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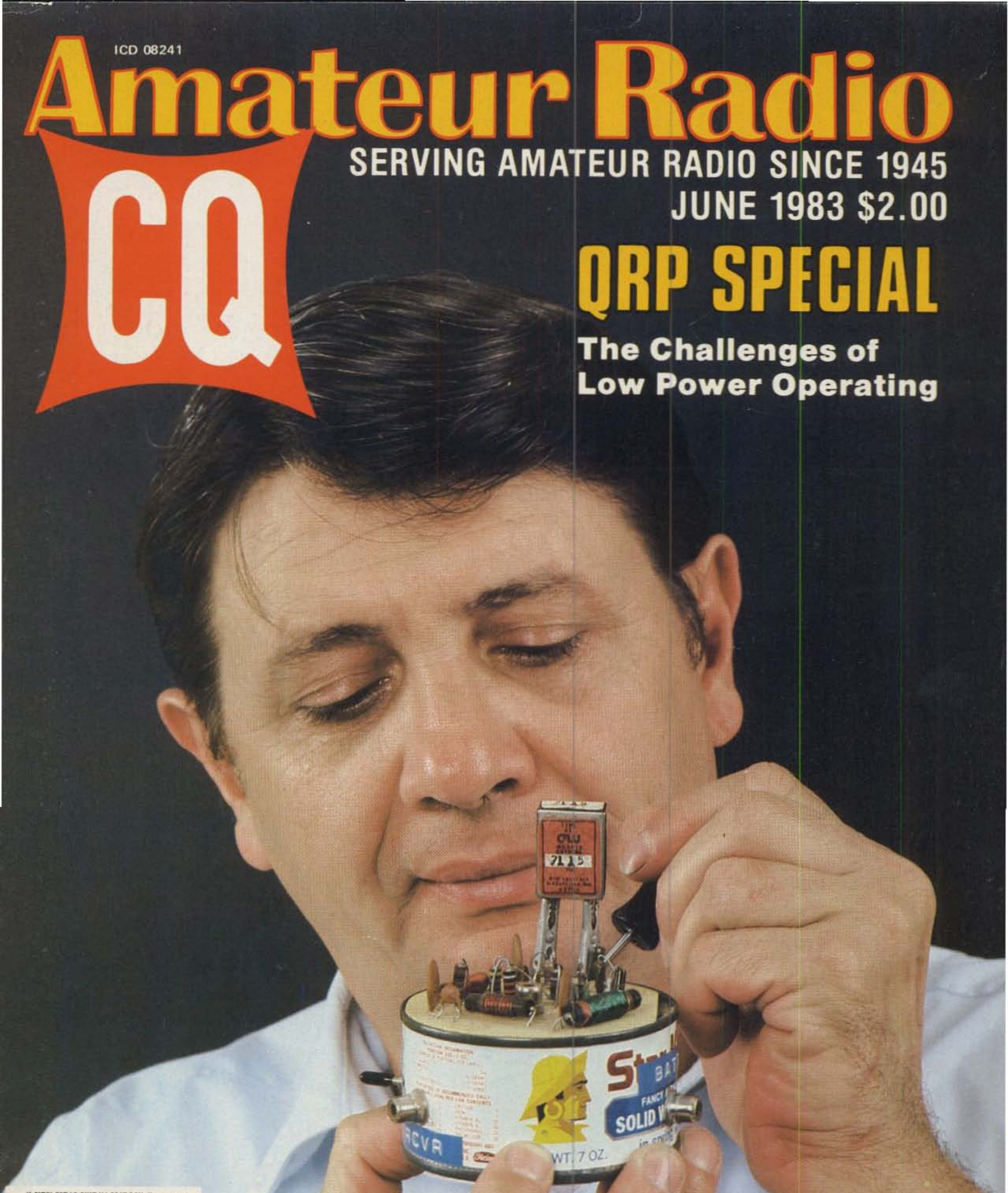

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THE RADIO AMATEUR'S JOURNAL

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NEW

SSB, CW, AM, FM, digital VFO's, 10 memories, band and memory scan, optional 118-174 MHz coverage...

R-2000

The R-2000 is an innovative all-mode SSB, CW, AM, FM receiver that covers 150 kHz–30 MHz, with an optional VC-10 VHF converter unit to provide coverage of the 118-174 MHz frequency range. New microprocessor controlled operating features and an "UP" conversion PLL circuit assure maximum flexibility and ease of operation to enhance the excitement of listening to stations around the world.

R-2000 FEATURES:

- **Covers 150 kHz–30 MHz in 30 bands.** Uses innovative UP-conversion digitally controlled PLL circuit. UP/DOWN band switches (1-MHz step). VFO's continuously tuneable across the band and from band to band.
- **Optional 118-174 MHz coverage.** Through use of innovative microprocessor technology, frequency, band, and mode data of stations in the 118-174 MHz range may be tuned, displayed (full frequency, ie., 146.000.0), stored in memory, recalled, and scanned, using the R-2000 front panel controls and frequency display, allowing maximum convenience and ease of operation.
  The optional VC-10 VHF converter unit may be easily installed on the rear panel of the R-2000.
- **All mode: USB, LSB, CW, AM, FM.** Provides expanded flexibility in receiving various signal types. Front panel mode selector keys, with LED indicators.
- **Digital VFO's for best stability.** 50-Hz step, switchable to 500-Hz or 5-kHz. F. LOCK switch provided.
- **Ten memories store frequency, band, and mode data.** Complete information on frequency, band, and mode is stored in memory, assuring maximum ease of operation. Each memory may be tuned as a VFO. Original memory frequency may be recalled. AUTO. M switch for automatic storage of current operating data, or, when off, selective storage of data using M. IN switch.
- **Lithium battery memory back-up. (Est. 5 yr. life.)**
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- **Dual 24-hour quartz clocks, with timer.**
- **Three built-in IF filters with NARROW/WIDE selector switch. (CW filter opt.)** 6-kHz wide or 2.7-kHz narrow on AM, 2.7-kHz automatic on SSB, 2.7-kHz wide on CW, or, with optional YG-455C filter installed, 500-Hz narrow. 15-kHz automatic on FM.
- **Squelch circuit, all mode, built-in, with BUSY indicator.**
- **Noise blanker built-in.**
- **Large front mounted speaker.**
- **Tone control.**
- **RF step attenuator. (0-10-20-30 dB.)** Four step attenuator, plus antenna fuse.
- **AGC switch. (Slow-Fast.)**
- **"S" meter, with SINPO "S" scale.**
- **100/120/220/240 VAC, or 13.8 VDC operation** (with opt. DCK-1 cable kit).

Other features.

- RECORD output jack.
- Audible "beeper" (through speaker).
- Carrying handle.
- Headphone jack.
- External speaker jack.

Optional accessories:

- VC-10 118-174 MHz converter.
- HS-4, HS-5, HS-6, HS-7 headphones.
- DCK-1 DC cable kit.
- YG-455C 500-Hz CW filter.
- HC-10 World digital quartz clock.
- AL-2 Surge Shunt

VC-10 subject to FCC approval

More information on the R-2000 is available from all authorized dealers of Trio-Kenwood Communications
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Compton, California 90220.

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TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

TS-530S

"Cents-ational"...IF shift, digital display, narrow-wide filter switch

The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530S FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

TS-660

The TS-660 "QUAD BANDER" covers 6, 10, 12, 15 meters.

- FM, SSB (USB), CW, and AM
- Dual digital VFO's
- Digital display
- IF shift built-in
- 5 memories with memory scan
- UP/DOWN microphone
- All-mode squelch
- Noise blanker
- CW semi break-in/sidetone
- 10 W on SSB, CW, FM; 4 W on AM.

Optional accessories:

- PS-20 power supply
- VOX-4 speech processor/VOX
- SP-120 External speaker
- MB-100 Mobile mount
- YK-88C, YK-88CN CW filters
- YK-88A AM filter.

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Compare Santec to anything you like, and you'll see — you've got to get a Santec to get: ■ memory channels which store standard repeater offsets for instant recall ■ less than 10 ma drain in receive to conserve power while you're monitoring ■ extremely wide power options of 0.1 W, 1.0 W or even 3.5 W for varying conditions ■ an accurate 24 hour clock for instant reference ■ and a full two year extended service plan which no one else will match.

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FEATURE	SANTEC ST-144	YAESU FT-208	KENWOOD TR-2500
Size (mm)	68 x 170 x 47	61 x 168 x 49	66 x 168 x 40
Weight with Batt.	600 gm	720 gm	540 gm
Readout	LCD (full 6 digits)	LCD (4 digits)	LCD (4 digits)
Memory Channels	10	10	10
Memory of Offsets	YES	NO	NO
Memory Backup	YES, Capacitance	Yes, Lithium Batt.	Yes, Lithium Batt.
Scan (mem. & band)	YES	Yes	Yes
Search Mode	YES	NO	NO
Step Size	5-100 kHz	5 or 10 kHz only	Any 5kHz multiple
Battery	Quick Change Pack 500 ma-hr, 9.6 V	Quick Change Pack 450 ma-hr, 10.8 V	Slide-on Pack 400 ma-hr, 8.4 V
Frequency Coverage	142-148.995 Tx (149.995 optional) 142-149.995 Rx	143.5-148.495 Tx Rx	143.9-148.995 Tx/Rx
Power (max)	3.5 W High 1.0 W Med. 0.1 W Low	2.5 W High 0.2 W Low	2.5 W High 3 W Low (approx.)
Priority	YES (in Mem/Scan)	Yes (Priority Ch.)	NO
Clock	YES	NO	NO
Computer Current Saver	YES (~10 ma)	NO (20 ma)	NO (27 ma)
Display	6 Digits + Mem. #	4 Digits + Mem. #	4 Digits + Mem. #

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- Remote Speaker (MS-505)
- Mobile Charger (ST-MC)
- Speaker Microphone (SM-3)

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CQ The Radio Amateur's Journal

ON THE COVER: There's no room for "Charlie" in this tuna can QRP rig. Frank Sullivan, NJ4S, of Miami, Florida, can tweak 250 milliwatts on 40 meters out of this rig. He's even worked WAS on QRP. Photo by Larry Mulvehill, WB2ZPI.

JUNE 1983 **VOL. 39, NO. 6**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

March was a busy month for the *CQ* staff. Jack went on a mini-DXpedition to log a little 4X4 time and returned just in time to go with me to the Charlotte Hamfest. Dick took Herb and Arnie from our Advertising Department and covered the Orlando Hamfest the same weekend. Having two big hamfests the same weekend wreaks havoc on the exhibitors who must try to attend as many as possible. I hope they can have at least a week in between Orlando and Charlotte next year. Dick's and my experiences appeared to be the same. The hamfests this year have a more positive attitude than did last year's events, and amateurs seem to be updating equipment and buying new gear in greater numbers than last year. Attendance is also up this year, as are the number of exhibitors. So come on out, enjoy the fun, and see all of the new and wonderful things guaranteed to make amateur radio even bettter.

It was a hectic weekend in Charlotte and a very busy one (they had a good flea-market, too). I have to thank a few of the ARRL officials at the show who helped us by checking WAZ applications and inspecting QSL cards. It really helped out everyone. Apparently, a lot of new amateurs in the Orlando area owe their licenses to Dick Bash. No, not in the way you're thinking of. Two members of the FCC staff in the Orlando area volunteered their time to come to the hamfest and give examinations. They brought about 200 610 forms with them. However, about 550 people lined up for the tests. Well, courtesy of the Dick Bash staff at Orlando (Dick always keeps a big stack of 610's at his booth), the remaining 350 or so applicants were able to take the exams. All in all about 80% passed this mass examination. Thanks, Dick, and I'm sure these new amateurs thank you, too. Like the Boy Scouts, it pays to be prepared.

The following weekend I flew down to Washington, D.C. for the 27th Annual Old Timers Dinner sponsored by the Washington and Northern Virginia chapters of QCWA. Our own Ted Cohen, N4XX, was the featured guest speaker of the evening. There were many notables from all areas of the government in attendance, and the FCC was well represented, too.

I originally had planned to be with Larry Brockman, N6AR, at the DX Convention in Visalia, California, in mid April, but events changed our plans. Dick was out of the office that week, flying to Spain to put the finishing touches on what I'm about to tell you.

Saludos Amigos

Hola! Yes, *CQ* is going Spanish. Starting in late summer there will be a Spanish edition of *CQ* available throughout the Spanish speaking world. It will be sold through the commercial newsstands and via subscription. The magazine will be produced in Spain through the joint efforts of *CQ* and Boixareu Editores, S.A. in Spain. Boixareu Editores is one of the largest and most prestigious publishers of Spanish language technical books (electronic and otherwise) and electronics magazines. Their book catalog lists over 400 titles comprised of both original editions and translations of outstanding books published first in another language. Bill Orr's *Radio Handbook*, published here in the U.S. by Howard W. Sams, Inc. (a division of ITT), is translated and published in Spanish by Boixareu Editores. They are also the publishers of *Mundo Electronico*, which is the largest Spanish language electronics magazine in the world.

The editors of *CQ Radio Amateur* (as it will be known) in Spanish are Carlos Rausa, EA3DFA, and Arturo Gabarnet, EA3CUC, both active DXers and contesters. Editorially, the Spanish edition of *CQ* will consist of material directly translated from *CQ* U.S.A. on a current or almost-current basis and original material developed regionally. Distribution of the first *free* sample issue will be in May of this year, with circulation of 100,000 targeted at Spain, Mexico, and Central and South America. The first full-size issue will break in October of this year.

Subscription and advertising information for *CQ Radio Amateur* in Spanish is available from *CQ* Publishing, Inc., 76 North Broadway, Hicksville, NY 11801. We are the sole agent in North America and U.S. territories for both advertising and subscriptions.

The address in Spain is *CQ Radio Amateur* de Boixareu Editores, Diputacion, 256 bis, Barcelona-7, Espana. The telephone number is (93) 302-67-27. When calling from the U.S., the country code for Spain is 34, followed by the city code for Barcelona which is 3, then the number, 302-67-27. The (93) is used only when calling from within Spain.

Amateurs visiting Barcelona are invited to visit the *CQ* Espana offices. Should you need guidance or assistance in relation to any amateur radio matter in Spain, please contact them. Our staff in Barcelona stands ready to help.

W2GT Steps Down

Ed Hopper, W2GT, will be stepping down as USA-CA Award Custodian effective with this issue of *CQ*. After almost 19 years of really dedicated effort on behalf of the USA-CA Award and Awards Column he says he needs a break. I think he really wants to have most of his house back, as he shipped out 20 huge cartons of records and column material. The rest of the stuff will be discarded, I guess, and the Hopper family can once again use the living room, the basement, and the attic. We'll all miss working monthly with Ed, but he has ensured a very smooth transition of Custodians. Will all of you County Hunters please give a big welcome to Dorothy H. Johnson, WB9RCY, your new USA-CA Award Custodian and editor of the Awards Column. She has All Counties USA-CA #320 and is very active in MARAC and county hunting.

I Gave At The Office

Last month I carped on the proposed volunteer program and my negative feelings on the subject. A week or so after I wrote that editorial I received a package in the mail containing material for "volunteer canvassers" in relation to a well-known charity. A month or two prior to the package arriving, I received a phone call one evening from a "telephone canvasser" from this same charity. The woman asked if I could collect for the charity on the street where I live, which has about 8 to 10 homes. I said yes, which surprised her, as apparently I was the only one to say yes that entire day. I'm certainly not that noble or altruistic, but I could spare about 20 minutes, which is all it could really take (and it did take just about 20 minutes).

I began to ask myself just how many people could find so many reasons for saying no to a charity—especially one as well known and respected as this one. It probably is the same reasoning that people use with their own religious groups when volunteering and work must be done. I don't know if this is the same logic that people use when they are called on for jury duty and try to get out of it, but ask yourself how many times you have been asked to help a charity, religious group, social cause, or anything in which you have to give of yourself to help someone else, and then total the number of times you did help. If the ratio is 1:1, then you are a terrific person, but I get a pessimistic feeling that most of us fall well below that ideal ratio. "I'll worry about X disease when I get X disease" thinking affects all of us, and if it's hard to motivate us to take an active part in controlling disease, crime, and any number of life-threatening conditions, then tell me what's so important about amateur radio in comparison that it will bring out the thousands upon thousands of volunteers eager to give of their time and money to help?

73, Alan, K2EEK

The real beauty of the Collins KWM-380 is behind the panel, not on it.

At Collins, we know serious amateurs won't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually

unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter.

Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

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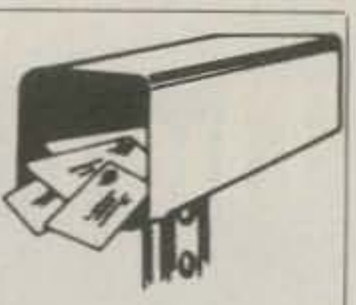

Antennas Great, But . . .

Editor, *CQ:*

The series of articles on antenna accessories for the hamshack (October '82 through April '83, *CQ*) by Karl T. Thurber, Jr., W8FX, was excellent, with an exception to a comment made in Part V, February, '83. He advocates a "belt and suspenders" approach to the use of lo-pass filters for TVI elimination by using a filter between the exciter and the linear.

The low-pass filter is designed to work into a termination of 50 ohms **resistive.** Many linear amplifier input circuits are anything but 50 ohms resistive at the operating frequency; thus, the insertion loss many be considerably greater than intended and may cause difficulty in getting enough drive to the linear, and also, the filter cut-off frequency may be shifted below its intended value. Unless a swamping resistor is used, I would suggest **not** using a filter between the exciter and linear amplifier.

For the same reasons outlined above, it is obvious that the v.s.w.r. of the antenna should be close to 1:1 or a Transmatch should be used to present 50 ohms resistive termination for the filter, because at the high power level, excessive voltage may appear across the filter's components, causing damage if the termination varies from the design value.

John P. Weber, Jr., K4JW
Melbourne, FL

K3COT, Silent Key

Editor, *CQ:*

It is with deep regret that I report the passing of William E. Jacox, K3COT, of Butler, Pennsylvania. "Jake" was first licensed in amateur radio in 1956 and was a well-respected General Class operator. He was born December 15, 1918, and passed away on December 16, 1982 while in Butler County Memorial Hospital.

Jake had been communicating with his brother hams from his bed and wheelchair for the past six years, and was known as Mr. Courtesy and Mr. Gentleman by all with whom he made contact. He had been employed as an Electrical Service Man by Armco Steel Co. of Butler for 30 years, retiring in 1969.

Jake served with the U.S. Air Force as a Radio Repairman on Okinawa during World War II, and was a member of the Board of Trustees of the Butler Presbyterian Church. He was a member of Butler Lodge #272, the Scottish Rite in the Valley of New Castle, Pennsylvania, Butler County Amateur Radio Association,

and the American Radio Relay League.

K3COT's friendly voice and good-will messages will be missed by all. Surviving are Mrs. Dorothy George Jacox, whom he married August 15, 1939, a son, David W. Jacox, and his mother, Mrs. Cathryn Patterson Jacox, also of Butler.

I have enclosed Jake's QSL card. It is one of the most treasured possessions of James Cooper, WB3EVJ, who loaned it to us for publication in *CQ*.

J.I. Galbraith, N3CVR
Secretary, Butler County ARA
Butler, PA

A History Buff

Editor, *CQ:*

I would like to suggest an idea which might be of interest to many. How about running a series on some of the older ham gear? I am interested in getting the story behind companies such as Collins, Hallicrafters, Hammarlund, National, and perhaps others. Maybe you could give the story behind a particular company, and then outline some of the better or unusual pieces of equipment produced by this company. I enjoyed the series on the old German receivers and thought that it could be done with American sets.

Congratulations on a fine magazine! I am currently working on a Novice license.

Lee R. Savary
Concord, NH

Keeping Us On Our Toes

Editor, *CQ:*

While referring to the January 1983 issue of *CQ* in order to read up on the WPX contest, I noticed a confusing time reference on page 102. It says, "Starts: 0000 GMT Saturday." There isn't any such time! Properly, you should have said 2400 Friday, which is midnight Friday. The correct starting time should read "0001" GMT Saturday, *or* 2400 Friday.

Just trying to keep you on your toes!

Richard L. Hoyt, W5RIT
Fayetteville, AR

ICOM IC-720A

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RECEIVE WIDE BAND RF AMPLIFIER CONTROL

HAM BAND (9) OR GENERAL COVERAGE (30-1 MHz Bands)

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The IC-720A is a proven champion that sets the pace in amateur communications.

Receiver.

The IC-720A utilizes an **up conversion** receiver scheme having its first IF at 39.7315MHz. This principle allows the receiver portion to tune from **100KHz to 30MHz** with virtually no spurious responses.

At the front end of the receiver section is a **wide band RF amplifier** with 2SK125 FETs in a low noise, wide dynamic range, push-pull configuration. Since the low pass filter before and the high pass filter after the amplifier are switched for each band, responses due to out of band signals are kept to a minimum.

The gain portion of the receiver is the 9.0115MHz second IF which includes the **Pass Band Tuning System.** This PBT system narrows the pass band width from either direction, and thus eliminates adjacent signals more effectively than IF shift alone . . . plus adding 8 more poles of filtering.

Transmitter.

The IC-720A's transmitter is durable, composed of two 2SC2097 transistors in a wide band, push-pull power amplifier. The final is fully protected against overload, and an efficient heat sink with internal cooling fan provides for a transmitter that is highly reliable that can stand high SWR and continuous duty on CW and RTTY.

The IC-720A has a highly refined **RF speech processor** to increase average SSB power and to improve intelligibility for DX QSO's. An additional 8 pole crystal filter is added to the IF section during speech processor use and eliminates unwanted components. This results in a clean, distortion free signal.

Control Functions

Many advanced features are found in the IC-720A that are provided for operator convenience and speed of operation.

Dual VFO's, available at the push of a button, provide simplex or split frequency operation and when used with the equalizing button, provide a receive VFO readout that covers the full transceiver range equivalent to an RIT readout.

10Hz/100Hz/1KHz Tuning gives the ultimate in precision from 1KHz per knob rotation to 100KHz per turn for fast QSY.

UP/DN Band buttons when used with the Ham/General Coverage button, provide operation only on the ham bands or continuous tuning on each of 30, 1 megahertz bands.

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Explorer 14 Tribander Antenna Ham net Price Includes BN-86 Balun and Beta Multi-Match	$ 399.95
Hy-Gain CD-45II Rotator	164.95
Hy-Gain 52 foot (15.8 m) Crank-Up Tower Model HG52SS	1,095.00
Antenna Mast, 10 feet (3.5 m)	68.50
Three Coax Arms	39.00
Total Ham Net Value	$1,767.40
Special Introductory System*	$1,295.00
YOU SAVE	**$ 472.40**

*Any other Hy-Gain antenna, rotator or tower may be substituted at regular Ham net. Free Delivery is offered for shipping points within contiguous 48 United States only. Offer is extended through participating Telex/Hy-Gain Amateur products distributors only.

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Introducing the hy-gain® EXPLORER™ 14

Remarkably Compact, High Performance Broadband Tribander with Quad-Band Option

New Para-Sleeve Design

The Explorer 14 is a new antenna design we call PARA-SLEEVE which uses an "open-sleeve" dipole optimized for maximum bandwidth and directivity. Here is the concept. A central dipole, driven directly by the transmission line, has a ½ wave resonance on the lowest operating frequency. Two shorter sleeve elements, tightly coupled to the central dipole, modify its impedance to create a ½ wave resonance on the highest operating frequency. This para-sleeve system is expanded by the addition of 15 meter traps and 20 meter element tips. A revolutionary new concept for HF tribanders. *So unique, we've applied for a patent.*

Broadband Performance

The Explorer 14 will load solid state transceivers to maximum output with VSWR below 2:1, eliminating the need for an antenna tuner. You'll have edge to edge broadband performance on 20, 15 and 10 meters with gain and front-to-back ratio competitive to giant tribanders that cost twice as much or more. You'll be able to work stations you cannot even hear with a dipole antenna. And, the Explorer 14 handles maximum continuous legal power with a respectable safety margin.

Short Boom Save Space and Money

If your space or budget was too limited for a long boom tribander, chances are the Explorer 14 will fit both. The boom is only 14' (4.3 m) long and the turning radius requires only 17'3" (5.3 m). The compactness of the Explorer 14 reduces its overall weight and windload surface so you can mount it on a roof tripod, a mast or a tower. For example, the Hy-Gain CD-45II rotator and HG52 tower are a perfect match for the Explorer 14. This saves you the cost of an extra heavy-duty rotator or tower.

Superior Construction

The Explorer 14 includes passivated stainless steel hardware and heavy gauge, pre-formed element and mast brackets. High grade 6063-T832 thick wall swaged aluminum tubing is used throughout. A BN86 balun is included and a new Beta Multi-Match provides DC ground to reduce lightning hazard and precipitation static. It's a rugged, easily assembled antenna that survives winds to 100 mph (160 km/h).

Quad Band Option

You can add a fourth band, either 30 meters or 40 meters to the Explorer 14 with the QK-710 kit. A kit that attaches to the central dipole and is easily adjusted for either 30 meters (WARC) or 40 meters at minimal extra cost.

Lew McCoy, W1ICP is among the most authoritative writers in amateur radio. For over 30 years he served on the ARRL technical staff with his last position as assistant senior technical editor. Presently he is the technical editor for CQ magazine. Here is what he had to say about the Explorer 14:

"In my opinion, with Explorer 14, Hy-Gain produced a truly high gain, high performance antenna in a small package. The "para-sleeve" design provides the amateur a whole new ball game, particularly in the area of broadbanding. I was really surprised when I actually verified the gain, front-to-back and bandwidth during my recent visit to the Hy-Gain labs and antenna range in Lincoln, Nebraska. The Explorer 14 is a winner."

SPECIFICATIONS

Electrical

Frequencies of operation:	20M	15M	10M
Under 2:1 VSWR (MHz)	14.0-14.35	21.0-21.45	28.0-29.7
Maximum F/B Radio (dB)	27	27	21
Maximum Gain (dB)	7.5	8.0	8.0
Maximum Power		Maximum Legal	
Lightning Protection		DC Ground	

Mechanical

Boom Length	14'1½" (4.3 m)
Turning Radius	17'3" (5.3 m)
Net Weight	43 lbs. (19.5 kg)
Wind Surface Area	7.5 sq. ft. (.69 m²)

Announcing

- **SPARC Special-Event Station WD4NHW** - The Southern Piedmont ARC will operate WD4NHW to celebrate the 10th annual "Helen to the Atlantic Ocean" hot-air balloon race on June 2–4. Operation will be s.s.b. during the daylight and early evening hours between 7200–7250 and 3865–3915 on 40 and 80. For a certificate send an s.a.s.e. to John Anthony, P.O. Box 28, Sautee, GA 30571.
- **Jefferson Davis QSO Party** - The Pennyroyal ARS annual Jefferson Davis QSO party will be held Saturday, June 4, from 1500 to 2400Z. Suggested frequencies are 3.940, 7.260, 14.310, 21.410, and 28.610 MHz phone and 3.730 MHz c.w. A certificate for contacts made that day will be available. QSL information is as follows: PARS, P.O. Box 1077, Hopkinsville, KY 42240 (include $1.00 and three 20¢ stamps).
- **KO8O from Madison, Ohio** - The Wireless Institute of Northern Ohio (WINO) will be on the air with a special-event station to commemorate Ohio Wine Week on June 10 and 12. On Friday evening they will operate between 7 and 11 p.m. EDST on 3900 and 7235 MHz. On Sunday afternoon they will be on between 11 a.m. and 4 p.m. EDST on 7235 and 21360 MHz. The station will be located at a winery in Madison, Ohio, using the call KO8O, and a certificate will be available from 7126 Andover Dr., Mentor, OH 44060 for a legal-size s.a.s.e. and an additional 40¢ (in postage or coin).
- **Special-Event Station KA8KTV** - The Macomb Emergency Communication Association will operate special-event station KA8KTV in commemoration of Michigan tornado season from 1300Z, June 11, until 2100Z, June 12. They will be on 20 meter RTTY, 14.080–14.090, 2 meter f.m. on 146.07/67, and the upper general class phone portion of 15, 40, and 80 meters as propagation allows. QSL with a certificate-size self-addressed envelope to: KA8KTV, Box 291, Utica, MI 48087. No return postage necessary.
- **Spivey's Corner, North Carolina** - Cape Fear ARS will operate WB4YZF from 1300–2100Z, June 18, from the 15th Annual National Hollerin' Contest. Frequency phone—7.235. Certificate available. For details, contact Lee Brown, N4DTB, 462 Shoreline Drive, Fayetteville, NC 28301.
- **Computers in Education '83** - This conference and summer institute for educators will be held June 20 through July 15 at Rutgers, The State University of New Jersey. The focus of the conference and summer institute will be on microcomputers and other new information technologies and their impact on education and applications. For more information contact Dr. Mitchell E. Batoff, Director CE '83, Institute for Professional Development, 245 Nassau St., Suite D, Princeton, NJ 08540, phone 609-924-8333.
- **SLARC Special-Event Station** - State Line ARC, Hobbs, NM, will operate Station W5SZS June 21 through July 11 during the World Soaring Competition. Pilots from 20 or more countries will be participating. Operations will be from 2200 to 0400 UTC weekdays and 1200 to 0400 UTC weekends, on 80 through 10 meters (s.s.b., plus or minus, 20 kHz up in general and c.w. in Novice bands), 2 meters f.m. and SSTV. For a special certificate, send QSL info with QSO number and $1.00 to W5SZS, Special Event, 209 W. Gold, Hobbs, New Mexico, 88240. S.w.l.'s are also eligible.
- **The Hen House Gang from Bethlehem, CT** - W1FHP and the Hen House Gang will operate from Bethlehem, CT, on June 25–26, from Bethlehem, NY, on July 9, and from Bethlehem, PA, on July 16. Contacts will be on 10, 15, and 40 meters. Awards also available for working four Bethlehems from around the world. Send log information to Call Book address with 20¢ stamp and your address label, if possible.

- **The following hamfests, etc., are slated for June:**

May 22, **LIMARC Ham Fair '83**, Islip Speedway, Islip, NY. Contact WA2FBQ at 516-796-2965.

June 4, **Central Ontario Flea Market**, Guelph, Ontario, Canada. Contact Guelph ARC, P.O. Box 1305, Guelph, Ontario, Canada N1H 6N9.

June 4, **North Area Repeater Assoc. Amateur Fair**, Minnesota State Fairgrounds, St. Paul, MN. Contact Amateur Fair, P.O. Box 857, Hopkins, MN 55343.

June 4, **Independent Repeater Assoc. Hamfestival**, Grand Rapids, MI. Contact I.R.A., 562 92nd Street, SE, Byron Center, MI 49315, or call John Knoper, KC8KK, 616-534-5501.

June 4–5, **Kansas State ARRL Convention**, Salina, KS. Contact Bill Ringquist, KA0CUF, RR 1, Box 155, Gypsum, KA 67448 (s.a.s.e.).

June 5, **Ebonaire ARS Hamfest & Flea Market**, Queens, NY. Contact WA2VYG at 212-523-2319, or KA2CPA at 212-528-0416.

June 5, **Chelsea Swap & Shop**, Chelsea, MI. Contact William Altenberndt, 3132 Timberline, Jackson, MI 49201.

June 5, **Northern Kentucky ARC Ham-A-Rama**, Burlington, KY. Contact Dick Johnston, WA4KUB, 3113 Brookwood Dr., Edgewood, KY 41017, or call 606-341-8759.

June 5, **Humboldt ARC Hamfest**, Bailey Park, Humboldt, TN. Contact Ed Holmes, W4IGW, 501 N. 18th Ave., Humboldt, TN 38343.

June 5, **Ninth Annual Manassas Hamfest**, Prince William County Fairgrounds, south of Manassas, VA. Contact Bob Kelly, KA4NES, *c/o* Ole Virginia Hams ARC, P.O. Box 1255, Manassas, VA 22110, or call 703-361-9468.

June 5, **Rome Ham Family Day**, Rome, NY. Contact Rome Radio Club, P.O. Box 721, Rome, NY 13440.

June 11, **First Annual Bowling Green Swapfest**, Bowling Green, KY. Contact Jack Wilson, WA4SAC, 451 Skyline Tr. Park, Bowling Green, KY 42101 (s.a.s.e.).

June 11, **Kootenai Radio Society Hamfest '83**, Coeur d'Alene, ID. Contact Vladimir J. Kalina, South 1555 Signal Point Road, Port Falls, ID 83854.

June 12, **Champaign Logan ARC Hamfest & Flea Market**, Bellefontaine, OH. Contact Michael DeVault, KU8I, 7157 Road 158, East Liberty, OH 43319.

June 12, **16th Annual Goodyear ARC Akron Hamfest**, Wingfoot Lake Park, east of Akron, OH. Contact Don Rodgers, WA8SXJ, 161 S. Hawkins Ave., Akron, OH 44313 (s.a.s.e.), phone 216-864-3665.

June 12, **Monroe County Radio Communications Assoc. Hamfest**, Monroe, MI. Contact Lee Keck, KA8LAR, 4773 Blue Bush Rd., Monroe, MI 48161, or call 313-242-0627.

June 12, **Six Meter Club 26th Annual Hamfest**, Willow Springs, IL. Contact John Trepina, K9QYT, 5015 W. 31st Place, Cicero, IL 60650.

June 13, **Hall of Science ARC Hamfest**, Kew Gardens, Queens, NY. Contact Tony Russo, WB2OLB, 212-441-6545, or John Powers, KA2AHJ, 212-847-8007.

June 16-19, **YL ISSB 1983 Convention**, Dallas, TX. Contact Joe or Mary Parsons, 1639 Evergreen Drive, Mesquite, TX 75149 (s.a.s.e.).

June 18, **Columbus, OH, Hamfest**, Columbus, OH. Contact Bill, W8LLU, 614-261-7053, or Kevin, WA8OHI, 614-891-2205.

June 18, **Raritan Valley Radio Club Hamfest**, Dunellen, NJ. Contact Bob, KB2EF, 201-369-7038, 10 a.m.–10 p.m.

June 18, **Treasure Valley ARA Hamfest**, Payette, ID. Contact KC7JU, P.O. Box 790, Payette, ID 83661 (s.a.s.e.).

June 18, **Skyline ARC Hamfest**, Cortland County Fairgrounds, Cortland, NY. Contact Skyline ARC, P.O. Box 537, Tully, NY 13159, phone 315-696-8476.

June 19, **Frederick ARC Hamfest**, Frederick, MD. Contact V.A. Simmons, KA3CVD, 7301 Pin Oak Drive, Middletown, MD 21769, or call 301-371-5735.

June 19, **Santa Maria Amateur Radio Swapfest**, Union Oil Co. New Love Picnic Grounds, south of Santa Maria, CA. Contact Santa Maria Swapfest, P.O. Box 2616, Orcutt, CA 93455.

June 19, **Lake County ARC "Dads Day" Hamfest**, Crown Point, IN. Contact KA9FCG.

June 19, **Annual Wilkes-Barre, PA, Hamfest**, Kingston, PA. Contact Hamfest Committee, P.O. Box 1094, Wilkes-Barre, PA 18703, phone 717-779-3882.

MESSAGE PROCESSOR TERMINAL

MPT3100

Message processing is now available for radio communications systems. The MPT3100 is a complete up-date of the popular HAL DS3100 RTTY terminal, adding the ability to store RTTY messages, edit them, and retransmit them singly or in preset groups. ALL of the previous features of the DS3100 and MSO3100 are retained and new mailbox commands are included. The editor may be used with any file that is stored. The MPT3100 includes ASR (Auto Send-Receive), MSO (Message Storage Option - "mailbox"), and TRO (Traffic Relay Option) modes. The MPT3100 is a new software package that works in ANY DS3100 with MSO3100 circuit board. Some of the features of the MPT3100 are:

NEW FEATURES OF MPT3100:

- Automatic storage of all received text in files separated by the standard "NNNN" terminator (TRO-REC mode)
- Full editing capability of all files stored by mailbox (MSO) or by TRO storage
- Editor allows insertion or deletion of text in any part of a stored message - 15 keyboard edit commands
- Editor may be used even while receiving, transmitting, or storing messages - even when MSO mailbox is in use
- Files may be renamed, created in the editor, cut into smaller files, and deleted with keyboard commands
- Message files may be transmitted singly or in batches
- Transmitted messages may be serial-numbered automatically
- The full format requirements for NAV MAR COR MARS NTP-8(A) are supported
- New TRO commands include: RXON, RXOFF, DIR, SEND, STOP, RESUME, RESTART, EDIT, CUT, CREATE, QUIT, RENAME, DELETE
- On-screen status indicators show: TRO mode; bytes of memory remaining; file names being recorded, transmitted, and edited
- MSO mailbox .SDIR directory command revised to shorten time required for transmission
- New .DIR [filematch] and .SDIR [filematch] mailbox commands give listing of only file names that include [filematch]
- Programmable "header ID" for each mailbox transmission

MSO Mailbox Features:

- Programmable MSO call-up command
- Mailbox may be controlled by external station to store message files, read files, delete files, and list the file directory
- DS3100 operator may perform all MSO operations on the keyboard without transmitting
- Mailbox transmissions include user-prompting and automatic CW and RTTY indentification
- HELP messages are provided to assist the new user in operation of the mailbox
- All mailbox messages stored may also be edited, renamed, and transmitted using TRO commands
- MSO commands are: .DELETE, .DIR, .DIR [filematch], .ENDFILE, .FILEHELP, .HELP, .KY1ON/OFF, .KY2ON/OFF, .PRINTON/OFF, .QBF, .READ, .RYS, .SDIR, .SDIR [filematch], .WRITE

DS3100ASR Terminal Features:

- Send and receive ASCII, Baudot, Morse codes
- ASCII or Baudot at 45, 50, 57, 74, 100, 110, 134, 150, 300, 600, 1200, 2400, 4800, and 9600 baud; full or half duplex
- Morse code at 1 to 175 wpm
- Full length 72 character line / 24 line screen display.
- 50 line pre-type on-screen transmit buffer
- True "ASR" operation - pretype transmit text while receiving
- 150 line receive display buffer
- MSO 3100 adds 32K bytes of additional storage
- 12 inch, P31 green display built-in
- Control functions are clearly marked on keytop
- On-screen status indicators with real-time indication
- Upper-lower case ASCII with ALL control codes
- Current loop or RS232 RTTY input/output
- Positive and negative Morse key outputs
- ASCII printer output prints Baudot, Morse, or ASCII text
- Operates on 105-130 / 210-250 VAC 50-400 Hz power

WHEN OUR CUSTOMERS TALK, WE LISTEN – and we have been listening. Rather than making a proven product obsolete – a product that is well known and respected for its reliability and capabilities – HAL has completely rewritten the software of the DS3100 to offer the features that our communications customers have been asking for. A full year in the preparation, these are features that could only be designed by people who know and operate RTTY. Best of all, ANY DS3100 can be modified at the factory to include the MPT3100! In marked comparison to other radio equipment that is made obsolete by new models every 6 to 12 months, the DS3100 lives on – a full 4 years after its announcement.

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URBANA, ILLINOIS 61801

If you are really serious about your RTTY, look to HAL, your REAL RTTY company.

Please write for even more details about the MPT3100 Message Processor Terminal. Call your dealer or HAL for prices and how to get a new MPT3100 or to arrange for modification of your present DS3100.

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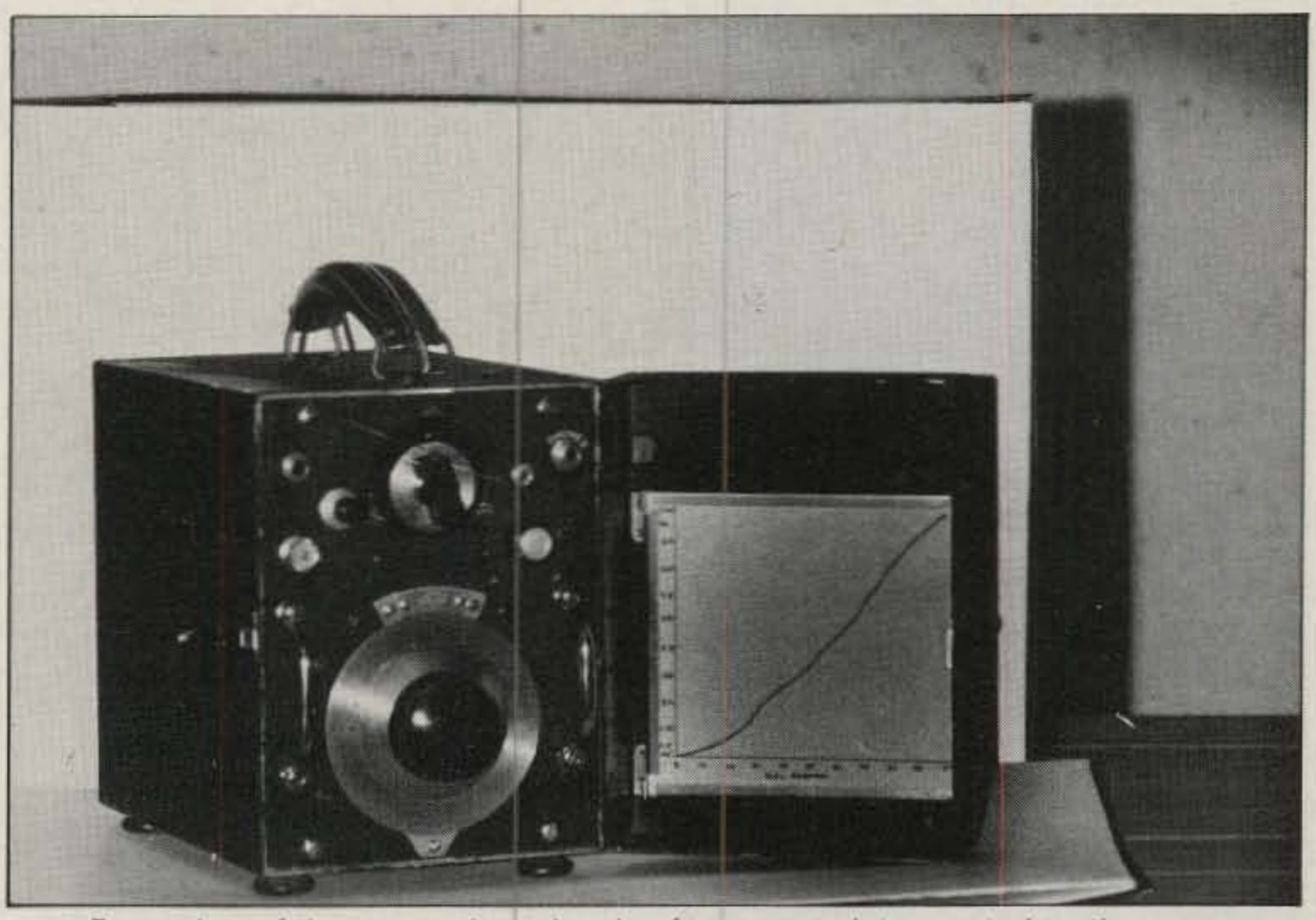
While it's a bit involved than a single-weekend project, K1RGO has come up with a top-notch few-weekend project that's guaranteed to fill your log with many QRP DX contacts.

Construct Your Own 80 Meter QRP/QSK C.W. Transceiver

BY SALVATORE J. DEFRANCESCO*, K1RGO

Browsing through a local amateur radio flea market one day, I spotted among the World War II vintage surplus a BC-906D frequency meter. What a nice piece of gear to build a QRP rig in, I thought. So, I gave the man $3.00 and it was mine. It was the vernier dial that really attracted me, since they have become scarce as hen's teeth lately, in this vicinity anyway.

With the miniature components of today and the liberal volume of this vintage frequency meter, I decided to gut it, leaving only the variable capacitor with the vernier intact, and to make an 80 meter c.w. transceiver, including as many features as I could think of. I decided to incorporate complete break-in operation with no relays, a tunable receiver offset, a battery low-voltage indicator to tell the condition of the NiCad rechargeable battery used, and a side tone for monitoring. Fig. 1 shows the block diagram of this transceiver.



Front view of the transceiver showing frequency plot mounted on the cover.

The V.F.O.

The heart of this transceiver is the v.f.o., which is used on both transmit and receive modes, and the receiver offset, which is tunable 8 kHz either side of transmit zero. In fig. 2, a series-tuned Colpitts oscillator with a source follower makes up the v.f.o. circuit. CV1 is a varactor diode which I borrowed from the modulator section of a G.E. 2-way f.m. radio, and is a 30 pF, 4 volt varactor (type V595 by Pacific Semiconductors), or equivalent. C1 is an NPO capacitor and L1 is a variable inductor used for easy alignment of v.f.o.

Q5 and Q6 switching transistors are used to bias CV1 for transmit and receive frequencies as controlled by the 2 NAND gates of the 4011 (IC1), which is controlled by key-up or key-down conditions. L1 should be wound on a ceramic form for best stability. I lucked out with a Poly-Pak special and had minimal drift. C4 and C5 are 330 pF silver mica capacitors and C6 is a 47 pF silver mica, too. It is of paramount importance that these capacitors be of good quality to ensure good oscillator stability. The tuning range is more than adequate for covering the 80 meter c.w. band. I plotted the vernier scale (0–100) for the range of 3.495 to 3.950 MHz determined by my trusty frequency counter, and I used the same chart retainer that came with the BC-906D for the new frequency plot.

To align the v.f.o., set C3 to the low end of the band and adjust L1 to 3.5 MHz; then tune C3 to minimum capacitance and observe the highest frequency obtained. The v.f.o. calibration can be performed in the transmit or receive mode with the offset control set mid-range.

Direct Conversion Receiver

Shown in fig. 3 is the direct conversion receiver. I used a 2N3819 FET (Q7) as a mixer and detector, which is fed to a multiple-feedback active audio filter of medium Q with a center frequency of 700 Hz.

L2 is a 15–100 μH, ⅜" diameter, coil (Poly-Pak special), the same as the coil used in the v.f.o. except that 6 turns of No. 26 wire are wound over the cold end, which is the secondary antenna-coupling coil. L2 and its parallel counterpart, the 100 pF capacitor, are the front-end tuned circuit and have a fairly high Q. L2 is the peaking control used throughout the 80

*17 Jeffry Road, East Haven, CT 06512

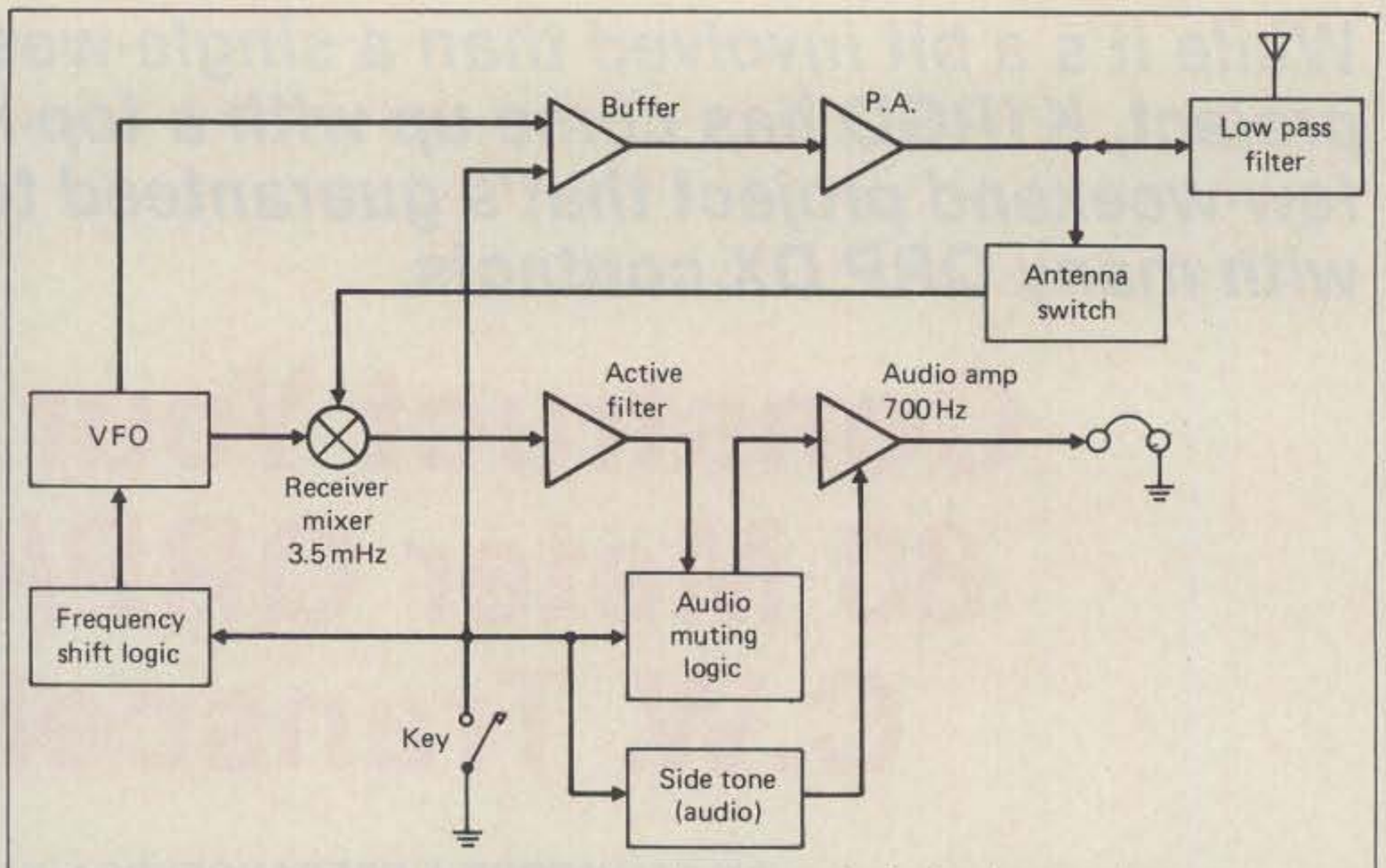


Fig. 1—Block diagram showing the path of circuit operation..

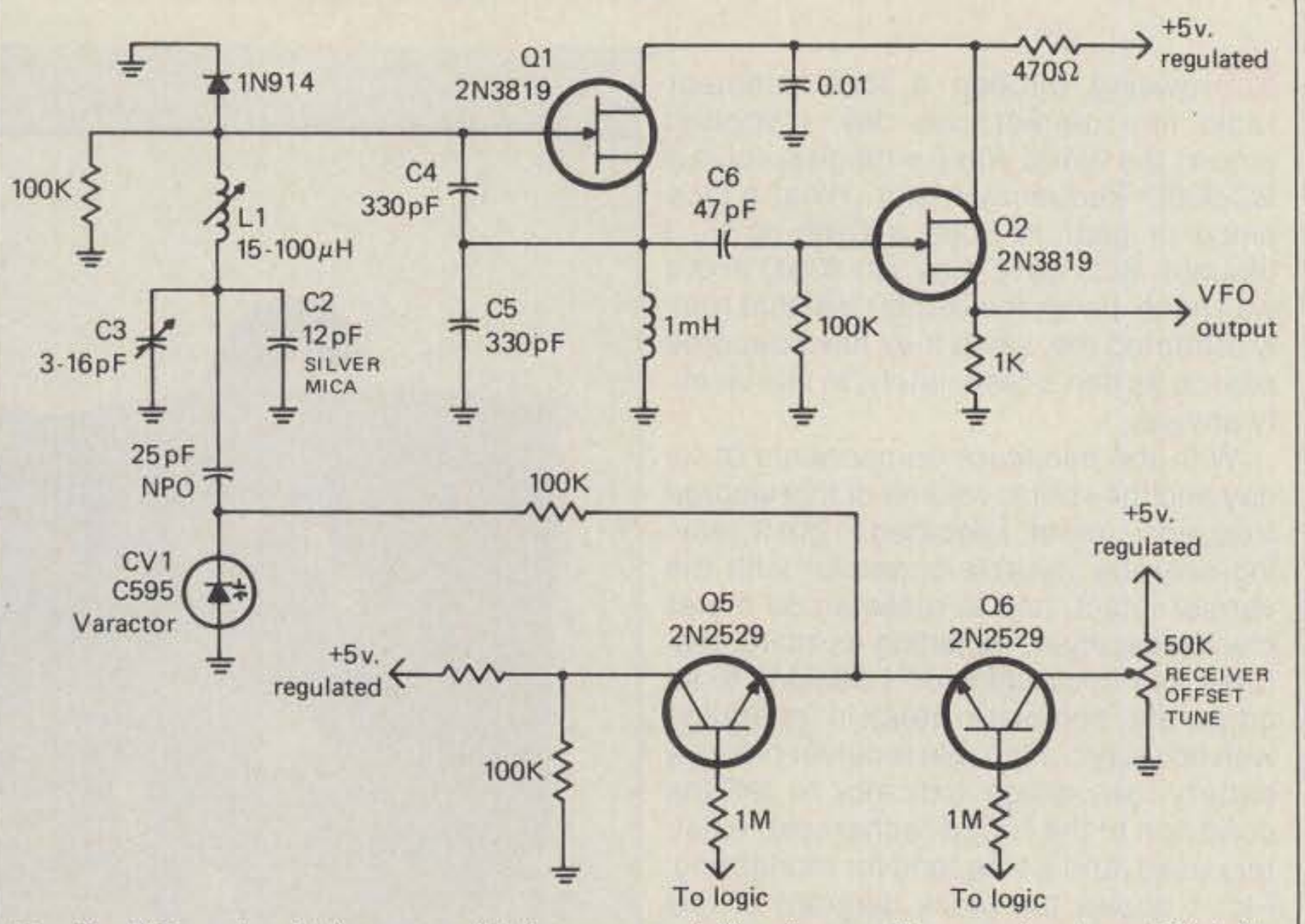


Fig. 2—V.f.o. circuit diagram with frequency shift scheme. It is a series-tuned Colpitts oscillator with a source follower.

meter band. Local oscillator injection is coupled to the source of Q7 through a 68 pF capacitor, and the drain output is fed through a .01 μF capacitor to the active filter. A .001 μF bypass capacitor from Q7 drain to ground prevents any r.f. from getting into the audio filter.

IC2 is a 741 operational amplifier used here as a multiple-feedback 700 Hz audio filter with a gain of 10 and a Q of 10, which gives you sufficient output to drive an audio amplifier without the need for a preamplifier. The audio bandwidth is about 70 Hz, which is good for most c.w. reception.

Q8 in fig. 3 is a 2N5457 FET switch which mutes the receiver during key-down-mode operation gated by IC1. IC3 is the audio output stage which can drive earphones with impedances from 10 to 2000 ohms. The gain is controlled by varying the 500 K feedback control. IC2 and IC3, both 741 operational amplifiers, are run single supply, with divider network configurations on pin 3 (+ input) for each. You may desire to add an outboard audio amplifier if you want to drive a speaker. I later found an old Radio Shack 200 milliwatt audio amplifier which I added at the output, giving me plenty of audio to spare.

Evaluating the sensitivity using an HP-606A signal generator, I found that 1 microvolt of input would give me more than adequate c.w. reception. Tuning around the band one night, I could copy many midwestern stations very well, and at one time I did copy OK1AOR quite comfortably.

Transmitter Section

The convenient advantage of VMOS devices is their ability to be driven easily. With the phenomenal power gain of this

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*Export model includes coverage of the 10-meter Ham Band.

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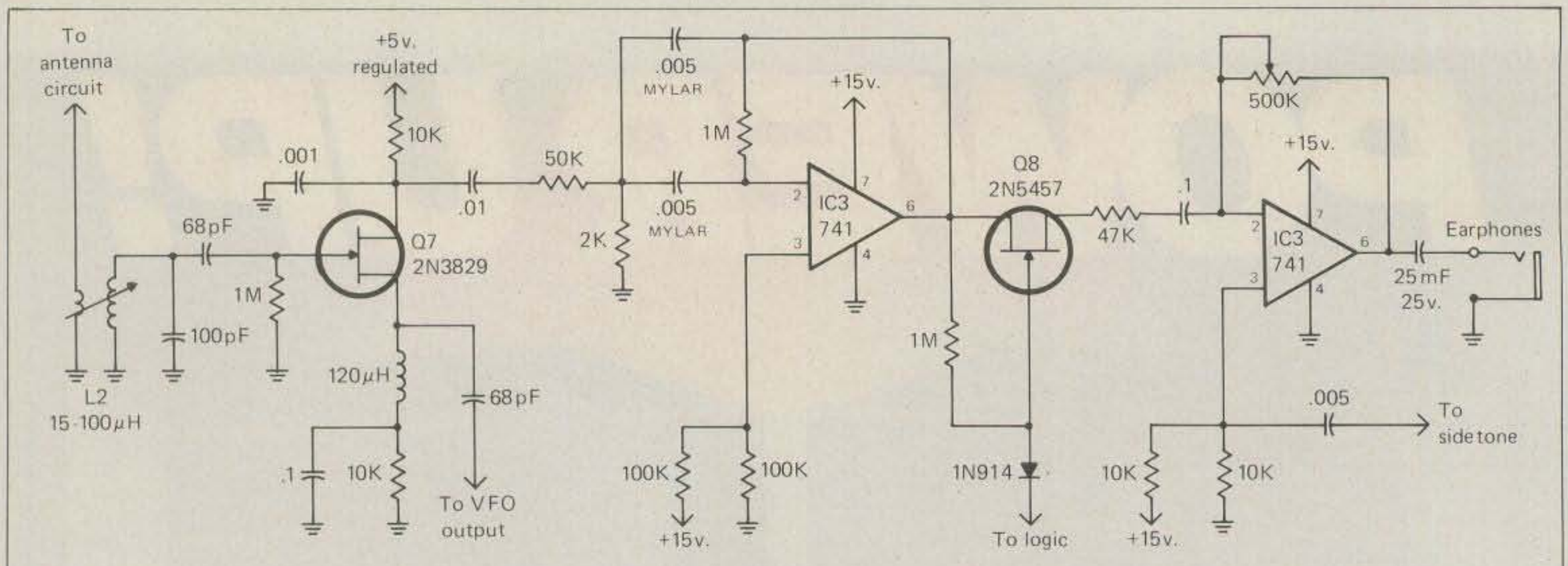
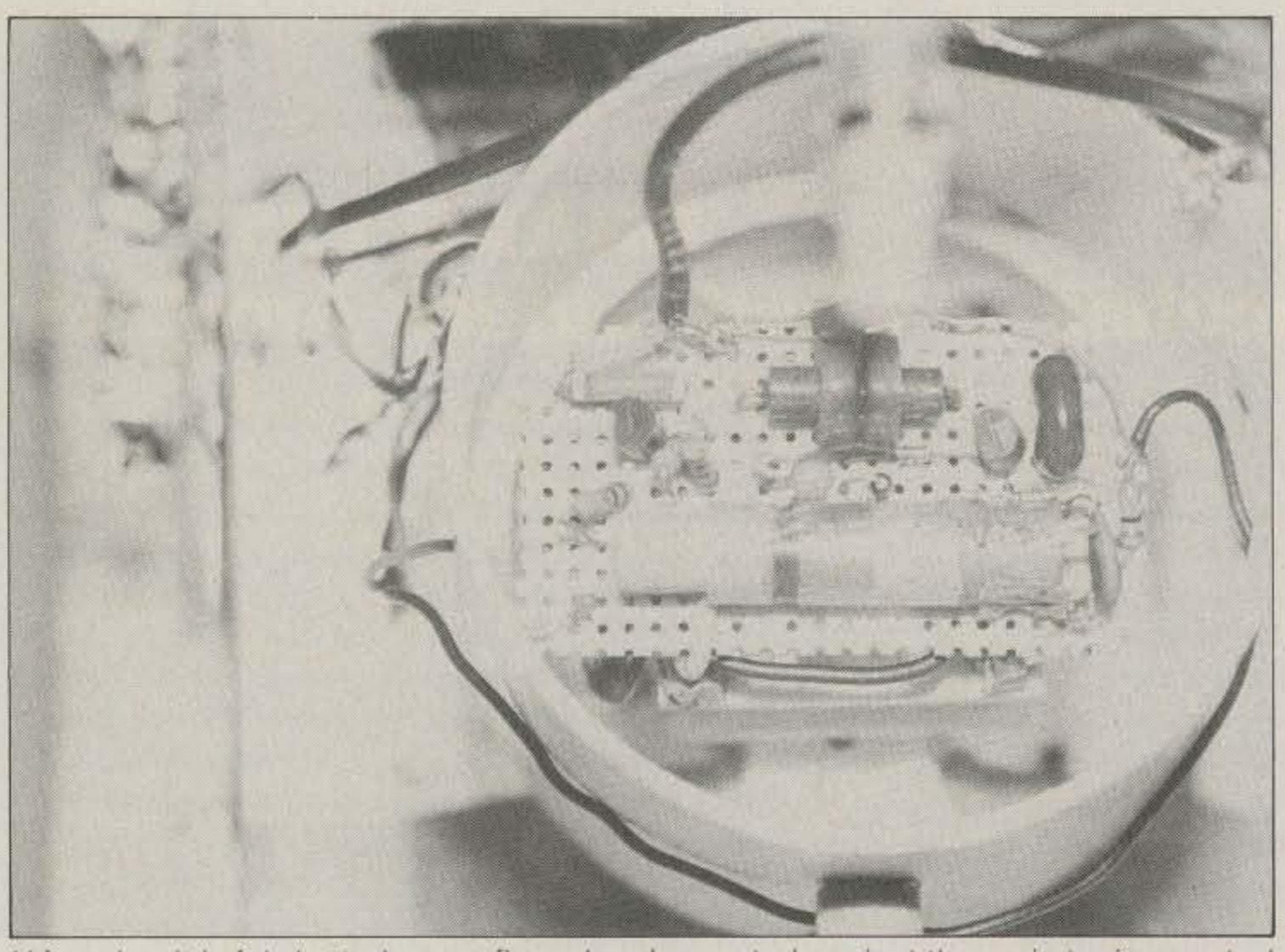
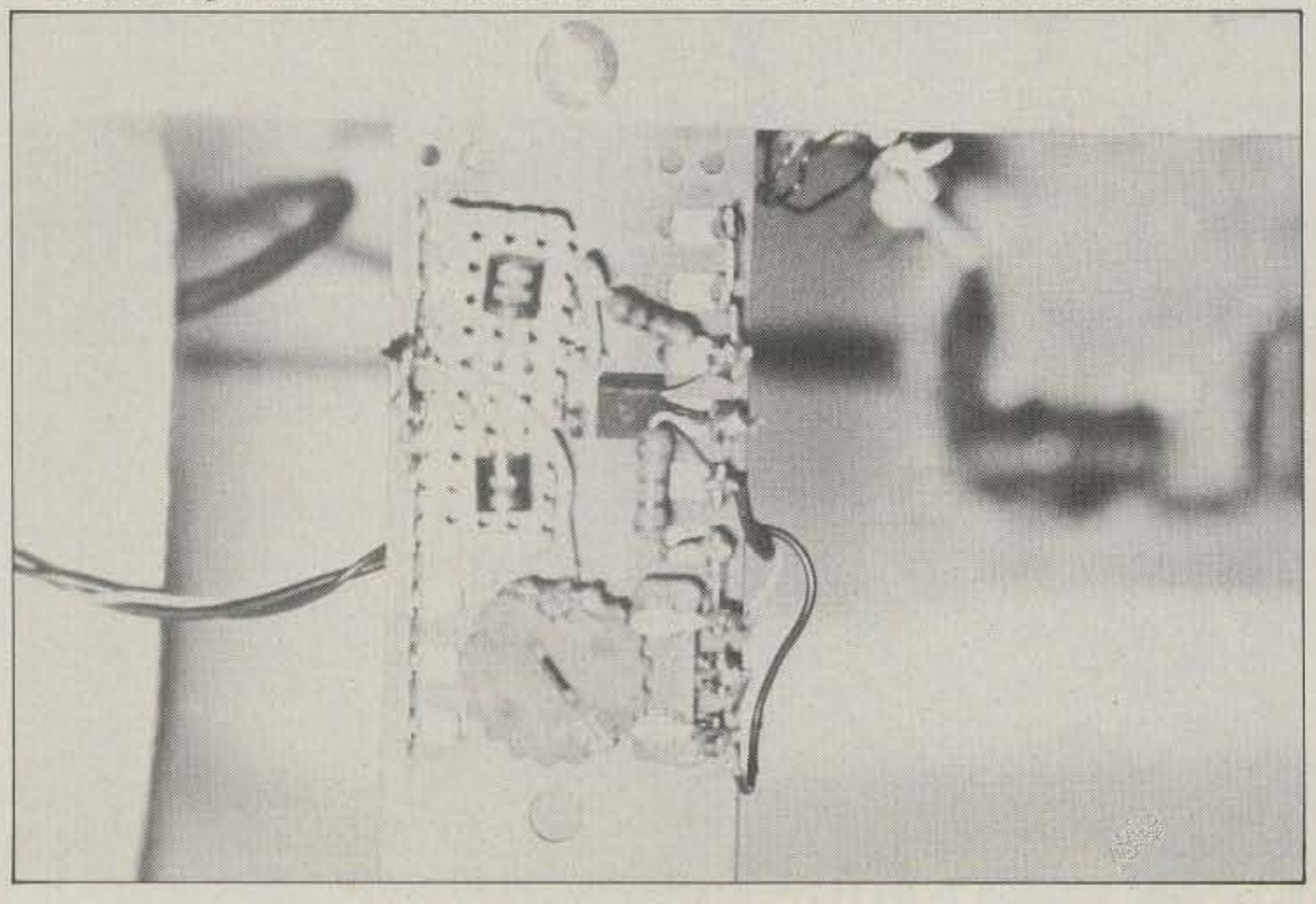


Fig. 3—Direct conversion receiver shown with muting is simple and economical to build.



V.f.o. circuit is fabricated on perfboard and mounted against the main tuning control. Low-voltage-indicator circuit board mounts easily on the main chassis frame.

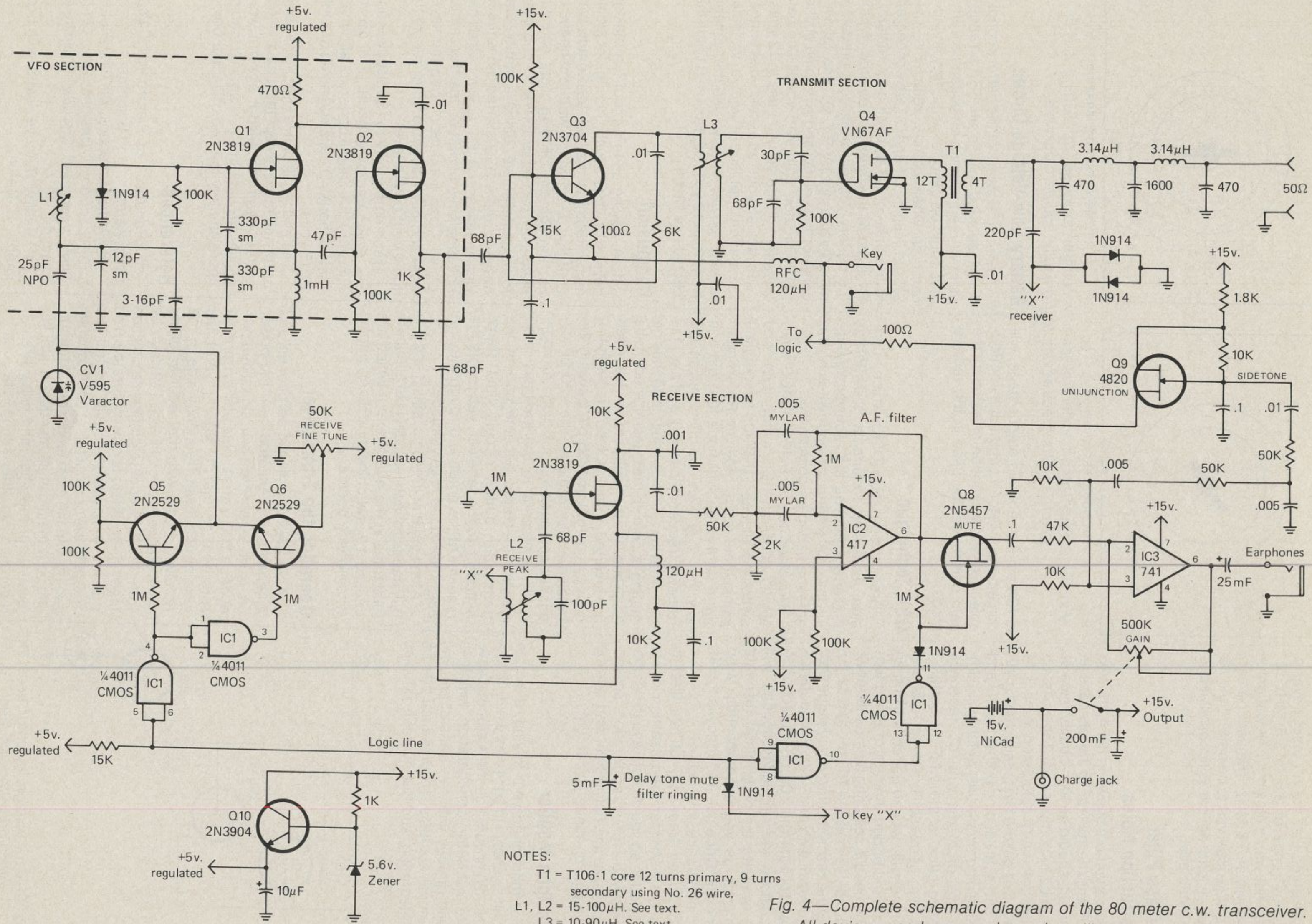


device you can use milliwatts of drive to get watts of output. I used a VN67AF for the P.A. which is inexpensive and can handle a few watts easily. Originally I ran 2 to 3 watts output at the expense of battery performance. I limited the output to 1 watt with the VMOS P.A. current hovering around 100 milliamperes. Now the 450 maH NiCad battery will last through a weekend of QSO's.

Referring to fig. 4, all that is needed to drive the VN67AF (Q4) is a class A buffer (Q3), which is a 2N3704 or equivalent transistor. The v.f.o. output is loosely coupled to the buffer through a 68 pF capacitor which gives Q3 more than enough drive. The r.f. drive output of the buffer is determined by Rf. Rf, a 6k resistor, is connected from the base of Q3 through an .01 μF capacitor used to block d.c. and yet keep a low reactance to 3.5 MHz. Rf controls the negative feedback of Q3, thus lowering the output of the buffer to limit P.A. drive level. The 6K resistor (Rf) used in the buffer feedback network limits the transmitter r.f. output to 1 watt. For convenience you may want to make Rf variable. A 50K potentiometer will do fine, and output can be varied from 0 to 2 or 3 watts. Transmitter keying is performed at the buffer stage.

L3 was another coil found in my junk box that suited my needs perfectly, since it was the value I needed. The buffer output coil, L3, is a 10–90 μH, ⅜ inch diameter coil, with the primary winding on the cold end of L3 consisting of 12 close turns of No. 30 enameled wire. The capacitive divider at the input of Q4 in conjunction with L3 is tuned for the low end on the c.w. band (3.5 MHz).

The output impedance of Q4 is matched to the 50 ohm impedance of the low-pass filter by using a torroid transformer with an impedance ratio primary to secondary of 2 to 1. The secondary is coupled directly to a 5-element Chebychev low-pass filter which attenuates any harmonics generated at the output of the final r.f. output stage.



NOTES:

T1 = T106-1 core 12 turns primary, 9 turns secondary using No. 26 wire.
L1, L2 = 15-100μH. See text.
L3 = 10-90μH. See text.

Fig. 4—Complete schematic diagram of the 80 meter c.w. transceiver. All devices used are popular and readily available off the shelf.

With a 50 ohm load and power indicator, I observed that the r.f. output over a frequency range of 3.5 to 3.8 MHz remained flat with a maximum deviation of 2 dB down at 3.8 MHz. The second harmonic was observed to be better than 40 dB down, and no parasitic oscillations were detectable.

Low-Pass Filter Construction Notes

The capacitors shown in fig. 4, the two 470 pF and the 1600 pF in the low-pass filter circuit, should be high-quality mica or silver mica in composition. The coils, L5 and L6, both were calculated to be 3.14 μH. You will get the best results using toroidil cores, producing both a high Q and self-shielding properties which will eliminate any problems with r.f. feedback radiating back to the v.f.o. or buffer. I used high permeability ferrite rods and experimentally wound the coils using an inductance bridge. Another method that can be used is selecting a tight tolerance capacitor, say around 100 pF, and calculating the resonant frequency value that would result with the 3.14 μH inductance in parallel with the 100 pF capacitor. A grid dipper and frequency counter will then evaluate the determined resonant frequency as you experimentally wind your coils. Once this frequency is found, your inductance is found.

The cutoff frequency of this filter is around 4.2 MHz, and the insertion loss is low enough so you do not have to be concerned with it for this application. Component values are not critical and can be within plus or minus 10 percent.

Side Tone Monitor

For monitoring your keying, a simple circuit as shown in fig. 4 was used. Q10 is a 2N4820 unijunction transistor in a sawtooth oscillator configuration which is keyed directly with the transmitter. The sawtooth output is smoothed out by a bit of integration, and this output is coupled to IC3 pin 3, the audio output stage, will contain the sidetone output at a comfortable level and will not be affected by the gain control setting used in the receive mode.

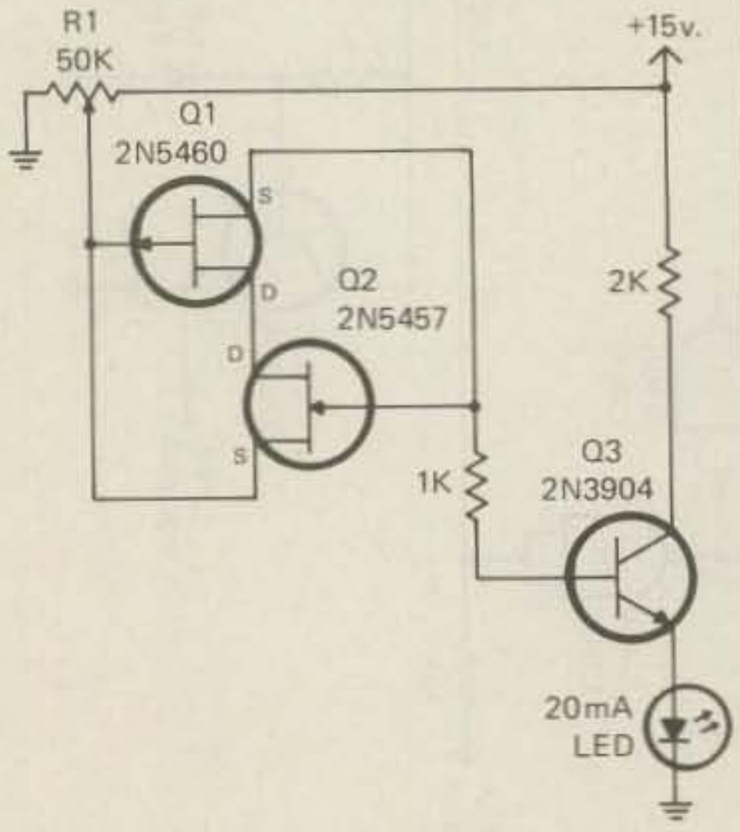


Fig. 5—Low-voltage indicator uses the pinch-off voltage concept.

QSK Technique

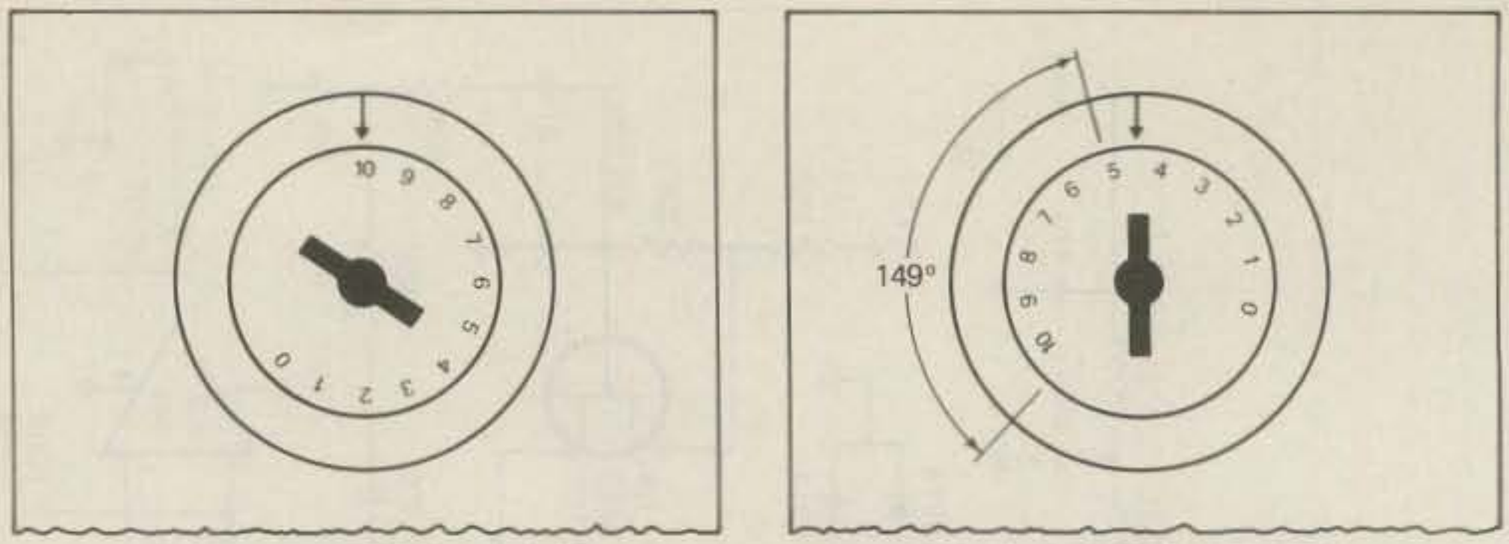
Break-in operation (QSK), which I consider a blessing, required a little effort to implement. Muting the receiver, changing the v.f.o. frequency, and switching the antenna had to be considered.

I decided to use a 4011 CMOS quad NAND (IC1), an FET switch (Q8), and switching diodes (1N914), which limit signal input to the receiver. Referring to fig. 4, in the receive mode IC1, pin 4 is low, pin 3 is high, which turns on Q6 (receive frequency control), and pin 11 is high, leaving Q8 to conduct, and thus no muting occurs. In the transmit mode, pins 3, 4, and 11, the logic states described are inverted, turning Q5 on (transmit frequency control) and Q8 off, causing the receive audio to mute. The 220 pF capacitor and back-to-back diode arrangement connected to the low-pass filter/transmitter output become part of the transmitter output circuit, limit transmitted r.f. to the receiver, yet couple the receiver to the antenna through the low-pass filter in the receive mode.

At the input of IC1 logic, pins 8 and 9, a 5μF capacitor acts as a delay to eliminate loud pops in the audio output which are caused by switching and filter ringing when keying occurs.

Operating the Transceiver

After the key or keyer, earphones, and antenna are connected, turn the power on. Now, to receive a c.w. signal that produces a 700 Hz beat note and to transmit zero beat on that frequency, you must tune on the lower frequency side of the received signal with the receiver offset control advanced clockwise 149 degrees from the fully counterclockwise position (see fig. 6). Offset is now calibrated. You can fine-tune with the offset control and return to the original offset position when tuning with the main tuning dial. After tuning your main dial as mentioned, just key away your message and enjoy break-in operation. No other tuning is needed.



(A) FULL COUNTERCLOCKWISE (B) 149° OFFSET CALIBRATION

Fig. 6—(a) Receiver offset control set fully counterclockwise. (b) Setting is 4.5, which is 149 degrees advanced from fully counterclockwise.

Battery Low-Voltage Circuit

To keep me aware of the battery condition, I decided to use an FET arrangement where the pinch-off voltage parameter could be used for switching an indicator on when battery voltage is low. Shown in fig. 5, Q1 and Q2 are connected to the base of Q3 through a 1K resistor. R1 is set to the threshold desired. When the battery voltage drops to a predetermined value set by R1, Q1 and Q2 will conduct, biasing Q3 and switching on the LED indicator. With a 15 volt NiCad battery, the voltage setting I use is 12 volts.

To adjust your threshold, disconnect the battery, replace it with a variable-voltage power supply, set the voltage from 10 to 12 volts, and adjust R1 until the LED just turns on.

Conclusion

I am having quite a bit of fun making dozens of QSO's with this rig, including many contacts that are also made with QRP rigs. Even with 1 watt I managed to get through the QRM at night and had many RST 599 reports. The v.f.o. proved to be quite stable. Once a station was tuned in and a QSO started, no retuning was necessary on the receiver, and I had no complaints of drift on the transmitted signal. I had good reports on the keyed note and no noticeable chirp running at the 1 watt output level.

I recommend a 12 to 15 volt power supply, which can be either a 12 or 15 volt NiCad rechargeable battery of about 450 maH or series D cells adding up to a total of 15 volts.

The end result of this QRP rig has been gratifying to me except that I have one regret. If I were to build it again, I would house the circuitry in a smaller cabinet approximately the size of a cigar box.

References

1. *Handbook of Electronics Calculations*, Kaufman and Seidman.
2. *Radio Handbook*, Bill Orr, 21st ed.
3. *Electronic Design with Off-the-Shelf Integrated Circuits*, Meiksin and Thackray.
4. *Design of Active Filters, with Experiments*, H. Berlin.

Here's how two hams from Chicago's CFAR Repeater, hanging in a basket under a big bag of hot air, produced a "first" in amateur radio.

FOX HUNT IN THE CLOUDS

BY PAUL C. CRUM*, W9LC

The original fox hunts, from which our 2 meter amateur radio fox hunts have drawn their name, were conducted very different from the way we now conduct our hunts. Where my signal of W9LC first sputtered on the air, powered by a Model T Ford spark coil, from its location on a farm in west central Illinois, no fox with the acumen traditional to these furry little animals would be about to sit still in one hole until a pack of hounds pounced upon him.

I have often considered this discrepancy between the original and the present-day systems, but until recently I had not been able to do much about it. I am a hack writer and an old and slow fixed-wing pilot. Approaching an article concerned with hot-air ballooning, it occured to me that certain peripheral benefits might be obtained from it. Although it should be confessed the profit motive

*6272 N. Cicero Avenue, Chicago, IL 60646

came in for consideration, with the idea of selling two articles from one episode, this was soon abandoned, and the undertaking became strictly "radio."

Of course, articles about hot-air ballooning, have previously appeared in amateur radio magazines. These have included how-to descriptions of talking from two nearby balloons,[1] and a story about using a balloon to lift a beam to the top of a very high tower.[2] But another idea presented itself: How about a "fox hunt" with the fox in a hot-air balloon?

When I first considered the flight, I discussed the practicability of such an operation with Gil, W9BUB, the technical director of the repeater. At first thought, it seemed it would present no challenge whatsoever to the hunters. It seemed they would not have to do anything but look up, see the balloon, and follow it to touchdown. Later, as the flight got underway, it became apparent that this was far from true. Numerous challenges presented themselves.

In planning the hunt, two general methods of procedure seemed most logical. In the first, it was thought the balloon should fly at a reasonable altitude, permitting those hams at fixed locations with beams to plot its course and compare it later with a log kept by the crew during the flight. The other, and most obvious, procedure was for the mobile direction-finding units to merely try to follow the balloon in flight and be the first to reach it after touchdown.

Quite naturally, in planning the flight, I sought the help of persons with whom I felt a particular kinship, partly because they shared the facilities of the local repeater, which I used almost exclusively. For very logical reasons known to us, this group was called the Motley Crew. The name came to designate the group because of the particular and varied characteristics of persons who comprised it. Since fox hunts were almost weekly occurrences with the group anyway, and since a number of them were also heavily into four-wheel-drive activities, I had no difficulty in obtaining their help.

For those not familiar with hot-air balloons, a bit of information about our craft may be of interest, particularly to the pilots of our fraternity. Although balloons vary somewhat in size, equipment, and other characteristics, most follow the same general pattern of design. Our own was a gigantic nylon bag 55 feet across at the maximum and 70 feet tall. The lower part was made from flame-resistant material similar to that used in uniforms of racing-car drivers. Passengers rode suspended in a wicker basket. Instrumentation was sparse, limited to a rate-of-climb indicator and an altimeter. Three tanks of propane gas were carried to feed the two burners attached above the basket. The main burner was formed by a coil of tubing wound spirally around a center core into one mighty heat-producing area centered below the open bottom of the balloon. During flight, a pilot light burned constantly, but the burners were operated only intermittently when required to maintain altitude or to ascend. When activated, the main burner, capable of heat generation of 10 million BTU's per hour, gave off a mighty roar that terrified all within range who were not familiar with it. It could be heard for great distances by persons on the ground. The secondary, or auxiliary, burner gave less heat and also much less noise. It produced a tall, yellow, dramatic-looking flame.

Although ballooning is considered a safe, undramatic sport by some, it presents a challenge that others are not anxious to meet. This phenomenon was apparent as the time came to schedule a fellow passenger. Fortunately, these things

WA9MAG inspects the basket arriving at the lift-off site.

K9AHK and W9LC trying to estimate the track the balloon will take.

[1] *"Balloon To Balloon Another 73 First," 73, September 1976.*
[2] *"It's Not Just Hot Air," CQ, August 1977.*

WB9WTQ, the official photographer in the foreground, helps unload the basket.

Dean Stellas, the pilot, lifts the basket to the vertical position as the balloon fills with air.

have a way of working themselves out. The companion who became available to me was suited to the undertaking by both background and temperament. He was also the one I most wanted to accompany me. Bob, K9AHK, was a newspaper man. His many years of experience were on papers ranging from the *Nashville Tennessean* to his present job on Chicago's *World's Greatest*. A degree of camaraderie was provided by the fact that his present employer also owns the radio/TV facility where I have spent most of my productive life. An excellent photographer, Bob became the official in-flight photographer.

The tempo of the activity at the launch site increased rapidly as lift-off time approached. There was much organizing, testing, and physical work to do before the large bag could be airborne. The big bag was strung out flat on the ground to its full length and width. Preliminary inflating was done by a portable gas-engine-driven fan. Because of its weight, several men were required to lift the basket and its equipment from the trailer to the ground. As the bag was being filled with air, the burners were checked. When the bag was almost full, several blasts of hot air from the burner were shot into it, and it rose slowly, appearing to awaken and stretch lazily heavenward, ready to lift the basket and its load.

An indication of the lack of room available to us can be visualized by the size—4½ feet on each side—of the triangular basket. Three tanks of propane gas, radio gear, with our three cameras and their accessories left limited room for personnel. With the pilot, Dean Stellas, Bob, and myself, the passenger area was snug.

Accustomed to take-offs in a variety of fixed-wing craft ranging from single-wheel gliders to planes on skis and floats, the lift-off in the balloon was an entirely new experience. As we stood in the basket talking to those on the ground, we suddenly found ourselves raising our voices and listening carefully to hear theirs. We were airborne.

The hunters' automobiles were parked two blocks from the launch site in the balloonport parking lot. The walk to their cars was unhurried, as they were confident they could easily find the balloon by going in the direction it had assumed at lift-off. Finally underway, they were surprised when they failed to find it where they had expected it to be. They were further confused by the amount of aerial activity in the region. The Windy City Balloonport is used by several balloonists as their launch site. On this paticular evening, one balloon had preceded us into the air, and another followed us closely, making it difficult for the hunters to determine visually which balloon they were supposed to follow. When they radioed for help in identifying our balloon, Bob told them facetiously to look for the balloon with the "X" he had marked on its bottom before lift-off!

We experienced two difficulties in operating from the balloon. The first of these was to be expected: Because of our altitude all ground stations could hear the balloon, but many of these could not hear each other. This often resulted in several units transmitting at the same time. One difficulty we had not expected was caused by a particular characteristic of hot-air balloons. As mentioned earlier, the main propane burner gave off an almost deafening roar each time the pilot activated it. This burner caused two distinct difficulties. The first was communications, and the other was physical. The burner was located only a few feet above my head. With the great heat output the heat radiated downward, resulting in one scalp "medium rare." More dramatic, and less painful, the noise generated by the burner was the cause of much difficulty in reception. It was impossible to hear signals on the little transceiver when this burner was activated. Frequently, as we stood by for a ground station, the pilot activated the burner and all answers were lost. Our

WA9FTS (a "hound") checks his handie-talkie and beam for the chase.

mike was purposely left on at times to permit ground stations to appreciate our problem.

Time was taken out from regular fox hunt communications for some 146.52 simplex operation. It had been hoped to work rather appreciable distances from our altitude, but the afternoon proved hazier than we had expected, so our altitude was limited to 1500 feet. This, together with our being too busy to spend as much time as we should have liked, prevented us from getting in as much simplex operation as we wished. Our DX for this type of operation was a "W Zero" mobile. It seemed, too, that comparatively few stations were on this simplex frequency this particular evening.

Both Bob and I were too busy during the flight for much log or note keeping. He was occupied with his aerial photography and maintaining contact with our Chicago repeater. I divided my time between communicating with the hunters and helping the pilot spot livestock below. Balloon flights are usually leisurely affairs, leaving time for socializing with those below on the ground. This we did when we were able, and it was most enjoyable.

Our landing was delayed a number of times by the presence of farm animals in the fields where we had hoped to set down. To the uninformed, it would seem that pigs, cows, and horses would not have very much to do with the flight of a hot-air balloon, but as any farmer knows, farm animals are generally quite excitable, and we wanted to avoid any "enemy action" from either the animals or their owners.

We rapidly approached the time when we would run out of both fuel and daylight. Our friends on the ground, who were in our locality at the time, tried to help us find a suitable landing spot. With balloon assemblies weighing 500 pounds, touchdowns must be made close to where the chase car can come to pick them up. Both finding such a spot and the ability of the hunters to reach us were hampered by the absence of roads leading conveniently in our direction. Quite often throughout the trip, although we traveled only a short distance over the ground, the four wheelers had to race several miles out of their way to reach us. With darkness falling and with only 15 minutes of propane remaining, we approached the village of Mc Henry. A balloon landing is somewhat more dramatic than its lift-off. Drifting rapidly toward a

Is this a chase car? WA9MAG and WB9YAE are in the background.

steep bank on the edge of the town, we followed the instructions of the pilot, leaning forward, flexing our knees and gripping the edge of the basket. At first contact, the bottom of the basket hit the ground with a jarring blow and bounced twice. The pilot yanked the rope leading to the trap at the top of the balloon, releasing much of the heated air, and the basket settled to the ground.

The area was soon bedlam, as the four-wheel drives, their lights flashing, came roaring and bouncing up to the finish.

Our pilot, Dean, and chase car driver, Kathy, had planned to make our flight a memorable occasion. When we cleared ourselves of the basket, Kathy brought out a tall, cold bottle that she had brought along to celebrate the occasion.

A report on the first amateur radio 2 meter fox hunt, in which the fox was the hot-air balloon, cannot be fairly covered without giving credit to those hearty—and sometimes lucky—souls who completed the chase. Dan, WD9FDR, one of the three on the hunt who were not actual members of the Motley Crew, was the first to reach the balloon. It was his first hunt, and he was the winner of it. Not being experienced in fox-hunting etiquette, he said he was not sure how to establish his victory—whether to just run down the hill and touch the balloon, or to hand us his QSL card. His two friends, Jerry, KA9BFR, and Tony, WD9GGG, closely followed him.

Jim, WB9WTQ, the photographer who was responsible for the pictures at and soon after lift-off, and Larry, WA9MAG, arrived next and were the first to put the "Crew" on the board. It was getting so dark when we finally got down, that Jim had trouble focusing his camera for the after-touchdown pictures. Two of the Crew's most active—and usually most successful—members, Harvey, WB9YAE, and Sam, WB9RDE, were next, finishing much farther back than usual. Several

"Windy Bill," WA9SRE, mounts the beam on "Orange Crate."

navigational miscalculations occured on the way to the launch, but the hard-luck prize of the afternoon went to Art, WB9JIT. His traditional phonetics for his 'JIT call, "just in time," failed him that afternoon. He complained that he used an entire tank of gas on the hunt, but had not been present at *either* the lift-off or the touchdown.

Gene, W9ITV, his wife, Judy, and their three small daughters followed WB9YAE and WB9RDE to the balloon touchdown site. Rather expectedly, "Windy Bill," WA9SRE, and his wife , Lavina, completed the procession as they leisurely arrived in the "Orange Crate," as they call their car.

An event of this magnitude reasonably called for a celebration by the Motley Crew. Of course, the Crew will celebrate whether or not they have a reason of any great magnitude, but the realization that they had accomplished an actual first in having amateur radio's first 2 meter fox hunt, with the fox in a hot-air balloon, fell heavily upon them. As was fitting, their usual Sunday night meeting place was chosen for the celebration.

It is difficult to arrive at an overall evaluation of an adventure such as this. Although it was an actual first in ham radio, the casual informality of its conduct defied usual methods of evaluation.

Gil, W9BUB, who as mentioned earlier had provided technical advice for the event, raised his voice to be heard above the crunch of pop corn, and related a comment the pilot of the balloon had made soon after touchdown. Although admittedly not extremely scientific, his comment will probably be of as much value as any that might be made concerning the event. In addition, it pays tribute to the special "abilities" of myself and K9AHK, who comprised the crew. Somewhat shaken by his experience with his unusual passengers, the pilot told Gil: "I've never heard any two guys talk so much in two hours in my life. They nearly drove me nuts!"

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TEST MESSAGES: Quick Brown Fox and RYRY's in Baudot, U*U* in ASCII, VV in Morse.

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UN-SHIFT on Space: Automatically shifts back to "LETTERS" upon receipt or transmission of space. Keyboard command on/off.

REAL-TIME CLOCK: Keyboard set, always on screen display, hours, minutes, seconds. Can also be inserted in transmit text buffer by keyboard command.

WORD WRAP AROUND: Prevents splitting words at the end of a line. Works in receive as well as transmit.

CODE PRACTICE: Random 5 char generator sends at any speed you set via the keyboard. Hand-Key input allows use in code practice oscillator that will also read your sending!

STATUS DISPLAY can be called up to show the condition and control commands for 20 programmable parameters, such as AFSK tone freqs, UNOS, printer, etc. Useful as a "HELP" command in case you misplace the manual. There's also a constant "TOP-LINE" display of Time, Mode, Speed, & Code in use.

DETECTION MODES

Direct	Phase correlation detector with AGC controlled bandpass filter (100 Hz nominal width — 800 Hz center frequency)
Demodulator	Computer program enhanced dual tone demod. Primary tones fixed @ 2125/2295 Hz, Secondary tones variable @ 500 — 3000 Hz.
**Terminal	RS232 compatible half duplex or full duplex up to 9600 Baud

DATA RATES

Morse	5-199 WPM Keyboard selectable in 1 WPM steps. Auto speed tracking or speed on receive
Baudot	All standard 45, 50, 57, 74, 100 Baud (60, 66, 75, 100 and 132 WPM)
ASCII	110 & 300 Baud normal & synclock using internal Modem. ATR adds speeds up to 9600 Baud.
Slow Scan	8 seconds per frame

OUTPUT OPERATING MODES

Symbol	Character ouputs when typed
Word	Words sent after "Space Bar"
Line	Line sent after "Return"
Buffer	Send entire contents of text buffer

TUNING INDICATORS

Audio Ref. Tone	800 Hz Keyed Regenerated
Visual	LED on Mark (Keydown)
Scope	Tuning ellipse for RTTY

PROGRAMMABLE MEMORIES

	10-40 character messages (400 total) or
Here is:	*10-80 character messages (800 total) battery backed
ID:	15 characters maximum in standard ID and 17 in RTTY ID
WRU:	Up to 15 characters
Selective Call:	ATR — 4 memories, up to 15 characters each. ACT-1 — 2 memories for printer on and printer off

****COMPUTER CAPABILITY**

Memory	Standard unit has 4000 bytes of RAM for user program. Basic package adds 16K.
Language	Basic or Motorola M6800
Commands	Input; Output; Load; Go with Break Point; or Normal Basic
Tape Interface	Store Programs on Audio Cassette

POWER

115 VAC, 60 Hz 60 VA Max, Act-1, 30 VA Max (230 VAC, 50 Hz optional)
12 volt version available
External input for charging expanded battery backed memory. 6-15VDC @ 10 ma. max.

MECHANICAL

ATR-6800:	
Size	14¾"W x 12¼"D x 4"H
Weight	15 lb.
ACT-1:	
Size	17.8 W x 3H x 9.5D
Weight	7 lb.
ATR-6800 & ACT-1:	
Color	Beige Top, Black Base
Material	AL5052 Aluminum Alloy

*Standard on ATR, Optional on ACT-1
**Standard on ATR, Not available on ACT-1

CIRCLE 12 ON READER SERVICE CARD

MICROLOG CORPORATION —18713 Mooney Drive—Gaithersburg, MD 20879 (301)258-8400

Once you've finished the receiver shown elsewhere in this issue, you can tackle this QRPp transmitter. It's definitely not a 6L6 in a breadpan type of project, but it can bring back that same feeling.

Roll Your Own TTL QRPp Transmitter In A Card File Box

BY EVERT FRUITMAN*, W7RXV

Who can ever forget the nervous excitement that hit them that first time their own call letters filtered back to them through the static? The thrill of that first contact, and the memory that we did it with probably 5 to 25 watts, lingers a *very* long time. Even now when we have somewhat better equipment available, it is still good to get on the air with low power and see what happens. Here's an easy way to do that with some simplified modern technology.

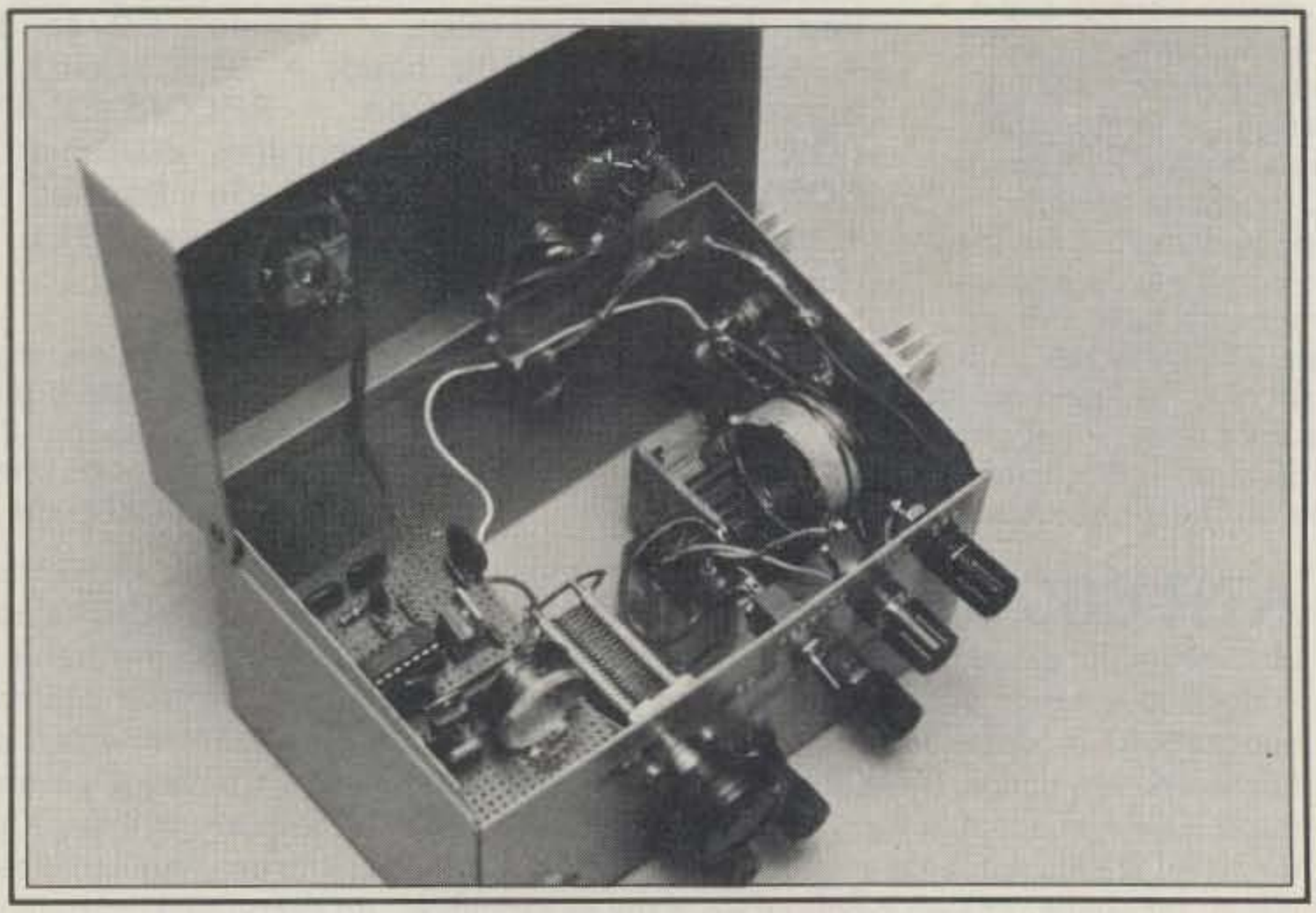
These transmitters, running from a few milliwatts to more than 15 watts, are good for the beginner as well as the old timer. Even though the higher power level lifts you above the limits of classic QRPp, the rigs are easily constructed and make good backup or portable equipment. They use one of the popular TTL series IC's and two or three transistors.

The more or less standard TTL clock oscillator shown in fig. 1 drives a buffer which is standard. The tank helps clean up the output waveform before it goes on the air.

Five gates of a 7404 hex inverter are used, two as an oscillator, and three more for buffering and phase inversion. The two out-of-phase outputs connect to opposite ends of a series-tuned tank, with no problems from the propagation delay caused by the series connected gates. There is enough output to light a small pilot lamp. I put this very simple transmitter on the air with good reports from the locals.

The single-ended oscillator/buffer makes a good driver with or without a tuned circuit; in fact, without the current limit resistor in its output, it can destroy the emitter-base junction of the amplifier. The amplifier, without a tuned circuit on its input has less tendency to break into self-oscillation, and that is why I wanted a transmitter with only one tuned circuit; the high drive levels available from the 7404 or 7400 IC's make it a practical reality.

*2808 West Rancho Drive, Phoenix, AZ 85017



The completed TTL QRP transmitter.

The transmitter shown in the photos and fig. 2, went together in a 3" × 5" card file box, with those things in mind. The oscillator is a bit sluggish, with the regulator set on the high side of 5 volts for more drive. I dropped the voltage a bit, and still use it.

A higher power version, incorporating several improvements and conveniences, found its way into a 4" × 6" card file box. (Where else do you get a chassis for less than $2.00?) A three-terminal regulator stabilizes the oscillator/buffer voltage, while a separate oscillator transistor brings the keying speed up to par, and a power amplifier pumps out more r.f. Finally, a spot/operate switch is an added operating convenience (see Fig. 3).

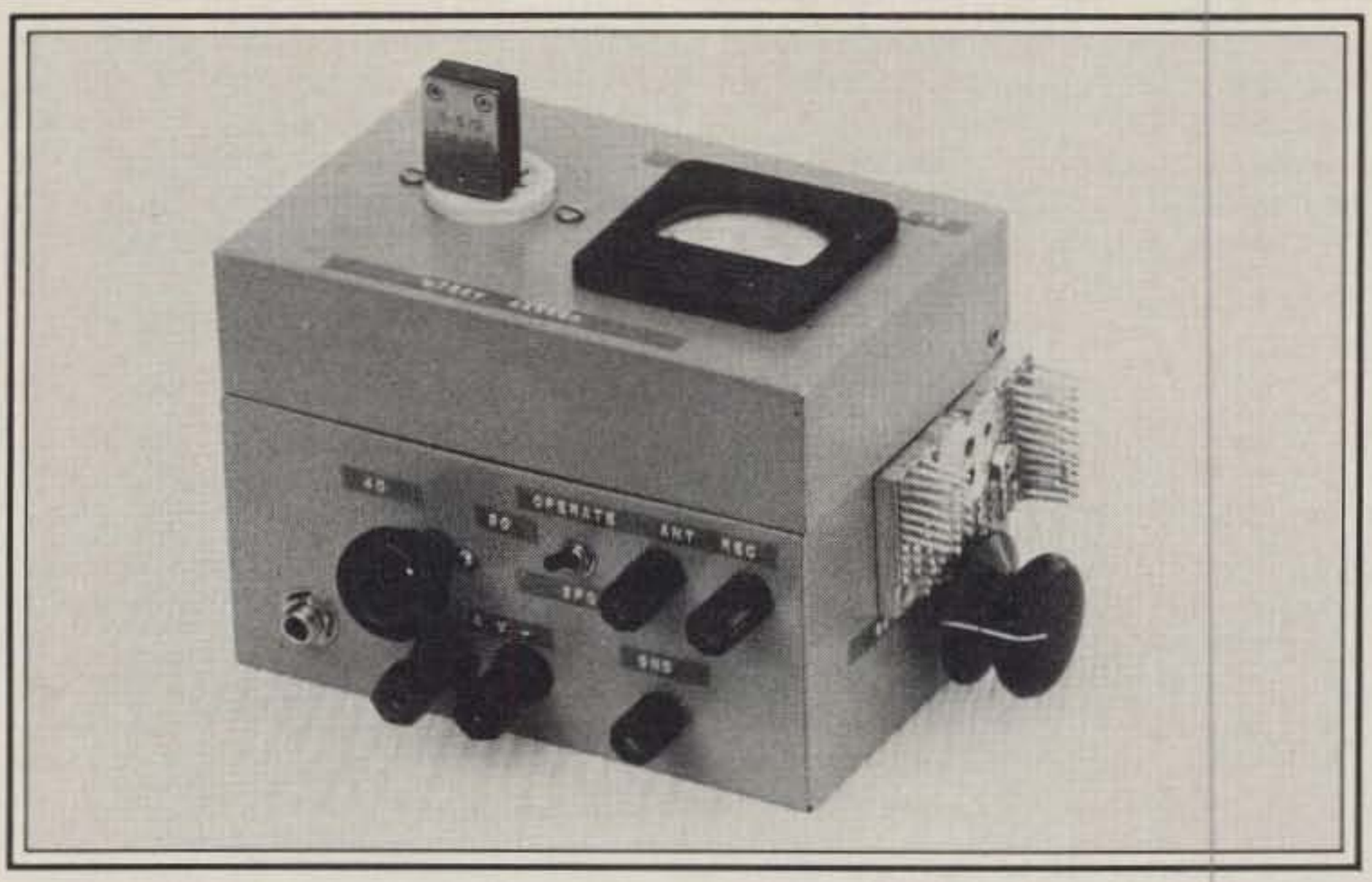
The oscillator has one side of the frequency-trim capacitor at ground potential which facilitates the addition of the circuits commonly used for transmitting RTTY and other forms of frequency-shift-keying (FSK).

The 470 ohm resistor at the input of the buffer gives a measure of isolation, and the 39 ohm resistor on its output limits base drive to the IPA. IPA collector current is monitored, as needed, by means of a voltmeter across the 1 ohm resistor.

The r.f. chokes may use ferrite or air cores; the tank coils, however, must use air cores. The links are wound on the collector end of the coils and should be three to four turns for antenna coupling, or one to two turns for interstage coupling. The 100 ohm resistor and 0.01 μF capacitor in series with the driver link improve the PA's efficiency.

Although my IPA transistor is one normally used as a driver in CB service, I found that a 2N3053 gives considerably more drive, and therefore more output. A 2N2102 or its substitute should give equally good results.

The tank circuits tune from 80 through



TTL QRPp in a box. Add key, power, receiver, and antenna.

20 meters, which can be both good and bad. Check the tuning/ output frequency (with an absorbtion wavemeter), otherwise you might wind up *near* 20 with a 40 meter crystal. And you know who takes a dim view of that!

The photos vividly show that the tanks do develop enough voltage at the junction of the coil and capacitor to light a fluorescent lamp. Be wary and avoid r.f. burns. The high Q that helps generate the high voltage also helps reduce spurious outputs. A spectrum analyzer indicated that the little rig's second harmonic content is down about 30 dB; the big one is down about 35. A low-pass filter would further reduce harmonic content. Incidentally, 30 dB below 2 watts is 2 milliwatts.

If you wish to try the original version of the transmitter, most of the parts fit on a single piece of perforated board, using a simple, non-critical layout. The series regulator is built around a 14 pin (DIP) socket; the four transistors plug into it with room to spare. It is in the lower left corner of the photo. The amplifier is above that and just below the oscillator. The crystal plugs into two pins taken from an old octal (tube) socket.

The variable capacitor comes from an old radio and has a maximum value around 250–300 pF. The coil is wound on cardboard tubing about 1½ inches in diameter. For optimum results on 80 meters use 22 turns of AWG #22 plain enameled wire; it will still tune the other bands. The link is three to four turns over the collector end of the coil.

The "Pipsqueek" loads up at about 110 ma at 25 volts, which could come from lantern batteries, a potentially long-life portable power supply. This rig should be able to deliver more r.f. if a better match between the collector and the antenna is achieved. The tune-up closely follows the method detailed later on for the bigger transmitter.

Another way of getting more r.f. out is by adding an amplifier. That's one of the things done in the improved version. The heatsink is needed if tune-up (play) time isn't limited to a reasonable length of time, as I found out the hard way. Use it if you anticipate RTTY operation.

The oscillator, buffer, regulator, and driver all mount on a single piece of board. The crystal socket, an octal tube

The driver tank is as far away from the final tank as practical, and at right angles to it. It is wound with AWG #26 or 28-gauge enameled wire. High Q isn't really desirable here. A two-turn link provides adequate drive.

Most of the PA parts mount directly on the chassis or on parts that do mount on the chassis. The PA tank coil is 18 to 20 turns of AWG #22 on a 1¼ to 1½ inch diameter form. The windings get a coat of coil dope and tape; add the link and another coating of coil dope.

The operation of each stage may be checked as it is completed. Before the 7404 is plugged in, be certain that the socket, mounts on the box top with the frequency-trim capacitor soldered to the bottom of the socket so that the adjusting screw is accessible from the top, with the cover closed.

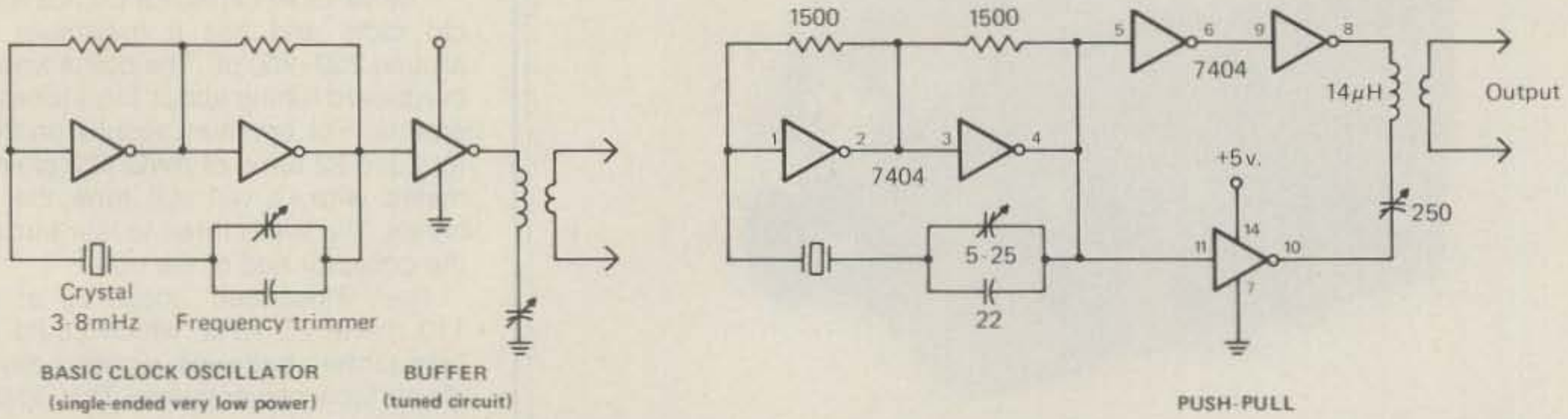


Fig. 1– A basic TTL QRPp transmitter.

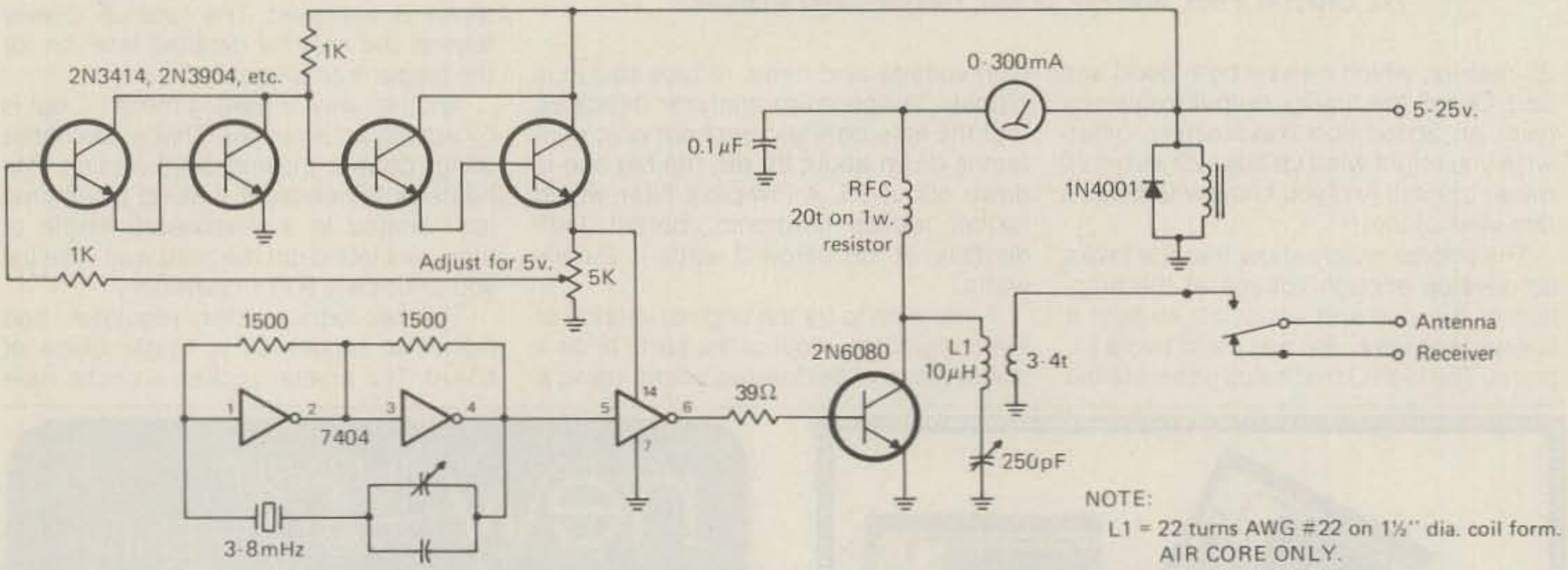
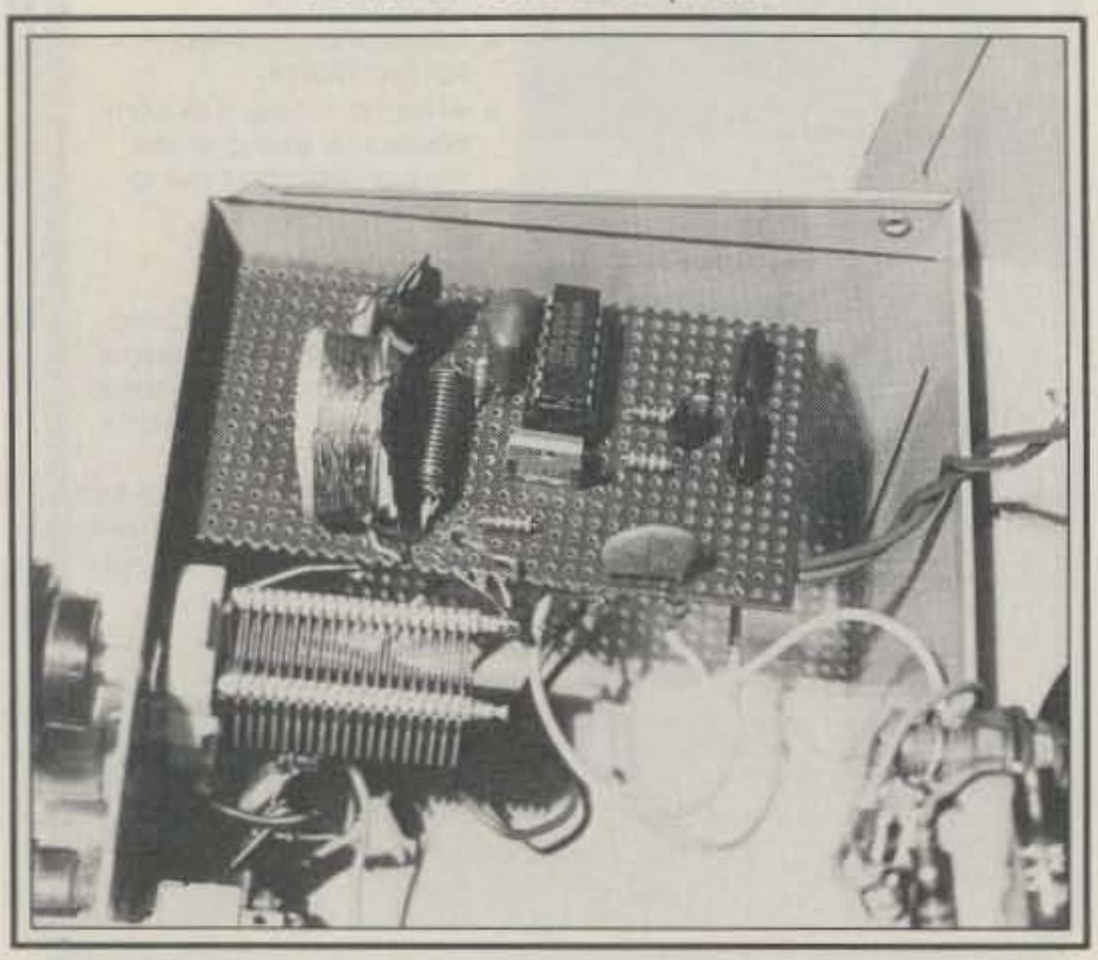
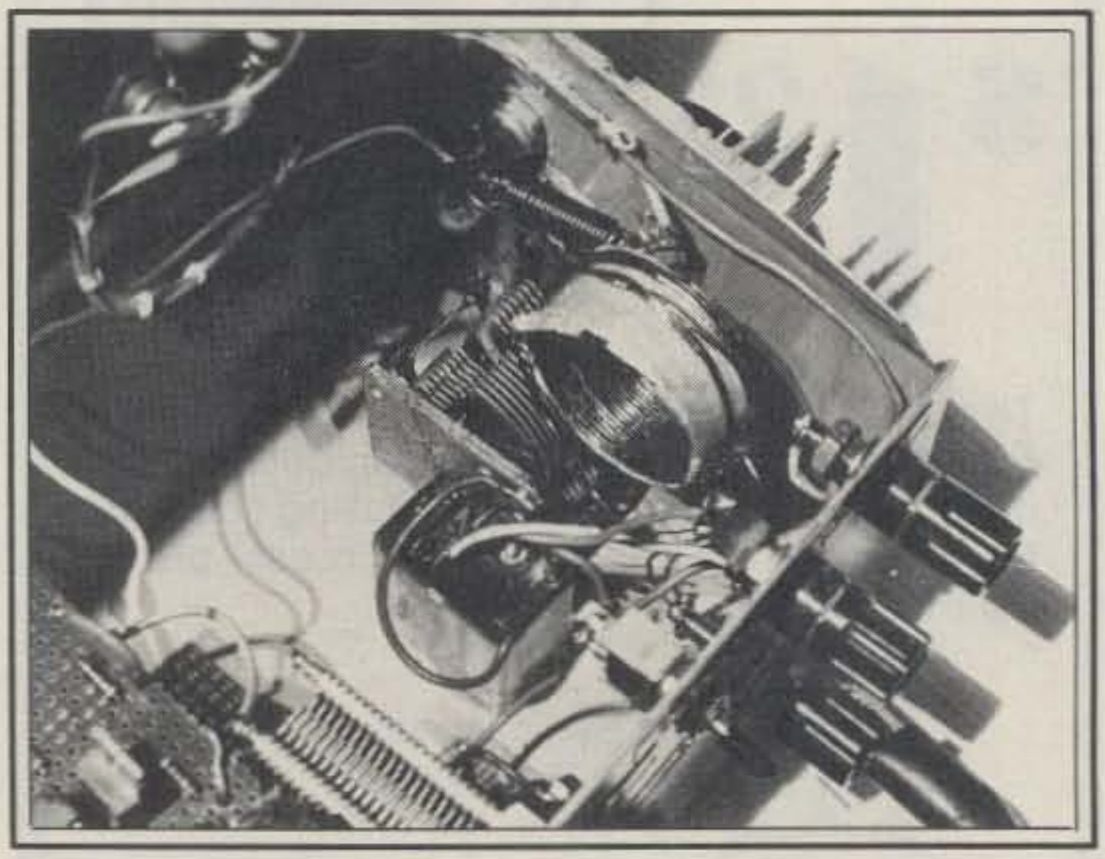


Fig. 2– A TTL QRPp transmitter with a PA. At 25 volts, it delivers about 2.5 watts into the PA. More d.c. in and r.f. out is possible with better collector-to-load matching.

Interior view, close-up of oscillator-buffer-driver. Oscillator is on upper right-hand side of board; regulator and buffer are near the center; driver transistor is on the upper left side. RFC is just to the right of the driver tank coil. Driver tuning (capacitor) is in the lower left side of photo.



Power amplifier showing direct method of wiring. PA transistor is in the top center of the photo, and PA tuning just below it. The antenna relay is next to the PA tuning. Part of the driver board is in the foreground.



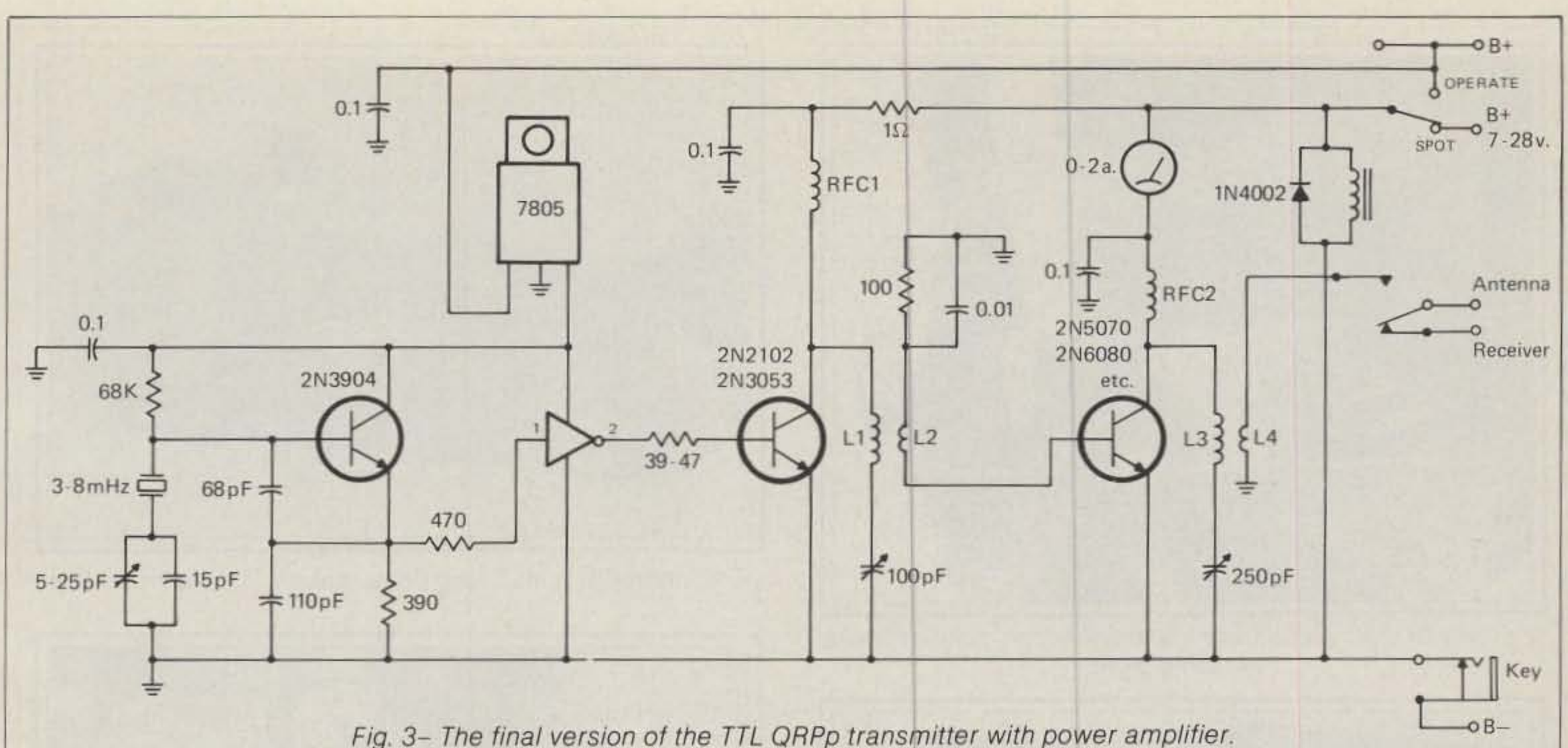


Fig. 3– The final version of the TTL QRPp transmitter with power amplifier.

Parts List

Capacitors

15p silver mica
68p silver mica
110p silver mica
5–25p mica compression trimmer
0.1 μF 50 volt 4 ea.
0.01 μF 50 volt
100 pF variable (nominal 12–120)
250 pF variable (nominal 15–300)

Resistors

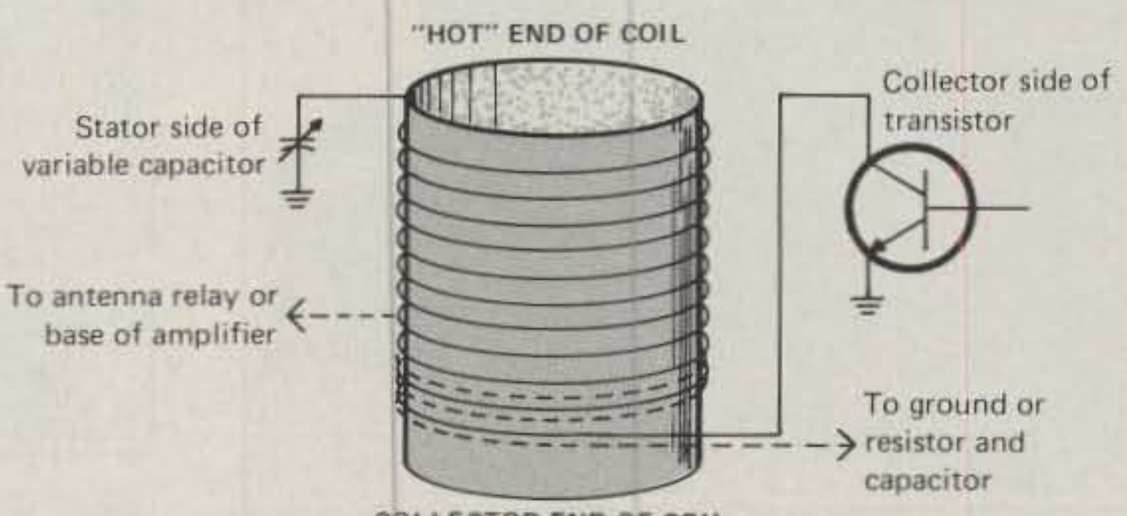
68,000 ohms ¼ W
390 ohms ¼ W
470 ohms ¼ W
39–47 ohms ¼ W
1 ohm 1 W

RFC

Nominal 2 microhenries: 20 turns AWG # 22–26 gauge enameled wire on 1 watt resistor will work; small powered iron core is better.

Tank Coils

L_1—20 turns AWG #26–28 gauge wire on nominal 1½" diameter cardboard tube.



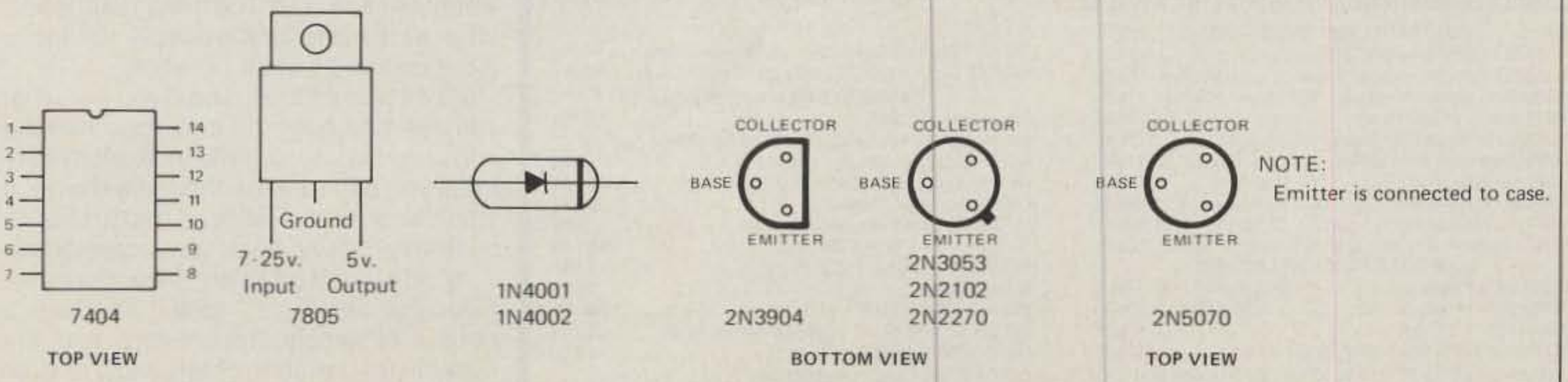
L_2—1 or 2 turns AWG #26–28 gauge wire on collector end of L_1.
L_3—20 turns AWG #22 gauge wire on nominal 1½" diameter cardboard tube.
L_4—3–4 turns over collector end of L_3.

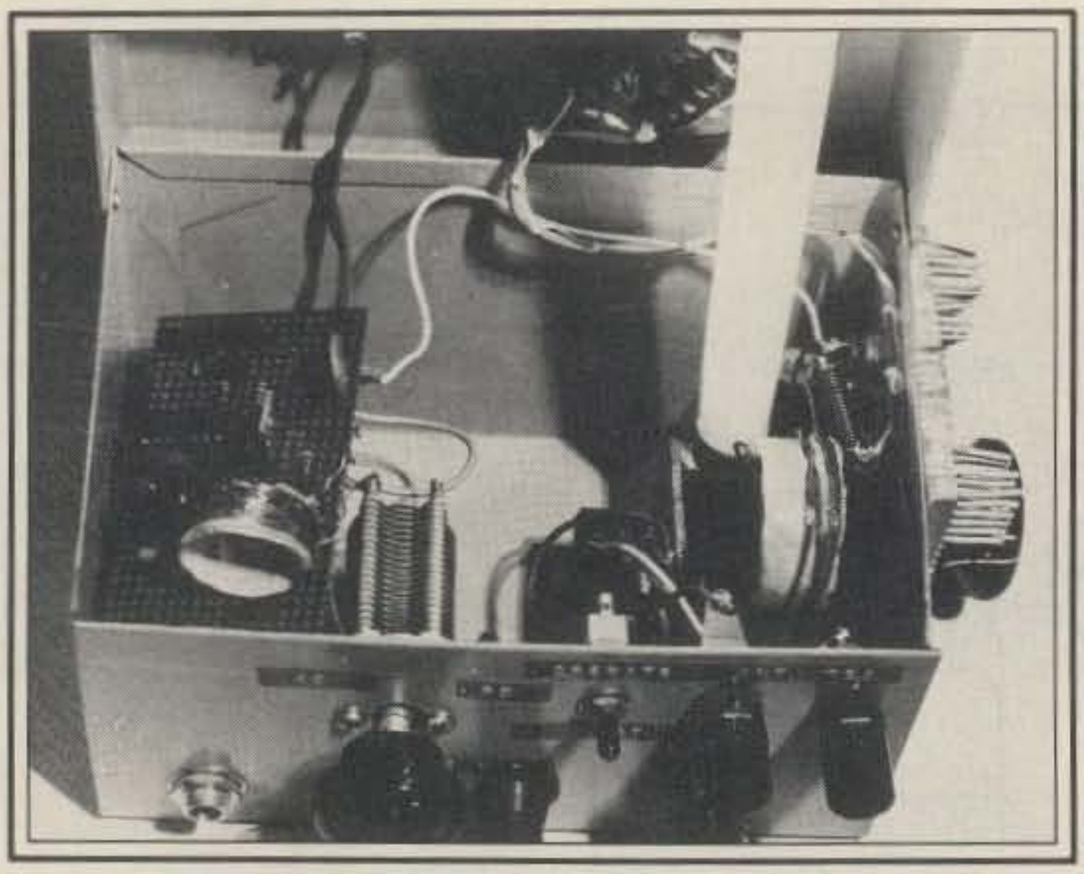
Transistors IC's

2N3904 (2N2222)
2N3053 (2N2270, 2N2102)
2N5070 (2N6080—This series is rated at 28 volts and has several units in the line that have been tested with equally good results.)
7404 hex inverter
7805 5-volt regulator

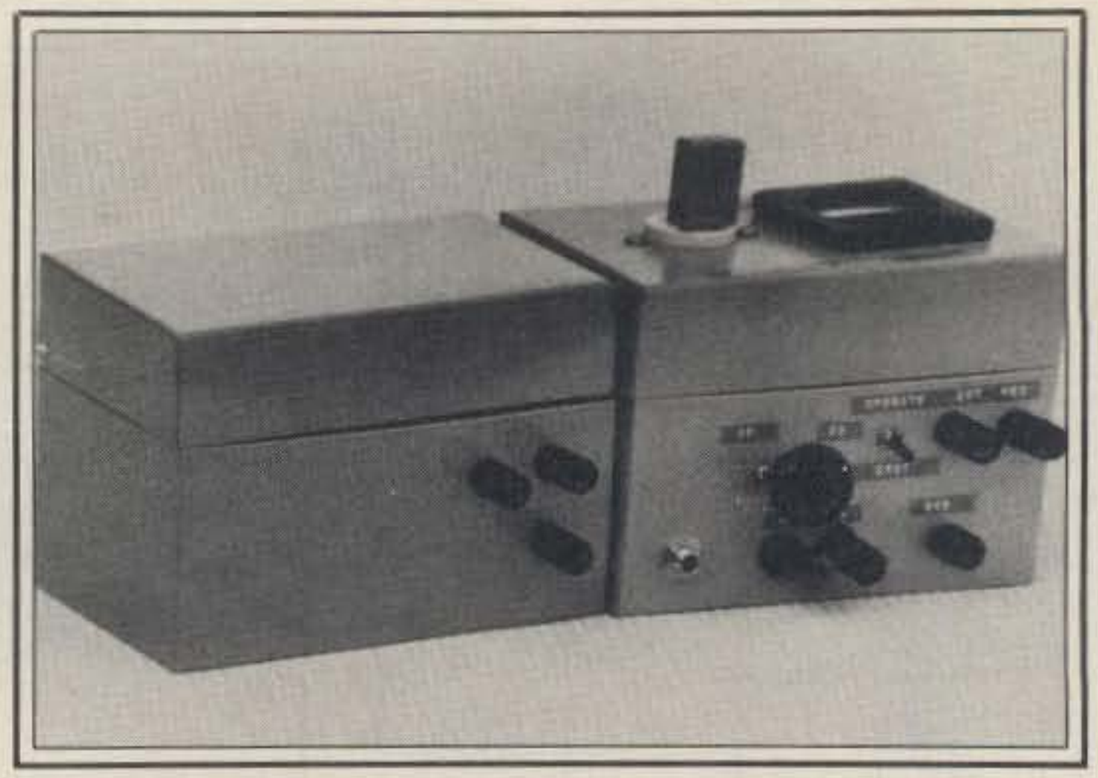
Miscellaneous

12–24 volt S.P.S.T. relay. Extra contacts on DPDT relay could be used for receiver muting.
Closed circuit (keying) jack
Binding posts for power and antenna connections
Board for parts
5 to 10 inches of heatsink
0–2 amp d.c. meter
Octal socket or suitable crystal socket
S.P.S.T. miniature toggle switch
4" × 6" card file box or other chassis



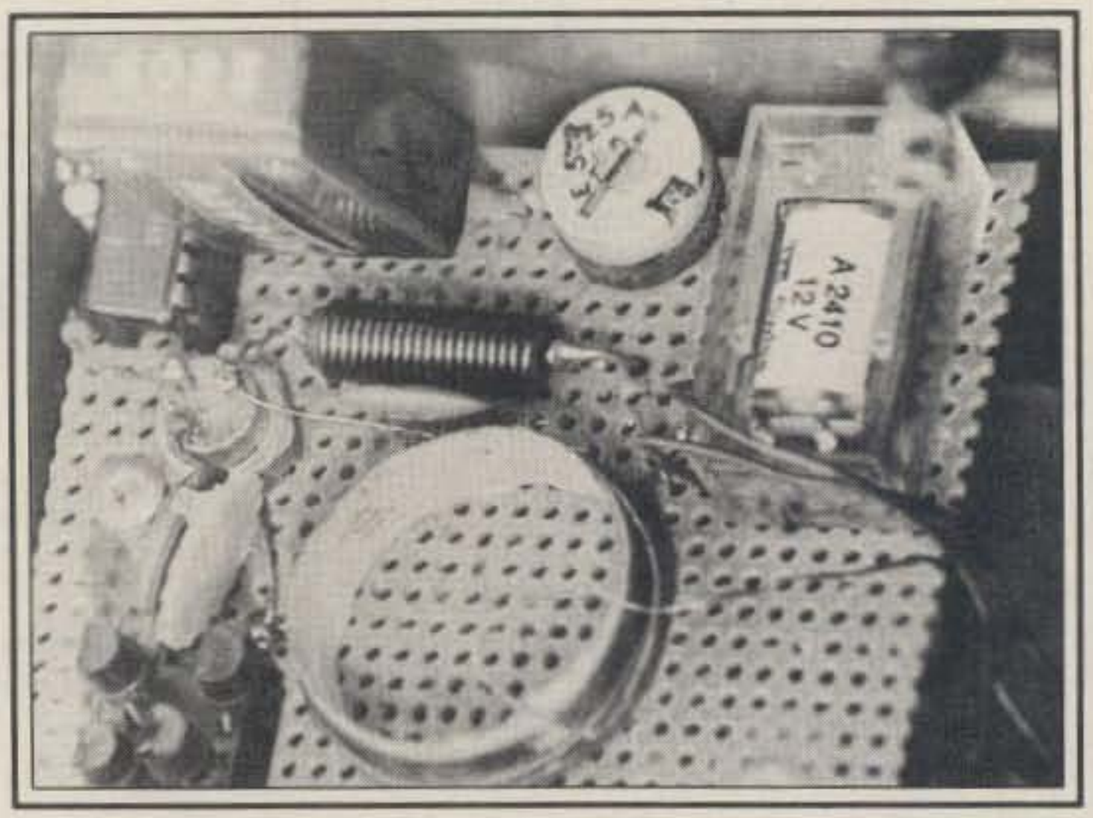


With only 14 volts applied, the transmitters can make a fluorescent lamp glow.



Transmitter with matching power supply; fuse is inside box.

Two battery packs are for added power, about 26 volts total. The extra binding post has a diode series connected to aid in recharging the batteries.



Inside the original. Oscillator, upper left, amplifier just below that, series regulator at lower left shows the four transistors plugged into the 14 pin DIP socket.

regulator delivers 5 volts with 10 to 15 applied. If that's okay, plug in a key, dummy load, crystal, or outboard v.f.o. Close the key and tune the driver for maximum signal on the desired band. Adjust the PA tuning for minimum collector current, and retune the driver for maximum output. The most output may occur with the final tuned slightly off resonance. This indicates normal operation into a somewhat mismatched load. Collector current reaches destructive levels in a short time with high voltage across a stage and the tuning way off; tune up with low voltage whenever possible. The tuning will need a little readjusting as the supply voltage is increased to 25 volts.

Key it a few times, and if you like what you see and hear, tie it to your antenna and surprise yourself with how many contacts you can make without the big rig. It won't be quite the same as that first QSO, but it might bring back some memories.

What started off as an "I-wonder-what-would-happen-if . . . " idea, turned into a couple of simple transmitters that are suitable for portable, emergency, or even regular use.

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Two independant 24 hour LCD displays! Read both GMT and local times at a glance.

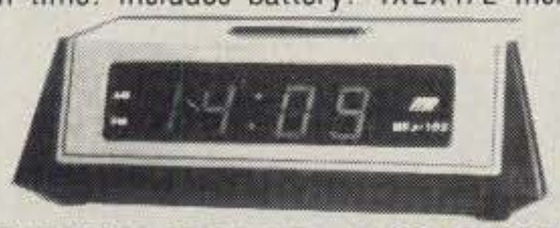
Six digit main display has seconds readout. Four digit auxiliary. Switch reverses main/aux.

Alarm plays 4 selectable melodies. Alarm "ON" indicator. Snooze button.

Quartz timing. Synchronizable to WWV.

Flip-top cover serves as stand.

Night light. Forward/reverse, fast/slow set buttons. Lock function prevents mis-setting. Display main time only, main/auxiliary or main/alarm time. Includes battery. 4x2x1/2 inches.



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Switchable 24 hour GMT or 12 hour format.

ID timer sounds every 9 minutes after reset.

Switchable seconds readout.

Observed timer. Just start clock from zero and note time of event up to 24 hours.

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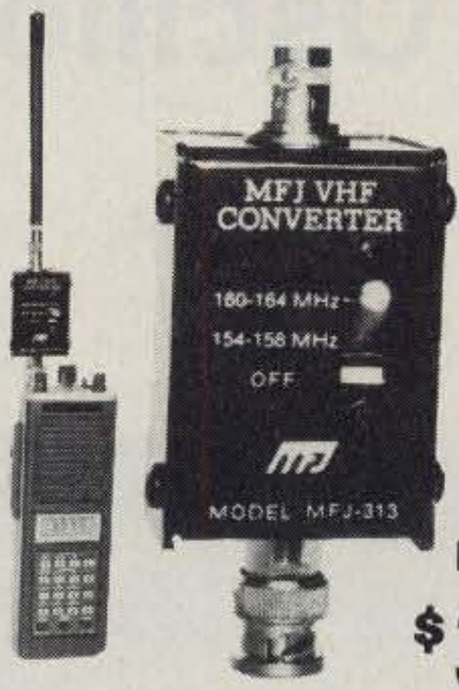

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Mounts between handheld and rubber ducky.

Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls.

Highpass input filter and 2.5 GHz transistor gives excellent uniform sensitivity over both bands. Crystal controlled.

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Enjoy scanning, memory, digital readout, etc. as provided by your handheld on Police/Fire band.

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MFJ-312, like MFJ-313 but for mobile 2 meter rigs. Transmit up to 40 watts thru converter without damage. SO-239 connectors. Mobile mounting brackets. Rugged. "ON" LED. Use 12 VDC or AAA battery. 3x4x1 in.

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Quality 50 ohm non-inductive resistor.

Oil cooled. Includes high quality, industrial grade transformer oil (contains no PCB).

Low VSWR to 400 MHz: Under 1.2:1, 0-30 MHz. 1.5:1, 30-300 MHz. 2:1, 300-400 MHz.

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CIRCLE 28 ON READER SERVICE CARD

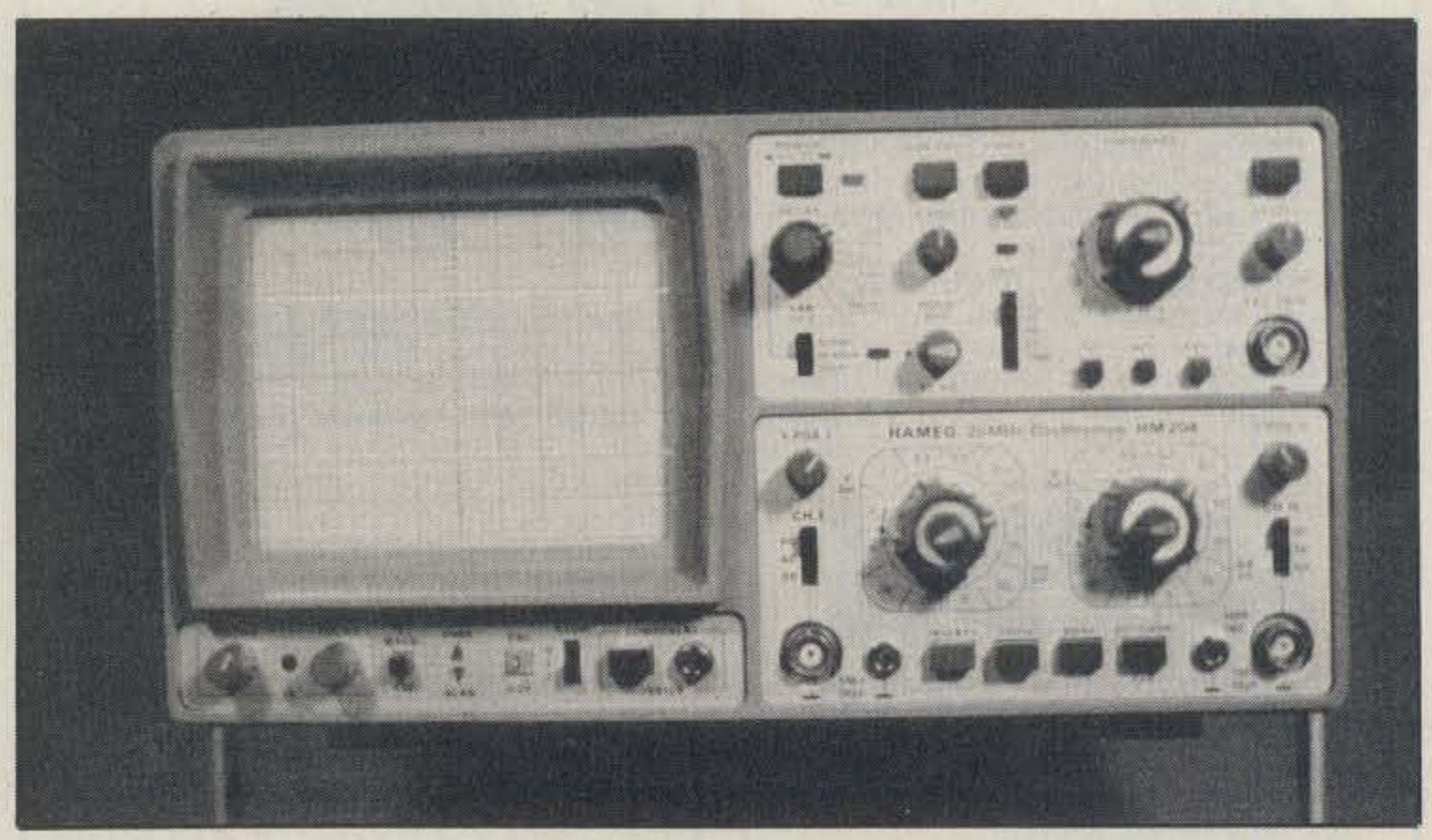
CQ Reviews:

The Hameg HM-203 and HM-204 Dual-Trace Oscilloscopes

BY STAN PRENTISS*

All oscilloscopes are not built in the U.S. or Japan, believe me! Take Hameg Messtechnik of Kelsterbacher Strasse 15-19, 6 Frankfurt/M. 71, for instance. Last year, this West German manufacturer introduced its low-cost dual-trace HM-203 and HM-204 oscilloscopes to the U.S. at $605 and $738, respectively, and they are now marketing the same from 88-90 Harbor Road, Port Washington, New York 11050.

The delayed-sweep HM-204 contains 18 integrated circuits; IC's with familiar symbols such as SN, NE, CD (for Texas Instruments, Nippon Electric, and RCA); 56 visible transistors; 9 low-capacity, neat ribbon connectors; and 6 clear, single-side, removable printed circuit boards. The flat-faced 8 × 10 centimeter rectangular cathode ray tube is supplied with medium D14-360 P43/93 (or optional P7/93 long decay) phosphors and is completely covered with a fully enclosed Mu-metal shield to protect against magnetic fields. Fused to prevent transient overloads or excessive internal current drains, the line-cord receptacle has four adjustable a.c. input positions at 110, 125, 220, and 240 volts, ± 10%. With all operating voltages regulated, power consumption amounts to 38 watts. Weight is 15.4 lbs; size 11.2"W × 5.7"H × 14.96"D; plus there are a "kickstand," adjustable carrying handle, and an all-metal shielded carrying case.



Front view of the Hameg HM-204 showing layout of controls.

Vertical Inputs/Outputs

The HM-203 and 204 are both dual-trace units with alternating or chopped sweeps and trigger on channels 1 or 2. Input impedances are the traditional 1 MHz shunted by 28 pF, between 5 mv and 20 volts per centimeter in 12 calibrated steps. If the variable control is turned clockwise, the vertical deflection factor reduces to 2 mv/div.

Input voltages are specified at 500 volts (d.c. + peak a.c.), with 1% maximum overshoot. Switchable 10 ×, 1 ×, and ground miniature probes supplied with each oscilloscope have an additional 9 megohm series resistor and variable "shunt" capacitor to cancel out undesirable low-frequency waveform tilt and to offer essentially uniform 10 megohm resistive impedance to the circuit under measurement. Channel 1 polarity may be either regular or inverted, with top and bottom overscan for either trace indicated by warning amber LED's. A 200 mV calibrated rectangular voltage is also available for 10 × LC probe adjustments, plus focus and intensity potentiometers, and a 10 × horizontal magnifier.

The two vertical Y inputs may have their traces simultaneously rotated by a recessed potentiometer in the event of rough handling or a change in the earth's magnetic attraction. A lighted graticule with 3-position switch controls CRT faceplate illumination, and a diode and transistor junction component tester has been added as an extra attraction to both units and offers 8.6 volt rms open circuit and 28 ma rms test current at dead short. Vertical traces may be manually positioned with no drag or bounce to accommodate a.c., d.c., or ground inputs through BNC connectors. A Horizontal External push switch places the YI-YII amplifiers in 180° phase offset for signal comparison or vector analysis. X-Y channels in this mode are phase-matched better than 3° to 100 kHz and usable to 2 MHz at lesser accuracies.

On the rear you'll discover three unmarked BNC connectors (reading right to left) for positive Z-axis modulation, a 6 volt constant voltage ramp output varying directly with time-base setting, and a 400 mv negative-going sync pulse that does the same. At higher repetition rates this pulse assumes the shape of a trapezoid, reminiscent of older vacuum-tube TV horizontal output grid drive potentials.

Horizontal Time Base and Amplifier

Hameg's horizontal amplifier is the YII input already noted, and it has a −3 dB bandwidth of d.c. to 2 MHz, with separate external trigger input to handle difficult sync conditions or, perhaps, to aid in measuring incident waveform jitter—all

*3715 Boyd Drive, Turkey Point, Edgewater, MD 21037

pushbutton controlled. Just to show that this manufacturer isn't spoofing, we did a few arc sine a/b show-and-tell calculations (fig. 1) to illustrate X-Y phase differentials at various frequencies. A table showing results follows:

Frequency	Calculations
100 kHz	sine^{-1} a/b = 1/20 = 2.8°
500 kHz	sine^{-1} a/b = 4/20 = 11.5°
1 MHz	sine^{-1} a/b = 6.5/17.5 = 21.8°
2 MHz	sine^{-1} a/b = 10.5/15 = 44.4°

Table I– X-Y Phase angle differences.

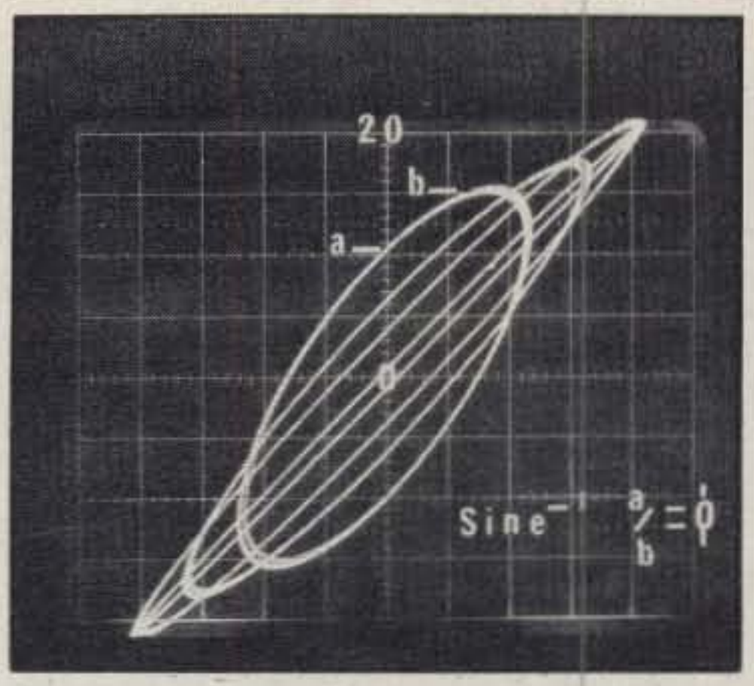


Fig. 1– X-Y amplifier phase comparisons.

Fig. 2– One waveform seen in the normal, delay search, and delay positions.

Each ellipse, of course, represents the phase difference between X and Y, and the single vertical measurement ascends in steps from 0 to 20 divisions. Note that in the initial amplifier calculation we let *a* equal 1 and *b* equal 20, so that 1/20 = 0.05, and the arc sine of this quantity calculates to just 2.8°, proving Hameg's specification that at 100 kHz, the X-Y phase differences are less than 3°. The final *a* and *b* marks are for the 2 MHz difference measurement, which results from identical signals being simultaneously pumped into both amplifiers.

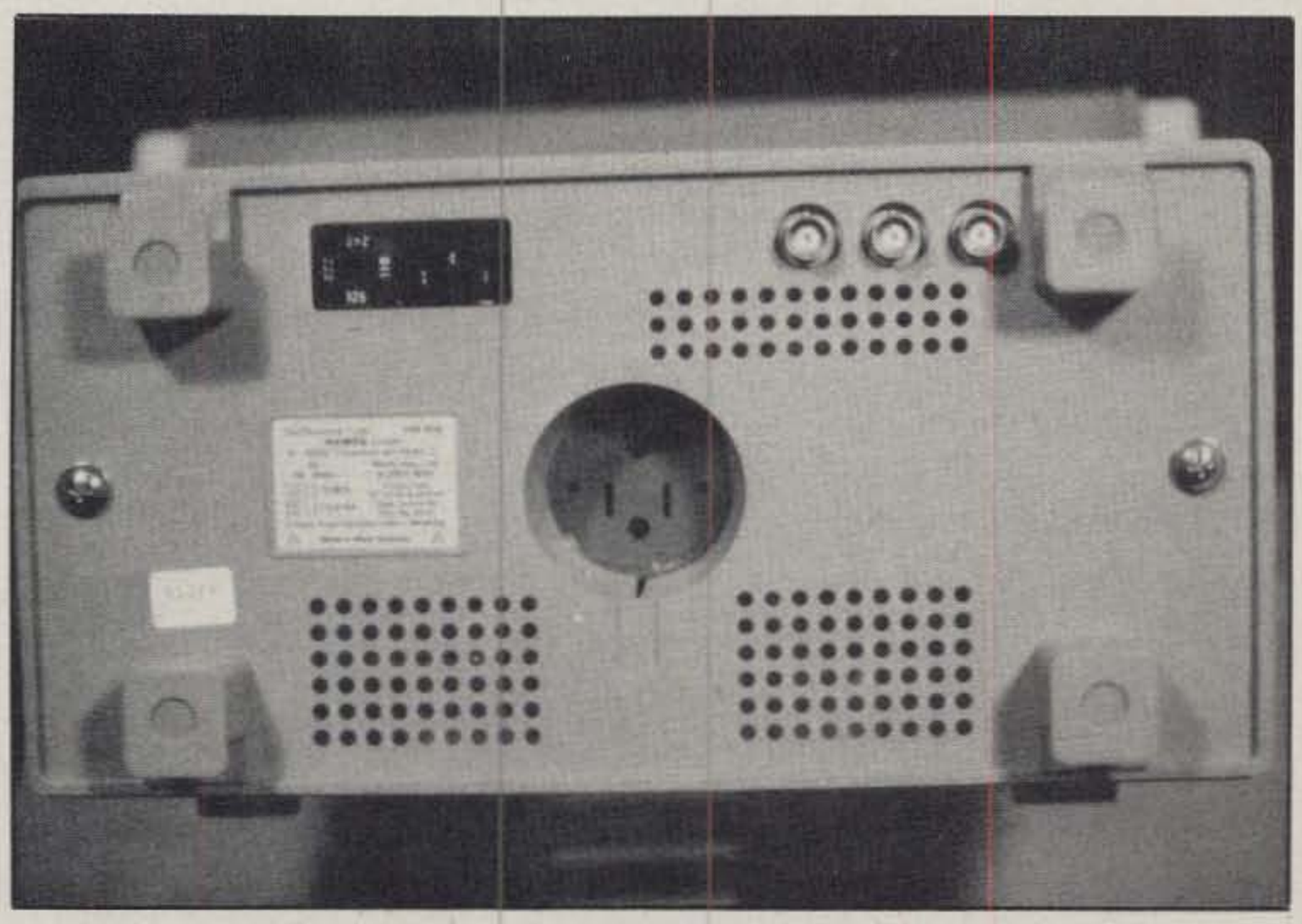
The single time base in 1-2-5 sequence has 21 calibrated steps from 2 seconds to 0.5 microseconds and variable control stepdown to 200 nanoseconds per centimeter. There is also the 10× magnifier that reduces sweep to 20 nsec/cm. In the calibrate position accuracy is specified at ±3%. You will also see a variable hold-off that's a 10:1 control, permitting continuous holdoff between sweeps for better triggering of aperiodic waveforms. Then you will find push-button-activated positive/negative slopes, along with an Auto/Normal triggering switch combined with variable range. The instrument will trigger on only ⅓ centimeter for either trace, depending on selection of Alt. or Ch. I/II triggering. Both of these pushbutton controls are connected to the Trigger Mode Switch by which you may select **AC, DC, HF** (high frequency), **LF** (low frequency), and line positions, which are actually filters or a.c. and d.c. coupling circuits. Above the trigger-set switch is a Single Trigger, one-shot arrangement with reset, which really works, but without the aid of a vertical delay line.

Now we don't mean to confuse any oscilloscope tenderfeet, but all these controls simply mean you have maximum flexibility in using such a dual-trace and single-time-base instrument. Actually, the HM-204 has what's called a psuedo-time delay that is designed to look at specific portions of a trace, but does *not* make trace No. 2 dependent on trace No. 1. What you have here is a straight time delay with both switch and variable 18-turn, 10:1 pot., calibrated between o.1 μsec and 100 msec. At this price, of course, there's no such thing as mixed sweep, and when you have selected the portion requiring delay, you're actually moving the information from one position to another for further examination. Thereafter, if the 10× magnifier is used, you should be able to view specific portions of the signal that are ordinarily too obscure to be seen.

Applications

As an example of a delayed trace using a complex TV video signal, let's set one vertical amplifier at 1v/div. and the time base at 2 msec. Across the top of the graticule in fig. 2 you see little more than one full field of video and sync, all occupying some 20 milliseconds of horizontal scan at an amplitude of 2.8V p-p. Now using the *search* mode at 1 msec/div., we sever the sweep in half, deleting or delaying 10 milliseconds of the display. Then, by placing the switch in **delay**, the entire waveform that had previously been curtailed is shown occupying the full graticule, but in its shifted and delayed position. As you can easily see, if the 10× magnifier was used, the center blanked and sync portion of the voltage would easily be detailed for critical observation. Undoubtedly, you would be able to see the 6 vertical sync and the 6 (×2) equalizing pulses that precede and follow them.

Illustrative photos of what we mean by using and not using the 10× expander are shown in figs. 3 and 4. We cranked up the signal generator to 25 MHz and shot what appears to be a pretty nice sinewave (fig. 3) with just a little additional brightness in its center. Most observers would say this was rather good for a 3 dB down 20 MHz scope at 5 MHz above its specified bandwidth. But don't be fooled, because somewhat more than evident intensification does, indeed, tell a tale; and in using unfamiliar equipment this might result from either the signal generator or imperfections in the scope. Fortunately, we had a good 25 MHz scope available for countercheck; the Hameg was promptly absolved, and the culprit identified as a sloppy oscillator in the generator.



The rear view shows the three unmarked BNC connectors described in the text.

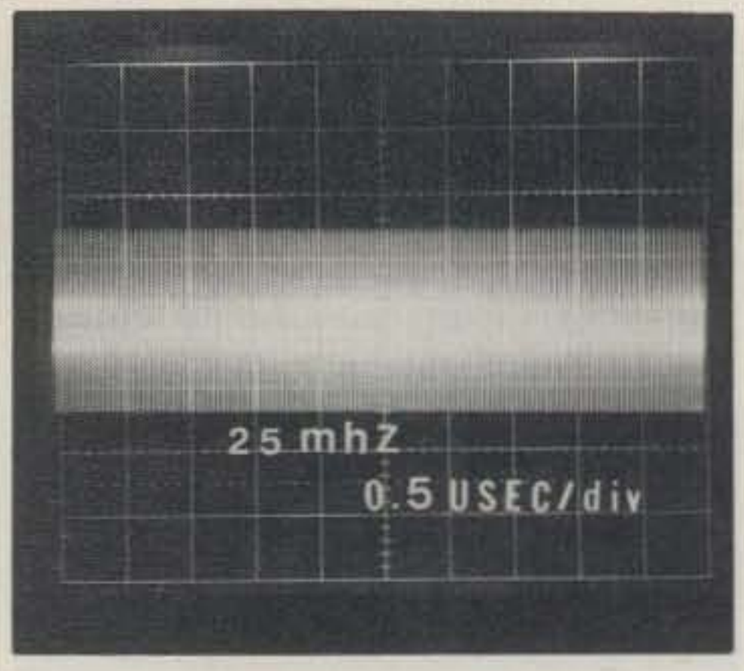


Fig. 3– Is this a good 25 MHz waveform?

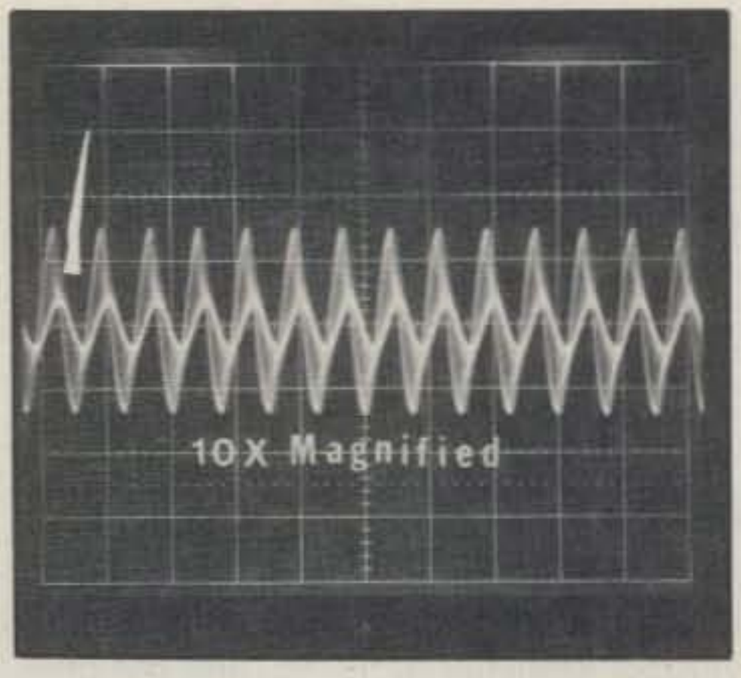


Fig. 4– Using the 10× magnifier, you can see that fig. 3 is not really a good 25 MHz waveform.

Using the 10× magnifier, you can see the problem clearly and cleanly identified in fig. 4. What appeared to have been nice little pulses turned out to be low-amplitude sine waves with a bucket of hum riding on positive and negative alternations. So at 50 nsec/div. these abberrations (as the engineers are fond of saying) are really smeared on each cycle. If you don't know this frequency, by the way, but do remember the time-base setting, how would you use your scope right now as a ballpark counter? Let's first try fig. 4 and follow with fig. 2. Remember that

$$F \text{ (frequency)} = 1/T \text{ (time)}$$

In Fig. 4, you have approximately 1.2 cycles in each time slot of the 50 nanoseconds setting. Therefore,

$$F = 1.2/50 \times 10^{-9}$$
$$= 0.024 \times 10^{9}, \text{ or } 24 \text{ MHz}$$

In fig. 2, however, the normal trace occupies 16.8 milliseconds in one cycle, since the time base is set at 2 msec/div. Consequently,

$$F = 1/2 \times 8.4 \times 2 \times 10^{-3}$$
$$= 1/16.8 \times 10^{-3} = 59.52 \text{ Hz}$$

Which, of course, is pretty close to the standard 59.94 Hz vertical color-field repetition rate. You readily see the difference between having more than one cycle in a single division and less than one cycle in several divisions as shown in fig.

2. So, oscilloscopes do, indeed, make good general-purpose counters, especially if they are calibrated within ±3% or less.

We would like you to know also that by using both the scope's time-base uncalibrated extender plus 10× magnification, we were able to partially see and calculate a satisfactory rise time figure of 14 nanoseconds. Fig. 5 at 1 μsec/div. will give you a pretty good idea of this oscilloscope's display of rectangular and sine waves. Obviously, rise and fall times are in the low nanoseconds, tops and bottoms square nicely, and the sine wave is not only symmetrical, but has uniform thickness throughout its cycle.

As a backup, we know that the 3 dB down measurement of this scope's amplifiers was 25 MHz. So by using the basic equation Bandwidth = K(constant)/TR (risetime), with 0.35 being the constant, you have

$$TR = 0.35/25 \times 10^{6}$$
$$= 0.014 \times 10^{-6}, \text{ or } 14 \text{ nsec}$$

Typical for amateur radio operators is the modulation envelope shown in fig. 6. Note that all cycles have been extended to reach the top and bottom graticule limits and are approaching 100% modulation. Here, the signal generator looks good at 1 kHz, our scope does its job, and the lighted graticule forms a pleasing background. Not only does the scope's sweep look good, but there is neither positive nor negative vertical compression or clipping, and the general geometry effect between deflection plates and *aquadag* (a chemical coating that forms an a.c. filter capacitor) CRT coating is more than acceptable.

Now let's go to the calibration tables, followed by probes, and then we'll have a few well-chosen comments you may find helpful.

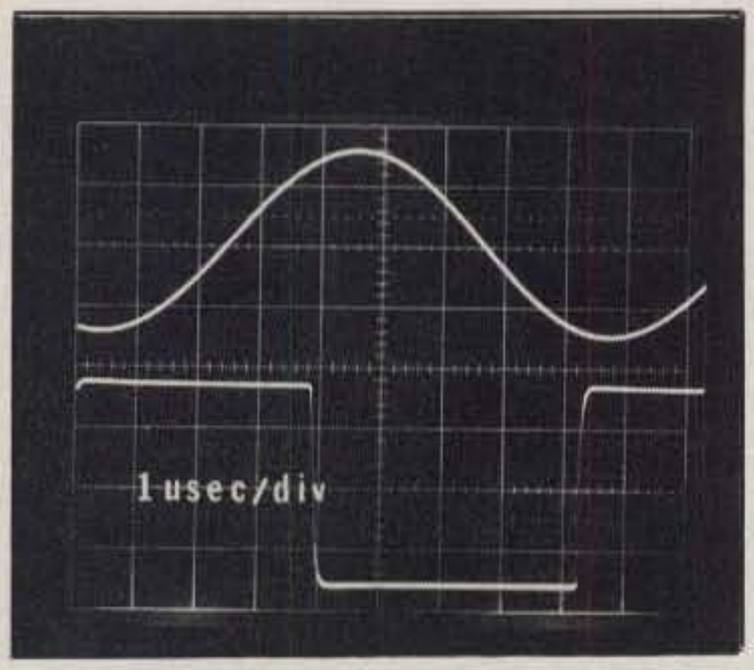


Fig. 5– A smooth sine wave and fast square wave indicate excellent vertical amplifiers.

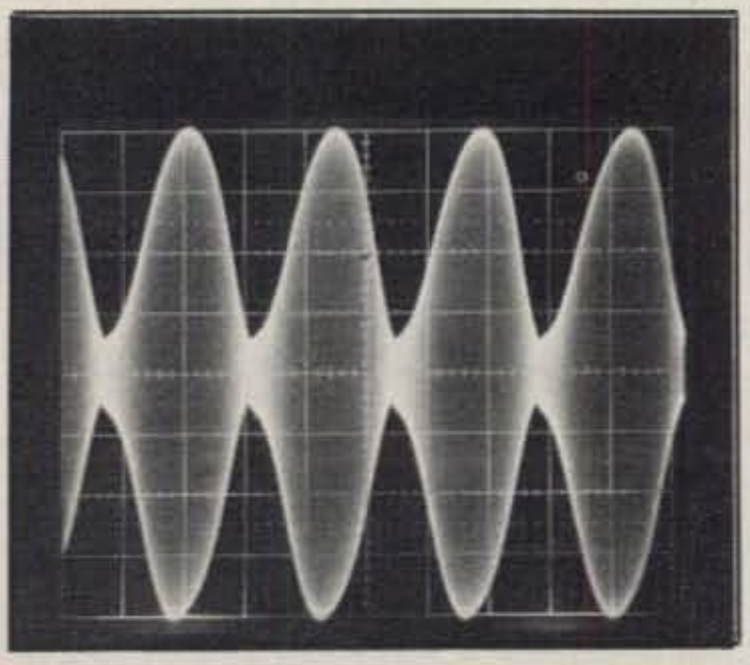


Fig. 6– Modulation envelope indicates good display and satisfactory geometry.

Setting	Ch. 1*	Ch. 2
5 mv	2.9%	1.5%
10 mv	2.9%	1.5%
20 mv	2.6%	1.5%
50 mv	2.6%	1.2%
0.1v	2.6%	1.2%
0.2v	2.6%	0.9%
0.5v	2.6%	1.9%
1v	3.0%	1.9%
2v	2.8%	2.0%
5v	2.8%	2.0%
10v	3.3%	2.0%
20v	3.2%	2.0%

Bandpass: –3 db at 25 MHz, both channels.
**Should recalibrate to same accuracy as Ch. 1, since all inaccuracies are similar.*

Table II– Vertical amplifier calibration.

2 sec	1.0%
1 sec	1.0%
0.5 sec	1.0%
0.2 sec	1.0%
0.1 sec	1.0%
50 msec	1.0%
20 msec	0.2%
10 msec	0.2%
5 msec	1.2%
2 msec	2.0%
1 msec	2.3%
0.5 msec	1.4%
0.2 msec	1.3%
0.1 msec	1.1%
50 μsec	1.3%
20 μsec	2.8%
10 μsec	2.9%
5 μsec	2.1%
2 μsec	0.8%
1 μsec	1.7%
0.5 μsec	1.9%

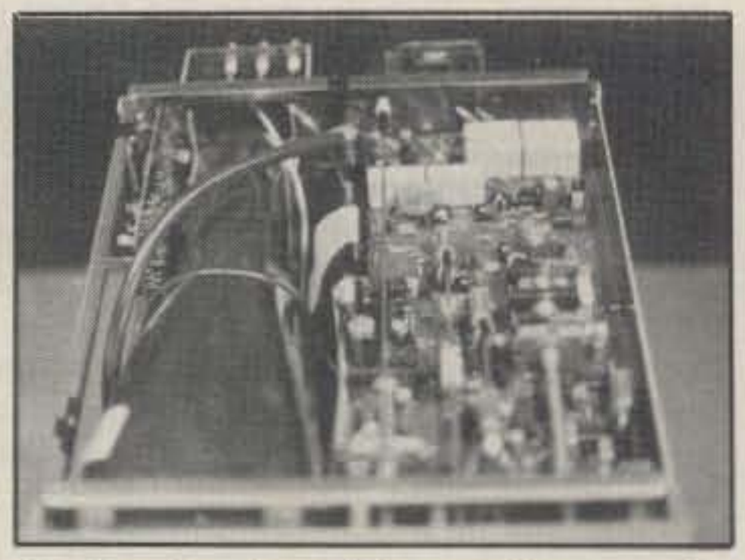
Note: With 10× magnifier at time-base setting of 0.5 μsec, error was 3.9%, and at 0.1 sec, error was 2%.

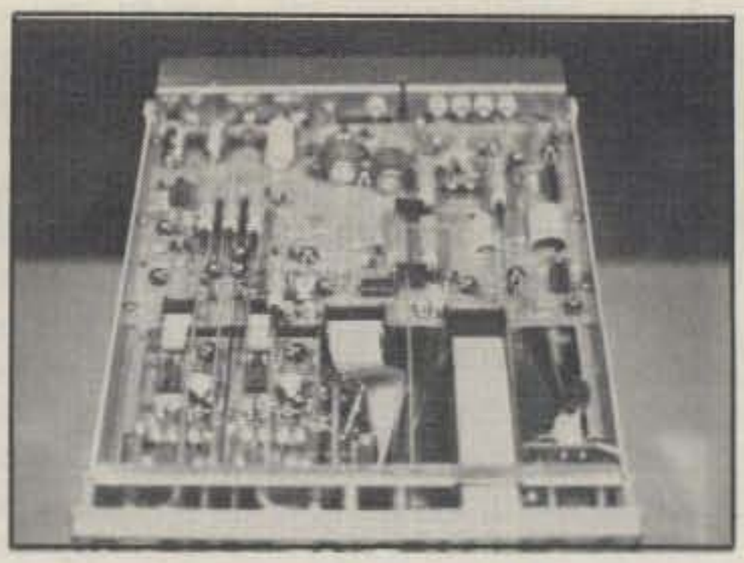
Table III– Horizontal time-base calibration.

Instrumentation: Calibration checked with Tektronix PG 508 Calibration Generator; TG 501 Time Mark Generator; and SG 503 Signal Generator. Video Generator 1248 and a.c. isolated Variac Powerite PR57 supplied by B&K Precision and Sencore, respectively.

Probes

Normally, a subject that evaluators don't like to discuss, probes are as important to an oscilloscope as antennas are to transceivers, radios, or television receiv-





Top interior view of the oscilloscope (left) and bottom interior view show off the neat, packed construction.

ers. A lousy electromagnetic transducer and accompanying lead-in means guaranteed poor reception.

Of the small-diameter, miniature type, these Series F HZ36 Hameg probes measure some 5 inches from tip to cable entry with a 10 inch ground strap firmly embedded at their flexible ends. A standard press-fit, spring-loaded claw is included, plus a protective tip, a non-shorting IC lead sampler, and a unique metal fitting designed to accept the probe tip and press fit a standard BNC connector.

With BNC-connected cable lengths of some 5 feet, the × 10 bandwidth ranges from d.c. to 150 MHz (fig. 7), compensation range is between 10–60 pF, and there is a rise time of less than 2.2×10^{-9} (nanoseconds). The × 1 bandwidth extends from d.c. to 10 MHz (risetime 35 nanoseconds), all at 600 working volts, including peak a.c. A plastic tool adjusts the LC trimmer so that only probe-tip capacitance should be evident in the 10 × third adjustable position. Even at highest frequencies, we barely observed any preshoot or overshoot in the scope trace—a *good* recommendation for both probes and scope input amplifiers. XP and RP factors between 1 megohm and 100 ohms and 500–100 volts are fairly linear, with RP falloff beginning at 1 MHz and XP above 15 kHz—all meaning that flat responses in oscilloscope measuring devices are all subject to the effects of accumulated impedances, voltages, and frequencies.

Comments

Good, old oscilloscopes do die because of age and electronic progress, and many new ones are always a pleasure to evaluate. But they don't all have to cost over a kilobuck. The HM-204 is designed as an accurate, low-cost servicing oscilloscope with considerably expanded features, along with better than average range vertical amplifiers and extended time base. When *precisely* calibrated, its overall accuracy should be about 2%.

Having neither schematic nor alignment instructions, we still like the very clean layout and extensive use of the many uniform and repeatable (in operation) integrated circuits throughout. Low frequency voltages between 1 mv and 1600 volts (20 × 8 × 10) may be measured, and time-base settings from 2 seconds to 200 nanoseconds (20 nsec with 10 × magnifier) can check recurrent waveforms at better than 25 MHz. We also discovered that the I + II button *adds* both amplifiers, and with the Invert I and I + II buttons engaged, the scope also acts as a differential amplifier for similar inputs. Trace rotation and lighted graticule smooths icing on the cake, as does excellent complex and simple waveform triggering, even though filters often must be manually selected for high and low frequencies (h.f., l.f.), as well as occasionally I/II and ALT sync triggers.

Oddly enough, the green-trace CRT accelerating voltage is given as only 2 kv, even though a satisfactorily bright display is easily visible at 25 MHz. Total post accelerating potential, therefore, should add up to 4 or 6 kv when the cathode voltage is included, and that's sufficient for any 20 MHz instrument. The chop-trace oscillator also injects *few* visible transients at low frequencies, since its repetition rate motors along at 1 MHz. And while there is certainly no A/B trace interaction for delayed sweep, the psuedo-delay is attractive in locating certain waveform sections and positions, and the 10 × magnifier will do the rest.

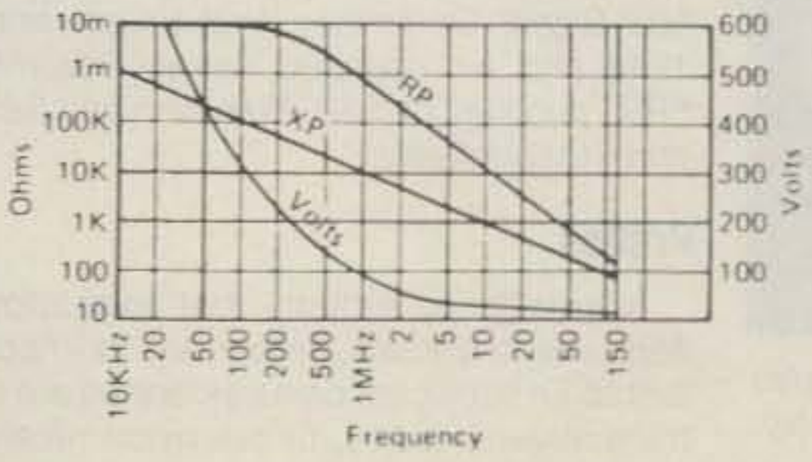


Fig. 7– As can be seen from the graph, round oscilloscope probes don't have flat responses.

Here's a terrific receiver project for the QRPer and weekend builder alike. It's not complicated to construct and should give you hours of fun.

Build Your Own Direct-Conversion Receiver

BY BOŽIDAR PASARIĆ*, YU2HL

In the last few years direct-conversion receivers have gained more and more popularity among European amateurs, especially those who wish to build a simple receiver of their own. Here is a description of a direct-conversion receiver using a novel principle of mixing, first promoted by V. Polyakov, RA3AAE. I hope that the American amateur fraternity will be interested in this little beginner receiver, hence this article.

For those who have not dealt with direct-conversion receivers before, let's say that in those receivers the result of mixing is not the usual intermediate frequency (460 kHz or similar) used in superhet receivers, but an immediate audible tone—c.w. or s.s.b. To achieve this it is necessary that the mixer's local oscillator (more precisely the b.f.o.) oscillates near the received radio frequency (e.g., $f_{in} \pm 1$ kHz). In such receivers the signal amplification and selectivity are obtained in the a.f. stage (fig. 1).

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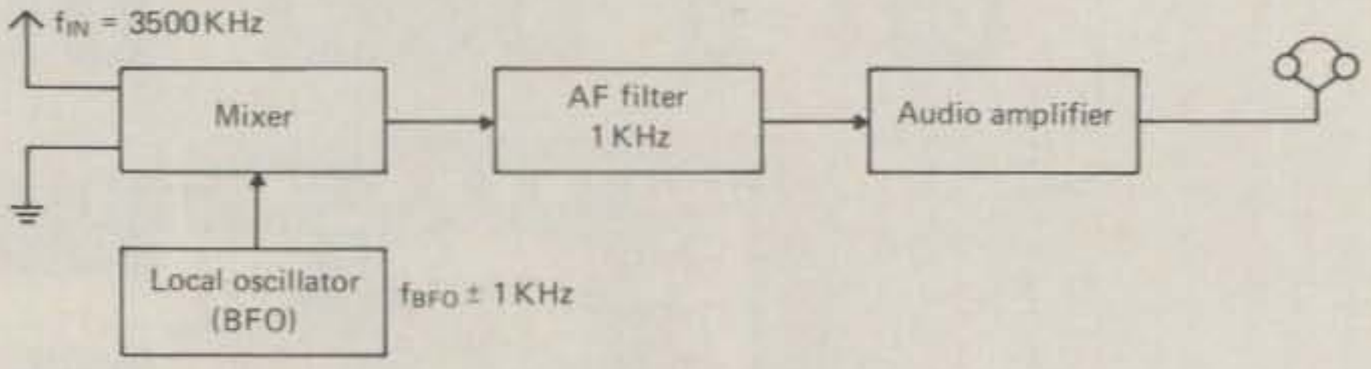
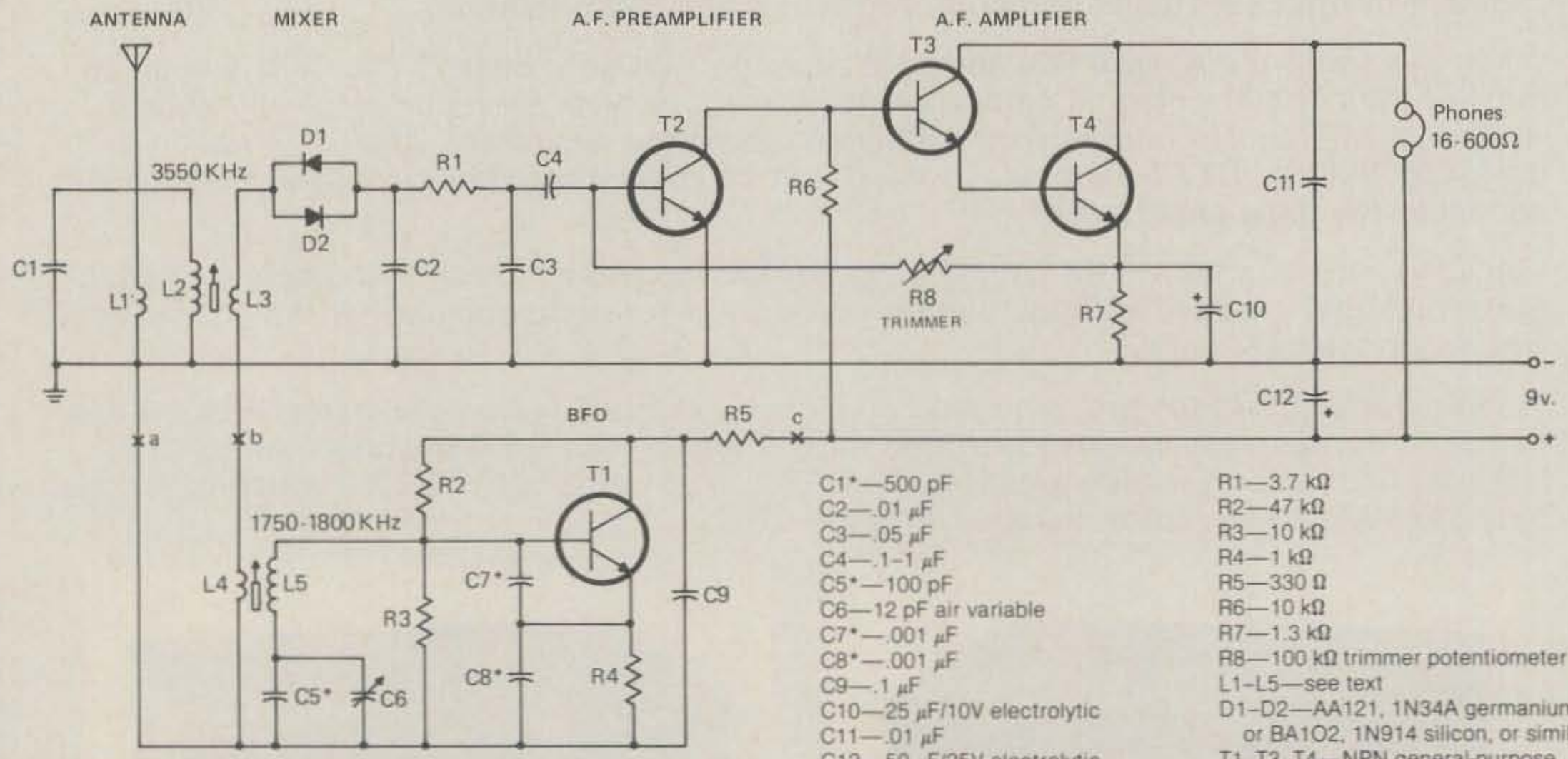


Fig. 1– Block diagram of a standard direct-conversion receiver.

Direct-conversion receivers, simple as they are, also have some disadvantages. No doubt, the most unpleasant one is the interference of strong broadcast stations whose unwanted signals are also detected (due to poor front-end selectivity of the receiver) and fed directly into the sensitive a.f. stage. True, this problem can be cured by the use of double-balanced mixers, but unfortunately at the expense of simplicity.

The Principle

In our receiver the solution is unusual and it will take some explaining to understand its functioning (fig. 2). The received radio signal f_{in} is fed through the antenna coil L1 to the resonant circuit L2C1 tuned (in our case) permanently to the middle of the 3.5 MHz c.w. band (3550 kHz). The local oscillator, *viz* the b.f.o., constructed around T1 is a Clapp, oscillating *on half of the received radio frequency* (i.e., between 1750 and 1800 kHz, because the receiver covers 3500–3600 kHz). Later



C1*—500 pF
C2—.01 μF
C3—.05 μF
C4—.1–1 μF
C5*—100 pF
C6—12 pF air variable
C7*—.001 μF
C8*—.001 μF
C9—.1 μF
C10—25 μF/10V electrolytic
C11—.01 μF
C12—50 μF/25V electrolytic

R1—3.7 kΩ
R2—47 kΩ
R3—10 kΩ
R4—1 kΩ
R5—330 Ω
R6—10 kΩ
R7—1.3 kΩ
R8—100 kΩ trimmer potentiometer
L1–L5—see text
D1–D2—AA121, 1N34A germanium, or BA1O2, 1N914 silicon, or similar
T1–T3–T4—NPN general-purpose transistors: BC-109, 2N2222, or similar
T2—Low-noise transistor: BF173, 2N3391A, or similar

1) Capacitors with an asterisk (*) are polystyrene.
2) Points a,b,c refer to figs. 4 and 5.
3) All resistors are ¼ or ⅛ watt.

Fig. 2– Schematic diagram of the direct-conversion receiver.

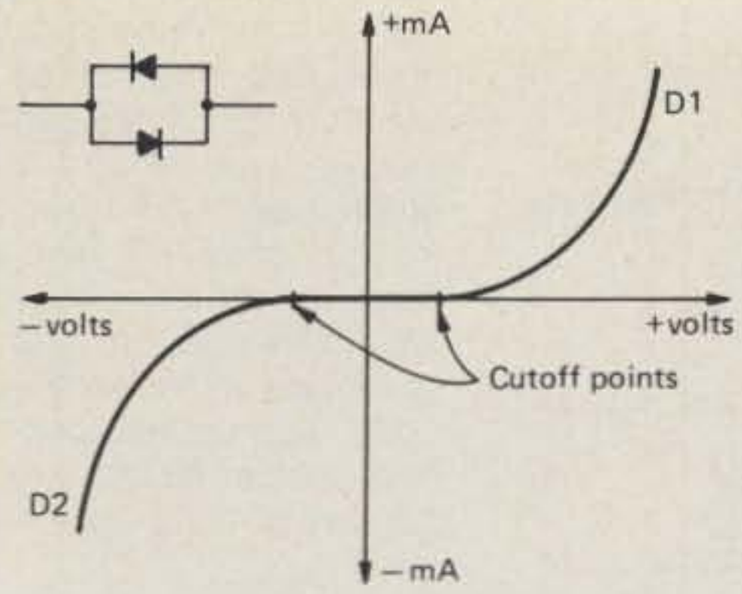


Fig. 3– The integrated characteristics of two identical matched diodes connected in parallel and back to back.

we shall see why. As a mixing device we use two identical *matched* silicon or germanium high-frequency diodes, D1 and D2, *connected in parallel and back-to-back!*

The received radio signal from the antenna (eg., 3500 kHz) is fed to the diodes through the secondary coil L3, and the b.f.o. frequency f_{bfo} (1750 ± 0.5 kHz) through L4—*both the coils being connected in series.* The result of mixing, an audible tone, c.w. or s.s.b., is routed to the low-noise a.f. preamplifier (T2) and from there to any standard a.f. amplifier.

How do we get an a.f. signal with such a strange combination? The secret is in the voltage-current characteristic of the two diodes shown in fig. 3. It is well known that even in the positive direction, diodes do not conduct current if the applied voltage is not higher than *the potential barrier* found in them. For silicon diodes that minimum positive voltage is about 0.5 V, and for germanium diodes about 0.1 V. Now, if we take two well-matched diodes and connect them in parallel and back-to-back, we shall get an inverted S-shaped characteristic shown in fig. 3. We draw your attention to the central flat part of it where neither diode conducts. Now back to fig. 2.

If the voltage from the b.f.o. applied to the diodes through L4 exceeds their cutoff voltage by two to four times, we shall have the following process: the pair of diodes will not conduct the incoming signal f_{in} while the b.f.o. high voltage is passing through zero between the cutoff points. However, when the b.f.o.'s voltage (positive or negative halfcycle) becomes higher than the cutoff voltage, one of the diodes will be conductive. Thus, the diodes function as a switching device. Since each cycle has two half-cycles, and each of them closes the diode circuit, it becomes obvious that the b.f.o. must work on half of the received radio frequency as we said before.

It can be mathematically proven that on the right side of the diodes except f_{in} and f_{bfo} we also get $(2f_{bfo} - f_{in})$ and $(f_{in} - 2f_{bfo})$, and those are audible tones. The frequencies f_{in} and f_{bfo} are grounded through capacitor C2 while the c.w. or s.s.b. signal is fed to the audio amplifier. Note that the usual loading resistor after the diodes has been omitted: being connected in anti-parallel mode, the two diodes cancel any a.m. detection, and we can hear only the pure results of mixing. It's as simple as that. For maximum results the characteristics of the two diodes must be closely matched. We also must add that the inventor of this mixer, Polyakov, strongly recommends the use of silicon diodes, although we have found germanium diodes equally usable.

The Circuit Diagram

After this explanation the electric diagram of the receiver is self-explanitory (fig. 2). The receiver works between 3500 and 3600 kHz, so the antenna tuning circuit C1–L2 has been permanently set to 3550 kHz by means of the ferrite core in L2. The secondary coil L3 has about ¼ turn of L2. The b.f.o. is a Clapp using a 2N2222 or similar general-purpose NPN transistor (T1). The tuning is done with C6—a 12 pF variable capacitor. The secondary coil L4 has approximately ⅛ the turns of L5 for germanium diodes (1N34A, AA 121, etc.), or ⅙ the turns for silicon diodes (1N914, BA 102, and similar). The RC filter C2-R1-C3 can be made resonant to 1 kHz if we substitute R1 with a 2H inductance. However, in the experimental receiver the coil produced a lot of hum, so we used a resistor instead.

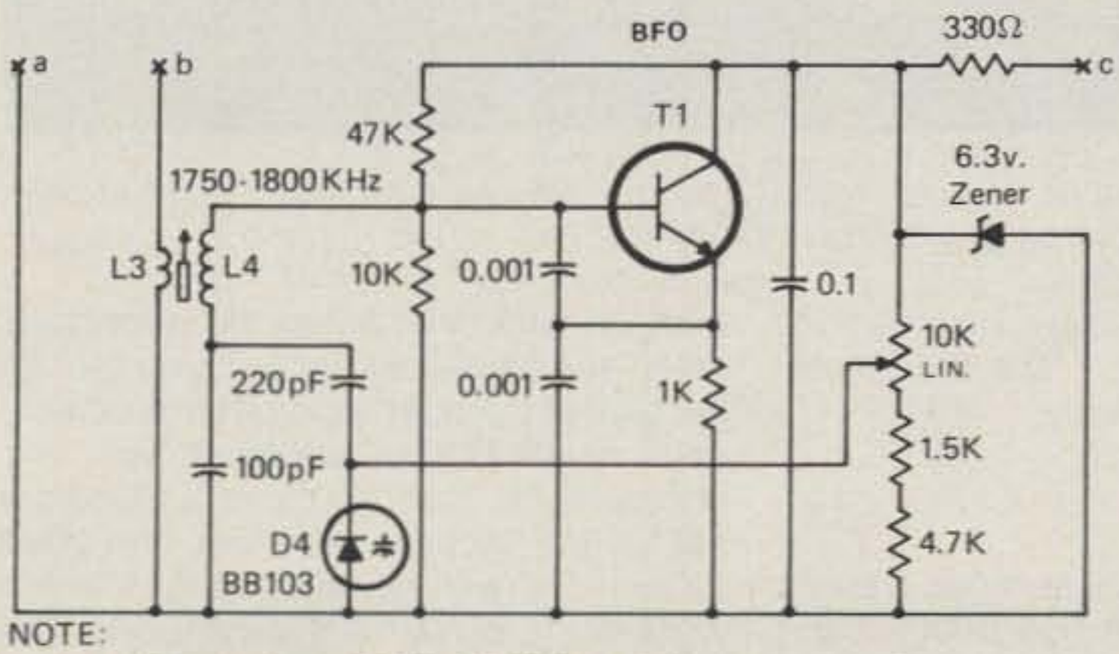
The audio signal is routed to the low-noise preamplifier (T2) with a 2N3391A, BF 173, or a similar low-noise transistor. This stage is set only once by R8 a 100 k ohm trimmer-potentiometer, for best performance. The last stage is a Darlington two-transistor amplifier with T3 and T4, which makes the whole a.f. chain very simple. The loudness is moderate when using earphones so no volume control was provided. In a more elaborate project an active audio c.w. or s.s.b. filter and a stronger a.f. amplifier should be used instead of T3 and T4.

For those who want to build the b.f.o. with varicap tuning, we offer a convenient schematic diagram in fig. 4.

Fig. 5 represents a b.f.o. with a PNP transistor and a broadcast-ganged dual-variable capacitor 170 + 420 pF which we removed from an old transistor a.m. receiver. In this case the band could be wider: 3500–3800 kHz. Please note that C9 in this scheme is a part of the resonant circuit providing for the correct feedback, so its capacity should be about eight times that of C7. Points a, b, c refer to the same points in fig. 2, in case you want to substitute the b.f.o.

Fig. 6 shows that the b.f.o. injection can also be made on the right side of the diodes. In that case the radio frequency is not weakened through L4.

As a first project we recommend building the unit shown in the schematic diagram in fig. 2. However, the finished sample shown in the photographs (figs. 7 and 8) is a combination of fig. 5 and fig. 6, while the a.f. stages were taken from fig. 2. Hence the large a.m.-band variable ca-



NOTE:
T1 = NPN transistor: BC109, 2N2222 or similar.

Fig. 4– A b.f.o. with varicap tuning. For use with the receiver shown in fig. 2, connect points A, B, and C to their corresponding points in fig. 2.

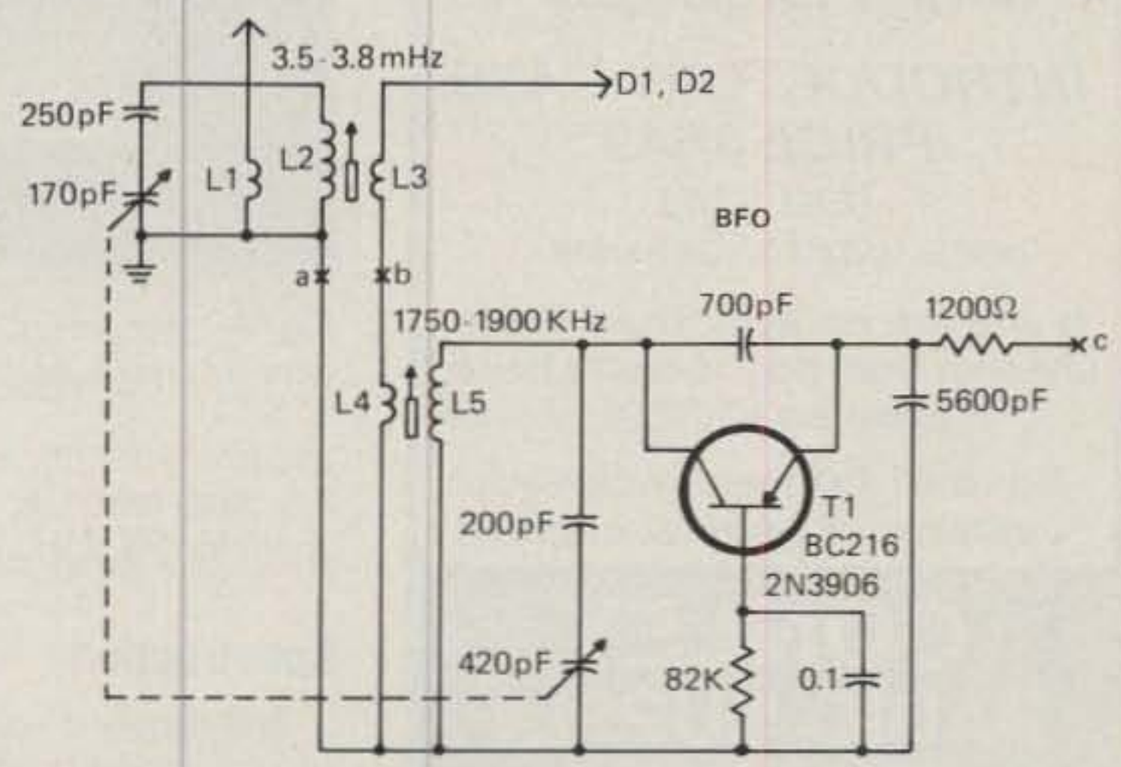


Fig. 5– An alternate b.f.o. with PNP transistors and a broadcast-type ganged variable capacitor. The coils L1 through L5 must be calculated and wound according to the capacitors used and the resonant frequencies.

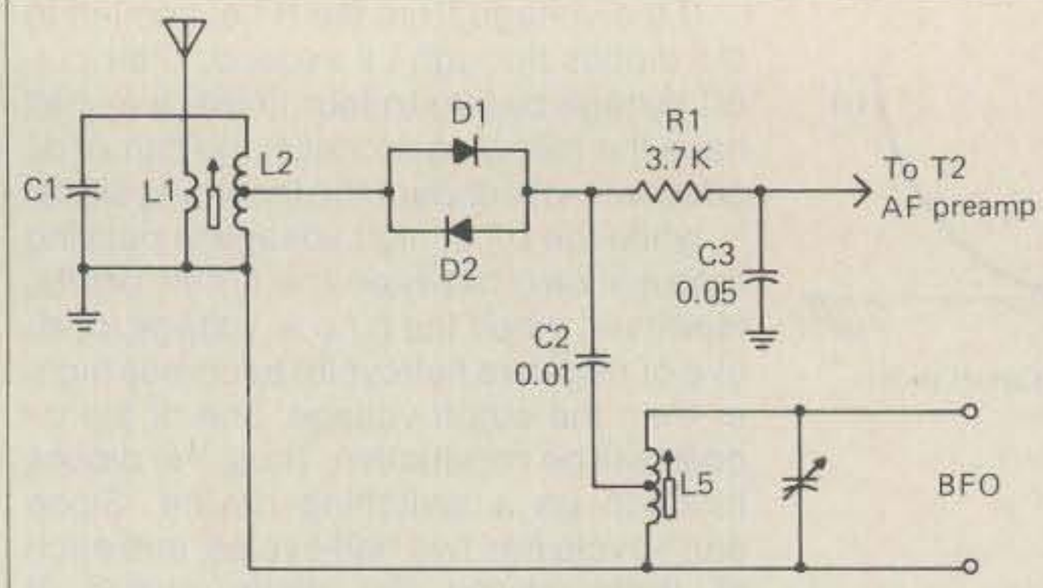


Fig. 6– In Polyakov's mixer (see references) the b.f.o. frequency can also be injected on the output side of the mixer. In that case R1 functions as an r.f. choke also. Likewise, instead of winding secondary coils, appropriate connections can be made to primary coils L2 and L5.

Fig. 7– Front-panel view of the direct-conversion receiver. There is only one control.

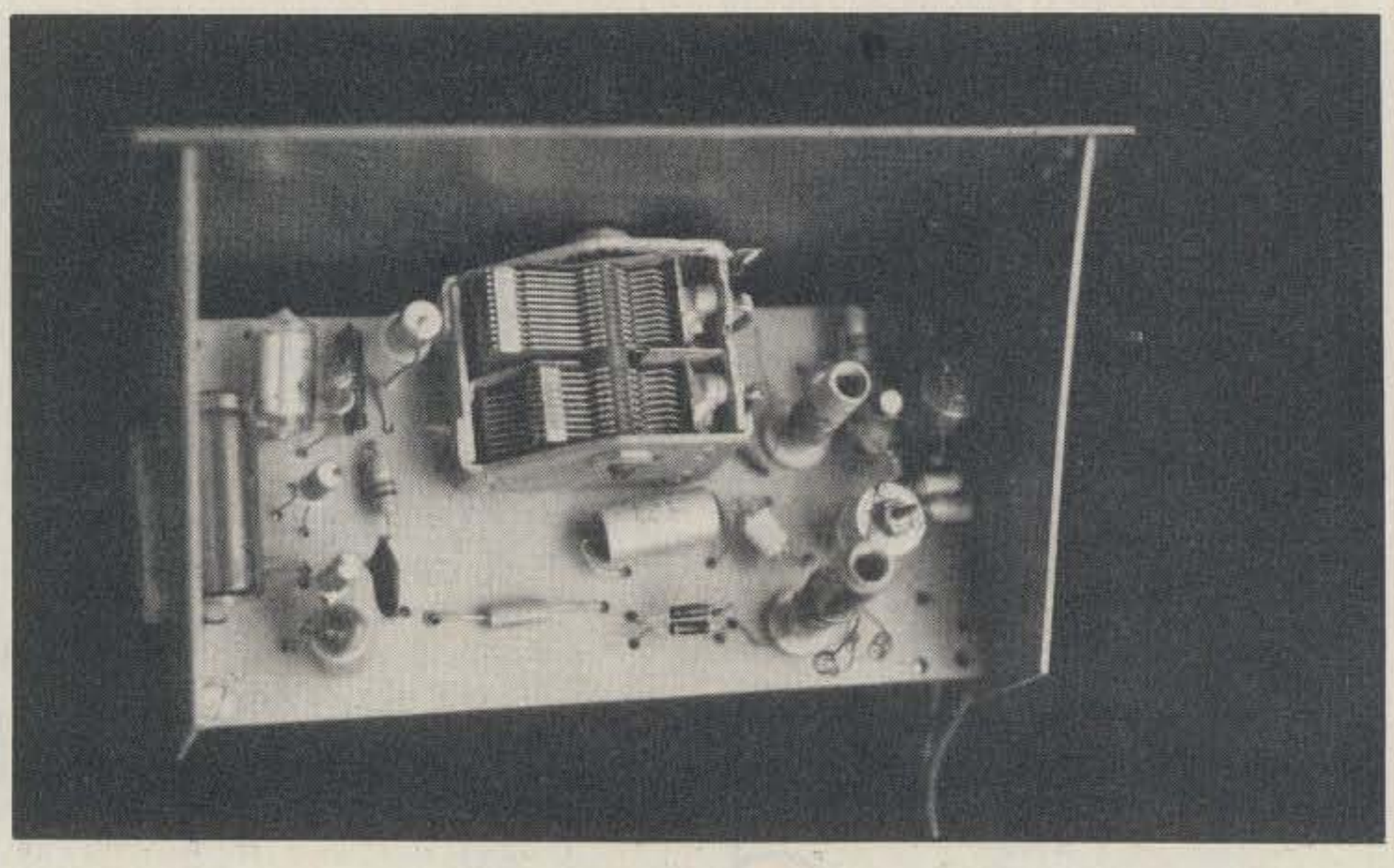
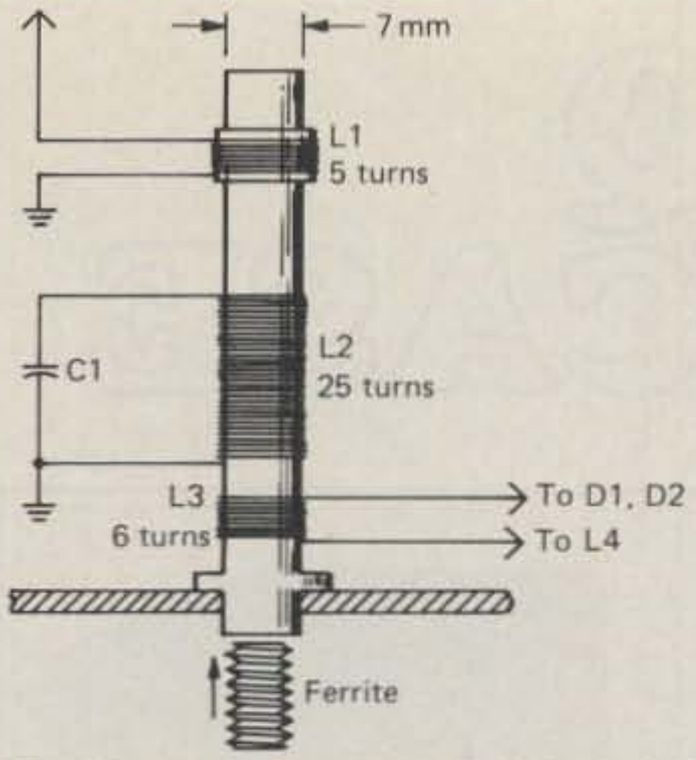


Fig. 8– The component layout and overall interior view of the receiver. Point-to-point wiring is done below the pc board chassis. The cabinet, too, is made from pc board.

pacitor in the photographs. However, all the data that follows in this article are given for fig. 2 exclusively.

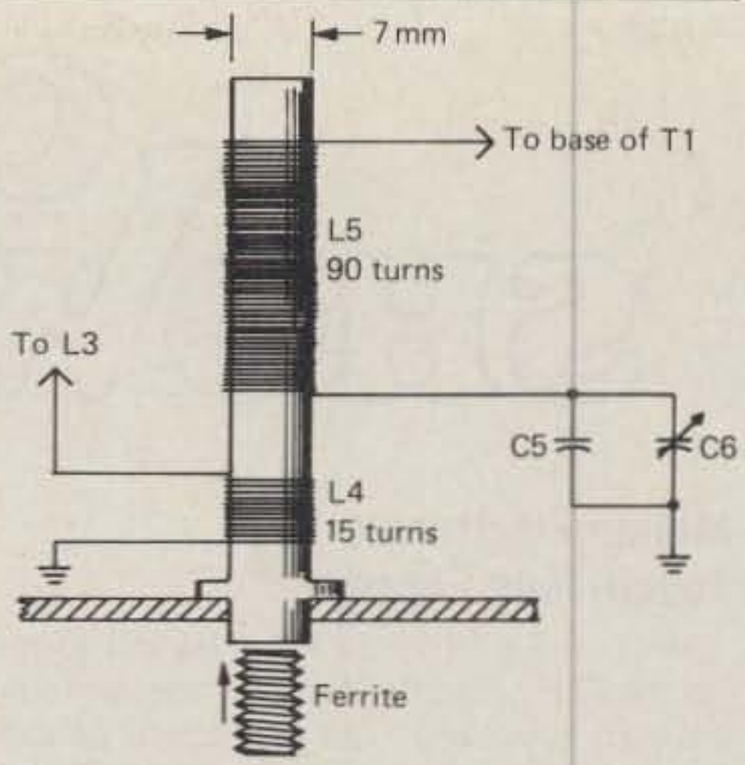
Construction

The receiver was soldered on a piece of universal pc circuit board 14 × 7 cm (5⅝" × 2⅝" inches). Since the sample was not intended for duplication, we didn't bother to produce an etched circuit board. All connections were made point-to-point with short pieces of insulated hook-up wire. We drilled the necessary holes and placed all the parts on the upper side of the board and all hook-up wire underneath. The overview is shown in the photographs. The front panel is 16 × 9 cm (6⅜" × 3½ "inches) cut from one-sided pc board, as well as the side panels which were cut to convenient dimensions. The whole framework, made of four pieces, was soldered to proper shape and strength (copper inside). The circuit board was raised 18 mm (about ¾ ") above the table level so that the antenna,



RF coil is wound with copper enameled wire No. 27 (0.35mm dia.) inductance of L2 is 4 μH.

RF COIL



BFO coil is wound with copper enameled wire No. 34 (0.15mm dia.) inductance of L5 is 90 μH.

BFO COIL

Fig. 9– Details of the coils used in the receiver as described in fig. 2.

ground, and phone connections could be placed on the side panels. There is only one knob on the whole receiver: the tuning knob.

The coils were wound on polystyrene tubes 7 mm ($^{9}/_{32}$") in diameter with small adjustable ferrite cores inside them. Since European standard coils are different from American ones the following data are only for orientation. The r.f. coil consists of L1, L2, and L3 (fig. 9). L1 has 5 turns, L2 has 25 turns, and L3 has 6 turns of No. 27 copper enamelled wire (0.35 mm diameter). The inductance of L2 is 4 microHenries and can be adjusted with the ferrite core. The antenna coil L1 was wound on a short piece of paste-board tubing so that it fits tightly over the main coil. In that case L1 can be moved up or down for best results. The same effect can be reached by changing the number of turns on L1. The b.f.o. coil was wound on the same type of tubing, but with No. 34 copper enamelled wire (0.15 mm diameter). L4 gets 15 turns, and L5 gets 90 turns. The inductance of L5 is 80 microHenries.

The receiver is powered from a 9V battery. Its drain is about 5 ma.

Adjustment and Performance

If everything has been soldered correctly the adjustment will be quite simple. Apply voltage and adjust R8 so that the voltage on the collector of T2 is about 2.5 volts. With help of a counter, dipper, or a communications receiver, tune the b.f.o. so that it covers at least 1750–1800 kHz. Tune L2 to 3550 using a dipper. Apply the antenna and you should hear c.w. signals. Readjust R8 once more for best performance, and that's it. Considerable improvement of sensitivity can be achieved by experimenting with the number of turns of L3 and L4, changing the distance between L1 and L2, and especially by choosing all transistors with higher gain and lower noise. In our case the receiver's sensitivity was 5 microvolts for an S4 signal in the phones.

Besides its simplicity, this type of direct-conversion receiver has several advantages:

1. Even strongest signals will not block the receiver, especially if silicon diodes are used.

2. Better sensitivity and clean reception are achieved due to supression of direct detection of all kinds of signals.

3. The receiver has greater stability of frequency because its b.f.o. oscillates on half of the received frequency.

4. The radiation of the b.f.o. through the antenna is reduced because the r.f. circuit is tuned to a different frequency.

5. Lower noise of the receiver is achieved through absence of the fundamental frequency and its noise.

The receiver was built without an r.f. stage so a good antenna is needed—resonant if possible. The receiver can also be built for 7, 14, 21, or 28 MHz.

Anyhow, the idea for a weekend project is here, and we leave it to you to add something more: an r.f. stage, a.f. active audio filter, more a.f. gain, other bands, etc. And do not think that this little gadget is a modern replica of your grandpa's "catwhisker" detector receiver when he was a boy. It works like crazy, especially on c.w.!

References

V. Polyakov, "A Mixer for a Direct-Conversion Receiver," *Radio*, December 1976 (in Russian).

V. Polyakov, "A Direct-Conversion Receiver," *Radio*, Nov. 1977 (in Russian).

Radio Communication, July 1977, comments on pages 531–532.

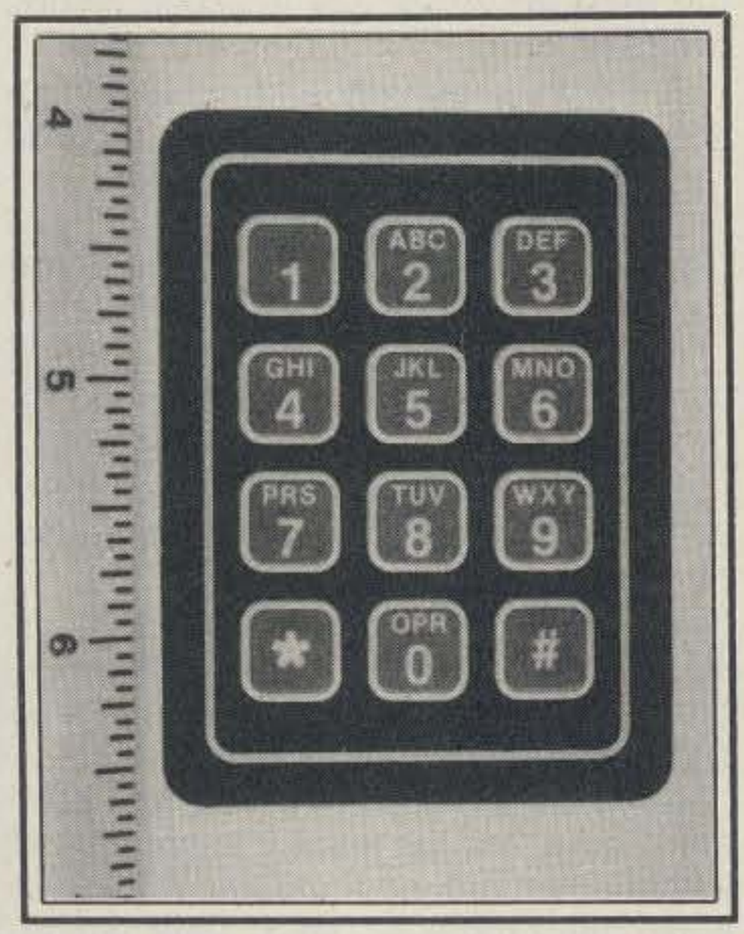
B. Pasarić, "An Amateur Direct-Conversion Receiver," *Radioamater*, September 1977 (in Yugoslav).

B. Pasarić, "Direct-Conversion Receiver, *Ham Radio*, September 1978 (please consider editor's errors in the diagram, page 101).

CQ SHOWCASE

Midian Electronics Touch-Tone Encoder

Midian Electronics, Inc. has introduced the TTE-1 Touch-Tone encoder with ultra thin keyboard. The unit features the thinnest available keyboard/DTMF encoder assembly with auto PTT and side tone. The keyboard mounts virtually flush on a flat surface. The DTMF encoder on the back of the keyboard fits into a 1″ × 1½″ hole for flush mounting. Digitally synthesized tones are for accuracy and stability with adjustable audio output level. The unit generates 12 standard Bell System Touch Tones. Options include keyboard only without encoder and LED indicating when auto PTT is activated.



For more information, contact Midian Electronics, Inc., 5907 East Pima St., Tuscon, AZ 85712, or circle number 104 on the reader service card.

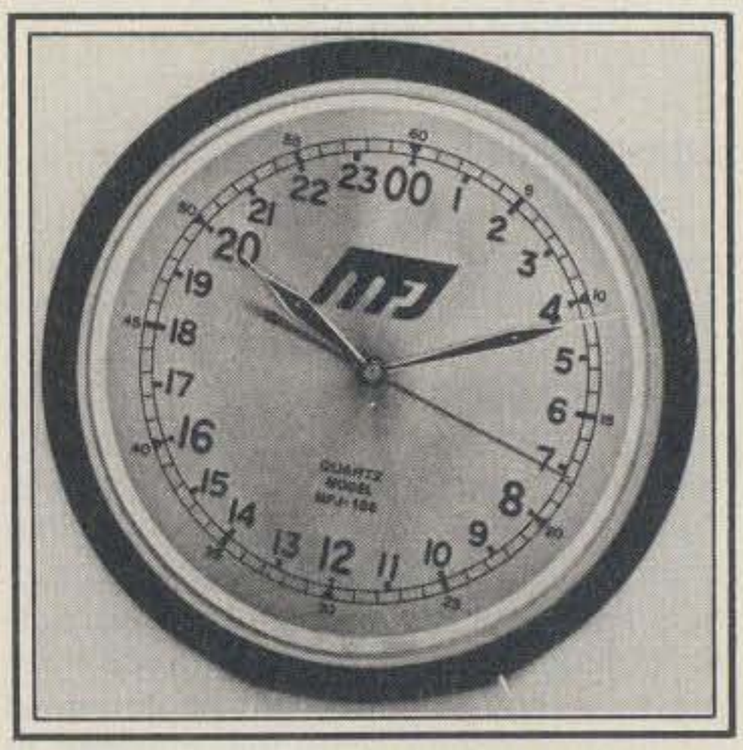
Tokyo Hy-Power Labs HL-45U Linear Amplifier

The HL-45U u.h.f. linear amplifier from Tokyo Hy-Power Labs is designed for use with 10 watt output 430–450 MHz crystal-controlled or synthesized rigs. It takes 10 watts and turns it into 40 watts output, plus provides a receiver preamp for best sensitivity. Input for the HL-45U is 2 to 15 watts with output of 10 to 45 watts. It operates from a 13.8 volt d.c. source and draws 7 amps at 45 watts output. It is all mode (s.s.b., c.w., and f.m.), has a built-in 12 dB low-noise receiver preamplifier, and utilizes carrier operated switching (COX).

The HL-45U measures 4.9″ × 2.7″ × 6.7″ and weighs 2.76 lbs. It has 3 switches and 3 LEDs on the front panel. The switches are as follows: s.s.b./f.m., power on/off, and receiver preamp on/off. The LEDs are "ON AIR" (green), power (red), and "RX" preamp (red). Suggested retail for the HL-45U is $199.95. For more information, contact Tokyo Hy-Power Labs Sales Dept., Encomm, Inc., 2000 Ave G Suite 800, Plano, TX 75074, or circle number 106 on the reader service card.

MFJ-105 24-Hour Wall Clock

MFJ has introduced its new 24-hour quartz-controlled wall clock. Its 12 inch diameter face gives increased visibility across a computer or radio room. This clock is quartz-controlled for accuracy to within 15 seconds a month. A sweep second hand makes precise reading easy. A single AA battery provides over one-year operation, immunity from power line failure, and eliminates a power cord (battery not included). The clock has a high-impact, brown plastic case with glass front.

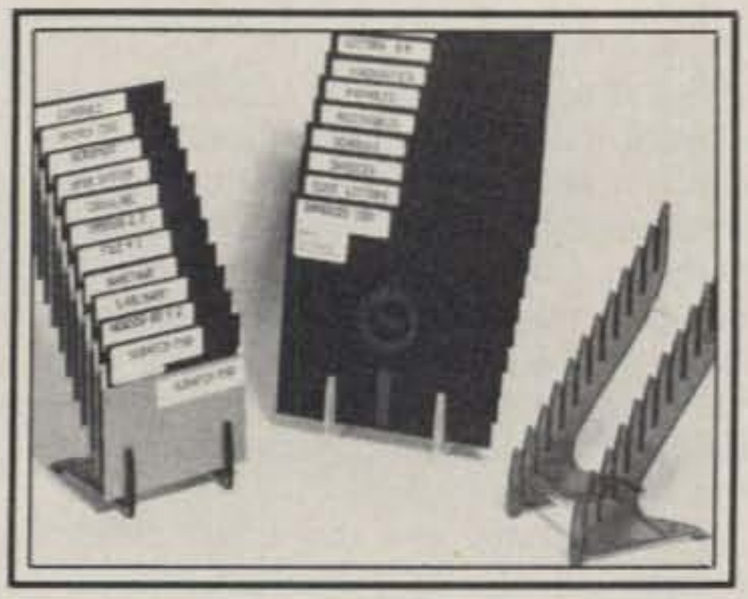


MFJ provides a 30-day money-back trial period, plus a one-year limited warranty. The MFJ-105 clock is available for $49.95 plus $4.00 shipping and handling. For more information, contact MFJ En-

terprises, Inc., P.O. Box 494, Mississippi State,MS 39762, or circle number 102 on the reader service card.

Electronic Time Service Center "Disk-O-Tier"

The "Disk-O-Tier" is a useful device for storing either 5 or 8 inch floppy disks. Many computer owners who use disk drives will lay their disks on the tabletop or work area rather than place them back in permanent storage. The Disk-O-Tier is handy for temporary or permanent storage for up to eleven 5 or 8 inch disks. The stair-step design allows for easy visibility of the disk labels.



The device is made from thermoplastic and is available from computer dealer and equipment stores. For more information, contact Electronic Time Service Center, P.O. Box 651, 35026-A Turtle Trail, Willoughby, OH 44094, or circle number 101 on the reader service card.

VoCom H.T. Conversion System

VoCom has announced its new H.T. conversion system. Conversion of virtually any hand-held radio to full-fledged mobile operation is possible with the Power Packet. The Power Packet gives 3 watts of audio output power to cover road noise, and its charging system keeps the H.T. charged and ready for portable operation. Also included is a microphone preamp to accommodate nearly any microphone and a hooded lamp to illuminate the H.T. at night. When dash mounted, all front-panel H.T. controls are accessible.

Smaller than many control heads, the Power Packet measures only 5" × 3¼" × 1½", solving the mounting problems encountered in modern, compact automobiles. The Packet, external speaker, r.f. amplifier, and the H.T. can all be mounted in separate locations within the vehicle, reducing or eliminating external visibility. Meanwhile, the Packet functions as a "control head" for the system. Interface instructions are available from the manufacturer for many popular radios. Price is $84.95; matching speaker $19.95; external r.f. amplifiers from $84.95. For more information, contact VoCom Products Corp., 65 E. Palatine Road, Prospect Heights, IL 60070, or circle number 105 on the reader service card.

Want to relive your old Novice days? Even if you don't, you can still enjoy building this little tube rig to check antennas or to use as a QRP portable.

Build A One-Tube, 10 Watt C.W. Transmitter

BY ED MARRINER*, W6XM

There are still fellow amateurs who like to hard-wire their own tube transmitters. Tubes are simple to use, cheap, available in surplus, and can make a small portable rig for taking on vacations. I use mine for tuning vertical antennas out in the front yard. This little rig could be used to drive an amplifier without r.f. feedback problems encountered in transistor exciters. You also don't need a heat sink, and it is just as small as any transistor transmitter of the same power. It is nostalgia, and that's my pitch!

This transmitter was built on a 4" × 5" × 1" chassis, complete with power supply. The case, or shell, or the transmitter was removed and recessed into a square hole cut in the chassis submounted. By pulling out the crystal, tube, and plug-in coil, it is only 1½ inches high. It goes in a coat pocket very easily.

I suppose some eyebrows will rise seeing a 20 ma transformer used at more current. However, remember that on c.w. you are not holding down the key. As long as the voltage does not drop and the transformer does not get too hot, you can overload it a lot! Only one filament is being lighted up, and this reduces the heat loss in the transformer, too. When the power supply is in the off position, a 1000 ohm resistor discharges the capacitors fast, and no signal is heard going from send to receive with the high value of capacitance discharging. The crystal oscillator is on during keying to obtain the best stable, no-chirp signal. It has soft keying characteristics with the key filter shown. In fact, it sounds beautiful.

Using crystals for the various bands and plug-in coils it will go most anywhere in the spectrum. Plug-in coils may be hard to locate, but there are some listed in the Fair Radio Sales catalog. Send an s.a.s.e. for prices or their catalog (P.O. Box 1105, 1016 E. Eureka, Lima, OH 45802). The little BDC-type tuning capacitors can be found in several catalogs. The coil size will depend on whether you use the same diameter coils. The antenna coil has enough turns on it to act as a series resonance circuit for feeding into a long wire. For a 52 ohm dipole you may want to reduce the coil to about 3 turns for 40 meters.

Transformers are the most difficult thing to find, as they are not advertised. If you know of a surplus source let me know. However, most parts stores still carry Stancor, Merit, and Triad on the shelf. Radio swapmeets seem to have a selection of transformers.

Once the little rig is finished, feed it into a dummy load and put a one-turn loop of wire around the coil and a flash bulb and peak up the output to see how it is working. String up an antenna and have as much fun as I have had with this mini power source.

*528 Colima St., La Jolla, CA 92037

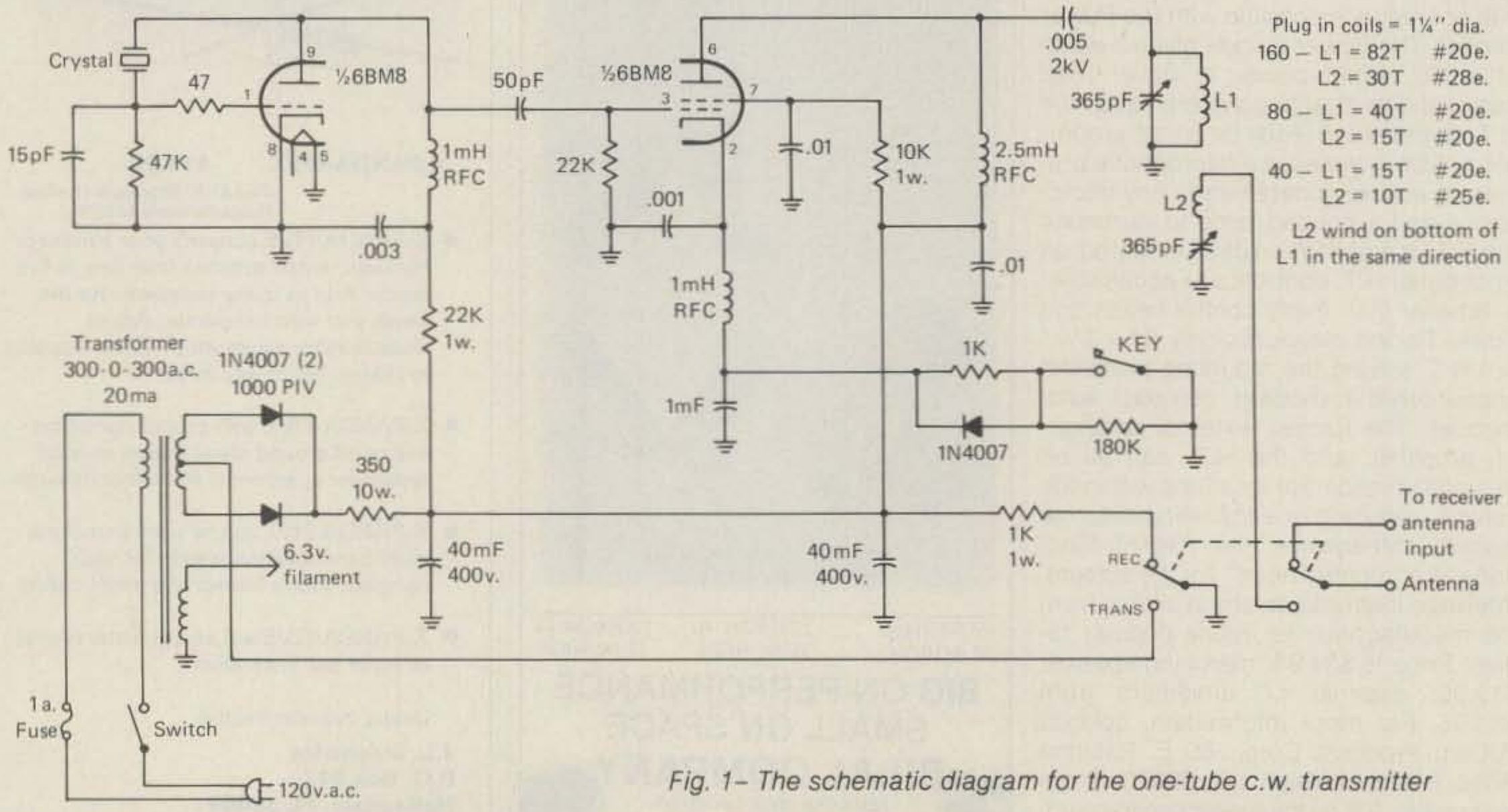


Fig. 1– The schematic diagram for the one-tube c.w. transmitter

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Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Dipole Antennas—Part II

Last month's Novice column contains the first part of this three-part article about Novice-band dipole antennas. To be of use to the Novice, all three parts should be read; none of these parts stands alone.

Coaxial Cable

See fig. 3 for typical loss data. The outside diameters of the insulation surrounding the center conductor (called the go line) in typical coaxial cables range from about 0.034 to 0.440 inch. Coax inpedances are between about 25 and 200 ohms, with most of them having a characteristic input impedance of 50 to 75 ohms. The r.f. signal travels along the outside surface of the center conductor and the inside surface of the shield (called the return line). Coax acts like a pipe, carrying r.f. signals back and forth between the antenna and the station equipment.

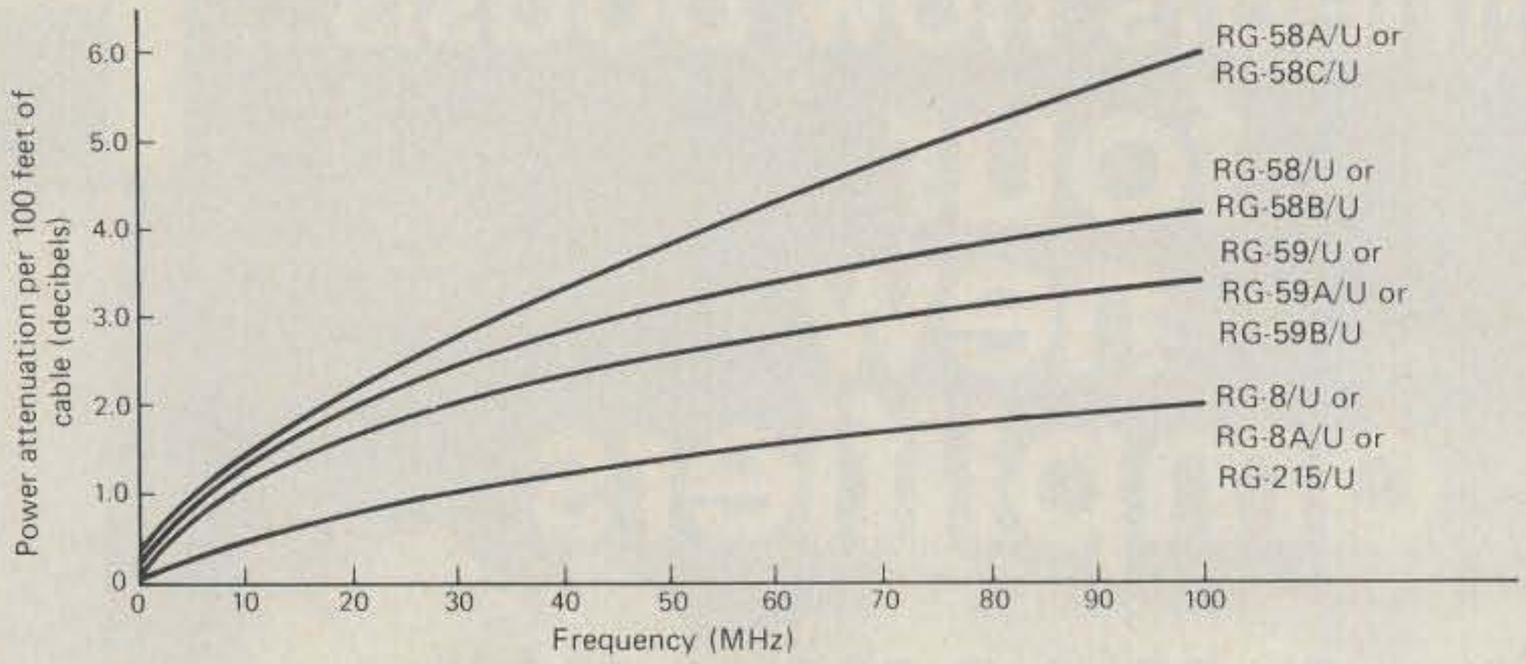

Fig. 3- Typical coaxial cables' loss characteristics.

Eighteen-year-old Carl Braun, KA9LYN, who lives in Fort Wayne, Indiana, thanks the Fort Wayne Radio Club for giving him a start in amateur radio–particularly Lynn Hyndman, W9FC, and Doug Dunfee, N9BUQ. Carl got a Novice license in October of 1981 and expects to upgrade about the time this picture is printed. His station includes a Kenwood TS-520 transceiver, a 40 meter inverted Vee, and a Hy-Gain TH-3 MK-III Yagi-Uda antenna mounted on a 50 foot Rohn tower. Carl has had about 400 contacts, including 43 with foreign amateurs.

Feedline Installation

It is usually advisable to obtain a single piece of feedline that is longer than what you think you will need to interconnect your equipment to the antenna. Most new amateurs underestimate the length of coax (or other) feedline needed to make this interconnection, forcing them to add an extension. If you make this mistake, do not attempt to splice the two segments of feedline; it is better to join them with connectors and to seal-over tightly attached connectors with waterproof tape or Coax-Seal®. It is very difficult to splice coax without introducing an objectionable impedance mismatch at the splice point. If an extension is to be added to a coax feedline, it is easy to attach male connectors (PL-259, or similar) to the coax ends you want to join together; then, attach these connectors to opposite ends of a double female (PL-258, or similar) straight adapter. Secure both male connectors very firmly in the double female barrel and wrap tape around the entire assembly area to preclude any possibility of moisture entering these connectors.

It is advisable to make the first feedline connection at the antenna, since that point is remote and is usually less acessible. The feedline weight should not be on the go line attached to the antenna. The feedline can be taped to a convenient fixed structure to reduce the strain applied to the antenna connections. The attached feedline should then be routed to the equipment in the shack. Avoid sharp bends in coax, since they can result in impedance changes (reductions) that can increase the feedline's standing-wave ratio (s.w.r.) and reduce its efficiency. It is a simple matter to secure coax at two or more points in areas where it would otherwise be subject to a sharp bend (such as draping over a rain gutter.)

The feedline must be long enough to allow it to be attached to the station equipment, and one should leave enough slack to permit the attached equipment to be moved a bit without having to disconnect the antenna. I believe that 12 to 24 inches of feedline slack is ideal at the equipment. Do not leave more than a couple of feet of feedline slack at the equipment or anywhere else. Do not coil excess feedline; cut it off. If you want to use a resonant (radiating) feedline, arrange the feedline routing or antenna height/location such that the resonant length is suitable with no excess.

Bringing the feedline into the house can be a problem. I have found that the best way to accomplish this requirement is to drill a hole in the floor immediately behind and below the rig and to thread the feedline through the underfloor space (or cellar) and up through the drilled hole. Another popular method is to remove a pane of glass from a window and replace it with a piece of clear plastic which is drilled to enable one to mount a double female barrel on it that will serve as a feedline feedthrough. In this case, matching male connectors are attached to the feedline sections inside and outside the window. If this system is used, care must be taken to avoid putting excessive strain on the relatively weak window structure. Many homes and apartments have unique features which permit easy feedline access to the shack. Make a good initial installation.

Antenna Switches

It is convenient to connect all the antenna feedlines to a switching system that provides instant selection of any desired antenna. There are special coax switches that are specifically designed to perform this function, and antenna switching capability is included in most antenna tuners. This convenience is off-

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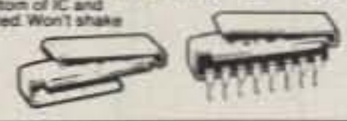

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50076	062	25	4	2.39
50077	062	50	8	4.25
50078	032	33	1.5	1.31
50079	032	88.5	4	2.47
50080	032	175	8	4.57

TI WIRE WRAP SOCKETS

Tin plated phosphor bronze contact – 3 wrap

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11301	8	$.40	$.36	$.30
11302	14	.59	.54	.45
11303	16	.64	.58	.48
11304	18	.73	.66	.55
11305	20	.99	.90	.75
11306	22	1.12	1.02	.85
11307	24	1.25	1.14	.95
11308	28	1.52	1.38	1.15
11309	40	2.05	1.86	1.55

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11201	8	$.10	$.09	$.08
11202	14	.14	.13	.12
11203	16	.16	.15	.14
11204	18	.18	.17	.15
11205	20	.20	.18	.16
11206	22	.22	.20	.18
11207	24	.24	.22	.20
11208	28	.28	.26	.25
11209	40	.40	.37	.33

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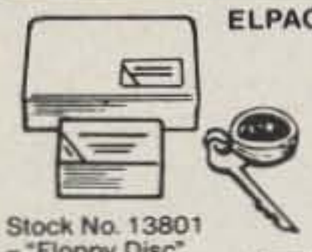

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13801-1 Data Sheet for 13801 ... .25

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13825	CB3801	3.0-7.0	12±0.6	0-25	.48x.51x3.05	$ 7.95
13826	CB3811	3.0-7.0	-12±0.6	0-25	.48x.51x3.05	7.95
13827	CB3802	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.95
13828	CB3812	3.0-7.0	-15±0.7	0-20	.48x.51x3.05	7.95
13829	CB3804	3.0-7.0	28±0.7	0-10	.48x.51x3.05	7.95
13830	CB3814	3.0-7.0	-28±0.7	0-10	.48x.51x3.05	7.95
1.5 W TYPE:						
13831	CL3801	4.0-7.0	12±0.6	125	.651x1.2x1.77	$24.95
13832	CL3811	4.0-7.0	-12±0.6	125	.651x1.2x1.77	24.95
13833	CL3802	4.0-7.0	15±0.7	100	.651x1.2x1.77	24.95
13834	CL3812	4.0-7.0	-15±0.7	100	.651x1.2x1.77	24.95
13835	CL3804	4.0-7.0	28±1.4	50	.651x1.2x1.77	24.95
13836	CL3814	4.0-7.0	-28±1.4	50	.651x1.2x1.77	24.95
13825-1	DATA SHEET FOR DC/DC CONVERTERS					.25

ELPAC POWER SUPPLIES – SOLV SERIES FULLY REGULATED

SINTEC Stock No.	ELPAC Part No.	Output Voltage	Output Current Rating	Dimensions (HxWxD) in Inches	OVP	Price
13802	SOLV15-5	5	3.0A	4-7/16x4x2	Fixed included	$39.95
13803	SOLV15-12	12	1.5A	4-7/16x4x2	Fixed included	39.95
13804	SOLV15-15	15	1.2A	4-7/16x4x2	Fixed included	39.95
13806	SOLV15-24	24	0.75A	4-7/16x4x2	Fixed included	39.95
13808	SOLV30-5	5	6.0A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13809	SOLV30-12	12	4.0A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13810	SOLV30-15	15	3.3A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13812	SOLV30-24	24	2.0A	5-5/8x4-7/8x3-3/16	OVP-4	59.95
13802-1	Data Sheet for SOLV Series					.25

Special of the Month!

MICRO-MIKE
Precision Pocket Microscope

Features: Professional quality optics • always in focus • precise measurements (readings to .001, accurate to 1%) • ideal size (under 5") • special beveled opening • durable aluminum case.

These high-powered, precision microscopes are contained in rugged, pocket sized cases. Micro-Mike provides distortion free magnification without focusing. Guaranteed for life!

Stock No.	Power	Price
51058	10X	$9.95
51059	20X	9.95

PIN FORMING TOOL

puts IC's on their true row to row spacing. One side is for .300 centers, Flip tool over for devices on .600 centers. Put device in tool and squeeze.

NEW! **Stock No. 10200 $14.95 (ANTI-STATIC MODEL)**

ONE TOOL DOES 8 thru 40 PINS! **Stock No. 11059 $12.95**

MODUTEC

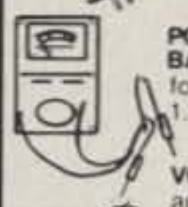
Miniclamp AC Volt-Ammeter allows singling one conductor out of many without disarrangement.

SET of THREE **$99.00**

Stock No.	AC Amperes	Price
13730	0-25A	$39.50
13731	0-50A	39.50
13732	0-100A	39.50

ACCESSORY LINE SPLITTER allows fast readings of AC power consumption of plug in equipment without separation of leads.

Stock No. 13727 **$9.95**



POCKET SIZED BATTERY TESTER for all types of small batteries from 1.35v to 4.5v

Stock No. 13733 **$13.95**

VOLT-I-CATOR automotive diagnostic meter plugs into lighter socket and indicates battery condition and charging rates.

Stock No. 13736 **$15.95**

AC VOLTAGE TESTER plugs into any 110v service receptacle to check line voltage over 50-150 VAC

Stock No. 13735 **$14.95**

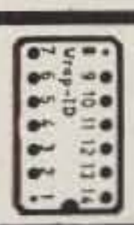
VOM-MULTITESTER versatile Volt-Ohm-Milliammeter in small package

Stock No. 13729 **$13.95**

OK MACHINE AND TOOL

IC INSERTION/ EXTRACTION KIT

Includes DIP IC extractors and inserters to accommodate all ICs from 14 to 40 pins. Tools that engage conductive surfaces are CMOS safe and include grounding lugs. Stock No. 13309 **$37.74**



SOCKET WRAP ID

DIP socket-sized plastic panels with numbered holes in pin locations. Slip onto socket before wire wrapping to identify pins. Also write on them for location, IC part number, function, etc. Simplifies initial wire wrapping, troubleshooting and repair.

13295	14 pin
13296	16 pin
13297	18 pin
13298	20 pin
13299	22 pin
13300	24 pin
13301	28 pin
13302	40 pin
13303	96 pin

$1.82 per pack

IC EXTRACTOR

One-piece, spring steel construction. Will extract all LSI, MSI and SSL devices with 8 to 24 pins.

Stock No. 13313 **$2.10**

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$100 to $250 - $4.00
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CIRCLE 135 ON READER SERVICE CARD

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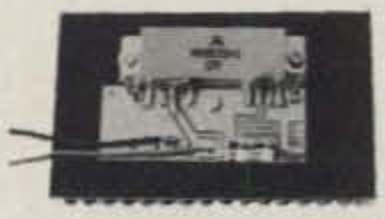
Let P.C. put you on the air and SAVE!

Complete System price $249.00 SAVE $13.00

TXA5-4 Exciter/Modulator . . . . . $89.00 ppd.
Wired and tested module designed to drive PA5 10 watt linear amplifier. The 100 MHz crystal design keeps harmonics out of two meters for talk back. Video modulator is a full 8 MHz for computer graphics and color. Requires 13.8 VDC reg. @ 70 ma. 80 mw output power. Tuned with crystal on 439.25, 434 or 426.25 MHz.
Dual frequency model available . . . . . $115.00 ppd.



PA5 10 Watt ATV Power Amplifier . $89.00 ppd.
The PA5 will put out 10 watts RMS power on sync tips when driven with 80 mw by the TXA5 exciter. 50 ohms in and out plus bandwidth for the whole band with good linearity for color and sound. Requires 13.8 VDC reg. @ 3 amps.

FMA5 Audio Subcarrier Generator . $29.00 ppd.
Puts audio on your camera video just as broadcast does at 4.5 MHz. Puts out 1 V p-p to drive TXA5. Requires low Z mike, 150 to 600 Ω and 12 to 18 VDC @ 25 ma. Works with any transmitter with 5 MHz video bandwidth.

TVC-2 ATV Downconverter $55.00
Stripline MRF 901 preamp and double balanced mixer digs out the weak ones and resists intermod and overload. Connects between UHF antenna and TV set. Output channels 2 or 3. Varicap tuner 420 to 450 MHz. Requires 12 to 18 VDC @ 20 ma.
Supersensitive TVC 2L with NE64535 preamp (.9 db N.F.) . . . . . $69.00 ppd.

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CIRCLE 120 ON READER SERVICE CARD

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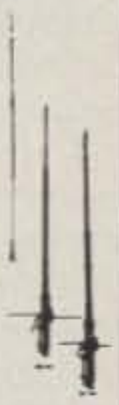
HUSTLER ANTENNAS

SF2 - "Buck Buster" 5/8" Wave 2 Meter Antenna w/3/8 x 24" Threaded Base - 3dB gain **$8.95**

HOT - EASY ON/OFF TRUNK MOUNT with 3/8 x 24" Swivel Ball for CG144 & SF-2

$14.95

CG144 5.2dB gain Collinear w/3/8 x 24" Threaded Base **$23.95**



G6144 - 6dB Base Antenna **$68.50**

G7144 - 7dB Commercial Grade Base Antenna **$98.00**

And many other Hustler Antennas & Mounts

BBL144	25.95	MRK-1	13.75
BBLT144	35.00	SFM	24.25
BBLT440	24.75	THF	13.95
HLM	13.95	UHT-1	8.95

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CIRCLE 136 ON READER SERVICE CARD

set by the fact that the switching device just switches the center conductor, leaving all shield lines connected to a common point. I prefer not to have my antennas interconnected, so I do not use an antenna switching system; I manually connect the desired antenna when a change is desired. Each of my unused antennas is connected to a panel that electrically short-circuits the center line to the shield line and connects them to the station ground to eliminate voltage buildup when they are not in use.

Directivity

A horizontal dipole antenna erected with one end north and the other end south provides optimum communications east and west, but stations can be worked that are north and south of such an antenna. Dipoles are not highly directive antennas. If you want to increase your dipole's directivity, simply close the dipole legs in that direction. Signal strength is increased in the direction ahead of the closed legs. Naturally, signal strengths are reduced in the opposite (back) direction. Fig. 4 shows these directivity characteristics. There is a practical limit to how much the dipole legs can be closed in the desired (forward) direction; that limit is reached when the dipole legs form an angle of about 45 degrees. Antenna impedance and s.w.r. are changed by closing the antenna legs to obtain additional directivity.

Impedance Versus Height

The impedance of a dipole antenna varies in relation to its height over electrical (true) ground, since the dipole works in relation to its mirror image in that r.f. ground. Fig. 5 shows these relationships. Note that antenna impedance is at its true characteristic point at each one-quarter wavelength distance above true (electrical) ground. The resultant impedance fluctuations decrease as the height above true ground increases, and the sine-wave curve flattens out to a straight line (at the true antenna impedance) at about 2.5 wavelengths above true ground. This means that a 40 meter Novice dipole has to be more than 300 feet above true ground to be relatively unaffected by small height changes. Such an antenna height is not feasible for most of us, and it is not my intent to imply that you must go to extremes to erect your antenna at such a height. The figure is just intended to show you that the maximum shift of antenna impedance occurs in the first half wavelength above electrical ground.

If you assemble a dipole that is cut to resonate in the desired band segment, do not change its length if you find that your antenna system has a high s.w.r. (standing-wave ratio). This undesirable condition can be due to the dipole's height above true ground. Simply raise or lower the dipole a few feet and again check the s.w.r. If it increases, change the antenna height in the other direction. If the s.w.r. decreases, try other heights in the same direction to determine the optimum height (which is indicated by the minimum s.w.r.).

The height above electrical ground is of more concern at lower frequencies (longer wavelengths) than it is at higher ones, due to the greater dimensions of the longer wavelengths. To state this another way, the 80 meter halfwave height above true ground would be about four wavelengths above true ground for a 10 meter dipole; small changes in the height of the 80 meter dipole would result in significant changes in its impedance, whereas small changes in the same height of the 10 meter dipole would not cause a noticeable change in its impedance.

Signal Penetration Into Earth

Fig. 6 shows typical r.f. signal penetration depths into the local ground surface.

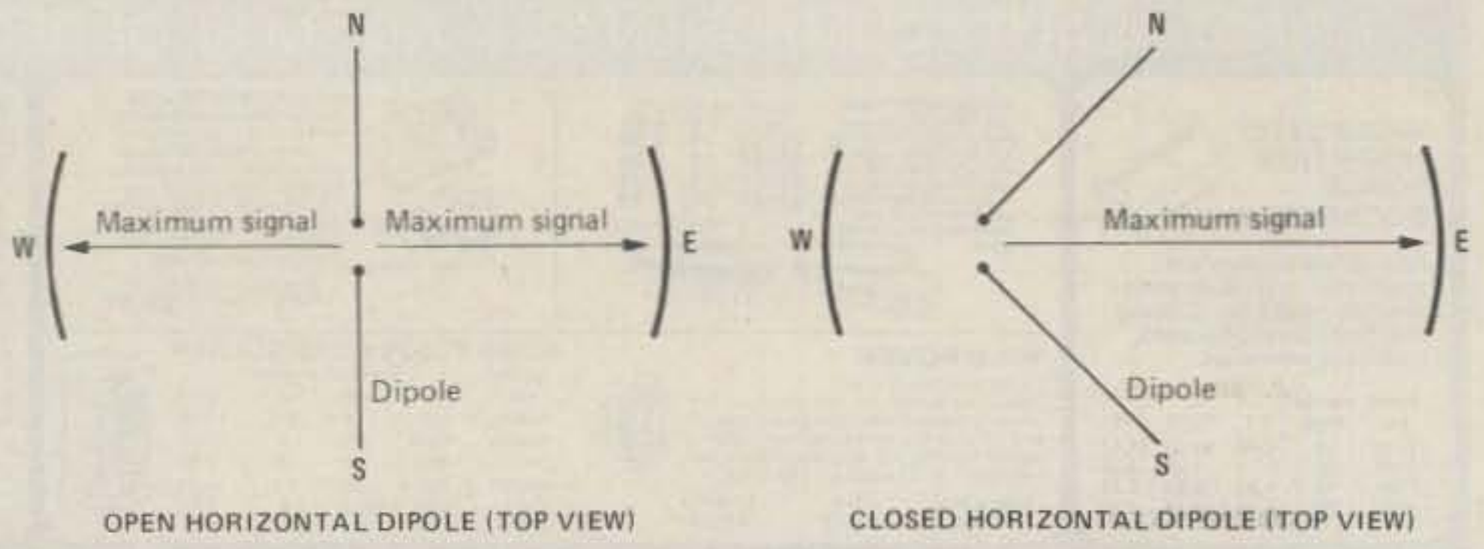


Fig. 4- Dipole directivity.

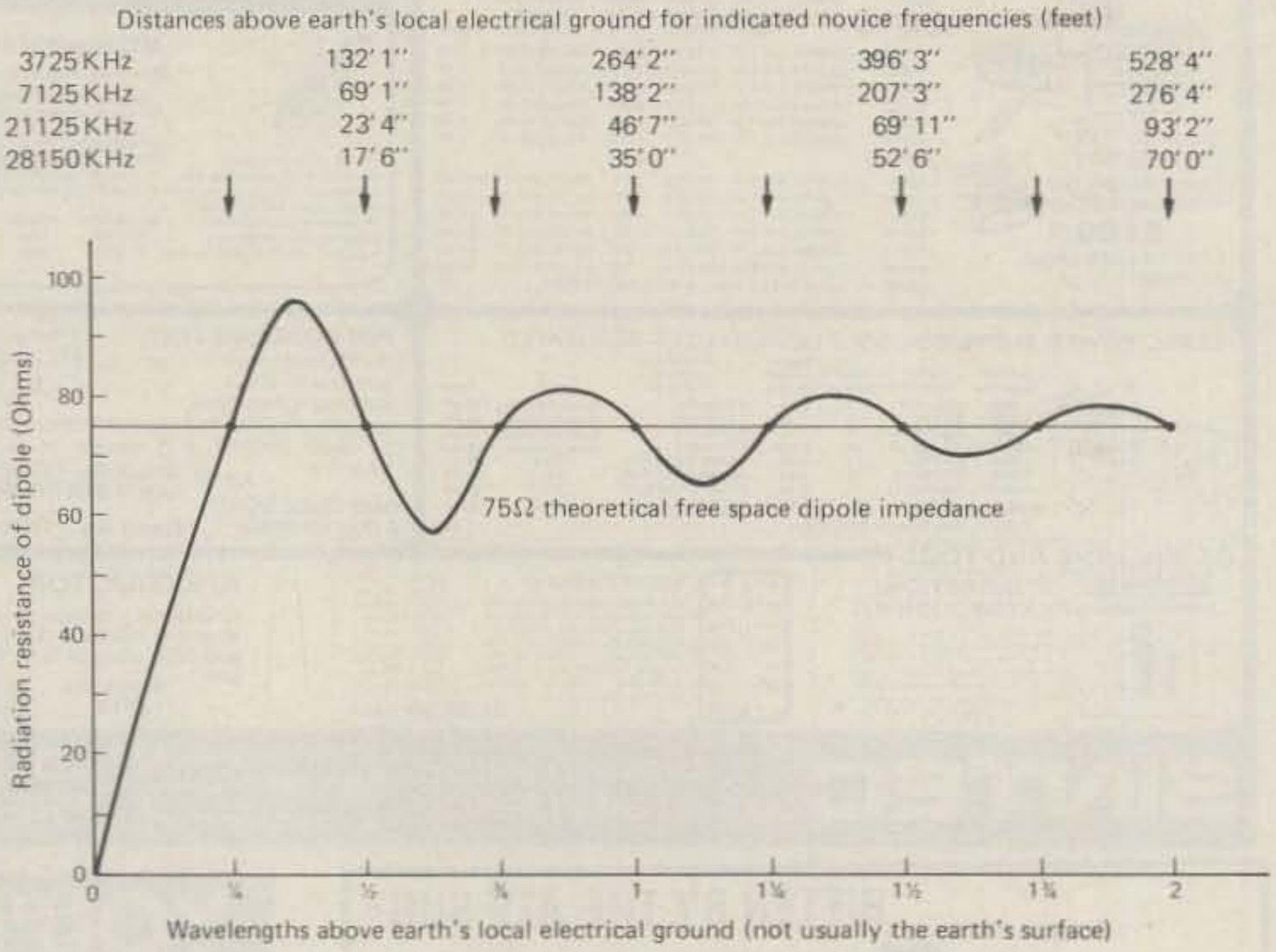


Fig. 5- Dipole impedance versus height above electrical ground.

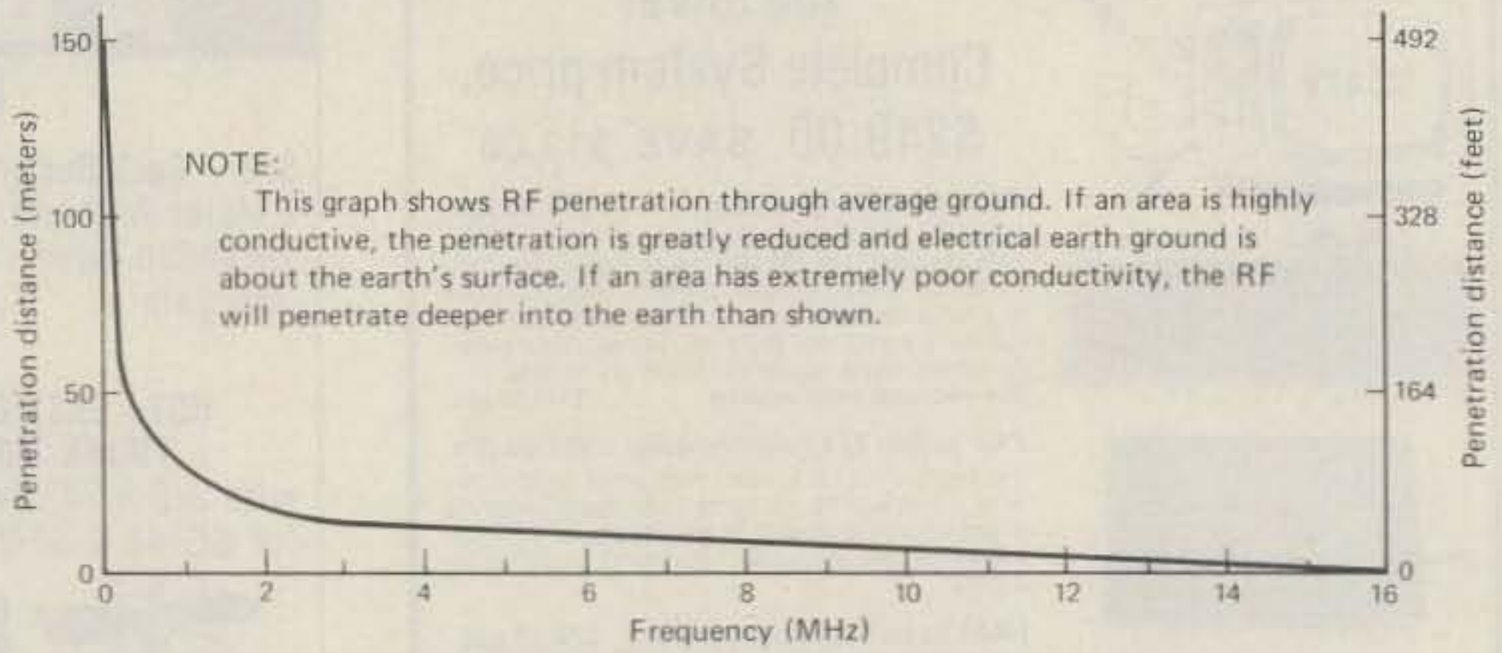


Fig. 6- R.f. penetration into local ground surface.

Antenna Location Selection

It is advisable to plan a good installation before one constructs the dipole antenna. I usually sketch a top view of the site showing all dimensions, station location, power lines, telephone wires, other cables, metal conductive surfaces, and possible attachment points for the ends of the dipole. The major location factors one must consider are:

(1) Avoid close proximity to metallic conductive surfaces such as tin roofing on sheds, rain gutters/drains, aluminum insulation inside attics, and air-conditioning ducts.

(2) Neither the dipole nor its feedline should be positioned where it could possibly come in contact with an electrical power line, if either the antenna system or the power line were to fall. Also, do not select an antenna location that will result in your having to be close to a power line when erecting the dipole.

(3) The antenna should be installed at the maximum height possible. This fact applies to all antennas, but it is particularly important with regard to 40 and 80 meter dipoles, which have to be fairly high to present their proper impedance characteristics. Consider the possibility that you may want to raise or lower your dipole to attain a better (lower) standing-wave ratio (s.w.r.) if the s.w.r. is found to exceed 3 to 1 at the initial installation height.

(4) Neither the dipole nor its feedline should be close to a telephone line or any other wire, including other antennas. If part of your dipole or feedline must pass near such a line, it should be nearly at right angles and as far away as possible to minimize coupling between conductors.

(5) If your physical layout permits it, plan to erect your dipole so that it will be broadside to the major areas (front and back) you plan to contact. Similarly, you may be able to plan an installation wherein the dipole legs can be closed in the direction of maximum contact interest. As examples, when I lived in New England, I often helped students erect dipoles with maximum directivity to the WSW; now that I live in southern California, such antennas are erected to provide ENE directivity.

(6) Relatively high voltages exist at the outer ends of a dipole; consequently, the dipole location should be such that neither people nor pets could be shocked. This is another factor in favor of horizontal dipoles and against drooping dipoles (inverted Vee's).

(7) Your dipole may look beautiful to you, but others may think it is ugly. It is best to plan a backyard installation.

(8) It is best to select rigid attachment points for both ends of your dipole, such as at buildings. If this cannot be done, try to mount one end to a fixed point. If a dipole end must be attached to a non-fixed point (usually a tree), plan to use a weight on a line running through a pulley to hold it up. Any non-flexible attachment to a

non-rigid point will result in a damaged antenna during a wind storm.

(9) Use string to erect an imitation dipole where the real one is to be installed. Use it to determine the actual required lengths of the feedline and the non-conductive line that will be attached to the end insulators to hold the dipole in place. You may prefer to do this on paper using your top-view layout.

Summary

This concludes the second part of this three-part article. The concluding part covers dipole materials, construction, installation, test, and maintenance.

A Voice Out of the Past

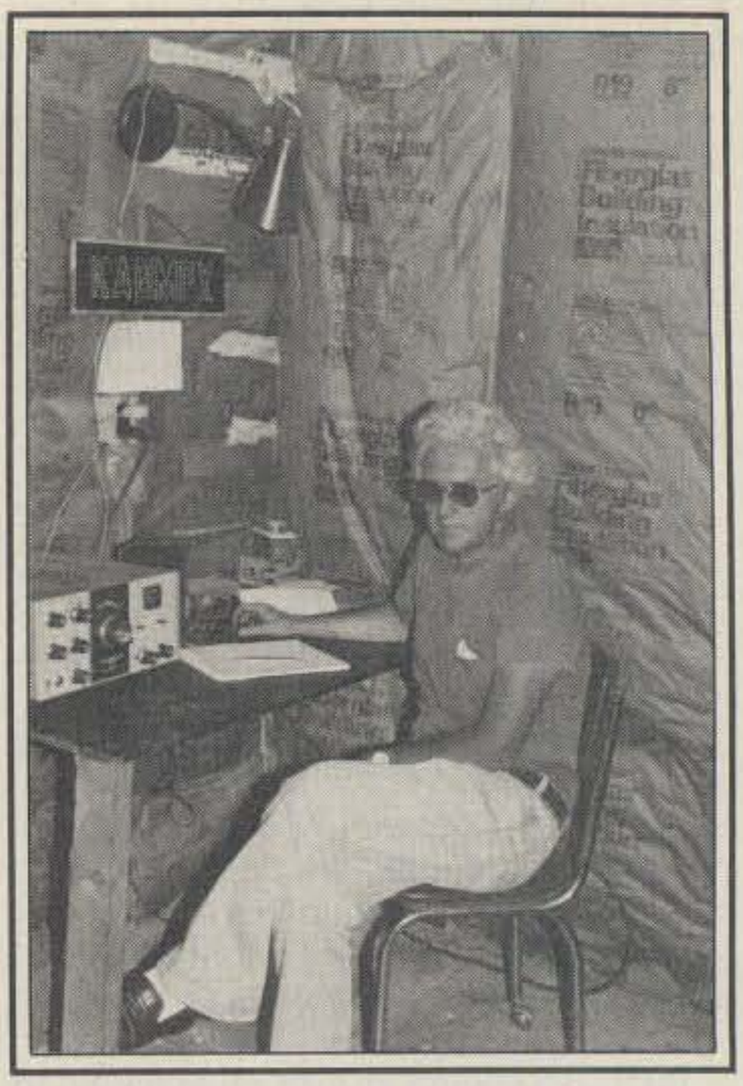
I taught licensing courses throughout the Boston area for about 15 years. I had more than 1000 students several times when I ran courses six and seven days per week. I occasionally have someone contact me to find out if W6DDB was once W1SAD in Massachusetts, which is correct. I had it happen again recently when Robert T. Snyder, KA1HPV, of Sharon, Massachusetts, called to find out if I am the Bill Welsh he remembers from 30 years ago. It is nice to hear from those who bring back good memories of past associations. It is also nice to have worked KA1HPV on the air; I was lucky enough recently to have an unscheduled contact with him on the 15 meter Novice band.

Photographs Wanted

Black-and-white photographs of Novices in their shacks are frequently included in this column. The size of the submitted photograph is unimportant, but it must have reasonably good definition, contrast, and subject matter. Color pictures can be used, but black-and-white photographs are preferred. A brief summary of operating activities and achievements, plus a personal self-introduction, are needed with each picture. Photographs are not returned unless they are accompanied by a request for their return, plus a self-addressed and stamped envelope. A free one year *CQ* renewal or subscription (please state which) is awarded to the amateur who sends the picture I select as the winner for the month. If you are a current *CQ* subscriber, please state that this is the case and enclose the mailing label taken from a recent issue of *CQ*, or a copy of the exact information on that address label. One award is made each month, no matter how many photos are printed.

I have never received a photograph from a Novice in Arkansas, Connecticut, Hawaii, Lousiana, Montana, Nebraska, Nevada, New Hampshire, Oregon, Rhode Island, South Carolina, Tennessee, Utah, Vermont, Washington, or Wyoming. If you are an active Novice in one of the 16 states listed in the preceding sentence, I hope you will take the time to send a good photograph. Photographs and accompanying captions provide a greatly appreciated introduction to a few of the newer amateurs.

73, Bill, W6DDB



Charlie Haggard, KA0MPX, of Alliance, Nebraska, is a 47-year-old conductor working for the Burlington Northern railroad on runs between Alliance, Nebraska, and Edgemont, South Dakota. He studied for his license during the 8- to 24-hour layovers at Edgemont; he is continuing this practice and expects to have upgraded to General by the time this introduction is printed. Alan Kreifels, K0SKN (a BN Railroad Engineer), and Dick Boman, W0WZR, are continuing to give Charlie help in getting a good start in amateur radio. Charlie got his Novice license in December of 1981, but he did not get on the air until the end of July in 1982. He has been making up for lost time since then. He has contacted amateurs in 21 states so far using a Heath HW-101 transceiver and a Butternut HF6V ground-mounted vertical antenna. Charlie and Alan plan to set up and operate a station at their South Dakota layover stop.

1982 CQ WW DX C.W. Contest
High-Claimed Scores

The following are C.W. high-claimed scores as of March 13, 1983. These are raw scores only, subject to verification.

USA
Single Operator
All Band

K1AR	2,762,383
N2LT	2,494,710
K1JX	2,417,034
K3LR	2,141,775
K9DX	2,100,372
K4PQL/8	2,081,820
N5AU	2,019,855
N3RD	1,988,415
WA8YVR	1,962,489
W1RR	1,949,020
N2FB	1,917,950
K8NZ	1,853,805
KØDQ/1	1,833,535
AK1A	1,830,320
N3RS	1,643,649
W2REH	1,605,258
K1GQ	1,490,426
K2DM	1,469,136
K2LE/1	1,451,670

28 MHz

N4WW	399,620
K1ZZ	325,130
K1RM	307,060
N4ZC	295,320
KT4W	261,369
WB4TDH	213,909

21 MHz

KR2N	462,702
K1TO	417,628
W2GMT	335,268
K8CX	269,280
N4ZZ	250,232
W6YA	231,434
N4BU	220,264
N4RG	200,100
W2AZO	190,080

14 MHz

K1KI	545,930
W1RM	483,560
N2PP	314,874
N5CR	299,343
KJ9D	292,352
N4EA	287,408
W5FO	287,036
KØZX	244,530
WD8AUB	218,397
W4AAV	204,776

7 MHz

K1XM	213,192
K1NA	150,111
K4CG	140,481
W6AM	129,492
K2EK	122,734
K5RR	116,938
WØKEA	115,350
N5JB	112,068
N3BJ	108,891
N4UA	100,700
N6RJ	100,332

3.5 MHz

K1PT	73,186
KØRF	40,079
WA4SVO	32,984
K4PI	22,656
N7RM	13,889

1.8 MHz

AE6U	5,004
N4SU	3,700
N4IN	2,848
K5GO	2,552
K1MEM	2,430
K6SE	2,376

Multi-Single

K5RC	3,770,073
W3BGN	3,748,580
N4AR	3,266,064
N4RJ	2,840,260
N1AC	2,807,951
KA4S	2,748,675
AD8I	2,716,092
K1RU	2,087,585
KS8S	2,052,420
N2RM	2,042,191

Multi-Multi

N2AA	9,653,207
K1OX	7,719,093
W3LPL	5,869,288
N9MM	5,538,880
ABØI	4,226,040
W3GM	4,110,120
N6RO	4,049,674
W1YN	3,252,321
K6XO	2,542,826

QRP

K8IA	400,064
W9KNI	345,417
W9PNE	107,706
KBØHA	96,858
KJ6F	40,362

DX
Single Operator
All Band

9Y4VT	6,945,522
CN8CX	6,256,320
4Z4DX	5,240,126
UF6CR	4,882,592
8P6J	4,636,763
4M3BRF	2,232,956
DK3GI	2,924,215
5Z4CS	2,703,085
9K2DX	2,591,452
K2NA/KP2	2,503,522
UV9AX	2,421,525
HH2VP	2,399,617
V3MS	2,393,100
OZ1LO	2,064,762
UB5EC	2,018,320
T32AL	1,858,428
JG1ILF	1,712,139
G3MXJ	1,630,280
LA7JO	1,588,633

28 MHz

DJ4AX	400,147
DH2FAW	343,924
YU7ECD	340,360
SVØCT	311,738
V3TV	310,421
IØXXR	265,896
WB4OSN/C6A	220,387

21 MHz

CX7CO	787,248
KG6DX	666,623
LZ2KTS	391,500
LU4DTJ	324,744
OH5BM	324,384
DJØUJ	314,150
GW4BKG	311,220
YU2CQ	300,465
JE1AYU	299,310
YU1DW	296,888

14 MHz

VE3BMV	694,191
YU4GD	598,533
CX7BY	576,096
OH5TQ	484,824
YT3C	464,464
YT3A	450,499
UR2REE	389,310
YU3TWT	349,350
UA3GD	336,020
UAØSAU	326,180
UA9LAL	317,700

7 MHz

KV4FZ	548,936
9Y4VU	400,554
UB5JMR	397,578
YV5ANT	338,734
JA5BJC	287,850
YU3VM	233,571
G3FXB	207,480
EA8YV	205,620
LZ2ZZ	188,486
ZL1AMO	182,932
YU2SD	171,701
OK2BFN	157,069

3.5 MHz

EA2IA	199,872
UA9TS	135,508
UY5OO	96,664
YU4EJC	91,035
T32AF	87,906
UP2BAR	86,071
HA8KQX	84,888
G4BUE	84,569
G4CNY	77,004
YU4BR	72,930
UB5BAT	70,384

1.8 MHz

EA8AK	75,966
EA9EJ	43,896
YU3EF	34,860
UA9SAX	30,015
4X4NJ	27,850
SP1ADM	24,336
EA2OP	22,880
OK3CXF	19,650
OK1DFW	18,975
G3SZA	18,821

Multi-Single

NP4A	11,672,460
RG6G	10,478,248
UK9AAN	5,639,792
UK2RDX	4,164,075
F3TV	3,997,896
L8D/X	3,974,398
5H3BH	3,822,318
EA3VY	3,734,860
K1XA/6Y5	3,623,523
OK5MIR	3,464,664
UK5QCI	3,389,568
HG5A	3,318,666
UK4FAV	3,278,728
UK5IBB	3,021,012
YU3DBC	2,873,092
UKØAMM	2,864,284
GU3TXF	2,833,592
VE3PCA	2,767,456

Multi-Multi

P42E	23,583,670
EW6V	14,702,688
OHØW	14,463,670
4N1U	7,329,525
YU9W	6,679,775
JA2YKA	5,945,629
JA3YBF	4,713,478
HZ1AB	4,706,566
JA7YAA	3,201,766
JA3YKC	3,073,210

QRP

UP2BIM	899,932
UB5UCJ	452,505
OH5WH	247,299
YV2BE	175,938
HA5KD	154,424
SM5CTT	127,764
JA1HGY	108,936
YU1NR	69,338
G5DEH	62,832
JA1TLK	60,358

Here's a great little addition to your receiver that can help you pick out the rare ones.

The Threshold Gate
A C.W. Operator's Accessory

BY FRED BROWN*, W6HPH

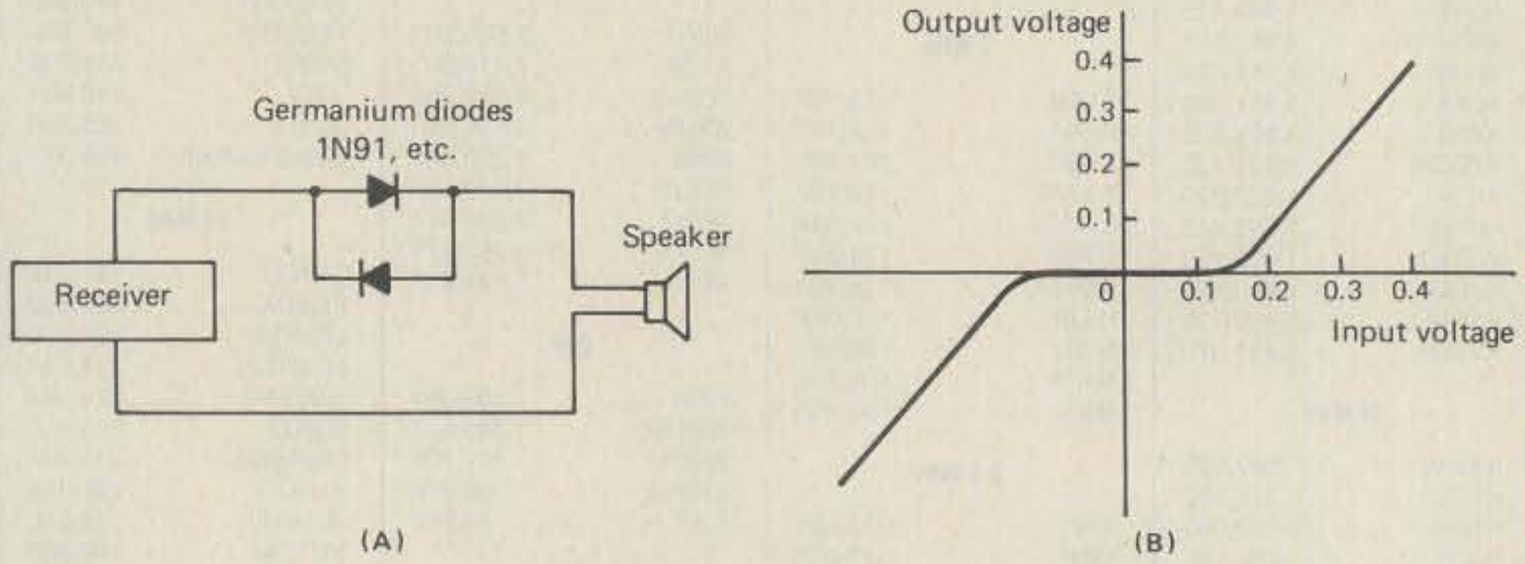


Fig. 1(A)— The simplest threshold gate consists of a pair of back-to-back connected germanium rectifier diodes in series with the speaker; (B) shows the input-output relationship for such a circuit.

A simple threshold gate for use between receiver and speaker is shown in fig. 1(A); fig. 1(B) shows the input-output relationship for such a circuit. Because of the barrier potential of germanium diodes, there is practically no output until input signal levels exceed a threshold level of about 0.2 volts. All signals below the threshold will not be heard, and unless you are copying a very weak signal, the background noise will be eliminated.

The threshold gate is therefore a signal-to-noise ratio enhancer, and the improvement can exceed 40 dB! Between the dots and dashes you hear nothing but silky silence. Of course, the gate will do nothing for the signal-to-noise ratio of weak signals; those signals with amplitudes below the threshold simply are not heard.

Another advantage of the threshold gate is that it produces distortion. Audio distortion is actually *desirable* for c.w. reception because it gives a beat note that is rich in harmonics. Normally, a c.w. receiver's output will be a pure sine wave, and the absence of harmonics increases operator fatigue. The presence of harmonics gives a tone that most operators regard as more pleasing to the ear and less fatiguing.

Fig. 2 shows a practical version of the threshold gate. Here two germanium transistors have been connected as "super diodes" to act as the amplitude gate.

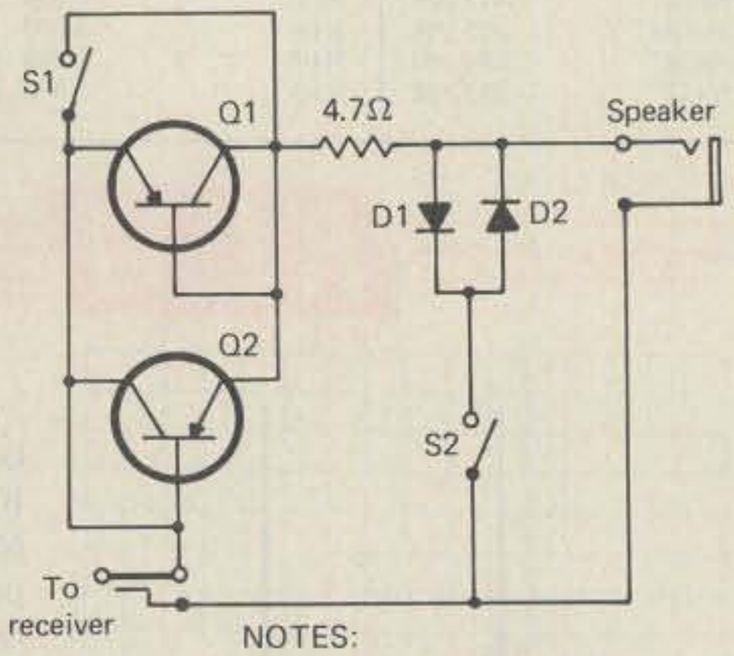


Fig. 2– This practical theshold gate uses a pair of super-diode connected germanium transistors and incorporates a diode noise limiter. Any kind of silicon rectifier diodes will work for the limiter.

Switch S1 shorts out the gate when normal reception is desired. A peak limiter using a pair of silicon rectifier diodes has also been included. These diodes limit all noise pulses to a maximum of about 1 volt peak. The limiter can be used by itself, or in conjunction with the threshold gate, it is switched in or out by means of S2.

The 4.7 ohm resistor is to prevent a short-circuit load on the receiver's output stage when the limiter is in use. This could cause destruction of the audio output transistors in some receivers. The resistor would not be needed for vacuum-tube receivers.

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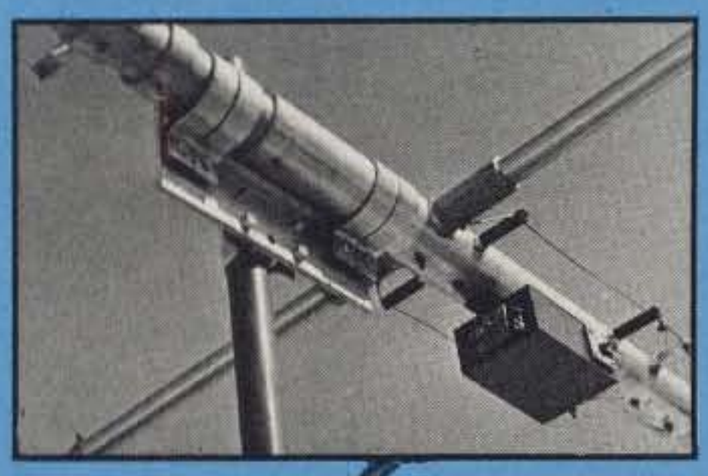

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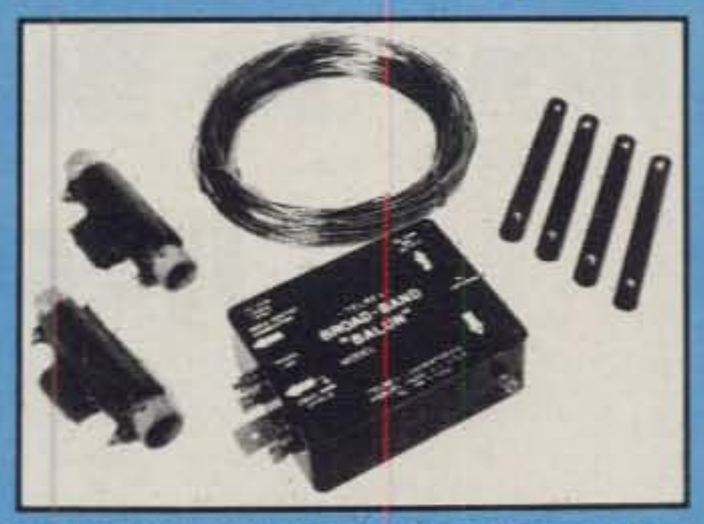

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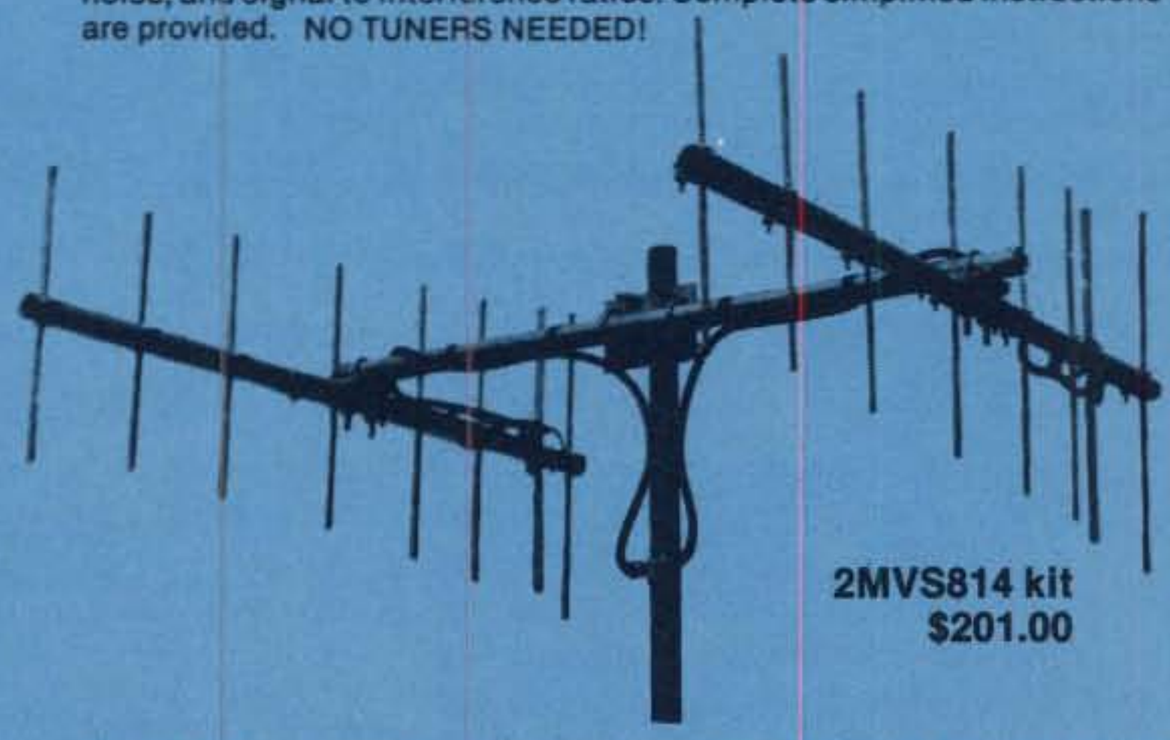

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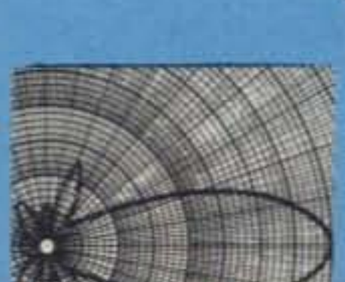

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The old saying is still true, you can't work them if you can't hear them. Here's a little add-on device to help you hear them, you still have to work them.

How To Build A General-Coverage Receiver Preselector

BY STEVEN E. MANN*, N4EY

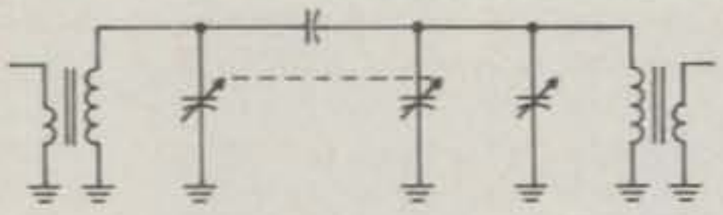


Fig. 1– A simplified circuit for the receiver preselector.

Has this ever happened to you? The 40 meter DX station that you've been waiting for is up, but you can't copy him due to the heterodynes and other trash on the band. Or maybe the band is clear but he's so weak that you have to turn on the preamp. Now the band is full of heterodynes as strong as the DX. Unfortunately, this is often a result of too much front-end gain and/or not enough r.f. selectivity.

There is a simple and inexpensive solution to this problem: add a preselector to your station. It adds front-end selectivity to your receiver or transceiver, eliminating strong-signal spurious responses, and has less insertion loss than most attenuators. Since most rigs have more gain than necessary on the lower bands—160, 80, and 40 meters—this should not be a problem.

The Circuit

The preselector covers from 1.8 MHz continuously through 30 MHz, so it can be used with a general-coverage receiver as well as ham-band rigs. A simplified circuit is shown in fig. 1. It is comprised of two sets of parallel tuned circuits top-coupled by a small capacitor. A dual-section variable capacitor is used for tuning. A trimmer is connected across one of the tuned circuits in each range to facilitate tracking. Link coupling is used to match the preselector to low-impedance lines. Three groups of parallel circuits cover the entire h.f. range. This is a passive circuit, so some reduction of signal is to be expected. In operation there is a loss varying from 5 to 10 dB due to tracking variations.

*P.O. Box 141, Burlington, NC 27215

Construction

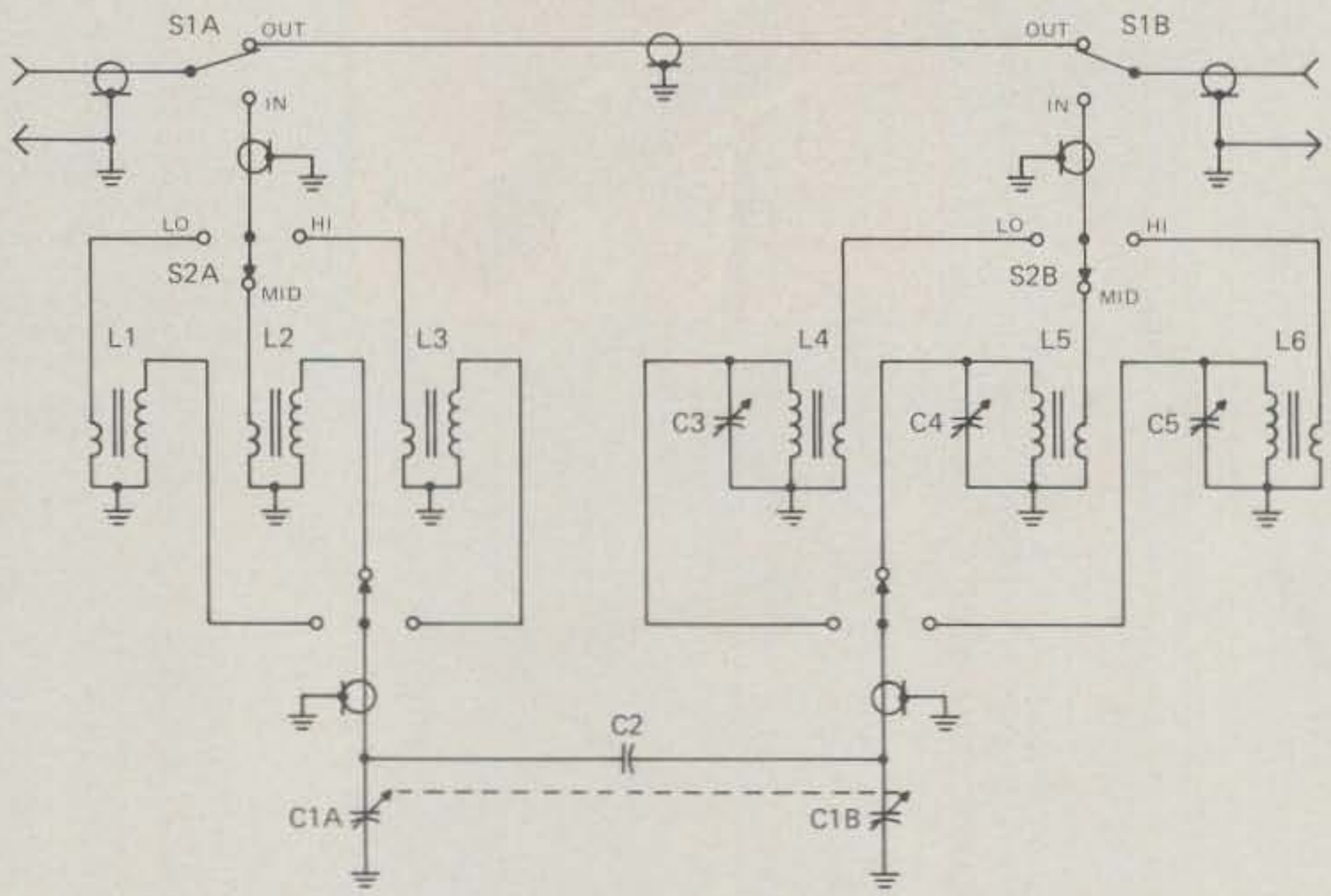
A dual 450 pF capacitor is used for tuning. A dual 360 pF broadcast unit can be used with some loss of coverage on the lowest range. There is enough overlap on the other ranges so that this should not be a problem. A gear reduction drive is recommended for the tuning capacitor, as the unit tunes somewhat sharply.

It should be built in a shielded box and connections should be made with shielded wire. This is necessary to prevent unwanted signal pickup by circuit leads which could degrade performance.

Alignment is simple. The unit is connected in line between the antenna or signal generator and the receiver. A weak to medium strength signal with no QSB is tuned in with the preselector switched out. It is then switched in and adjusted for a peak S meter reading. The trimmer for that band is then adjusted for a peak reading. Tracking should be checked at several points throughout the range. For those who wish, tracking may be optimized by compressing or spreading turns on one of the coils in each range. If a double peak or a notch is noted, the two sections are not tracking and realignment is necessary.

Operation

The preselector is connected in the feedline between the antenna and receiver or transceiver's receiver antenna jack. **Do not transmit through the preselector.**



Parts List

S_1—DPDT toggle switch.
S_2—4-pole 3-position rotary switch.
C_1—Dual-section variable capacitor, 450 pF each section.
C_2—2.7 pF ceramic capacitor.
C_3, C_4, C_5—25 pF trimmer capacitors.
L_1, L_4—Low-range (1.8–6 MHz) coils (approx. 15.4 μH), 52 turns #28 enamel wire on T-68-2 with a 6-turn link.
L_2, L_5—Mid-range (5–15 MHz) coils (approx. 2 μH), 20 turns #28 enamel wire on T-50-2 with a 4-turn link.
L_3, L_6—High-range (12–30 MHz) coils (approx. .32 μH), 9 turns #28 enamel wire on T-50-6 with a 3-turn link.

Fig. 2– The general-coverage preselector. It covers from 1.8 MHz through 30 MHz.

The unit was first tried in front of a Ten-Tec 540 (Triton IV) on an evening when 7 MHz broadcast stations were 40 dB over S9. Spurious responses were noted throughout the band. When the preselector was switched in, they disappeared.

Next, it was tried with a Drake R4C and an Ameco PLF-2 preamp. When the R4C was used alone, no spurious responses were noted. However, when the preamp was switched in, heterodynes were found throughout the band. The preselector was installed between the preamp and the antenna. The extraneous responses were eliminated.

My Kenwood R-600 general-coverage receiver suffers greatly from many spurious responses when it is used with a full-size outdoor antenna. With the preselector in use they are eliminated. The combination is fantastic! There is some signal reduction on most frequencies as anticipated, but on others there is an increase in S meter reading when the unit is in use. Apparently, the preselector peaks the signal much better than the R-600's very broad front end. The antenna used for most of the tests was an 80 meter center-fed Zepp. Similar results were also noted with a 4-band trap vertical and a 20/15 meter dipole.

If your rig suffers from strong-signal spurious responses when used alone or with a preamp, then try this preselector. You'll be pleased with the results.

QRP

a monthly feature by
ADRIAN WEISS, K8EEG

THE ART OF VERY LOW POWER OPERATING

QRP Field Day 1982

The 1982 QRP Field Day program ran into problems because of a mix-up on lead times for the June issue. As a result, the report on the 1981 QRP FD wasn't published until September, even though it would have added much to the June 1982 "special" QRP issue of *CQ*. The real damage occured in regard to publicity. Many who sent in entries did so "just in case" the program was still in operation. Oh well, these things regrettably happen.

This year no one ventured out into the fray in the one watt class, and last year there was only one intrepid QRPer up to this challenge. We'll give the one watt category one more trial year, and if less than five entries show up, we'll have to assume that it is a dead turkey.

The clubs were in there battling it out, and last year's two operator/one transmitter trophy winners recruited an extra operator, and together, *N4BP, N4UM,* and newcomer *WA4YWE* take the multi-op/multi-transmitter class using a single transmitter. In the two operator/one transmitter (5w) class, *Ed Manuel, N5EM,* and *Glen Reid, K5HGB,* take the trophy. On to the reports!

The Reports

Ben Saylor, K6TG, has been a regular entrant in the QRP FD event for many years, and he notes: "Here is my 1982 FD report—better than last year, but not up to snuff by a long way! Operated in 1E this time with my FD antenna setup but located at home. All contacts were on c.w. Didn't try s.s.b. at all. Antenna was an 80 meter inverted Vee on a 40 ft. wooden pole fed by 300 ohm ribbon through a homebrew antenna tuner—the antenna I've used in the field in past years. Again, the rig was an FT-7 cranked down to 5 watts output with battery power. Received a card from Dick Simpson, W6JTH, the peerless mountaineer of QRP. He and John Grebenkemper again operated W6JTH from a mountain QTH. During FD they were on a ridge in Lassen National Park with high winds and generally dismal weather. They operated an HW-7, HW-8, and f.m. rig, and only got 40 contacts, mostly on 40 meters."

Gene Smith, KA5NLY, reports: "I took my Argonaut 515 (and spare 505 and HW-8 "in case") with a mini-quad to the FD site on Pinnacle Mountain in Clinton, Arkansas (elevation unknown), and set up on a bluff. I had the mini-quad in the back of the pickup and caught it on a pasture gate getting into the site. I had to practically rebuild the antenna and did not get on the air until 2007Z! Then I had broken so many of the little capacitance spikes that I was only able to operate on 15 meters because of adjustment problems. Incidentally, I was the Novice position in the club setup. Worked 15 meters until it died out and then threw up a longwire with an MFJ antenna tuner to try 40/80 at night, but no luck. So I went back to 15 for the rest of the night—only one contact, a station in Guatemala for a 45 minute ragchew. I fell asleep on the key, and woke up around mid-morning and made a few more contacts, with several 599 reports from New England, GA, and NC.

"The mini-quad was on a 19 ft. mast which I turned by hand. During daylight, full power for the Argo was generated by an Arco 35 watt solar panel, and batteries were charged for night operation from the panel.

"Only made 27 contacts, but the two other positions only had 54 and 36 to their credit, so I guess I didn't do so badly. They were running 10 watts. None of us knew anything about FD or contesting, so we just sort of floundered about—WX was terrible with rain, electrical crashes, etc.—rotten QRM killing all bands through most of the FD period. Also, I am an inveterate ragchewer and spent too much time with non-FD stations in 30–45 minute QSO's. I gotta learn to change gears if I am ever going to be a contester! Anyway, I plan to try again next year, but hope to do some things differently: (1) have antennas for other bands besides 15; (2) don't ragchew; (3) don't tear up antenna just before 1800Z; and (4) get serious about it!"

Brad Hutton, WA1YIO, operated from the home QTH to see what could be done: "The new Argonauts 515 arrived only a few days prior to FD. Just got on the air for a few hours to have some fun and to see what I could work with existing antennas. I found that I could work anything that I could hear! And the comments from QRO stations were worth the price of the Argo! I'm hooked on QRP now. I've worked 15 countries on 15 meter phone in just a week—mostly South American stations, but I did work a couple of DL's also. I'm still amazed at what 5 watts will do. So, I'm on my way to DXCC QRPp, and hopefully by spring 1983, I'll have the needed 100 countries. Can't wait for the QRP contests to come now!"

Jerry Bartachek, WBØBEK, an old veteran of *The Milliwatt* days when he contributed articles about operating QRP as a Novice, tried FD from the home QTH and notes the solar-flare black-out: "Used the home setup with a 90 ft. random wire up 15 ft. on 40 and 2-element tribander at 27 ft. for 20/15. Operating time totaled just over 6 hours in several snatches of time between visiting relatives, family activities, church, etc. Summer absorption made all the bands appear to drop out simultaneously on Saturday afternoon for a few minutes. I thought the receiver was broken! Some anomalies encountered: North Dakota on 15 meters, LA off the back of the beam, a 599 report out of CA, and lots of very short skip (*Es*) on 20/15 meters."

Jerome Doerrie, K5IS, another veteran from *Milliwatt* days, used the Argonaut 515 and a dipole. **Richard Reimund, N5AE,** used an old Argo 505 and dipole.

Red Reynolds, K5VOL/9, was out again this year with his crew bearing the "Harper Air Hawks" name. The group included **KA9LMY, KA9KBH, K9VON, K9PNG, KH6BD/9, WD9ISE, and KA9HAO.** The group used a pair of Argo 515's and an Argosy, all powered by batteries charged by solar cells, as well as racking up 21 QSO's on solar power alone. Red comments: "We used a tribander hung by a rope from a tree. It showed a loss compared to a dipole! So much for that idea. One station had a 100 ft. wire for 40/20. The 80/15 position had a 270 ft. wire installed at 50 ft. via spinning rod and sinker. We had to keep checking the Argosy power switch when we worked 1's, 2's, and 3's on 15 meters! Long wires do work! We also set a record for the coldest FD in history; my keying hand froze up at 0300 on 80 meters. Thank Ten-Tec for the Argosy—a fantastic rig. But we had to leave a QRP power meter in the line to monitor the output because the Argosy meter didn't indicate at low power levels."

Tom Davis, K8IF, led a shrunken version of last year's "Hamburger Helpers" into the field, including **K8BX** and **WD8DWQ,** and posted 684 QSO's in their effort. The "Jack and his Gang" group, headed by

83 Suburban Estates, Vermillion, SD 57069

Sam Neal, N5AF, including **W5TFB, K5EJA,** and **K5SOR** edged them out with a 685 QSO showing. **Dave Evans, K5SOR,** noted: "As you probably guessed, we're all pretty new to QRP, and this is our first QRP contest, but most likely not the last. At least three of the four of us now have the QRP 'bug.'

The highlight of the effort follows: "The natural power station at N5AF consisted of a Ten-Tec Delta 580 transceiver modified for QRP by simply applying 6 v.d.c. to the r.f. driver and PA stages instead of the usual 12 v.d.c. In this manner, 5 watts output was obtained at the normal drive control setting and easily regulated when changing bands. Receiver and remaining transmitter stages were operated from the normal 12 v.d.c. supply. The power source was a small gel-cel for the rx/tx stages and a small lead-acid 6 v.d.c. battery for the driver/final stages. These batteries had been previously discharged by normal use and then recharged by a wind generator. The windplant used was a Windcharger 122H, a 14 v.d.c. unit that is installed and in daily use at the home station of K5SOR. The wind-charged batteries held out for about 70 QSO's before discharging."

Paul Seamon, Jr., N2RI, was out again with **AI2Q** and **KQ2G** as "Sticky and the QRP Sheet Eater Boys." (Where do you guys come up with some of these names? —ed.) They report: "The weather was great. This year we set up our two transmitters next to the Hudson Boat Canal in Freeport, LI, NY, on the south shore about 25 miles east of NYC and a half-mile from the Atlantic Ocean. We had good ground systems for each station—a couple of pieces of conduit pipe fitted with wire and tossed into the canal's saltwater. You're probably wondering about the club name. We are all sailing enthusiasts, and the 'sheets' are the lines that are used to control the angle of the sails with respect to the wind . . ."

The group used a pair of Argo 509's, an extended double Zepp for 40m, a wire collinear beam for 20m, and a weather balloon vertical 300 ft. high supported by a 5 ft. weather balloon. Needed an r.f. choke between feedpoint and ground to eliminate arcing. They improved over last year's showing by about 70 QSO's.

Veteran **Bob Spidell, W6SKQ,** rounds off this year's report: "We enjoyed ourselves (**WA6OQP** and **KE6WA** went along) up in the mountains again this year, but were very dismayed over the band conditions, especially right at about 1900Z when all the bands took a nose dive. What a solar flare that must have been! It took about 12–18 hours before the bands got back to any type of normalization. I guess we must have stayed up to about 1 or 2 in the morning, and then got up around 7 a.m., and believe it or not, the bands were back to normal. Seems that we got tired more easily at the 8000 ft. altitude than if we'd have been at a lower altitude.

"About the best part of the sojourn was eating large steaks on Friday night and enjoying our desserts, and then again eating a great breakfast the next morning before the contest. We were ready for bear! (I don't remember anything like this happening on my FD's!—ed.) I did notice one thing about FD contesting out here in CA on 40 meters. There is not that much activity to warrant extended periods of time on this band. Maybe the best operating strategy would be to operate 15 s.s.b. with a beam for one operating position, and a Vee beam for daytime 20 c.w. operation. All in all, it was great to get three guys together and ham talk when the bands were flat or we were too tired to operate. It sure beats talking to yourself during lax periods!"

Planning and Operating QRP FD

Well, gang, hopefully more of your will head out into the field this year and submit your entries. Here are some tips for newcomers that could eliminate some disappointment.

1. Don't count on your equipment working after you've hauled it out to the FD site! Check out all gear ahead of time, take it out for a trial run, and correct any problems that can arise. Don't leave for the site without all the necessary accessories, tools, and spares. Take a "bug" or

handkey in case the keyer malfunctions. An extra rig (if you have one) isn't a bad idea. Also take pliers, knife, electrical tape, extra hook-up wire, spare coax cables, alligator clips, plugs, #47 bulbs (current indicators for open-line or single-line feeders), extra accessory batteries, etc. Carefully check all solder joints on connector cables as well as the antenna coax run, and redo if corroded. Stress to these items in the temporary FD setup may finish the job begun at the low-stress home location. Take along an extra 200–300 ft. of antenna wire in case you need it.

2. Site selection is important. If you use a wire antenna, tall trees with sparse branches are ideal, and spacing is important. When too close together, trees serve only as obstacles to erecting an antenna, and they have a way of catching wires and lines. Ideally, a grassy meadow with a pair of 80 ft. trees (no branches) about 140 ft. apart, plus a few scrub trees for shade, fits the bill. Beware of state parks servicing vacationers; TV's generate noise that can be a problem, and usually a lot of children are around who are capable of pulling down an antenna.

3. The antenna is the key factor in the FD effort. Pick it carefully. If you are located in the populous eastern U.S., the 80/40 meter antenna should provide coverage close-in and over a wide area. For operating from the sparsely populated regions of the midwest and western U.S., a gain antenna on the high bands is the best choice. Figure out which type of coverage on which band will produce access to the highest activity areas, and go with the antenna type and height that fits. Avoid aiming for a low radiation angle; given summer ionosphere virtual heights and the typical FD antenna heights used, a low radiation angle is self-defeating. A half-wavelength is probably optimum in terms of all the factors involved. If you must, be satisfied with a dipole or inverted Vee. But make the effort to achieve some antenna gain. The various handbooks show a large selection of wire arrays which are ideal for FD—bi-directional radiation patterns, either end-fire or broadside, with a cheap 4–7 dB gain tossed in the bargain. Among these are the extended double Zepp (single wire), the longwire, and multi-wire arrays such as the *8JK, Lazy-H, ZL-Special, Vee Beam,* and others. Remember that feedline loss with open-line feeders is considerably below loss for 100 ft. runs of the best coax.

4. Preparing the antenna before FD is a must. Pick it, cut it, and prune it with the exact components you will use. Simulate FD conditions—rig outside, battery power, no city-mains ground. Once you have it working, take it out to the site and go through the process of erecting it. Don't figure that since the guy in the article you read spincast his antenna line over a 60 ft. branch, it will be a snap for you! The bow-and-arrow trick sounds like a "first try, sure bet" approach. Oh yes, the bow will sling that arrow right over the top branch, but the arrow won't pull the line down the other side without some extra weight strapped on. The simplest approach, if you have a decent throwing arm, is the 6 lb. monofil fishing line with 6 oz. sinker. The sinker must be very firmly knotted on, otherwise it will end up in the next county on your first throw. Take extra sinkers.

5. A day in the field requires some attention to human comforts. FD operating is grueling enough without being exacerbated by a fatigue-inducing operating position. A chair and table are the bare minimum—picnic tables at parks are fine also. Carry along adequate liquid refreshments; it gets hot out there. Don't even try operating s.s.b. without at least a gallon of drinks. Likewise, it gets cold at night, so a jacket and sweater (long pants assumed) are bare minimums. Take along a camping lantern or some light source that will illuminate the log and rig.

6. FD is a contest situation and requires special operating techniques. General QRP operating techniques such as calling only strong signals, listening a lot, careful frequency selection, and others do not apply to such a situation. The basic strategy is to locate and call as many stations as possible continuously and persistently. Certain conventions apply here.

First, short calls are a must, and timing is crucial. Unless the other guy is loafing along at 10 w.p.m., respond to a "CQ FD" instantly upon the other guy's "BK" with a quick "DE W0RSP BK." Do not waste time sending his call letters first. Operators skim the readable signals, picking the first one that is available. If two quick calls don't produce a contact, move on to another station. Full break-in is important. While the other guy is sending your report, be listening for the next station to call. If your signal appears to be getting out, don't hesitate to make 3 × 2 "CQ FD CQ TEST CQ TEST DE W0RSP W0RSP BK" calls frequently as you tune through gaps in the activity. End QSO's with a "DE W0RSP QRZ?" sign-off. If an operator hears you, he'll nail you.

If you are using a direct conversion receiver, figure out the transmit-receive frequency offset and tune across the band with your transmit frequency out in front of your receive frequency. For example, the HW-8 transmit frequency is about 700 Hz below the receive frequency. Tuning down onto a signal from a higher frequency will place your transmit frequency zero beat with his. Tuning from the lower end upward onto a signal will place your transmit frequency about 2 kHz lower, never making the contact.

Pick the area of a band to operate in on the basis of your expected signal strength. If you have a dipole at 15 ft. on 40m, stay away from the heat of the action. Rather,

1982 QRP Field Day Results

2 Op./1 TX, 5w Class

Call	C.W./S.S.B.	QSO's	Score
1. N5EM	253/6	259	1704
2. K6TG	125/—	125	750
3. N5AE	38/52	90	690
4. K5IS	26/23	49	444
5. WA1YIO	—/54	54	324
6. KA5NLY	27/—	27	312
7. WB0BEK	36/—	36	216

Multi-Op/Multi-TX, 5w Class

1. N4BP	627/543	1170	7170
2. N5AF	685/—	685	4260
3. K8IF	684/—	684	4254
4. N2RI	310/315	625	3900
5. WB9JVX	427/157	584	3654
6. W6SKQ	188/206	394	2514

(Entries: Station, number of c.w./s.s.b. QSO's, total QSO's, score.) (Scoring: Number of QSO's × PWR Mult × 1.5 Batt Mult + 150 Full Portable Bonus; PWR Mult, 5w = × 4, 1w = × 8.)

Milliwatt Field Day Trophy Winners

Year	Station	Total QSO's	Score
1970	K4OCE	220	1470
1971	WA6ABP	137	1175.5
1972	W7DRA	55	562.5
1973	WA5WYO	79(1w)	742.5
1974	W0IYP	439	2784
1975	WB8OSM	220	1470
1976	K6TG	128	918
1977	N2AA	389	2790
1978	WA4IAR	442	2802
1979	WD5BKO	287	1872
1980	K1JX	741(1w)	4596
1981	N4BP	999	6144
1982	N5EM	259	1704

One Watt Class

1981	K5WNH/0	239	3018

Club Standings 1979-82

1. N4BP (1982)	1170	7170
2. K8BX ('81)	854	5274
3. K8IF ('79)	732	4488
4. N5AF ('82)	685	4260
5. K8IF ('82)	684	4254
6. AC2U ('81)	627	3912
7. N2RI ('82)	625	3900
8. WB9JVX ('82)	584	3654
9. N2RI ('81)	555	3480
10. K8BX ('80)	378	2985
11 KB8GC ('79)	437	2772
12. KM8X ('81)	407	2595
13. W6SKQ ('82)	394	2514
14. W0MHK ('79)	336	2166
15. K1GAX ('79)	342	2052
16. WA0VBW ('81)	312	2022
17. K9BCM ('81)	300	1950
18. W3FQR ('79)	243	1608
19. K2NH ('81)	224	1494
20. AD5F ('79)	223	1338
21. VE6PD ('81)	155	1080
22. W6JTH ('80)	152	1062
23. W3AI ('79)	126	906
24. W9ZSJ ('80)	117	852
25. K1NGQ ('81)	62	398

head out to the edges of activity where less QRM is encountered. If you have a 40m "8JK" up 40 ft. on 15m, wade right into the action. Whatever, keep skimming and calling relentlessly. Should fatigue build up to the point where you are becoming "spacey," take a walk and clear your head, then back to the fray.

Expectations are critical in terms of psychological motivation during the contest. If you think you should be working 35 QSO's per hour, you'll drive yourself crazy with frustration and end up too angry to operate effectively. Again, be realistic about what your power and antenna are likely to produce in contacts. With a dipole at 30 ft. on 40m, daytime operation with 5 watts in populous areas should produce 10–13 QSO's per hour. Don't expect more. A gain antenna on 20/15/10 meters can stretch to 35 QSO's per hour, depending upon propagation and operating skills.

To prepare for operating in FD, practice zero-beating incoming signals. Work the code speed up to 35 w.p.m. Practice instantly responding to the other guy's "BK" with your "DE" spaced one letter after his "BK." Practice "wideband" listening techniques with the selectivity back-off and several signals in the passband at the same time.

I know that FD is supposed to be fun, and that the above comments seem to turn it into a grueling high-tension exercise, but believe me, operating FD with the wrong techniques results in more frustration and tension than being prepared to do it the right way! Just remember: If you are operating at peak intensity and succeeding, you can take a break from the action to really relax. If you're messing up and not succeeding, taking a walk won't help you relax! At any rate, good luck to all of you who go out into the field. Send in your results to me by the end of August with any stories, photos, and comments you have, and you'll see them in print next June!

Entries: Cover sheet indicating class, breakdown of QSO's by band and mode, power output used, power source, and whether full portable away from home QTH. **Scoring:** Total QSO's × PWR Multiplier (5w = X4, 1w = X8) × Batt/Solar PWR (× 1.5) + 150 Full Portable Bonus. Include checklist of stations by band. Xerox's of ARRL entries are adequate.

73, Ade, W0RSP

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CIRCLE 178 ON READER SERVICE CARD

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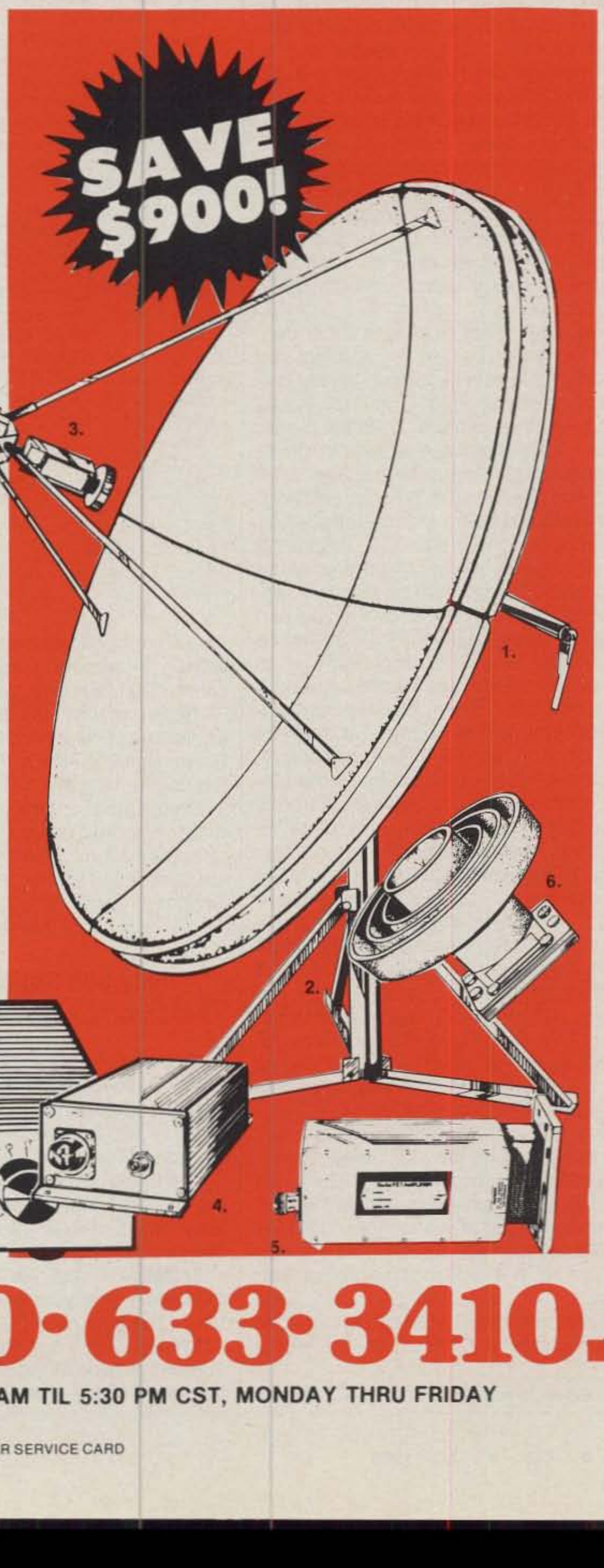

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6. Scalor feed horn. Delivers 0.5 dB more gain than conventional rectangular types. Virtually eliminates system noise.

Note: Interconnecting between components not included. Your VCR's RF modulator can be used with this system, otherwise an RF modulator will be required. Approximate cost, $59.

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CIRCLE 179 ON READER SERVICE CARD

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The one major DX contest this month is the JARL All Asian Phone Contest. Reviewing the results in last month's Calendar showed that the participation stateside was rather light, probably due to poor propagation. However, the c.w. results in this issue show quite a turnout and a good number of certificate winners. There were many areas in the phone section that were not represented, so give it a try; you might be a winner.

This being World Communications Year, the Ministry of PTT is awarding cups to the continental winners, and the JARL is awarding medals in addition to the certificates.

On a subject not related to DX or contests, but a vital part of this column, you no doubt have seen a cartoon in your daily newspaper entitled "Find six things wrong in this picture." Well, if you haven't, I can point out several errors in the cartoon (photograph) that appeared in the April issue of this column. (1) There is no Stamford River; it's the Rippowam. (2) The pooch's name is CQ, not Spot. (3) The statue is located on the shores of the Long Island Sound. (4) The statue is facing south, not north; that's why you can see all those tall buildings in the distance across the Sound. One of them is in Hicksville, where the Smith Brothers hang their hats, when they are not galavanting around the country, and where they conjure up all this April foolery. There are many other errors in the picture, but then what can you expect from a couple of clowns whose only claim to fame was having their pictures on a box of cough drops many decades ago? One of these days, Al and Dick, one of these days . . . "Pow, right in the kisser!" *(I feel that I have been neglected in the April Fools' issue the past couple of years, so don't forget me next year!)*

The AGCW-DL Group's announcement of their QRP C.W. Party on May 1st did not make the deadline for the May issue. It was a 40 and 80 meter only activity. There were two classes: (A) up to 5 watts input, and (B) up to 25 watts input. One point is given per QSO in own country, and 2 points for other areas. DXCC list was the multiplier. If you worked any of the participating stations, your log goes to: Werner Hennig, DF5DD, Mastholter, Strasse 16, D-4780 Lippstadt, West Germany.

A final reminder: Mailing deadline for logs in our recent WPX C.W. Contest is July 10th, but it will be extended for you fellows in remote areas. Logs may be sent to *CQ* Magazine, WPX C.W. Contest, 76 N. Broadway, Hicksville, N.Y. 11801, and/or to our new WPX Contest Director, Steve Bolia, N8BJQ, 7659 Stonesboro Dr., Huber Heights, OH 45424.

Once again I emphasis the deadline for material for this column. I must have it no later than June 15th for the September issue and July 15th for the October issue. Send it to my home address, of course.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

May	**28-29**	**CQ WW WPX C.W. Contest**
May	28-29	Indy 500 Sprint Contest
June	4-5	RSGB National Field Day
June	11-12	World Communication RTTY
June	11-12	ARRL VHF QSO Party
June	11-12	South American C.W. Contest
June	17-19	Six Meter QSO Party
June	18-19	NINE Land C.W. Contest
June	18-19	All Asian Phone Contest
June	25-26	ARRL Field Day
* July	1	Canada Day Contest
† July	2-3	Venezuelan Phone Contest
July	9-10	IARU Radiosport Contest
† July	16-17	SEANET C.W. Contest
† July	16-17	Colombian Contest
July	30-31	Venezuelan C.W. Contest
Aug.	6-7	DARC WAE C.W. Contest
† Aug.	13-14	SEANET Phone Contest
Aug.	20-21	SARTG RTTY Contest
Aug.	27-28	All Asian C.W. Contest
Sep.	3-4	DARC "Corona" 10M RTTY
Sep.	10-11	Gray Valley SWL Contest
Sep.	10-11	ARRL VHF QSO Party
Sep.	24-25	Maine QSO Party

* Not official.
† Estimated date.

Indy 500 Sprint Contest

2100Z Sat. to 0520Z Sun., May 28/29

This novel contest sponsored by the Indiana Radio Club Council is being held in conjunction with the Indy 500 Auto Race. It's only 500 minutes in length, and note the added feature in the exchange.

The same station may be worked once per mode per band, and you must take at least two 15 minute "pit stops" during the 500 minute contest period.

Exchange: Signal report, state, province or country, and your guess as to the winner of the auto race (59/Conn/Foyt).

Scoring: One point for each QSO with stations outside of Indiana, 2 points if station is in Indiana, and 5 points if station is on the grounds of the Indianapolis Motor Speedway (no multiplier).

Frequencies: C.W.—3740, 7140, 14090, 21140, 28140. S.S.B.—3910, 7290, 14290, 21390, 28590, 147.51.

Awards: Prizes to the top scorers in each US call district, top Canadian, and each DX country. (How about if you pick the winner of the race?)

Mail all entries as soon as possible to: Ray Weghorst, W9OBF, 3030 Marquette Court, Indianapolis, Ind. 46268.

World Communication Year RTTY

0000–0800Z & 1600–2400Z Sat., June 11
and 0800–1600Z Sun., June 12

The Australian National A.R.T.S. is conducting this contest, which this year replaces the old VK/ZL RTTY of previous years.

All five bands may be used, 3.5 to 28 MHz, in that portion of the band used by RTTY (no 10.1 MHz).

Classes: Single Operator, multi-operator, and s.w.l.

Exchange: RST, *CQ* Zone, time (UTC).

Scoring: QSO points are determined as per the C.A.R.T.G. Zone Chart. Multiply total by the number of countries and again by the number of continents worked (maximum 6). After the above calculation, world stations add 100 points if on 14 MHz, 200 points if on 21 MHz, and 300 points if on 28 MHz for each VK/ZL station worked. Example: 720 points from zone chart (send a self-addressed envelope with two IRC's to VK2EG for a copy of the C.A.R.T.G. Zone Chart) × 5 continents × 29 countries = 104,400 points, plus 6 VK/ZL's worked on 14 MHz = 150,000 final score.

A station may be worked only once on each band, but again on another band for additional multipliers. The ARRL country list is used as a standard; in addition, each VK, ZL, JA, VE, VO, and W/K call area will be used for scoring. Own country does not count as a multiplier.

Use a separate log sheet for each band and column them in this order: Date, Time (UTC), Station worked, Exchange sent and received, and Points claimed.

A summary sheet showing the scoring, name and address in block letters, and signature of operator (each operator if a multi entry) is also required.

Participating certificates will be sent to all contestants, and several trophies will be presented by Mr. Butler, Secretary of the I.T.U., at a Seminar in Sydney.

All entries must be received no later than August 19th and go to: W.J. Storer, VK2EG, 55 Prince Charles Road, French Forest, 2086 N.S.W. Australia.

RSGB National Field Day

1700–1700Z Sat.–Sun., June 4–5

Activity for this c.w.-only Field Day is not confined to Great Britain. You will also hear some portable activity out of Germany and Switzerland.

Although overseas stations are not directly eligible, they are invited to participate and submit a report of the stations worked.

A certificate will be awarded to the overseas station in each continent that shows the most contacts. Send your logs to: D. Lawley, G4BUO, 24 Glen View, Gravesend, Kent DA12 1LP, England.

ARRL VHF Contest

1800–0300Z Sat.–Mon., June 11–13

Action will be found on the 50, 144, 220, and 420 MHz bands, and even higher up in the spectrum.

The scoring varies with the different bands used, and there are certain requirements and restrictions in the rules. Working WAS on 6 meters is a possibility. Complete rules will be found in the May issue of *QST*.

I strongly recommend that you write to ARRL Headquarters for official forms. Include an s.a.s.e. with your request to: ARRL VHF Contest, 225 Main St., Newington, CT 06111.

South America C.W. Contest

1500Z Sat. to 1500Z Sun., June 11–12

Sponsored by *Electronica Popular* magazine of Brazil, and supervised by the Grupo Argentino de CW of Buenos Aires, this will be an annual affair the second weekend of June.

It's c.w. only on all bands 3.5 through 28 MHz with activity between South America and the World.

Classes: Single operator both single and all bands, and multi-operator, single transmitter, all band only.

Exchange: RST plus a QSO number starting with 001.

Scoring: Two points per QSO multiplied by the number of different South American country prefixes worked on each band. A station may be contacted once on each band for QSO and multiplier credit. (South American stations may work other S.A. stations for multiplier credit only. They will use the DXCC Country list for their multiplier.)

Awards: Certificates to the top-scoring stations in each country and the three top scorers in each class.

Use a separate log sheet for each band and the usual summary sheet with scoring information, etc.

Mailing deadline is July 31st to: Grupo Argentino Contest Manager, P.O. Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

All Asian DX Contest

Phone: June 18–19 C.W.: Aug. 27–28
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 23rd year of this activity sponsored by the JARL. The exchange is between Asian countries and the rest of the world.

Classifications: Single operator, both single and all band. Multi-operator, both single and multi-transmitter, all band only (one signal per band only).

Club stations are classified as multi-operator and each operator will give his age in the exchange.

Exchange: For OM's—RS(T) plus age of operator. For YL's—RS(T) and 00.

Scoring: 3 points for contacts on 160; 2 points for contacts on 80; 1 point on all other bands. (KA contacts do not count.)

Multiplier: For Asians the multiplier is determined by the number of different countries worked on each band (DXCC list). For non-Asians it is determined by the number of different Asian prefixes worked on each band (*CQ* WPX list).

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

Keep in mind that non-Asians use Asian prefixes as their multiplier, not countries.

Note: JD1 stations on Ogasawara (Bonin and Volcano) are in Asia, and JD1 stations on Minamitori Shima (Marcus) are in Oceania.

Awards: Certificates to the top scorers, both phone and c.w., in each country and each U.S. call area. In each class, both single band and all band, up to the fifth rank, depending on the number of returns. Medals to the all-band continental leaders, both single and multi-operator.

Logs: Keep all times in GMT. Use a separate column for the country or prefix multiplier, and fill in only the first time it is worked. Use a separate log for each band. Include a summary sheet showing the scoring and other information, and a signed declaration that all rules and regulations have been observed.

There is a strict disqualification clause for taking credit for duplicate contacts in excess of 2% of the total on each band, as well as other infractions.

Logs must be received no later than Sept. 30th for the Phone section, and Nov. 30th for the C.W. section. They go to: JARL Contest Committee, P.O. Box 377, Tokyo Central, Japan.

Asian Country List: A4; A5; A6; A7; A9; AP; BV; BY; CR9; EP; HL/HM; HS; HZ/7Z; JA-JR; JD1; JT; JY; OD; S2, TA; UA/UK/UV/UW9-0; UD6; UK6C, D, K; UF6/UK6F, O, Q, V; UG/UK6G; UH8/UK8H; UI8/UK8A, G, I, L, O, T, Z; UJ8/UK8J, R; UL7/UK7; UM8/UK8M, N; VS6; VS9M/8Q; VU;

Left to right are John, 8P6KX/9Y4JW/J73JW, and Elsa, 8P6MH/9Y4LL/J73LL. This photo was taken in Barbados during the 1981 CQ Worldwide Phone Contest by Ed, K2QIE. (Photo via K4IIF)

VU (Andaman & Nicobar); VU (Laccadive); XU; XV/3W; XW; XZ; YA; YI; YK; ZC4/5B4; IS (Spratly); 4S; 4W; 4X/4Z; 70 (S. Yemen); 70 (Kamaran); 8Z4; 9K; 9M2; 9N; 9V; (Abu Ail).

NINE Land C.W. Contest

1700Z Sat. to 1700Z Sun., June 18–19

This is a new one organized by the Joliet ARS in which there is no limit to whom you can work; however, contact with NINE Land stations (Ill., Ind., and Wisc.) have double QSO point value. Only one contact per band with the same station permitted.

Classes: Single and multi-operator, one transmitter and portable field operation, multi-operator maximum of two.

Exchange: Consecutive QSO numbers beginning with 001, and state, VE province, or DX country.

Scoring: Contacts with NINE Land stations count 2 points; with all other stations 1 point.

Multiplier: Number of states, VE provinces, and DX countries worked (counted once only). There is a bonus multiplier of 1 for each 20 NINE Land stations worked.

Final Score: Total QSO points from all bands times the number of states, provinces, DX countries, and bonus points worked.

Frequencies: 1805 and 60 kHz up from lower edge of 10 through 80 meters (no 30 meters). Novice: 25 kHz up from low edge of their bands.

Awards: Certificates to high scorers in each class in each state, VE province, and DX country.

Dupe sheets are required for entries with over 200 contacts, and a summary sheet showing the scoring, etc. Include a large s.a.s.e. for a copy of the results.

Mailing deadline is July 23rd to: Joliet ARS, Att.: Paula Franke, WB9TBU, P.O. Box 873, Beecher, IL 60401.

Six Meter QSO Party

0000Z Fri. to 2400Z Sun., June 17–19

This is the 8th annual QSO party sponsored by the Six Meter International Radio Klub. The party is open to all, members and non-members, but it seems to be geared for membership participation.

Cross-band contacts are not permitted, and competition is for single-operator stations only. Operation, of course, is confined to the 6 meter band.

Exchange: SMIRK number, ARRL section, VE province, and country. (ARRL U.S. only; KH6 and KL7 count as countries; VE use provinces.)

Scoring: Contacts with members count 2 points, with non-members 1 point. Multiply total QSO points by the number of ARRL sections, VE provinces, and foreign countries worked.

Awards: Certificates to the top-scoring stations in each ARRL section, VE province, and country. There are two trophies for the overall winners in the U.S./Canada and foreign areas.

All Asian Contest 1982 C.W. Results

U.S.A.

1.9 MHz

*AE6U	9

3.5 MHz

*W7DRA	546

7 MHz

*N6RO	31,110
N6AUV	25,740
*N7AM	16,902
WA7UEC	11,264
N6RJ	8,370
K7ABV	1,335
*WA1AER	8

14 MHz

*W6SZN	20,862
*KBØG	14,094
*N8II	11,660
*W1BL	6,016
AA1M	5,360
*K7NF	5,043
*W3GG	4,640
WA8DXB	2,904
*WD9IIC	2,816
*W4VQ	2,190
NØCKC	1,196
K3TW	1,196
WA4MIY	741
W9QWM	576
KA1CBD	336
WA4OML	165
NØBYC	42

21 MHz

*N6MU	27,060
*KO7G	8,241
*K2LL	6,762
*K1ZZ	6,144
KA7GXO	3,040
*W9RE	2,730
WB2VFT	2,556
*N4MM	2,160
N2UN	2,100
*WA3DMH	1,530
KA1IXV	1,325
KO9Q	1,170
K9WA	1,032
*KØOST	266
WA1FCN	150
W1OPJ	88
WA2LWT	64

28 MHz

*K6OMB	312

All Band

*N5JJ	172,772
*N6DHV	153,614
*N2LT	104,445
*W1RM	83,390
*W3GM	56,875
*W8UVZ	39,930
*K4RZ	39,911
*K7WA	36,855
N5JB	34,112
AI1S	24,288
W1RR	21,080
KA1CFC	14,694
W7SX	14,364
W7YF	14,356
K1KI	12,600
N3ED	11,440
AG5C	11,360
K4KQ	10,878
W1END	10,176
KB5FU	8,946
N8BJQ	8,645
KI3L	8,610
*KJ9W	6,985
W5PWG	6,552
K1XM	5,555
K3FN	5,083
W5OB	4,888
KE6PQ	4,862
K6IA	3,471
K8MR	3,256
W4KO	3,080
W4BV	2,880
W1CNU	2,829
K6CSL	2,584
KW2J	1,891
KC2PC	1,107
W5EIJ	945
W5NR	455
W3ARK	440
KA1GHR	414
KJ7I	384

Multi-Opr.

*W6BIP	211,000
*WB2QEU	627

Dom. Rep.
14 MHz

*HI8LC	169

Panama
All Band

*HP1AC	4,982

Canada
All Band

*VE7AAQ	99,015
VE3GCO	15,394
VO1AW	8,250

Alaska
21 MHz

*KL7IKV	88

All Band

*KL7AF	60,243

*Certificate Winners.

Since the party is geared for membership participation and requries the use of official log forms, it is suggested that you write for more details. Include a large s.a.s.e. with your request to the address below.

Mailing deadline for entries is July 11th to: Spencer F. Ritchie, KC2TX/5, 5122 Sagamore, San Antonio, TX 78242.

ARRL Field Day

1800–2100Z Sat.–Sun., June 25–26

Without a doubt, this activity generates more stateside participation in manpower than any other amateur radio activity. It is mostly a club-organized activity, and therefore requires that the coordinator be knowledgeable about what is required.

Entries are separated into many classes. Rules and requirements are quite extensive and will be found in the May issue of *QST*. It is advisable that you read them thoroughly.

Official log forms are a must. Direct your request with a large s.a.s.e. to the ARRL, Att.: Mark Wilson, AA2Z, 225 Main St., Newington, CT 06111.

Canada Day Contest

0000 to 2400 UTC Fri., July 1

Sponsored by the Canadian Amateur Radio Federation, this contest follows the same pattern as the one in December.

Everyone can work anyone, 2 through 160 meters, both on phone and on c.w.

The Outback DX Club of northern Sweden won the Bob Cox, K3EST, trophy during the 1981 CQ Worldwide Phone Test. K4IIF of the CQ DX department journeyed to Stockholm to make the presentation. Left to right are K4IIF, Rainer Martinsson, SM2DMU, and Bengt Eric Ericsson, SM2DGU, receiving the coveted award for the Outback Club. In return, K4IIF received an SK2KW tee shirt.

Single operator, single band and all band, multi-operator, single transmitter all band only. There is also a QRP (5 watts) and non-Advanced license classification.

The same station may be worked on each band and mode for QSO and multiplier credit.

Exchange: RS(T) and QSO number starting with 001. VE1's are requested to indicate their province.

Scoring: 10 points for each QSO with a Canadian. One point if with anyone else. Add 10 bonus points for each contact with any CARF official news station using the suffix TCA or VCA.

Multiplier: Number of VE prov./terr. worked on each band and mode (12 prov./terr.). Contacts with stations outside Canada count for QSO points, no multiplier.

Frequencies: Phone—1810, 3770, 3900, 7070, 7230, 14150, 14300, 21200, 21400, 28500, 50.1, 146.52. C.W.—1810, 3525, 7025, 14025, 21025, 28025, 50.1, 144.1. Try phone on even hours, c.w. on odd.

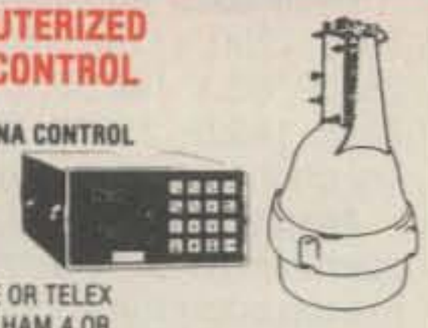
Awards: A plaque to the overall single operator, all-band winner. Certificates to the top scorer in each category, in each VE province/territory, U.S. call area, and each DX country.

Include a summary sheet with your log showing the scoring, etc., and a dupe sheet. Official log forms are available.

Mailing deadline is July 31st to: Canadian Amateur Radio Federation, P.O. Box 2172, Station D, Ottawa, Ont. K1P 5W4 Canada.

ANTENNA/TOWER SALE!

PRO-SEARCH COMPUTERIZED ANTENNA SYSTEM CONTROL



THE MOST ADVANCED ANTENNA CONTROL SYSTEM AVAILABLE—
Computerized—Talks—Scans
Programmable—Auto Brakes
Order Your Pro-Search Today!

AVAILABLE FOR EXISTING CDE OR TELEX ROTORS OR WITH NEW TELEX HAM 4 OR TAILTWISTER MOTOR UNITS!

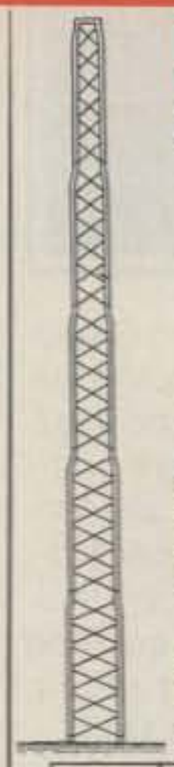
TELEX hy-gain

Pro-Search Talking Controller List $551.91 - Now Only $489!
Pro-Search Non Talking Controller List $415.91 - Only $369!
Pro-Search Talking Controller With Telex Ham 4 Motor $599!
Pro-Search Non Talking Controller W/Ham 4 Motor Only $479!
Pro-Search Talking Controller With T2X Motor - Only $649!
Pro-Search Non Talking Controller W/T2X Motor - Only $529!

POLAR RESEARCH LI'L SLIPPER

- Mount and Rotate Additional Antennas at any Elevation **On Your Existing Tower!**
- Use with H Frame to Stack & Rotate VHF/UHF Antennas **On Your Existing Tower!**
- Add a Second Tribander and up to Four VHF Antennas **On Your Existing Tower**—Great for Contesting!
- Will Safely Support and Rotate full 360 degrees up to 11 sq ft and 200 lb. Antenna Load.
- Complete with Rotor/Control and all Mounting Hardware
- Fits all Towers—Guyed—Free Standing—Crankup

Suggested List Price $695—Introductory Special $599!
ORDER YOURS TODAY—IN STOCK FOR IMMEDIATE SHIPMENT!



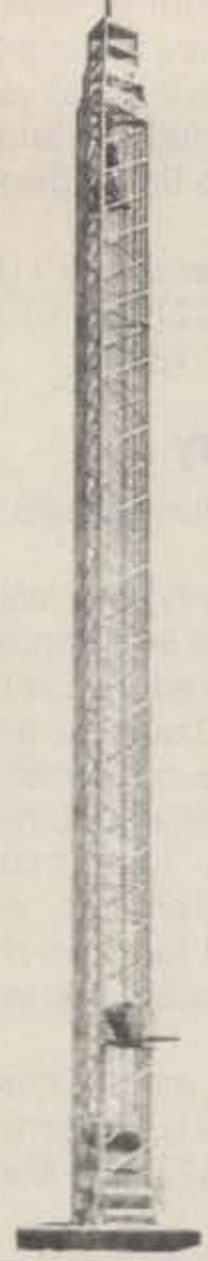
UNARCO-ROHN Self Supporting Towers — On Sale!

Freight Prepaid

These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And — Save even more — include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! How's that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429



Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:

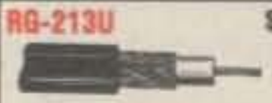
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq. ft., 50 mph	$ 499
W-51	51 ft.	9 sq. ft., 50 mph	$ 799
LM-354	54 ft.	16 sq. ft., 60 mph	$1449
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2499

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!

RG-213U

$.29/ft $279/1000 ft
Up to 400 ft via UPS



- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield
- Non-contaminating Vinyl Jacket
- Low Loss Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax™	$1.49/ft
⅞" LDF5-50 Andrew Heliax™	$3.99/ft

select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$22	$22	$22	$22
⅞" Heliax™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259	$1.25	Nickle PL259	$.90
UG21B N Male	$2.95	UG23D N Female	$2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld	$.12/ft	14 Ga. Copperweld	$.10/ft
14 Ga. Stranded	$.10/ft	18 Ga. Copperweld ¼ mi	$30
450 Ohm H.D. Line	$.16/ft	H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun			$11
Van Gorden Center Insulator			$6

HUSTLER

4BTV 40-10 mtr Vert	$79	5BTV 80-10 mtr Vert	$99
G6-144B 2-mtr Base	$79	G7-144 2-mtr Base	$109

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$10	$10	$12	$15	$19
2KW Super	$14	$15	$19	$24	$33

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT

HF6V 80-10 mtr Vertical	$129
RMK-II Roof Mount Kit w/radials	$39
STR-II Stub Tuned Radial Kit	$20
TBR-160HD 160-mtr Coil Kit	$49
2MCV-5 2-mtr Base Vertical	$39

Free Shipping in Continental U.S. on HF6V Antennas!!

CUSHCRAFT

A3 3-el Tribander	$179	A4 4-el Tribander	$229		
R3 20/15/10mtr Vert	$229	A743/A744 40mtr Kit	$69		
10-3CD	$76	10-4CD	$89	15-3CD	$99	15-4CD	$109
20-3CD	$179	20-4CD	$239	40-2CD	$279	AV5	$99
A50-5	$65	A50-6	$89	A147-4	$25	A147-11	$39
214B	$69	214FB	$69	3219	$79	220B	$75
228FB	$189	416TB	$59	424B	$63	617B	$179
147-20T	$63	144-10T	$45	144-20T	$69	432-20T	$49
14TMB	$25	ARX2B	$39	AMS147	$29	PD-2	$25

Many other Cushc.aft models in Stock—CALL!

HY-GAIN

V2S 2-mtr Base Vertical	$39
TH5MK2S Broad Band 5-el Triband Beam	$319
TH7DXS 7-el Triband Beam	$379
TH3MK3S 3-el Triband Beam	$219
TH3JRS 3-el Triband Beam	$159
TH2MK3S 2-el Triband Beam	$139
HY-QUAD 2-el Triband Quad	$279
402BAS 2-el 40-mtr Beam	$199
205BAS 5-el 20-mtr Beam	$299
155BAS 5-el 15-mtr Beam	$179
105BAS 5-el 10-mtr Beam	$119
204BAS 4-el 20-mtr Beam	$229
203BAS 3-el 20-mtr Beam	$139
153BAS 3-el 15-mtr Beam	$79
103BAS 3-el 10-mtr Beam	$59
DB1015BAS 3-el 10/15 mtr Beam	$159
64BS 4-el 6-mtr Beam	$55
66BS 6-el 6-mtr Beam	$109
18HTS 80-10 mtr Hy-Tower Vertical	$339
LC-160 160-mtr Coil Kit for 18HTS	$39
214 14-el 2-mtr Beam	$35
2BDQ 80/40 mtr Trap Dipole	$49
5BDQ 80-10 mtr Trap Dipole	$99
BN86 80-10 mtr KW Balun W/Coax Seal	$19

MACO (WILSON) ANTENNAS

SY-33 3-el Triband Beam	$199
SY-36 6-el Triband Beam	$269

MOSLEY

CL-33 3-el Triband Beam	$229
TA-33 3-el Triband Beam	$199
TA-33JR 3-el Triband Beam	$149
S-402 2-el 40-mtr Beam	$279

HYGAIN/TELEX SPECIAL!

For a limited time only, SAVE $500 on this fantastic offer from HyGain and Texas Towers!

HG-52SS Tower—HyGain's Most Popular	List	$1,095
CD-45II Rotor—HyGain's Most Economical	List	165
Explorer 14 Antenna - Hy-Gain's New Compact Broadband Model	List	399
HG-10 Heavy Duty 10 ft. Mast	List	69
HG-COA Coax Arms (Set of 3)	List	39
Total Package List Price		$1,767
Texas Towers Package Discount		−500
Your Total Package Cost		$1,267

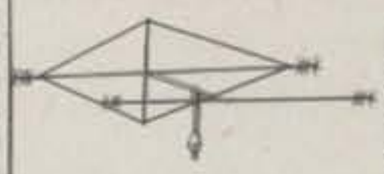
PLUS — FREE SHIPPING! Anywhere in the Continental USA

We can substitute any HyGain antenna or rotor in this special promotion at similar savings—Don't miss out on this fantastic opportunity to own one of the finest antenna systems available anywhere.

KLM

KT34A 4-el Broad Band Triband Beam	$309
KT34XA 6-el Broad Band Triband Beam	$469
3.8-1 80-mtr Rotatable Dipole	$429
7.2-1 40-mtr Rotatable Dipole	$159
7.2-2 2-el 40-mtr Beam	$289
7.2-3 3-el 40-mtr Beam	$439
7.2-4A 4-el 40-mtr Beam	$599
6el-20mtr Big Stick Monoband Beam	$599
6el-15mtr Big Stick Monoband Beam	$389
6el-10mtr Big Stick Monoband Beam	$229
10-30-7LP Log Periodic Broad Band Beam	$599
144-148-13LBA 13-el 2-mtr Beam	$79
143-150-14C 14-el 2-mtr Satellite Antenna	$79
420-470-18C 435 MHz Satellite Antenna	$59
432-16LB 432 MHz Long Boom Antenna	$59

MINI-PRODUCTS HQ-1 only $139!



Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$99
Alliance U100 (for small beams & elevation)	$49
Telex HAM 4 (15 sq ft rating)	$199
Telex Tailtwister (20 sq ft rating)	$249
Telex HDR300 Heavy Duty (25 sq ft rating)	$439

Standard 8 cond cable $.19/ft
(vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft
(vinyl jacket 2-#16 & 6-#18 ga)

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $32.50 25G $41.50 45G $93.50

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$789
FK2558	58 ft	13.3 sq ft	$879
FK2568	68 ft	11.7 sq ft	$959
FK4544	44 ft	34.8 sq ft	$1099
FK4554	54 ft	29.1 sq ft	$1219
FK4564	64 ft	28.4 sq ft	$1329
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.12/ft
1/4" EHS Guywire (6000 lb rating)	$.15/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating)	$.12/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.35
1/4" CCM Cable Clamp (1/4" Cable)	$.45
1/4" TH Thimble (fits all sizes)	$.30
3/8EE (3/8" Eye & Eye Turnbuckle)	$5.95
3/8" EJ (3/8" Eye & Jaw Turnbuckle)	$6.95
1/2" EE (1/2" Eye & Eye Turnbuckle)	$8.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$9.95
3/16" Preformed Guy Grip	$1.79
1/4" Preformed Guy Grip	$1.99
6" Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32" or 3/16" Cable)	$.95
502 Guy Insulator (1/4" Cable)	$1.95
5/8" Diam - 8 ft Copper Clad Ground Rod	$11

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	$.59/ft
9901LD Cable End (for 2100/4000 cable)	$4.95
9902LD Cable End (for 6700 cable)	$5.45
Socketfast Potting Compound (does 6-8 ends)	$8.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$39	$59	$79
.18 in Wall	$39	$69	$99	$109
.25 in Wall	$69	$129	$189	$249

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod	$19	HDT-5 5 ft Tripod	$29
HDT-10 10 ft Tripod	$49	HDT-15 15 ft Tripod	$69

Heavy Duty Tripods include mtg hdw-UPS Shippable

TEXAS TOWERS

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COMMUNICATIONS EQUIPMENT SALE!

MIRAGE AMPLIFIER SALE!

B1016 2 Meter Dual Purpose $249
H.T. 1-2W In - 35-90W Out
or Transceiver 10W In - 160W Out

Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
B23	2M	No	2W	30W	5A	$ 79
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105-125 VAC Output: 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	*Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199

MODEL RS-50A

HAL Communications Sale!

CWR6850
$849!

CT2100
KB2100 $859!

CWR6700 Receive Only Telereader	$439
DS2050KSR RTTY System with Keyboard	569
DS3100ASR Deluxe RTTY Terminal	1799
DS3100ASR with MSO3100 Message Unit	2132
RS2100 1" Scope w/Loop Supply	289
ST5000 RTTY Demodulator	219
ST6000 Deluxe Demodulator/Keyer	649
BMC12AU 12" Green Screen Monitor	111

YAESU FT-230R

List $359
Call For Your Special Price

YAESU FT-480R

List $529
Call For Your Special Price

KDK FM2030

SALE PRICE $269!

YAESU FT-707

List $699.95 Special Price $589

R.L. DRAKE

TR-7A Transceiver On Sale $1389!
Accessories In Stock - Call!
L7 HF Amplifier Only $969 (Less Tubes)
Eimac 3-500Z Tubes $199/pair

TEN-TEC SUPER SALE!

List $1,169
Your Special Price $1,029

Omni-C Close Out $769!

New Argosy
Digital Transceiver
List $599.95 Sale $539

ALL ACCESSORIES IN STOCK—CALL!

SANTEC

ST144μP Handie Talkie ON SALE! Only $279

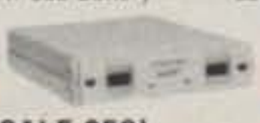
IN STOCK FOR IMMEDIATE DELIVERY

- 142-149.995 MHz
- 3.5W/1W/.1W Output
- 24 Hour Clock
- Liquid Crystal Display

OTHER SANTEC ITEMS

ST-440μP 440 MHz H.T.	$299
SM-3 Speaker Mic	33
ST-LC Leather Case	29
ST-6BC Base Charger	29
ST-500B3 Ni-Cad Battery	29

TOKYO HY-POWER LABS



Regular $69.95 SALE $59!

HL-30V 2 Meters, 2W In - 30W Out

OTHER TOKYO HY-POWER ITEMS

HL-82V 2 Mtr. 2-12W In - 35-85W Out	$139
HL-160V 2 Mtr. 1-15W In - 160W Out	299
HL-20U 440 MHz 1-3W In - 20W Out	99
HL-90U 440 MHz 10W In-80W Out w/Preamp.	339
HC-200 HF Ant Tuner w/Wattmeter	89
HC-2000 Deluxe 2KW HF Antenna Tuner	299

AEA CP-1

Computer Patch Interface
List Price $199.95
Call For Special Price
On All AEA Products.

RF POWER LABS AMPLIFIERS

A1000	160-15 Mtr. KW w/AC Supply	$1329
V76	6 Mtr. 8-15W In - 120W Out w/AC Supply	499
V360	6 Mtr. 5-10W In - 450W Out w/AC Supply	1189
V70	2 Mtr. 10-15W In - 90W Out w/AC Supply	499
V71	2 Mtr. 1-3W In - 90W Out w/AC Supply	519
V180	2 Mtr. 5-15W In - 200W Out w/AC Supply	599
V350	2 Mtr. 10-20W In - 400W Out w/AC Supply	1189

Fan Kits and Rack Adapters Also Available—CALL!

JANEL QSA5 PREAMP $39!

QSA-6	$41	432PL	$53
PB-30	$21	PB144	$21
PB-50	$21	PB220	$21

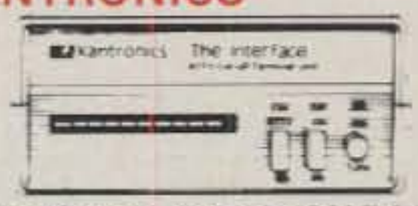
DAIWA CN-620B $111!
160/2 mtrs
20/200/2000 wts

BENCHER PADDLE
BY-1 Blackbase $39
BY-2 Chrome $49

MFJ MODEL 104 On SALE For Only $33!

202B Noise Bridge	$54
250 2KW Dummy w/Oil	31
260 300W Dry Load	25
262 2KW Dry Load	59
422 Keyer w/Paddle	89
482 4 MSG Mem Keyer	89
484B 12 MSG Keyer	125
494 Keyboard	249
496 Keyboard	299
525B RF Processor	109
624 Phone Patch	59
901 300W Tuner	54
940B Tuner w/Meter	72
941C Tuner w/Meter	79
949B Deluxe Tuner	129
989 Deluxe 2KW Tuner	289

KANTRONICS



THE INTERFACE Reg. $169.95 SALE $149.00!

OTHER KANTRONICS ITEMS

Mini-Reader	$239	Hamtext VIC-20	99
Mini-Terminal	259	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
VIC-20 Hamsoft	49	TRS-80C Hamsoft	59

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AGL Electronics is North Texas' AUTHORIZED Dealer for over 70 product lines. Call us for your station needs. From Rubber Ducks to 80 meter beams, Handhelds to HF Transcievers, we have it and can help. Call Bill, K5FUV, Gordon, N5AU, and Mike, KG5F for advice on our products, while Gary, KM5X gets it out the door and on its way to you, and Bob, W5AH, stands by for the occasional warranty service. We also do service on most amateur and commercial rigs as well.

AEA

ISOPOLE 144 SPECIAL!!	$39.00
CK-2 Contest Keyer	$ Call
MM2 Morsematic	$ Call
MBA-RO Reader ..... Special!	$ 259
MBS-RC Reader-Sender	$ Call
Moscow Muffler	$ 135

Woodpecker Blanker for Transceivers

Other AEA products in stock. Call.

ASTRON POWER SUPPLIES

RS7 A 5 amp cont-7 amp ICAS	$49
RS20 A 16 amp cont-20 amp ICAS	$87
RS20 M above w/meter	$105
RS35 A 25 amp cont-35 ICAS	$134
RS35 M above w/meter	$145
RS50 A 37 amp cont-50 ICAS	$186

BENCHER

BY-1 Key Paddles	$35
BY-2 Keyer Paddles, Chrome	$45

Other Bencher products. Call

ETO ALPHA

76 A 2-8874 tubes for 2 KW	$1590
76 PA 3-8874 tubes-runs cooler	$ Call
76 CA 3-8874 tbs-hprcil XFMR	$ Call
374 A 2-8874 tbs-broad band	$ Call
78 3-8874 tbs-broad band	$ Call
77 DX 1-8877 tb-runs real cool	$ Call

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KB2100 Keyboard for Above	$141
CWR 6850 Telerdr. Terminal	$849

CWR-6850 Telereader -- $849.00

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Sorry, we can't accept personal checks for mail orders, and don't ship COD.

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Keep trying, 'cause the phone company's infinite wisdom requires that we have more phone lines than people to answer them. The WATS line won't give you a busy signal either, so try again later. We're here. By the way, we can't answer the WATS on Saturday due to the local store traffic.

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Rohn 45G	$91.90/section

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The Serial Number Memory Keyer

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ETO ALPHA 374A

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FT-230 now with TT MIC

NEW!! Matching FT-730 450mhz Transceiver Available Soon!

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IC 2 AT ..... Special	$233
IC 740 160-10m HF XCVR	$945
IC 720 A/PS15 combo	$1255
IC 25 A 2m XCVR/w TT mic	$299
IC 251 A 2m all mode	$569

ICOM IC-720A

with PS-15 -- $1255

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B23 2 in 30 out Talkie Power	$ Call
B108 10 in 80 out 2m Amp	$ Call
B1016 10 in 160 out 2m AMP	$ Call
B3016 30 in 160 out 2m AMP	$ Call
D101N 10 in 100 out 450 mhz Amp	$ Call
MP1 meter	$ Call
MP2 meter	$ Call

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5/8 wave 2m HT ant	$18
Power Pocket for IC 2 AT	$174

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FT102 new 160-10 XCVR. 3 6146's! $ CALL ! !

FT902 DM 160-10 XCVR	$1129
FT707	Most Popular
HF Mobile we Sell	$ Call
FT-ONE	Aptly named, because it is Number One ... $ Call
FT208 R 2 m handheld	$ Call
FT708 R 450 mhz handheld	$ Call
FT230 R 2 m 25 wt mini xcvr	$ Call
FT480 R 2 m all mode	$ Call
FT780 R 430 mhz all mode	$ Call
FT290 R 2 m portable all mode	$ Call

Complete Yaesu line with Accessories normally in stock.

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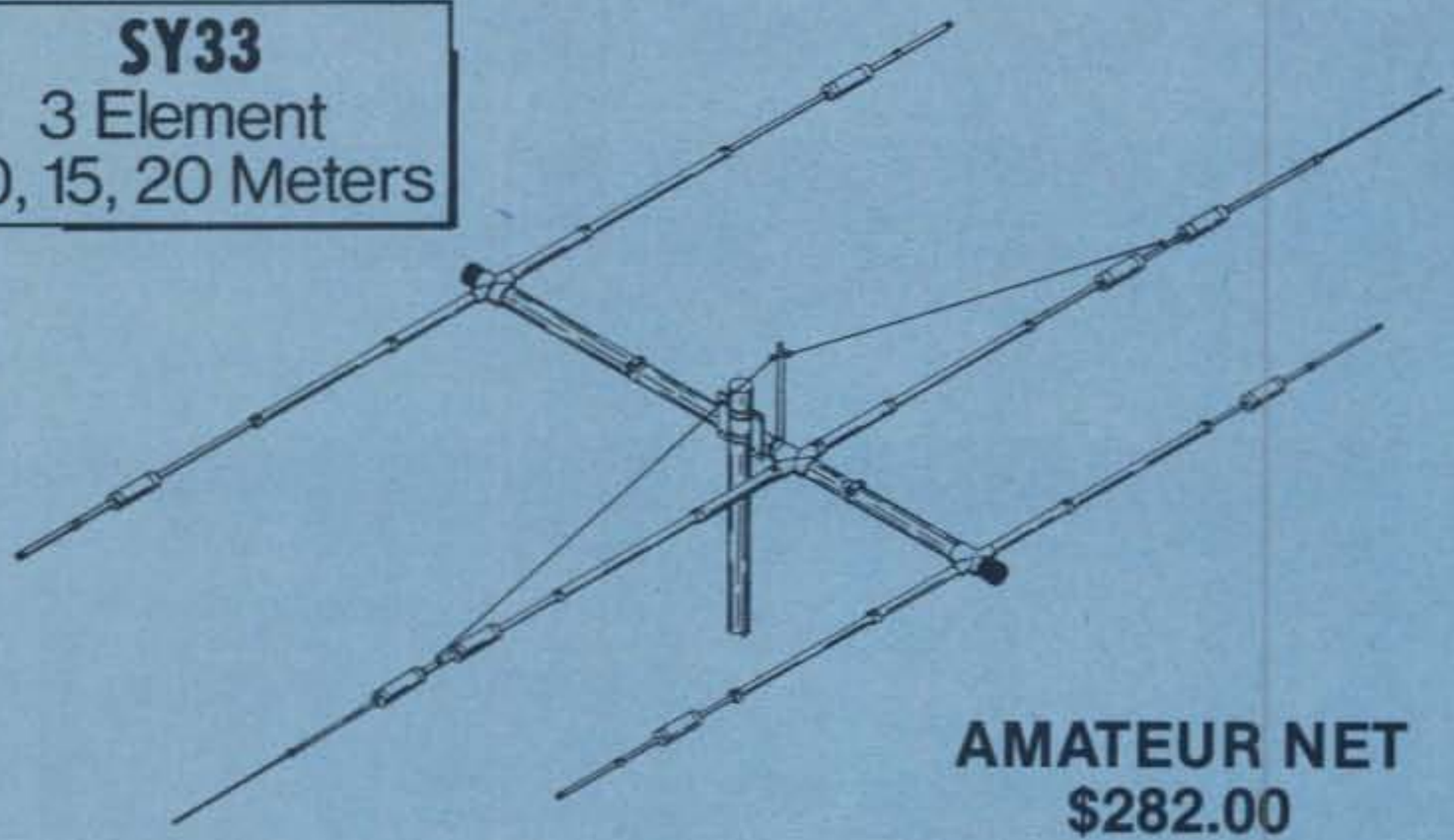
CIRCLE 174 ON READER SERVICE CARD

WILSON ANTENNAS ARE BACK...

AND MACO IS THE MANUFACTURER

SY33
3 Element
10, 15, 20 Meters

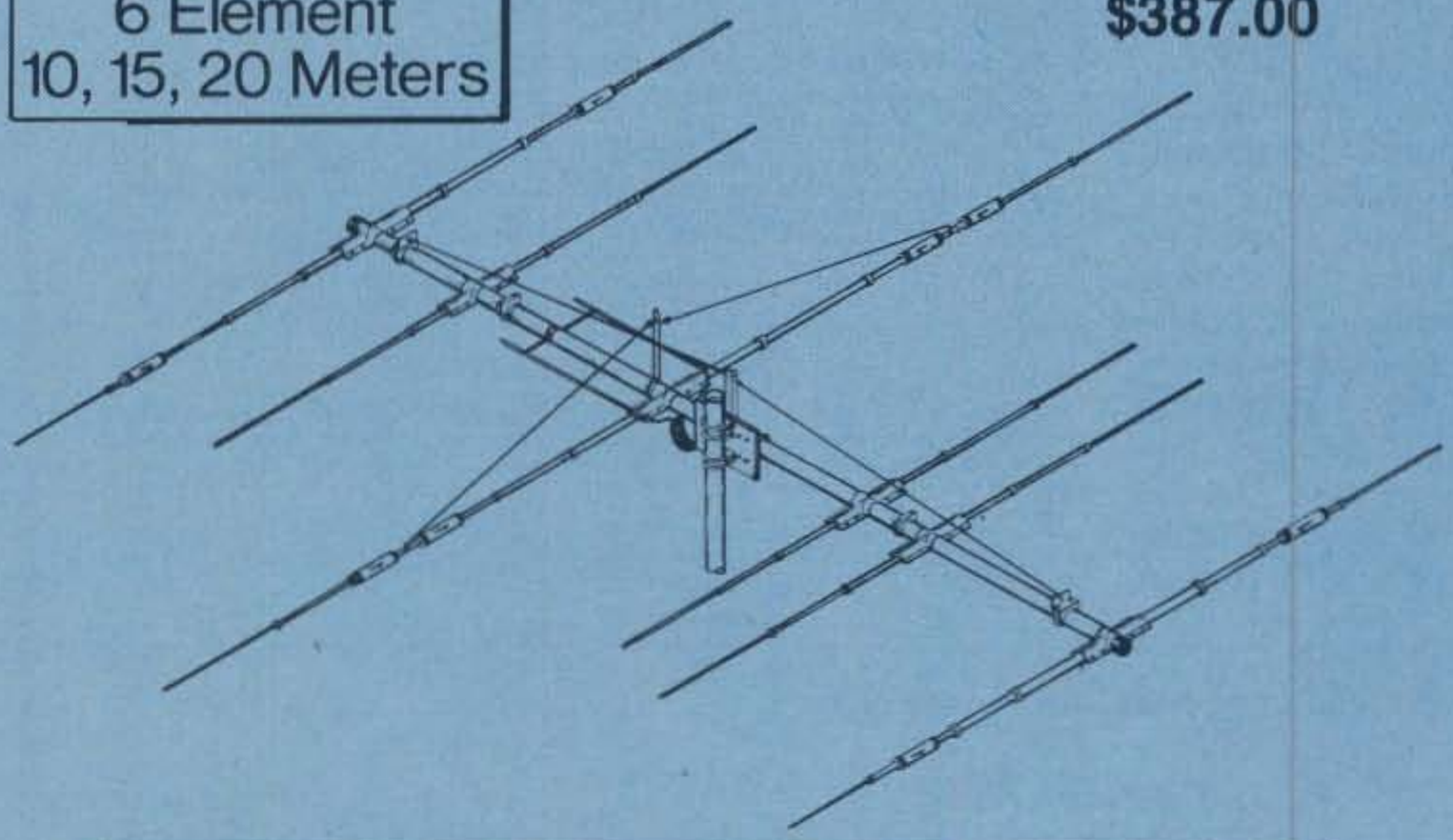


AMATEUR NET
$282.00

Band MHz:	14-21-28	Longest element:	27'4"
Maximum power input:	legal limit	Turning radius:	15'9"
Gain (dbd):	up to 8 dB	Maximum mast diameter:	2" O.D.
VSWR at resonance:	1.3.1	Surface area:	5.7 sq.ft.
Impedence:	50 ohms	Wind loading at 80 mph:	114 lbs.
F/B ratio:	up to 20 dB	Assembled weight (approx.):	37 lbs.
Boom (O.D. x length):	2" x 14'4"	Shipping weight (approx.):	42 lbs.
No. elements:	3	Direct 52 ohm feed, no balun required	
		Maximum wind survival:	100 mph

SY36
6 Element
10, 15, 20 Meters

AMATEUR NET
$387.00



Band MHz	14-21-28	Longest Element:	29'6½"
Maximum power input	legal limit	Turning radius	19' 1"
Gain (dBd)	up to 9 dB	Maximum mast diameter	2" O.D.
VSWR at resonance	1.1:1	Surface area	8.6 sq. ft.
Impedance	50 ohms	Wind loading at 80 mph	215 lbs.
F/B ratio	up to 20 dB	Assembled weight (approx.)	53 lbs.
Boom (O.D. x length)	2" x 24' 2½"	Shipping weight (approx.)	62 lbs.
No. elements	6	Maximum wind survival	100 mph

ADD 30 AND 40 METERS TO YOUR TRI-BAND WITH THE NEW 33-6 MK AMATEUR NET $99.00

Now you can have the capabilities of 30 meter and 40 meter operation on the System 36 and System 33. Using the same type high quality traps, the new addition will offer 200 kHz of bandwidth at less than 2:1 SWR. The new 33-6 MK will fit your present SY36 or SY33, and using the same single feed line.

WV-1A
4 BAND TRAP VERTICAL
(10 - 40 METERS)
AMATEUR NET
$99.00

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured are large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a base mount bracket to attach to vent pipe or to a mast driven in the ground.

SPECIFICATIONS

- 19' total height
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- Input impedance: 50Ω
- Power-handling capability: Legal Limit
- Two High-Q traps with large diameter coils
- Low angle radiation
- Omnidirectional performance
- Taper swaged aluminum tubing
- Automatic bandswitching
- Mast bracket furnished
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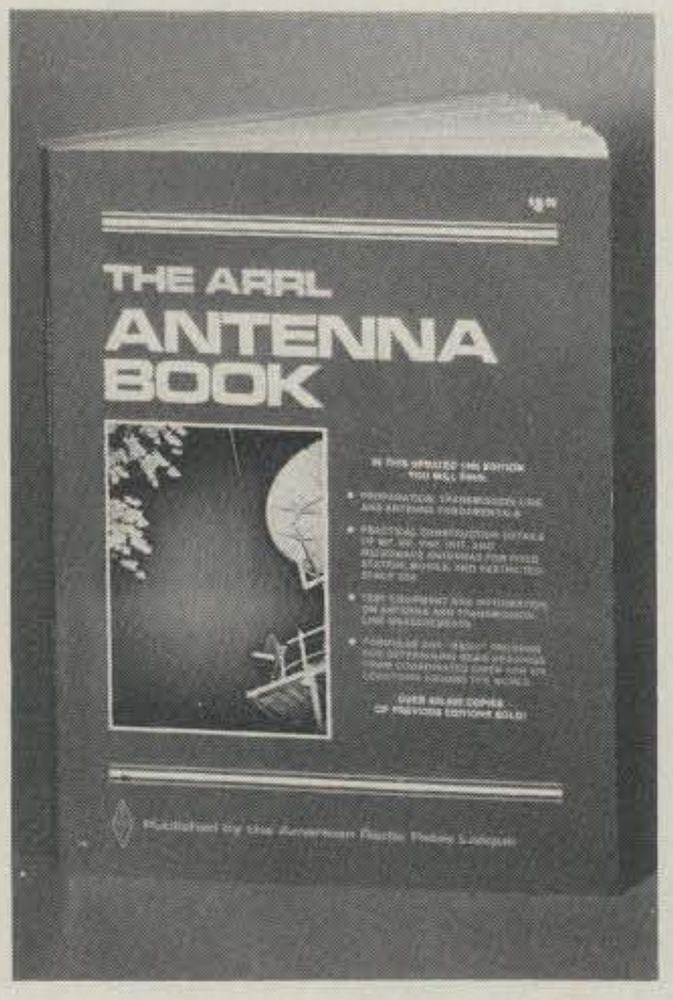
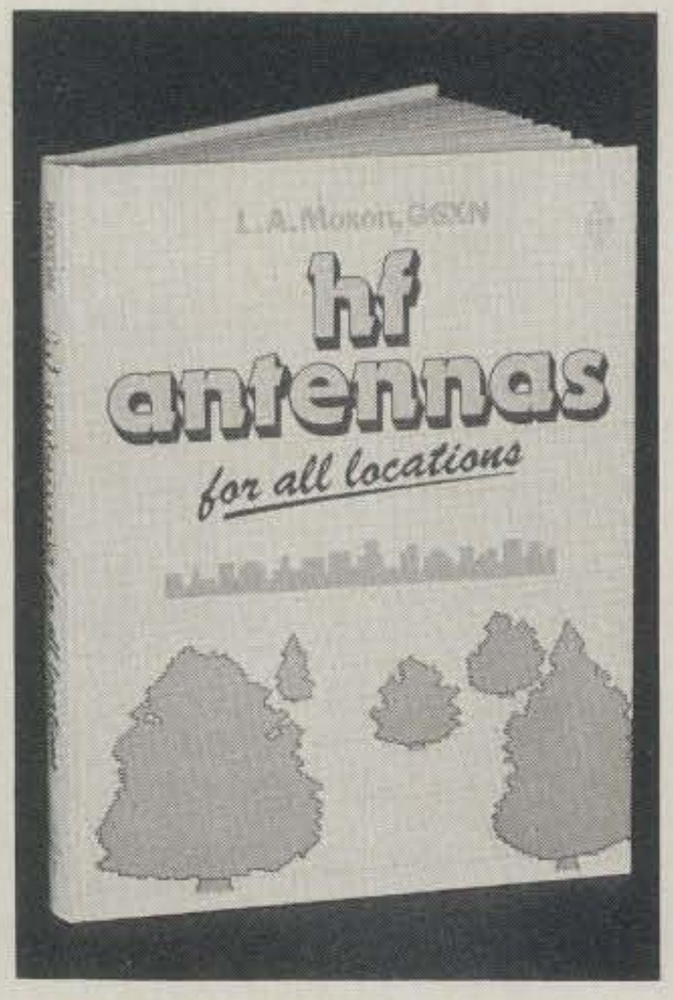
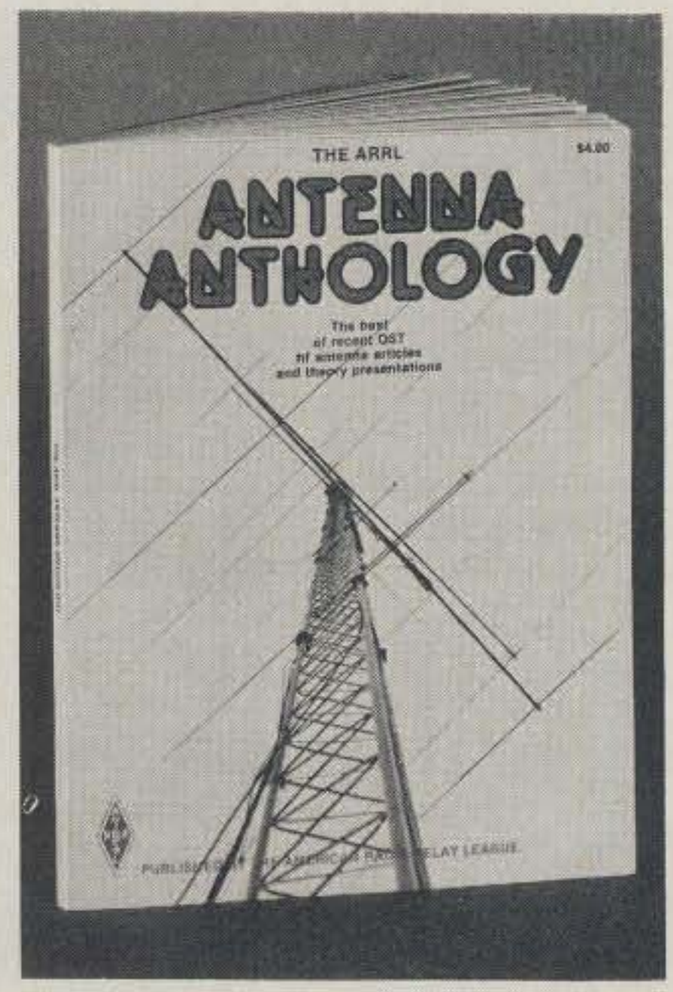
CIRCLE 36 ON READER SERVICE CARD

BOOKS

"A STATION IS ONLY AS EFFECTIVE AS ITS ANTENNA SYSTEM"







THE ARRL ANTENNA BOOK The best and most up-to-date antenna information around. The just revised 14th Edition contains in its 328 pages propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Paperbound. Copyright 1982. **$8.00** in the U.S., **$8.50** elsewhere.

HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; The Antenna and Its Environment; Single-element Antennas; Hortizontal Beams; Verticle Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00**.

ANTENNA ANTHOLOGY The best *QST* hf antenna articles and theory presentations. Verticals: 2 and 4 band verticals for the novice, Cheapie GP, High Performance system for 20, 40 and 80, other loaded systems. Yagis: Short antennas, and The Log-Yag Array. Quads: Wire quads for 80 and 40, 2-Element Quad for the Novice, Miscellaneous Antennas: Loops, Delta-loops, Antennas for travel trailers and campers, plus matching devices and antenna test accessories. Copyright 1978, 148 pages. **$4.00** U.S., **$4.50** elsewhere.

Enclosed in U.S. funds drawn on a U.S. bank or an international money order is $_____ for the books marked below:

( ) ARRL Antenna Book **$8** U.S. **$8.50** elsewhere

( ) HF Antennas **$12.00**

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CQ

Awards

a monthly feature by
A. EDWARD HOPPER, W2GT

NEWS OF CERTIFICATE AND AWARD COLLECTING

It's hard to say goodbye. It's harder to single out what you'll miss most after closely working with someone for 18 years. Whatever you can say puts a tremendous burden for those that follow to live up to. In this case, Dorothy Johnson, WB9RCY, will be taking over the helm of *CQ*'s USA-CA Award and Awards Column from A. Edward Hopper, W2GT (in 18 years I never did find out what the A. stood for). Ed took over a shaky program from Cliff Evans, K6BX, and through hard work, perseverance, and extreme dedication, built up a world-respected Award Program and indeed made the entire world county conscious. I also know that this move was a hard choice for Ed, too, as we discussed it for several months prior to this announcement. It's hard for Ed to pass the reigns over after all of this time and typically he methodically went about selecting his own replacement. Ed's confident and so am I that Dorothy can do all of us proud. All of us at *CQ* will miss working with Ed and *all* of us, Dorothy included, have a lot to live up to.

Alan, K2EEK

The Story of the Month for June as told by Jim is:

James E. Rounds, W1SXX
All Counties #380 5-15-82

"I am 73 years old. I married rather late, at age 39. We have a son, James, Jr., 33, and a daughter, Susan Annette, 30. The XYL is Dorothy H. Rounds (age unknown). James, Jr. lives in Foster and works for a big local daily. The XYL has been an R.N. since the early forties and served in the Armed Forces at a field hospital in New Guinea. I was with the Second Armored Division in N. Africa, Sicily, France, Belgium, Holland, and Germany.

"Got my introduction to radio at A.F. Radio School in Fort Knox, KY, and finished with a rating of 20 w.p.m. sending and receiving. Served with a Recon. Co. for 3 years and 4 months as a radio operator in a command half-track using one c.w. rig and two f.m. rigs. After being discharged, I bought an SX-42 receiver, boned up on theory, and at about that time got married! Got my ham ticket in the spring of 1950 and upgraded to the old Class A the following year. I still hold the Advanced Class license.

"Built a small transmitter using an old 6L6 and a TV transformer in my power supply for about a year, using this low power c.w. on 80 and 40 meters. I then graduated to a TBS-50 in June 1951, and used it until March 1, 1975. On March 6 (my birthday, and also the day I retired) I put my Heath SB-401 transmitter and SB-303 receiver on the air, and am still using them. I am also still using the Murch transmatch and the Heath s.w.r. and wattmeter, plus the Heath dummy load. For c.w. I use the Vibroplex bug. My son helped me build all the Heath gear. (Forgot to mention that our daughter is also an R.N. and works in a Denver hospital.)

"My antenna is a 3-element beam (tribander) up about 35 feet, and I use a trap doublet for 80 and 40.

"I was about to send for the 1000 county endorsement when I found the 14336 net in late 1975 and decided to wait until I got all of them. I joined MARAC, and have been to three yearly conventions and a couple of minis. I have found the County Hunters to be, on the whole, a swell group of people. I hold ISSB #9664, 10-X #10779, and many other awards, such as the 73 Sections, Lake Erie, Zone 4, WAS, WAC, and DXCC. Used to handle some traffic back in the fifties and early sixties. Like to get into a contest now and then, and love to ragchew, especially with fisherman and golfers. The awards I treasure most are my All Counties #380 and the *CQ* All Counties Plaque.

"Oh yes, before retiring I was a surveyor both private and for the State of Rhode Island doing layout work on roads and bridges."

James E. Rounds, W1SXX, showing many QSL's and nice station equipment.

The James E. Rounds family: Dorothy and Jim, Jr. in front, with Susan and Jim, W1SXX, behind them.

The W1SXX home on 5 acres which used to be a peach orchard.

Awards Issued

Burwyn Thurman, N9TN (ex-WB9NOZ), who had received USA-CA-500 #1195 9-10-77, did his paperwork and claimed USA-CA-1000 through All Counties endorsed Mixed.

John Devoldere, ON4UN, waited until he had them All and applied for USA-CA-500 through All Counties endorsed All 2XS.S.B. His 500 was #2 to Belgium (all others were #1 to Belgium), as ON6IT received USA-CA-500 #1651 in September 1981. In case you didn't know, John was #1 to receive *CQ*'s 5 Band WAZ award!

Lad Hlavaty, W1CRL, sent for USA-CA-500 through USA-CA-2500 endorsed All S.S.B., All Mobiles, All 14; and USA-CA-3000 endorsed All S.S.B.

Buster Boatman, Jr., N0CKC (ex-KA0CLS), acquired his USA-CA-1000 through USA-CA-2000 endorsed All A-1 and 2500 endorsed Mixed.

Werner Brill, DL9YC, added to his nice collection USA-CA-2000 endorsed Mixed (#1 to Germany).

Leon Bird, N5DWS, obtained USA-CA-1000 endorsed All S.S.B., All A-1, and USA-CA-1500 endorsed All S.S.B.

Jack Francis, KM4Q, had me send him USA-CA-500, 1000, and 1500 endorsed Mixed.

Bertil Anderson, SM7ASN, got USA-CA-500 and 1000 endorsed Mixed.

Elvio Pizzo, I0ZQ, collected USA-CA-1000 endorsed Mixed.

USA-CA-500 Certificates were gained by:

Arnfinn Kristoffersen, LA8CJ, endorsed Mixed.

P.O. Box 73, Rochelle Park, NJ 07662

Special Honor Roll
All Counties

#116 Burwyn W. Thurman, N9TN 2-8-83.
#117 John A. Devoldere, ON4UN 2-17-83.

David Landry, KA1CRP, endorsed All A-1.
David Thurston, WD8JTG, endorsed Mixed.
Fobert Piat, F3XY, endorsed All S.S.B.
Erling Melby, LA5LT, endorsed All A-1.

Awards

The Wolverine Award: Sponsored by the Grand Rapids Amateur Radio Association, Inc. of Grand Rapids, Michigan, the idea was born in mid-July of 1956 by W8YDJ, W8ESR, and W8IDZ. The first amateur to qualify for the award was Anna Strawway W8QOM, who worked all 83 countries of Michigan.

Rules for U.S. and Canadian stations are as follows:

1. Must submit *cards* proving contact with stations in *at least 68* of the 83 counties of Michigan.
2. Contacts with mobile stations or any reports of less than 3-3-8 on c.w., or less than R3-S4 on phone, will not be considered valid contacts.
3. Contacts must have been made after January 1, 1947 on any or all bands, either phone or c.w. or both.
4. Applications must be accompanied by $2.00 in cash or stamps to cover cost of return postage and handling.

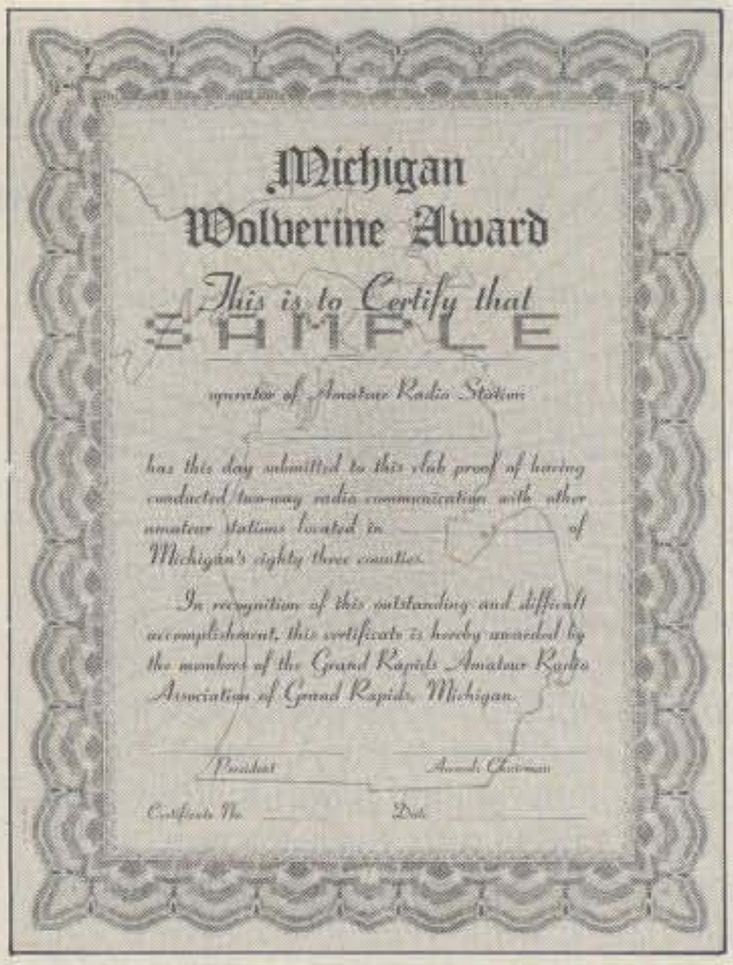
Rules for stations outside the Continental U.S. and Canada:

1. Written proof of contacts may consist of a detailed list showing dates, times, calls, reports sent and received, and operator's name.
2. Must submit proof of contacts with *at least 25* of the 83 counties in Michigan.
3. Application must be accompanied by 4 IRC's.

The All Counties Endorsement seal is a gold seal imprinted with the seal of the State of Michigan in the center, surrounded by the words All Counties Endorsement. To obtain this endorsement seal, holders of the Wolverine Award:

1. Must submit *cards* proving contact with stations in all 83 counties of Michigan, excluding the counties already worked to obtain the Wolverine Award.
2. Application must be accompanied with $2.00 in cash or stamps to cover cost of postage and handling.

Send requests to: Awards Chairman, GRARA, P.O. Box 1248, Grand Rapids, MI 49501. *(Thanks to Karl, K8UNZ, for this information.)*


Michigan
Wolverine Award
This is to Certify that
SAMPLE
operator of Amateur Radio Station
has this day submitted to this club proof of having conducted two-way radio communication with other amateur stations located in ____ *of Michigan's eighty three counties.*
In recognition of this outstanding and difficult accomplishment, this certificate is hereby awarded by the members of the Grand Rapids Amateur Radio Association of Grand Rapids, Michigan.
President *Awards Chairman*
Certificate No. *Date*

The Michigan Wolverine Award.

Special Tirae '83 Award: To commemorate the July 14th activities, which is the biggest event of the year in French Polynesia, the Radio Club of French Polynesia (FO9AA) is offering this certificate to all radio amateurs who qualify. The Fete (July 14th), which coincides with the French Bastille Day, attracts many visitors from all over the world to French Polynesia. Events take place on all islands, and you can hear the activities on Radio Tahiti on 15.170 and 11.825.

DX stations from all over the world are invited to participate and work stations in French Polynesia to qualify for this certificate. To qualify, DX stations must contact three stations in French Polynesia (FO8 or FOØ) on at least two different bands. A total of three stations is the minimum, and you may contact the same station on different bands. *Only* s.s.b. contacts are considered valid.

Look for French Polynesia stations on: 28.600, 21.300, 14.240, and 14.120; 7.090 listening on 7.090 and 7.250; and also 3.800.

To be valid, the contacts must take place between 0000Z July 15th and 2359Z July 21. *This will be an annual award.* Fee for the certificate is 12 IRC's. QSL's are not required; just send a copy of your log, or complete log data to: Special Tirae Award, c/o FO8HL, B.P. 5006, Pirae, Island of Tahiti, French Polynesia, South Pacific Ocean, Maururu roa. *(Thanks to Ross, WB6GFJ/FOØFB, for this data.)*

The Torshavn Award (TTA): Sponsored by FØROYSKIR RADIOAMATØRAR, of the Faroe Islands, a member of the IARU, and the award is available to all licensed

USA-CA Honor Roll

3000		ON4UN	561	NØCKC	766
W1CRL	444	DL9YC	562	ON4UN	767
N9TN	445			SM7ASN	768
ON4UN	446	**1500**		KM4Q	769
		W1CRL	623		
2500		N9TN	624		
W1CRL	503	N5DWS	625	**500**	
N9TN	504	NØCKC	626	LA8CJ	1806
ON4UN	505	ON4UN	627	W1CRL	1807
NØCKC	506	KM4Q	628	KA1CRP	1808
				ON4UN	1809
		1000		WD8JTG	1810
2000		W1CRL	762	F3XY	1811
W1CRL	558	IØZQ	763	LA5LT	1812
N9TN	559	N9TN	764	SM7ASN	1813
NØCKC	560	N5DWS	765	KM4Q	1814

radio amateurs and s.w.l.'s under the following rules:

Time period: May 1, 1983, 0000 GMT to January 1, 1984, 2400 GMT.

Bands: All bands 3.5 through 432 MHz, excluding 10, 18, and 24 MHz.

Modes: All modes.

Classes: One class only.

Scoring:

MHz	EU	DX
3.5 and 7	25	40
14, 21, and 28	20	30
144 and 432	40	75

Contacts with the club station, OY6FRA, count double on all bands.

Points needed: 75.

Cost: 10 IRC's, or the equivalent.

Application: No QSL cards, but a list confirmed by the national award manager or two licensed amateurs.

Address: FRA Awards Manager, P.O. Box 343, 3800 Torshaven, Faroe Islands. *(Thanks to OY7ML for this information.)*

Notes

The *International Directory of Awards*, recently sold by Vance LePierre, W5IJU, is no longer available, and Vance is returning money sent for it.

For an s.a.s.e., Bud Lafferty, W0UBT, 7131 Logan Ave. No., Brooklyn Center, MN 55430, will send you a lot of data on County Hunting and associated data.

The B & B Shop, 1348 Pinewood Drive, Woodbury, MN 55125, also has an up-to-date flyer with lots of important information about County Hunting and associated material that is free for an s.a.s.e.

The TU-BORO Radio Club has plans for some weekend mobile trips (s.s.b. and c.w.) to New England and the Delaware area. Send your comments to: Martin Small, WA2APT, 33-57 170th Street, Flushing, NY 11358.

The 15th Annual County Hunters Convention, sponsored by MARAC, will be held July 6 through the 10th in Charleston, West Virginia. You do *not* have to be a member of MARAC to attend and enjoy yourself! If you do not have the details, get in touch with WB8SNO at once!

This has been a very difficult column to write, for several reasons. One is that I'm doing it on my birthday, and it is my "Swan Song." But to be serious, please welcome our new USA-CA Director, Dorothy H. Johnson, WB9RCY. You all know her as a fine Net Control, Assistant Net Control, and mobile operator, and many of you have had the pleasure of meeting her at MARAC County Hunter Conventions and at the Dayton Hamvention. So please send all applications, etc. directly to: Dorothy H. Johnson, WB9RCY, 333 South Lincoln Avenue, Mundelein, IL 60060. Also please make all checks and money orders payable to her.

Dorothy and her husband, Wayne, became interested in amateur radio because they have some friends who are hams and thus thought it would be an interesting challenge. They attended classes conducted by LAMARS (the Libertyville and Mundelein Amateur Radio Society), and Wayne was licensed in 1975 and Dorothy in 1976. Dorothy became interested in County Hunting after listening to Wayne's brother George, K2TPS (now AC2O), All Counties #121. Dorothy first checked into the Net in October 1976, when they were mobile in Jasper County, Iowa. She has been a confirmed County Hunter ever since.

Their first ICHN-MARAC convention visit was in Rochester, Minnesota, in 1977. Since then they have attended annual conventions in St. Louis, Atlanta, Denver, and Des Moines. They also attended mini conventions in Wisconsin, Tennessee, and Portugal, and met with amateur radio operators from Maine to Alaska and from Canada to Mexico. They have enjoyed making many friends and learning much from such meetings.

In 1978 Dorothy was voted Mobile Opera or of the year. In 1979 she was given the County Hunter of the Year Award, and she also has the MARAC "Excellent Operator" Award. These awards are greatly treasured, as they came from a group of very special people whom she greatly respects and for whom she has much affection.

Wayne is now N9WA; their son, Dennis, is N0WA; their daughter, Deborah, is KA9AZQ, and their grandson Bill is WD9GYX. Bill's younger brother Andy comes to his grandfather twice each week to study amateur radio and hopes to be licensed before this year is finished. I nearly forgot to mention that Dorothy has All Counties #320.

Although I have greatly enjoyed my work with *CQ* (and with you) and all your wonderful cooperation and letters, after 18½ years and now with eye problems that apparently medicine/drops and operations will not help, I must QRX and give the eyes some rest. Again thanks to YOU ALL! (I even forgive the few who tried to change my name to Hooper or Harper!) CU on the Net!

73, Ed, W2GT

Here's a pocket-size 30 meter rig with internal NiCad battery pack, v.f.o., and speaker. Its modular design simplifies construction to a mere weekend project.

THE QRP-30

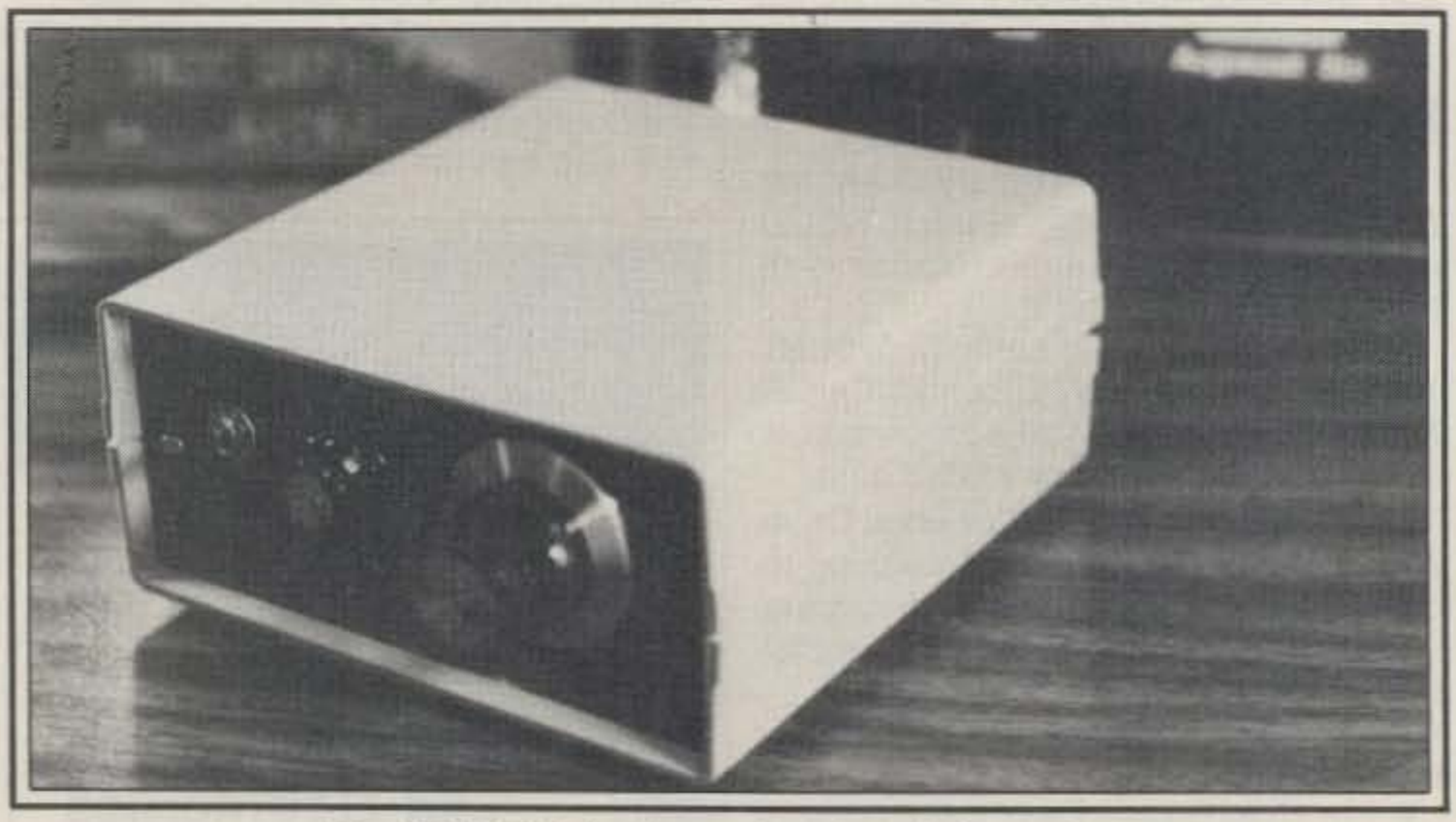
A 30 METER QRP TRANSCEIVER

BY DAVE INGRAM*, K4TWJ

As you've surely heard by this time, the recently opened 30 meter band has proven to be a fantastic blast of operating excitement. Complimented with mode restrictions of c.w. or RTTY and a maximum input power limit of 250 watts, this "split" 10.1 MHz spectrum is a true QRP haven especially becoming to amateur "weekenders" and home construction enthusiasts. (Thirty meter amateur allocations are 10.100 to 10.109 and 10.109 to 10.150 MHz. **DO NOT transmit in the yet-restricted 10.109 to 10.115 MHz range**.) This band's close proximity to 40 meters gives high appeal for modifying low-power transmitters (changing a few capacitors usually shifts tuned circuits from 40 to 30 meters), and direct conversion receivers can also be advantageously employed in this range. As our good friend Bill Orr, W6SAI, points out, 30 meters is occasionally prone to the "Swiss Cheese" effect: signals are usually strong but may sometimes fall into temporary "holes." When "atop the cheese," 4 watts can work the world on 30, and when "the holes" appear, even 250 watts may not be sufficient. As many of you know, I've been quite active on 30, usually running QRP and usually working everything from VK and HK to 5Z4 and VP5. Yes, 30 meters is a fantastic band!

The QRP-30 was essentially created out of need. A pocket-size h.f. rig for use on weekend jaunts to the beach, etc., was not available commercially, and larger rigs with accompanying power supplies, etc., were a "hassle" for such spontaneous activities. I might also add that the originally planned unit was merely a crystal- or v.f.o.-controlled 30 meter transmitter for use in conjunction with an R600 receiver. After realizing that a couple more circuits (receiver "front end"/ product detector and audio amplifier) would constitute a "stand alone unit," the transceiver took shape.

Eastwood Village No. 1201 So., Rt. 11, Box 499, Birmingham, AL 35210



The QRP-30 fully dressed and ready for action.

Overviewing the Rig

The modular design of this tiny unit permits construction in a variety of ways to match one's available parts and assembly time . (See fig. 1). While the QRP-30 is easily duplicated, it is quite likely that others will substitute some of their own preferred "modules" or stages within the rig. Our original plan, for example, was to use a toroidal product detector "front end." Unable to secure proper toroids locally, we switched to a 40763 circuit. Again this was not available locally. Finally, we found a CA3028A, and thus used a suitable circuit for that device. Any of the previously mentioned circuits can be found in the ARRL book *Solid State Design for the Radio Amateur*, and they can all be retuned for operation on 30 meters (reducing tuned circuit capacitances is usually sufficient). A similar situation was experienced in the audio amplifier stage, so we settled for a somewhat noisy but suitable preassembled Radio Shack unit. Since direct conversion receivers are susceptible to a.c. power supply hum, and since QRP rigs should be fully portable, a NiCad battery pack for a Yaesu FT-208R was used. This arrangement permitted 2 meter talkie items to serve "double duty" while also traveling light.

We suggest constructing the QRP-30 one stage at a time, ensuring proper 30 meter operation of each as you go. This consideration will also simplify any possible troubleshooting. Additionally, three of the four basic modules are available commercially (two via a toll-free number and another via a local Radio Shack). Home assembly can thus be reduced to constructing a single dozen parts stage, interconnecting modules, adding a few "extras," and maybe later refining the unit to personal desires (which can result in a very impressive unit).

The V.F.O.

An inexpensive 40 meter v.f.o. manufactured by MFJ Enterprises was selected for frequency control of the QRP-30, primarily because of its small size and rapid availability. (The MFJ-40V is $29.95, available from MFJ Enterprises, Box 494, Mississippi State, MS 39762, phone 1-800-647-1800.) Check the v.f.o.'s operation on 40 meters and

SWD-1 VIDEO CONVERTER

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The SWD-1 Video Converter is utilized on cable TV systems to remove the KHz's signal from a distorted video (channel 3 in/out) and also pass thru the normal undistorted/detected audio signal. Rocker switch selects operating mode to remove KHz's distortion from the video or pass all other channels normally. Simple to assemble—less than 30 minutes. Pre-tuned. Input/output Channel 3. Impedance 75 ohms. 117VAC.

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- 23dB Average Gain
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- Includes P.C. Probe, F-61 Connector and Mounting Hardware

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Kato Sons' Regulated Varible DC Power Supply

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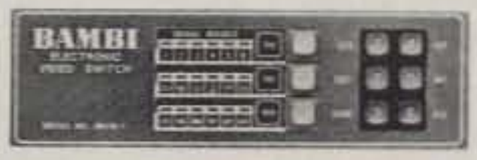

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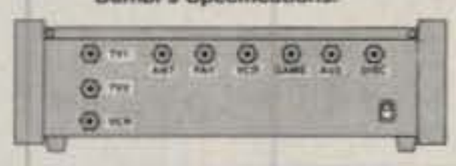
Bambi's Specifications:



Input/Output Impedance	75 ohm
Signal Loss	3dB ±1dB
Noise	4dB ±1dB
Input Return Loss	12dB min.
Isolation	65dB min.
Power Req.	117VAC 60 Hz, 2W
Dimensions	10¼ W x 6⅝ D x 3¼ H
Weight	4½ lbs

Check the quality of Bambi against that of much higher priced competition. All solid state electronic switching provides low attenuation (3dB), wide frequency response (40-890 MHz), and excellent isolation between signal sources (each I/O section individually sheilded for 65dB min. isolation).

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Assembly Time Approximately 5 Minutes.

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MPS-1 Modulator Kit. $39.95

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Kato Sons' Down Converter Kit ★1.9 - 2.5Ghz★

Designed for Simple Simon by former Japanese CQ Amateur Magazine's UHF Editor/Engineer. Unit utilizes new ingenious Printed Circuit Probe for maximum gain. Circuit board fits inside MAE-2 antenna housing. Requires mechanical assembly only. All electronics are pre-soldered and pre-tested. Usable up to approximately 15 miles

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Debbie CCTV-1 CLOSED CIRCUIT TELEVISION CAMERA

Excellent For Use In Home or Business Security Systems, Monitoring Production Lines, Childrens Play Areas, Etc.

Features:

- 2/3" Electrostatic Focusing Vidicon Tube
- EIA 525 Line, 60 Fields Per Sec. Scanning System
- 600 Line at Center Horizontal Resolution
- 1 Footcandle Minimum Illumination
- 10,000 to 1 Automatic Light Control Range
- 1.0Vpp Composite, Negative Sync, 75 Ohm Video Output
- 40dB Signal to Noise Ratio
- Standard "C" Lens Mount
- 110V ±10%, 50-60Hz, 9 Watts

Debbie CCTV-1 Requires C-Mount Lens **$159.95**

16mm, F1.6 Hi-Resolution Lens w/Cap **19.95**

Mounting Bracket Flexible, Locking, 360° Gooseneck for use in ceiling or wall mounting **12.95**

NOTE: When using the Debbie CCTV-1 with Bambi BEVS-1S, an RF Modulator such as our Model MPS-1 is required.

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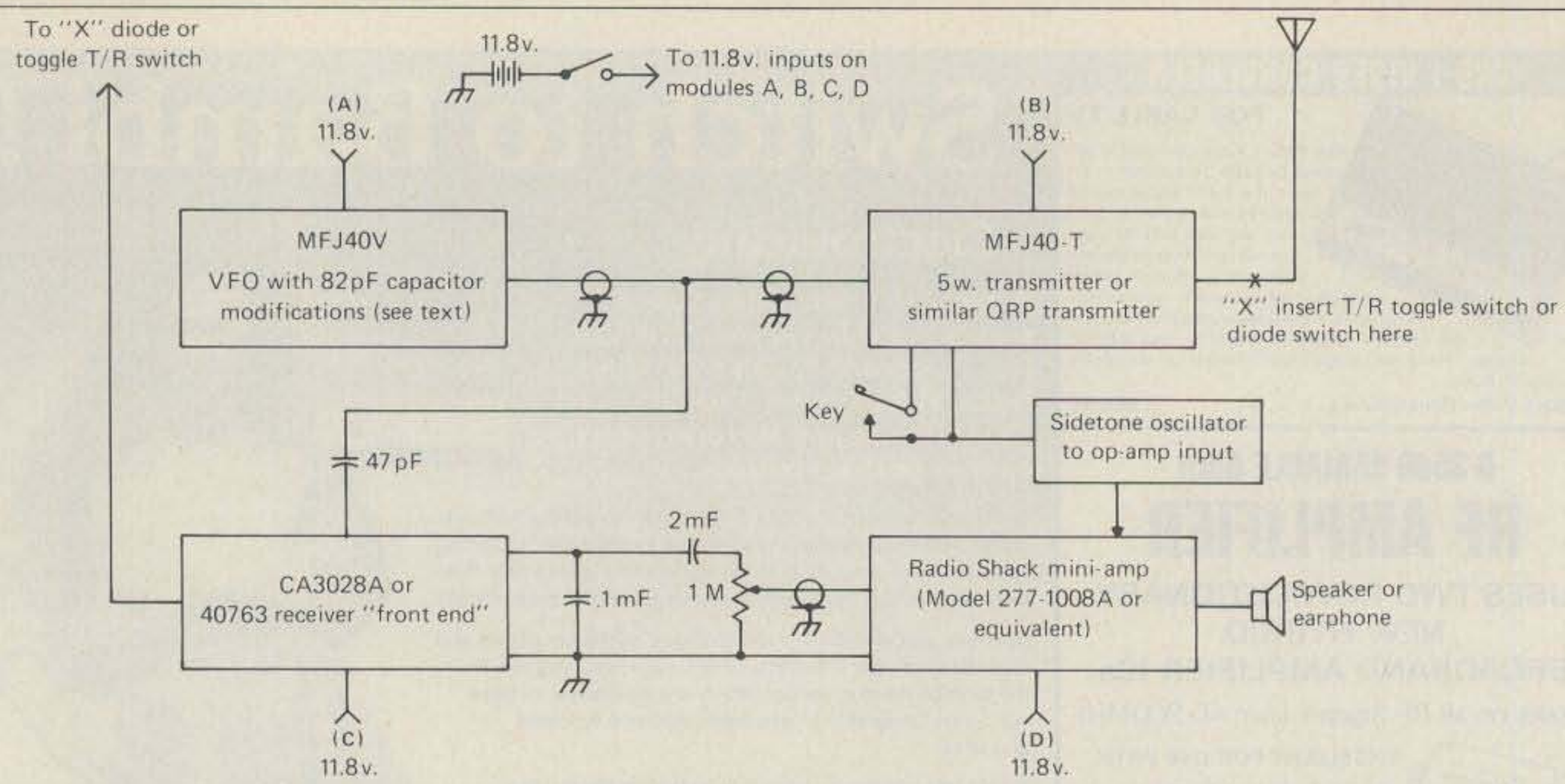


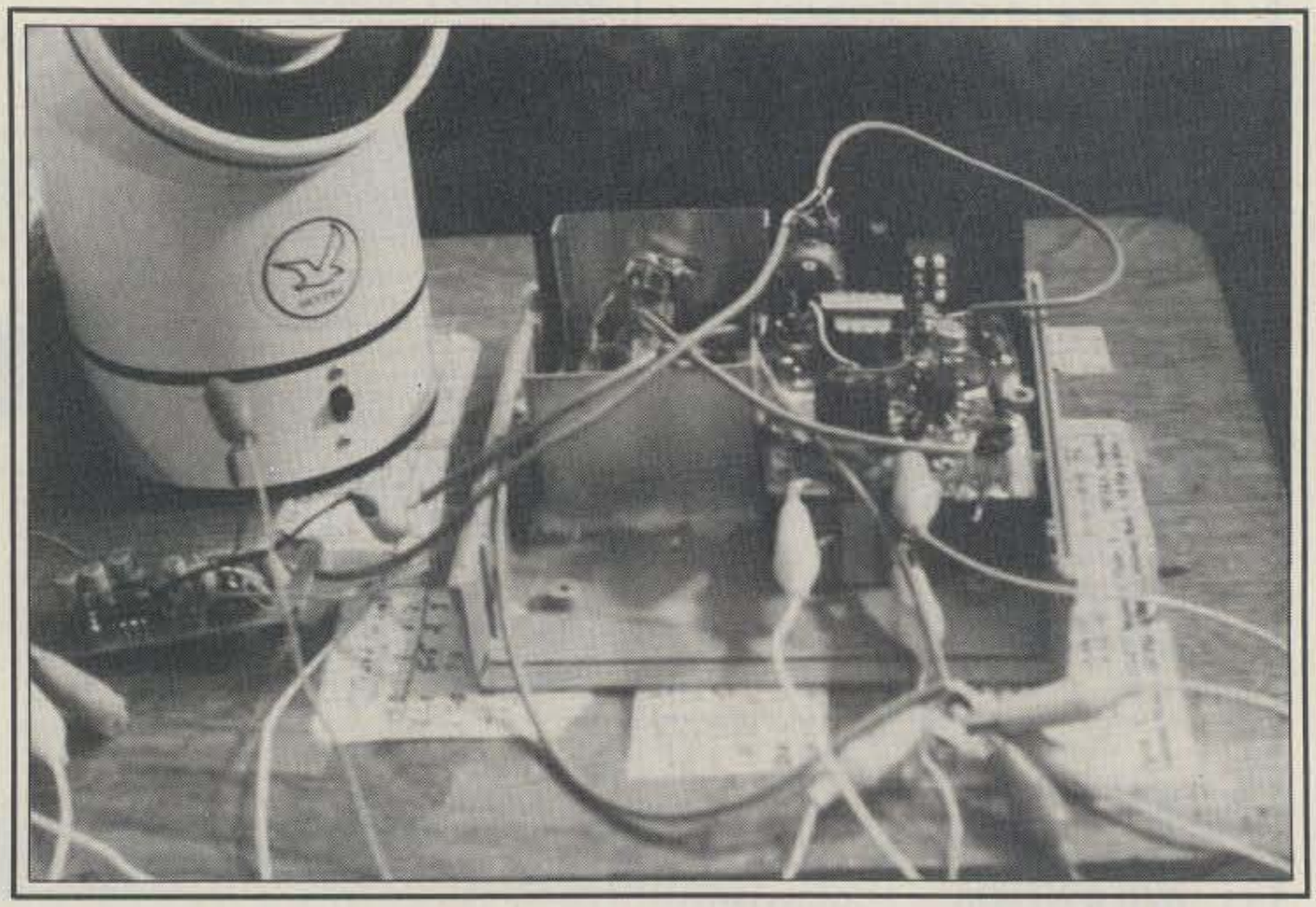
Fig. 1—Block diagram of QRP-30 transceiver, illustrating basic hook-up of the unit's four modules. Note v.f.o. controls transmitter frequency plus provides local oscillator signal for receiver. This straightforward design is quite effective for 10.1 MHz operation.

get the "feel" of its tuning before modifying. Replace the v.f.o.'s 270 pF capacitor paralleling the oscillator coil and tuning capacitor with an 82 pF equivalent, and then use a general-coverage receiver to find the frequency-shifted signal (this capacitor is located between the slug-tuned coil and the r.f. choke). While monitoring the v.f.o.'s frequency, adjust the oscillator's slug toward the bottom of its travel for smooth 30 meter coverage.

Band spread wasn't overly abundant after the change, therefore 15 and 25 pF capacitors were added on "each side" of the tuning capacitor for span limiting (these values can be varied somewhat as desired, but use NPO's with short leads for best frequency stability).

The next step involved removing the v.f.o.'s circuit board, phenolic mounts, and tuning capacitor, and placing them in a smaller metal box (I used a Radio Shack #270-235: $2\frac{3}{4}'' \times 2\frac{1}{8}'' \times 1\frac{5}{8}''$). The unit went wild with hand capacity. Returning the v.f.o. to its "MFJ box" restored smooth operation. *Hmmmm.* After some trials (!) the culprit was found to be poor grounding between the tuning capacitor frame and the Radio Shack box. Placing metal washers on *both sides* of the capacitor's shaft (one washer is supplied with the capacitor), tightening the capacitor's nut securely, and using the supplied shaft shim fully solved the problem. Patience has its virtues here.

Other oscillator/v.f.o. circuits may be used in the QRP-30, if desired. We considered, for example, using a "shiftable crystal VXO" similar to that employed in the "Ultra-Portable 7 MHz transceiver," but bypassed it due to unavailability of 10 MHz crystals. (Ultra-Portable: page 219, *Solid State Design for the Radio Amateur*, ARRL, Newington, Connecticut 06111.) That circuit, however, should prove quite useful for many "outdoors" or "micro-rig" enthusiasts. A crystal warping capacitor should yield several kHz coverage on 30 meters, and temperature stability should be superb.



The QRP-30 during mid-construction. Battery pack is visible below receiver "front end," which is beside the v.f.o. case. Note cotton packing around v.f.o. for thermal protection (double-sided tape holds the v.f.o. case to cabinet). Radio Shack amplifier is beside Skytec c.w. speaker. Despite the many clip leads, it really works!

As a guideline for shifting tuned circuits in v.f.o.'s, transmitters, etc., we used the formula $25330/F^2$ (MHz) $\times$ (L(uhy) $\times$ C(pF). L was unknown, so I began with 7 MHz and found a hypothetical L, and then used that value along with 10.1 MHz to find the new C. Example: 25330/49 $\times$ 250 = 25330/12250 = 2.0677 (hypothetical L). Then $25330/10.1^2 \times 1.0677 = 25330/102 \times 2.0677 = 25330/210.90 = 120$ pF. Taking into effect the main tuning capacitor and the slug readjustment, we thus selected a 100 pF capacitor, which wasn't available locally (again!), and thus an 82 pF item was used. (Martin F. Jue has agreed to include an 82 pF capacitor with 40 meter v.f.o.'s being modified for 30 meters. Mention this article/information when ordering from MFJ.)

The Receiver Section

As mentioned in the first part of this article, our choice of receiver front-end devices wasn't really a choice. Fortunately, however, the CA3028A integrated circuit exhibits good sensitivity and high output

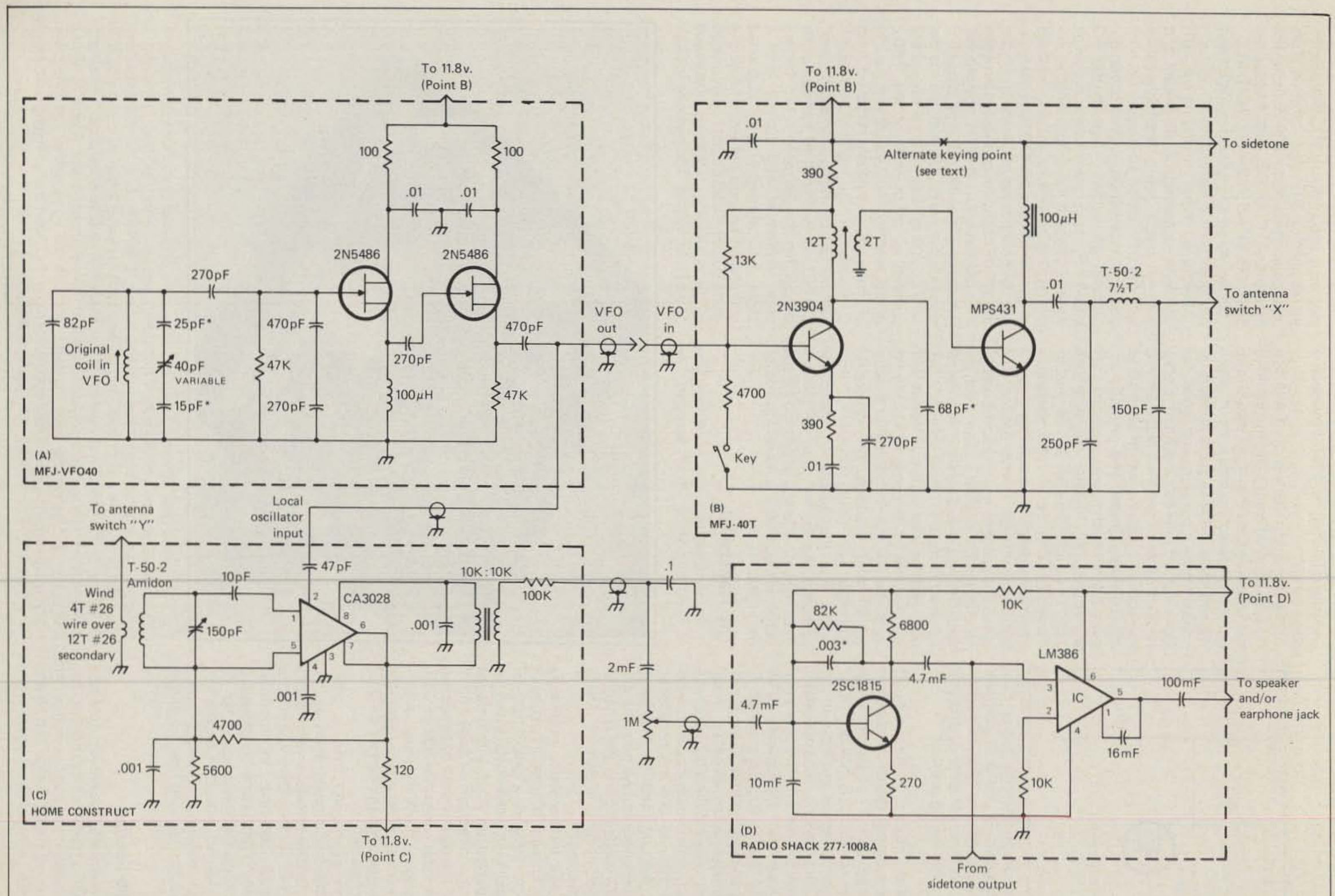


*Fig. 2—Circuit diagram of the QRP-30 with each module separated by dotted lines. Modules A, B, and D were purchased and modified. Module C was constructed on double-sided PC board. (Note: Capacitors marked with * were changed. Values shown permit 30 meter operation [6 caps marked]. All resistors are ½ or ¼ watt. Capacitor values not marked are mF. T1 is a miniature 10K to 10K interstage transformer.)*

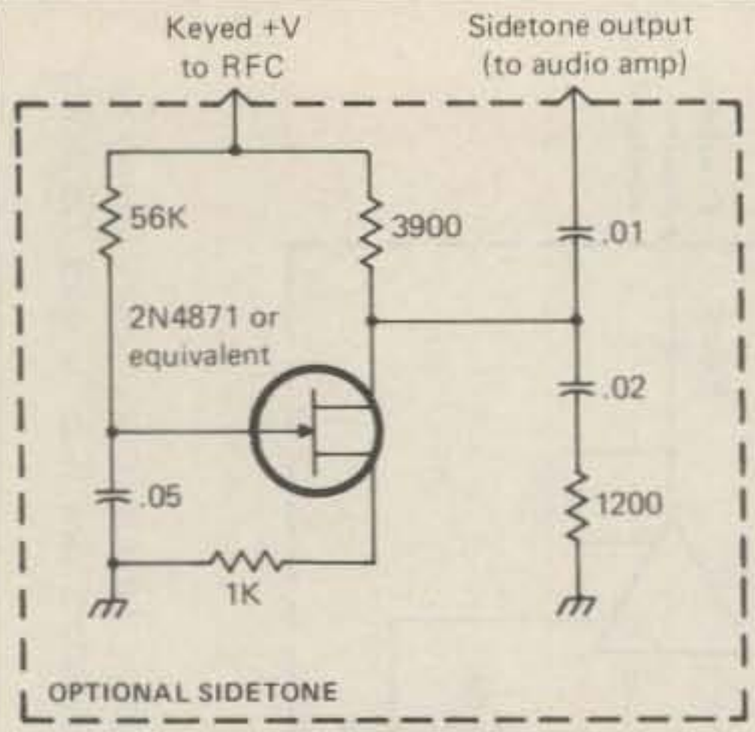


Fig. 2A– Optimal sidetone circuit connects to Modules D and B. If sidetone module is used, ground 4700 ohm resistor from v.f.o. input (Module B) and use alternate keying point "X."

when used as a product detector in direct conversion systems. The circuit diagram of this stage (possibly the only stage you'll home construct) is included in fig. 2. Incoming r.f. signals are input to the IC's Pin 1 and the v.f.o./Local Oscillator signal is directed to Pin 2. The difference between these two frequencies is an audio signal (300 to 800 Hz, preferably), which is then directed from IC Pin 6 to a general-purpose audio amplifier stage. Component values in this stage are relatively noncritical. Bypass capacitors between .01 mF and .005 mF have been used successfully, and all interstage transformers checked gave good results. We heartily suggest using the smallest physical-size items available for overall unit compactness.

During the transceiver's initial construction and setup, a tuned input circuit was omitted. Instead, a simple 100 μH choke was placed between Pin 5 and the 10 pF capacitor on Pin 1 with antenna and ground connections at each end of the choke. The results were quite acceptable when local power-line noises were not horrendous. The tuned input, or simple preselector, was added after the complete receiver had been working for a couple of weeks.

Although we haven't tried it, other product detector circuits such as the 40763 or passive toroidal arrangements mentioned earlier should work as good or better in this "front end." Incorporating such circuits is simply a matter of feeding in the r.f., Local Oscillator, and removing audio. If desired, you can experiment with output coupling and bypass capacitor values for tailoring the frequency response.

The Audio Section

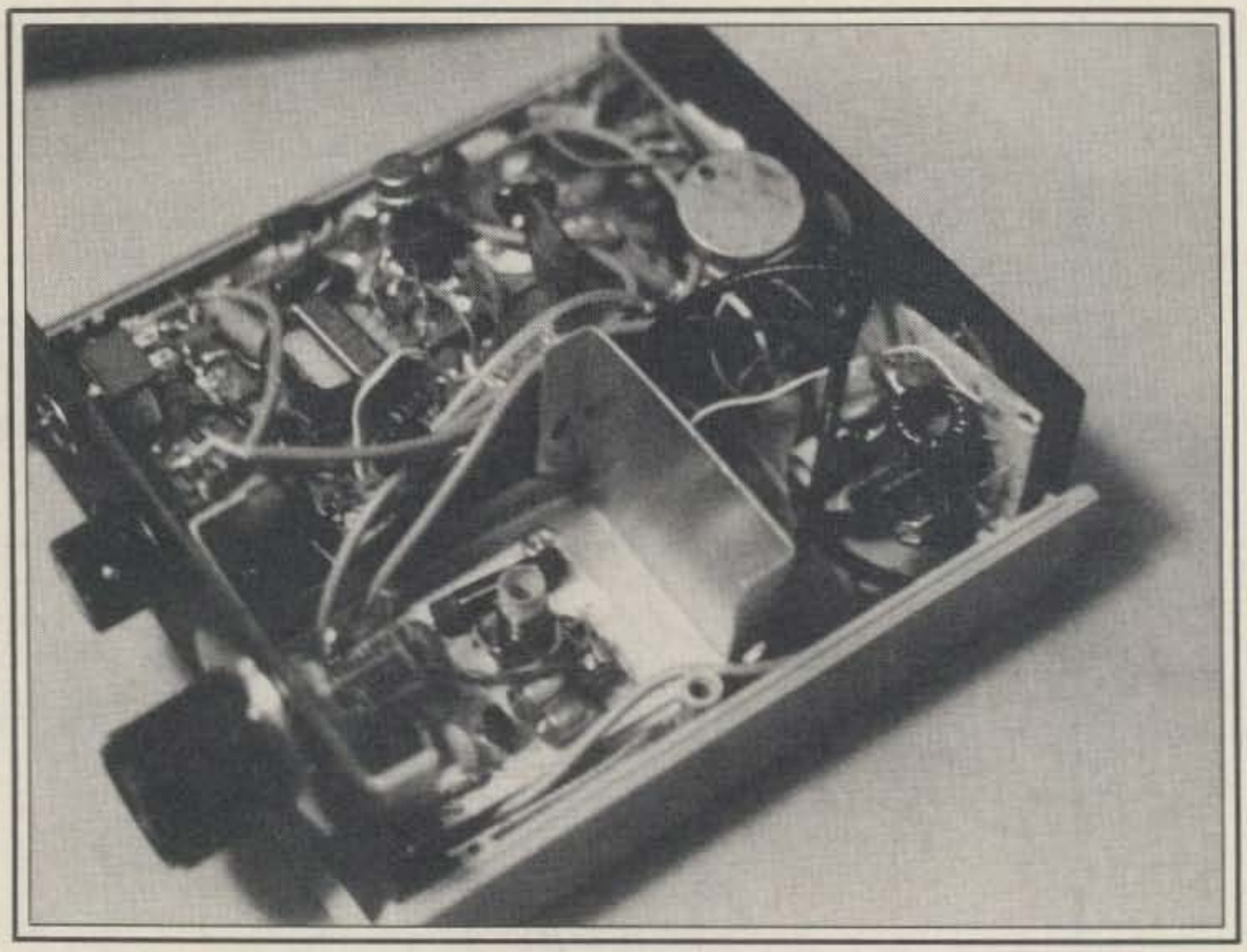
Now we arrive at the easiest achieved and "most agreeable" portion of this mini-transceiver: the audio amplifier. Almost any good circuit design can be employed here; we merely suggest using one with relatively low internal noise and distortion.

The first audio section used with this rig was adopted from a nearby stereo. I merely connected the "front end's" output to the stereo's auxiliary input, and it worked great. Next, a portable tape recorder's mike input was used (good, but signals could only be heard during playback). Unable to secure a high-gain and low-noise IC locally, we headed for a nearby Radio Shack. The resultant acquired audio section was salvaged from an Archer #2771008A mini-amplifier. This small unit sells for $11.95 and includes 2⅛ inch jacks, a 2 inch speaker, a small audio amplifier, a schematic, and a cabinet worthless to this project. The jacks and speaker were removed and fitted into the transceiver's case. Next, the amplifier was direct-wired to an external volume control and power source. A 560 ohm resistor was placed in series with the +V line for dropping 12 volts to 8.5 volts. Follow the mini-amplifier's schematic (after ensuring the unit works smoothly with your receiver's "front end"), and the adaptation should go smoothly. Again, feel free to use any audio section you find appealing for this stage. Physical size is usually the determining factor.

The Transmitter

Rather than taking the necessary time to build this stage "from scratch," we elected to use an MFJ-40T QRP transmitter modified for 30 meter operation. (This unit is also available for $29.95 from MFJ Enterprises, P. O. Box 494, Mississippi State, MS 39762, phone 1-800-647-1800.) This two-stage unit is quite compact and produces up to 5 watts output.

Before 30 meter modifiying the 40T, check its operation on 40 meters and note r.f. output levels (interconnection with the unmodified 40 meter v.f.o. suggested). Once familiar with its operation, proceed as follows. Remove the PC board from its cabinet and trace/label all wires. Disregard the crystal switch completely. The single wire going to the base of Q1, the 13K and the 4700 ohm resistor, will be the v.f.o. input. *Carefully* remove the 270 pF capacitor connected between the collector of Q1, 2N3904, and ground. Replace it with a 68 to 100 pF dipped or silver mica. Next, remove the output tank's 2200 pF and 1500 pF capacitors (located on each side of the T-50-2 toroid). Replace the 2200 pF with the 250 pF capacitor previously removed from Q1's collector, and replace the 1500 pF with a 150 pF dipped or silver mica. Check/tune the modified transmitter by connecting the 30 meter v.f.o., battery pack, wattmeter, and dummy load. A slight readjustment of Q1's slug-tuned coil should provide between 1.5 and 4 watts output. Exact output is determined by the previously mentioned 68/100 and 150 pF capacitors. Their values may be



Top view of the QRP-30 transceiver showing general layout of modules and controls. The top cover is removed from the v.f.o. metal case for clarity. Receiver "front end" is beside v.f.o., and sits atop a Yaesu battery pack. The Radio Shack audio amplifier is mounted behind the "front end" and battery pack (piece of white tape showing). The (MFJ) transmitter section is held in right rear area by double-sided tape. The strange item in the middle rear is a speaker acquired from a pocket pager. A couple of v.f.o. and power cables can be seen "snaked" through the rig's middle. This photo was taken while modifying the output connector (note rear hole) and changing from toggle to diode break-in.

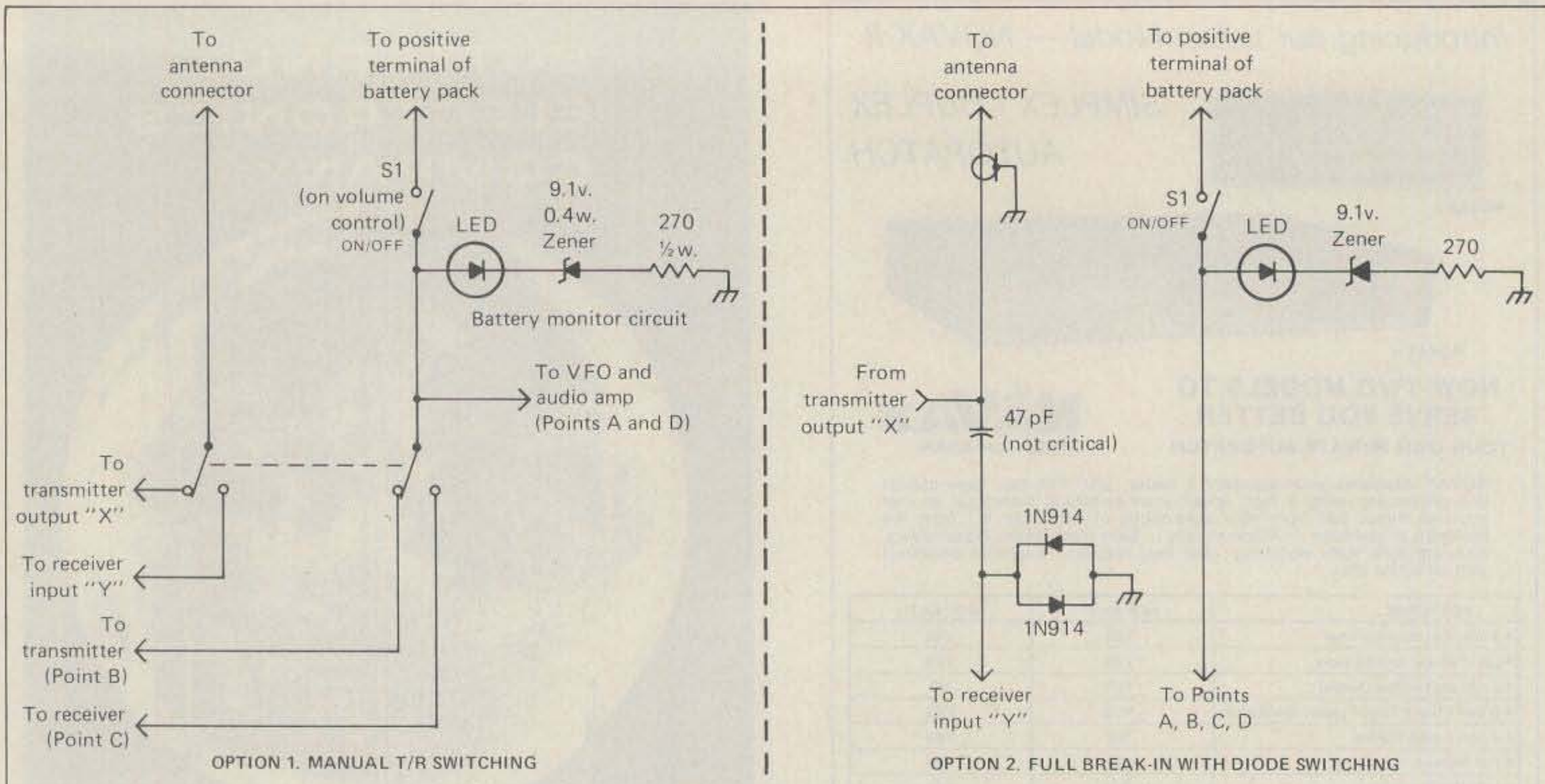


Fig. 3—Optional switching systems and battery monitor for use with the QRP-30. Either arrangement can be used, according to desires. Note in option 1, receiver "front end" may be switched off to prevent earphone noise or left on for sidetone monitoring. A separate sidetone was not used with option 1, thus all four modules were continuously powered.

fluctuated for more output, and more battery current drain. Remember to retune Q1's coil when changing capacitors.

If full break-in operation is included, remember to add the 47 pF capacitor's value to the transmitter's output capacitance (the IN914 diodes effectively connect the coupling capacitor to ground during transmit).

Leaving operating voltage applied to the receiver during transmit produces a raspy but acceptable sidetone monitor (receiver input is grounded by the IN914 diodes). If a separate sidetone monitor is preferred, connect its input to the r.f. choke marked "alternate keying point," and short the original keying point. Note both key connections are above ground. The receiver's "front end" can then be switched off during transmit. In order to conserve space, we cut the transmitter's circuit board to exclude the crystal socket area. If you try this, *be careful!* An accidental slip will "botch" the transmitter section. Practice a few cuts on another PC board first.

All Together Now

As previously mentioned, each stage or module should have been checked to ensure proper 30 meter operation as construction progressed. You should now be ready to mount all modules in the rig's selected cabinet and replace the maze of interconnecting clip leads with small cable (RG174 is suggested). If you use an Archer #270-218 cabinet and Yaesu FNB-2 battery pack as I did, you'll need to slightly bend the v.f.o.'s metal case. Next, heat and form the plastic screw guides slightly with a hot iron to give the final ¼ inch clearance. This will allow the v.f.o. enclosure and battery pack to lie flat on the cabinet's bottom. Secure each with double-sided tape, and then pack cotton around the v.f.o. for added temperature stability. A homebrew battery clamp can be fabricated by properly spacing two screws on a piece of cut perfboard. Secure the clamp with a heavy rubber band. Place the receiver "front end" board atop the battery pack and secure with double-sided tape. Module interconnecting cables can be "snaked" neatly between the v.f.o., battery pack, and "front end" board. After mounting all connectors on the rear panel's middle area, secure the audio amplifier and transmitter to the panel's sides with double-sided tape. Use a small "U"-shaped heat sink on the transmitter's final. If everything is laid out smoothly, the 2 inch speaker will sandwich above open spaces between the modules and their top cover. Otherwise, a 1 inch speaker will be required.

The optional LED and zener diode circuit at the d.c. power switch acts as both a pilot lamp and battery-charge monitor. The LED illuminates brightly with a fully charged pack. When the NiCads approach the "knee" of their discharge curve, the LED becomes very dim. Approximately 10 minutes operating time are left in the NiCads at that point.

The full break-in circuit is also optional, and may be omitted in favor of toggle switching if desired. Both toggle and solid state switching are shown in fig. 3. Select either according to your desires. Before connecting the full break-in circuit, ensure proper transmitter and receiver operation. Measure voltage at the receiver input before connecting the break-in circuit: voltage must be less than 0.6 volt during transmit, otherwise the CA3028A may be damaged. The receiver's "front end" is also shown switched by d.c.: This prevents earphone noise (which makes a fair keying monitor). Use or omit according to needs. The sidetone circuit is also optional.

Conclusion

As one can logically surmise, this is both a flexible project and a project which can continue expanding endlessly. There's still room in the cabinet to add a Curtis 8044 keyer circuit, and use its sidetone output for monitoring during transmit. Varicap tuning of the v.f.o. is also appealing. Dual (or Quad !) control pots would give multi-v.f.o. capabilities.

A second version, including all features of the QRP-30 plus the previously mentioned "extras" (and more), is presently under construction. Projected dimensions are the exact size of a 100 mm cigarette pack (micro-sized parts required). Meanwhile, the original QRP-30 continues working its fair share of DX (over 20 countries thus far). Remember QRP isn't magic. If you can't work DX with a random hank of wire and 100 watts, you can't expect better results with QRP.

Since the QRP-30 receives both c.w. sidebands, use an auxiliary receiver for initially learning how to tune stations for on-frequency responses. Once familiar with this consideration, tuning and operation of the little transceiver is a snap.

CQ WW C.W. 160 DX Contest High-Claimed Scores

BY DON McCLENON*, N4IN

Following are the high-claimed scores as of April, 1983. *Denotes multi-op station.

NP4A	400,504	KK5I	88,182
KV4FZ	262,728	OK1KSO	87,482
GW3YDX*	225,425	KØCL	84,487
EA3VY	221,544	W7RM	83,979
UK2RDX*	201,828	K7OX	79,506
GW3NYY	175,916	K5RR	79,351
WA2SPL	175,628	W1BIH/PJ2	78,500
G3SZA	173,397	N4CXM*	76,890
K5NA	165,015	VE5RA	75,981
GM3IGW	161,720	KØHA	74,118
YT3W	160,642	K8AC	72,450
AA1K	153,244	N4EHJ*	72,288
VE3BMV	148,824	K5RC	71,898
W1MX*	148,509	K1MEM	69,454
N5JJ	141,507	WA8YVR	69,423
AD8I	140,310	AF5M	69,138
VE3ABG	140,184	K7XX	68,322
WA2SRQ	132,588	YU4YA	66,495
LZ1KDP	129,920	N5DD	66,235
KS8S	128,604	KC8P	65,481
K7CA	128,439	W7EV	65,265
W9RE	121,976	UB5ZAL	63,434
GM4GRC*	117,614	W4TMR	63,426
N4SF*	117,096	LA4O	62,594
OZ1LO	117,095	RA9AKM	61,642
UK2PRC*	114,464	KC8JH	61,640
W2IB	114,122	YU2CBM*	60,771
W4DR	108,422	OK3CXF	60,412
OH1MA	108,072	OK3DG	60,186
N4IN	107,010	EA7DMF	59,956
VE3INQ	104,855	VE1AXT	59,466
WØAIH/9	104,348	VE7CRU	59,364
NA5R	104,052	KE9A	59,020
W2FJ	103,320	W4OO	58,433
K6SE	100,386	VE7BS	56,650
ABØI*	97,674	W3ESU/4	56,034
KØFVF/9	94,941	WA4SVO	54,208
N8EA	92,976	KK9A	52,780
KZ5M	92,272	W3BGN	51,072
WØBXR*	91,872	UK5IBM*	50,138
K5TA	91,528		

*3075 Florida Ave., Melbourne, FL 32901

DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATIONS AROUND THE WORLD

"For how many things, which for our own sake we should never do, do we perform for the sake of our friends."
Marcus Tullius Cicero

The DX department is pleased to announce the election of one of the greatest all-around Dxers of our time, Dr. Sanford E. Hutson, K5YY, to the DX Hall of Fame.

San Hutson is a DXer's DXer, who for many years has given unselfishly of his time and resource to making DXing a better hobby for all of us. Not only has he carried out many DXpeditions to rare locations, he has frequently done so at great physical risk, including an operation during the midst of an east African civil war. He has also donated many hours of his time to the preparation and presentation of slides and talks to radio clubs, both large and small, and to amateur radio conventions.

Hutson began his career on the DXpedition trail in 1970 with operations from Swan Island (KS4) and Grand Cayman (ZF1). At that time his call was K5QHS. In 1973 he began a series of consecutive DXpedition operations at 1–2 year intervals with efforts from Juan Fernandez (CE0Z) and Chile (CE3), followed in 1974 by 3 countries in strong demand for the 5-band DXCC award: Dominica (VP2D), Martinique (FM7), and Guadaloupe (FG7). However, it was in 1976 that he established himself as a DXpedition operator of the first magnitude with his trips to French Somaliland (FL8), Mayotte (FH8), and the Comoroes (D6A). These were the first DXpeditions to FH8 and D6A after they received new country status.

San's activity hit a peak in 1978 with his African sweep through the Sudan (ST2), the Southern Sudan (ST0) where he was almost caught in a crossfire, Mauritius (3B8), Mayotte (FH8), the Comoroes (D68), and Zanzibar (5H1).

The new decade found K5YY turning his attention to the Pacific, where he carried out successful operations in 1980 from American Samoa (KS6), Western Samoa (5W1), Niue Island (ZK2), and Tonga Island (A35), after which he returned to the Caribbean in 1982 to give 5-Band DXCC chasers another crack at St. Lucia (J6) and St. Vincent (J8).

San has also served DX through League and DX club activities and as a QSL Manager. He can confirm contacts

P.O. Box 205, Winter Haven, FL 33880

Dr. Sanford E. Hutson, K5YY, was elected to the DX Hall of Fame on January 22, 1983. Photo shows the K5YY home station.

with 7Q7JO, HS1ABO, VP9EN (late 50's), VK9DF—Papua (late 60's), and UM8FZ (late 60's). His League and club service includes the Chairmanship of the ARRL DX Advisory Committee from 1979–83 and Assistant Director of the ARRL Delta Division in 1979–80. He was a charter member of the Arkansas DX Association (ADXA) when it was founded in 1967, and he holds a lifetime membership in that Association. He was recognized as ADXA DXer of the year in 1973 and served as president in 1978. His operating awards include the DXCC Honor Roll (337), 5-Band DXCC, the first DXCC on 160 meters from west of the Mississippi River, WAZ, WAC (including 160 meters), the Virginia Century Club DX Award, the Southeastern DX Club Award, and many certificates in *CQ* and ARRL contests.

Dr. Hutson has served as an honored guest speaker at many banquets and conventions, including W9DXCC in 1975 and 1976, DXPO in 1976, the Dayton DX Forum in 1979, 80, and 81, the Southeastern DX Banquet in 1977, the Visalia/Fresno DX Forum and Speaker in 1978 and 79, the Houston DX Forum in 1979 and 81, Gulfport/Biloxi in 1980 and 81, ARRL Los Angeles in 1980, Charlotte in 1981, the Tristate Ham Convention in 1979 and 81, Dallas AmCom in 1980, and the Arkansas State Convention in 1980. In addition, since 1965 he has given over 50 talks to local ham clubs, civic organizations, schools, and on TV segments.

K5YY was nominated for the DX Hall of Fame by M.L. Young, W5QKR, and Bob Kelley, W0BW. The nomination was endorsed by Jack Gutzeit, W2LZX, former President of the Long Island DX Assocation and National Advertising Manager of *CQ*, and was voted unanimously by the *CQ* DX Awards Advisory Committee.

Congratulations to Dr. Sanford E. Hutson, K5YY, DX Hall of Fame.

The DX Hall of Fame

Gus M. Browning, W4BPD
Nov. 1, 1967
John M. Cummings, W2CTN
March 23, 1968
Steward S. Perry, W1BB
Aug. 16, 1968
Richard C. Spenceley, KV4AA
March 1, 1969
Danny Weil, VP2VB
Sept. 15, 1969
H. Dale Strieter, W4DQS
May 23, 1970
Stuart Meyer, W2GHK
Oct. 31, 1970
Martin Laine, OH2BH
Jan. 22, 1972
Ted Thorpe, ZL2AWJ and
Chuck Swain, K7LMU
Aug. 6, 1972
C.J. Joe Hiller, W4OPM
March 30, 1973
Ernst Krenkel, RAEM
April 14, 1974
Frank Anzalone, W1WY
June 19, 1976
Lloyd Colvin, W6KG, and
Iris Colvin, W6QL
Nov. 12, 1976
Geoff Watts, Editor
& Publisher
June 11, 1977
Don C. Wallace, W6AM
Sept. 23, 1978
Joe Arcure, Jr., W3HNK
Dec. 1, 1979
Hugh Cassidy, WA6AUD
April 26, 1980
Erik A. Sjolund, SM0AGD
April 25, 1981
Franz Langner, DJ9ZB
May 9, 1982
Dr. Sanford E. Hutson, K5YY
Jan. 22, 1983

De Extra

Thanks to Jim Hadlock, K7WA, President of the Western Washington DX Club, Inc. for the following which first appeared in *Totem Tabloid*.

One of the more aggravating things I've heard recently goes something like this: "The 10 MHz band? Why bother! Nothing you work there counts anyway." Of course this refers to the decision by the ARRL, *CQ*, and other worldwide groups to keep the newly-opened 30 MHz band free from the more competitive aspects of amateur radio such as contesting and awards.

I hope that the spirit of DXing is bigger than just the pursuit of DXCC "counters." Otherwise, imagine the ultimate DXer. He or she would set up a super station with tall towers and huge antennas, then make the DXCC Honor Roll with just 312 QSO's in 312 countries and then disman-

The WPX Program

Mixed

1036	EA3NJ	1041	OK3ZAS
1037	W4WSZ	1042	W6NLG
1038	NE6I	1043	WB6JMS
1039	AC6H	1044	F8BO
1040	N3ED	1045	EA3CNY

S.S.B.

1572	EA5BCX	1576	W6NLG
1573	KA8BUM	1577	JE2SPW
1574	N3ED	1578	KA3CRC
1575	SM3BSF	1579	EA3CNY

C.W.

2194	OH3YR	2199	OK1DCU
2195	N3ED	2200	OZ1HET
2196	K9WZ	2201	SK3BG
2197	VE7DRI	2202	EA3CNY
2198	KA3CRC		

WPNX

213	KA1HCQ	214	KA9JKK

Award of Excellence: N3ED

Endorsements

Mixed: 450 W4WSZ, N3ED, OK3ZAS, WB6JMS, F8BO, EA3CNY. 500 W4WSZ N3ED, F8BO, EA3CNY. 550 N3ED, KA3CRC, F8BO, EA4CNY. 600 N3ED, F8BO, EA3CNY. 650 KCØUJ, N3ED, KO2Q, F8BO, WB4FOT, EA3CNY. 700 KCØUJ, N3ED, EA3CNY. 750 N3ED, EA3CNY. 750 N3ED, KCØUJ, DL1AM. 800 N3ED, W8UMR, KCØUJ, DL1AM. 850 N3ED, JA2KVD, W8UMR, KCØUJ, DL1AM. 900 CT1LN, I5AFC, N3ED, W8UMR, DL1AM. 950 N3ED, W8UMR. 1000 W8UMR. 1050 W8UMR. 1100 W8UMR. 1150 W8UMR. 1200 SM3EVR. 1250 SM3EVR.

S.S.B.: 350 UP2PAD, WB7VHA, N3ED, W6NLG, JE1GBI, KA3CRC, EA6GP, EA3CNY. 400 UP2PAD, WB7VHA, N3ED, KKØL, W6NLG, KA3CRC, EA6GP. 450 UP2PAD, I2TZK, N3ED, KO9Q, EA6GP. 500 UP2PAD, I2TZK, N3ED, EA6GP. 550 UP2PAD, N3ED, EA6GP. 600 KC9DS, N3ED. 650 N3ED. 700 K5GOE, N3ED, KC8YM. 750 N3ED. 800 IØPSB, XE1XF. 850 I5AFC. 1050 I2JSB. 1100 I2JSB. 1150 I2JSB.

C.W.: 350 OH3YR, NE6I, AC6H, N3ED, OZ6KS, K6UXO, KA3CRC, EA3CNY. 400 OH3YR, N3ED, KA3CRC, K2POF. 450 OH3YR, N3ED, WA6VJP, DL3GK. 500 N3ED, DL3GK. 550 N3ED, WØJIE, JA5SIX. 600 JA7ARM, N3ED. 650 N3ED. 700 N3ED. 750 N3ED. 800 K9UQN, K5GOE, N3ED. 850 N6UH. 950 SM6AYM. 1500 G2GM.

10 meters: EA3CNY, UP2PAD, N3ED, K2POF, KK5P, WØJIE.
15 meters: AC6H, N3ED, EA3CNY.
20 meters: N3ED, OZ5EDR, EA3CNY.
40 meters: N3ED, EA3CNY.
80 meters: N3ED, OK1DCU, EA3CNY.
160 meters: EA3CNY.

Asia: UP2PAD, W4ZYQ, I2TZK, N3ED.
Africa: KA3A, N3ED.
Europe: EA3CNY, UP2PAD, W4WSB, I2TZK, N3ED.
So. America: N3ED.
No. America: AC6H, N3ED, EA3CNY.
Oceania: N3ED, NC8YM.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

tle the whole thing and take up another hobby. Of course none of us are like that, but I do hear things like "I never work JA's" or "I never get on except to work a new one" from self-styled DXers.

What has happened to the thrill of communicating with another *person* across the miles, oceans, or continents? Can you remember the excitement of your first DX QSO? I still can, and it was nearly 20 years ago! If amateur radio is going to continue to make its "unique contribution to international good will," it's going to take more than "5NN PSE QSL" contacts to do it. Work some QRP JA's, practice your Spanish with an LU, discuss gardening with a Y22 or a ZL, and try out the new 10 MHz band. Make some new DX friends—that's what DXing is *really* all about.

Leena Laine, OH2BE, XYL of Martti, OH2BH, at the operating position.

WPX News

WPX Manager Norm Koch, K6ZDL, has undertaken a revision of the prefix list used as the basis for the WPX Honor Roll. His objective is to eliminate non-current prefixes, those no longer in use, so that newer DXers will have the same opportunity to move up the Honor Roll as the old timers. It would be unfair to the new prefix chaser to count out-of-date prefixes which can no longer be heard on the bands. For example, two prefixes dropped recently are DM, the former East German prefix, and ZE, the old Rhodesian prefix.

One of the criteria Norm is using is the Geoff Watts Country/Prefix List. This is a well-documented reference which is useful in any DXer's ham shack. Latitude will be accorded those special prefixes which turn up in the *CQ* WPX C.W. and S.S.B. Contests.

A list of prefixes to be deleted from the Honor Roll list will be published in a future issue of *CQ*. If you have any suggestions put them on a postcard to K6ZDL at P.O. Box 1351, Torrance, CA 90505. Norm's schedule may not allow him to correspond with you, but he will consider your opinions.

Some interesting prefixes on this year include:

CQ, CR, CS, CU—Portugal, CT1, and dependencies CT2 and CT3 used the prefixes CQ, CQ2, and CQ3 during the first 3 months of 1983, after which they shifted to CR1, CR2, and CR3 during April, May, and June. From July through September they will use CS1, CS2, and CS3, and then finish the year CU1, CU2, and CU3 during October, November, and December.

EM4—EM4LAM was QRV on most bands this spring. QSL to the UA4 bureau.

T42—T42AMC was a special call used in Cuba for World Communication Year.

T7—In April, the official 9A, and unofficial M1, prefixes for San Marino were replaced by T7. M1B is now T77B and M1C is T77C.

TO—This is the World Communication Year prefix for French stations. QSLs go to the corresponding F calls (for example, TO6EYS via F6EYS).

5J, 5K, 5L—Columbian stations are using these special prefixes to celebrate World Communication Year. 5K2AA is HK2AA, etc. HKØLR on San Andres is using 5LØLR.

Here and There

Congratulations to outgoing QRX DX Editor Bill Kennamer, K5FUV, for his many contributions to DX and best wishes to him in his future endeavors. Best of luck to Bob Winn, W5KNE, the new Editor.

CQ Canadian checkpoint, Stan Parsons, VE1RY, advises that his address is incorrect in the *Callbook*. Mail to Stan

The WAZ Program

10 Meter Phone

237	N5ACX	239	W2LOG
238	KB9US		

15 Meter Phone

157	JH2KDN	158	KM1D

20 Meter Phone

441	N4RR	444	VE3EFX
442	GM4KHE	445	K3DH
443	K4KUZ	446	KM1D

15 Meter C.W.

86	JA2DXD	87	JA7HMZ

20 Meter C.W.

186	K4KUZ	188	JA5SIX
187	W9NUD	189	WD9AHJ

40 Meter C.W.

40	N4RR		

All Band WAZ

S.S.B.

2614	KB1BE	2628	JA8ARA
2615	W6DN	2629	JA7DOT
2616	K4KUZ	2630	WA3KSA
2617	OZ1DYC	2631	KØLD
2618	KBØNL	2632	PA3AWQ
2619	DJ6GK	2633	WA3YGQ
2620	DJ1HN	2634	DK8JS
2621	DJ4YH	2635	HB9RG
2622	DJ6JB	2636	HB9CIQ
2623	JF2RT	2637	HB9CIR
2624	JA3JAZ	2638	KB8BN
2625	G4JCZ	2639	KB7HB
2626	KB6WT	2640	IØCHF
2627	KB3OM		

C.W. and Phone

5529	WØOGJ	5537	WØCON
5530	KØHQW	5538	WØBF
5531	SP7AW	5539	PY2FK
5532	SP6EQZ	5540	EA3NJ
5533	YU7DX	5541	NE6I
5534	K8AC	5542	DL9HP
5535	DF3FR	5543	YU3TFS
5536	LB1GB		

All Phone

582	DJ6DW	583	DL3NE

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

When he is not chasing CQ zones from his car, Phillip Greentree, VK2DPN, is sometimes found at his home station. Phil has four individual WAZ award certificates for mobile operation. These are C.W. Phone WAZ, 10 meter single-band phone WAZ, 15 meter single-band phone WAZ, and 20 meter single-band phone WAZ. He is now working on 40 meters. Until someone can prove otherwise, VK2DPN is our candidate for world's champion mobile DXer.

should be directed to P.O. Box 640, Kingston, N.S., Canada B0P 1RO.

Mike, UW0MF, reports that two zone 18 stations, UA0UCY and UA0AMM, are actively looking for U.S. stations on 80 meters. During the winter months they were trying to be on 3647 kHz s.s.b. daily, 7 days per week, at 1200 UTC listening for the U.S. between 3795 and 3800 kHz.

In earlier issues we have listed the 1983 officers for some of the DX clubs. The following is an update:

Kansas DX Assocation—Bill Freeland, AC0A, President; Allen Fowler, W0UQD, Vice President; John Shoultys, WD0BNC, Secretary-Treasurer; and Dean Lewis, WA0TJ, Activities and Program Director. The Kansas DX Association meets the second Wednesday of each month.

Frazer Valley DX Club—Al Johnson, W7EKM, President; Dick Moen, N7RO, Vice President; Bob Johnson, WA7ZWG, Secretary; Earl Dery, VE7IN, Treasurer.

Connecticut DX Association—Ron Richards, WB1EAZ, President; Paul Shafer, KB1BE, Vice President and Tom Le Clerc, WB1CBY, Secretary-Treasurer. This group meets at 7:30 p.m. on the third Wednesday of each month at the ARRL headquarters building in Newington, CT. for further information, write to P.O. Box 181, Columbia, CT 06237.

Contest Association of South Texas—Ken Quin, K5TSQ, President; Steve Muenich, NA5C, Vice President; and Rene Correa, K5JX, Secretary Treasurer. Correspondence should go to K5JX at 1013 Valley View Drive, Weslaco, TX 78596.

Central Arizona DX Association—Mike Fulcher, KC7V, President; Mike Cartright, WB7FDQ, Vice President; and Ron Freeman, KY7F, Treasurer.

The Bicentennial of the first flight of a hot-air balloon will be marked this month by the five stations in Annonay, France. All during June they will be signing the special HW prefix to mark the first hot-air balloon flight by Joseph and Etienne de Montgolfier on June 4, 1783.

Calls to be heard will be: HW3BZ by F3BZ, HW3CO by F3CO, HW5MO by F5MO, HW6ADV by F6ADV, and HW6BFI by F6BFI.

QSL to the individual stations. You can also QSL via the REF-2, square Trudaine, 75009 Paris or via URC, BP 7308, 75362 Paris Cedex 08. Jean-Jacques Roche, F6BFI, is looking for a lot of action during the period of this special prefix. Look for them on most bands.

World's Top Mobile DXer

CQ's candidate for world's top mobile DXer is Philip Greentree, VK2DPN. Phil has earned no fewer than four WAZ certificates operating from his rolling hamshack. These include 10 meter single-band phone WAZ #197 dated January 1982, 15 meter single-band phone WAZ #152 dated December 1982, 20 meter single-band phone WAZ #430 dated December 1982, and also a regular c.w.—phone WAZ.

Phil writes as follows: "At one stage I was convinced I would not complete 21 MHz after trying for 3 years to find Zone 2. Then as they say, patience is a virtue, but in my case it was almost the ultimate frustration. Zone 2 is the ultimate challenge for VK's on 10 and 15 meters, so you can imagine my delight when the boys on the Certificate Hunters Club Net lined up VO2CW for me. I feel I owe the CHC/IARS group a big debt, as they went out of their way to find Rick for me so I could complete 15 meter WAZ mobile. VO2CW also made a schedule for 20 meters on the same day and took care of that problem for me as well. The ridiculous thing was having had Zone 2 confirmed on 40 meter mobile for over a year before I ever heard any stations from that area on 20 and 15.

"I now have 146 zones *confirmed* toward 5-Band WAZ mobile, so if all goes well, within the next few months I will be sending 150 cards to you to claim the world's first 150 zone plateau mobile.

"I have my Morse key out and am getting in some practice, since the remaining 19 zones on 40 meters will not be all on s.s.b. It is getting hard, believe me! It will take several years, but I think I can complete 40 meter WAZ mobile. But I have no such illusions about 80 meters. The first ham to work 80 meter WAZ mobile should receive a lifetime supply of petroleum for the effort, HI HI!

"Am now on 235 countries confirmed mobile so that tally is also creeping up.

"Best wishes, and thanks to the *CQ* staff for WAZ, an award that offers a real challenge."

The first U.S. DXer to earn single band WAZ mobile is Glenn, W6KZL, who was awarded 20 meter single band WAZ #428, endorsed mobile.

5 Band WAZ

Standings as of February 1, 1983

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. W0SD, Edward Gray (U.S.A.)
13. K0ZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)
15. OK3TCA, E. Melcer (Czech.)
16. K6SSS, Fred Capossela (U.S.A.)
17. ZL3GQ, Peter W. Watson (New Zealand)
18. OK3CGP, Stefan Melcer (Czech.)
19. SM0AJU, Leif Lundin (Sweden)
20. OZ3PZ, Preben Thomsen (Denmark)
21. I3MAU, Reno Mauri (Italy)
22. I2ZGC, Gianni Zillio (Italy)
23. 4Z4DX, Dov Gavish (Israel)
24. N4KE, Ron Blake (U.S.A.)
25. K5UR, Rick Roderick (U.S.A.)
26. K9AJ, Michael McGirr (U.S.A.)
27. SM3EVR, Tord E. Julander (Sweden)
28. LA5YJ, Bjorn Hugo Ark (Norway)
29. DL3RK, Walter Geyrhalter (W. Germany)
30. N4WJ, Frank McCormick (U.S.A.)
31. G3MCS, W.R. Hawthorne (England)
32. SM5AQD, Hakan "Hawk" Eriksson (Sweden)
33. W0MLY, George McKercher (U.S.A.)
34. I0RIZ, Gianni Rizzi (Italy)
35. ON5NT, Ghislain Penny (Belgium)
36. OH6JW, Antti Kiviuoma (Finland)
37. OK1AWZ, Milan Dlabac (Czech.)
38. IV3PRK, Pierluigi "Luis" Mansutti (Italy)
39. DJ6RX, Klaus Heintzenberg (W. Germany)
40. OH3YI, Ossi Lehvas (Finland)
41. I4RYC, Relli Claudio (Italy)
42. ZL1BIL, Mike Edwards (New Zealand)
43. I4EAT, Fausto Minardi (Italy)
44. ZL1BQD, R.J. Runciman (New Zealand)
45. TG9NX, Francisco Capuano (Guatemala)
46. XE1J, Joe Levy (Mexico)
47. F5VU, Jean Brunner (France)
48. W3AP, Norwood Lowry (U.S.A.)
49. YO3AC, Andrei Giurgea (Romania)
50. K3TW, Tom Warren (U.S.A.)
51. XE1OX, Elicio Munoz (Mexico)
52. VE7IG, Reg Beck (Canada)
53. OK1ADM, Vaclav Vsetecka (Czech.)
54. CT1FL, Carlos Viana (Portugal)
55. WA1AER, Raymond Sylvester (U.S.A.)

The top contenders for 5 Band WAZ:

1. JA3EMU, 199
2. N4WW, 199
3. W1NG, 199
4. N4RR, 199
5. W8UVZ, 198
6. EA8QL, 197
7. K1MEN, 197
8. K7UR, 196
9. K4CEB, 196
10. F6DZU, 196

200 Stations have attained the 150 zone level

Acknowledgements

The DX columns of monthly amateur magazines are written several weeks in advance and cannot possibly carry the latest happenings in the DX world. Every active DXer should read an up-to-date DX bulletin.

DX writers also rely on the bulletins, and we would like to thank the following for help in preparing this column. Call-signs of the editors are shown in parentheses: *The Long Island DX Bulletin* (W2IYX), The Northern California DX Club's *The DXer* (N6BLN)—for NCDXC members only, the *Southern California DX Club Bulletin* (W6YQ), the *W6GO/K6HHD QSL Manager List, DX News Sheet* (G3XTT & G3ZAY), *Balanced Modulator* (W4PTT & N4UF), DX-NL (DL3RK), *QRZ DX* (W5KNE), *DXPRESS* (PA0GAM), *DX'ers Magazine* (W4BPD), and Totem Tabloid (K7ZR).

From the Mailbag

de Lee, N7DF: "After reading your article entitled "Hey, The DX Stations Don't Like Duplicates Either" in the March *CQ*, I rushed to the typewriter to jot off some comments.

"I have developed a standard policy when in the hunt-and-pounce mode. I listen for one exchange go-around; if the DX station does not identify, I work him and ask for his call. I consider this to be only fair, as I don't have the time to waste sitting on his frequency waiting for him to identify at his convenience, as I can usually keep a 2 or 3 QSO per minute rate going even while tuning and calling.

"It does not take that long to give your call, no matter how long, if you use careful procedure, and the lessened number of duplicates far more than compensates for the reduced rate of QSO's. In my own operating I keep an accurate, running dupe sheet and do not log any call that I find to be a dupe when the QSO is made. After the contest I completely re-dupe the logs and strike out any dupes that might turn up. This is usually less than one-half of one percent in major contests. In contests like the *CQ* WPX, the sheer number of QSO's makes it impossible to accurately dupe while running because of the high rates, 6–8 contacts per minute, that are usually maintained during peak openings; so it is during these periods that the few dupes missed are turned up.

"Another big problem with many DX

CQ DX Awards Program

S.S.B.

1226	WB3KPS	1230	KD6LY
1227	WA3HUP	1231	N4DRC
1228	WB3CQN	1232	N6VO
1229	W2GVX	1233	K0HQW

C.W.

571	WA3HUP	575	F6FSQ
572	W2GVX	576	SV1LV
573	W6DN	577	AC5K
574	G3MYO		

S.S.B. Endorsements

310	W0SFU/311	275	WB1EAZ/275
300	WA3HUP/301	275	VE7BSM/275
275	W6DN/298	250	K4LR/250
275	WA9PWN/295	200	K0HQW/212
275	K4CXY/289	200	N6VO/208
275	WD0BNC/289	QRPp	N4MM
275	WB3CQN/275	28 MHz	N4DRC

C.W. Endorsements

300	AA6AA/301	150	WA7NXL/153
310	W8KPL/313	150	F6FSQ/152
200	W8SYR/200		

The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager. Effective with the next report, all totals will be adjusted to reflect the deletion of Serrana Bank, Bajo Nuevo and the Saudi Arabia/Iraq Neutral Zone. Total countries will be 315.

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

2400	YU2DX	1686	K5UR	1210	4Z4DX	987	EA9IE	791	W6YMH
2311	F9RM	1609	N2AC	1204	DA2DC	975	KC8CC	791	WD9IIC
2263	YU4HA	1604	N9AF	1189	W8RSW	958	YU2CBK	783	JA9FAI
2169	K6JG	1538	YU7AW	1189	JH1VRQ	952	WB8ZRL	768	EA1JO
2114	W2NC	1488	SM7TV	1180	K8LJG	937	N4IB	757	AI8M
2100	K2VV	1481	W8CNL	1135	N6JM	892	KA3A	747	VE2FOU
2071	K6XP	1353	I6SF	1121	W7CB	848	KO8T	732	N2AIF
2075	VE3GCO	1347	WØSFU	1108	DJ2UU	846	YU1DZ	722	K7CU
1924	N4MM	1339	KF20	1049	KL7AF	822	G3ZRH	718	W6OUL
1866	YU7BCD	1287	SM3EVR	1026	N3ED	817	N8BJO	697	KC8JH
1819	W4BQY	1281	K9BG	1013	W8ILC	814	G4FAM	658	K8HF
1726	N4NO	1248	IN3ANE	1011	I2MQP	808	WØJIE	656	K9TI
1703	W7LLC	1228	K6ZDL	995	LA7JO	800	YU2CQ	621	OE1KJW
1690	PAØSNG								
1690	N6JV								

S.S.B.

2227	F9RM	1530	HB9AAA	1247	N4NO	971	W6YMV	750	N4IB
2024	IØZV	1510	YU7BCD	1175	CT1UA	933	KC8CC	732	VK6YL
1970	IØAMU	1446	PAØSNG	1107	KF2O	925	N2AC	698	W3GXK
1888	W9DWQ	1426	K5UR	1101	PY3BXW	922	TG4NX	665	DK4AP
1871	K6JG	1416	OZ5EV	1101	W4BQY	874	WB6GFJ	649	OE8MOK
1838	K6XP	1399	IØMBX	1098	F2MO	849	KL7AF	646	KB2DE
1815	K2POA	1391	WØYDB	1033	KC4OV	850	WA2FKF	638	I1POR
1770	K2VV	1391	W9DWQ	1032	N6FX	829	WB8ZRL	608	JH5FQO
1721	N4MM	1300	WD8MGQ	1013	W2NC	808	K8LJG	607	KC8YM
1706	ZL3NS	1294	YU7AW	1009	I2MQP	805	W8ILC	604	W8RSW
1687	N6CW	1289	N2SS	1003	WA4OIB	796	AC2J	603	KBØC
1586	I1ZSO	1271	I6ZJC	997	ZP5RS	768	W6LQC	600	IØSGF
1568	I8YRK	1253	WA4QMQ	995	G4CHP	764	N3ED		
1537	I8KDB								

C.W.

1936	W8RSW	1516	K6XP	1344	WA1JMP	1108	I6SF	743	DJ1YH
1888	W2NC	1509	N4NO	1342	N4MM	1105	N6FX	719	KA3A
1763	W8KPL	1508	YU7BCD	1316	VK4SS	1101	YU3NP	656	VE2FOU
1656	ON4QX	1486	W9DWQ	1314	K5UR	1065	K6ZDL	646	AG5C
1652	N6JV	1432	W3ARK	1295	W9FD	925	N4YB	644	EA1JO
1626	WA2HZR	1432	N2AC	1245	VO1AW	858	K8LJG	616	W8ILC
1609	K6JG	1410	G2GM	1195	VE7CNE	799	KL7AF	612	G4FAM
1575	DL1QT	1401	W4BQY	1182	YU7AW	798	KF2O	605	N2AIF

stations, especially on 80 and 160, is that they only give the call of the station they are answering at the beginning of the report. This usually means the call is lost in the QRM from stations tailing the pileup."

de Corky, W8EAO: "Your article in the March '83 issue entitled "DX and Contests Do Mix" is very true. In the recent ARRL DX Test, I worked 4 different countries out of 5 QSO's on 20 meters, and 16 different countries out of 22 QSO's on 15 meters. I picked up 3 new countries: Antarctica on 20, Antigua on 15, and Turks and Caicos on both 15 and 20. That makes about one new country for every 10 QSO's—not a bad average—and I had a lot of fun to boot.

"I operate QRP, so all of the above was with an HW-8 running one watt to either a homebrew vertical fastened to the side of the garage on 20, or a homebrew Yagi at 25 feet on 15. Since 1978 I have worked 147 countries operating QRP, mostly with converted CB verticals for antennas, as I only put up the Yagi in November 1982, and 75–80% of my countries were worked during contests.

"Yes, DX and contests do mix, as long as you add in a little patience."

5B WAZ No. 31

Bill Hawthorne, G3MCS, of Aylesbury in Buckinghamshire, England, won the 5B WAZ #31, and at the same time collected the individual band awards for WAZ.

Bill Hawthorne, G3MCS, of Aylesbury in Buckinghamshire is the holder of 5B WAZ No. 31. Long active in DX and awards efforts, Bill has been president of the Chiltern DX Club.

An engineer, Bill is 51 years old and was first licensed back in 1959. While he primarily works s.s.b., he also works c.w. and has worked a c.w. DXCC. During the accumulation of the necessary QSL's, he used an ICOM 701, this since replaced by a TS-830S with v.f.o. and a Drake L4B.

Bill holds the English Class "A" license, and is married with three children. He also holds the 5B DXCC, gained the RSGB "Supreme Awards" No. 1 back in 1970 and has a passel of v.h.f./u.h.f./h.f. awards from the RSGB and other worldwide activities.

The antenna is a TH3Mk3 with a sloping dipole with GP for 40 meters and a quarter-wave sloper on 80, this with an extensive buried earth system.

As has been the case in others working on 5B WAZ, 80 meters was the tough one to fill out. Some who did not make it during the sunspot cycle now declining will live in frustration until the next cycle slowly inches up the sunspot count. No other member in the family has displayed interest in amateur radio.

Bill is president of the Chiltern DX Club, this having a few more than 20 members. They also operate a 2 meter DX alert net on 144.525 MHz should anyone be interested in listening in. Bill generally avoids the DX contests, finding the DX generally on his own, but also sometimes catching an alert on the 2 meter box.

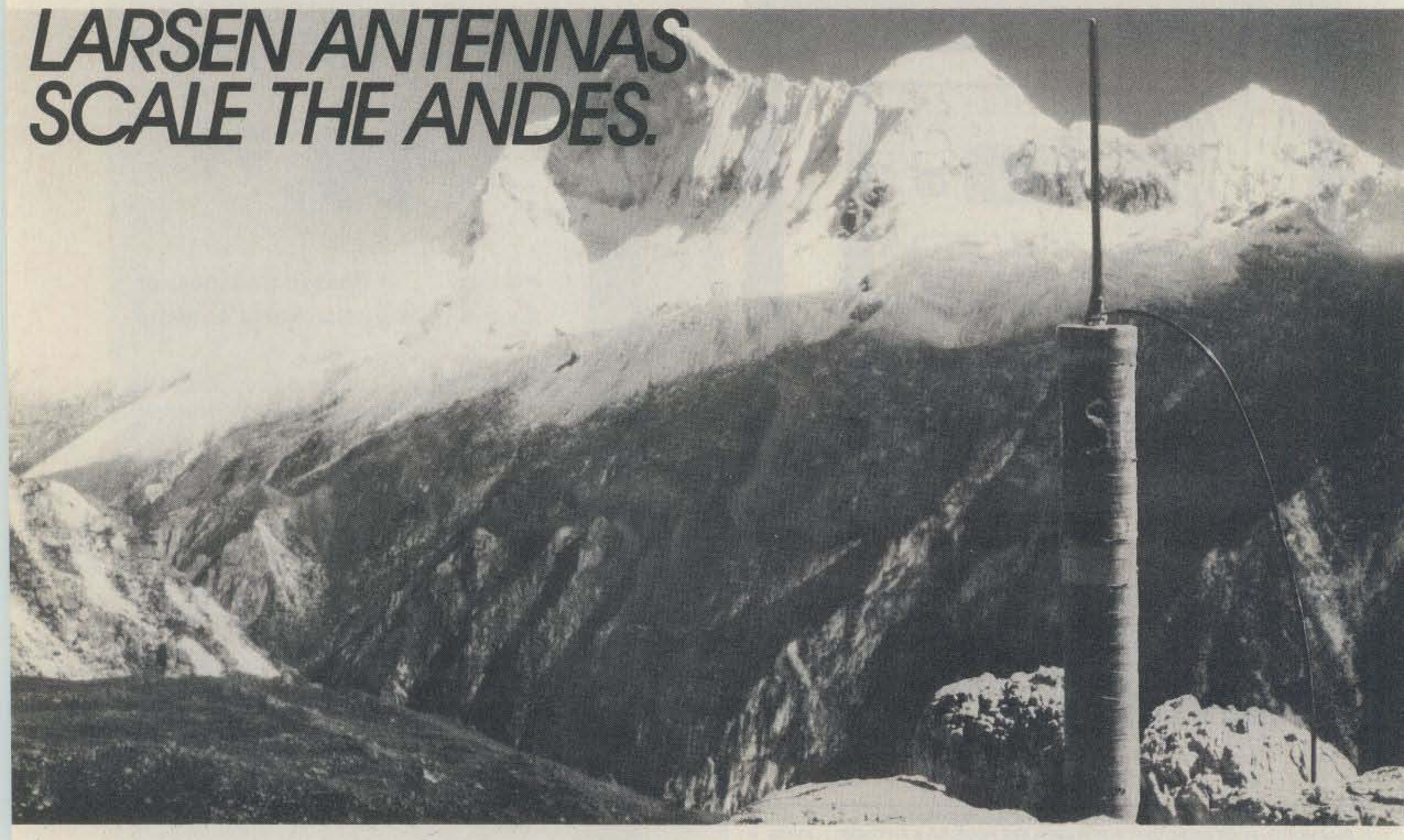
Take a look at the station. Sometimes we have seen those with racks filling the walls and looking like clones of broadcast stations. Many DXers eventually learn that success may not come from overwhelming power alone. Some learn some of the finer points of successful DXing. Some also learn to listen. And a lot of this pays off eventually. It is always encouraging to note another 5B WAZ who shows evidence of being a skilled and canny DXer. Certainly G3MCS deserves the award.

QSL Information

A22DC to VE3LZF
A71BH & A71BJ to G4HNP
BV2A and BV2B to c/o P.O. Box 30547, Taipei, Taiwan
BY1PK, BY1QH and BY8AA to P.O. Box 6106, Beijing, Peoples Republic of China
C31YF to G4DYO
CN8CX to K4CEB
CR9AC to DJØFX
CT2DL to KE4OC, Frank Williams, 106 Del Los Angeles, Milton, FL 32570
DF8MP/XZ to DL2KAO
EK9C/8(Zone 18) to KA6V, Box 5859, Oxnard, CA 93031
EL6A to K4SE
FB6ZQ & FB6ZR (Amsterdam Island) to F6GXB
FB8XAB (Kerguelen Island) to F6GXB
FY7YE to W5JLU
G5ACI/AA (Abu Ail) to YASME Foundation, Box 2025, Castro Valley, CA 94546
HZ1TC to OE3YLK
KA1UA/J88 to WA1KAT
KC4AAA to K9AUB
KC6SZ (Mar. 16-22, 1983) to JA6BSM
KC7UU/5N5 to K6EDV
KG4CD to Box 585, FBPO, Norfolk, VA 23593
KX6JM to Box 673, APO San Francisco, CA 96555
LU1ZA, LU1ZB, LU1ZC & LU1ZR to LU2CN
OD5FB to WA2QAU
OD5LX to SMØDJZ
PY0ZSD, PY0ZSE, PY0ZSF, PY0ZSG, & PY0ZSH—QSL c.w. contacts to DA2ZH and s.s.b. contacts to DK9KX
TJ1GH to DL1HH
TR8JD to F6AJA
TT8AC to N4NX
TT8AD to HB9CLA
V2AAW to WA4ICB
V5HE to DL1JW
VE2DVG/YK to VE2FEX
VK8AQU to KØJW
VK9ZA to VK6YL
VK0JS and VK0YL to Box 90, Norfolk Island, 2899 Australia
VK0RC, VK0RE and VK0AS to VK3DJV
VP2EC to N5AU
VP5FUX to KB9AW
VP5XX to WB9TIV
VP8ADD & VP8ADE (South Orkney Island) to KØJW
Y83ANT to Y44YK, P.O. Box 176, 6100 Meiningen, G.D.R.
YI1BGD to Scientific Center, P.O. Box 5864, Baghdad, Iraq
YS1LSR to Box 1493, San Salvador, El Salvador
ZD8JGN to W9CN
ZD9BV to W4FRU
ZF2FK to K9QVB
ZF2FL to Ham Radio Outlet, 2620 W. La Palma, Anaheim, CA 92801
ZK2JK to KB6JK
ZL4OY (Campbell Island) & ZL4OY/C (Chatham Island) to VK3DWJ
3V8PS to Box 470, Tunis, Tunisia
4U1UN to W2MZV
4Z4AB to K3STM
5L0LR to HK3SO
5R8AL to WA4VDE
5W1DM & 5W5DM to KB6JK
5W1DQ to Graham Fuller, General Delivery, Apia, Western Samoa
5X5FS to EI9G
5Z4JN to JA8CDT
5Z4MN to VE7DLM
5Z4NN to JI1VLV
6W8AR to DJ3AS
6W8DY to VE4SK
7P8CL to SM5GOJ
8Q6JA & 8Q7JA to JA8MWU
8Q7AB to K5BO
9K2BE to G4GIR
9K2DX to N6TR
9N1MM to N7EB
9X5SL to DL8DF

73, John, K4IIF

LARSEN ANTENNAS SCALE THE ANDES.



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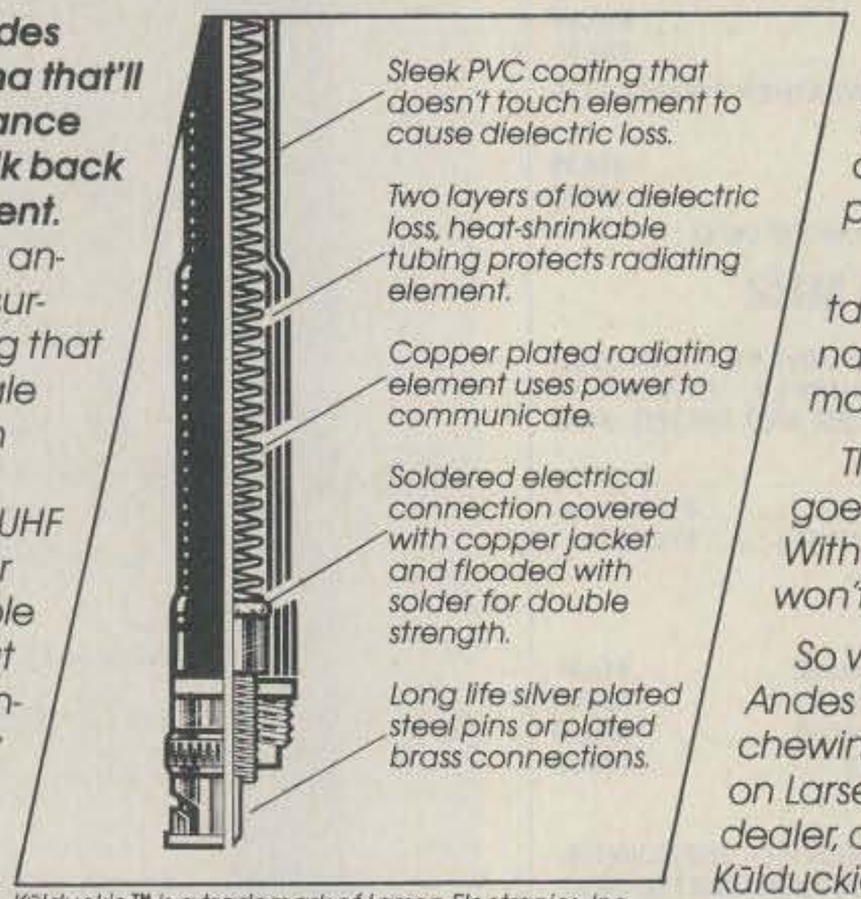

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Vancouver B.C., V5T 2C4 Phone 604-872-8517

Here's another use to which you can put your scope. It's also a good reason for having one around the shack.

How To Check The Modulation On Converted CB Rigs

BY CHARLES E. COHN*, KB9XV

If you're operating a converted CB rig on a.m., here's an easy way to check the modulation. All you need is an oscilloscope. It need not have wideband frequency response, but it should be d.c. coupled. Connect the scope to the voltage supply point for the final amplifier as shown in fig. 1. Connect a dummy load to the antenna connector, press the mike button, and speak into the microphone. You will see a display as in fig. 2.

With no modulation, the voltage at the test point will be about at the supply voltage. When you speak into the microphone, the voltage will swing above and below that level. If the swing is from zero to twice the quiescent level, you have 100% modulation.

If the voltage swings below zero, then you are overmodulating. I have never seen that happen; the sets are apparently designed to prevent it; either through a limited modulator swing or by means of a diode inserted as shown in fig. 1 to keep the voltage from going negative.

If the audio gain is excessive, you will see a great deal of clipping in the speech waveform. This produces splatter and ruins intelligibility. If there is a modulation pot (which normally controls the amount of audio fed back to the automatic—level—control circuit) it should be turned down until the displayed voltage reaches zero only on occasional peaks.

Since peoples' voices vary, the test should preferably be made with the voice of the person who normally uses the set. This is a good test to make before spending money for a power mike or other audio-gain enhancement. You will most likely find that you don't need one. (All the sets that I have looked at had plenty of audio gain, and in fact needed to have the modulation pot turned down for my loud voice.) There is nothing to be gained by transmitting an overdriven, heavily clipped signal. Nobody will be able to understand what you are saying.

*445 Ridge Ave., Clarendon Hills, IL 60514

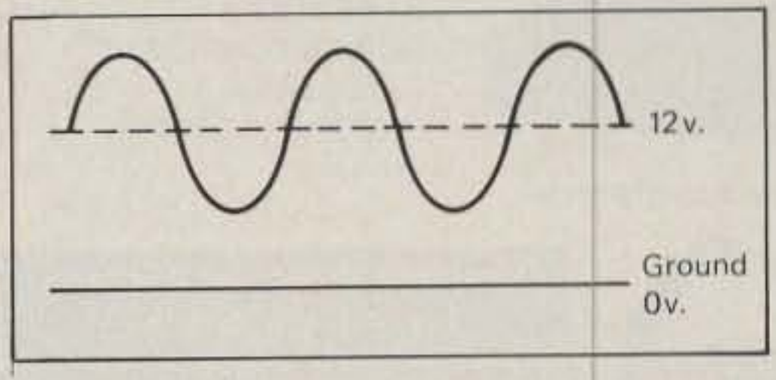
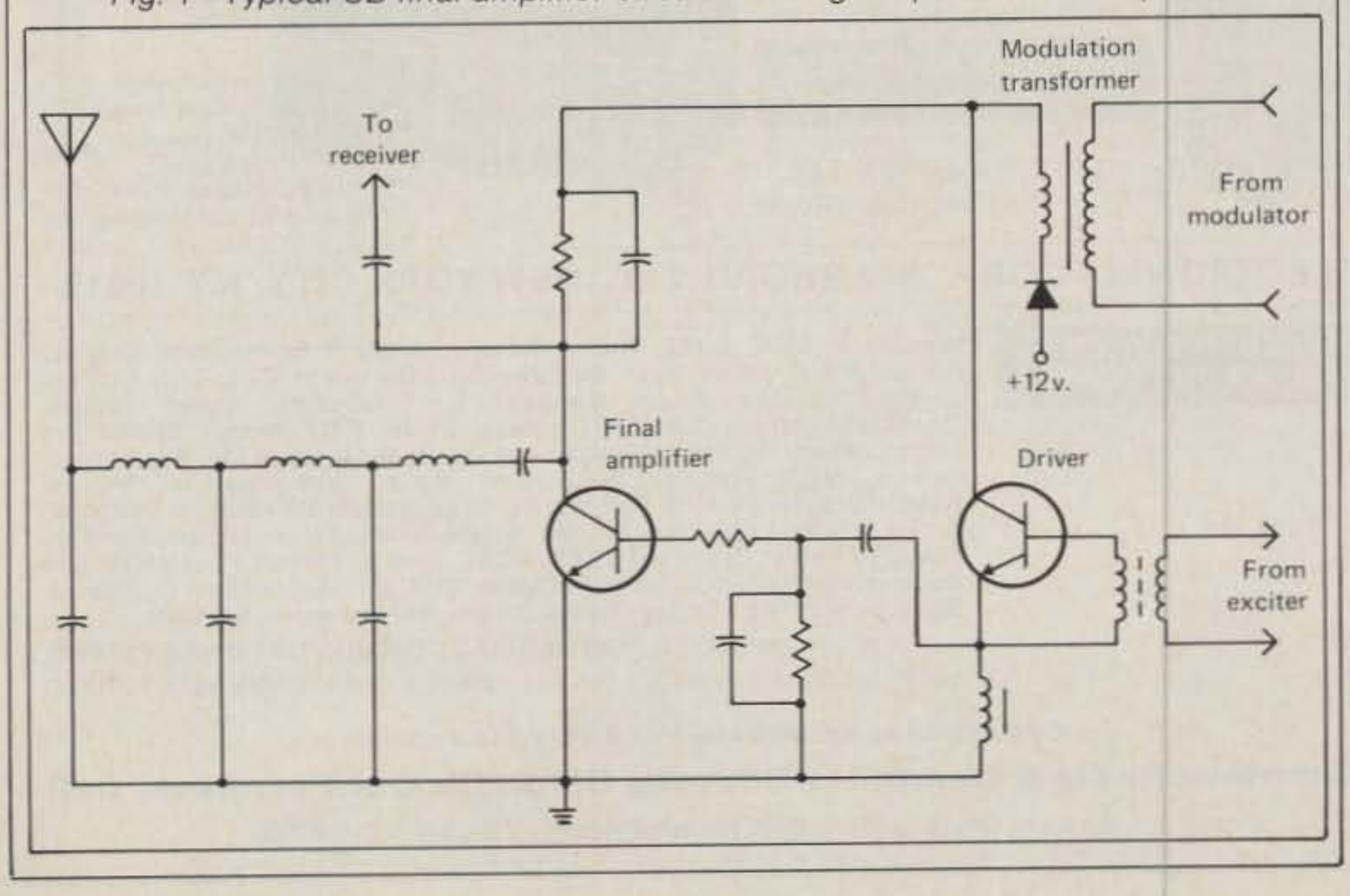


Fig. 2– Typical scope display.

Fig. 1– Typical CB final amplifier circuit showing scope connection point.



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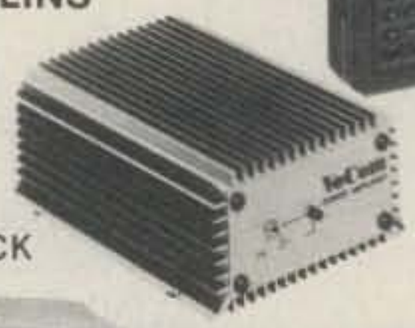

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Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Typical summertime propagation conditions are forecast for the h.f. amateur bands during June. Optimum frequencies for DX are expected to be somewhat *lower* during most of the daylight hours, and somewhat *higher* during the late afternoon, early evening, and nighttime hours, than they were earlier this spring. Daytime signal absorption is expected to increase considerably during June and the summer months, resulting in generally weaker signals. Thunderstorm activity and associated levels of static are also expected to increase considerably during the summer months, often making reception difficult.

Sporadic-*E* ionization should increase considerably during June. This is expected to improve short-skip conditions for distances up to at least 1300 miles.

This month's *CQ* Propagation Charts contain DX predictions for the period June 15 through August 15, 1983. Short-Skip Charts for June, for openings between 50 and 2300 miles, and from Hawaii and Alaska to the mainland, appeared in last month's column. Instructions for the use of this month's DX Charts appear elsewhere in this column.

The following is a brief band-by-band description of propagation conditions expected during June 1983. For specific times of DX openings, refer to the Propagation Charts on the following pages. See the Last Minute Forecast at the beginning of this column for a forecast of general day-to-day propagation conditions expected during June.

10 meters: A sharp seasonal decrease is expected in DX propagation conditions on this band during June and the summer months. While considerably fewer openings are expected, some fairly good ones still should be possible to southern and tropical areas during most of the daylight hours. Frequent short-skip openings between distances of approximately 750 and 1400 miles are expected in June.

15 Meters: This should be the optimum band for DX openings during much of the late afternoon and early evening hours. Good-to-excellent DX openings are forecast to most areas of the world during the daylight hours, with excellent openings expected to tropical and southern regions well into the evening hours as well. Numerous and widespread short-skip openings over distances between approximately 600 and 2300 miles are forecast from shortly after sunrise, through the hours of daylight, and into the early evening hours.

20 Meters: The band is expected to remain open to one DX area or another practically around the clock during June. It should be the best band for DX openings during the early evening hours, and through the hours of darkness and the sunrise period. Exceptionally high signal levels are expected during periods of optimum conditions. Numerous and widespread short-skip openings are expected over distances ranging between 350 and 2300 miles. During the late afternoon and early evening hours, propagation conditions should be optimum for both short-skip and DX openings, resulting in an exceptionally high level of interference.

40 Meters: DX conditions on this band are expected to decline during June because of a seasonally high noise level, and the fewer hours of darkness in the northern hemisphere. Some fairly good openings, however, should be possible to many areas of the world during the hours of darkness and the sunset and sunrise periods. Excellent daytime short-skip openings are forecast for distances between 150 and 750 miles, with nighttime openings extending out to the short-skip limit of approximately 2300 miles.

80 Meters: High static levels and few hours of darkness are also expected to restrict DX openings on this band during June, but some fairly good ones should be possible to some areas of the world during the hours of darkness and the sunrise period. Excellent short-skip openings are forecast during the daylight hours over distances ranging between 50 and 250 miles. During the hours of darkness, the short-skip range should extend out to approximately 2300 miles.

160 Meters: Intense solar absorption during June will prevent ionospheric reflection during most of the daylight hours, with openings limited to a groundwave range of generally less than 50 miles. After sunset, short-skip openings should be possible up to approximately 1200 miles. Occasional openings beyond this range may be possible on some nights during periods of lower than usual static levels. What little chance there is for a DX opening during June should take place during the hours of darkness and the sunrise period.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for June 1983

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 4, 17-18, 27	A	A	B	C
High Normal: 1, 5, 10, 19-21, 23, 28	A	B	C	C-D
Low Normal: 2-3, 9, 12-14, 16, 22, 24-26, 29-30	A-B	B-C	C-D	D-E
Below Normal: 6, 8, 11, 15	B-C	C-D	D-E	E
Disturbed: 7	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. **Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.**
2. **With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on June 1st, good-to-fair (B-C) on the 2nd and 3rd, excellent (A) on the 4th, etc.**

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

V.H.F. Ionospheric Openings

June is generally a good month for v.h.f. ionospheric openings. A sharp seasonal increase in sporadic-*E* ionization is expected during the month, which should result in some fairly frequent 6 meter short-skip openings over a range of 1000 to 1400 miles. During periods of widespread ionization, two-hop 6 meter openings may occasionally be possible up to distances of approximately 2300 miles. An occasional 2 meter short-skip opening between approximately 1200–1400 miles may also be possible during periods of intense sporadic-*E* ionization. Short-skip openings are likely to occur between 10 a.m. and 2 p.m., and again between 6 p.m. and 10 p.m., local daylight time, although they can take place at all other times as well.

Two minor meteor showers are expected during June—the *Herculids* and *Scorpids*. They may produce enough meteor ionization between June 3rd and the 5th to permit an occasional meteor-type opening on the v.h.f. bands.

Trans-equatorial (TE) scatter openings are expected to fall off considerably during June, but a rare opening on 6 meters may be possible between 8 and 11 p.m., local daylight time, on long north-south

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paths which cross the geomagnetic equator at an approximate right angle. TE openings, if they are to occur at all, will favor locations in the southern tier states.

While very little auroral activity is expected during June, some may occur during periods of radio storminess. Check the Last Minute Forecast at the beginning of this column for those days in June which are expected to be Below Normal or Disturbed. These are the most likely days on which auroral activity may occur.

Sunspot Cycle

A smoothed sunspot number on the order of 88 is forecast for June 1983, as the present cycle continues to decline. This will mark the passing of the present cycle from a *very high* phase into a *high* phase. It will remain in a relatively high phase of activity until the smoothed sunspot number declines to 60. This is not expected to occur until early 1984.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

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

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

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

June 15–August 15, 1983
Time Zone: EDT
EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Central Europe & North Africa	16-18 (1)	08-09 (1) 09-12 (2) 12-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	09-15 (1) 15-16 (2) 16-18 (3) 18-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-09 (2)	20-21 (1) 21-22 (2) 22-23 (3) 23-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 21-22 (1)* 22-23 (2)* 23-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & European USSR	15-17 (1)	11-15 (1) 15-18 (2) 18-19 (1)	09-15 (1) 15-17 (2) 17-19 (3) 19-22 (4) 22-01 (3) 01-03 (2) 03-06 (1) 06-09 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	16-18 (1)	11-13 (1) 13-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	12-16 (1) 16-18 (2) 18-20 (3) 20-00 (4) 00-01 (3) 01-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	11-13 (1) 15-17 (1) 17-19 (2) 19-21 (1)	10-12 (1) 12-15 (2) 15-17 (3) 17-23 (4) 23-03 (3) 03-04 (2) 04-05 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-03 (4) 03-04 (3) 04-05 (2) 05-07 (1)	20-22 (1) 22-00 (2) 00-02 (1) 22-00 (1)*
Eastern & Central Africa	17-19 (1)	09-12 (1) 12-14 (2) 14-17 (3) 17-19 (4) 19-22 (3) 22-23 (2) 23-00 (1)	14-16 (1) 16-18 (2) 18-20 (3) 20-00 (4) 00-02 (3) 02-03 (2) 03-05 (1)	21-00 (1)

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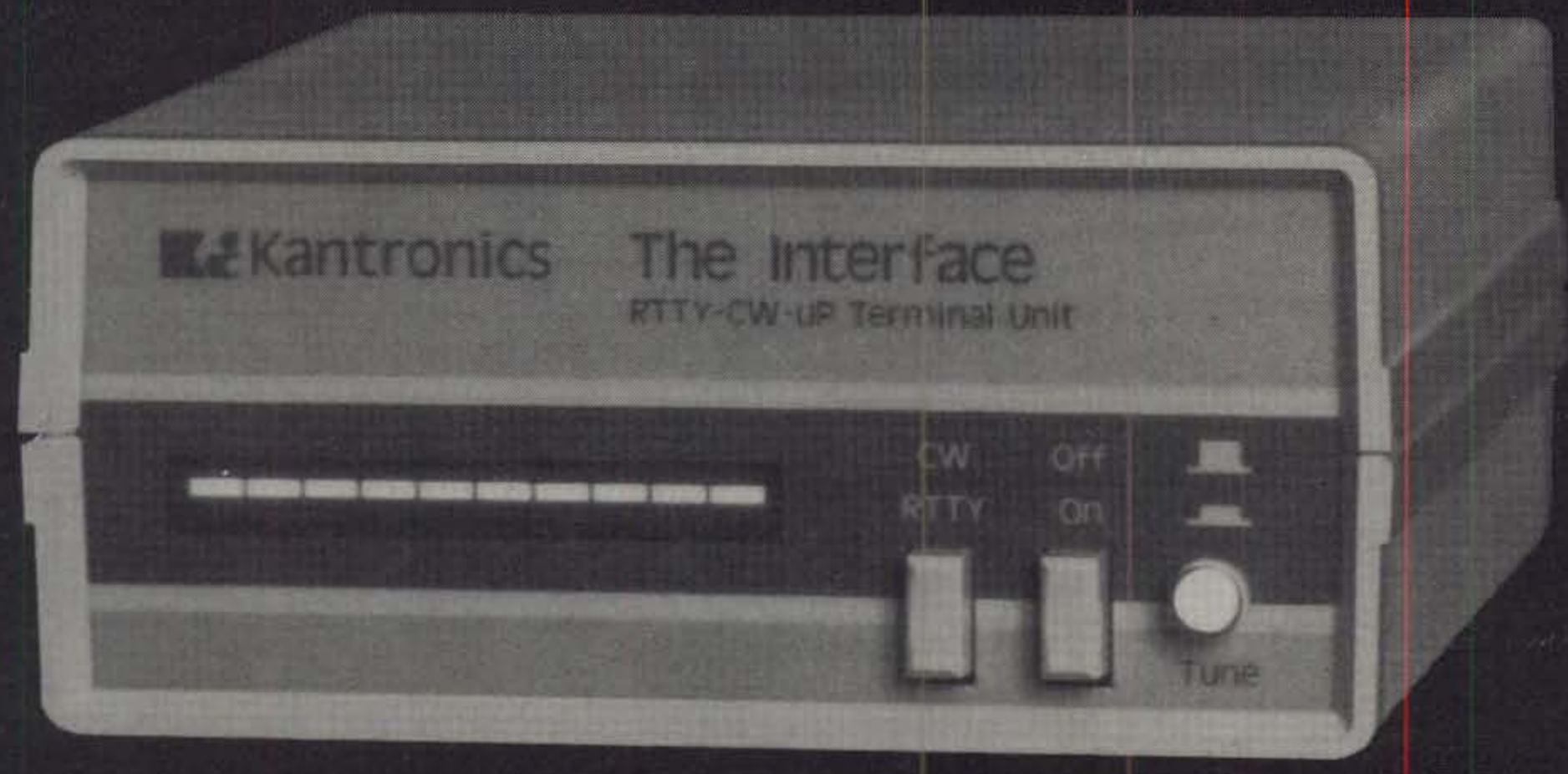

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Southern Africa	10-13 (1)	08-10 (1) 10-11 (2) 11-12 (3) 12-13 (4) 13-14 (3) 14-15 (2) 15-16 (1) 01-03 (1)	23-01 (1) 01-03 (3) 03-05 (2) 05-08 (1) 14-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	21-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South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

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

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

Time Zone PDT (24-Hour Time) WESTERN USA TO:

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

* Indicates best time for eighty meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2), or higher.

Antennas

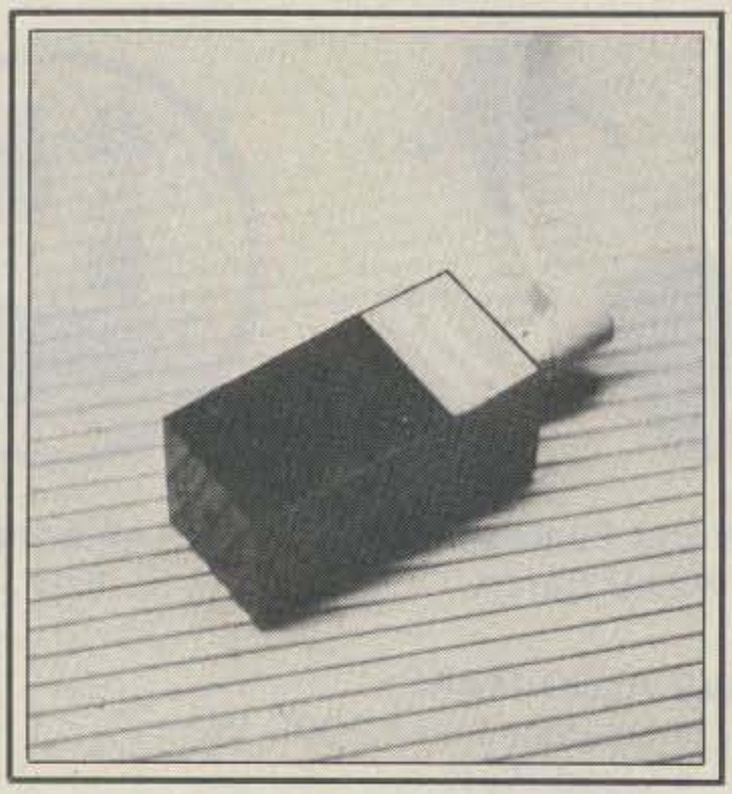
a monthly feature by
KARL T. THURBER, JR., W8FX

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Random Headings, Part II

Last month, Antennas columnist W8FX did some "catching up" by reviewing reader mail and also by examining some new mobile antennas and accessories. This month, he continues in the same vein.

In last month's Antennas column, we publicly answered some mail that we thought would be of interest to *CQ* readers, and we looked at some interchangeable 2 and 10 meter Valor Pro-Am mobile antennas and accessories that your columnist made use of in a new mobile installation. This month, we will follow a similar plan. We will open the mailbag once again for some reader comments on previous columns. We'll then examine a new commercial h.f. antenna and an interesting receiving accessory. Let's first dig into the mailbag.



Palomar Engineers "Loop Coupler" on author's workbench. An RCA-type phono jack is used to feed the signal from the Loop Amplifier. (W8FX photo)

Readers Say

Last summer in the July through September 1982 issues of *CQ* we did a three-part article on the transmatch. In the August 1982 issue, we discussed the background of the so-called "ultimate transmatch," the development of which is largely credited to Lew McCoy, W1ICP, then of the ARRL headquarters staff and now a fellow *CQ* writer. In the August column, I "glitched out" by misspelling the name of one of the early transmatch experimenters! He read the article, caught the glitch, and wrote the following interesting letter. This is from Al P. LaPlaca, W2WW:

"I've just now gotten around to reading the August 1982 issue of *CQ* magazine (I'm running a little behind in my magazine reading these days!) and came across your feature which discussed the background regarding the ultimate transmatch. The fact that my surname is misspelled doesn't seem to bother me as much as a slight distortion of the facts with regard to the time frame involved.

"In the late 60s, with the sunspots on their way to an all-time high, I was very much into DXing under my original callsign of K2DDK. I had a Hy-Gain ground-mounted 5 BTV, 5-band trap vertical, which I used primarily on 80 and 40 meters on both c.w. (mainly) and s.s.b. I kept the Heathkits happy by feeding the antenna through a KW Johnson Matchbox. However, there was a very high v.s.w.r. on 75 meters which the Matchbox could not handle. So I cast about my reference files for some ideas with which I could obtain a wider degree of matching capability. The 50-ohmer Transmatch caught my fancy since I realized that if the coil were also made variable then the unit should match just about anything. Having all parts in the junkbox at the time meant I had the world's very first Ultimate Transmatch about 2 hours later. That was in the summer of 1969 . . . early summer, as I recall. It lived up to my expectation: it matched everything I put on it everywhere on every band! That fall, at a meeting of the North Jersey DX Association, I spoke about it to Lew McCoy, W1ICP; his comment at the time was that it was a novel idea which he would like to try out. Correspondence followed, and he asked for and received some photos of my unit for his article in the July 1970 issue of *QST*. For the record, Karl, that's the way it really happened . . ."

Thanks, Al, for further refining and, indeed, adding to the record concerning the ultimate transmatch. And my apologies for letting slip through a typo in your name!

On a different note, it's interesting to analyze and reflect on the variety of reader mail received. Several letters are received each week, either directly (which is more efficient, time-wise), or forwarded through the New York offices of *CQ*. Most of the mail is complimentary in nature, but some deservedly highlight technical errors of omissions in past articles; we nevertheless appreciate both type of correspondence. The bulk of the letters we get ask advice on specific antenna subjects, usually along lines related to something discussed in a previous column. We try to answer all mail promptly, although it's a bit difficult to find the time to answer those very long, complex letters that require an equally long and detailed reply, or those which fail to enclose an s.a.s.e. or IRC (we, and not *CQ*, foot the postage bills). Letters in these two categories go to the bottom of the stack, although they, too, will be answered.

Writing a magazine column exposes any deficiencies in one's grammar, syntax, organizational capabilities, and technical expertise. No matter how diligently one prepares a column for print, someone out there is a greater technical specialist in some specific area of a given column's material, and is quick to point out to the columnist the error of his ways. That this will happen is gracefully taken for granted. However, occasionally readers will accuse one of being deliberately biased in reporting, or even of trying to unfairly "suppress" some technical approach or another. Occasionally, too, your columnist receives complaints from readers who are annoyed because of an omission in an article—something they considered important was *not* discussed.

A few letters have also been received from manufacturers who took umbrage to a failure to mention their firm's products or show photos of them when discussing various kinds of antennas and r.f. accessories; be assured, there's no plot! Not long ago, for example, in response to an electronics feature article I had published in another magazine, I received an anguished letter from a distributor wondering what his firm had done wrong to have been omitted from a list of suppliers I had shown as part of the article. The reason for omission, of course, was space limitation, and not a conscious decision reflecting any lack of merit on the part of his firm, his products, or his service.

In any case, keep the letters coming; they represent the only *real* way to know someone out there is reading (and digesting) the column each month!

Some Interesting Products

Before going on this month to discuss some broadband h.f. antennas, I would like to highlight a little-known Palomar Engineers product of interest to broadcast band (b.c.b.) listeners.

317 Poplar Drive, Millbrook, AL 36054

The Palomar Engineers "Loop Coupler," described in the text, is shown here next to a G.E. "Superadio," a favorite portable radio with b.c.b. DXers. The device allows the Palomar Engineers Loop Amplifier to be used with self-contained radios that have a built-in antenna but no external antenna connections. (W8FX photo)

This one, which I don't see listed in the Palomar catalog, is the "Loop Coupler." This nifty little device was developed to facilitate the use of the Palomar loop antenna with certain brands of receivers that have no way of disconnecting their built-in loop. Writes Jack Althouse, K6NY, of Palomar Engineers:

"We have run into a problem when selling our loop antenna to s.w.l. and b.c.b. listeners: some of the Japanese radios have terminals marked "Ext Ant," but have no way of disconnecting the internal b.c.b. loop. Also, the terminals connect through a very small capacitor, so not much signal comes in through this path. The loop coupler is a coil on a ferrite rod. It is driven by the loop amplifier and, by transformer action, couples the signal to the receiver's loop."

Jack sent along a sample of the loop coupler for my evaluation; I found that it did an excellent job of electromagnetically coupling my Palomar Engineers LA-1 b.c.b. loop amplifier to a portable General Electric "Superadio" (a popular receiver among b.c.b. DXers). To use the Loop Coupler with the "Superadio," the following steps were taken:

1. The loop amplifier was connected to the loop coupler with a short length of coax, having a u.h.f. connector on one end and a phono connector (for the loop coupler) on the other.

2. A b.c.b. station was tuned in, and the receiver was positioned so as to null out the station.

3. The loop coupler was placed on the receiver.

4. The loop amplifier's tuning control and the loop position were adjusted for maximum signal reception.

5. The position of the loop coupler (relative to the set's built-in loop) was changed to obtain maximum signal transfer.

No problems were encountered in using the little device, nor did the loop amplifier's performance seem to be degraded by the introduction of the coupler. However, the instructions provided with the loop coupler caution that the receiver and the loop amplifier should be spaced 2 or 3 feet apart, since—if they are placed too closely together—the system may oscillate (my system did not).

The Snyder Broadband Dipole. It's usually not easy to get low s.w.r. performance over an entire h.f. band, such as 160 or 80 meters, with a dipoles mounted close to the earth. An antenna directly fed with coax and resonated carefully to band center may show a 1:1 s.w.r. at resonance, but may exhibit a disturbingly high s.w.r. as one approaches the band edges. In some cases, the band-edge s.w.r. condition is bad enough to adversely affect the operation of modern solid-state transmitter and tranceiver finals so that an in-shack antenna tuner or "line flattener" is needed for proper loading.

A number of approaches to antenna broadbanding have been tried over the years. These include the use of extra-large-diameter tubing for antenna elements, multiple-wire folded dipoles, cage antennas, and the so-called coaxial dipole or "double bazooka," among others. These widely varying approaches attempt to solve or mitigate the bandwidth problem, while maintaining good operating efficiency.

A recent offering, similar to the double bazooka antenna popularized in the late 1960s, is the Snyder Broadband Dipole, a single-band half-wavelength antenna that makes use of linear coaxial flattop sections and a ferrite matching transformer for direct feed by a coaxial feedline. The monoband Snyder design is intended to produce a very flat s.w.r. over each of the three lower h.f. bands for which the antenna is available (160, 75/80, and 40 meters). According to s.w.r. curves provided by the manufacturer, the s.w.r. does not exceed 1.5:1 at any point on these bands. A glance at the s.w.r. curves in fig. 1 shows the interesting "lazy W" pattern attained.

The Snyder antenna can be mounted much like a standard dipole, in either flattop or inverted-V style with the minimum angle under the apex 90 degrees or larger. As with any dipole antenna, the antenna should be installed at a height of ¼ wavelength or higher. Admittedly, this is impractical in most amateur installations; the manufacturer advises that 40 feet is good enough for the 80 and 40 meter antennas, while the 160 meter version should be mounted higher, if possible. If the antenna is set up in the inverted-V configuration, the end insulators should be at least 10 feet above ground.

The Snyder antenna is designed for use with 50 ohm coax. However, since—as with most wire antennas—the impedance increases with increased height,

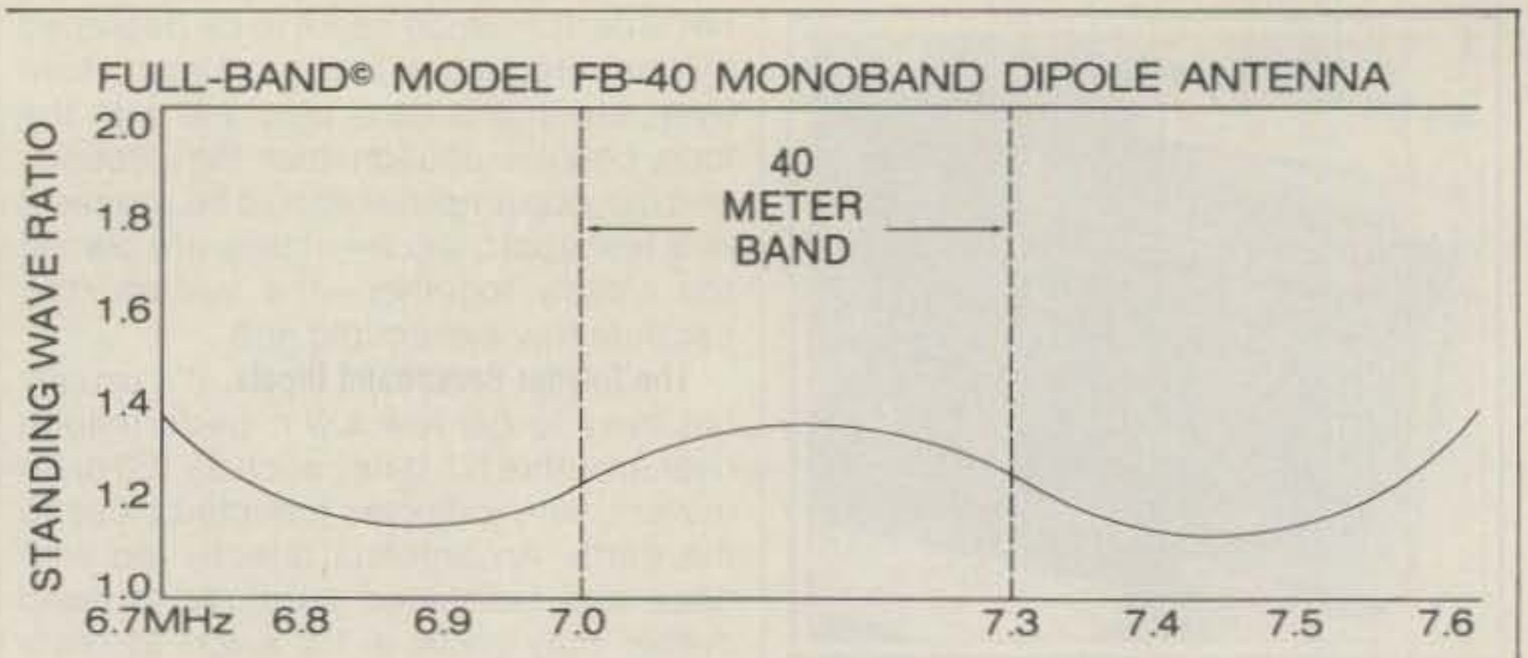
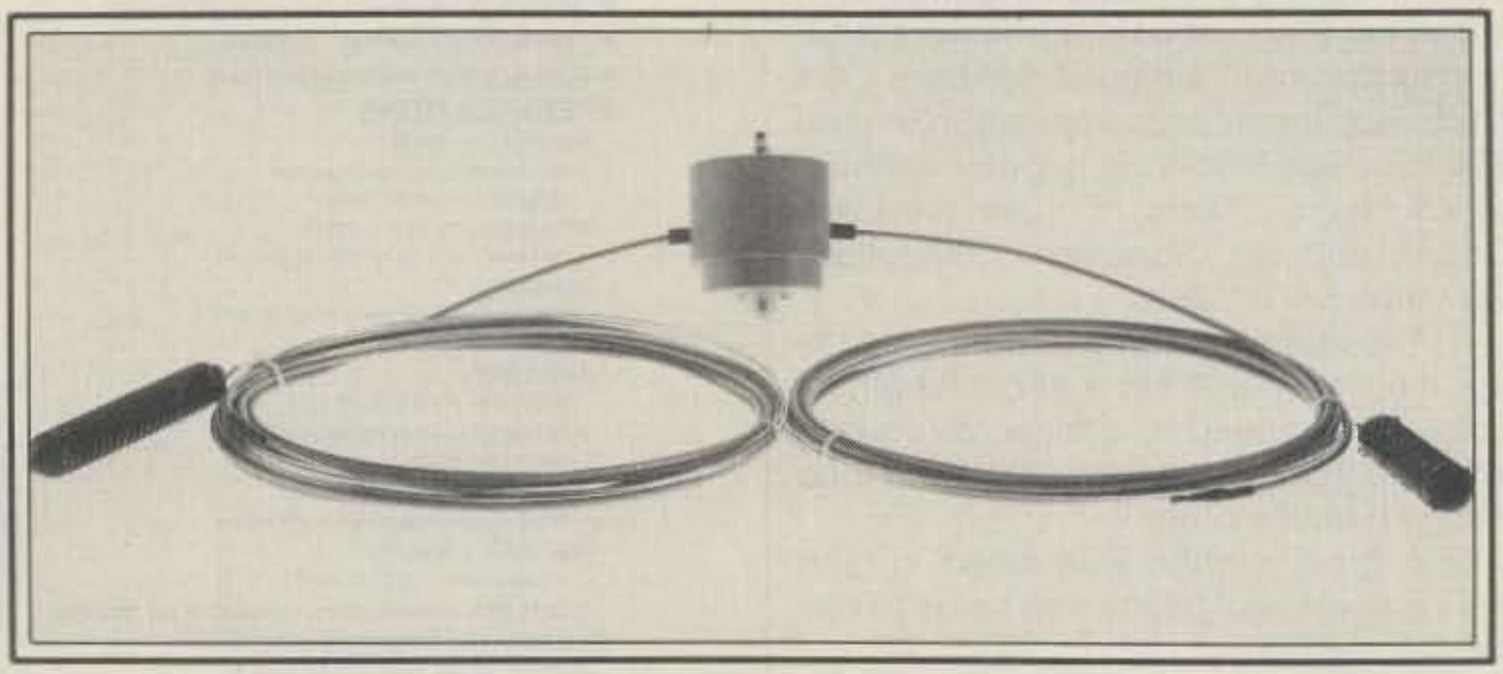
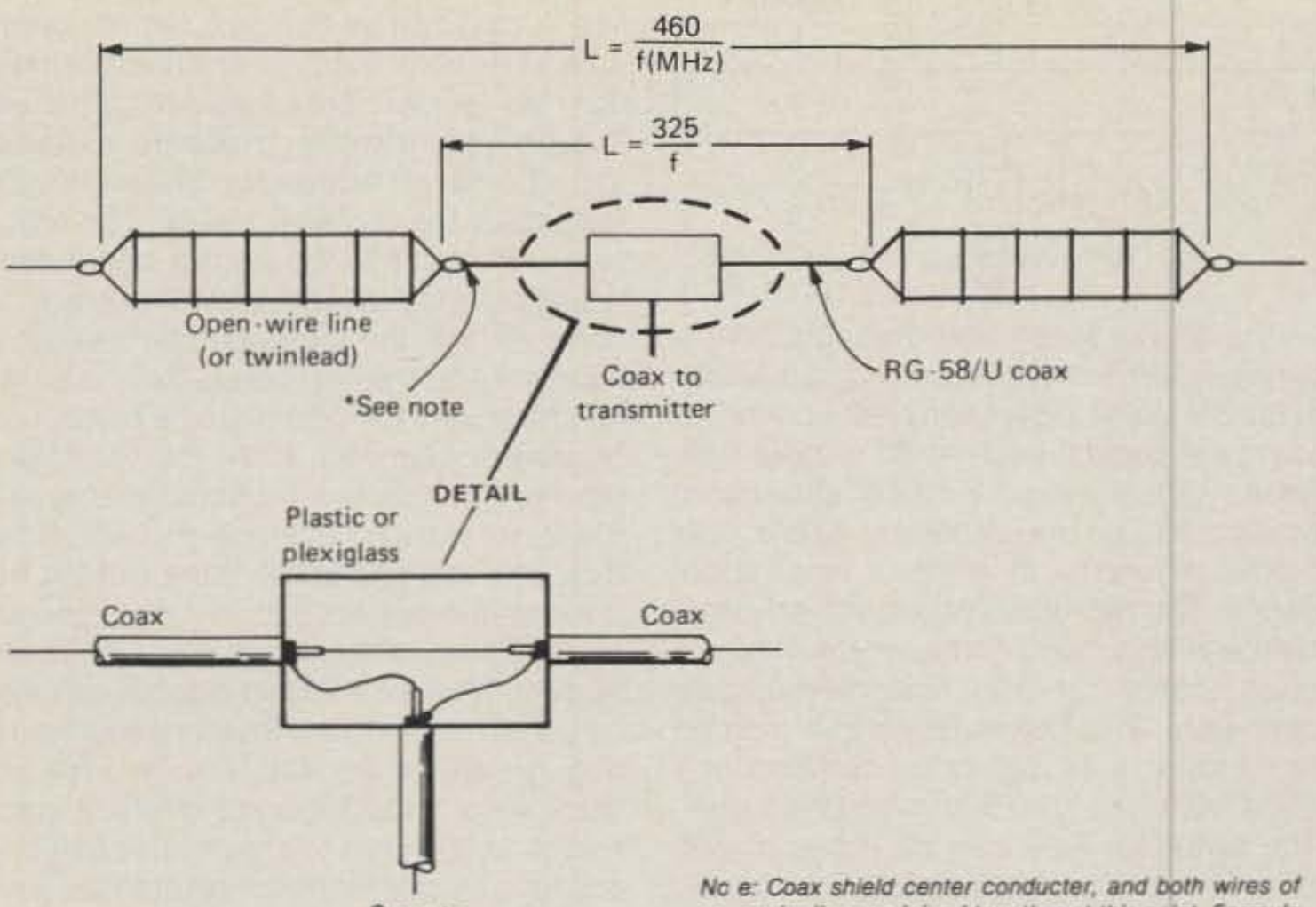


Fig. 1– Manufacturer's s.w.r. curves, Snyder Monoband Dipole antenna.



Shown here is the Snyder broadband dipole, an interesting and unusual antenna that is designed to provide wideband operation on either 160, 75/80, or 160 meters—the three most difficult h.f. bands on which to obtain low-s.w.r. performance across the entire width of the band. The single-band Snyder antennas range in flattop length from 66' 3" for the 40 meter model, to 248' 9" for the 160 meter model; each antenna may be installed as a conventional horizontal or 90-degree inverted dipole. The antennas have a center ferrite impedance-matching transformer for direct feed with 50 or 72 ohm transmission lines; no matching networks or antenna tuners are required for operation. Price class is about $110 for the 40 meter version, up to about $180 for the 160 meter model. (Photo courtesy Snyder Antenna Corporation)



Nc e: Coax shield center conducter, and both wires of open-wire line are joined together at this point. Formula gives length in feet.

The antenna shown above is based on a single-band coaxial design by W8TV; it is said to offer significant broadband operating characteristics. The double bazooka, as it is known, can be installed in practically any configuration, but is usually set out in flat-top fashion, or installed as an inverted-V. The outer open-wire sections can be replaced by a single wire with a slight reduction in operating bandwidth. The antenna is fed directly by coaxial cable. A small plexiglass block or insulator may be used as a support where the coax and open-wire line are joined together.

Fig. 2– The double bazooka antenna.

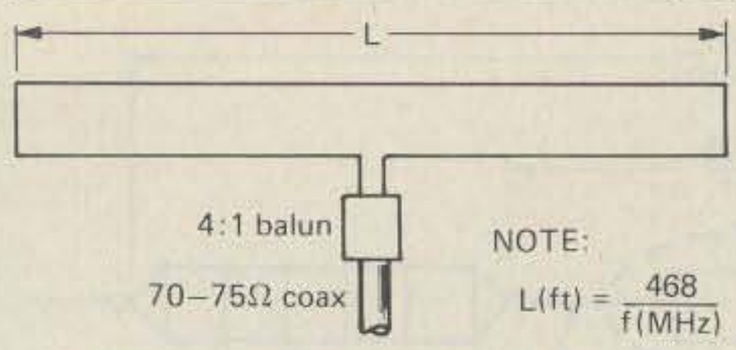
when the height exceeds ⅜ wavelength, the use of 75 ohm coax would provide a better choice. Since the feedline is "untuned," feedline length has no significant effect on the tuning or performance of the antenna.

The Snyder broadband design apparently has its antecedents in the popular coaxial dipole or double bazooka postulated by W8TV in a 1968 *QST* article (see bibliography). Not an Army instrument of war, the double bazooka is an interesting broadband design for 80 and 40 meter work; the antenna is constructed as shown in fig. 2. It consists of a specially-cut section of coax opened at the center, with the coax feedline connected at that point. The end sections of the antenna are made of open-wire line. In effect, the coax's outer conductor (shield) acts as a half-wave dipole in conjunction with the two open-wire antenna sections. The inside sections act as ¼-wave shorted stubs which present a high impedance at resonance. Off-resonance, the stub feedpoint reactance changes so as to effectively cancel out the antenna's reactance. The overall result is an increased operating bandwidth.

The double bazooka's mechanical construction, like the explanation above, gets a little tricky. For mechanical simplicity, single-wire end sections can be substituted for the open-wire sections at a possible cost in broadband characteristics. Small-diameter coaxial cable can be used to construct the flattop portion; use of large cross-section coax might make the antenna too heavy and difficult to support. A lightweight RG-8/U equivalent such as RG-8X could be a good choice for both the flattop and the feedline, although cheaper RG-58 type cable could be substituted in constructing part of the flattop, even at high power levels.

As is often the case with unusual antenna designs that offer possible "breakthrough" performance, a great deal of controversy surrounds the double bazooka. The basic question is one of reality and trade-off: is the increased bandwidth of the antenna real, and is it obtained at a sacrifice in efficiency? A New Jersey ham, M. Walter Maxwell, W2DU, has conducted some investigations into the operation of the double bazooka. The results of his work, reported several years ago in *Ham Radio* and *QST* (see bibliography), led him to believe that the degree of bandwidth claimed is illusory, that features other than the shunt-compensating reactance provided by the coaxial stubs are responsible for achieving the bandwidth attributed to the coaxial feature, and that the wide bandwidth attained is achieved at the expense of efficiency.

We won't prejudge the double bazooka. Instead, we would be interested in receiving actual reports on the operation of homebrew and commercial antennas of



The above antenna represents a very simple approach to increasing bandwidth in single-band operation, especially on the lower bands, such as 80 meters. The folded dipole has the same directional properties as the ordinary dipole, but "looks different" in terms of input impedance. The two-wire system has an impedance of about 300 ohms, which makes a good match for 300 ohm twinlead or open-wire line. The antenna can also be fed through a 4:1 balun transformer for a good match to 70–75 ohm coaxial cable. The antenna itself can be made of 300 ohm line (such as so-called TV "ladder line"), or it can be built like regular open-wire line, with the two conductors held apart by feeder spreaders. This antenna, though very simple, presents a flatter impedance-vs.-frequency characteristic than does the ordinary dipole. The result is a wider useful operating bandwidth, while still maintaining a low line s.w.r. To some extent, the increased bandwidth is explained by the two conductors in parallel effectively forming a single conductor of greater diameter. Note that the folded dipole is basically a monoband antenna; it will not work on even harmonics. However, on odd multiples of the design frequency, the current distribution is correct for the antenna to operate properly. Three- and multiple-wire folded dipoles can also be constructed to achieve impedance ratios greater than 4:1. For example, a three-wire folded dipole offers a good match to 600 ohm line; it will also exhibit a broadband operating characteristic.

Fig. 3– The folded dipole antenna.

this type. Although this author has not personally used one of these antennas, we should point out that former *CQ* columnist Bill Orr, W6SAI, discussed the Snyder broadband dipole in his August 1982 *Ham Radio* column; he reported a fairly "flat" s.w.r. curve (using the 160 meter model) and good results from other hams who have used the Snyder dipoles on the various h.f. bands. The firm asserts a high efficiency for the antenna which they sell.

For purposes of comparison, the folded dipole antenna, a distant cousin of the coaxial dipole or double bazooka, is shown in fig. 3.

Wrapping It Up

In this month's column, we have again opened the reader mailbag. We've also looked at some interesting broadband antennas and an interesting antenna accessory. And, we hope that we will receive some reader mail on experiences with the broadband antennas discussed in this month's column.

Next month, we'll again be in there with another antenna subject of timely interest. See you then.

73, Karl, W8FX

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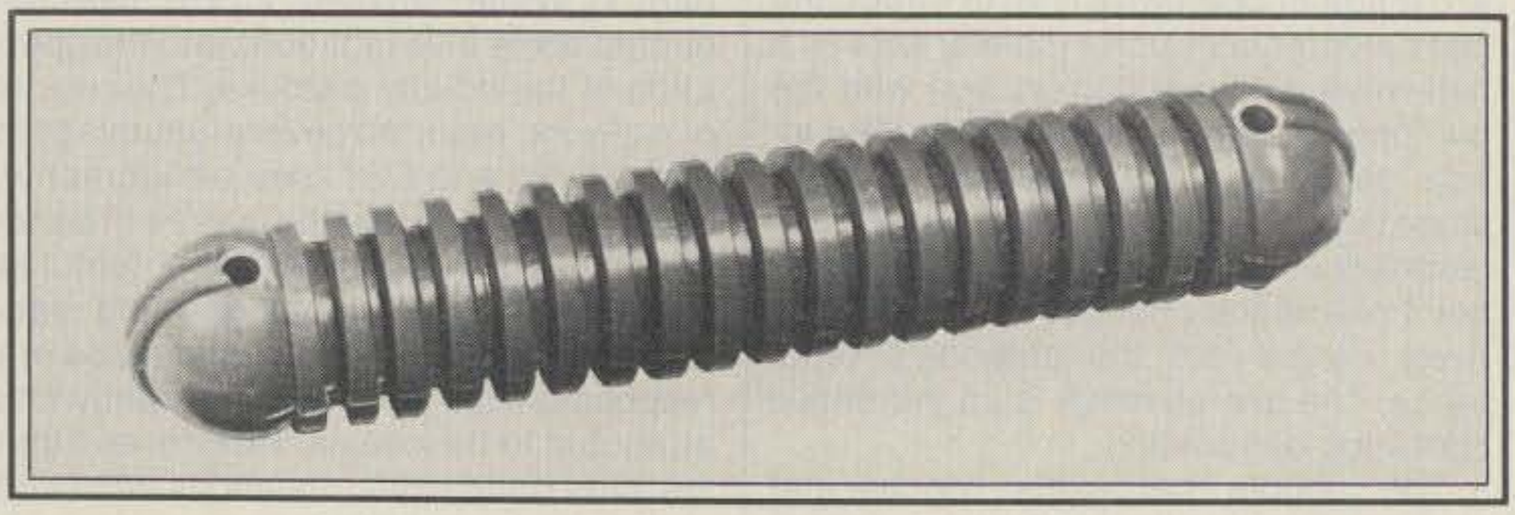

When working with heavier-than-normal antennas such as the coaxial dipole (double bazooka), it is important to use heavy-duty end insulators to ensure adequate strength. The Hy-Gain insulator shown here is a rugged, 7-inch-long end insulator molded from a high-impact material called Cycolac® . The insulator is heavily serrated to increase the leakage path to approximately 12 inches. (Photo courtesy Hy-Gain Electronics)

dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

VCR's Account for Increasing Number of R.F.I. Reports

Your Washington Editor is receiving an increasing number of r.f.i. reports involving video cassette recorders. The reports cited VCR's produced by a number of manufacturers, suggesting that r.f. susceptibility is not limited to any given brand. Interference is apparently linked to operation on 3.5 and 7 MHz, although more reports are needed to better define the nature of the problems.

If you or your neighbors are experiencing r.f.i. to VCRs, you are encouraged to file a complaint with the manufacturer and the Electronic Industries Association (2001 Eye Street, NW, Washington, DC 20006). Copies of the complaint should also be sent to the FCC (Attn: Field Operations Bureau, 1919 M St., NW, Washington, D.C. 20554) and the ARRL RFI Task Group (225 Main St., Newington, CT 06111).

Touch-Control Lamps Continue to Cause R.F.I.

This column recently noted that touch-controlled lamps manufactured by Sears have been cited as a source of r.f.i. to amateur operations. Now, reports reaching our desk indicate that problems of a somewhat different nature are apparently being experienced with touch-control lamps produced by a Wisconsin manufacturer.

Specifically, this manufacturer's touch-control lamp appears to be susceptible to radio signals from transmitters operating in the 144 MHz band. In one case, even a 2 watt handie-talkie held 8 feet from the lamp caused the light to blink. This same lamp was also reported to have emitted a strong signal on 1858 kHz.

Reports on the touch-control lamps cited by amateurs have been forwarded to the Field Operations Bureau of the FCC for action.

Fiber-Optic Systems the Key to Elimination of CATVI

As announced in *Microwave & RF* magazine, "Times Fiber Communications of Wallingford, CT, will install the world's largest fiber-optic CATV network next year under contract to United Cable Television." The network, which will provide service to over 24,000 single- and multi-family dwellings in the Alameda, CA, area, will accommodate 120 channels and will be fully interactive. Of interest to amateurs and other users of the r.f. spectrum is the fact that fiber-optic systems are virtually free of the radio-frequency interference (r.f.i.) problems which are associated with systems using coaxial cable for signal distribution. In such systems, signal leakage resulting from cable deficiencies has been responsible for interference to the amateur 144 and 220 MHz bands, and for alleged interference to cable channels E and K by amateurs. It is hoped that other CATV systems will follow United Cable Television's lead and upgrade their distribution networks at the earliest possible date.

PRB Files for Reversal of Review Board's Decision

On February 25, 1983, the FCC's Private Radio Bureau applied for review by the Commission of the Review Board's January 26, 1983, decision. The decision dismissed an Order suspending the Technician class operator license of David Hildebrand, N6BHU, of Hollywood, CA, and ordering him to Show Cause as to why his amateur radio station license should not be revoked.

The Board's action had overturned an Initial Decision of Administrative Law Judge Joseph P. Gonzalez which revoked and suspended the license for willful violation of Section 97.119 of the Commission's Amateur Radio Service Rules. Section 97.119 provides that "No licensed radio operator or other person shall transmit communications containing obscene, indecent, or profane words, language, or meaning."

In its application for review, the PRB stated: "The Review Board has overturned the indecency prohibition of Section 97.119, and in so doing, the Board has acted beyond its authority. The Board has confused its duty to determine whether Hildebrand's communications were indecent with whether there is an indecency standard in amateur radio. . . . If allowed to stand, the Board's decision will have an irreparable impact on all of amateur radio."

FCC Revokes CB and Amateur Station Licenses of Reseda, CA, Operator

The Federal Communications Commission has concluded that Walter N. Russell's flagrant violations of the Citizens Band Radio Service Rules not only warranted revocation of his license for CB station KABP-2240 at Reseda, CA, but also of his license for WA6WFN in the Amateur service.

A 1980 initial decision by FCC Administrative Law Judge Edward Luton concluded that while Russell's CB station license should be revoked for transmitting on an unauthorized frequency, using a modified radio, and failing to identify his station with the authorized call sign, there was no basis for suspending his amateur General Class operator license or for revoking his amateur station license. Subsequently, the Private Radio Bureau filed for review, contending that Russell's willful violation of the CB Rules warranted revocation of his amateur license.

The Commission agreed with the PRB's assessment, noting that Russell's flagrant disregard for the CB Rules suggested that he would also violate the Amateur Rules. Thus, revocation of his amateur and CB station licenses and suspension of his amateur General Class operator license were warranted.

In a similar case, the Commission has revoked the amateur and CB station licenses of Bernard J. Winner, of Tucson, AZ, and affirmed a staff suspension of his amateur operator license. Winner (now ex-WD8CMB) had been found guilty by Administrative Law Judge John H. Conlin of operating his amateur station on an unauthorized frequency and of failing to properly identify his transmissions. Later, however, an FCC Review Board found that since there were no violations of the CB Rules, the Commission lacked the authority to revoke Winner's CB license. This decision, in turn, was contested by the PRB.

The Commission has now found that its enforcement powers are broad enough that it can revoke a station license for willful or repeated violations of any rules promulgated under the Communications Act. Moreover, the record established

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that Winner willfully violated the Rules, and those violations were sufficiently serious to warrant revocation of his CB license, together with the revocation of his amateur station license and suspension of his amateur operator's license.

Commission Cautions Amateurs Not to Violate Prohibitions Against Business Communications

A group of amateurs in California who had been working with a local sheriff's office on a daily basis were warned against handling business affairs in the amateur bands. The Commission indicated that the preparation for emergencies did not require daily practice of the type observed. Further, said the Commission, it was not in the public's interest to substitute amateur communications for communications which should be provided by the service designed for police work.

Despite the concern regarding business communications in the amateur bands, the Commission does approve of activities such as the Halloween "Goblin Watch." These exercises, run by amateurs to assist local law enforcement officials across the country, are regarded as "voluntary communications for the general public" and are permitted under Section 97.1 of the Rules.

Call to Deaf Hams Issued

Writing in the latest issue of *AMRAD Newsletter*, Barry Strassler, KA3KDF, issued a general call to deaf hams (and to those deaf persons who want to become hams) to contact him. Uppermost in Strassler's mind is the question of whether or not a formal organization should be set up to serve the needs of deaf amateurs. If you think such an organization is needed, he's also interested in your views on organizational objectives and philosophies. If you are a deaf amateur, contact Strassler at Telecommunications for the Deaf, Inc., 814 Thayer Avenue, Silver Spring, MD 20910, (301) 589-3006 (Voice/TTY).

HBO to Scramble Signals

In a move which is sure to send tremors through the small earth station marketplace, HBO has announced that it will scramble the satellite signals it transmits to more than 4,400 affiliated cable systems nationwide. By using equipment produced by M/A-COM Linkabit, said Edward Horowitz, Vice President for studio and network operations, HBO will significantly improve signal security in the face of increasing piracy by owners of small earth terminals. The security system first will be implemented by cable affiliates that receive HBO's feed in the Pacific and Mountain time zones; later, equipment will be provided to cable operators receiving the feed in the east. Scrambling is scheduled to begin in 1985.

Is a Regulation-Free Telecommunications Market on the Horizon?

As reported in the *Washington Post*, Rep. Timothy E. Wirth, Chairman of the House Telecommunications Subcommittee, is quoted as saying that "In the evolution of the electronic marketplace, I believe Washington is now largely irrelevant. . . . The real action is in the marketplace, not the government." Wirth made his comments in a speech delivered at New York Law School.

Echoing Wirth's comments was Mark S. Fowler, Chairman of the FCC. Proposing a "regulations-free telecommunications market," Fowler was quoted by the *Post* as saying that "regulation's role as a surrogate for competition" eventually will become "completely unnecessary." Fowler has already moved to reduce paperwork involving license applications and is moving to take the FCC out of the business of providing certain other services to the telecommunications community. "Our goal," said Fowler, "must be effective competition, not effective regulation."

Your Washington Editor and the entire staff of CQ magazine congratulate Mr. Paul Rinaldo, W4RI, on his appointment as the ARRL's Technical Department Manager.

As it was omitted last month, we would like to thank Messrs Dave Beauvais, KB1F, and Malcolm Crawford, K1MC, for contributions to last month's column.

We extend our appreciation to the Regional Director of the FCC's San Francisco, CA, Field Office, and to Mr. Raymond A. Kowalski, Chief, Special Services Division, PRB, FCC, for their contributions to this month's column.

CQ BOOK SHOP

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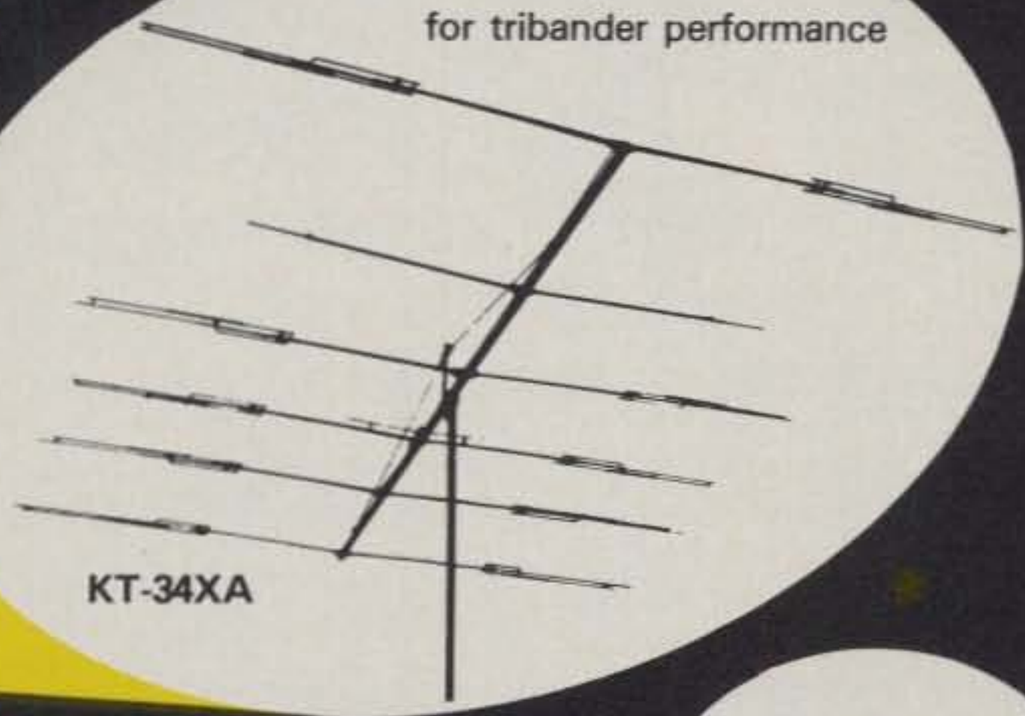

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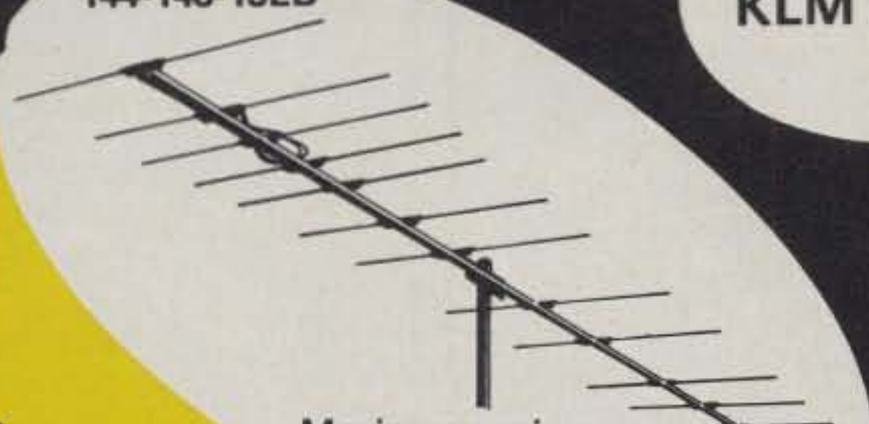

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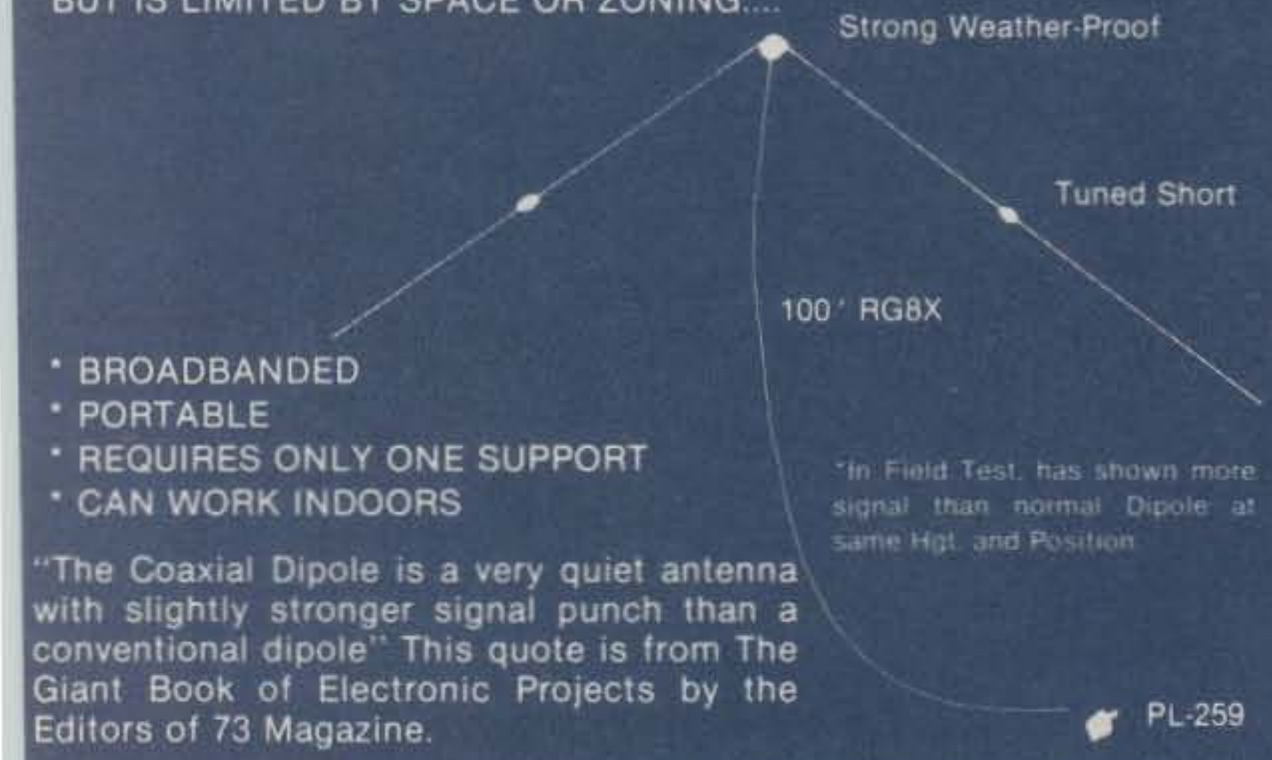

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World of Ideas

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A LOOK AT THE WORLD AROUND US

Natural Power Sources for Amateur Radio

As we all know, energy costs in today's world are on a skyrocketing spiral of uncontrollable proportions. This fact is brought into sharp focus each month when increased electrical bills set us pondering the feasibility of switching to our own alternate energy sources. Rising instances of ice storms causing snapped power lines during winter and electrical storms leaving us powerless in summer add yet more merit to such "independence thinking." During spring and fall, power-line noises caused by cracked insulators or faulty cable clamps moving in the wind may once again cause us to think of "breaking away" from commercial power mains or visiting a remote location from which we could enjoy, if only occasionally, amateur radio to its fullest.

An increasing number of amateurs are finding their own solutions to the electrical energy dilemma by partial or step-by-step implementation of natural power systems. More than a mere "specialty" or "experimental" concept, today's solar and wind power systems are capable of providing energy for everything from 100 watt output transceivers to complete home setups using natural power (which, incidentally, are tax deductible). The attractive aspects of these independent systems are their long-term cost per kilowatt hour and a new flexibility/freedom from commercial "brownouts" (the times when our gear is usually most needed). We might also point out that h.f. operations from an electrically isolated spot often give the impression of a totally different (and very exciting) group of h.f. bands.

Setting up electronic equipment and a natural power source is quite different today than it was a few years ago. Rather than using a small solar array connected to a low-power transmitter (which could only operate effectively during periods of direct sunlight), today's setups employ a bank of lead-acid storage batteries for supplying energy directly to an h.f. transceiver of creditable power output. (See Lew McCoy's article "*CQ* Reviews: The Encon Solar Array, A Study in Photovoltaic Power," *CQ*, April 1983.) The battery's charge is replenished/maintained by an outdoor multi-cell solar array. Wind generator systems, which usually produce greater outputs, operate in a very similar manner. These arrangements permit collecting and storing electrical energy in what might be visualized as a "rainbarrel manner," and using that energy precisely when it is needed. The vast number of 12 volt powered transceivers, televisions, RV lights, water heaters, coolers, etc., give almost immediate feasibility to such ideas.

We are already familiar with battery charge/discharge techniques and external/independent power setups from our use of 2 meter gear and talkies. Those same concepts can be instigated on a larger and expanding scale by first natural-powering our h.f. rig, and then replacing 110 volt lamps with 12 volt equivalents (adding a 12 volt item is substantially more energy efficient than using 12 volt to 110 volt a.c. inverters). Should you opt for a weekend cottage in an electrically quiet, isolated area, you can "start from scratch" with your own power system. There's also no reason why several sources can't be intermixed: solar for sunny days, wind for breezy days, and maybe gasoline generator for "backup protection." Again, the concept is similar to powering a 2 meter rig. We're slightly hesitant to suggest water power systems, because of possible problems involved with damming, reservoirs, flooding, and surprise tidal waves, plus protecting upstream/downstream and aquatic life.

Solar Power Systems

Let's say you've decided to take the natural energy plunge and consider what's involved in setting up a solar power system. A bank of storage batteries along with a charge controller or voltage regulator and voltage/current metering panel are mated with an outdoor solar array, and you're set. Everything except the solar panels may be purchased from an auto salvage yard, but check such items closely. If you're looking for long life and high-reserve current storage capability, we suggest quality batteries available from solar energy companies.

Calculate your needs roughly according to expected wattage needs during a day's or week's time (with some over-allowance for emergencies). If you plan to use a QRP transceiver such as Ten-Tec's Argonaut or Argosy approximately 3 hours each evening, for example, visualize a 50/50 transmit-receive current ratio of approximately 1 ampere at 14 volts, or 14 watts per hour times 3 hours (42 watts). An Encon Company model 4200EG solar panel and heavy-duty lead-acid battery will handle these requirements quite well. (The 4200EG costs approximately $400. It, and/or a variety of other solar systems capable of providing up to 15 kw of daily electrical energy, are available from Encon Corporation, Dept. A, 27584 Schoolcraft, Livonia, Michigan 48150.) The 4200EG delivers 14 volts at 1.3 amps in direct sunlight (18.2 watts per hour). Assuming 5 hours of sunlight hits the panel daily, 91 watts of energy are provided (less a slight chemical loss). Extra power can be stored for use during cloudy days, or it can be used for powering other items. The size of the "storage barrel" depends on battery ampere capacity.

Now let's "push" our small system with its single solar panel and see what can be obtained. Let's assume we use a popular 12 volt, 100 watt output s.s.b./c.w. transceiver either 40 minutes a night or 2 hours every third evening. Considering a 45/55 percent transmit/receive duty cycle, an average hourly current would be 9 amps, or 126 watts (14 volts times 9 amps). The 40-minute operation would use a full 90 watts; the 2 hour operation would be acceptable, provided an occasional "off day" for extra energy storage is added.

A better bet, however, would be to move up to Encon's Amcon I solar package, which includes two solar panels, two batteries, and a charge controller. The solar array produces 64 watts per hour, or approximately 320 watts per day, and the batteries can store 185 amps at 12 to 14 volts, or approximately 2,200 watts. That's enough energy to run our hypothetical 100 watt output rig approximately 4.5 hours every other night, or nearly 17 hours continuously from a full charge. Stated another way, the stored 2 kilowatts could power our rig approximately 2 hours each evening for over a week's period of continuously inclimate weather. Sort of like soaking up sunlight with a sponge and letting it trickle out as needed, eh? (The approximate cost of Encon's Amcon I package is $1300.)

Wind Power Setups

Making an admirable comeback from previous decades, wind power systems are proving their worth in many areas around the country. The watts-per-dollar

*Eastwood Village No. 1201 So., Rt. 11, Box 499, Birmingham, AL 35210

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investment of these units is usually higher than solar power, but useful winds may not always be available as needed. A fully independent natural power setup would probably include both solar and wind capabilities, along with a small microprocessor for monitoring and controlling their operations. This arrangement would provide on-demand charging of separate battery segments, energy switching according to needs, and "power dumping" into water heaters, etc., during times of full-storage battery charges. Most wind generator systems operate in a manner similar to solar power: batteries store on-demand energy which is replenished by the natural power source. Home-constructed generator systems usually consist of a kit-produced wind turbine which is auto fan-belt-connected to two or more auto alternators. Small drive pulleys used in conjunction with reworked bicycle wheels often provide speed increases.

One of the most impressive commercial windpower systems we've seen is manufactured by, appropriately enough, Windpower Corp. (16341 E. 8 Mile Road, Stanwood, Michigan 49346). The model R1500 produces up to 1500 watts output (12 or 24 volts), and two or more units can be parallel-connected for higher outputs. Storage batteries used with this system should have a rating of at least 400 amp hours. The system includes microprocessor monitoring and control, and the overall design is orientated towards full home applications.

Planning A Natural Power System

As we have seen, natural power is in no way restricted to QRP setups. Its use, however, is directly related to an area's available sunlight or useful winds. Realizing this fact, the first step towards harnessing your useful natural power involves checking daily sunlight and wind averages. If you're still unsure at this point, secure one or two storage batteries and a single solar panel for starters. As the system proves its merit, additional panels, wind generators, and more batteries can be added. Finally, the system will grow to the point of fully powering a small remote cottage or breaking interconnecting ties with commercial mains.

There's a substantial amount of additional information and assistance available to individuals wanting to learn more about harnessing natural power for personal use. TAB Books, Inc. (Blue Ridge Summit, PA 17214) offers the following books: *Making and Using Electricity from the Sun* (#1118), *Adding Solar Heat to your Home* (#1196), and *How to Make Home Electricity from Wind, Water and Sun* (#1128). Cop MacDonald, VE1BFL, writes a very informative column on natural energy in *Mother Earth News*, and he spearheads Alternate Energy Source nets which meet on 14,344 kHz at 1930 GMT Sundays, and 14,325 kHz at 0200 GMT Tuesdays, Wednesdays, Fridays, and Sundays. Complete or partial energy systems, plus a wealth of information on their use, are also available from the previously mentioned Encon and Windpower companies. If you would like to pioneer an exciting new frontier and realize a personal independence and satisfaction at the same time, check out the true possibilities of natural power. You'll be pleasantly surprised with the results.

Closing Notes

In response to inquiries about whether we've dropped video involvement, I again emphasize that we have not. Indeed, our newly published book *Video Electronics Technology* (TAB #1474) covers everything from 1925 TV to laser discs, satellite TV, ATV, and holographic video. We plan to highlight our efforts in developing an amateur holographic video system soon in this column. (Why merely watch TV when scenes can be fully recreated within a full viewing room. This way, you're actually "in the picture," viewing precisely what you like, and not camera shots.)

We also plan soon to include "by request" months answering your information requests and highlighting those special areas. Let's hear of your interests and ideas!

73, Dave, K4TWJ

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COMPUTER SOFTWARE: VIC-20/COMMODORE 64/ATARI 400/800 /PET, "CW MORSE" send/receive with I/O connector, schematic for homebrew interface and documentation—$17.95. VIC RTTY send/receive (VIC only)—$19.95. VIC MICRO LOG, contest logging system for VIC-20—$9.95. Include $2.00 shipping. FREE CATALOG. RAK Electronics, Box 1585, Orange Park, Florida 32067-1585.

ROSS $$$ NEW BARGAINS: HUSTLER 5-BTV $98.50, 6-BTV $124.90, 3-TBA Triband Beam $189.50. KAYPRO-II Portable Computer $Phone$. ICOM IC-730 $634.90, IC-25A $279.90, IC-4AT $229.90, IC-2KL $1259.00. Every day is ICOM day at Ross. KENWOOD TR-2500 & PB-25 $Phone$, R-600 $289.90, TS-830S $799.90, R-2000 $455.90, DFC-230 $239.90. YAESU FRG-7700 $389.90, FT-102 $885.90, FT-980 $1279.90, FT-77 $529.90, FT-ONE with Filters $1999.90. USED DENTRON MLA-2500 $495.90, Super Tuner 3 KW $159.90. KENWOOD TS-120S $449.90, TS-180S/DFC $579.90, TR-2400 $189.90, TR-7600 $195.00, TL-922A $929.90. LIMITED TIME OFFER. Mention this ad to receive these BARGAIN PRICES. All prices cash, FOB Preston. Closed Monday at 2:00. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263. Phone (208) 852-0830.

WANTED: Kenwood TS-830S. Mint. Reasonable. KA5LUU, 501-856-3784.

FOR SALE: TEK Scope 561A rack mount but boxed, with 3A6, dual trace, 3B3 time base w/delay plug-ins. Scope manual included. Vy good condition. Price $250 or trade for 2m HT. N6BNP, 28409 Coveridge Dr., Rancho Palos Verdes, CA 90274.

POWER SUPPLIES dual voltage, fully regulated and adjustable. A good buy for a great laboratory power supply. For full info and specs write: E&S Electronics, Box 71763, Charleston, SC 29415.

ANTENNA: 5 band dipole/inverted V, ready to install. Send SASE for ME 5 brochure. MYAD ELECTRONICS, Dept. C, RD 1, Box 138, Linwood, NJ 08221.

83 CALLBOOKS: US $19, DX $18, both $35 Ppd. W9JVF, 1147 N. Emerson, Indianapolis, IN 46219.

"CQ CONTEST": A new 100+ page operating booklet for all major contests with official rules, entry forms, logs, operating tips, etc. $8.00 US postage paid from VE3GCO.

MUSEUM now open for radio historians and collectors. Free admission. Old-time amateur (W2AN) and commercial station exhibits, 1925 replica store and telegraph displays. 15,000 items. Write A.W.A. for details: Bruce Kelley, W2ICE, Holcomb, NY 14469.

NINETY-EIGHT PERCENT of residences are without Burglar Alarm protection. Learn sales and installation. Big demand. Excellent profits. Extra income source. Information two dollars (redeemable). Security Electronics International, P.O. Box 1456-QT, Grand Rapids, Michigan 49501.

APPLE COMPUTER OWNERS! The RADCOM PLUS+ PACKAGE consists of a quality TU INTERFACE that installs in the APPLE, connects to your rig, and uses SUPER-RATT, the most advanced, feature-packed SOFTWARE ever developed for SENDING/RECEIVING RTTY and MORSE CODE, with SELCALL, RBBS, and much more. Detailed information from: Alex M. Massimo, AF6W, 4041 41st Street, San Diego, CA 92105.

ICOM 720A/PS15 with CW Filter, super clean, like new in boxes. Under warrantee, total xmit time about 2 hours. Call Glen 206-632-9089. $1059, I ship.

WB5UXA SPECIALS: TH7DXS $369.95, TH5MK2S $303.50, TH3MKS $211.50, 18AVT $89.95, MFJ 941C $81.00, Icom 251A $569.00, 25A $299.00, 290H $478.00, VJ-90 90-watt 2-meter linear w/preamp $135.00, VJ20 20 Amp 12V supply $110.00. Dixie Marine Electronics, P.O. Box 1426, Gonzales, LA 70737. Call 1-800-535-8134. In Louisiana call 1-800-272-8293.

GOING to Amateur Radio. Will sacrifice full-coverage receiver. Sony CRF 330K, Top of the Line. List $2500, will sell for $1200. Like new. John Doiron, 1124 Sycamore, Brownsville, TX 78520. Phone 512-542-2377.

REPLACE RUSTED ANTENNA BOLTS with Stainless Steel Bolts. Small Quantities, Free Catalog. ELWICK, Dept. 482, 230 Woods Lane, Somerdale, NJ 08083.

SAVE!!! EASILY ASSEMBLED KITS. 2.5 GHz Downconverter $29.95. Power Supply less Transformer $15.00. Plans only $7.50. HOPTRONIX, Box 402183, Garland, TX 75040.

WANTED: Used Oil Filled Cap. (funct) 12TO50 K.V. .01TO.015 Micro-Farad. Contact: Ronald Carp, 446 Meadowood Dr., Edgewood, MD 21040. Phone 301-676-6763.

QSL CARDS. Plastic-coated QSL cards. Design your own or choose from catalog. Excellent quality. Low prices. Free catalog and samples. Mail Order Express, Box 703-C, Lexington, NC 27293.

HANDHELD OWNERS: Expanded coverage for the ICOM IC2/2A and the KENWOOD TR2500. Our professional alterations will give you coverage from 140 to 150 MHz (approximate) with no change to your present performance. Send $38.00 U.S. MO or Cashier cheque (we pay return shipping) with your insured IC2 or 2A or your TR2500 to TARGET ENTERPRISES, P.O. Box 3413, Blaine, WA 98230. In Canada send to P.O. Box 2155, New WESTMINSTER B.C. V3L-5A5. Phone (604) 421-3351.

BURGLAR ALARM BUSINESS BOOMING. Learn—get in now. Information $2.00. Security Electronics International, P.O. Box 1456-W, Grand Rapids, Michigan 49501.

WHEELING WV HAMFEST, Wheeling Park, Sunday, July 24. Major prizes plus Cash Award. Dealers most welcome, tables available, indoor displays only $2 admission fee required but reserve space. CONTACT: TSRAC, Box 240, RD 2, Adena, OH 43901. Phone 614-546-3930.

VIC-20 HAM SOFTWARE. SASE APPRECIATED. Walt, KA9GLB, 4880 N. 49th St., Milwaukee, WI 53218.

WANTED: HEATH HG-10B VFO, working or not working. KAØELD, 217 N. Hamilton, Pratt, KS 67124.

WANTED TO BUY: Used Police-Type Radar Unit. Must be working. Also Motorola handie talkie, any condition. Send description and price to D.L. Beaver, 904 San Felipe, Angleton, TX 77515.

IBM PC/APPLE Aftermarket products; Hobbysts' Electronics Project Kits: $50.00 complete Modem Kit, Subscription/Satellite TV Decoder Kits, Eprom Programmer/Duplicator, Popular Memory IC Testers, Data Sheets, Application Notes, and more than 6000 parts in stock: Semiconductors, Discretes, Video Products, Tools, etc. Please write for your free literature/catalog. Independent Electronics, 6415-06 Airline Rd., Dallas, TX 75205.

TRADE: New Flame Retention #2 Oil Burner in sealed carton. Complete package. Up to 2.25 GPH. Want IC4AT or 2 meter amplifier with preamp and power supply. At least 60 watts, or Kenwood 7850. You pick up. Fred, NP2AL, POB 495, Flushing, NY 11379.

COMPUTER DUPE SHEET. Program files calls and searches for duplicates in seconds. Saves calls on tape for reloading later. Screen prints complete file. Cassette and instructions $12.95. For VIC-20 or TRS-80. Ultra Electronic, 1122 16th, Bay City, MI 48706.

HATS WITH NAME AND CALL $4.95 plus $1.50 postage. SASE for hat information. Colorful QSL's Samples $.50. Specialty Printing, Box 361, Duquesne, PA 15110.

VIC-20 SOFTWARE makes video pictures for ATV SSTV or home VCRs, also fantastic CW keyboard program. SASE for details, Jim Grubbs, PO Box 3042, Springfield, IL 62708.

WANTED: Pre-1950 TV sets and old TV GUIDE magazines. W3CRH, Box 90-C, Rockville, MD 20850. Phone (301) 654-1876.

WANTED: 12V Solar Panel, VIC/Commodore software, accessories, Ten-Tec Model 200 VFO, Heath 6H-17 Soldering Iron & Line Voltage Monitor, "81" or "82" World Radio-TV log, also AN/GRR-5 Receiver. Tom Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

INFORMATION WANTED on the large Acorn Tube JAN1630/VT-128. K8HCZ, Griebe, Rt. 1, Parksville, KY 40464.

FOR SALE: Hewlett Packard Model 335B FM Monitor $200, now tuned to 89.5 MHz. Excellent. W7QML, 1644 S. 132nd Street, Seattle, WA 98168. Phone (206) 242-2508.

HW101, HP23B power supply, CW filter, aligned by factory, 10/80, excellent condition, $200. ED, WA7DAX, 3509 Muriel Way, Granger, UT 84119. Phone 801-966-5077.

WANTED: Manual or schematic for Dumont #208 oscilloscope. Repro. OK. Mike Stasiak, 3819 White Ave., Baltimore, MD 21206.

CRYSTALS: S.A.S.E. for my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

FOR SALE: Yaesu FL-2100B (10–80m) with extra tubes and Manual, $300. KLM 160V Antenna, $80. AI9U, 421 Sherman St., Downers Grove, IL 60515.

DRAKE MN-2000 $160, Xfmr 3250V 300mA CT $35, 9000V 1A rectifier $15, rotators. Bishop, NØEA, 561 Geneva 100, Aurora, CO 80010.

HAMFESTERS 49th Annual Hamfest and Picnic. Sunday, August 14, 1983, Sante Fe Park, 91st and Wolf Road, Willow Springs, Ill., Southwest of Chicago. Exhibits for OM's and XYL's. FAMOUS SWAPPERS ROW. Tickets: At Gate $3.00, Advance $2.00. For Advance tickets, check or M.O. and s.a.s.e. to HAMFESTERS, P.O. Box 42792, Chicago, IL 60642.

SALE: Tempo fmh 2 meter handheld with Tempo ACH charger, $115.00. Heath HW30 Tower, $20. WAØNLR, 2931 Central Park #38, Topeka, KS 66611.

QUIETUS CASSETTE NET! Recording Radio Amateur anecdotes weekends 0300Z, (612) 874-9561.

FOR SALE: Heath gear, HR-10, Tower, 6 and 2 meter converters, Seneca (as is). CHEAP. John, WA8FNJ, 15040 N. River Road, Pemberville, OH 43450.

FOR SALE: Apple II Computer, disk drives, misc. hardware & software. Write for list. M.W. Babb, N4PF, 506 Westwood Drive, Louisville, KY 40243.

YAESU FT301S, 600/250 Hz CW, FV301, ps/spkr, MFJ CW filter, $500. AA1K, 145 Farm House Ln, Bear, DE 19701.

HENRY 3K CLASSIC factory modified to 3K Classic "X". Used one hour (mint cond.) w/orig cartons & inst. Going out of Ham Radio! Prefer pick-up. $2595. W1AGA, 97 Bradfrod St., N. Andover, MA 01845.

FOR SALE: G.E. DO-36 Desk-Mate commercial 60-watt VHF-hi base station, in excellent condition, plus Motorola T-1200 remote console with several options installed. Make offer. Also, Pathcom FM-152 (now Landmaster) 6-channel 2.5-watt/1-watt hand-held (VHF-hi), remote speaker/mike, nicads, desk charger and holster. Make offer. Jeff Howell, P.O. Box 463, Madison, IN 47250.

BARGAINS: Yaesu FV-101 VFO $50, Yaesu speaker $8, Hallicrafters PS-150 DC supply $25, MR-1 mobile mounting bracket $10. All Prepaid. S.A.S.E. for list of extra surplus gear. J.R. Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

FOR SALE: 500 Hz C.W. Filter for FT-101 (not ZD), brand new, $35 delivered. Tel: 617/632-4281. Nils Anderson, 20 Cross St., Gardner, MA 01440.

FOR SALE: 38'25G, Base Plate, Hse Bracket, Bearing, Shelf, ATB-34 Beam, On Ground, U Pick Up. Best offer over $200. W1CRL, Needham, MA. Phone 617-444-4393.

SELL/SWAP: Hallicrafters SR2000 (kw xcvr) & P-2000 PS, $400. HA-20 Rem VFO, $125. S-120 Rcvr, $25. National NC300 Rcvr, $100. Motorola FMTRU50 (Gd 2M Reptr), $50. WA9VLK (815) 939-1440.

WANTED: AN/URA-17 comparator-converter and coaxial transfer relays w/"N" conn. C.T. Huth, 146 Schonhardt St., Tiffin, OH 44883.

WANTED: Remote VFO for Kenwood TS-520S. Mike, N8DRL, Phone 593-4519, 852 Grove St., Conneaut, OH 44030.

WANTED: Kenwood SP-120, VFO-120. ANY NATIONAL EQUIPMENT! SELL: TI-58 Calculator $50. 120' microwave tower, 4KW gasoline generator. T.N. Colbert, 13609 Colony Lane, Burton, OH 44021.

ABSOLUTELY MINT OMNI D Series C, warranty, not a scratch, power supply and remote vfo, $1050. Round 75S-3C, $550. Wanted Heath SB-104-1 Noise Blanker. K4RV, Route 7 Box 168, Lexington, SC 29072. Phone 803-359-4618 work, 803-359-3418 home.

COLLINS 51S-1. Absolute mint, always covered. 51G-1 L.F. tuner. Manuals. Ship prepaid USA, $1600. H. Marhoff, 980 7th St. N.W., Largo, FL 33540. Phone (813) 584-2988.

FOR SALE: Kenwood SM-220 Scope, mint., original carton, manual, cables. Bill Wilson, KØCOJ, Box 1350, Detroit Lakes, MN 56501.

WANTED: All types of Collins catalogs, brochures, and documents for my collection. Also want vernier tuning knob for my 75A-4. W8UCI, 11320 Darla Court, Warren, MI 48089.

FOR SALE: Racal RA17C RX, $600. BC221A, $60. RME DB22A p/sictr, $50. All plus shipping. G.D. Dexter, (414) 248-4845.

FOR SALE: Heath DX-60B Tx, HR-10G Rx, and HB-10G VFO, $100. W2AU Quad, $35. Tom Slusarchyk, P.O. Box 332, Grand Island, FL 32735. Phone (904) 357-3330.

WANTED: Dual-trace scope, 15 MHz or faster, solid state. Bob Fischer, WB8BEL, 599 Sherwood Drive, Huntington, WV 25704.

FOR SALE: Oldies but goodies, classics. Heath DX60B xmtr $75. Heath HG-10 VFO $30 (together $95). SB-33 xcvr $125 (all three $195). Griffin, W8MEP/5, 6140 Pine Real, El Paso, TX 79912.

FOR SALE: Tri-Ex W-51 Self-Supporting tower with Base. $500. J. Hagen, 9407 White Hemlock Ln, Matthews, NC 28105. Phone: 704-847-7513.

McKAY DYMEK DR22C Receiver mint, Drake RV4 hardly used, National NCX-3 + AC supply, Tempo One Transceiver mint + AC supply + counter + remote VFO. Contact D.W. Wismer, VE3EHC, 18 Sheldon Avenue N., Kitchener, Ontario, Canada N2H 3M2.

ELECTRONIC AVOCATIONS card! SASE. Timm, 2308 Garfield #304, Mpls., MN 55405.

DRAKE SPR-4 general coverage receiver with manual. Mint, make offer. Carl, KA6KWB (916) 366-9111. 2942 Gwendolyn, Rancho Cordova, CA 95670.

FOR SALE: Roller induct., capac., and RF switches for high-power final or ant. tuner, $5–$20. No ship, you pick up W6DMB, Culver City, CA, 839-5438.

SELL: HR1680, mint, $150. HW101, CW Filter, mobile and fixed supplies, $450. W2EZ, 9 Whitney Farms Circle, Fairport, NY 14450.

NATIONAL NC-270, mint-condition ham-band receiver, $155, FOB. W9VZR, 4627 North Bartlett Ave., Milwaukee, WI 53211.

YL's NEAR SYRACUSE, NY: If you are a dedicated, determined undergrad through recent postdoc in mathematics, science, or engineering, call N2AKV at 637-3903.

SELL: Collins 75S-3C, 32S-3, 312B-4, 516F-2. Mint. Original owner. $1500. Call Walt, N2CPE, 516-427-0052.

WOULD LIKE TO TRADE my pair of mint Zeiss binoculars, 10X40B - Dialyt ($489) for a mint Ten-Tec Argonaut or similar rig. N3BQA, 20 W. Madison St., Baltimore,MD 21201. Phone 301-685-6308.

NEW MFJ-945 300 watt antenna tuner with manual, $55 postpaid. Tom Webb, 231 Bittersweet, Henderson, KY 42420.

WANTED: Operating manual and schematic diagram for Clegg 99er. Will pay copy costs. J.C. Dyckman, WA3KFT, 117 Richard Road, Aston, PA 19014.

WANTED: Receivers, xmters, for general coverage & ham bands. Clem Duval, 33727 Brownlea, Sterling Hts., MI 48077 (313-268-2467).

SELL: DENTRON Jr. Ant. Tuner, 300W, w/power output meter. Excellent, $45 plus shipping. Dick Randall, 1263 Lakehurst Rd., Livermore, CA 94550.

FOR SALE: Ham-M Rotor, mint condition, $80. Will ship UPS. Bill Hauser, WA4ZSB, 2435 Alexander Dr., Titusville, FL 32780.

NEW AUTEK QF-1A Audio Filter. Never used. Hy-Gain 14 AVQ/WB ant and roof mount. Best prices. H. Greenfield, W9TNZ, 9501 Lorel, Skokie, IL 60077. Phone 1-312-966-4909.

WANTED: SB-221 or SB-201. Tom, W2WCE, 201-444-6605.

WANTED: Coaxial Transfer/Crossover switches with type 'N' connectors. C.T. Huth, 146 Schonhardt St., Tiffin, OH 44883.

ISOPOLE 144 MHz Antenna, brand new in original box, $28 takes it. WA@NZO, Leon, RR#2, Regent, ND 58650. Phone 701-563-4654.

NATIONAL TV 10-T wanted, FB-7, NCX-1000 National SW-3, etc. SASE. W5ERY, 316 East Hurd St., Edmond, OK 73034.

WANTED: Butternut 160M loading coil, Ten-Tec Model 200 VFO, Heath IM-103 Line Voltage Monitor, and GH-17 Soldering Iron. Solar panels or photovoltaic cells for QRP. Tom Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

ALUMINUM SPIDER for boomless quad (new), $15pp. Want Bird Mod 43 Case & Mtr. Mov't. W7MAF, 1815 17th Ave. So., Great Falls, MT 59405.

WANTED: Gonset GPP1 Phone Patch Instruction Manual or copy of. Call collect during weekends 404-536-8693. Miguel Elguera, Rt. 12, 3549 Thompson Bend, Gainesville, GA 30506.

SELL: Microcraft Morse-A-Word Code Reader, like new, $100. K1VKO, 43 Seaview Ave., E. Norwalk, CT 06855. Phone 203-853-0587.

COMPLETE HEATH STATION: SB-301, 401, 500, 600, 610, 620, 630, excellent, many extras, may separate, $800. ROBOT 70 and 80A, $300. CCTV Camera, $75. WD8OXK, 614-592-4089, late mornings, no collect, U ship. WANTED: Tribander (TA-33?).

WANTED: Operation and Maintenance manual for Tektronics Type L high-gain fast-rise-time plug-in for a Model 545 O'scope. Will copy and return. Bruce A. Rahn, WB9ANQ, 410 Coronado Trail, Enon, OH 45323.

WANTED: Morse Code Reader, any kind. Please give price, first letter. Stan Coutant, 666 E. Sierra Madre Blvd., Sierra Madre, CA 91024.

KANTRONICS MINI-READER, new condition, $225. Kenwood TS-820S, VFO-820, MC-50, $650. W5VGF/6, Box 344, Ramona, CA 92065. Phone 619-789-3674.

WANTED: One or two "Hetrofils" as made by James Millen Mfg. Co. in the late 30's & early 40's. N. Crane, 12020 E. Snyder Rd., Tucson, AZ 85749.

FOR SALE: 75S1, 32S1, 516F2, 312B4, $480. 30S1, $1,200. 3 RTTY Printers—Make Offer. Ten-Tec Keyer, $45. 817-547-1519, Copperas Cove, TX 76522.

WANTED: Military battery type BB-451/U, paying $175 in any condition. (Used in 60's and early 70's in radio sets PRC-47, PRC-41.) Michael P. Murphy, 11621 Valle Vista Rd., Lakeside, CA 92040. Phone (619) 561-2726.

WANTED: Drake UV-3 FM Transceiver, working or not. Ed Baker, 1575 Lark St., Hanford, CA 93230. Phone 209-584-7041.

** SATELLITE STATION ** ICOM: IC-211 2M FM/SSB/CW $350, IC-402 432/435 Oscar transceiver $290, IC-3PS/IC-30L 432 linear/speaker/P.S. $130, IC-280 2M FM with new small car remote cable $170; MICROWAVE MODULES 432/435-28S Oscar transverter for TS-520/820/FT101, etc., $220; ARR P432/435VD Oscar converter $55; VHF ENGR. BLE10/40 432 linear $125; DIAWA RF-660 RF processor for TS120/130/IC730, etc., $60; MM ELECTRONICS MSB-1 deluxe audio filter $60; Yaesu SP-101P speaker/patch $50. Bob, WA6ERB/0, 14311 W. Virginia Drive, Lakewood, CO 80228, 303-986-0189 (e).

WANTED: Hallicrafter SX101 and HT-37 parts and tubes. Especially need 100 kcs crystal. Don Richardson, WB5UIA, 903 Madison St., Minden, LA 71055.

WORKED FOR GENERAL DYNAMICS? I need info on AN/PRC-70 parts too! Please write. I am a collector. Tony Grogan, 5 Rollingwood Dr., Taylors, SC 29687. Phone 803-244-0324.

HEATH HR-1680 rcvr, HS-1661 spkr, HW-8 xceiver, HD-1410 Keyer, HD-1250 dipper. R. Boyd, Box 793 Stn "A," Montreal, P.Q. H3C 2V5. Phone (514) 486-9902 after 18:00 hrs.

FOR SALE: Kenwood TS-520, like new, $450. Includes key, mike, headphones, portable ant. Also for sale, Cushcraft ATV-5 vert. ant., $75. Bill, KA5JQH, 713-273-4299.

WANTED: Johnson 1 KW Matchbox for $150. Phone collect to W6AM, 213-377-4120 or 213-424-3459.

MFJ DUAL TUNABLE SSB/CW filter model MFJ 752B in perfect condition, asking $65. WD8DAS, S.B. Johnston, 823 Irvington NE, Massillon, OH 44646. Phone 216-832-3977.

FOR SALE: Drake TR7 with heavy-duty P/S, fans, AM and CW filters, and AUX board. Drake MN2700 tuner. KLM 34XA antenna, HAM IV rotor. 120 foot hardline. Rohn 60 foot foldover tower (45G) with thrust bearing, ¼" guyline, and insulators. All excellent condition. $2000. C. Gehring, KB2RK, (315) 564-6577.

WANT: Any National equipment, working or not. Kenwood SP-120, VFO-120 H-P 41C calculator. Sell: TI-58 Calculator, 120' microwave tower, 4KW 120-240 V gas powered generator. T.M. Colbert, 9404 N. Church #316, Parma Heights, OH 44130.

VERTICAL VIBROPLEX WANTED. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

ISOPOLE 144 MHz Antenna, brand new in original box, $28 takes it. WA0NZO, Leon, RR#2, Regent, ND 58650. Phone 701-563-4654.

REWARD for schematic or instruction book for "Conar" transmitter Model 400 CW transmitter. "Kit Type." KC5TP, 16 W. 34th St., Sand Springs, OK 74063.

"Hams Do It With Frequency" bumper sticker $1.00. D. Mollan, WB7FDE, 7805 NE 147th Ave., Vancouver, WA 98662.

WANTED: Prop-pitch Motor. State condition, best price. Jim, K3VJH, 2219 Ross Court, Silver Spring, MD 20910. Phone 1-301-565-2219.

FOR SALE: Tri-Ex W-51 Self-Supporting tower with Base. $500. J. Hagen, 9407 White Hemlock Ln, Matthews, NC 28105. Phone: 704-847-7513.

WANTED: Solar Cells or Panel, AN/GRR-5 Military Receiver and power supply. VIC-20 Computer and accessories, Ten-Tec "Power Mite" QRP Transceiver. Tom Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

CRYSTALS for Wilson 1402SM: 146.385 TX; 146.01/61, 146.115/715, 146.34/94; $2 each + post. AA1K, '82 CBA.

NOVICE ALL-AMERICAN Certificate: Work a Novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

NEED: New matched pair RCA 8122 Tubes for linear amplifier. Philip Eastman, WA4UKE, 2202 Buckingham Dr., Augusta, GA 30906. Phone 404-798-5077.

WANTED: Working CM-22A comparator (part of CV-89) and AN/URA-17 converter. C.T. Huth, 146 Schonhardt St., Tiffin, OH 44883.

KEYER: Ten-Tec model KR-40 for sale, mint condition, $50 or best offer. WANTED: 160–10 wattmeter, 160–10 amp. WB4URW, 8802 Bellefonte Rd., Richmond, VA 23229.

SELL: Collection of thirty years of receiving tubes, new, boxed, at dollar each. Advise types required for availability. W5QJT, P.O. Box 13151, El Paso, TX 79913, Coronado Station.

APPLE II COMPUTER and peripherals for sale. Large software library. Write for list. M.W. Babb, N4PF, 506 Westwood Drive, Louisville, KY 40243.

TUBES!! About 40 different tube types for sale. All new, unused, for older type radios. Also list of ham gear for sale. Free list. Robert G. Campbell, P.O. Box 138, Walhalla, ND 58282.

JOHNSON KW MATCH BOX with SWR & output power meter, $125. Want Yaesu SP-901 speaker, gen. cov. R-1000 Recvr. W. Marx, K4EXF, 215 E. Ill. Ave., New Port Richey, FL 33552.

WANTED: Field Strength Meter for VHF and UHF TV and FM bands. State price and condition. T.K. Brown, RD1, Box 225, Forksville, PA 18616.

HICKOCK M/C tube tester $30, RCA CX-35 Mobile Test Set $30. SASE for list. K6KZT, 2255 Alexander, Los Osos, CA 93402.

SB-220 $475; FT-101ZD, CW Filter $585; D104-UB8 w/preamp $35; Turner Plus 50 Mike $25; Kirk 5075B 4:1 Balun new $10; Drake LPF KW $10. Will ship. Art Ford, 552 Hillside Ct., Melbourne, FL 32935.

FOR SALE: 75S3-B, 32S3, 312B4, 516F2 $1250 (R/E). 75S1, 300 Hz $295. 312B4 (R/E) $275. TS530S, MC-60 (new) $650. KWSI P.S. parts. SASE. J.W. Craig, 32 Birchwood Drive, Rye, NH 03870.

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e warranty on our unit is one year on materials d labor, and ninety days on parts.
is unit is a very inexpensive way to have the best both worlds. A real time saver during contests. nds off operation will save many hours of hang-g on the rotor. Just a few dollars more than the anual control box, but worlds apart in state-of-e-art and operation. Price $229.95

BETTER
PSE-1, PSE-3

The "DX'ER" is the top of the line of the non-voice synthesized units, and is for the ham who is in need of more features on their controller. It has "2" digital readouts, one to show the antenna's current position, plus a storage readout which holds a heading or digitally displays your last position. This is valuable for switching between long path or short path, or checking front to back, or working between two different stations...a real time saver and just a nice convenience.
The "DX'ER" also has "5" scan functions: 0-90, 90-180, 180-270, 270-360, and 0-360. This is a real aid in looking for that dogleg opening or peaking a weak signal.
It can be expanded to talk, and does have the hardware necessary to use with the computer interface.
It can be remotely keyed, where verbal confirmation isn't required. Price $362.95

BEST
PSE-2, PSE-4

This is the ultimate in rotor controls. Nothing tops this one.
It has all the features of the other models, plus it talks...Yes, it talks.
The "DELUX" has a voice synthesizer which confirms your entries, plus tells you your heading as you enter it and when your antenna arrives.
All commands are spoken, plus as your antenna turns you hear a 400HZ tone going in one direction and a 80HZ tone in the other. This gives you positive verification of movement.
This unit, as the others, will combine with the HAM IV, T2X, and HDR-300, giving you the best antenna rotor combination you could ever want at any price. Price $469.00

INTRODUCING THE ULTIMATE PACKAGE...FROM PRO-SEARCH™ NINE COMBINATIONS OF OUR CONTROL UNIT AND THE TELEX/HYGAIN* ROTOR MOTORS...
FOR JUST A FEW DOLLARS MORE YOU CAN HAVE THE CONTROLLER OF THE FUTURE TODAY!

Package #1 PSE-1A

The "Contester" Package...try one of these LEX/HY-GAIN rotors with our PSE-1A/3A. A stem which is low in cost, high in performance.

AM IV* T2X* HDR-300*

E-1A will save you lots of time in your favorite ntests. No more hanging on the rotor ntrol...Gives you positive control with DIGITAL adout plus 10 memories, command positioning, d single button manual movement.

Package Special

PSE-1A + HAM IV	$369.95
PSE-1A + T2X	415.95
PSE-1A + HDR-300	544.95

Package #2 PSE-1/PSE-3

The "DX'ER" Package...Couple this unit with a rotor and you have the best non talking control we make. Expandable, plus has 5 scan functions, 2 DIGITAL displays and REC/LAST to check long path or short path. Has all internal hardware to plug into our computer interface. Can be remotely controlled from accessory jack.
Try this with any of the TELEX/HY-GAIN* Rotors! This will give you the broadest of functions with a mid-range price.

Package Special

PSE-1,3 + HAM IV	$508.95
PSE-1,3 + T2X	548.95
PSE-1,3 + HDR-300	677.95

Package #3 PSE-2/PSE-4

The "Delux" is the most sophisticated antenna control unit ever made. With the "Delux" you have all the functions of our other units, plus it talks...Yes it talks. Not only do you have your headings digitally displayed, but is also said as your antenna stops...All commands are spoken, plus as your antenna turns you hear a 400Hz tone in one direction and an 80Hz in the other, giving you positive varification of movement. This unit, when combined with the HAM IV, T2X or HDR-300 gives you the best buy anywhere at any price...

Package Special

PSE-2,4 + HAM IV	$608.95
PSE-2,4 + T2X	655.00
PSE-2,4 + HDR-300	784.00

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CIRCLE 177 ON READER SERVICE CARD

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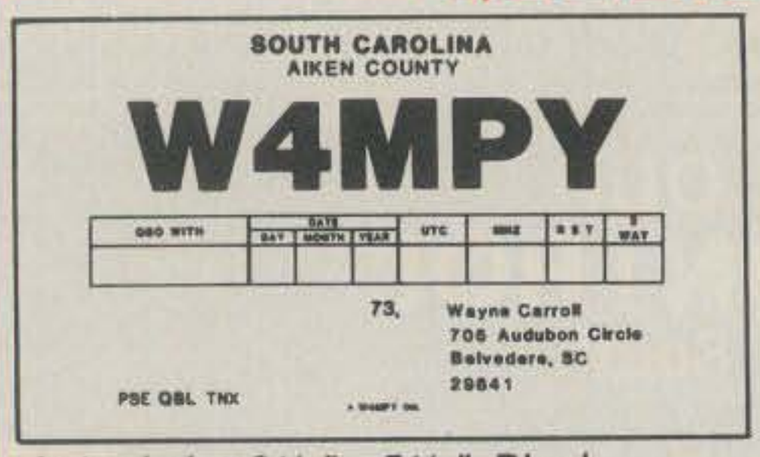

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WANTED: (1) RTTY FSK adaptor. Was made to install in IF of Navy RBC-1 Receiver 4–27 MHz. Dan, Box 9064, Newark, NJ 07104.

WANTED: Ten-Tec PM Series QRP Gear (PM-1, 2, 3, RX-10, AC-4, 5 etc.). Write Rick Arland, G5CSU, Box 1454, APO NY 09127.

FOR SALE: Ten-Tec 405 amp and power supply with manual and cables. $205 I ship. WB1GMH, Box 637, Pittsfield, VT 05762.

WANT: Electro-Voice T-35 Tweeter. SELL: MARCONI Wireless Telegraph Co., Genuine Stock Certificates suitable for framing, $25. Write: Sheehan, Box 48, Ballardvale, MA 01810, phone (617) 664-6788.

GALAXY GT-550 Transceiver, 550 watts of SSB, 80–10M with matching SC-550 Speaker-Power Supply, excellent condition with manual $330 plus $10 UPS. Also Gonset G-50 6M Transceiver tunes 50–54 MHz, VFO, built-in meter-power supply and speaker, with mic, excellent condition $65 plus $10 UPS. NØDST, Tom Hagerman, 1812 Neihardt, Branson, MO 65616.

CLEANING HOUSE: 28 years of excess gear. Stamp for list. James Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

FOR SALE: Clean Drake TR-4CW, MS-4, AC-4, $425.00 you ship. Call Gary after 4 p.m. EST 419-447-8229.

MFJ-496 keyboard with AFSK module and power supply, $250. IC-720A PS15, cw and am filters, $800. W2HDF 609-927-0254.

FOR SALE: Yaesu FT101B Transceiver and ICOM IC-290A 2-MTR All-Mode Transceiver. WA8KUR, Warren, OH. Phone 216-369-4021.

WANTED: Argonaut 509 or 515 QRP rig, postpaid to New York address. Price and details please by airmail letter to: Alex Dick, G3NQU, "Bonacre," St. Gennys, Bude, Cornwall, England.

WANTED: Mount, FT-154, used with WWII BC-348 receiver. C.E. Garrison, K4KSU, Rt. 3, Box 344, Warrenton, VA 22186.

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Advertiser's Index

MEET THE NEW YAESU FT-102

The FT-102 is factory equipped for operation on all present and proposed Amateur HF bands. An extra AUX band position is available for special applications. Equipped for SSB, CW, and AM (RX), the FT-102 may be activated on FM and AM (TX) via the optional AM/FM-102 Module.

The all-new receiver front end utilizes a low-distortion RF preamplifier that may be by-passed via a front panel switch when not needed. Maximum receiver performance is yours with this impressive lineup of standard features: IF Notch Filter, Audio Peak Filter, Variable IF Bandwidth Control, IF Shift, Variable Pulse Width Noise Blanker, Independent SSB and CW Audio Channels with Optimized Audio Bandwidth, and Front Panel Audio Tone Control. Wide/Narrow filter selection is independent of the Mode switch.

The celebrated transmitter section is powered by three 6146B final tubes, for more consistent power output and very low distortion. An RF Speech Processor, Mic Amp Audio Tone Control, VOX, and an IF Monitor round out the transmitter lineup.

Futuristic panel design and careful human engineering are the hallmarks of the FT-102. Convenient pop-out controls below the meters may be retracted when not in use, thus avoiding inadvertant mistuning. Abundant relay contacts, rear panel phono jacks for PTT, microphone/patch input, and other essential interface connections make the FT-102 extremely simple to incorporate into your station.

SPECIFICATIONS

TRANSMITTER

Power Input: (1.8-25 MHz) (28-29.9 MHz)

SSB, CW	240W DC	160W DC
AM	80W DC	80W DC
FM		160W DC

RECEIVER

Image Rejection:
- Better than 70dB from 1.8-21.5 MHz
- Better than 50dB from 24.5-29.9 MHz

IF rejection:
- Better than 70 dB

Selectivity (−6 dB/ −60 dB):
- SSB, CW, AM; 2.7/4.8 kHz (with no optional filters)
- Width adjusts continuously from 2.7 kHz to 500 Hz (−6 dB)

Spurious Radiation: Better than −40 dB

SP-102 FT-102 FV-102DM FC-102

SP-102

The SP-102 External Speaker/Audio Filter features a large, high-fidelity speaker with selectable low- and high-cut audio filters. The front panel A-B switch allows selection of two receiver inputs for maximum versatility. Also available is the SP-102P Speaker/Patch.

See your Authorized Yaesu Dealer today for a hands-on demonstration of the rig that everybody's talking about. It's the FT-102, The Transceiver of Champions!

FV-102DM

The FV-102DM Synthesized External VFO tunes in 10 Hz steps. Keyboard entry of frequencies, UP/DOWN scanning, and 12 memories make the FV-102DM a "must" for serious DX or contest work.

FC-102

The FC-102 Antenna Coupler is capable of handling 1.2KW of transmitter power, with an in-line wattmeter, separate SWR meter, and A-B input/output selection expanding your station's capability. The optional FAS-1-4R allows remote selection of up to four antennas via one coaxial cable connected to the FC-102.

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Price And Specifications Subject To Change Without Notice or Obligation

1082

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