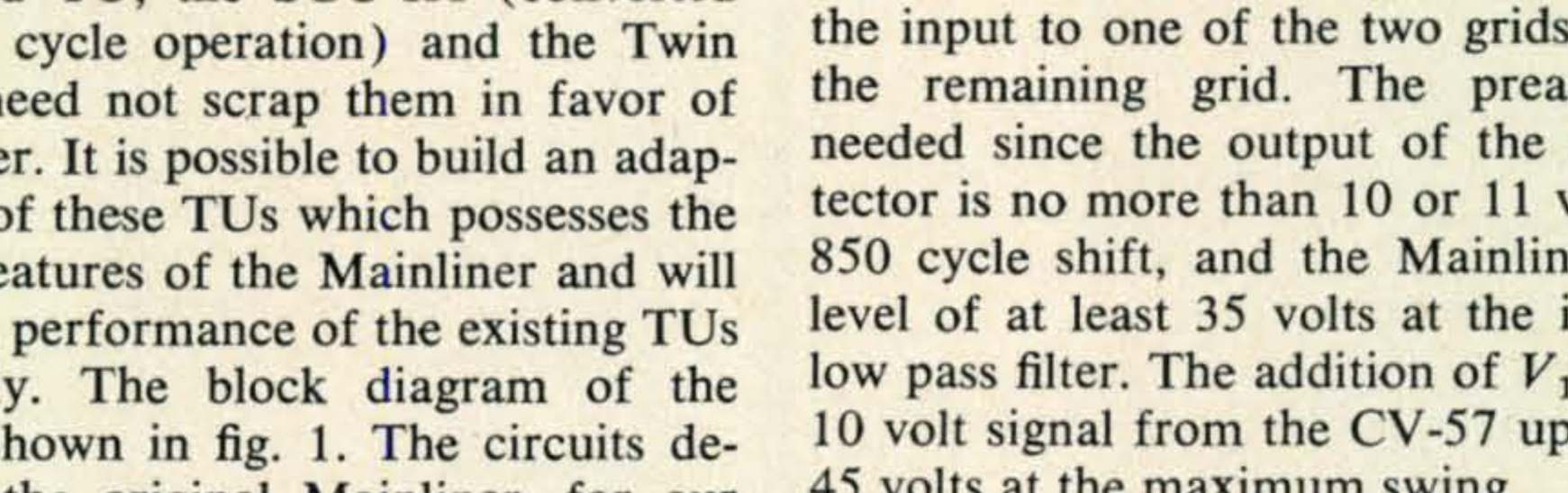


Fig. 1—Block diagram of the adapter modeled after K8DKC's Mainliner[1].

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Fig. 2—Circuit of the adapter and power supply that can be used with many TUs around today. All resistors are ½ watt 20% except where otherwise noted. All capacitors with values less than one are in mf except for electrolytics marked by polarities. Capacitors with values of one or more are in mmf.

the circuit. If you wish to attempt leaving it out, connect the 2.2 meg series grid resistor of V_{4A} directly to the junction of the two 3.3 meg resistors in the ATC/DTC stage.

The tube types used are not too critical. A 6SN7 may be used for the 12AT7 and 12AU7. A 6SL7 may be used for a 12AX7 and an 807, 6BQ6, 6L6, 6Y6, 6F6 or a 5881 can be used for the 6W6 keyer, V_5.

Adapting the TUs

CV-57—The CV-57 (and CV-357) are converters of the i.f. type. They were designed for general purpose military use, and as is often the case with such generalized designs, the performance under amateur conditions is rather poor. The inexpensive Mainline adapter is designed to take the output from the detector of the CV-57 at either the arm or top of the THRESHHOLD LEVEL control, R_{318}, or the test point E_{609} in the keyer unit. It may also be taken from pin 8 or 9 of the

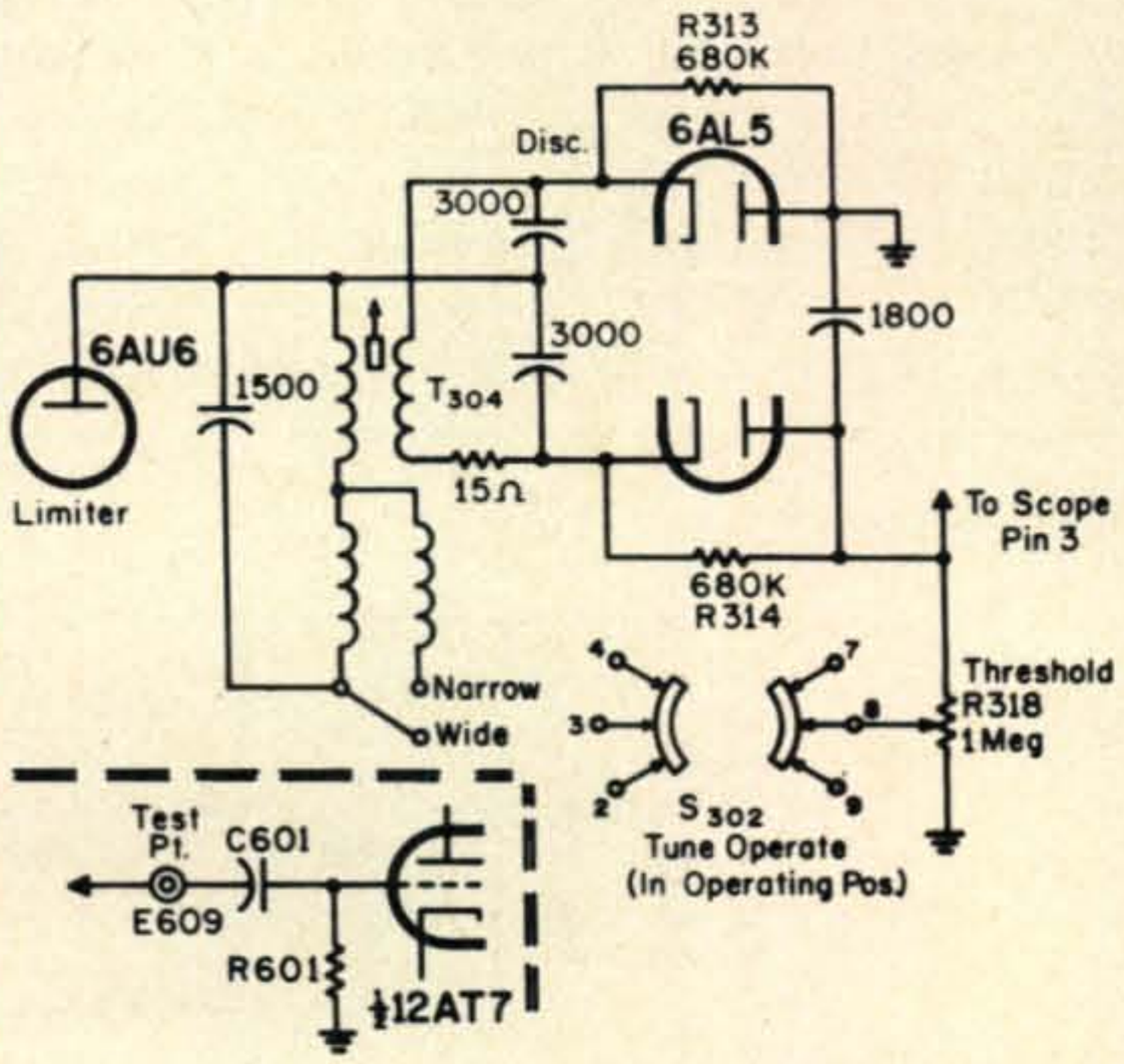

Fig. 3—Mainline adapter connections for the CV-57 or CV-357 TU as explained in the text.

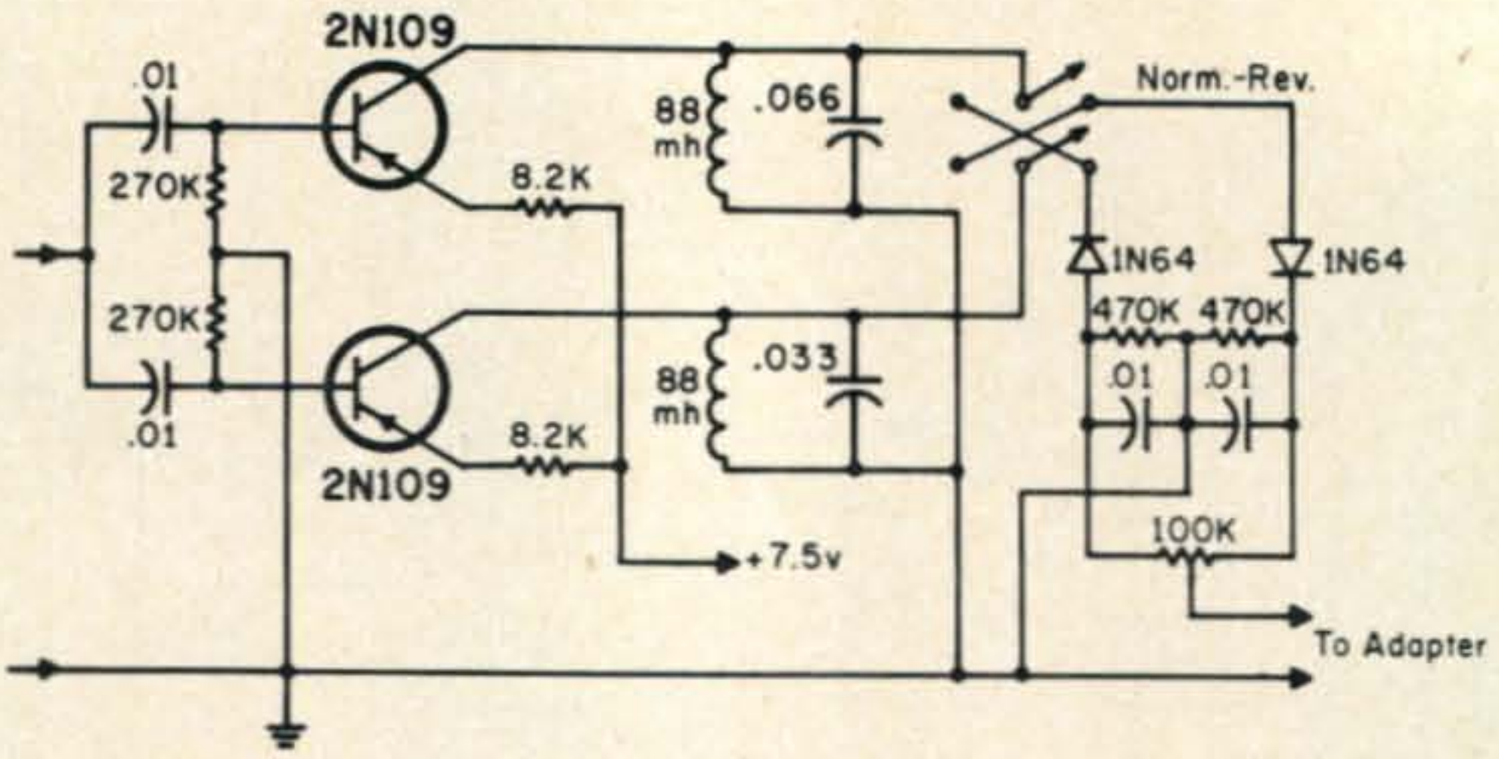

Fig. 4—Partial circuit of the W2JAV TU showing the connection points for the mainline adapter.

TUNE-OPERATE switch as shown in fig. 3. If the arm of the THRESHHOLD LEVEL control is used as the take-off point, it will be necessary to turn the THRESHHOLD control to full maximum when copying 170 cycle shift signals. For 850 cycle shift, the control may be set at about four on the scale.

W2AJV—In the transistorized W2JAV TU, the feed for the adapter is taken from the 100K balance pot and minus 7.5 volts as shown in fig. 4. The NORMAL-REVERSE switch shown in fig. 2 as part of the V_1 input circuit can be omitted if desired.

Twin Cities—The Twin Cities TU Mark-Space detector section shown in fig. 5 requires that a pair of diodes, either CR_3, CR_4 or CR_5, CR_6 be reversed in polarity. A 250K pot is then placed across their outputs, and the arm and ground is brought out to the adapter.

SGC-1A—In the **SGC-1A,** one of the diode detectors must be reversed and a common load in the form of a 100K pot placed between the outputs of the mark and space detectors. The arm of the pot is then brought out to the Mainline adapter.

Adjustment of the adapter is quite straightforward. The input grid of V_{2A} (pin 2) is grounded and the potentiometer (R_2) in the cathode is adjusted for zero volts at the cathode of V_{2B} (pin 8). The balance pot (R_3) in the Slicer stage is now set so that it is in the center of the range of On or Off for the keyer stage as shown by current or no current in the printer loop.

The short at pin 2 of V_{2A} is now removed and either grid of V_1 is shorted to ground) (pin 2 or 7). The potentiometer in the cathode (R_1) is then adjusted until the voltage at the cathode of V_{2B} is again at zero. This completes the adjustment for use with the CV 57/357 TU.

For any of the other converters, the last adjustment will be the balance pot from the detectors, the arm of which is adjusted so that noise from the converter detectors will make the average voltage at the cathode of V_{2B} fluctuate around zero.

After you have run with the "Best of the Mainline" for a while, you may decide to build a complete one. Skeptics who build this adapter easily become convinced that they should go all the way. ■

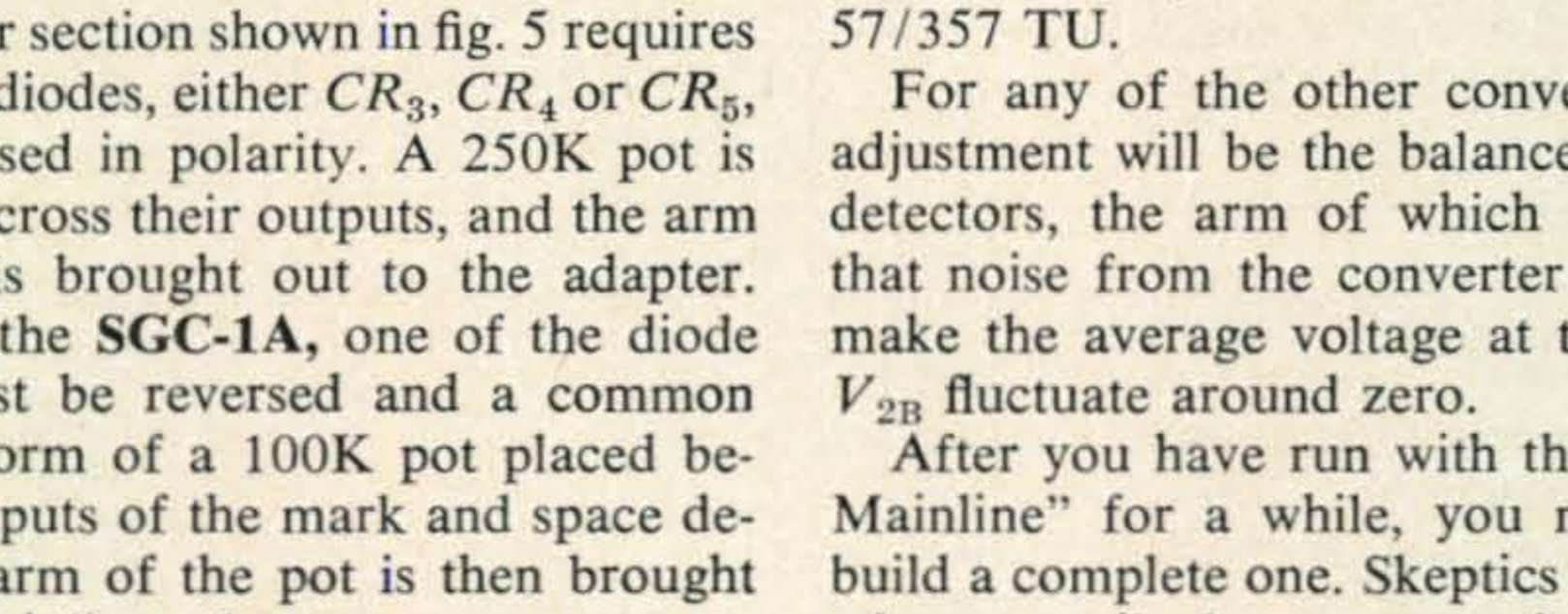

Fig. 5—Partial circuit of the Twin Cities TU showing the Mark-Space detector and the take off points for feeding the mainline adapter.

See page 126 for New Reader Service

200 watts PEP on 160 meters for $109.95

New Heathkit® HW-18 series 2-channel SSB transceivers for 160 meters, MARS, & CAP

Good news for 160 meter, MARS, and CAP ops. No more adaptations, no more conversions, no more make-shift rigs. This new series of low frequency SSB transceivers is tailored just for you with the sensitivity, selectivity, power output and convenience that make for effective communications . . . all at a fraction of the price you've had to pay before. Compare the features, specs. and price . . . you'll agree this new series has what it takes to put more action into 160 meters.

200 watts PEP SSB • 25 watts input with carrier for compatibility with AM stations • 160 meter model uses LSB • Crystal filter sideband generation • 2 channels, switch selected, crystal controlled • Fixed tuned for easy PTT operation • Automatic level control • Transmit & receive freqs. locked for true transceiver operation • Clarifier control adjusts transceiver freq. • Relayless transmit-receive switching • Local-Distance switch prevents receiver overload • Built-in speaker • Mobile mount & PTT mic. included • 12 tube circuit, 17 tube function • Circuit board & wiring harness • Operates mobile or "fixed" with HP-13 & HP-23 power supplies

Kit HW-18-3 (160 meters) less crystals, 15 lbs. **$109.95**
Kit HW-18-2 (MARS) less crystals, 15 lbs. **$109.95**
Kit HW-18-1 (CAP) with crystals, 15 lbs. **$119.95**
Assembled HWW-18-1 (CAP) with crystals, 15 lbs. **$179.95**

160 meter crystals; 1805, 1809, 1813, 1817, 1821 kHz, 1 lb., each **$4.95**

MARS crystals; specify LSB or USB; 4451.5, 4518.5, 4558.5, 4581.5, 4591.5, 4595 kHz, 1 lb., each **$4.95**

CAP crystals; 4467.5, 4507.5, 4585, 4602.5, 4630 kHz, 1 lb., each **$4.95**

HW-18 SERIES SPECIFICATIONS — RECEIVER SECTION: Frequency coverage: HW-18-1 & 2, 4450 to 4650 kHz; HW-18-3, 1800 to 2000 kHz. **Sideband:** HW-18-1, USB; HW-18-2, USB or LSB option. **Clarifier range:** HW-18-1, ±100 Hz; HW-18-3, ±250 Hz. **Sensitivity:** All models, 1 uv input signal will provide at least a 15 dB signal-plus-noise to noise ratio. **Selectivity:** HW-18-1 & 3, 2.7 kHz @ 6 dB down, 6 kHz @ 50 dB down; HW-18-2, 2.1 kHz nominal @ 6 dB down, 7 kHz max. @ 60 dB down (3395 kHz filter). **Intermediate frequency:** All models, 3395 kHz. **Image rejection:** 100 dB. **IF rejection:** 50 dB. **Antenna input impedance:** 50 ohm, unbalanced. **Receiver audio power output:** 1 watt. **TRANSMITTER SECTION: Frequency coverage:** HW-18-1 & 2, 4450 to 4650 kHz; HW-18-3, 1800 to 2000 kHz. **Transmitting mode:** HW-18-1, USB & USB with carrier; HW-18-2, SSB & SSB with carrier (USB or LSB option), HW-18-3, LSB & LSB with carrier. **Frequency accuracy:** HW-18-1 & 2, .005% overall (after adjusting to channel frequency). HW-18-3, .002%. **RF power input:** 200 watts PEP. **Output impedance:** 50 ohm, unbalanced. **Microphone:** High impedance ceramic. **Unwanted sideband suppression:** 45 dB min. below peak output with 1000 Hz modulation. **Carrier suppression:** 45 dB min. below peak output. **Ambient temperature range:** +10° to +110°F. **GENERAL SPECIFICATIONS: Power requirements:** 800 VDC @ 250 mA peak, 250 VDC @ 100 mA, —130 VDC @ 5 mA, 12.6 VAC or VDC @ 3.75 amperes. **Cabinet dimensions:** 6¼" H x 12¼" W x 10" D. Add 1" to height, width, & depth for gimbal bracket, knobs & connecting plugs. **Net weight:** 12 lbs.

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AN R.F. OUTPUT METER

BY LUIS VEGAS, *YV5ACL

MEASURING the output of your rig is important since it is an indication of proper tuning. Proper tuning will result in a reduction of spurious signals and reduced tendency towards flat topping. Unfortunately, maximum output does not correspond to any specific value of plate current in the final amplifier in Class AB_1, AB_2 or B.

Care should be taken to see that maximum output corresponds with the dip in the final and the simple relative output indicator shown in fig. 1 can do this for you. It is reliable from 1 to 30 mc as checked against a Waters dummy load-wattmeter and a Collins in-line wattmeter.

Circuit

The circuit shown in fig. 1 represents no new departure from existing output meters. The r.f. voltage on the transmission line is reduced by the voltage divider formed by R_1 and R_2. The voltage across R_2 is rectified by the IN35 and filtered by the two 0.01 mf capacitors. The resultant d.c. is applied to the meter through the adjustable multiplier, R_3.

* POB 2285, Caracas, Venezuela.

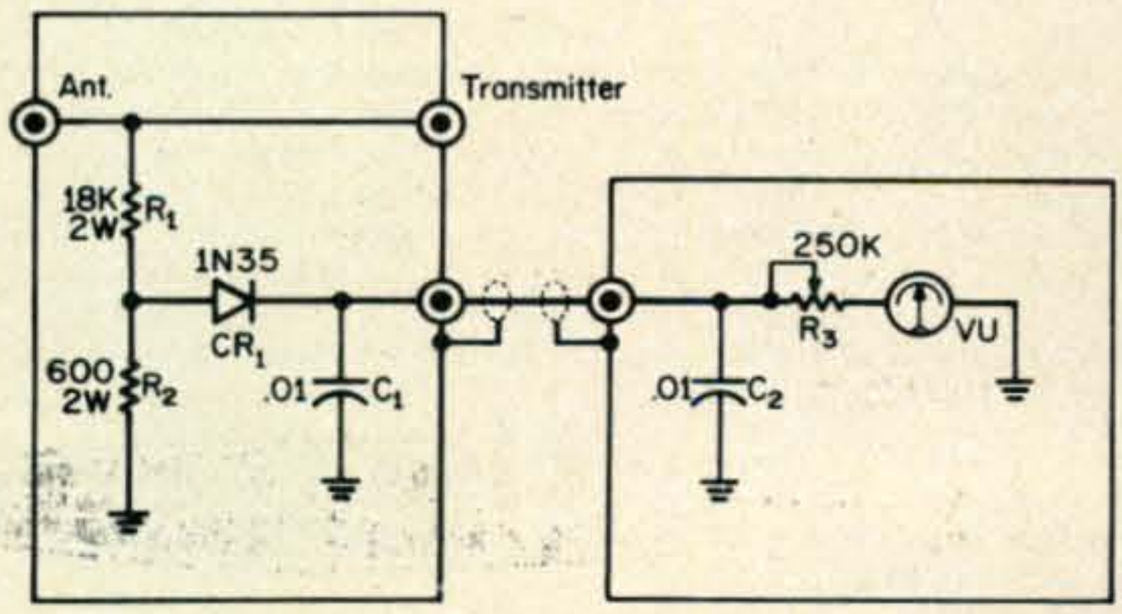

Fig. 1—Circuit of the output meter in-line sampler and the indicator unit. Capacitors C_1 and C_2 are 0.01 mf ceramic types rated at 600 volts. The circuit is suitable for power ranges from 300 watts p.e.p. to 3000 watts p.e.p. and can be adjusted by varying the value of R_1.

The use of a VU meter as the indicator rather than a conventional milliammeter or microammeter has an advantage for this application. The dynamic characteristics of a VU meter connected across a 600 ohm source results in low overshoot. For example, with a sudden application of a steady state sine wave sufficient to cause a zero db reading (100%) the pointer will not over shoot mor ethan 1.5% nor any less than 1%. Also the meter shall read 99% in 0.3 seconds. This will permit interpretation of the modulation pattern as explained under operation.

Construction

The output meter consists of two parts, the unit in the antenna line and the meter connected to it by a shielded cable or small diameter coax. The meter and is components can be located conveniently at the operating position while the in-lin portion can be located behind the transmitter or some other suitable point.

The voltage divider, R^1 and R^2, must have a total value of 359 times the value of the

[*Continued on page 114*]

View of the interior of the in-line section placed atop the station speaker housing that also contains the output indicator. Connection is made to the meter by the shielded cable plugged in on top of the unit.

See page 126 for New Reader Service

$240!

NEW HEATHKIT® HW-100 5-BAND SSB-CW TRANSCEIVER

ou asked for it . . . a multi-band version of the eathkit "single-banders" . . . low-cost SSB operation 10 or 15 meters . . . an SSB transceiver equal or perior to many assembled rigs, but at *much lower st.* That's the HW-100.

ow did Heath do it? We expanded on the "single-nder" design . . . borrowed from the heritage of e famous SB-101 . . . took a look at the competition . and produced the most SSB equipment you can t for the money.

eck the features and the specifications:

Solid-state (FET) VFO • 80-10 meter coverage • witch selected upper or lower sideband or CW • 180 tts input PEP SSB — 170 watts input CW • Crystal ter • Full coverage on all bands with 500 kHz per nd segment • Smooth vernier control of frequency th patented Harmonic Drive™ dial mechanism • ilt-in 100 kHz calibrator • Separate offset CW rrier crystal • TALC • Quiet, enclosed relays • xed or mobile operation with HP-23 or HP-13 power pplies • Easy assembly with circuit boards and ring harness

t **HW-100,** 18 lbs., no money dn., $22 mo. **$240.00**
t **HP-13,** DC power supply, 7 lbs., $7 mo. **$64.95**
t **HP-23,** AC power supply, 19 lbs., $5 mo. **$49.95**
t **SB-600,** 8 ohm speaker, 6 lbs. **$18.95**

-100 SPECIFICATIONS — RECEIVER. Sensitivity: Less than .5 micro-t for 10 dB signal-plus-noise to noise ratio for SSB operation. **Selec-ity:** 2.1 kHz minimum at 6 dB down, 7 kHz maximum at 60 dB down 395 MHz filter). **Input:** Low impedance for unbalanced coaxial input. **tput impedance:** 8 Ω speaker, and high impedance headphone. **wer output:** 2 watts with less than 10% distortion. **Spurious response:** ge and IF rejection better than 50 dB.

TRANSMITTER. DC Power input: SSB: 180 watt P.E.P. (normal voice: continuous duty cycle). CW: (A1 emission) 170 watts (50% duty cycle). **RF Power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 Ω nonreactive load). **Output impedance:** 50 Ω to 75 Ω with less than 2:1 SWR. **Oscillator feedthrough or mixer products:** 55 dB below rated output. **Harmonic radiation:** 45 dB below rated output. **Transmit-receive operation:** SSB: PTT or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. **CW Sidetone:** Internally switched to speaker or headphone, in CW mode. Approximately 1000 Hz tone. **Microphone input:** High impedance with a rating of —45 to —55 dB. **Carrier suppression:** 45 dB down from single-tone output. **Unwanted sideband suppression:** 45 dB down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 dB down from two-tone output. **RF Compression (TALC):** 10 dB or greater at .1 ma final grid current. **GENERAL. Frequency coverage:** 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 hertz per hour after 30 minutes warmup from normal ambient conditions. Less than 100 Hz for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial calibration:** 5 kHz. **Calibration:** 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz. **Front panel controls:** Main tuning dial. Driver tuning and Preselector. Final tuning. Final loading. Mic and CW Level control. Mode switch. Band switch. Function switch. Meter switch. RF Gain control. Audio Gain control. **Side controls:** Meter Zero control; Bias; VOX Sensitivity; VOX Delay; ANTI-TRIP. **Internal controls:** Carrier null; neutralizing. **Tube complement:** OA2 Regulator (150 V); 6AU6 RF amplifier; 6AU6 1st receiver mixer; 6AU6 Isolation amplifier; 6AU6 1st IF amplifier; 6AU6 2nd IF amplifier; 6BN8 Product detector and AVC; 6AU6 VFO Amp.; 6CB6 2nd transmitter mixer; 6CL6 Driver; 6EA8 Speech Amplifier and cathode follower; 6EA8 1st transmitter mixer; 6EA8 2nd receiver mixer and relay amplifier; 6EA8 CW sidetone oscillator and amplifier; 6GW8 Audio amplifier and audio output; 12AT7 Heterodyne oscillator and cathode follower; 12AT7 VOX amplifier and calibrator oscillator; 12AU7 Sideband oscillator; 6146 Final amplifiers (2). **Diode complement:** 6 Germanium Diodes: Balanced modulator, RF sampling, and crystal calibrator harmonic generator; 9 Silicon Diodes: ALC rectifiers, anti-trip rectifiers, and DC blocking; 1 Zener Diode: cathode bias. **Transistors:** MPS105 FET-VFO; 2N3393 — Voltage regulator. **Rear apron connections:** CW Key jack; 8 Ω output; ALC input; Power and accessory plug; RF output; Antenna; Spare. **Power requirements:** 700 to 850 volts at 250 ma with 1% maximum ripple; 300 volts at 150 ma with .05% maximum ripple; —115 volts at 10 ma with .5% maximum ripple; 12 volts AC/DC at 4.76 amps. **Cabinet dimensions:** 14-13/16" W. x 6-5/16" H. x 13-3/8" D.

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A SOLID-STATE TRANSCEIVER ACCESSORY PACKAGE

BY JOHN J. SCHULTZ, *W2EEY/1

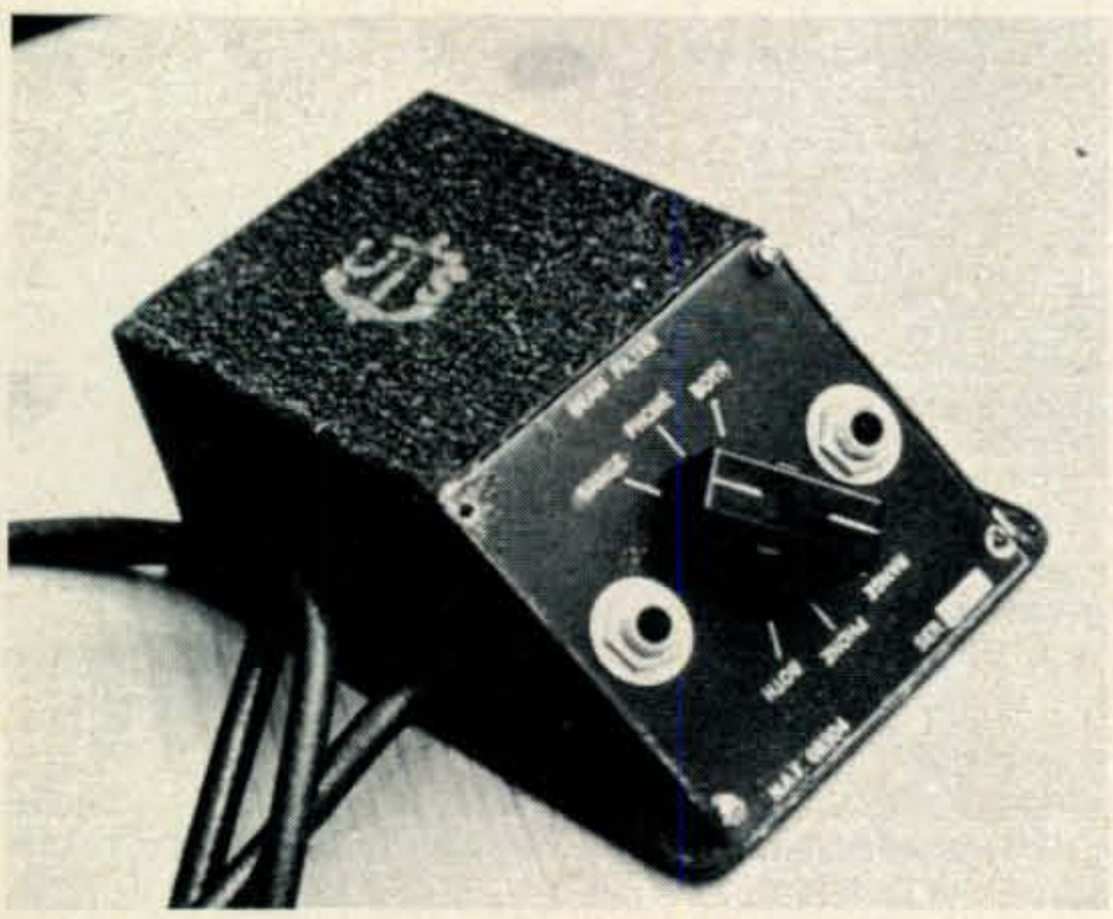
Combining a rather forgotten but still very useful piece of surplus equipment with integral transistor circuitry produces a unit which can considerably enhance the operation of almost any commercial transceiver, either on s.s.b. or c.w., at minimal cost.

ALMOST all of the transceivers on the market today do not include a number of features which would allow them to be really complete station "packages." The question of which features are lacking depends, of course, upon what mode of operation is of prime interest. For the c.w. man, the lack of a c.w. monitor and the lack of sharper selectivity than that provided by the usual 2.1 to 3 kc s.s.b. filter would seem to be the main failings. For the phone man, the lack of an audio compressor, a device which has proven its worth many times under weak signal conditions, seems to be the main omission. For both the c.w. and phone man, the lack of such a simple thing as a headphone jack is apparent on many transceivers.

One could end up with a collection of various outboard devices in order to provide the desired accessory functions or one could internally modify the transceiver. The latter approach has various advantages in that no outboard enclosures are required and one can provide selectivity at its most desirable point—in the r.f. chain. However, many amateurs are reluctant to "dig" into a commercial unit because of the possibility of reducing its resale value or because of the possibility of disturbing a circuit function. The best compromise would seem to be to construct an integrated type of outboard enclosure which combined the various accessory functions desired but yet which requires only one cable connection to the transceiver.

This article describes such an accessory package built by the author for use with a commercial transceiver. Some readers may wish to add to or subtract from the accessory functions included in the unit described depending upon their interest in a particular

* 40 Rossie Street, Mystic, Connecticut 06355.



The unconverted FL-55 unit as found on the surplus market.

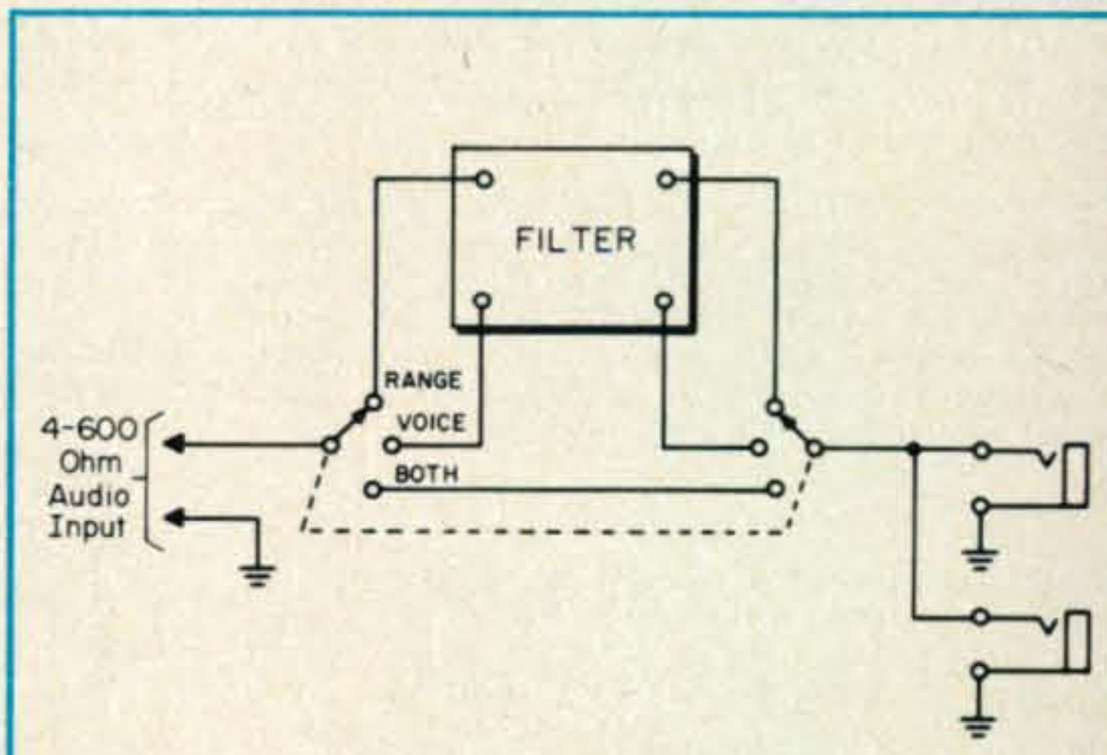


Fig. 1—Wiring diagram of the original FL-55 filter unit.

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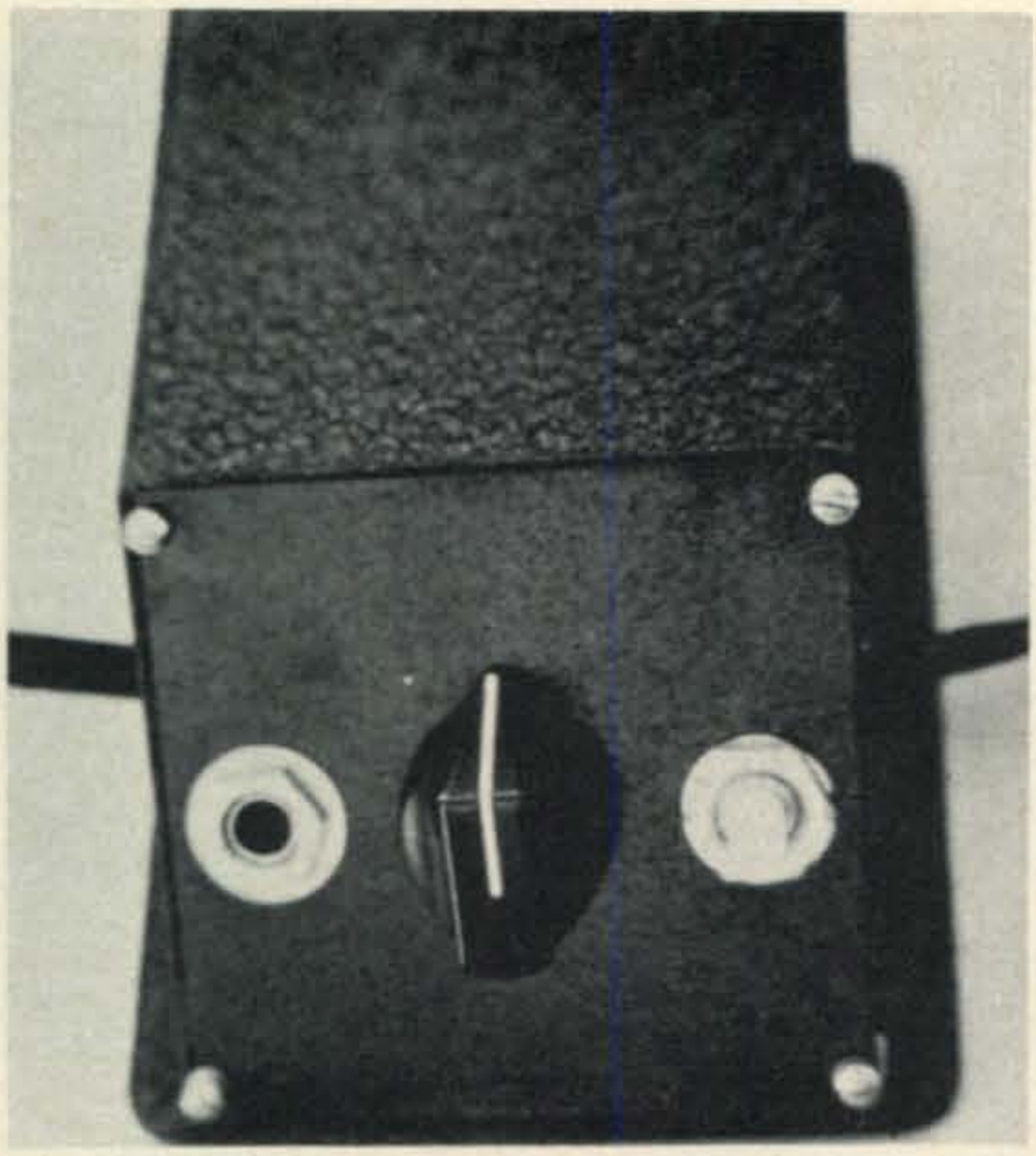

The converted FL-55 unit with internal transistor circuitry can provide a wide variety of accessory functions for any transceiver.

mode of operation. This can be easily done or various functions could even be added at a later date as the need or desire for them developed.

Basic Unit

The FL-8 range filter is a surplus item known practically to any amateur who has been active since WW II. It is a sharply selective audio filter designed to work in a 600 ohm low-level (headphone) circuit and switchable to either pass only 1020 cycles or reject only 1020 cycles and pass the rest of the 300-3,000 cycle range. Probably no other piece of surplus equipment has become so popular as a means of adding audio type selectivity to a receiver for c.w. operation where the receiver did not have a crystal filter or other means of sharp c.w. selectivity built-in. The unit works quite well in this role and the only disadvantage to its use is that one common to any means of audio rather than i.f. selectivity. The a.g.c. function of the receiver is controlled by all the signals which pass through the i.f. passband of the receiver. Thus, when using an audio filter one may have very easily separated a desired signal from the QRM but find the signal suddenly varying in level at a keyed rate. This can occur when a strong signal near in frequency to the desired one controls the receiver a.g.c. action although the signal itself is rejected by the audio filter. With a separate receiver where the a.g.c. circuit can be turned on or off, this situation is easily cured by disabling the a.g.c. However, no transceiver as yet provides an a.g.c. disable circuit and so with a transceiver one simply has to accept this disadvantage inherent in using audio selectivity.

Somewhat less well known than the FL-8 but widely available on the surplus market and much more suitable for conversion purposes is the FL-55 filter (available from G and G Radio, 75-77 Leonard St., New York, N.Y. 10013). The electrical function of the filter is the same as the FL-8 but is housed in a rather attractive slope-front panel enclosure which is not only handier for operating usage but also provides extra space inside the enclosure for the housing of other accessory circuits. Figure 1 shows the simple wiring diagram of the basic FL-55 filter. The RANGE position allows only 1020 cycle signals to pass through while the VOICE position allows all signals except 1020 cycles to pass.

Adding Circuits

Figure 2 shows in block diagram form the circuit functions which were added inside the FL-55 filter enclosure to produce the complete transceiver accessory package. One section of the original switch was used to either select or bypass the RANGE (1020 cycle peak) connections to the filter in the receive mode. The other section of the switch was used to parallel the push-to-talk circuit of the transceiver and lock the transceiver in the

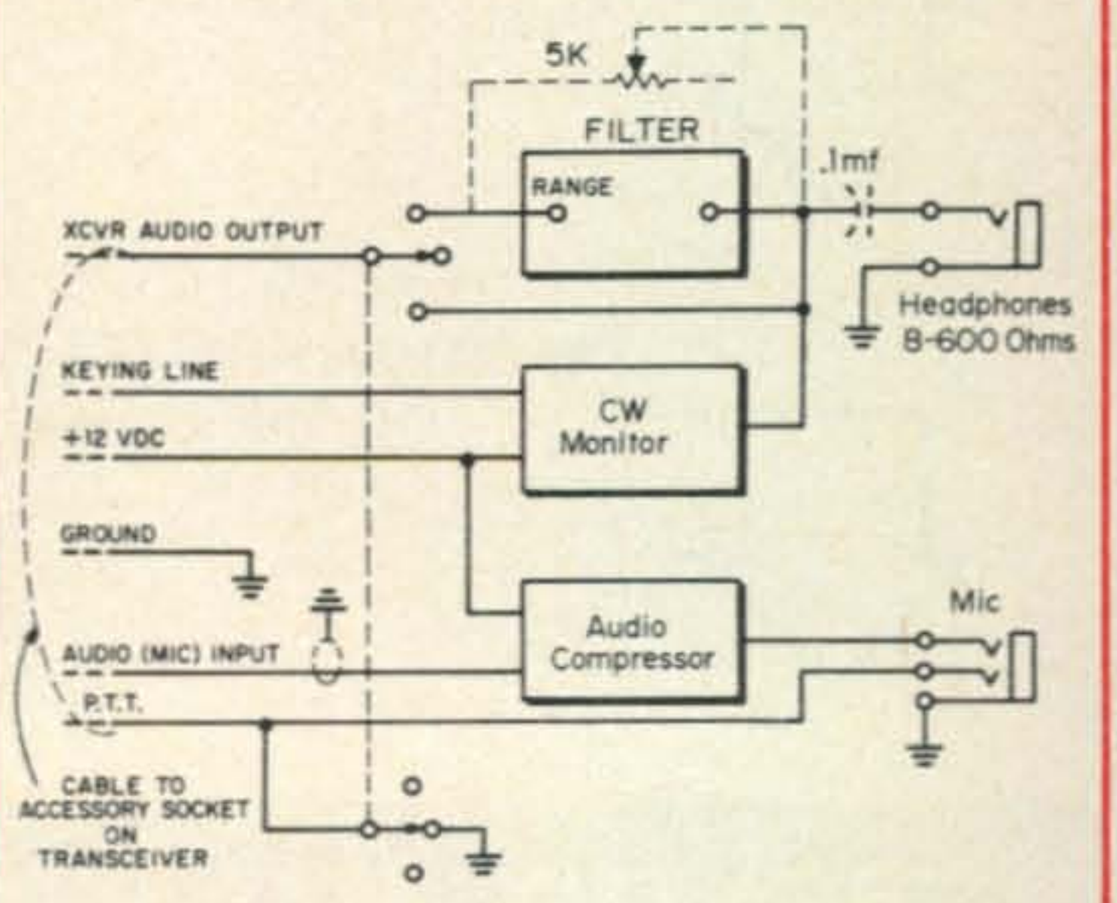

Fig. 2—Shown in block diagram form are some of the accessory circuits which can be added to the basic FL-55 filter to produce a complete transceiver accessory unit.

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transmit position when desired. The c.w. monitor is activated whenever the keying circuit is grounded and its output connected to the headphone jack on the FL-55 enclosure. The audio compressor is also included in the FL-55 enclosure and feeds the normal audio input circuit of the transceiver. The presence of both the headphone and microphone input circuits in the FL-55 enclosure allows either the usage of a separate headphone and microphone or one of the increasingly popular headset units with a boom type microphone.

A single multi-conductor cable (shielded) connects to the accessory socket on the transceiver and provides all the necessary connections including the supply of about 12 volts d.c. from a relay power supply within the transceiver to power the transistor circuits in the FL-55 enclosure.

The reader may, of course, desire to use different circuits but those used by the author for the c.w. monitor and audio compressor are shown in figs. 3 and 4. The c.w. monitor is designed to work with a grid-block type of keying system as is used on almost all transceivers. When the keying line is ungrounded, the high negative voltage on the line is reduced by the 10K divider network to a safe value to apply to the base of the 2N697 transistor and to cause the transistor to conduct. The base circuit of the 2N 1305 oscillator is effectively grounded and the circuit does not oscillate. When the keying line is grounded, however, the ground is basically removed and the c.w. monitor will function.

The audio compressor (fig. 4) is a fairly conventional two-stage affair which produces a good 15-20 db compression range once properly adjusted. It is designed for use with

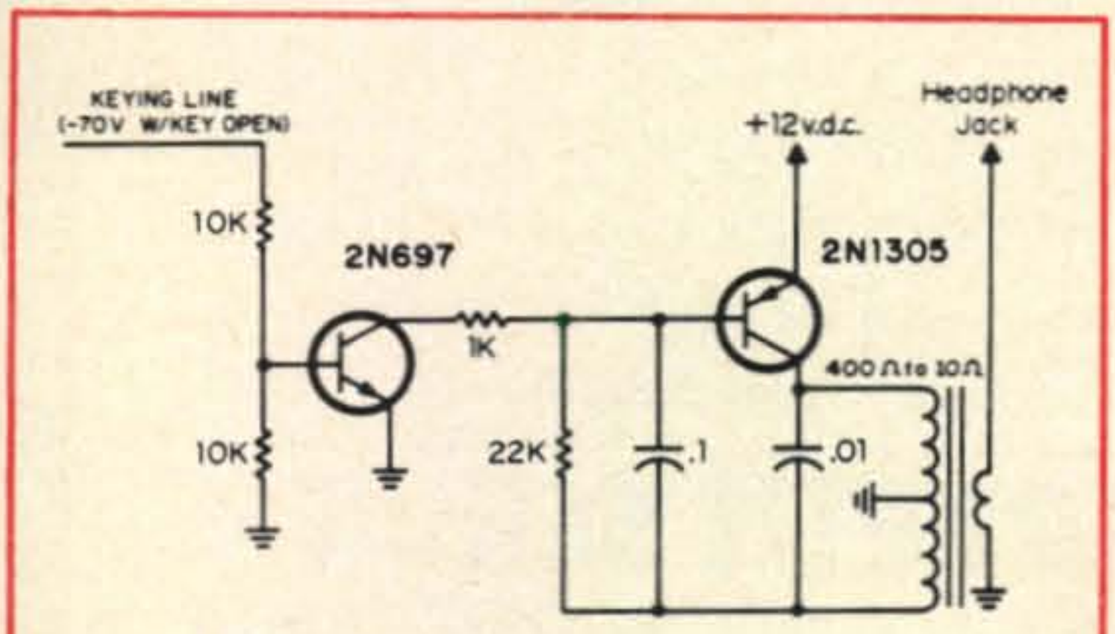
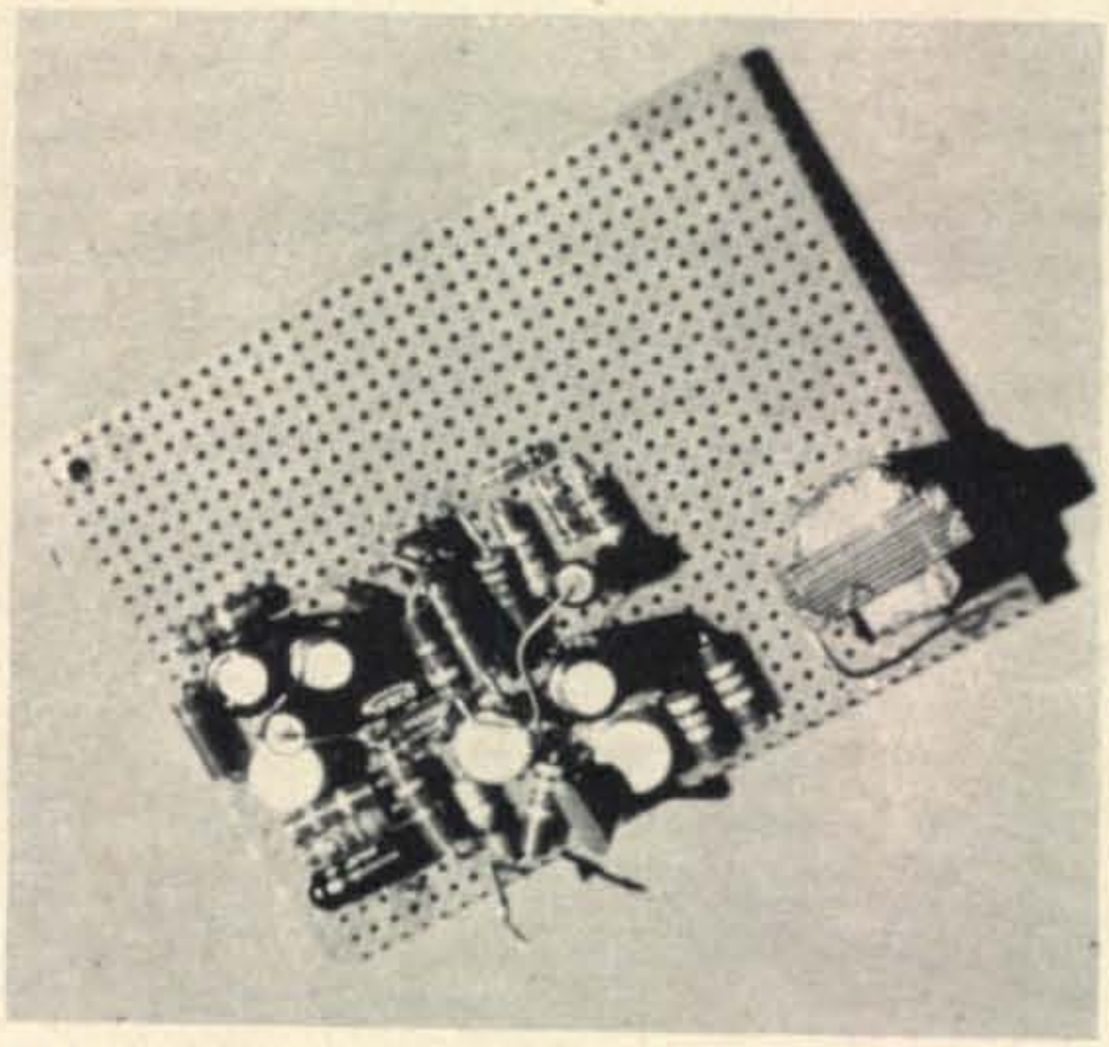


Fig. 3—C.w. monitor designed to be activated from the usual grid-block key line in a transceiver.



Transistor circuitry which is mounted inside the FL-55 enclosure is assembled on a piece of vector board which fits behind the front panel of the FL-55. Shown partially completed are the circuits used by the author in figs. 3 and 4.

a conventional high-impedance crystal or dynamic microphone. Part of the output in the collector circuit is coupled through the 0.05 mf coupling capacitor to the 10K compression level potentiometer and the 1N270 diode. The d.c. control voltage produced is used to control the base current and thus the gain of the 2N697 stage.

A complementary symmetry type of coupling circuit is used between the two transistors to reduce the number of circuit components required. Doing this reduces the maximum gain possible somewhat but enough is still available to provide very good compressor action. The setting of the 10K potentiometer has to be determined experimentally since it depends upon the type of microphone being used, *etc*. Since it normally does not require readjustment once the proper setting is found, it is not brought out as a front-panel control and could even be replaced by a fixed resistor network if desired.

Construction

Once the front panel of the FL-55 filter is removed an internal terminal board will be seen. This terminal board should be removed and only those leads associated with the RANGE function of the filter not cut away. The leads in question are obvious when the circuitry of the simple front panel function select switch is followed through.

Since the actual audio filter occupies only about three quarters of the space in the body

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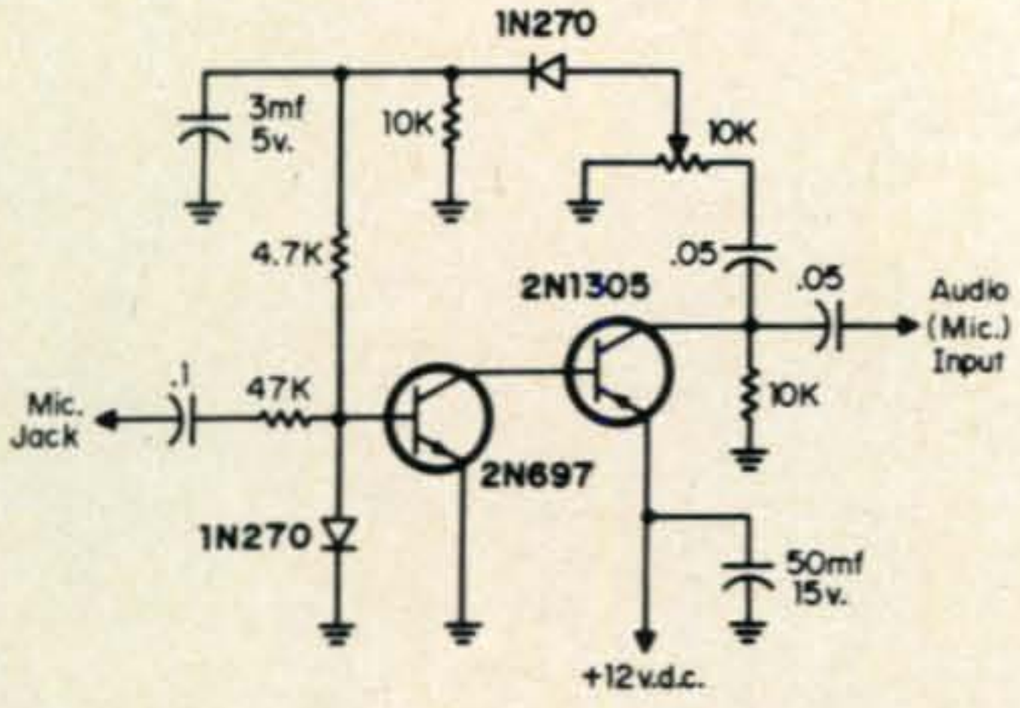

Fig. 4—Simple audio compressor circuit used in the authors version of the FL-55 accessory package.

of the filter (after the sloping front panel) there is quite a bit of room available, if one is careful, to add accessory circuits.

The author used a piece of vectorboard which was cut to about the same size as the removed terminal board from the FL-55 and was mounted using the original mounting studs inside the FL-55. Again, the mounting method becomes readily apparent once one actually disassembles the FL-55 unit. Most of the components are mounted on the lower half of the vectorboard in order to provide maximum clearance for the controls on the front panel. Cable entrance is easily provided by the cut-outs which are present on both sides of the FL-55 enclosure.

An application from a spray paint can does a very nice job of improving the appearance of the enclosure and removing the various government inspection markings. The front panel is simply reversed and painted in order to provide an unmarked and new front surface.

Summary

Many items of surplus equipment have simply been outdated and rendered valueless for amateur radio usage by such things as the development of relatively inexpensive transceivers and transistor circuitry. The FL-55 filter is a rather unique and inexpensive (2 to 3 dollars) piece of equipment which is really probably more useful now than it was some ten years ago. This article has only presented one way in which the author has used the basic FL-55 and its enclosure do develop a

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"On The Road to Ilford, Essex . . ."

BY SYLVIA MARGOLIS*

WITH radio amateurs you need waste no time with brittle, social niceties before making friends. That he shares your obsessionist hobby makes the newcomer O.K. You may have talked to him for years, so an eyeball QSO is only putting a face and personality to a voice. Or the stranger might be a controversial figure. If, like us and British justice, you assume a prisoner to be innocent until proved guilty, you will never rely on hearsay to assess a character, but will wait to decide for yourself. We wait until a man has been in our home, under the microscope of family inspection for many days, before making a decision about him.

New house guests are usually given our younger son's room, which means evicting the younger son into the elder son's room and playing havoc with family routine. Before we installed the un-British luxury of central heating, the upstairs hallway was the warmest place in the house and everybody got dressed there on cold mornings. Now the house is warm all over, but habits persist which can disconcert a stranger, so we offer them a modicum of privacy first time round.

Once accepted, he is welcome to return. But, re-appearing for a night or two, as happens with globe-trotting, cosmopolitan radio amateurs, on subsequent visits he is given a camp bed and told to shift for himself in whichever corner of the living rooms he can filch from Resident Cat.

That's the system we have evolved and it works well. Only in one, un-noteable instance has an amateur radio visitor, regrettably an American, been black-listed from our home and this no-character is likely to get his facial geography altered if he ever shows in London again.

The system was put to its most demanding test one cold, wet Monday, after a cold wet Sunday, when I got a message that an American amateur had called R.S.G.B. from Nairobi, Kenya, asking if he could participate in our *Welcome To London Program*.

The Radio Society of Great Britain welcomes all men of good will to London, but this wasn't one of my hospitable weeks. A flu epidemic was raging and there was an ominous prickle in the back of my throat. The Editor of the glossy, women's magazine who pays the bills (what led you to suppose that *CQ* pays the bills?) was breathing down my neck for 5,000 words (no hurry—yesterday will do!) And it was *Mobile News* week (see *Like a Hole in our Head*, June, 1967, *CQ*). "The callsign is W9WNV." said R.S.G.B.

A piano makes as good a lectern as any in the G3NMR home. That's the author's son, G3UML, on the right.

* 95 Collinwood Gardens, Clayhall, Ilford, Essex, England.

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Three DXers in series—or is it in parallel? Operating is G4AR, Eric Dowdeswell, who was, for many years, ST2AR. Bob Lane, WA6ZIQ/G5AAM, is on the right.

Here was the most controversial character in amateur radio asking for hospitality. Here was a man who had evoked criticism and vituperation from sensible people whom I knew well and loved, as well as from screeching psychotics, whose vituperative outpourings were filling the air and the Press. Here was a man about whom everybody said everything, yet about whom nobody knew anything, the faceless man, the enigma, to whom all kinds of kooky, sinister characteristics and motives are being attributed. Here was the eye of the hurricane.

A good journalist has to be where things happen. If things don't happen, a good journalist makes them happen. It was my duty, on behalf of *CQ* readers, to lift the veil on the Donald Miller Mystery. The problem was that I had no intention of getting involved in the controversies surrounding the man. I'd like to knock together the silly heads of all the participants, to bash some sense into them. Would his presence in my home perhaps signify partisanship in the arguments and offend charming people who had shown me nothing but kindness, generosity and friendship? Yet I was intrigued. Donald Miller and I had met, very briefly, once before, but our conversation was stilted because there were 20 people standing round, watching us, to see if this momentous confrontation might produce fireworks. I had lots I wanted to ask Dr. Miller.

Curiosity no doubt, will do for me, as it did for the cat, but what a way to go! *I went!*

Until after midnight we were checking with London Airport to see if Dr. Miller was on any of the Nairobi flights. No Miller. I lay awake for hours worrying about where Dr. Miller might be. Lots of people, I hear, have done the same thing, for different reasons. Had he not been in Nairobi at all, as he is said not to have been in other places? Had he telephoned London from Heard Island? Was the whole thing a hoax, generated by you-know-who? Was he already in a taxi on the way from London Airport? And where the hell were the spare sheets?

Dr. Miller was in Geneva, that's where Dr. Miller was. He called Tuesday, just before midnight. I took the call, dripping, hugging an inadequate towel round me. The beautiful voice sounded as good as it does on 20, except this was my own, private QSO and nobody was going to QRM it! Yes, we'd meet him next day. Five-nine-go!

My 17-year-old son, Laurie, G3UML, had passed his driving test 4 weeks before. Driving to London Airport is always a hair-raising ordeal, through the thick of Central London, then on the freeway, in a country notorious for its appalling driving. No regulations are going to tell *Englishmen* how to conduct themselves, in cars or elsewhere! But the god who protects schoolboys, their mothers and DXers watched over us and we made it, with time to spare to watch the thousands of tourists who cram into London even in January, when the sensible thing to do is to leave London. An antisocial policeman criticised our choice of parking spot, but maybe he was one of those that Don didn't work.

"Welcome to London!" I told our guest, then added: "The Tar and Feather Party is waiting outside." He took it very nicely.

We met Don at 1430 on Wednesday, 17 January, 1968, and left him again at the Airport at 1130 on Saturday, 20 January. Nit-pickers will question how I was able to find out so much in 69 hours about Dr. Donald Miller. Remember I am an experienced interviewer and there is no difference between interviewing Frank Sinatra for a women's magazine and interviewing Donald Miller for *CQ*. Besides, none of us bothered much with sleep, so I was able to utilise almost the entire time for research.

Dr. Miller and I were alone for four of those hours, in which time the phone rang nine times, the doorbell six, Don made two long (very) distance calls, next door's cat got caught up a tree and had to be rescued, I made a cake that sank in the middle and washed the kitchen floor free of the previous night's mud, when all 16 of Don's visitors

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trooped through the kitchen to inspect the beam, as if our beam were any different from any other beam.

Wednesday evening some people drove four hours to see our guest, including G3FKM, Dr. John Allaway, who heads the Honor Roll, and G4MJ, Ken Basterfield, who rates pretty high on the List, too. I wanted to call some of my unmarried Red Cross girl friends to come over, to meet Don, because a bachelor is a bachelor and they were all longing to learn about Rodriguez. My Ever Loving Husband, Maurice, G3NMR, said loftily that this was a DX Conference and couldn't I be content to have the cream of British DX in my home, without trying to play Cupid, too. I think the DXers want to keep Don unmarried, Girls, so that he's for ever free to go cavorting off on those suicidal junkettings they call DXpeditions!

We had a demonstration that night of how daft DXers can be. It's not until you experience DX operation from source that you can presume to criticise. From our home station, Don called on his normal frequency, 14105:

"G5AEW/A QRZ 190-220."

There came a howl on the frequency that would have shattered every window in Newington, Conn., and the pack closed in. The voice was right, the frequency was right. They never stopped to listen to the callsign.

"Hi, Don . . . good to hear you, Don . . . 5/9 as many db's as you like, Don . . . how are you, Don?"

One W8 did ask:

"What was the last letter of the call, Don?"

"W."

"Fine, Don, fine . . ." and the W8 slid very properly off the frequency. G4MJ said the same thing had happened when Don operated from his home in Birmingham last Summer.

Now, it occurs to me, silly little woman, with no knowledge of DX, that, when these characters realise that Don Miller worked them from London, England not from Never Never Land, it is Don Miller they will condemn, for making fools of them, not their own cloth ears. I was learning the DX game.

We saw a program of slides of the places Don hadn't been to, although there he was, indubitably, again and again, looking, with beard, dark glasses and cap, rather like Castro, which, I suppose, is another strike against him.

Several hours of talk later, it was Thursday. Don had some calls to make in London, on which I accompanied him, not so much to keep tabs on him, as to get him home in time for the evening schedule of jollification. London is so complex and vast that American tourists have been known to disappear on the Underground system and have been found, years, later, happily gone native. I guess that a man who had found his way all over the Pacific and Indian Oceans could be relied on to transport himself from Piccadilly to Westminster. But there I was, incontestible proof that Dr. Miller did go from Piccadilly to Westminster on Thursday, 18 January, 1968.

"Quo Vadis?"—no prize for guessing the place they are discussing!

That night it was our privilege to bring two famous DXers together. The United Nations Security Council couldn't have done it better. WA6ZIQ, our very good friend, Bob Lane, drove 80 miles, with his gorgeous blonde wife, Edie, for dinner. This was a confrontation at the highest possible level, like Johnson and de Gaulle sitting round my table and signing the U.S. into the Common Market. We put Edie in between them, for safety sake, but the conversation sparkled and many little problems and queries were rationalised. Soon the two celebrities were exploring new DX possibilities, my living room floor spread with marine charts like a battle HQ. There aren't many places left that haven't been activated, but a few remain, the Holy Grails of amateur radio, ready to enslave

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Guests of Honor at the Birmingham meeting of the West Midland DX Club. Eight of this Club's twelve members are on the Honor Roll. Don Miller and Roy Stevens, G2BVN, are in the front row, on either side of the Club's Chairman, G3FKM, Dr. John Allaway.

men's emotions and passions and maybe kill men, too.

Several hours of talk later, on Friday afternoon, we were driving to Birmingham, for a meeting of the very exclusive West Midland DX Club, whose chairman, G3FKM, had invited Don with Maurice, me and Roy Stevens, G2BVN, to be Guests of Honor. On the way to Birmingham we operated mobile. Maurice made a Stateside contact, a DXer of some repute, who should have known better, who gushed over Roy, Maurice and me and tried to ignore our American guest. Silly little woman that I am, I thought of birds pecking at a wounded bird. I was learning the DX game fast.

The Red Carpet at the West Midland DX Club was thick and lovely around our ankles. We ate gloriously, which was just as well, because as a cook I'm a good writer, so at least Don had one good meal during his U.K. stay. We revelled in a warmth of welcome that I have never experienced before, except in the United States, and in the most rareified atmosphere of DX I have ever experienced anywhere. Eight members of this Club's twelve members are on the Honor Roll!

We left Birmingham at midnight.

Now comes the first of my revelations about the enigmatic Dr. Miller, privilege offer for *CQ* readers. He is a superb doctor. The Birmingham-London freeway is inhabited, at night, by ghoulies and ghosties, ruthless truck drivers, hippies, beatniks and assorted no-goodniks. Don fell asleep in the car, but woke regularly, every half-hour, to enquire if Maurice, the driver, was O.K. Satisfied as to the state of the driver's health, he went back to sleep.

We reached home at 4 A.M., tired, happy, relaxed, four people in complete accord, to find that my sons, probably as a subconscious symbol of revolt against their feckless parents, had bolted all the doors. This had happened before, so we knew what to do. Doing it meant breaking a window. Then, over a nice cup of tea, we helped Roy choose some of Don's photos for the R.S.G.B. journal, *Radio Communication*. We got to bed at 5 A.M. and were up, some minutes later, to take Don to catch his New York plane.

On the way he called a European station, who was working a VK. The European resented this intrusion by a humble G-mobile and grumbled to the Australian about the G-QRM. Eventually he came back, just to shut us up, and gave a 3/3 report.

"Watch this," said Don, wryly, "the overs will come back quicker and quicker, as recognition dawns, and the signal report will go up and up."

He told the European his name was Don. There was silence, then:

"Are you the Don who operated as VQ8CB?"

"Roger."

"*Hello*, Don . . . nice to hook up with you, Don . . . your signal has gone up now, Don . . . 5/9 plus 20,40,60, Don . . . marvelous signal . . . no QRM, Don. . . . I think the attacks on you are very unfair, Don, and I want no part in them, Don, and what is my report, Don . . . ?" interspersing the name, Don, into every phrase, so his local friends should know that he, and he alone, was working the famous Don Miller. Propagation, it seems, depends a lot on your callsign. I was learning the DX game very fast indeed!

At London Airport we made awkward smalltalk.

"It's been very good of you," yawned Don.

"Yes, it was good of us," I yawned back, "but you got nothing special, just the ordinary R.S.G.B. Welcome to London treatment. Don't flatter yourself! Besides, I have to find copy for *CQ* somewhere and Britain needs the dollars!" We yawned our goodbyes.

What did I discover, in 69 sleepless hours, about Don Miller? Nobody seems to know much about him, because nobody bothered to ask. I asked.

Donald Miller was born in Chicago, in 1936. His father is a lawyer. He received his medical education at John Hopkins and the

[*Continued on page 122*]

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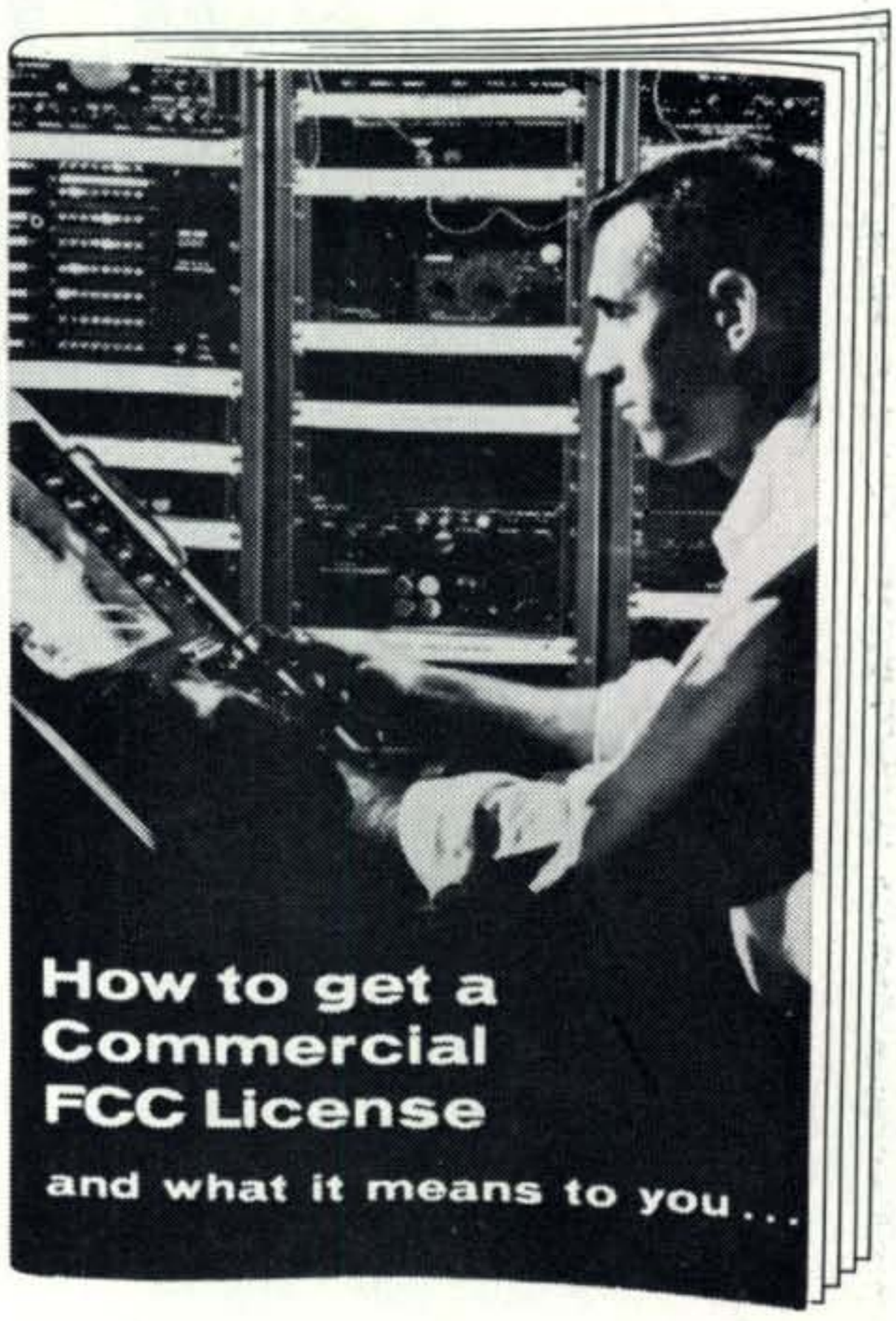

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CONSTRUCTING EFFICIENT HELICAL ANTENNAS

BY JOHN J. SCHULTZ, *W2EEY/1

A simplified design method is presented for anyone who would like to construct a reduced length antenna in a restricted space and take advantage of the proven superiority of helical loading techniques.

IT HAS been proven by the tests of many antenna designs that helical inductive loading is superior to lumped impedance loading—such as the usual center or base loading coil scheme. Helical loading provides both a form of inductive loading and capacitive loading and the bandwidth and impedance restrictions are far less than with lumped constant loading.

Which form of loading can be used, however, often depends upon the physical conditions under which an antenna is used. In a mobile situation, for instance, the bandwidth restraint imposed by lumped inductive loading of a whip is often accepted because of the ease of constructing such an antenna. Some mobile antennas are available using helical loading but they are not easily constructed by an amateur in his workshop and the small diameter rod used only minimally allows the advantages of the helical construction to be realized.

The home station situation, however, where some additional space (although not enough for full size antennas on all bands) is available presents an ideal opportunity to utilize helical construction. For instance, such a form of antenna, even for the low-frequency bands (80 and 40 meters), can be constructed using a diameter of a few inches and roof or attic mounted. The efficiency will not be that of a full-size dipole but certainly it will be superior to any form of lumped constant loaded antenna. If the diameter of the form used to support the antenna can be made large enough, the helical may also have some unique advantages when a horizontally polarized antenna is desired but where space constraints do not allow the antenna to be aimed "broadside" to the desired direction.

The advantage comes about, as shown in fig. 1, due to the changing radiation pattern of a helical antenna. Figure 1(A) shows a conventional helical loaded ½ λ dipole. As with a regular dipole, the usual figure eight radiation pattern results with the maximum radiation "broadside" to the antenna. However, as the diameter of the dipole helical winding is made larger, some axial mode radiation develops as shown in fig. 1(B). There is no exact study data available to confirm the extent of the axial radiation for dipole antennas. It seems probable, however, that when the diameter approaches the lineal length of one half of the helical dipole that the axial radiation will be about as strong as the broadside radiation. In its extreme form axial mode radiation is used as a basis for a u.h.f. helical antenna with very high gain and directivity having essentially no broadside radiation.

This brief article presents a simple design method to build a helical antenna when one knows a bout what space is available and wishes to fit an antenna into that space for operation on a particular band. The design method allows for options regarding the diameter of the helical antenna in case it is desired to try to take advantage of the axial radiation possibilities of the helical design.

Design Method

Figure 2 presents the basic design chart for a helical as a function of its various dimensions. The chart is not based upon a certain frequency and so can be used to design an antenna for any one of the amateur bands. The

* 40 Rossie Street, Mystic, Connecticut 06355.

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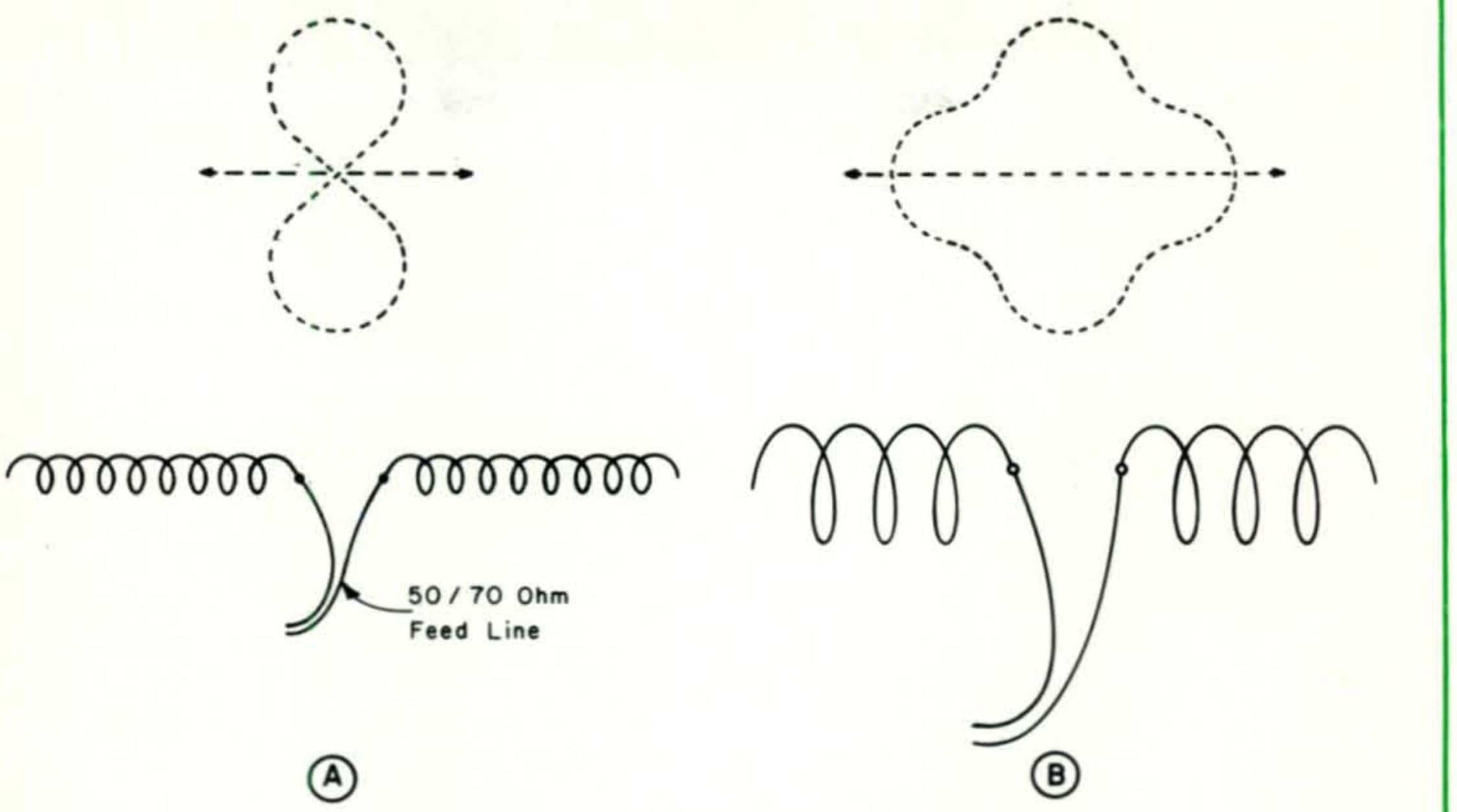

Fig. 1—Small diameter helical dipole has radiation pattern similar to normal dipole (A). As diameter is increased, however, some axial radiation occurs to make pattern more omnidirectional (B).

meaning of the various letter symbols is shown in the illustration of the two turn helix in fig. 2 and should be clearly understood (both *d* and *D* are diameters). Being in absolute terms, the chart can be used either with inch or centimeter dimensions, whichever is most suitable for the reader.

The basis of the chart is linked to fitting an antenna into the space available as seen from the vertical axis of the graph. From the space available one determines by what factor a full-size antenna must be reduced and then, from the graph, find the helical antenna dimensions which will suit this antenna size reduction. The one dimension ratio which is not covered on the graph is d/D. The chart is based on a nominal d/D ratio of 1/10 but actually will remain fairly accurate as this ratio goes from 0.01 to 0.3, a range which covers most of the practical construction needs for a fixed station situation. In general, however, the largest wire diameter (d) is desirable from the viewpoint of reduced losses and maximum antenna bandwidth.

Tubing, of course, is excellent material to use if one can bend it propertly. Coaxial cable (using the shield as a form of flexible tubing) is also excellent for use where one can make some support (such as in an attic) upon which to wind the cable. The cable need not be in new condition and in fact can have suffered internal dielectric damage as long as its shield is intact so surplus cable at bargain prices, which one may have to be very wary of for use as a coaxial transmission line, is perfectly suitable. The chart is based upon circular windings and the closer the windings are to this form the more accurate the chart dimensions will be. Discontinuities and sharp bends in the windings will distort the radiation pattern. However, if the pattern is not too important and one just wishes to construct a general coverage antenna for 80 or 40 meters in a given space there is no reason why the windings cannot be diamond-shaped so that construction is greatly simplified using a simple wooden support frame.

Design Example

The use of the design chart is best illustrated by a simple example. For instance, suppose the space available will only allow construction of an antenna 16½ feet long and it is desired to construct a 20 meter dipole (having a normal full scale ½ λ length of 33 feet). In this case, the length reduction factor is 0.5 and one enters the vertical axis of the chart in fig. 2 at this value. The D/L ratio is chosen as 0.01 (0.02 or 0.04 could also be used depending upon other factors as ex-

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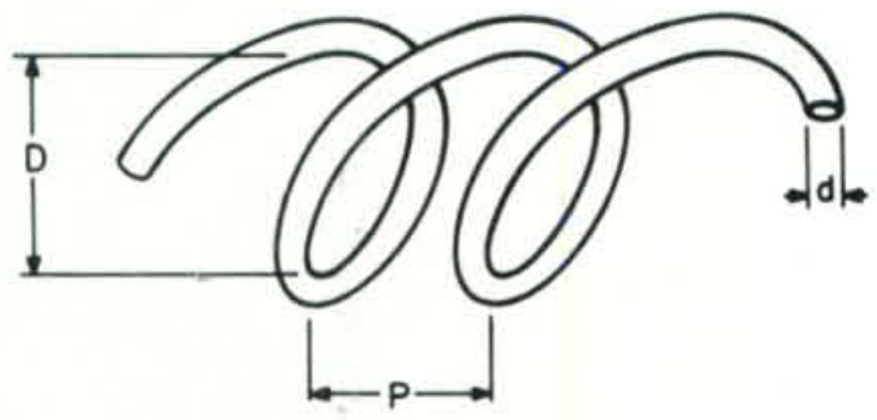

Entire Length = L

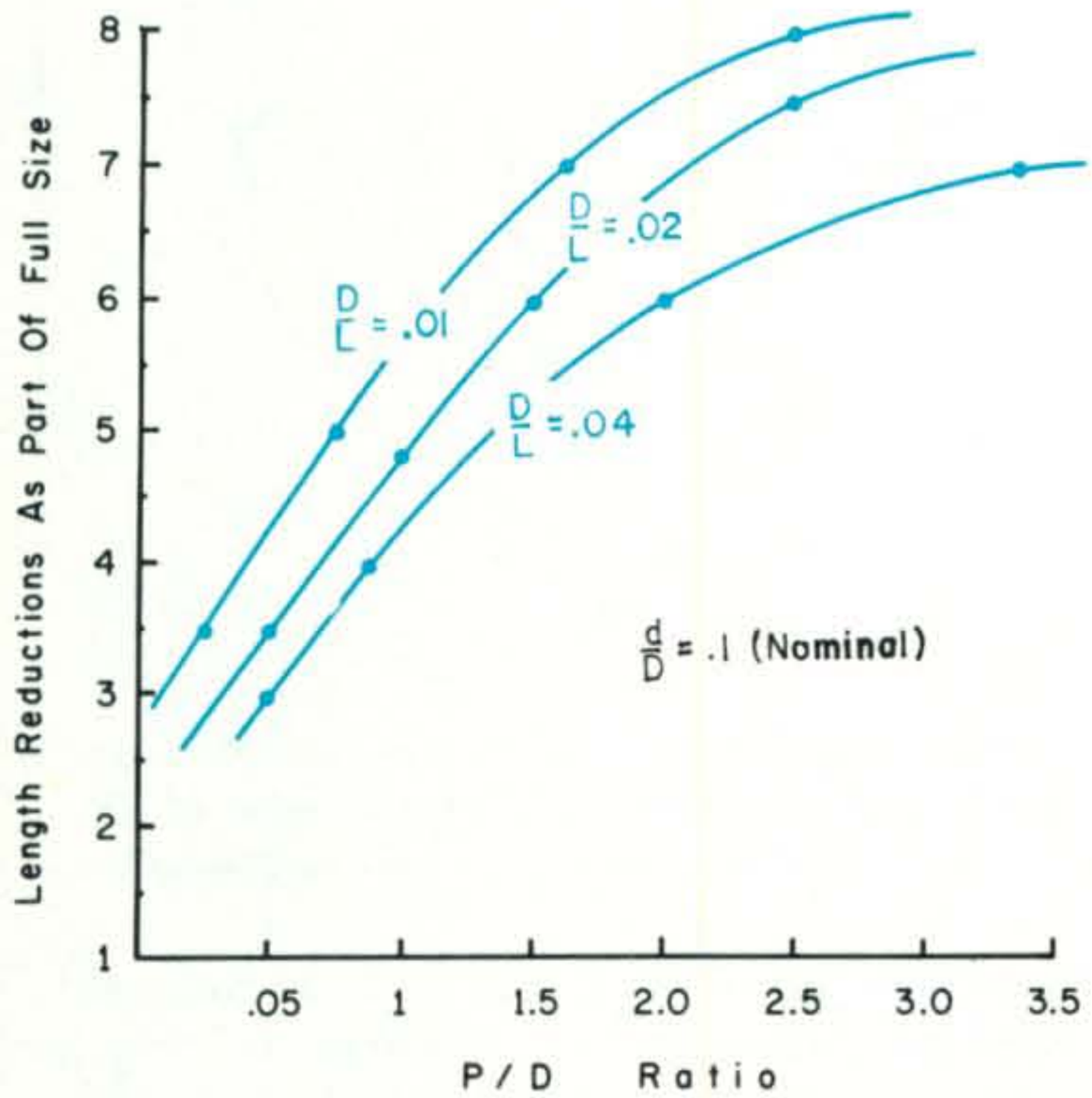

Figure 2—Graph to determine helical antenna dimensions based on size reduction desired.

plained shortly). Since L is 16½ feet, D is about 2". The wire size used is approximate and determined from the nominal (d/D) ratio upon which the graph is based of 0.1. Diameter d is, therefore, $0.1 \times 2"$ or about the size of #4 A.W.G. If larger size wire is available it certainly can be used to advantage. The use of smaller size wire (down to a minimum d/D ratio of 0.01) has to be considered in terms of the transmitter power being used. The use of wire based upon the minimum d/D ratio of 0.01 would indicate about #24 A.W.G. Such a size of wire might be useful for flea power but would certainly produce terrible ohmic losses if not simply burn up when used with even a moderate power transmitter. Using the $D/L = 0.01$ curve on the graph, then, the P/D ratio for a 0.5 length reduction is found to be 0.75. The pitch is, therefore, $0.75 \times 2"$ or 1½". The 20 meter helical antenna dimensions are then, in summary, $L = 16½$ feet, $D = 2"$, $d =$ #4 A.W.G. and $P = 1½"$. This information is sufficient to construct the antenna. The only question one may have is how much #4 AWG wire is needed. This can be calculated easily using the formula:

$$\frac{L}{P} \sqrt{P^2 + (\pi D)^2}$$

which simply represents the number of turns (L/P) times the lineal length of one turn if it were stretched out.

In the case of the example given, the total length of wire required comes out to about 70 feet. This may seem like quite a bit of wire to simulate a 33 foot long regular antenna but it is necessary because of the loading effect of the helical design. As a check of the graph, one could calculate the length of wire necessary if the reduction factor were only 0.8. In this case, the length of wire needed is only 36 feet which very closely approaches the normal 33 foot length.

Similar to the example shown, one can calculate the parameters of a helical antenna for any given band. The graph can also be used in reverse. That is, one can decide upon a certain diameter and then use the graph backwards to find the pitch, length and other parameters. Such a procedure might be employed when one wanted to make the diameter as large as possible to achieve more of an omnidirectional radiation pattern. Not all calculations will yield practical solutions. That is, wire sizes may be indicated which will not handle the transmitter power or lengths may be indicated which fall far out of the nominal $0.1d/D$ ratio of the graph. This does not mean that such antennas cannot be constructed nor that they may not be efficient but simply that their resonant frequencies cannot be related to full size antennas in the same manner that others can which fall within the design range of the graph.

Construction

Used within its indicated limits, the graph of fig. 2 will yield, to a narrow tolerance, the parameters of a helical antenna. No graph, however, can take into account all the factors which modify an individual installation. Some provision, therefore, should be made for final adjustment of the helical antenna using either an s.w.r. meter or a grid-dip meter. Using either instrument, the helical should be tuned in its mounted position for correct resonance by allowing a few extra turns on the helix and cutting them off as necessary. The tuning becomes more critical

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as the length reduction factor is decreased.

Summary

The purpose of this article was to present a simple design means for relatively high efficiency helical antennas. The graph of fig. 2 goes down to a length reduction factor of about 0.2, which represents an 80 meter dipole in 24 feet of space. Certainly, helical antennas have been made much shorter than this on 80 meters but then one starts to enter the realm of relatively inefficient designs, restricted bandwidth and touchy tuning, a situation comparable to using an inductively loaded mobile whip.

The bandwidth of a helical antenna with a length reduction factor of 0.5 will be about the same as a full size antenna. A length reduction factor of 0.3 will usually allow proper operation over the c.w. or phone portion of the low-frequency bands. Lower length reduction factors produce very rapidly decreasing bandwidths over which the s.w.r. remains below about 2:1 or 3:1.

The graph of fig. 2 can be used to determine the parameters for either a helical dipole or a ¼ λ helical monopole where the other ¼ λ part of the antenna is simulated by a ground plane. However, a ground plane of sufficient size and low-loss becomes a very elusive thing on the low-frequency bands and, generally, if space limitations permit it at all a balanced form of antenna such as a dipole will be found to be a much more efficient type of reduced size radiator. ■

"What's your secret . . . how did you manage to get your antenna up so high by yourself?"

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BORDERLINE DX

BY ALBERT KAHN, *W8DUS

THE idea of operating in the CQ WWDX Contest in Mexico came rather suddenly just a few weeks before the contest. Permits for aliens were a possibility again I learned, so I went to work through channels.

A week before the contest I was told that a permit definitely would be issued. Hopefully, I made reservations at a posh motel in Nuevo Laredo, just across the border from Laredo, Texas. They acquiesced somewhat reluctantly to the installation of an antenna and operation in a room.

Without actually having the permit, I loaded an SR-2000 transceiver, a portable Hy-Gain triband two element beam and a 40-80 meter dipole along with keyers, headphones, co-ax and the usual boxes of tools and assorted junk in the family automobile. Fortunately, I had room left for the XYL who would have been a little more enthusiastic if the permit had been in hand for this 4,000 mile drive.

The Nuevo Laredo ham club meets every Wednesday night and, fortunately, I arrived in time to attend. It was tremendous. This sleepy little border town produced a ham club with their own club house, 70 members and warm hospitality. I joined the club and was inducted by answering "Si" to questions in Spanish which, for all I knew, could have been anything.

The next day we checked into the motel with a telegram authorizing XEØDUS. I had expected that I would have a choice of rooms and assistance in erecting the beam. A half hour later I was still arguing that the beam was not as large as it looked and that, honestly, I wouldn't electrocute the other guests. Promise or no promise, it was a polite, but intransigent "NO!"

Fortunately, Sid, K5KYD, had come over to help me set up. He called XE2MMF who rushed right over with the keys to the ham club. So, depositing the XYL at the motel, we drove miles down narrow winding streets to the club. There, the local gang pitched in and soon the beam was up, the dipole hung and the rig on the operating table. One of the local XE's even brought an electric fan.

Friday at 0000 GMT I took off on ten meters. W6DLY answered, then the traffic got heavy. The whole effect was uncanny. It was a DX contest, I had to tell myself, but the W/VE stations were piled up ten deep and yet, I was only a couple of miles from the USA. That was the way they stayed on all bands for the entire contest, except

*429 Moccasin Ave., Buchanan, Michigan, 49107

The author shown logging in some rare ones.

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Three views of the Amateur Radio Club of Nuevo Laredo. The building serves as a meeting place for their 70 members and was graciously provided to the author for operation in the CQ WW DX contest.

for a short period of long skip to Asia.

It was a sort of personal SS contest with pileups that grew until they became so hopeless that I would have to quietly move to a clean spot and start over. Once in a while at a new frequency, I would tuck in a G, an LU or some real DX.

Being one of the hunters for many years, I couldn't shake off empathy for the guy who had been calling me for a half hour. I tried to dig below the loud ones for the 100 watter and dipole, but without too much success.

I wanted to call "CQ Europe Only", but for the USA hams who needed Zone 6, and had been stalking me, I just couldn't. Yet, I could hear the Europeans calling me, clobbered by the W/VE's barrelling in on short skip.

Like an old fire horse who responds to a fire bell, I reacted to real DX. Whenever I heard something exotic, I jumped into the pileup. A DX station only hears one signal at a time; often, only part of a call. He frequently must wait until a few sign off. So, my XEØ wasn't especially effective. I resented this, I think, as my ego had been so inflated by the chase, I returned to the easier job of being chased.

Operational skill has more to do with connecting with DX stations than I had realized. The old pros such as W3BES, W6CUF or W8JIN didn't have signals that were a lot better than the others; yet, I worked them without delay. Their timing and precise frequency selection was about perfect.

There were some great signals, too. W8PQQ, W3VKD, were outstanding. The old campaigners, W8ZY, W1JYH and all the regulars were a pleasure to work. Howy, W2QHH, punched his 55 watts through the coal burning kilowatts with relative ease.

After a thousand QSO's and 20 hours, I suddenly realized that I was hungry and sleepy. Because of my sudden change of plans, I had not stocked up on snacks and I was afraid to cat nap because I knew I could never find my way back to the motel in the dark, and I was starved.

Reluctantly, I closed down and meandered through the back streets to the motel for a fine dinner and a good night's sleep.

Sunday morning I opened up at about 1400 GMT and kept up the pace the rest of the day.

Toward the end of the contest some long skip developed on 21 mc and I ran a string of JA's intermixed with mostly West Coast stations.

The pileup was still a half a dozen layers deep when the contest ended.

The local gang were all wonderful. XE2JM stayed with me the entire weekend, sleeping on a bench. He felt it was safer that way. XE2MMF, WA5DYJ, K5KYD always popped up when work was to be done. My thanks to XE1AX and the LMRE for an assist with the permit. To XE2NLT, the Nuevo Laredo Radio Club, I am proud to be a member.

There are hazards in DXpeditioning. Like losing friends.

Walk into a club meeting at home, there will be one or two buddies who will barely speak. If they do speak, it will run something like this:

"So you just didn't want to work me, I guess."

"I didn't hear you, maybe skip wasn't right."

"Don't tell me you didn't hear me, you worked everybody around me."

"Honest, I didn't hear you."

"Huh!"

My only hope is that someday he will return from a DX jaunt and face his friends.

If any Mexican can get a permit to operate in Buchanan, Michigan, our club would like to reciprocate. ■

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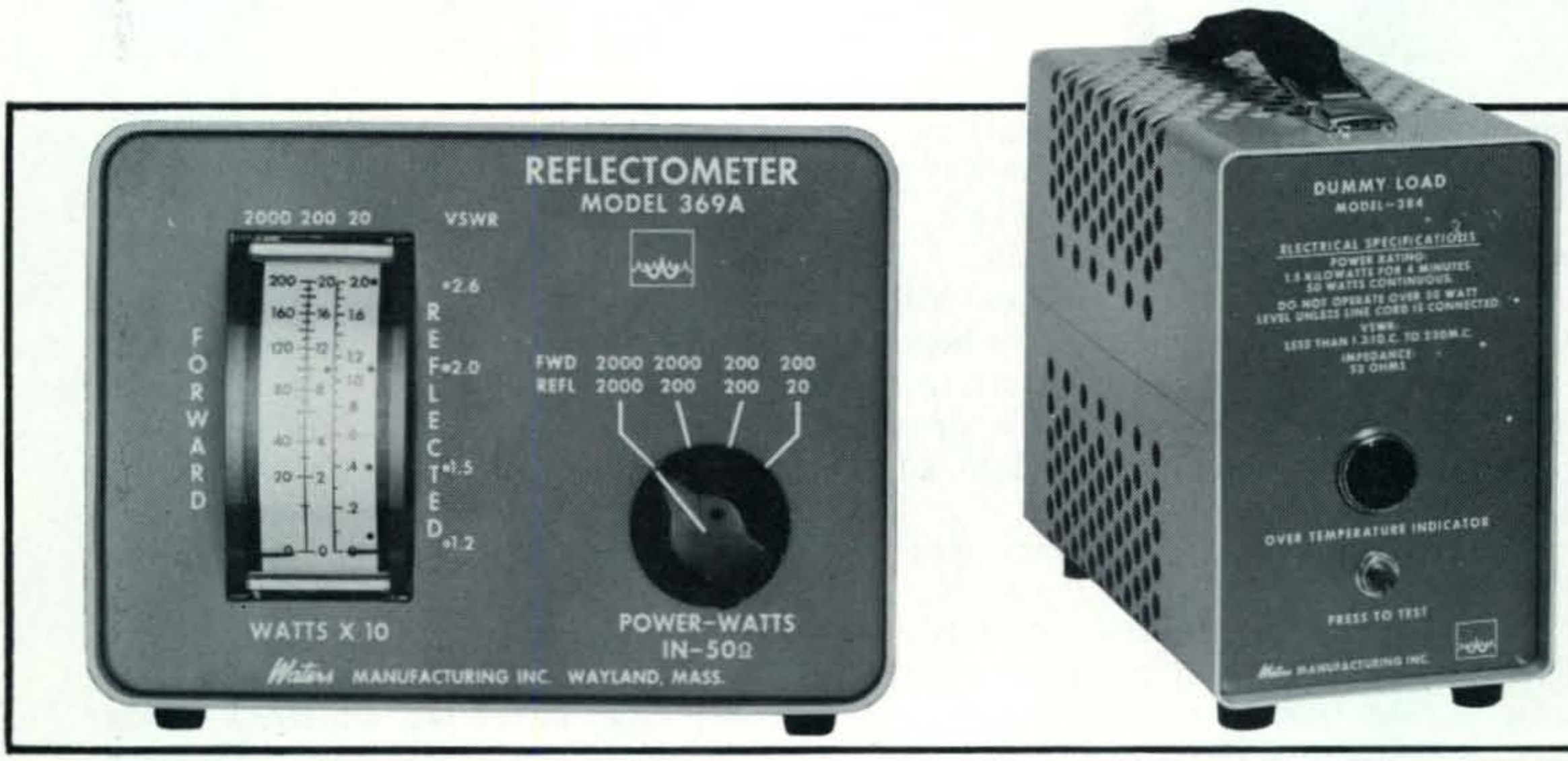

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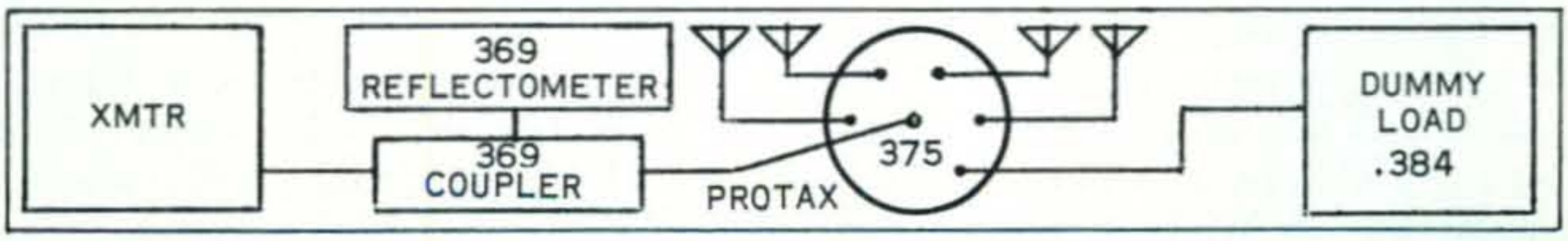

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The Lazy Man's Mobile Protector

BY DAVID J. GOODMAN,* WA8UIT

MANY articles have appeared recently in amateur publications describing methods of constructing burglar alarm systems for use on automobiles with amateur radio installations. While all of these schemes are quite worthwhile, they all represent a lot of construction effort and are designed solely to make a loud noise (blow a horn or siren) in order to scare away a thief who would tamper with a car so equipped.

After the YL had her Motorola control head and microphone stolen from her locked car while it was parked overnight in the driveway of her home, I began to consider several possibilities for preventing a recurrence. Since our cars are identical (Chevrolet Camaro's) and we have identical rigs, I was doubly concerned, since it could certainly happen to me, as well.

A review of the literature revealed many clever electronic schemes, but all required external arming and disarming by means of hidden switches, keys, *etc*. This was written off as a poor choice, since the YL is *not* the type to either remember to arm the alarm when leaving the car, or to recall without exception that it must be deactivated upon reentering the vehicle. (I had shuddering visions of her accidentally setting off a siren three times a week in the pre-dawn darkness as she was leaving for work). Other means would have to be found.

A study of the Camaro's construction and some consultation with the detectives showed how ridiculously simple entry is into the hardtop-type auto. Since this class of car has no centerpost, the back seat window glass and the door glass are separated only by a strip of rubber. The interior door lock buttons are positioned only a couple of inches from this weatherseal and can be easily popped up by means of almost anything inserted between the glass and rubber from the outside. No special tools required—an old windshield wiper arm, a screwdriver, what have you. It can be done faster than using a key.

We decided that we would settle for a simple system that would keep the thief out of the car, rather than sound an alarm.

The standard, plastic interior door lock buttons, shown in fig. 1A, were unscrewed and were replaced with specially fabricated ones, made from ¼-inch diameter Teflon rod stock. As can be seen from fig. 1B, these buttons are flangeless, preventing operation by prying or hooking with a loop or noose,

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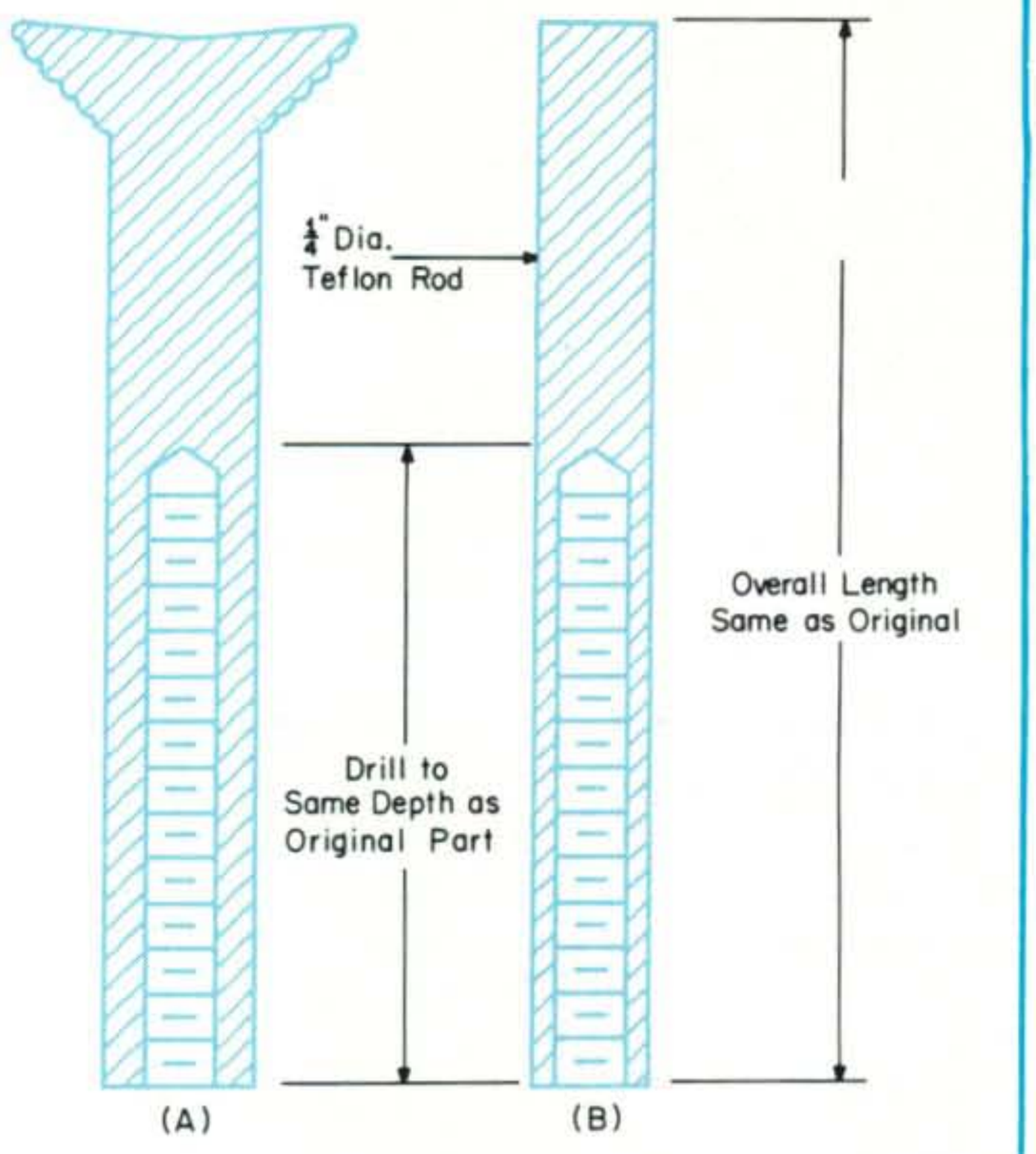

Fig. 1—(A) Outline of the original door lock button. (B) Outline of the Teflon replacement shows a smooth exterior shape. The Teflon is drilled and tapped to match the original button.

* 3305 De Sota Avenue, Cleveland Heights, Ohio 44118.

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USING THE GRID-DIP METER

BY WILFRED M. SCHERER,* W2AEF

ALTHOUGH a few cumbersome versions of the grid-dip meter had been in use as far back as the early 1920's, it remained relatively unnoticed as the useful tool it is. It was not until after World-War II that it achieved its popularity and came into general use as a result of several articles published in *CQ* which described practical working models and that called attention to and demonstrated the many applications for which the grid-dip meter may be employed.[1]

The supply of back copies with the references has long ago been depleted and although much of the operational data has been duplicated in the instructions accompanying many commercial models of the instrument which have since appeared, an updated repetition in respect to the device itself and its many applications might be welcome to those otherwise unfamiliar with its scope of usefulness.

* Technical Director, *CQ*.

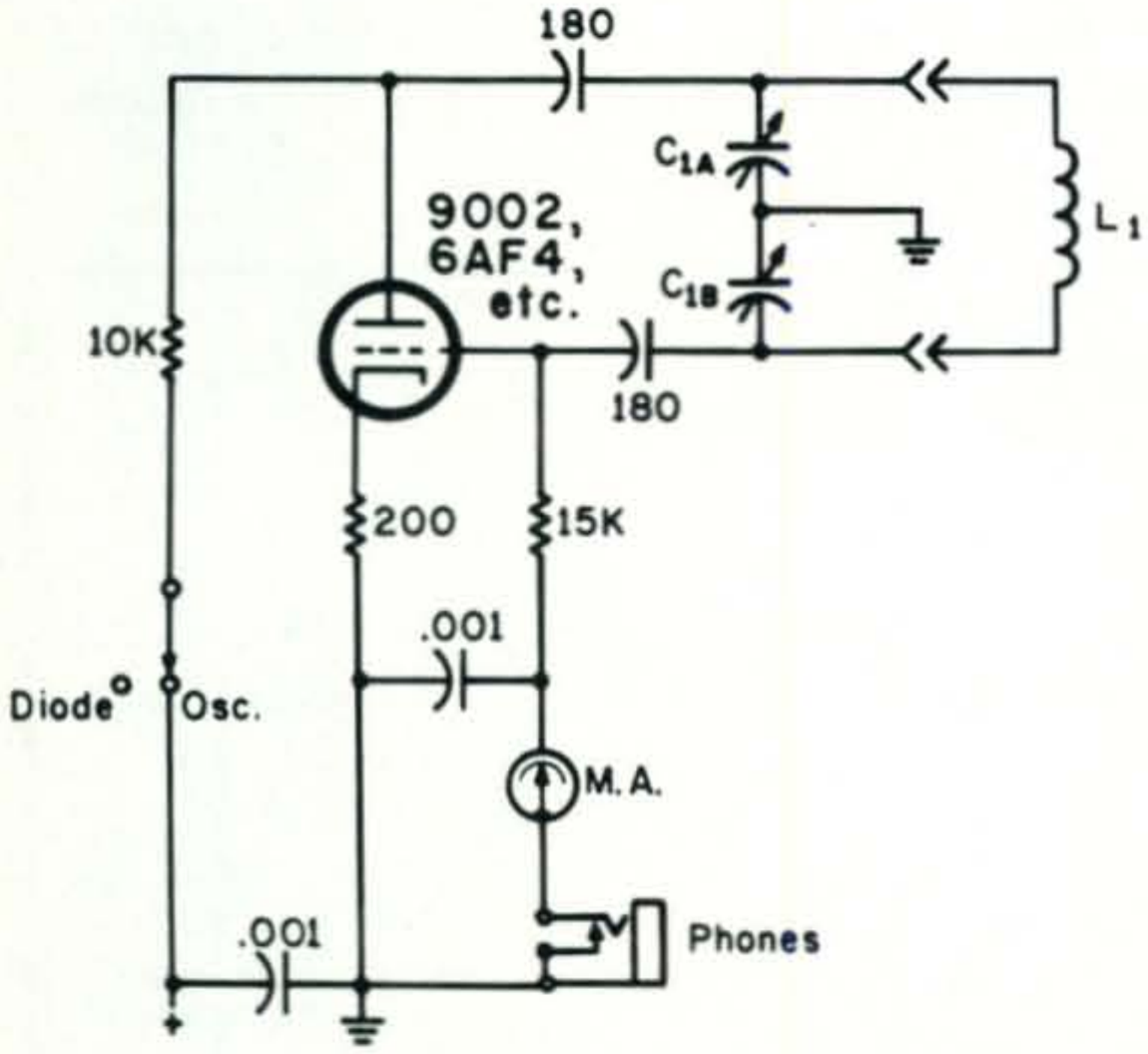

Fig. 1—Basic circuitry for the grid-dip meter. With plate voltage applied it functions as a Split Colpitts Oscillator. Grid current, indicated by M_1, dips when power is taken from the tank, C_1-L_1, by a circuit resonant at the oscillator frequency when coupled to L_1. Headphones plugged into the phone jack enable a beat to be heard from a signal picked up at the frequency of the oscillator. With plate voltage removed, the tube functions as a diode. The meter indicates the diode-load current which will rise when the circuit is tuned and coupled to a source of r.f. Various schemes are used to vary the meter sensitivity or grid current, so that a high-scale reading may be obtained on all ranges.

Basic Functions

The basic functions of the grid-dip meter are:

1—As a GRID-DIP OSCILLATOR (g.d.o.) for determining the resonant frequency of *de-energized* r.f. circuits.

2—As an OSCILLATING or NON-OSCILLATING DETECTOR or FREQUENCY METER for determining the presence and frequency of r.f. power in *energized* circuits.

3—As an R.F. SIGNAL GENERATOR.

Principle of Operation

Figure 1 shows the basic circuit for the grid-dip meter.

For operation as a GRID-DIP OSCILLATOR, plate voltage is applied and the setup functions as a self-excited oscillator. When it is then coupled to a circuit that is resonant at the oscillator frequency, r.f. power is taken from the oscillator by the resonant circuit. This reduces the strength of oscillation with a consequent decrease in the oscillator grid current which is indicated by a meter in the grid return. Therefore, whenever the oscillator is tuned through the frequency at which

1 Scherer, "The Dipper," *CQ*, May 1947.
Scherer, "Applications of the Grid-Dip Oscillator," *CQ*, Jan. 1949.
Scherer, "The Improved Dipper," *CQ*, Feb. 1949.

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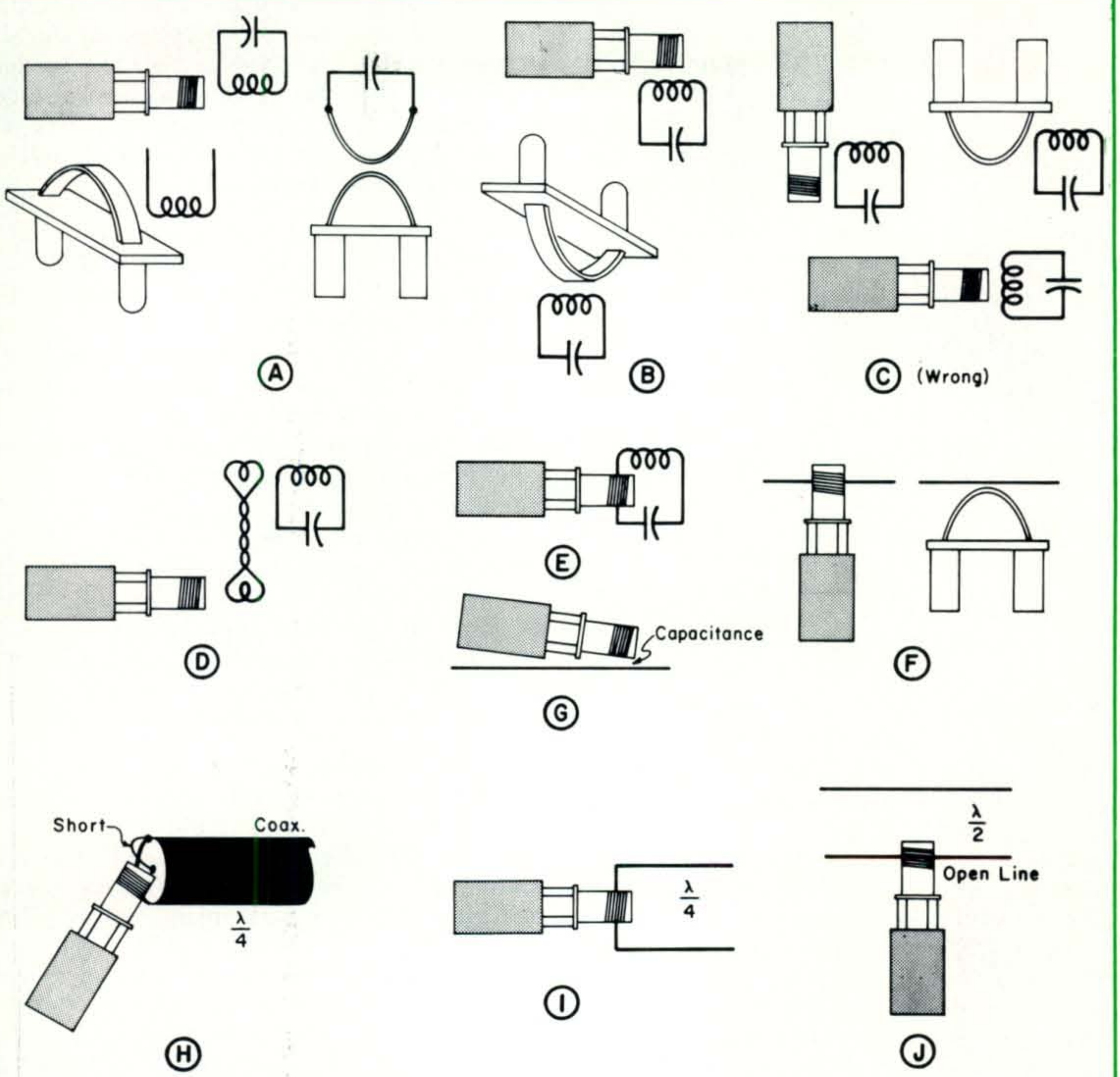

Fig. 2—Methods of coupling the grid-dip meter to circuits under test. In all cases, greatest accuracy is realized when coupling is as loose as possible, consistent with obtaining a sufficient dip indication. Best results usually are obtained using method *A*. The inductors are in line end-to-end. Note the orientation of the hairpin-type inductors. *B* may be used as an alternate where the inductors are side-by-side. Methods at *C* are incorrect. *D*—Link coupling for use in hard-to-reach places. One or two turns of the line should be wrapped around the g.d.o. inductor. The other end of the link is coupled closely to the test inductor. For this situation coupling sometimes may be made on a lead of the circuit as at *E*. At *F*—Inductive coupling to antennas or other straight wires. Better coupling is sometimes had by reversing the inductor 180° when it is plugged into the g.d.o. or by placing it below the wire lead instead of above as shown. Capacitive coupling to wires is shown at *G*. H—For quarter-wave shorted coax lines. *I*—For quarter-wave shorted open-wire lines. *J*—For open or shorted open-wire half-wave lines.

the circuit under test resonates, a dip will occur in the meter reading. The frequency at which this takes place is then read from a calibrated scale on the instrument.

Employed in this manner, the grid-dip meter may be used to check the resonant frequency of a circuit *without the application of power to the circuit in question.*

Circuits may thereby be checked or pretuned, before completion of a piece of gear in which they are to be used, saving considerable time and providing a definite assurance of correct frequency adjustment, or one that is at least "in the ballpark." Usually, only minor trimming will be required under actual operating conditions. Guess work or cut-and-

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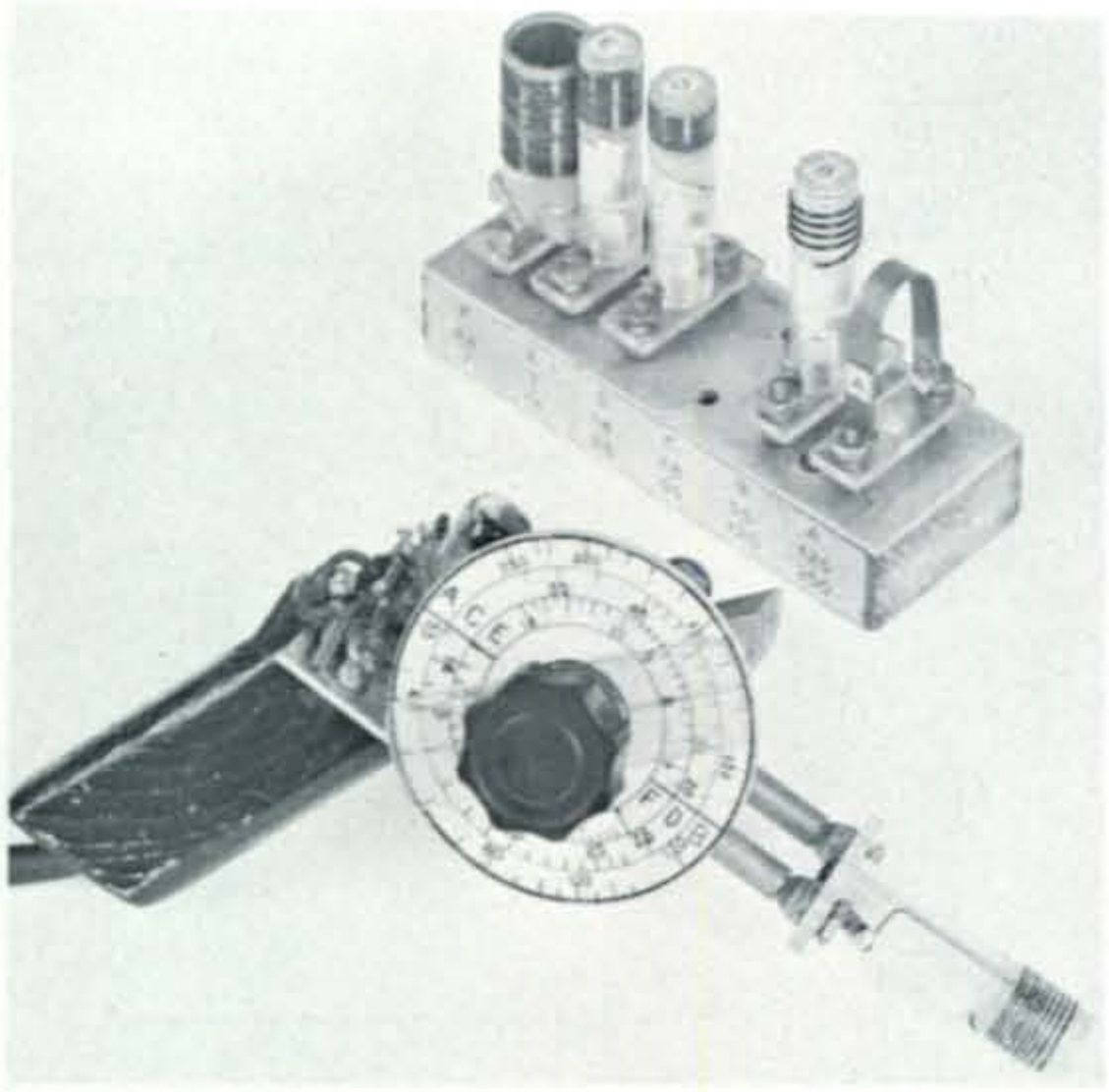

The "Dipper" described in one of the references. Probe-type operation was made possible by the pistol grip and small plug-in inductors. Frequency range covered 3-250 mc. Power supply and meter were separate.

try methods are eliminated. Certainty also is established as to the tuned-circuit components in equipment if it otherwise does not operate properly due to errors or failures in other portions of the circuitry. Antenna resonance and the electrical length of transmission lines also may be made with the g.d.o. function, as shown later.

For operation as an OSCILLATING DETECTOR, plate voltage is applied and the circuit oscillates as before, but this time headphones are connected in the grid return and an audible beat may then be heard when the oscillator is tuned to the frequency of an *energized* circuit to which it is coupled.

For operation as a DIODE OR NON-OSCILLATING DETECTOR, plate voltage is removed, oscillations cease and the cathode and grid of the tube allow it to function as a diode which rectifies any r.f. that is induced into its tuned circuit. The meter, which is in the diode-load circuit, then reads up-scale in response to any increase in diode current which will reach a maximum when the instrument is tuned to the frequency of a source of r.f. to which it is coupled.

Detector operation in either of the above modes thus furnishes a means of indicating the presence of r.f. and its frequency in energized circuits. Greater sensitivity is realized when the oscillating mode is used.

For operation as a SIGNAL GENERATOR, plate voltage is applied, the circuit oscillates and thus produces r.f. energy that can be used for many applications in place of the standard signal generator, except where special shielding or known r.f. voltages are needed. In this capacity it also may serve as a signal source for driving an s.w.r. or r.f. impedance bridge, or in other applications where a measurable amount of power is required

Construction

For most convenient operation, the grid-current meter and phone jack are built directly into the instrument which also includes a self-contained power supply. It also is desirable to provide a method that enables tuning with the same hand by which the device is held. This permits one-hand operation to allow test-circuit adjustments to be made at the same time by the other hand.

The ranges are changed by means of plug-in inductors which are wound on elongated forms of relatively small diameter to enable their use in a probe-like manner in close quarters. In order to obtain the needed low inductance, the u.h.f. inductors usually are a hairpin type made of about ¼" wide strap.

Solid-State Types

Similar type instruments may be made using transistors or a tunnel diode in place of the vacuum tube. While these provide the convenience of self-contained battery operation, their overall performance as a g.d.o. usually does not match that of the vacuum-tube version[2] and their use as a signal source is somewhat limited due to their low-power output. Then too, burn-out of the active element may result when operation is conducted near strong r.f. fields.

It is difficult to obtain sufficient current-dip indications in the solid-state circuits, so these affairs generally employ a diode, coupled to the oscillator tank, that rectifies the r.f. to actuate a d.c. meter. When a circuit, resonant at the oscillator frequency, absorbs power from the tank, the meter therefore responds accordingly as with the conventional instrument.

Because of diode loading and the low impedance of the solid-state devices, the circuit *Q* is lowered with a consequent loss in coupling to other circuits and a broader response, resulting in less-positive dip indications, particularly at the higher frequencies. Since no grid current is involved, these affairs are often referred to simply as a dip-meter or like the writer's early job, a "dipper."

2 Some improvement in this respect might be experienced with the use of the field-effect transistor.

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Methods of Coupling

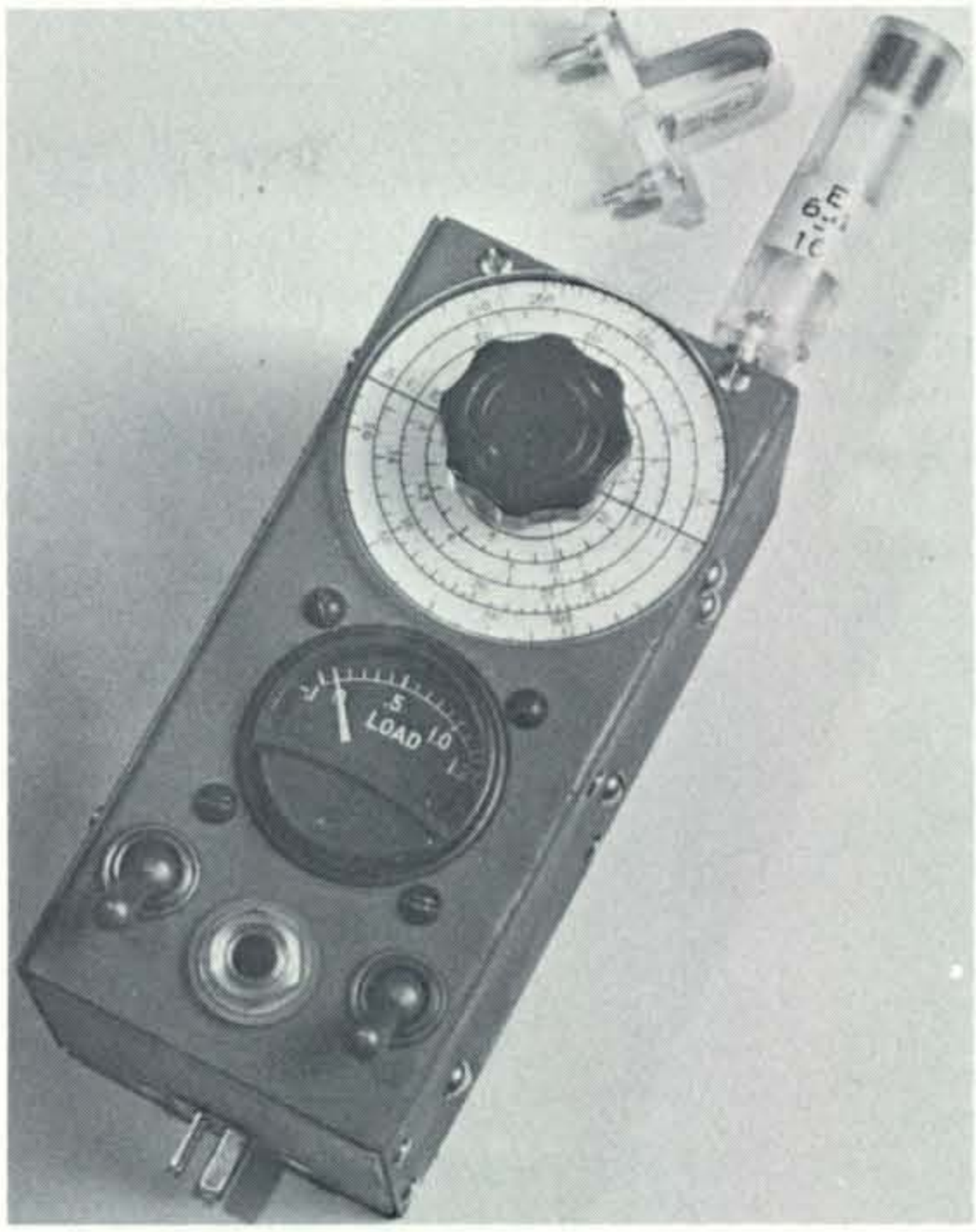
Methods of coupling the grid-dip meter to various type circuits are described at fig. 2. With g.d.o. use, the coupling should be made initially as close as possible for the most positive indication of a meter dip, after which the least coupling should be used that will still permit a readable dip. The test circuit may otherwise "pull" the oscillator frequency, introducing an error in the readout. Where a precise evaluation is desired, the oscillator frequency (when at the dip) should be checked against a calibrated receiver.

Harmonics of lumped-constant circuits (such as those made up of inductors and capacitors) will not be indicated with the g.d.o. operation; however, additional frequencies often may be indicated such as those due to other resonances caused by the inductance of circuit wiring, stray capacitance, distributed capacitance in inductors, etc. These usually will be found at a higher frequency than that of the circuit of interest. On the other hand, harmonics of antennas and transmission lines will be indicated as explained later.

In order to make sure you have located the dip for the circuit in question, touch the "high" side of the circuit inductor with a metal object or otherwise temporarily detune the circuit and note if the dip frequency changes; otherwise the indicated dip may be that of another portion of the circuit or of an adjacent one. When another inductor is in close proximity to the one under test, it may then be necessary to avoid incorrect dip readings by shorting it out or disconnecting one end of it.

When search is made for a meter dip, the current reading may gradually vary over the range; however, a resonant dip will be indicated when the meter rather suddenly drops with a subsequent rise as the tuning is made past the dip. An exception to this may be in cases where the normal grid current drops off considerably toward the end of a range, in which case the dip may appear only as a slight hesitation on the slope.[3]

It also sould be noted that the higher the circuit Q, the sharper will be the indicated dip. Consequently, a broad dip is usually found with unloaded or full-length antennas where the Q is inherently low. Broad dips also may be due to loose or inadequate coupling to the test circuit, which generally is a likely condition with antenna measurements.



The "Improved Dipper", a compact package described in one of the references. More convenient use was provided with a built-in meter and phone jack, self-contained power supply and tuning arranged for one-hand operation. The frequency range was 1.7-275 mc. The 110-275 mc plug-in inductor is lying at the upper left.

G.d.o. operation with lumped constant circuits provides a dip indication only when the circuit is parallel resonant. For readings on series-resonant circuits, the components must be temporarily connected in parallel using as short connections as possible.

Applications

Probably the most used applications for the instrument as a g.d.o. involve the tuned circuits in receivers and transmitters. The following procedures are a general guide line for methods used for aligning or trouble-shooting such equipment.

All tubes should be in place and r.f. circuitry associated with the tuned elements should be connected. This includes preceding and following stages that may be coupled to the circuit under test. Plate and filament power should be removed. If the latter is applied, a tube may still function as a diode, loading the circuit and making it difficult to obtain sufficient coupling to the g.d.o. Likewise, a shunt resistor used for broadbanding or swamping may have the same effect and

[3] Unless the instrument is properly designed, inherent spurious dips, caused by internal reasonances, may be indicated.

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require removal. Transistors, too, may heavily load a circuit and therefore might have to be removed, before the resonant dip will be indicated. Where this has been necessary, the subsequent resonant frequency will be altered, depending on the capacitive effect of the transistor.

Receiver Circuits: In the case of a receiver, the tuned circuits should be resonated to the desired frequency as indicated by the g.d.o. function. Gang-tuned circuits should be aligned for bandspreading and tracking by checking for resonance at each end of the range as well as at one or two places in between. Methods of electrically obtaining bandspread and tracking may be found in radio textbooks.

After this procedure, power may be applied to the receiver and the instrument employed as a signal generator for checking the final alignment. A very short antenna should be connected to the receiver input and the instrument should be placed on the bench away from nearby conductors and where body movements are least apt to affect the r.f. signal from it. If, during the procedure, the signal is too strong producing overload or spurious birdies, the antenna should be cut down or the instrument placed farther away or the receiver gain reduced.

The receiver S-meter or a v.t.v.m. at the detector will have to be used as the level indicator. The a.f. output may be used if the

[*Continued on page 120*]

NASTAR RECEIVES TELEPRINTER

A teleprinter donated by ITT World Communications Inc., a subsidiary of the International Telephone and Telegraph Corporation, will assist radio amateurs in developing a 432-megacycle radio relay station to be placed on the moon in the early 1970's.

The ITT teleprinter will be used by the Nassau College Amateur Satellite Tracking (NASTAR) organization in Garden City, L.I., for relaying progress reports, specifications and other data on Project MOONRAY to amateurs worldwide.

John W. Butterworth (right), ITT Worldcom vice president, discussing teleprinter given by the Internation Telephone and Telegraph subsidiary to Nassau College Amateur Satellite Tracking (NASTAR) with Nicholas Marshall, president of NASTAR (seated) and George F. Chambers, president of Nassau Community College, Garden City, N.Y.

The aim of this project is to send an active electronic radio repeater to the moon, so that the amateurs can communicate with each other by line-of-sight radio via the lunar station. Project MOONRAY's target objective is to have the five- to 10-pound repeater placed on the moon by members of the third U.S. manned expedition.

NASTAR has been planning Project MOONRAY for seven years, and has members and technical advisors in West Germany, Switzerland, Australia and Puerto Rico, as well as in the continental United States.

ITT Worldcom has made several contributions to the space-age advancement of amateur radio. In 1966, it joined two other ITT companies in providing a parametric amplifier for Project Teletek, an educational satellite communications organization in Kuala Lumpur, Malaysia. More recently, the ITT subsidiary supplied 25 teleprinters to the Military Affiliate Radio System (MARS) in New Jersey, which provides back-up communications for the armed forces and civil defense organizations in time of emergency or national disaster. ■

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"G5ZZZ Calling CQ"

BY MARTIN HEIMAN,* K7BDY/G5AEX AND
BERRY PRIESTLEY,† G3JGO

As a result of living within half a mile of each other G5AEX/K7BDY and G3JGO learned a thing or two about the difference between Arizona and Buckinghamshire from the ham radio viewpoint, and so we produced this amateur supplement to *Europe on $5 a day* for the intending G5 plus 3.

Getting the Licence

To obtain your application for an amateur radio licence in the United Kingdom write to:

Radio Services Department,
G.P.O. Headquarters Building,
St. Martins-le-Grand,
London, E.C.1.

You will be required to send a copy of your present amateur licence along with the completed application to the Radio Service Dept. When your application is accepted the G.P.O. will ask you for the licence fee of £2 ($4.40). Do not send the fee with your original application.

It is advised that application for licence be submitted at least 3 weeks prior to your expected operation in the U.K. to allow time for processing.

Frequency Bands and Power Regulations

These are narrower than the U.S.A. bands and the power limits are lower. Full details are on the licence but the following information will help decide if a rig is suitable or not.

S.s.b. power is limited to a p.e.p. *ouput* equal to 2⅔ times the permitted d.c. input for that band. To measure this requires an oscilloscope, a power meter and a two tone generator. As most of the popular transceivers are incapable of getting near the h.f. band figure of 400 watts this need not worry you too much. There are no regulations to subdivide the bands by mode, but by long custom the l.f. ends are reserved for c.w. A means of measuring transmitter frequency is required, such as a crystal marker (100 kc).

V.H.F.

First of all—NO SIX METER BAND! Try 70 mc (four meters) popular as a mobile band but uncomfortably close to channel 5. Two meters is only half as wide, and the aeronautical frequencies 144.00, 144.09 and every 90 kc through to 144.900 must be avoided. Most 2 meter transmitters are crystal controlled and surplus crystals are becoming harder to find in the U.K. Polarization on all v.h.f. bands is horizontal, except for some 70 mc mobile. Wideband f.m. is not permitted on any band but n.b.f.m. is OK. TV antenna rotators are things we read about but heavy duty models are imported

Antennas

Commercial antennas are available although a bit more expensive than stateside. Good components such as traps and load coils for home brew antennas are available at a reasonable price. K7BDY found an end-fed long wire with a home brew antenna tuner to work out quite well. This is where an s.w.r. bridge comes in very handy, so bring one along. With proper adjustments on the antenna tuner a s.w.r. of less than 1.3:1 was obtained on the bands worked, 80—40—20, meters.

Coax, Connectors and Spares

Nearly all TVs use 75 ohm coax feeder similar to RG59/U with "low loss" and "super low loss" versions for the higher TV bands. This and TV coax plugs and sockets are much used by amateurs both for r.f. and microphone sockets due to cheapness and availability. This cable can be fitted to standard PL259 with the UG176/U adapter. These can be bought surplus or new from distributors or ham stores together with types N, C & BNC.

Really low loss high power cable in both

* Box 744, Showlow, Arizona, 85901.
† 43 Raymond Rd., Langley, Slough, Bucks, England.

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Frequency	Power	Mode
1.8– 2.0 mc	10 Watts d.c. input	c.w. & a.m.
3.5– 3.8 mc	150 Watts d.c. input	c.w. & a.m.
7.0– 7.1 mc	150 Watts d.c. input	c.w. & a.m.
14.0– 14.35 mc	150 Watts d.c. input	c.w. & a.m.
21.0– 21.45 mc	150 Watts d.c. input	c.w. & a.m.
28.0– 29.7 mc	150 Watts d.c. input	c.w. & a.m.
70.1– 70.7 mc	50 Watts d.c. input	c.w. & a.m.
144.0–146.0 mc	150 Watts d.c. input	c.w. & a.m.
427.0–450.0 mc	150 Watts d.c. input	c.w. & a.m.

A chart of the frequency, power, and mode allocations used in the U.K.

50 and 70 ohms impedance is available but needs looking for.

U.S. type microphone connectors are used very little and difficult to get, as are SLOW BLOW fuses, so a small stock of spares is a good idea. Most commonly used tubes (valves) and semiconductors are available and a wide range of other components.

Power Supplies

The standard a.c. supply is 230v, 50c.p.a., although 220 and 240v are often met. 200v, 50c.p.s. 220v d.c. or 25c.p.s., are uncommon but still around in odd patches, so check before you plug in. Transformers for 115v can be bought fairly easily from ham shops, or most TV stores could get one to order. Scrounging an old TV to use the power transformer as an auto transformer from 230v to 115v won't work—no power transformers in TV sets here! Power plug size and shape varies from place to place, so buy them when you get there.

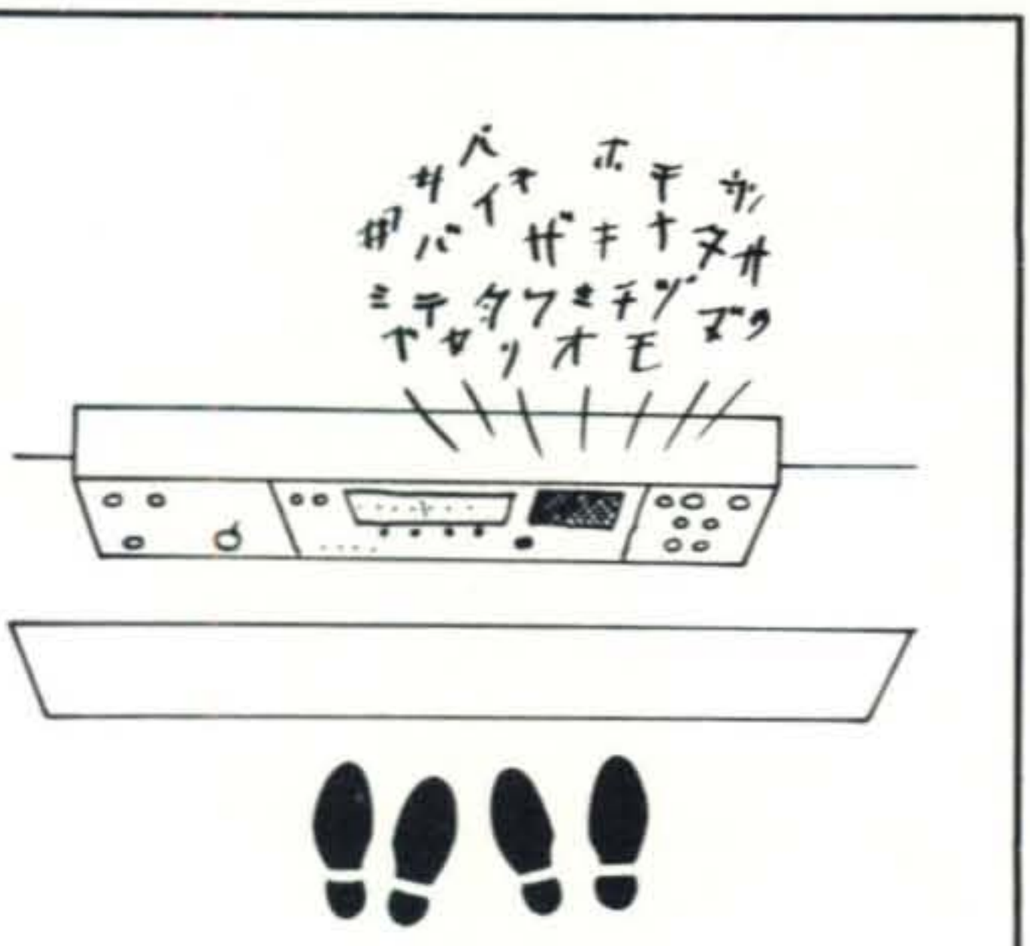
T.V.I.

TV bands are 41—68, (watch that third harmonic on 20 meters) 174—216 and 470—960 mc and at least one channel in each of the first two will be in local use. Low pass filters cutting off at 43 or 54 mc may be effective for the higher channels, but are no good at all for channel 1. British low pass filters cut off at 36 mc but mostly are designed for 72 ohm coax so keep on eye on the s.w.r!

The Post Office runs an overworked Radio Interference Service, and can be called in to explain to an irate viewer that he needs a high pass filter. This is liable to take some time and may involve 30 days QRT, so a friendly solution may be better. High pass filters can be bought for about $2 from the Radio Interference Officer. Part of his job is also inspecting amateur stations, so for your own good try to make his burden less by solving your own problems where possible.

Meeting the Locals

The R.S.G.B. runs a "Welcome to London" scheme, details are available from the Publicity Officer, Sylvia Margolis, 95, Collinwood Gardens, Clayhall, Ilford, Essex, England. Also the R.S.G.B. G call book gives a list of local club secretaries (and the address of your G5 plus 3 QSL sub manager). It costs 6/6 (about $1) from R.S.G.B., 28, Little Russell Street, London, W.C.1, England. The old faithful system of looking for a beam and flashing a QSL at the owner is fine also, provided it isn't a TV antenna! ■



"I think your mistake was in buying war surplus Japanese equipment."

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VHF TODAY

BY ALLEN KATZ,* K2UYH

THERE is a best type antenna for every v.h.f. band. When it comes to high gain on two meters that best type of antenna is the yagie array. Some of you may disagree (we're sure *CQ* will supply you with space in which to voice your objections) here are our reasons. . . .

Antenna gain; $G = \eta A/\lambda^2$ where G is the gain over an isotropic radiator, A is the aperture or effective area of the antenna broadside to the direction of transmission, and η is an efficiency factor; is limited by aperture size. Some antennas have approximately the same effective area as physical area. Examples of this type antenna are the parabolic reflector and the colinear array. The effective area of other types of antennas is not so obvious. The simple dipole when looked upon from the front appears to have almost zero area, yet it has 2.1 db of gain over an isotropic radiator. Therefore it must have a larger effective area then physical area—as it indeed does—see figure 1(A).

When smaller antennas are stacked to form a larger antenna, what we are doing is increasing the antenna's effective area. For optimum results we want the individual apertures to just touch. If we stack the antennas further apart then their individual apertures warrent, we will be increasing the antenna's physical size, but not its effective area and thus not its gain. Likewise if we overlap the apertures we will be decreasing the physical area, but we will also be decreasing the effective area and thus the gain.

When a number of dipoles are stacked to form a colinear array as shown in figure 1(B), the effective area of the array becomes approximately equal to the physical area. If however, parasitic elements are placed in front of a dipole to form a yagi the physical area of the antenna remains constant while the effective area increases. The effective area of a 16′ two meter yagi is shown in figure 1c. This antenna has the same effective area as the 32 colinear dipoles of figure 1(B). Which antenna is easier to build, easier to mount, and has the least wind loading?

Now if you were only to consider the reasoning presented thus far, one might conclude that the best high-gain antenna for two meters is a very long yagi. But there are other factors to be considered as one proceeds from the subject of moderate gain antennas to that of high gain antennas. First of all as the boom length of a yagi is doubled, its effective area is doubled not its stacking distance. A yagi's stacking distance actually increases as the square root of its boom length—see figure 2. This effect occurs because of the geometric relation between the sides of a square and its area. This means to obtain an aperture which corresponds to a gain of 25 db (at a 100% aperture efficiency) would entail constructing a yagi longer than 100 feet. To suspend a pole horizontally for more than 100′ is no simple mechanical task. It might even be easier to mount a colinear array of the same aperture (approximately 40′ on a side) see figure 1(D).

Besides the above minor matter, we have not considered the second factor that of efficiency. Hither to we have considered all antennas to have 100% aperture efficiency—this is not necessarily the case. Just because an antenna has an aperture of 1600 square feet does not insure it has a large gain—a point that hits home all too sadly for this writer. After building up 20 yagies for a 432 mc array, each of which exhibited a razor sharp directional pattern (a sure indication of aperture), we discovered that their gain was little more than than of a dipole. Needless to say we do not recommend yagies for 432. A similar loss of efficiency can occur in long two meter yagies. It is particularly hard to achieve anything near expected gain from two meter yagies much over 25 feet in length. Furthermore, when stacking inefficient yagies you must still stack them at their optimum stacking distance or you will lose even more gain.

The colinear array may now look a little better to you, but it too has efficiency problems. In general phasing errors and line losses are cumulative, the more feed points the more loss and the lower the efficiency. Consequent-

* 48 Cumberland Ave., Verona, New Jersey 07462.

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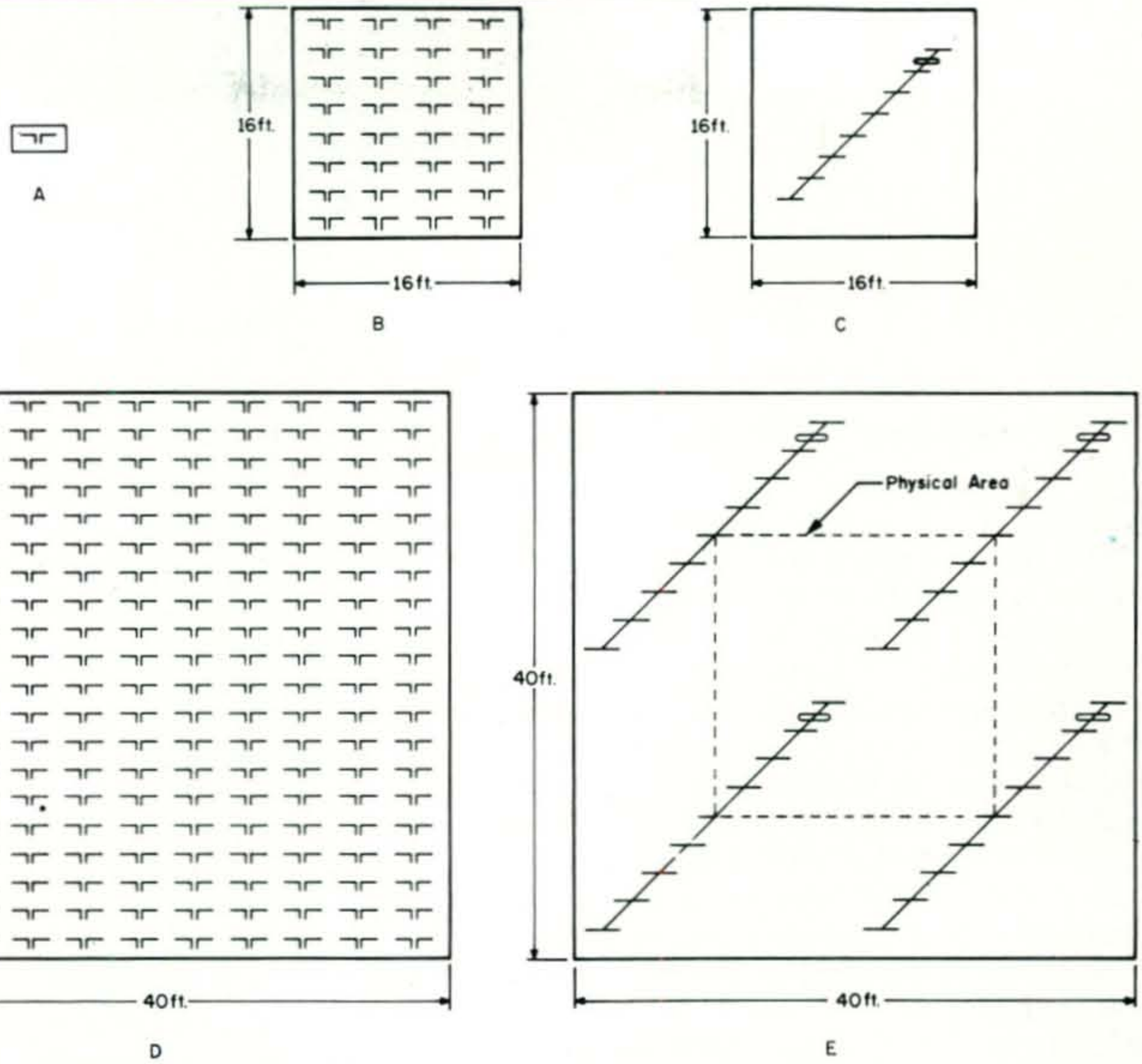

A B C D E

Fig. 1—(A) shows a half-wave dipole and aperture. (B) is a 32 element colinear and aperture. (C) depicts a 16 foot yagi and aperture. (D) represents a 200 element colinear and aperture, and (E) shows four 28 foot yagis and aperture. The apertures in this diagram are shown as being rectangular or square, in actuality they are elliptical. The error caused by this approximation is small and certainly offset by the advantage in calculation.

ly, you want to keep the number of antennas you phase together as few as possible.

In past issues of *CQ*, we recommended the use of a parabolic reflector for "real big" antennas. For although it has initially less efficiency than either the yagi or the colinear array, its efficiency remains virtually constant as its size is increased and thus eventually exceeds the failing efficiencies of the more conventional antennas. Unfortunately at 144 mc what we mean by "real big" are antennas with apertures whose sides are in excess of 60′—much too large for most of us to consider!

Getting back to large, but not ridiculously large antennas, it would seem, considering all the facts, best to stack the longest high efficiency yagies you can get your hands on. My

[*Continued on page 112*]

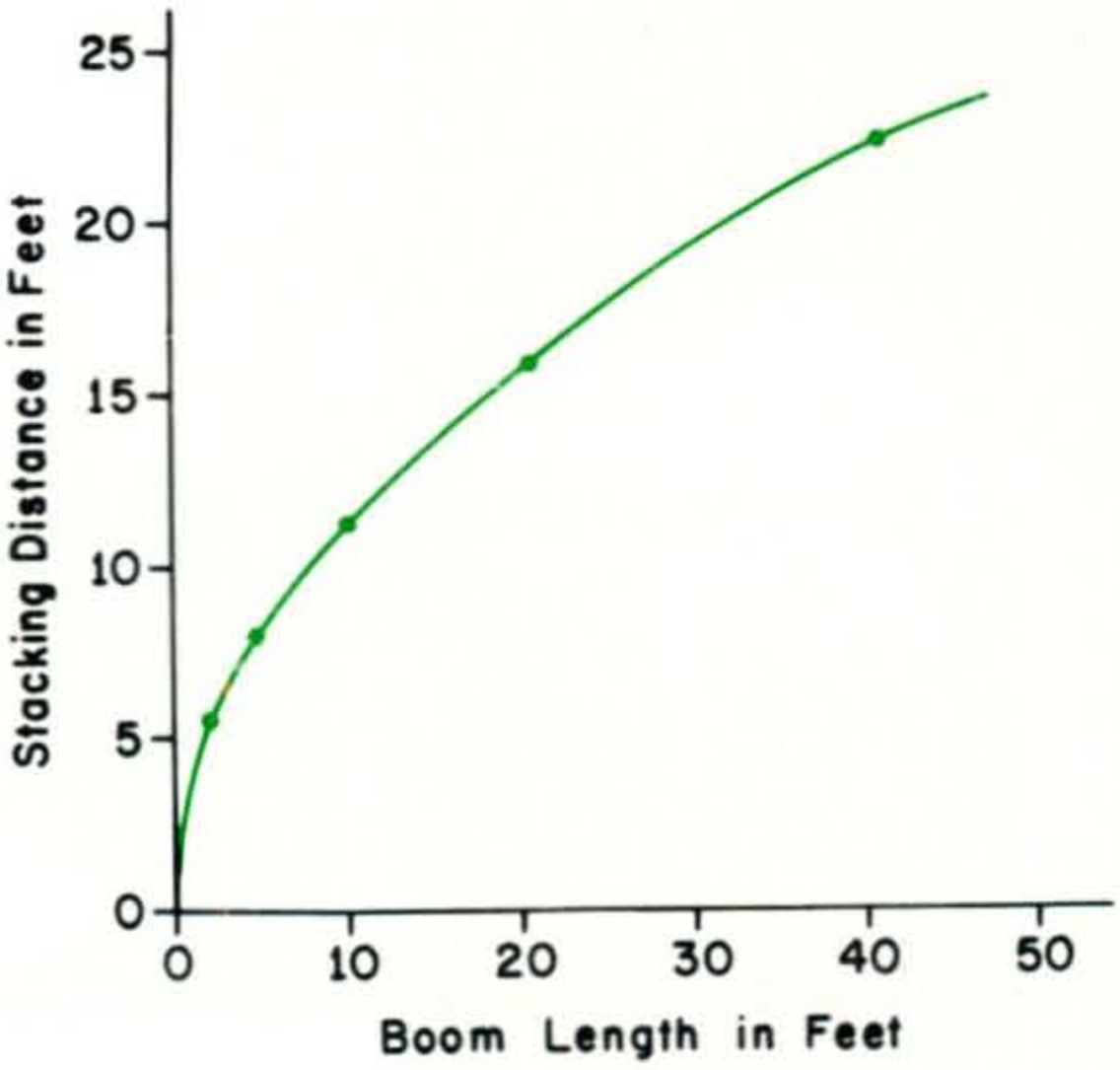

Fig. 2—Yagi stacking distance (aperture) vs. boom length.

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COSMIC NOISE IN 1920?

BY JORMA J. RIIHIMAA, *OH2YX

Did the amateurs of the 1920's receive radio bursts from the sun and Jupiter?

MANY radio amateurs are familiar with the Sudden Ionospheric Disturbance (S.I.D.). It is initiated by a solar flare, usually by one of high importance. The ultra-violet radiation from the flare produces excess ionization in the ionosphere. One of the results of the enhanced ionization in the lower ionospheric regions is the increased attenuation of the h.f. waves (Short-Wave Fade-out, S.W.F.).

Sometimes a simultaneous increase in the background noise level is experienced over the v.h.f. or h.f. regions, or both. This noise sounds like a more or less steady hiss. It is due to radio emission from a disturbed area in the vicinity of the flare, where charged particles get into violent motion. The phenomenon may be very clear because the "radio silence," which also includes the long-range atmospherics, usually starts a few minutes before the onset of the hiss. The attenuation is much more severe for the waves that propagate at low angles of elevation and long distances in the D-region, than for the waves from the sun that penetrate the ionosphere at a high angle.

* 3135 S.W. 42 Place, Gainesville, Florida.

It Has Happened Before

The SID's accompanied by h.f. solar hiss have been witnessed by radio operators for many years. It is probable that this is the way that solar radio bursts had been received before much knowledge existed of extra-terrestrial radio waves in general. It can be shown that the first reception of solar radio emission was technically possible even before the dawn of Radio Astronomy in the 1930's. Indeed, a closer study of the subject takes us directly to the mid-twenties.

In those early years the thermionic tube was relatively new, and the propagation of radio waves was not well understood. The short-wave radio was a great novelty, while its initial development, as is well known, was almost exclusively in the hands of radio amateurs.

The many interfering clicks and crashes and swishes that the early amateur heard in his earphones most probably escaped the attention. Most of the noise bursts that came all the way from the sun must have been buried in the multitude of secondary effects. It may be interesting, however, to reconstruct this period and show what the pre-discovery con-

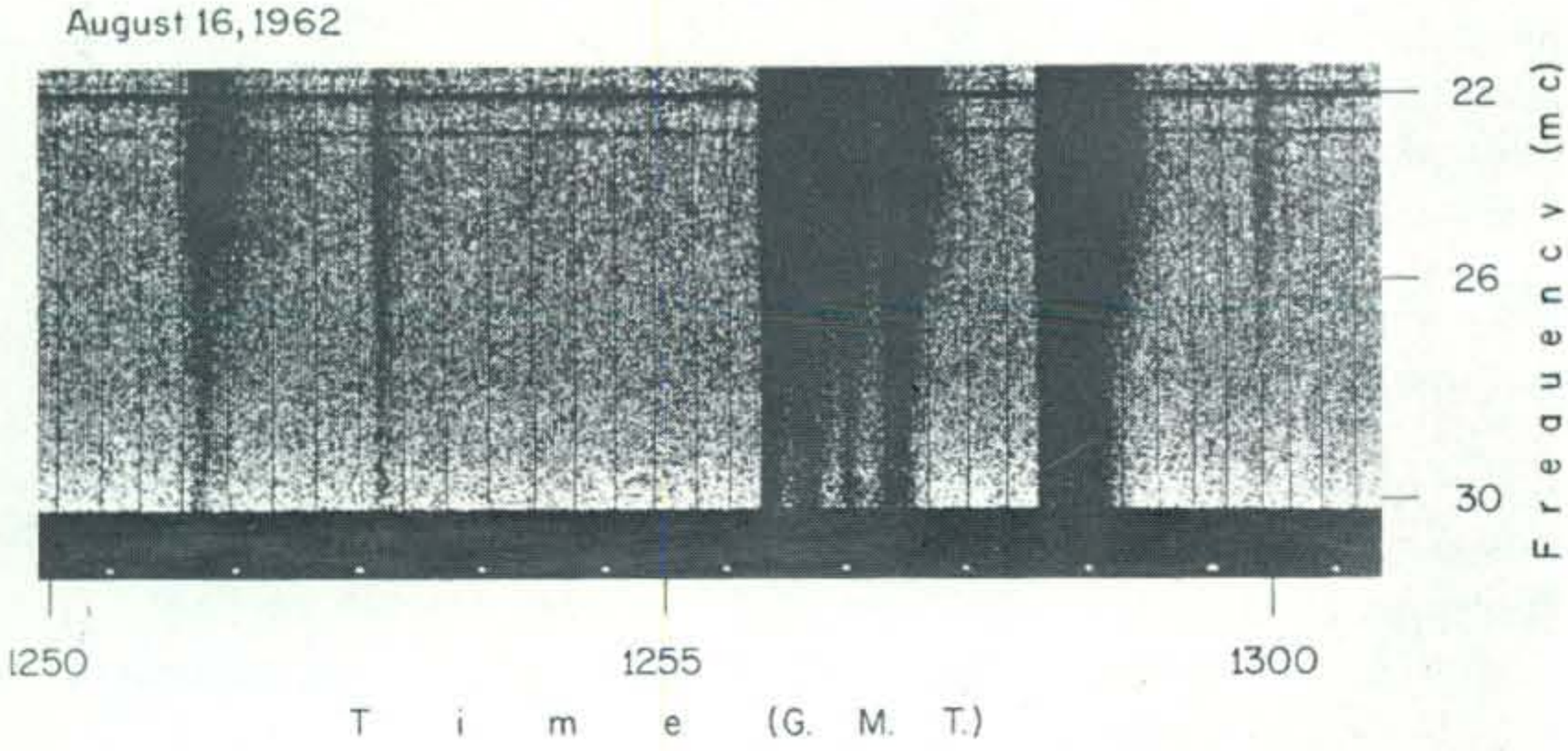

Fig. 1—Dynamic spectra of the fast-drift, or Type III, solar bursts, as observed in the decametric wavelength region. The time increases horizontally from left to right and the frequency vertically from top to bottom. Increase in the noise level is indicated as blackening of the record. *(University of Helsinki record)*

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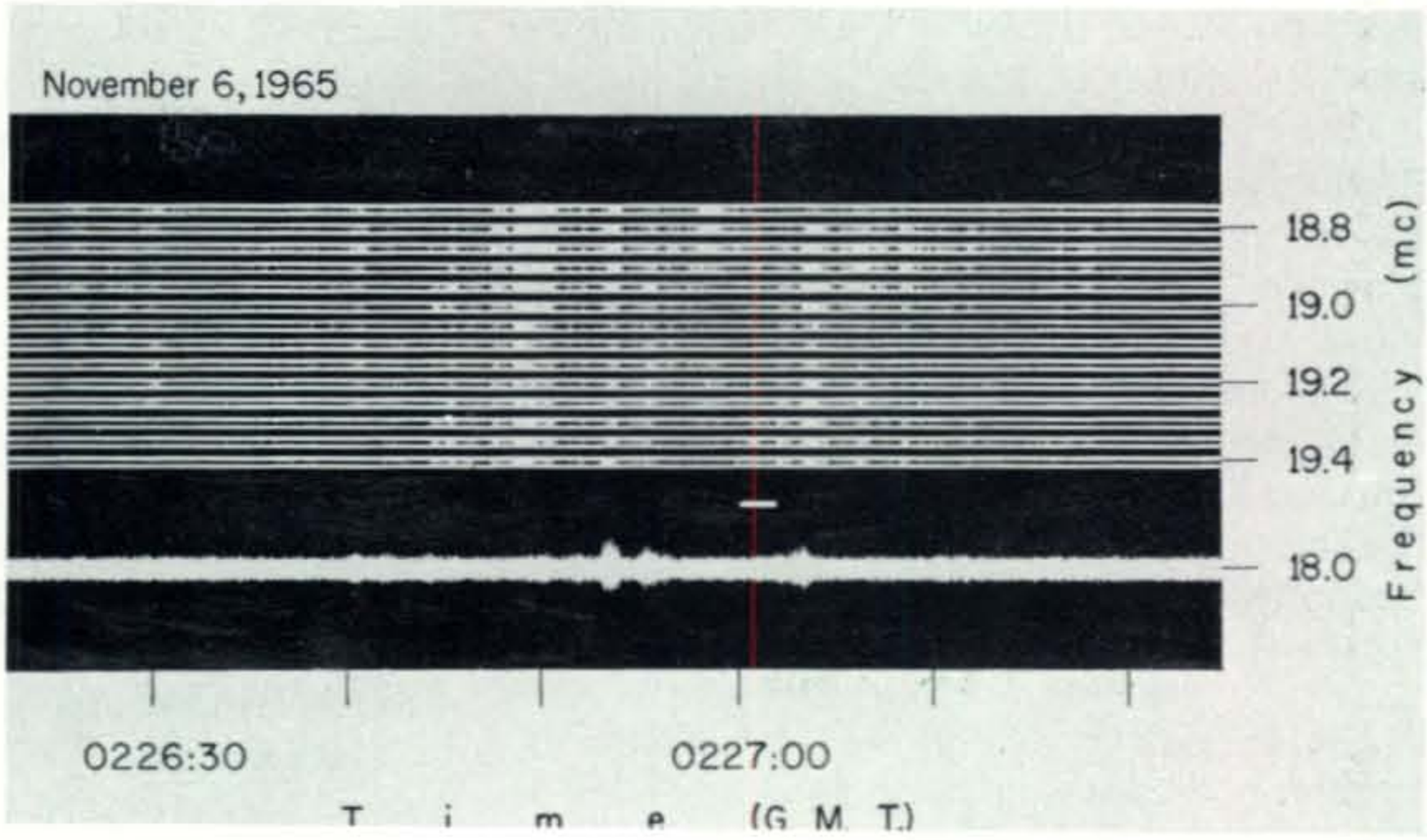

Fig. 2—High-resolution multi-channel records of radio bursts from the planet Jupiter. Fourteen channels spaced by 50 kc intervals, are recorded. The closing track denotes increase in the noise level with time at the appropriate frequency. At the bottom is a single amplitude-modulated trace. This is produced by an early 3-tube short-wave receiver, kept in regeneration and connected to a simple antenna. *(University of Helsinki record)*

ditions were to receive radio bursts from the sun, as well as from the planet Jupiter.

Noises from Sky . . . and the Regenerative Receiver

The short-wave receiver of the 1920's consisted of Armstrong's regenerative triode detector followed by one or more audio-frequency amplifying stages. As the old timers vividly remember, such a receiver can be highly sensitive. If used in regeneration, as was always done in order to read unmodulated signals, it was actually capable of amplifying the input circuit noise to an audible level. Increases in the input temperature by as little as 10,000 °K could be detected aurally. This was proven by the author in experiments with an early type of short-wave receiver and a noise generator.

In the decametric wavelength region the antenna temperature due to the sky noise is of the order of 10^5 °K. The level of bursts from the sun, however, may considerably exceed this figure. A major solar radio event may produce a peak flux which is so high that the equivalent excess antenna temperature may reach the value of 10^6 °K or more, even in the case of antennas having very low directivity. In such a case the aural detection threshold could have been exceeded even with poor antenna matching.

A major event, however, is a relatively infrequent phenomenon. The most common type of solar event in the decametric wavelengths is the so-called fast-drift, or Type III, burst. It is a noise burst which starts at a frequency of a few hundred mc and drifts towards lower frequencies with increase in time; in the decametric region it usually drifts an octave in a second or so. Shown in fig. 1 are the dynamic spectra of the decametric extensions of such bursts, recorded by the author at the University of Helsinki, Finland. If received on a constant decametric wavelength, the Type III burst manifests itself as a rapid rise in the noise level, followed by a slower decay. The burst lasts from a few seconds to a minute or so.

Expectancy of Detection

We may compare, say, the periods of 1925-26 and 1961-62. They are of different phases of solar cycle but have, on the average, similar sunspot number readings. The sunspot number is a general indication of the solar activity and tells us the approximate expectancy of solar radio bursts.

From the decametric spectral observations during the latter period, carried out by the author, and from other published solar activity data it is estimated that the occurrence of bursts producing million-degree temperatures in simple antennas in 1925-26 probably was of the order of a few per month, most of them Type III bursts.

Breakthrough

The vertical penetration of the ionosphere is possible only at frequencies higher than the critical frequency of the F_2 region, f_0F_2. With other angles of incidence penetration is possible only at a frequency which is approximately equal to, or higher than, f_0F_2 times the secant of the zenith angle of the downcoming wave. The penetration frequency can be estimated for the past years from the knowledge of the ionosphere we now have. In the daytime in the mid-twenties it most

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probably varied between 5 and 10 mc for the average altitude of the sun.

The rush into the 40 meter region in 1924-25 thus gave a few chances of penetration of the terrestial ionosphere by external signals. However, the daytime ionosphere is much more transparent in the 20 meter region, which was also being explored by growing numbers of amateurs at that time. It is therefore most probable that all the conditions for the reception of solar radio bursts were satisfied in the mid-twenties.

Signals from Jupiter

Let us now consider the planet Jupiter. Jupiter is a sporadic radio source, and it is the strongest emitter on decametric wavelengths after the sun. The maximum peaks of Jovian decametric bursts may reach the level of the total sky noise.

After 1925 Jupiter was moving northwards in the ecliptic. During its oppositions in the late twenties it appeared above the radio horizon in the northern hemisphere at night.

Arguments similar to those for solar bursts are less obvious for bursts from Jupiter. Therefore, a series of direct experiments was undertaken by the author in connection with a routine spectral recording program of Jupiter's decametric radiation and was carried out at the University of Helsinki, Finland.

A Direct Test

A 3-tube receiver consisting of a regenerative triode detector and two transformer-coupled audio stages, all tubes of type 30, was tested. A half-wave dipole was inductively coupled to the grid circuit of the detector. Although such an antenna was not popular in the early days of radio, its directivity is not much different from that of other simple types of antennas formerly used.

An oscilloscope was connected to the plate of the third tube of the regenerative receiver to deflect the spot of the c.r.t. display vertically, while it was photographically recorded by a film which was in fast horizontal motion. The test set was tuned to 18.0 mc and the regeneration capacitor was adjusted to just let the receiver oscillate. The dipole was slightly detuned for easier regeneration. The recording was done in parallel with a routine recording of Jupiter's decametric radiation for which purpose a 14-channel radio spectrograph was used.

Results

In fig. 2 a multi-channel record is reproduced. The tracks are photographed from the outputs of a comb-type i.f. amplifier, the channels being spaced by 50 kc intervals. Each channel gives an area-modulated record; the closing track denotes increase in the noise level.

At the bottom is a single trace, which is the record of the noise output of the regenerative receiver at 18 mc. The bursts appear as noise increases also in this record. However, not all Jovian bursts have bandwidth of as much as 1 mc, and therefore the 18 mc trace and the multiple tracks on 19.1 $\pm$ 0.3 mc do not necessarily exhibit one-to-one correlation.

The experiment with this early type of receiver was repeated on several nights from October to December, 1965. It was always aurally monitored while its output was being recorded. All the events recorded from the 3-tube receiver were also recognized in the earphones as distinct and characteristic "swishes," typical to Jupiter bursts, lasting most often for a second or so. Such noise bursts appeared by the dozen during a noise storm, and some of them produced an increase in the noise level of 6 db or more.

The power spectrum of Jupiter's decametric emission promises more flux with increasing wavelength, and it may therefore be presumed that unrecorded early receptions of bursts from Jupiter had taken place starting perhaps in the late twenties. These experiments also indicate that the level of antenna temperature from which the solar bursts could have been detected was less than a million degrees.

It seems most likely that many radio amateurs and short-wave listeners received solar and possibly Jovian radio bursts, but were unware of their origin. These incidents took place a few years before Jansky's and Reber's pioneering work in Radio Astronomy.

Early Literature

There are records of very early attempts to detect solar radio radiation. Shortly after Heinrich Hertz discovered radio waves, several physicists got such an idea. The most significant of these experiments were those carried out by Sir Oliver Lodge and Ch. Nordmann, around 1900. All of these experiments failed due to the insufficient sensitivity of the wireless equipment of the time.

It is one of the surprises of the history of science that the whole idea of performing more such measurements was completely forgotten thereafter. Two and half decades later

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the technique was good enough for such measurements, but the physicists seemed to have lost all the interest. Only some radio amateurs unknowingly received solar radio waves, which Lodge and Nordmann had tried so hard to discover.

In an extensive search of the radio literature of 1925-1932 the author has found only one interesting pre-discovery statement, which appears in an article by R. K. Potter in 1931: "Exceptional cases have occurred at times when 'rain static' or atmospheric noise of a hissing character is in evidence." The 'atmospheric noise of a hissing character' almost certainly was solar in origin.

In 1932 Karl G. Jansky published his study of h.f. atmospheric noise, which reveals the existence of an extra-terrestrial noise component. Jansky's studies inspired Grote Reber, W9GFZ, to start his famous experiments, which led to the birth of Radio Astronomy. ■

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Annual WCARS Meeting Draws 150 Members

THE West Coast Amateur Radio Service held its third annual meeting on January 6, 1968, during the SAROC convention at Las Vegas, Nevada. 150 members were in attendance at the session headed by incumbent President Ed Conroy, WB6LIS, Oakland, Calif; Secretary Mary Coggins, WA6VIB, Canoga Park, Calif; Treasurer Ed Gribi, WB6IZF, King City, Calif.; and Net Coordinators Lyle Carpenter, W6KVQ, Ukiah, Calif., and Bayley Dorris, WB6DBS, Pacific Grove, Calif. Nearly 900 amateurs from all over the U.S. attended the Sahara Amateur Radio Operators Convention at the Hotel Sahara.

Members and hundreds of other participants from all over the West monitor 7255 kc all day every day for the purpose of providing a clear channel for fast breaking emergencies and a calling frequency for all manner of routine services. For instance, more than 60 unreported highway accidents were called in on the frequency in 1967 for relay to authorities. Value and acceptance of the Service is indicated by its more than doubled membership in one year. Helping to pass the 500 mark during the meeting were distinguished new members J. A. Gmelin, W6ZRJ, Cupertino, Calif., ARRL Pacific Division Director; and J. R. Griggs, W6KW, Granada Hills, Calif., Southwestern Division Director.

(Ed Gribi, WB6IZF)

Shown operating the official station of the Sahara Amateur Radio Operators Convention at the Hotel Sahara, Las Vegas, Nevada, January 4-7, 1968, are Lee Miller, WA7AEL, Las Vegas; and Wayne Nail, WB6CBW, Fremont, Calif. The station was set up and manned by members of the West Coast Amateur Radio Service, the 500 member group that monitors 7255 kc all day every day for the purpose of providing a clear channel for emergencies and a calling frequency for routine services. The fancy insignia on Wayne's jacket and the wall poster is a replica of the red, white, and blue decal that WCARS members sport on their mobiles.

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AN IMPROVED DUAL BAND MOBILE ANTENNA SYSTEM

BY JAMES E. TAYLOR,* W2OZH

The antenna system described provides superior radiating characteristics by a direct extension of the commonly known principles of operation of loaded whip antennas.

FOR a mobile enthusiast of some fifteen years ago, recently returned to the fold, two observations concerning present day mobile operation came to mind: (a) The modern single-sideband equipment is more effective than that of the old a.m. "daze" by at least a factor of ten. (b) The loaded whip antennas have remained essentially the same down through the years.

Confirmation of this latter observation may be found by referring back to articles in *CQ* Magazine under the authorship of the late George Brown.[1] In those articles, and elsewhere, the advantages of a whip antenna with a high-*Q* center loading coil for low frequency use were emphasized.

It is the purpose of this article to review some of the important principles involved in the design of such antennas and then to extend these principles along logical lines for improved radiation characteristics. The antenna to be described is for the 40 and 80 meter bands, but the principles will apply to any bands where center-loading is appropriate.

General Principles

The center-loaded whip antenna system can be divided into four significant parts: the base section, the loading coil, the top section, and the feed system.

The principle radiative part of the antenna is the base section. In operation, the loading coil is tuned by the series capacitance of the top section to form a series resonant circuit so as to maximize the current and voltage at the base and top sections, respectively, thereby maximizing the power radiated.

The radiation resistance (which corresponds to radiated power) of such a system is rather low. In order to reduce losses the r.f. resistance of the base section and of the ground connection, where a current loop exists, should be as low as possible, and the *Q* of the coil should be as high as possible.

The top section has an r.f. voltage loop which is complimentary to the current loop in the base section. The area of this top section provides the capacitance which series tunes the coil to resonance. This capacitance is usually adjusted by changing the length of the top section, but the tuning adjustment can be accomplished equally well by varying the size of a piece of metal foil, or by changing the location of a wheel-like top-hat connected to the top section. It is important that the dielectric and corona losses in this voltage-loop section be kept small, just as the resistance losses in the current loop section must be kept small. It is also important that the tuning capacitance be located relatively far from the coil to avoid shunting or parallel tuning of the coil.

The loading coil may be a source of losses, both dielectric and resistive, since its two ends have high voltage and high current, respectively. Therefore, it is desirable to decrease the coil inductance while retaining its high *Q*. This is sometimes accomplished by the addi-

* 1257 Wild Flower Drive, Webster, New York 14580.

1 George Brown, W2CVV; *CQ*, ca. 1948.

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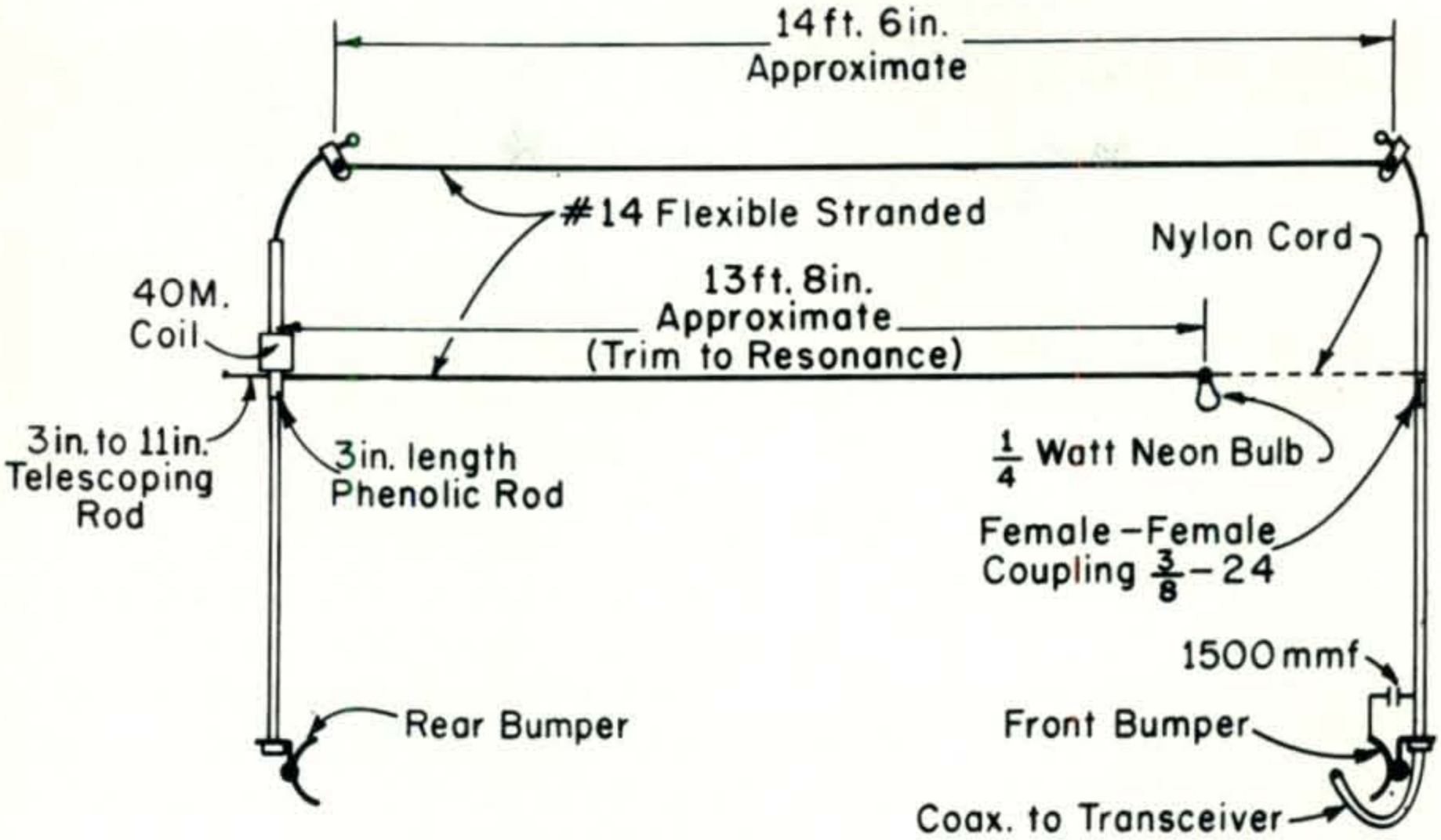

Fig. 1—Sideview and dimensions of a dual band mobile antenna system. The 40 meter coil used is a Master Mobile Ultra High Q unit. The base of the 40 meter coil is insulated from the rear bumper support by a 3" length of phenolic rod. The horizontal voltage section is connected to the coil base with a 3" to 11" telescoping rod that can be used for fine resonance adjustments. The ¼ watt neon bulb on the end of the lower voltage section should be insulated from the wire as explained in the text. For 40 meter operation, the coil is shorted out, the 13' 8" wire is replaced with a 6' 5" wire and the 1500 mmf capacitor is removed from the feedline.

tion of a capacitive hat on the top section so that resonance can be attained at the desired frequency with a coil having lower inductance and, therefore, lower losses.

Since the feed point resistance (including radiation resistance and loss resistance) of such a resonated whip antenna system is quite low, it may be necessary to add an impedance matching network at the base of the antenna in order to realize an effective feed system. It is desirable to have this feed system simple and relatively in the clear, to minimize losses. In practice, it is sometimes more efficient to tolerate some mismatch rather than to add the losses which accompany the introduction of a more elaborate network.

The above general principles are well known and they are reviewed here only so that the following description of the evolution of an improved system may be more readily followed.

Basic Design Approach

As was pointed out above, one method of reducing coil losses involves the use of a greater capacitance in the top section of the loaded whip. A second method of decreasing the required inductance is by increasing the length of the base section which carries high r.f. current. Both methods tend to improve radiation efficiency directly and, in addition, the losses in the coil are reduced because of its lower inductance. In effect, both methods tend to increase the dimensions of the radiating portion of the antenna while decreasing the length of the coil, which is an inefficient radiator. The potential result is a substantial net improvement in the efficiency of the antenna system.

If we consider the configuration of the conventional eight-foot whip antenna comparing it with the horizontal dimensions of the automobile supporting it, we quickly reach the conclusion that additional space is available. Since, for the low frequencies, we need all of the radiating space that we can get, interesting possibilities begin to suggest themselves.

System Arrangement

Let us first consider the effect of lengthening the base section of the whip. This will be a non-critical procedure since it involves increasing the radiating current loop, analogous to adding wire near the center of a dipole antenna. Since this makes the antenna systems resonate at a lower frequency, we must tune the top section for a higher frequency by removing capacitance, if the coil

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inductance remains constant.

Alternatively, we may accomplish the same result by using a smaller coil inductance, a move in the right direction.

Let us assume that the base section of the whip is mounted on the front bumper of the car; how can we conveniently increase its length? One obvious direction is to extend this length upward and then in the rearward direction to the top end of a bumper-mounted vertical coil support on the rear bumper. Don't worry about the turn from the front bumper-mounted section to the horizontal section; the r.f. current negotiates curves in fine style.

We have now increased the length of the radiating base section substantially, (#14 flexible stranded phosphor bronze control cable between two standard bumper-mounted supports works well) and we can conveniently mount the coil on the rear support, with its upper vertical whip section directly connected to the horizontally extended base section. Remember, however, that we planned to decrease the coil inductance. Therefore, we use a low inductance loading coil designed for the 40 meter band.

Next, let us consider the voltage section of the antenna. For this we need increased dimensions with a corresponding increase of capacitance. In order to avoid additional bumper mounts, it is convenient to extend the voltage section from the lower end of the coil, insulated from the vertical support rod forward toward the front bumper-mounted rod, thereby completing our folded configuration. The free end of this voltage loop section is insulated from and supported by the front vertical rod.

Construction

The constructional details will be made clear by referring to the photograph and to the diagram, fig. 1.

The ends of the horizontal top wire are secured by solder lugs under screws through stainless strap clamps which pass around the vertical whips near their tops. The whip rods are flexed inward over the car to maintain tension on the wire so that the motion of the whips is stabilized.

The horizontal voltage section of the antenna is supported by a large solder lug at the bottom end of the coil. After trimming to resonance, the forward end of this wire is supported in a level position by an insulating nylon cord from the front bumper-mounted rod.

The coil, which is mounted atop the rear bumper-mounted rod, is the Master Mobile Ultra High Q 40 meter unit. (Any high *Q* 40 meter loading coil should prove satisfactory, with some compensating adjustment of the capacitance of the voltage section of the antenna.)

Adjustment

The system is tuned to resonance in the 80 meter band by changing the length of the voltage section. Initially, temporary experimental tuning can be aided by means of a rectangle of aluminum foil connected to the top section by alligator clips. (Incidentally, a convenient comparative indicator of r.f. field strength is a small neon bulb attached to the voltage end of the antenna. The bulb must *not* touch the wire, as the output from an HW-12A is enough to puncture the glass. This indicator is particularly suited to evaluation of coupling systems where losses may erase the beneficial effects of improved impedance match.)

The resonant frequency was determined by changing transmitter frequency while measuring reflected power on an s.w.r. bridge. The minimum indication of reflected power coincides with the resonant frequency of the antenna system. When the antenna system was fed directly by coaxial cable, with no matching network, an s.w.r., at resonance, of approximately 3:1 was measured. The addition of a capacitance of 1500 mmf directly across the coax at the feed point was found to be sufficient to reduce the s.w.r., at resonance, to under 1.1:1.

The length of the voltage section was trimmed to give a resonant frequency of 3950 kc. With this center frequency the s.w.r. rose to 2:1 at 3970 kc, and at 3920 kc. There is no important decrease in field strength for a s.w.r. as high as 2:1. Here we see that the bandwidth of this antenna system is much greater than that of a short whip. Also, the match is sufficiently good to obviate the need for an inductive matching system with its attendant losses. Judging from the excellent match obtained, it would appear that the radiation resistance is higher than that of a short whip.

Since we have of-the-order of ¼ wave length of conductor length for 40 meters, it is obvious that the system can be used on that band as well as the 80 meter band. For

[*Continued on page 120*]

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Compare these prices, and then decide and schedule your trip to the ham fest. You will obviously save enough to more than pay for the cost of your week-end. To those unable to make the show, write in to us. The same deal is yours; just mention the Swampscott Ham Fest Special, and tell us what you have to trade, or otherwise make remittance and we'll see to it that the best deal is available to you, too.

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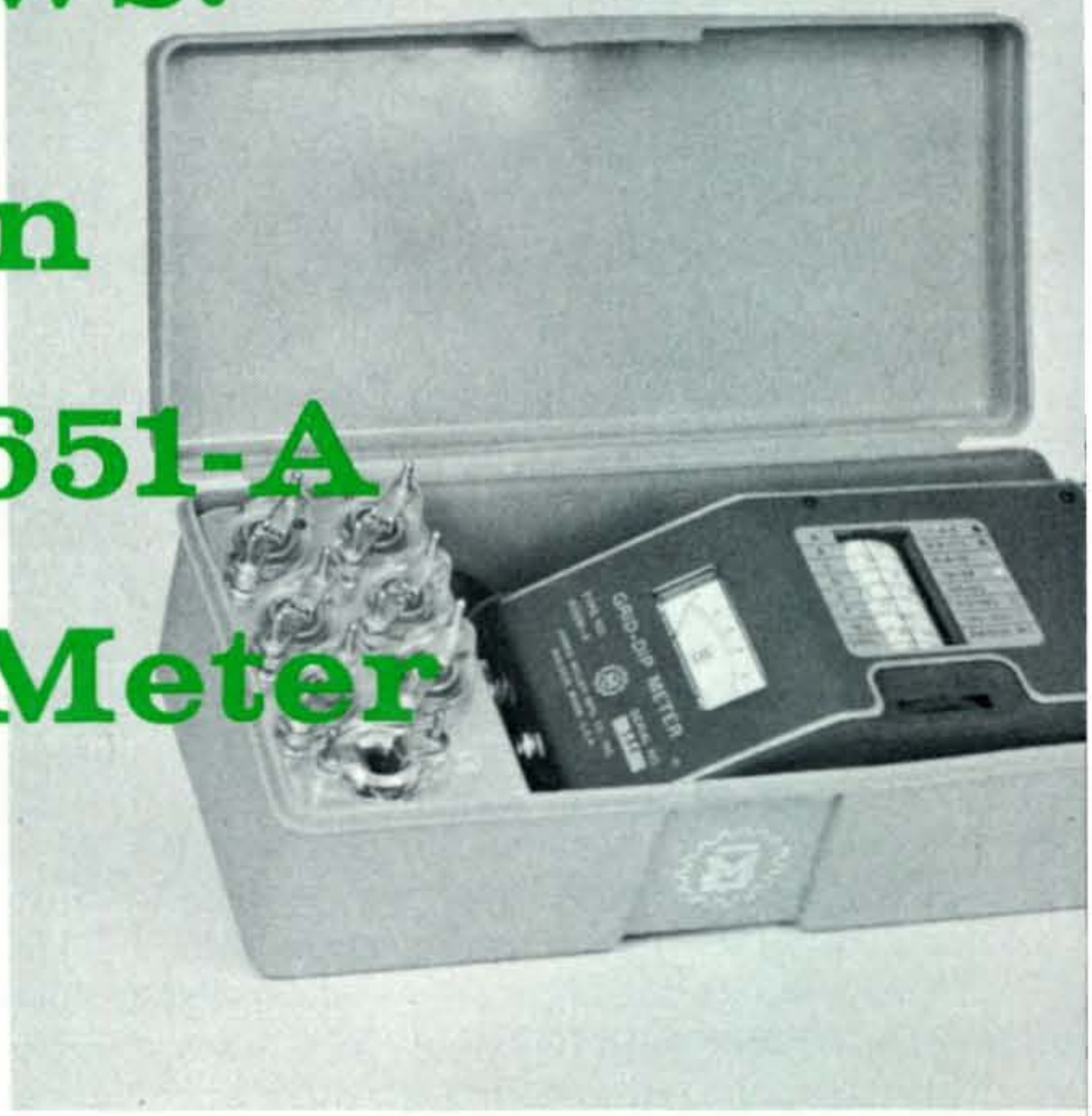
CQ Reviews:

The Millen Model 90651-A Grid-Dip Meter



BY WILFRED M. SCHERER,* W2AEF

SOME two decades ago the Millen Model 90651 Grid-Dip Meter was the first high-quality commercial instrument of its type to appear on the market "designed for performance" with such features as: built-in meter, self-contained power supply, one-hand operation, sturdy construction and with accurate calibration for use over the 1.7-300 mc range, supplemented with optional inductors for 165 kc to 2 mc coverage. It has since become a standard for use by both amateurs and engineers in the shop or laboratory, as is attested by the tens-of-thousands now in service.

The writer has been fortunate in having one of the early Millen units which through the years has provided yeoman's service. Although it is pretty well battered from hard usage in the shop, lab, field and at antennas, including having been dropped from considerable heights, it has maintained its calibration and excellent performance. Nevertheless, we thought it might be nice to have a spanking new unit, so one of the latest versions, the Model 90651-A, was obtained which, besides, has some additional features. We'd like to tell you about it.

* Technical Director, *CQ*.

Details

Generally, the physical appearance and size of the Model 90651-A is the same as the original production, the only noticeable outward changes being an oblong-shaped window for the meter, two control knobs and a steel-gray color instead of black.

Electronically, the standard g.d.o. circuit is still used with a vacuum tube and a.c. operation, but the principle change is the inclusion of a transistorized dc. amplifier which provides greater meter sensitivity, making it easier to observe dips that might otherwise be obscure when good coupling to the test circuit is not possible, or where circuit Q's are low. The higher sensitivity also permits an adequate meter reading to be obtained when the instrument is used as a diode detector on active low-power circuits such as those involved with transistors or harmonics.

Another feature is that the grid-current meter has a taut-band suspension movement

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and is thus not susceptible to sticky operation or to damage by mechanical shock.

A sensitivity control permits initially setting the meter for a high-scale reading during g.d.o. operation or for maximum sensitivity as may be needed with diode-detection or absorption-wavemeter type use.

A second control is used for the a.c. power on-off and to change the function between the diode or oscillate mode. There also is the usual headphone jack for detection in the oscillate mode.

Active Oscillator-Element

In case you're wondering why the job was not made an all-solid-state affair, it might be pointed out that although completely self-contained battery operation might enhance convenience, there are several limitations imposed by a solid-state oscillator in this application.

First of all, we have yet to see the performance of such a g.d.o. match that of the vacuum-tube counterpart. Because of the low power and the generally lower-*Q* circuit involved, adequate coupling and positive dip indications are not always readily obtained. Furthermore, the low-power level limits some uses for the instrument as a signal source particularly where it may be so needed for checking circuit *Q* or for driving an r.f. bridge for which a g.d.o. is often employed. Also, the transistor may possibly be damaged during operation around high-level r.f.

Other Features

As with the original model, the plug-in inductors are protected with plastic sleeves. They are each identified by color, by a letter and by the frequency range. These are correlated with similar identifications at the dial fiducial, making it easy to quickly determine the frequency readout. V.h.f. operation is optimized using a silver-plated inductor.

One-hand operation is permitted by a knurled thumbwheel that may be operated by the hand holding the instrument. This wheel drives the tuning capacitor through a spring-loaded reduction gear for smooth tuning. It also drives a drum dial on which each scale is the same length with plenty of incremental calibrations between the major points. There also is a 0-10 logging scale. Seven frequency ranges are used to cover 1.7-300 mc.

Should battery operation be desired, connections to the instrument may be made through a small hole in the case that is normally capped with a snap-on plug. The instrument case is copper-plated on the inside ensuring good ground paths and contacts, shielding and elimination of internal resonances which, together with proper r.f. filtering of supply leads, eliminates unwanted spurious dips.

The Model 90651-A is supplied with a handy polypropylene carrying case equipped with a handle. It not only contains the instrument itself, but it also has space for a removable stand that holds the inductors. The size of the instrument (less plug-in inductor) is 7¼" long × 3½" wide × 3¼" high and it weighs 3 pounds. The case is 11⅜" × 5" × 3¾". Total weight of case plus instrument, stand and inductors is 4¼ pounds.

Functions

Although the basic functions of the grid-dip meter, as an almost indispensable tool with r.f. circuit work, are fairly well known, they are reiterated as follows:

1—As a grid-dip oscillator to determine the resonant frequency of de-energized r.f. circuits.

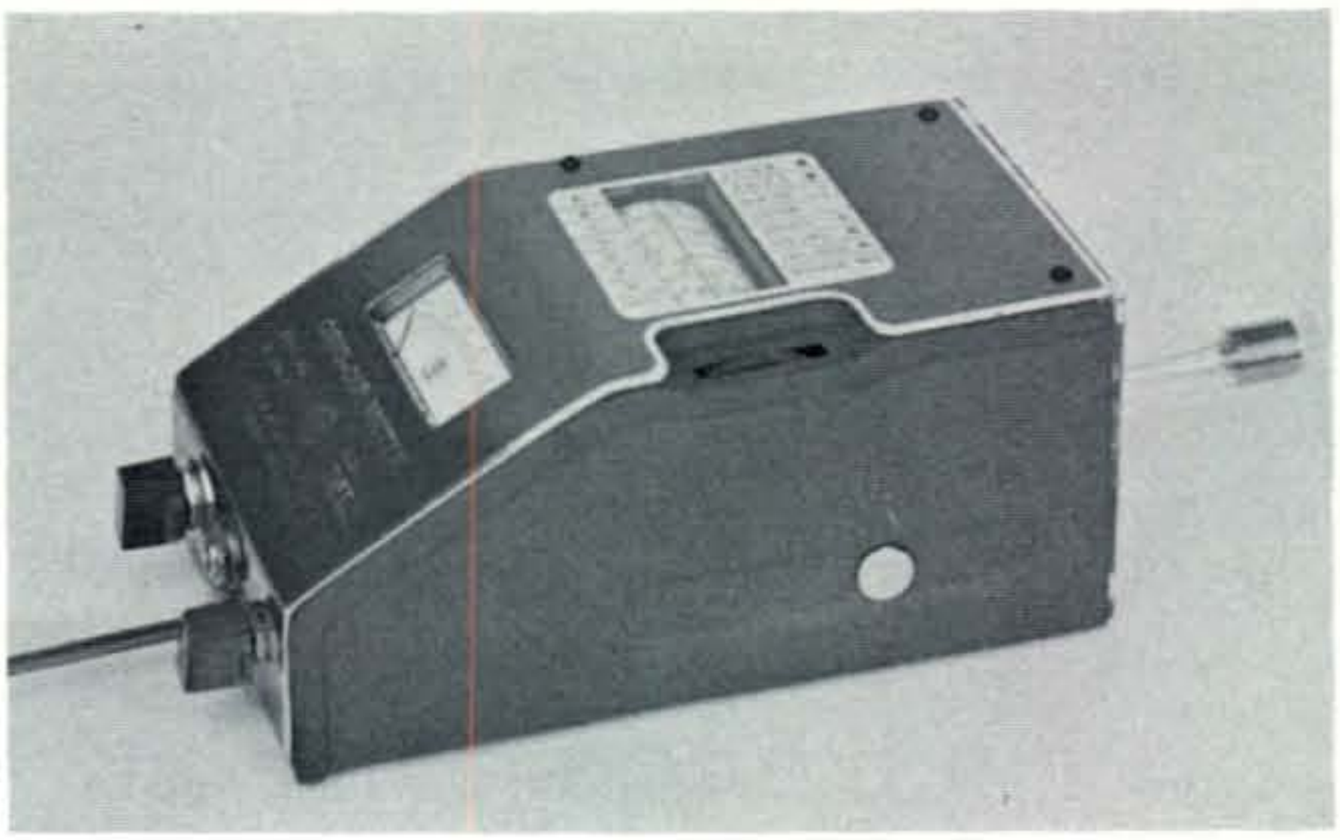
2—As an oscillating detector for determining the fundamental or harmonic frequencies present in energized r.f. circuits.

3—As a tuned diode or non-oscillating detector for use as an absorption-type frequency meter and r.f. indicator on energized circuits.

4—As an r.f. signal source.

Further details on the grid-dip meter and its various applications are given elsewhere in this issue

[*Continued on page 122*]



The Millen Model 90651-A G.D.O.

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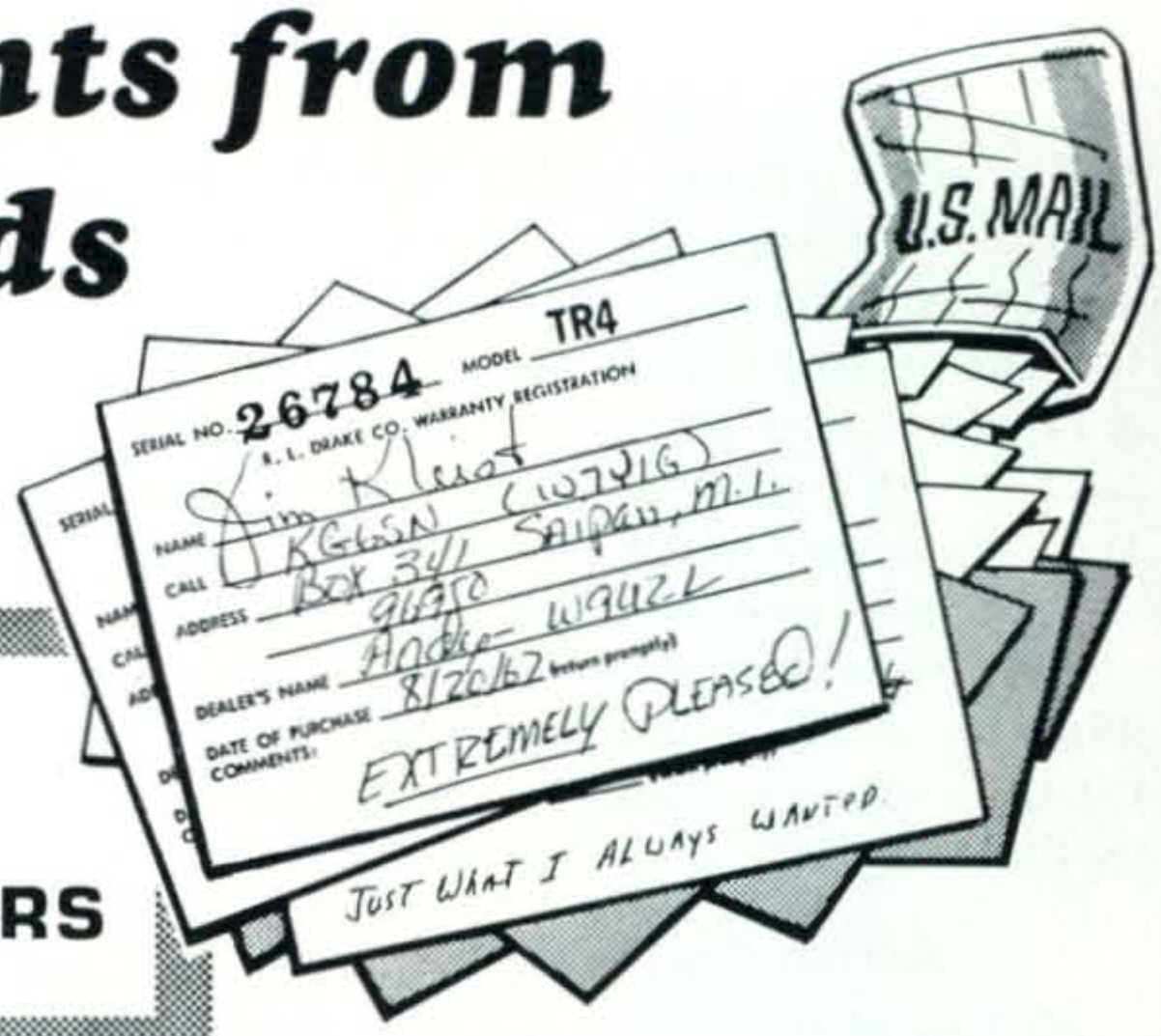
Some comments from warranty cards by owners of



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Joe Braz Ribeiro, PY4UK
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"A very F.B. piece of equipment. Audio very nice, especially on SSB, which is rare."

Thomas F. Totten, Jr. WB2GZR
Saratoga Springs, N. Y.

"Running it with a Mosley "Classic" beam and proves a most fine and nice transceiver. Really proud of it."

Orlando Escudero O., CE-3-OE
Santiago, Chile

"Looks good—sounds good—very well pleased with performance."

Wayne M. Sorenson, WAØETL
St. Paul, Minn.

"Have had Drake 2-B for three years. Knew that TR-4 was same Good Stuff."

Charles E. Bishop, WA8FTT
Columbus, Ohio

"Just what I always wanted."

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Harold A. Zick, WA9IPZ
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"Excellent equipment."

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"I'm sure this, like the other Drake equipment I have, is the finest money can buy. YOU MAY QUOTE ME ON THAT."

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Jerome D. Lasher, W2RHL
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"Replaces my TR-3."

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Milton C. Carter, W2TRF
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Milton C. Carter, W2TRF
Lakewood, N. J.

"Well pleased."

Rev. James Mohn, W3CKD
Lititz, Pa.

"I am delighted with Drake gear. This is the second of your transceivers for me. I have used a TR-3 in my car for about 2½ years—only trouble: replacing a fuse!"

Guy N. Woods, WA4KCN
Memphis, Tenn.

"Ask the ham who owns a Drake TR-4"

. . . or write for details . . .

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A Continuous Motion Narrow Band Television System

Part II

BY SID DEUTSCH* AND RAYMOND SIMPSON,† WA2PYX

In Part II of this three part series, the principles of a narrowband continuous motion television system for amateur use are further developed to determine the necessary characteristics for the transmitter and receiver. Also listed are a set of proposed standards. Part III (just added) covers construction.

THE circuit area basic to any TV transmitter is the timing chain. As shown in fig. 5, the backbone of the 3.1 kc bandwidth TV transmitter is a timing chain that starts with a 6144 c.p.s. square wave and counts down to a 3 c.p.s. square wave. The clock oscillator frequency should be accurate to within 0.01% to minimize synchronization problems at the receiver. A tuning-fork oscillator may be used for this purpose.

As shown at the right side of fig. 5, the timing chain supplies various transmitter functions:

Blanking: The camera and monitor beams are blanked out during dot hops and also during vertical and horizontal retrace periods.

Sampling: The composite video signal of fig. 4 is sampled by narrow (0.016 msec) pulses. The sampling pulse generator should be driven by a variable-delay multi to enable optimum positioning of the sampling pulses. Sampling is done in a balanced-modulator type of circuit in which the 6144 c.p.s. sampling pulses act as an "r.f. carrier." The signal of fig. 4 is fed in via a coupling capacitor that removes any d.c. component. The output consists of positive 6144 c.p.s. pulses when the signal of fig. 4 is positive and negative pulses when the input is negative; on an average, positive and negative areas are equal so there is no output component at 6144 cycles. In practice, carrier suppression is never perfect, and we find that it is advisable to add a trap at 6144 c.p.s.

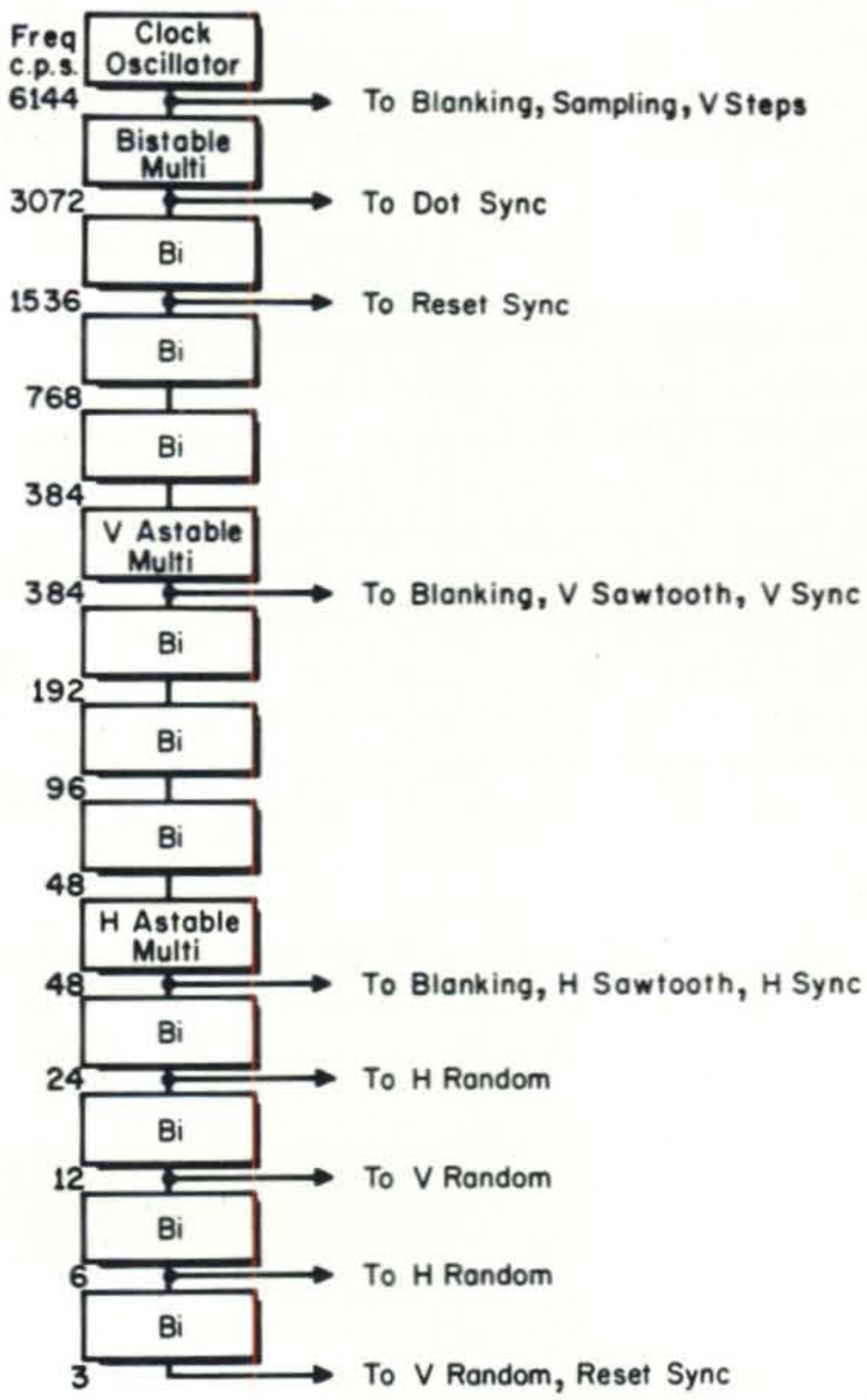

Fig. 5-Block diagram of a transmitter timing chain for a continuous motion narrowband TV system.

* Polytechnic Institute of Brooklyn, 333 Jay Street, Brooklyn, N.Y. 11201.
† 22 Carlisle Place, Merrick, New York 11566.

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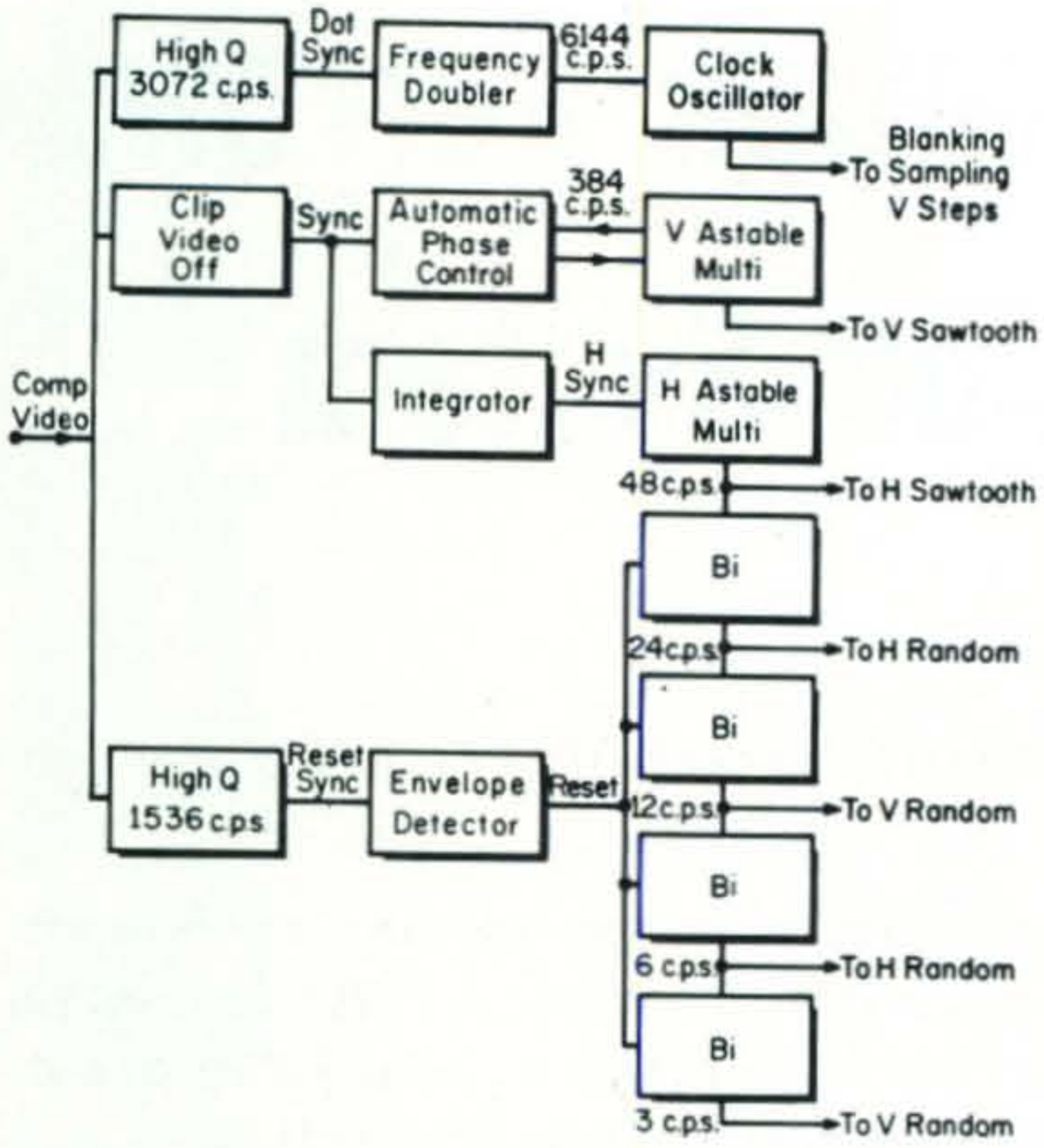

Fig. 6-Block diagram of the receiver timing section for a narrowband TV system.

V Steps: The vertical deflection steps of fig. 2(B) are generated by adding 6144 c.p.s. triangles to a conventional 384 cycle sawtooth. The flat steps occur when the triangle and sawtooth slopes are equal and opposite. The triangles are easily derived by integrating the 6144 cycle square waves.

V and H Deflection: Because of the pseudo-random square wave components, the vertical and horizontal deflection circuits must be capable of operating at 3 and 6 cycles, respectively. If the camera uses magnetic deflection, transistor drivers can supply the high currents that are needed, without transformer coupling. The d.c. components are easily blocked by means of low-voltage high-capacitance electrolytics. The flyback voltages are reasonably small at the lower sweep frequencies that are involved.

The 3.1 kc Receiver

It may appear that the transmitter bistable chain of fig. 5 can also be used for the receiver, so that we need only synchronize the 6144 cycle clock. This proposal is not valid, however, because each counter stage tells the following stage when to switch, but does not tell it whether to switch from 0 to 1 or from 1 to 0. This additional information must be supplied by means of a reset pulse. To reset the entire chain, the reset pulse has to be extremely narrow (less than 0.16 msec to reset the first bistable multi) and is must have a repetition rate of 3 c.p.s. It would be impossible to distinguish this reset pulse from noise spikes. To avoid these difficulties, separate vertical and horizontal sync pulses are used, as previously noted.

The receiver timing section is depicted in fig. 6. The right-hand column consists of blocks that are common to transmitter and receiver.

The composite video signal carries its own vertical and horizontal blanking, but the 6144 c.p.s. dot blanking must be restored, as indicated, so that the monitor beam will be turned off during dot hops.

The H sync integrator introduces a time delay of about 0.3 msec in the synchronization of the H astable multi, so that the horizontal retrace period in the receiver should be reduced to 0.7 msec.

Proposed Standards

The reader has had an opportunity by now to become acquainted with the 3.1 kc system, so we may consider the reasons for choosing various frequencies.

The set of values $N \cong 2000$ elements, $W \cong 3000$ cycles, and $F \cong 3$ cycles in Eq. (1) is justified as follows:

First, fig. 1(A) demonstrates that 1800 elements is a minimum below which the recognition of facial features becomes highly unreliable. The television pictures are even less readable than those of fig. 1(A) because of dot flicker and noise.

Second, a nominal video bandwidth of about 3000 cycles is maximum for amateur short-wave applications. Wider bandwidths use up precious frequency allocations. Vestigial sideband modulation is recommended, as discussed later on.

Third, our experiments show that 3 cycles is the lowest frame rate at which chemical storage allows the illusion of continuous-motion television. This requires an *L*3 phosphor or its equivalent. The cost of a small cathode-ray tube that is suitable for narrowband television is reasonable.

The timing chain of fig. 5 uses divide-by-two circuits. This is not mandatory (conventional television uses divide-by-three, five, and seven stages), but it is simple, reliable, and inexpensive. Because there is no compelling reason for not utilizing bistable multis, it is proposed that the pseudo-random dot scan timing chain should be restricted to divide-by-two circuits. This implies that a frame frequency of 3 cycles must be accompanied

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Band-width, C.p.s.	*Frame freq., C.p.s.*	*Total ele-ments*	*Field scan freq, c.p.s.*		*Field scan elements*		*Random scan order*	*Total elements*	
			Horiz.	*Vert.*	*Cols.*	*Rows*		*Cols.*	*Rows.*
3072	3	2048	48	384	8	16	H, V, H, V	32	64
6144	3	4096	48	768	16	16	V, H, V, H	64	64
12288	3	8192	48	768	16	32	H, V, H, V	64	128
24576	3	16384	48	1536	32	32	V, H, V, H	128	128
49152	3	32768	48	1536	32	64	H, V, H, V	128	256

Table I-Long Persistence narrowband systems.

by a field frequency of 24 or 48 cycles, and that bandwiths are restricted to $3 \times 2^{10} = 3072$ c.p.s., $3 \times 2^{11} = 6144$ c.p.s., and so forth.

The conventional television standards were adopted at a time when 50 or 60 cycle power supply hum interference was a problem. To minimize the visual deterioration caused by hum, the field frequency was made equal to that of the power line so that hum effects would be stationary. Some countries have 50 field/sec television and in others it is 60 fields/sec. With the advent of solid-state circuitry, fortunately, hum is no longer a problem. One can easily construct a d.c. supply for the camera tube heater. A field frequency of 48 cycles is proposed because it avoids taking sides in the 50 or 60 cycle controversy, and because it is synchronous with the field frequency of motion pictures. A field frequency of 24 cycles is rejected because it would result in large-area flicker with a short-persistence phosphor.

The width/height ratio for conventional television pictures is 1.333. Because our narrowband picture would primarily be used to show facial features, the height should be greater than the width. A height/width ratio of $\sqrt{2} = 1.414$ is proposed, as shown on fig. 1. This yields picture elements that have a constant shape regardless of bandwidth, as illustrated below:

Example 1: If the bandwidth is 3072 c.p.s., figs. 2 and 3 indicate 32 columns $\times$ 64 rows = 2048 elements total. With an average density of 25 dots/cm, the picture should be 1.52 cm wide by 2.15 cm high. The actual densities will be $32/1.52 = 21$ dots/cm horizontally and $64/2.15 = 30$ dots/cm vertically.

Example 2: If the bandwidth is increased to 6144 c.p.s., there will be 64 columns $\times$ 64 rows = 4096 elements total. With an average density of 25 dots/cm, the picture should be 2.15 cm wide by 3.04 cm high. The actual densities will be $64/2.15 = 30$ dots/cm horizontally and $64/3.04 = 21$ dots/cm vertically.

Similarly, for any other bandwidth, the densities will be 21 dots/cm in one direction and 30 dots/cm in the other.

Because the picture height is greater than the width, it is proposed that the high-frequency scan be vertical. A horizontal high-frequency scan (as in conventional television) would require $(2)(3072)/8 = 768$ c.p.s. in fig. 2 instead of 384 c.p.s., and the higher frequency would demand higher power and voltage ratings in magnetic deflection. In addition, only 1 out of 16 rows is lost during retrace in fig. 2; with horizontal high-frequency scan, we would lose 1 out of 8 columns, which is excessive.

Finally, it is proposed that the pseudo-random square-wave sequence be such that the lowest- frequency square wave is applied in the direction having the greatest dot density in order to minimize dot flicker. In Example 1 above, therefore, the 3 cycle square wave should be applied to vertical deflection, and this determines all of the other components as shown in fig. 3. For the 6144 c.p.s. system of Example 2, however, the 3 cycle square wave should be added to horizontal scan. The 24, 12, 6, and 3 cycle components should be respectively applied to V, H, V, and H. The apparent local scan sequence would be given by fig. 3 rotated 90°.

The above discussion is summarized in Table 1, which covers bandwidths of 3.1 to 49.2 kc. The halftone reproductions of Fig. 1(b) illustrate the resolution that we ideally should get with a bandwidth of 12.3 kc, and fig. 1(C) corresponds to the 49.2 kc picture.

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"Random scan order" in Table 1 refers to the pseudo-random square waves in the order of decreasing frequency.

Radio-Frequency Modulation

Amplitude modulation is used for conventional television. In some countries, the r.f. amplitude is increased with increasing black; in others, with increasing white. Each method has its advantages and disadvantages. Similarly, if frequency modulation is used, we can either increase the frequency with increasing black or with increasing white. Fortunately, the decision as to which method to use is not an important one because a phase splitter will allow either polarity to be viewed.

Suppressed-carrier modulation cannot be used for television because video frequencies must be accurately reproduced at the receiver. A vestigial-sideband a.m. compromise is employed in conventional U.S. television: all of the upper sideband, 4 mc wide, is transmitted, but only about 1 mc of the lower sideband (plus all of the carrier) is sent. Similarly, for the 3.1 kc system, we can transmit all of the upper sideband and carrier, but only 25% of the lower sideband. The lower-sideband roll-off must be gradual to prevent transient overshoots and undershoots, so a total r.f. bandwith of about 4.5 kc is needed.

Vestigial-sideband f.m. can also be used, but f.m. offers no substantial advantages over a.m. for picture transmission. As far as immunity to noise and interference is concerned, any scanning and modulation method that fills up the entire r.f. channel with video spectral lines is suitable. Suppose, for example, that an r.f. bandwidth of 35 kc is made available. We can transmit the 24.6 kc system of Table 1, via vestigial-sideband a.m., to get a long-persistence picture with some 14,700 visible elements. We can alternatively, with the same r.f. power, transmit the 3.1 kc picture, using wideband f.m. to fill up the entire r.f. channel. The received image would only have 1800 visible elements, but it would have good immunity to noise and interference. Approximately the same result can be obtained, however, by shrinking the 24.6 kc vestigial-sideband a.m. received image until it is the same size as the 3.1 kc picture. The situation for television is quite different than for audio, where wideband f.m. is one of several methods for filling up the entire 35 kc channel despite an audio bandwidth of only 3 kc. In television, the video bandwidth can be increased simply by increasing the scanning frequencies.

F.m. may have practical advantages in that we can operate the transmitter output stage Class C and modulate at low signal levels. For a.m., on the other hand, we can use grid and/or screen modulation because the eye is not sensitive to the amplitude distortion that is usually associated with these low-modulation-power techniques. ■

[*To be continued*]

BY THE WAY...

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(USAF Photo)

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Grumbles

by Sam

I've been surveying the DX scene of late and I'm really disappointed. Have you noticed that we've almost run out of "countries" to send our DX-peditionists? Yes, after we ran through all of the garden variety DX spots like France and Brazil we all sought out more difficult-to-work spots like Gambia and Moldavia. When we used those up we scratched up additional places—San Marino, Andorra, Monte Carlo and the like. Next we turned our view to worrying about working stations in lightly populated remote corners of the globe —Spratley, Niue, Heard Island. Really groping for anything we might possibly have missed, we have combed the atlases and navigational charts for what might be termed "last resort" DX spots—Minerva Reef, Rockall, St. Peter and St. Paul Rocks, and other marginal reefs, rocks, and patches of dirt which protrude, even slightly, from the water.

Don't look now, Fred, but we're ready to dig down to the next layer of "new countries," and you might have guessed that we seem to have hit the bottom of the barrel. There's just *so much* land area on the planet and we've worked it dry.

Think what this means to the entire future of ham radio. What about all of those guys running 80-million watts into the 75 element beams—the ones who only grace the band when there is a "new country" floating around to work. Do you realize what this means? With these guys off the air it may actually be possible to get a contact around the world on 20 meters with less than a full gallon, and on fone! And what about the prospect of having such good communications that you may actually have time to give more than your handle, QTH, and a QSL request—you may actually have to *say* something to the guy on the other end of the horn. No, it's really too much to ask of today's hams; it could herald the final phase of the hobby.

The next layer of DX *is* in there, only now we're going to have to use a bit of ingenuity to dig it out in order to save ham radio.

For instance, did you know that right now —this very minute— there is a nation around which has never known a ham operator within its borders. Im not kidding! The nation is (don't laugh) a 30 by 100 foot artificial island located 6½ miles southwest of Jamaica. It's called New Atlantis and already sports 10 citizens. The nation has been granted "de facto" recognition by the International Court of the United Nations, has a flag, a national anthem, postage stamps, and considers itself a soverign state.

Anybody interested in visiting New Atlantis should try to locate its President, Leicester Hemingway (brother of Ernest Hemingway), who lives in Miami Beach somewhere.

That's the kind of place we're going to have to scout up, only we need a lot more of these spots. Then, of course, we haven't yet touched on any of the foreign embassies located right here in the United States. As you probably know, an embassy is considered to actually be foreign territory by international law. Several European nations have already established radio links between their capitals and their embassies; even in Washington, D.C. These stations use callsigns of the nations which operate the respective embassies. Why no ham stations? Sounds like they would be new countries.

[*Continued on page 116*]

*c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y., 11050.

See page 126 for New Reader Service

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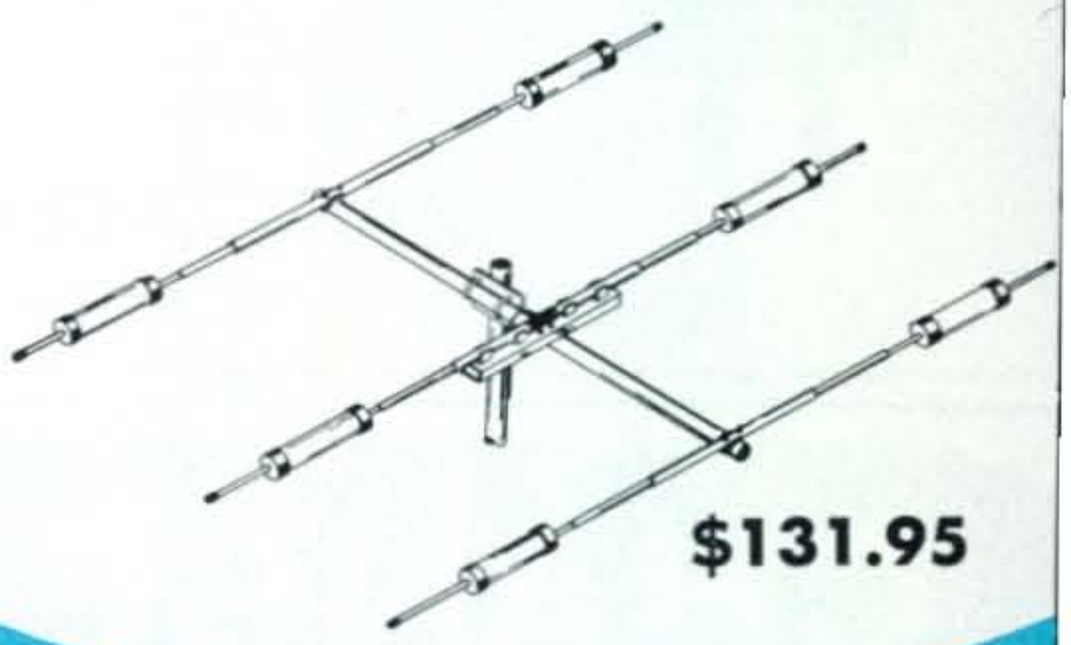

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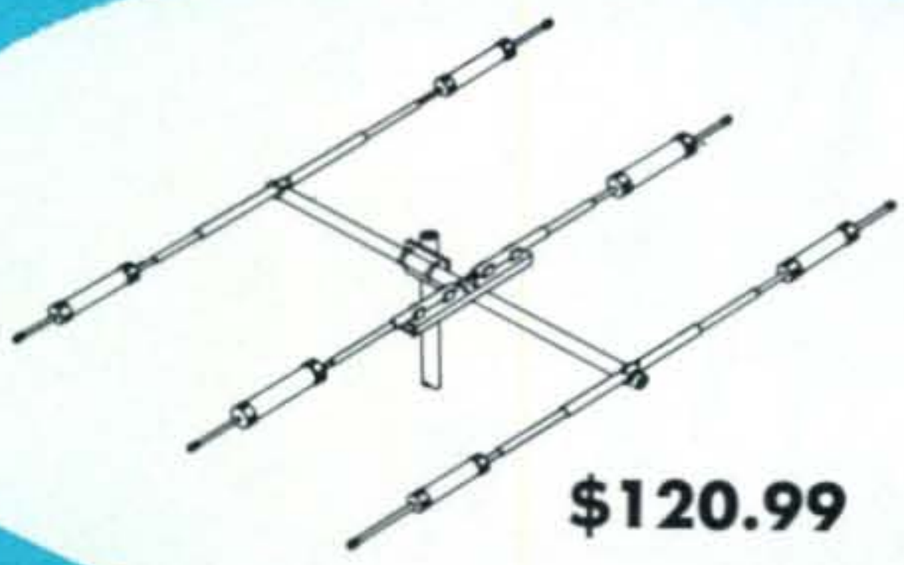

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The DXpedition

BY DON MILLER,* W9WNV

Part V—The Last Leg to Mauritius

One of the most frustrating problems we faced before leaving the U.K. was locating Commonwealth officials and obtaining statements in writing. Encountering the usual degree of buck-passing and reluctance when dealing with anything out of the ordinary, Bill and I realized that England was no different from any other country. (How many government officials do you know who have ever heard of a DXpedition?)

At first I was optimistic; wishing to inquire about such places as Falklands, Seychelles, Mauritius, and British Phoenix Islands, I thought we'd kill two birds with one stone by visiting the Colonial Office in person, without any appointment. I learned at the outset of the DXpedition that in these instances telephone calls are generally a waste of time and much less successful than even an unannounced personal visit, or series of visits. The irritating thing about both phone calls and visits, particularly the former, is the number of times you have to repeat your story or request, usually starting at the bottom of the chain of command and working your way up. It isn't easy to explain what a DXpedition is all about in a few minutes, and such a story invariably loses a bit with each translation. Sometimes hours were consumed in such explanations and requests.

On trying to visit the Colonial Office, I learned it had recently been renovated, incorporated into the Commonwealth Office, and seemed to be spread out all over London. After trying to obtain information from two offices unsuccessfully, I came upon a building located directly across from the famous No. 10 Downing Street. After straight-arming my way through the usual mob of short-shirted, sun-goggled, camera-toting tourists, I made my way to the lobby where the clerk informed me that it was here that most of the representatives from British Colonies and Territories were located. At last! I breathed a sigh of relief and mentioned the Falkland Islands. The clerk managed a

* c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

DX dinner for Don and Bill sponsored by the RSGB in London.

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Jack Herbstreit, WØIIN, President of the International Amateur Radio Club (IARC) and Director of ITU's International Radio Consultative Committee (CCIR).

puzzled frown and went scurrying away, returning ten minutes later with a guard and a secretary. They all looked at me and squinted. "Falkland Islands," I repeated. More puzzled expressions and silence. The secretary departed and quickly returned with another girl and a young man. They all looked at me. I developed enough courage to try again. "I'm interested in obtaining some information regarding the Seychelles and Mauritius," I exclaimed. "What sort of information?" Here we go again, I thought, and started to explain, when the secretary exclaimed, "Oh, Mauritius is French. . . . you'll have to visit the French Embassy on that one." Good grief! I didn't have the courage to ask about British Phoenix for fear I'd be referred to the nearest *aviary*.

A Hectic Week

On July 26th Bill and I flew to Frankfurt. The following week's itinerary went something like this:

July 26–Met at Frankfurt airport by Burt, DJØKQ and Walter, DJ9GD, arranged with Burt to ship 30 lbs. excess baggage direct to Mauritius, driven by Walter to Manheim, 50 miles to the south, where our DX meeting was to take place the following night. There we were joined by Karl, DL9OH, Gunter, DL6EN, and Claude, DL8ML. After Walter's guided tour of Heidelburg, Kim, DL4SK joined us all for a fondue dinner; the usual political and DX discussion lasted into the night.

July 27–DX gathering with about 60 German DXers. Remainder of itinerary to Mauritius confirmed.

July 28–Flew from Frankfurt to Geneva, met by Ted Robinson, F8RU, Secretary of the IARC; joined for lunch by Gerard, HB9AW, 4U1ITU's chief op., met the IARC gang and operated 4U1ITU. Gathering of DXers in the evening, in ITU's conference room with translations by Ted.

July 29–Flew to Zurich, met by Peter, HB9PL, and his XYL, Ruth, met with the Zurich DX group and showed color slides, then rushed to airport to catch flight to Nairobi.

July 30–Arrived Nairobi and collapsed.

July 31–Spent half a day in the Nairobi Game Park photographing the animals. Prepared to split up the next day.

August 1–Bill flew to Mauritius via Madagascar while I departed to Johannesburg, met by Bill, ZS6UR. Bought aluminum tubing and constructed our masts. Got in a few hours operating under my new ZS6 call.

August 2–Flew from Johannesburg to Mauritius, met by Bill and Jack Astley, who would be our skipper for the Indian Ocean DXpedition.

I don't know how many miles we traveled that week, nor how many times we checked in and out of customs, immigration, and hotels. We had decided to reach Mauritius as quickly as possible to begin the DXpedition. Certainly our meetings with the DXers in Manheim, Geneva, and Zurich, and our visit to the game parks in Kenya were highlights. But most impressive of all was our visit to the ITU and IARC in Geneva.

The ITU

The International Telecommunications Union (ITU) was established in 1865 as a union of 20 member countries to establish telegraph regulations. Since reorganization into its present form under the United Nations in 1947, the ITU has grown to include more than 120 members sharing the responsibility for all the world's telecommunications. The need for the ITU is obvious. In the Union's own words:

"Telecommunications span the world. Yet, although they easily traverse vast distances and physical obstacles, they often have difficulty when it comes to crossing man-made frontiers between nations. This was clear right from the beginning, more than 100 years ago, when people first started sending telegrams from one country to another (the telegrams had to be handed across at the frontier). Some kind of international agreement was necessary. In 1876, the telephone was invented, and then, toward the close of the 19th century, radio. These new communication media also became international. They also required international organization. Today, more and more people merely lift a telephone receiver and call another country or turn a knob and listen to a foreign radio program. With-

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out the ITU the call would be impossible and the program inaudible. With the possibilities of communication through space, international agreement is more important than ever."

The ITU works to fulfill these basic purposes by international conferences and meetings, publication of information and international technical cooperation:

(1) To maintain and extend international cooperation for the improvement and rational use of telecommunication of all kinds;

(2) To promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunication services, increasing their usefulness and making them, so far as possible, generally available to the public;

(3) To harmonize the actions of nations in the attainment of those common ends.

At ITU Headquarters at Geneva are to be found its four major organs:

1—General Secretariat
2—International Frequency Registration Board (IFRB)
3—International Radio Consultative Committee (CCIR)
4—International Telegraph and Telephone Consultative Committee (CCITT)

The present Secretary-General is Mr. Mohammed Mili of Tunisia.

Of possible greatest interest to amateurs, is the IFRB which advises the Union and makes recommendations regarding frequency allocations. These actions occur at the ITU's Plenipotentiary Conferences, normally occurring at intervals of five years or more. The latest word on a possible date for the next such meeting is 1972, at the earliest. This does not mean that our amateur frequencies are "safe," by any means, but at least the pressure is reduced somewhat. Perhaps, in the interval, continued development of satellite communications and other sophisticated methods will further reduce the pressue on the h.f. spectrum. This is certainly not to be interpreted as any sign to "relax" our safeguarding of amateur frequencies; rather, it should serve as added impetus for amateurs to be constantly on guard.

The IARU

As the name implies, the International Amateur Radio Union is an organization of the various amateur societies throughout the world. The IARU has absolutely no connection with the ITU, but is strictly an amateur body. For the time being, the Officers of the ARRL automatically hold corresponding positions as IARU Officers. This concept of ARRL being IARU's "governing body" is tolerated by the Union due to the obvious financial advantages. Unfortunately, there seems to be growing resentment among some of the IARU's members at this state of affairs. ARRL recently sent its Assistant General Manager on an amateur radio tour of some of the African countries, but disrespectfully failed to first seek either endorsement or permission from the IARU Officers for that region (IARU Region I)! ARRL might do well to try to improve the situation within its own region and its own organization first, and permit the other societies and Region Officers to conduct their own affairs.

The IARC

Like the IARU, the International Amateur Radio Club (IARC) has no official link with the ITU. The Club, however, and its station, 4U1ITU, are located within the ITU Building in Geneva, and most Club Officers are also ITU Officials. Jack Herbstreit, WØIIN, Director of CCIR, was elected IARC President in January. Ted Robinson, F8RU, has been Secretary of the Club since its inception. Gerard deBuren, HB9AW (WA6QAU),

Dr. Miroslav Joachim, OK1WI, President of the International Amateur Radio Club (IARC), 1965-1968.

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Chief Operator of 4U1ITU, keeps the Club Station active to the tune of over 15,000 QSO's each year. Club Patrons are U Thant, Secretary-General of the United Nations, and M. Mili, Secretary-General of the ITU.

The potential value of IARC is obvious. Being strategically located at ITU Headquarters in Geneva, IARC is in the ideal position to serve as an intermediary between ITU and the IARU, keeping the amateur societies posted on the latest ITU developments and notifying IARU of upcoming conferences, attitudes on amateur radio among the various delegates, and what might be accomplished in each area to improve attitudes and public relations. Thus, IARC could serve as an invaluable link to the ITU, but ARRL has never given the Club formal recognition and apparently does not intend to do so. Nevertheless, IARC maintains close relationships with most of the Region I amateur societies. If the day comes when this potential is recognized, I'm certain all of amateur radio will benefit.

IARC's CPR (contributed to propagation research) award and annual contest is a case in point. Under this program, founded by former IARC President Dr. Miroslav Joachim, OK1WI, log data for thousands of amateur contacts in the various CPR zones are submitted to the Club and processed by computer to give valuable propagation statistics which aid in future propagation predictions. Naturally, this creates much-needed favorable publicity; ITU Officials recognize and appreciate this scientific contribution of amateur radio. Recently, however, when IARC's Secretary asked ARRL if there would be any objection to holding the CPR contest program during March (which the League occupies with two of its contest weekends), an ARRL Official referred to the program as a "publicity stunt!"

The Role of DX

In Part I (January, 1968 CQ) I pointed out some of the advantages of DXpeditions and promised to illustrate just how DXing could be put to use to actively promote and preserve amateur radio. First we must consider from what quarters amateur radio has received support in the past. Our government has recognized two basic advantages, the use of amateur radio in emergency and disaster situations, and the creation of a reservoir of military communications personnel. In the first case, amateur radio can no longer be realistically considered as essential; this is not to say that there won't always be isolated instances where amateur radio may "come to the rescue." However, the spread of sophisticated communications to most remote areas, along with the emergence of Citizen Band Radio as a more efficient emergency system (by sheer numbers and limitation to single frequencies), the role of the amateur in emergencies is not what it used to be.

In the second case as well, the need for amateurs has greatly diminished. Although the radio amateur possesses most of the qualifications of the military radio operator, the military operator of today need have few of the amateur's abilities, typically operating no c.w. and being responsible for no maintenance (his gear is repaired or replaced by a different department). This was from my experience as MARS Director in Korea five years ago. Of military communications personnel, less than 2% are hams.

Certainly we cannot realistically expect any great support from our government on these two points. Where, then, can amateur radio turn to marshall new government recognition? The answer is simple. Until recently there has been little emphasis on amateur radio as a tool of international good will and understanding. This point cannot be overestimated, and should be constantly brought to our government's attention. To illustrate, a recent international magazine pointed out that, in the Soviet Union, those best informed about life in the United States were the 50,000 radio amateurs. Considering that there are over 250,000 amateurs in the USA, then, there are almost unlimited possibilities for establishing personal friendships and common bonds. Along these lines, it must be stated that every time there is an exchange, whether it be by the Olympic Games, by sports and cultural exchanges, or by amateur radio, ties remain which always serve to improve understanding between peoples of different parts of the world. Even a brief exchange of signal reports between amateurs in the USSR and the USA is no exception. When one considers that these QSO's run into the hundreds of thousands, the conclusion that international good will has been promoted is inescapable. Since governments of all nations are constantly striving to improve international relations, amateur radio could develop almost unlimited support from any government made to recognize the value of DX. Perhaps if our own society had some government link this could be accomplished.

Next month: DXpedition to St. Brandon, VQ8CBB. ■

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USING A T NETWORK

By JOHN J. SCHULTZ,* W2EEY/1

The Pi-network is familiar to all as a circuit used in most transmitter output stages and unbalanced type antenna tuners. A 'T' network tuner, which employs the same elements as a pi-network but in a different circuit arrangement, has definite advantages over the pi-network when a match to very short antennas is required.

THEORETICALLY, whenever two impedances are matched by a 3 element reactive network of either the pi or T configuration, (fig. 1) the losses should be the same whichever network form is used. Intuitively, this is understandable since complementary current and voltage relationships must exist regardless of the network used if the terminal impedances are to be properly matched.

In practice, however, various other factors enter the situation which may upset this idea of equality. For one thing, the dissipative losses in various reactive elements is different, generally lower in variable capacitors, for instance, than in large inductances. The physical size, cost, *etc.*, of the practical elements needed to match a given set of impedances may also make one form of circuit more desirable than another.

The pi-network has received deserved acceptance as a versatile and generally easily adjustable form of matching network. Details of its construction is well documented in many articles and handbooks and will not be repeated here. One sees for less usage, however, of the T form of matching circuit and yet for the proper application, it can be more useful than the pi-network. The purpose of this article is not to present any detailed theoretical discussion of the T network, but to generally explore the conditions under which it is useful and to give some values for practical circuits.

* 40 Rossie, Mystic, Connecticut 06355.

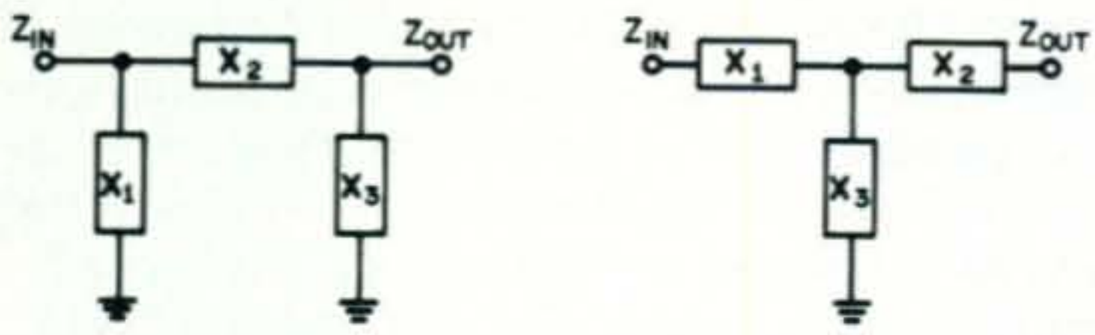

Fig. 1—Theoretically the losses using a 3 element reactive network will be the same for a given impedance match for either a pi or T network.

Basic T Network

The T network can be visualized as a combination of L networks, the same as the pi-network, Figure 2(A) shows the usual L network and the pi-network. The pi-network can be formed by connecting another L network, reversed and following the first L network. The T network can be formed by connecting another L network, reversed, but preceding the first L network.

For a given impedance transformation, the values of the two reactances (in ohms) which form the basic L network are equal. Therefore, while practical construction restraints usually preclude its use, there is no reason why the basic L network cannot be constructed as shown in fig. 2(B) with the reactive elements interchanged. Both pi and T network forms using this version of the basic L can also be formed as shown.

A total, therefore, of four networks (2 pi and 2 T types) can be formed, all of which can perform the same impedence matching function and all of which can be made to have the same bandwidth and harmonic reduction features.

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Aside from the physical component values which result, the one pi and one T form which use two inductors are undesirable because of the losses that would take place, the cost of the inductors and the difficulty of bandswitching two inductors. The two forms which are left are the conventional pi-network and the less well known T network with capacitive legs.

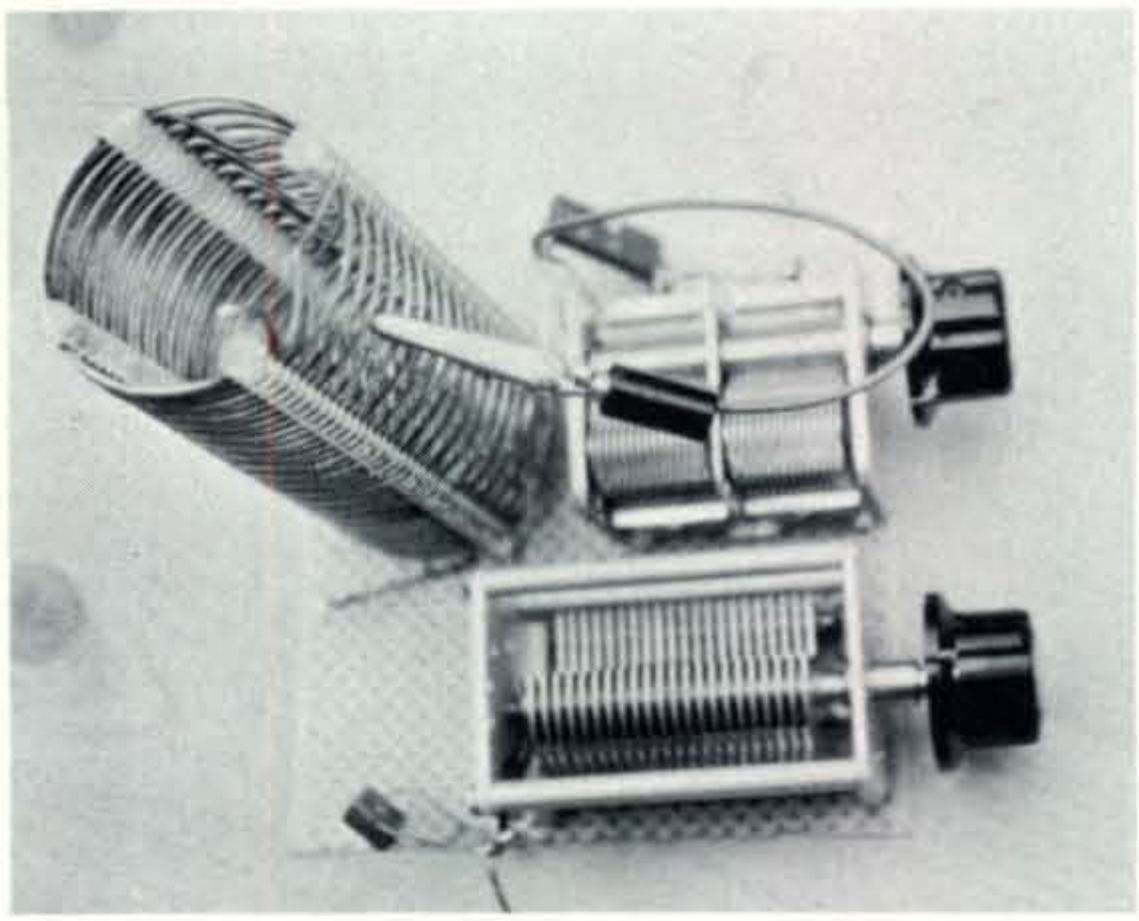
The T network for a practical matching problem, such as that for which a pi-network might be used, has the advantage that one trades some capacitance for inductance and the coil size required will be somewhat lower than for the pi-network. This factor combined with the one that less current flows through the inductive branch means that overall losses, assuming the use of good quality air variable or vacuum variable capacitors, should be somewhat lower with the T network. The difference in efficiency between the pi and T network forms becomes most noticeable when a large impedance transformation must be made (such as from a very short antenna used on a low frequency band) and when high power is used. Less loss will occur in the T matching network and, if bandswitching is employed, component requirements are less stringent. Usually one large range air or vacuum variable capacitor in each leg will suffice to cover the bandswitched network operating from 80-10 meters. Only the inductor element has to be switched and this can be done by a relatively simple and inexpensive switch since one end is grounded. The insulation requirements are reduced, especially when matching a very reactive load. In a pi-network this would require the inductor bandswitch to be well insulated from ground.

Test Circuit

Figure 3 shows the component values for an experimental T coupler built by the author and the photographs show the simple grouping of the components. No chassis construction was used since the circuit was experimental in nature and designed only to prove the coupler before later constructing a more elaborate model.

The values given for the components are such that a 50 ohm coaxial line can be matched to a highly reactive load (a 12 to 16 foot whip) over the 80-10 meter range.

The network is adjusted similarly to a pi-network with a value of inductance being chosen and then the variable capacitors used



Simple T network configuration used to check comparative performance of pi and T network using various length antennae.

for tuning and loading functions. A field strength meter should be used to determine which set of element settings gives the best efficiency although, invariably, it will be found to be the one using the least inductance with capacitor values such that the transmitter can still be properly loaded (1:1 s.w.r. on the coaxial line between the transmitter and T network).

Loading on all bands was easily achieved and with far less problems than ever would have been possible using a pi-network with such a short antenna. An exact comparison of the network performance versus a conventional pi-network was not possible because of

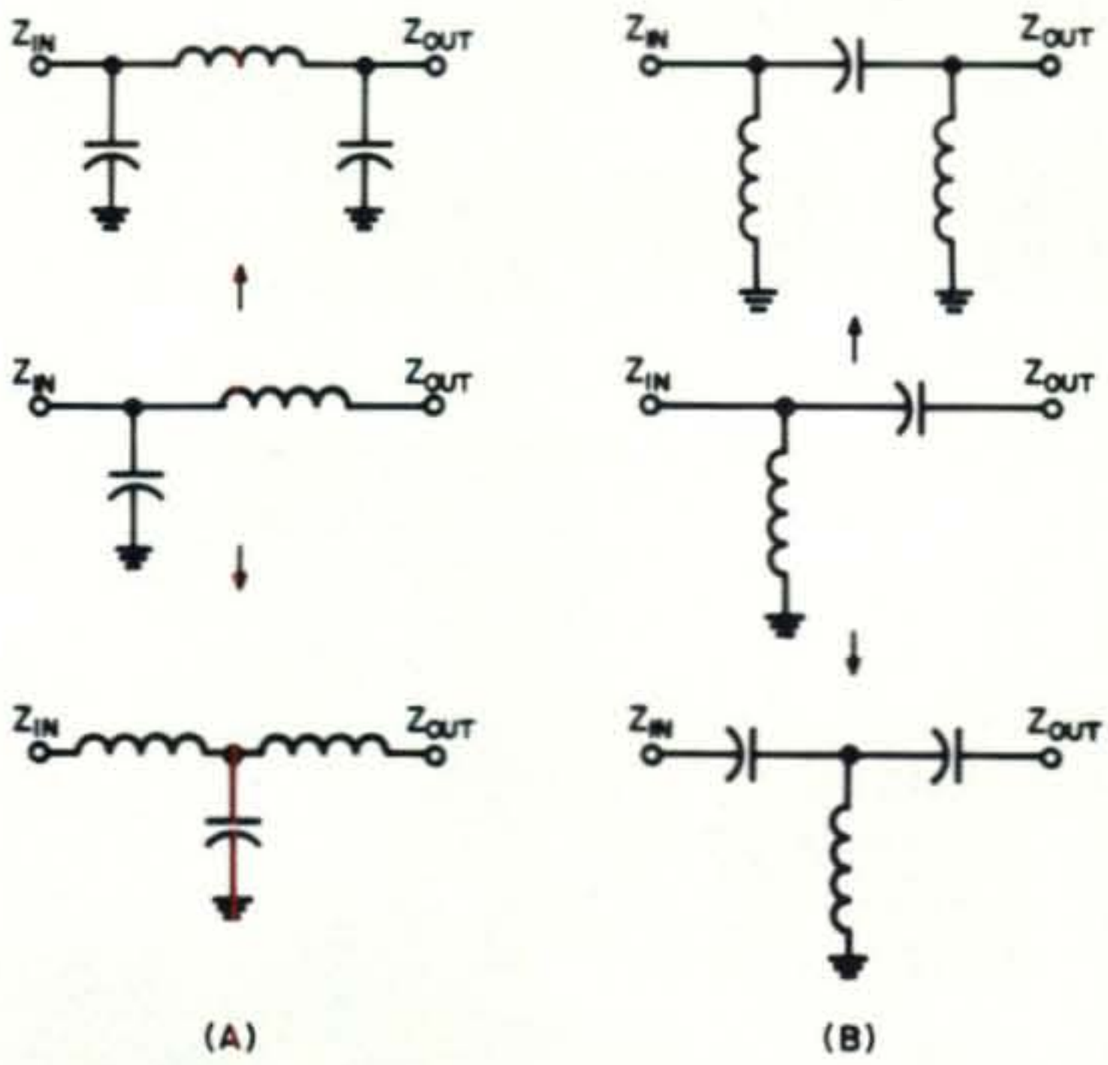


Fig. 2—The reactive values of the arms of the L network are equal in (A) and (B) for a given impedance match. One form of pi and T network can be constructed from each basic L section.

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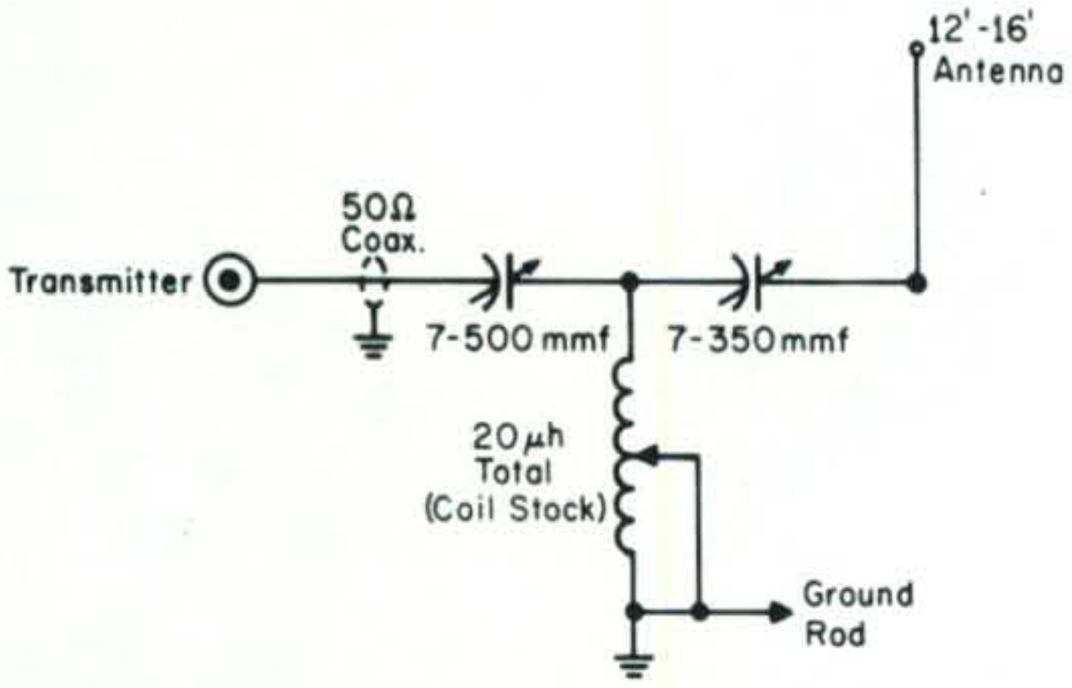

Fig. 3—T network constructed to operate into short antenna on 80-10 meters.

the time required to change and adjust the networks. The general impression, however, was that the T network was definitely superior on the lower frequency bands, 80 and 40, and this coupled with the ease of loading on these bands made us regard the experiment as a success.

Summary

On the higher frequency bands and when using an antenna of reasonably long length (¼ λ or more) there would seem to be little advantage to the T network over the pi-network. However, on the lower frequency band and when using a very short antenna, the T network appears to be of definite advantage.

This form of antenna coupler has already been used by commercial equipment manufacturers where, for instance, a high-powered mobile transmitter must be matched to a short whip which could not be inductively loaded because of the possibility of damage to the loaded whip due to physical factors. The approach may be very useful for amateur mobile operation on the lower frequency bands by having a well constructed T network in the trunk of a car and eliminating the inductive loading of the whip antenna. The increased efficiency of the T network may well compensate for the improvement in efficiency achieved by center-loading versus base-loading of the whip and so one could have still efficient mobile installation (as far as mobile installation efficiencies go, anyway) without a costly and conspicuous antenna structure. Otherwise, the T network should also be useful in a fixed or portable situations for anyone constrained by a short antenna on the lower frequency bands.

As with any antenna coupler, the practical efficiency depends upon the quality of the components used. Fortunately, with the T network this is not difficult to achieve since the component values are such that readily available parts can be used. If possible, fixed capacitors should not be shunted across the variable capacitors to increase the total capacity, since unless expensive transmitting mica types are used, they will degrade performance. For low power installations (up to a few hundred watts) the inductor wire size can be #12 or #14. For higher-power installations, the inductor should be made of 3/16 to ¼ inch tubing. In the latter case, for a given installation, the inductor value required can be determined using very low power and a small wire-size inductor and then the larger inductor constructed according to the values found. ■

BY THE WAY...

VQ8RCS On Top Of The World

This is a view of the world's most northerly amateur radio station, VQ8RCS, 437 miles from the North Pole. The operators of the station (Canadian Forces Alert, Alert, Northwest Territories, Via Ottawa, Ontario, Canada.) and other operators throughout Canada are constantly making phone patches for the men stationed at Alert to keep them in touch with their families. Conditions permitting, VQ8RCS is on the air daily, on 14.165 mc ready to contact amateurs in all parts of the world. If you hear them on, give them a call.

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FURTHER NOTES ON THE COLLINS 32S-1 AND 3

BY M. H. GONSIOR, *W6VFR

Some time ago, the writer co-authored some notes[1] concerning improvements to the 32S-1, most of which were subsequently found in the excellent 32S-3 configuration. This article deals with some further refinements on the 32S-1 as modified from the original format as well as the 32S-3.

As all of the 32S-1's and some of the S-3's are getting a bit on the old side, it would be well to investigate some of the aging of this remarkable equipment. First, tubes will, from heat, *etc.*, drift away from their normal characteristics. Check the idling current of the 6146's by reading the I_p of each tube alone so a well-matched pair is used for best linearity. Secondly, check the balance of the first mixer. The chances are you haven't done this for some time. In the author's case, the 12-AT7 was so badly unbalanced that the pot had run out of adjustment. A new tube did the trick. Incidentally, for those who did modify their S-1 according to the original article, the adjustment of the first mixer is quite simple. Just insert a small amount of carrier at the frequency of operation and set the balance controls for the maximum power output.

Also, this same technique may be employed for the i.f. adjustment at 455 kc (T_2) since the 455 kc crystal in the b.f.o. is a fine signal generator. Simply adjust the slug for maximum drive. The author's was extremely far out of adjustment. Following this procedure, it is necessary to rebalance the balanced modulator. Also, it is well to periodically check the neutralizing and the feedback neutralizing, especially if you have changed tubes to the new 6146B's, *etc.*, or the 6CL6. This can be done simply by observing if the maximum power output occurs at minimum I_p. If it does not, simply adjust the two variable capacitors, C_{71} and C_{55} until this happens. The lengthy Collins procedure is not necessary.

Driver Neutralization

At this point it is well to investigate the neutralizing of the 6CL6 driver. Collins[2] points out that this tube has an extremely high Miller effect and therefore the neutralizing must be done at full power, not in accordance with the usual handbook procedure. This will require a similar setup as the 6146's except it is not as convenient. It will be necessary to measure the cathode current versus output to be sure that a maximum inverse relationship exists by adjusting C_{57}. Advance the drive well above normal since readings are facilitated by working past the linear region of the tube.

Balanced Modulator

Check the balance of the balanced modulator. Here again a simplified procedure is to adjust it after warmup with the full transmitter on so that all voltages are stabilized, since it is sensitive to power levels and therefore voltages. Listen to your own signal, move

* 418 El Adobe Place, Fullerton, California 92632.

1 Kreager, P. C. and Gonsior, M. H., "32S-1 Operating Improvements," *CQ*, August 1962, p. 47.

2 "Amateur Single Sideband," *Collins Radio Company*, 1962, p. 76.

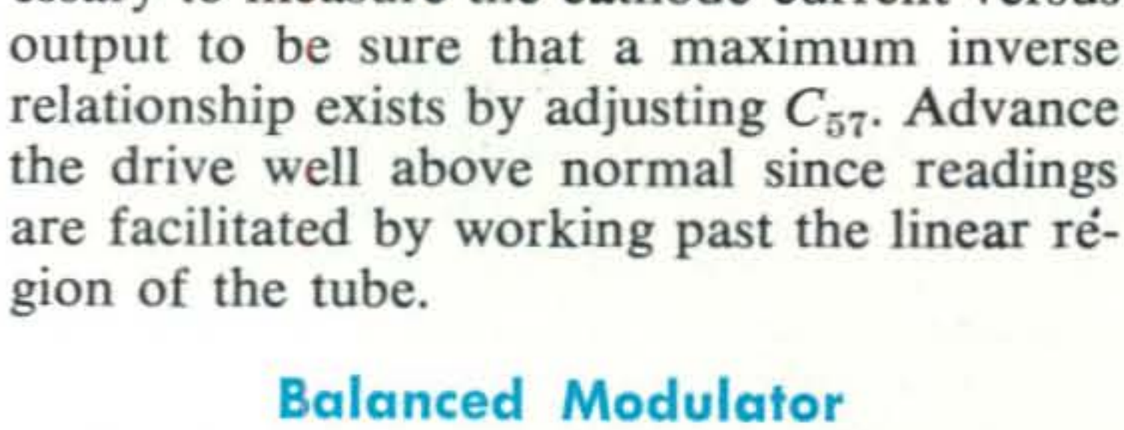

Fig. 1—Modification made to V_{2B}, the b.f.o. in order to stabilize the output against line voltage variations.

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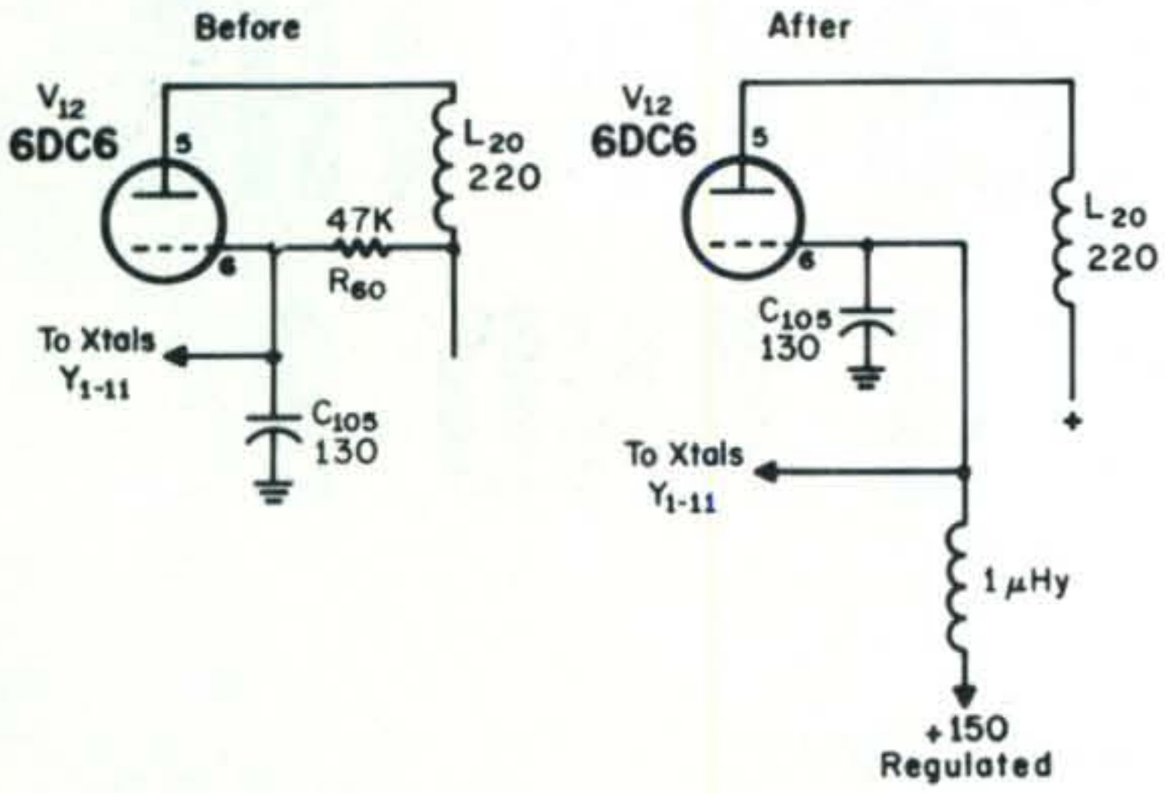

Fig. 2—Modifications to made to V_{12}, the high frequency crystal oscillator in order to improve stability and maintain a more constant injection voltage.

off ±1.35 kc (U or LSB), and adjust the two balance controls for minimum carrier. Remember, however, that the carrier must be renulled if you are going to work the other sideband because of the injection voltages as well as the mechanical filter symmetry considerations. Along this line, have you noted that the balanced modulator has a morning and evening adjustment, i.e., power line voltage sensitivity? This can be cured to a great extent by lifting the screen on V_2B from the B+250 line and moving it to the regulated v.f.o. source as diagramed in fig. 1.

Intermittents

Have you noticed an intermittent drive situation, especially if you only work one band? This is generally caused by a buildup of oxides on the switch deck contacts, since it loses its self-cleaning ability by relatively little use. The solution is a spray can TV tuner cleaner, which does a good job.

At this point, it would be well to vacuum clean the entire chassis using a small brush to remove dust, *etc.*, from the inaccessible corners. In lieu of this procedure, the corner gas station compressed air supply is another simple means of accomplishing the same end.

Regulating The H.F. Osc.

Further, Collins regulated the 32S-3 high frequency crystal oscillator, V_{12}, shown in fig. 2. Apparently, they found that the stability of the high frequency oscillator would be improved together with the attendant advantage of more constant injection voltage to the second mixer.

A.L.C.

Regarding the a.l.c., a number of stations are heard using potentiometers across the a.l.c. buss or pulling out the a.l.c. rectifier in an effort to squeeze the last drop of energy out of their rigs. From long experience in using a scope on the 32S-1, any gain/power level resulting from more than 10 db of self-a.l.c. is definitely running into the non-linear region and will result in flat-topping. The Class AB_1 operation of the 6146's just can't be violated in s.s.b. operation with any respect for your neighbors. Speaking about scopes, it will be well to invest in one, any kind, since they will all give good r.f. response with direct coupling. There isn't any substitute for waveform monitoring with linear operation. You just can't load single tone and by guess expect to achieve proper loading without observation.

Scope Observation

Regarding the loading of the S-Line, it is well to observe this on a scope from the standpoint of best drive and linearity, just like any other pi-network. This is especially true if it is driving a linear amplifier where impedance matching becomes an important factor. Further, the plate tank tuning adjustment is nicely observable on the scope.

It takes some practice to learn to monitor properly by observing a minimum number of patterns, expand the horizontal baseline, and then critically observing only a few peaks. It helps to lower the baseline too, and to observe only the top half of the waveform thereby effectively increasing the size of the scope presentation. On the subject of monitoring, it is almost impossible to observe flat-topping at 455 kc on a modern receiver. Almost all square waves will be nicely rounded by the receiver selectivity at i.f. frequencies. The rule of thumb is ten times the audio frequency, or a 21 KC bandpass at the i.f. in the average s.s.b. setup of 2.1 kc. In the past eight years I have worked only one station, W2GWE, who was monitoring at r.f. in his receiver where you can really see something! Concerning the vox-mox, keying-like click in the S-Line, I haven't been able to solve it since it is apparently not directly concerned with the relays. This was deduced from the fact that it is eliminated by lowering the audio gain so it is impossible that it is cross-coupling in the wiring harness. This will take some serious scope analysis. Anyone found the cure for this bug?

[*Continued on page 114*]

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ARMED FORCES DAY 18 MAY 1968

radio test

On Saturday May 18, 1968 the Department of Defense will sponsor the observance of Armed Forces Day. In Order to foster the continually growing rapport between the civilian and military communities, the Departments of the Army, Navy and Air Force will conduct communication tests between U. S. Amateur radio operators and selected military communications stations.

The military stations participating in the military-to-amateur crossband operation and receiving contests for both c.w. and RTTY operation are:

NSS—Washington, D. C.
NPG—San Francisco, California
WAR—Washington, D. C.
AIR—Washington, D. C.

Those amateurs establishing two-way contact with participating military stations will receive a specially designed QSL card confirming crossband communications. For those demonstrating operating proficiency by receiving a perfect copy of the Secretary of Defense originated message(s) transmitted during the receiving contest portion of the communications tests, a special Department of Defense certificate will be awarded.

Military To Amateur Crossband Test

Military radio stations WAR, NSS, NPG and AIR will be on the air from 181400 GMT to 190245 GMT. During this test of crossband operations, the military stations will transmit on specified military frequencies while amateur stations will transmit in the indicated portions of the amateur bands. Contacts will consist of a brief exchange of locations and signal reports. No traffic handling will be permitted.

Station	Military Frequency (kc)	Emission	Amateur Band (mc)
NPG (Navy Radio, San Francisco)	4010.5	RTTY	3.65-3.8
	4005	c.w.	3.5-3.65
	4013.5	s.s.b.	3.8-4.0
	4016.5	c.w.	3.65-3.8
	7301.5	s.s.b.	7.2-7.3
	7332	RTTY	7.0-7.2
	7375	c.w.	7.1-7.2
	13975.5	c.w.	14.0-14.2
	14383.5	s.s.b. (l.s.b.)	14.2-14.35
	20954.5	s.s.b.	21.0-21.45
	49.692 (mc)†	a.m.	50-54
	143.700 (mc)‡	a.m.	144-148
	148.410 (mc)†	a.m./f.m./ a.f.s.k.	144-148

C.W. Receiving Contest

A c.w. receiving contest will be conducted for any person capable of copying International Morse Code at 25 w.p.m. The c.w. broadcast will consist

WAR (Army Radio Wash., D.C.)	4001.5	c.w.	3.5-3.65
	4020	c.w.	3.65-3.8
	6992.5	c.w.	7.0-7.1
	7325	c.w.	7.1-7.2
	14405	c.w.	14.0-14.2
NSS (Navy Radio Wash., D.C.)	3357	c.w.	3.5-3.65
	4012.5	RTTY	3.60-3.65
	4015	c.w.	3.65-3.8
	4040	s.s.b.	3.8-4.0
	3701	c.w.	7.1-7.2
	7365	s.s.b.	7.2-7.3
	7380	RTTY	7.0-7.05
	14386.5	s.s.b. (u.s.b.)	7.1-7.15 and
	14480	c.w.	14.05-14.10
	143820*	a.f.s.k.	14.2-14.35
		RTTY/ a.m.	14.0-14.2 144.0-145.5
AIR (Air Force Radio Wash., D.C.)	3347	RTTY	3.5-3.8
	3397.5	c.w.	3.5-3.8
	4025	s.s.b.	3.8-4.0
	6997.5	c.w.	7.0-7.2
	7305	s.s.b.	7.2-7.3
	7315	RTTY	7.0-7.2
	13995	c.w.	14.0-14.2
	14397	s.s.b.	14.2-14.35
	20994	c.w.	21.0-21.1

*Provided it is consistent with operational and training commitments, this frequency will be keyed from a U.S. Navy aircraft flying between Washington, D.C. and Boston, Massachusetts during the major portion of the time allotted for military to amateur crossband contacts. The flight path will be over Baltimore, Philadelphia, New York City and Hartford, Connecticut. The call sign NSSAM will be utilized from the aircraft.

†To be operated from Mt. Diablo.

‡Provided it is consistent with operational and training commitments, this frequency will be keyed from a U.S. Navy aircraft flying between Los Angeles and Seattle during the major portion of the time allotted for military to amateur crossband contacts. The call sign NPGAM will be utilized from the aircraft.

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of a special Armed Forces Day message from the Secretary of Defense addressed to all radio amateurs and other participants. The schedule for this broadcast is as follows:

Time	Transmitting Station	Frequencies (kc)
18 May 1968 190300 GMT (182300 EDST) (181900 PST)	WAR—Army	3347, 6992.5, 14405
	NSS—Navy	3357, 4015, 7301, 14480
	NPG—Navy	4005, 4016.5, 7375, 13975.5
	AIR—Air Force	3397.5, 7315, 13995
	A6USA—Army Radio, San Francisco	6997.5

RTTY Receiving Contest

An RTTY receiving contest will be conducted for any individual amateur or station possessing the required equipment. This is a test of the operator's technical skill in aligning and adjusting his equipment, and serves to demonstrate the growing number of amateurs becoming skilled in this method of rapid communications. The RTTY broadcast will consist of a special Armed Forces Day message from the Secretary of Defense to all radioteletypewriter enthusiasts. The message will be transmitted at 60 w.p.m. in accordance with the following schedule:

Time	Transmitting Station	Frequencies (kc)
18 May 1968 190335 GMT (182335 EDST) (182135 CST) (181935 PST)	WAR—Army	3347, 6992.5, 14405
	NSS—Navy	4012.5, 7380
	NPG—Navy	4001.5
	AIR—Air Force	3397.5, 7315, 13995
	A6USA—Army Radio, San Francisco	6997.5
	A5USA—Army Radio, Fort Houston, Texas	4025

Submission Of Competition Entries

Transcriptions should be submitted "as received." No attempt should be made to correct possible transmission errors.

Time, frequency and call sign of the station copied as well as the name, call sign (if any) and address of the individual submitting the entry must be indicated on the page containing the text. Each year a large number of perfect copies are received with insufficient information, thereby precluding the issuance of a certificate.

Completed entries should be submitted to the Armed Forces Day Contest, Room 5A522, The Pentagon, Washington, D.C. 20315 and postmarked no later than 31 May 1968. ■

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DX

BY JOHN A. ATTAWAY,* K4IIF

An apology in advance gang for a column which will be a little shorter than usual this month. During the time that I would normally be preparing my contribution for the merry month of May I was 1—Embroiled in the construction of a new home, 2—Spending most of one weekend on a trip to the Bahamas to operate Harold North's station, VP7NA, during the second weekend of the ARRL DX Fone Contest, and 3—Jetting to California and New Jersey on a business trip which included side visits to some of the prominent DX clubs and the North Jersey DX Roundup. All and all it's been a busy month.

Considering first the award's program, we have 16 new WPX certificate winners and 27 new WPX endorsement stickers to report, along with 12 new WAZ awards and one new SSB DX Award. However, the big news is the announcement at the North Jersey DX Roundup on March 23 of the second member of the DX Hall of Fame. You will recall that the DX Hall of Fame, first mentioned in the July, 1967 column, is reserved for those amateurs who have made a really major contribution to DX which has stood the test of time. For several months the CQ DX Awards Advisory Committee evaluated 15 suggested nominees before announcing in the November issue that the first man elected to the Hall of Fame was Mr. Worldwide DXpedition, Gus Browning, W4BPD. Now, the committee, the editor Dick Ross, and myself take great pleasure in announcing that the second man to be elected to the DX Hall of Fame is Mr. QSL Manager himself, Jack Cummings, W2CTN.

It is highly doubtful that there is a DXer anywhere in the world who does not have many cards showing W2CTN, QSL Manager, as Jack has handled literally hundreds of stations from among the rarest countries. Our present list shows 227 stations for which W2CTN maintains logs for at least a portion if not all of their operation. Naturally a QSL Manager this active has continual changes in his station list so it is probable that we are not fully up-to-date. However, here is our listing of stations handled by W2CTN. For information on these stations send a self-addressed, stamped envelope to John M. Cummings, W2CTN, 159 Ketcham Avenue, Amityville, N.Y. 11701.

* P.O. Box 205, Winter Haven, Florida 33880.

Stations Handled by W2CTN, QSL Manager

CN2BK, CN8FE, CN8FW, CN8GB, CN8GC, CP1EA, CP1EA/5, CP5EZ, CR3KD, CR4AH, CR4AX, CR6DX, CT1NW, CX9AAN, DU1OR, EI2AT, EL5A, EP2RW, FA3CT, FA9UO, FG7TC, FG7TD, FG7XF, FG7XJ, FG7XK, FG7XS, FG7XV, FK8AH, FK8AI, FK8AT, FK8AW, FM7WP, FM7WU, FY7YG, GC3MWR, GC3POI/p, GC3SHZ/p, HB9AET/HZ, HBØSJ, HC1GC, HC4IE, HC4IM, HI8MMN, HI8XAG, HI8XGB, HK1AAF, HK2YO, HK3LR, HK3RQ, HK4RQ, HK6LR, HK6RQ, HKØRQ, HP1AC, HP1IE, HR2FG, HS1JB, JZØBM, JZØDA, JZØHA, JZØML, JZØPO, KA2DF, KA2JH, KA2LD, KA5RC, KB6CY, KC4USK, KC6FM, KG4AM, KG4BX, KG6APR, KR6BQ, KR6JZ, KV4CI, KW6CP, KW6CU, KW6EJ, KW6EK, KZ5LC, LX3AA, LX3AB, LX3KP, MP4BFK, MP4QBG.

OA4FM, OA7F, OA8D, OE9DZ, OH2BH/OHØ, OH2EW/OHØ, ON5IG, OQ5BC, OQ5IG, OX3BZ, OX3DL, OX3KC, OX3RH, OX3UD, OZ3UD, PJ2ME, PY7BAL/Ø, PZ1AP, PZ1AX, PZ1BR, PZ1CM, SL1CF, TA3BC, TG9AL, TI2CMF, TI2WD, VE1ASJ/1, VK2AYY/LH, VK2FR/LH, VK9AG, VK9GK, VK9JK, VK9MJ, VK9NT, VK9RR, VK9SB, VO2WM, VP1TA, VP2AV, VP2LD, VP2KH, VP2KT, VP2MV, VP3RW, VP4TR, VP5BP, VP6AK, VP6AP, VP6BW, VP6LJ, VP6PJ, VP6PV, VP6RG, VP7BP, VP7CS, VP7NS, VP7NW, VP8AI, VP8HJ, VP9BY, VQ1GDW, VQ1HT, VQ1SC, VQ2EW, VQ2HD, VQ2IE, VQ2JM, VQ3CF, VQ3HH, VQ3HV, VQ4AQ, VQ4IV, VQ5IG, VR2DA, VR2DK, VS9MB, VS9MP, VU2JA.

WØGTA/8F4, XW8AI/FG7, XZ2TH, YS1CN, YS1IM, YS1MM, YS1RSE, YS1SB, ZB1BX, ZB1FA, ZB1RM, ZB2AP, ZB2I, ZC4CZ, ZC4SG, ZD2DCP, ZD2KHK/NC, ZD5M, ZD8BC, ZD8HB, ZD8HL, ZD8RH, ZD9AM, ZE1AY, ZE1BK, ZP9AY, ZS2SS, ZS3EW, ZS40F, ZS6CN, ZS7M, 3A2BZ, 3AØDK, 4W1C, 4W1D, 4W1F, 5A2CW, 5A3CAD, 5A4TC, 5B4AA, 5B4CZ, 5B4RA, 5B4TC, 5H3HH, 5H3VV, 5J3LR, 5N2ACB, 5N2DCP, 5N2KHK, 5X5IG, 5Z4IV, 7X3CT, 7Z1AA, 9G1BQ, 9G1CW, 9G1DV, 9H1R, 9J2IE, 9L1BC, 9M4LP, 9M6BM, 9Q5IG, 9V1LP, 9Y4TR.

New CQ Awards Winners

WPX S.S.B.: CR4BC-317, G3PQF-318, UA3RDO-319, UB5ND-320, UA3BK-321, and PAØDEC-322.
WPX C.W.: WA4EPM-829, HB9NL-830, DL6CT-831, UC2KAG-832, UA4KNA-833, and W9HDR-834.
WPX Mixed: W5KUC-159 and W9LKI-160.
WPX Phone: YV4QG-148.
S.S.B. Contest WPX: OZ3SK-3.
WAZ C.W./Phone: W9VNE-2398, JA1EGM-2399, and K9WEH-2400.
WAZ 2-Way S.S.B.: HB9AHA-510, PAØDEC-511, K4MQG-512, JA1MIN-513, 4U1ITU-514, G3JEC-515, and OE3SAA-516.
WAZ Phone: DJ7YR-370 and K2ISP-371.
S.S.B. DX Award: 300 Countries: W9ILW-29.
WPX Endorsement Stickers: Continent—*Europe:* CX2CN, HB9NL, DL6CT, andVE7IG/VE8. *Africa:* W9UZS, CX2CN, and SP6FZ. *Oceania:* W9UZS

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and W6CHY. *Asia:* VE7IG/VE8. *North America:* W9UZS.

Mode—*Mixed:* WA6MWG-600, W4HUE-550, W5KUC-550. *S.S.B.:* KP4CL-650, PAØDEC-400, and CR4BC-300. *C.W.:* W2HO-700, W9GFF-650, W9UZS-600, W4HUE-500, WIDGT-500 and HB9NL-450. *Phone:* CX2CN-500, and YV4QG-350.

Band—*14 mc:* KP4CL.

New Deal For The CQ S.S.B. DX Awards

The DX Department is pleased to announce that as of May 1, 1968 the Ohio Valley Amateur Radio Association has agreed to serve as custodian for the *CQ* S.S.B. DX Awards. These duties will be handled specifically by Louise, W8HDB, and her OM, Herb, W8BQH.

For those of you not familiar with this award it is *CQ*'s countries award, with the limitation that all contacts be via the s.s.b. mode. Certificates are given for working 100 countries, 200 countries, and 300 countries, with intermediate endorsement stickers for 125, 150, 175, 225, 250, and 275 countries.

Louise will be taking care of the records and correspondence while Herb checks the cards. Both are active QSL Managers as well as DXers. They hope to have the *CQ* S.S.B. DX Honor Roll returned as a regular monthly feature very soon. Their address is 3785 Susanna Drive, Cincinnati, Ohio 45239.

Interpretation of Portable Prefixes for WPX

We had a nice letter this month from Marty, WB6NWW, asking for a ruling on the correct WPX status of several portable stations he had worked. Since there has been a lot of interest in this question we are reprinting Marty's list with italics denoting the correct choice in each case.

KP6AP/KH6 counts as: KP6, *KH6.*
WL7FFG/WN6 counts as: WL7, WL6, *WN6.*
KØUTO/KL7 counts as: *KL7*, KØ, KLØ.
WA8GXY/HR1 counts as: *HR1*, HR8, WA8.
VK2ADY/Ø counts as: VK2, *VKØ*.
OA8Q/4 counts as: *OA4*, OA8.
WA7EWC/Ø counts as: WAØ, KØ, *WØ*, WA7.
VE3DLC/2 counts as: *VE2*, 3C2, 3C3, VE3.
3C3DLC/2 counts as: 3C3, *3C2*, VE2, VE3.
HK3QB/W4 counts as: *W4*, HK4, HK3, W3, WA4, WB4.
WA5RZD/HK3 counts as: HK5, *HK3*, WA5, WA3.
ON6AF/VKR counts as: ON6, VKR6, VKR (Not familiar with VKR, would be necessary to see QSL).
VK4AG/W5 counts as: VK4, *W5*, K4, K5, VK5, WA5.
KH6AF/W1 counts as: KH1, *W1*, KH6, WA1, K1.
3CFJZ/SU—SU3, SU1, SU2, 3C3, VE3, *SUØ*.

De Extra

The 'Credibility Gap' in DX—A Possible

Craig Boyer, WN5RWU, second winner of the WPNX Award, CQ's prefix award for novices only. Craig runs 75 watts to a 4-element, 15 meter beam and receives on a Drake R-4A. As of Feb. 19 he had worked 72 countries and 49 states after 10 months as a novice. He is 14 years old and is the son of well-known DXer W5CCP. Who will be the next winner of this new award?

Solution: DXing, and it's associated DXpeditions, is a game of sorts and as such it has rules. Any worthwhile game has rules; they are a necessity. However, during the past year or two people have become preoccupied with the possibility that rule violations have been taking place. Consequently, it has become fashionable to question the veracity of many DXpeditions. A 'credibility gap' exists, and it is unfortunate because a sport of this nature functions best in an atmosphere of mutual trust. We need to have faith in each other.

However, the DX Awards Committee of the American Radio Relay League has adopted a form letter which it sends to amateurs who have operated from rare locations away from their normal habitats. A copy of this letter was forwarded to us by a rather indignant overseas amateur who felt that the letter bordered on being a personal insult. It really isn't that bad, but it *is* blunt. It wastes no time in asking for papers to prove that the DXpedition actually operated from the rare location. In today's world where things American are frequently resented just because they are American, one can see that this letter might ruffle a few feelings.

So what alternative does the DX Fraternity have? The League's letter will undoubtably make it harder to cheat, assuming that cheating has taken place in the past. However, is it the only way? No! A solution occurs to us which is so darn simple that it must have been thought of before. Consequently, there may be valid reasons why it has been rejected. However, since the widest point in the 'credibility gap' seems to occur between the ARRL DXCC Committee as representatives of the

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Here is the family of Joe, HB9PQ. The 7 boys and 1 girl are occasionally known as Snow White and the 7 Dwarfs, or as the QRM, depending on circumstances.

ARRL Board of Directors, who in turn represent the American amateurs, why not have the ARRL sponsor a major worldwide DXpedition of its own? If such an expedition could not be financed out of current revenue, the League could accept contributions much as the World Radio Propogation Study Association and the *Yasme* Foundation have done in the past. With ARRL controlling the finances, handling the licensing arrangements and QSLs, and the operator or operators being among their own, there could be no 'credibility gap.' In addition, it would give the DXCC Committee a first hand exposure to the problems of the DXpeditioner. This would be a good thng as it would help them to understand the complex situations which can develop on DXpeditions.

Be assured that we at *CQ* will be happy to accept QSLs for credit to WPX, WAZ, and the SSB DX Awards from an ARRL sponsored DXpedition, even one to Navassa Island.

Do I hear any comment?

Amateur Radio in the Bahamas

This writer was in VP7 land for a matter of hours during the second phone weekend of the ARRL DX Contest as the guest of Harold "Ken" North, VP7NA, President of the Bahamas Amateur Radio Society, BARS. It was a most delightful visit, with about 12 hours at the rig, and answered several questions for me. One involved P.O. Box 913, the club's old address, to which I had addressed a couple of letters which were never answered. Ken informed me that Box 913 had been on loan to the BARS at one time and had been widely publicized as the club's address. However, this box has been in other hands for many months and the present holder is not connected with amateur radio in any way. Consequently, any cards or letters sent to that box will probably never be seen by the Bahamian amateurs. The club's present address is P.O. Box 6004, Nassau, Bahamas, and all mail should be so directed.

An additional problem BARS has had with QSLs is that many people all over the world send cards for VP1, VP2, VP3, VP4, VP5, VP6, VP[illegible], and VP9 to BARS. VP7NA pointed out that they are no more able to deliver cards to other VP countries than are the ARRL bureaus. Usually they have no choice but to return many of these cards to the senders.

Ken also described the call assignment system in VP7-land. First, there is only one call with three letters after the prefix, namely VP7ARS, the local club station. All others have two letters, and if the first letter after the 7 is an N it indicates that the amateur is a native Bahamian. For examples, VP7NA, VP7NS, etc. Calls assigned to U.S. personnel on the out islands are temporary and begin with letters other than N. There are no calls starting with A, but VP7B, C, D, E, and F have been used. They haven't reached FZ as yet.

Don Thompson, VP7NS, gave me the very interesting bit of news that reciprocity between the USA and the Bahamas is nearing reality. Don is with the Bahamas Telecommunications Corporation which is the licensing authority in VP7-land. He thinks that it is doubtful that this will take the form of VP7 calls for visiting US amateurs. Permits to operate portable VP7 are more likely. Yours truly has applied for permission to operate as K4IIF/VP7 so I hope to have something definite for you on this next month.

More on Outgoing QSL Services

In previous columns we have mentioned the QSL Services operated by W3GJY, W3KT, and the International Short Wave League. Since that time *CQ* USA-CA Awards Chairman, Ed Hopper, W2GT, has called our attention to a fine QSL Service operated by Hank Doell, WB2RMM of 2015 Victor Holcomb Rd., Victor, N.Y. 14564. Hank has recently retired and is devoting full time to his Service which he started in September, 1966. He accepts cards at the rate of 35 for $1.00 if all 35 are submitted at the same time. Cards in lots of less than 35 are forwarded at

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the rate of 3¢ per card. Remittance must accompany the cards. Six cent commemorative U.S. postage stamps will be accepted in payment. Cards for the U.S., for U.S. possessions, Canada, or Mexico are not handled.

The WB2RMM Bureau operates as follows: An envelope is addressed to each country which is expected to have enough cards in a month to warrant it, and each batch of cards that arrives is immediately sorted into the proper envelopes. When six or more cards are in one envelope that envelope is forwarded and a new one addressed to take its place in the file. On the first of each month *all* envelopes with cards are sent even if they contain only one card, and a new batch of envelopes is prepared. Thus, cards may be dispatched the same day they arrive, in a day or so, or not later than the first of the following month.

Anybody Need a QSL Manager?

The following 2 gentlemen have recently contacted us to offer their services as QSL Manager for any DX stations who may be interested:

Allen G. DeMarr, WAØPUQ
848 McIntosh Dr.
Rosemount, Minn. 55068
William Conlon, K9KOD
1315 N. Franklin Av.
Litchfield, Illinois

More On The VK2AVA Expedition

Dear John:

With the publication in March *CQ* of my letter to you concerning WA2RAU I have discovered that I completely misinterpreted the letter of G3FKM and have done Doc a very grave injustice.

WA2RAU never once expected or asked for donations toward the Lord Howe DXpedition of VK2AVA! Doc made it clear in all publications that he expected Sase or IRC with the cards he would handle. Then, despite all that publicity, I now discover that Doc philanthropically spent $186 of his own money because some unthinking amateurs failed to heed his request and did not send sufficient postage with their cards. Instead of doing what many QSL managers do—put cards without return postage into the bureaus or entirely neglect them—Doc returned cards by airmail from his own pocket. I further learned that Doc took very valuable time from his medical practice to be certain that all replies were made without any delay whatsoever!

I never meant anything derogatory toward

At the microphone during last year's Liberian Amateur Association Field Day is Honorable Samuel Butler, EL2L, Communications Commissioner of Liberia. In the background operating c.w. is one of the countries newest holders of the Novice Class license.

Doc. He is a prince of a fellow and an extremely dedicated amateur. I was trying to get across at that time that I did not find the percentage of unthinking hams in regards to QSLing as great as Doc found it. However, in recent months, I have received through the new W4 Bureau, DARC, RSGB, and just the other day the ZL Bureau, enough cards for YJ8BW, ET3AC and FL8AC (the latter two having been QRT almost 2 years now) to make me think that the foreign amateurs do not understand the magnitude of the QSL manager's job. Of course, I realize that many foreign amateurs, and U.S. ones for that matter, cannot possibly afford to send IRCs or s.a.s.e. and hence the purpose of the QSL bureaus. But at the same time I think they are taking advantage of them. The bureau

Here are 2 of the best known DXers of VP7-land. Above, is Loyd "Bahama Bill" Thompson, VP7NH. Right, is Don Thompson, VP7NS, the Bahamas' top certificate hunter.

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Senor Oscar Schwarz, XE1IIL, one of Mexico's leading DXers. *(Photo courtesy XEØYL).*

method is quite expensive from the U.S. end of things when you realize how many bureaus a manager has to mail to, especially with the increase of postal rates. And more especially when the U.S. does not have an out going bureau. Accordingly I feel that when a rare station is concerned the bureaus should not be used to a great extent.

Most QSL managers cannot afford to do what WA2RAU did for VK2AVA! Now because of me he is being called names. I apologize to him and his friends. WE STILL NEED AN OUTGOING BUREAU regardless of the wonderful job W3KT and W3GJY do with theirs. If amateurs want cards so badly they should at least furnish the return postage when the cards themselves have been paid for. A station which is very rare and sends out 1000s of cards cannot be expected to foot the bill—whatever it is—for hundreds—and there are hundreds of cards which come via the world bureaus, no more than he should be expected to pay the bill if the cards came directly to him, that is, unless he wants to.

Please assure readers that all cards received by me for my "chickens" will be answered if in the log—but those without return postage will be sent via bureaus when and if there is enough to go to the bureau. Hence, they should have envelopes at their bureaus and should wait until the cards arrive there.

73, W4NJF

QSL Information

(Special thanks to WAØOTE and W4OPM who made major contributions to this month's info.)

CR4BC–Box 36, Mindelo, Cape Verde Islands, Africa.
CR6KT–Box 289, Sadabandeira, Angola.
CR7DS–Box 163, Vila Pery, Mozambique.
CR7PC–Box 1819, Lourenco Marques, Mozambique.
CX9PP–Box 1, Riviera, Uruguay.
DJØSD–Via WB2IEC.
EA8EX–Box 215, St. Croix, Tenerife, Canary Islands.
EAØAH–c/o W4DQS.
F Bureau–R.E.F., B.P. 70, Paris 12 ème, France.
FG7XT–To K5AWR.
FY7YN–Via VE1KG (Not W4EXO).
G3WYX (Contest group)–c/o G3RUV, 18 Lonsdale Road, Heavitree, Exeter, Devon, England.
G5AIL–48th Tactical Fighter Wing, Box 2283, APO, New York, 09179.
GD3RFK–c/o K4MQL.
HC8FN–Via WA2WUV.
HI8IBC–To K9GZK.
HI8XJP–c/o U.S. Embassy, Santo Domingo, Dominican Republic.
HKØBIS–Box 81, San Andres Island, Via Columbia.
HR6EB–Via K9BCH.
I9RB–c/o W2GHK, Box 7388, Newark, N.J. 07107.
JW5YG–Nyaalesund, Svalbard (Via Norway).
KM6BI–Box 20, FPO, San Francisco 96614.
KS4CF–To W4ZXI.
KS4CG–Via W4LVF.
KX6FN–c/o K2OJD.
KX6FU–Box 1723, APO, San Francisco 96555.
KX6GH–Box 1723, APO, San Francisco 96555.
KZ5MF–Via WN4DWN (NOT via WB2UKP).
OE1GWA–c/o WB2IEC.
OE1ZNC–c/o WB2IEC.
OE1ZRC–c/o WB2IEC.
OX4AB–Box 393, APO, New York 09121.
PJ2ME–To W2CTN.
SM5BPJ–Via W5LGG.
TF3WKX–c/o WA6IJG.
TF3EA–To VE4SK.
TG5HC–Via WA8LST.
TG9UZ–Box 336, Guatemala City, Guatemala.
VE8ML–Upper Air Station, Alert, N.W.T., Canada (Not via VE3BZO).
VK7SM–c/o W6BCT.
VKØAL–To VE6APO, Box 743, Spirit Lake, Alberta, Canada.
VP1JK–Box 489, Belize City, British Honduras.
VP2SY–Via K2MRB.
VP2VM–c/o G5FH.
VP5AA–To W1WQC.
VP7NA–Cards for contest QSOs on March 2 and 3 go via K4DNS. All others to K9GZK.
VP8IU–Via VE7AON.
VQ9JW–To G30NU.
VR3DY–c/o KH6GJW, 1627 Young St., Apt. 208B, Honolulu, Hawaii 96841.
VS6AZ–Via W6GB (ex-K6GMA).
VS6DO–Not via W2RDD.
WA1ARF/KL7–To W7NNF.
WA3DVO/VP6–c/o K4QIN.
WAØFUU/VP9–Via K3WAJ.
XE1PJL/XF4–Jose Levy, XEIJ, P.O. Box 200, Colima, Col., Mexico.
XP1AB–Box 393, APO, New York 09121.
YA1DAN–c/o KP4CL.
YS1WKE–To K4RCS.
YS1XEE–Via WB4BOJ.
YV3TXT–To WB6UJO, 9 Junipero Serra, San Rafael, Calif. 94901.
ZA1BY–Box 440, Tirana, Albania.
ZB2BM–RAF Club Station, North Front, Gibraltar.
ZD7KH–c/o K2HVN.
ZD8CC–Via K7UXN.
ZD8HAL–To KØETY.
ZD8RH–c/o W2CTN.
ZF1DX–Via K6KDS.
ZL3AB–To W6GB (ex-K6GMA).
ZP5CF–Box 512, Asunsion, Paraguay.

[*Continued on page 113*]

See page 126 for New Reader Service

Propagation

BY GEORGE JACOBS,* W3ASK

MUCH favorable comment has been received concerning the change in the period of validity of the DX Propagation Charts which appeared in last month's column. Beginning this month, therefore, the Short-Skip Propagation Charts will also be valid from the 15th of the month in which they appear, rather than the first of the month, as previously. For example, the Short-Skip Charts appearing in this month's column will be valid from *May 15 through July 15, 1968.*

In the future, Short-Skip Propagation Charts will be published in this column according to the following schedule:

CQ Date	*Period Covered By Short-Skip Charts*
January	Jan. 15-Mar. 15
March	Mar. 15-May 15
May	May 15-July 15
July	July 15-Sept. 15
September	Sept. 15-Nov. 15
November	Nov. 15-Jan. 15

DX Propagation Charts will be published according to the following schedule, which is a slight change from the one appearing in last month's column:

CQ Date	*Period Covered By DX Propagation Chart*
February	Feb. 15-Apr. 15
April	Apr. 15-June 15
June	June 15-Aug. 15
August	Aug. 15-Sept. 15
September	Sept. 15-Oct. 15
October	Oct. 15-Dec. 15
December	Dec. 15-Feb. 15

According to this schedule, Short-Skip and DX Propagation Charts will appear each alternate month, except for September, when both sets of Charts will appear in the same column.

May Propagation

During May, as the sun rises higher in the northern skies, optimum frequencies for long-distance propagation are expected to be somewhat *lower* during most of the daylight hours, and somewhat *higher* during the late afternoon, early evening and nighttime hours, than during the late winter and earlier spring months. Static levels are also expected to increase during May, and signals may be somewhat weaker on DX openings during the daylight hours.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for May 1 through June 15, 1968

Days	*Forecast Rating & Quality* (4)	(3)	(2)	(1)
Above Normal: **1, 6, 17, 23, 29,** 10, 13	A	A-B	B	B-C
Normal: **2-3, 5, 7-9, 11, 13-16, 18-20, 22, 24-26, 28, 30,** 1-4, 8-9, 11-12, 14-15				
Below Normal: **4, 10, 12, 21, 27, 31,** 5, 7	A-B	B	C	D
	B-C	C-D	D	E
Disturbed: 6	C-D	D-E	E	E

HOW TO USE THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthesis at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meanings: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals, fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—These Propagation Charts are valid through July 15, 1968. These Charts are prepared from basic propagation, data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce, Boulder, Colorado.

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Auroral activity is generally at a low lovel during periods of below normal or disturbed ionospheric conditions During such periods, openings are likely to occur on 10, 6 and 2 meters for distances up to approximately 1200 miles, as a result of reflection or scatter from ionized patches produced by an auroral display. Check the "Last Minute Forecast" at the beginning of this column for periods during May that are expected to be below normal or disturbed.

Sunspot Cycle

The Federal Solar Observatory at Zurich, Switzerland reports a monthly mean sunspot number of 107 for February, 1968. This results in a 12-month smoothed sunspot number of 96, centered on August, 1967. A smoothed sunspot number of 116 is forecast for May, 1968, as the present cycle nears its maximum level of intensity.

This month's column contains Short-Skip Propagation Charts for distances between 50 and 2300 miles, as well as Charts centered on Hawaii and Alaska. For specific times of DX openings during May, refer to the DX Propagation Charts which appeared in last month's column. For day-to-day propagation conditions expected during the month, see the "Last Minute Forecast", which appears at the beginning of this column.

A seasonal decrease is forecast for DX conditions on *10 meters*. While fewer openings are expected, some fairly good ones should be possible to tropical and southern areas during the daylight hours. Frequent short-skip openings, between distances of approximately 750 and 1400 miles, are also forecast for May.

Excellent world-wide DX propagation conditions are forecast for *15 meters* from shortly after sunrise, through the early evening hours, and into the hours of darkness on many circuits. During most of the daylight hours, this is expected to be the optimum band for DX openings. Numerous short-skip openings, between approximately 600 and 2300 miles are also predicted for the daylight and early evening hours.

DX propagation should be possible to one area of the world or another practically around-the-clock on *20 meters*. This should be the best band for DX propagation during the hours of darkness and through the sunrise period, when exceptionally high signal levels are expected. Excellent short-skip conditions are also forecast for this band between distances of approximately 350 and 2300 miles, during most of the daylight hours.

With higher static levels and fewer hours of darkness expected during May, *40 meter* DX propagation conditions should decline somewhat during the month. Some fairly good openings, however, are predicted to various areas of the world during the hours of darkness and during the sunset and sunrise periods. Excellent short-skip openings are forecast for the daytime hours, over distances between approximately 150 and 750 miles. During the hours of darkness, short-skip openings should extend to the one-hop limit of 2300 miles.

Higher static levels should also restrict DX openings on *80 meters* during May, but a few fairly good ones are forecast to some areas of the world during the hours of darkness. Excellent short-skip conditions are expected during the daylight hours for openings over distances ranging between 50 and 250 miles. During the hours of darkness, the short-skip range is expected to increase to approximately 2300 miles.

There is little chance during May for more than a very occasional DX opening on *160 meters*. What few DX openings may occur, will take place during the hours of darkness and the sunrise period. Short-skip openings beyond a groundwave range of about 50 miles are also very unlikely during the daylight hours. After sunset, short-skip openings may be possible up to a distance of approximately 1000 miles. Occasional openings beyond this range may be possible on some nights.

V.H.F. Ionospheric Openings

The *Aquarids,* a major meteor shower, is expected to take place during the first week of May. It is expected to peak at approximately 8 P.M. EST, May 4. Fairly frequent meteor-type ionospheric openings should be possible on 10, 6 and 2 meters as a result of the ionization that will be caused by the millions of meteors expected to enter the earth's atmosphere during the shower period.

A considerable seasonal increase in sporadic-E ionization is expected during May. This should result in some fairly good 6 meter short-skip openings between distances of approximately 1000 and 1400 miles. Short-skip 6 meter openings are most likely to occur between 9 A.M. and 1 P.M., and between 5 P.M. and 9 P.M., local standard time. There's also a fairly good possibility that some 6 meter trans-equatorial scatter openings may be possible during the early evening hours.

See page 126 for New Reader Service

CQ Short-Skip Propagation Chart

MAY 15 - JULY 15, 1968

Local Standard Time at Path Mid-Point (24-Hour Time System)

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	07-09 (1-2) 09-13 (2-3) 13-17 (1-2) 17-21 (2) 21-07 (1)	07-09 (2-0) 09-13 (3-0) 13-17 (2-0) 17-21 (2-1) 21-07 (1-0)
15	*Nil*	06-09 (0-2) 09-13 (0-3) 13-17 (0-2) 17-19 (0-3) 19-23 (0-2) 23-06 (0-1)	06-09 (2) 09-13 (3) 13-17 (2-4) 17-19 (3-4) 19-21 (2-3) 21-23 (2) 23-06 (1)	06-09 (2-1) 09-13 (3-2) 13-15 (4-3) 15-19 (4) 19-21 (3-2) 21-23 (2) 23-06 (1-0)
20	09-12 (0-1) 12-18 (0-2) 18-00 (0-1)	06-09 (0-2) 09-12 (1-3) 12-18 (2-4) 18-20 (1-3) 20-00 (1-2) 00-06 (0-1)	06-09 (2-3) 09-12 (3-4) 12-18 (4) 18-20 (3-4) 20-22 (2-4) 22-00 (2-3) 00-06 (1-2)	06-09 (3) 09-15 (4-3) 15-22 (4) 22-00 (3-4) 00-02 (2-3) 02-06 (2)
40	06-08 (1-2) 08-11 (2-4) 11-19 (3-4) 19-21 (2-3) 21-00 (1-2) 00-06 (0-1)	06-08 (2-4) 08-09 (4-3) 09-15 (4-2) 15-17 (4-3) 17-19 (4) 19-21 (4) 21-00 (2-3) 00-06 (1-3)	07-09 (4-3) 09-15 (2-1) 15-17 (3-1) 17-19 (4-2) 19-21 (4) 21-02 (3-4) 02-07 (3)	07-09 (3-1) 09-17 (1-0) 17-19 (2-0) 19-21 (4-3) 21-02 (4) 02-05 (3-4) 05-07 (3)
80	07-10 (4) 10-18 (4-3) 18-22 (4) 22-07 (3-4)	07-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-05 (4) 05-07 (4-3)	07-08 (1) 08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-05 (4) 05-07 (3-2)	07-08 (1-0) 08-18 (0) 18-20 (1-0) 20-22 (3-2) 22-03 (4-3) 03-05 (4-2) 05-07 (2-1)
160	05-08 (4-1) 08-09 (3-0) 09-18 (2-0) 18-20 (3-1) 20-22 (4-2) 22-05 (4-3)	05-08 (1) 08-18 (0) 18-20 (1-0) 20-22 (2-1) 22-00 (3-2) 00-03 (3) 03-05 (3-2)	07-08 (1-0) 08-20 (0) 20-22 (1) 22-00 (2-1) 00-03 (3-2) 03-05 (2) 05-07 (1)	07-20 (0) 20-00 (1) 00-03 (2) 03-05 (2-1) 05-06 (1) 06-07 (1-0)

Hawaii

Openings Given In Hawaiian Standard Time †

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

Alaska

Openings Given in GMT ‡

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

† Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT or Z Time. For example, when it is Noon in Honolulu, it is 17 or 5 P.M. in NYC, EST.

‡ To convert to Local Standard Time in Alaska, *subtract* 8 hours in the Pacific Standard Time Zone; 9 hours in the Yukon Zone and 10 hours in the Alaskan Standard Time Zone, from the GMT times shown in the Chart. GMT is 5 hours *ahead* of EST; 6 hours *ahead* of CST; 7 hours *ahead* of MST and 8 hours *ahead* of PST. For example when it is 18 GMT it is 13 or 1 P.M. EST in NYC.

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

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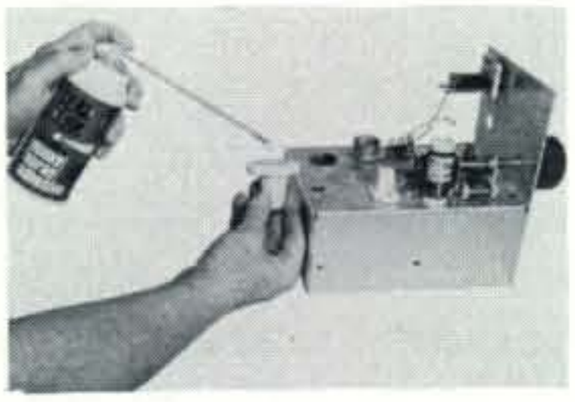
New Amateur Products

Heathkit

The Heathkit 108 page catalog, is available for the asking from the Heath Co., Benton Harbor, Mi., or by circling 62 on p. 126.



Leal

New from the Leal Co. is Leal-Lok an all purpose, non-mix, epoxy spray adhesive. Leal-Lok has a number of uses such as fastening brackets, small parts, components and hardware. Literature is available from Leal Co., Box 53, Oaklyn, N.J. 08107 or by circling 63 on page 126.

Q AND A

BY WILFRED M. SCHERER,* W2AEF

Equipment Reviews

Before getting to the questions this month we'd like to say some words about the equipment reviews presented in *CQ*.

First of all, these are primarily intended as a service for our readers, telling them about a piece of gear—what it does, how it does it and how *well* it does it.

Second, they provide a showcase wherein a manufacturer can have a product brought to light and explained, even if he is not an advertiser.

Particular emphasis is given to certain salient technical or mechanical details that may incorporate some new wrinkles of special interest or to point out why certain provisions are included or excluded. This is done so that the reader may be well informed about the equipment, thus enabling him to better understand it or to intelligently discuss it with fellow amateurs, regardless of whether or not he owns such gear, is a prospective purchaser or simply a bystander. Useful hints also may be derived for those who like to do their own design and construction work.

Operating suggestions are often given which, in addition to those in the equipment manual, may help the user to get the most out of the equipment or provide more convenient operation.

As for the prospective purchaser, the review information may be helpful as a guideline on what to expect in a particular piece of gear; however, there are other considerations such as styling and how the unit appeals or feels operationally to the individual. These he must judge for himself.

The reviews are *not* simply a copy of portions of the equipment-manual or from the advertising blurbs. They are based on extensive examination of how *we* found the particular equipment on hand. It should be noted, however, that just as there often is a bad apple in the barrel, bad equipment may turn up in the amateur field. In other cases we may have run into a unit that functions particularly well, but the rest of the production run may show some inherent fault. This we cannot predict nor can there be any assurance that some new fault will not crop up somewhere along the line.

Timing of Reviews

A question sometimes raised concerns why many *CQ* reviews appear later than similar reports on a product in other publications. This may be due to one or more of the following reasons: 1—Delayed delivery of the equipment to us; 2—Time consumed for extensive investigation of the gear; 3—Prior scheduling of other equipment reports; 4—Undersirable timing; 5—Improper operation of the equipment.

It is not our intention to beat the other guy to it and be the first to talk about a new product, but rather it is intended to provide as thorough, honest, and objective a report as is ethically possible, pointing out the "baddies" as well as the "goodies." It must be admitted however, that we sometimes get "carried away" with a product, but this is due to a genuine enthusiasm, rather than a desire to please an advertiser.

Weeks of time often are consumed in fine-combing through the gear closely examining circuitry and mechanical details, keeping an eye open for assembly techniques or problems (in the case of a kit), making and rechecking measurements and in giving the gear a good going over under actual on-the-air operating conditions. In respect to the latter, such aspects are looked for as handling capabilities, conveniences, ease of operation, undesirable characteristics and other features that are not readily judged by measurement. In the case of a transmitter, whether or not you can work a lot of DX with the particular job has no bearing, as this can be accomplished with any rig of the same power used with a given antenna.

Cases often arise where the gear does not meet the published specifications or where there is some inherent fault or poor performance involved. The manufacturer is then advised both as to the situation and of a suggested remedy or modification that may clear up the trouble. The review is then withheld until such time as we personally see that the difficulty has been corrected, otherwise the report must be presented unabated.

* Technical Director, *CQ*.

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At the risk of being criticized for "tootin' our own horn," we might add that although this procedure causes a delay in publication, it is a free engineering service of ultimate benefit to both the manufacturer and consumer. It gives the manufacturer the opportunity of taking the necessary steps to avoid possible complaints or embarrassment on subsequent deliveries and, probably of greater significance, that it also ensures the prospective purchaser of a better product.

Now don't get the idea that a late review necessarily means the equipment under appraisal was not up to snuff, as one or more of the other causes for delay may have been responsible instead, including the time required to prepare the manuscript in an understandably-written manner.

At any rate, we hope you enjoy the reviews and derive some benefit from them. Related suggestions will be most welcome.

Heater Regulation for R-390 Receiver

QUESTION: The Amperite Ballast tube 3TF7, in my R-390 receiver is short lived and hard to get. Can you provide a circuit that will replace the 3TF7, but retain the regulation?

ANSWER: The 3TF7 ballast tubes are available for $1.80 each from Barry Electronics, 512 Broadway, New York, N.Y. 10012.

If it is desired to eliminate the tube and install a new regulating system (as you suggest), it can be done with back-to-back Zener diodes connected across the a.c. supply source as a shunt regulator. The circuitry and constants are given at fig. 1. The regulated potential will be 12 volts, but if it is necessary to reduce this down to the original 11.3 volts (at pin 3 on V508), add a series resistor of about 2 ohms (½-watt) at the point marked X. The specified zener diodes may be obtained for $2.00 each from the source given in the March Q & A Column.

Although one zener will provide some voltage regulation, the a.c. waveform will be unsymmetrical. This is corrected by the back-to-back setup which also avoids excessive flow in the diode during the forward-conducting part of the cycle. On one half of the cycle one diode institutes the zener voltage while the other acts as a short. This situation reverses on the succeeding half cycle and regulation is thus provided over the full cycle.

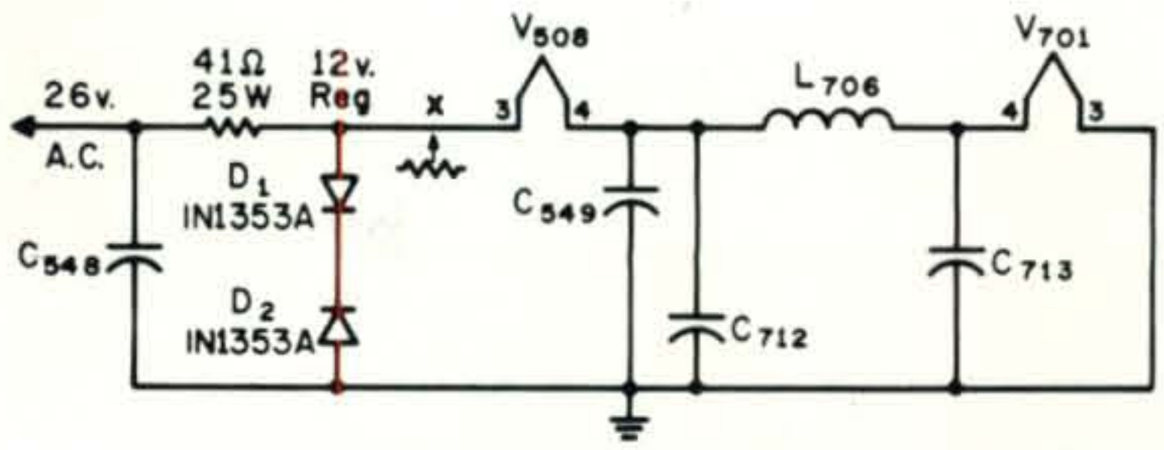

Fig. 1—Circuitry for obtaining heater-voltage regulation in the R-390 receiver, using Zener diodes instead of the 3TF7 ballast tube. D_1-D_2 are 10-watt 12-volt zener diodes. The basic setup may be used for other applications where low-voltage a.c. regulation is needed.

Ants on Antenna

QUESTION: Could you tell me what to use when antenna is fastened to a tree, to prevent ants' from the tree coming into the house by way of the antenna?

ANSWER: We must admit that this question at first evoked a chuckle and led us to think someone was pulling our leg; however, such a situation is not as comical as it sounds, inasmuch as it is one well within the realm of possibility, as confirmed by a phone call to a local exterminator

There are two approaches to follow. The first is to keep the ants off the tree by banding the tree trunk with a preparation made for the job. One such preventative is "Tree Tanglefoot" which may be obtained from most hardware stores or a garden-supply house. If you cannot locate this, consult a local tree-surgeon or exterminating outfit for another preparation.

The second approach is to keep the ants off the antenna by installing a six-inch wooden disc on the supporting line for the antenna (on the tree-side of the far insulator) and coating the disc with the same preparation. Such a disc might also be installed where the lead-in enters the house.

Perhaps the ants, at last, will realize that an *ant*-enna is not for them!

Balun for HQ-129X

QUESTION: The HQ-129X receiver has a 400-ohm balanced input that is inconvenient to use with a 52-ohm system. Can you give me some sort of balun values using toroid forms that is fairly broadbanded and that will have a good match to the receiver with balanced coax on 80-10 meters?

ANSWER: The HQ-129X may be set up for an unbalanced input by connecting the ground terminal (on the antenna-connector strip) to the adjacent antenna terminal. A simple step up transformer could then be used; however, for the balanced 400-ohm in-

[*Continued on page 98*]

SOMETHING BIG IS BREWING

Noticed the changes in CQ lately? Like the all **new,** all-color format? Or the **increase** in the number of articles? (we run more than any of the others now.) Or the **new vhf section?**

That's just the beginning. **CQ is on the rise.** CQ alone, of all the Ham Radio magazines showed an increase in subscriptions, single-copy sales and advertising last year. And when you're growing strong, it pays to go all the way.

We've been planning **bigger** issues still for the months ahead, and our editors are buying hundreds of great articles in advance to meet our growing needs.

So hop on the CQ band wagon. **Get your subscription** in today and make sure you get all the great new things we have planned for the months to come.

Oh, by the way, don't forget that CQ subscribers get to run classified ads **free** any time needed (see ad adjacent to the classified section). And that's worth money.

Progress may not be our most important product, but you could never tell.

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CQ BOOK MART

ANTENNA ROUNDUP Vol. II

Cat. #119-2. Here's your chance to get a copy of one of the most comphensive books on antennas ever offered to the Amateur. Ten big theory articles backed up by 82 detailed and illustrated construction projects for VHF on into microwave, from longwires to 17 element beams and Sterba Curtain arrays.

THE NEW RTTY HANDBOOK

Cat. #116. A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, written by Byron Kretzman, a well known authority in the field.

CQ ANTHOLOGY I

Cat. #102-1. We've looked back through the years 1945-1952 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out and are unavailable.

SURPLUS SCHEMATICS

Cat. #117. This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available.

VHF FOR THE RADIO AMATEUR

Cat. #115. If you are, or are planning to be a VHF operator you can't afford to be without this dynamic new handbook written especially for you. Filled from cover to cover with all new and original construction material presented so you can understand it.

ANTENNA ROUNDUP Vol. I

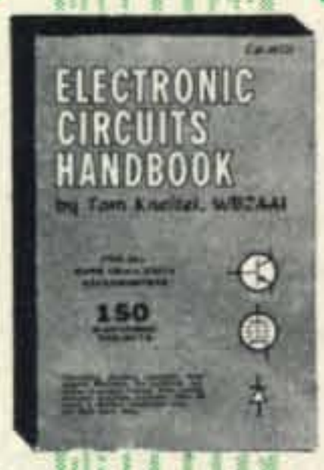
Cat. #119. A common denominator for all ham stations is the antenna. Here at last is the cream of antenna information packed into a 160 page book. Forty-seven information-packed articles that will dispel much of the mystery surrounding antennas.

SIDEBAND HANDBOOK

Cat. #103. One full year in the preparation of this terrific volume. This is *not a technical* book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff, gadgets, receiving adaptors, exciters, amplifiers.

SURPLUS CONVERSION HANDBOOK

Cat. #122. Contains 192 pages of conversion articles including the famous Command Set's plus a whole slew of the most popular military surplus gear including such gems as: SCR-522, ART-13, BC603, BC659, ARC 1, ARC 3, etc. Actually, it covers almost every piece of surplus gear worth the effort to convert for ham use.



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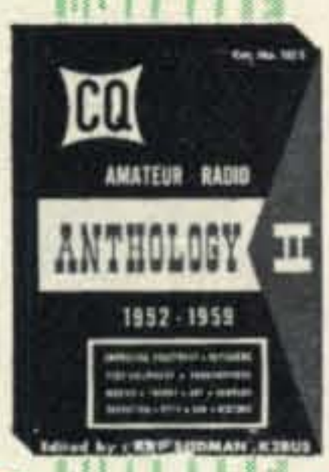
Cat. #121. Describes and discusses in detail 150 of the most often needed circuits around the shack. Novices and old-timers alike will find many valuable circuits here ideal for construction projects. Eleven great chapters cover a multitude of circuits for all.

SHOP & SHACK SHORTCUTS

Cat. #120. Here is a collection of hundreds of hints, kinks and short cuts which should be part of the library of every experimenter ham and CB'er. A veritable gold mine that will help save time, improve their shop techniques, dress up their shacks, and increase the efficiency of their equipment.



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ELECTRONIC CIRCUITS HANDBOOK VOL. II

Cat. #121-2. Tom Kneitel, K2AES, does it again with this sequel to his best selling Volume I. This time it's 159 additional circuits which will appeal to all Every shack will have a spot for this book. All circuits fully described in text with complete detailed construction steps plus schematics.

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put, a 4:1 balun should provide a suitable match.

The 400-ohm input for the receiver is a nominal specification and may vary somewhat either way. As a matter of fact, it is doubtful that the use of the balun, compared with a 52-ohm feed to the unbalanced-input of the receiver, will result in any significant improvement in reception.

On the other hand, a 1:1 balun between the antenna itself and the coax transmission line may offer some improvement, particularly in respect to noise pickup. A do-it-yourself kit for a 1:1 or 4:1 toroid balun is available at $5.00 from Amitron Associates, 12033 Otsego Street, North Hollywood, California.

Solid-State 455 Kc Crystal-Controlled B.F.O.

QUESTION: Can you furnish a schematic diagram of a solid-state crystal controlled 455 kc b.f.o. that will operate from 9 v.d.c. that I can use with the product detector described on page 74 in the October issue of *Popular Electronics*?

ANSWER: The circuit diagram for a 455 kc crystal-controlled b.f.o. is shown at fig. 2.

Please note that except as a last resort, inquiries related to articles in other publications should be sent to them as per our discussion on the subject last month.

Heater Connections for 4CX1000-A

QUESTION: In the Sept. '62 issue of *73* the schematic on page 36 for a cathode-driven linear amplifier, using a 4CX1000, does not indicate how the tube heaters should be connected. Since this tube has its cathode internally connected to one of the heater legs, how should the wiring be made to permit cathode drive? I have attached the circuit as I think it should be.

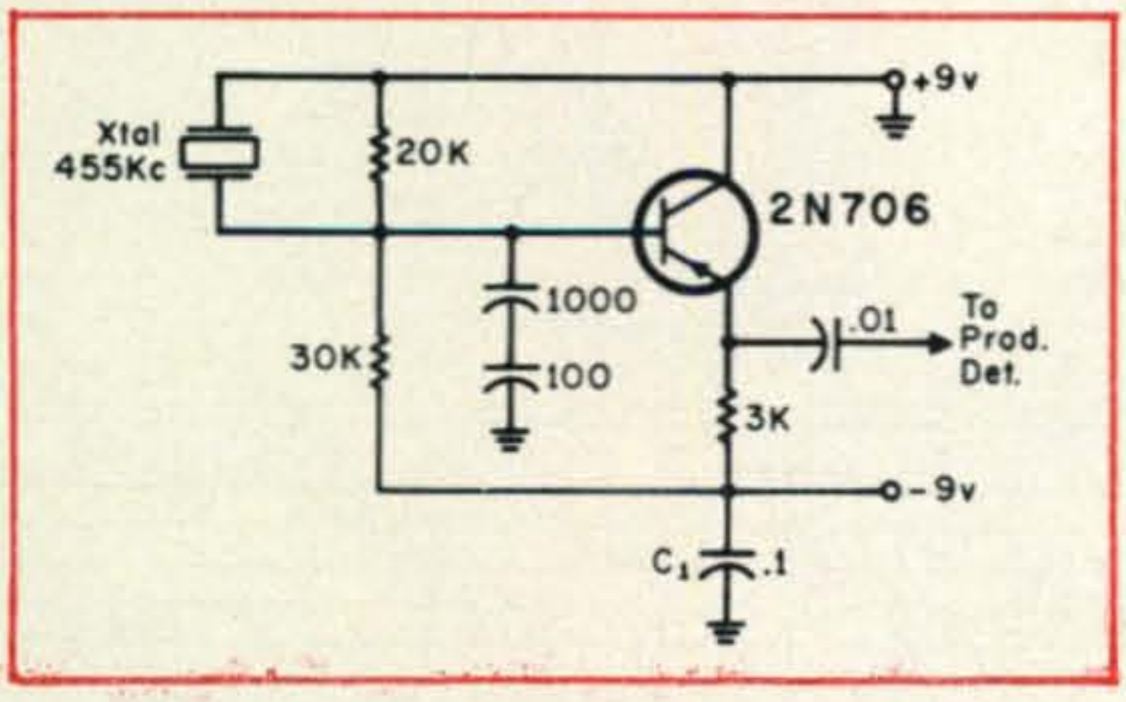

Fig. 2—Circuit diagram for a 455 kc crystal-controlled b.f.o. The *minus* 9 volts may be grounded, instead of the *plus*, in which case the *plus* 9-volt terminal should be disconnected from ground. C_1 should then be disconnected from the *minus* side and used to bypass the plus terminal.

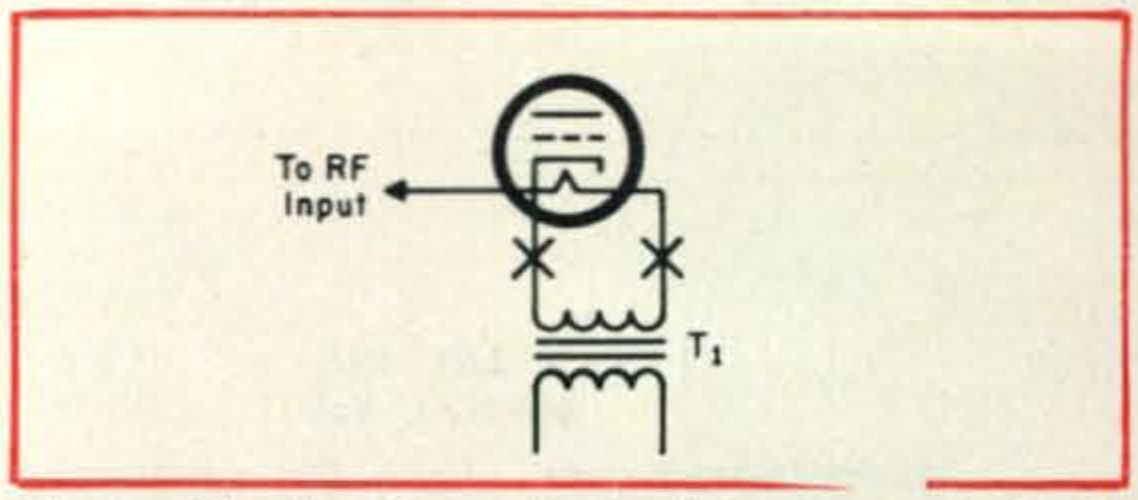

Fig. 3—Circuitry for cathode drive (grounded-grid operation) where the tube cathode is internally connected to the heater. T_1 should be a low-capacitance job, otherwise r.f. chokes will be needed at points marked *X*.

ANSWER: Although this question is related to another publication, it is felt to be of sufficient general interest to warrant space here.

The heater-cathode circuit as you have drawn it, as shown at fig. 3, is correct; however, in order to maintain the cathode above r.f. ground, r.f. chokes, capable of handling the heater current, must be inserted in the heater leads. You can build your own as described in the various handbooks or use a B & W FC-15A. Otherwise a low-capacitance filament transformer must be used.

Number of Turns of Wire

QUESTION: In a recent article a coil was specified to be made with #16 enamel wire spacewound on a ½" diameter wooden dowel for 3½". How many turns are used spacewound in a 3½" length?

ANSWER: The number of turns of a particular size wire (with a specified insulation) that can be spacewound over a given length can be determined by reference to a copper-wire table, such as published in various radio handbooks, where it will be found that a maximum of 19 turns of #16 enamel wire can be close-wound over a one-inch length. Since space-wound means spacing between turns equal to the diameter of the wire, you divide by two. The result indicates that 9½ turns may be space-wound over an inch, so for 3.5 inches the number of turns is: 3.5" × 9.5 t. = 33.25 t. (use 33).

Front-End Crystal Filters

QUESTION: Do you have any information on 20-meter front-end crystal filters?

ANSWER: The only information we've run across on the subject may be found on page

[*Continued on page 118*]

See page 126 for New Reader Service

THE awards PROGRAM

BY ED HOPPER,* W2GT

THE May, "Story of The Month" concerns itself with Norm Maguire, W5NXF/KH6FQB.

Norman L. Maguire, W5NXF/KH6FQB

Norman, 46, was born and raised in Stamford/Glenbrook, Conn. He attended Lehigh University and the University of New Mexico, and graduated from U.N.M. with degrees of B.S. in E.E., and B.S. in M.E.

Mrs. Maguire (Polly), was born in the Boston area but was raised on Long Island—at Port Washington. (*Wonder if she got* CQ *to move there? Hi.*). Polly graduated from Mount Holyoke College in Massachusetts with a B.A. in Physics and recently acquired an M.A. in Mathematics from U.N.M. But handling four children and the OM takes up most of her time these days.

The children are: Chuck, Marilyn, Dick and Susan. Chuck is a Junior in Architecture at the University of California in Berkeley, while Marilyn is a Freshman at Colorado College, Colorado Springs.

Norm has been an Aeronautical Engineer and Mathematician as well as having worked in the broadcasting and atomic fields but, being modest, he will not talk about being a member of the six man team that designed a famous Jet-plane. For health reasons, he is now semi-retired but in the investment field and spends half of his time as W5NXF and the other half as KH6FQB.

His first commercial license was obtained in 1943, and first amateur ticket in 1946 as W1QNK.

Norm got interested in Certificate Hunting after reading those fine articles by Howy, W2QHH some years ago in *CQ*, and now has over 300 awards.

Norman has been a member of the National Radio Club since 1935 and has been an officer of this club at various times. Although not now a member, he was an officer and director of NNRC for years. At different periods, he has enjoyed membership in BCB DX Clubs, which explains that large loop antenna in the photograph.

Last August, Norm and Ed De Long, had planned to go over to rare Kalawao county but they had to cancel the trip due to some equipment trouble.

As this is being written, Norman is enjoying the fine weather in Honolulu where the KH6FQB equipment is a Swan 350 with a 52 inch DPZ whip antenna on the apartment balcony. When not haming, much fun is had sailing in his Pacific Catamaran. A few of

Norm, W5NXF working a new one.

* 103 Whittman St., Rochelle Park, N.J. 07662.

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Worked Vermont.

his many visitors at KH6 have been: WØMCX, KØMAS, WA6MWG, WA6OET, VE8AH and KA7AB.

In New Mexico, the W5NXF equipment includes: KWM-2; 30L-1; with beams on 10, 15 and 20 meters.

The W5NXF/KH6FQB USA-CA record is: #1-V, All A-3, USA-CA-500 Award issued September 1961. February 14, 1962, #4 USA-CA-1000 Award endorsed All A-3, Mixed, and later All 7mc 2 × s.s.b., All 14 mc 2 × s.s.b. #4 USA-CA-1500 Award, All A-3, issued November 14, 1962 and later endorsed All 2 × s.s.b. On June 4, 1965, #21 USA-CA-2000 Award, endorsed Mixed was issued and later endorsed All 2 × s.s.b. On December 21, 1967, USA-CA-2500 Award #22, All A-3 was issued. The present confirmed counties score is 2540. *Aloha.*

Letters

Kay, K4TBG, writes: "Enclosed you will find 7 years of hard work but happy times. I have waited so long to reach the 500 goal and now I'll keep on plugging for the 1000.

Thank you for your Lovely Certificate. I am a Technician and hope some day I can go farther.

I am married but the OM is not a ham and has no interest in it. Have two married daughters and six grandchildren.

I think amateur radio is a wonderful hobby and especially for us older folks."

Walt, WA2HGL, writes: "Well, I accomplished both objectives I had set for myself: to get my USA-CA-2000 and DXCC.

I have been operating mobile in New Jersey, New York and Pennsylvania on 3943 on Wednesday evenings with some operation on 14336 and 14340 when the nets are not swamped with mobiles. The Independent Net often has mobile QRZing on 3 or 4 different frequencies to handle the load.

I will be going mobile on Wednesday evenings whenever the budget permits and my log keeper is available.

I believe that N.J. is pretty well represented by myself and W2KXL/M on 20. At the present, I have 75 pretty much to myself and I'm having a real ball with the pile-ups for the rare counties."

Roger, WA8LWK, writes: "Please remind your readers of the First Annual Michigan QSO Party, May 18-20, co-sponsored by the Central Michigan A.R.C. and the Greater Michigan Foundation.

I expect to operate from Gogebic county on 80/40/20/15 c.w. and we hope to have a second station on s.s.b.

If your readers will write about their needed Michigan Counties, I will try to get to some of them this summer." (Write R. Phillips, RFD 1, Eagle, Michigan 48822).

Richard, WA9LJZ, writes: "Our club, Palisades Amateur Radio Club, is going to have another activity for the benefit of the County Hunters. Our try on January 13th for Carroll county was a very good effort with about 100 contacts, however the next week we went portable into Jo Daviess county and had but 5 contacts.

We will operate from Carroll county on May 11. We will work plus or minus 5 of 7225 from 1500 to 1700 GTM and plus or minus 5 of 14336 from 1700 to 2200(+) GMT.

We will go into Jo Daviess county with the same line up on the following weekend (May 18) *only* if we get enough requests to make it worth while. If enough fellows tell us on the air that they need Jo Daviess, we will go up there.

We have special cards made up and will QSL 100% for each card received." (Richard Kline, WA9LJZ, President, Palisades ARC, 726 No. 4th St., Savanna, Ill. 61074).

Ev., W6DOR/W7BYF, writes: "Here is an unusual request—perhaps thru your column I could find out if anyone has a QSL, other than myself, that was sent from Dayton, Ohio to Washington, D.C., by the first *Jet Airmail.* This was 30 May, 1953, I also sent one via the same mail to W1AW but I believe ARRL no longer has it. This QSL contains the American Air Mail Society cancel and an air mail stamp commemorating the "50th Anniversary of Powered Flight."

Conn. VNP Award.

See page 126 for New Reader Service

Do cancelled ham tickets rate a certificate? I have all 14 of mine starting in 1934." (*NO*).

Jim, K1QZV, writes: "After having done some county mobiling, I found that the logs I was using were too complicated for this type of operation. So, after carefully checking the FCC rules, I designed my own log.

I have a limited supply, which I will be pleased to donate to those who do a *lot of mobiling* if they will send me a #14 envelope self-addressed with 20¢ postage on it.

Each log contains 100 pages and each page has room for 32 entries, that is 3200 contacts per book." (Jim Harrington, K1QVZ, 37 Scotland Road, Cranston, R. I. 02920). (*Oh yes, Jim also donated QSLs to Ed De Young K6CCA/KP6AP/KH6GLU/VR3DY for some of his operations*).

Ron, K6JAH, writes: "I would like to have your readers advise me of their needed counties in California.

I would be pleased to go to some of these counties if I get enough requests, including those from DX stations.

I will publicize times, dates, frequencies and counties. I plan to operate 10-40 meters. Naturally I will QSL 100%." (Ron Suttora, K6JAH, 544 Falcon Way, Livermore, Calif. 94550).

Awards

The Worked Vermont Award: *Now* sponsored by the Central Vermont Amateur Radio Club of Montpelier, Vermont. Contacts with 13 of Vermont's 14 counties are required and all contacts must be made from within a 25 mile radius of applicants home QTH. Mobile contacts with stations working from within Vermont count as valid contacts. Endorsements will be made for all one band or mode, if requested. QSLs are no longer required as proof, but a note signed by another licensed amateur or a club official saying he has seen the QSLs and that they are in possession of the applicant, is required. Apply to: Ray N. Flood, W1FPS, 2 Marlboro Ave., Brattleboro, Vermont 05301.

The CVN Participation Award: Issued by the DX International Communications Association, a subsidiary of the Canadian DX Club. A consecutive series of checkins in either the 2 or 6 meter Nutmeg VHF Traffic Net is required and when any amateur is recognized as doing such, he will be awarded the *C*onnecticut *V*HF *N*ET *P*articipation Award. Director of the Award is: Ralph J. Irace, Jr., WA1GEK, 4 Fox Ridge Lane, Avon Conn. 06001.

Center Of Population Award.

The Center Of Population Award: Sponsored by the Centralia Radio Club, Centralia, Illinois. Stations in Illinois, Indiana, Missouri, Kentucky, and Tennessee must work 5 Centralia stations. All others need 4 stations, except DX needs 2. Centralia stations must have received applicants QSLs. Applicant need not have QSL, log data is sufficient. Send GCR list and $.50 (Free to DX) to: Ken Bauer, RR5, Centralia, Illinois 62801. On any good map you will see the Center of population mark just northwest of Centralia. This will be good only until 1970 when this Center will change after the new census, it is slowly moving west.

White Stick Award: This certificate is awarded to any Radio Amateur who produces proof of contact with fifty blind amateurs, of which not more than ten may be in his own country. All contacts must be after 1st January 1963. Any mode or band may be used, and awards will be endorsed accordingly. All claims, with remittance of one dollar, eight shillings sterling, or ten IRCs, should be sent to the Founder and Custodian, Frank A. Robb, GI6TK, 125 Downshire Road, Holywood, County Down, Northern Ireland. All amateurs are requested to notify GI6TK of the call signs of any blind amateurs in their area. This will help him compile a world list of blind amateurs.

Notes

Again thanks to Gil, ex-W8GIU/5, now W5QPX, for sending a POD 26 to JA1KSO. Thanks also to Doug., W1KVA for POD 26s going to JA1ACA and JA1MIN. Oh yes, Gil, W5QPX is the only station active on c.w. in Dallam county and only 7 blocks from Hartly county where there is *NO* activity on c.w./

[*Continued on page 113*]

White Stick Award.

See page 126 for New Reader Service

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

May	3-6	Teenage QSO Party
May	4-5	USSR DX Contest
May	4-5	Nebraska QSO Party
May	11-12	OZ-CCA Contest
May	11-12	Georgia QSO Party
May	18-19	YL Int. SSBers Contest
May	18-19	Michigan Week QSO Party
May	19-26	Michigan State QSO Party
May	25-27	Missouri QSO Party
May 31 - June 3		CHC/FHC/HTH QSO Party
June	8-9	National Field Day
June	8-10	New York State QSO Party
June	21-23	ARRL Field Day
July	3-5	KA Field Day
July	20-21	Colombia Contest
August	10-11	DARC WAE C.W. Contest
September	7-8	DARC WAE Phone Contest
October	5-6	VK/ZL/Oceania Phone Contest
October	12-13	VK/ZL/Oceania C.W. Contest
October	12-13	RSGB 28 mc Phone Contest
October	19-20	Boy Scouts Jamboree
October	**26-27**	**CQ WW DX Phone Contest**
October	26-27	RSGB 7 mc C.W. Contest
November	9-10	RSGB 7 mc Phone Contest
November	**23-24**	**CQ WW DX C.W. Contest**

Teenage QSO Party

Starts: 2100 GMT Friday, May 3
Ends: 0400 GMT Monday, May 6

The 2nd annual Teenage party sponsored by the LaFollette High School ARC, did not get their announcement to us in time for the April issue. And it is doubtful you will receive this issue in time for the contest.

Score 1 point for each teenage contact and 1 multiplier for each ARRL section worked.

Additional information and logs go to: Teenage QSO Party, LaFollette High School ARC, 702 Pflaum Road, Madison, Wis. 53716

USSR DX Contest

Starts: 2100 GMT Saturday, May 4
Ends: 2100 GMT Sunday, May 5

Remember, this is a world wide contest and you can work stations outside the USSR for contest credit. Rules in last month's CALENDAR.

Mailing deadline is June 1st and logs go to: Central Radio Club, P.O. Box 88, Moscow, USSR.

Nebraska QSO Party

Starts: 1600 GMT Saturday, May 4
Ends: 2200 GMT Sunday, May 5

Full details in last month's CALENDAR. Logs go to: Lincoln ARC, Att: KØQIX, 3829 "W" Street, Lincoln, Neb. 68503. Mailing deadline is June 10th. Include a s.a.s.e. for a copy of the results.

OZ—CCA C.W. Contest

Starts: 1200 GMT Saturday, May 11
Ends: 2400 GMT Sunday, May 12

This is the 17th running of this contest by the EDR. Its a world wide type contest and operation is confined to c.w. on all bands, 3.5 thru 28 mc. Both single and muilti-operator stations permitted.

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

Scoring: Each completed QSO counts 3 points. Contacts with OX, OY and OZ stations are worth 6 points. The multiplier is determined by the sum of countries worked on all bands. Call areas of W/K, VE/VO, PY, LU, VK and ZL also count as a multiplier. Final score, total QSO points times the sum of the multiplier.

Awards: Certificates to the highest scoring stations in each country and call areas listed above.

Include a summary sheet with your log and a signed statement that all rules and regulations have been observed, and that you will abide by the decision of the EDR Committee.

Mailing deadline is June 15th to: E.D.R. Contest Committee, P.O. Box 335, Aalborg, Denmark. Include an IRC for contest results.

Georgia QSO Party

Starts: 2100 GMT Saturday, May 11

* 14 Sherwood Road, Stamford, Conn. 06905.

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Ends: 0300 GMT Monday, May 13

The seventh annual Georgia QSO Party is once again sponsored by the Columbus ARC.

There are no time or power restrictions and the same station may be contacted on each band and mode.

Exchange: QSO nr., RS/RST and QTH. County for Ga. stations; state, province or country for others. (Ga. to Ga. contacts permitted)

Scoring: Each contact counts 2 points. Ga. stations multiply total QSO points by number of different states and VE provinces worked. Others use number of Georgia counties for their multiplier. (Max. of 159) DX stations may be worked for QSO points but do not count as a multipler.

Frequencies: c.w.–1810, 3590, 7060, 14060, 21060, 28060. s.s.b.–3975, 7230, 14290, 21410, 28600. Novices–3725, 7175, 21110.

Awards: Certificates to the top scorers in each state, province, country and Georgia county. Additional awards if warranted. Plaques to the highest scoring out of state and Georgia entries. And the highest Georgia s.s.b. score and Georgia Club score.

Logs: Date/time in GMT, station worked, exchange sent/rec'd, band, mode and multiplier. Include a summary sheet and signed declaration that all rules and regulations have been observed.

Mailing deadline, June 3rd and logs go to: Columbus ARC, Att: Charles K. Epps, K4BVD, 1638 Forest Avenue, Columbus, Georgia 31906.

YL Int. SSBers QSO Party

Starts: 1800 GMT Friday, May 17

Ends: 0100 GMT Monday, May 20

Both phone and c.w. may be used up to 0100 Sunday the 19th but *only* c.w. for the rest of the 24 hr. period to 0100 Monday.

There are many categories and a somewhat complicated scoring system. It is advisable that you write to WA6MWG for rules and log summary sheets. If you wish to enter the DX/W-K team category you must also advise him.

Following are the rules in brief. There are three categories and you can enter more than one.

1. DX/W-K Teams: These teams will consist of a DX station and a stateside station. Each will enter the single operator section. Scores will be combined for team score.

2. YL/OM Teams: These teams will comprise of related pairs; husband/wife, father/daughter, mother/son, brother/sister. Operation must be from the same QTH and each will use their own call. Each scores separately, logs may also be submitted for single operator section.

3. SINGLE OPERATOR: This is the only category open to non-members, as well as members.

Exchange: RS/RST, name, s.s.b. nr., state, VE province or country, Zone and partner's call (if team member). All times in GMT.

Scoring: Same for all categories. Contacts between SSB members 4 points, with non-members 2 points, c.w. contacts count double. (Non-members must contact SSB members only, contacts between non-members have no value.)

Multiplier: Sum of different prefixes, countries, states, VE provinces, Zones and teams. (Where both members have been contacted.) KH6 and KL7 count both as state and DX country.

Frequencies: Phone–3810, 7215, 14332, 21373, 28673. (DX–3773, 7090, 14132, 14332) c.w.–3565, 7020, 14080, 21080, 28080.

The same station may be worked on different bands and modes for additional QSO points, but *not* for additional multipliers. Each station must show 6 hours of continuous rest in each 24 hour period. Each log must show at least 6 hours of operating time.

Awards are many and varied for the first

Seeing two CQ Columnists together is unusual, but three at the same time is an event of major proportions. The occasion was the North Jersey DX Round-up this past March at Wayne, N.J. Any resemblance to the pictures you see heading our columns each month is purely accidental. (About time we have some new ones taken, don't you think!)

See page 126 for New Reader Service

For the past couple of years Don Miller never stayed in one place long enough for us to present him with the Trophies he won in our 1966 World Wide DX Contest. We finally caught up with him at the North Jersey DX Round-up. Our man John Attaway, who was one of the guest speakers at the dinner, made the presentation. The Bill Leonard, W2SKE Trophy for his operation from VQ9AA/D on all band phone. And the K2HLB, Dr. Harold Megibow Memorial Trophy for c.w. operation on 14 mc at 1G5A.

3 places in the many categories and sections. There are at least 10 Trophies listed.

Submit logs within 30 days to: Pete Billon, WA6MWG, 4040 Via Opata, Palos Verdes Estates, Calif. 90274

Michigan Week QSO Party

Starts: 2100 GMT Saturday, May 18
Ends: 0300 GMT Monday, May 20

This activity is co-sponsored by the Central Michigan ARC and the Greater Michigan Foundation and is not to be confused with "Michigan Week" proclaimed by the Governor each year. Contacts may *not* be used for the "Michigan Week Certificate." That's another affair.

Operation is limited to 24 hours for contest credit. The same station may be worked on each band and phone and c.w. are separate contests.

Exchange: RS/RST plus a 3 figure QSO number starting with 001. Mich. stations will include their county, all others their state, province or country.

Scoring: One point per contact. (In-state contacts permitted for Mich. stations) Mich. use state, VE provinces and countries for their multiplier. Others, different Mich. counties worked. (Max. of 83)

Frequencies: c.w.—3560, 7060, 14060, 21060, 28060, 50.100, 147.900. Phone—3830/3930, 7205/7235, 14240/14340, 21310/21410, 28750, 50.400, 145.000, 146.940.

Awards: Certificates to the top scorers in each state, province or country. Michigan stations will compete for 1st place Trophies and 2nd—5th place certificates.

Mailing deadline is June 30th and go to: Central Michigan ARC, P.O. Box 73, Lansing, Michigan 48901

Michigan State QSO Party

Starts: 0500 GMT Sunday, May 19
Ends: 0500 GMT Sunday, May 26

This is a week long activity sponsored by the Michigan CHC Chapter #13 and takes place each year during "Michigan Week."

The object is to work as many Michigan counties and CHCers as possible. A station may be worked only once unless he is mobile or portable in a different county and then will only count as a county.

Exchange: Mich. RS/RST, County, CHC Nr. and Nr. 13 if a chapter member. (Use HTH if non-member) Others: RS/RST, state or country.

Scoring: 1 point for each Mich. county worked, 1 point for each Mich. CHCer worked, (not a Chapter 13 member) 2 points for each Chapter 13 member worked, and ½ point for each out-of-state or DX station worked by a Michigan station. Total of QSO points will be your final score.

Awards: To the highest scoring Michigan, out-of-state and DX stations.

Logs must be in before June 30th. They go to: Kurt R. Schmeisser, 20114 Houghton Ave., Detroit, Michigan 48219

Missouri QSO Party

Starts: 2300 GMT Saturday, May 25
Ends: 0300 GMT Monday, May 27

This is the 5th Missouri party sponsored by the Northwest St. Louis ARC. There are no power restrictions or time limit. The same station may be worked on each band and mode for contact points.

Exchange: QSO Nr., RS/RST and QTH. County for Missouri stations; state, province or country for others.

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Scoring: Missouri—1 point per QSO, total multiplied by number of states, provinces and countries worked. Out-of-state: 2 points for each Mo. contact, multiplied by Mo. counties worked. (Max. of 115)

Frequencies: c.w.—3520, 7025, 14050, 21050. Phone—3950 (0300), 7225, (1600), 14330 (2000) and 21350. Check phone freq. at indicated times for Missouri stations on the 26th.

Awards: Certificates to the top stations in each state, Ve province and foreign country. (min. of 5 contacts) The top 5 single operator stations in Missouri and 3 top club stations in the world will also receive awards.

Mailing deadline June 30th. Logs go to: John Carter, KØIFL, 4236 Shaw Blvd., St. Louis, Missouri 63110. Include s.a.s.e for copy of results.

CHC/FHC/HTH Party

Starts: 2300 GMT Friday, May 31
Ends: 0600 GMT Monday, June 3

This one stirs up a lot of activity, what with the Certificate Hunters Club, the Flying Hams Club, Hunt the Hunters, Novices and s.w.ls. all going for awards, it gets a bit involved. It is highly recommended that you write K6BX for announcement. (Include s.a.s.e.)

Exchange: CHCers and FHCers: QSO Nr., RS/RST, name, CHC/FHC nr., state and county. (DX stations, DOK, LANN, Province and etc.) HTHers and Novices same above less membership number.

Scoring: CHCers: CHC to CHC 1 point, CHC to HTH 2 points, YL, Novices and FHC 3 points. HTHers: HTH to CHC 3 points, FHC counts 4 points and YL CHC 5 points. (HTH to HTH no value) The same stations can be worked on a different band and mode for contact points. (s.s.b. and a.m. different modes)

S.w.1s. can also submit a log of stations heard for s.w.1. awards Use same scoring system as the HTHers

Multiplier: Add the number of different continents, countries, VE provinces, US states Own state/country can also be claimed. KH and KL count both as state and DX.

Final Score: Multiply total QSO points by sum total of above multiplier.

Awards: 1st, 2nd and 3rd place certificates for the world, each continent, country, state, VE province. Plus over 40 Trophies in many special categories.

Frequencies: c.w. — 3575, 7030, 14075, 21090, 28090, a.m.—3810, 7235, 14230, 21330, 28800. (DX 3675, 7075) s.s.b.—3990, 7210, 14340, 21440, 28690. (DX 3775, 7090) v.h.f.—50.3 Novice—3710, 7160, 21140.

A detailed and accurate log and summary sheet is requested. Inaccuracy in the scoring will be deemed sufficient cause for disqualification. There is no multi-operator category, if used score must be divided by number of operators.

Besides contest awards your log may also be used for the many awards in the CHC program. Applications for these awards can be made with your contest entry. It is therefore essential that you secure official forms from K6BX (s.a.s.e.) so that you will get the most credits for your efforts.

Logs must be submitted no later than July 5th and they go to: Clif Evans, K6BX, 3212 Mesa Verde Road, Bonita, Calif. 92002

Editor's Notes

The Oceania Trophy donated by Jack Chalk, KW6EJ, for the WPX SSB Contest, will be available to *all* of Oceania. Jack has decided *not* to exclude Hawaii as announced in the rules.

If you are confused by some of the announcements in this month's CALENDAR, I'm with you. With two Michigan activities on at the same time, a teenage announcement received much too late to give it proper coverage and an activity that stops operation in one mode but allows the other to continue for another 24 hours, I'm just as confused as you.

73 for now, Frank, W1WY

"Why? Because I like privacy when I'm on the air . . ."

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SURPLUS sidelights

BY GORDON ELIOT WHITE*

OFTEN surplus goodies turn out to be real finds despite a rather uninteresting first appearance. I recently saw a piece of coaxial plumbing from one of the midwestern surplus shops that did not impress me, though it was a nice hunk of scrap brass. I looked into it a bit though, and it was much better on the second reading.

The item was a directional coupler, useful for checking standing wave ratios on feed lines. Sold for $8 by Mendelson Electronics, 516 Linden Avenue, Dayton, Ohio, this bright piece turned out to be useful at frequencies of up to 1,000 megacycles, handling 120 watts input. Pretty useful plumbing, if you need something like that, particularly since at lower frequencies it probably could stand a kilowatt or so. Moral: don't overlook the small surplus items.

This month I want to make an exception to my general policy of not going into intimate details of particular conversions. Usually every surplus hound has his own ideas of how to do a conversion, and this column cannot support a full-time lab effort in exotic research, so I have stuck to the hard facts and left the wire-by-wire directions out.

However, the AN/FCC-3 RTTY terminal gear is showing up in quantity now, and is being overlooked, I believe, though its conversion is rather simple. I would call this conversion, which I will outline below, a satisfying one. More than just turning the set on, but not more than an evening's work, and practically guaranteed to work. Like the girls' cake mixes, most of the hard part is done already, but you can add enough to feel some sense of accomplishment.

As I explained in the previous column, the AN/FCC-3 (and the -6 and -7 versions) are a frequency-division multiplex set, made up of separate audio channels that are mixed in a separate unit for transmission over a voice grade circuit.

Each channel of the equipment had its own audio frequency shift keyer, and its own demodulator. Used alone, these rack-mount units make excellent amateur RTTY terminals, though the receiving end will obviously not offer the same ability to dig down through QRM for faint and fading signals as the TT/L-2 or commercial demodulators in the $200 and up class. On fairly good signals, the FCC-3 will do quite well, even though fading conditions, as it offers excellent limiting range.

The FCC-3 receiving terminal does lack a tuning indicator, but by bringing out leads from the discriminator (pins 5 and 6 or 7 and 4; see fig. 1) to the vertical and horizontal plates of an inexpensive oscilloscope the familiar + pattern may be easily observed.

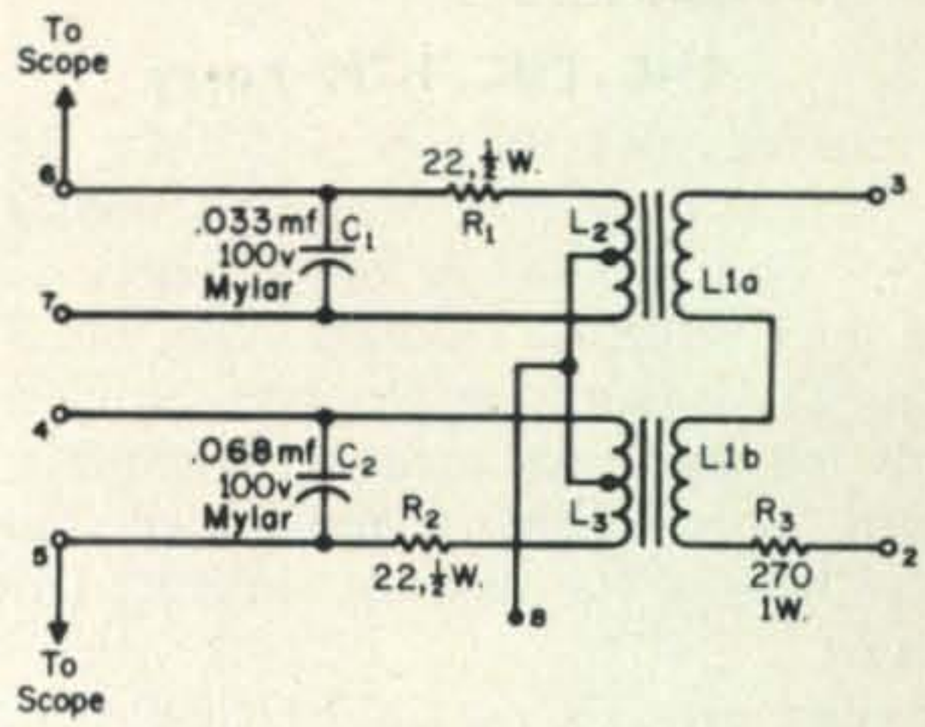

Fig. 1—Discriminator for the AN/FCC-3 receiving unit.

L_{1a}—60 t. #22 e. wire wound over L_2 (scramble wound ok)

L_{1b}—60 t. #22 e. wire wound over L_3 (scramble wound ok)

L_2—88 mh telephone toroid. Two windings connected at center which is grounded to pin #8 of the socket

L_3—same as L_2

Socket indentifications are some as in original circuit. This gives 850 cycle shift at standard amateur frequencies of 2125 and 2975 c.p.s. mark & space. L_2 may be tuned to 2975 c.p.s. by adjusting value of C_1 or by removing turns from the toroid; L_3 likewise may be tuned in the same manner to 2125 c.p.s. by adjusting the winding or C_2. I used a v.t.v.m. as an output meter and an adjustable, calibrated, audio oscillator for input. A 1 meg. resistor must be used in series with the hot lead of the oscillator during tuneup to avoid loading the filter to the point where no sharp peak is shown.

* 5716 N. King's Highway, Alexandria, Virginia 22303.

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Alternatively, an eye tube may be used to indicate correct tuning.

Figure 1 shows the circuit of the FCC-3 receiving discriminator. This may be easily plugged in to an octal socket in the top of the receiver, if the original narrow shift discriminator is not desired. When removing the narrow discriminator, the narrow input filter must be discarded also, and either a new bandpass filter made or the socket jumpered. The jumper would bridge pins 3 and 7 of the filter socket. For tuneup the filter may be dispensed with, although for more serious work it is a very great help towards good RTTY copy.

Design of audio filters is beyond the scope of this column, but I might refer readers to excellent articles by Irv Hoff K8DKC which appeared in *QST* (August, and September, 1966). These filters would do quite well in the FCC-3.

If one has access to a junk yard where telephone carrier equipment is scrapped, the old 40C1 system may possibly be found, with salvageable filters. The 40C1 used 170 c.p.s. spacing between its channels, two at which conveniently fall upon 2125 and 2975 c.p.s., which are the desirable mark and space frequencies for ordinary use. The 40C1 units are found on large rack-panel plates (see fig. 2) and the filter cans are marked 125S (2975 c.p.s.) and 125L (2125 c.p.s.).

Figure 3 is a list of the 40C1 filters and their frequencies.

Actually, any 600 ohm audio filter matching the desired frequencies may be used. The AN/FCC-3 has an octal filter socket, making exchange of filters rather simple.

Since the FCC-3 units were designed for tandem phone plugs, which are neither common in surplus nor in any way necessary, I find it far easier to bypass the unnecessary complexities of the original wiring. For initial testing you can use J_{106}, the lower right jack on the right end of the front panel, but for greater convenience rewire the jacks: Turn the chassis upside down on the bench, remove the two screws holding the bottom plate in place, and set it aside (it has a schematic printed on it). One of the two lower jacks is wired to ground for both the sleeve and tip contacts. The other has a green wire running from the tip contact to a resistor. Cut this wire at the resistor (10 k, R_{103}) and transfer it to pin 1, V_{101}; there is enough slack to reach without difficulty. This bypasses the filter, going directly to the first limiter grid.

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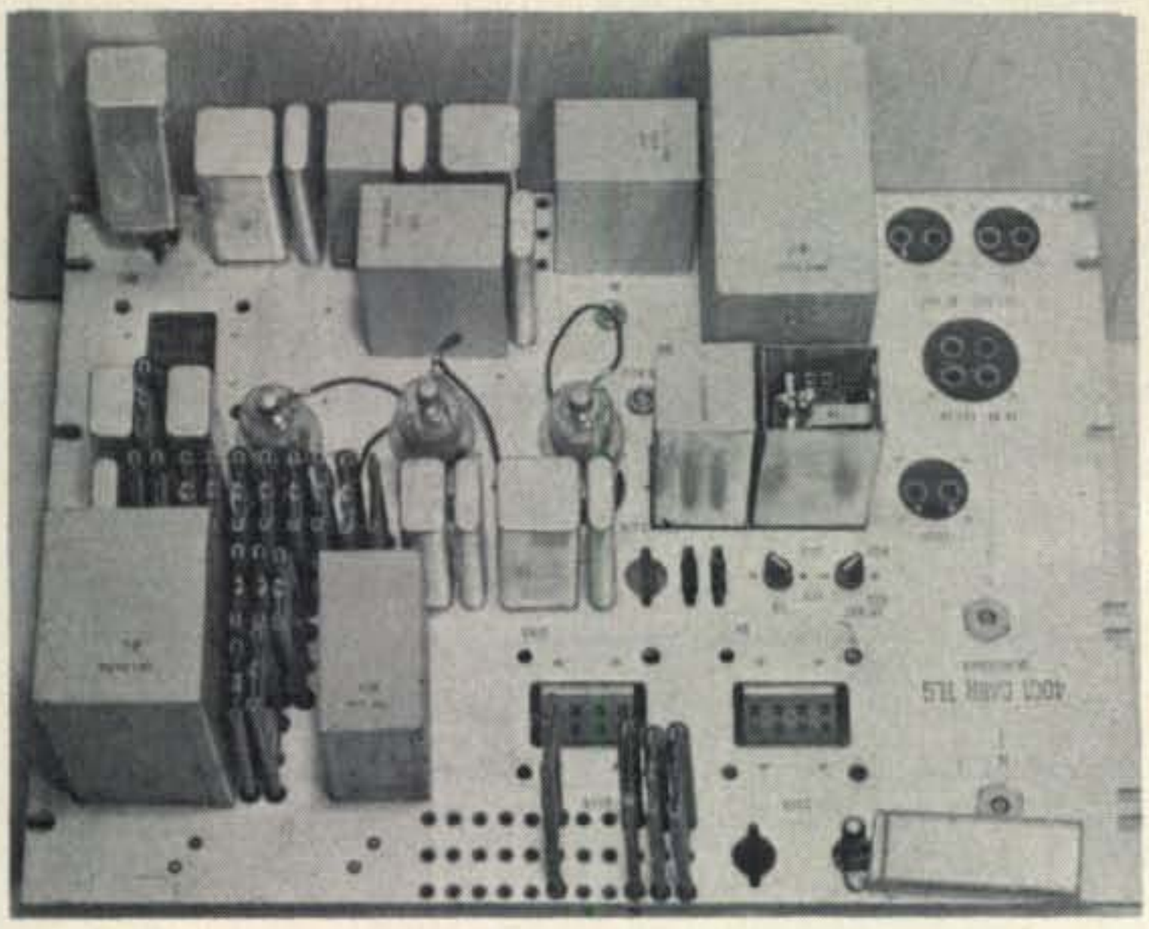

Fig. 2—Interior view of the 40C1.

It may be useful to re-wire the second MONITOR jack in parallel with the first, for convenience in patching various inputs, and for monitoring the input.

Do the same thing for one or all of the jacks in the upper right end of the chassis, running the tip lead to pin 3 of the input band-pass filter socket, allowing the filter to be selected or bypassed by choice of audio input jacks.

The EQUIP and MONITOR jacks on the left center portion of the front panel are the DC loop connections. Re-wire the LINE jack so as to put it in series with the other two, configured in a way that allows it to close the circuit when no plug is inserted. The EQUIP jack is *not* a "closed" type, and must have a plug in it to complete the loop circuit.

Tuneup of the discriminator should be done after the input winding (L_1) is added to one side of the toroid—preferably while in the circuit, so as to take into account the inductance and capacitance (the latter, chiefly) which will affect the tuning during operation.

Either substitution of capacitors or removal of turns from the toroid can be used to bring the coil to precisely 2125 or 2975 c.p.s.

Since the AN/FCC-3 was designed for narrow shift work, bias and other settings will have to be grossly readjusted for 850 c.p.s. operations, which is five times as wide a shift.

The first check on the receiving end, is to balance the discriminator output. Measuring d.c. output at the center (arm) of pot. R_{18}, adjust R_{18} for equal voltage while receiving either mark or space tone. Use either the audio oscillator or the converted transmitter for an input. Don't worry too much about dif-

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ferences in level between the transmitted mark and space, as the limiters in the receiving T.U. will handle 60 db range, in fact will limit fully on a signal you cannot hear!

Following the setting of R_{18}, set the oscillator to 2550 c.p.s., the mid-point in the standard 850 c.p.s. shift, and adjust R_{25}, the slicer pot, until the unit switches from mark to space (keys the loop) at that point. It is important that the loop be approximately the same as it will be set up for normal operations, *i.e.* with the same amount of inductance (printer magnets). This control may need to be touched up again while receiving, for best copy, though the above setting will perform well enough as a starting point.

The "conversion" discriminator offered in Fig. 1 is fairly narrow, about 100 c.p.s., though strong signals with little QRM or multipath, may be copied as far as 115 c.p.s. each side of the nominal filter frequency. The 22 ohm resistors (R_1, R_2) load the toroids enough to give the discriminator tolerance for a moderate amount of drift and path frequency distortion, wrong shifts, etc. They are narrow enough however to remove a lot of adjacent channel QRM.

In the absence of an oscilloscope for tuning, I suggest that the demodulator be tried first on a good strong steady signal such as WBR, in Miami, puts out carrying weather data. WBR broadcasts on 3235, 5937, 8130, 10,950, 14,395, and 16,440 kc with 850 c.p.s. shift RTTY. (The 5937, 8130, 10,950 and 14,395 frequencies run 24 hours a day). You can be certain that these signals use proper shift and are free from transmitted distortion.

Plug your printer magnets into the EQUIP jack, and use a milliammeter plugged into the MONITOR jack to set the proper printer current. (usually 60 ma) Without an incoming signal present, set the internal switch in the FCC-3 unit to EQUIP and use the LOOP pot to adjust the current. If you get no meter indication, flip the NORMAL-REVERSE switch.

Plug the receiver audio (approximately 600 ohms impedance) into the lower right hand jack marked MONITOR on the right side of the front panel, and look for vibration of the meter needle. The proper method of tuning RTTY is to center the signal in the receiver passband with the b.f.o. off. When the S-meter indication is maximum, turn on the b.f.o. Tune it to a point 2550 cycles from zero beat, thus giving audic beats at 2125 and 2975 c.p.s.

Assuming the initial tuning was fairly ac-

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curate, the signal may be trimmed up with the BFO control. Though slight mistuning introduces bias, the limiters in the demodulators will handle a great deal of variation between mark and space amplitudes.

Final adjustments should be made to the tuning to give the maximum action on the loop meter. Properly tuned, on ordinary text, the needle will deflect from above 60 ma to below 30 ma as it attempts to follow the loop keying.

If the printer prints garble, flip the NORMAL-REVERSE switch. The machine should calm down and "synch" on the keying within a few characters. The WBR weather signals consist of several different types of codes, air terminal forecasts and occasional synoptic forecasts. Only the forecasts are in intellligible English, but if you get steady printing of five-digit number groups, with proper line feeds and carriage returns, with no bells or overprints, your system is working properly.

Amateur RTTY is harder to tune for a number of reasons. Lower power is used than that available to commercial or government stations, and many operators transmit off the keyboard at hunt-and-peck typing rates. Shifts may not be exactly 850 cycles. Many amateurs are using narrow shift (170 c.p.s.) and others have only the foggiest idea of the shift they are putting out, though they believe they are sending 850 c.p.s. shift.

Short transmissions, interspersed with c.w. identification, are frustrating to tune, though experience will make the task easier.

The FCC-3 will accept AFSK in the v.h.f. bands (where tuning is easier), as well or better than h.f. signals. V.h.f. RTTY is less subject to fading, and no b.f.o. stability problems are involved.

The transmitter section of the AN/FCC-3 system is, if anything, easier to use than the demodulator. Using the original narrow-shift plug-ins, set the transmitter section up with the printer and current meter following the outline given above for the receiving section. This time the audio jacks put out a signal which is keyed higher or lower following the teleprinter signal.

With a speaker or phones plugged into the audio jacks, break the loop circuit in some manner, either by keying the printer or by using the keyboard BREAK button. Note as the loop meter deflects, the tone changes. If it does not shift, turn the NORMAL-REVERSE switch in the transmitter.

Bell System 40C1 tone filters

Number	Frequency (c.p.s.)
124 U	240
124 A	420
125 C	585
124 B	590
125 B	600
124 C	760
125 D	936
125 U	259
125 A	430
124 D	940
124 E	1,100
125 E	1,104
124 F	1,270
125 F	1,270
125 G	1,440
124 G	1,450
124 H	1,610
125 H	1,610
124 J	1,790
125 J	1,810
125 K	1,952
124 K	1,960
125 L	2,125
124 L	2,130
124 M	2,290
125 M	2,295
124 N	2,460
125 N	2,465
124 P	2,630
125 P	2,637
124 R	2,800
125 R	2,807
124 S	2,970
125 S	2,975
124 T	3,140
125 T	3,147

—bandwidths range from 85 cps to 125 cps at the 3 db points.

Fig. 3—A list of the 40C1 filters and their frequencies.

Output level may be controlled with a screwdriver adjustment in the transmitter.

To give 850 c.p.s. shift it is necessary to replace the keying oscillator transformer with a conversion unit. Remove the transmitter filter, which is not necessary in single-channel operation. It was used in the original narrow-band multiplex system to assure no interference could occur between adjacent channels. Jumper pins 3 and 7 of the filter pocket.

The only adjustment required in the transmitter is to set the BIAS pot full *clockwise* unless test equipment is available for more sophisticated tuneup.

In actually building the oscillator transformer, the idea is to get the higher frequency to fall upon 2975 c.p.s., then "break" the loop, which places additional capacitance across the circuit, lowering the frequency to 2125 c.p.s. Fine tuning can be done with the

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trimmers in the transmitter. Large changes are made with the two switch-controlled capacitor banks (S_{105} and S_{106}) and final trimming with adjustable capacitors C_{112} and C_{117}.

If too much capacitance is used for the keying of the lower frequency, the oscillator will stop, thus careful work is necessary here. Some juggling of inductances and capacitance may be required, since 850 cycles are quite a bit more shift than the original design contemplated.

Both the transmitter and the receiver conversion units are affected by circuit parameters, thus should be finally tuned in place. I tuned them in "haywire" fashion at first, for there is little change introduced by bolting together the plug-in. ■

Scratchi [*from page 13*]

shack. I desiding I better counting money, so getting right at it. Half hour later taking money to Hon. Shack, and that when I discovering that my new reseever is missing!

That winner, that no-good bum, took my new reseever and left me my old one! Howcomes?? You thinking any self-respecting amchoor knowing that Scratchi not giving away any bran-new reseever. Hokendoke, how stoopid can peeple be!!

Well, that my predickament, Hon. Ed. Can't going to poleece as I not sure that running raffle are legal. So, if you running Hon. Classy Fried ad for me, and feller contacting me, I'll giving him back his one bux parking fee and still giving him my old reseever. Certainly he not passing up red-hots deel like that.

In fack, as soon as heering from him, I sending you money to paying for ad.

Respectively yours,
Hashafisti Scratchi

VHF [*from page 51*]

personal preference is for a yagi around 14′ in length. This size yagi does not require any extra triangular bracing and still has a fairly high gain. Andy, WA2FGK, with whom we have done a great deal of antenna construction, uses 22′ yagies. One might stretch out the choice to include the very popular 28′ Long John yagies. This antenna has certainly proved its efficiency. If you were to stack four of these yagies in an array, you would have an antenna with an approximate aperture of 1600 square feet (see figure 1(E).) or 25 db gain if they are close to 100% efficient.

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This antenna would have the same gain as a 100% efficient 110′ yagi and only occupy a physical area of 20′ on a side—considerably less then the colinear array of 200 elements and 40′ on a side which would have to be constructed to equal its aperture. Which antenna would you choose? We chose the stacked yagies. Next month we will go into construction details. Until then 73—Allen Katz, K2UYH

USA-CA [*from page 101*]

a.m./s.s.b.

If you are in need of counties in N.J., N.Y., Penna., Michigan, Illinois, or California—may I suggest that you again read the notes under, LETTERS.

The new Amateur Achievements Award Directory is now available for $4.00. Write ARAC, Box 7326 Euclid Station, St. Petersburg, Florida 33734.

A sad note to report, the death of another friend, Earl Thomas, W2MM, President of QCWA.

Mail has been wonderful and heavy, but I've tried hard to keep up with it, so I'll be glad to hear—How was your month? 73, Ed., W2GT.

DX [*from page 90*]

ZS5PG–c/o W6GB (ex-K6GMA).
4X4SK & 4X4SO–Via W4TKN (ex-W2IWP), 9304 Hamilton Drive, Fairfax, Va. 22030.
4X4TP–To VE3ACD.
4X4VB–Via WA4WTG.
5H3KJ–c/o W7VRO.
5N2AAW–Via K50Q0.
5N2ABF–Box 2469, Lagos, Nigeria.
5U7AL–Not via W4WHF.
5W1AS–P.O. Box 498, Apia, Western Samoa.
5Z4GT (ex-VQ4GT)–Leny Mazery, 43 Rue du Canada, *13* Marseille (10e), France.
5Z4SS–To K9KLR, P.O. Box 1816, Gary, Indiana 46409.
601GB–c/o W1YRC.
6W8BM–Box 290, Dakar, Senegal.
6Y5ET–P.O. Box 254, Kingston 5, Jamaica.
7P8AB–Dr. A. C. Jaques, P.O. Box 389, Maseru, Lesotho.
7XØWW–Via R.E.F.
8P6AH–To VE3DLC.
8P6BU–c/o WB2UKP.
8P6CC–Via W4OPM.
9G1GA–To K7UOV.
9G1HM–Box 2165, Accra, Ghana.
9G1KT–c/o W7AIA.
9H1R–Via WB2IEC.
9NIMM–c/o W3KVQ.
9Q5CD–To W8UTQ.
9Q5LC–c/o ON5PQ.
9X5VF–Via ON5PD.
9Y4DS–To K9KLR.
9Y4VT–c/o W3DJZ.

73, John, K4IIF

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More on 32S-I

There is approximately 10 db of feedback employed in the S-Line which results in a one-for-one suppression of distortion products. All things considered, this says that it is 10 db better in this regard than its competitors. This leads to some interesting observations on manufacturers' specifications!

To the proud owners of the 32S equipment, you can be sure that it is still the best in the field with its excellent mechanical filter and r.f. feedback system which, incidentally, is the only one, I believe, in amateur equipment. These features make S-Line outstanding in cleanliness of operation and a genuine asset to the modern s.s.b. station. ■

Output Meter [*from page 22*]

transmission line impedance (52 ohms); therefore the power consumed on either transmit or receive, will be negligible.

Operation

Tune the transmitter for maximum output as shown by maximum deflection of the VU meter. This will correspond to a point where a slight increase in the final I^p will result in drop in output. Set control R^3, the calibration pot, for 100% or 0 db (not full scale).

During voice operation the VU meter should indicate average peaks of 85% and occasional peaks of 100%. ■

Solid State Transceiver Accessory Package [*from page 28*]

transceiver accessory package. Many variations of the basic ideas presented are possible. The phone operator might wish to concentrate upon building into the enclosure a more elaborate type of compressor circuit and perhaps a vox circuit while the basic filter is used for additional selectivity for occasional c.w. operations. The c.w. man may wish to forget about the audio compressor but rather build into the enclosure some form of integrated circuit electronic keyer and perhaps some form of variable T filter in order to complement the selectivity provided by the basic filter.

With a bit of planning and care with the circuit layout, the use of the FL-55 as a basis for a transceiver accessory combination package can prove to be the most economical means available to upgrade the overall performance of any commercial transceiver. ■

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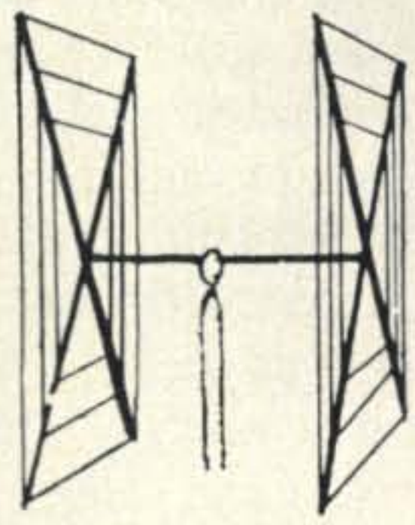
GOTHAM'S AMAZING ANTENNA BREAKTHRU!!

How did Gotham drastically cut antenna prices? Mass purchases, mass production, product specialization, and 15 years of antenna manufacturing experience. The result: The kind of antennas you want, at the right price!

UADS Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



3AZR CUBICAL QUAD ANENNAS — these two element ams have a full wavelength iven element and a reflector; e gain is equal to that of a ree element beam and the dictivity appears to us to be exptional! ALL METAL (except e insulators) — absolutely no mboo. Complete with boom, uminum alloy spreaders; urdy, universal-type beam ount: uses single 52 ohm coaxial feed; no stubs matching devices needed; full instruction for the mple one-man assembly and installation are inuded; this is a fool-proof beam that always works th exceptional results. The cubical quad is the tenna used by the DX champs, and it will do a onderful job for you!

/15/20 CUBICAL QUAD SPECIFICATIONS

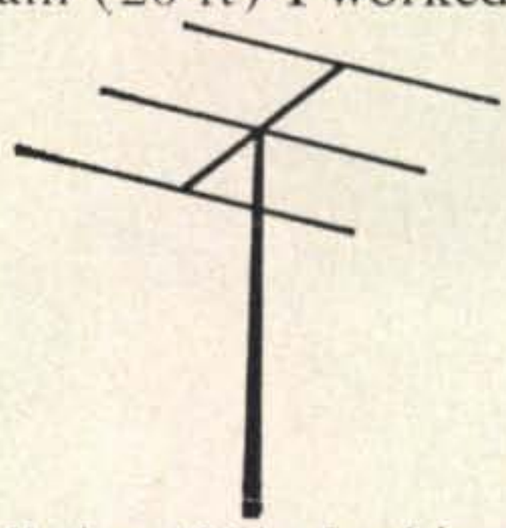
ntenna Designation: 10/15/20 Quad
umber of Elements: Two. A full wavelength iven element and reflector for each band.
eq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 c.
ipping Weight: 28 lbs. Net Weight: 25 lbs.
mensions: About 16′ square.
wer Rating: 5 KW.
eration Mode: All
VR: 1.05:1 at resonance
ain: 8.1 db. over isotropic
B Ratio: A minimum of 17 db. F/B
om: 10′ long x 1¼″ O.D.; 18 gauge steel; double ted; gold color
am Mount: Square aluminum alloy plate incorrating four steel U-bolt assemblies. Will easily pport 100 lbs. Universal polarization.
Radiating Elements: Steel wire, tempered and ted, .064″ diameter.
X Frameworks: Each framework consists of two sections of 1″ OD aluminum 'hi-strength' (Re-e) tubing, with telescoping ⅞″ tubing and short ction of dowel. Plated hose clamps tighten down telescoping sections.
Radiator Terminals: Cinch-Jones two-terminal ings
Feedline (not furnished); 52 ohm coaxial cable

Now check these startling prices—note that they *much lower* than even the bamboo-type:

-15-20 CUBICAL QUAD	$35.00
-15 CUBICAL QUAD	30.00
-20 CUBICAL QUAD	32.00
VENTY METER CUBICAL QUAD	25.00
FTEEN METER CUBICAL QUAD	24.00
N METER CUBICAL QUAD	23.00

ll use single coax feedline)

BEAMS The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU. THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36′ of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞″ and 1″ alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$16	4 EL 10	$18
3 EL 20	22*	7 EL 10	32*
4 EL 20	32*	4 EL 6	15
2 EL 15	12	8 EL 6	28*
3 EL 15	16	12 EL 2	25*
4 EL 15	25*	*20′ boom	
5 EL 15	28*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT, Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK, OZ4H, and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

HOW TO ORDER: SEND CHECK OR MONEY ORDER. WE SHIP IMMEDIATELY UPON RECEIPT OF ORDER BY RAILWAY EXPRESS, SHIPPING CHARGES COLLECT.

OTHAM, 1805 Purdy, Dept. CQ, Miami Beach, Fla. 33139

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Mobile Protection [*from page 41*]

but they can still be easily operated in the normal manner, even with gloves on. The use of Teflon, a fantastically slippery material, provides an added measure of protection against a sharp or toothed tool getting a wedge grip. Additionally, the neutral white color of natural Teflon is quite attractive looking and makes a suitably aesthetic replacement for any color scheme. The Teflon rod was drilled and tapped to 10-24 (the thread on the operating rod) in a lathe, to preserve centering. A good drill press probably would work as well. The Teflon rod stock should be readily available at any plastics house. The material required for the two cars described cost about thirty cents.

Added protection is afforded in the Camaro (and possibly in many other late-model cars) by the fact that operation of the interior door handle will not release the lock buttons. This means that even if a wire is inserted into the car and the interior handle operated, the car will still be secure. Smashing out the windows is the only way that entry can be made to our Camaro's, now. Such violent access requires tools and time and generates a lot of noise, things that the usual sneak thief will bypass.

While the system described is not 100% burglar-proof, it is believed that the amount of protection for the effort and cost is very substantial. The method has been enthusiastically received by the local police. ■

Grumbles [*from page 70*]

What about the United Nations Building, which is international territory right in the heart of New York City? Someone could go up on the roof for a few hours and run all bands from 80 through 2 meters and shake up the place with a "4U" prefix.

Some years ago, Bill Orr, W6SAI, came up with some clever thoughts on "new countries." Bill unearthed foreign enclaves located within certain countries and speculated that they might count as new countries inasmuch as they were actually separated from the mother nation. Although nobody ever tested Bill's idea, the enclaves are still there. They include Campione D'Italia, located in the Ticino area of Switzerland; it's a genuine speck of Italy which is surrounded by Swiss soil. Another is Biltgen, a town in northern Switzerland which is territory of the German Federal Republic. Still another is Livira, an enclave of

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Spain located near Andorra, and on French territory.

Bill also passed along a 3rd or 4th hand yarn which told of a park located somewhere in Hawaii which is apparently territory belonging to New Zealand, having been ceded to the Zedders by the U.S. Government because the park contains the grave of Captain Cook. Wouldn't this meet "new country" criteria?

Then, of course, it pays to keep an anxious eye on geological bulletins since every now and again a new natural "country" pops out of the sea. Only last December an island now known as Number 7 Metis Shoal suddenly appeared in the Tonga Islands. The island is about ½ mile long and 150 feet high.

Another island, Sturtsey, rose from the sea November 14th, 1963, southwest of Iceland. By now it's about 2 square miles and already has small plants taking root.

Trouble is with so many of these little islands that they are usually only with us only on a tentative basis. Last year the ring-shaped volcanic island, Dectection (in the South Shetland Islands), suddenly erupted in great cloud of steam and lava. Other islands vanish beneath the waves as suddenly as they appeared. Could be tricky pulling down the antenna in time.

Say, I can think of at least 7 or 8 hams I'd like to ship off on a DXpedition to an island which is momentarily expected to sink or be consumed in volcanic ashes. In fact, I'm going to start sending out invitations to Sturtsey while it's still with us.

Oh, Jeeves, what's that address in Newington?

Q & A [*from page 98*]

14 of the August 1967 issue of *QST* under the title of "Front-End Receiver Filters", by E. H. Conklin, K6KA. Suggest you look up this article or write to the author whose address is Box 1, La Canada, California 91011.

Incremental Tuning For The NCX-3

QUESTION: I have heard that you have an article in a past issue of *CQ* on Incremental Tuning for the NCX-3 Transceiver. If so, in what issue did it appear and are back copies available?

ANSWER: Such an article entitled "A Goody Box for the NCX-3" appeared on page 60 of the April 1966 *CQ*. Back copies are available at $1.00 each. ■

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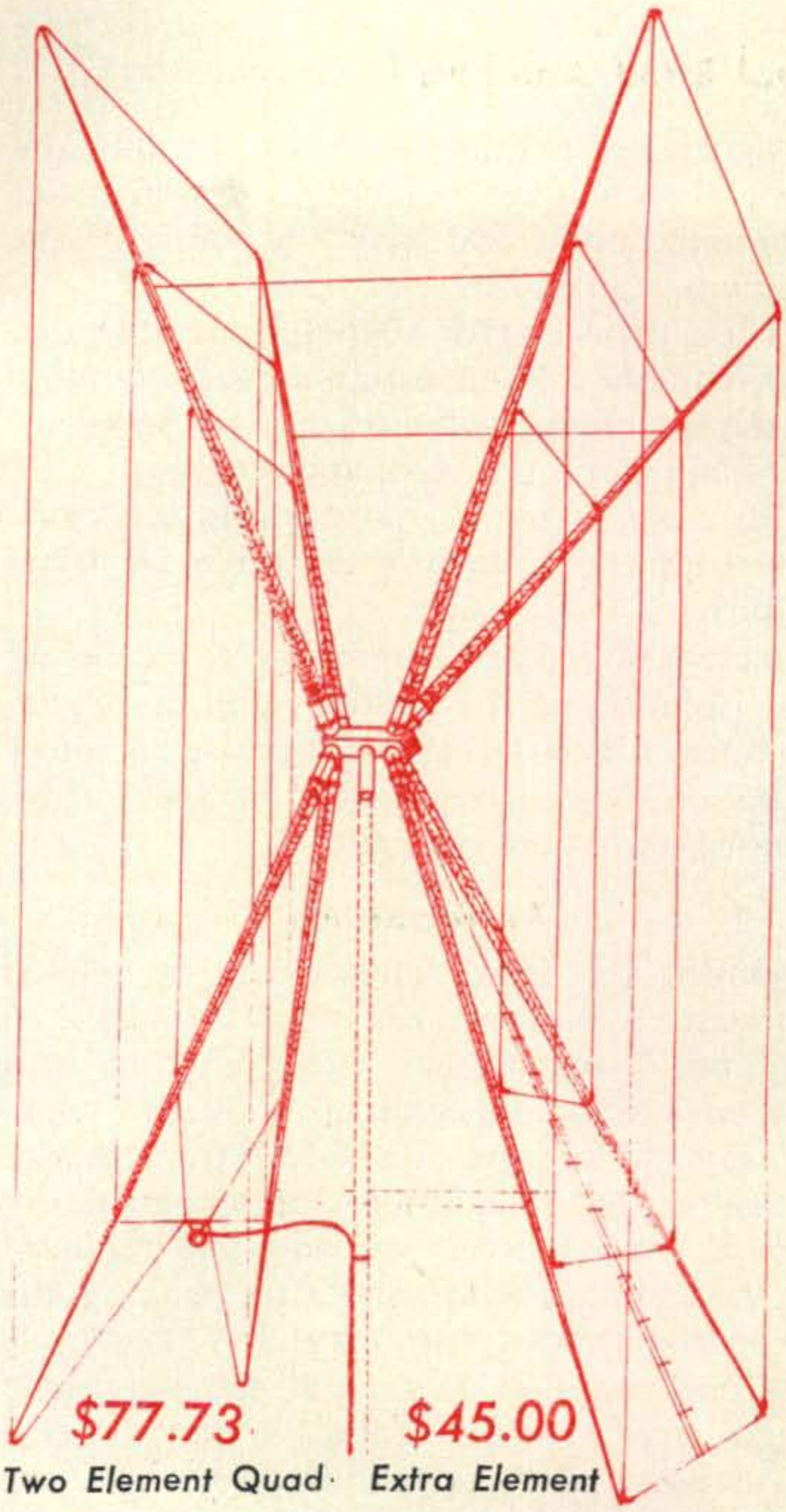
FIBRE-GLASS
GEM-QUAD

FOR 10, 15, AND 20 METERS



$77.73 Two Element Quad · $45.00 Extra Element

(Price F.O.B. Winnipeg—Includes U.S. Customs Import Duty.)

ever before has one antenna offered so much

- The GEM QUAD is a two, three, or four element antenna designed to operate on ten, fifteen, and twenty meters.
- Forward gain for two element GEM QUAD up to 8 db on DX, "where it counts."
- Optional third element (easily installed) has given total forward gain of approximately 8.9 db with a narrow forward cone of effectiveness, resulting in excellent rejection of unwanted signals.
- Front to back ratio for two element antenna is 25 db; for three elements, 30 db. (Figures occur at a frequency slightly higher than design frequencies of 14.0 to 14.35, 21.0 to 21.40, 28.0 to 28.95). Elements spaced 0.15 apart for optimum performance.
- Toroid balun kit supplied for single feed-line matching.
- Mounting spider of durable heavy duty aluminum alloy. 1½ inch o.d. stub facilitates easy mast mounting.
- Hollow spider allows insertion of boom for additional element.
- Fibreglass arms withstand 100 m.p.h. winds with minimum loading on tower (2.5 sq. ft. wind load area).
- Tridetic arm design (air passes through the arm). Low wind resistance eliminates need for excessive guy wires.
- Simple assembly and tuning instructions are supplied with every kit, showing measurements and assembly procedure. When assembled as instructed, tuning only takes a matter of minutes.
- Maintains rigid form continuously. Double "Cone-shaped" design maintains critical measurements under severe weather conditions. Completely weather resistant—will not freeze or crack.
- Light weight (complete antenna weighs 20 lbs., 3rd element 10 lbs.) Simple TV rotator will rotate antenna.
- Single 52 ohm feed-line for all bands. SWR of 1 to 1 easily obtained using ferrite Toroid Balun, (produces minimum harmonic radiation). Will handle maximum power input.

Structural Glass LIMITED

20 Burnett Ave., Winnipeg, Manitoba, Canada

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Dual Band Antenna [*from page 60*]

this purpose, it is only necessary to short out the coil, prune the radiator to the 40 meter resonance point and alter the value of the matching capacitor.

The dimensions for 40 meters are indicated approximately. Some trimming and alteration of the matching capacitor may be necessary to obtain optimum resonance.

To summarize, we have developed a system with the following desirable electrical features:

increased radiant length, increased height and isolation of the current loop, appreciable horizontal polarization, increased angle of radiation, broad frequency coverage and increased radiation resistance.

Performance

On-the-air tests have been completed wherein the performance of the antenna system, on 75 meters, has been compared with that of a standard commercial loaded-whip. During these tests the field strength was measured, the experimental antenna was removed from the rear support and replaced by the standard whip, and after peaking, the field strength was again measured. This cycle was then repeated. In general, the increase in signal strength when using the new antenna was reported to be substantial. A typical comparison was that obtained in the first such test run. Two stations were worked, simultaneously, in the late afternoon, each at about 100 miles distance, one in front of the car and the other to the rearward. One station reported an increase in signal strength from S-2 to S-7, the other from S-3 to S-6 as the standard antenna was replaced by the new antenna. In addition to such semi-quantitative comparisons, the qualitative performance measured in terms of results in numerous QSO's has been quite gratifying.

Conclusion

As has been pointed out, the antenna system which has been developed is capable of yielding a substantial improvement over more conventional mobile antennas on 75 and 40 meters. These results have been obtained by straight-forward utilization of the space available above the automobile.

Perhaps a few words are appropriate concerning appearance of this unconventional system. Before undertaking this project the individual must answer the question, "Do I want a strong signal, or do I want conventional appearance?" If the XYL's sensitivity is involved, you can always paint the antenna parts to harmonize with the finish of the car. An important aspect of the matter is the question, "Just how important is the appearance of a car on a turnpike a hundred miles from home?" ■

Using The G.D.O. [*from page 46*]

grid-dip meter is modulated. This can be done with the application of tone into the phone jack of the instrument.

Where a superheterodyne-type of receiver is involved, it may be necessary to first align the i.f. system, in which case the g.d.o. inductor should be positioned near the input lead for the i.f. system. This can also be done where one stage at a time must be checked, including mixer and r.f. stages.

If, after the i.f. strip is working, the set fails to function, the cause may be due to a defect in the heterodyning oscillator or v.f.o. This can be checked by using the instrument either as a diode or an oscillating detector to find out if the receiver oscillator is working and at what frequency. On the other hand, if a malfunction is suspected in this area, the instrument as a signal generator may be temporarily substituted for the receiver oscillator by coupling it near the input of the particular mixer.

Transmitter Circuits: Using the instrument as a g.d.o., the tank circuits may be adjusted to the desired frequency, similarly following the procedures used with receiver circuits. Any output load should be removed from the p.a. tank when this stage is checked.

After these steps, connect the output load (preferably a dummy load), apply power and touch up the alignment according to the meter readings and power output. If the equipment fails to function, the individual stages may be checked for r.f. power in the associated tank circuits, also making sure it is at the correct frequency. This can be done using the instrument either as a diode or an oscillating detector. Search also may be made thereby for harmonics or spurious signals, such as mixing products as often experienced with multiple-

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conversion transmitters. The oscillating detector will be more sensitive for this work. While doing so, care must be taken to avoid coming in contact with high voltages that may be present at the test circuits.

Other Applications

Other applications will be described in Part II of this article and will include: neutralizing; tracking down parasitics and harmonics; measurement of capacitance, inductance, *Q*, transmission-line length, antenna resonance; checking traps, r.f. chokes, filters, crystals; use as field-strength meter and other signal-generator uses. ■

CQ Reviews The Millen G.D.O.

[*from page 63*]

The Millen 90651-A Grid-Dip Meter is ideally suited to all these applications, especially for those who desire top performance with the convenience of operation, accurate calibration (to 2%), high sensitivity, stability and a rugged high-quality instrument.

It is priced at $90, complete with carrying case, inductors for 1.7-300 mc operation, inductor stand and instructions for operation in most used applications. The polypropylene carrying case also is available as a separate item for present owners of the original standard Model 90651 which is still available at $78.50. The price for the case alone is $5.47. Other accessories include a tone modulator, low-frequency inductors (165-2000 Kc) and a dual-link probe for coupling on hard-to-reach circuits. These are products of Millen Manufacturing, Inc., 150 Exchange Street, Malden, Mass.—*W2AEF*

Sylvia

[*from page 32*]

University of Illinois and served as a surgeon in Korea with the U.S. Air Force.

He is 5 ft. 9 ins. tall and chubby, which chubbiness will increase. He is suntanned, clean-shaven (except on expeditions), has light eyes hidden by thick glasses, which give him an inscrutable expression, whereas he is merely short sighted. He has good teeth, which I believe to be his own. At least he never took them out in my presence. He has nice hands and a round face, which will get rounder. His dark hair he wears in a crew cut, which doesn't suit him, but I think he cuts it himself. He was displeased with the way my hairdresser cut my hair and nagged and nagged, until I gave him scissors and he trimmed me up a bit, which has made a lasting impression on my hairdresser.

As a house guest he is to be recommended. He is quiet, bathes regularly, leaves the bathroom clean, doesn't kick the children or the Resident Cat, makes his own bed. He drinks no tea, coffee or alcohol except rum, which is a nuisance, but is addicted to Coca Cola, a trait he shares with another famous DXer. He likes rare meat, fried chicken, and everything sweet. He eats few vegetables. His table manners are impeccable. He's fussy about his shirts and shoes and sleeps without pajamas. He likes girls in miniskirts, loves to dance and plays the piano, but very, very badly. He likes corny music and plays a competent game of Scrabble. Regrettably he reads the Sports Column and Funnies in the newspapers before he reads the headlines an adolescent Americanism which is rather sad. Otherwise he is so efficient, it's frightening.

So many of the distinguished amateurs who have visited us have been dynamic extroverts, brilliant scientists, omnipotent tycoons, priapic Don Juans, scintillating professional "personalities." Here was the most famous amateur of all, a quiet, diffident, vulnerable, unpretentious young man, always on the defensive and understandably bitter and aggressive about the way things have turned out. He has no facile, cultivated charm, but men like him and women find him attractive.

Like all celebrities, he is completely egocentric and obsessionist in his devotion to DX and to the pursuit of what he considers to be justice. He is demanding, critical, intolerant, domineering and irascible. I told him, in a moment of fierce dissent, that he was a very difficult young man and would make an impossible old man. His sense of humor tends to the mischievous and immature, which might account for some of the trouble in which he finds himself. He has no time for fools. He is a compulsive talker and outtalked me, but what he says makes sense, which is more than can be said of what I say. That's Donald Miller.

I don't give a damn about Heard Island or Chagos. I don't give a damn about who was where and when. On his next visit, Donald Miller will have to make do with the camp bed. ■

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WHAT'S A CLASSIFIED AD IN CQ WORTH?

NOTHING!

Unless, of course, you happen to have something to sell . . . or buy . . . or swap . . . Then you can only measure the value in satisfaction, time saved, etc. Of course, a typical classified ad in the other major ham magazine costs between $2.50 and $3.00, so maybe that's a way to measure.

Now—What does a classified ad in CQ cost?

NOT A RED CENT ! ! !

That's right, you read us loud and clear. CQ subscribers can run non-commercial classified ads any and every month absolutely free of charge. All you have to do is send us your mailing label, on a postcard, as proof that you're a subscriber, with your ad neatly typed or printed. There's a limit to three lines in any single month to make space for everybody to get in that needs to.

SO—What's a subscription to CQ worth? Well, maybe twelve months of great reading, maybe twelve months of free classified ads, maybe both. That's up to you. In any case, at $6.00 a year, CQ is a steal. Do we have your sub yet? If not, why not?

Ham Shop

Advertising Rates: Non-commercial ads 10¢ per word including abbrevations and addresses. Commercial and organization ads, 35¢ per word. **Minimum Charge $1.00.** No ad will be printed unless accompanied by full remittance. **Closing Date:** The 10th day in the second month preceding date of publication.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publishers of CQ cannot vouch for the merchandise listed therein.

Direct All Correspondence & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L.I., N. Y., 11050.**

SELLING Complete station. Like new, SX117, HT32, HBR8/11 home built receiver. Boom Mike, many extras. Worth $900.00, sell for $500.00. K8VKM, Box 464, Moundsville, West Va.

WRL's used gear has trial-terms-guarantee! 75A1—$169.95; G66B—$39.95; 913A VHF amp.—$179.95; Apache—$99.95; HA 10 Amp—$189.95; HW30/2er—$44.50; AF67—$49.95; Ranger 2—$149.95; 2B receiver—$179.95; Valiant—$149.95; HQ100—$99.95. Low price on hundreds more. Free "bluebook" list. WRL, Box 919, Council Bluffs, Iowa 51501.

SELL 6.5KVA generator, 120-240 single phase 60 cycles, water cooled on trailer. 40 hours since complete rebuild. $550. R. Ellis, 1356 Elizabeth, Las Vegas, Nev. 89109.

DAH-DITTER Electronic Keyer . . . New Integrated Circuit Electronic Keyer. Fully Self Completing on both dit and dah. Built in AC supply and keying monitor. Isolated reed relay output. Completely assembled and tested, ready for operation. Price only $34.95. Order now direct from M & M Electronics, Dept. K, 6835 Sunnybrook, NE, Atlanta, Georgia 30328.

WANTED—QST's—Last four issues needed to complete private collection 1916—FEB., MAY, JUNE, JULY. Any reasonable price paid. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washinton, L.I., New York 11050.

QSL's by RUTGERS VARI-TYPING SERVICE, Thomas St., Milford, N.J. 08848. Free samples.

QSL's — BROWNIE-W3CJI — 3111 Lehigh — Allenton, Pa. 18103, Samples 10¢ with catalog 25¢.

YOUR CARD in glittering raised 3-D on blazing backgrounds becomes a beautiful collector's item. Samples 25¢ (refundable). 3-D QSL Co., Monson, 4, Mass. 01057.

RTTY gear for sale. List issued monthly, 88 or 44 Mhy toroids, uncased, five for $1.50 postpaid. Elliott Buchanan and Associates, Inc. 1067 Mandana Blvd., Oakland, Calif. 94610.

EARN YOUR DEGREE in electronics engineering. Highly effective home study courses in electronics engineering technology and electronics engineering mathematics. Free Literature. Cook's Institute of Electronics Engineering, P.O. Box 36185, Houston, Texas 77036 (Established 1945).

RUBBER ADDRESS STAMP including call letters. Three or four lines $1.50. Signature stamp $3.50. Free catalog. Jackson's PO. Box 443-F, Franklin Park, Illinois 60131.

QSL's 100, $1.25 and up. Postpaid. Samples, dime. Holland, R3, Box 649, Duluth, Minn. 55803.

PROTECT Radio gear with a warning sticker that reads "WARNING PROTECTED BY LECTRONIC ALARM SYSTEM" Same as supplied to commercial burglar alarm companies. 2" x 3½", yellow/green vinyl applies instantly without water to windows in mobile unit or operating shack. Also ideal for the back door of your house or basement windows. Money back if not satisfied! 3/50¢ or 6/$1.00, prepaid. Order today from: CESR, 4 Parish Court, Stony Brook, N.Y. 11790.

WHAT is going on in your area? Send news to tri-state Ohio-Kentucky-Indiana's newspaper amateur column. Ham Call, Sunday Cincinnati Enquirer, Cincinnati 45202.

FOR SALE: Plans and specs for a 40' crank-up tower, $2. Costs less than $40.00 to build. K5VDO, 1007 Janlee Dr., Burkburnett, Texas 76354.

FOR SALE: 1 kw parts: Air-Dux Pi Assembly, $7; B&W FC-15, $7; B&W LPF #425, $10; Bud var. cond. 100/100 mmf, .2" gap, $7. G. Smith, 915 Lovera Blvd., San Antonio, Texas 78201.

FOR SALE: Teletype covers: 28ASR (LBPC), $27; 19, $10; 14, $5. Gear sets, 60 w.p.m., (14, 15, 19) $3 per set (no 14TD gears). J. Thomsen, W9YVP, 8280 Tennessee Ave., Clarendon Hills, Ill. 60514.

WANTED: Manual for AN/TLR-2 or AN/TLR-5 receiver. J. T. Smith, W8ESH, P.O. Box 1034, Huntington, W. Va., 25713.

FOR SALE: Galvanometers/meter relays, new Weston #705, 0-10 microamps or 5-0-5 by shifting zero adjust. $5.50 ea, postpaid. Glen Richie, P.O. Box 26, Salem, Virginia 24153.

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WANTED: s.s.b. adaptor for Johnson Viking Valiant F. H. Simmons, R.F.D. #3, Du Quoin, Ill. 62832.

QSLS: Ham, CB, WPE. Samples $.15. Nicholas & Son Printery, P.O. Box 11184, Phoenix, Arizona, 85017.

FOR SALE: RTTY station. Rack-mounted S-line; SB-200; TT/L, Panadapter; Model 15; tower; tri-bander, and many extars. Write to M. Cook, 1992 Windsor St., Westbury, N.Y. 11590.

TRADE: Antique radios and components. Send for list. Want receiver, exciter or test gear, even if not operating. Please give description in your letter, J. Boer, 449 Hill St., Boonton, N.J. 07005.

FOR SALE: RME-6900 with manual. Make offer. Bill, WA2FFZ, 186 West Ave., Pitman, N.J. 08071.

WANTED: F455J-2.1 filter for 75A-4 receiver; MX-50/AP probe assembly and cord for TS-34/AP scope. WØHBT, 6101 France Ave., So. Minneapolis, Minn. 55410.

FOR SALE: Heath twoer (HW-30) with xtal, mike & stand, $40; AMECO code practice osc., $9; 2 meter Squalo, $5; Heath Cond. Sub. box, IN-22, $5; Heath Res. Sub. box, IN-12, $5. All perfect, with manuals. WB2FGR, 786 Grand Terrace Ave., Baldwin, L.I., N.Y. 11510.

FOR SALE: Emaculate,, Swan 350 with 100kc osc. New model No. C797370 with a.c. supply, #325. WØFDY, 1112 E. Laurel, Garden City, Kans. 67846.

WANTED: Panoramic power supply unit PS-12, and instruction manual for Mullard Valve Tester CT8Ø/1/3 & Servo Corp. rcvr. R-52ØØ. P. C. Ignatow, K6KRS, 0 San Carlos Drive, Salinas, Calif. 93901.

SKEDS: 50 mc s.s.b./c.w. skeds during June/July weekends from Crystal Bay, Nevada with my other call, W7BYF. Write W6DOR, 4100 Worthington Drive, North Highlands, Calif. 95660.

FOR SALE: Three Precise Devel. Corp. Model 315 5" scopes, $30 ea. Also two Model 300C wideband units, $50 ea. In working order. Will ship on receipt of check or M.O. W2ERJ, 31 Elliot Road, Great Neck, L.I., N.Y. 11021.

FOR SALE: Jerrold wired TV components for sale or trade, brand new, original cost over $1000. Write for list. Gene Hubbell, W7DI, 6633 E. Palo Verde Lane, Scottsdale, Arizona 85251.

FOR SALE: Valiant transmitter, $125; Gonset G-66, $70; G-77A, $75. W9TTA, 4110 Apperson Way N., Kokomo, Ind. 46901.

WANTED: CQ's—1945, Jan. thru Dec.; 1946, Jan. & Feb.; QST's, 1929 and earlier. RTTY's 1953, 1954, 1955. For sale: CQ's, 1946 thru 1957; Radio's, 1933, 1934, 1935. S.a.s.e. for list. D. Scher, W2KDW, 11 Webster St., Irvington, N.J. 07111.

FOR SALE/TRADE: Raytheon Marine transceiver, 30 watts, 12 v, new cond. Trade for Hallicrafters SX-117 or SX-146 receiver in good cond. Glenn Anderson, 1100 New Jersey Ave., Pine Beach, N.J. 08741.

FOR SALE: Realistic Model DX-150 all transistor communications receiver, $70; B&W TR switch, $10. D. Kadish, W10ER, 135 Barbara Road. Waltham, Mass. 02154.

FOR SALE: Thunderbolt Linear, latest model, used only ten hours. mint cond. with power swamper, $295. Will ship prepaid. Don Woodruff, 15 Castlewood Dr., San Rafael, Calif. 94901.

FOR SALE: TS-4 Tenna-switch with SO-239 connectors and 70' control wire, $14· Dow-Kev DK-71, 24 volt s.p. 6 t. coaxial switch for remote switching, with BNC connectors, $20. WAØJUM, Box 59, Mobridge, S. Dakota, 57601.

FOR SALE: Ranger II, 6-160m, a.m./c.w. A steal at $100, local pick-up. Robert Cobaugh, W2NX, phone no. 212-229-2449.

FOR SALE/TRADE: Mint, little used HQ-170C rec. and spkr., $190, or will add cash to trade for Collins rcvr. Also want RTTY Model 19 equip. and receiving converter. W9BXJ, 4341 Sheridan Rd., Racine, Wisc. 53403.

WANTED: Old ham plates. Looking for any state. Jerry Elmore, KØTRU. RTE 1, Central City, Iowa 52214.

FOR SALE: Model 15 with table, junction box, polar relay, 60 c.p.s., $75: Typing unit w/basket, $25; R-19 receiver, $30. H. Brown. W6DJX. 15 Fisher Dr., Greenville, S.C. 29607.

FOR SALE: SBE-33 with Astatic mike, SBE suitcase, $200; RCA Vidicon TV camera, EIA interlace or random, 8 mc bandwidth, $200. R. G. Copeland, 9506 Hartland Circle, Santee, Calif. 92071. (714) 448-9539.

FOR SALE: FR-67/U digital freq. meter; TS-186D freq. meter, 100 to 1000 gc, $195 ea. C. E. Spitz, 1420 S. Randolph St., Arlington, Va. 22204.

FOR SALE: Polycomm PC-62B 6/2 m transceiver, 12v.d.c./110v. a.c. Excel. cond., $175. B. Soltoff, K3IUV, 961 Warfield Lane, Huntingdon Valley, Pa. 19006.

FOR SALE: QST magazines, Jan. 1953 thru Dec. 1962, $36. A. M. Fox, P.O. Box 2202, Huntsville, Texas 77340.

FOR SALE: (2) Motorola FMTHRU-1A handie-talkies on either 146.76 or 146.94 mc f.m., $35. Schumacher, 12030 Washington Blvd., L. A., Calif. 90066.

FOR SALE: Galaxy 300 transceiver, $140. John Guthrie, W3SJL, RD 1 Virginia Road, St. Marys, Pa. 15857.

FOR SALE: Tubes, 4CX250R's, $10; 4CX250B's, $8; 4-65's, many others, s.a.s.e. brings list. W8GNS, 1185 Mosswood Cincinnati, Ohio 45224.

WANTED: HT-32B, local sale preferred. T. Cooper, W2IL, 1 Greenmount Rd., Haddonfield, N.J. 08033.

FOR SALE: Swan-250, used very little, mint cond., first $ takes it. FOB Pittsburgh. H. L. Snyder, 2185 Sampson St., Pi burgh, Pa. 15235.

FOR SALE: Drake 2B with 2AC, mint, $165; Navy TCS, 50 w put, c.w./a.m., a.c. p/s, pick-up only, $50. H. Berner, W2 1033 East 9th St., Brooklyn, N.Y. 11230. 212—ES 7-1850 P.M.-8 P.M.)

WANTED: Service manual for Dumont 303-A scope. Will buy copy and return. J. R. Don Carlos, DCA-Europe, E316, APO N N.Y. 09131.

FOR SALE: Heath sixer (HW-29A), vry gud cond. Want ph patch. WB4FGZ, 2132 W. Paris St., Tampa, Fla. 33604.

FOR SALE: 12 v dynamotors; new GE CG43AAG Xmtr-Rcvr; Po Xfmrs good used to 375-0-375; power supplies 600-700 v @ ma; more. See my adds last 2 months, make offer. WB2 516—FL 4-7152.

FOR SALE: KWM-2, no pwr. supply, $665; SB-100 with a.c. su and speaker, $350. Chas. Johnson, W5IE, 501 W Sears Denison, Texas 75020.

FOR SALE: 6 meter package: Heath 6er, 12 v. p.s., 5 xtals, 4 beam, $50, takes all. Will deliver 30 mile radius. W3WIY, 1 Kaywin Ave., Bethlehem, Pa. 18018.

BOOK WANTED: "Fundamental Principles of Vibrator Po Supply Design," compiled and published by P. R. Mallory & Inc., 135 pages Hardbound, 1st edition, March 1947. D. Wisn VE3EHC, 260 Frederick St., Kitchener, Ontario, Canada.

FOR SALE: Lafayette HE-30, $40; new Leica M3 w/accesso $225; 50 mc, 144 mc, 220 mc h.b. converters. Want Preci 110 v.o.m; Millen l.f. grid dip coils. I. Seidman, 735 Gre Ave., Long Branch, N.J. 07740.

FOR SALE: HQ-170C & DX-100B in good cond. Want electr keyer with paddle & triband beam. R. E. Dorough, Box 61, rell, Texas, 75160.

FOR SALE: 3 element, fibreglass Quad Kit, including wire, 100' RG-8/U cable, $50. A. H. Bott, 340 S. 24th St., Qui Ill. 62301.

FOR SALE: HT-37 and HT-41, $400; HE-50, ten meters, $40; 300, $200; WRL Tech-Ceiver, w/a.c. pwr. sup., 6 meters, All manuals included. Pick up only. W2FEI, Telephone: 516- 5411.

FOR SALE: Mint HQ-100A rcvr., $150; Knight T150, good, 50 watt transmitter, $30; Novice xtals, extras, Good No station. Reasonable offers accepted. WAØQBU, R #1, Neo Missouri, 64850.

BUILD your own powerful directional antenna. Any freque Illustrated design charts, $2.00. Satisfaction guaranteed. (ingnelli, Box 102A, Northvale, N.J. 07647.

FOR SALE: QST's, March 1927 thru 1960. Complete in binc excellent, $100; EICO 753 (solid state v.f.o.), 751 a.c., 752 supplies, excellent, $275. S. Allen, 5300 Fifth Ave., Apt. Pittsburgh, Pa. 15232.

FOR SALE: Two brand new Swan 500C with 117XC supplies, tory sealed cartons, full factory warranty. Sell at very, very price or trade for ham gear, coins, guns, etc. Don Pa W4HKQ. c/o Payne Chevrolet-Oldsmobile, Box 525, Springf Tenn. 37172.

FOR SALE: HRO-50 coils and dial scales, AC and AD, $15 Knight C-577 compression amp., like new, $15; Astatic D mike w/new cart., $10; EICO HF-20 watt hi-fi amp., or will swap a Dynamic 50 watt stereo amp. for another HF R. Keuler, 228-A N. State St., Chilton, Wisc. 53014.

FOR SALE: Galaxy III, w/calib., a.c. & d.c. supplies; Hus 80-40-20m w/bumper mount, manuals incl. All excellent, p tically unused. Must sell! Only $340, or best offer. M Knapp, c/o Mr. N. H. Anderson, 720½ E. 36th St., Savan Ga. 31401.

MARITIME MOBILES, military stations in eastern states. Guardian Angel Service Net every Sunday 1400Z, 7.205 mc. info in reply QSL or post card to Sect'y K3QPM or K8YUW, Publicity Director.

HELP WANTED: Counselor, male, over 20. To teach and orga ham radio program in boys summer camp in western M July & Aug. Top salary. Camp Lenox, 37 Wood Valley Lane, Washington, N.Y. 11050.

QSL's, $6.95 per 1000. Free samples. C. B. Printers, P.O. 2231A, Anderson, Indiana 64011.

FOR SALE: Hallicrafters HT-40 xmtr, $60; SX-140 rcvr., D-104 mike w/stand, $15; Heath sixer with modifications $125 takes all. Russell Clark, RD2, Elmira St., Waverly, N.Y

FOR SALE: Like new, National NC-155 w/manual, 80 thru coverage, $100. Michael Brown, 217 Hartley Ave., Beckley Va. 25801.

See page 126 for New Reader Ser

s—Join the CQ club of America, you get a giant newsletter month. For more details write to; CQ Club, 1013 Webster Bay City, Mich. 48706.

T: Collins mechanical filter F455J15 1.5 kc for 75A4. State and price. P. Ballinger, 1331 Concord Ave, NE. Massillon, 44646.

T: Model 28 KSR, 28TD, 28 Reperf, 100V, 200V, HT32A or K117, 75S-3 B. Cash waiting. G. Tate, 7 Artillery Rd. Taylors, ar. 29687.

: RME 4300 $60. RME VHF 152A $25. Millen 90W xmtr & mod in rack cabinet & P.S. & Sep VFO $50. Pkg Deal $125 nuch Make offer. B. Gode, Wallace Hall—Room 0352, Iowa University, Ames, Iowa 50010.

INFO for the amateur interested in RTTY. DeMotte, 4008 S. tic Ave, Daytona Beach, Fla. 32019.

ED: Instructograph tapes and tape transport for School Club. R. Leffert, Shattuck School, Fairbault, Minn. 55021.

E: CQ Mar '46 for CQ May '45, Aug '45, or Jan '46. R. Amos, Usange St, Beltsville, Md. 20705.

OPLEX Presentation bug, FB shape, not modified BC-455, coaxial relay, or Vibro-Keyer, D. Ballard, 800 Main St, Ho- Ind. 46342.

TED: Parts for junk box. Tubes, xfmers, all types of com- nts, junk, odds and ends, etc. M. Friedrich, Rt. 2, Box 3, Gonzales, Tex. 78629.

TED: Low cost CB transceiver, H Smith, 467 Park Ave, Bir- ham, Mich. 48009.

SALE: KWM2 serial no power supply $665. SB100 with ac r sup and speaker $350. C. Johnson, 501 W. Sears St, Deni- Tex. 75020.

TER PACKAGE: Heath 6'er, 12 volt p.s., five xtals, 4 element , $50 takes all. Will deliver 30 mile radius. R. Hutchinson, Kaywin Ave, Bethlehem, Pa 18018.

SISTOR Power supply $16.50. Phone patch $15. Crystal rator 100 Kc $9.50, Toroid Transformer 12V to 250W. D.C. . Scope Calibrator $12.50. S. Boer, 449 Hill St, Boonton, 07005.

TED: Old Oscilloscope any condition, will trade a Koss o Headset and a new dynamic Microphone. Billy K. Hart, est Drive, Saraland, Alabama, 36571.

Model 15 and 14 TRFX WITD TD and Power Supply mounted ortable stand beautiful mint condition. Cash and carry 00. 133 Morlyn Ave., Bryn Maur, Pa. 19010. PH. LA 5-8849.

SALE: Heath MT-1 and MR-1, w. manuals, $75. F. McJannet, 7 Evanston N., Seattle, Wash. 98133.

SALE: SBE-34 and SBE hand mike (with all cables). Will ship id for $333.00. L. Kirschemann, WAØNZO, P.O. Box 633, nt, N. Dakota 58650.

ED: QST binders and ARRL Handbooks, State qty, cond., and . All letters answered. L. Mueller, 12700 Elliot Ave., SP-287, nte. Calif. 91732.

SALE: Valiant, $125, SB-10, $70, ($175 for both) RME 6900 speaker, $200. L. Nathanson, W8DQL, 23491 Plumbrooke, field, Michigan 48075. Tel. # 313-353-3588.

SALE: 75A-1 with A-2 xtal filter, $140; SX-100, $110; TX-62, r 350 mike, CB-6 conv., PS-1, $140; Hi-Gain 3-el. 6-meter & rotor, $50. J. Satterlee, 213 Frederick, Fort Atkinson, 53538.

L, Ralph Cabanillas, Jr., Los Angeles, Calif. is now W6IL.

SALE: Cleaning shack: S-line cabinets & parts, filters, etc.; 50B's, HA-14 linear; GSB-201 Linear. S.a.s.e. for list. K5TGJ, Lakewood, Garland, Texas 75040.

ICE: Heathkit Service Technician will build your Heathkit. X, Box 311, Benton Harbor, Mich. 49022.

SALE: Heath HW-32A transceiver with Shure 202 mike, excel- cond. No power supply. $75. H. Adler, 10 Scott St., Massa- a Park, N.Y. 11762.

SALE: AMECO 6-2 xmtr, like new, $110; AMECO 621 v.f.o., Both with manuals. L. Brower, 9040 Cherry Ave., Morton , Ill. 60053.

SALE: Hallicrafters SR-42, $125; Gonset (2m) GC-105, $140; 99er, $75. All in excellent cond. L. Amundson, KØOSL, 465 Ave. N., E. Grand Forks, Minn. 56721.

FOR SALE: Heath SB-200 Linear, professionally wired, little use, like new, $180. K6VJE, 10234 Vista De La Cruz, LaMesa, Calif. 92041.

FOR SALE: Warrior Linear amplifier. New silicon diode power supply. Immaculate, $150. K1JPR, 22 Darbrook Road, Westport, Conn. 06880.

WANTED: PTO for R-388. Used unit OK. Mike Ludkiewicz, W1DGJ, 143 Richmond Road, Ludlow, Mass. 01056.

FOR SALE: Link Frequency Meter, Type 2051-B, 4 channels, 7.5 and 15 kc deviation. Complete with cables and transformer. Weston model 269 d.c. voltmeter, 0-30 v. L. A. Stapp, 2903 Ash, Hays, Kansas 67601.

SWAP: New 5BP1 cathode ray tube in carton for 5LP1 or 5LPII. A. H. Russell, Rt. 2, Box 1035, Nokomis, Fla. 33555.

FOR SALE: McCoy 32B1 Golden Guardian s.s.b. filter with xtals. New, won as prize, make offer. Bud Mosier, K9LXH, Farmland, Ind. 47340.

WANTED: Radio Magazine, July, 1935; "Who's Who In Amateur Radio" (c 1934); Ham call letter license plates from KH6, KL7, KP4, KZ5, VO. G3IDG, 96 George St., Basingstoke, Hampshire, England.

FOR SALE: Home-brew linear, 4-811's, solid state pwr supply, built in s.w.r. bridge. Good cond., $70 plus freight. Bob Massey, WA9NBU/8, 544 West Wadsworth, Houghton, Mich. 49931.

FOR SALE/TRADE: NC-125, VF-1, Heath RX-1 Mohawk, Tri-band converter. Need: Ham-M, wattmeter, Mobile antenna, Collins 70-K1 PTO, mobile boom mike (Hi-Z). I. Webb, 432 Rosario Dr., Santa Barbara, Calif. 93105.

FOR SALE: National Radio Course bound in 3 volumes, $10. Capitol Radio Course, 1950 edition, bound in 4 volumes, $25. Cabinets, 5½" wide by 8½" by 11" deep with grey panel, suitable for ARC-5 rec., $5 ea. W6BLZ, 528 Colima St., La Jolla, Calif. 92037.

FOR SALE: San Antonio area DXers, 71' crank-up tower, Ham-M, TH6DX tri-bander, some wind damage, $700 worth for $185. K6ZGQ/5, 110 Morning Valley, San Antonio, Texas 78227. Phone: OR 4-0981.

SWAP: Collins 75A-4 filter, 455J-60 or 455J-15 for 455J-05. BC-221T freq. meter with a.c. supply and modulator, $55. W. H. Grant, 56 Garfield Ave., Glen Head, N.Y. 11545.

WANTED: Government call books for 1922, 1923, and 1924. Will pay fifteen dollars each. Erv Rasmussen, 164 Lowell St., Redwood City, Calif. 94062.

FOR SALE: BC-221AL. New Cond., with calibration book, spare tubes, and xtal, $65. F. Williams, K3APJ, 902 Las Vegas Drive, Temple, Pa. 19560.

FOR SALE: AMECO CN-144-W factory wired 2m conv. Output 28-32 mc; easily changed. Almost new. Instructions. $30 ppd, K9YRA, 1017 Pfingsten, Glenview, Ill. 60025.

WANTED: Collins Noise Blanker for KWM-2, and SB-10 in good condition, will pay top price and shipping. Don Miller, W9WNV, Box 3278, San Bernardino, Calif. 92404.

FOR SALE: Lafayette HA-500, 80-6 meter rec. $110; Johnson Messenger I (CB), convert it to 10 meters, $50 including mike and a.c.-d.c. supply; Home-Brew T.R., $7.50. J.A. Henebry, WN2DCH, P.O. Box 266, Salt Point, N.Y. 12578.

FOR SALE: Heath OP-1, professional oscilloscope, triggered sweep, calib. vert., etc., with two Tektronix probes, $170. I pay shipping. T. S. Housseau, 6704 4th, Spokane, Wa. 99263.

FOR SALE: DeVry electronics courses with all manuals and exams (incl. answers): Course #250, $10; #501, $20; #510, $10; #520, $10. K5SGH, 1204 N. 9th, Van Buren, Ark. 72956.

FOR SALE: Ranger I transmitter, $115; HQ-145 rec., $135. Both in good cond. with manuals, will ship. VE7XX, Box 880, BC, Canada.

FOR SALE: RTTY equipment, TU, Model 14TD; scope monitor; schematics, manuals, etc. F. DeMotte, P.O. Box 6047, Daytona Beach, Fla. 32022.

FOR SALE: Several new 015 v.a.c. panel meters, 3½" rd., G.E., $2.25 ea., 0-300 v.d.c. meters $2.25 ea. plus postage. Samkofsky, 201 Eastern Pky., Brooklyn, N.Y. 11238.

FOR SALE: Heath HR-10 receiver es DX-60A trans., 5 xtals, relay, $110 for station. Will also sell individually. D. Ollodort, WN6VXN, 1908 Vascones Drive, Hacienda Heights, Calif. 91745.

page 126 for New Reader Service

Advertiser's Index

For further information about ads in this issue, circle these numbers in Reader Service Coupon.

READER SERVICE

NAME _____ CALL _____
(Please Print)

ADDRESS _____

CITY _____

STATE _____ ZIP CODE _____

Reader Service numbers below correspond to those at the left of the advertiser's names in the Advertiser's Index.

Please send more information on your ads in the May '68 *CQ* keyed as follows:

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	Total Inquiries				☐

Void after May 1968

CQ MAGAZINE, Dept. RS

14 Vanderventer Ave.

Port Washington, L. I., N. Y. 11050

See page 126 for New Reader Service

Why the Regenair 321 Quad is Important to you!

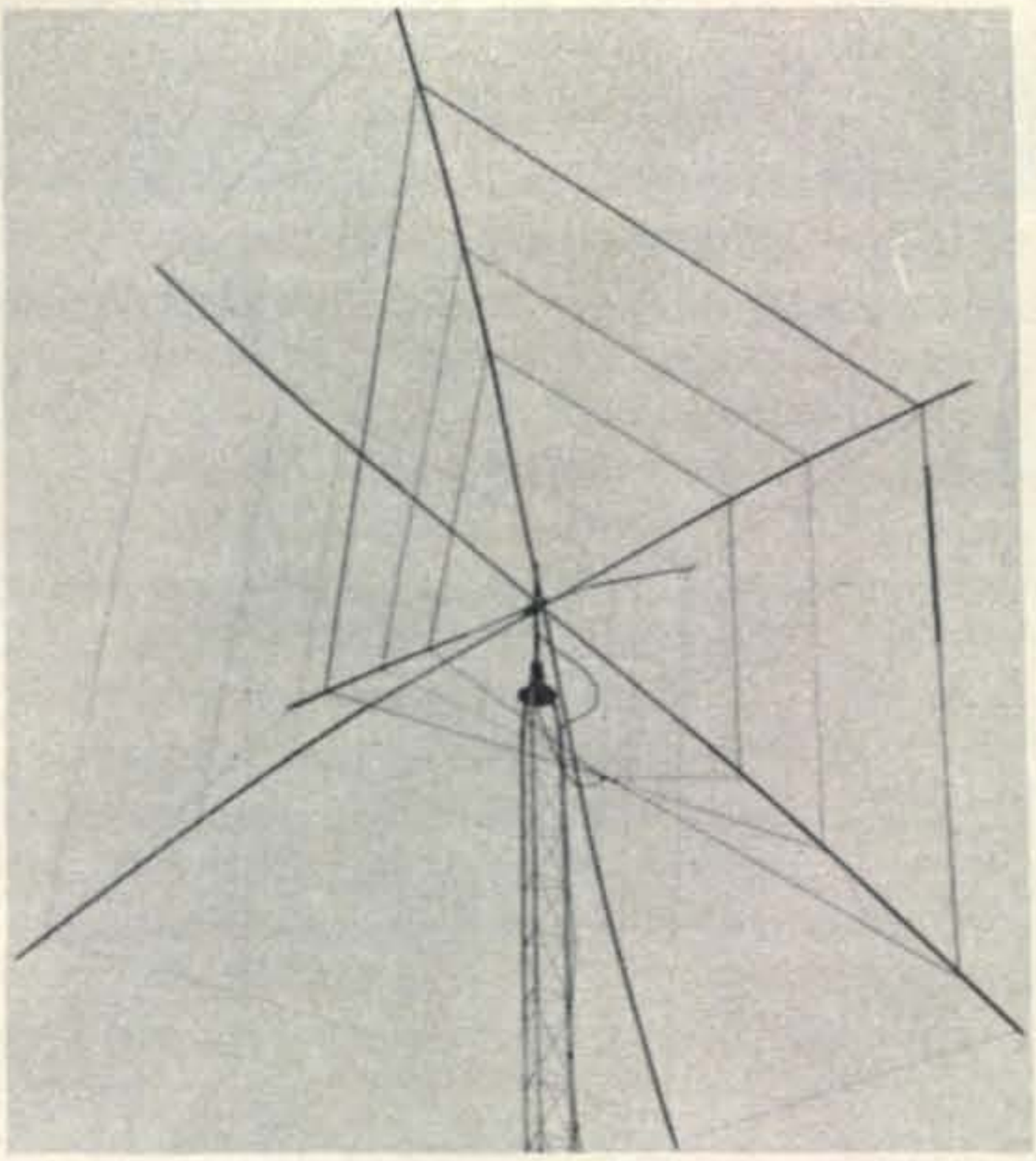
Present day transceiver and transmitter designs require an antenna match with as flat a resonant response as possible. In the olden days a typical 500 watt rig required a relay rack and 500 pounds of gear. The physical spacing and voltage parameter of the tank circuits were such that one never worried about VSWR; indeed, that term had not yet been coined! Flash over and mismatch were laughed at and tolerated.

What a difference today! In a table top box scarcely 1½ cubic feet and weighing less than 50 pounds we find a modern sideband transmitter and receiver thrown in as well. Take a good look at the components: fixed capacitors smaller than ½ a postage stamp; a loading capacitor with .005 inch spacing; and transmitting tubes that are in reality TV horizontal outputs. These, then, are what you find. Do you wonder then why the manufacturer tells us we must operate into loads of 2.5 to 1 or better? Do you wonder then why the factory says to tune up in less than 30 seconds? Is it a surprise to you to find that new finals are required so quickly?

Look at this problem more closely. The 6HF5's are rated 30 watts dissipation. Two of them in parallel equal 60 watts limit. Yet the rig has a PEP rating of 500 watts and can develop up to 265 RMS watts in the forward or incident position. Its power supply furnishes 800 volts. You adjust the bias for 50 mills average, or 40 watts. Here is two-thirds of the total dissipation rating in idling power. The danger comes into the picture because the average ham can't or won't confine his operation over that narrow spectrum where his antenna is in resonance and where his VSWR is less than 2.5 to 1.

Good engineering tells us that at 2.5 to 1 we have 10% of our forward power coming back to stay as circulating current and heat. Ten per cent of 265 watts is 26.5 watts. This added to our idling current equals 66.5 watts—an *excess* of value beyond what the tube manufacturer says his tubes can take.

Sure—new SSB designs are in the works: transceivers whose receivers will have variable selectivity; whose transmitters will use better tubes; rigs that can take more guff. But can you wait that long or afford that much money?



There is an alternative now—in fact, two choices. You can either be more mindful of the frequency tolerances of your setup, or better still, you can obtain one of our Reginair Quads. This is the only commercially available product that gives three band operation with one 52 ohm feed line and absolutely guaranteed low, low VSWR over the entire 10, 15, and 20 meter bands.

This Quad is furnished complete with easy to understand assembly instruction, at only **$89.95** FOB Harvard, Massachusetts. We prefer to ship via Railex. Study the box score and see if this antenna isn't the answer to your operating and maintenance problems. You might even find that DXing can be fun now that you are hearing the rare one.

BOX SCORE

Forward gain over dipole	5.9 db
Forward gain over isotropic dipole	8.0 db
Front to back ratio	25 db
VSWR over 28-29.7 MHz; not more than	1.5:1
VSWR over 21-21.45 MHz; not more than	1.5:1
VSWR over 14-14.35 MHz; not more than	1.5:1
Maximum RF input	2 kw
Maximum mast dimension	1¾" dia.
Wind resistance	4.5 sq. ft.
Feed line	52 ohms
Outside dimensions	18'x18'x12'
Turning radius	9½'
Net weight	35 pounds
Shipping weight	40 pounds
Designed for 100 mph winds; ½" radial ice	
Frontal lobe	75°
Standard model price	$89.95

HERBERT W. GORDON COMPANY

Woodchuck Hill Road, Harvard, Mass. 01451

"Helping Hams to Help Themselves"

AMATEUR ELECTRONIC SUPPLY

RECONDITIONED HAM EQUIPMENT

★ 10 Day Free Trial (Lose only Shipping Charges) ★ 30 Day Guarantee ★ Full Credit Within 6 Months on Higher Priced New Equipment ★ Pay as Little as $5.00 Down – take up to 3 Years to Pay the Balance ★ Order Direct from this Ad !

AMECO
CN-50 Conv (14-18) $29
CN-144 Conv (14-18) 29
PV-220 Preamp 9
PCLP Preamp/sup. 19
TX-86 Xmtr 109
621 VFO 39

AMPLIDYNE
621 VHF Xmtr $149

B&W
51SB SSB adaptor $109

CLEGG/ SQUIRES-SANDERS
22'er 2m Xcvr $175
66'er 6m Xcvr 175
99'er 6m Xcvr $ 75
Thor 6 (RF only) 99
417 AC sup/mod 75
418 DC sup/mod 75
Zeus VHF Xmtr 375
Allbander HF tuner 75
Venus 6m SSB Xmtr 225
416 AC supply 75
Apollo Linear 175

COLLINS
75A-3 Receiver $269
75A-4 (ser. 1729) 375
75A-4 (ser. 3190) 425
Speaker (A1, 2, 3) 9
75S-1 Receiver 295
75S-3 Receiver 399
75S-3B Receiver 449
32V-3 Xmtr 175
32S-1 Xmtr 375
32S-3 Xmtr 575
30L-1 Linear 375
312B-4 sta control 149
KWM-2 Xcvr 750
516F-2 AC supply 115
516E-2 DC sup (28v) 75
MP-1 DC supply 119
302C-1 Wattmeter 40

R. L. DRAKE
2A Receiver $159
2B Receiver 189
R-4 Receiver 275
R-4A Receiver 299
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TR-4 Xcvr 425
T-4X Xmtr 299
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EICO
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ELMAC
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PMR-7 Receiver 39
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GLOBE/GALAXY/WRL
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PSA-300C AC sup 40
Galaxy 300 VOX 12
Galaxy III Xcvr 189
Galaxy V Xcvr 269
Galaxy V Mk II 299
AC-35 AC supply 59
UM-1 Modulator 25
Rejector 9

GONSET
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Comm IV 6m 149
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6m Linear II 75
6m Linear III 89
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901A AC supply 39
910A 6m Xcvr 199
911A AC supply 39
903A 2m Linear 195
913A 6m Linear 175
G-63 Receiver 89
Thin Pak 19
G-76 Xcvr 99
G-76 DC supply 39
G-77 Xmtr 49
G-77A Xmtr 69
GSB-101 Linear 169
GSB-201 Linear 199
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G-460A UHF Lin 299

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SX-115 Receiver 325
SX-117 Receiver 199
SX-122 Receiver 199
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HT-37 Xmtr 225
HT-40 Xmtr 49
HT-41 Linear 199
HT-44 Xmtr 225
HT-46 Xmtr 249
SR-160 Xcvr 175
PS-150-120 AC sup 75
PS-150-12 DC sup 75
MR-150 Rack 15
P-500 AC supply 75
P-500DC DC supply 95
HA-6 Transverter 99
P-26 AC supply 45
SR-42 2m Xcvr 125
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SR-46 6m Xcvr 109
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HA-1 Keyer 59
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HQ-100AC Rec 139
HQ-110A Rec 159
HQ-110AC/VHF 225
HQ-170C Rec 179
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DX-100B Xmtr 99
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TX-1 Xmtr 115
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HA-20 6m Linear 75
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HEWLETT PACKARD
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608D VHF Gen 899
TS-510A/U VHF 699

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Challenger $ 54
Viking II 69
Ranger I 89
Ranger II 139
Valiant I 139
Valiant II 189
500 Transmitter 275
KW Amp/desk (store pick-up only) 595
Audio amplifier 39
Invader 200 275
275w Matchbox 39
275w M'box/SWR 69
KW M'box/SWR 109
6N2 VHF Xmtr 89
6N2 VFO 34
Mob. Xmtr (as-is) 15
Mob. VFO (as-is) 10

KNIGHT
TR-106 6m Xcvr $ 99
V-107 VHF VFO 15

LAFAYETTE
HE-45 Xcvr $ 59
HE-45A Xcvr 69
HE-45B Xcvr 75
HE-61A VFO 15

NATIONAL
NC-300 Receiver $149
NC-303 Receiver 249
VFO-62 34
XCU-300 Calibrator 9
NCX-3 Xcvr 189
NCXA AC supply 75
NCXD DC supply 75
VX-501 VFO 125
200 Xcvr 275
AC-200 AC supply 65

P&H
PS-1000B DC sup $ 75

POLYTRONICS
PC-6 6m Xcvr $139

LAKESHORE
Phasemaster II $ 69

MOSLEY
CM-1 Receiver $ 99

RCA
WO-33A Scope $ 83

RME
DB-23 Preselector $24
4350A Receiver 99

SBE
SB-34 Xcvr $289
SB2-LA Linear 175
SB2-VOX 15

SWAN
SW-175 Xcvr $ 99
SW-240 Xcvr 169
117AC AC supply 75
406 VFO 49
410 VFO 75
350 Xcvr (early) 249
350 Xcvr (late) 299
SW-117C AC sup 75
500 Xcvr 375
250 6m Xcvr 249

TOPAZ
C10WDD DC sup $ 25

TRANSCOM
SBA-3 AC sup/spkr 19

UTICA
650 Xcvr/VFO $ 99
650A Xcvr/VFO 125

WHIPPANY LABS
"Lil Lulu" Xmtr $ 99
"Lil Lulu" Rec 99

4/8/68

To: **AMATEUR ELECTRONIC SUPPLY**
4828 West Fond du Lac Avenue
Milwaukee, Wisconsin 53216 C

Ship me the following Reconditioned Equipment:

FIRST CHOICE _____

SECOND CHOICE (IF ANY) _____

THIRD CHOICE (IF ANY) _____

I enclose $_____; I will pay balance (if any)

☐ COD ☐ 1 year ☐ 2 years ☐ 3 years

Name _____

Address _____

City _____

State _____ Zip _____

☐ Send Latest Ham Catalog.

The items listed below are brand-new and carry the full manufacturers New Equipment Warranty. Some items have been on display, but most are Factory Sealed. No Trades... ND = New Display.

		Reg.	NOW
AMECO			
TX-86 Xmtr kit, 6v fil.		$ 89	$ 54
TX-86 Xmtr kit, 12v fil.		89	59
AC-1 Transmitter kit		19	14
BTI		Reg.	NOW
LK-2000 Linear	ND	$795	$695
E. T. CLEGG CONVERTERS		Reg.	NOW
228A 2m, 28-29Mc if		$135	$ 98
228B 2m, 28.5-29Mc if		135	98
614B 6m, 14.0-14.5Mc if		115	83
COLLINS		Reg.	NOW
136B-1 Noise Blanker			$ 50
351D-2 Mobile Mount		120	75
MP-1 DC Supply		198	158
R. L. DRAKE		Reg.	NOW
DC-3 DC Supply		$149	$ 98
SC-6 6m Converter		65	54
T-4X Transmitter		399	340
R-4A Receiver		399	340
AC-3 AC Supply		99	85
EICO		Reg.	NOW
720 Xmtr - wired		$129	$ 99
730 Modulator - wired		89	69
730 Modulator - kit		59	49
E-5 Enclosure for 730		4	2
753 Transceiver - wired		299	239
753 Transceiver - kit		149	134
751 AC Supply - wired		109	89
751 AC Supply - kit		59	54
752 DC Supply - wired		109	89
GALAXY		Reg.	NOW
Galaxy V Mk II Xcvr		$420	$357
DC-35 DC Supply		99	83
PSA-300 AC Supply		119	49
V-10 Deluxe VFO		89	34
Rejector AC Supply			3
GAVIN		Reg.	NOW
Maverick II 6m filter		$ 34	$ 25

		Reg.	NOW
HY-GAIN			
2BDP 80-40m Dipole kit			$ 14
SW-1 Indoor SWL Antenna			9
2TD Traps - 80 & 40m			12
103B 3 el. 10m Beam			22
111 11 el. 1¼m Beam			9
12RMK Roof Mount kit			6
LINEAR SYSTEMS		Reg.	NOW
Adcom 250-6 DC Supply		$145	$ 50
Adcom 350-6 DC Supply		125	65
Adcom 250-12 DC Supply			50
MOSLEY		Reg.	NOW
V-5 80-10m Vertical		$143	$ 89
V-4-8 40 & 80m Vertical		103	59
S-402 2 el. 40m Beam		143	72
A-203C 3 el. 20m Beam		129	79
NATIONAL		Reg.	NOW
200 Transceiver	ND	$359	$298
AC-200 AC Supply	ND	75	67
NCXA AC Supply	ND	110	97
NEW-TRONICS		Reg.	NOW
CD-40 40m Cliff Dweller			$ 50
CD-75 75m Cliff Dweller			50
REGENCY		Reg.	NOW
MR-33B 30-50Mc Monitoradio		$ 84	$ 68
SINGER		Reg.	NOW
PR-1 Pnaadaptor		$144	$ 59
SQUIRES-SANDERS		Reg.	NOW
66'er 6m Transceiver		$249	$198
417 AC Supply		139	69
418 DC Supply		159	79
Allbander tuner		129	64
16" Video Monitor		299	149
TELREX		Reg.	NOW
2M-2022 20 el. 2m Beam			$ 25
20M-317B 3 el. 20m Beam			95
40m Inverted V kit/balun			15
40-80m Inverted V kit/balun			25

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"Duo-Bander 84"

80-40 Meter SSB Transceiver

HAM NET... $159.95

WRL CHARG-A-PLAN $8 Monthly

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NOW 400 WATTS *the HOT one!*

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A Complete 80-40 Meter MOBILE PACKAGE!

Includes: 1 ea.: Duo-Bander 84, DC384 Power Supply, one Bandspanner Antenna, BDYF Mount, 350C mic, Mic Plug, PL 259 Plug, UG176/U Reducer and 25' RG58/U coax Cable. All supply cables are included.

ORDER: ZZMA103 package. $279.95 ($14 monthly)

OR...

A Complete 80-40 Meter FIXED STATION PACKAGE!

Includes 1 ea.: Duo-Bander 84, AC48 250 watt supply, 80/40 Duo-Doublet Antenna kit, 350 mic., Mic. Plug, PL259 Plug, UG-176/U Reducer and 100 ft. RG58/U coax cable.

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WORLD RADIO LABORATORIES, Inc. CQ-g 29

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