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The Radio Amateur's Journal

08240

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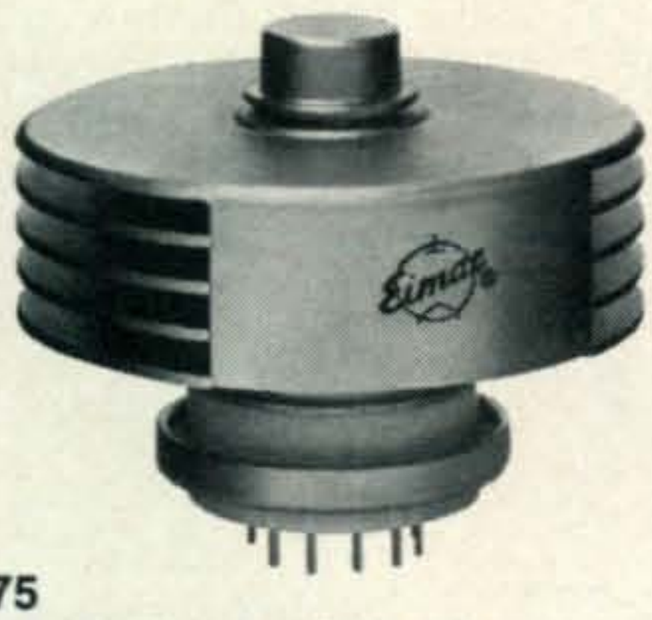

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JULY, 1971 VOL. 27, NO. 7

CQ The Radio Amateur's Journal

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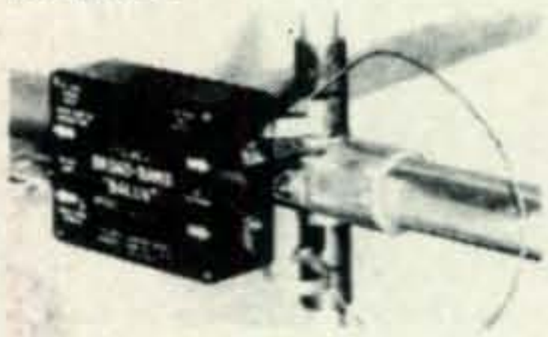

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ZERO BIAS

THE recent retirement from FCC of Bill Grenfell, W4GF, chief of the Amateur and Citizens Radio Division left ominous questions in the minds of interested amateurs. Would his replacement be an amateur? Would he be responsive to the ever-changing needs of the amateur service? As former chief of the division, W4GF had been an active amateur who was deeply dedicated to the welfare of amateur radio. To find another active amateur sufficiently qualified in administration and international affairs was job enough, but to find such a man with the same dedication to the welfare and growth of amateur radio as W4GF appeared doubly difficult.

A. Prose Walker, W4BW

The man was found, however, and *CQ* takes extreme pleasure in extending warm congratulations to the new Chief of the Amateur and Citizens Division of FCC, A. Prose Walker, W4BW. Prose has been an active amateur since 1924 who has been licensed in all US Districts except the 7th and 9th. He has had some taste for operating from the other end of the circuit from special ITU stations 4U1ITU, EA6ITU, LA7ITU and VU2ITU. Among his operating achievements are WAZ, WAS, RCC, FOC, A-1 Operators Club and five DXCC certificates, one dating back to 1939. He is a member of QCWA and the Potomac Valley Radio Club, and holds an Extra Class amateur license. Obviously W4BW fills the requirement of active amateur.

His qualifications from a professional standpoint would fill a papge or more. Prose is a registered Professional Engineer in the District of Columbia and was elected a Fellow in the IEEE in 1964 for his "contributions to international standards in the utilization of the radio spectrum."

Prose has been involved since 1940 in matters related to the use of the radio spectrum in numerous capacities, and as a member of many industry-government committees: National Defense Executive Reserve (FCC); Vice Chairman, National Industry Advisory Committee; Chairman, Field Test Panel, National Stereophonic Radio Committee; Chairman, N.A.B. Disc Recording/Reproducing Committee; Television Allocation Study Organization (TASO), etc.

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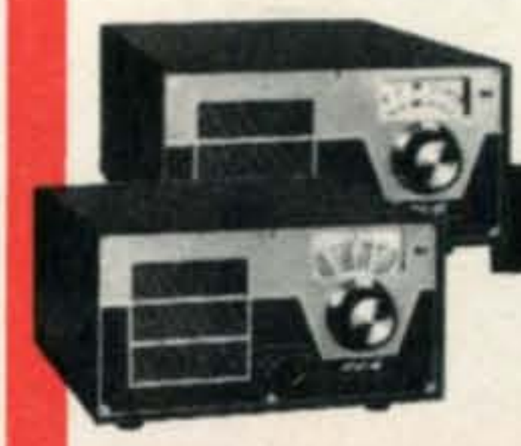

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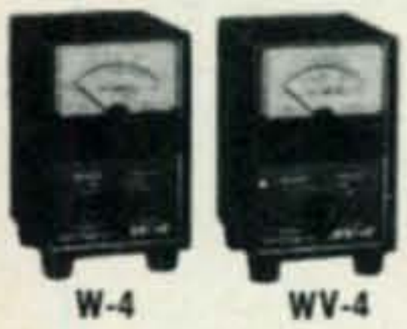

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OUR READERS SAY

10 w.p.m. Code Speed

Editor, *CQ*:

I note the comments of Mr. Roth in April *CQ*. I happen to be a broadcast engineer, and a television engineer. According to his theory I should be demanding that every ham be an expert in both fields.

Good luck to the man if he can do high speed code. Everyone to his own taste. I, for one, have been trying for almost 15 years to pass the 13 w.p.m. test. I don't think that has any bearing on whether I can run a ham transmitter without radiating slop as well. To my mind, Morse has just one use—getting a message out when you are reduced to cutting the carrier on and off. That's an emergency and 5 w.p.m. is plenty.

My own suggestion is alternate requirements. Basic theory for everyone, but let there be a group of questions on each mode—including a code test option—and a choice available. C.w. is so little used in commercial service that it belongs at the rear, behind s.s.b., a.m. TV, RTTY and others. The object of the ham license is training and experimentation in modern communications, which Morse is not.

Joel S. Leek, W1KCR
Claremont, NH

Editor, *CQ:*

Reading the editorials in *CQ* concerning the 10 w.p.m. code speed prompted me to write this letter. The only opinions experessed so far have shown a purely selfish concern. The non-hams, Novices and Technicians want the speed reduced as they feel it will make their General class ticket come more easily. The old timers who already hold the General or high, argue that since they had to pass 13 w.p.m., everyone else should be forced to do the same.

Let us look at the proposal from the viewpoint of the best interests of amateur radio. Old timers will remember that the code speed requirements used to be just 10 w.p.m. In keeping with the upgrading of all amateur standards as radio technique improved during those days, the ARRL petitioned to the FCC to raise the code speed to 12.5 w.p.m. The FCC responded by raising it to 13 w.p.m. stating that 12.5 would have been to messy to calculate and grade (*QST*, August 1936, p. 22). Radio has certainly tended to become more sophisticated since that time. Should we respond to technical progress by relaxing amateur standards?

In these days of affluent society and mass produced commercial ham rigs there are thousands of individuals, unwilling to put forth the sincere, diligent effort to master the present examination requirements who would, if given the opportunity, congest our bands with the sort of nonsense one can now hear up on 27 mc. The one last barricade which spares amateur radio from this mass degradation is the present code requirement.

The so-called plateau of learning which discourages so many aspirants to the General class ticket is due to the fact that at about ten w.p.m. many individuals reach the ultimate in their ability to decipher a code character by counting the dits and dahs *before* they learn to recognize the characters by their sounds. Only when one has achieved the latter can one claim to really know how to copy Morse code. Thus reducing the code speed to 10 w.p.m. would unleash upon our bands a mass of new-breed amateurs lacking the ability to properly receive c.w. How many of these people, once having a General class ticket with 'phone privileges, would continue to use c.w. until they mastered the code if they were unable or unwilling to do the same during a two-year period as Novice?

There is much concern that the number of amateurs is no longer continuing to increase as it has in the past. The fact is we have reached a saturation point. To create a ham population explosion by reducing the present entrance requirements would contribute to the destruction of amateur radio as we know it.

Donald Chester, K4KYV
Woodlawn, TN

Editor, *CQ:*

Yes, I agree, I think the 10 w.p.m. code speed would be just great. First of all it was very, very difficult for me to make the 13. I did, but I think that "they" shouldn't have to—10 w.p.m. shows you know the code. It opens amateur radio to someone new, and then it gives the choice whether as an individual you want to use phone primarily or whether you want to go on with c.w. Having the basic code you can, and if you do, I'm sure the speed will come rapidly with use—I hope it is approved by the FCC.

Name withheld upon request

Editor, *CQ:*

I read with interest the letters in the April issue re the reduction of general class code requirement to 10 w.p.m. Perhaps you would be interested in the views of at least one Novice currently working toward General.

If we, as amateurs, accept incentive licensing to a sufficient degree to accept classes of licenses, and not advocate all to be on an equal level, then we must believe that what we are to have must be earned.

I am presently working on my General class licence and though I have not yet reached 13 w.p.m., (but could probably easily pass a 10 w.p.m. code test—because the "code hump phenomenon" is a very real occurrence), I do not think it is either necessary or advisable to lower the code speed requirement.

I cite these reasons: disregarding the fact that this proposal might seem unfair to those who were required to pass a higher speed test, I believe it would be unfair to me, because I would not have had to meet the same high standards as had previous General class licensees. This proposal would not hurt those who had to pass a 13 w.p.m. test in any way (except possible further overcrowding of already overcrowded General bands), but it would hurt *me*, because I would always know that I obtained my privileges, equal to those of other Generals, with less effort on my part. I would

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always feel somewhat "second-rate."

It is not that I feel that such an action would lower new Generals in the eyes of older amateurs; it is that it would lower my accomplishment in my own eyes. Possibly others share my views. I do not mind working for what I get; that which I have achieved after working hardest means much more to me than that which comes too easily.

It is for these reasons that I feel the code speed requirement for General class licensees should remain at 13 w.p.m.

Kathleen S. Zinn, WN5BIJ
Wichita Falls, TX

Editor, *CQ:*

I just finished reading your April '71 issue and want to say I agree, completely, with your suggestion to lower the General class code speed requirement to 10 w.p.m. I took the General exam two-and-a-half years ago and had no problems with the theory, but I almost didn't pass the code exam because of the "code hump phenomenon." If the code speed had been 10 w.p.m. I wouldn't have had any problems. Happily, I passed the exam and glad I did. I know some people who didn't pass it and went the Technician route instead, but still wish they could pass that exam. If this change passes we may someday hear them on the h.f. bands.

Also, I would like to commend you on your excellent magazine, especially your articles on f.m. I've always had questions about amateur f.m. and would like to get in touch with some hams in the Southern Connecticut area.

Keep up the good work.

Dave Maciorowski, WA1JHK / 1
Milford, CT.

Green Journalism

Editor, *CQ:*

Frankly, I did not plan to renew my subscription to *CQ* because some of the other magazines suit my particular interests better.

However, I was quite disgusted by the *73* editorial which attacked *CQ* so bitterly over the 2 meter CB band allocation. I didn't feel that you were the least bit guilty, but I went back and checked your previous editorials to make sure. Your position which you pointed out in your last editorial was just as I had remembered.

So, here's my renewal for 3 years to support your stand. I hope you can stamp out that snake in the grass up in New Hampshire before he kills Amateur Radio in his mad efforts to sell out the 220 mc band to CBers and line his pockets in the process.

William R. Campbell
Corpus Christi, TX

Editor, *CQ*:

Re your editorial in May *CQ*, you should not have given the *73* Editor the "honor" of such a rebuttal! Granted it is always difficult to "turn the other cheek," and you were running out of cheeks.

Incidentally, isn't there an FCC rule governing the "portable" operation of a station when that station has been permanently located in the area where portable operation has supposedly been conducted from some 10 years? *Personally, I feel* that W2NSD should be required to apply for a New Hampshire call if he is going to reside in the state,

(Continued on page 96)

The Yaesu FTdx 560 is a great rig, but it's no bargain.

At $450, it's a steal.

Considering all the FTdx 560 offers, you might think its $450 price tag was for a kit. But it isn't.

You get a powerful, air-ready station. A handsome, completely hand-crafted transceiver that's fully guaranteed for one year.

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One more point: About 90% of the amateur stations in the Orient are Yaesu; in Europe, it runs about 80%. They're good. It is quite likely Yaesu is the best transceiver made anywhere in the world.

Send for our free information packet that tells the Yaesu story and gives you facts, specifications and schematics for the FTdx 560. The radio you can steal.

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Announcements

Freehold, N.J.

There will be an amateur radio station operating from the Great Monmouth Fair, June 28, through July 4. The FCC has issued a special call (and prefix) KC2GMF for the occasion. Members of the Garden State Amateur Radio Club will have the station on the air from 2-10 p.m. each day. Special county QSL card will be available by writing to: Great Monmouth Fair, Box 111, Freehold, N.J. 07728.

Correction

Due to an error, the price listed previously for the Command Co. FCC study course (*CQ* Ham Shop) is wrong. It should be $9.95 and not $5.00. We regret any inconvenience this may have caused.

Huntington, West Virginia

The Tri-State Amateur Radio Association's Hamfest will be held on June 6, at Camden Park in Huntington, West Virginia. For last minute details contact Fred T. Hall, Jr., WB8AQU.

Brandon, Florida

The third annual Ham Camporee will be held in the Florida Camplands on June 11-13. Contact WA4YNW or Brandon ARC, Box 828, Brandon, Florida 33511 for further information.

Milton, Pa.

The Milton ARC and the West Branch Amateur Radio Association are jointly sponsoring the Penn Central Hamfest to be held Sunday, June 13. For more information contact R.D. Baker, K3RCM.

Special Call and Prefix

KCØKC will be heard on all bands for the period July 1st through July 5th gmt. Members of the Mobile Amateur Radio Awards Club Inc (MARAC) and the Independent County Hunters Nets meeting in Kansas City thru these dates will man the station around the clock. Stations must be logged in GMT. A special QSL card is available for 2 IRCs or s.a.s.e. to KCØKC, P.O. Box 753, Shawnee Mission, Kansas, 66201.

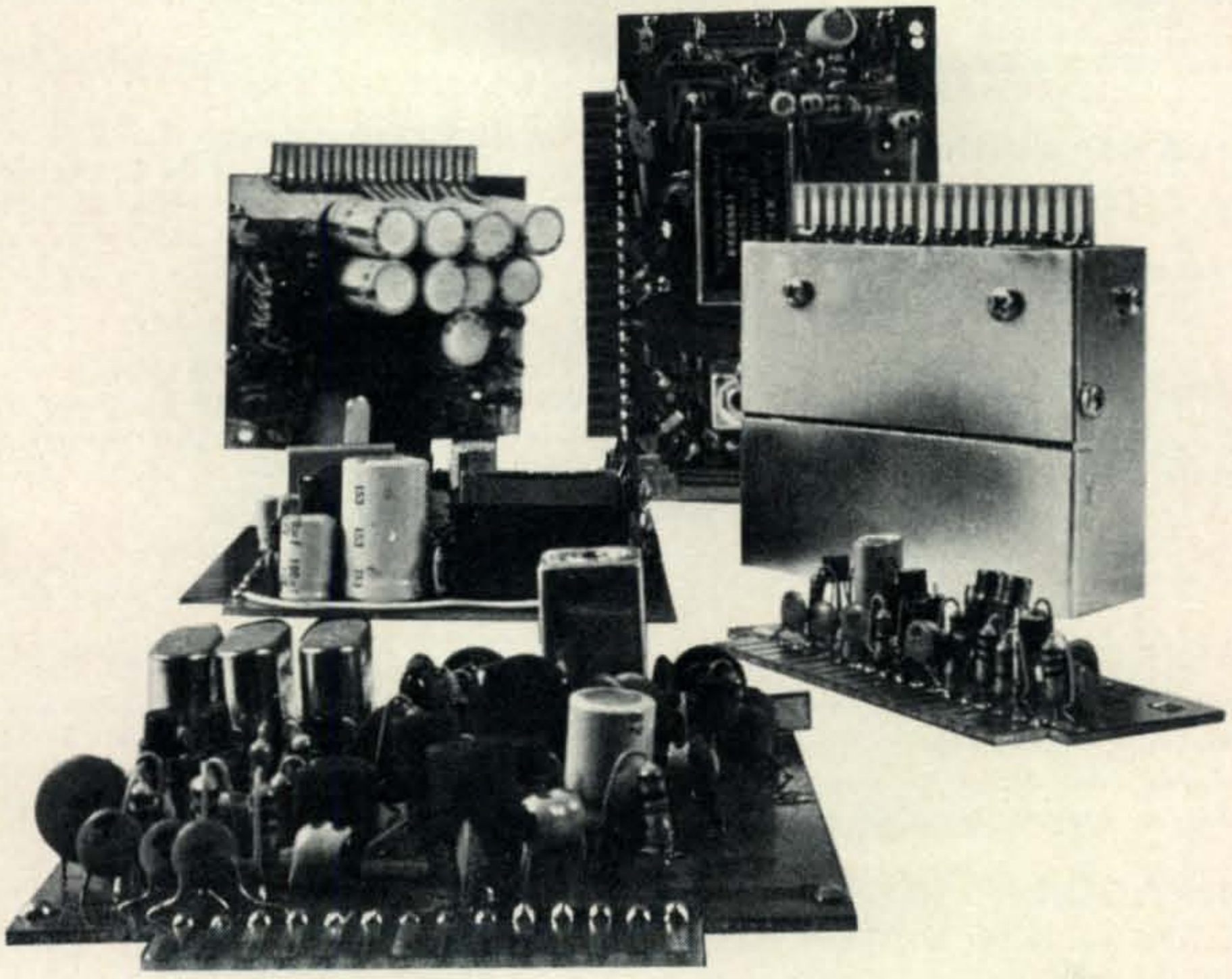
Brandon, Manitoba

The eighth annual International Hamfest will be held on July 10, 11, at the International Peace Garden. This Hamfest is sponsored by the Grand Forks, N.D. ARC and the Amateur Radio League of Manitoba, and is held at the garden bordering North Dakota in the US and Manitoba in Canada. For complete details write to Ron Samchuk, VE4SR, 834 9th St., Brandon, Manitoba, Canada or William T. Bosley, WBØATJ, 513 South Main St., Rugby, N.D. 58368.

La Porte, Indiana

The Indiana Radio Club Council's annual picnic will be held on Sunday, July 11 at LaPorte County Fairgrounds. There will be a large flea market and numerous exhibits and activities for all. For details write to Dave Osborn, K9BPV, P.O. Box 272, LaPorte, Indiana 46350.

Here's just half a dozen reasons why the Yaesu FT-101 is the world's best portable rig.



Those six computer-type plug-in modules hold most of the FT-101's 10 FET's, 3 IC's, 31 silicon transistors and 38 silicon diodes. Being solid-state, they're built to give you years of superior performance. But if any one of them ever gives you trouble, you simply mail it back to us for a factory-new replacement module.

Not that you should expect trouble. What you should expect — and what you get — is the most

sensational portable rig ever offered to the American amateur. With features like these: a built-in VOX, 25 KHz and 100 KHz calibrators, the WWV 10 MHz band, a high Q permeability tuned RF stage and a 5 KHz clarifier. And 260 W PEP, 180 W CW and 80 W AM. With 0.3 microvolts receiving sensitivity — for a 10 db signal-to-noise ratio.

Not to mention a built-in 12 VDC and 117 VAC power supply. Plus an in-motion necessity — a noise blanker that picks out noise spikes, leaving only clean noise-free signal copy behind.

The FT-101 is a thirty-pound package of DX punch, air-ready when you are, wherever you are. Just add an antenna, feed it 12 or 117 volts, and you're ready to work the world.

So sure are we of the 101's solid-state reliability, we guarantee it for one year from date of purchase. And we guarantee you that it will be a very good year . . . the first of many to come. The FT-101 — only $499.95.

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BEAM ANTENNA HANDBOOK

New 4th edition of W6SAI's popular book includes: correct dimensions for beams 6-40 m; facts on beam height; true gain data; truth about T-match, Gamma match; build your beam & Balun. 200 p, $4.95.

VHF HANDBOOK

The original VHF text by Bill Orr, W6SAI, and Herb Johnson, W6QKI, covers: propagation including moon echo; VHF circuitry; test equipment, noise generators, Long Yagi arrays, VHF beams. 209 pages, $3.95.

BETTER SHORTWAVE RECEPTION

New 2nd edition by W6SAI and W2LX is ideal introduction to radio for new Novices and Generals: propagation; how to get best receiver "buy"; how to align a receiver; SW antennas; equipment to build. 156 p, $3.95.

S-9 SIGNALS!

Everything you need to know about building efficient, low-cost wire antennas for ham bands: sugar-coated theory; dipoles; multiband dipoles and GPs; Cobras; Demi-Quad; Marconi; Twin-T; beams. 48 pages, $1.95.

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Makes building kits, home brew gear, easy, fun, almost foolproof! How to work metal, mount parts, wire, solder, test equipment, avoid hazards; tools, shop techniques; best assembly procedures. 136 pages, $3.95.

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Milwaukee, Wisconsin

The South Milwaukee Amateur Radio Club will hold its second annual "Southeastern Wisconsin Swap-Fest" on July 17 at Shephard Park (VFW Post 434), 9327 South Shephard Ave., Oak Creek, Wisconsin. Plenty of parking available. Admission is $1.00. For more information write to WB9EQA, 1900 West Kimberly Ave., Milwaukee, Wisconsin 53221.

McKeesport, Pa

The Two Rivers Amateur Radio Club will hold its annual hamfest July 18, at the Balcon Hotel grounds in McKeesport, located 15 miles east of Pittsburgh. For information write Charles Thomas, WA3MWM, 7022 Blackhawk, Pittsburgh, Pa. 15218.

Jackson, Miss.

The Jackson Hamfest and Supper will be held on July 24 at the Mississippi Fairgrounds. For more information, tickets, or reservations contact the Jackson Amateur Radio Club, P.O. Box 8371, Jackson, Mississippi 39204.

Kelowna, British Columbia

The Penticton Civil Defense ARC announce their sponsorship of the annual International Okanagan Hamfest in co-operation with the clubs from Kelowna, Vernon, and Kamloops. This will be a large event at the Gallagher Lake Lodge in Oliver, B.C. For complete details contact Denny Warner, VE7ASY, RR No. 4, Crawford Road, Kelowna, B.C. Canada.

Escarba, Michigan

The Delta County Amateur Radio Society will have their annual U.P. Hamfest in Escarba on the weekend of July 31—Aug. 1. For advance registration and full information write to B.P. Treml, W8KBZ, 1, Gladstone, Michigan 49837.

Chicago, Illinois

The Six Meter Club of Chicago, Inc., will hold its 14th annual Hamfest in Frankford, Illinois, on Route 45, one mile north of Route 30, on Aug. 1. For further information write to the Six Meter Club of Chicago, 7802 West 66th Place, Argo, Illinois.

Wright City, Mo.

The Zero Beaters Amateur Club's Hamfest will be held Sunday, Aug. 1, in the City Park at Washington, Missouri. Plenty of activities for all. For further information write to Rex Prk, WAØFRW, Rt. 1 No. 10 Kerland Drive, Wright City, Mo.

Livingston, Montana

The 39th annual WIMU Hamfest will be held again at Mack's Inn, Idaho, 23 miles south of West Yellowstone, Montana, on US 91. The dates are Aug. 6, 7, & 8th. Pre-Registration is $3.50 before July 24th. Mail preregistration and information requests to Owen H. Hood, WA7IZR, 407 North Main, Livingston, Montana 59047. Registration at the hamfest will be $4.00 per person.

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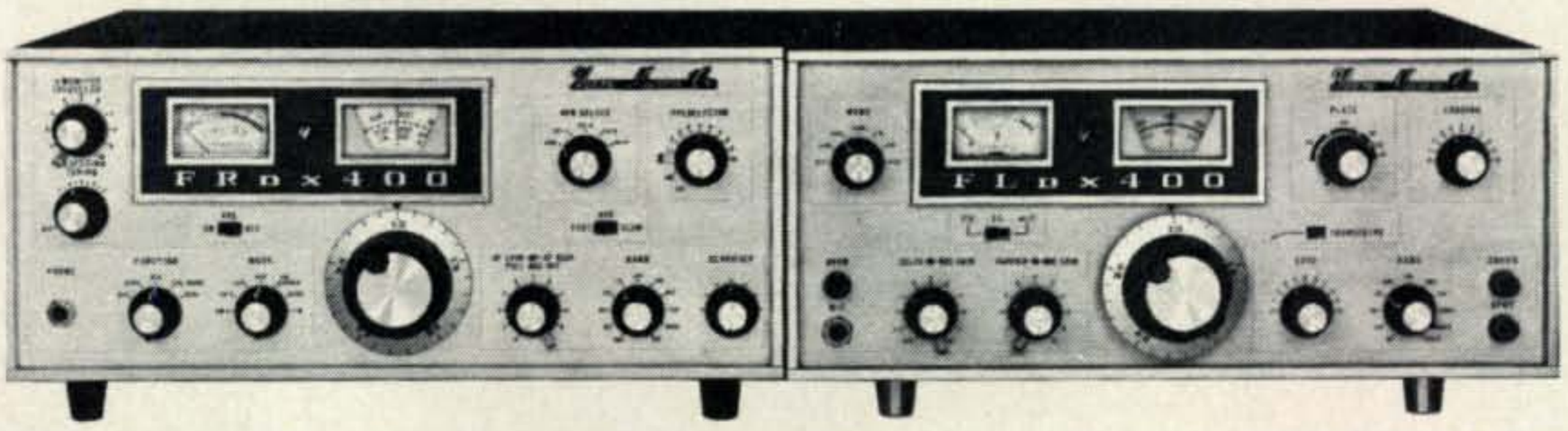
Now you don't have to pay twice the price to get twice the rig.



Picture this pair in your shack. The Yaesu FLdx 400 transmitter and the FRdx 400 receiver. Loaded with power. Loaded with sensitivity. Loaded with features. Loaded with value. Read on, and discover how you can have the most up-to-date receiver-transmitter rig in the world . . . and at an unbelievably low price.

The FRdx 400 Receiver

Get a big ear on the world with complete amateur band coverage from 160 meters through 2 meters, including WWV and CB reception. Four mechanical filters do it — they provide CW, SSB, AM and FM selectivity. Separate AM-SSB-FM detectors are included, along with squelch and transmit monitor controls. Plus a noise limiter and a variable delay AGC. And a built-in notch filter with front panel adjust for notch depth.

The FRdx includes calibration markers at 100 KHz and 25 KHz, with accurate calibrator checks verified by WWV. A solid-state FET VFO for unshakable stability. And a direct-reading 1 KHz dial affords frequency read-out to less than 200 Hertz.

The FRdx 400 sells for $359.95.

The FLdx 400 Transmitter

Here's how to set yourself up with dual receive, transceive or split VFO operation. The FLdx 400 with its companion receiver brings you the ultimate in operational flexibility. Flexibility like frequency spotting, VOX, break-in CW, SSB, AM and even an optional FSK circuit.

The completely self-contained FLdx 400 features a built-in power supply, fully adjustable VOX, a mechanical SSB filter, metered ALC, IC and PO. A completely solid-state FET VFO provides rock-solid frequency stability.

We rate the FLdx 400 very conservatively. That rating guarantees you 240 W PEP input SSB, 120 W CW and 75 W AM. The FSK option will go all day at a continuous 75 W. And you get full frequency coverage on all amateur bands — 80 meters through 10 meters — with an optional provision for certain other bands that you can personally specify. For all that, you pay just $299.95.

FL2000 B Linear Amplifier.

Ideal companion to the Series 400, this hand-crafted linear is another example of Yaesu's unbeatable combination of high quality and low cost. Designed to operate at 1500 watts PEP SSB and 1000 watts CW, this unit provides superb regulation — achieved by a filter system with 28 UF effective capacity.

Other features include dual cooling fans (one for each tube), individual tuned input coils on each band for maximum efficiency and low distortion, and a final amplifier of the grounded grid type using two rugged carbon-plate 572 B tubes. Ready to operate at only $299.95.

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New Amateur Products

Lampkin Laboratories

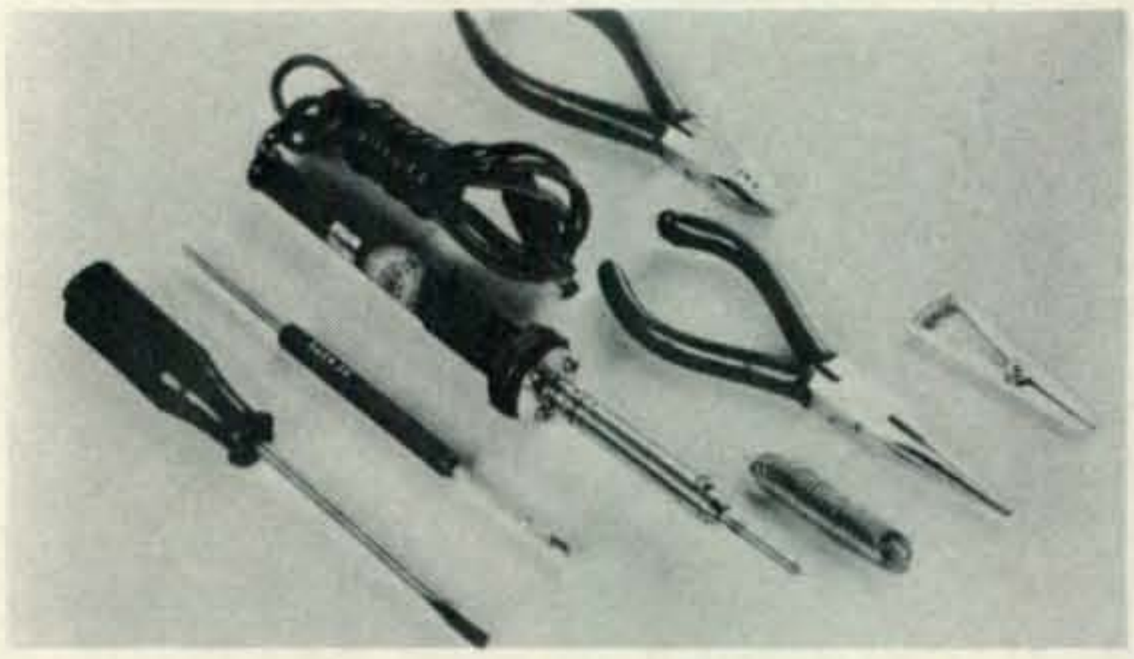
LAMPKIN offers their new Type 107A Digital Frequency Meter / Synthesizer / Signal Generator in one small package weighing just 22 pounds. As a frequency meter its range is 10 kc to more than 500 mc on local transmitters or on received signals with an accuracy of better than 1 part per million (0.0001%) and heterodyne detector sensitivity better than 5 millivolts. (The 107A does not measure f.m. modulation deviation) As a signal generator its frequency range is 1 kc to more than 500 mc, either c.w., a.m. or f.m. modulated from variable frequency internal source. Usable voltage output is 1 volt to less than 0.1 microvolts. The 107A is priced at $2,150. For complete technical specifications write to Lampkin Laboratories, Inc., Dept. 205, 8400 Ninth Ave., N.W. Bradenton, Fla., 3305 or circle 71 on the Reader Service coupon.

Omega T Noise Bridge

OMEGA–T is now offering an extended range antenna noise bridge that can be used over the entire range from 1 to 300 mc. By adjusting to the best noise null, independent measurements of impedance and resonant frequency (rather than s.w.r.) allow accurate peaking of the antenna. The unit is solid state and sells for $39.93. It has a model number TE-7-02. For complete details write to Omega-T Systems, 300 Terrace Village, Richardson, Texas 75080 or circle 74 on the Reader Service coupon.

Turner Microphones

TWO noise-canceling microphones for mobile applications in high ambient noise areas have been introduced by Turner. The Model NC350D is a low impedance dynamic microphone and the NC350C is a high impedance ceramic microphone. Both have a frequency response of 200-4,000 c.p.s. and an output level of -55db. The NC350D has a list price of $35.00 and the $21.00 for the NC350C. For further information write to Turner Division of Conrac Corp., 909 17th St., Cedar Rapids, Iowa, or circle 72 on the Reader Service coupon.



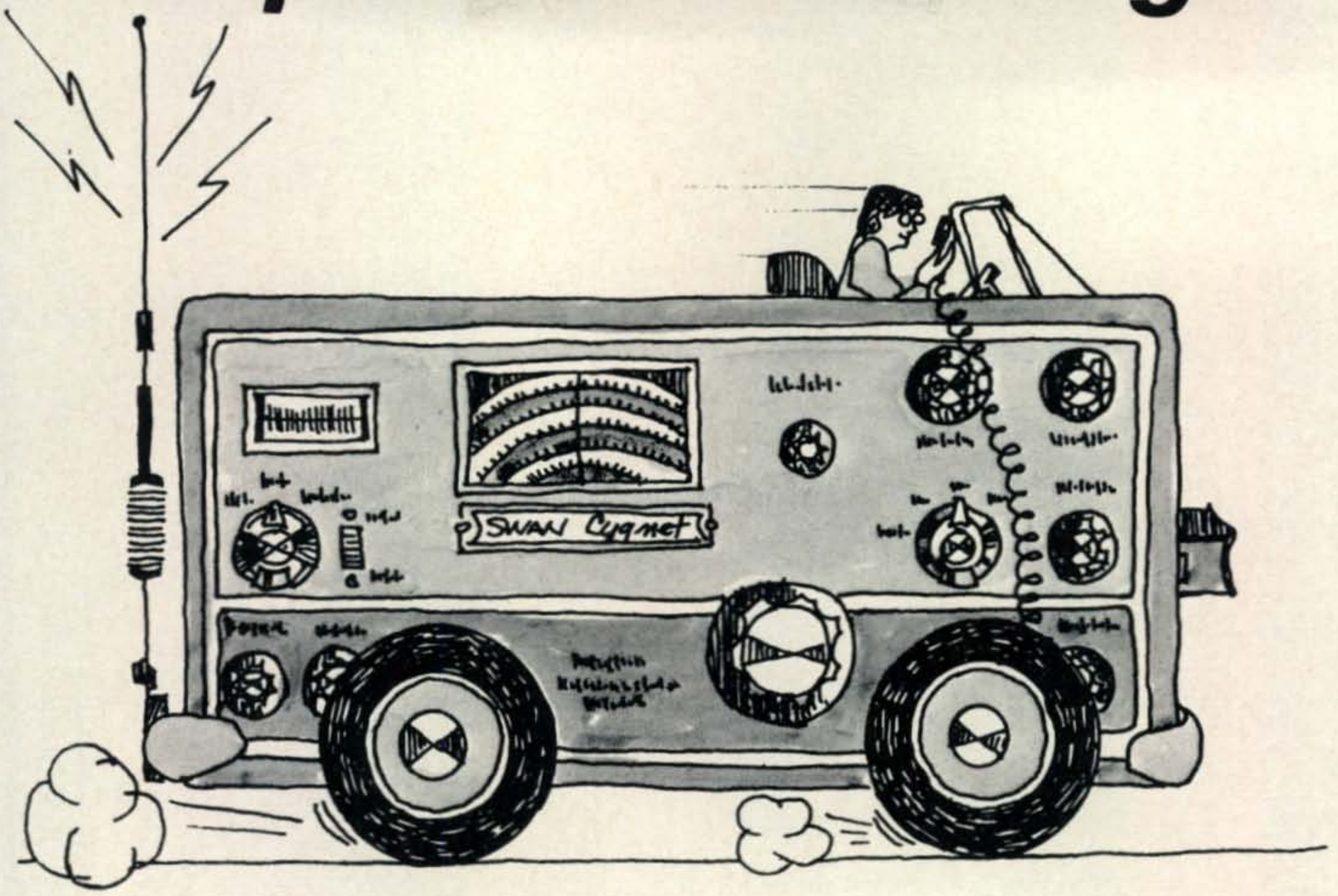
General Cement Tool Kit

A 7 piece took kit is a featured item in GC Electronics' new catalog. The tool kit consists of a long-nose and diagonal-cutting pliers, screwdriver, soldering iron, soldering aid, heat sink, and a coil of solder. The kit is designated catalog number H3-378 and retails for $7.95. For more information write to GC Electronics, Div. of Hydrometals, Inc.' 400 South Wyman St., Rockford, Ill. 61101, or circle 70 on the Reader Service coupon.

Blulyne SG-10

THE Blulyne SG-10 Function Generator features 3 functions; an ultra linear ramp, square wave, and pulse with adjustable pulse width from 0-100% duty cycle. The frequency range is from 0.1 c.p.s. to 100 kc with variable amplitude control, variable pulse width,—rise times less than 200 nanoseconds, and contnuously variable frequency control. The SG-10 sells for $69.95. For more information write to Blulyne Electronics Corp., Williamstown, Mass. 01267 or circle 73 on the Reader Service coupon.

the perfect mobile rig...



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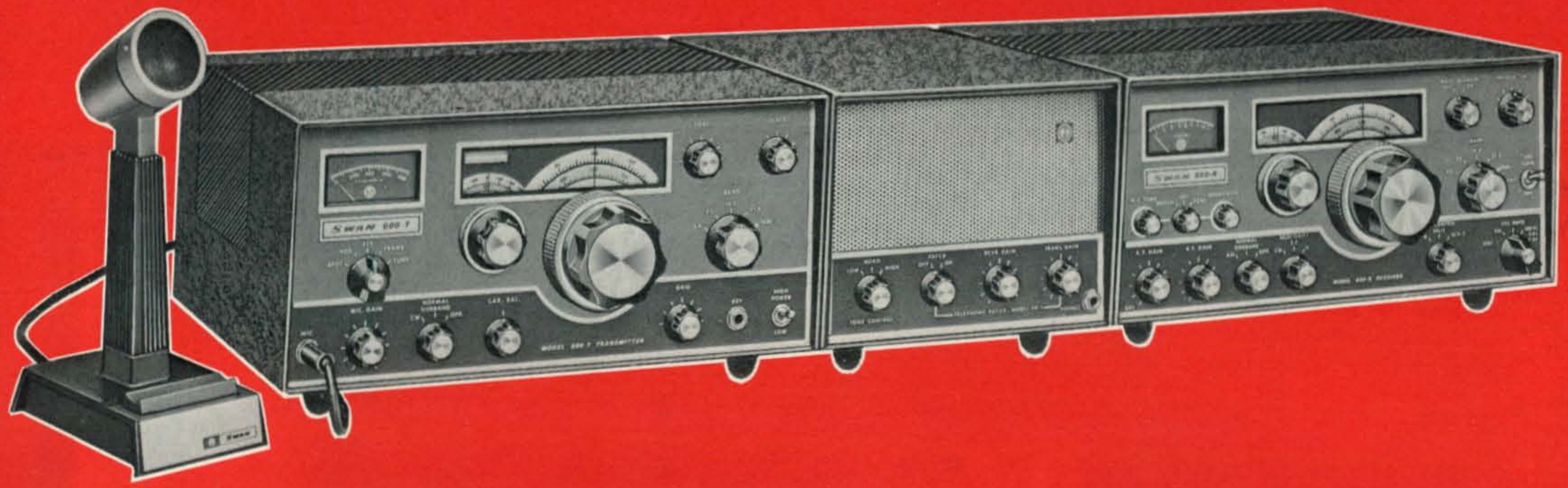

The remarkable success of the Swan transceivers has been based on our continuing policy of giving the amateur radio operator the best possible equipment at the lowest possible price. This is called "Value Engineering."

Now we at Swan have applied "Value Engineering" principles to the fabulous Swan Twins, and the results are truly remarkable.

With their superb selectivity, precision tuning, wide versatility, and natural voice sound. the Swan 600T and 600R offer you the complete amateur station, with more operating pleasure per dollar than any other equipment on the market, at any price.

We invite your comparison, and believe that you too will agree ... the Swan Twins are truly the ultimate in "Value Engineering."

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600R RECEIVER SPECIFICATIONS:

SSB, AM, CW superheterodyne receiver.

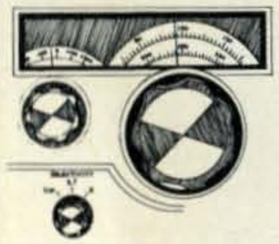
FREQUENCY RANGE with built-in tuning system:

3.4 to 4.4mc, 6.7 to 7.7mc, 13.8 to 14.8mc, 20.9 to 21.9mc, 27.5 to 30mc.

With external tuner, Model 330: General coverage from 3 to 30mc.

With external crystal oscillator, Model 510X: 3 to 24mc, 10 crystal positions. These external oscillators plug directly into the 600R.

TUNING SYSTEM: The lower bands, 80 through 15 meters, are covered in 200 kc segments. 10 meters is covered in 500 kc segments. 100 kc and 25 kc crystal calibrator markers provide for highly accurate frequency readout on a large, easy to interpret dial.



Ultra smooth vernier tuning with large knobs gives you the incomparable feel of a Swan tuning system.

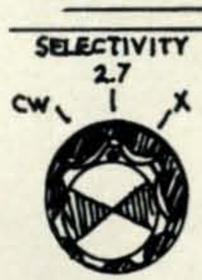
SENSITIVITY: Superior front end design gives you 1/4 microvolt sensitivity for 10 db signal plus noise to noise ratio at 50 ohms input impedance. At the same time, front end overload, cross modulation, image, and spurious responses have been reduced to "state-of-the-art" minimums.

R.F. SELECTIVITY: Antenna tuning circuitry in the 600R front-end provides continuous coverage from 3 to 30 mc. This is accomplished in 5 frequency ranges selected by the band switch: 3 to 5.5 mc, 5.5 to 10 mc, 10 to 16 mc, 16 to 24 mc, and 24 to 30 mc.

Reception outside the normal VFO range of the receiver requires an external oscillator which can be the Swan 510X crystal controlled oscillator, or the Model 330 general coverage tuner. Either of these external oscillators plugs directly into the 600R.

Image rejection is a minimum of 55 db at 30 mc, increasing to better than 75 db at 3 mc.

I.F. SELECTIVITY: Swan's standard crystal lattice filter with 2.7 kc bandwidth, 1.7 shape factor, and ultimate rejection in excess of 100 db makes the 600R's selectivity superior to any other production receiver on the market.



With installation of the optional 16 pole crystal lattice filter (SS-16B), the 600R offers selectivity that far exceeds any receiver, at any price, anywhere! Selectivity then becomes truly incredible, with a shape factor of 1.28 and ultimate rejection exceeding 140 db.

Two additional crystal lattice filter options are available: One is a narrow band CW filter, the other is a broad band AM filter.

There are provisions in the 600R for the installation of up to 3 filters, with front panel selection.

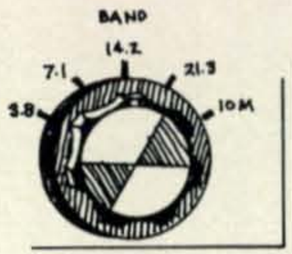
A.F. SELECTIVITY: Audio response of the 600R is 300 to 3000 cycles, ± 3 db, with 3 watts output to a 4 ohm external speaker. Headphone jack is provided with the speaker accessory unit.

An optional IC Audio Filter accessory is available for installation in the 600R. It provides a choice of either notching or peaking a selected audio frequency, and greatly enhances both phone and CW reception.

I.F. NOISE BLANKER: (optional) Installs inside 600R. Extremely effective in suppressing impulse noises such as auto ignition interference.

EXCLUSIVE SINGLE CONVERSION DESIGN: with fewer spurious responses than multi-conversion designs.

HYBRID DESIGN: 7 tubes, 8 transistors, 12 diodes. Transistors used where they provide definite advantage. Tubes used where they still provide superior performance.



FULLY COMPATIBLE WITH 600T: providing for transceiver operation as well as separate frequency control. Also CW sidetone and genuine CW break-in operation.

BUILT-IN AC POWER SUPPLY: for 117 volts, 50-60 cycles.

DIMENSIONS: 15" wide × 6½" high × 12" deep. Weight: 23 lbs.

600R with standard 2.7 kc crystal lattice filter, less speaker..... **$395***

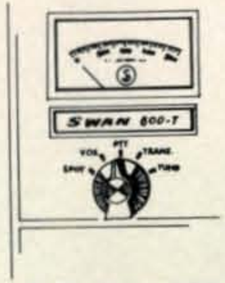
600R Custom with SS-16B super selective filter, I.F.Noise Blanker, and IC Audio Filter factory installed. Less speaker **$560***

600T TRANSMITTER SPECIFICATIONS:

FREQUENCY RANGE: Full coverage of 10, 15, 20, 40 and 80 meters. Extended frequency coverage for MARS operation with plug-in crystal oscillator accessory, Model 510X.

TUNING: Internal VFO system is identical to that used in the 600R.

POWER RATING: 600 watts P.E.P. with a pair of 6KD6 power tubes. 500 watts CW, 150 watts AM, 100 watts continuous RTTY/SSTV.



Pi-Network output for 50 or 75 ohm coax.

Suppression: Carrier 60 db down, unwanted sideband 50 db, third order distortion approx. 30 db.

Audio response: ± 3 db from 300 to 3000 cycles.

CW Keying: Grid block, full break-in system. Includes sidetone to receiver.

INTERNAL POWER SUPPLY for 117 volts, 50-60 cycles.

DIMENSIONS: 15" wide × 6½" high × 12" deep. Weight: 32 lbs. **$495***

ACCESSORIES:

STANDARD SPEAKER
Has tone switch and headphone jack **$18***

DELUXE SPEAKER (illustrated)
Includes Swan phone patch, tone switch and headphone jack **$59***

I.F. NOISE BLANKER
Installs internally in 600R..... **$79***

IC AUDIO FILTER
Installs internally in 600R..... **$44***

OPTIONAL CRYSTAL LATTICE I.F. FILTERS
600 cycle bandwidth CW Filter..... **$20***
6 kc bandwidth AM Filter..... **$22***
SS-16B Super Selective 16 pole.... **$75***

PLUG-IN VOX FOR 600T,
Model VX-2 ..... **$29***

SWAN DESK MIKE Model 444 ..... **$25***

*Factory price.

WRITE FOR THE COMPLETE 1971 SWAN CATALOG.

Expanded C.W. Capability for the Heath HW-Series

BY STEPHEN J. BURNS, *W3AJ

Several readily accomplished modifications will give the Heathkit Single-Banders full band coverage and provision for c.w. The The HW-32 in particular is discussed, but the ideas presented are applicable to the 80 and 40 meter models and the "A" series as well.

THE need for greater flexibility in the HW-32 arose from the author's frequent residence in countries with an extended phone band along with a renewed desire for c.w. operation. At first, the rough and ready expedient of using switchable fixed capacitances in the v.f.o. circuit was used to extend the coverage, but it was felt that the resultant lack of calibration accuracy was too great a handicap. The answer to this problem was addition of two crystal controlled ranges.

Additional Coverage

In addition to the original 18.275 mc crystal, crystals[1] were purchased for 18.175 mc (giving 14.10 to 14.25 mc) and 18.075 mc (14.00 to 14.15 mc). The 18.275 crystal (14.20 to 14.35 mc) was removed from the circuit board and grouped with the others around a rotary ceramic switch (three positions used) installed where the VOX potentiometer originally is; the latter, in most cases a "set and forget" control, can either be secured internally or installed in a hole drilled in the side of the chassis. This necesitates trimming the shaft down sufficiently so the case will fit back on, filing a groove across the face of the shaft, and drilling a hole in the case itself to allow screwdriver adjustment of the control. The author adopted the latter course for the sake of ease of operation. This now gave full band, accurately calibrated coverage, but neither the receiver nor transmitter gain over the 350 kc range was uniform. This problem is treated further on.

Adding CW

Several tacks were available for providing c.w. capability. The first that came to mind was that used by Sideband Engineers for the SB-34, namely keying an audio tone injected into the transmitter microphone amplifier. This was tried and subsequently discarded on several counts. First, it was difficult to design a simple, yet stable audio oscillator of suitably high frequency (about 1 kc); second, finding adequately filtered d.c. from a cathode or, alternately, rectifying the filament voltage both proved unfeasible; third, at S9 and higher levels the beat between the injected tone and the residual carrier was objectionable.

This indicated that some means had to be found to offset the transmitter frequency 1 kc and key a sufficiently high level carrier generated internally. A good deal of careful planning and experimentation went into the development of the following method.

Here's How

A quick computation will show that a capacitance no greater than 0.5 mmf across the tuning capacitor will give an offset of 1 kc. Since no fixed capacitors of this value are readily available, a piece of miniature coaxial cable (RG-174 / U) approximately 3 / 16" long (discounting lead length) was used to obtain the desired offset (longer lengths giving more offset and vice versa) of 850 c.p.s., which is the most comfortable frequency for this operator to receive c.w.[2]

The carrier was obtained as shown in fig. 1. The added capacitor *C* was necessary to compensate for the capacitance to ground of the lead going to the 10K potentiometer (audio taper). With proper adjustment of C, carrier suppression in the u.s.b. mode remained better than −40 db.

---

[1]126 E. Walnut Park Drive, Philadelphia Pa., 19120
[1]Available from International Crystal, type CS-05.

[2]Remember that in a u.s.b. receiver, the lower side of a carrier is heard, but the HW-32 takes the *difference* of the crystal and v.f.o. frequencies.

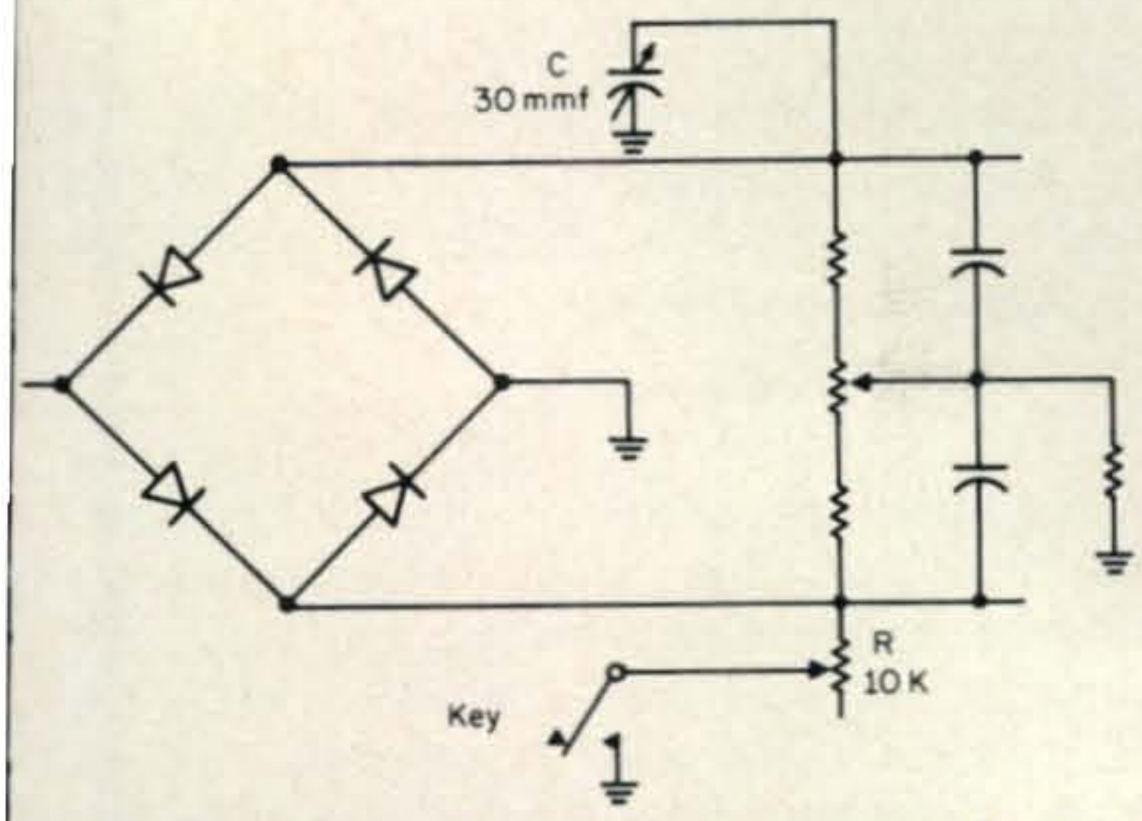


Fig. 1-To introduce carrier on transmit, the balanced modulator is unbalanced by the addition of R from one side of the modulator toground. As shown, keying was first tried in the ground side of R but this method was discarded in favor of cathode keying of the driver. Capacitor C is adjusted to compensate for the capacitance of R to ground to maintain balance for s.s.b. operation.

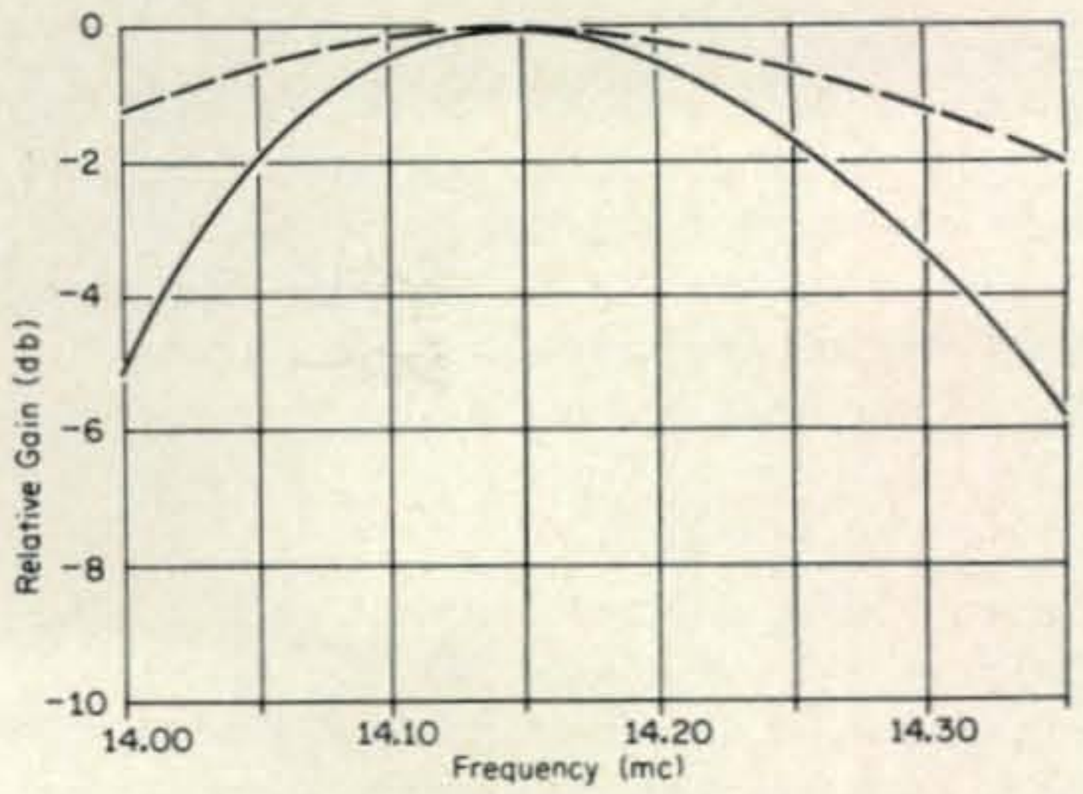


Fig. 2-Re-alignment of the transceiver broadens its over-all transmitter gain as shown. The receiver is within 1 S-unit in sensitivity over the entire 20 meter band.

Keying

It was tried at first to key the transmitter at the point indicated. However, a substantial key click appeared which could not be remedied by conventional means because of the peculiarly sensitive nature of the circuit. It was then decided to key the cathode of one of the transmitter stages instead, leaving the diode ring unbalanced all during c.w. transmission. With this method some back wave may be in evidence, but it is down better than -45db with 100 watts d.c. input reference. The ground connection of the driver stage cathode resistor (R_{52}) was severed to determine the suitability of keying at that point. This worked fine and though the author replaced the existing 0.1 mf bypass capacitor with a 2 mf tantalum electrolytic, no significant change was noted in the already clean keyed waveform. A phono receptacle for the key can be mounted in the rear of the chassis next to the microphone jack.

It was decided that manual operation (MOX) would be acceptable for the sake of simplicity. To transmit c.w. it would be necessary simultaneously to 1—introduce the offset, 2—unbalance the carrier, 3—unground the driver cathode resistor, and 4—ground the PTT line. This was easily accomplished by a subminiature rotary switch mounted beneath and slightly to one side of the tuning dial. This permits the use of a relatively short lead from the offset capacitor to ground, thereby enhancing the mechanical stability of the arrangement.

Alignment

It came as no surprise to the author that no two of the following four conditions could exist simultaneously: optimum receiver/-transmitter gain throughout the band. It was decided that uniform transmitter gain would be sought since the author's HW-32 is used to drive a linear amplifier with very particular drive requirements.[3] As shown in fig. 2, transmitter gain is uniform within 2 db across the band. Receiver gain, measured using a Hewlett Packard 606A, varies by slightly more than one S unit (=6db) from peak to minimum.

Aligning the transceiver was no easy task. The top of the cans for L_2(driver grid), L_3(*driver* plate), and L_5(v.f.o. heterodyne) must be drilled open to permit adjustment of the slugs. Where to adjust these coils and two more is given in Table 1. This is just a starting point; frequencies of optimum receiver/-

It might be noted that the 10K potentiometer is optional if solely barefoot operation is contemplated; it is simply a level control.

Coil	Top	Bottom
L_2	T (low)	T (high)
L_3	T (mid)	—
L_5	R (high)	T (mid)
T_2	R (mid)	T (mid)
T_3	R (mid)	R (mid)

Table I-Rough alignment data for retuning the transceiver for more uniform transmitter performance. Low indicates peak at 14.030 mc; mid indicates 14.175 mc; high indicates 14.320 mc.

transmitter gain can be varied, though not independently, to suit the operator. The final result was an input of 100 watts d.c. on c.w. and 180 watts p.e.p. on s.s.b. phone. Receiver sensitivity was maintained at its rated value throughout most of the band.

Additional Changes

Several minor modifications which the individual operator may, at his discretion deem desirable were also made. A 2.5 mh r.f. choke was added in series with the microphone lead to cure an intermittent r.f. feedback problem that arose when using a compressor. The cathode resistor of V_8, the receiver r.f. amplifier can be bypassed entirely, or a smaller value (say 50 ohms) used in its place. The 150 ohm cathode resistor of V_5, the transmitter driver, can be reduced to 100 ohms. Both changes provide for somewhat increased gain. Additional amplification can be obtained by bringing the value of the 4.7k grid leak resistor R_{91} of V_9, *the receiver i.f. amplifier up to 100K. By replacing* C_{63}, one of the two fixed neutralizing capacitors with a 30 mmf air variable, the finals can be accurately neutralized, thereby giving longer tube life. Additionally, the 390 mmf loading capacitor should be changed to one of the same type with a nominal value of 300 mmf for better matching to 75 ohm loads. Finally, it would be a worthwhile investment of $2.00 for the operator to acquire the HW-32A manual, for there are yet other small changes which can be made.

Evaluation

Despite all the dead-end approaches taken and countless hours of experimentation required to develop, install, and test the modifications described, the author feels the results have more than justified the effort. Those of you who have heard a very rusty first signing W3AJ can testify how this operator has enjoyed the change of pace from s.s.b. No deterioration of the sideband signal was noted after final alignment was completed. If it bothers you that more holes in a rig than it came with originally lowers its resale value, rest assured that once having executed the modifications described you'll be keeping your "Hot Water" rig much longer than you first thought.

Acknowledgment

The author wishes to thank the members of the Swarthmore College Physics Department who have assisted him in this project, and particularly Messrs. John Dougherty and P.S. Stutman, WB2LKD, for their invaluable advice. ■

AMATEUR RADIO STARS IN "THE ANDERSON TAPES"

"The Anderson Tapes" is the name of a soon-to-be-released movie about a master robbery. The robbery is foiled at the last moment by the use of amateur radio by a young invalid amateur. This perhaps is the first time that amateur radio has been shown to the public on a large scale that does not violate technical feasibility nor depict the amateur as just a person fooling around with some toy.

There is also a glimpse of Canal Street in New York with some of the surplus still around plus some of the most sophisticated electronic surveilance equipment out today.

Those of you who remember the public relations job done in connection with the movie "The Bedford Incident" several years ago will once again see that here is a chance for your club or group to play up amateur radio to the public and get some good publicity. Check with your local theatre manager about setting up a station to handle traffic in his lobby when the movie opens near you.

"The Anderson Tapes" is presented by Columbia Pictures and stars Sean Connery, Dyan Cannon, Martin Balsam and Alan King. The dates that the picture is scheduled to open are in the next column. Here's a chance for millions of people to see amateur radio first hand. Help show it well.

The Anderson Tapes Playdates

New York — Loews State, Loews Orpheum	June 18
Los Angeles — Loew's Hollywood	June 23
San Francisco — Alexandria	June 23
Chicago — 6 Theatre Engagement	July 2
Minneapolis — Mann Theatre	July 7 or 14
Albany — Fox Theatre	July 14
Philadelphia — 10 Theatre Engagement	July 14
Atlanta — Tara	July 14
Washington D.C. — 7 Theatre Multiple	July 14
Baltimore — 4 Theatre Engagement	July 14
New Orleans — Robert E. Lee Theatre	July 14
Kansas City — 4 Theatre Engagement	July 14
Dallas — Cine 150 & Downtown	July 15
Houston — Delman	July 16
Ft. Worth — Seminary South 1	July 30
Detroit — 5 Theatre Engagement	August 25
New Haven — Whalley Theatre	July 21
Cleveland — 5 Theatre Engagement	July 21
Indianapolis — Circle Theatre	July 21
Oklahoma City — Shepherd 2 Theatre	July 21
Des Moines — Riviera Theatre	July 21
Memphis — Malco Theatre	July 21
Buffalo — Cinema 1 & Seneca Mall	July 21
Charlotte — Charlottetown Cinema 2	July 23
Milwaukee — 3 Theatre Multiple	July 28
Boston — Circle Theatre	August 5

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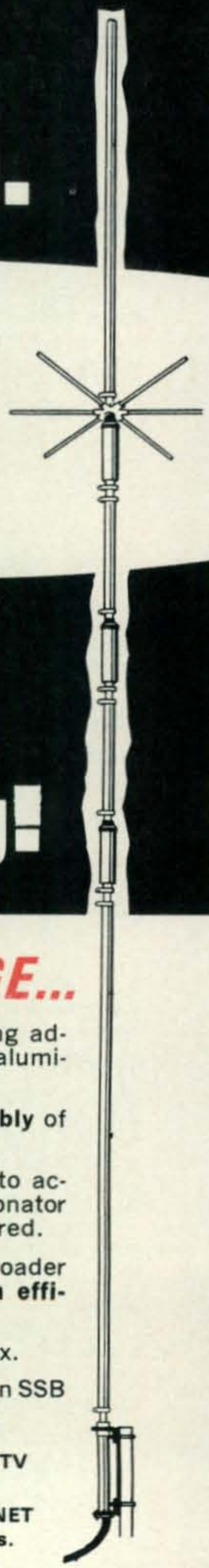

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Stop Transients!

BY JO EMMETT JENNINGS,* W6EI

A TRANSIENT may be defined as a voltage pulse of short duration and may be of positive or negative potential. This pulse is superimposed on the desired potential which may be a sine wave, square wave, or other wave form, as well as d.c. The discussions here will be confined to 50/60 cycle a.c. sine waves from the power lines. Transients, as examined in this paper, are caused by energizing or de-energizing a magnetic field.

Figure 1 shows a turn-on or turn-off pulse. Under abnormal conditions, a pulse may be up to 15 times the sine wave crest voltage; however, in commercial transformers, the peak is usually 2 to 5 times the crest voltage. Discarded pole transformers from power companies are the exception. These old transformers have a high core loss so transients may be 5 or 8 times the crest voltage, and are produced by higher magnetization currents. These old dogs have been used for years, but are not ideal for use with solid state rectifiers. If the transformers were not turned on or off, there would be no problem of transients.

While on the subject of transformers, the use of silicone diodes must be considered as to the available current from a transformer under fault or short conditions. High power transformers have an impedance rating given in percent. To determine the fault current of such a transformer, divide the maximum current rating by the impedance. For example: A given transformer having a 10% impedance and a current rating of 1 ampere is solved as follows: 1/0.1 equals 10 amps maximum fault current. Usually, the low impedance transformers have the best regulation characteristics. If the above mentioned transformer had a 5% impedance, the fault current would be 20 amps, instead of 10. Good silicone diodes have a 1/2 cycle rating of 50 times the continuous current rating. Some of the best grades have a 100 times rating.

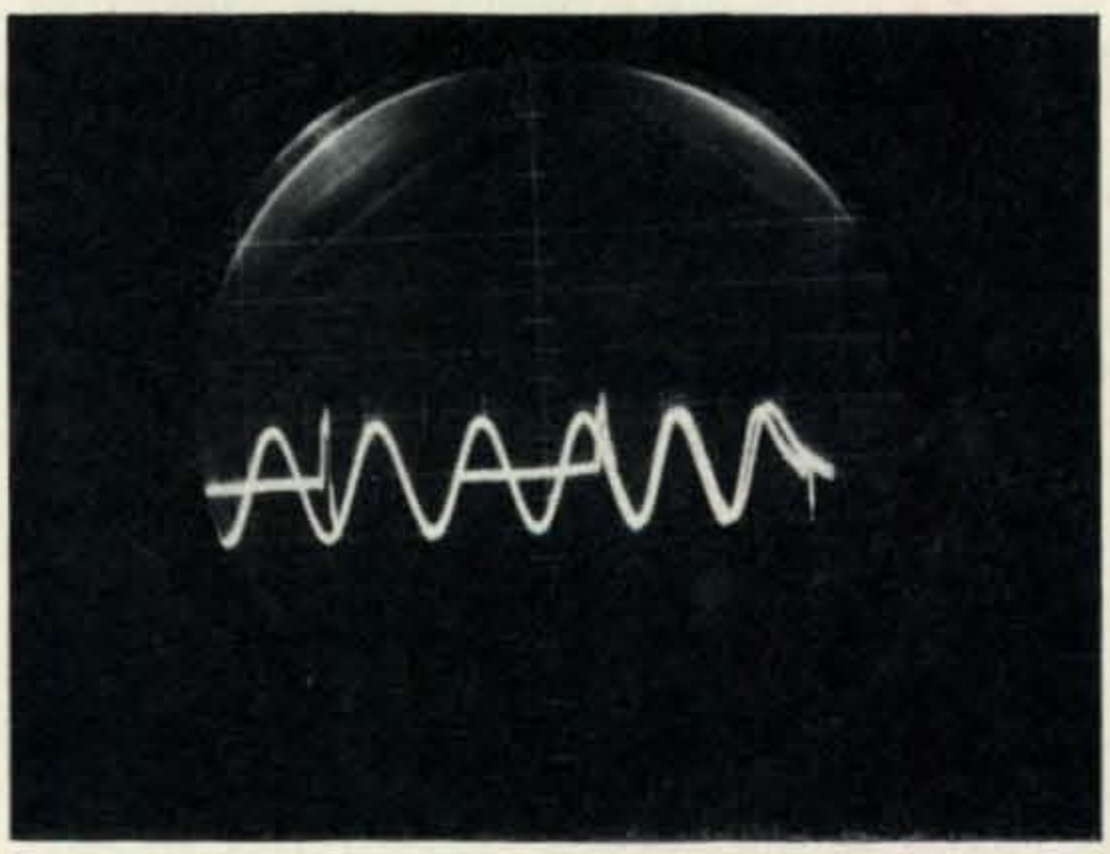


Fig. 2—The same test setup as in fig. 1, with the exception that a 200 watt lamp has been connected in parallel with the transformer primary. The transient level is roughly equal to the secondary peak voltage.

*120 Manfre Road, Watsonville, Cal. 95076

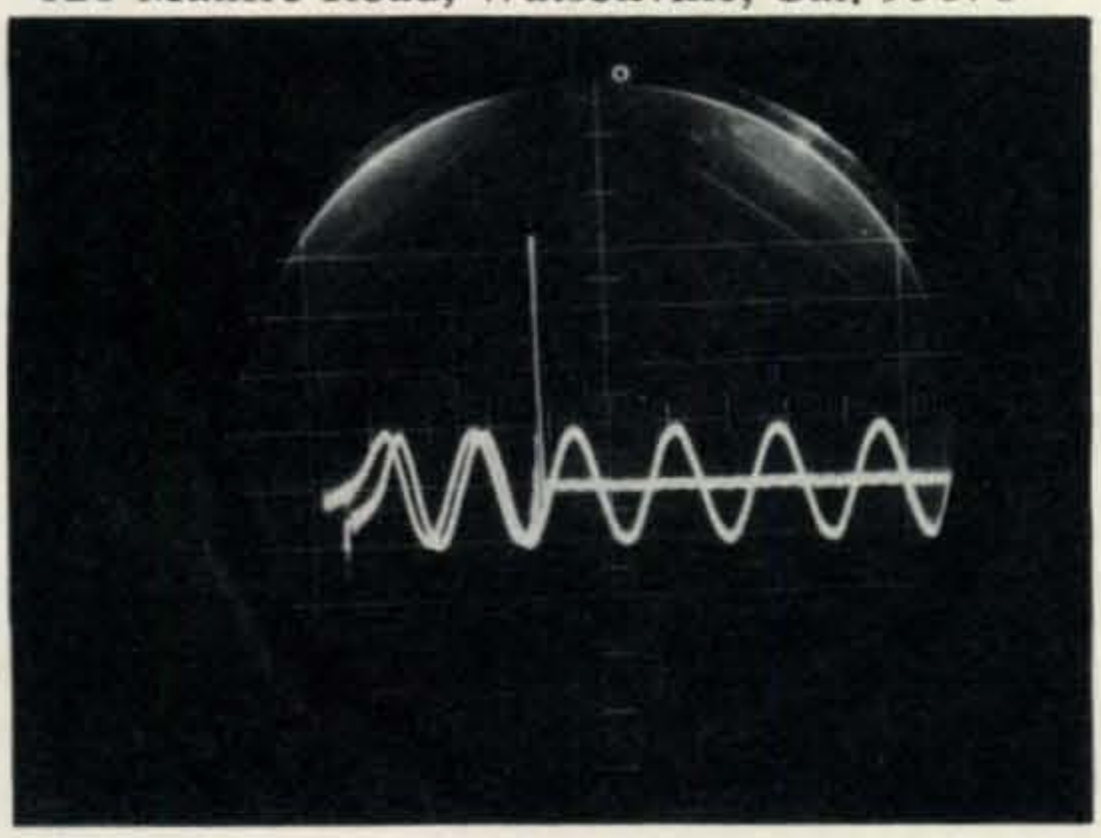


Fig. 1—Scope photo showing a turn-on or turn-off transient measured at the secondary of a high voltage transformer with no transient suppression.

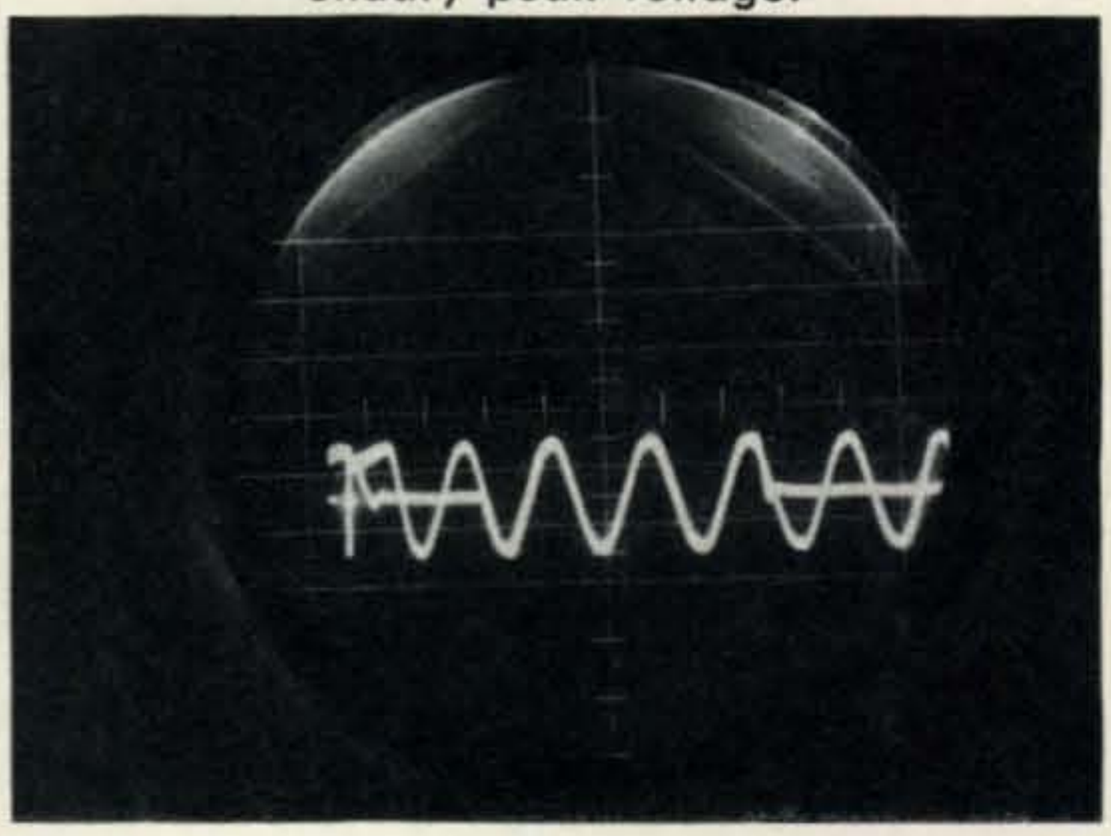


Fig. 3—The addition of a Jennings Industries TS-120 suppressor network across the transformer primary effectively eliminates all traces of the transient.

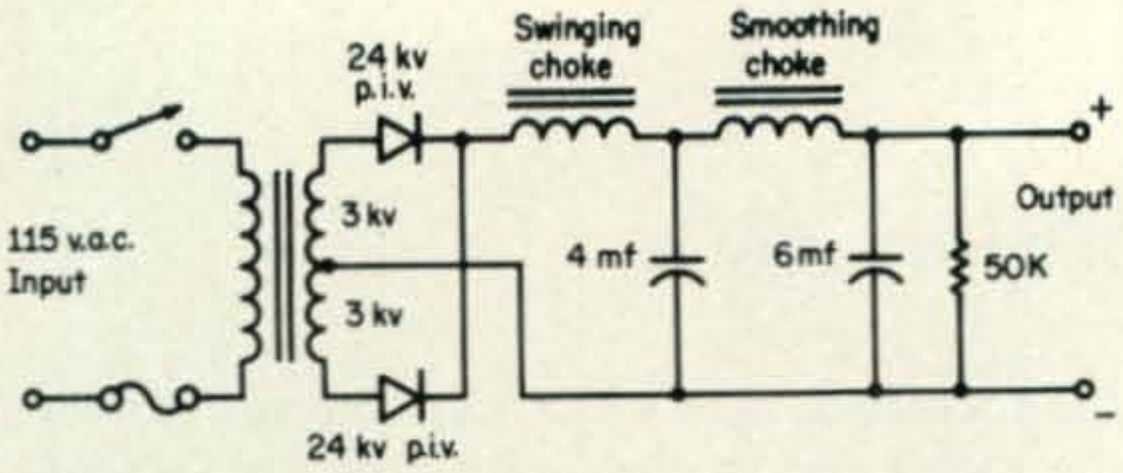


Fig. 4—Conventional full-wave center-tapped high-voltage power supply uses no transient suppression. To protect diodes, sufficiently high p.i.v. rating must be allowed; in this case 24 kv for a 6 kv c.t. transformer.

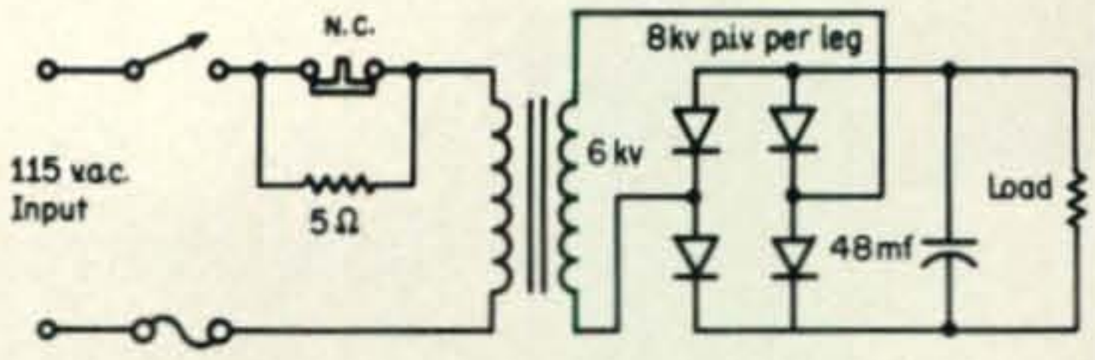


Fig. 5—The addition of a small series resistor to the primary circuit shorted by a normally closed push button switch will allow some degree of transient protection to a power supply by limiting surge current. A full wave bridge rectifier, as shown, is frequently preferred over the full-wave center-tapped circuit of fig. 4.

A transformer like any r.f. inductor has a high *Q* when unloaded. This value depends upon the design, core, KVA rating, and voltage rating. Loads applied to the primary winding reduce the *Q* to unity, when rated dissipation of the transformer has been applied to the secondary winding in the form of a resistive load.

Our first tests to stabilize the potential was done with a resistor or light bulb in parallel with the primary winding. (See fig. 2) As the resistance was decreased in value, the pulse voltage decreased. For a 1 KVA transformer, a 200 watt bulb or 70 ohm resistance connected to the primary winding produced an excellent suppression of pulses, but there was the problem of dissipating the heat, and the increased power costs. Secondary resistors are not advised because the available output power is reduced by the value of the swamping resistor. Jennings Industries developed a network which would suppress transients when connected to the primary, but would not use power from the line except during the period of the pulse in milli-seconds of conduction. Two models are made, one for 120 v.a.c. (J1-TS120) and the other for 240 v.a.c. (J1-TS240). Figure 3 shows how effective the suppression is accomplished as shown on the oscilloscope. Power handling capacity is up to 10 kw at 240 volts—single phase—or 30 kw—3 phase: 1/2 that value for 120 v.a.c. Control of pulses is not limited to power transformers, but may be used on any inductive loads such as motors, solenoides, etc.

Let us examine a conventional high voltage power supply using two 24 kv p.i.v. diode stacks per leg for 3000 volts d.c. output. A full wave center tap transformer is rectified and filtered by a swinging and smoothing choke See fig. 4. Chokes are used to isolate pulses, and average them out. For this reason, the choke may create transients when the d.c. field is rapidly collapsed, as it does not suppress the transients from that source, which can wipe out a solid state rectifier. What is the solution to the problem? The simplest way is to get rid of all components that do not suppress transients.

Figure 5 shows a power supply which maintains a stable voltage and suppresses pulses. This supply is simple, having a normally closed push-button switch to depress

[*Continued on page 99*]

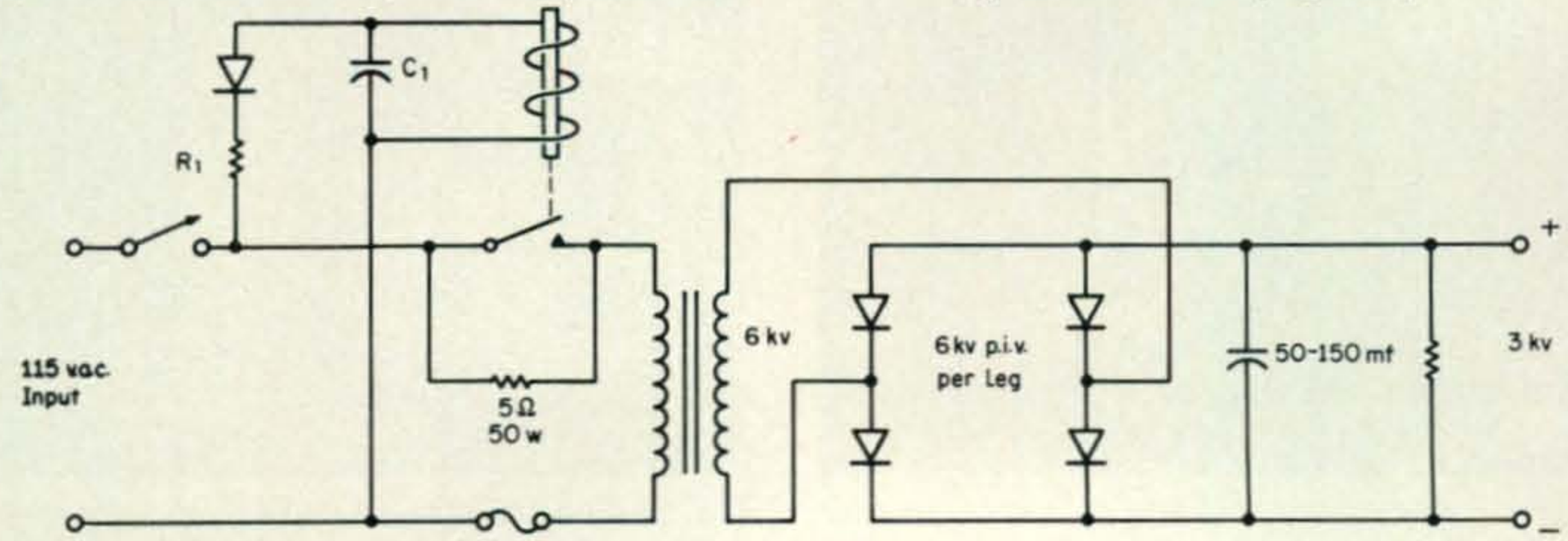


Fig. 6—To provide more convenient transient protection, the series resistor of fig. 5 may be automatically switched out of the primary circuit by a time delay relay circuit. The length of the delay is determined by the values of R_1 (500 to 1500 ohms), and C_1 (1000 to 3000 mf).

Dayton Hamfidential

THIS is for forty-nine out of fifty hams out there, those of you who broke those New Year's resolutions and still haven't made it out to amateur radio's answer to Woodstock, the Dayton Hamvention. Or maybe there was too much conflict of interests, with Dayton having to share the April 24th spotlight this year with a small promenade through Washington. For those of you who did opt for Washington, too bad, all of the better exhibits were in Dayton.

Don Miller, W9NTP, of slow scan TV fame was the man in demand throughout the afternoon. His corner boasted a half dozen slow scan television demonstrations going on almost at once. Slow scan TV got a lot of attention at the Robot Research booth across the hall too, of course, but for some reason most of the heads sooner or later turned toward Dr. Miller. It may have been because of the versatility of his equipment, but methinks the Hot Pants-ed redheaded circulation femme from that Midwest f.m. magazine, *RPT*, two tables over had something to do with it.

The flea market was nothing if not gigantic. (See this month's cover.) Traders braved early morning frost and tortuous winds in setting up their wares, some starting at daybreak. When the main floor opened at eight, hot coffee, like the cavalry, arrived just in time. Despite early morning chills, the day turned warm and lovely with all of the traditional deceitful style one comes to expect from Dayton weather.

Dayton has always been one of the biggest events on the amateur calendar. This year's attendance topped 4700, representing 2% of American Hamdom, and making the Hamvention the biggest convention in the city of Dayton. Strangely, less than 300 wives showed up, leading to evening news reports that when it comes to conventions, nine out of ten hams don't bring their wives.

—Weinstein

We're not sure whose liberation front sponsored this one, but they wouldn't let her join.

To balance our coverage, here's one example of a ham who did bring his wife, our own Hal, WA2OBR, who would rather not talk about it.

These fellows appear to be haggling flea market prices in fine ham tradition.

THE BA* IDENTIFIER
A Junkbox Repeater I.D.'er

BY CRAIG V. BLEDSOE,† K4TXK/6

WHEN the average ham thinks of a repeater system, he most likely is contemplating a sophisticated device liberally financed by a multitude of dues-paying members. This indeed may be the stereotype, but the converse is also certainly true. The Bass Ackwards Relay, in which this I.D.'er is installed, provides 52.76 mc to 52.525 mc repeater coverage for the Sacramento Valley and San Francisco Bay Area with 330 watts output. It was built solely with spare parts and pieces contributed by local area hams; so when the I.D.'er was constructed, the operating budget was zero and the value of the parts on hand not much higher.

*After the name of the repeater, "The Bass Ackwards Relay."

†Rt. 1, Box 456, Shingle Springs, Ca. 95682

The infernal device is completely mechanical in operation. The advantages of this approach are reliable operation, simple troubleshooting, instant code changeability (with a different code wheel), and virtually no expense. This is your opportunity to clean out all that surplus and make it work.

There are a few items which deserve special attention. The SC-682 is the Mallory Sonalert audible warning device available from Allied Radio and many other distributors. The Sonalert is the basic audio component used in many burgular alarms and unsafe condition (smoke, fumes, etc.) detectors. If you can find a defunct example of one of these alarms, your Sonalert won't cost a penny. There are a lot of good reasons for using a Sonalert rather than homebrewing a

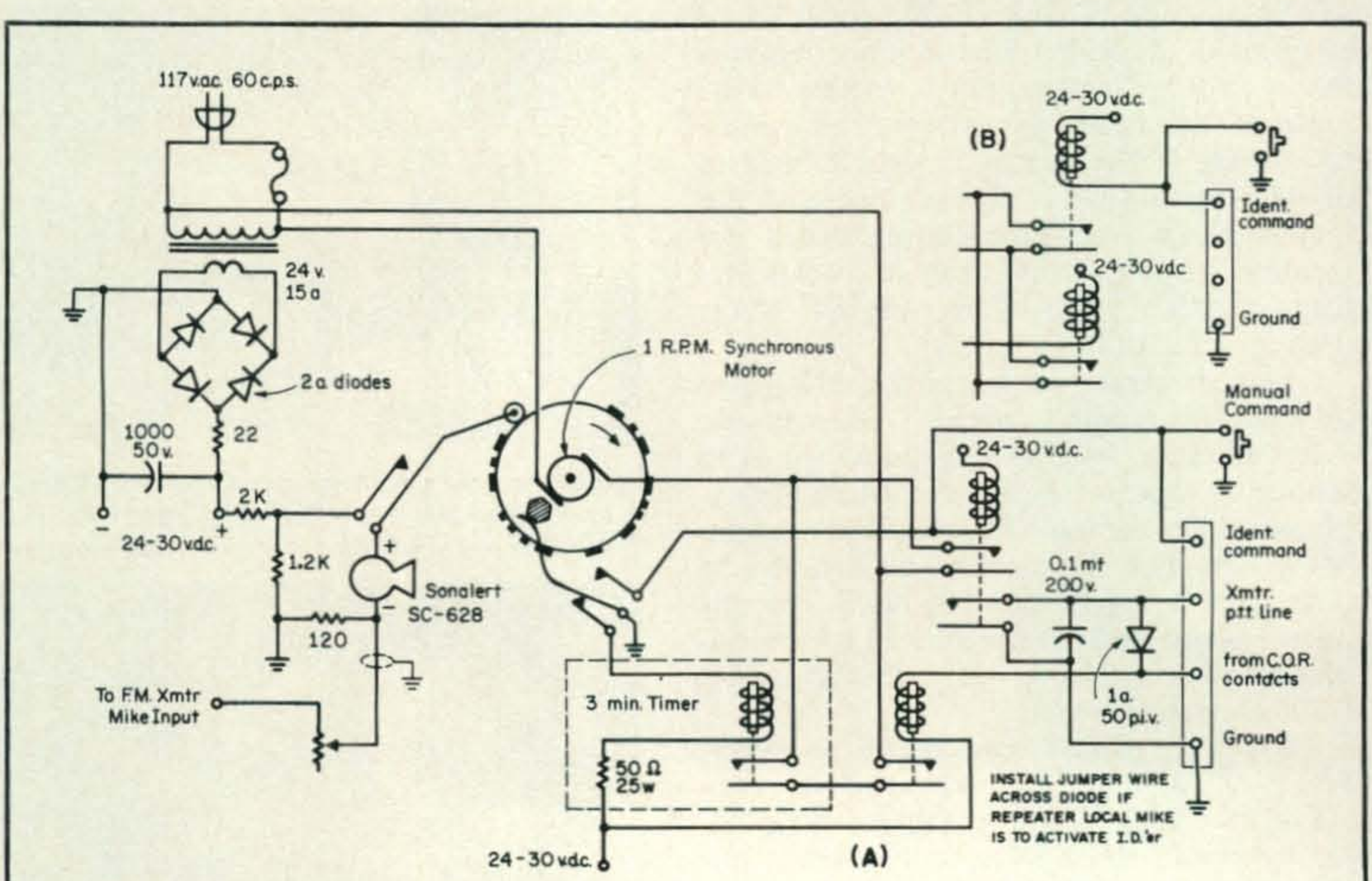
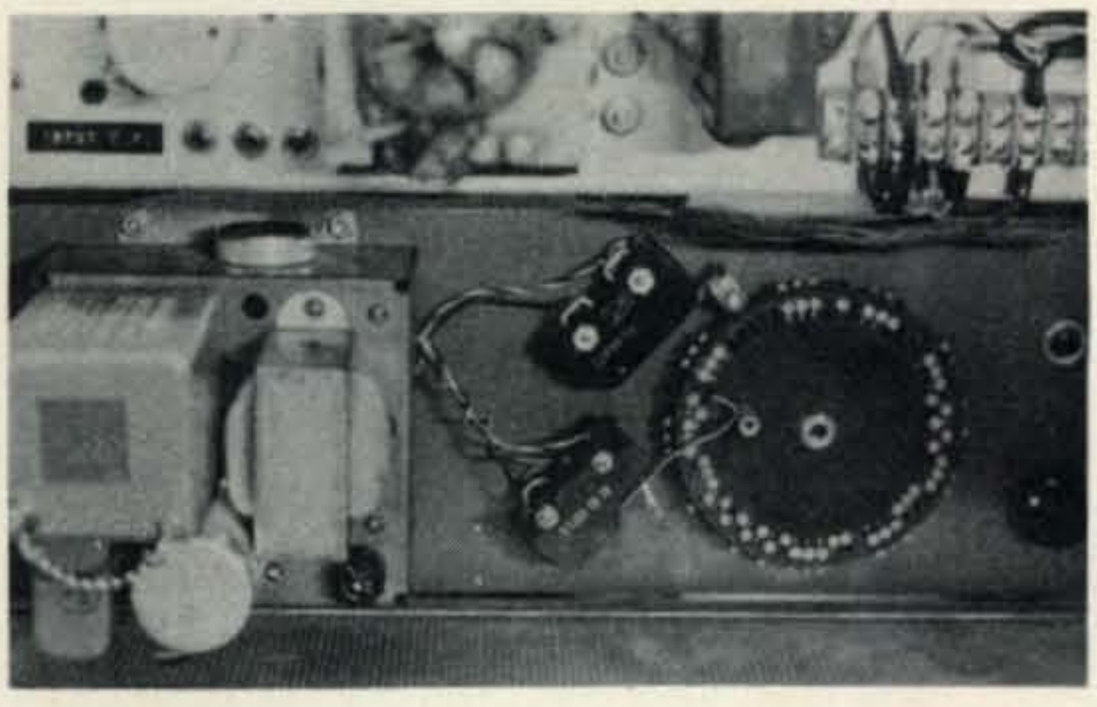


Fig. 1—(A) Circuit of the Bass Ackwards Identifier. The 115 volt synchronous motor may be whatever speed is available in the neighborhood of 1 r.p.m. (B) Addition of another relay to the circuit at (A) will eliminate any possibility of false triggering of Secode or other digital command systems.

transistorized oscillator. The frequency and level of the tone is virtually independent of voltage and temperature excursions. This eliminates any nostagically chirpy and clicky sounds that far too many repeaters exhibit, in spite of whatever "not-so-red-hot" power supply you brewed up to supply the d.c. The temperature variations can cause those super I.C. identifiers to make some awfully weird noises from unheated mountaintop vaults, while the Bass Ackwards I.D.'er keeps banging away.

Another hidden advantage is that the SC-628's frequency is 2805 c.p.s., which is the most common Secode dialing frequency for repeater control. This is a great boon to anyone on the system who is trying to set his dialer on frequency. All he needs to do is bring up the I.D.'er and compare the frequencies. Setting up his scope for a 1:1 Lissajous pattern will of course get him down to the last cycle. Finally, for local monitoring of the keying function, the Sonalert is its own sidetone oscillator—and an unmistakable one at that.

In fig. 1, inside the dotted lines is the three minute timer circuit. The contacts close at the end of three minutes and remain closed until the power is broken resetting them



The Bass Ackwards Identifier showing the two microswitches, one turning off the drive motor at the end of the i.d. sequence; the other tracking the code character pegs to generate the necessary c.w. information. The power supply shown differs from that shown in fig. 1.

open. The device I used is exactly that: a time delay relay (Wheaton Engineering Corporation Model E 361 E, a common surplus store item). It doesn't have to be anything like mine as long as it does the job. Another simple surplus device is the thermally actuated delay tube—a mainstay in those big amplifiers to keep the h.v. off until the filaments warm up. Even a one transistor VOX delay circuit modified for three minute hold-in will work

[*Continued on page 99*]

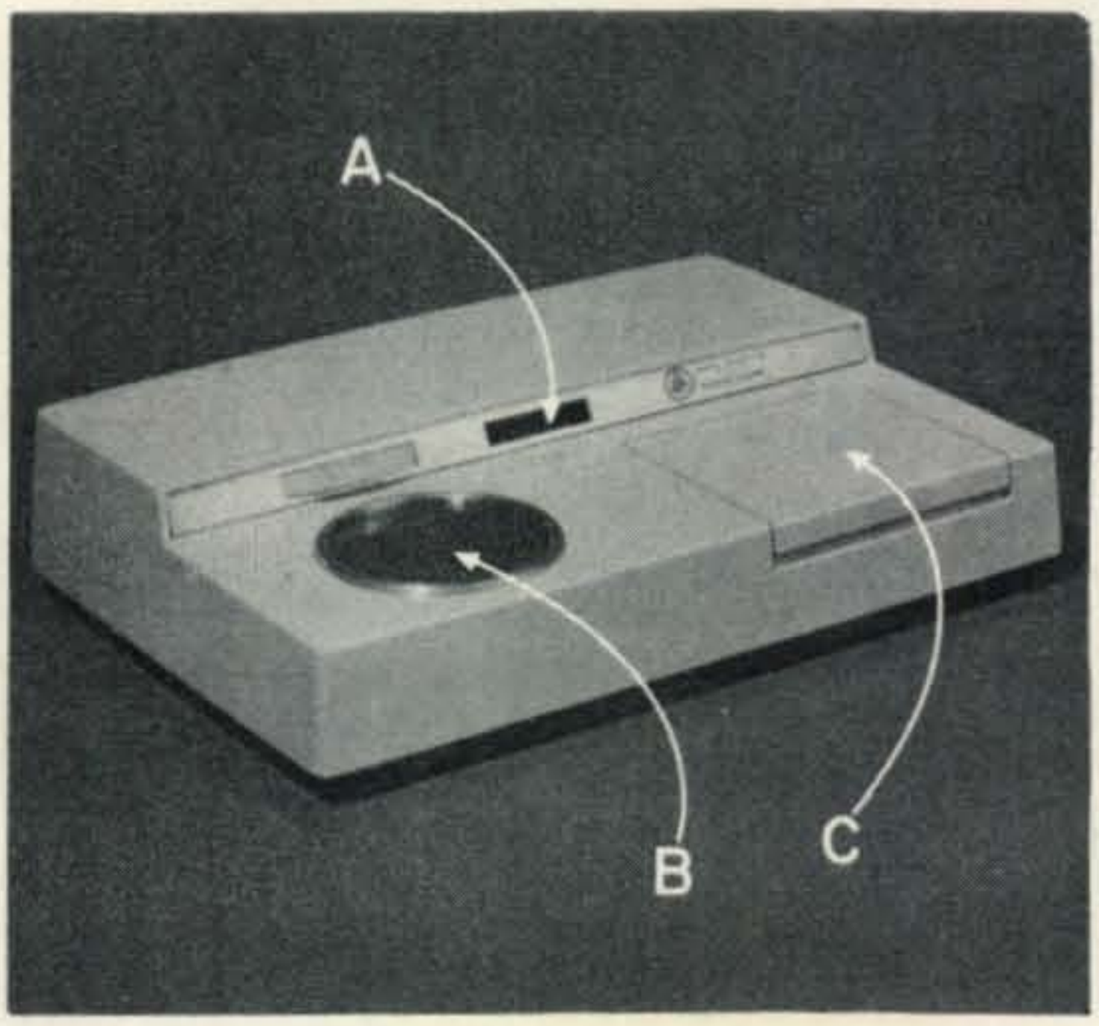
Amateurs Train Handicapped Persons To Use Bell Telephone "Code-Com"

BY JOAN WEILBACHER*

STILL another in the long list of amateur radio's service to the public was recently brought to our attention by George Wachter, WA4JSM, of Huntsville Alabama. Some members of the local radio club, in conjunction with the Alabama State Rehabilitation Center, have initiated a Morse Code training program to help handicapped persons learn the proper use of "Code-Com."

Developed by Bell Telephone Laboratories, the new Code-Com enables a deaf or a deaf/blind person to *receive* information over an ordinary telephone. A person without speech can also use the Code-Com to *send* information.

For a deaf person, the set converts sound signals into flashes of light (A in the photo).



The Bell Telephone "Code-Com."

*Editorial Assistant, *CQ*.

For a deaf/blind person, the Code-Com converts sound signals into vibrations of the disk or sensor pad (B).

For a person without speech there is a key (C) which allows signals to be transmitted.

Although simple codes can be worked out between the handicapped user and his friends and acquaintances, learning the Morse and Phillips codes would, of course, enable him to carry on a much quicker and more satisfying "conversation." If the caller doesn't have a Code-Com set, he just says "dit" for each dot in the code and "dah" for each dash. Field trials held in Indianapolis, New York and Columbus, with the assistance of handicapped persons and local Bell telephone companies, showed that after some practice with Morse code, users were able to attain sending and receiving speeds of about ten words a minute. During the trials, handicapped persons sometimes were able to identify a caller's voice by the patterns of light flashes or disk vibrations.

The unit, manufactured by Western Electric, has been available for public use since January of this year and is already in practical use in the Illinois and Washington, DC areas. Your local phone company, however, has to "petition for tariff" to the PSC for use in each individual area which, we're told, takes about three weeks. Delivery is expected to be "off the shelf."

A few words of caution must be injected at this point. If you are at all interested in this new device, either for your personal use or to help in teaching code, don't just pick up the phone and expect your local operator, business office representative, PR office or Telephone Pioneers to know what you're talking about; they didn't in our area, nor in the main offices in New York City. Our local rep eventually put us in touch with a very pleasant gentleman in the Marketing Department (an ex-ham, by the way) who knew *of* the Code-Com set. He, in turn, had an equally nice gentleman from AT&T contact me, and *he* sent me all sorts of press releases, photos and an instruction booklet.

However, when I began to assemble the various bits and pieces, I realized I had a number of questions that the releases, *et al,* didn't cover. Just by coincidence, both of the gentlemen mentioned above were out of town at the same time and *no one* else could give me any information. (At one point I was given the number of the main switchboard of the New York Telephone Company in New York City. Would you believe a recording told me it was not a working number!) At the mention of Code-Com a deathly silence prevailed over all. Did it really exist?

What if I were deaf, or dumb, or blind? Would there possibly be someone, somewhere, who would even know that this extremely beneficial device existed? Could they put me in touch with anyone who could install it? Could it even be used in my area? That's the answer, I thought. I'll work it from the other way 'round. After all, if I were a handicapped person, it would be my hospital or rehabilitation center that would tell me about a great thing being made available for my use. Bell Labs wouldn't send *me* a press release. So . . . I called The Lighthouse, the institute for the blind in New York City. They were very glad I had called, because the set was news (albeit good) to them. The same conversation was repeated with the Deafness Research Foundation, the Industrial Home for the Blind and the local VA hospital. I actually felt I was doing a service to the community when, after I had explained Code-Com and its availability to the Nassau County Speech and Hearing Center, they expressed a desire to initiate a training program for its use. (They, at least, had heard that some such device "was being worked on at Bell.")

At this point I decided to wait for someone to return from out-of-town to answer my questions, which were multiplying all the time. And, ironically, when you remember with whom I've been dealing, it seems the problem all along has been a lack of communication. It seems that business reps in all areas are supposed to know about a department for the handicapped—they don't. They were supposed to have received a release specifically about Code-Com—??? Information pieces on special devices are inserted with our bills—does the bookkeeper tell the rehabilitation staff everything? *Someone* at the Institute for the Blind was shown a demonstration of Code-Com and *someone* ordered a large number of sets, but *no one* thought to tell their information center. I think the Army had a name for this type of thing . . .

Now then, it does seem that there is truly a device called Code-Com and it seems to be really long overdue breakthrough. Perhaps because many of you will read about it here, it will find widespread use by our handicapped friends in the near future. ■

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CQ Reviews: Simpson Model A 2 Meter FM Transceiver

BY GLEN E. ZOOK, *K9STH / 5

A NUMBER of United States Manufacturers formerly specializing in commercial or marine f.m. communications equipment are broadening their line to include amateur f.m. equipment. One of these manufacturers is Simpson Electronics, Inc. of Miami, Florida. Simpson has adapted their marine v.h.f.-f.m. radio-telephone for use in the two meter amateur band. Basically the unit is a solid-state 4 × 4 channel (four receive and four transmit independently selected) f.m. transceiver. Rated transmitter output is 6 watts and receiver sensitivity is 0.6 microvolts for 20 db quieting. Construction is on G-10 epoxy boards, with an aluminum case. The Model A will operate from a 12 volt negative ground source.

Technical Details

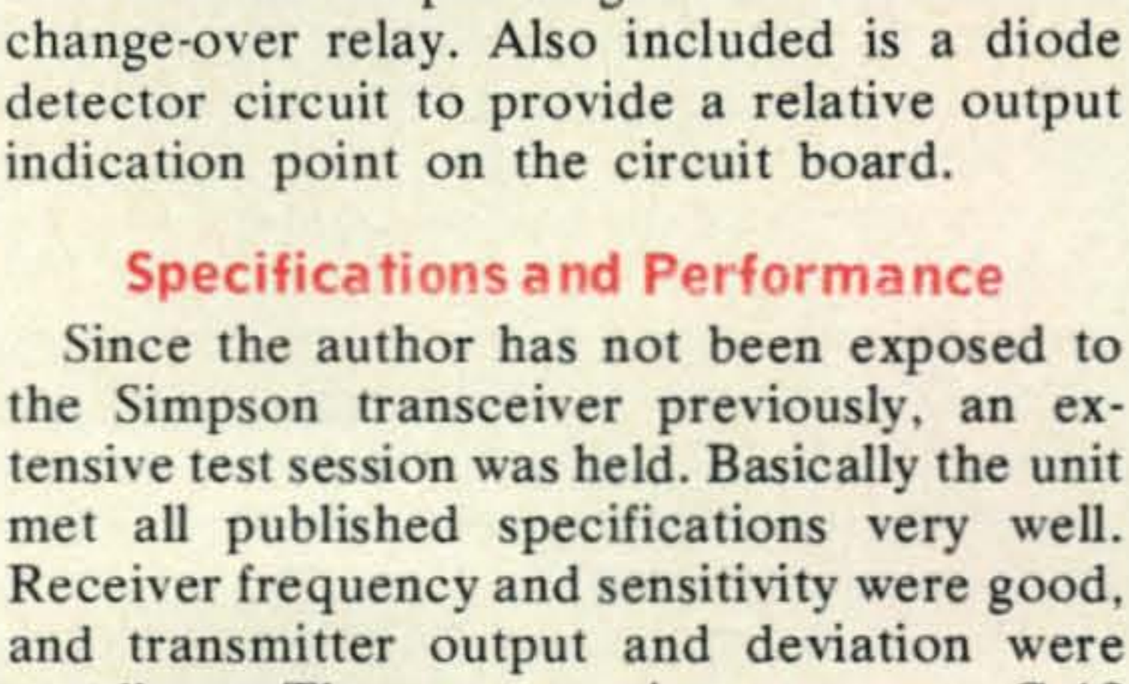
As stated before the unit is entirely solid-state. Rated frequency tolerances for both transmit and receive are 0.001%.

Receiver: The receiver of the Simpson Model A is a dual conversion, four channel superheterodyne. The high i.f. is the usual 10.7 mc and the low i.f. 455 kc. A MOSFET is used as the first mixer after a common emitter r.f. amplifier. The first oscillator uses third overtone crystals in the 45 mc range. Provision is made to vary (warp) the frequency of these crystals to ensure on-frequency operation. Discrete components are used in the 10.7 mc high i.f. stages. A 10.245 mc crystal oscillator supplies the conversion signal for producing a 455 kc low i.f. signal. The second mixer is a bi-polar transistor. All further stages of r.f. and a.f. amplification except the audio output are included in two integrated circuits. A series pair transistor circuit is used for the audio output amplifier. The squelch is noise derived and uses a total of three transistors and two diodes.

Transmitter: The transmitting section of the Simpson Model A is completely solid-state using phase modulation. Frequency multiplication is 24 times (2 × 3 × 2 × 2). A total of four transmit crystals can be selected, with warp provision to ensure on-frequency operation. The oscillator is followed by an emitter follower into the varicap reactance modulator. The microphone audio is amplified and limited before application to the deviation control. The deviation control is set for the desired frequency deviation and applied to the varicap modulator. Four stages of frequency multiplication follow the modulator. The driver and final operate straight-through producing a minimum 6 watts output. A low-pass harmonic filter is inserted between the output stages and the antenna change-over relay. Also included is a diode detector circuit to provide a relative output indication point on the circuit board.

Specifications and Performance

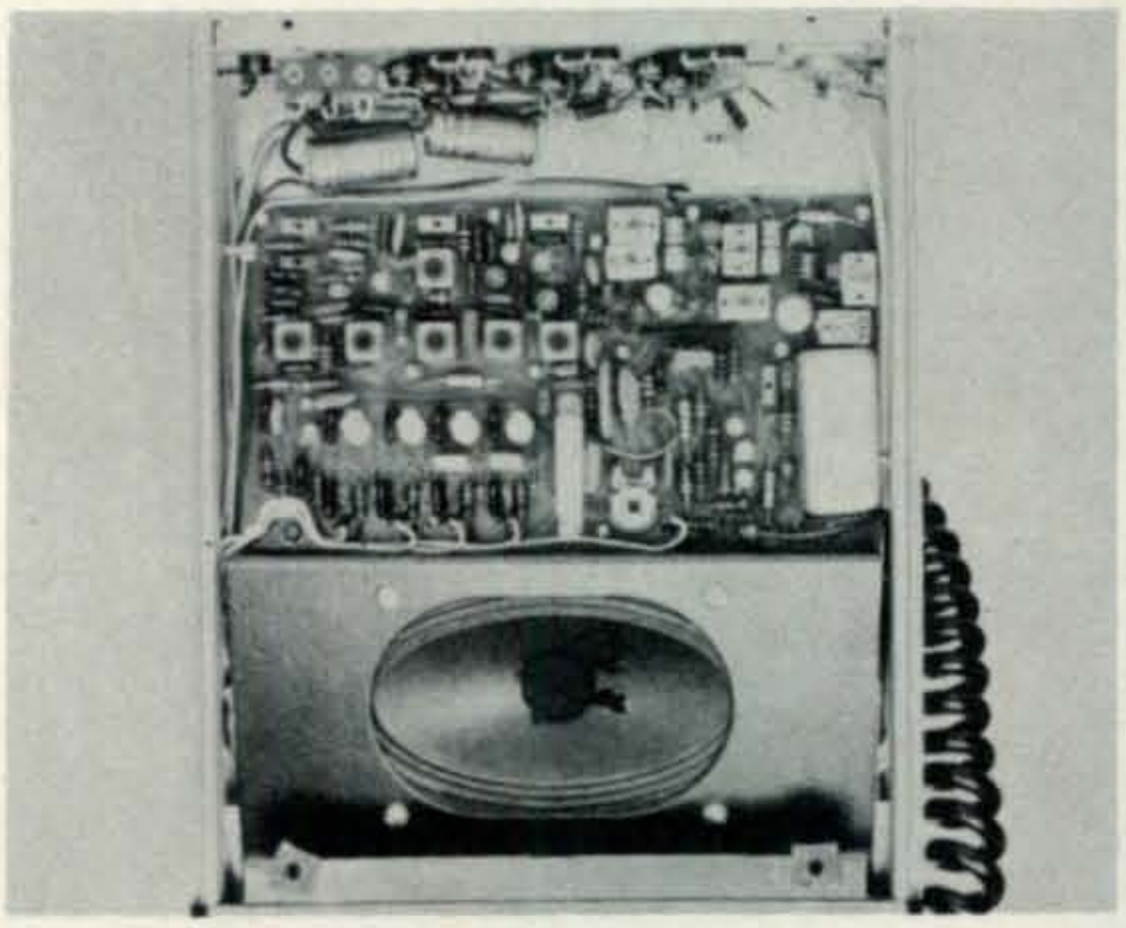
Since the author has not been exposed to the Simpson transceiver previously, an extensive test session was held. Basically the unit met all published specifications very well. Receiver frequency and sensitivity were good, and transmitter output and deviation were excellent. The construction was on G-10 epoxy boards and workmanship was good. Audio quality on both transmit and receive



The Simpson Model A is a four channel 6 watt solid state 2-meter f.m. transceiver.

*FM Editor, *CQ*.

was excellent. The receiver audio quality is due in no small part to a larger-than-usual built-in speaker. The microphone is carbon, but produced a better-than-average sounding signal. This is unusual for a carbon microphone. The selectivity specifications used by Simpson for the Model A are somewhat unusual. Simpson uses 13 kc and 36 kc points for selectivity points. A more useful point is 30 kc (for narrowband) which is the next channel (or 60 kc for wideband). These are the points at which the test unit was checked. The manner in which the Simpson Model A met specifications is in the "box score ", at the end of this review.



The Simpson's circuit boards are of high quality G-10 epoxy material. Note the size of the speaker in relation to the circuit board.

Construction

It has been pointed out previously that the unit is constructed on G-10 epoxy material. The layout is simple and easy to service. All components including the deviation adjust potentiometer are of good quality. Most semiconductor devices appear to be made by RCA and the markings on the i.f. and r.f. cans indicate Miller.

General Comments

As usual, one must take the bad along with the good. For the most part, the good outweighs the bad when looking at the Simpson Model A. It is up to the individual amateur to decide just what he wants.

The first problem one encounters with the Simpson Model A is when it is turned on. The squelch and volume controls are concentric. When one is turned, the other control also turns. This is due to the plastic knobs used on these controls. Replacement of these knobs with metal ones should relieve this situation.

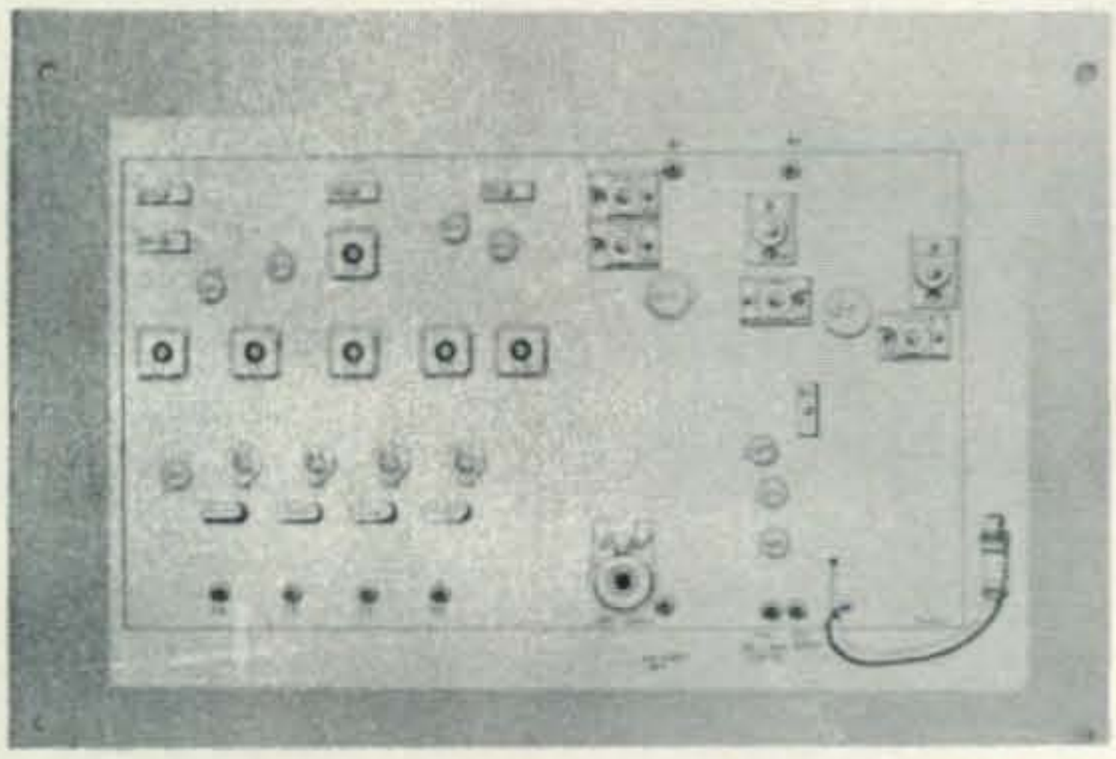
The second problem is the fact that no plug is provided in the d.c. input (12 v.d.c.) line for easy removal of the unit from the vehicle. The unit must be disconnected by removing the leads from the automobile's terminal strip in order to use it somewhere else.

The third problem is the fact that the microphone is permanently wired into the transmitter, making replacement difficult. Also, when carrying the unit the microphone is always dangling.

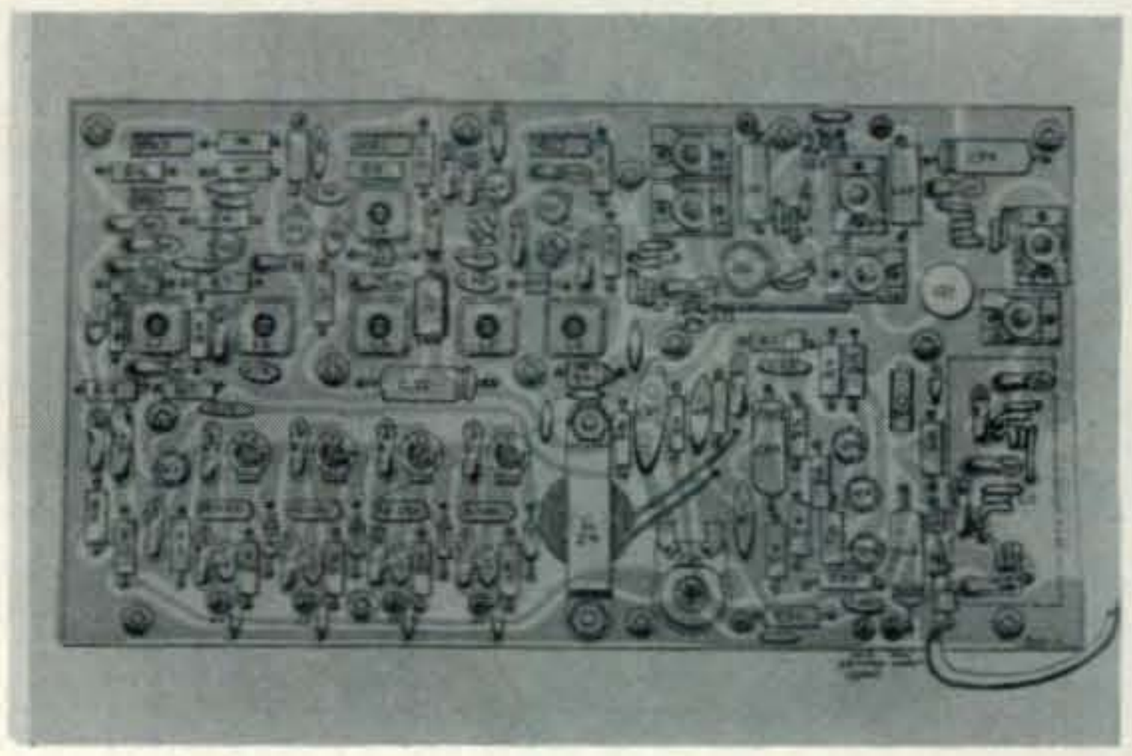
The final problems is given with mixed emotions. The physical size of the Simpson Model A is considerably larger than any of the other amateur-only f.m. units (even those running twice the power). This is due primarily to the much larger speaker inclosed inside the cabinet.

First, on the positive side, the instruction manual of the Simpson is the best manual this author has seen to date. Complete tune-up instructions, parts lists, and even circuit board layouts (in two colors!) are provided. Additional component placement is indicated on both case covers. Photographs of both the

(Continued on page 98)



Each cover of the Model A has a drawing showing the locations of major components and crystal "warp" capacitors.



Excellent pictorial drawings of the circuit boards are provided in the Simpson manual for ease of servicing.

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With nostalgic interest in the "thirties" and the "forties" in popular swing, growing number of hobbyists are recreating or restoring vintage automobiles, telephones, furniture and radios of that era. Auto buffs restore old Model A's and scour the junkyards for a good Dusenburg or Pierce-Arrow chassis to be rebuilt. More and more radio amateurs, entranced by the virtues, beauty and simplicity of the ham gear of that era, are rebuilding and restoring old-style receivers and are putting old-time amateur transmitters on the air.

..It is neither easy to find the old ham gear, nor is it always simple to trace the circuitry and get it working. The necessary detective work, however, is part of the fun. The enjoyment of fixing and using antique equipment seems to be a rapidly growing facet of our hobby. Faced with the wrap-around cabinet, solid state circuitry and the complexity of s.s.b. gear, many hams shy away from home construction. Old-time gear, with its basic circuitry, straightforward assembly and functional style is admirably suited for the amateur who wishes to combine his talents at equipment construction and restoration with the satisfaction of having a station different from the run-of-the-mill, transceiver and linear amplifier.

..With a series of articles to be presented at random, W6SAI introduces many of CQ's younger generation of readers to the "golden age" of amateur radio and to some of the marvelous radio equipment in use at that time. This article covers a pioneer receiver, and a later article will present an old-time c.w. transmitter that you can build yourself and put on the air.

BY WILLIAM I. ORR, W6SAI, 48 CAMPBELL LANE, MENLO PARK, CA #94025

The Year is 1931. National Radio introduces the SW-3 All-Wave Receiver.

Do you remember?

Perhaps you do.

Perhaps you were there.

Perhaps you were the young lad on that long-ago day on Cortlandt Street, gazing in awe at the dazzling display of radio equipment in the dusty windows of row upon row of radio stores . . . or maybe you were the old timer, scratching his head over the complexities of erecting the new fangled doublet antenna . . . or perhaps you were the avid DX'er, working J2GX on 14,399 kilocycles, with a trusty 210 and brand-new SW-3 bandspread receiver . . . If you were, you were fortunate enough to have lived in the "golden years" of amateur radio, when shortwave transmission and DX was as new as the sunrise . . . an art, not a science.

Today's radio amateur newcomer, with his transistorized s.s.b. exciter, solid state keyer, desk-top linear and tri-band beam atop a crank-up tower can never know the thrills and

glory of the golden years of shortwave radio. Each QSO was an event, and the enjoyment was doubled by the fact that most of the station equipment of the average amateur was home made . . . and worked!

An outstanding landmark of that bygone era was the famous National SW-3, one of the first shortwave receivers designed and manufactured exclusively for the radio amateur. Years ahead of its time, the SW-3 revolutionized receiver development and amateur radio. Here is the full story of this amazing set, many of which are still in use today . . . 40 years later!

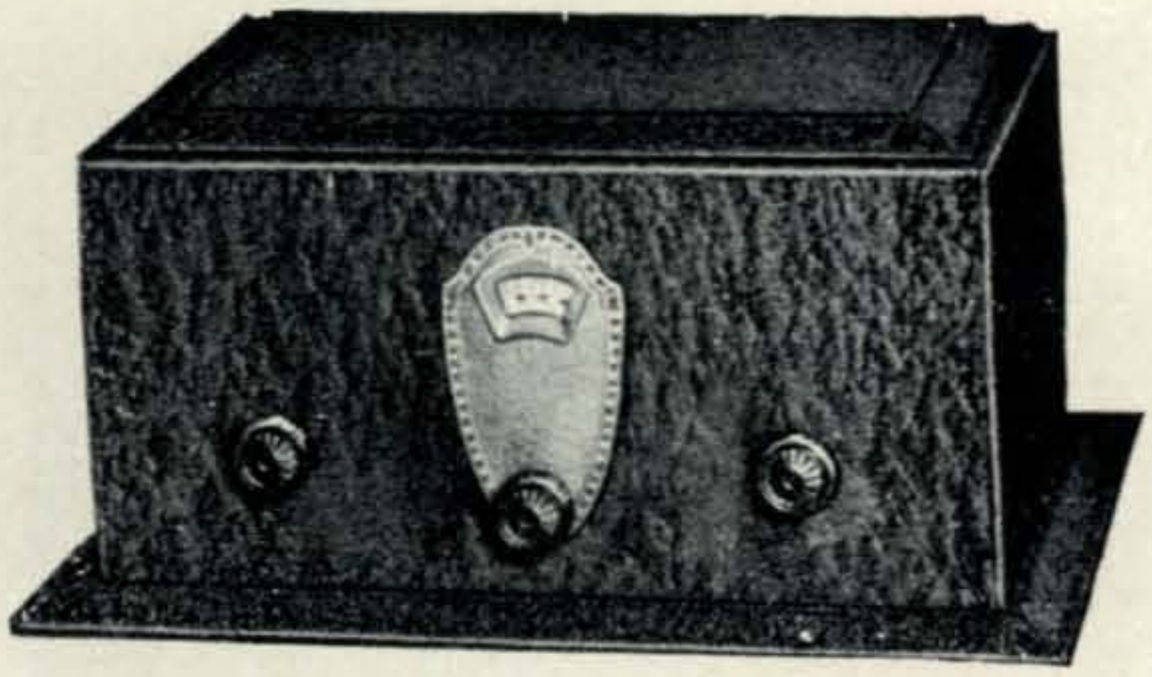


Fig. 1—The SW-4 Thrill Box, grandfather of the famous SW-3 receiver. The four tube SW-4 covered the range of 15 to 570 meters with 6 plug-in coils of doubtful Q. The receiver was built in a steel cabinet and had a UX-222 untuned r.f. stage, a 200A detector, a 240 first audio stage and a 171-A second audio stage. The receiver was either sold as a kit for about thirty dollars or completely wired for about thirty five dollars. Hydroscopic coil forms absorbed moisture from the air and receiver performance was erratic, especially in damp weather. Obsoleted in 1931 by the SW-3, the old SW-4 is a collector's dream today!

Development of the SW-3

The SW-3 was designed in the late twenties with the idea in mind of developing a product that would have appeal to the radio amateur as well as being adaptable for use by the airlines as a reliable, light-weight receiver for commercial aircraft. In particular, Pan American was looking for such a unit for their early flights to South America.

At that time, PAA's feeling was that a radio operator with good c.w. equipment would prove more reliable for long distance, over-water communication than the weighty, cumbersome telephone equipment operated by the pilot and used by other airlines at that time.

The only available receiver that might do the job was the obscure SW-4, a rather cumbersome set designed after a prototype receiver developed in the RCA Van Cortlandt Park Laboratory and manufactured in small quantities by National and Westinghouse. By its weight and size, and the fact that the plug-in coils proved to be ready absorbers of moisture, the SW-4 proved to be unsuited for the trans-oceanic work in the PAA planes.

Little was understood at that time as to why the performance of the SW-4 receivers, using such coils, varied so tremendously with the weather. However, about 1930, the old Boonton Rubber Company became one of the pioneer bakelite custom moulding companies. This company had close connections with the radio industry through a sister company, Boonton Radio Company. The bakelite moulding powder sold by the original Bakelite Corporation was based upon the use of wood flour filler which was extremely hydroscopic. Moulding, in those days, was done with steam, rather than electric heat and—as a consequence—moulding rooms were extremely humid. The coil forms moulded by this process varied tremendously in their Q and good and bad coils could be wound on forms that (to the eye) were exactly the same.

In an effort to solve this problem, the Boonton Rubber Co. switched from the old filler to a ground mica filler and changed over to electrically heated presses. The result was, for the first time, the availability of precision, high-Q moulded coil forms that permitted the manufacture of uniform inductors. The new material was used for coils for the SW-3 receiver, and National Co. registered the trade mark "R-39" for the forms. The first production run of coils and receivers was made during the summer of 1931.

During the long, useful life of the SW-3 receiver, over 10,000 units were built and the set was used by amateurs, commercial stations, airlines, ships and uncounted expeditions as a compact and wholly reliable receiver. Even today, the SW-3 is still in active service and doing a good job of coping with today's complex communication problems!

The SW-3 Design

The SW-3 receiver, manufactured by the National Company (then of Malden, Mass.) is a 3 tube set having an r.f. stage, regenerative detector and single audio amplifier. A feature of the receiver is the "single dial control," with r.f. and detector tuning ganged. The SW-3 uses plug-in coils, covering the radio spectrum from 9 to 2000 meters in 10 coil sets. In addition, extra coils provided bandspread for the

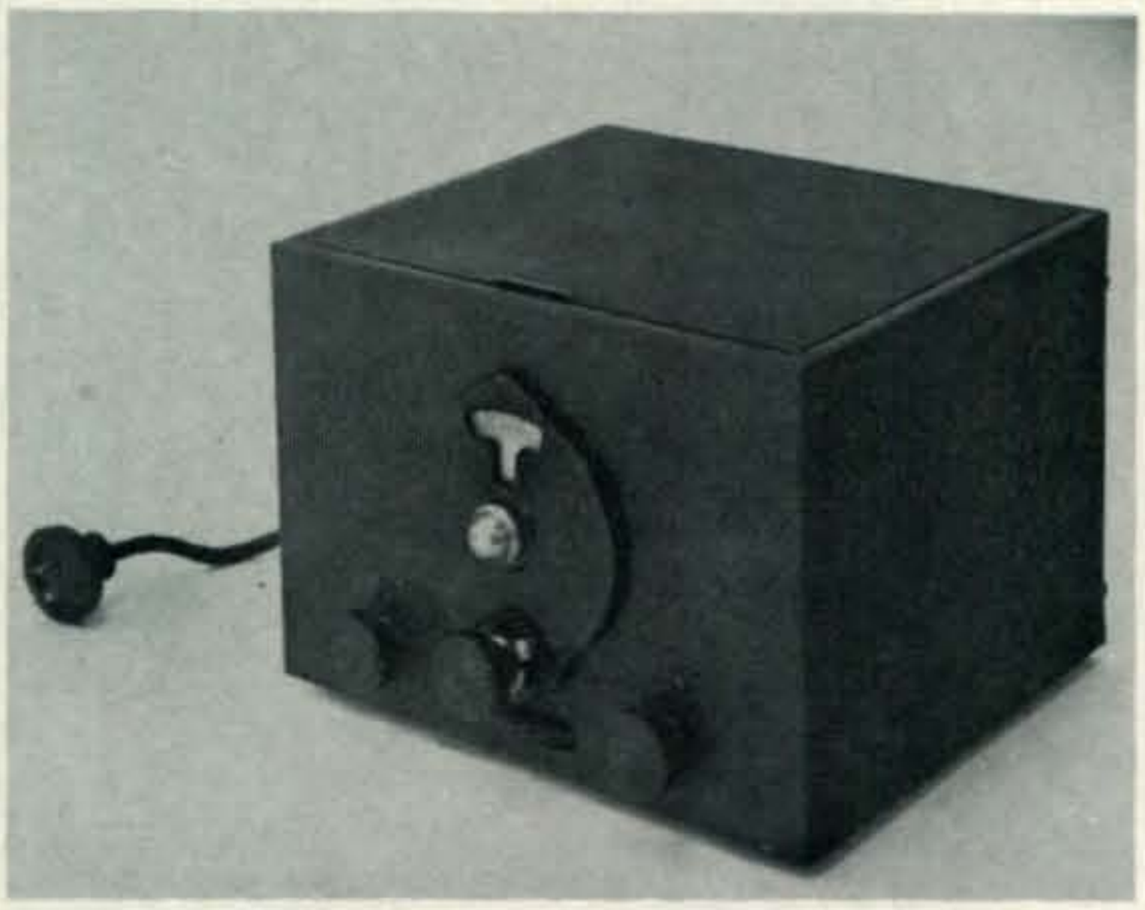


Fig. 2—National SW-3 receiver was ultimate set for DX'er in 1931. This 3-tube tuned r.f., regenerative detector receiver provided bandspread reception on 80, 40 and 20 meter bands with unique plug-in coils. Beneath center tuning dial is the horizontal adjustment for r.f. gain. At left is the r.f. turning control and at right is the regeneration control. A 4-prong plug on power cable provided operating voltages from external power supplies or dry batteries. SW-3 receiver still performs well on c.w. and s.s.b. today.

10, 20, 40, 80 and 160 meter bands. The receiver is contained within a steel, black crackle finished cabinet measuring about 9" on a side.

During the course of the 14 year production run, three basic receiver designs were used. The most popular version, and the one covered in this article, is the a.c. powered version using 2.5 volt glass tubes. A chart is included showing the main differences between the various versions of the receivers, and coil information for the entire SW-3 "family".

The circuit of the SW-3 receiver was developed by the engineers of National Company, with the assistance of David Grimes (ex-W2GKM), at that time the Director of the RCA License Laboratory. The first prototype models of the receiver were built in the home laboratory of James Millen, W1HRX (then W1AXL), in North Reading, Mass. The first production receivers were made during the summer of 1931 and the first advertisements for the new receiver appeared in the fall, 1931 issues of *QST* magazine.

The very first SW-3 receivers were apparently not made under an RCA license. To limit patent infringement liability, inasmuch as National did not hold an RCA license at that time, the receivers were sold as unwired, and (presumably) were wired by a so-called "Jackson Laboratories" before shipment. The Jackson Laboratories was a dummy company with no assets and was named after one of the streets on which the National Company was then located! (Early SW-3's having the Jackson Laboratories stamp on the shipping carton are a vintage collector's item).

The first version of the SW-3 (Model 1) used an r.f. stage with a type 35 variable-mu tetrode, a regenerative detector using a second 35 tube, and an impedance coupled audio amplifier with a type 27 triode. During the 14 year lifetime of the receiver, tube types and components were continually juggled about, but the basic circuitry and layout remained essentially the same.

Within a short time, two more versions of Model 1 receiver were produced. The first version was made for mobile use, employing 6-volt heater type 36 and 37 tubes in place of the 2.5 volt tubes. The second version employed the fragile, microphonic 1.4 volt d.c. tubes (30 and 32) for dry battery operation. Relatively few of these three early Model 1 receivers seem to exist today.

The Popular Model II Receiver

The Model II version of the SW-3 appeared about 1936 and employs the interchangeable 2.5 volt or 6.3 volt pentode tubes, and the circuit of this popular model is shown in the schematic. The r.f. stage uses either a 58 or 6D6 tube, with stage gain controlled by changing the cathode bias by means of the variable control, R_1. This potentiometer is mounted horizontally below the tuning dial and is controlled by a thumb dial, conveniently calibrated in signal strength units. An auxiliary tuned circuit (R.F. TUNE) permits the r.f. stage to be aligned to the particular antenna in use.

The detector uses a second 58 or 6D6 tube in a plate feedback circuit, with regeneration controlled by a screen voltage potentiometer, R_2. The detector is impedance coupled to a 27 or 76 triode audio amplifier which has high impedance magnetic earphones connected directly in series with the plate lead.

Many Model II receivers seem to have been manufactured during the period 1936-1940 and these are the models that turn up most often in today's want-ads.

The Model III Receiver

The final Model III version of the SW-3, called the "Universal" model appeared shortly before or after World War II. It uses metal tubes (6J7 and 6C5) and by means of a clever

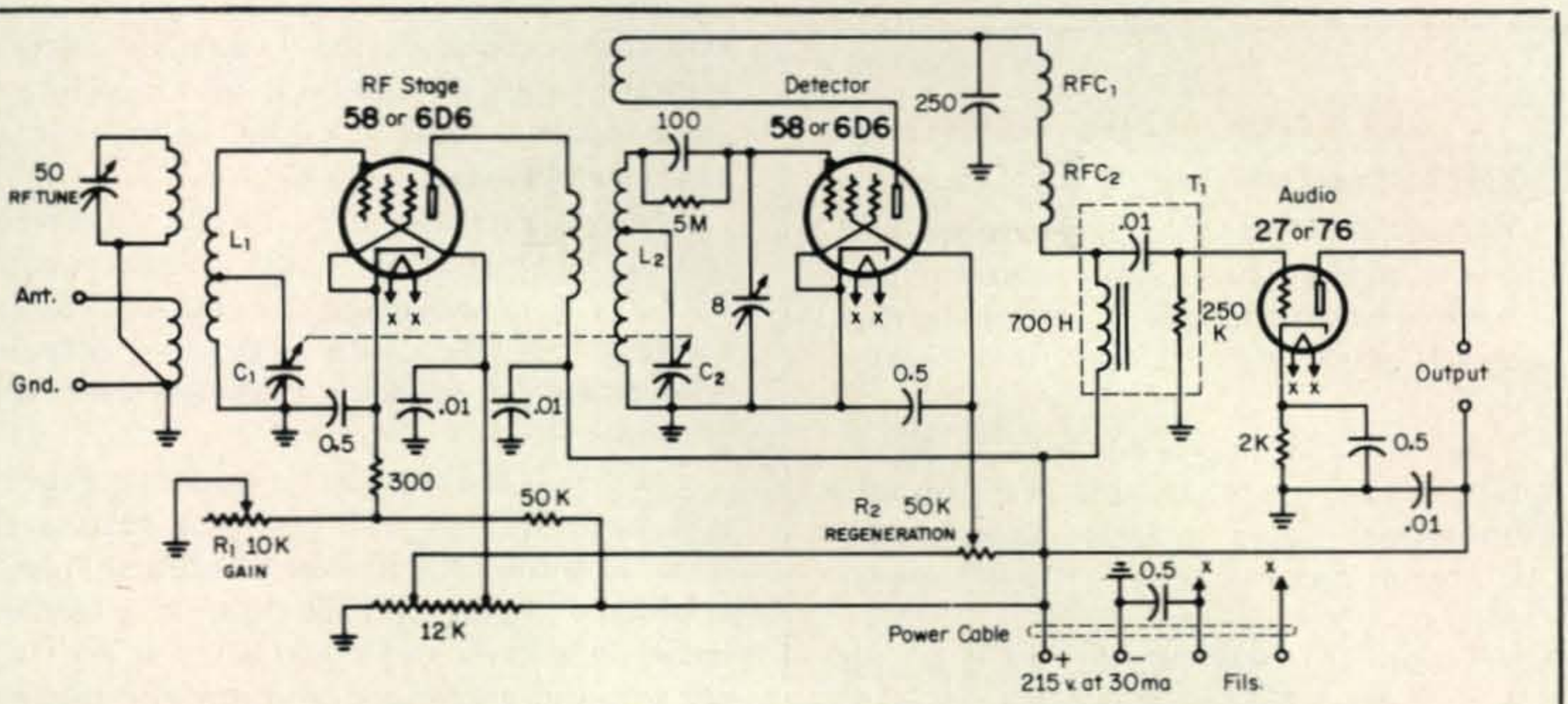


Fig. 4—Schematic of Model Two version of National SW-3 Receiver.

switching system, is convertible to battery operation with the substitution of 1.4 volt octal tubes (1N5 and 1A5). Few Model III receivers seem to exist today, and it is not known how many were made. It is surmised that production was slim, as the superheterodyne receiver was becoming increasingly popular at this time, and the regenerative receiver was entering into eclipse.

Table I summarizes the various versions of the SW-3, including the numerous coil sets.

The SW-3 Today

Any model of the SW-3 is a collector's item today and the lucky owner of one of these beautiful pioneer receivers will have a pleasant surprise coming to him when he gets it working properly. Considering that the SW-3 was designed before single sideband became a household word, it is amazing to discover how well the little receiver performs in this mode. While the SW-3 tends to be somewhat electrically and mechanically unstable on the highest ranges (10 meters, for example), stability on the lower bands (particularly 160, 80 and 40 meters) is compatible with today's operating demands. The regenerative detector is extremely sensitive and the SW-3 can "hear" as weak a signal as the most modern receiver. To one accustomed to today's multi-stage, multi-tube (transistor) receiver, the quiet background noise and the high earphone level developed by the three tube SW-3 is quite impressive.

The SW-3 requires a plate supply of about 125 to 200 volts at a total current drain of less than 20 milliamperes. National Velvet power supplies designed for the SW-3 are occasionally available and do the job, provided the old electrolytic capacitors are replaced with new ones. For more stable operation, however, a modern voltage regulated power supply is suggested.

Because the average signal level today is much higher than the level of 1931, the SW-3 exhibits a tendency to overload on strong, local signals, much in the manner of some of

Fig. 3—Simplicity of the SW-3 circuit is revealed when cabinet lid is lifted. At the left is the r.f. stage, with the plug-in coil between tube shield and cabinet. Two gang tuning capacitor is at center, with detector stage at the right. Detector coil had padding capacitor mounted in the top for calibration adjustment. At rear of SW-3 is audio coupling unit and audio output tube. Plug-in coils had their own grid leads, and grid leads usually used with non-bandspread coils may be seen clipped to holders mounted on inside edges of shield compartments.

Table I—
Variations In SW-3 Models

SW-3 Model One

Version I: Uses 35, 35, 27 tubes and color coded coils. An audio volume control potentiometer is used instead of an r.f. gain control. Uses "10-20" series coils.

Version II: As above, but with 36, 36, 37 tubes and B+ switch for mobile operation. Later models incorporated r.f. gain control. Uses "10-20" series coils.

Version III: Uses 30, 30, 32 (1.4 volt d.c.) tubes. Incorporates B+ switch. R.f. gain controlled by antenna coil potentiometer. D.c. bias supply required. Uses "10-20" series coils.

SW-3 Model Two

Uses 58, 58, 57 (2.5 volt) tubes or 6C6, 6C6, 76 (6.3 volt) tubes. Uses "60" series coils. The schematic of this popular receiver is shown in the illustration

SW-3 Model Three ("Universal")

Uses 6J7, 6J7, 6C5 (6.3 volt) tubes or 1N5, 1N5, 1A5 (1.4 volt) tubes. Incorporates a.c./d.c. filament switch standby switch, earphone jack (some models) and bias resistor in B-minus return. Uses "30-40" series coils.

NOTE: The only apparent difference in the various coil series is the number of turns in the feedback ("tickler") coil. Many coils are interchangeable between the different receivers. The tickler coil may be easily rewound, adding or subtracting one or two turns to make one style of coil work in a different receiver design. Tickler winding should permit regeneration to occur with control potentiometer set at about midpoint.

today's more expensive receivers. The simple solution to this problem is to insert a 50 mmf variable capacitor in series with the antenna lead at the set, adjusting the capacitance value on a strong signal to reduce the overload condition. Alternatively, the SW-3 will perform wonders on a 15 foot wire antenna with less chance of overload than when used with the customary station antenna.

Tuning the SW-3

How many of today's radio amateurs have used a regenerative receiver? (Old Timers can skip this section, as they know by heart the idiosyncracies of this type of set). Here are some tuning hints for the newcomer and super-het owner.

Today's amateur, used to the direct read-out in kilocycles on many deluxe receivers could be at a loss using the uncalibrated dial of the SW-3. One of the first tasks, therefore, is to make a calibration chart for each set of plug-in coils.

The SW-3 requires more operator expertise and know-how to achieve best results than does a modern receiver designed for the appliance operator. There's less circuitry between listener and signal, so to speak, in the old set, and an expert operator can make the SW-3 perform wonders, just as a cowboy can guide his lithe, wiry pinto pony into places where the driver of a luxury Cadillac dare not follow.

Let us begin. The SW-3's sensitivity level is set by the REGENERATION control, at the right of the panel. Advancing the control will cause the detector to go into regeneration, at which point a soft plop will be heard in the 'phones. The R.F. TUNE (left-hand) control is adjusted for maximum sensitivity also, which occurs at the point where regeneration commences with minimum detector screen voltage. Thus, the two controls are adjusted in step until regeneration occurs with r.f. tune control

(continued on page 94)

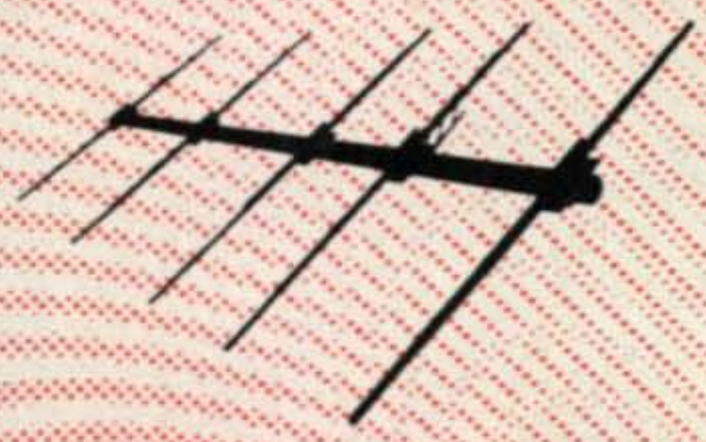
Table II—SW-3 Receiver Coil Data

Range (kc or mc)	*Coil Set Numbers* *Universal Model 3*	*Model 2*	*Model 1*
90-160 kc	42	72	22
150-220 kc	41	71	21
190-280 kc	40	70	20
250-390 kc	39	69	19
320-650 kc	38	68	18
500-900 kc	37	67	17
690-1500 kc	36	66	16
1500-2700 kc	35	65	15
2500-4500 kc	34	64	14
4200-8000 kc	33	63	13
7.0-12.0 mc	32	62	12
12.0-21.0 mc	31	61	11
19.0-35.0 mc	30	60	10

NOTE: Bandspread coils have suffix letter A. For example, the 80 meter bandspread coils are 34A, 64A or 14A. Early Model 1 coils are not numbered, but are color coded.

WILSON ELECTRONICS

W7GVA designed MONO BANDER BEAMS



QUALITY MONO BAND BEAMS AT LOW LOW PRICES

Nothing will beat a full size mono bander Beam for gain or directivy. Ask the ham who has 250 or 300 countries what type of ant. he uses.

Wilson Electronics offers a complete line of mono bander beams at below wholesale prices. By going direct to you, along with our purchasing power on large quantities of aluminum, and low overhead, we can give you a rugged heavy duty top quality mono bander beam for a much lower price than any other manufacturer.

MECHANICAL SPECIFICATIONS

All W7GVA mono bander beam elements are constructed of the finest aluminum available 6063T832 top quality alloy. All tubing is seamless extruded hardrawn.

All Wilson Electronics mono bander beams have a 3" OD boom made of top grade seamless aluminum 6063-T6 alloy.

A 20 meter element consists of a 12 ft. section of 1 1/8" OD .058 wall center section, two 6 ft. pieces of 1" OD .049 wall middle section, and two 6 ft. pieces of 7/8" OD .049 wall end sections. Reflectors have two additional 2 ft. end sections of ¾" OD .035 wall.

15 meter element are the same except for the 7/8" OD end sections.

All our mono bander beams have a boom to mast plate of ¼" thick aluminum secured to the boom and mast with full circle clamps. All booms 30 ft. or more use two sections of boom secured with a heavy wall boom coupler, the boom can be tilted on booms 30 ft. or longer.

Our element to boom clamps are constructed of thick wall aluminum angles. With our unique clamps there are no holes drilled in the element. All hardware is cadmium plated.

All our beams come complete with adjustable reactance tuned gamma match network which can handle 2,000 watts plus on CW and SSB. All our beam take a 1¾ to 2¼" OD mast and can be rotated with a ham M or roto brake rotator.

WIDE SPACED 20 & 15 METER MONO BANDERS

5 ELEMENT 20 METER BEAM
$139.95

GAIN	12DB
FRONT TO BACK RATIO	28DB
BOOM LENGTH	40 FT
MAX. ELE. LENGTH	36' 6" FT.
WIND SURFACE AREA	15.6 SQ. FT.
WIND LOAD (80MPH)	305 LBS.
WIND SURVIVAL	100 MPH
TURNING RADIUS	26.5 FT.
NET WEIGHT ASSEMBLED	85 LBS.

4 ELEMENT 20 METER BEAM
$119.95

GAIN	10DB
FRONT TO BACK RATIO	28DB
BOOM LENGTH	30 FT.
WIND SURFACE AREA	12.5 SQ. FT
WIND LOAD (80 MPH)	245 LBS.
WIND SURVIVAL	100 MPH
TURNING RADIUS	25 FT.
NET WEIGHT ASSEMBLED	62 LBS.

3 ELEMENT 20 METER BEAM
$69.95

GAIN	8.5DB
FRONT TO BACK RATIO	25DB
BOOM LENGTH	20 FT.
WIND SURFACE AREA	9.3 SQ. FT.
WIND SURVIVAL	100 MPH
TURNING RADIUS	21.5 FT.
NET WEIGHT ASSEMBLED	41 LBS.

6 ELEMENT 15 METER BEAM
$119.95

GAIN	13DB
FRONT TO BACK RATIO	28 DB
BOOM LENGTH	32 FT.

4 ELEMENT 15 METER BEAM
$69.95

GAIN	10DB
FRONT TO BACK RATIO	28DB
BOOM LENGTH	20 FT.

2 ELEMENT FULL SIZE 40 METER BEAM AVAILABLE SOON $139.95

Send a _____ ele_____meter beam

Enclose M. O. or check for_____

Shipping prepaid by Wilson Electronics.

Name_____

Address_____

City, State_____

WILSON ELECTRONICS

P.O. BOX 794, HENDERSON, NEVADA 89015 / (702) 737-3596

New FM for '71 Standard's SR-C826M

professional quality, solid state, two-way radio, designed and sold exclusively for amateur use in the United States and Canada.

Standard Communications Corp., the world's largest manufacturer of marine V.H.F. equipment, has just developed a new industrial quality, high performance 2-meter unit. This rugged, compact transceiver is available only in the U.S. and Canada thru an authorized Standard dealer. The "826" is so compact that it makes mobile installation practical in almost any vehicle or aircraft, it becomes fully portable with the addition of Standard's battery pack.

GENERAL

Freq. Range — 143 to 149 MHz, 2 MHz spread

Supply voltage — 11 to 16 VDC. Negative Ground 13.8VDC nominal

Current Consumption — .15 amp receive standby. 2.4 amp transmit

Number of channels — 12- Supplied with 4 channels

1) 146.94 Simplex
2) 146.34/94
3) 146.76 Simplex
4) 146.34/76

Microphone — Dynamic

Dimensions — 6⅞"w x 2½"h x 9⅞"d

Weight — 4½ lbs. max.

Frequency stability—.001% (—10 to +60°C)

TRANSMITTER

RF power output — .8 or 10 watts

Output impedance — 50 ohms nominal

Deviation — Internally adjustable to ±10 kHz min. factory set to ±7 kHz

Spurious and harmonic attenuation — 50dB below the carrier power level

Type of modulator — Phase

RECEIVER

Sensitivity — .4 or less microvolts for 20 dB quieting

Squelch sensitivity — Threshold — .2 microvolts or less

2 MOSFET RF Amplifiers
1 MOSFET Mixer

Deviation acceptance — Up to ±15 kHz deviation

Spurious and image attenuation — 65 dB below the desired signal threshold sensitivity

Adjacent channel selectivity (30 kHz channels) — 60 dB attenuation of adjacent channel

Type of receiver — Dual conversion superheterodyne

Audio output — 5 watts For external speaker

$339.95 (complete as shown with microphone, built-in speaker and external alternator whine filter.)

STANDARD COMMUNICATIONS CORP.

World's largest manufacturer of marine V.H.F. equipment

P.O. Box 325, Wilmington, Calif. 90744 (213) 775-6284

F.M.

BY GLEN E. ZOOK, *K9STH / 5

THE average f.m. repeater in the United States is rapidly expanding from the simple input/output machine to a complex communications system. Multiple receiving sites to eliminate holes are beginning to make the scene. Multiple input and output frequency combinations are possible in many repeaters. And, the auto-patch is becoming more and more evident. These auto-patches (which allow telephone calls to be made from the mobile) place a great responsibility on both the repeater owner/operator and the repeater user. An auto-patch gives a flexibility to the repeater which cannot be obtained by any other commonly avaiable method. The potential of the auto-patch in reporting automobile accidents is alone worth the efforts on installing the patch. Of course there are many other uses to the mobile f.m'er. Although the question of attaching the patch to the telephone lines was settled by the Carterfone case, there still remains a grey area in terms of FCC regulations. At present the trend seems to be to let the auto-patch operate as long as it is being used legally and intelligently. Unfortunately there are a few operators who use the auto-patch in lieu of purchase or renting of either mobile telephone (MTS or IMTS) or radio common carrier (RCC) equipment. These operators use the auto-patch for business calls and related business activities. This is not only a legal violation, but it is a violation of both the spirit and intent of amateur radio. It is up to the repeater owner-operator to see that this type of violation does not occur. If such practices continue, it is only a matter of time before everyone is hurt because of the actions of a few.

Mini-Review

The mini-review this month is the Cush-Craft AR 2 Ringo antenna. The Ringo is a half wave vertical polarized antenna which can be set for any frequency in the 135 to 180 mc range. The half-wave vertical is somewhat unusual in the fact that it can be operated efficiently without radials. This feature, along with a fairly low angle of radiation makes the half-wave antenna very useful, especially where space is at a premium (like on the top of tall buildings or towers). The major drawback to the half-wave vertical has been the problem of matching coax to the antenna. Cush-Craft has overcome this with the circular matching section at the base of the antenna. This matching section resembles a ring at the base, thus the name "Ringo". Such a matching section places the entire antenna at d.c. ground for minimum noise pickup and lightning protection.

The basic construction of the AR 2 Ringo is of high quality aluminum. The top section is adjustable for setting to the desired length, and the matching section is adjustable for optimum match to 50 ohm coaxial cable. An SO-239 u.h.f. female connector is provided at the base for easy connection of the feedline. The base itself is hollow for mounting on the top (not the side as usual) of a section of mast of up to 1¼"diameter (such as TV antenna mast). A set screw is provided for securing the antenna to the mast.

The antenna comes completely assembled. The only work involved is looking up the length of the antenna for the desired operating frequency, setting this length, mounting the antenna on the mast, and adjusting the matching section for minimum reflected power. This last step should be accomplished using either a quality v.h.f. s.w.r. bridge, or an in-line type of wattmeter such as the Bird "Thru-line". The common "Monimatch" type of s.w.r. bridge will give false readings at 146 mc unless special care has been taken to construct the meter for the v.h.f. range. S.w.r. bridges for use at 160 through 10 meters will usually give false readings because of the relatively long length of the pickup section when compared to a wavelength at v.h.f. By the way, you do have to connect the feedline.

As with any v.h.f. antenna good quality feedline should be used. RG58 / U is not a good line for two meters. RG58 / U is a minimum, and a lot of signal will be lost even in RG8 / U. Use foam coax if available, and never turn down an offer of heliax or similar high-grade feedline.

The test antenna worked very well. It compared favorably with 5 / 8 wavelength antennae normally used for close in work. Of course it does not compare with the multi-element rotatable collinear used for DX work, but that is why Cush-Craft builds the collinear also. The AR 2 Ringo is rated at 3.75 db gain over unipole and is avaiable for $12.50 at many local distributors. Information is available from Cush-Craft, 621 Hayward Street, Manchester, N.H. 03103.

Technical Talk

This technical talk dives further into the maze of setting up an f.m. test bench. Last month's column carried construction data on building a dummy-load and for building an a.c. power supply for 12 v.d.c. units. The construction project this month will be for building attenuator pads for insertion between the signal generator for isolation and matching. More on this later.

The main problem which presents itself to the f.m'er interested in acquiring test equipment is money. A good bench, if purchased from commercial sources runs over $3,000 and, if one is really serious, he can tie that much up in the frequency standard alone. Fortunately, test gear can be ob-

*818 Brentwood Lane, Richardson, Texas 75080.

A general bench layout. Note that the most-used items are at eye level. Equipment is relatively inexpensive but can handle most f.m. needs.

tained from the surplus market and built from readily available parts. Showing how to do this will be of prime importance while showing how to set up the test bench.

Setting up the bench can be accomplished over any period of time. Of course several individuals can pool equipment to make up a very complete bench with no very large cash outlays to any one person. This is a good project for clubs or repeater organizations. In any case a priority list for obtaining equipment should be set up. Of course, if a good piece of equipment becomes available at an attractive price it should be grabbed even if it is down the list a bit. The priority list which follows is based on my personal experience in both commercial and amateur f.m. It is by no means sacred. This is the order in which the particular item is needed in my experience.

1. v.o.m.
2. Dummy Load
3. Signal Generator
4. Test Set (if Motorola equipment serviced)
5. Frequency Standard
6. Oscilloscope
7. Audio Oscillator
8. Universal Control Head

The choice of a v.o.m. over a v.t.v.m. as the first item is based on the fact that most early f.m. work is usually done on mobile units. A v.o.m. is free of a.c. lines and thus has advantages over the v.t.v.m. Both the v.o.m. and v.t.v.m. can be used to align f.m. units. Several manufacturers provide test points and make test sets for their equipment, but a v.o.m. or v.t.v.m. on a low voltage d.c. scale will work satisfactorily.

The dummy load is a must. That is why one was described last month. A light bulb makes neither a good 50 ohm load nor a good non-radiating load. In fact, under certain circumstances a light bulb makes a good antenna.

The third piece of test equipment needed is a good signal generator. By a good signal generator I mean one with an accurately calibrated attenuator and good shielding. The inexpensive models made by Heath, Knight, Eico, and others are not completely satisfactory. These units are not adequately shielded, they do not have a calibrated attenuator, are usually fairly unstable at v.h.f.- and usually cover two meters and up only on harmonics. This type of signal generator is fine for low frequency alignment and general experimenting. No offense to any of the manufacturers, for I personally have equipment manufactured by all three which do an excellent job. Heath and Knight do have satisfactory signal generators, but they are at the top of the line and are much more expensive than the usual run-of-the-mill equipment. It is possible to align f.m. equipment with simple generators, but it is very difficult and the actual 20 db quieting point is unknown. When the basic sensitivity of the receiver approaches 3 to 5 microvolts the radiation from the generator with the output control turned all the way down is sufficient to saturate the limiters. At this point the generator must be physically carried away from the receiver. Each time the distance from the receiver must be doubled to reduce the signal strength by 6 db. A much better solution is to use a signal generator built for more precision service. The Hewlett-Packard 606 and 608 are fine instruments, but are outside the scope for the pocketbooks of most f.m'ers. The Measurements 80 and 80R are also excellent for the f.m. bench. Although the 80 and 80R are still fairly expensive, their surplus counterparts are becoming available at reasonable prices. The TS-497B and URM26 are two of the surplus versions of the 80. The URM26 is physically smaller than the TS479B but they both cover 2 to 400 mc on fundamentals. Don't worry if the signal generator says that it is for a.m. Using a modulated oscillator, these generators have more f.m. than a.m. at 50 mc and higher. For example, on my TS497B 10 % modulation on the meter is ±7.5 kc f.m. deviation at 147 mc! Of course there are many other signal generators which will do a fine job. These are just a few.

Motorola units have a central metering jack for use with a convient test set. By using only one cable and one adaptor cable (for Motrac, Motran, Business Dispatcher, and Mocom 70) all but the new "Micor" equipment can be aligned. There is a kit available for the "Micor",but very few hams are using these units anyway. A suitable test set appears in December 1968 *73* Magazine on pages 18 and 19. I wrote the article before becoming affiliated with *CQ*.

Next month's column will continue with the remainder of the equipment on the list. For now it is time to get to the construction project for the month. When using any signal generator it is necessary to match the output impedance of the signal generator (in practice rarely 50 ohms) to the desired 50 ohm input of the receiver. If this is not done, the receiver will usually be aligned to match some unknown impedance with a substantial loss in receiving sensitivity when attached to the 50 ohm coax from an antenna. The primary device used commercially is a 6 db matching pad. This pad matches the signal generator output to the 50 ohm

input of the receiver with a 6 db attenuation of the signal. The Measurements signal generators and the military equivalents have a mark on the variable attenuator to indicate when a pad is used. The result is a halving of the signal voltage. That is, if the primary mark on the calibrated attenuator reads 10 microvolts, the signal reaching the receiver is 5 microvolts. Another useful pad is one which attenuates and matches with a loss of 20 db. This effectively divides the calibrated attenuator reading by 10, and expands the scale greatly.

An attenuator / matching pad can be constructed using either a "T" or a "Pi" configuration. The Measurements pads use the "T" and the military pads use the "Pi" to achieve the same results. For home construction the "T" configuration is the simplest. A well shielded pad can be constructed with a small block of aluminum, a hand power drill, and a hacksaw. Of course a good home power workshop including a drill press would be a great help, but the pad can be constructed without these tools. A simpler method of constructing the pad would be to use a very small mini-box,but such a pad would be useful only up to 2 meters, and maybe not too accurate there.

The basic construction consists of obtaining a block of aluminum or brass about 1" thick and 2" square. Two ¼" diameter holes are drilled per the diagram. One hole goes completely through the block, while the other comes in from one side and joins with the first hole. One end of each hole is enlarged to 5 / 8" diameter to a depth of about ¼". This is to accomodate coaxial fittings. The block is then drilled with three holes to pass number 6 bolts. Holes for securing the coax connectors to the block are then drilled. If a tap is available, drill and tap for number 4 bolts to a depth of about ½". If no tap is available, drill and use number 6 sheet metal screws. The entire block is then split with a hacksaw (be careful to saw a straight line). The resistor network is them assembled as in the diagrams, and the block reassembled using the three holes drilled through the sides for bolts.

The better the resistors used, the more accurate the attenuator. Metal film resistors make the best type to use. However, ordinary 10 % carbon resistors will work, and 5 % are used in the military models. Values for both the 6 db and 20 db pads are given in the sketch. By the way, such a pad gives protection to your signal generator in case of keying the transmitter. If a transmitter is keyed into the pad, the resistors are destroyed, but the input to the signal generator is unharmed. Resistors are a lot cheaper than having a piston-type calibrator rebuilt and recalibrated.

Q&A

Q. What do you think of the (nationally known f.m. transceiver)?

A. Each piece of f.m. equipment being manufactured for amateur f.m. work will be reviewed in *CQ*. To date reviews on the Standard

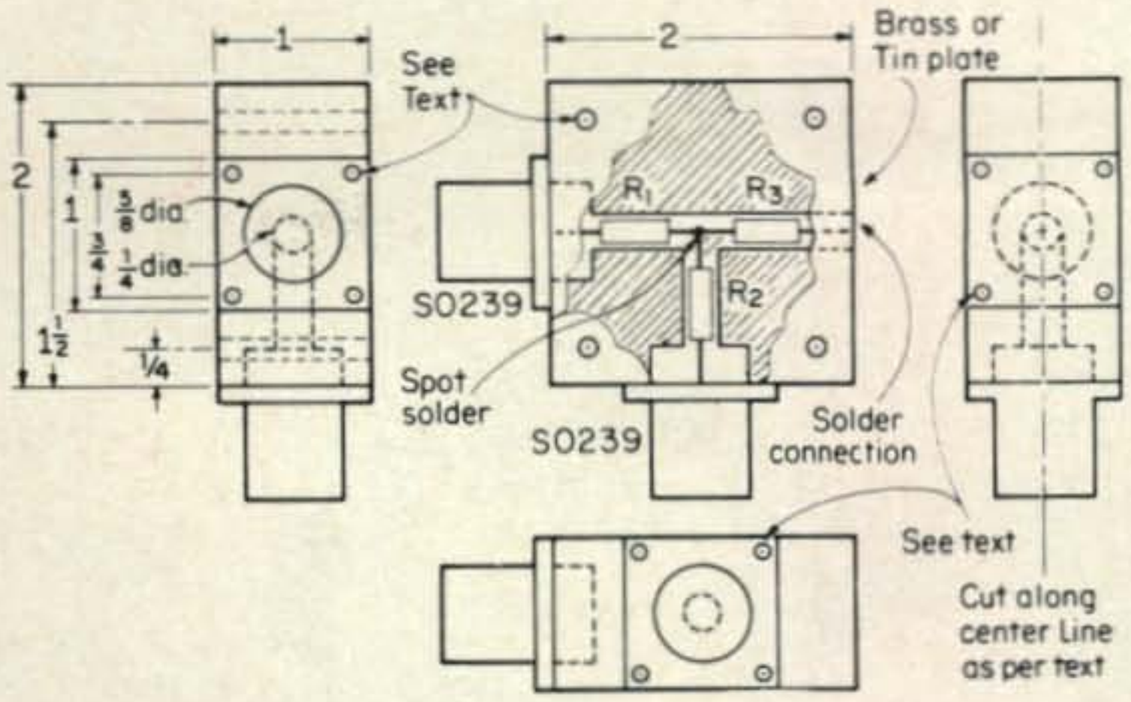


Fig. 1. Diagram for the construction of an attenuator pad. All dimensions are in inches.

SR-C806MA and SR-C826M, the Regency HR-2, the Varitronics-Inoue IC-2F, the Drake Marker Luxury, and the Simpson Model A have appeared during 1971. The pieces of equipment mentioned in the question have not yet been received for review. My opinion of the equipment reviewed is a matter of public record by means of the published review.

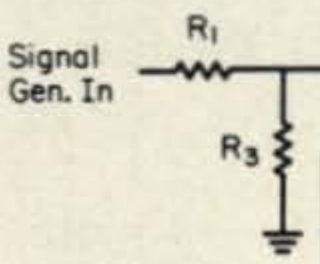
Q. On what basis do you make your reviews?

A. The reviews of f.m. and f.m. related equipment are made on the basis published specifications versus actually achieved performance. Items such as workmanship, extra features, furnished accessory items, and the like also enter into the review. The equipment is checked out using commercial f.m. test equipment. No punches are pulled, but also no attempt to discredit any manufacturer is made. To date all manufacturers have received any criticism favorably. Of course the best situation is for the manufacturer to use feedback from users and reviews to improve the product. I am happy to say that all manufacturers worked with are doing this very thing. Look for an article in *CQ* on just how these reviews are prepared and how the tests are run.

Q. What is the best way to go about buying an amateur f.m. transceiver?

A. First of all, read the advertisements to see what features you like and decide on two or three units. Next read the reviews on the equipment in *CQ*, *73*, and *QST* (*HR* has very few actual reviews) to get varying view-points. If you know someone with any of the equipment being considered talk with him about his likes and dislikes. Next go down to the local ham radio store and take a look at what

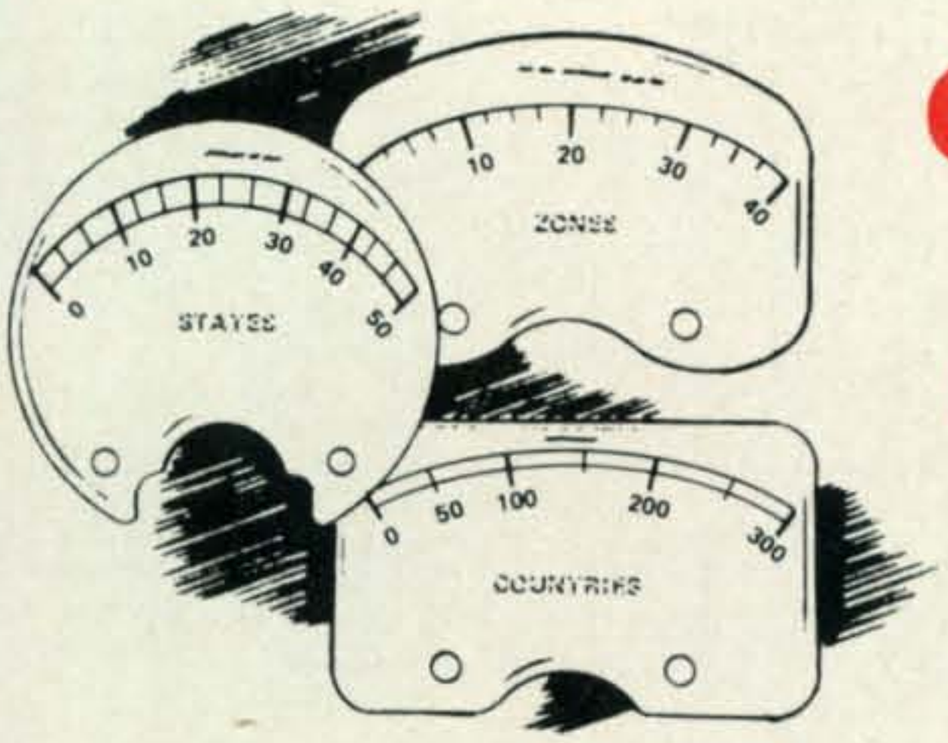
(Continued on page 102)



For 50Ω Termination
(For other values see CQ, July, 1964, pp.31-33)

	6 db			20 db		
	Calculated	1%	5%	Calculated	1%	5%
R_1	17.3 Ω	17.4	18	42.5	42.2	43
R_2	17.3 Ω	17.4	18	42.5	42.2	43
R_3	69.6 Ω	69.8	68	21.0	21.0	22

Fig. 2. Schematic and resistor values for the attenuator pad.



Custom Make Your Own Meter Dials

BY JULIAN N. JABLIN,* W9IWI

HERE is an improved, yet very simple, way of making dial scales for meters on which you need special markings.

Most articles on converting surplus meters, or those which describe adaptations of standard meters for special purposes, suggest pasting a paper scale with new markings over the existing plate on the meter. In some instances a new cardboard plate is suggested, cut to the shape of the metal plate and marked appropriately.

These are makeshift at best. The paper thickens the plate sufficiently so that the pointer may rub on it. If the paper absorbs any moisture (from the damp atmosphere in a basement shack, for example) it will almost certainly bulge and interfere with the pointer. A cardboard replacement scale will behave in the same way, unless it is sprayed on all sides and edges with clear lacquer.

The best bet is to use the back of the dial which comes with the meter and mark it to indicate what you want.

Disassemble the meter. Using extreme care not to bend the pointer or damage the movement, remove the two screws which hold down the dial plate and slide it out from under the pointer. At this stage I generally put the movement back into the case to protect it until I am ready to replace the plate.

Using a piece of stiff tissue paper, such as drafting paper, trace the outline of the dial plate, indicating the screw holes and the arc on which the present scale is printed. This will later be used to mark a new arc; the outline and screw holes will help to orient the tissue properly. Rub pencil lead on the back of the tissue under the arc.

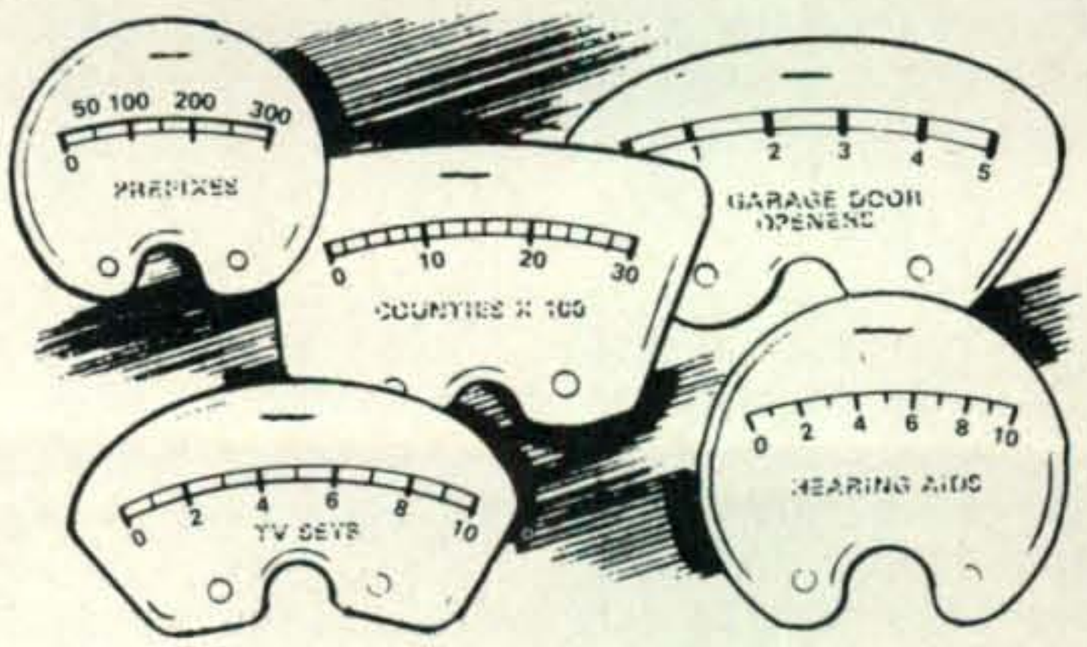
Lightly sand the back of the meter plate with fine sandpaper or emery. Then spray it with a matte finish paint. Use any color that suits you and matches your equipment. I have used white and gray on different meters, and once I picked up a can of auto undercoat which was light gray. The small spray cans available in hobby shops for model boats and planes are fine. Spray on two or three very light coats. The objective is to just cover the metal and to avoid a thick build-up of paint. Give the paint plenty of time to dry, and clean out the screw holes with a toothpick.

Now, lay your tissue template over the painted surface, orienting it carefully with the outline and screw-hole marks. Lightly trace the arc, the end points and any intermediate marks that you will need. The pencil rubbing on the back of the tissue will transfer these markings to the plate.

This next stage is the only part of the job that takes any skill and patience. Using india ink, or a very fine black felt-tip pen, ink in the arc and the index lines. Then put your special markings on the plate. A simple way to do this is to use Letraset, Datak or any of the waxy "rub-on" alphabets available by mail from advertisements in the radio magazines or at art supply stores. One sheet will do a lot of meters and panels. Some instructions suggest spraying the finished lettering with Krylon or some other clear lacquer, but since the finished job is protected behind the meter glass, I do not feel it is necessary in this application.

If, at any point in the proceedings, you make a mess of things, it is a simple matter to

(continued on page 96)



* 9124 North Crawford Ave., Skokie, Ill. 60076.

get the picture!

Shown above is an actual size, unretouched photo of the picture image taken from the Robot Model 70 Slow Scan Television monitor, as it was transmitted by the Robot Model 80 Slow Scan Television Camera.

ROBOT MODEL 70 MONITOR.... **$395**
ROBOT MODEL 80 CAMERA..... **$395**
25mm, f1.9 lens..... **$30**

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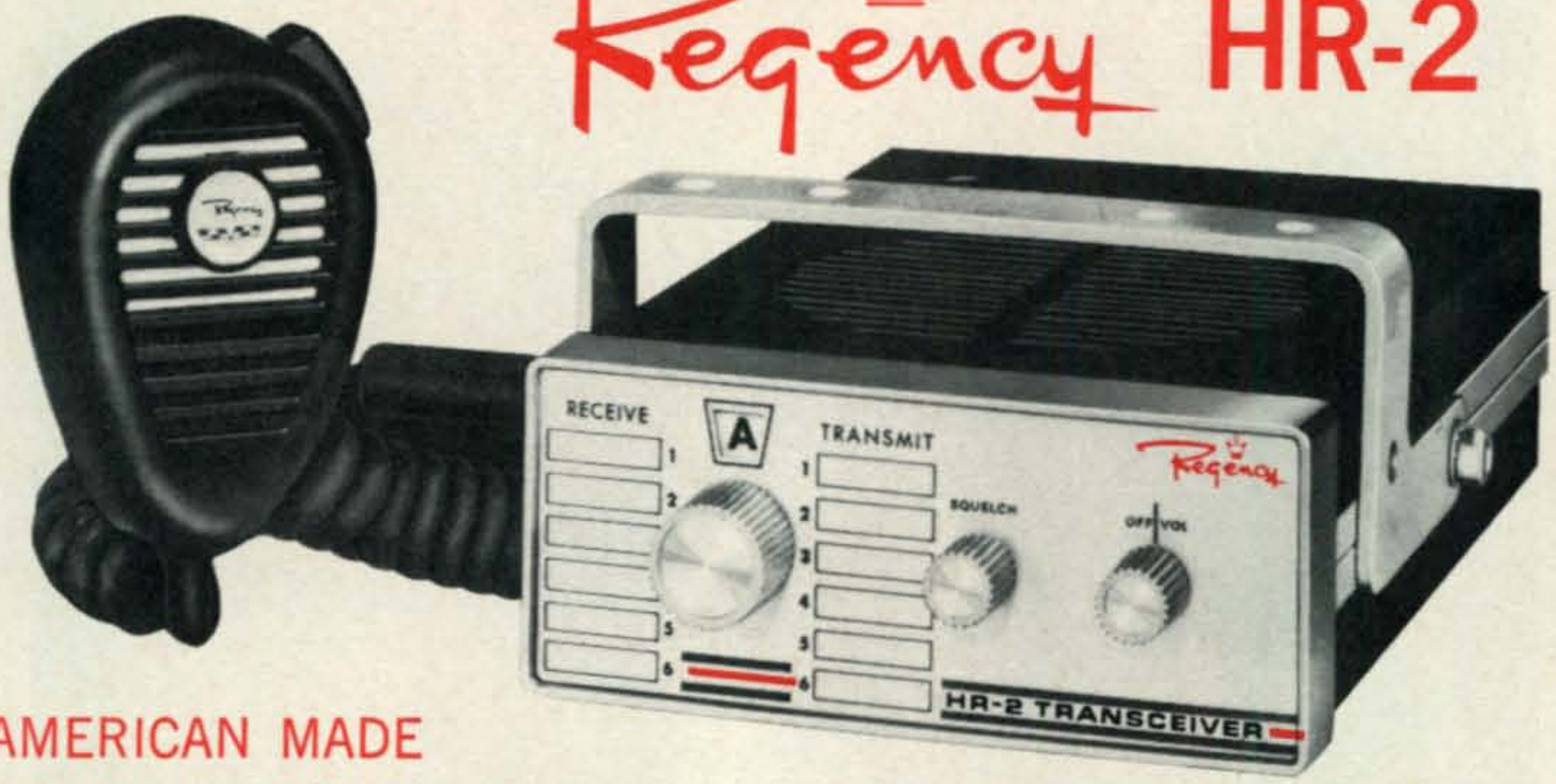
Write for our free brochure on SSTV and the Robot camera and monitor

Regency HR-2



AMERICAN MADE

Mobile 2 Meter FM Transceiver

Here is what the 2 meter, FM Ham World has been asking for.

Specifications: 90 day warranty

RECEIVER

The HR-2 receiver is a double conversion, superhetrodyne with highly selective ceramic filter.

Frequency Range	144-148 MHz
Sensitivity	0.35 μv (nom.) 20DB Quieting
Selectivity	6DB Down ± 16KC 50DB Down ± 32KC
Audio Output (3-4 Ω Speaker)	3 Watts 10% Distortion 5 Watts Maximum
Channels	6 Crystal controlled with provision for adding an additional 6 channels
I.F. Frequencies	10.7 MHz & 455KHz

TRANSMITTER

The HR-2 transmitter uses phase modulation for the ultimate in carrier stability. Built in SWR load mismatch circuitry provides protection against open and shorted antenna conditions.

Frequency Range	144-148 MHz
Power Output	10 Watts (min.) @ 13.6 VDC
Modulation	Phase Modulation with automatic deviation limiting
Deviation	Automatic Limiting with internal adjustments from 0-15KC deviation
Microphone	Plug-in, hand held, high Z Ceramic supplied
Channels	6 Crystal controlled with individual trimmer capacitors for Frequency netting

GENERAL

Power Requirements	13.6 Volts (nominal)
Receive (Squelched)	180 MA.
Receive (Max. audio output)	800 MA.
Transmit	2.5 Amps (max.)

STANDARD EQUIPMENT

Built-in 4" Speaker
Mobile Mounting Bracket
SO-239 Antenna Connector Socket
T & R Crystals for 146.94 MHz
PTT Ceramic Mike

only $229.00 Amateur Net

Regency **ELECTRONICS, INC.**

7900 Pendleton Pike, Indianapolis, Indiana 46226

This is actual size and shape of our radio. Cut it out and place it under your dash to see how compactly it fits.

CQ Reviews:
The Heath Model IB-101 Frequency Counter

BY WILFRED M. SCHERER,* W2AEF

A DREAM of many radio amateurs is ownership of a frequency counter, but this has seldom been fulfilled due to the usual high cost of these devices. The Heath Company has now changed all this with the introduction of their Model IB-101 Frequency Counter which sells in kit form for a nickle under $200.

This counter, however, is by no means limited to use by radio amateurs. As a matter of fact, it is a high-quality professional type designed primarily for commercial applications in the laboratory, on the production line, for equipment testing and servicing, for use in the classroom, etc.

The IB-101 is a lightweight and portable digital counter of the EPUT type; that is, it records events-per-unit of time. It is a 5-digit job with two ranges, one in kilocycles up to at least 15,000 kc, the other in cycles-per-second up to 99,999 c.p.s. with an accuracy to a ± 1 count. By switching between the two ranges an 8-digit measurement can thus be made down to the last cycle.

A frequency scaler also is now being made available as an accessory unit to provide an additional range in megacycles for readings up to 175 mc.

Technical Descriptions

Only a general technical rundown will be given, inasmuch as explicit details would require too much of our alloted space, which can be put to better use by showing a few ways in which the amateur may utilize the counter which reader correspondence indicates to be more interesting.

The IB-101 is s solid-state affair employing 26 IC's, 6 diodes and 8 transistors, including 1 MOSFET. It is operated from a self-contained 120 / 240 v.a.c. power supply.

Referring to the block diagram at fig. 1, the input circuit employs a MOSFET that functions as a hi-to-lo impedance-matching amplifier to minimize loading on the circuit under test (the input impedance is 1 meg shunted by 20 mmf). The MOSFET is protected against overload with internal zener diodes. The amplifier is followed by a network that shapes up the frequency response for operation over the specified range.

The resulting signals actuate the Schmidtt trigger which is a regenerative bistable circuit that produces a square-wave output each time it is triggered and reset. The sequential pulses therefrom are changed by decade counters (J-K flip-flops) into a binary-coded 8-4-2-1 output. Recycling occurs on every 10th input pulse.

The four bits of binary-coded data from each decade counter are taken and stored by the buffer / storage units upon command of the transfer signal. The decoder drivers translate the data from the buffer / storage units into decimal form and drive the cathodes of the related cold-cathode type display tubes.

Timing signals for gating, transfer and reset are obtained from a 1 mc crystal-controlled clock through a chain of divide-by-ten frequency dividers. The range switch selects timing signals of 1 second at the Hz position or 1 millisecond at the kHz position.

The Heath Kit Model IB-101 frequency counter.

* Technical Director *CQ*

The accuracy of the counter depends on the precise timing of the clock, so a trimmer capacitor at the crystal is provided to set the 1 mc frequency against a standard signal such as that from WWV. A sensitivity control is located after the input amplifier to adjust the voltage at the Schmidtt trigger input just below the trigger turn-on point, thus ensuring activation by very small signals.

Construction

The IB-101 is assembled (by the user) on a doubled-sided plated-through fiberglass circuit board; that is, circuit runs are on both sides with the necessary interconnections between sides plated together through a small hole at the required point. The components are mounted on only one side of the board. The IC's are installed in sockets for easy servicing and interchangability without the need for resoldering. The sockets are made up of individual clip-type connectors installed on the top of the board. The display tubes plug into conventional-type sockets.

The board is mounted on a metal chassis at the sides of which are attached rails for accepting and securing U-shaped top and bottom case covers. A bail handle enhances portability and also may be used as a tilt-up stand. A three-position detent ensures stability of the handle when set at the desired angle.

A receptacle at the rear of the unit accepts a 3-wire detachable a.c.-power cord. The input connector is a BNC type at the front. The display tubes, which produce brilliant ½"-tall numerals, are viewed through a plastic window, Rocker-arm switches are used, one for power on-off, the other for selecting the desired range. Lamps show which range is engaged. There also is an over-range lamp, the purpose of which is indicated later. The size of the unit is 3⅛" × 8¼" × 9" (H.W.D.) excluding the handle, and it weighs 4½ lbs.

Assembly Work

There are about 700 points to be soldered on the circuit board. 544 of these are for the display-tube sockets and the IC connectors. The foil circles at these spots are quite small and very closely spaced, requiring meticulous soldering care with a low-wattage fine-point pencil-type iron. Where such an iron is not available, the manual shows how one may be improvised using a large-size wire (supplied with the kit) wrapped around a larger iron.

Calibration is accomplished by adjusting the crystal frequency against a standard signal such as WWV or a standard bc station or by checking for a 10,000 kc readout against another counter. The sensitivity can be set using an internally-obtained variable signal from the oscillator or by employing an external source the level of which can be varied. Our time for the whole job amounted to 7 hours. Others report 5-10 hours.

Operation and Performance

The IB-101 is simple to operate. Triggering and reset are automatic. No input-level adjustment is needed; however, care must be taken not to exceed the maximum input-voltage rating of 200 v. r.m.s. at 1 c.p.s. to 1 kc; derated 48 v. per decade thereafter.

Placing the range switch at Hz provides a readout in cycles-per-second. If the frequency is over 99,999 c.p.s. an over-range lamp lights, indicating this situation and thus requiring the range to be changed over to the kHz one. In making a complete read-out, it must be kept in mind that the two last, or right-hand, digits on the kHz range will be the same as the first two, or left-hand ones, observed on the Hz range.

For example: for a frequency of 14,251.356 kc, 14251 will be indicated on the kHz range, while 51356 c.p.s. will be shown on the Hz range. The decimal point always remains at the right of the last digit. Since 14251 kc equal 14,251,000 c.p.s., putting the two readings together yields 14,251.356 c.p.s., taking into account the two-digit carry-over from the kHz range. Similarly, since 51,356 c.p.s. = 51.356 kc, the two readings vield 14.251.356 kc.

On either range the reading can exhibit a ± 1-count error, depending on how the clock-time interval at which the signal pulses start. This is characteristic of a digital-type counter, since the clock is not synchronized with the signal and either 10 or 11 pulses can thus be counted during the alloted time. On the Hz range this can show up as a slow change of 1

The Heath Kit Model IB-102 frequency scaler.

c.p.s. back and forth, while on the kHz range the last digit may tend to blink with a 1 kc change.

When the Hz range is used, it takes 2 seconds after the application of a signal or a frequency change for the correct count to be had. With the kHz range the count is had in a matter of milliseconds.

The minimum input-voltage rating is (a.c. only) 100 m.v. r.m.s. at 1 c.p.s.-1 mc and 250 v. r.m.s. up to 15 mc, after 30-minutes operation. Our unit functioned with 30 m v input for the 1 c.p.s.-1 mc coverage, 150 mv up to 15 mc and 200 mv up to 22.5 mc (although the counter is rated for at least 15 mc, we've seen several that go up to 20 mc or so).

The ambient temperature-stability rating for the unit is: <2 parts in 10^7 degrees C. at 20°C. to 35°C. after 30 min. warm up; .002 from O°C. to 50°C. This is primarily made possible due to the fact that the 1 mc crystal is a special high-quality low-temperature-coefficient type costing several times that of the run-of-the-mill crystal. Although a noticeable degree of heat is generated within the IB-101 after 30 minutes of operation, excellent stability was maintained during several two-hour test runs against a temperature-controlled crystal calibrator. Starting cold from 75°F. ambient, the counter reading remained within the 1-count rating. In other tests the unit kept in step up to 22.5 mc with a commercially manufactured job costing over $1000.

Model IB-102 Frequency Scaler

The Model IB-102 Frequency Scaler is a solid-state job, built like the IB-101 in the same type and size case, with handle, and operates from a 120 / 240 v.a.c. source. It consists of a wide-band amplifier, good up to at least 175 mc, followed by a setup using IC's that divide the input frequency by 100, 10 or 1. The selection is made by pushbuttons. Thus the output frequencies of the unit will be 1 / 100, 1 / 10 or the same as the input. When connected between the signal source and a counter, signal frequencies above the counter limitation then are converted at the scaler output to fall within the range of the counter.

The signal-input frequency is then determined by multiplying the counter reading by 100, 10 or 1, as the case may be. The divide-by-one position allows a direct readout in the normal manner to be made within the counter range without the need for changing interconnections.

When the IB-101 counter is involved, another way of determining the signal frequency is that when dividing by 10 and mentally moving the counter decimal point *2* digits to the left, the kHz counter range will indicate mHz and the Hz ranges indicates kHz. Similarly, when dividing by 100 and mentally moving the decimal point *1* digit to the left, the kHz range will indicate mHz and the Hz range will show kHz.

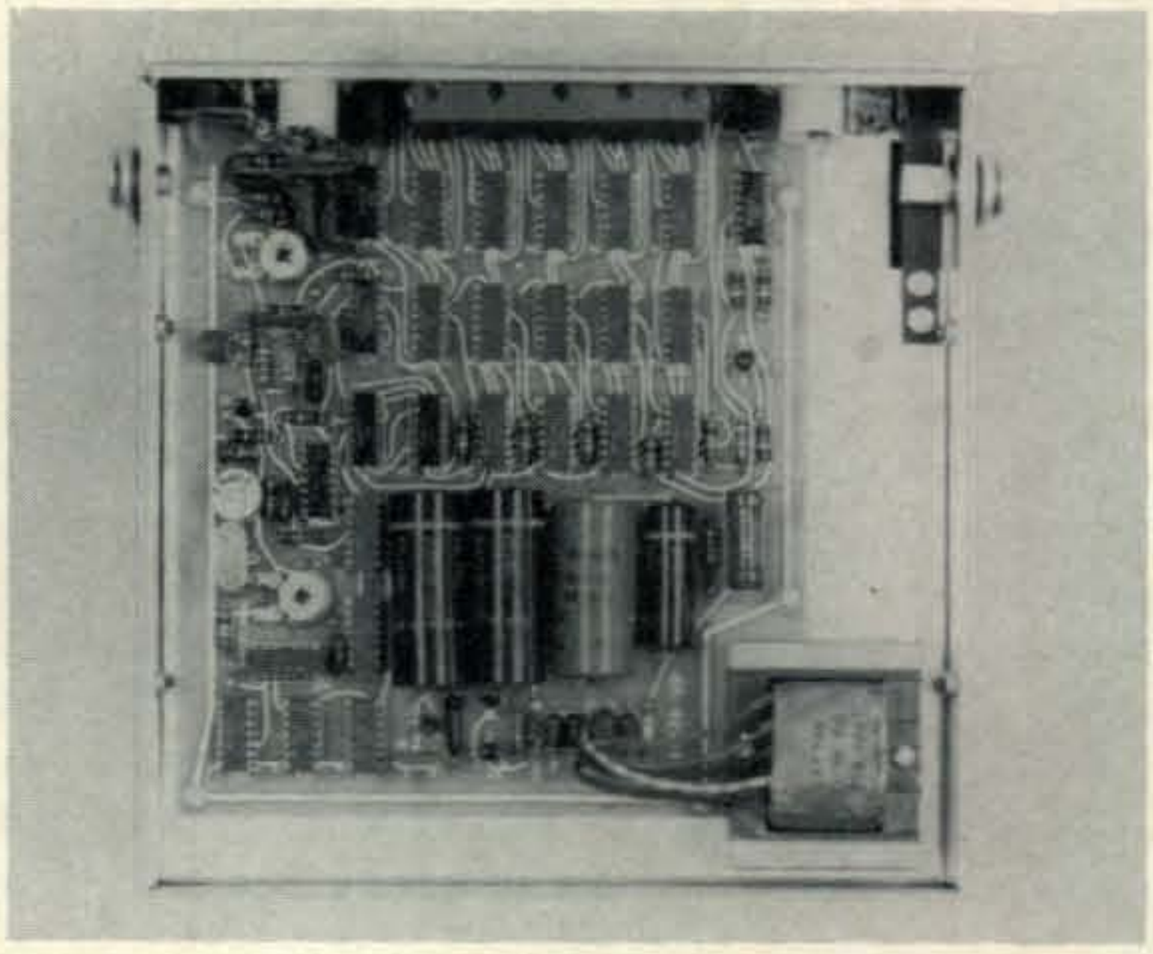
Because the scaler goes up to 175 mc and since the IB-101's typically function up to 17,500 kc, a complete readout using the two units can be had up to 175 mc. Putting together the readouts from the various ranges, a 9-digit readout capability is thus obtainable at frequencies above 100 mc. The scaler should, therefore, be an attractive accessory for those engaged in v.h.f. / u.h.f. work.

The minimum input-voltage rating for the scaler is 50 mv r.m.s. up to 100 mc, 125 mv up to 175 mc. The maximum input-voltage rating is 3 v. r.m.s. at 50 ohms impedance. Output voltage is 1v. min. @ 1 meg with 20 mmf. Note that the scaler also may be used with other counters for extended coverage, in which case the counter readout is multiplied as previously described.

Applications

A few applications of primary interest to the radio amateur are as follows:

Received-Signal Frequency: The ideal way to use the counter for reading the frequency of received signals is the setup shown at fig. 2A. By mixing the outputs of the receiver b.f.o., v.f.o. and heterodyning oscillator and accordingly tuning the mixer outputs for the required sum- or difference-frequencies, the



Interior view of the IB-101. It is a box full of IC's. The crystal for the clock is at the right.

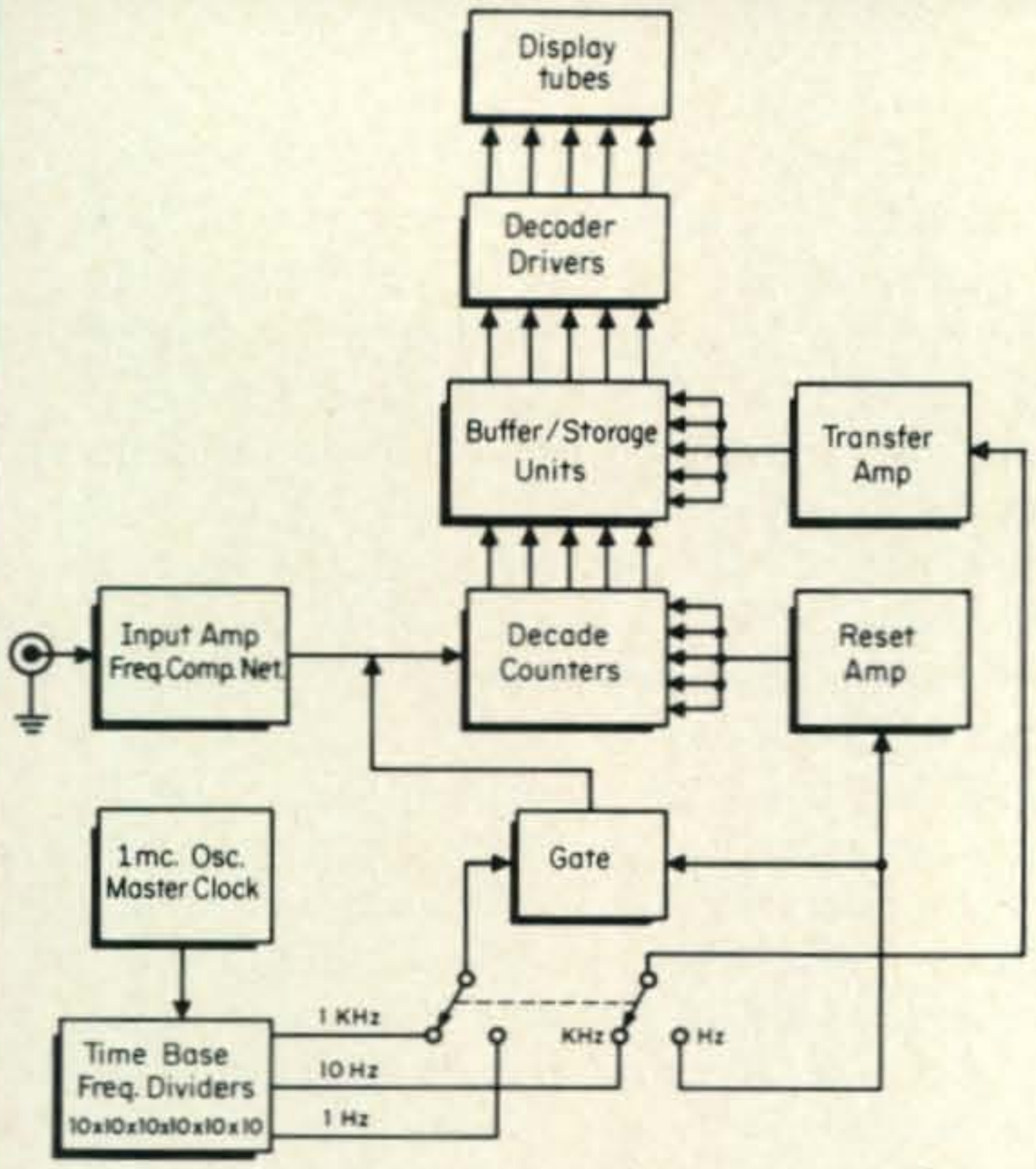


Fig. 1-Block diagram for the IB-101 Frequency Counter.

final output frequency will be that to which the receiver is tuned for the signal.

The frequencies shown are those employed with the Heath SB-Series of receivers. Where a transceiver is involved, it must be modified to provide the necessary oscillator outputs. Information on transistorized mixing setups will be found elsewhere[1] The tuned circuits thereof will have to be altered according to the oscillator frequencies of the receiver engaged for the work.

Another setup is shown at fig. 2B; however, a measurement may not as quickly and conveniently be made. The procedure is as follows:

Turn off the receiver b.f.o. and demodulate an s.s.b signal using a BC-221, tuned in the 3.5-4.0 mc range, for carrier reinsertion. Where the b.f.o. cannot be turned off or in the case of a c.w. or a.m. signal, zero beat the BC-221 with the signal. If the 3.5 mc amateur band is in use, read the frequency directly from the counter. If another band is in use, multiply the counter reading according to the harmonic relationship between 3.5-4.0 mc and the band of interest.

For example: with the 7 mc band in use, multiply the reading by 2, for 14 mc by 4, etc. Any other v.f.o. also may be used in which case the fundamental frequency of the v.f.o. will be read by the counter with the received frequency determined as above.

The BC-221 output must be carefully adjusted for proper level-relationship with that of the received signal to avoid receiver overload and excessive a.g.c. action. In most cases the v.f.o. signal level can be controlled by the degree of pickup between the v.f.o. and the receiver according to the length of the antenna used at the v.f.o., closeness to the receiver, etc.

[1]MacLeish, "A Frequency Counter for the Amateur Station", *QST*, October 1970, p. 15.

Transmitter-Frequency Measurement: A

Continued on page 90

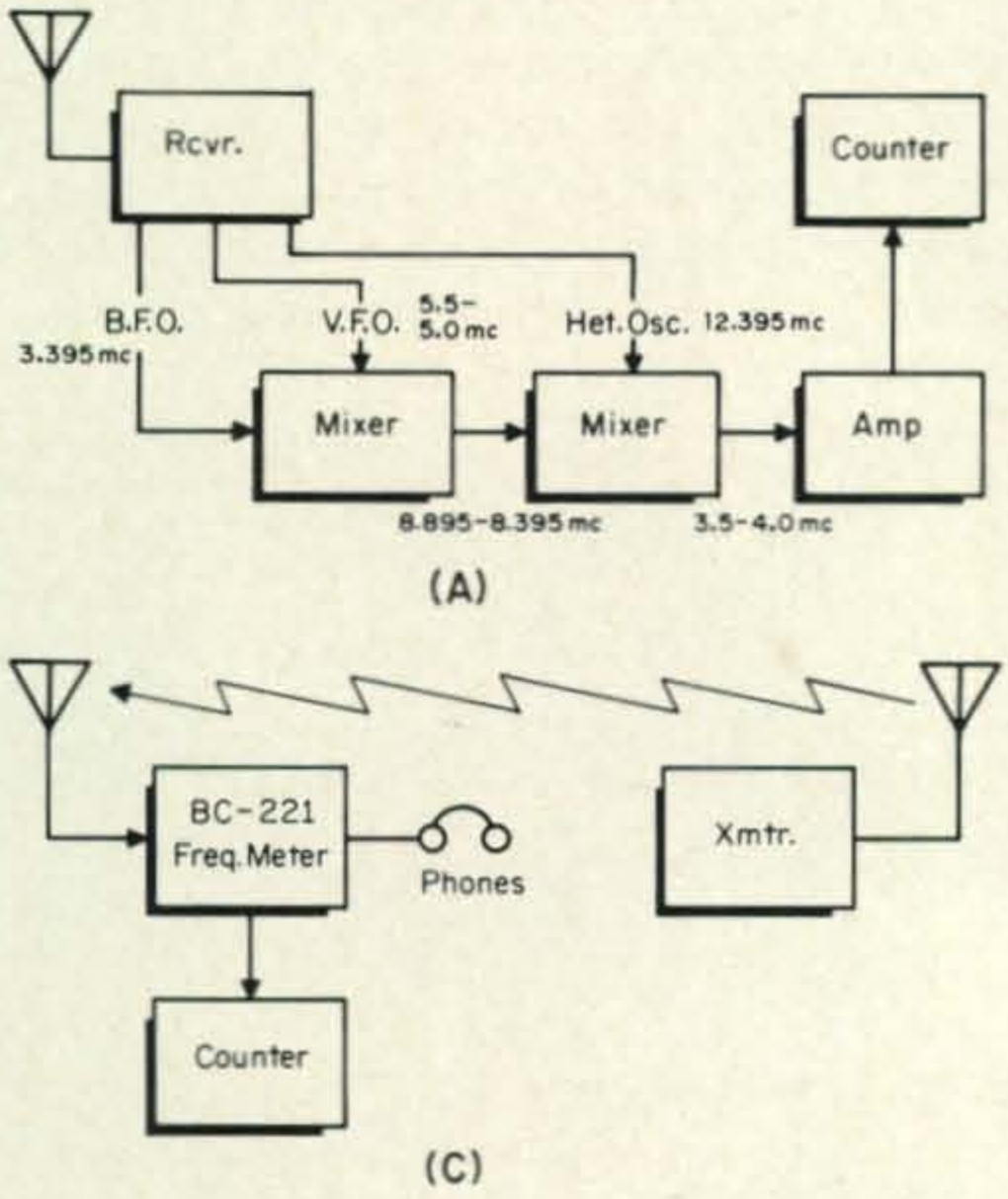


Fig. 2 (A) Setup for using a counter directly with a receiver. (B) Indirect method of checking received signals with a counter in conjunction with a BC-221 frequency meter; useful through 30 mc. Other v.f.o.'s also may be used. (C) Indirect method of using a counter for checking transmitter frequencies. (D) Setup for using counter to check receiver frequency response.

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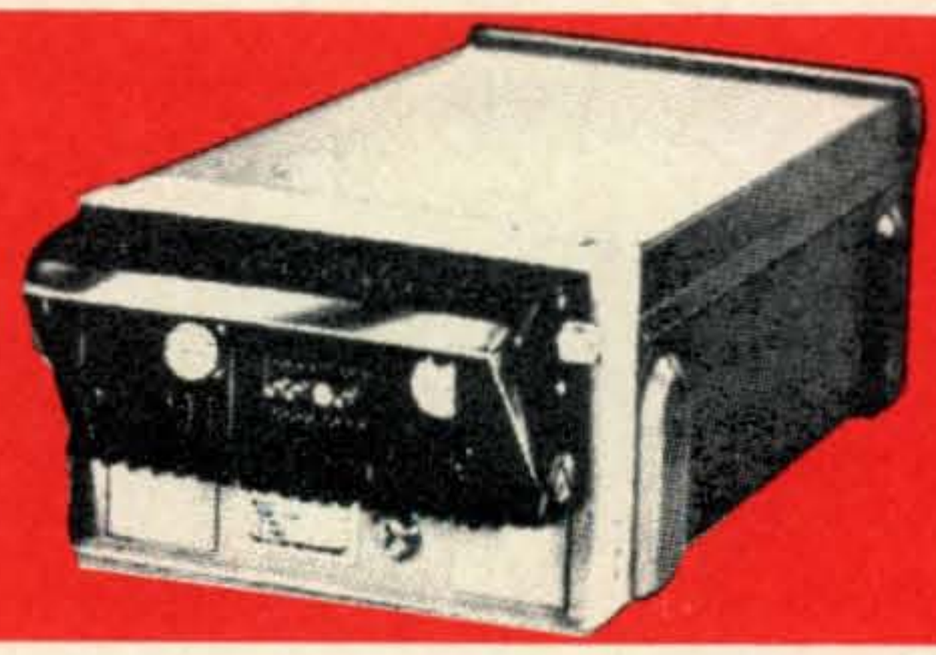

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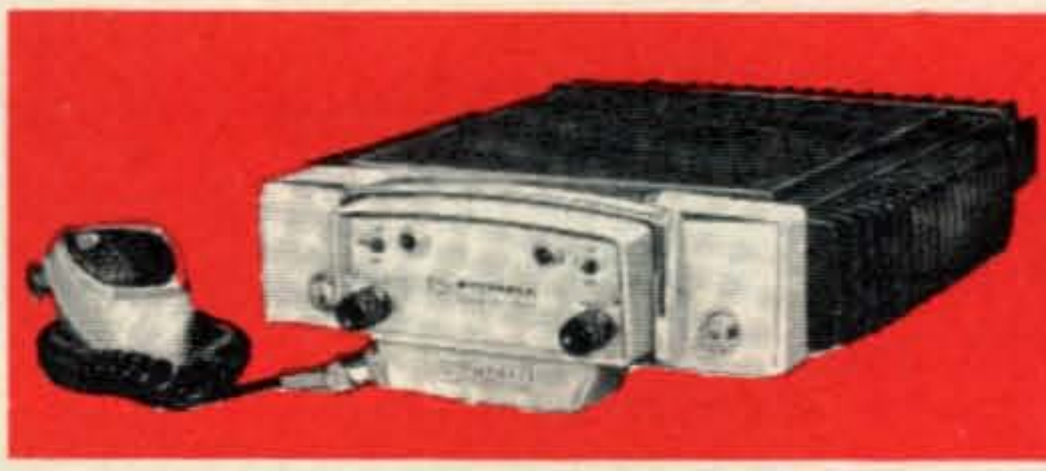

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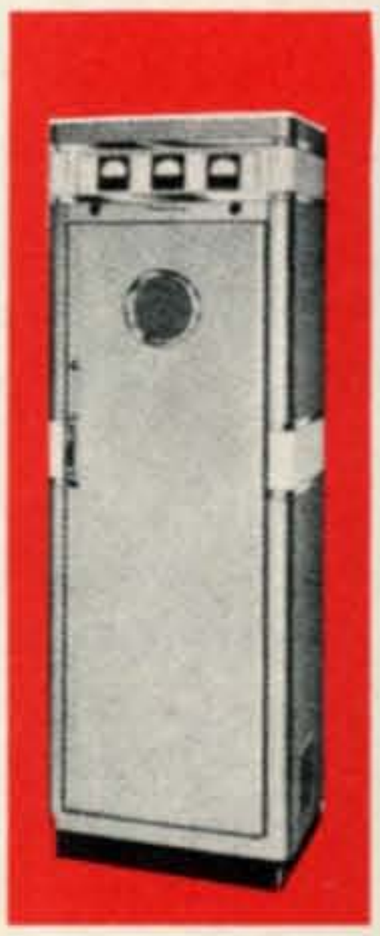

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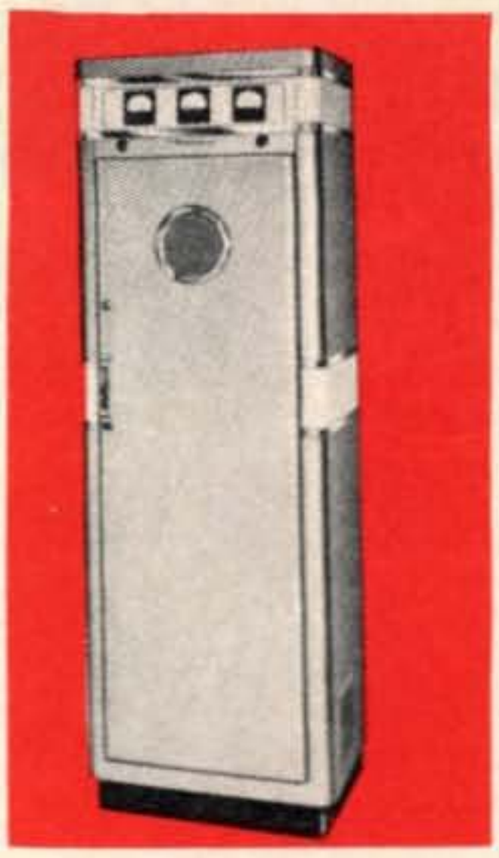

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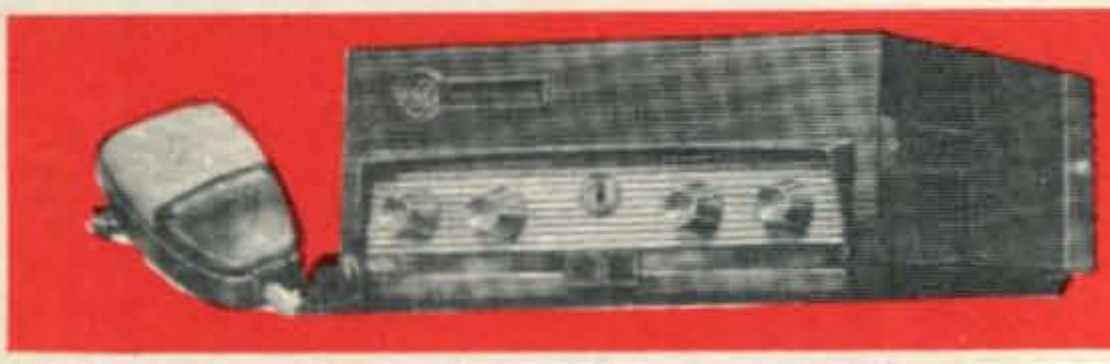

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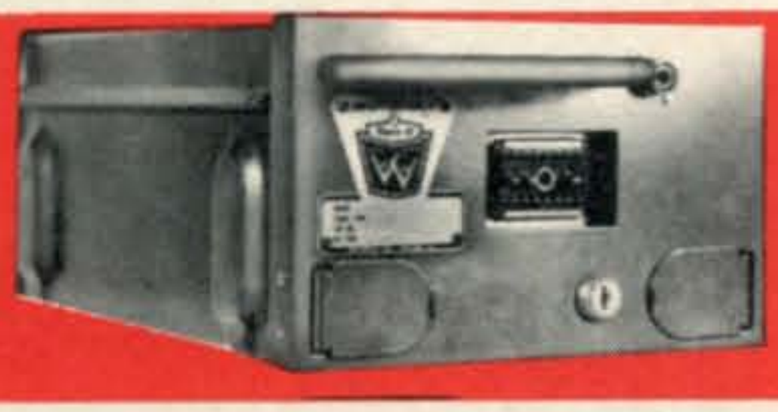

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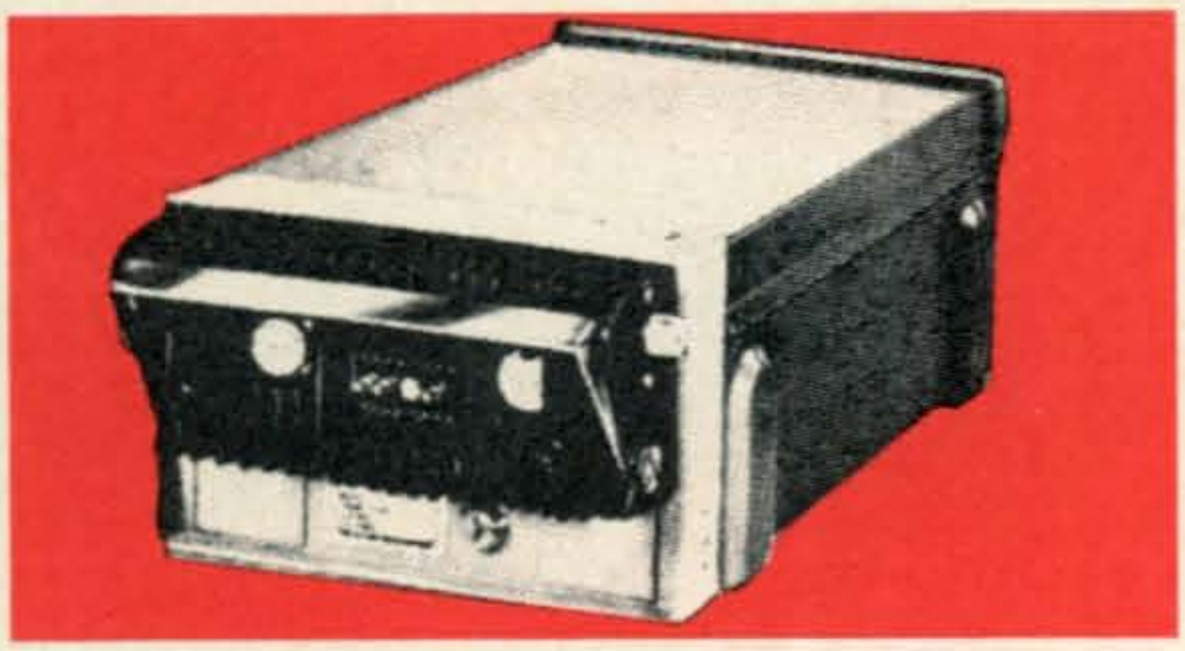

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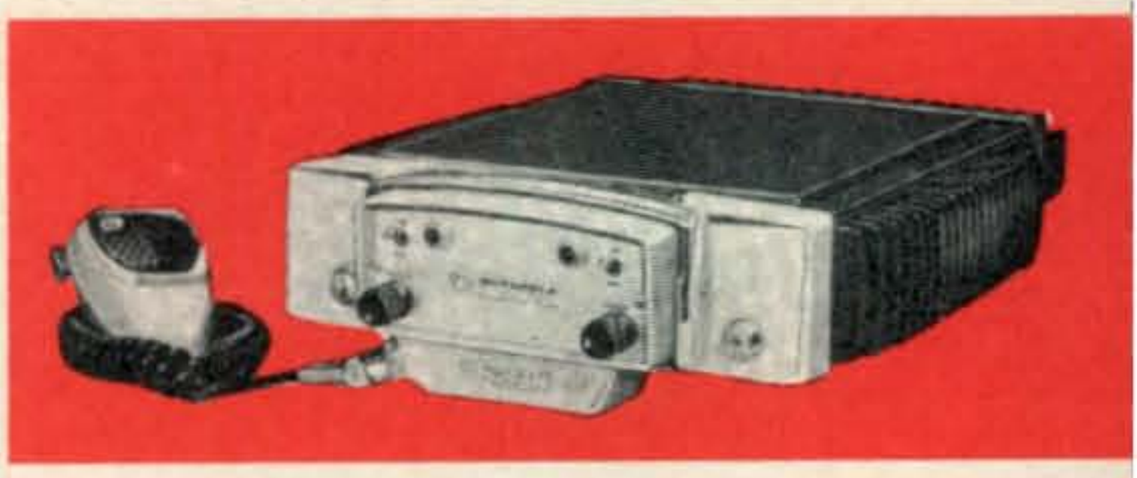

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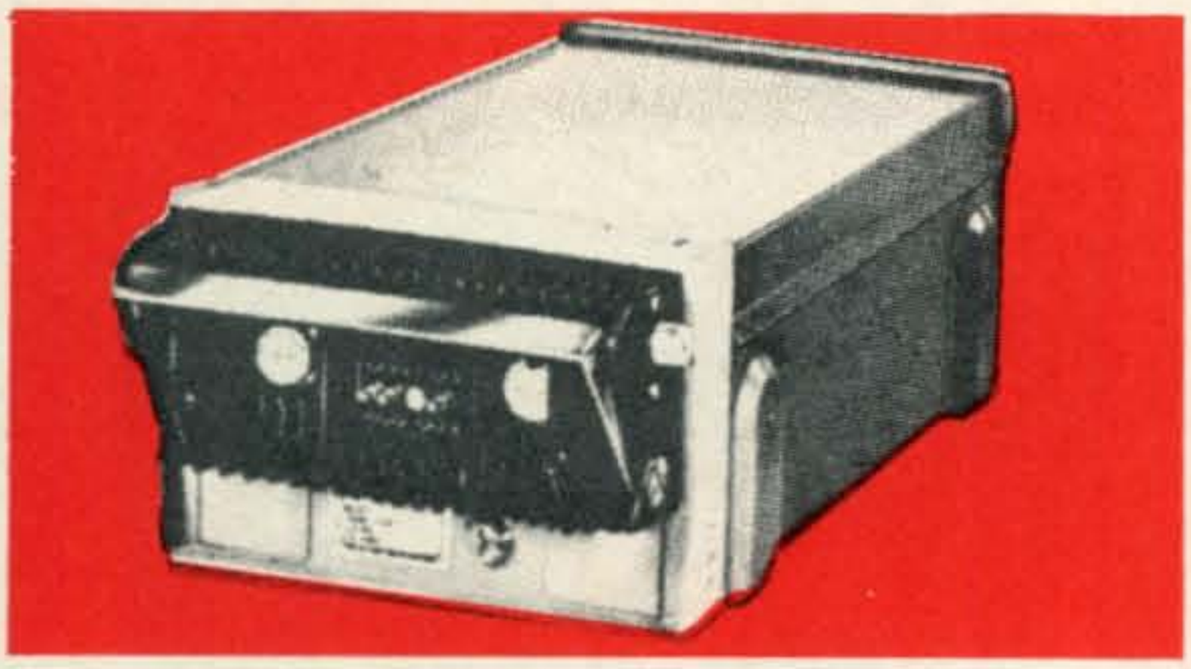
T44 A-A6 or A6A..... $28.

available only with accessories

Motorola T44AAV - 450-470 MHz 6/12 volt, 15 to 18 watt,

complete accessories.....$48.

With private line minus reeds.....$78.



Motorola U44BBT 450-470 MHz

12 volt, 15 watt transistor power supply with private line (dual squelch) complete

with accessories..... $158.

less PL..... $123.

RCA CMU15A, 6/12 volt, 450-470 MHz

complete less accessories..... $18.

accessories (sold separately).....$20.

RCA "E" line, 12 volts, 15 watts, transistorized power supply,

including accessories..... $98.

RCA CMU15B 6/12 volt, 450-470 MHz

less accessories..... $28.

accessories (sold separately)..... $20.

RCA, G.E. UHF BASES

RCA CSU330, 450-470 MHz

330 watts, upright cabinet..... $150.

FI/42 Progress Line 110 v, AC desk top, 15 watts..... $168.

TI/42 Progress Line 110 v, AC desk top, 15 watts..... $188.

DO42 Progress Line, 110 v, AC, Desk Mate, 15 watts..... $188.

Z148S Accent Line, 110v, AC, desk top, 10W..... $168.

MOTOROLA UHF BASES

L44AAB 110 v, AC, Desk Top, 15 watts, **with Private Line..... $198.**

J44AAB, 110 v, AC, Weather proof cabinet, 15 watts, with Private Line... $178.

REMOTE CONTROLS

Motorola P8270..... $55.

Motorola TA1200 series..... $95.

GE - RC 3..... $45.

GE - RC 4..... $75.

GE Telemote Mark-60 transistorized remote, telephone style..... $65.

TECHNICIANS SPECIALS

Offered at reduced prices on as-is basis. Repairs are necessary and/or parts may be missing. Less accessories unless specified.

RCA CMV2, 12 volt, 30-50 MHz, 30 watts, less accessories, less case..... $10.

BENDIX MRT-10, 12 volt, 150-170 MHz, 25 watts, less accessories, less case..... $10.

Motorola T-44 Series, 42 volts,
450-470 MHz, 15 watts, less accessories,
less case..... $10.

G. E. Pre-Progress 40-50 MHz,
250 watt, upright cabinet..... $148.

G. E. Pre-Progress 40-50 MHz, 60 watt
desk mate..... $68.

G. E. Pre-Progress 40-50 MHz,
60 watt, pole mount..... $58.

Dumont 161-E Base, 33 MHz, 100 watts,
upright, very clean..... $75.

G. E. Pacers, EG43S, high band, 12 volt,
"T" power, 15 watt, front mount.
less accessories..... $58.

G. E. Pacers EG42S low band, 12 volt
"T" power, 15 watt, front mount
less accessories..... $58.

G. E. Pacer Power Supply Only
less strips..... $25.

G. E. 4ES1 Series, 150-170 MHz,
20 watts, 6 volts, less access..... $10.

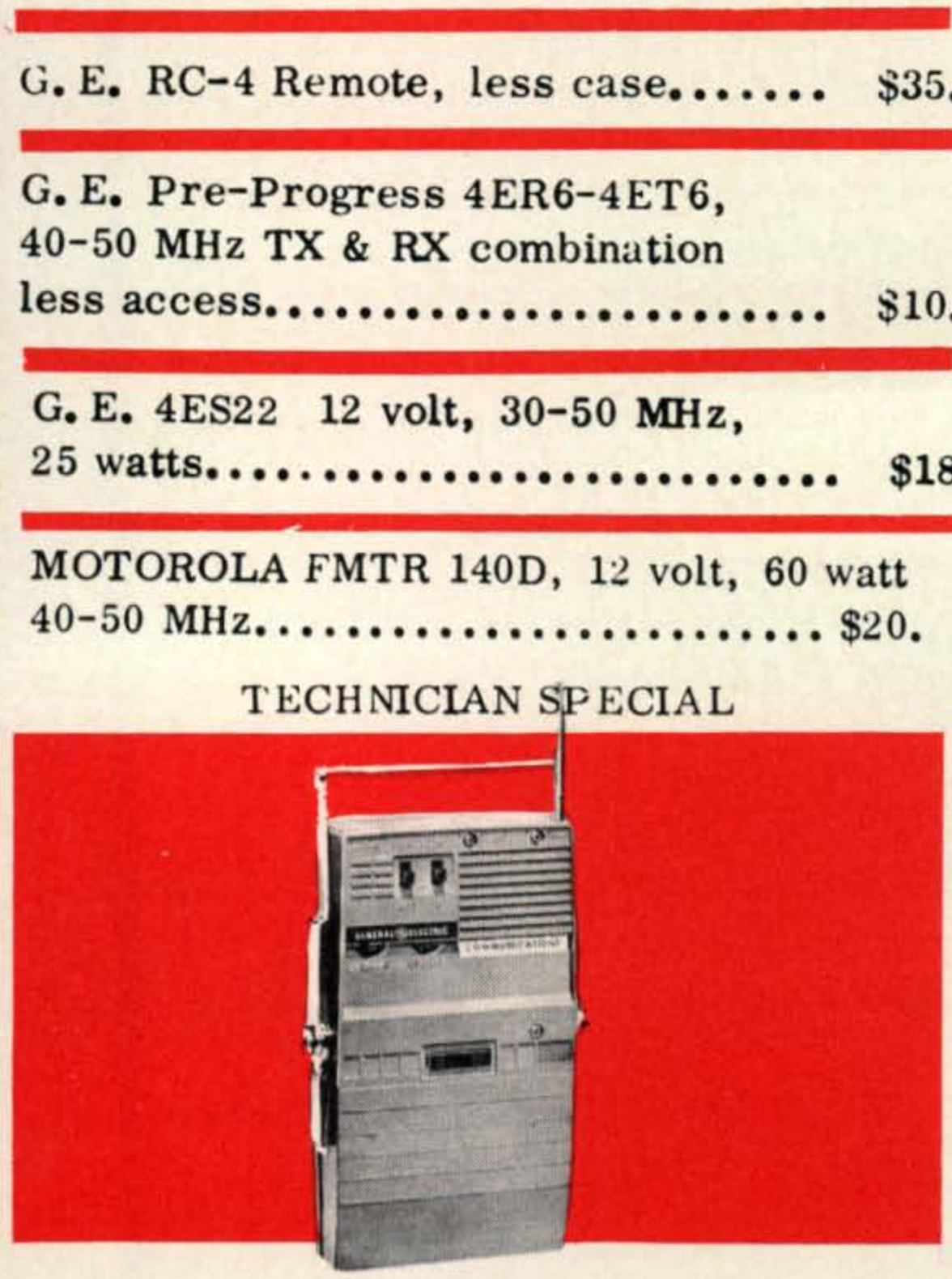
G. E. RC-4 Remote, less case..... $35.

G. E. Pre-Progress 4ER6-4ET6,
40-50 MHz TX & RX combination
less access..... $10.

G. E. 4ES22 12 volt, 30-50 MHz,
25 watts..... $18.

MOTOROLA FMTR 140D, 12 volt, 60 watt
40-50 MHz..... $20.

TECHNICIAN SPECIAL



Voice Commander No. 1, 132-150 MHz
band, 1 watt hand held portable Not In
Working Condition but physically complete,
less batteries, with bottom housing
and power supply board..... $35.
Charger for above unit..... $5.
Leather carrying case..... $2.

Voice Commander No. II, 150-170 MHz
1 watt all transistorized, hand held
portable Not In Working Condition but
physicially complete, less batteries,
with bottom housing..... $50.
Charger for above unit..... $7.50
Leather carrying case..... $2.

Voice Commander Parts and Accessories

V. C. No. 1, 150-170 MHz Band Trans-
mitter Boards, 1 watt F. M.
fully tubed..... $5.
Audio and Squelch Boards..... $5.
Power Supply Boards..... $5.

MOTOROLA T33G, 12 volt, 150-170 MHz
10 watts, less accessories..... $48.

MOTOROLA U44BBT 450-470 MHz,
12 volt, 15 watt "T" power supply,
less accessories..... $68.

BRAND NEW!
Telescope Antenna, fits
all V. C. models..... $5.
Lapel Speaker/Microphone
for all models..... $5.

PARTS AND ACCESSORIES
F. O. B. Orange, California
New! New! (all solid state)
Silent Sentry

Continuous Tone Squelch, replaces
Motorola Private Line, GE Channel
Guard and RCA Quiet Channel, including
mounting bracket..... $74.95

Accessories for General Electric
Pre-Progress Low or High Band
Speaker..... $3.
Control Head..... $3.
Microphone..... $3.
Cable Assembly..... $6.
If purchased as set..... $12.

Accessories for Motorola for models such
as FMTR, FMTRU, etc. 80D & 140D
Speaker..... $3.
Control Head..... $3.
Microphone..... $3.
Cable Assembly..... $6.
If purchased as set..... $12.

GREGORY ELECTRONICS CORP.

PARTS AND ACCESSORIES

RCA Cases for Carfone Line,
specify model..... $10.
RCA L.D. Control Head..... $8.
RCA Carfone Control Head..... $4.

G. E. Progress Line Base mike,
Reluctance type, Shure Bros.
model S-36..... $10.

General Electric Dynamotors
30 watt, 12 volt..... $4.
30 watt, 6 volt..... $3.
60 watt, 12 volt..... $5.
60 watt, 6 volt..... $4.

RCA Crystal Ovens. 12 volt or
6/12 volt. dozen..... $36.

New G. E. "T" power, 30 watt, heat
sinks with transistors and wiring..... $10.

G. E. Progress Line speakers
with bracket..... $5.

G. E. Progress Line baskets, less
covers, less front plate..... $3.

Shure reluctance handsets with mike
connector and coil cord..... $10.

Old Motorola, G. E., R. C. A., etc.
control heads..... $1.
6 for..... $5.

Low Band base and spring
combinations..... $1.
6 for..... $5.

Motorola receiver selective call units
P-8629, some with reeds..... $15.

Motorola pack set "P" series canvas
carrying case..... $3.

Outdoor weatherproof hi-power horn
type P. A. speakers..... $15.

G. E. Pre-Progress Housing for 4ET6-
4ER6 TX and RX..... $2.

LIMITED SUPPLY!

G. E. Progress Line Power Amplifiers
(less power supply)
Type EF4A, as is
range 25-33 MHz..... $75.
33-42 MHz..... $75.
42-50 MHz..... $75.

G. E. Progress Line receiver strips
30-50 MHz, narrow band..... $35.
Wide band..... $30.
Lots of 10 - 10% discount

RCA "E" line series combination
control head and power supply..... $30.

G. E. channel guard tone units, decks
RC type..... $25.

G. E. channel guard tone units, Pacer
channel guards, less reeds..... $15.

RCA RC Plug-in type, quiet
channel..... $5.

G. E. Progress Line Pacer Base
Station microphones. New!..... $10.

Motorola P-9301. A single tone burst
oscillator..... $6.

RCA cases for carfone desk type bases,
less front panel..... $10.

Carbon telephone handsets, as is.... $1.
Six for..... $5.

G. E. SCHEMATIC OUTLINE and Inter-
connection Diagrams for GE 2-way FM
radios.
Vol. 1, Pre-Progress Line (1949-55)
25-50 MHz 72-76 MHz.
Vol. 2, Pre-Progress Line (1949-55)
150-170 MHz, 405-425 MHz, 450-470 MHz
each volume..... $4.50

NEW REVISED EDITION! Motorola FM
Schematic Digest, 136 pages of Motorola
Diagrams, up to and
including Motran..... $6.50

See Page 4 & 5 for
BIG DISCOUNTS ON
QUANTITY PURCHASES

Pre-Progress line speakers
less mounting bracket..... $3.

Reeds..Private Line or
Channel Guard..... $5.
Misc. CPS

4ET24 G.E. Progress Line, 450-470 MHz,
Tx strip, less ovens..... $25.

PORTABLES

G.E. Pocket Mate, fully transistorized, 150-170 MHz high band, 1 watt, hand held portable with leather case, less charger.....$200.

Physically complete. Not subject to bench check or tuning.
General Electric H-31 series, 1.7 watt, all transistorized receiver, with microphone, less antenna, as is 150-170 MHz, with dry battery..... $65.
with Ni-cad..... $85.

G.E. Ni-Cad Power Supply & Bottom Housing for H-11 or H-31 series portables. Batteries are as is..... $15.

Motorola H-23 series, 150-170 MHz, 1.5 watt unit with ni-cad rechargeable battery..... $75.
4-unit chargers, if available..... $15.

Motorola Z-23AAC series, 1.5 watt, partially transistorized receiver, 150-170 MHz, with dry battery supply..... $50.

Motorola P-33AAC, 150-170 MHz, 5 watt, partially transistorized receiver, with dry battery..... $65.

NINIC FM POCKET RECEIVER

With dry battery..... $59.95

Add $20 for crystals and tuning to your frequency. 30-50 MHz or 150-170 MHz All units new. Solid state modular construction. Adjustable squelch. Sensitivity 0.3 microvolts to break squelch. Dual conversion crystal controlled. With conventional dry cell or chargeable ni-cad battery. Weight: less than 1 lb. Size: 6 5/8" x $2\frac{1}{2}$ x $1\frac{1}{4}$".

ODD LOT CORNER

4ET6 General Electric
6 v 30 watt, 40-50 MHz
transmitter..... $4.
12 v 30 watt, 40-50 MHz
transmitter..... $6.

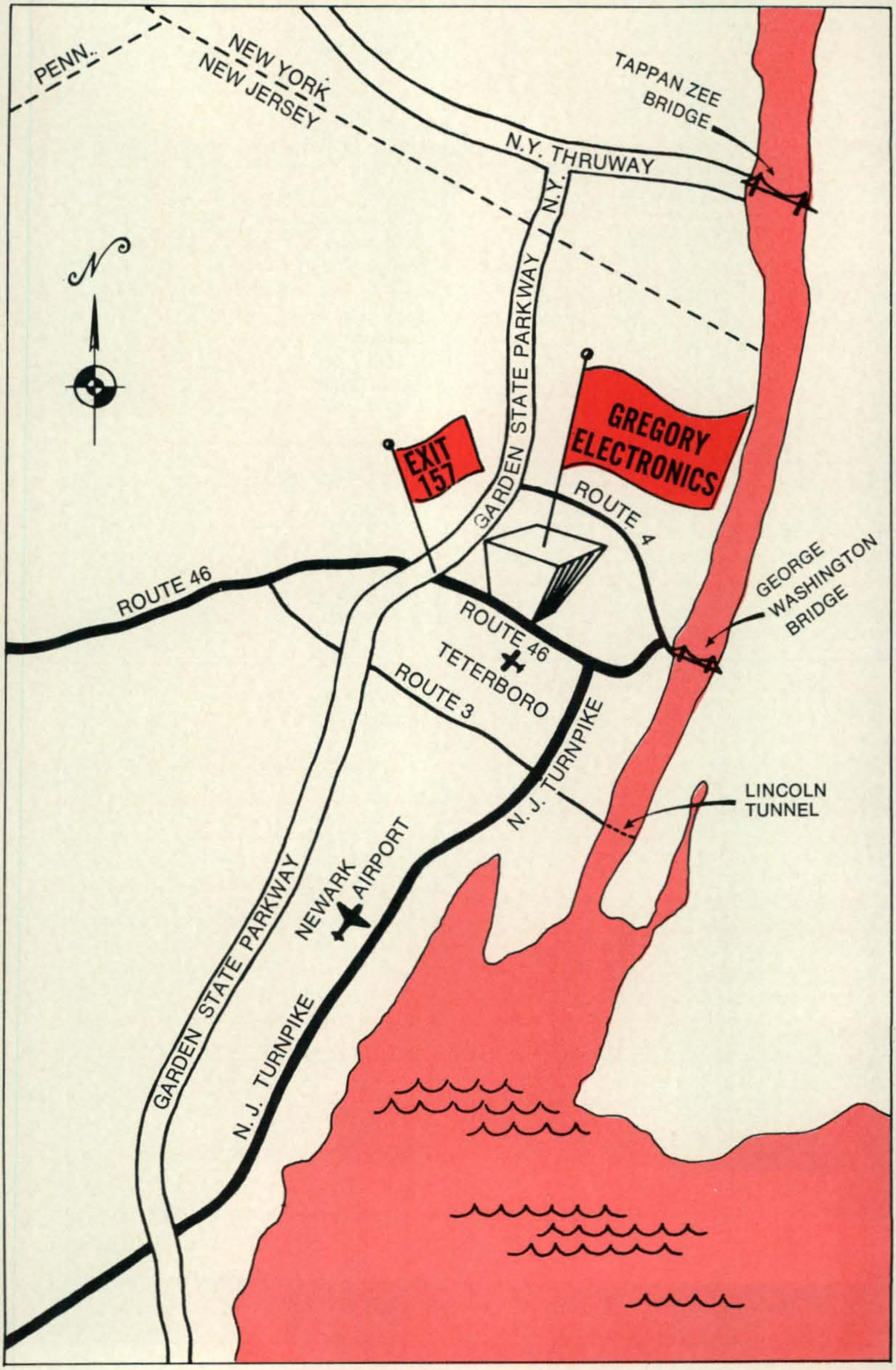
4ET6 - General Electric
6 v 60 watt, 40-50 MHz
transmitter..... $5.
12 v, 60 watt..... $7.

AM Receiver strip
on 2.5 MHz..... $10.

National Electronic Laboratory Utilifone, model NEL 200, AM, 12 volt, $1\frac{1}{2}$ watt, tuned on 121.9 MHz, with accessories, ideal for monitor receiver..... $18.

We've Expanded...

We have expanded our warehouse to double its capacity. We can now stock a larger and more varied line of equipment. Should you be in our area (15 minutes from N.Y.C., see map on back page), you are cordially invited in to browse. We now have the warehouse space to carry 15,000 pieces of used FM Mobile Communications Units.


PENN.
NEW YORK
NEW JERSEY
TAPPAN ZEE BRIDGE
N.Y. THRUWAY
N.Y.
GARDEN STATE PARKWAY
EXIT 157
GREGORY ELECTRONICS
ROUTE 4
ROUTE 46
ROUTE 46
TETERBORO
ROUTE 3
GEORGE WASHINGTON BRIDGE
N.J. TURNPIKE
LINCOLN TUNNEL
NEWARK AIRPORT
GARDEN STATE PARKWAY
N.J. TURNPIKE

DX

BY JOHN A. ATTAWAY, *K4IIF

A SHORT note of thanks to all who called in during our recent Contest-pedition to the Turks and Caicos Islands. Larry (W4DQD), Lou (W4PJG), and I hope that VP5JA was a new prefix or country for you.

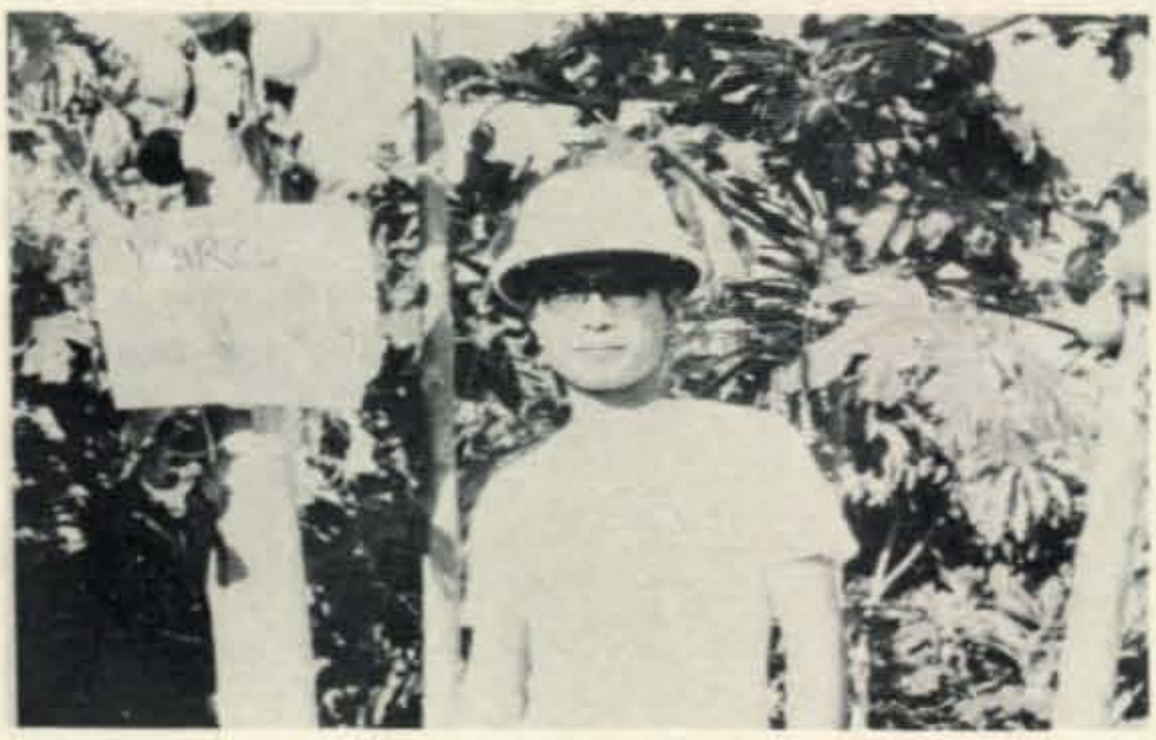
It was a great experience for us after a shaky start. First, the plane was 5 hours late and we didn't reach the site until 2315 GMT, meaning we had to scramble around in the dark putting up antennas in a strange location. It was the next morning before we got the mess squared away and really started making contacts. Then, at 1500 GMT with Larry in the middle of a roaring pileup, the hotel generator went off. Turned out it was just the regular weekly oil change and overhaul and nobody had bothered to warn us because who needs electricity in the middle of the morning when everybody's out fishing. C'est la Vie! However, with the kitchen, and even the bar, open virtually 24 hours a day the Third Turtle Inn was a great DX-pedition spot and we hope to get back some day.

The second night amazed us with what could be done on 160. There were no trees or poles for support, so we ran one leg of our 160 dipole from the roof down to the beach, and lay the other leg across the bushes up the hill behind the hotel. There was no way to get it up in the air so 90% of the wire was less than 3 feet above ground, yet we were still 5/9 over a large portion of the eastern U.S. Never know till you try. Also of interest were the number of comments that we were the strongest signal on the band, even though we ran only 100 watts. Viva la QRP!

De Extra

For The New DXer: If you're just getting started in this DX game you have probably found that running up a big prefix, country, or zone score takes a lot of time. If you've been doing a lot of rag-chewing you've found it interferes with DXing and you've dropped it. DXing requires you to listen, listen, listen.

By now you've found out about the Foreign Edition of the *Radio Amateur Callbook Magazine* published by Radio Amateur



JD1ABO out for a Marcus Island stroll during his January, 1971 DXpedition

(Photo courtesy W2GT)

CQ DX AWARD HONOR ROLL

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmations with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES is used as the country standard. Effective with this listing the Saudi Arabia / Kuwait Neutral Zone (8Z5 / 9K3) has been deleted from current country status.

2XSSB

TI2HP	319	W9JT	307
W2TP	319	VE2WY	302
DL9OH	318	F2MO	301
WA2RAU	318	YS1O	300
WA2IZS	317	F9MS	299
W9ILW	317	K1SHN	297
W3NKM	316	XE2YP	294
K6LGF	316	HP1JC	285
K6YRA	315	W9KRU	284
W3DJZ	313	WAØKDI	282
W4OPM	313	K4RTA	279
I1AMU	312	KH6BB	278
W6EUF	310	ZL1AGO	278
I1KDB	309	WAØCPX	278
W4IC	309	WA3IKK	276
W6NJU	309	G3RWQ	276
XE1AE	308	WA6MWG	275

CW

W6ID	318	W6NJU	290
DL3RK	300	K1SHN	286
W4OPM	299	W6ISQ	285
WA6EPQ	293	W4BQY	280

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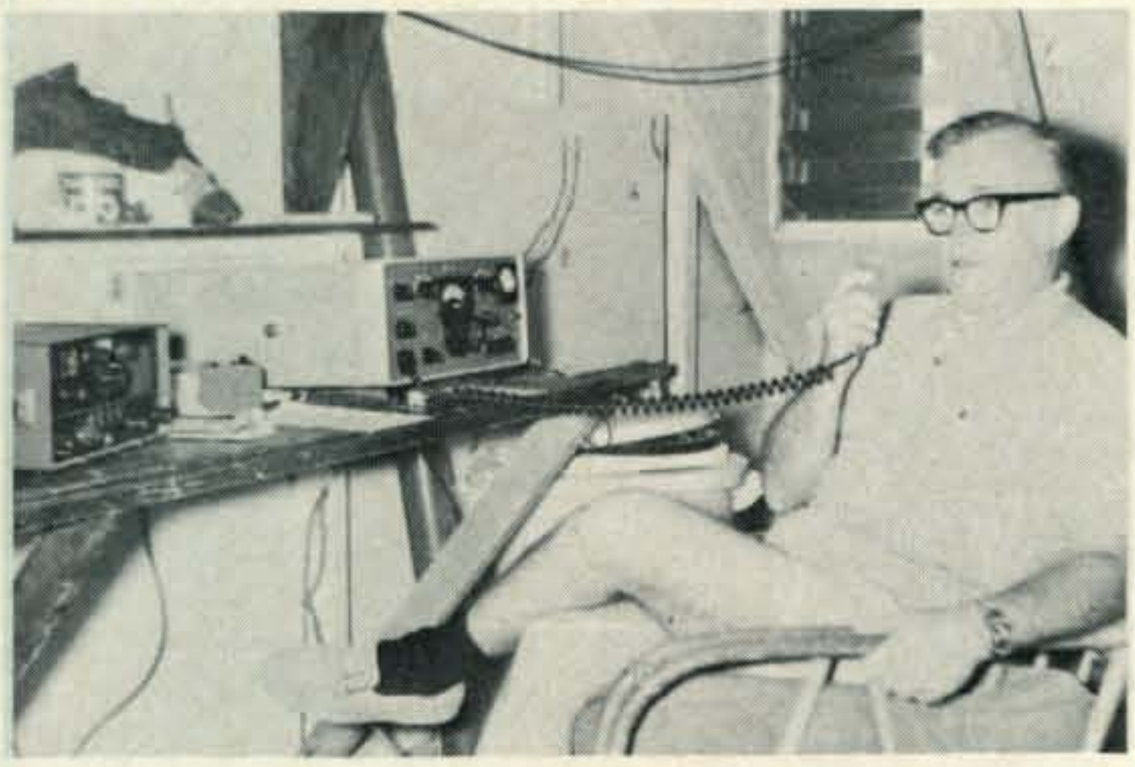
* P.O. Box 205, Winter Haven, Fla. 33880



Dr. Charles B. "Doc" Crow, WB4MKU / VP5CC operating from the shack of Jim Bassett, VP5AB during last winter's ARRL DX Contest. Doc suggests that QSLs for VP5CC and WB4MU / VP7 be sent to P.O. Box DX, Birmingham, Alabama, 35213. This is also a good address for cards to VP2AZ, VP2EX, ZF1CC, PJ9CC, PJ8CC, and 9Y4CC.

Callbook, Inc., 925 Sherwood Drive, Lake Bluff, Illinois 60044. This book is absolutely essential for all DXers and should be one of the first things you buy. It gives the addresses for most DX stations and oversea's QSL Managers.

DXing can be a lonely life if you let it. However, the lonely way is the hard way. Let's talk about some of the ways to make it easier by enlisting the help of others. First, you should seek out like-minded amateurs in your area. If you live in a big city there is almost certain to be a major DX club nearby. A good place to check for names and addresses of these clubs is through our DX Committeemen, who represent most of the top clubs, and also the list of clubs who submit scores for the *CQ* Worldwide DX Contests. The most recent contest list is found on pg. 41 of the Sept., 1970 issue. Our DX Committeemen include VE3DLC, K1IMP, W1WY, WB2NDI, W3GHD, W4OPM, W4WSF, K4OCE, K5AAD, W6WX, W6NJU, W7YBX, W9DWQ, W9JVF, and WØYDB.

One advantage of joining other DXers is to pool listening time. Many areas have 2 meter alert nets, or landline nets, of active DXers who hasten to spread the word when a good one is heard. You can still get that painting or yard work done without missing something rare.

The next step is to insure that both you and your group have the benefit of the latest published information. Unfortunately this column isn't enough because a monthly magazine goes to press too early to get the up-to-the-minute info. A weekly bulletin is a must, and fortunately you have a good choice. Among those circulated to this desk each week, with the call of the editor or publisher in parentheses, are the *Long Island DX Bulletin* (W2GKZ), *DXpress* (PAØLOU), *West Coast DX Bulletin* (WA6AUD), *The DXer's Magazine* (W4BPD), and *Long Skip* (VE3DID).

Of course, to qualify for WAZ, WPX, and the *CQ* C.W. and S.S.B. DX Awards, you've got to have QSL cards to prove your contacts. QSLing procedures are something we could write volumes about. If you simply send your card to a rare station you can consider yourself lucky if you get his card in return. Whereas you may work only 1 or 2 stations a week from which you "need" a card, the rare station may work several dozen each week who want his card. Obviously, QSLing can be an expensive, time-consuming chore for him. Therefore, anything you can do to make it easier for him will greatly enhance your chances of a card.

The first thing to remember is always list the time of the QSO in Greenwich Mean Time GMT. All DXers follow this practice to make it easier to locate specific contacts in the log. The second thing, and very important, is to send a self-addressed, stamped envlope, or self-addressed envelope with International Reply Coupons (IRC's) along with your card. Foreign stamps may be purchased from W2SAW, and IRC's are available at your friendly neighborhood postoffice.

The procedure is the same whether you deal directly with the rare station or through his QSL Manager. Many QSL Managers send out

The CQ DX Award Program

C.W. DX Awards

32 .....WA5VDH	34 .....WAØKDI
33 .....KØEKR	35 .....K4TSJ

SSB DX AWARDS

80 .....I1KDB	85 .....W0KHI
81 .....VP9MI	86 .....K4TSJ
82 .....G3FKM	87 .....WB2EZU
83 .....W9DWQ	88 .....W1MZB
84 .....K1SHN	

Complete rules for the *CQ* DX Award Program may be found on pg. 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a self-addressed, stamped envelope to the Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor.

hundreds of cards each week and they are strictly unpaid volunteers. Some actually spend appreciable sums of their own money having cards printed for rare stations, and they deserve every courtesy you can give them.

Before sending your card directly to a rare station you should first determine whether he has a QSL Manager. Usually he will tell you over the air, but if he has a big pile-up on his hands he may not have a chance. Each month we run a list of QSL Managers recently reported to us. However, we can't begin to get them all, and you should check your weekly bulletin for their list as well. In addition, an excellent permanent listing is maintained in W6GSV's QSL Manager's Directory. It is well worth the modest cost and can be obtained from Dept. B, Box 54222, Terminal Annex, Los Angeles, California 90054.

Enough for now, good luck and good DX!

Activity from the Ivory Coast is frequently provided by Mike, TU2DD. Mike is 22 and operates aborad an oceanographic vessel based near Abidjan. His home call is F5ZZ. QSL to K2QHT, Glamore Court, Smithtown, N.Y. 11787.

Checkpoints and the New DX Awards

When we set up the system of checkpoints it was our intent to provide a means of verifying cards locally to avoid mailing costs and risks. However, over the years a number of people have begun to mail cards to their nearest DX Committee member for checking. Until now this has not caused any problem. However, with great interest in the *CQ* C.W. and S.S.B. awards, cards in lots of up to 300 are being mailed to our Committeemen frequently without sufficient postage to insure their return. Therefore it is our request that if you must mail your cards for these awards, please mail them to Jerry Hagen, WA6GLD, who is better equipped to cope with the problem. If you wish to have them returned by Registered or Certified mail, be sure to enclose sufficient postage to take care of this service. We suggest that rare and valuable cards always be sent by Registered Mail to minimize the risks.

Rare and Unusual Prefixes for WPX

It's been a great spring for prefix hunters. The Brazilian amateurs produced another tremendous showing during the WPX Contest in putting several score new ones on the air based on the letters PP, PV, PW, and PX instead of the regular PY. When you QSL these stations just substitute PY for the prefix used and consult the Callbook. For example, PW6BN was operated by PY6BN. Don't forget the self-addressed envelopes and IRC's.

The old Timer's DX Club (OTDXC) of Palermo, Sicily has had a field day with their new Italian island prefixes. IC, ID, and IE combinations have been used, and we understand that I1—I0 are to be used on the Italian mainland. The number will be the first digit of the postal zip code.

Here are a few of the more prominent catches reported this past spring, and predictions of some yet to come:

DX1—DX1HMI in the WPX Contest was a DU1, Philippines station.

The WAZ Program

S.S.B. WAZ

860 . . . K4RTA	864 . . . . . DL9SV
861 . . VK3AMK	865 . . . . . OK3EA
862 . . . . JA8EL	866 . . . . . W4CYC
863 . . . JA1FJB	867 . . . . ZL2ACP

C.W.—Phone WAZ

3136 . . . . K4RTA	3145 . . . W1CNU
3137 . . WA7FKV	3146. . . . DU1OR
3138 . . WA8TND	3147 . . . . DJ3LR
3139. . . . WØTRF	3148. . . . DL3RK
3140 . . . . W4ZYT	3149 . . . . LA8LG
3141 . . . . OZ8JD	3150. . . . WØGKS
3142 . . . . K4ARP	3151 . . . . K5PFL
3143 . . WA4FDR	3152. . . . DL1NC
3144 . . . W4DUQ	3153 . . . . SP8EV

Phone WAZ

455. . . . . DJ3OJ
456 . . WA5LMG
457 . . . . . K2SHU

Complete WAZ rules are shown on p. 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Fla 33880.

The 3Z0L operation from the Lenin Museum in Warsaw. Standing is Bog, SP5DCF, Seated are Wald, SP5DZJ, and Lutek, SP5DOX. The rig was a homebrew 500 watt transmitter to a multiband dipole. QSL to Warsaw Radio Club, Box 298, Warsaw 1, Poland.

(Photo Courtesy H. Kotowski.)

GB3—GB3SKY is scheduled for 6-band operation June 19-22 from the Isle of Skye. Operators are to be G3IKR, G3VPE, G3IXP, and G3ZXO.

HUØ—HUØA was operated by YS2CEN in El Salvador.

HW6—HW6KAW was a special French call. QSL toF6KAW.

I2—I2LAG was I1LAG at the Milan Exhibition.

IC1—IC1AA, IC1SEZ, and IC1ZGY, on April 8-12, were operating from San Pietro Island. QSL to OTDXC, Box 143, Palermo, Sicily.

ID1—ID1BGJ and ID1BUP were in the Tremiti Islands. QSL via I1BGJ.

IE1—IE1PUG was used by the OTDXC from the Lipari Islands. Also QSL to Box 143, Palermo, Sicily.

JD3—JD3AAW was operated by Japanese amateurs from Ogasawara Island.

KCØ—KCØKC has been issued to the Independent County Hunters Net for use July 1-5, 1971 in Kansas City. A frequency to be used rather heavily is 14336 kc s.s.b. QSL to WAØWOB.

KQØ—We are placed to announce well in advance that KWØNEB will be operated from the Nebraska State Fair continuously from 2100 GMT, Sept. 1, 1971 to 0500 GMT, Sept. 9, 1971. There will be rigs on 10-80 meters c.w. and s.s.b. QSL to WØYOU.

The WPX Program

We are very pleased to announce that 4 novices won the WPNX Award this month. This is the largest number ever to receive this award in a single month.

WPNX

28 ....WN7PEZ
29 .....WN4SIJ
30 ....WN2LYN
31 ....WNØYMC

S.S.B WPX

596 ....W4WWD
597 ...YN1HSM
598 .....JW7UH
599 .....XE1UA
600.....CE6CA
601.....YV5CIL
602....WA2FLA

C.W. WPX

1088 ....W9LAX
1089 .....KL7CZ
1090 .....I1FHA
1091 ....K2QBW
1092 ....W4RNL

Mixed WPX

270 .....K6TZK
271 ...OE3HOW
272 .....W8MXO
273 ....PE2EVO
274 .....JA2LA
275 .....K8HKM
276 .....K4CIA
277 .....W9LAX
278 .....DK1GQ
279 .....W4DUQ
280 .....K7AHO

Phone WPX

207 .....XE1UA

WPX Endorsements

S.S.B.: DL9OH—750, I1KDB—650, WØYDB—600, W8GKM—550, XE1J—500, YV5CIL—500, W4WSF—450, DL9XN—400, I1FHA—400, K7RDH—400, DJ4XA—400, and W1MZ-B—400.

C.W.: W8LY—900, ON4QX—750, K4IEX—700, WB2FMK—700, DJ4XA—650, DJ7CX—650, OK2QX—600, VO1AW—550, WA9UET—450, W4WSF—450, W7USE—400, and W9LAX—350.

Mixed: W8ROC—800, W4IC—800, DJ7CX—750, W4HOS—650, W9ZTD—650, WA6MWG—650, W1EOA—600, JA4XW—550, PE2EVO—500, and JA2LA—500.

Phone: CT1HF—900, W4WSF—500, W2LEJ—500, and CR7FR—400.

80 Meters: K4IEX
40 Meters: K4IEX
20 Meters: W7USE and DJ4XE
15 Meters: OK2QX
10 Meters: W4WSF
Asia: W7USE and JA4XW
Europe: JA4XW, WB4KZG, and XE1J
North America: WØYDB and XE1J
Oceania: W7USE, JA4XW, DJ7CX, and XE1J
South America: DJ7CX and XE1J

Complete rules for WPX, WPNX, and VPX may be found on p. 66-67 of the June, 1970 issue. Applications blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor.

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One of the most active stations from Turkey is operated by Horacio Correa, TA3AC / KOZUV. Horacio advises that QSLs may be sent either via W3KT or to his new QSL Mnager, LA3UF. He is anxious to try for statewide contacts on 80 and 40 meters. Each day from 0400-0500 GMT he is on 3780 listening about 3805. From 0300-0400 he tries 7085 listening on 7215.

OG2—OG2A is a Finnish call. QSL to OH2-BAD.

TA6—This rare Turkish prefix has been activated by TA6JB who is frequently reported on 21044 kc c.w. between 1100 and 1600 GMT. QSL to DJ9ZB.

VU7—A VU7US operation was reported to be in the planning stages for late April. The location was to be the Andaman and Nicobar Islands.

WP4—Puerto Rican novice WP4DJZ has been heard several time on 21120 kc.

5T2—5T2ITU QSL cards may be obtained via 5T5AD, Box 100, Nouakchott, Mauritania.

Activity From Zone 23

Recent reports from the rarest of the zones include the following: JT1KAA on several frequencies including 14015, 14040, 14037, and 14042 at times ranging from 0150—0345 GMT; JT1AM on 14042 at 0130 GMT; JT4KAB on 14036 kc at 0225 GMT; and UA9VH / JT1 on 14205 at 0130—0230 GMT and again at 1410 GMT. In addition, UA0YT and other UA0Y-stations continue to provide Zone 23 contacts.

CANAD-X Antenna Program

The Canadian DX Association has made arrangements with the International DX Association (INDXA) to supply antennas and rotators to needy DX stations and DX-peditions. Recipients must be recommended by INDXA and approved by the CANAD-X Executive. First to gain assistance will be Andre, 5VZWT, and Barry, ZK1CD. The aim of the program is to get "rare countries" more active with stronger signals.

QRPp News

The big story this month is from Bob, K4OCE, of the North Carolinia DX Association who advises that he as completed WAZ using his 7 watt rig. His last two were UA0YT in Zone 23 and VK9GN in Zone 28. He has the UA0 card and the VK9 is on the way. Does anyone know of a WAZ award earned with a power level this low or lower?

The Milliwatt is moving ahead with plans for a DX award strictly for the QRP operator. The basic certificate will require 25 countires worked using 5 watts power or less. Endorsement stickers will be awarded for 50 and 75 countries, and a trophy for 100 countries. Consideration is being given to a special award for those using only 1 watt or less. The latter would require only 20 countries to earn the certificate, with endorsement stickers being awarded for multiples of 20.

Tops in the less-than-5-watts sweepstakes, as reported to *The Milliwatt,* include the following: W4VNE—56 countries (1 watt), WA8DDI—48 countries (2 watts) in only 6 months, K3BG—38 countries (2 watts), and WA6ABP—37 countries (0.8 watts).

QSL Information

The following volunteer their services as QSL Manager for any interested DX station: WA2DHS, 10 Parkdale Dr., Lancaster, N.Y. 14086. WA2HZR, 5562 Bear Rd., Apt. M6, North Syracuse, N.Y. 13212. WA2MPC, 21 E. Payne St., Lancaster, N.Y. 14086, K5TVC, 801 E. 23rd St., Farmington, N.M. 87401.

AP2KS—Via WB9BWU.
BV1US (1960-61—To K4YJQ, Rt. 1, Box 115A, Wetumpka, Ala. 36092.
CE3CF—c / o K6RA
CR3KD—Via WA4PXP
CR6IK—To W8CNL
CR6MT—(Deceased January, 1971)—c / o W8CNL
CR6YY—Via W8CNL
CR9AK (March, 1971 DXpedition)—To JA1AEA
CS5CS—This station believed to be a pirate.
CT2BD—c / o WA8SVU
DL4LG—Via WB9EAK
EA8GZ—To VE7BWG
EI2VDX—c / o K6TWT
EP2TB—Via W1YRC
FØWJ—To W5QNY
FB8XX—c / o F2MO
FM7WE, FM7WQ—Effective May 1, 1971, via W2GHK. W4OPM has retired.
FO8BO—Direct, not via WA6TQK
FR7ZU/T—c / o F9MS
G3KHK / 4X4—To W2CTN
GB3SKY—c / o RSGB
HI8XL—Via W3HIZ

Continued on page 104

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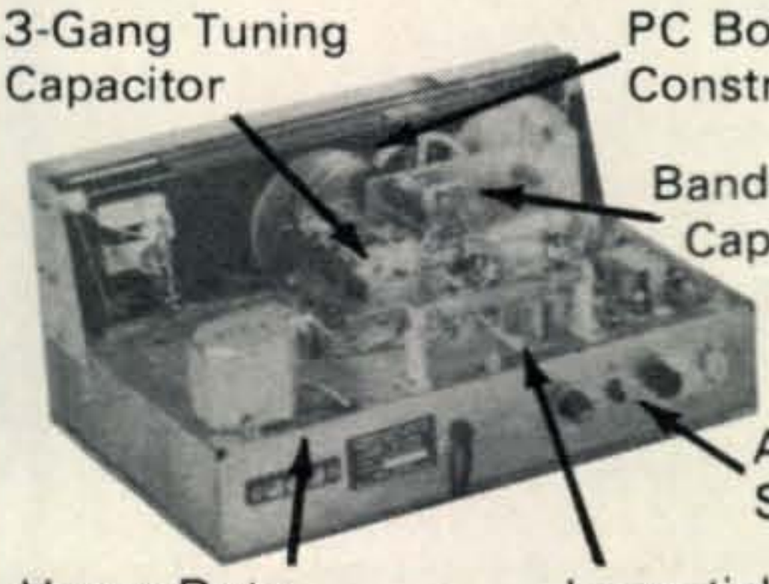

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Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

July	3-4	Venezuela Contest
July	8-17	Calgary Stampede
July	17-18	Colombia Contest
July	17-18	Ontario QSO Party
July	24-25	County Hunters C.W. Contest
Aug.	7-8	DARC WAE C.W. Contest
Aug.	21-22	New Jersey QSO Party
Aug.	28-29	All Asian C.W. Contest
Sept.	11-13	Delta QSO Party
Sept.	11-13	Wash. State QSO Party
Sept.	11-12	DARC WAE Phone Contest
Sept.	22-24	YL "Howdy" Days
Oct.	2-3	VK / ZL / Oceania DX Phone
Oct.	9-10	VK / ZL / Oceania DX C.W.
Oct.	9-10	RSGB 21 / 28 mc Phone Contest
Oct.	16-17	WADM C.W. Contest
Oct.	20-21	YL Anniv. C.W. Party
Oct.	23-24	RSGB 7 mc C.W. Contest
Oct.	**30-31**	**CQ WW DX Phone Contest**
Nov.	3-4	YL Anniv. Phone Party
Nov.	6-7	RSGB 7 mc Phone Contest
Nov.	7	Czechoslovakia Contest
Nov.	7	El Dorado Contest
Nov.	**27-28**	**CQ WW DX C.W. Contest**

Venezuela Contest

Starts: 0000 GMT Saturday, July 3
Ends: 2400 GMT Sunday, July 4

Complete rules in last month's Calendar. Include a remittance of $1.00 or its equivalent in IRC's with your application. Logs must be postmarked before August 1st and go to: Radio Club Venezolano, Independence Contest, P.O. Box 2285, Caracas, Venezuela.

Calgary Stampede

The Calgary A.R.A. will be operating its station VE6NQ from the grounds of the Calgary Stampede between 1900 and 0500 GMT daily, from July 8th to the 17th.

Several transmitters will be active, depending on prevailing conditions, on the following frequencies: 3560, 3780, 3825, 3900, 3943, 7060, 7190, 7225, 7270, 14060, 14150, 14250, 14336, 21060, 21240, 21300, 28060, 28500, 28600. Call-ins will be accomodated.

A special QSL card will be sent to all contacts. A QSO with VE6NQ during this period will count as two Calgary contacts for those working for their Calgary Stampede Certificate.

Those visiting the Stampede will find exhibits and displays of amateur equipment.

Your QSL's go to: Calgary Amateur Radio Association, P.O. Box 592, Calgary 2, Alberta, Canada.

Colombia Contest

Starts: 0001 GMT Saturday, July 17
Ends: 2359 GMT Sunday, July 18

This is Colombia's annual contest commemorating the anniversary of its independence.

Work HK's as well as other DX, on all bands 10 thru 80, on c.w. and phone.

Exchange: The conventional RS/RST report plus a progressive 3 figure QSO number starting with 001. The HK's will include their district number in their report.

Scoring: *Stations in the Americas:* HK contacts count 3 points, others 1 point.

Stations in other continents: HK contacts 5 points, 1 point for others.

The multiplier is derived from the sum of HK districts and different countries worked on each band. Final score, total QSO points times the sum of the multiplier from all bands.

Awards: Certificates to the top single operator and multi-operator station, both single and multi transmitter, in each country. There are also awards for the continental winners and the world leaders.

Include a summary sheet with your log, check your score for duplicates and accuracy, and name and address in BLOCK LETTERS.

Mailing deadline is September 30th to: Independence of Colombia Contest, P.O. Box 584, Bogota, Colombia.

Ontario QSO Party

Starts: 1700 GMT Saturday, July 17
Ends: 2400 GMT Sunday, July 18

Sponsored by the Radio Society of Ontario this event will activate many VE3's in resort areas not normally on the air. The same station may be worked on different bands and modes for QSO points.

Exchange: QSO nr., RS/RST and QTH; county for VE3's, ARRL section or country for others.

Scoring: Ontario stations score 1 point per QSO, multiply by number of ARRL sections and foreign

*14 Sherwood Road, Stamford, Conn 06905

countries worked. Others score 3 points per VE3 contact, multiply by number of Ontario countries worked on each band.

Frequencies: 3560, 3685, 3855, 3909, 7030, 7240, 7290, 14040, 14140, 14225, 14290, 21050, 21300, 28100, 28600, 50250, 50360, 144.-144.5, 145.8

Awards: Certificates to the highest scoring station in each ARRL section and each Ontario county. (min. of 25 contacts)

Mailing deadline is August 31st to: Radio Society of Ontario, Att: Contest Chairman, P.O. Box 334, Toronto 18, Ontario, Canada. A s.a.s.e. will get you a copy of results.

County Hunters C.W. Contest

Starts: 0000 GMT Saturday, July 24
Ends: 2400 GMT Sunday, July 25

The C.W. County Hunters Net plans to have many mobile and portable stations active from many of the rarer counties.

The same station may be worked on each band for QSO points. Portable and mobile stations changing counties may also have repeat contacts. Stations on county lines exchange only one number but each county may be counted as a multiplier.

Exchange: QSO nr., Category (portable and mobile) RST, state (province or country) and county (for U.S. stations).

Scoring: QSO's with fixed stations 1 point, with portable or mobiles 3 points. Multiply QSO points by number of U.S. counties worked.

Frequencies: 3575, 7055, 14070, 21070, 28070.

Awards: Three separate categories. Certificates to:

1. Highest fixed or fixed portable in each state, province or country, 300 or more points.

2. Highest score in each state by a portable operating from a county that is not its normal QTH, 300 or more points.

3. Highest scoring mobile in each state operating from 3 or more counties, with a minimum of 15 QSO's per county.

There are also Trophies to the Top single operator Portable and Mobile station in the United States.

Stations with 100 or more QSO's must include a check sheet of counties worked.

Mailing deadline is September 1st to: C.W. County Hunters Net, Att: Jeffrey P. Bechner, KØWNV, 42 East Signal Drive, Rapid City, South Dakota 57701. Include a s.a.s.e. for results.

DARC WAE Contest

C.W.—Aug. 7-8 **Phone**—Sept. 11-12
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 17th running of this popular contest by the DARC.

All bands may be used, 3.5 thru 28 mc. Two classifications, single and multi-operator (single xmtr.) And a compulsory 12 hour rest period in the 48 hour contest period, which may be taken in up to 3 periods any time during the contest.

Exchange: The usual five and six digit serial number, RS/RST plus a progressive QSO number starting with 001.

Points: One point per QSO, except on 3.5 mc where it will count 2 points.

Multiplier: For non-European stations, number of European countries worked on each band. (see WAE country list)

Europeans will use the latest ARRL list, and in addition each call areas in following countries: JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9 and UAØ.

To promote more activity on 40 and 80 meters, the multiplier on 40 may be multiplied by 2, and on 80 by 3, before it is added to the total multiplier.

Final Score: Total QSO points plus QTC points multiplied by sum total countries from all bands.

QTC- Traffic: This feature is often overlooked by contestants. Additional point credit may be realized by reporting at QTC.

A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to a European station.

The general idea being that after a number of European stations have been worked, a list of these stations can be reported back during a QSO with another station. An additional 1 point credit may be claimed for each one.

A QTC can only be sent from a non-European to a European station.

A QTC contains the time, call and QSO number of the station being reported. ie: 1300 / DJ2YA / 134.

A QSO can be reported only once and not back

DARC WAE 1970 Contest Results

C.W.

U.S.A.

W1PL . . . 108,199
W1TW . . . 33,102
W1WMH 40
W1BGD/2 104,940
VE2MW/W2 37,440
WB2KTO . 27,072
W3AU . . . 171,496
W3AFM . . 29,192
W3AIZ . . . 22,736
W3ARK . . 13,340
W3QQL . . . 7,644
W3MDO 2,875
WA3HMM . . 240
K4PQL . . . 95,082
K4II 50,339
W4HOS . . 26,491
K4OD 2,852
W4KMS 946
W4WSF 931
WB4JYB 264
W5JAW . . 44,544
WB6QJD . . 4,416
W6DGH . . . 3,498
W6DQX . . . 2,784
WA8VBY . 27,555
K8BCK . . . 26,765
W8DSO . . . 2,808
WB8EUN . . . 826
W9IOP . . . 29,835
W9QWM 297
WAØKDI . 10,760
WAØVBV . 6,732

Alaska
KL7MF 708

Canada
VE1AIH . . 37,310
VE1EK . . . 1,518
VE2WA . . . 5,670
VE3BUV . 13,545
VE3EEW . 5,625
VE3CQA . . 3,540

Panama
HP1BR . . . 5,975
HP1AC 2,045

PHONE

U.S.A.

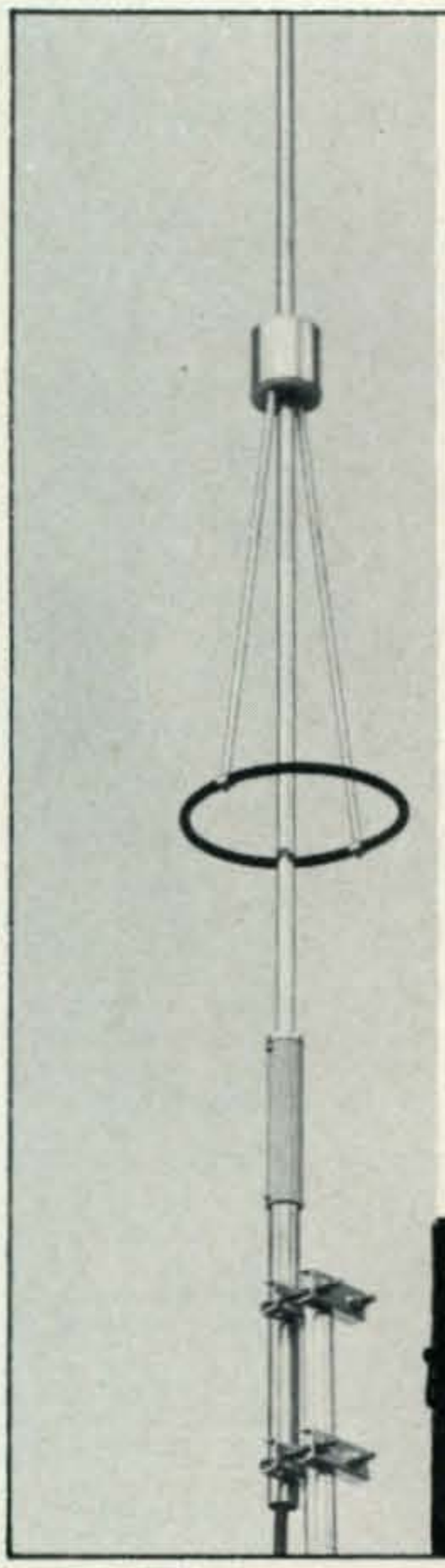
W1UYU . . 64,600
W1DO 42,296
K1DPB . . 21,950
K1GUD . . 10,718
WA1EXE . . . 364
K1WMQ 308
WB2SQN 201,480
W1BGD/2 174,742
W2DKM . 121.728
WA3HRV/2 . . . . . 86.022
DL7KX/W2 71,250
DL6CL/W2 41,976
W2FCR . . 33,712
WB2UIH . 32,956
WA2YCA . 28,674
WA2AYP . 28,665
W2STM . . 21,359
W2LEJ . . . 16,836
WB2MQI . . 8,505
WB2DBK . 5,440
W2CKR . . . 5,236
WA2DKV . 2,223
WA2FOS . . 2,100
WA2AUB . . . 144
WA3KEG 125,640
WA3IXF . . 6,200
W3MDO . . . 3,990
K3ETS 98
W4WSF . . 89,335
W4DQD . . 46,280
WA4UFW 36,480
K4MG 22,173
W4HOS . . 19,140
K4II 2,136
W4KMS . . . 1,300
W4WRY 299
W4ZTW 105
K5MDX . . 38,192
WA5YAS . 13,824
W5WMU/5 . 2,208
K6SVL . . . 21,022
W6DQX . . 13,502
WB6HDH 10,560
W6DGH . . . 8,568
W6KHS . . . 3,024
K7RLS 2,937
W5QQQ/7 . . 2,831
WA7CGR . . 2,044
WA8PWZ . 7,854
WB8EUN . 6,358
W8GKA . . . 6,264
WB8HUD . 1,846
W9ZBD . . . 2,960
WØPAN . . 16,912
WØKB 6,912
WBØABE . 6,400

Mexico
XE1UA . . 12,857
XE1LLS . . 2,112

Panama
HP1JC 2,928

Puerto Rico
KP4AOD . 26,649
KP4DKX . 11,656

Dominican Rep.
HI8LC 403



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Gain—4.17 db
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Bandwidth—±3.5 MHz
Impedance—50-52 ohms
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All Asian 1970 Contest Results

U.S.A. All Band

K4BVD/6	**58,590**
WA6IVN	**54,656**
WB6QJD	**43,704**
W9EWC	**19,926**
W9IOP	8,300
K2DJD	**8,148**
W6DQX	6,776
W6DGH	6,680
WA8QIY	**6,650**
WA5QZG	**5,808**
W8HN	4,240
K6MG	4,104
VE7AZT/W7	**4,002**
W7KS	3,960
K2BQO	3,675
W6JSO	3,627
W6JPH	3,570
KØGJD	**3,503**
K4II	**2,864**
W6GBY	2,668
W2LWI	2,345
W1QV	**2,262**
W4JK	2,212
W9DY	2,077
W4KXV	2,040
W1AX	1,750
W2HL	1,475
W3CRE	**1,472**
WØBMM	**1,325**
W5OB	1,311
W6OKK	1,127
WB6ADA	1,083
W5OJS	896
WA4MSU	836
WØPAN	**810**
W4HOS	600
W6RQZ	440
W6CLP	325
W6NYG	322
W2DF	299
W8MXO	198
W5LRY	144
WA7MMK	98
K7EFB	35
K5MHG/6	24

28 mc

WA6BVY	**10**
W6ISQ	3

21 mc

WA6IVM	**2,968**
WA6CMX	**1,989**
WA3EFH	585
K6CL	506
WB6YIZ	440

14 mc

W6AFI	**9,021**
W1YYM	8,100
W1BGD/2	7,826
W2AIW	5,068
WAØSDC/9	**5,040**
K6IH	3,243
WA7CGR	2,250
WAØKDI	**1,653**
W4ONO	1,302
W4WSF	722
K9TTE	640
WAØVBV	**561**
WA6HOM	450
KØLHE	**240**
W3CBF	192
WA2AYP	96
W2CVW	56
W4UF	30
W1SK	9

7 mc

W6MAR	**3,660**
K6YRD	3,348
W6KJG	3,220
K6RU	2,774
W7HRN/6	1,875
W6ZGM	1,035
WA6LKB	630

Alaska
14 mc

KL7MF	**4,704**

Canada

VE1AI	**432**

14 mc

VE1AE	**30**

Grenada
All Band

VP2GLE	**16**

Panama
All Band

HP1AC	**171**

14 mc

HP1BR	**384**

Multi-Opr.

W3AU	**34,850**
VE1ASJ/W7	9,071

to the originating station.

Only a maximum of 10 QTCs to a station per band are permitted. You may work the same station several times to complete this quota. Only the original contact however has QSO point value.

Keep a uniform list of QTCs sent. QTC 3/7 indicates that this is the 3rd series being sent and that 7 QSOs are being reported.

Awards: Certificates to the highest scorer in each country and call area mentioned in the European multiplier. Awards will also be given to stations having at least half the score of their continental leaders. Newcomers (single oprs. licensed less than one year) scoring at least 10 percent of their continental leader will also be awarded. There is no minimum operating time, but a reasonable score is required to be eligible for an award.

Disqualification: Violation of the rules of the contest, unsportsmanship conduct, or taking credit for excessive duplicate contacts will be deemed cause for disqualification.

It is suggested that you use the official DARC log form. A s.a.e. with sufficient IRC's to cover your request to address below. Figure 40 QSOs to the page if you make up your own.

Mailing deadline for logs is Sept. 15th for C.W. and Oct. 15th for Phone. WAEDC Contest Committee, D-8950 Kaufbeuren, P.O. Box 262, Germany.

(Continued on page 92)

Propagation

BY GEORGE JACOBS, *W3ASK

Despite an accelerated decrease in the sunspot cycle, both 15 and 20 meters are expected to share the honors for optimum DX propagation conditions during July.

Good-to-excellent openings are forecast for 15 meters throughout much of the daylight hours, and to some areas throughout the early evening hours as well. Conditions will favor north-south openings, but some openings are expected to almost all areas of the world. Peak conditions on this band should occur during the late afternoon and early evening hours.

Twenty meters should remain open for DX to one area of the world or another, almost around-the-clock. Optimum conditions are forecast for the early evening hours, the hours of darkness, and the sunrise period, with excellent openings possible to almost all areas of the world.

The seasonal decrease in daytime F-layer ionization coupled with lower solar activity will sharply reduce the number of 10 meter DX openings during July. Nevertheless, some fairly good openings should be possible on north-south paths and to tropical regions, especially during the afternoon hours.

Despite seasonally higher static levels, some fairly good 40 meter DX openings should be possible to many areas of the world during the hours of darkness and the sunrise period. High static levels are expected to reduce the possibility of 80 meter DX openings during July, although some fairly good ones are forecast during the hours of darkness. Not many DX openings are expected on 160 meters during the month, because of seasonally high levels of static and solar absorption.

Short Skip

This month's column contains Short-Skip Propagation Charts for the period July 15-September 15, 1971. DX Propagation Charts for July appeared in last month's column.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for July, 1971

Days	*Rating & Forecast Quality* (2)	(1)	(4)	(3)
Above Normal: 8, 14-15, 19, 24.	B	B-C	A	A-B
Normal: 2, 4, 7, 9-11, 13, 16-18, 22-23, 25, 29-31.	C	D	A-B	B
Below Normal: 1, 3, 5-6, 12, 20-21, 26, 28.	D	E	B-C	C-D
Disturbed: 27.	E	E	C-D	D-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 2 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 high than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describes reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; 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 800 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 Sept. 15, 1971. These Charts are prepared from basic propagation data published monthly by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

Short-skip conditions are expected to be optimum during July, due mainly to the combination of peak sporadic-E ionization and seasonally peak nighttime F-layer ionization. During the daylight hours considerable short-skip openings are forecast for 10 and 15 meters over distances ranging between approximately 500 and 1300 miles, with some openings extending as far out as 2300 miles. Frequent short-skip openings on 20 meters, ranging between 250 and 2300 miles, are expected almost around-the-clock, with peak conditions occurring during the late morning hours and again during the late afternoon and early evening hours.

Good daytime short-skip openings are expected on 40 meters between distances of approximately 100 and 600 miles, with excellent night-time openings between 250 and 2300 miles. Good 80 meter openings are forecast for the daylight hours over distances up to approximately 300 miles, with the range extending up to approximately 2300 miles during the hours of darkness. While no 160 meter short-skip openings are expected during the daylight hours, some openings should be possible during the hours of darkness for distances up to about 1300 miles. During periods of lower than usual static levels, 160 meter night-time short-skip openings may extend out as far as 2300 miles, the maximum distance possible by one-hop propagation.

V.H.F. Ionospheric Openings

The big v.h.f. propagation news during July should be the numerous 6 meter, and occasional 2 meter openings that are likely to occur as a result of a seasonal peak in sporadic-E propagation. Fairly frequent 6 meter openings should be possible during the month, over distances between approximately 500 and 1300 miles, with some openings extending out to as much as 2300 miles. While short-skip openings can occur at just about any time of the day or night on 6 meters, statistics indicate that they peak a few hours before noon and again during the early evening hours. During many of the openings expected during July, signal levels should be exceptionally strong.

During intense sporadic-E openings, as the skip distance is observed to be *decreasing* on 6 meters, the MUF is *increasing*. When you can hear skip stations on 6 meters as near as about 500 miles, check 2 meters for an opening in the same direction. Generally, when the 6 meter skip distance falls below about 500 miles, 2 meter openings should be possible between distances of about 1000 and 1300 miles.

The evening hours of July 29 should be a good time to check for meteor openings on the v.h.f. bands. This is the time when the *Delta Aquarids* shower is expected to peak, with a predicted meteor count of between 20 and 30 an hour. An increase in meteor activity should also be noticeable a few days before and a few days after the peak.

July is usually a poor month for Trans-Equatorial (TE) propagation, and few if any openings are expected. If you live in the southern third of the USA, and are very patient, check the 6 meter band for the occasional TE opening that may occur to South America between 8 P.M. and midnight.

Some v.h.f. short-skip openings resulting from auroral ionization should be possible during July. Check the "Last Minute Forecast" appearing at the beginning of this column for periods that are predicted to be disturbed or below normal. These are the dates upon which auroral v.h.f. openings are most likely to occur during the month.

Sunspot Cycle

The present sunspot cycle is now decreasing at a more rapid pace than during the past several months. The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 58.2 centered on March, 1971. This results in a 12-month smoothed sunspot number, upon which the cycle is based, of 96 centered on September, 1970. This is the first month since November, 1967 that the level of solar activity has dropped below 100.

A smoothed sunspot number of approximately 70 is now forecast for July, 1971.

CQ Short-Skip Propagation Chart
July 15—September 15, 1971

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

Distance From Transmitter (Miles)

Band (Meters) / *50-250*	*250-750*	*750-1300*	*1300-2300*
10 — *Nil*	07-09 (0-1)* 09-13 (0-3)* 13-17 (0-1)* 17-21 (0-2)* 21-23 (0-1)*	07-09 (1)* 09-13 (3)* 13-17 (1-2)* 17-21 (2-3)* 21-07 (1)*	07-09 (1-0)* 09-13 (3-1)* 13-17 (2-1)* 17-21 (3-1)* 21-07 (1-0)*
15 — *Nil*	07-09 (0-2)* 09-13 (0-3)* 13-17 (0-2)* 17-19 (0-3)* 19-21 (0-2)* 21-07 (0-1)*	07-09 (2)* 09-13 (3)* 13-17 (2)* 17-19 (3)* 19-21 (2)* 21-23 (1-2)* 23-07 (1)*	07-09 (2-1) 09-13 (3-2) 13-17 (2-3) 17-19 (3-4) 19-20 (2-3) 20-23 (2-1) 23-07 (1-0)
20 — 09-00 (0-1)*	06-09 (0-2)* 09-15 (1-4)* 15-20 (1-3)* 20-00 (1-2)* 00-06 (0-1)*	06-09 (2-3)* 09-16 (4)* 16-21 (3-4)* 21-00 (2-3)* 00-06 (1-2)*	06-09 (3-2) 09-15 (4-2) 15-16 (4-3) 16-21 (4) 21-23 (3) 23-00 (3-2) 00-06 (2-1)
40 — 07-11 (1-2)* 11-16 (2-4)* 16-20 (3-4) 20-22 (1-2) 22-07 (0-2)*	07-09 (2-4)* 09-11 (2) 11-16 (4-2) 16-17 (4-3) 17-20 (4) 20-22 (2-4) 22-04 (2-4) 04-07 (2-3)	07-09 (4-1) 09-16 (2-1) 16-17 (3-1) 17-20 (4-3) 20-04 (4) 04-05 (3-4) 05-07 (3)	07-17 (1-0) 17-20 (3-2) 20-05 (4) 05-07 (3-1)
80 — 06-11 (3-4) 11-15 (4-3) 15-21 (4) 21-04 (3-4) 04-06 (4)	07-09 (4-1) 09-11 (4-0) 11-15 (3-0) 15-17 (4-1) 17-19 (4-2) 19-21 (4-3) 21-06 (4) 06-07 (4-2)	07-09 (1-0) 09-15 (0) 15-17 (1-0) 17-19 (2-1) 19-21 (3-1) 21-04 (4) 04-06 (4-3) 06-07 (2-1)	07-17 (0) 17-19 (1-0) 19-21 (1) 21-03 (4-3) 03-04 (4-2) 04-05 (3-2) 05-06 (3-1) 06-07 (1)

*Predominantly Sporadic-E Openings

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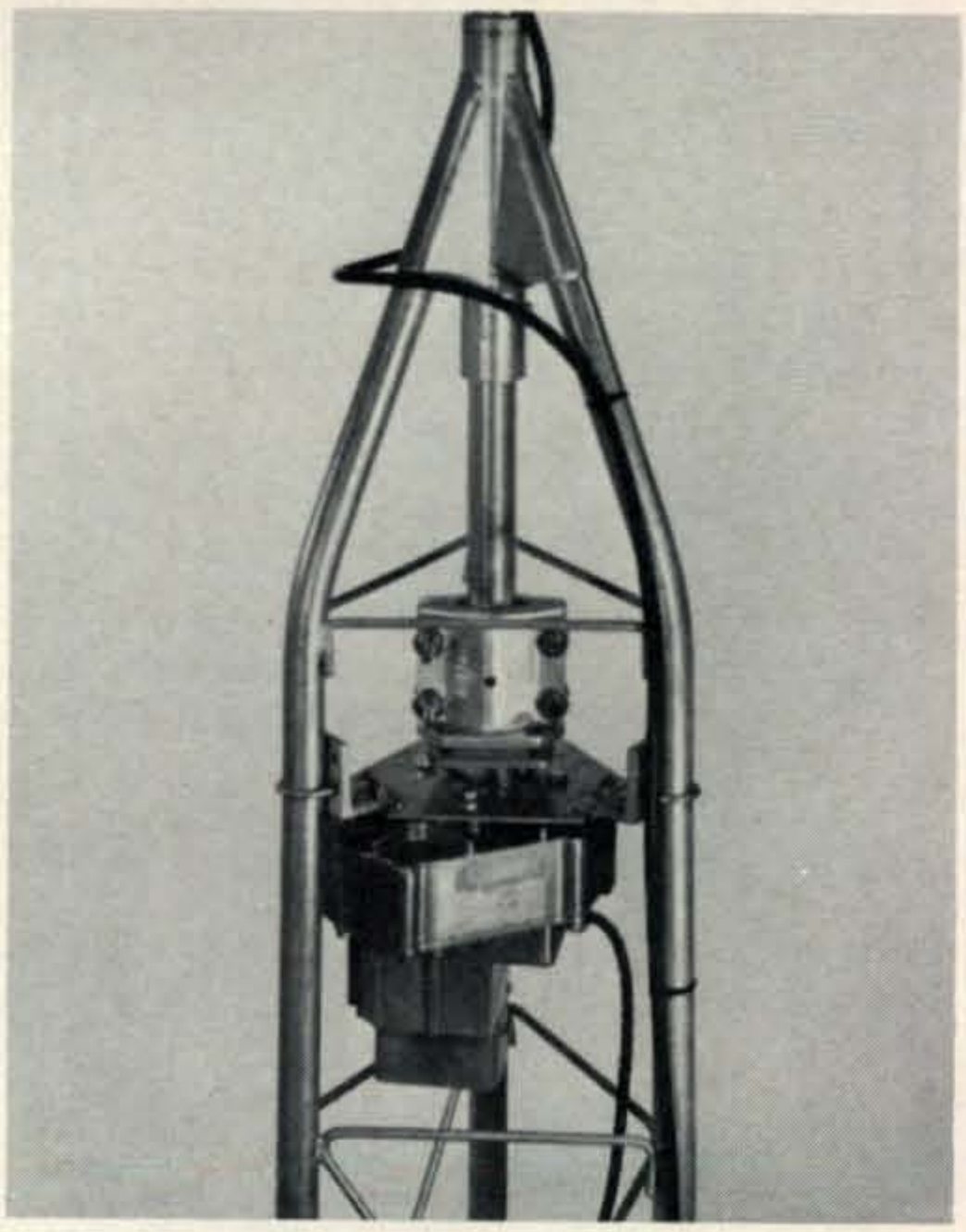

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HAWAII
Openings Given In Hawaiian Standard Time‡

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

ALASKA
Openings Given In GMT†

To:	*Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern	*Nil*	00-02 (1)	12-15 (1) 22-01 (1) 01-04 (2) 04-06 (1)	07-10 (1)
Central USA	*Nil*	21-00 (1) 00-03 (2) 03-04 (1)	13-16 (1) 22-00 (1) 00-03 (2) 03-05 (3) 05-06 (2) 06-08 (1)	08-12 (1)
Western	01-04 (1)	17-22 (1) 22-00 (2) 00-03 (3) 03-04 (2) 04-05 (1)	13-14 (1) 14-15 (2) 15-19 (3) 19-01 (2) 01-03 (3) 03-05 (4) 05-07 (3) 07-09 (2) 09-11 (1)	07-09 (1) 09-12 (2) 12-13 (1) 09-12 (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 he Chart. GMT is 5 hours *ahead* of EST 6 hours *ahead* of MST and 8 hours *ahead* of PST For example, when it is 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.

July 9, 10, and 11, 1971

RADIO EXPO '71

Seventy years ago Guglielmo Marconi successfully received radio signals in the United States from across the Atlantic. Since that time, the skills and talents of Radio Operators have played an important part in the growth of the communications industry. You are invited to see just how far we have come at RADIO EXPO '71.

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Radio Expo '71 will bring together, for two full days, talented electronics people interested in the development of the state of the art.

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- upwards of 50,000 square feet of enclosed exhibit area
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- U.S. Army
- U.S. Navy
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You are invited to join us at Radio Expo '71:

- The two-day advance purchase ticket price per person is $3.00,
- the at-gate price $3.50.

LOCATION

Radio Expo '71 will be held at the Lake County Fair Grounds, halfway between Chicago and Milwaukee at the intersection of U.S. 45 and Illinois 120. It is 4.3 miles west of the Belvedere-Waukegan exit of Interstate 94 and 6.0 miles west of U.S. 41.

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THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll

53—Michael E. Nickolaus, WAØKGD, 3-17-71.
53—Donald E. Birch, K7NEQ, 4-1-71.
(See Foto-Story April '70 *CQ*)

THE July, "Story of The Month" is:

Michael E. Nicolaus, WAØGD
All Counties No. 53,3-17-71

Mike was born November 18, 1942 on a farm in Aurora, Hamilton County, Nebraska, where he lived until the age of 16.

At the age of 18, he fell in love with and married Dolores D. Dieckmann and they have 3 children, Lori Jo age 8; Jeffrey age 7 and Rhonda age 4.

Mike was first licensed as WNØKDG in 1964, became WAØKGD in 1965 and acquired his Advance Class license in 1970. He has kept active since 1964 and accidently started County Hunting in 1966 by checking into the 75 meter net. Vic, WØGYM (All Counties No. 6, 4-4-68) gave him great encouragement and help.

Not satisfied with just collecting counties, Mike has made many mobile trips and given out hundreds of counties and has personally met at least 150 County Hunters, including Vic, WØGYM who has started so many into amateur radio and county hunting.

WAØKGD also has DXCC with a score of about 185 worked. Other activities include membership in the Lincoln Amateur Radio Club, President of LARC in 1970, chairman of their Awards Committee which sponsors the Nebraska QSO Party and the Cornhusker Counties Certificate. Holds OPS appointment, was manager for two years of the Nebraska Storm Net. Also does much c.w. work phone patching, teaches code and theory classes and other Public Service work.

Mike sure got a big thrill when he was able to give Harry, K8KOM (All Counties No. 9, 5-13-69) his last county, Keya Paha, Neb.

The present equipment at WAØKGD includes a Galaxy V with v.f.o. SB-200 linear, TH-3 MK2 beam and dipoles for 40 and 80.

Mike works for IBM as a customer engineer.

Our records show he was issued: USA-CA-500-#580 in July 1966; then in January 1971 1000#226, 1500#156, 2000#124,2500#98 and USA-CA-3000-#67. The big one, All Counties No. 53 was issued 3-17-71.

Mike's local newspaper did a nice story on him which is fine public relations work for amateur radio and county hunting.

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

USA-CA HONOR ROLL

3000		2000		1000	
W6JHV	71	WPE9ETT	128	W4LXI	233
W2EQK	72	W4LXI	129	KØWNV	234
W4LXI	73	WA5ALB	130	W1KVA	235
2500		**1500**		**500**	
W6JHV	102	W4LXI	160	WPE6BJD	842
WPE9ETT	103	KØWNV	161	W4LXI	843
W4LXI	104	K8IQB	162	W5HUM	844
				CR6E1	845
				W2PDB	846

Awards Issued

Mike Nicolaus, WAØKGD qualified for All Counties No. 53 and how fortunate to have his story and photo in this month.

Don Birch, K7NEQ also qualified for All Counties #54 and brought the endorsement of his USA-CA-2500-#56 to All 14 mc 2×SSB.

John Nelson, W6JHV who qualified for All Counties #51 on 2-24-71, also acquired USA-CA-2500 and 3000.

Gary Medford, W2EQK applied for USA-CA-3000.

Ed Alston, W4LXI caught-up on his paper work and received USA-CA-500 through 3000 and I believe he does not have many to go to complete All Counties.

Andy Draeger, WPE9ETT added USA-CA-2000 and added All 14 mc 2 × SSB endorsement to his USA-CA-1000.

Jeff Bechner, KØWNV was issued USA-CA-1000 and 1500 endorsed All A-1, and raised the endorsement to his USA-CA-500 to All 2 Way A-1 Mobiles, the first such endorsement.

Myron Braun, K8IQB acquired USA-CA-1500 and raised the endorsement of his USA-CA-500 to All 7.2 SSB Mobiles.

Doug" Fairbanks, W1KVA sent for USA-CA-1000.

Jack Winther, WPE6BJD qualified for USA-CA-500 endorsed All Phone and wishes to thank all the County Hunters who were so kind to answer his reports with their QSLs, notes and photos. His returns were almost 75%, which is a fairly good percentage.

Bill Bailey, W5HUM was issued a USA-CA-500 (I wonder how many kid him about the ole song about Bill Bailey and ask him to hum it for them, Hi).

Jose Maria Bronco de Matos, CR6EI qualified for a USA-CA-500 endorsed All A.-1.

Ed Nadolny, W2PDB also acquired a USA-CA-500 endorsed Mixed.

Awards

Ten O'Clock Line Award: A new county award named after an Indian treaty as explained on the award. The Ten O'Clock Line runs through, or into, eight Indiana counties: Vermillion, Parke, Clay, Putnam, Owen, Monroe, Brown, and Jackson. The award is available in two ways: By working the required number of counties in classes as listed; or by working 10 holders of the award. Class A-8 counties plus 3 Johnson County (Indiana) stations. Class B-6 counties plus 2 Johnson County stations. Class C-5 counties plus 1 Johnson County station, Class D-10 holders of the award. Send GCR, log data and $1.00 or 10 IRCs to K9EMV, Win Hardisty, 116 Mercator Drive, Greenwood, Indiana 46142. (This data courtesy of *MARAC Newsletter*).

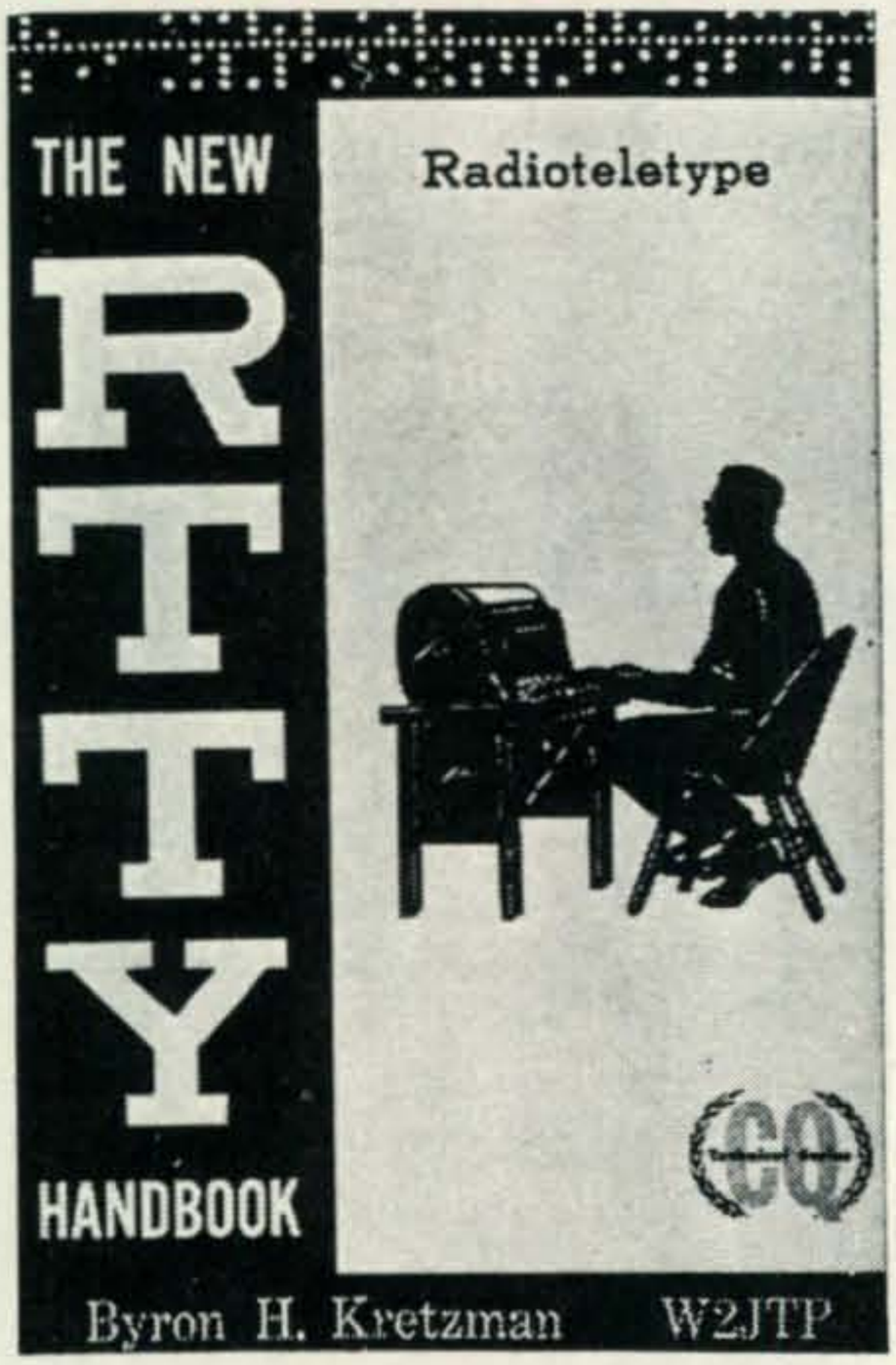
Thunder Bay Award: On January 1, 1970, the twin Canadian cities of Port Arthur and Fort William, Ontario were amalgamated into one unit to be known as Thunder Bay, Ontario. To honor this union, the Lakehead Amateur Radio Club has made this award available to all radio amateurs and short-wave listeners. For VE / VO, eight different Thunder Bay stations must be worked (or heard for s.w.ls) since January 1, 1970. For all others, five different Thunder Bay stations must be worked (or heard for s.w.ls) since January 1, 1970. Contacts may be on mixed modes and bands. No QSLs are required, send full log data on stations worked or heard and one Canadian dollar or 10 IRCs to: Lakehead Amateur Radio Club, Awards Committee, P.O. Box 571, Station "P", Thunder Bay, Ontario, Canada.

Mike, WAØKGD working that needed county.

Morro Bay Centennial Award: Sponsored by the Estero Radio Club of Morro Bay, California to celebrate and in honor of Morro Bay's 100th year. The Celebration runs from July 1970 to July 1971 and contacts must be made during that period. Work eight stations in San Luis Obispo County including three club members, any band or mode. Club members include: W6BNF, JTA, STG, TYR, PPZ, ZRR, K6TOE, WA6DDQ, DEI, FHV, GOR, MGG, QDA,

Thunder Bay Award.

"THE NEW RTTY HANDBOOK"



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City_____State_____Zip_____

WB6ECM, FOG, PGK, SBH, VKN, YCH, WN6DHS, KOG, NFB. Send log data and $1.00 to WA6DEI, Custodian, Box 1118 San Luis Obispo, California 93401.

Worked All Frankfurt Award: The WAF (German) award is available to all amateurs who have the required QSLs. Only QSLs count which are marked either DOK#F Ø5 and / or "Member Radio Club of Frankfurt". Each such card counts 1 point per band. If the same station has been worked on all 5 short wave bands, it counts 8 points. A card from the club station DLØFM or DLØFMA counts 5 points, but only once and no band multiplier can be used. QSLs marked either mobile or portable are valid. All QSLs since January 1, 1960 are valid. Applicants in DA / DJ / DL / DK / DM need 35 points. Applicants in Europe (WAE Countries) need 25 points. DX applicants need 15 points. For 144 mc and higher bands, 15 points are needed. Send GCR list, 10 IRCs or U.S. $1.00 to Award Custodian, DL6OX, Joe Hillmann, Pfungstr 3, 6 Frankfurt / M, West Germany. Applicants who have also received the "Worked Frankford Radio Club" award of the Frankford Radio Club in Penna, U.S.A. will get a gold seal on the WAF award at no extra cost.

Notes

If you were fortunate enough to work KCØKC during the big ICHN Convention in Kansas City, July 1 through July 5, for a special QSL send s.a.s.e. or 2 IRCs to KCØKC, P.O. Box 753, Shawnee Mission, Kansas 66201.

Remember the County Hunters CW Contest, July 24-25. See full details in CONTEST CALENDAR by Frank, W1WY. Logs go to Jeff Beckner, KØWNV, 42 East Signal Drive, Rapid City, South Dakota 57701. Yes, there is much c.w. activity by Counters Hunters. Jeff, KØWNV in less than two years he has had a mobile rig has given out 169 counties in Ø and 7 land on c.w., this includes 57 of the 67 counties of South Dakota.

A note from Dick Randall, K6ARE has an interesting idea for all of you who have run out of wall space and to you who want to save money on buying a special frame for each award. Dick got a large 3-ring binder and a bunch of clear plastic sheet protectors and assembled his many awards in the binder. Very few of the awards required trimming an edge or two in order to fit, and each is well protected

Continued on page 88

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AMATEUR—2 meters TRANSMITTER-RECEIVER

(from 144 to 148 MHz)

- 8 to 10 WATTS
- SOLID STATE
- 8 CHANNELS
- HIGH PERFORMANCE RECEIVER

Professional Quality for the Professional Amateur!

SPECIFICATIONS

Frequency Coverage: 144—148 MHz
Dimensions: 6¾"W x 2⅝"H x 9"D without tray
Weight: 5 lbs.
Microphone: Controlled Magnetic
Antenna Impedance: 50 ohms

RECEIVER
Sensitivity: At least 0.5 μV for 20 db Quieting, 0.35 μV for 12 db Sinad
Selectivity: 16 KHz @ 3 db
Freq. Tolerance: .001% from —30°C to 60°C
Spurious Rejection: At least 60 db
Audio Power: 2 W. w/less than 10% distortion
Squelch Range: 0.2—0.8 μV
Intermediate Freq.: 10.7 MHz & 455 KHz

TRANSMITTER
Emission: 16F3 (Frequency-Modulated)
Freq. Tolerance: .0005% from —30°C to 60°C
RF Power Output: 8 to 10 Watts
Spurious & Harmonic Attenuation:
More than 50 db below RF carrier
Deviation: Internally adjustable 0—10 KHz

POWER REQUIREMENTS
Receive: Squelch standy: 0.175 Amp.
Maximum audio: 0.500 Amp.
Transmit: 1.90 Amperes
Voltage: 13.8 VDC—Neg. Ground only

The Finest Printed Circuit Materials and Exclusive Design Techniques Provide the Best in Professional Quality and Performance

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Q AND A

BY WILFRED M. SCHERER,* W2AEF

Effect of Silcon-Diode Rectifiers On Voltage-Regulator Tubes

QUESTION: Will changing the rectifier tube to silicon diodes or to one of those solid-state replacements damage the voltage-regulator tubes? This is in no particular piece of equipment, but mostly receivers in general.
ANSWER: Changing to solid-state rectifiers usually increases the supply voltage by 10-40 volts, depending on the original supply voltage and the current load. This will not harm the regulator tubes as long as the total current through the tube is not increased beyond about 30 ma.

This can be checked most easily by inserting a milliammeter in the negative lead or ground lead to the regulator tube. Also measure the voltage across the series dropping resistor to make sure the wattage rating for the resistor is not exceeded ($P+E^2 \div R$)

Increased Voltage Tolerance With Crystal R.F. Probes

QUESTION: Have you any suggestions for a crystal-diode r.f. probe that will handle more than 30 volts r.m.s. to which most are limited? I'd like to determine power levels into a 50-ohm dummy load by measuring the r.f. voltage for 100 watts or so.
ANSWER: The voltage tolerance for crystal-diode r.f. probes may be increased by connecting several diodes in series as shown at fig 1. The voltage tolerance is that of one diode times the number of diodes used. Three diodes with a 30 v. r.m.s. rating thus will handle 90 v. r.m.s. which when used across a 50-ohm load will indicate up to 160 watts of power ($P = \frac{E^2}{R}$). At levels below 1 volt the accuracy will deteriorate from that of a single diode due to the cumulative effect of the non-linear diode characteristics at low levels. Since the diodes are in series, the total input capacitance will be lower than with one diode. A probe constructed on this basis is the Heathkit Model PK-3.

Another way out is to employ a capacitive voltage divider as shown at fig. 2. C_1 should be made as small as possible to minimize reactive loading; while C_2 is selected to provide the ratio for the desired voltage division such as 5:1 or 10:1. C_1 should be adjusted for calibration against a known voltage, preferably at the desired frequency. Connecting leads must be kept short.

In the May Q & A Column we had a query about transceive operation with the 75A-4 receiver and requested such data from readers. A number of replies were received calling our attention to an article in *CQ*, May 1965 which described a setup for transceiving with the 75A-4 in conjunction with the Hallicrafters HT-32. Although the original inquirer did not state the type transmitter to be used with the 75A-4, this article might have produced some principle ideas on how to go about the job with various type transmitters. We mention this here in the event others should like to try out similar schemes with other rigs.

NCX-5 Drift

QUESTION: What can be done to reduce frequency drift on the NCX-5 Transceiver?
ANSWER: It has been reported that NCX-5 drift may be minimized by changing the v.f.o. transistor from a 2N706 to a 2N706*A*.

BCI to Amateur-Band Receiver

QUESTION: I have a 130-foot dipole fed at the

(continued on page 92)

* Technical Director, *CQ*

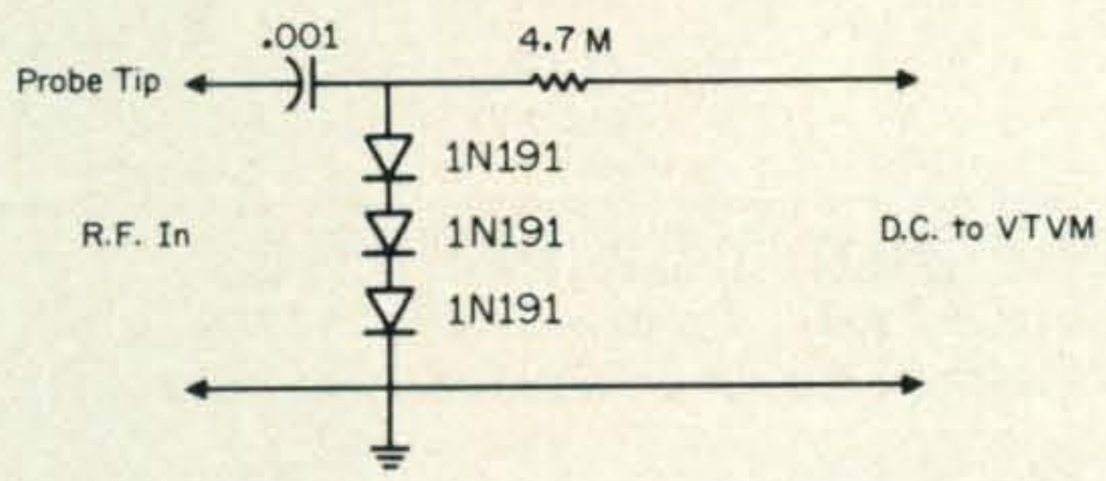

Fig. 1-R.F. probe using three crystal diodes to increase voltage-input tolerance.

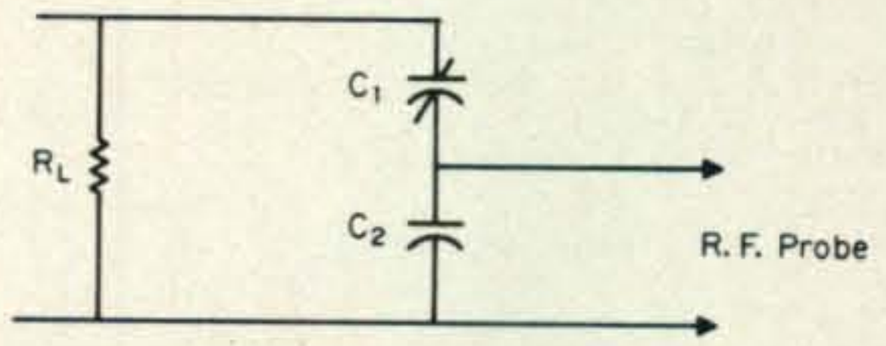

Fig. 2-Capacitive voltage divider for increasing r.f. probe range as described in text. For 5:1 ratio make C^1 = 0.5-2 mmf and C^2 = 10 mmf. For 10:1 ratio make C^1 = 2-5 mmf and C^2 = 22 mmf.

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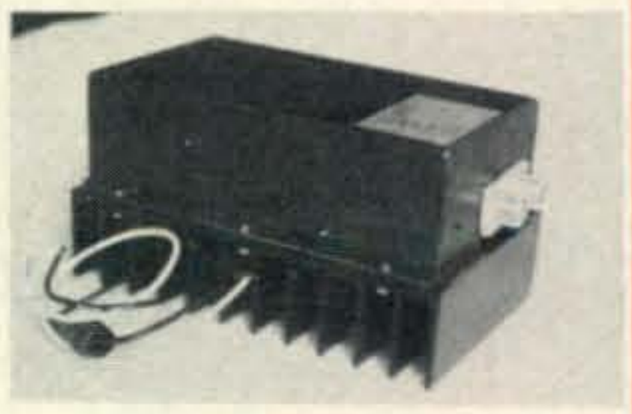

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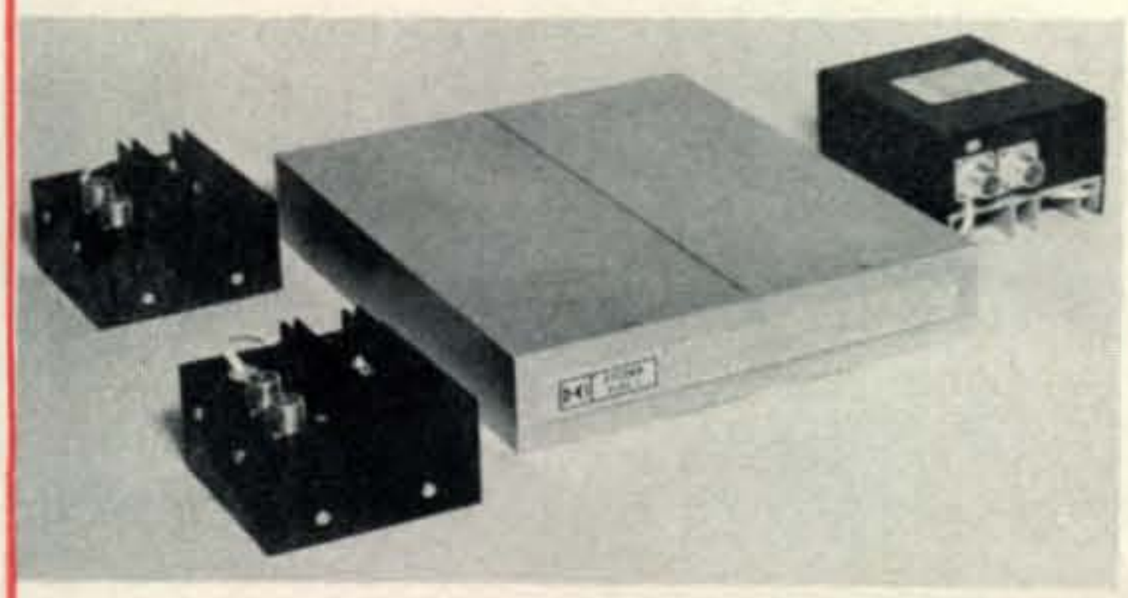

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SURPLUS sidelights

BY GORDON ELLIOT WHITE *

ADD one more to the roster of surplus converters (or demodulators or terminal units) useful by the radio Teletype crowd. The Technical Material Corporation model CFA-1 has appeared in surplus channels in reasonable numbers in recent months, and is attracting interest by RTTY'ers. The military nomenclature appears to be CV-763/URR.

The CFA-1 joins the familiar CV-89/URA-8A, and the less common but occasionally available CV-57/URA-7, CV-60/URA-6, / Boheme 5C, CV-17, Northern Radio 107 and 174, Frederick 1200 and 1203, etc. All are military commercial units, directly usable for amateur or s.w.l. purposes.

Like most of its brethren, the CFA-1 offers a tuning scope, and is a rack-mount module. It weighs 30 pounds, measures 3½ inches high and requires a 19" rack at least 16 inches deep. Power is 117 or 220 volts a.c., and external loop power of 130 volts d.c., 60 ma, must be provided for the printer magnets.

A front panel view of the CFA-1/CV-763 is shown. Controls include main a.c. power switch and associated pilot light, tuning 'scope, sense switch, channel 1 and 2 on/off, threshold, bias, and Mark-Space-Line display selector. The sense switch is used to "invert" the teleprinter signal if it is received "upside down," i.e. with the mark and space information reversed. The threshold potentiometer is used to adjust the demodulator for different values of frequency shift, and the bias control (screwdriver adjustment behind a small cover) can correct for signals overweighted on the length of either the mark or space pulses.

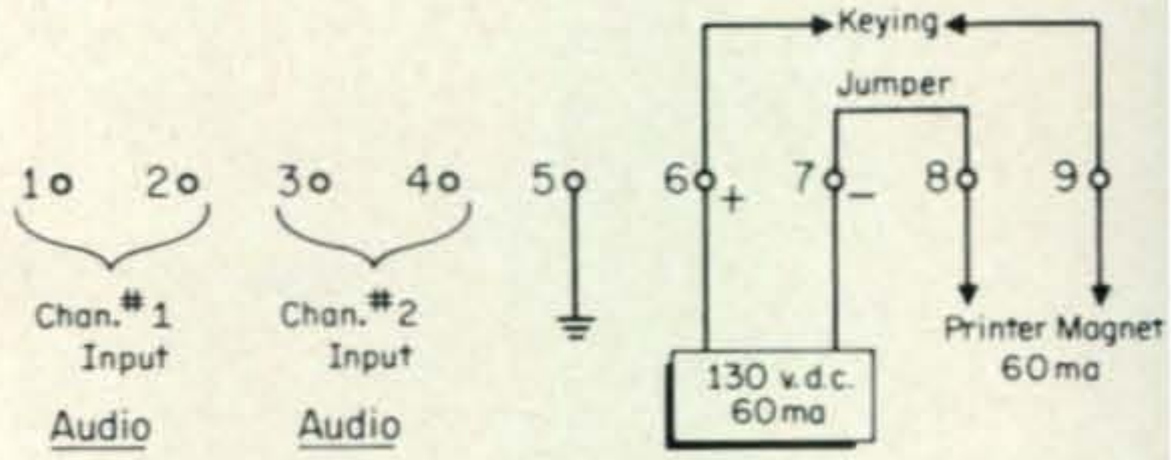

Fig. 1–Rear panel connections on the CFS-1.

Fig. 1 shows the connections to the CFA-1 rear panel. Input should be 600 ohm audio at a level of 20 millivolts or better to achieve full limiting. The CFA-1 is a diversity unit, capable of handling inputs from two different receivers and combining their signals to give far more reliable reception than single-channel systems can offer. If diversity is not used, connect the single audio input to both channels in parallel.

If patch-panel connections are used, terminals 6 and 9 can be hooked into the station loop, but if a hard-wired system is desired, connect the loop power supply to 6(+)and 7, and the printer magnets to 8 and 9. There is simply a jumper in the CFA-1 unit from 7 to 8. The output from the converter is the keyed teleprinter signal, and the keying tube (6Y6G) may be considered as an electronic substitution for relay contacts.

A word about diversity: the use of diversity reception is the best way to add really substantially to reliable copy in the high-frequency bands. Even using a relatively simple, or cheap, second receiver, with a good quality main station receiver, will remove a great deal of garble from RTTY copy. The trick is to place the antennas as far apart as possible, hopefully a half wavelength, but any space is of some value. The theory is that fading is the worst enemy of RTTY reception, and that a null is a phase-controlled phenomena. A half-wavelength away, the signal should be at maximum strength.

Since severe fading just about wipes out the signal momentarily at any single point, any signal is better than none. A decent Command receiver can offer a lot of improvement in a diversity set-up-if you can't afford another

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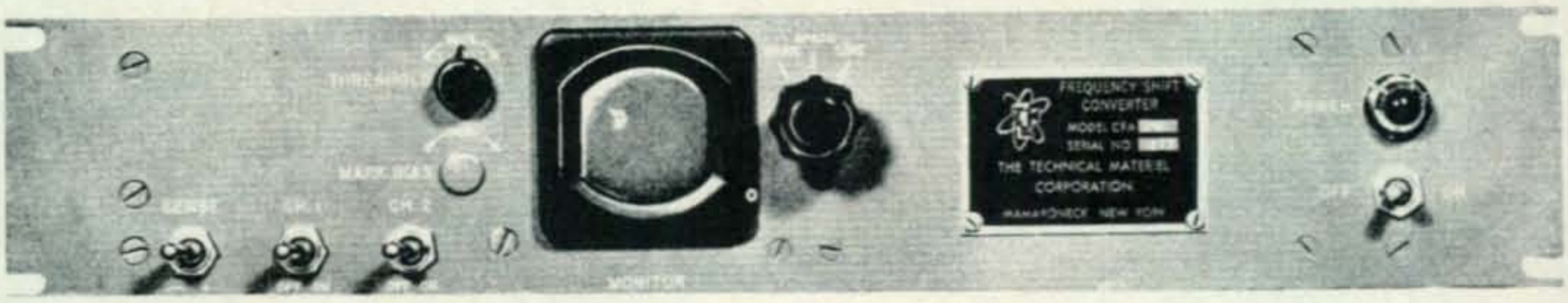

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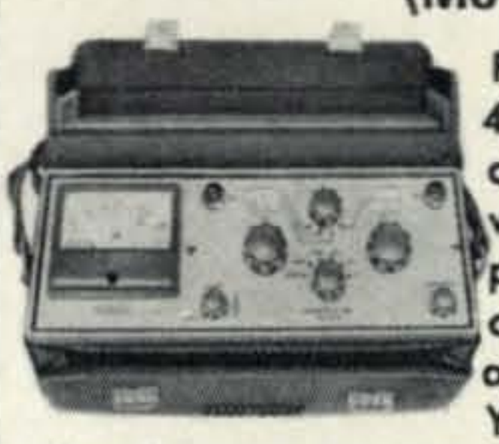

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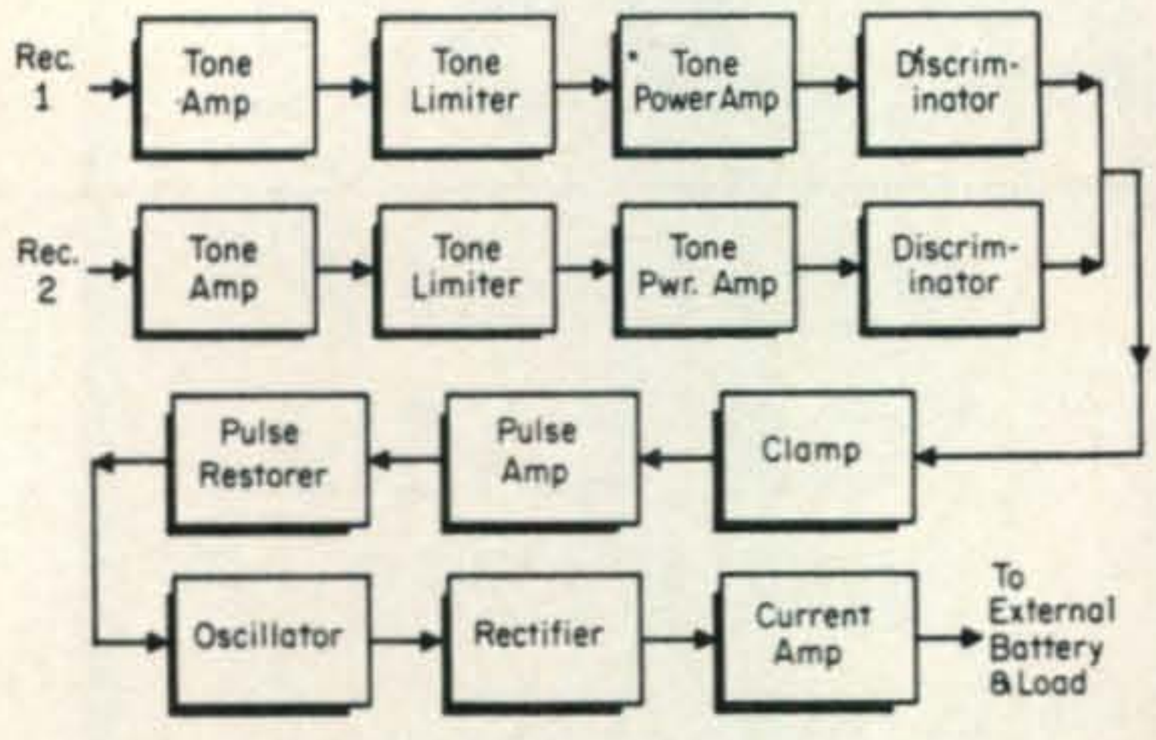

Fig. 2–Block diagram of the CFA-1.

Collins. . . . You will find that in many cases, those noise bursts that wipe out the signal come in shallow fading nulls. Diversity reception on even a cheap, broad, second receiver will often give enough signal to override the noise.

The military, and really good commercial practice, occasionally go to triple frequency diversity, i.e. the same signal sent simultaneously on three frequencies. This is patently impossible for amateurs, as well as being triply wasteful of the spectrum. Space-diversity is not quite as good, but it offers an order of magnitude improvement over single-receiver systems.

The worst part of diversity work for general RTTY purposes, aside from net operations, is the brief nature of the contacts. Where you are moving around in the bands, tuning a second receiver for a fast QSO is just one more operation than can be handled in the time available.

The Boehme 5-C and the CFA-1 are the best of the lot for diversity use. They incorporate both channel inputs in one unit, and require a minimum of converter controls to set up diversity reception. The CV-57, 69, 89, etc. require two converters, one for each channel, thus doubling the cost, and you have to set up a third unit, the combiner, a time-consuming

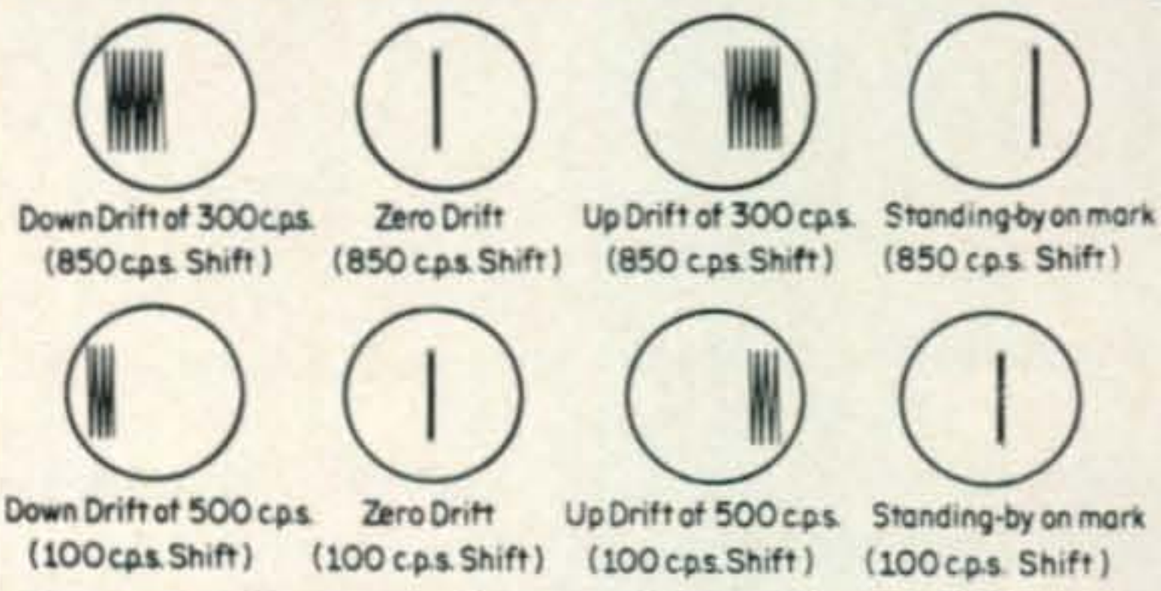

Fig. 3–The monitor patterns for different input connections.

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task. The Northern Radio 107 and 174 terminals offer similar simplicity, differing chiefly in detail. The earlier 107 offers no threshold control and the 174 types require special plug-in networks to change shift values. The 5-C (see *CQ* July 1966 p.97) and the CFA-1 have both threshold controls and can accept different shifts. The 5-C, though far more bulky, has the better shift control, using ganged adjustable inductors, while the CFA-1 relies on threshold control to adjust to different shifts.

The CFA-1 offers decent limiting, in a strictly frequency-modulation reception mode. This is not quite as sophisticated for some forms of difficulties in receiving as the TT-L 2, or the Frederick units, which use decision threshold computer circuitry, but it is quite a respectable design, nonetheless. Shift bias caused by even a rather wide degree of receiver drift is compensated for by a clamp circuit (*V*-8) which counteracts the drift-induced error voltage.

The CFA-1 can be used to receive frequency shift Morse, set up just the same way as for teleprinter work. The bias control then will offer some control of the relative dot and dash spacing. For c.w. Morse, the signal is tuned to one side of the discriminator slope until pulses are obtained in the output. d.c. pulsed Morse can be copied on several types of surplus Morse inkers, of which the Boehme is one, or used to drive an oscillator, or used as the input for a Morse-to-Teletype computer.

Fig. 2 is a block diagram of the CFA-1. Fig. 3 indicates the correct oscilloscope displays for different input conditions. ■

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USA-CA

From page 80

and on easy display for visitors or easily taken to your next club meeting. I must admit that the beautiful USA-CA Award will have to go on the wall-Hi-making room for flags of the 50 states does take space.

Many thanks to Mike Steiniger, K6BEP for the wonderful job he did as Editor of the *Independent County Hunters Newsletter* (as did Bing Miller, WØGV) and I hope that even before you get to read this, another County Hunter will pick up and continue with the *ICH Newsletter*. The missing All Counties recipient was W1BHV / K1CXP, #17, dated January 2, 1970. How was your month? 73, Ed., W2GT.

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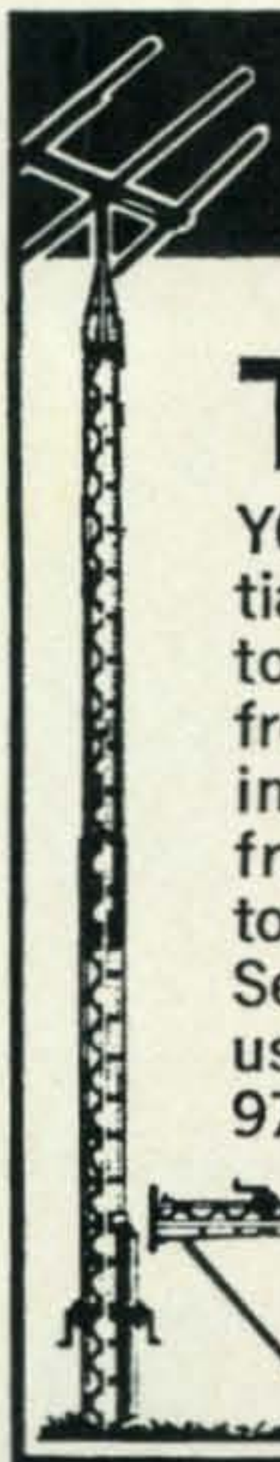

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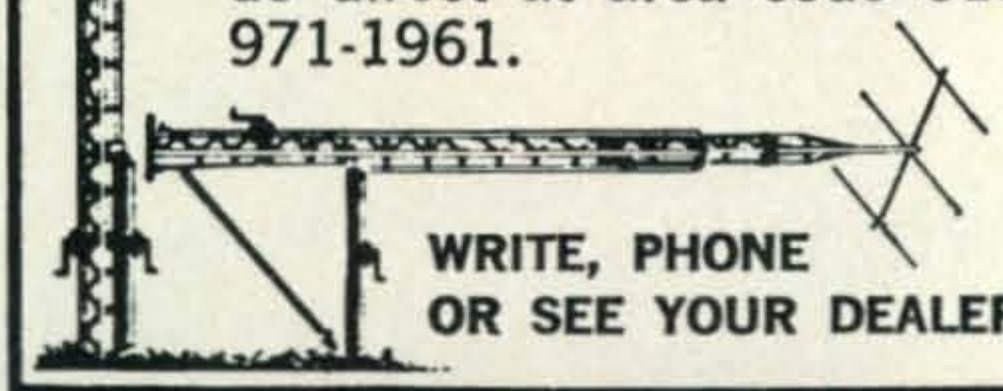

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CQ Reviews IB-101 *(from page 50)*

transmitter frequency may be read with the counter by direct pickup, through a small antenna, of a c.w. or a.m. signal. For s.s.b. the situation is somewhat different, since the carrier is balanced out and the tuneup position cannot usually be used, because the carrier-generator frequency generally is then shifted into the filter passband. A direct readout must then be obtained using outboard mixers or by providing a means for unbalancing the modulator to enable the direct-pickup method to be used. The latter could be handled by a switch or pushbutton setup installed on the transmitter.

Another method of measurement and monitoring is shown at fig. 2C. Using the BC-221 as an oscillating detector, tune it for proper demodulation of the s.s.b. signal as heard with headphones at the BC-221 while the transmitter is being modulated. In other words, "talk the BC-221 on frequency." The transmitter frequency is then determined as described for fig. 2B.

In the case of a transceiver, this method may be used for received signals, inasmuch as the equipment is tuned to the same frequency for both transmitting and receiving, assuming that the oscillators remain exactly on frequency with either mode of operation.

Overall Receiver A.F. Response: This may be found using the setup at fig. 2D. The receiver is tuned through its passband with the audio frequency indicated by the counter noted at the upper and lower 6 db a.f.-output points (half of maximum voltage within the passband). The r.f. gain should be reduced or the a.g.c. disabled to avoid levelling off that might otherwise be caused by a.g.c. action.

Other Applications: These are only a few of the possible applications. Others are checking v.f.o. dial calibration and linearity, g.d.o. calibration (g.d.o. inductor link-coupled to counter), equipment frequency drift, crystal oscillator frequencies, s.s.b. transmitter frequency response, a.f. and r.f. oscillator frequencies when setting up filters, phase-shift networks, RTTY shift, f.m. deviation, making Doppler measurements and many additional procedures where an accurate frequency determination is required.

The Heath Model IB-101 Frequency Counter is priced at $199.95 (kit). The Model IB-102 Scaler kit is $99.95. Another counter, the Model SM-105A is available as a factory assembled job. It is a bit smaller than the IB-101 and counts from 10 c.p.s. to 80 mc using

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two ranges each with a 5-digit readout displayed by light-emitting diodes. Price is $350. Additional data on these products may be obtained from the Heath Company, Benton Harbor, Michigan 49022.

—*W2AEF*

Contest Calendar *(from page 72)*

WAE Country List

C 31, CT 1, CT 2, DL / DJ / DK / DM, EA, EA 6, EI, F, FC, G, GC, GD, GI, GM, GM Shetland Isl., GW, HA, HB / 4U1ITU, HBØ, HV, I, IS, IT, LA, LA / Bear Island JX, JW, LX, LZ, M 1 / 9 A, OE, OH / JØ, OK, ON, OY, OZ, PA / PI, SM / SL, SP, SV, SV / Crete, SV / Rhodes, TA / European part, TF, UA / UV / UW 1 thru 6, UB / UY, UC, UN, UO, UP, UQ, UR, UA / Franz Josef Land, YO, YU, ZA, ZB 2, 3 A, 9 H. (4U1 HB)

Editor's Note

A recent proposal by Herb Lacey, K4FBG, to phase out State QSO parties and have Call-Area QSO parties instead, was made as a possible solution to ease the crowded Contest week-ends.

Figuratively speaking, the plan has some merits. The reasoning being that there are 50 states and eventually we could end up with a State party on each week-end. Since there are only 10 Call Areas the line of reasoning is quite obvious.

However there is much more involved than a slide-rule analysis. It is my opinion that better co-ordination between the involved clubs would avoid the many duplications of dates, frequencies and other problems that make operating on some week-ends a pretty hectic experience.

I would want to study the plan more thoroughly before making any additional comments. I would also like to hear your opinion of this proposal, especially from clubs who stand to lose their identity if this plan is adopted.

73 for now, Frank, WLWY

Q & A *(from page 82)*

center with RG-59 / U coax. Prior to this I was feeding the antenna with 450-ohm open wire through a Johnson Matchbox. In both instances I have severe interference from our local broadcast station on 1520 kc. The signal can be heard up and down in the phone section of the 3.5 mc band. The difficulty has been found using at least a half-dozen different type receivers. Other local amateurs are not experiencing this problem. It surely has to be some outside rectification, but how do I go about looking for it? Any suggestions?

ANSWER: Ordinarily this situation could be due to receiver front-end overload by the b.c. signal; however, since the difficulty exists with several receivers, this possibility appears to be remote, but not necessarily so. Nevertheless, check this by trying a short antenna, 8-10 feet

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Frequency Coverage	144-148 MHz
Number of Channels	12 Channels, 2 supplied Channel 1 Receive 146.94 MHz Transmit 146.34 MHz Channel 2 Simplex 146.94 MHz
Modulation	Frequency Modulation
Transmitter Control	Push-to-Talk
Power Drain	AC: Receive 6 Watts Transmit 50 Watts DC: Receive 0.5 Amps Transmit 4 Amps
Power Source	AC: 117 Volts Factory Wired 220/240 Volts 50-60 Hz DC: 13.5 Volts ±10%.
Dimensions	7⅞" W x 2¾" H x 10¼" D.
Weight	8¼ lbs.
Standard Accessories	Dynamic Microphone, Antenna, Connector Plug, AC/DC Cord

Transmitter

RF Output Power	10 Watts
Frequency Deviation	15 KHz maximum
Frequency Stability	±.001% or less
Spurious Radiation	Greater than —80 dB below Carrier
Frequency Multiplication	12

Receiver

Receiver Circuit	Crystal-controlled Double Conversion Superheterodyne
Intermediate Frequencies	1st 10.7 MHz, 2nd 455 kHz
Input Impedance	50 to 75 Ohms
Sensitivity	0.5 μV or less for 20 dB S+N/N ratio 1 μV or less (30 dB S+N/N ratio at 10 kHz deviation with 1 kHz modulation)
Intermodulation	Greater than 80 dB
Spurious Sensitivity	At 40 kHz separation
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long. An indoor one will do. If the interference disappears, the culprit is either receiver overload or a problem in your normal antenna system, such as loose or corroded connections, leaky insulator, etc. that could produce non-linear responses. In the case of receiver overload, a parallel-tuned trap (adjusted to the BC station frequency) , in series with your antenna input, should help. A high-pass filter with a cutoff below 3.5 mc (and / or with maximum rejection at the B.C. station frequency) also would be a good bet.

If with the small antenna the problem still exists, the cause probably is due to non-linear devices in your locality that are activated by the BC signal. This could be rusty, loose or corroded gutters or drain pipes, house plumbing, fencing, wires. TV antennas or masts, etc. The best way to track down these might be to use a portable receiver with a small antenna or direction-finding loop. Since others are not affected, the cause is no doubt in your immediate neighborhood.

We have a lot of trouble like this in the New York area, particularly due to mixing of the many stations located here. The effects change between day and night and even with the weather!

Manual-Appeal Thanks

John Gaudio, K7VIN, wishes to express his thanks to the many readers who came to his rescue with a manual on the Elmac AF-67. We, too, appreciate their aid to a fellow amateur.

73, Bill, W2AEF

SW-3 Receiver *(from page 38)*

peaked and the regeneration control at the minimum (counter-clockwise setting) that permits regeneration. A few moments listening to a weak c.w. signal will permit this adjustment to be made faster than the time it takes to read about it.

S.s.b. and c.w. signals may now be tuned in the normal manner, remembering that the ear, rather than a non-existent i.f. system provides selectivity, and that all signals have a mirror-image on the other side of zero beat.

The regenerative receiver is ill-suited to a.m. reception as detector sensitivity suffers badly when the regeneration control is retarded for normal a.m. reception. An a.m. signal, however, may be zero-beat in the same manner as an s.s.b. signal for the satisfactory reception.

And now that you have acquired the knack of listening to your treasure . . . good DX to you!

(continued on page 96)

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This valuable book is imported from Germany and written by DL1CU. It contains a collection of phrases and expressions designed to assist those amateurs who wish to enlarge their knowledge of various languages for use on amateur radio. It is a must for every DX'er. $1.50

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Where are the 10,000 Receivers Now?

A mint condition SW-3 receiver is a rare gem, indeed. Where did all the 10,000 sets manufactured by National Company disappear to? The majority, sadly, have been junked over the years or caniballized for parts. However, a sizeable number were tuned to 600 meters and used as auxiliary receivers on the West Coast tuna fishing boats. San Francisco radio stores remember a large sale of 600 meter plug-in coils for the SW-3 about the time radio amateurs traded the regenerative receiver in on the new superhetrodyne sets.

Interest among radio amateurs is reviving in this wonderful radio receiver, and those SW-3's showing up in want-ads are quickly snapped up by collectors. This little receiver still occupies a warm spot in the heart of many old-time amateurs who worked their first DX with this magic, black box of tricks, so many years ago.

The author wishes to thank Mr. James Millen, W1HRX, of the Millen Mfg. Co., Malden, Mass. for much of the background material contained in this article.

Meter Dials

(from page 44)

lightly sand everything off down to the bare metal and start over. If the lettering does not come out as you wish, it can sometimes be removed carefully with a pencil eraser and done over. When the plate is finished to your satisfaction, carefully slide it into place with the new face up and replace the screws. Then return the movement to the meter case. You now have a meter which reads exactly what you want it to and is a distinctive part of your own equipment.

EDITOR'S NOTE: An added benefit with W9IWI's system is that should it be necessary at a later date to return the meter to its original state, one simply has to flip the plate over, and the job is done.

Our Readers Say

(from page 8)

especially as a permanent resident. I feel this should be looked in to.

James W. Craig, W1FBG
Portsmouth, NH

Editor, *CQ*:

Just read the editorial comments in May '71 issue—great! It's about time someone tells it like it is re W2NSD / 1. My most hearty congratulations to you and *CQ*.

Bob Clapp, WB6YHD
La Puente, CA

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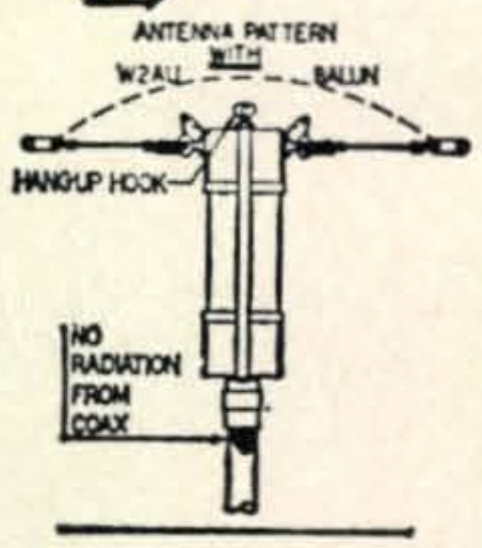

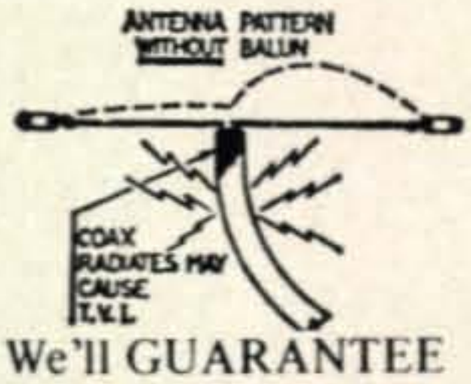

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CQ Reviews Simpson *(from page 32)*

circuitboard layouts and parts location charts are shown elsewhere in this review.

A second really good point is the G-10 epoxy boards. This type of material is easy to work on and is very long-lasting.

Third, parts are locally available should they be necessary, and fourth, the splitting of receive and transmit frequency selectors. There are only four positions available for each sections, but the final outcome is sixteen possible combinations.

Simpson Model A

GENERAL SPECIFICATIONS

Size: 8"x3"x11".
Power Requirements: 12 v.d.c. negative ground .25a / 1.5a trans.
Accessories Furnished: Microphone, d.c. Cable, Mounting Kit

TECHNICAL SPECIFICATIONS

Receiver	*Claimed*	*Achieved*
Sensitivity 20 db quieting	0.6 μv	0.4 μv
Adjacent Channel Rejection		
30 kc	60 db†	62 db
60 kc	none	65 db
Audio Output (full quieting signal)		
±5 kc dev.	2.0 w.	2.2 w.
±7.5 kc dev.	2.0 w.	2.4 w.
± 15 kc dev.	‡	Distorted
Number of Channels	4	4
Frequency Stability	.001%	.001%
Transmitter:		
Power Output		
13.8 v.d.c.	6 w. min.	7.5 w.
Deviation:		
Preset	±5 kc	± 6 kc
Maximum	none	± 18 kc
Number of Channels	4	4
Frequency Stability	.001%	.001%

† specified at 36 kc ‡ Max 11 kc

Conclusion

The final choice of what f.m. unit to purchase is the decision of the individual. The Simpson Model A is equipped with a mounting bracket, microphone, and crystals for 146.34 and 146.94 mc transmit and 146.7 and 146.94 mc receive. Information on the Simpson Model A is available from Simpson Electronics, Inc., 2295 N.W. 14th Street Miami, Florida 33125. The price is $249.00 amateur net.

—K9STH/1

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ARC7	BC610A	SCR274	TBW

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.

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B.A. Identifier [*from page 27*]

fine, *if you check* the operation under variable voltage and temperature conditions.

The I.D. wheel itself is a surplus item with resettable pins as used in most FAA identifier devices. By setting the pins to the extended or retracted position, any desired group of characters may be sent as the roller-footed microswitch passes over them. It is impossible to specify the current rating for the fuse or diodes without knowing the drain of the particular relays and other components used, but as a good estimate consider 2 amp. diodes and a 1 amp. slo-blo fuse.

Figure 1(B) is identical to fig. 1(A) except for the additional relay in the ident command feature. For most applications the simple ground-to-ident technique used in (A) will work flawlessly. However, if the ident command is received on a receiver which operates on the repeater output (or any receiver which is disabled when the repeater transmitter is energized), the (B) circuit is necessary. The transmitter PTT line in (A) is grounded only by the ident command input until the s.p.d.t. microswitch falls off the peg. This situation will produce relay stuttering and arcing, and it will introduce false pulses into the Secode or other digital command systems with subsequent erroneous operations. (B) is protected by the extra relay, so that the transmitter cannot be activated until the control microswitch has fallen from the peg.

I hope that this device will benefit others who as typical hams find themselves short on cash and very long on "reserve electronic equipment" (described most indelicately by XYL's as "junk"). Regardless of potential rule changes concerning repeater operation, the number of repeaters is rapidly increasing worldwide; and existing repeaters are diversifying with expanding frequency capacity and complexity. These situations all are indicative of a growing need for more and cheaper identifying devices, and perhaps this design will fulfill at least a small portion of that need. ■

Transients [*from page 24*]

to allow the capacitor bank to partially change before applying full voltage. The series resistor prevents blinking the lights, and also prevents line currents from exceeding 20 amps at 120v. or 40 amps at 240v., plus the elimination of transients, and pro-

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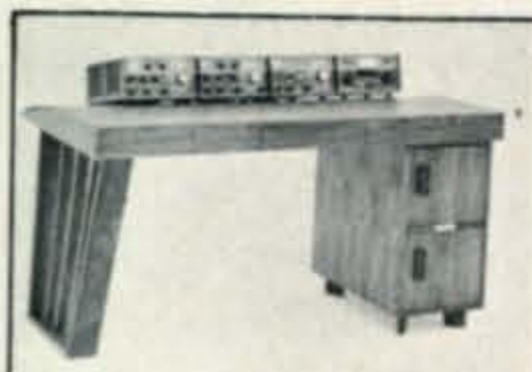

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tection to the rectifier against over current. In one installation, with capacitor input, without the series resistor, the line current exceeded 400 amps inrush curent at 240v.

Figure 6 shows the addition of a time delay which takes several seconds before closing and applying full power. This method is simple, small, and inexpensive to make. Other types of time delays are available and satisfactory. When the high capacities are used as a filter, the voltage is higher, in fact, 1.41 times the r.m.s. value determines the output d.c. Also, the bridge rectifier is recommended in place of the full-wave centertapped circuit. A 2200 volt transformer delivers 3100 v. d.c. output, where it previously delivered about 200 v. d.c. maximum, provided a heavy duty bleeder was used to stabilize the voltage. Computer grade capacitors work well provided the maximum voltage is not exceeded, as they must have no temperature rise during operation. Individual resistors may be connected across each capacitor in lieu of a large wire-wound which takes more space. What to do when an existing power supply uses chokes, etc. and cannot be connected to the stabilized design? Fig. 6 shows a rectifier and filter capable of operating at the peak voltage of the transformer, which stabilizes the supply.

For existing power supplies using any filter design, the J1-TS240 suppressor is the best protection possible in a small package. Line variations, transients, or even minor lighting disturbances on a line are arrested in this device. All peaks are prevented from being generated in the power transformer. Where transformers have the tendency to produce high peaks, clipping the primary voltage peaks also stabilizes the secondary voltage. Addition of the secondary suppressor is especially good in the extra control it exhibits as a secondary transient elimination providing the extra space is available for the capacitor bank and rectifier.

Several methods have been presented here for the protection of silicon diode stacks. The power is not limited to amateur, but is suitable through 500 kw. The information presented here covers a wide range of applications for increasing reliability of new and used eqtuipment. Now that transients can be fully controlled, the cause of destroying a rectifier system has been eliminated; and low voltage stacks will work with full efficiency. ■

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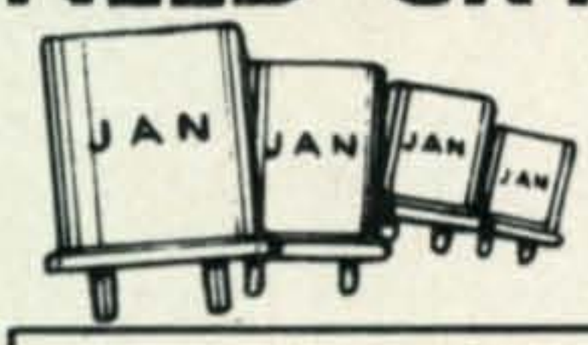

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F.M. *(from page 43)*

he has to offer. Many dealers will steer you away from units which have been having trouble (he has to get involved with warranty, so the better the unit the better he likes it). Once deciding on the exact unit, ask to see the inside and for an on-the-air demonstration of the exact unit to be taken home. Reviews in *CQ* have pointed out some quality control problems which may or may not have been taken care of in your exact unit. Before signing the papers make sure that the details of the warranty are known. Finally take the unit home, read "Tips And Tidbits For the f.m. Newcomer" in April 1971 *CQ*, and have a ball.

News

Several new repeaters have been reported to this columnist during the past month. Among these are Roaring Gap, North Carolina, 146.22 mc input and 146.94 mc output with auxilliary input of 146.94 mc and output of 145.50 mc. Benton Harbor, Michigan is on 146.34 mc input and 146.94 mc output with 2400 c.p.s. tone-burst. Boise, Idaho, is also on 146.34 / 146.94 mc. Galion, Ohio, is on 146.34 / 146.76 with a $35.00 repeater using pre-progress reciever and 41V transmitter.

Colin Rowe, VE3AZY, is keeping up the listing of Canadian and Northern USA repeaters using computer format. This directory is quite informative and lists repeaters by location, frequency, and frequency band listings for ease in locating and using the various repeaters. Any information from the area serviced should go toVE3AZYat Apt. 707, 2310 Fox Crescent, Ottawa 14, Ontario, Canada.

My old home town, La Porte, Indiana, is in the process of putting on a 146.22 / 146.82 repeater, which should be operational when this column is read. The expected site is very near the Indiana East-West Toll Road, so try that frequency while travelling through Northern Indiana on your way to and from Chicago.

Another publication has recently printed a directory of f.m. repeaters in the United States and Canada. In this directory several glaring errors were noticed. In an effort to provide *CQ* readers with an up-to-date source of information on repeaters, *CQ* will correlate information to provide an accurate directory of repeaters. To accomplish this will require the help of every repeater owner or operator. A post-paid card will be sent to all known repeaters to obtain frequency, location, and other needed information. If your repeater doesn't receive one of these cards within 6 weeks of this publication, please let me know so that I may forward the cards to you. When the card is received, please fill it out and return it as soon as possible. Since the postage will be paid by *CQ*, the only effort will be a few minutes with a pen or pencil.

Finale'

The support which this column has received from the f.m. population is most gratifying. The only thing one could wish for is more photographs of interest to the f.m. world. Keep up the good work and see you next month. ■

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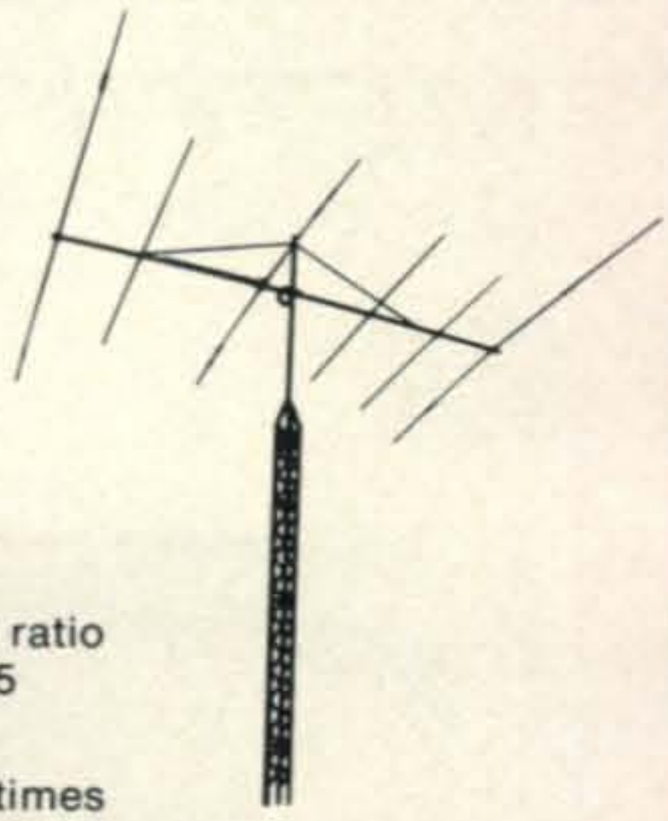

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(from page 68)

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HAM RADIO NEEDS good Public Relations. Send all good news items, clippings, etc. to me with SASE for free Xerox copies. WA1GFJ, 160 Elm St., N. Haven, Conn. 06473.

RTTY INFORMATION for the Amateur interested in RTTY. F. De Motte, P. O. Box 6047, Daytona Bch Florida. 32022.

LAFAYETTE HA225 Receiver, SW & 6-160 mtrs, Amego Preamp, 100KC Crystal extras, Cost $178. SELL $85. Geffner, 48 Park Ave. E., Merrick, New York. 11566.

HIGH POWER R. F. Chokes, wound with Double-covered spun glass wire. W4GD, 3087 Carnes Ave., Memphis, Tenn. 38111.

SELL OR SWAP: Special Defense Edition, 1942, of the Radio Amateur's Handbook. Will sell or swap for best offer. WN8HMG, 2526 Hilliard, Rome Rd., Hilliard, Ohio. 43026.

HQ-180A with noise immunizer. Perfect condition. $325. 4-400 $20. 4-1000 socket, $3. WANTED: SB-600 and HP-23A. Bob, W0YVA/4, 4423 N. 17 Street, Arl., Va. 22207. 703-524-2398.

WANTED: Apache xmtr good working condition.—Must have manual. Will pick up to 75 miles. W6-NVA. 1724 S. Westmoreland Avenue, Los Angeles, Ca. 90006.

LINEAR BUILDERS: 30 Amp Filament Chokes for grounded Grid Linear Amplifiers. Bifilar wound. Not surplus. $5.00 ea. Postpaid USA. Vonn R. Murrell, K4HHA, 712 Rich Rd., Newport, Tenn. 37821.

WANTED: Old Crosley "Musicone" speaker and radio magazines of the 1922-1926 era. W7KE, 1109 So. 2nd St., Hamilton, Mt. 59840.

WANTED: GERTSCH FM-3 or FM-6 Frequency Meter, elements for Bird No. 43 Wattmeter. W. Davis, K6KZT, 4434 Josie Ave., Lakewood, Cal. 90713.

SELL: TS-186D frequency meter like new, 100-10000 mc, has xtal oven, $49; 160 meter Loran Receiver, $15. Trade VHF/UHF SASE. W4API, Box 4095, Arlington, Va. 22204.

HALLICRAFTERS HA-20, new in carton, $100. Johnson Mess. II CB Transceiver with 20 xtals, $50, or swap for good novice transmitter, Joe, WA-2CKM, 1816 Park View Ave., Bronx, N. Y. 10461.

DRAKE—R4-B — MS-2 Spkr. Xtals for 28 m CW, WWV Mars Frq. in mint condx. $375. R. Farwell, W4BJ, 370 N.E. 147 Terr., N. Miami, Fla. 33161.

FOR SALE: Apache Mod. TX1 and SB10-$150. Also SX111 — $125. Call WA3HGI (717) 825-9029 after 4 pm.

SELL: QST's, CQ's, German DL-QTC's; 220MHz RX; Reg DCPS. 24 V, 40 amp; VTVM, 2 mtr TDQ xmtr; etc. K. Paquee, 53 Jerome Ave., Trumbull, Ct. 06611.

4" WESTON panel meters, various ranges, $3 each, plus P.P. Some PNP silicon transistors, new, same as HEP-57. 10 for $2.00 PPD. Want: HW32 es HP23. Samkofsky, W2YSF, 201 Eastern Pkwy., Brooklyn, N. Y. 11238.

FOR SALE: Mint condx HQ170C with matching speaker. $160. Will consider swaps. Tom Dornback, K9MKX, 19W167 21st Pl., Lombard, Il. 60148.

FOR SALE OR TRADE: for Clean R-390A, 51S 1, 51-J-4: Perfect HQ-50-A, HQ-170-C, 3EL Hygai trap tribander, AR22, 40 ft. tower. K8CCV, 5471 Norquest Blvd., Youngstown, Oh. 44515.

BLIND & PARALYZED HANDICAPPERS' CLUB offers free membership and services to the B & P No fees. Write W4OMW, Bob Knapp, R7, Greenville, N. C. 27834. or box 385, Bonita, Ca. 92002.

WANTED: Hustler antennas for 75M, 40M, & 10M, State condx and price. Sell or trade Lysco 600 Novice Xmitter, $35. C. I. E. First Class F.C.C Course complete, $110.00. K4RTA, 105 Freshrun Dr., Hendersonville, Tenn. 37075.

2METER FM POWER BOOSTERS. All Solid-State. USA-made amplifiers, up to 60 watts output. From $59.95. Sochor, Box 552, Arlington Hts., Illinois. 60006.

New International Club for HAM Musicians. Write G3TNN, Ruth Uwins, 18 Claredon Rd. N. St. Annes, Lancs, England or Clif Evans, K6BX, Box 385, Bonita, Calif. 92002.

New Fourth Call District Club has many programs promoting all states and hams inclusive on international scene. Join this worthy club. Write 4th call district, W4OMW, Bob Knapp, R. 7, Greenville, N. C. 27834.

HAMMARLUND GEN. RCVR HQ 145XC wid clock 550KC-30 MC $150 Local pickup only. WA8FLE, 2821 Honesdale, Cinn., Oh. 45239.

TRADE: Garrard Lab 80, Ranger I, other gear access., garage full of tubes, meters, mags., and parts. For SSB xmitter. P. O. Box 4074, Panam-a, City, Fla. 32401.

THE BERGENFIELD AMATEUR RADIO KLUB (BARK) is going to have a ham auction on May 16 1971. The exact place, we don't know as yet, bu it will be in Bergenfield, N. J. area.

HEATH SB-620 "Scanalyzer" $100 ppd. Heath IM-36 Lab Transistor Checker, $45 ppd. Collins 2.0 Kc Mech. filter F455N20 new $25 ppd. K7 CPW, 2115 Wolfe Pl. W., Seattle, Wa. 98199

HENRY 4K-2 linear for sale. Specially built, separate R.F. deck. Write: D. Anderson, 888 Linda Flora Dr., L. A., California. 90049.

WANTED: OM's to join INt. YL Club part of larges hamdom organization in world. Naturally, YL's invited also. Write to WA2GPT, Secretary Int. CHC Chapter 4, Bea Dietz, 40 Lynwood Dr., Valley Stream, N. Y. 11580.

WANTED: BC 453, 454, 455 receivers. Sell Wagner 3600-0-3600 v at 1 amp with 110/220 primary $25 FOB. W0AIH, P. Bittner, 814 4th St S, Virginia, Minn. 55792.

SWAP: Collins Mint Lab 51J2 w/manual for equa 75A4, Art Ford, 9 Havemeyer Ln., Commack, New York. 11725.

HW-32A-Xtal Cal. Never mobile Engineer built Vernier Dial, Exc. $90.00. Mobile Bkt. and manual W. Schmidt, W2DTK, 21 N. Central Ave., Toms River, N. J. 08753.

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FOR SALE: Collins 75A4 3.1 kc filter. Brand new $25.00, ppd. W2ASI, 15 Kensington Oval, New Rochelle, N. Y. 10805.

HEATH Twoer, mike, manual, xtals. FB condx. Will ship. $35. Adinolf, 5113 Arvada, Torrance Calif. 90503.

"1971 TESTS-ANSWERS" for FCC First and Second Class License - plus - "Self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. COMMAND, Box 26348-H, San Francisco, California. 94126.

FOR SALE: Brand new AN/ART13 Autotune Transmitter complete with tubes and the original operations manual, $50.00. ALSO: Brand new BC-1031 Panadapter (455 KHZ) with tubes and manual, $70. Both for $110.00. W3RYJ, RD4, Box 368, Reading, Penna. 19606.

HAMFESTERS 37th Hamfest and Picnic Sunday, August 8, 1971 Santa Fe Park, 91st and Wolf Road, Willow Springs, Illinois. Southwest of Chicago. Exhibits for OM's and XYL's. Famous Swappers Row. Information and Tickets, Joseph W. Poradyla, WA9IWU, 5701 S. California Ave., Chicago, Illinois. 60629.

YOU ALL COME to International Independent County Hunters Convention, in Kansas City, July 2, 3, 4, 1971. SASE to WA0SHE, for informaiton, C. J. Mahoney, WA0SHE, 6001 Blue Ridge Cut Off, Baytown, Mo. 64133.

HEATHKITS wired 15% of cost. Price, reference on request. SASE. P. O. Box 6144, Linglestown, Penna. 17112.

WANTED: R390, R390A, R389, 51J4, 51S1, Racal, Nems Clarke, Marconi Receivers. SWRC, P. O. Box 10048, Kansas City, Missouri. 64111.

WANT: Hallicrafter VHF — S94, S95, SX104, SX-105, CRX-Z Mark I, etc. State price w/postage & condition first letter. R. Ireton, 507 Heater, Cary, N. C. 27511.

WANTED: Heathkit Panadaptor, any model or surplus 455 Khz model. Used Hy-Gain 14AVQ vertical antenna. R. J. Brubaker, W0DYR, 3932 Charlotte, Kansas City, Missouri. 64110.

HEATHKIT IM-25 FET input completely assembled in brand new condition, with new batteries. Asking $90.00. A. Greenberg, 821 Rutgers Rd., Franklin Sq., N. Y. 11010.

FOR SALE: SB301 with AM, CW and SSB filters also SB600 speaker with SB401 transmitter. All professionally wired and aligned, plus HO13 Ham-O-Scan, all for $495. W2SVS, Fred England, 29 Parker Pl., Saddle River, N. J. 07458.

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COLLINS KWS-1, $250. Will trade for mobile transceiver. 1324 Ensenada Number 2, Modesto, Calif. 95350. 209-523-2812.

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NOVICES: Need help for general ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. AMATEUR LICENSE, Box 6015, Norfolk, Virginia. 23508.

SELL: HW-32 with HP-23, $100; DX-40, $30; Twoer, $25. WB8HAT, 19 Curtis St., Athens, Ohio. 45701.

PASS FCC Extra, Advanced, General Exams Easily with Simplified, Economical Books and Code Records. Free Catalog. Ameco Publishing, 314C Hillside Avenue, Williston Park, N. Y. 11596.

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m FM transistorized transceiver. Multi-channel 2 vdc/110 vac, 1-10W. $170. D. Anderson, (213) 78-6738.

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MANUALS: $6.50 each: R-390/URR, BC-639A, SP-600JX, OS-8C/U, BC-348JNQ, TS-587B/U, URT-7, CV-591A/URR. W3IHD, 4905 Roanne Drive, Washington, D. C. 20021.

COLLINS 51S1 general coverage receiver. 0.2 to 30.0 mHz. Like new. $850. C. Fenwick, W0FTM, 4340 Eaglemere SE, Cedar Rapids, Iowa. 52403. Telephone: (319) 366-1012.

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CINCY STAG HAMFEST: Attention hams. Mark this date, Sunday, Sept. 26, for the 1971 Cincinnati 34th Annual STAG Hamfest, the one big STAG Amateur Radio event of the '71 year. Meet all of your friends here. More details later. W8DSR, Hamfest Secretary, 6307 Fairhurst Avenue, Cincinnati, Ohio. 45213.

WANTED: Gonset enamel-metal emblem usually on speaker grill six and two equipment. J. A. Yanko, 1041 Allen Avenue, Saint Lewis, Missouri. 63104.

EVANSVILLE, Indiana Hamfest, 4H grounds (Highway 41 North 3 miles) Sunday, July 11, 1971 air conditioned, auction, overnight camping, ladies' bingo, reserved flea market booths, advance registration. For flyer contact Morton Silverman, W9GJ, 1121 Bonnie View Drive, Evansville, Indiana. 47715.

HAMFEST: Indiana Radio Club Council's Annual picnic, Sunday July 11th, LaPorte County Fairgrounds, LaPorte, Indiana. Large Flea Market with reserved locations available for large exhibitors and vendors on the Midway and Main Bldg. Mobile FM Clinic. Prizes. Tech Sessions. For flyer, write: Dave Osborn, K9BPV, P. O. Box 272, LaPorte, Indiana. 46350.

THIRD ANNUAL HAM CAMPOREE — Florida Camplands, June 11-13, contact WA4YNW or - Brandon Amateur Radio Society, Box 828, Brandon, Florida. 33511.

SWEEP GENERATOR: Knight KG-652 — 4 bands, 300KC to 250MC on fundamentals. Width 0 to 13 mc. Brand new w/book and cables. $45.00. H. Marhoff, Box 569, Largo, Fla. 33540.

COLLINS 75S-3, speaker, manual, spare tubes, like new; $400. DX-60 xmttr, manual, crystals, tubes; $40. 34-24 76th St., Jackson Hts., N. Y. (212) 639-3195.

NEED POWER SUPPLY for COLLINS TCS-12 Command Set, and any other equip. for this unit. Am restoring, so only original equip. price and cond. 1st letter. 2321 North 130th, Seattle, Wash. 98133.

FOR SALE: Immaculate HT37 $140. Immaculate Drake 2A/2AC/2AQ $125. D. McDonell, K6LHA, 85 W. Las Flores, Thousand Oaks, Cal. 91360. (805) 495-7637.

COMPLETE MOBILE STATION HW22A, HP13A, Hustler, Mic., Spkr. $150.00. W6VSQ (714) 427-6862.

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STOLEN: 2/5/71 SWAN 240, Serial 223222. Richard L. Zysk, K0GSV, 3457 A Humphrey, St. Louis, Mo. 63118.

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MANUALS FOR SALE: HT-44, SX-117; HT-30 MK1; KWM-2, M-2A; and Pacemaker. All new. $1.50 each. $5 all. PP. J. DeShong, 11847 E 16th Tulsa, Oklahoma. 74128.

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RARE BOOK: Atomic Energy for Military Purposes; the History of the Bomb by Smith, Princeton Univ. Press, 1945, First Ed. $5.00. W6BLZ, 528 Colima St., La Jolla, Calif. 92037.

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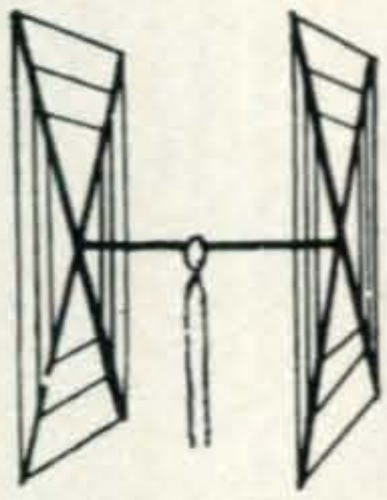
Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

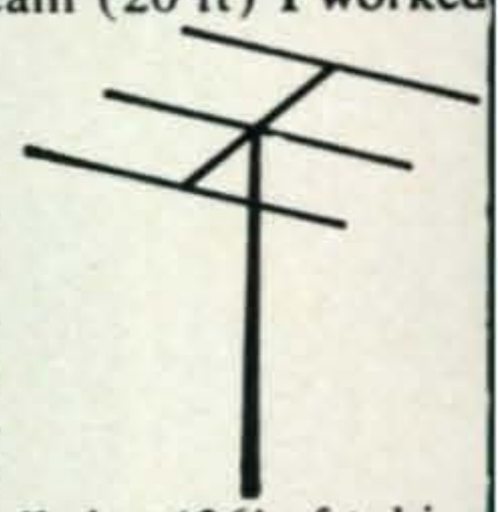
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
3 EL 20	27	7 EL 10	34*
4 EL 20	34*	4 EL 6	20
2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
4 EL 15	27*		
5 EL 15	30*		

***20' Boom**

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV K8HGY, K3UTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT XE2I, KP4AQL, SM5BGK, G2AOB, YV5CLK. OZ4H. and over a thousand other stations

V40 vertical for 40, 20, 15, 10, 6 meters	$14.9
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.9
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.9

GOTHAM
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204BA	20 Meter, 4-Element "DX" Beam	**149.95**
5BDQ	All-Band (89/10 m) 2 KW Trap Dipole	**69.95**
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14AVQ	40/10 m Trap Vertical "World's Most Popular"	**39.95**

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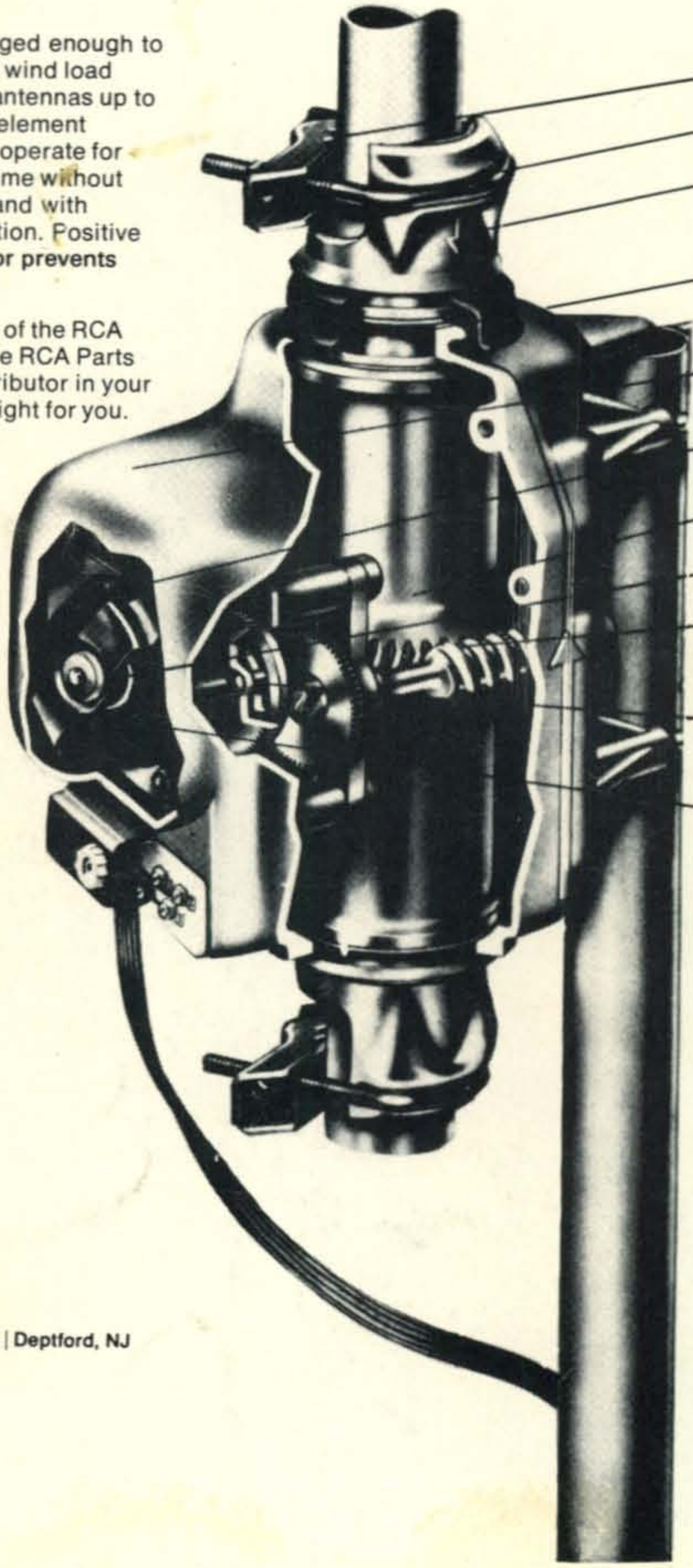
The RCA rotator...more features and performance than you'd expect from a "TV" rotator.

An RCA rotator is rugged enough to handle the weight and wind load requirements of ham antennas up to the size of a normal 3-element 20-meter beam. It can operate for sustained periods of time without thermal overload . . . and with absolute synchronization. Positive **disc brake on the motor prevents "overshoot."**

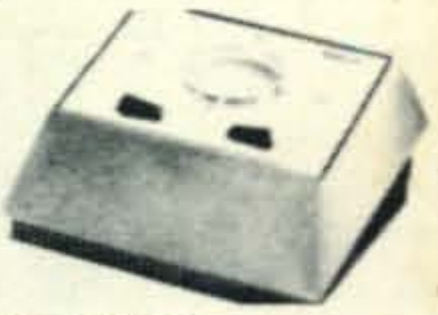
Check all the features of the RCA Rotator . . . see it at the RCA Parts and Accessories Distributor in your area. It might be just right for you.

RCA
Rotators



- V-block serrated clamping system locks mast securely.
- Reinforced shaft has nested "U" bolt.
- Center-position alignment markers speed installation.
- Stainless steel bearings are permanently lubricated. No external thrust bearings required.
- High-tensile aluminum housing is rugged, lightweight for less inertial loading on mast.
- High-temperature insulation on motor allows continuous operation.
- Main drive gear is cast integral to main shaft; can't loosen.
- Positive disc brake on motor prevents "overshoot."
- Positive worm drive prevents windmilling.
- Overtravel clutch permits motor to run before load is engaged—for pre-turning momentum.
- High-efficiency motor consumes less power; less voltage drop over long cable runs.

Model 10W707
The RCA fully automatic Rotator **has solid state circuitry for positive synchronization. Positive directional indicator lights. Silent operation.**



Model 10W505
The RCA positive push-button fingertip control Rotator **with 360° indicator dial. Unique design assures precise control with few moving parts. RCA performance and quality at a modest price!**

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