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THE RADIO AMATEUR'S JOURNAL

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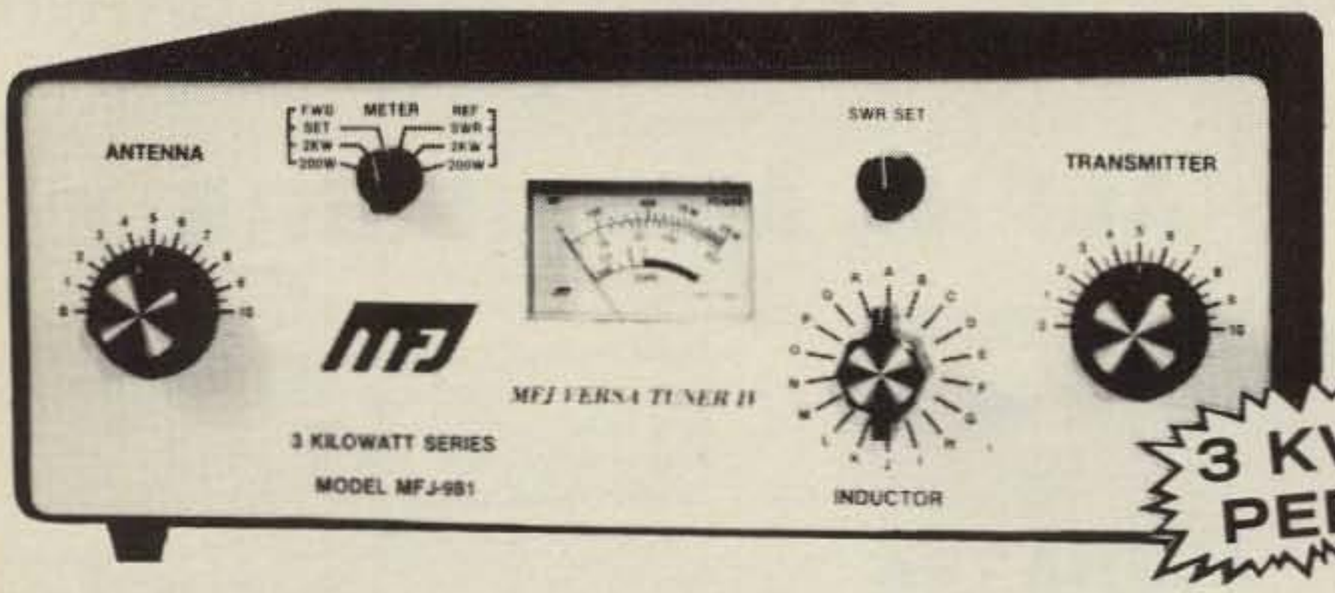

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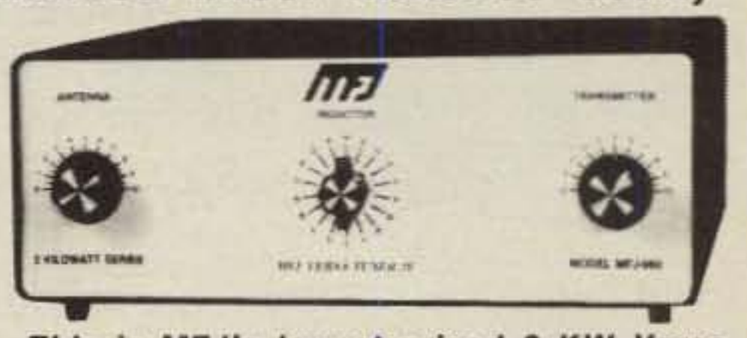

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Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

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Zero Bias

an editorial

This past winter, New York hosted the Treasures of Tutankhamun exhibit at the Metropolitan Museum of Art. Millions of people persevered in order to spend some time gazing at this marvelous panoply of artifacts while it was here. While most people were awed by the beauty of the magnificent objects on display, very few could discern without the aid of a guide book, the meaning of the hieroglyphs inscribed on these treasures. Not only could Tutankhamun's name be read, but events chronacled, religious beliefs spelled out and all sorts of activities described and read in terms of glyphs. Once you learn the symbols, the meaning becomes clear.

It's quite a transition from Tutankhamun to amateur radio, but the analogy is there. In Part II of L.B. Cebik's article "Getting the most out of Schematic Diagrams" this month we continue the discussion of optimizing the use of electronic *glyphs* and *pictographs* so that the "reader" gets the full intent and meaning of the unfolding circuit. Schematic diagrams develop character while depicting a word or story. The mind can conjure interpretations from schematics, form mental pictures of components, seek improvements and adaptations and even visualize potential use . . . all from a glyph.

We can all look at the schematic diagram for a transmitter however elaborate, and the word transmitter pops into our conscious. We can read further into the pictograph and define what kind of transmitter it is. We can take that same pictograph and define what kind of transmitter it is. We can take that same pictograph and "see" discrete components on a chassis or PC board. We can "work through" the construction and envision a completed transmitter up to and including sitting at our operating position and if you close your eyes real tight and think real hard you can even make out your first contact (probably a rare and exotic country that you and you alone will ever work).

All of this unverbal communication comes from basically the same kind of glyph that "spells" out Tutankhamun. Pictures that tell a story for all to hear. Hopefully author Cebik's efforts will increase our "reading level" and make the message clear.

Our cover this month combines a chart of electronic glyphs (schematic symbols) and a photo (pictoglyph) of some of the components illustrated in the chart. I want to thank the people at Radio Shack in Fort Worth and especially Hy Siegel, K9CCN/5 their Promotion Manager for staging and taking the picture.

Several thousand years from now, when future archaeologists and anthropologists dig up the remains of some long extinct amateur station they might have a rough task deciphering the artifacts for eventual display. A little plaque might read "After painstaking laborious work it was determined that this item utilized a primitive form of electrical energy. From its composition and shape it appears to have been aimed. Rudimentary symbols and records indicate that it was called a 'Gunplexer'. From the root words understood so far it appears to have a hunting function. As yet we have been unable to determine just what it was that was being hunted and for what reason."

Declassified Classified

You have probably noticed an increased amount of space devoted to our Ham Shop section this month. Well we're trying to catch up with the increased popularity of our classified section. As it is with our production schedule being three months ahead of the cover date most of the ads are almost four months old by the time you see them. We're going to try and clear the decks this month and keep on a current basis with the ads. *CQ*'s Ham Shop is a free service to *CQ* subscribers and we want you to use it. Commercial advertisers are the only ones paying a fee for its use. *CQ*'s Ham Shop is the ideal way to buy, sell or swap your way into a new rig or to round up those extra few bucks to pay those unexpected bills.

On the Other Hand

There are two other bits of information covered this month which might concern you. One is the *CQ* Awards Programs and what we must do to insure their future. As with all other goods and services, the price is going up. Elsewhere in this issue is an article on what is involved and what it is going to cost. The second point that should be of interest to all of us is where amateur radio is heading. Vic Clark, W4KFC, First Vice President of the ARRL has been appointed by the League to head up a Long Range Planning Committee on amateur radio. In this issue Vic requests all amateurs, League members or not, to supply the committee with thoughts and ideas concerning the future of amateur radio. I believe Vic to be sincere in his efforts and truly hope the League is finally getting their bureaucratic house in order.

Politics and Poker

Over the last few weeks I've received about half a dozen short manuscripts on the recent Iranian situation, articles that concerned themselves with handling traffic and who said what and where to articles on how people, frightened in an uncertain period, managed to leave Iran. I even received a telegram from ARRL President Harry Dannals, W2HD urging all amateur radio Editors to use discretion in what is written or disclosed about amateur radio activity and particular individuals during that time. I tend to agree with Harry especially after reading some of the articles.

I find it incredible that individual amateurs, amateur radio clubs and some governmental agencies can be so naive with regard to the real world. No wonder amateur radio is looked at suspiciously or anyone with a transceiver is considered suspect during explosive times. The Americans in Iran like any foreigner stranded in conflict anywhere, often jeopardize local's safety in their flight. Removing ones-self from the danger does nothing to lessen the vulnerability of the local. Covert or clandestine amateur radio operation makes us all look like spies and lo the poor DXpeditioner or innocent traveler who thinks he'd like to operate from a foreign country should think more than twice from now on. More often than not the DXpeditioner or traveling amateur can be denied permission to operate or "asked" to leave. Resident aliens can be expelled, equipment confiscated or fines levied. In panic situations or political unrest, indigenous personnel are unlikely to be protected by such amenities.

73, Alan, K2EEK

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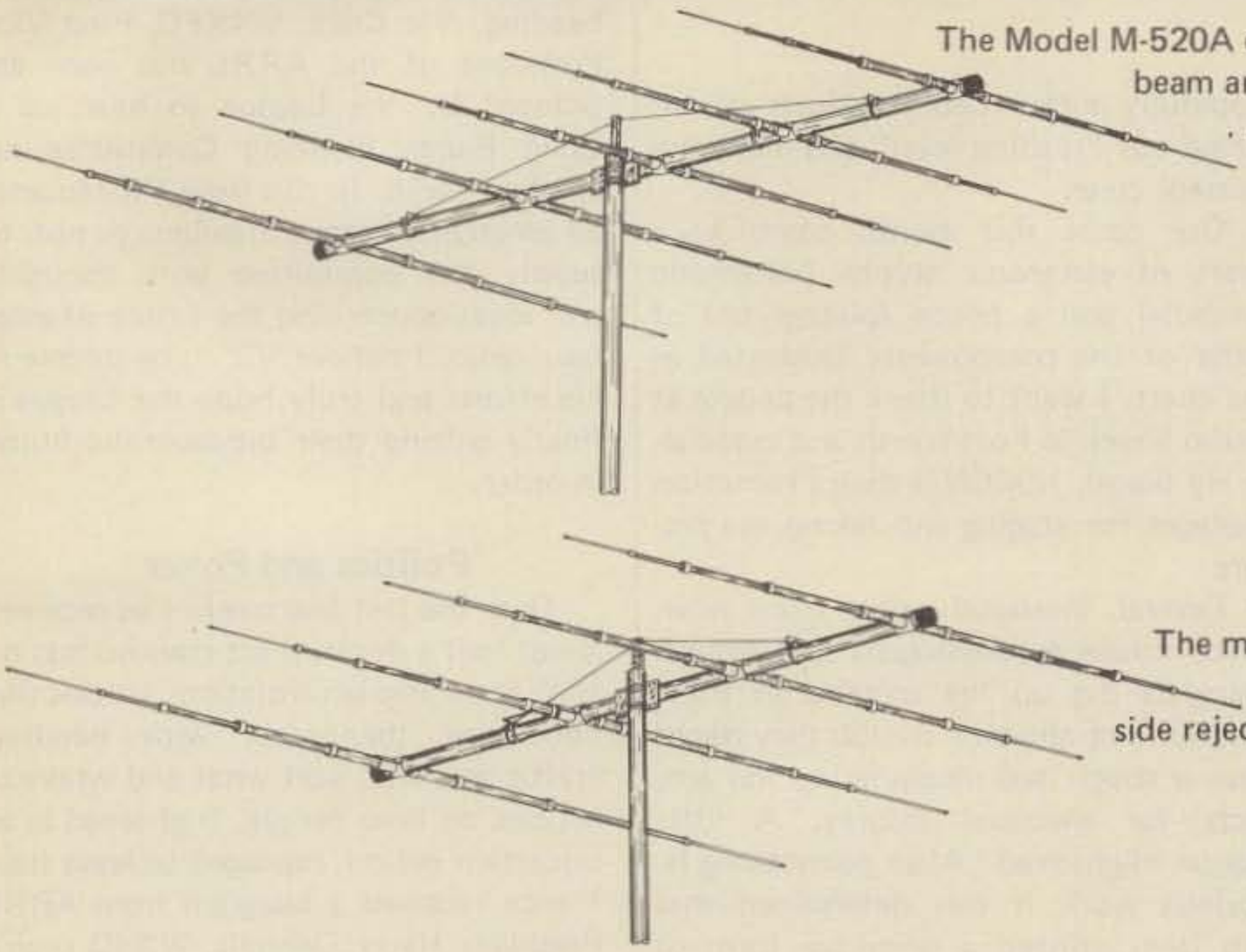

The Model M-520A offers the discriminating DXer an unexcelled beam antenna that really punches through the QRM . . . ask anyone who owns one! Features 5 full sized elements on a 2" O.D. x 34 ft. boom. Low SWR across the entire 20 meter band. The M-520A is shipped UPS in two cartons.

M-520A

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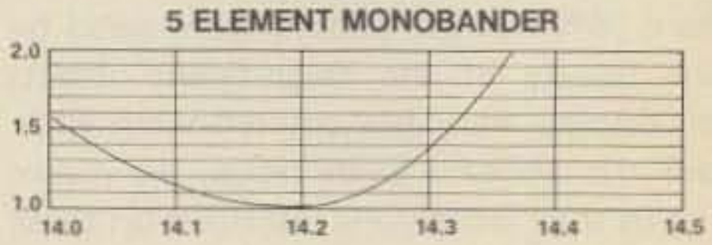

The magic 20 meter beam: M-420A . . . 4 elements on a 26 ft. boom. Super front-to-back and side rejection. The M-420A ships UPS in two cartons.

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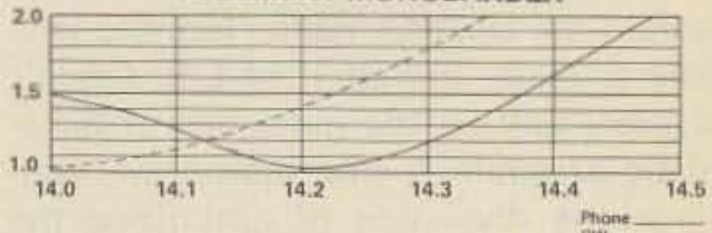

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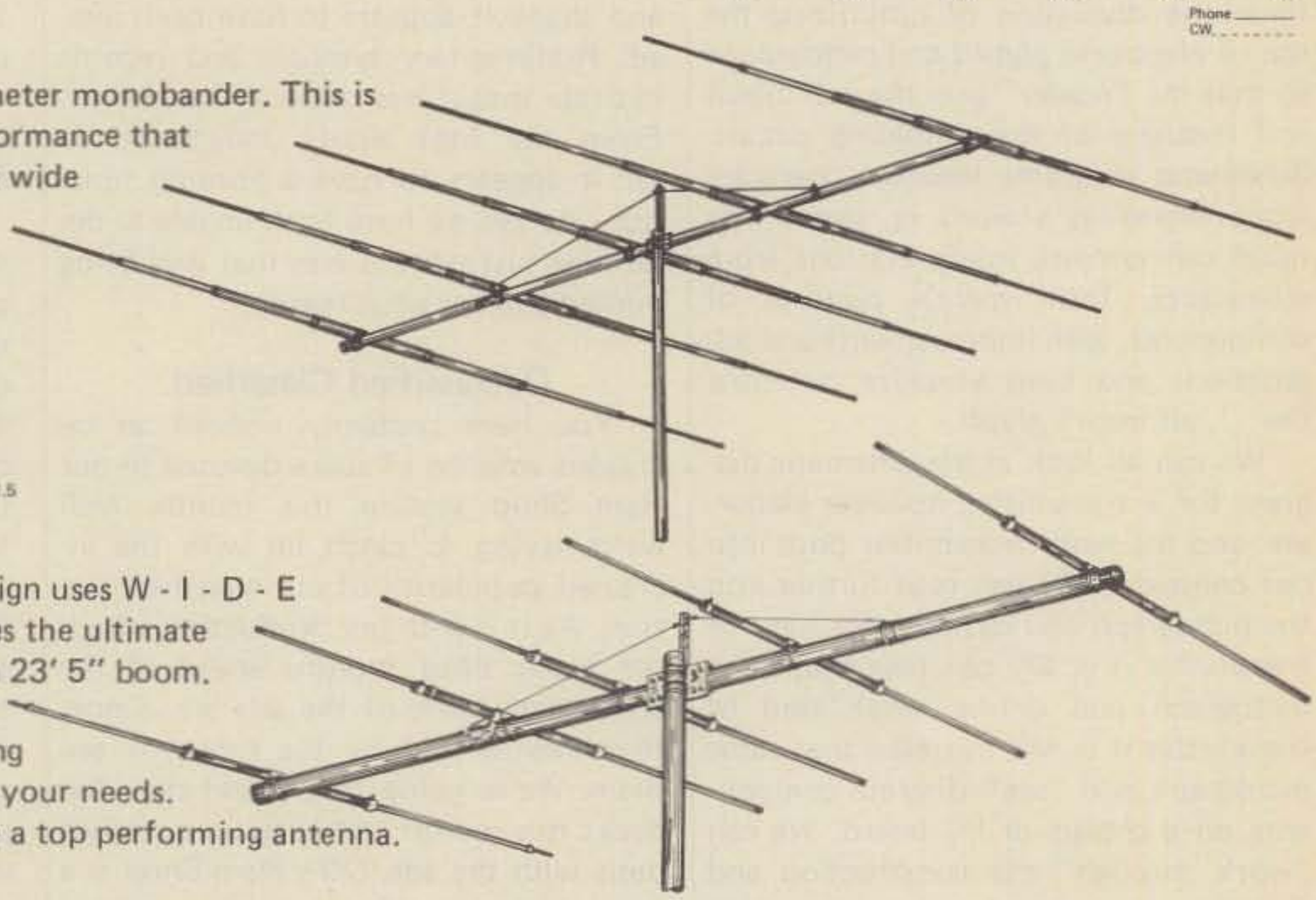

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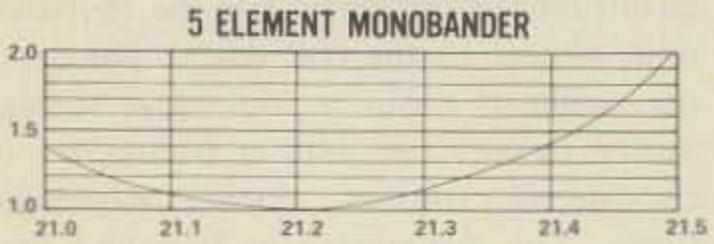

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M-105A

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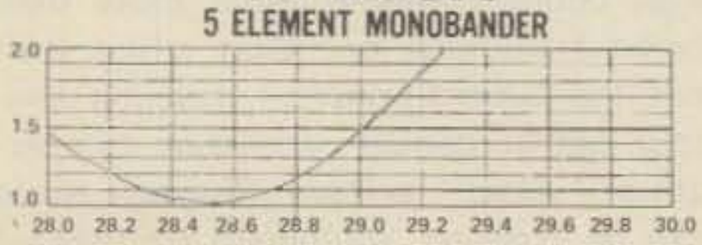

SPECIFICATIONS	MODEL M-520A	MODEL M-420A	MODEL M-155A	MODEL M-105A
Band MHz	14	14	21	28
Maximum Power Input	Legal Limit	Legal Limit	Legal Limit	Legal Limit
Gain (dB)	11.5	10	12.0	12.0
VSWR (at Resonance)	1.1:1	1.1:1	1.1:1	1.1:1
Impedance	52 ohms	50 ohms	50 ohms	52 ohms
Front-to-Back Ratio (dB)	25	25	26	25
Boom (O.D. x Length)	2" x 34'6"	2" x 26'	2" x 25'7"	2" x 23'5"
No. Elements	5	4	5	5
Longest Element	36'6"	36'6"	25'3"	18'2"
Turning Radius	25'	22'6"	17'6"	22'6"
Mast Diameter	2" O.D.	2" O.D.	2" O.D.	2" O.D.
Boom Diameter	2" O.D.	2" O.D.	2" O.D.	2" O.D.
Surface Area (Sq. Ft.)	8.9	7.6	4.25	2.9
Wind Load	227 lbs.	186 lbs.	108 lbs.	75 lbs.
Assembled Weight (Approx.)	70 lbs.	50 lbs.	40 lbs.	35 lbs.
Shipping Weight (Approx.)	79 lbs.	55 lbs.	45 lbs.	40 lbs.
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Announcing

● **Eugene, OR** — The 4th Annual Lane County Ham Fair will be held on July 21st and 22nd, 1979, at the Oregon National Guard Armory. Registration is $3 with advance registrants receiving an extra drawing ticket. There will be displays, lectures, contests, etc. For registration or more info, contact: Earl or Wanda Hemenway, K7KVV/WA7SZR, 2366 Madison, Eugene, OR 97405 or phone (503) 485-5575.

● **Bowling Green, OH** — The 15th Annual Wood County Ham-A-Rama will be held on July 29, 1979, at the Bowling Green Fairgrounds. Gates will open at 10 a.m., with free admission and parking. Dealer tables and space available. There will also be a drawing for prizes. K8TIH talk-in on 52. Tickets are $1.50 in advance, $2 at the door. For more info, write to: Wood County ARC, c/o Eric Willman, 14118 Bishop Rd., Bowling Green, OH 43402.

● **Wellington, OH** — The Northern Ohio Amateur Radio Society will hold its Second Annual ARRL approved Noarsfest on Saturday, July 7, 1979, at the Lorain County Fairgrounds. There will be a drawing with over 100 prizes. There will also be a large indoor exhibit hall for dealers and a huge blacktopped midway for flea market and trunk sales. Gates will open to sellers at 6 a.m. and 7 a.m. to the public. Admission is $1.50 in advance, $2 at the gate. Indoor dealer tables are $4 each by advance registration. Flea market spaces are $1 each. For advance registration, info, or tickets, write: Noarsfest, P.O. Box 354, Lorain, OH 44052.

● **Denver, CO** — The Rocky Mountain Radio Relay League Inc., would like to announce "Field Demonstration Day and Swap Fest" to be held on July 22, 1979, at the home of Mr. Karl Ramstetter, WA0HJZ, which is located off Highway 93, one mile north of the city limits of Golden. Signs will be posted for further directions. For more info, contact: Mr. Charles Kaufman, WA0 GUN, Chairman, 3734 South Poplar, Denver, CO 80237.

● **Palmyra, IL** — The twenty second Annual Breakfast Club Picnic and Hamfest will be held on Saturday and Sunday, July 14th and 15th, 1979, at Terry Park. A flea market, games, food and prizes drawings are scheduled. Activities start at noon, Saturday and close about 4 p.m. on Sunday. Talk-in on 52 simplex and 3973 kHz. Advance tickets and info are available from: The Quad-County Radio Club (sponsoring organization), P.O. Box 81, 602D E. Walnut St., Chatham, IL 62629.

● **Bellefontaine, OH** — The Champaign Logan Amateur Radio Club, Inc., will hold its Annual Hamfest on Sunday, July 1, 1979, at a new, bigger and better location—the Logan County Fairgrounds. Trunk and tables sales will be $1. Admission will be free and there will be door prizes. Talk-in on 146.52 simplex. For further info, contact: John L. Wentz, W8HFK, Box 102, West Liberty, OH 43357 or Frank Knull, W8JS, 402 Lafayette Ave., Urbana, OH 43078.

● **Baltimore, MD** — The Baltimore Radio Amateur Television Society (BRATS) will be holding the Annual BRATS Hamfest on Sunday, July 29, 1979. The event, beginning at 8 a.m., rain or shine, includes a giant flea market, indoor and outdoor exhibits and top prizes. Location: The Howard County Fairgrounds. Talk-in on 16/76, 63/03, 52/52 and 52.525. Tickets—$2, Tailgating—$2. Tables—advance— $4, at the door —$5. Contact: BRATS, P.O. Box 5915, Baltimore, MD 21208.

● **Okanagan, Canada** — The Okanagan International Hamfest will be held on July 28th and 29th, 1979, at the Gallagher Lake KOA Kampsite. Featured will be prizes, entertainment, a flea market, etc. Call-in frequencies: 75m—3800, 2m—34/94 OKN Repeater, 76/76 simplex. For further info, contact: John Juul-Andersen, VE7DTX, 8802 Lakeview Dr., Vernon, B.C., V1B 1W3 or Lota Harvey, VE7DKL, 584 Heather Rd., Penticton, B.C., V2A 1W8.

● **Allentown, PA** — The Tri-Club Hamfest will be held on July 15, 1979, from 8 a.m. to 4 p.m., at the Allentown Police Academy pistol range. Admission will be $2 for lookers and $4 for sellers. Talk-in on .34/.94 and .52. For more info, contact: Sam Yoder, Rt. 1, Box 410, Allentown, PA 18104.

● **Oak Ridge, TN** — The Oak Ridge Amateur Club will hold the Oak Ridge Hamfest '79 on July 14th and 15th, 1979, at the Oak Ridge Civic Center. The FCC will be in Oak Ridge on Saturday to give exams. Exams will start promptly at 8 a.m. in the High School Cafeteria, across the street from the Civic Center. Anyone wanting to take the exam must have form 610 completed and have your present license with you. 10,000 square feet will be available for commercial and flea market exhibits. Admission will be $1. For further info on commercial and flea market space, contact: Charles Byrge, WB4 OBE, P.O. Box 291, Oak Ridge, TN 37830. Talk-in on 146.88, 147.72 and 146.82. Local talk-in on 146.52.

● **Indianapolis, IN** — Indiana's largest Hamfest will be held on Sunday, July 8, 1979, at the Marion County Fairgrounds. The Hamfest will feature a large, well appointed commercial exhibit area plus indoor and outdoor flea markets. Technical forums will be featured by the Indiana Radio Club Council. Talk-in on 16-76, 28-88, and 10-70. For additional info, write: The Indianapolis Hamfest Association, Box 1002, Indianapolis, IN 46206.

● **Marshall, MO** — The fourth Annual Hamfest, sponsored by the Indian Foothills Amateur Radio Club, will be held on July 22, 1979, at the Saline County Fairgrounds. Advance tickets are $2 each or 3 for $5. At the door, tickets will be $2.50. There will be many prizes and flea markets featured. Talk-in on 52, 28/88 and 147.84/24. For further info and tickets, contact: Norman Gibbins, WB0SZI, 692 North Ted, Marshall, MO 65340.

● **South Haven, MI** — The Black River Amateur Radio Club will be operating a special event station during the National Blueberry Festival in South Haven on July 18-22, 1979. The call of the station will be W8IGV and the frequencies used will be on or near 3.975, 7.275, 14.275, 21.375 and 28.675. CW operation will be conducted randomly throughout the Novice/Technician sub-bands. Any station working W8IGV during this period, can receive a colorful post-paid certificate by mailing a QSL card to: The National Blueberry Festival, P.O. Box 224, South Haven, MI 49090.

Our Readers Say

Unpredictable Wear

Editor, CQ:

I received my copy of *The Shortwave Propagation Handbook,* by George Jacobs, W3ASK and Theodore Cohen, N4XX, on March 8th. I found the book so fascinating, that I've read it twice and have read chapters 1, 4, 5 and 6 a third time. I was going to try and keep my autographed book in good condition, but I'm afraid that I've almost worn it out.

Congratulations on publishing such an excellent book.

Al Williams, WB3GPM
Alexandria, VA

Seek You

Editor, CQ:

I have enjoyed reading your magazine for quite some time. I remember a lot of the articles from way back. Your magazine was interesting then and has remained the same.

Your readers might like to know of an organization that has been started. It is called *The Amateur Scientist Research Organization.* Many persons like to experiment and this organization fills the bill of providing a means of bringing them together.

For more information, write: ASRO, P.O. Box 4, McMechen, W.Va. 26040. They will receive the latest newsletter and bulletin. Of course, there will not be any charge or obligation.

Richard S. Meyer, WD8BJW
McMechen, W.Va.

Bravo Bill

Editor, CQ:

As a relative newcomer to amateur radio (first licensed August 21, 1978), I find the Novice column by Bill Welsh, W6DDB, very informative. I especially enjoyed the QSL articles. Amateur Radio—Part I has cleared up a lot of confusion for me.

Garry Cameron, VE7DZR
Port Alberni, B.C. Canada

the praise is pouring in

*Shown with accessory touch tone pad

Top view

We have never enjoyed such an overwhelming response to a new product. Letters of praise for Tempo's S-1 are coming in daily. Words such as great, fabulous, and fantastic are common. In a few short months the S-1 has taken the Amateur world by storm. In addition to its unique features and its versatility, it has now proven itself to be an extremely rugged and dependable unit...qualities unmatched at any price, but unheard of at the S-1's low price.

This amazing pocket sized radio represents a major breakthrough in 2-meter communications. Other units that are larger, heavier and are similarly priced can offer only 6 channels. The S-1's price includes the battery pack, charger, and a telescoping antenna. But, far more important is its *proven* performance record as a fully synthesized 800 channel hand held transceiver.

The optional touch tone pad adds greatly to its convenience and the addition of a Tempo solid solid state amplifier adds tremendously to its power.

The proven TEMPO S-1 does it all... portable...mobile ...base station and gives you 800 channels in one of the smallest hand helds

SPECIFICATIONS

Frequency Coverage:	144 to 148 MHz
Channel Spacing:	Receive every 5 kHz, transmit Simplex or ±600 kHz
Power Requirements:	9.6 VDC
Current Drain:	17 ma-standby 500 ma-transmit
Batteries:	8 cell ni-cad pack included
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5")
RF Output:	Better than 1.5 watts
Sensitivity:	Better than .5 microvolts

SUPPLIED ACCESSORIES
Telescoping whip antenna, ni-cad battery pack, charger.

OPTIONAL ACCESSORIES
Touch tone pad: $55 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Rubber flex antenna: $8 • Leather holster: $16 • Cigarette lighter plug mobile charging unit: $6 • Matching 30 watt output 13.8 VDC power amplifier (S30): $89 • Matching 80 watt output power amplifier (S80): $169

Price... $349.00 With touch tone pad... $399.00

The Tempo line also features a fine line of extremely compact UHF and VHF pocket receivers. They're low priced, dependable, and available with CTCSS and 2-tone decoders. The Tempo FMT-2 & FMT-42 (UHF) provides excellent mobile communications and features a remote control head for hide-away mounting.

The Tempo FMH-42 (UHF) and the *NEW* FMH-12 and FMH-15 (VHF) micro hand held transceivers provide 6 channel capability, dependability plus many worthwhile features at a low price. FCC type accepted models also available.

Please call or write for complete information. Also available from Tempo dealers throughout the U.S. and abroad.

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Drive Power	Output	Model No.	Price
2W	130W	130A02	$209
10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
2W	30W	30A02	$ 89

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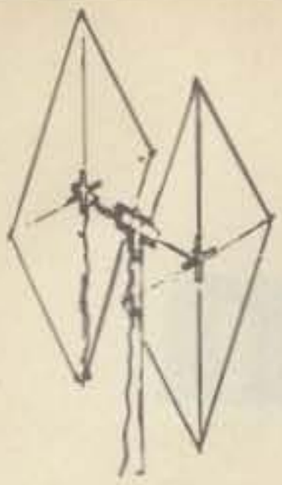

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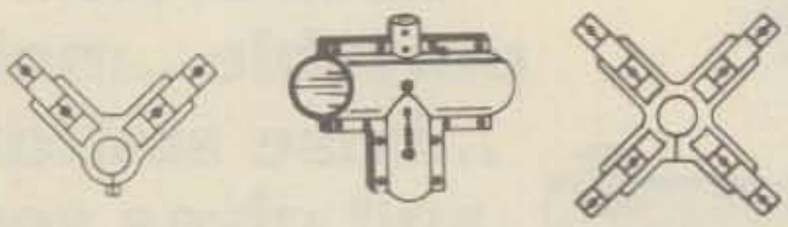

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DL-1	(2)	1½" Hub V-Supports	
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	(1)	2" Boom to 1½" Mast T-Mount	$24.69
DL-3	(2)	3" Hub V-Supports	
	(1)	3" Boom to 2" Mast T-Mount	$40.64

QUAD MOUNT KIT

QM-1	(2)	1¼" Hub Spiders (Small Spider for VHF)	
	(1)	1¼" Boom to 1¼" Mast T-Mount	$11.95
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QM-3	(2)	1½" Hub Spiders	
	(1)	1½" Boom to 1½" Mast T-Mount	$16.10
QM-4	(2)	2" Hub Spiders	
	(1)	2" Boom to 1½" Mast T-Mount	$24.69
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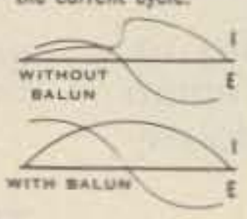

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5075-D	Dipole	3.4-52 mcs	2K PEP
5075-B	Beam	3.4-52 mcs	2K PEP
5075-LF	Dipole	1.7-10 mcs	2K PEP

MODEL 5075-B For Beam Antennas Net Wt. 7 Oz.

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"The one that probably best illustrates our point —that your Amateur Radio dollar buys a lot more these days—is the ICOM IC-211. . . The key word in any description of the IC-211 is *versatility.*"

QST Magazine, "Product Review", Dec. 1978

All ICOM radios significantly exceed FCC specifications limiting spurious emissions.

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Specifications:

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  20.950 MHz - 21.550 MHz
  28.000 MHz - 30.000 MHz
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  *standard from factory (crystals available for entire range)
- Modes of operation: USB, LSB, CW, RTTY, SSTV
- Frequency stability: PTO; total drift is less than 100 Hz after warm up. Total frequency change is less than 100 Hz over 11 - 16 V-dc input supply change.
- Frequency readout accuracy: better than ± 4 KHz between 100 KHz calibration points.
- Power supply requirements:
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  13.6V-dc regulated 2A
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  750MA receive-full audio
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- Weight: 11 pounds
- Size: H4"W10"D15" including heat sibk extrusion.

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- Sensitivity: less than o.25μ V for 10dB S/N
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- Audio output: 1 watt 8 ohm load

Transmitter:

- Power input:
  SSB - 200 watts PEP
  CW - 200 watts
  RTTY and SSTV - 100 watts
- Load impedance: 50 ohms, nominal
- Spurious output: greater than 50dB down
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A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.
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PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104. *Specify when ordering.*
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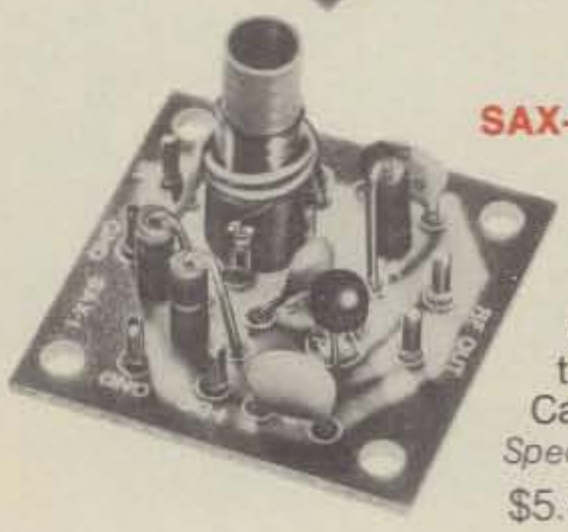

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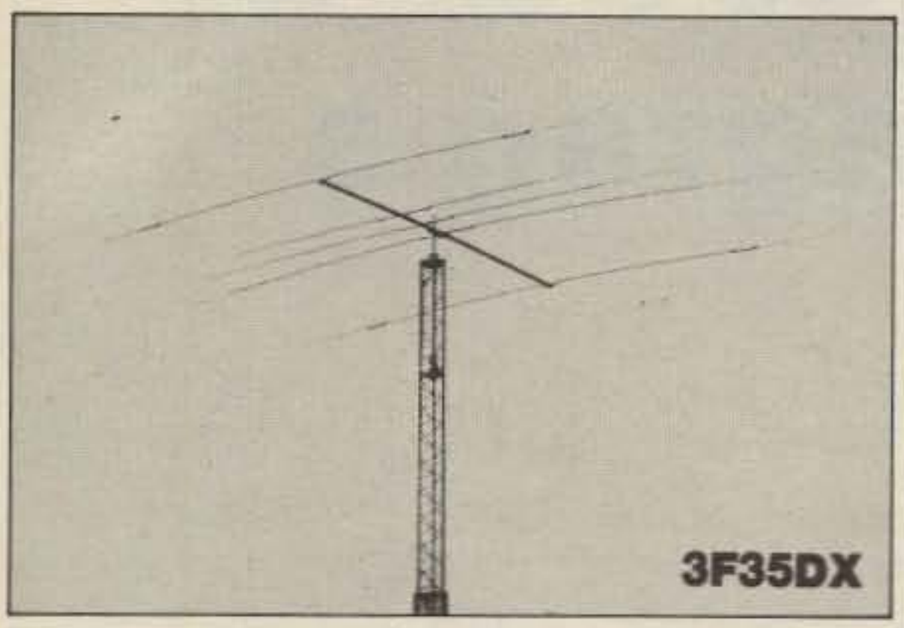

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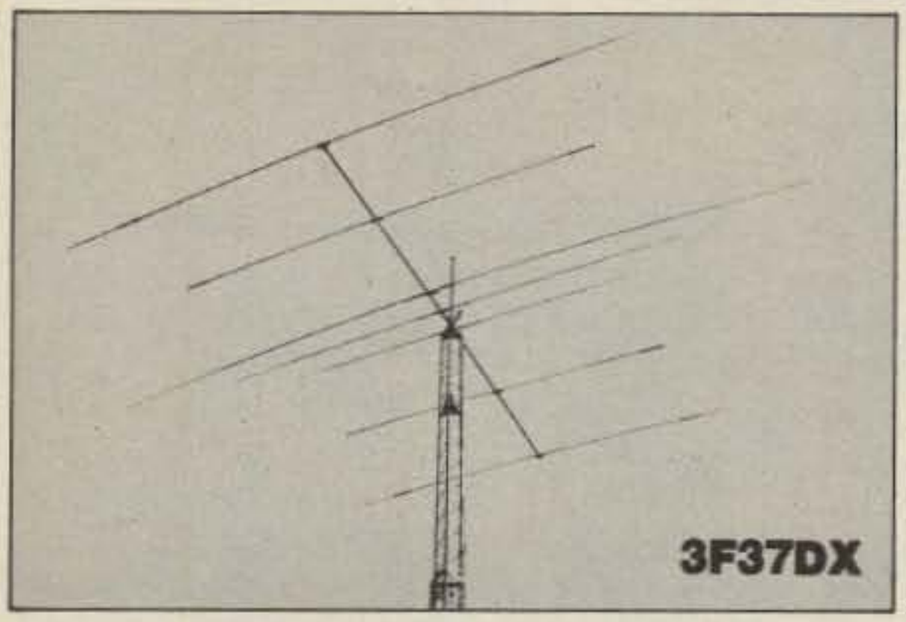

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ELEMENTS		7	5
ELEMENTS PER BAND	20m	3	3
	15m	5	3
	10m	5	3
ANTENNA GAIN	20m	8.5dB	8.0dB
	15m	10dB	8.5dB
	10m	10dB	8.0dB
FRONT BACK RATIO		25dB	20-25dB
MAX. POWER INPUT		3kw	3kw
VSWR		1.5 OR BETTER	1.5 OR BETTER
IMPEDANCE		50Ω	50Ω
MAX. ELEMENT L.		10.5m	10.5m
BOOM LENGTH		7.5m	5.0m
BOOM DIAMETER		50mm	50mm
TURNING RADIUS		5.3m	5.25m
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SUITABLE MAST		50mm	50mm
WEIGHT		23kg	17kg

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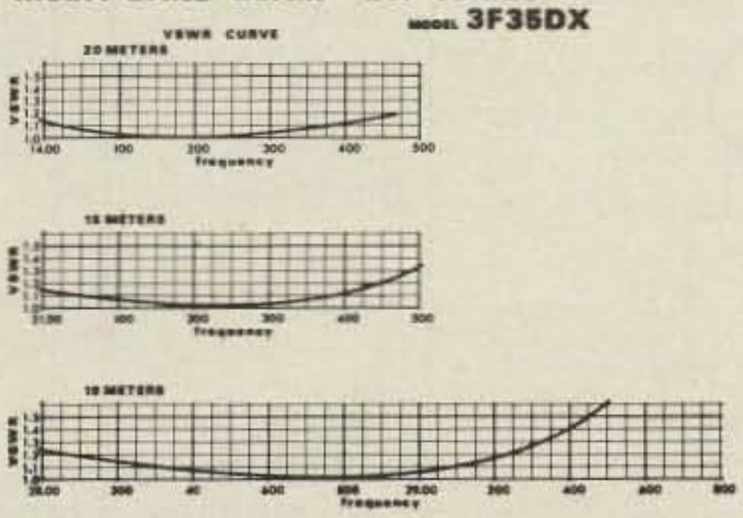
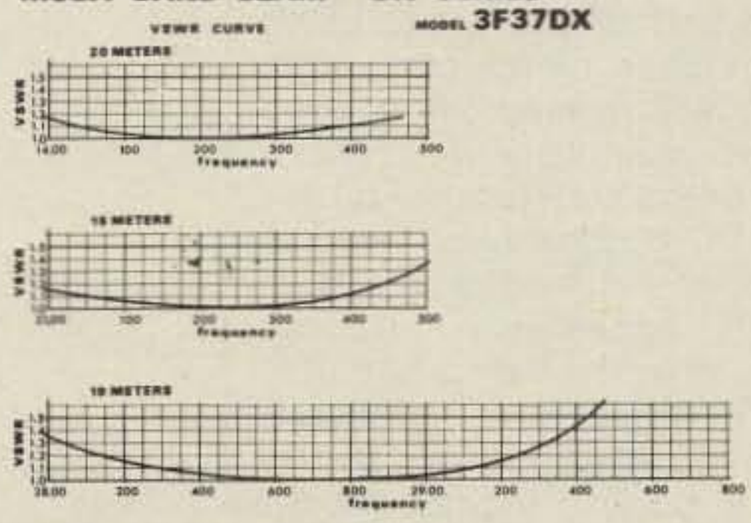


MULTI BAND BEAM DX SERIES MODEL 3F37DX



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L.B. Cebik concludes his interesting article.

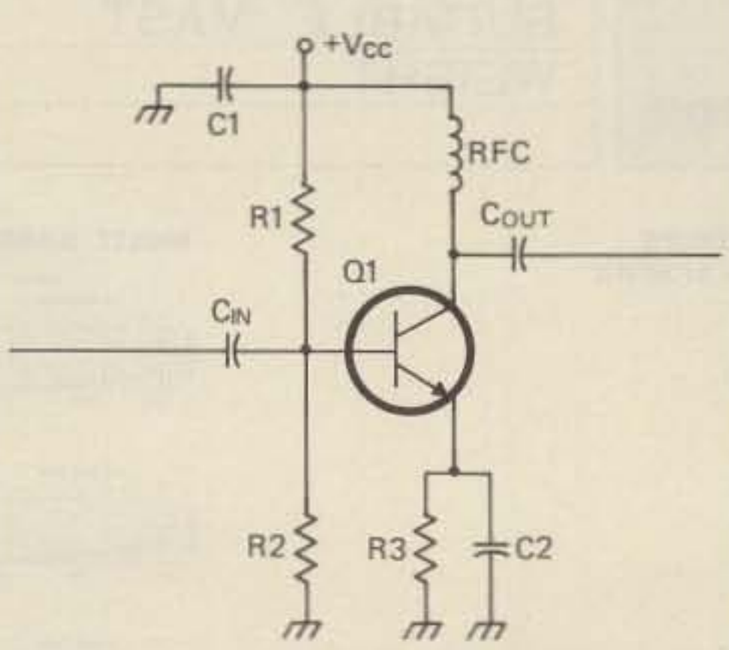
Getting The Most Out Of Schematic Diagrams

Part II

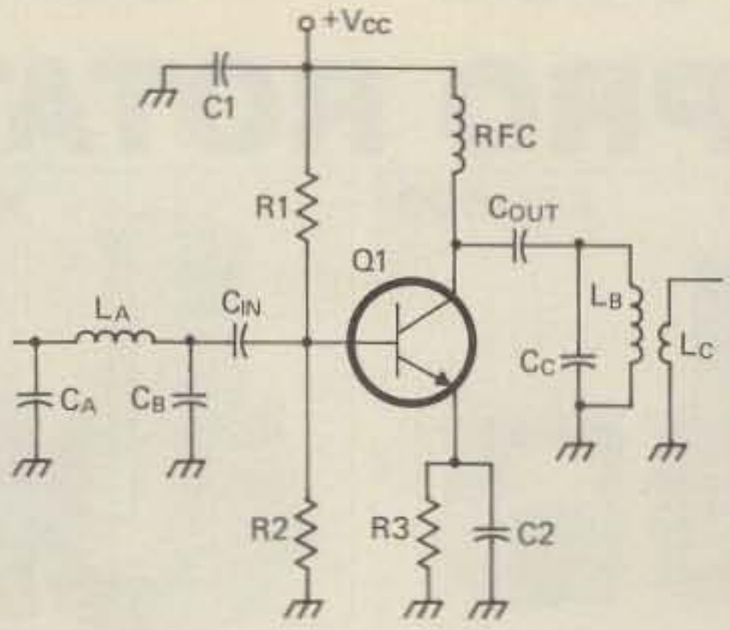
BY L.B. CEBIK*, W4RNL

When we draw individual circuits, we often overlook parts that are held in common between two circuits. Fig. 7A shows what appears to be an untuned amplifier. Fig. 7B, however, expands the drawing a bit and shows that the amplifier indeed has frequency determining circuits; they just happen to be on the other side of coupling capacitors. Do they belong to the adjacent circuits or to this one? The answer is to both. If you are thinking about the process of building, then coupling capacitor may be a good dividing line, especially if different circuits are being constructed on different boards. If, however, you are thinking in terms of feedback, stability, selectivity, impedance matching, and the like, then the tuned circuit is indeed part of this circuit. If you copy it into a notebook for future reference, be sure to include all the elements—whether control circuits or tuned circuits—that affect its immediate operation.

Although the points in this section have not been expressed as questions, it is easy to see that they imply questions which a schematic can answer. What are the energy paths in this circuit? What control elements work in conjunction with this circuit? What adjacent elements affect or operate effectively as part of this circuit? Questions like these will help you completely analyze a circuit in a way which eventually will permit you to evaluate, compare, and select circuits for a project of your own. They will also aid you in analyzing what may be wrong with a piece of equipment you are servicing. And they will also call attention to good construction practices with respect to components which may interact.



A. An apparently untuned r.f. amplifier. . .



B. . . . becomes a tuned stage when we add the circuits on the other side of the coupling capacitors.

Fig. 7 - When is an untuned amplifier stage really tuned?

3. *Questions about components.* The progression of thought about schematic diagrams has slowly grown more and more specific. When we reach the level of individual components, we have just about reached bottom (except for integrated circuits, which include complex circuitry inside their tiny plastic or metal bodies). But the question we ask at this level can be just as important as those at any other.

The list of questions we can ask about components is nearly endless, but here is a starter list upon which you can build.

Active devices. What kind of device is used? What supply voltages and currents does it require? What is its power level? How does it perform its function in this circuit, e.g., amplifying, mixing, detecting, etc.?

Bias resistors. What values did the builder choose? Why those values? What size (power level) did he need? Which resistors control voltage or current levels, and which are for decoupling? See fig. 8 for an example.

Other resistors. What is the function of resistors that do not form part of the bias circuit? To broaden selectivity? To provide feedback?

Capacitors. Which one control frequency? Which by-pass? Which control feedback? Why were certain values chosen? Why were certain

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types of capacitors specified, e.g., disc ceramic, silver mica, polystyrene, etc. See fig. 9, a simplified schematic of a v.f.o. for an illustration of some of these points.

Inductors. What is the value of the inductors in tuned circuits? What construction is specified (for example, slug-tuned with brass or iron. toroids, ceramic or phenolic forms, air wound, etc.), and why?

Chokes. What values and types of chokes are used in the circuit?

Other components. What are the functions and values of diodes, transformers (including baluns)? Are there any special connectors, switches, or jacks? How is metering, if any, handled?

The answer to these and other question you can pose about individual components may not be readily apparent from the schematic diagram alone. Many of the answers may occur in the text of the article. The author may specify that he used polystyrene capacitors for temperature stability, or that he used a ceramic coil form for higher Q and mechanical rigidity. On many points, however, the author may be following common practice, for example, in using disc ceramics for bypassing. The explanation has been given long ago and in many handbooks, so the author feels no need to mention that within tolerances of plus or minus fifty percent or more, bypassing is uncritical thus making disc ceramic capacitors perfectly satisfactory. If this is not the case, as with bypassing at v.h.f., he will usually bring up the matter.

This situation—the one we call "following common practice"—is the most difficult for the new schematic reader to master. What is common practice for old timers may be totally new for you, since it may be the first time you have encountered it. Here is where your reading might go well beyond a given article into handbooks and texts. This is not so awesome as it seems. Handbooks and texts are most bewildering when we try to read them from cover to cover without looking for something specific. In this case, however, we will have definite questions; the index will help us locate sections of interest and we need read only them. And because we have specific questions, we will more than likely remember what we read (or at least where we read it).

Questions about supplementary information. Besides all the information noted above, schematic diagrams often contain supplementary information concerning various aspects of circuit operation. The most important of this information are voltage readings taken at various points in the circuit. Examine fig. 10 closely. Notice that there are numbers in boxes and in circles as well as dashes and stars in front of some of the numbers. In making up this example, I have filled the diagram with more information than most authors include. However, some of this data may be given in the text of an article. Hence, you should have in mind certain questions to ask of the diagram and article. If answers are available, filling them in on the diagram helps to organize information in a very useful place.

The key questions to ask are these:
1. What are the d.c. levels at various points in the circuit? What are their "key up" and "key down" values? Notice that in this mixer stage of a c.w. transmitter, there is a difference between the two values, since the key removes the negative d.c. voltage from the base of the keying transistor. The stages it keys also undergo changes in voltages depending upon whether the emitter-collector circuits conduct (key down) or not (key up).

2. What are the signal voltage levels at various points in the circuit? Again, returning to fig. 10, notice that r.f. voltages can be read at many points in the circuit. Voltages tend to drop after passing through passive components such as capacitors. In general, amplifiers tend to raise the voltage levels. But look at the buffer following the mixer. Its function is to isolate the mixer stage from succeeding stages and to transform impedance to a lower level; therefore, the voltage actually drops a bit. This is proper operation for a circuit of this sort.

The utility of specifying d.c. and signal voltages is to provide you with

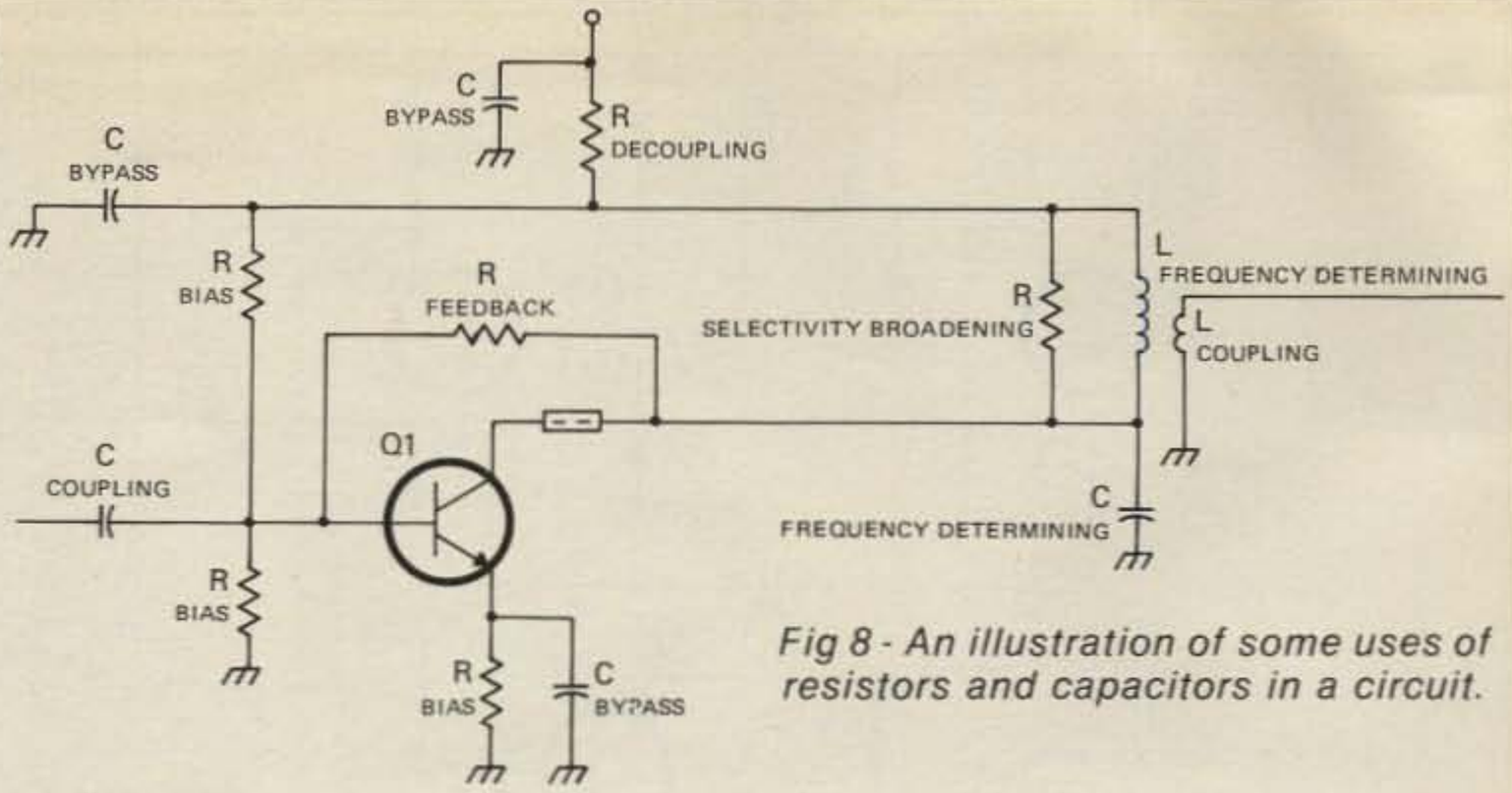

Fig 8 - An illustration of some uses of resistors and capacitors in a circuit.

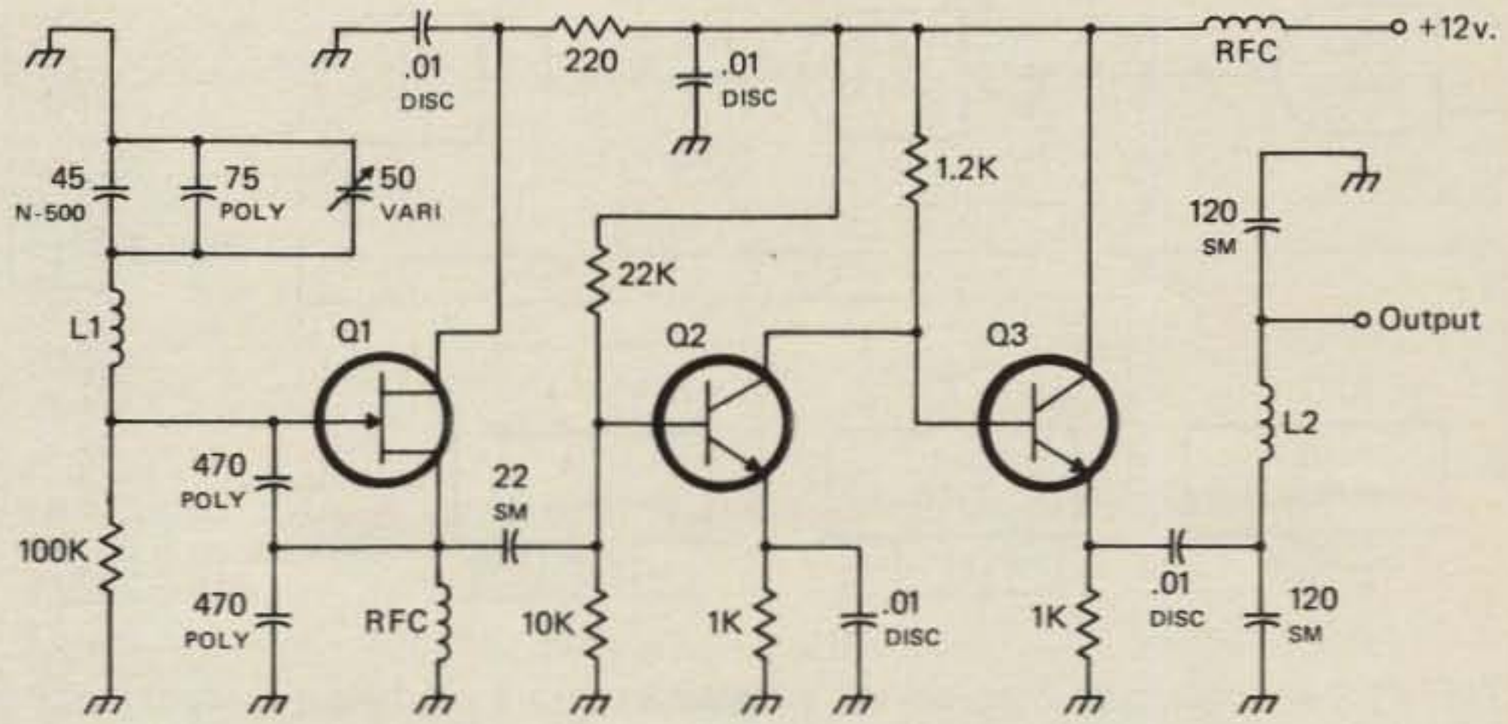

Fig. 9 - A simplified diagram of a v.f.o. circuit. POLY = polystyrene, which are used where maximum frequency stability is desired. SM = silver mica, which are "second best" for stability and are available in many values with close tolerances. N-500 indicates a negative temperature coefficient which counters the drift with heat of other components. VARI = variable (air) capacitor. DISC = disc ceramic, used mainly for bypassing where close tolerances and stability are not a major problem. The notation of disc capacitors is rarely made; they are inferred from the values and uses in the circuit.

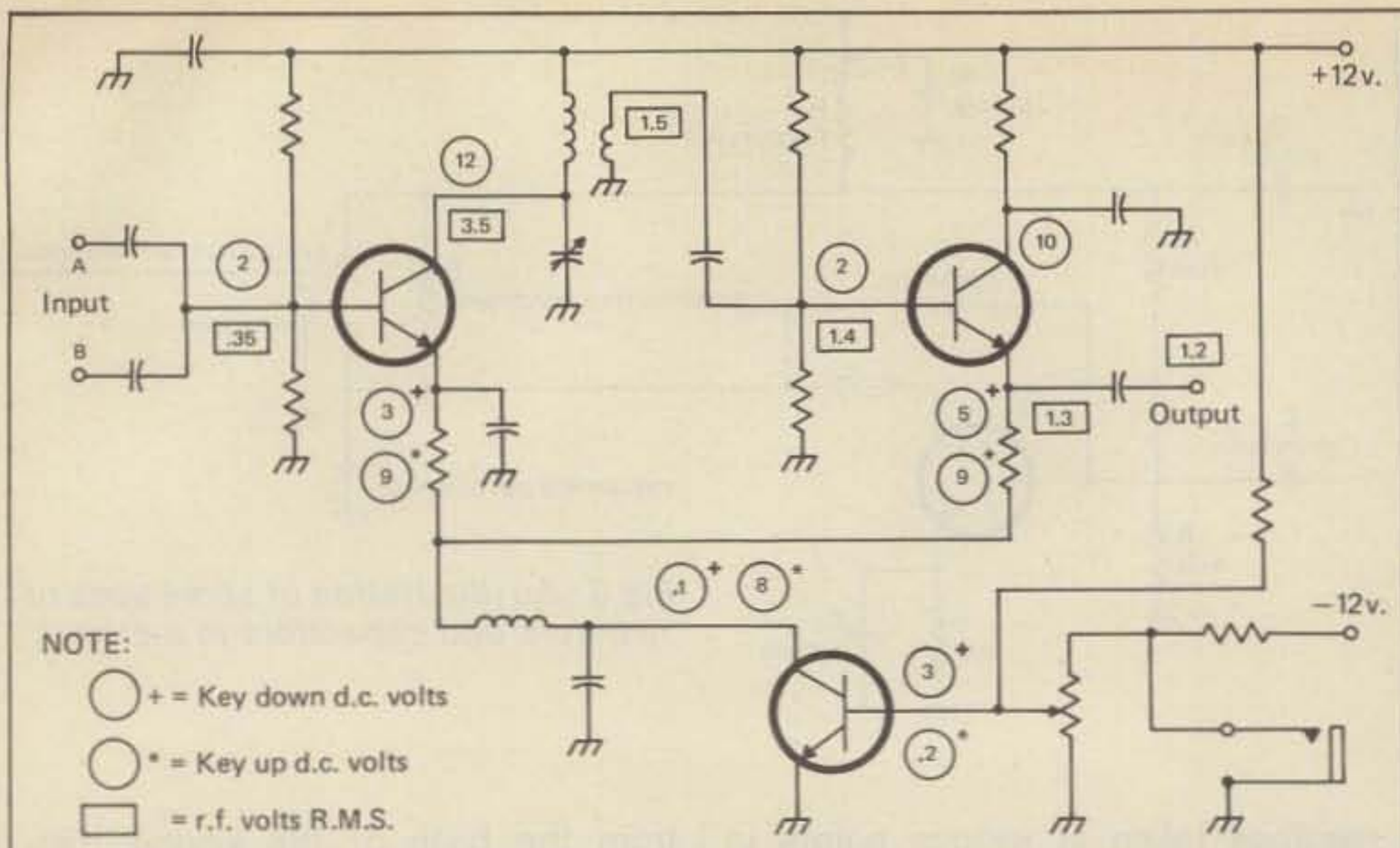

Fig. 10 - Schematic diagram illustrating the placement of operating and signal voltages at various points in the circuit. Parts values have been omitted from the diagram to set the readings in bold relief. This circuit represents a low level mixing stage followed by an untuned buffer, both keyed by a switching transistor. Note the "key up" and "key down" d.c. levels as well as the signal levels. Coding of the boxes and circles is given in the legend, since there is no single standard for presenting such information on schematic diagrams. If a schematic does not contain this information, but is available in the text of the article, you can enter it into the diagram.

a general guide to proper circuit operation. Whether you are building or servicing a piece of equipment, you can be confident that if the d.c. voltages are within 10 to 20 percent of the specified values, all is probably in good order. Keep in mind, however, that there are other ways for things to go wrong.

There is no universal standard for listing voltages on a circuit diagram. Usually, the method used by an author will be given in a key on one side or the other of the diagram. In the same general area will be other notes. Some may specify that resistance values with M (e.g., 1.5M) are in megohms, those with k (e.g., 4.7k) are in kilohms. Other notes may specify that values of capacitance up to 1000 are in picofarads and decimal values (e.g., .01) are in microfarads. Variations from this scheme will supply the unit as well as the value (e.g., 10 μF). Such notes may also give the meaning of abbreviations used with components, for example, poly = polystyrene capacitor, sm = silver mica, etc.

In diagrams of digital IC circuits, do not expect to find many, if any, major notes on voltage levels. The reason for this is that digital IC circuits usually provide one supply voltage for all units, and the high and low states will be approximately the same from unit to unit. These values will be consistent for each series of ICs. For example, TTL ICs in the 7400 series are fed a regulated 5 volts to the supply pins (see fig. 11). High levels are generally above 3.8 volts and low levels are below 1.2 volts. Variations from these values which do not mean a bit of trouble either in the device or in the circuit are rare. Knowing the general parameters for digital devices of the series that the author used in his article is necessary, since he will rarely cover this either in the text or in his diagram.

Learning how to use voltage information, whether d.c. or signal, is important to you, whether you are building, servicing, modifying, or adapting a circuit. Given a piece of equipment, these values present useful clues as to whether the circuit is operating properly. From a design or building perspective, the voltage values can let you know what to expect from a circuit and whether it will do the job you want it to do. An amplifier that does not amplify enough calls for either another stage or some circuit changes. One that amplifies too much can create just as many problems by overdriving the next stage, perhaps generating distortion or harmonics. In radio's early years, the byword was to get as much as possible from every circuit, and even that was usually barely enough. Today's high gain, efficient, and inexpensive devices have changed our thinking. We can now design for neither too much nor too little output, and this has given our circuits a flexibility as never before.

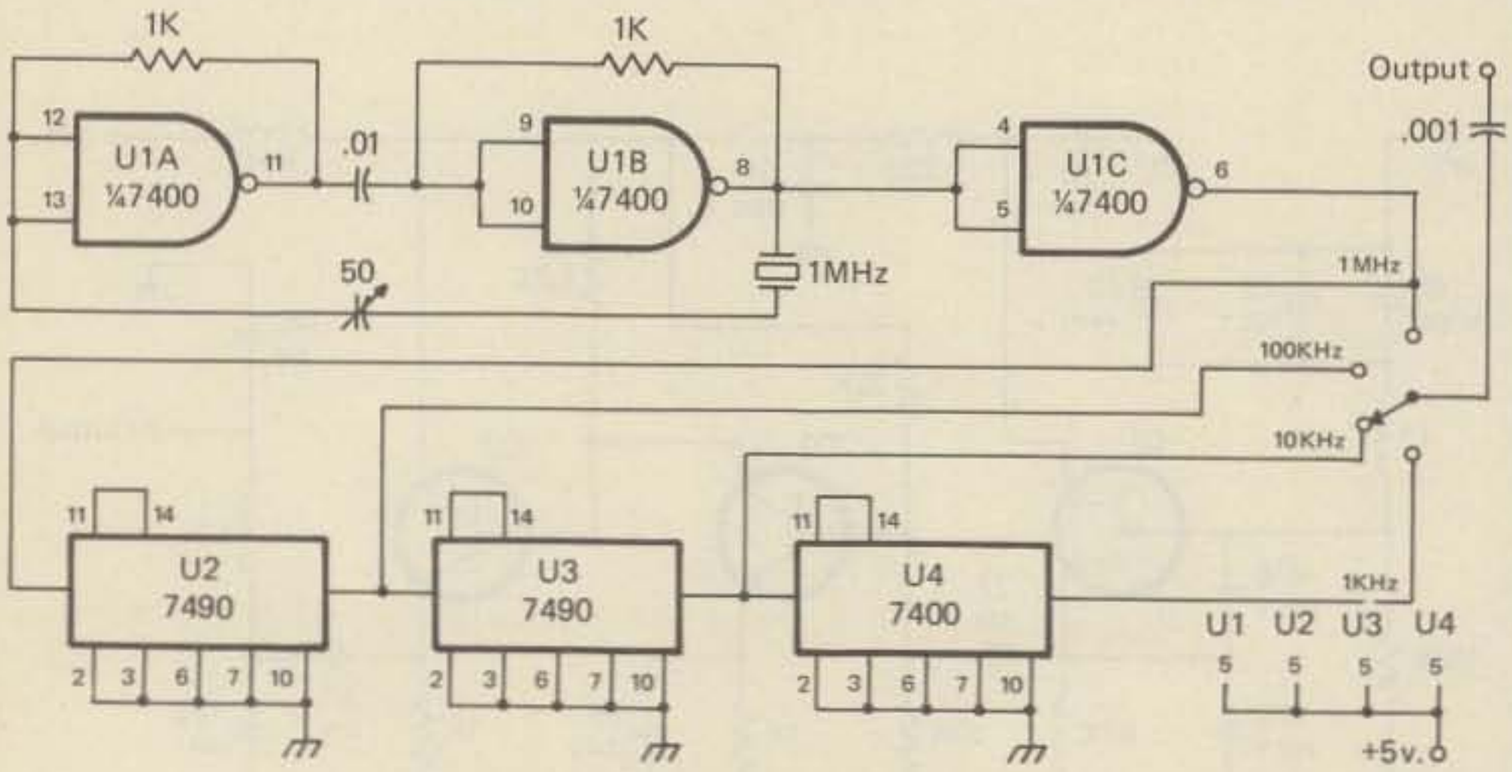

Fig. 11 - A schematic diagram of a small example of digital circuitry using series 7400 TTL IC's. Perhaps the crystal gives away the fact that U1A and U1B together form an oscillator. Unless one knows the functions of the other chips and chip sections, it would be difficult to fully understand this circuit. The switch suggests that the 7490's somehow divide the frequency by ten, but there is no hint that they do this by dividing the sequence by two and five. Too, there is no clue without knowledge of the operation of NAND gates that U1A, U1B and U1C are set up as inverters. For construction purposes, this information may not be needed, but the reader who wishes to understand the circuits he builds will likely end up reading much supplementary material.

Some Special Considerations

In addition to the basic questions which help us squeeze information out of a schematic diagram, there are dozens of other considerations which do not lend themselves to a completely systematic account. Therefore,

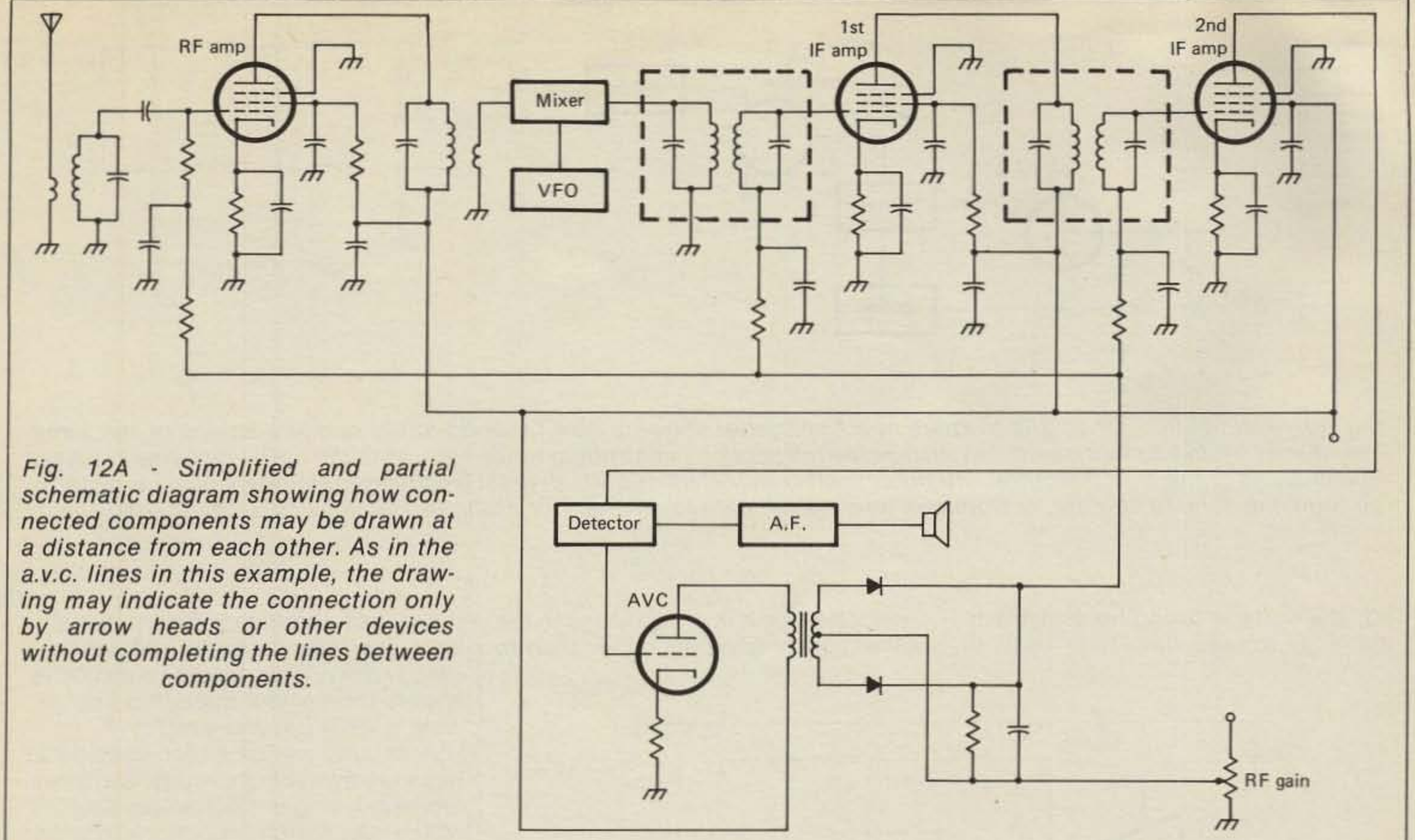

Fig. 12A - Simplified and partial schematic diagram showing how connected components may be drawn at a distance from each other. As in the a.v.c. lines in this example, the drawing may indicate the connection only by arrow heads or other devices without completing the lines between components.

here is a potpourri of items to think about.

First is the matter of special circuits which affect many other circuits. Figs. 12A and 12B illustrate ways in which such circuits might be shown on a schematic. 12A shows an a.v.c. circuit along with parts of r.f. and i.f. amplifiers. Notice that there is no line drawn from the a.v.c. amplifier to the two stages it affects. The voltage output of the a.v.c. amplifier (more negative as signals grow stronger) is shown only at the a.v.c. circuit itself. Yet, when reading a schematic of the reciever as a whole, you must understand the way in which this circuit affects the other circuits. The voltage on the gates of the r.f. and i.f. FETs will vary with the output of the a.v.c. amplifier. In short, you must make the connection in your head since it is not on the drawing.

Fig. 12B shows power supply and blocked grid keying connections for two transmitter stages. Here the lines are completely drawn, but certain important components which affect circuit operation are drawn at a considerable distance from the circuits themselves. Resistor R1 affects the key down current of the keying circuit and is part of a voltage divider circuit (with R2) determining the precise negative voltage on each grid. Notice

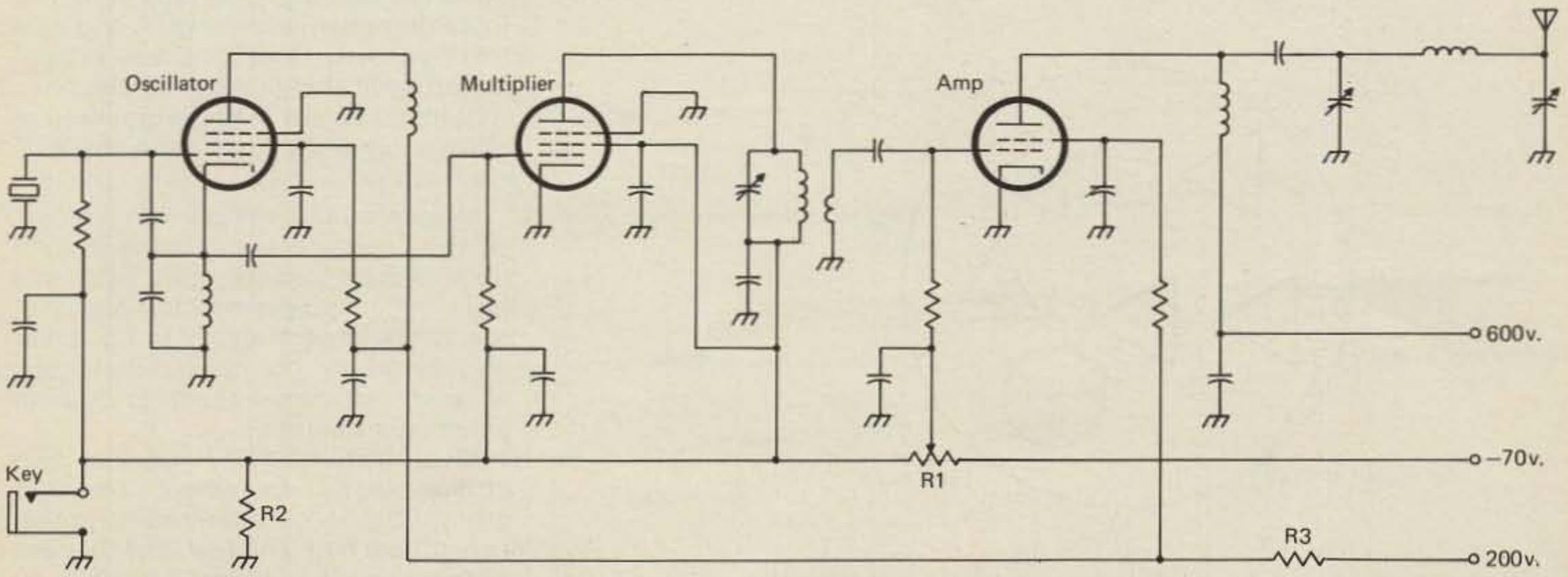

Fig. 12B - Simplified schematic diagram of a transmitter illustrating the fact that components drawn far apart on a diagram may play an important role together. R1 and R2 form a voltage divider circuit for the blocking voltages on the tube grids. R3 provides a voltage drop for all screen grids and all plates except that of the final amplifier. More complex equipment may separate parts even further in schematics.

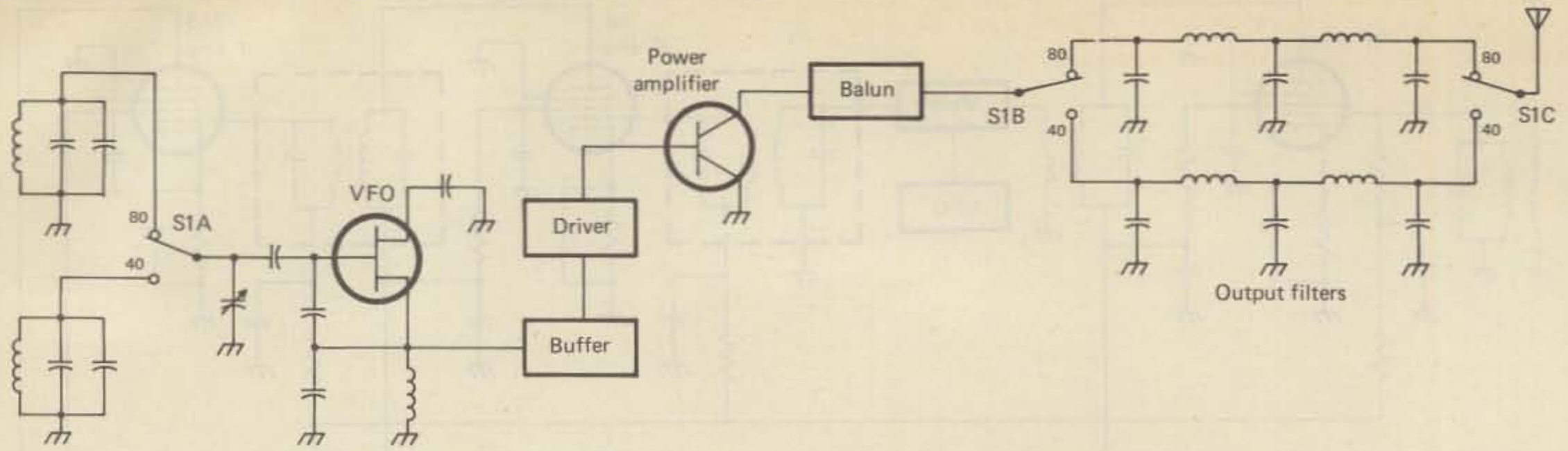

Fig. 13 - A simplified schematic diagram of a transmitter showing how far apart in the circuit sections of the same switch may be. In addition, there may also be switch sections controlling tuned circuits in the buffer and driver stages. Full analysis of the circuit requires attention to all circuit elements which must be changed simultaneously in order to go from one band to another, or from one transmitter state to another (for example, from c.w. to s.s.b. to TUNE, etc.).

R3, the voltage dropping resistor in the high voltage line. It is easy to overlook since it is drawn close to the power supply terminal, rather than to the stages. Diagrams of commercially built gear can separate components even further. Thus, the key question is always this: where does that line go, what does it do, and why?

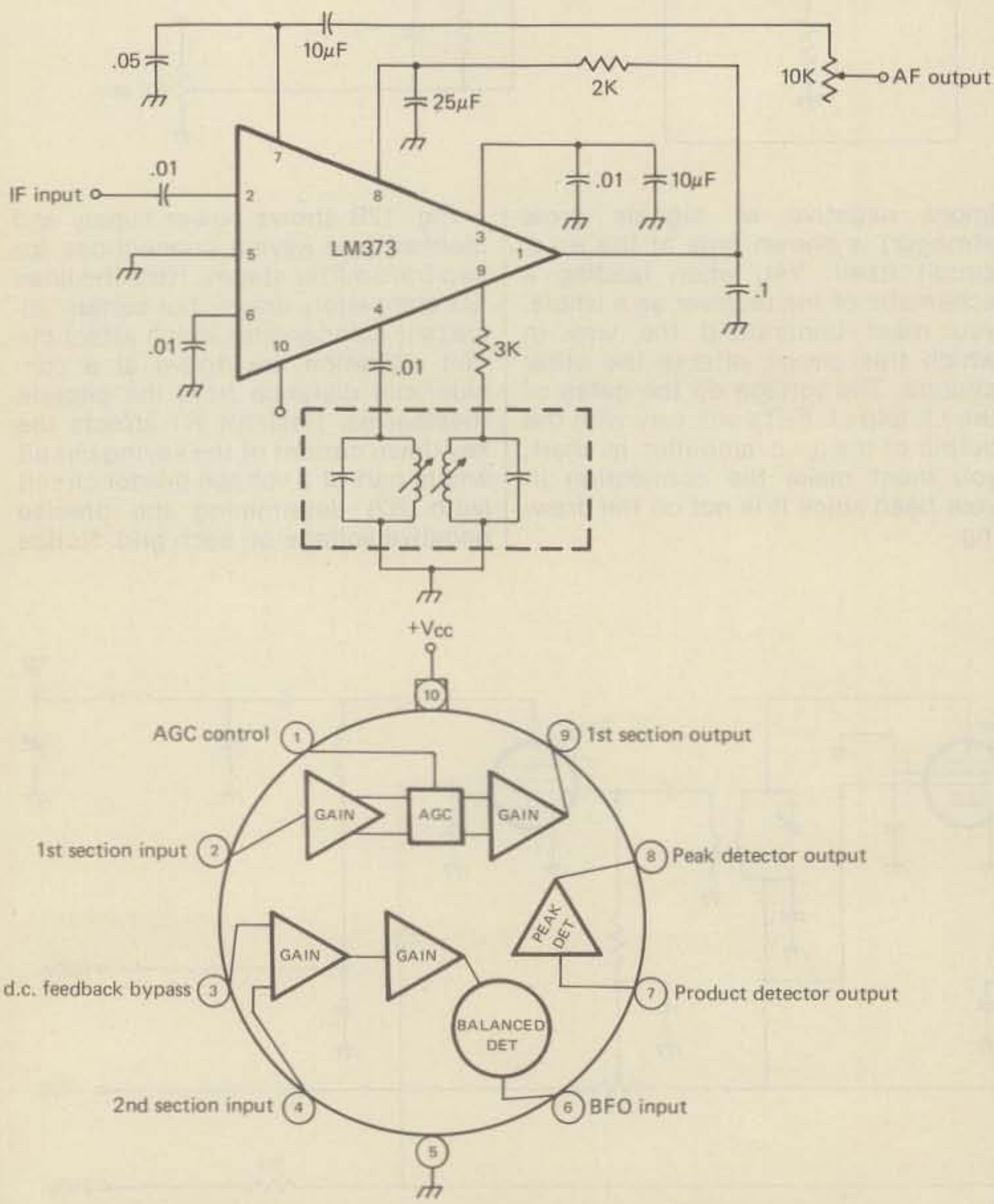

Fig. 14 - A schematic diagram of an i.f. circuit using the LM373 integrated circuit. Notice that at least some of the circuit elements begin to make sense when the overall diagram is combined with the simplified internal diagram which provides functional information.

A second set of major considerations are switching circuits. Switches represent single mechanical devices which may perform functions in widely separated parts of an overall circuit. It is not uncommon to find six or seven wafers changing circuit values in many parts of a modern transmitter or receiver. Fig. 13 is a simple illustration which shows a switch changing tuned circuits in the oscillator and in the transmitter output, even though several stages of the transmitter intervene and are shown as blocks.

The central question to ask is what things must work together to alter the operation of a piece of equipment. Band switching is just one obvious example. Changing a transmitter from standby to tune-up to operate may require the shifting of several voltages, including plate, screen grid, and control supplies. Once you have determined what things must be switched together, you are in better position to analyze what changes were made in each stage.

Integrated circuits provide a gigantic third consideration. Some of their peculiarities in schematic diagrams have been mentioned, and some of the symbols were shown in fig. 2. Let us take a brief but more orderly look at what we can expect to find in schematic diagrams.

Most writers divide ICs into two groups: digital and linear. The first group tend to be operated to obtain two states: high and low, and they are widely used in such devices as computers, frequency counters, keyers, and control circuits. The second group, linear ICs, perform amplifying functions much like discrete tran-

sistors, with the exception that their complex internal structures often allow us to do something better than we can do it with individual components.

Four major subgroups of linear ICs are these: 1. *Transistor arrays.* These are simply matched transistors, some in special configurations inside one case. Often, each transistor can be used separately. An example is the CA3018-A. 2. *Regulators.* These devices are designed to be used in power supplies to control the voltage and/or current. 3. *Operational amplifiers.* These versatile multistage amplifiers provide high gain, positive and negative inputs, and relatively easy control with a few external components. The 741 is perhaps the basic op amp for the home experimenter, and the active audio filter controlled only by external resistors and capacitors is a primary example of a good use for op amps. 4. Finally, there are the *special purpose ICs* which may range from a complete audio amplifier on a chip to complete IF systems. One chip even contains a complete broadcast band receiver.

Schematic diagrams containing any of these elements usually provide us with less information than those containing discrete components. For the most part, we are shown only a shape (such as any of those in fig. 2) along with the components attached to the various leads. Sometimes, the connections will have less to do with the order in which a signal is processed than with the need to squeeze many components into a limited diagram space. IC schematics, then, should rarely be read without supplementing the diagram with information from other sources. A functional guide to the interior of the IC is a necessity. Fig. 14 shows a typical circuit using an IC, together with an expanded view of the functional blocks inside the circuit. Circuit elements without meaning suddenly become clear. For example, the tuned circuits between pins 9 and 4 now clearly couple two separate amplifiers in the same package.

Unfortunately, not all authors include interior views of their ICs. For digital ICs and op amps, this is usually not needed, since we tend to think of these types of ICs as functional units. To obtain information on other types of ICs, you have to search the handbooks or one of the IC guides which appear every so often.

All of which brings us to this conclusion. A schematic diagram contains a wealth of information, but it is not an end in itself. Whether we are interested in building, servicing, modifying, or designing equipment, or just want to learn about electronic circuits, the schematic leads us to other helpful material. And this material leads us to other schematics. The schematic diagram is most useful as a focal point for our thinking. Back in 1930, one author said this: "When you can draw and talk about circuits in terms of the various conventional symbols you are on what is familiar ground to every amateur and experimenter. Then you can meet the dyed-in-the-wool expert and understand what he talks about." (A.R.R.L. *Handbook,* 1930, p. 52). Modern electronics may not be quite that simple any more, but mastering the art of reading schematic diagrams can still teach us a lot. It is all a matter of learning to ask them the right questions. ▣

Ade Weiss concludes his discussion of r.f. power measurement, along with presenting three quick construction projects to help you make those measurements.

R.F. Output Power Measurement

Part II: Building A Wattmeter, An R.F. Probe And An In-Line S.W.R./Wattmeter

BY ADRIAN WEISS*, K8EEG/W0RSP

In the first section of this paper we discussed the general unreliability of the input power standard as an index of transmitter performance both in regard to the performance of the unit itself, and in regard to its effectiveness in a communications situation. In this section, we will describe the construction and application of three instruments which are useful in making r.f. output power measurements.

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The Measurement of R.F. Output Power

There seem to be a general attitude that the measurement of r.f. output power is a difficult task beyond the intelligence and capability of most amateurs. In part, this attitude is responsible for the continued reliance on input power as an accepted standard. However, nothing could be farther from the truth. Simple instruction plus some basic mathematics can provide every amateur with the means of measuring the performance of transmitting gear.

In the following paragraphs, the construction and application of three instruments are discussed. Each is within the reach of every amateur. The accuracy of r.f. power measurements taken with these instruments depends primarily upon the accuracy of the d.c. instruments, such as a v.t.v.m./FET v.m./d.v.m., used to calibrate them. As proof that every amateur can be equipped to make r.f. power measurements, an r.f. probe constructed in 24 minutes flat, measured from entry into the office and the first actual r.f. power measurement. will be described. No one has an excuse if r.f. power measurements are only 24 minutes away!

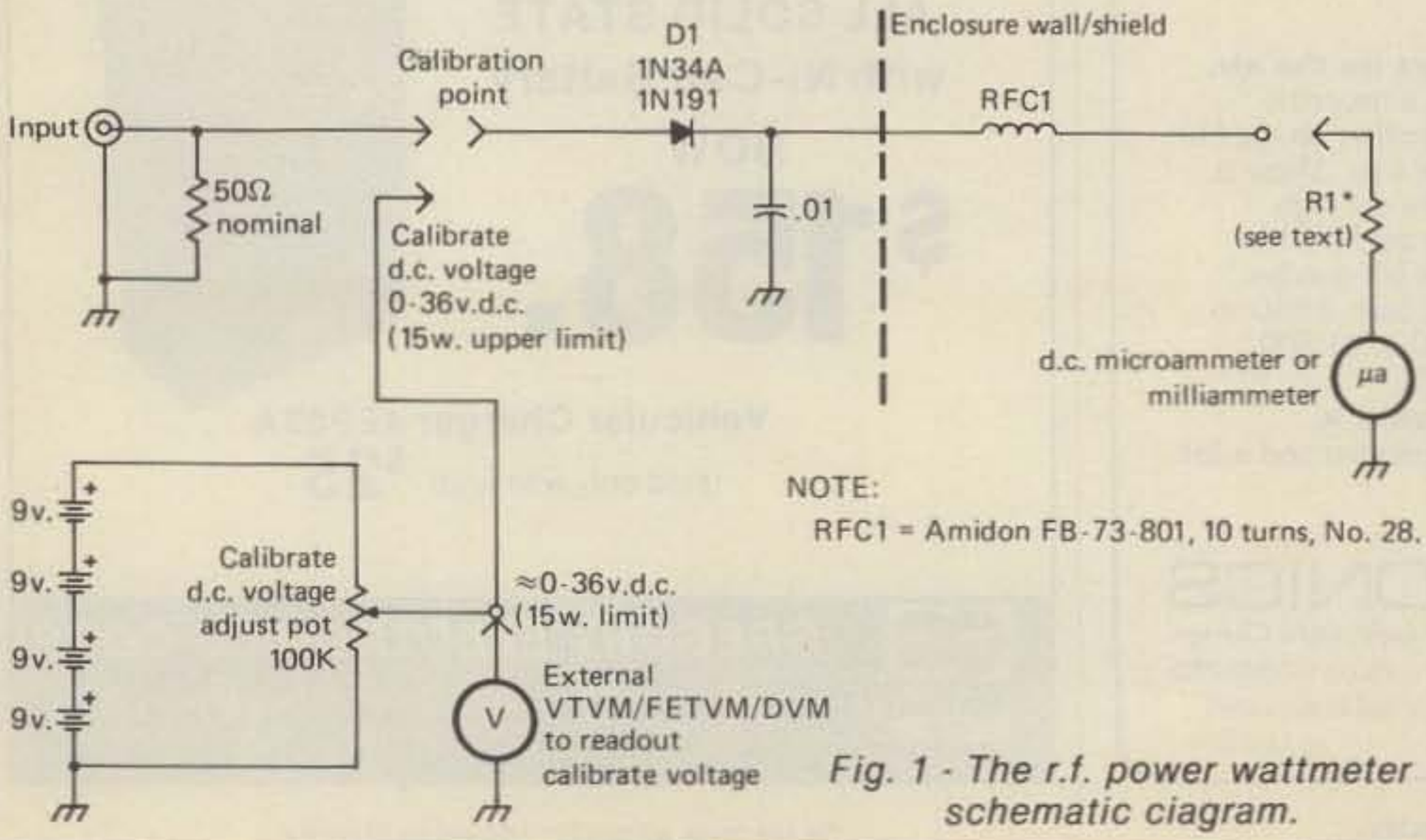


Fig. 1 - The r.f. power wattmeter schematic ciagram.

R.F. Power Wattmeter

Fig. 1 shows the circuit of a simple, easily calibrated, and accurate **r.f. power output meter** that can be used in conjunction with an external v.t.v.m./FET v.m. or other high impedance instrument, or in conjunction with a self-contained calibrated meter.

The theory of circuit operation is quite simple. It is an *a.c. peak voltage* sensing circuit. When an a.c. of r.f. signal is placed across the load R1, a voltage representing the *a.c. peak* level of that voltage is rectified through D1 and charges capacitor C1 to that *a.c. peak* level. That a.c. peak

voltage can then be measured, and the formula of fig. 2 used to calculate the average power output of the power source. The circuit is as simple as circuits can be, and hence basically foolproof in doing what it is supposed to do. It is useful primarily for the measurement of a c.w. signal, or two-tone s.s.b. test signal. Measurement of voice-actuated s.s.b. signals is a very complicated matter, and generally, amateurs are neither prepared, nor is equipment available, for actual measurements of average r.f. output from a voice-actuated s.s.b. transmitter. In the s.s.b. case, while the instrument in theory will measure the peak envelope power of the signal, in practice this is almost impossible because meter movements and readout systems do not respond rapidly enough to follow the actual flow of peaks during the pronunciation of several syllables.

Measurement of the peak voltage can be accomplished by using an external high-impedance v.t.v.m./FET/d.v.m., or a self-contained micro/milliammeter. A voltmeter *cannot* be used as a measuring device because of its low impedance. Likewise, an inexpensive Radio Shack (or other brand) v.o.m. will not provide accurate measurements because of typically low input impedances. The circuit for a self-contained micro/milliammeter consists of RFC1, the R2 series-dropping resistor, and the meter. The purpose of RFC1 is to isolate the meter from the dummy load at r.f., while R2 is chosen in combination with the meter to produce the desired meter scale *vs* watts range. If an external v.t.v.m./FET/d.v.m. is to be used as the measuring instrument, it would be wise to include RFC1 and enclose the R1 dummy load in a shielded compartment. R.f. isolation is essential to accurate measurement.

Construction

Contruction is simple and consists of assembly of the dummy load and mounting in a shielded compartment. The photos show the use of double-clad p.c. board as the walls of an appropriate enclosure, although the builder may use a minibox or similar enclosure if he wishes. Fig. 3 shows the dummy load end-boards for a unit using three 2 watt 150 ohm resistors. Once the boards are etched, the resistors are sandwiched between them in mounting holes spaced to provide about a one diameter clearance between resistors for ventilation. The units will be capable of dissipating 6 watts continuous, and higher powers intermittently. The remaining parts, D1, RFC1, C1, and R2, are then soldered in place, the dummy load measured as accurately as possible, and the remaining walls can be cut from p.c. board stock and soldered into place. Remember to drill several holes above and below the dummy load resistors before adding the top and bottom boards for ventilation.

$$\text{Average power (watts)} = \frac{(E_{\text{peak (d.c.)}})^2}{2R_{\text{dummy load res.}}}$$

or

$$E_{\text{d.c. calibration voltage}} = \sqrt{\text{Avg. } P_o\text{(watts)} \times 2R_{\text{dummy load res.}}}$$

Author's calibration table (actual R = 51.9 ohms)

P_o	D.c Cal. Voltage
10	32.22 v.d.c.
9	30.56 v.d.c.
8	28.82 v.d.c.
7	26.96 v.d.c.
6	24.96 v.d.c.
5	22.78 v.d.c.
4	20.38 v.d.c.
3	17.65 v.d.c.
2	14.40 v.d.c.
1	10.19 v.d.c.
.9	9.67 v.d.c.
.8	9.11 v.d.c.
.7	8.52 v.d.c.
.6	7.89 v.d.c.
.5	7.20 v.d.c.
.2	4.56 v.d.c.
.1	3.22 v.d.c.
.05	2.28 v.d.c.

Fig. 2 - R.f. power wattmeter calibration formula.

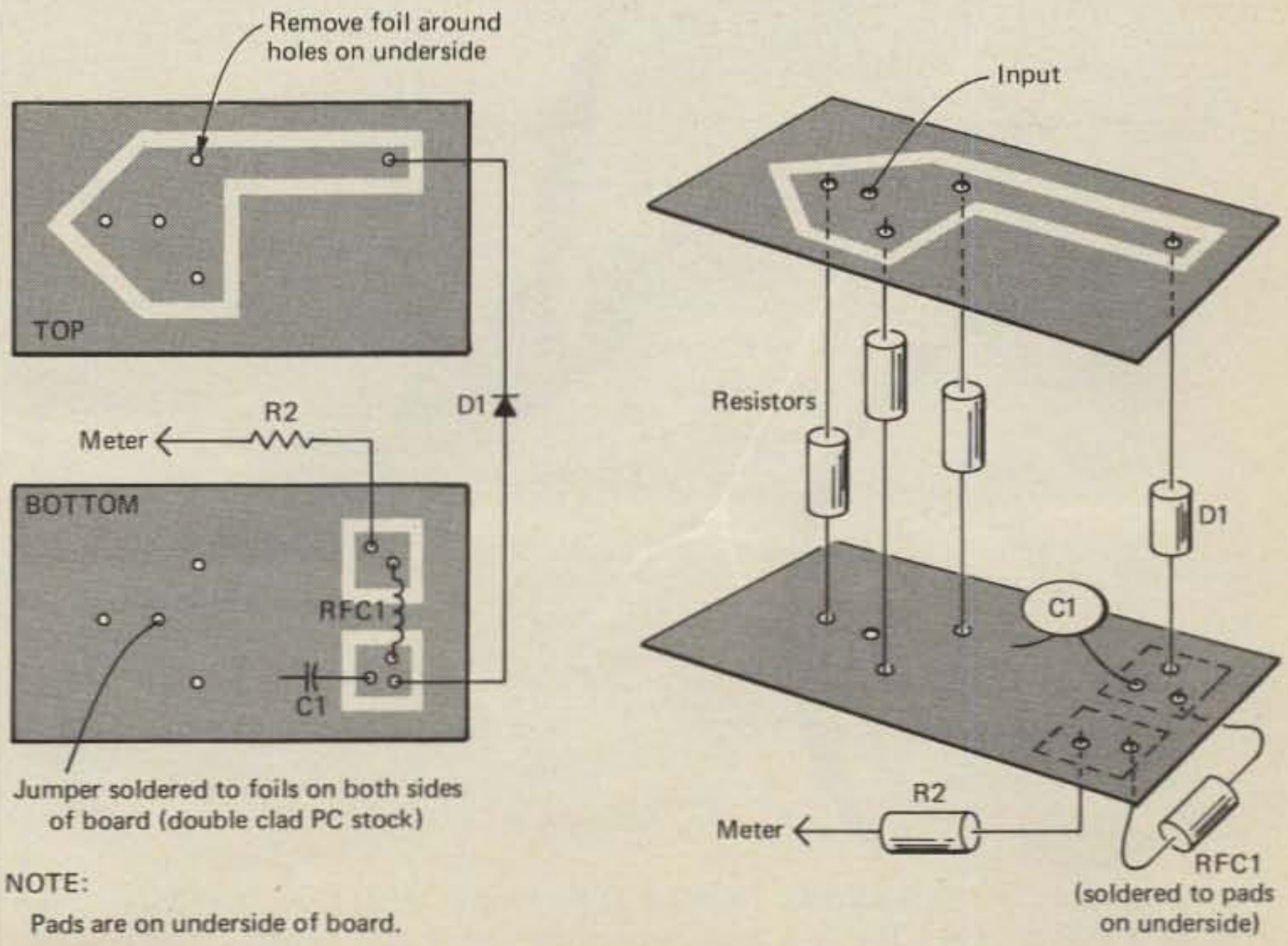
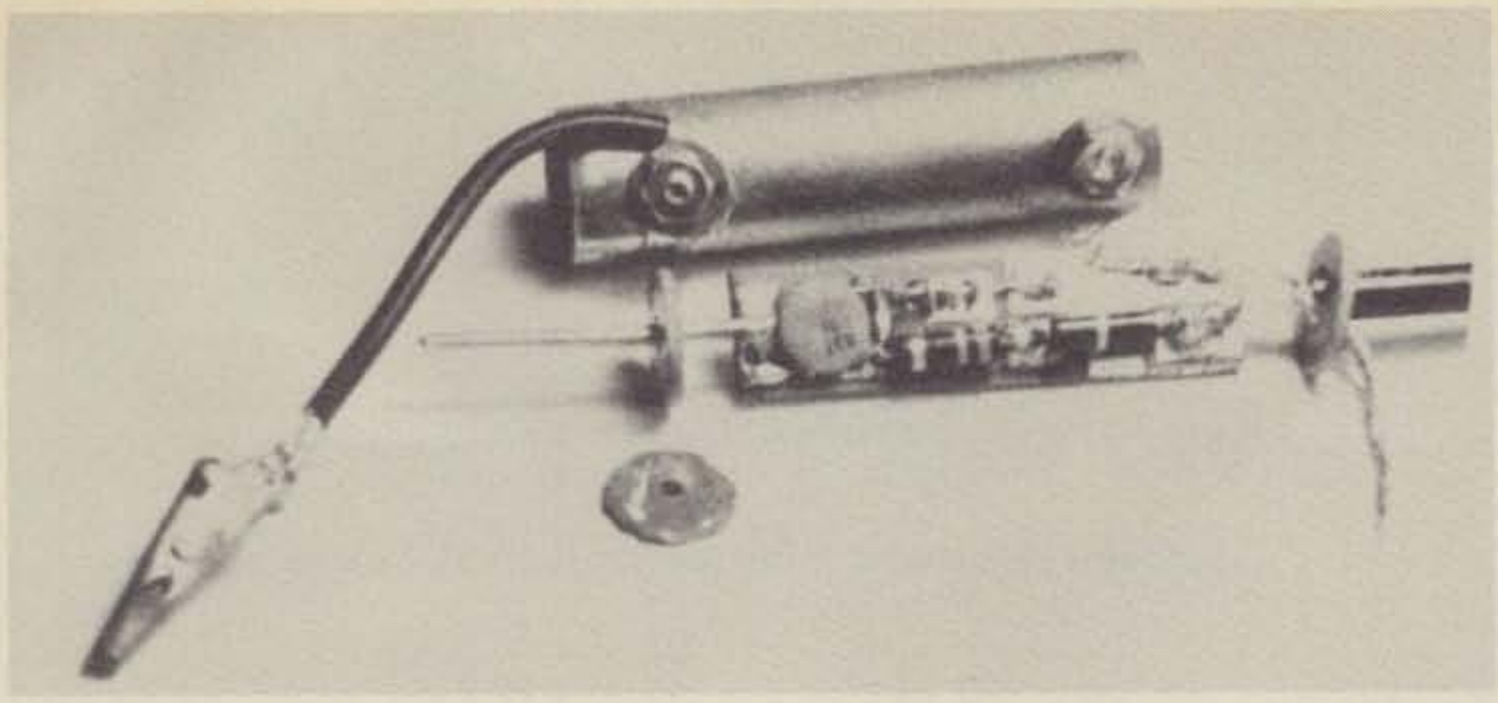
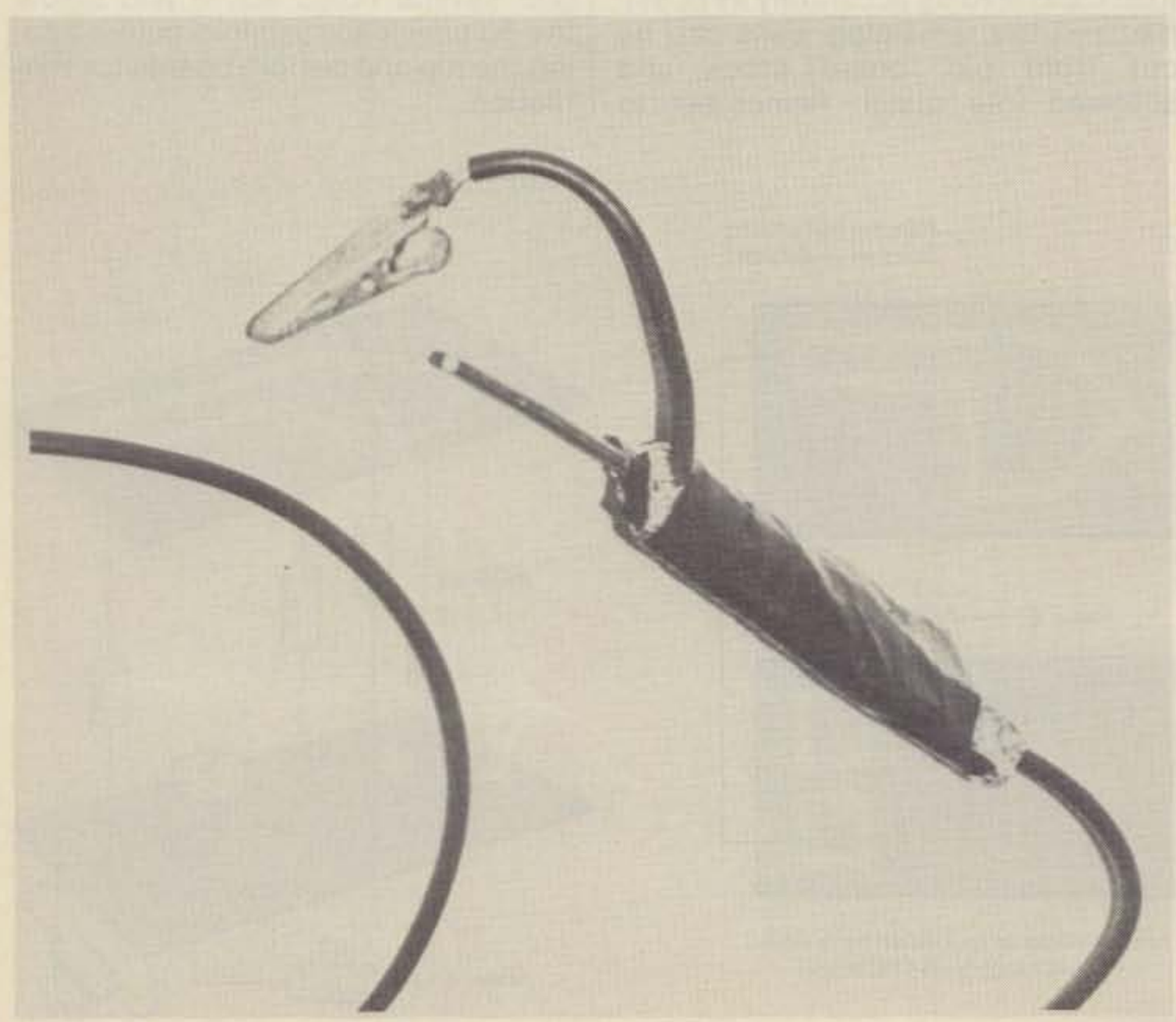


Fig. 3 - The r.f. wattmeter p.c. board wiring.

No - 29-30



Detail of the r.f. probe construction. The p.c. board shows the two series resistors R1-2 at the bottom edge, with C1 at the probe end. D1 is above R1. The probe tip is mounted directly on the same pad as C1. The end-cap that is soldered to the probe is shown mounted on the probe tip. In construction, after it is cut to size and the foil removed from around the probe-tip hole, the cap is placed on a hard surface, the housing tube end centered on it, and hammered into place. It is then soldered to the tube at three points. Next, the coax cable center conductor is soldered to the appropriate pad, and the shield braid split into two leads, one of these is soldered to the p.c.b. ground foil, and the other attached to the housing tube by means of the bolt seen on the rear end of the housing. The housing itself is cut from 1/2" copper tubing purchased at the local plumber. The width of the p.c.b. is adjusted for a snug fit into the tube. The ground clip is bolted to the front of the tube. The stranded wire of the ground clip lead, as well as the coax braids, are twisted and "tinned" or soldered solid before mounting. The p.c.b. is then slipped into the tube and pressed flush against the front cap. The second front cap, seen laying below the probe tip, is then slipped over the tip and pressed flush against the end cap, and soldered to the tip to prevent movement into the rear of the tube and soldered. The other end of the cable uses standard banana plugs to mate with the VTVM/FETVM/DVM input jacks.



The completed K8EEG World Record R.F. Probe. The final electrical tape wrapping compresses the foil wrapping, insuring a stable electrical contact between the foil housing and ground clip and coax shield leads.

Dummy Load Resistor Values

Any number of combinations of standard value resistors can be used which result in a nominal 50 ohm load. The combined wattage of the resistors represents the continuous duty dissipation rating of the load. In the unit shown, three 2 watt 150 ohm resistors provided a 51.9 ohm load for 6 watts rating. In another unit, 21 1000 ohm 2 watt resistors provided a 51 ohm load with a 42 watt rating. If a standard value will not, when combined in a number to produce the desired dissipation rating, provide a total resistance that is within a 48-54 ohm range, several resistors of a value *larger* than the standard value may be added to the load to bring the load resistance down to within the 48-54 ohm range.

Calibration

If the unit is to be used in conjuction with an external v.t.v.m./FET/d.v.m., the voltage readout by the meter can be used in the formula of fig. 2 to converted to volts-watts. If an internal micro/milliammeter is to be used, it must be calibrated to either readout directly in watts, or to cross-reference micro/milliamps *vs* watts. In the unit shown, a "cheapie" surplus type 1 mA meter such as is used in audio gear was recalibrated to produce a 5% accuracy of readout. However, this type of meter is non-linear, especially with regard to a "crowding" effect at the upper end of the scale, with the result that, for a 13 watt full-scale calibration, the 5 watt marker appears at about 80% full scale, with the remaining 8 watt markers squeezed into the upper 20% of the scale. So, choice of an upper limit far greater than the desired upper limit of accuracy circumvents the problem. In the unit shown, 13 watts was chosen as an upper limit, permitting accurate readout at 10 watts. High quality meters will show a linear response, and this strategy is not required.

Calibration is accomplished at d.c., one of the attractive features of the circuit, because it permits a very accurate initial calibration depending upon the accuracy of the meter used in setting the calibration voltage. For calibration, a variable voltage d.c. source is necessary, such as a bench supply or three 9 volt transistor batteries across a potentiometer as shown in fig. 1. An external v.t.v.m./FET/d.v.m. is used to set the calibration voltage to the calculated levels found by the formula of fig, 2, which includes sample calibration points for the author's unit. To calibrate, disconnect D1 from the

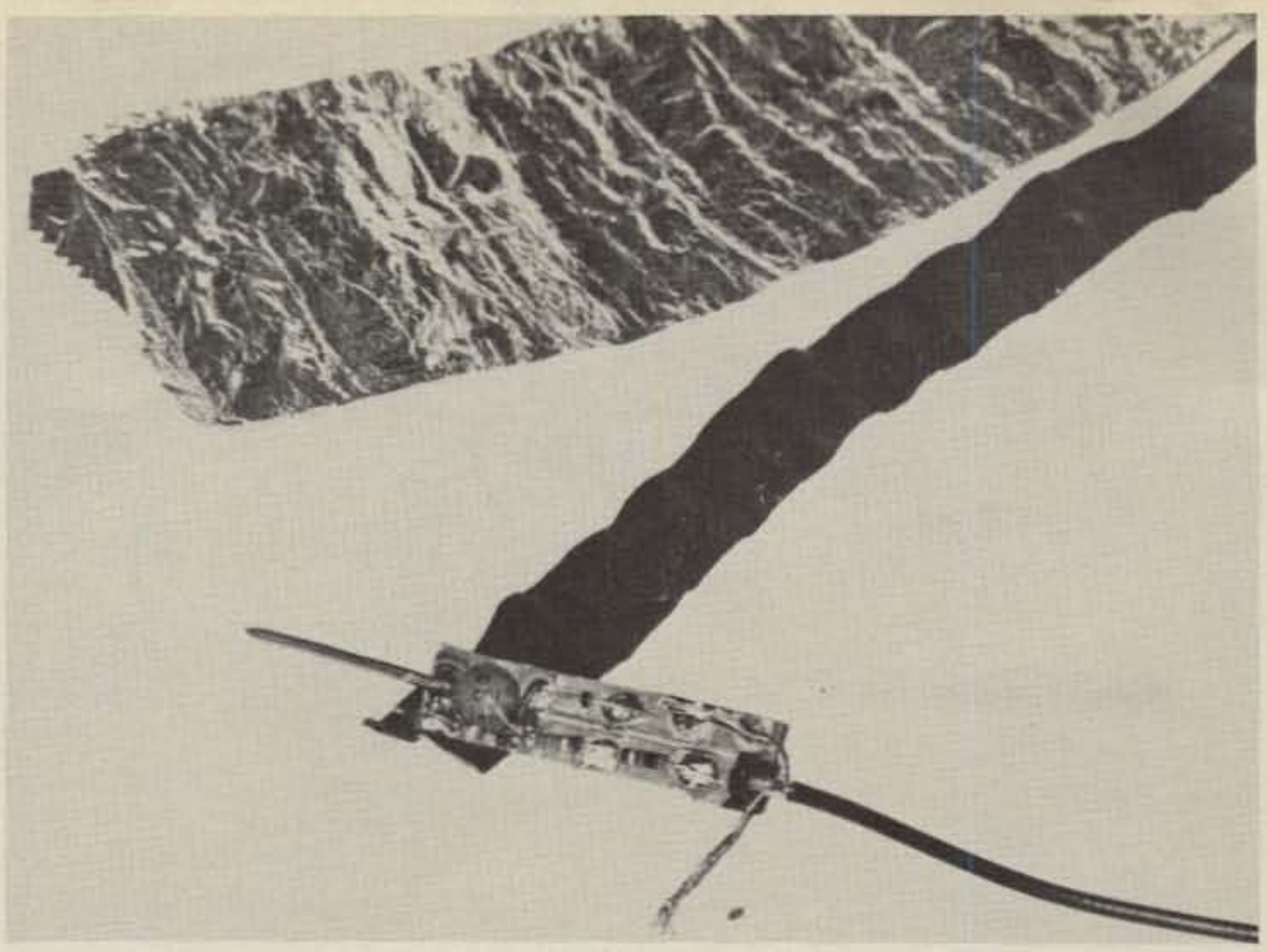
dummy load, and connect the calibration voltage across the input to D1 and ground. Then set the calibrating voltage to the calculated watts *vs* volts levels, and either make the meter scale (if the meter is to be directly calibrated in watts) or enter the micro/milliamp readout for that level in a table which correlates watts *vs* micro/milliamps. Once all of the calibration volts *vs* watts points have been marked, accuracy of readout can be determined by reversing the process *i.e.*, attempting to reset the calibration voltage by readout in watts. The surplus meter shown in the photo results in an amazing level of accuracy for its small scale, but very careful, nay! laborious, effort was necessary in marking the scale.

The unit is ready for use once installed in its enclosure. It can be hooked up to the transmitter through a short piece of 52 ohm coax with appropriate connectors. Its uses are several. It can first, of course, measure the output from a transmitter. Second, it can be used to calibrate the Breune in-line wattmeter discussed below. And third, it can be used to check the accuracy of the r.f. probe discussed next.

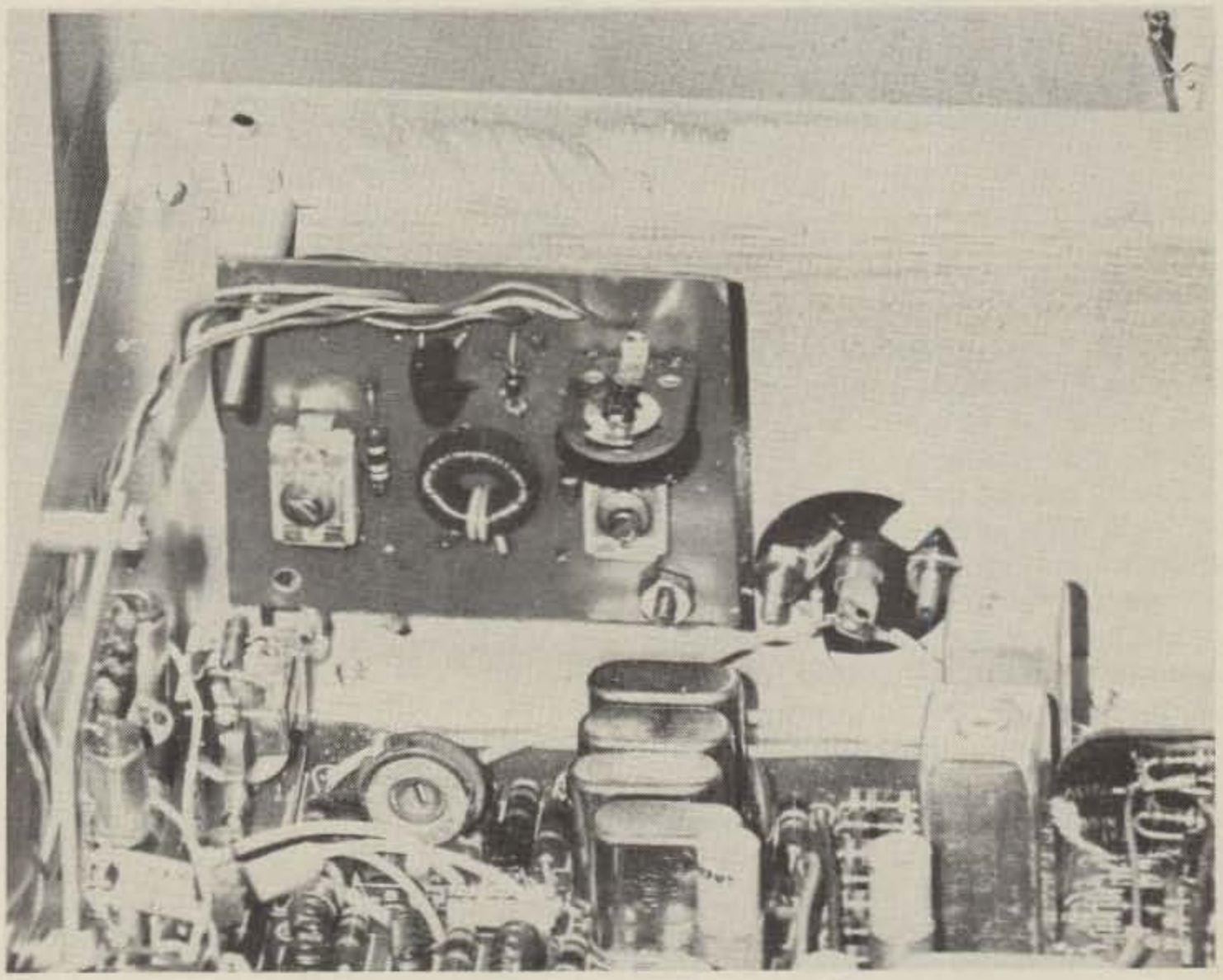
R.M.S. Voltage R.F. Probe

A second method for measuring r.f. power output is by using a v.t.v.m./FET/d.v.m. in conjunction with an r.f. probe, such as is shown in fig. 4. In this approach, the r.f. voltage developed across a load of known resistance is measured by means of the probe, and the r.m.s. voltage then plugged into the formula of fig. 4 to calculate average power.

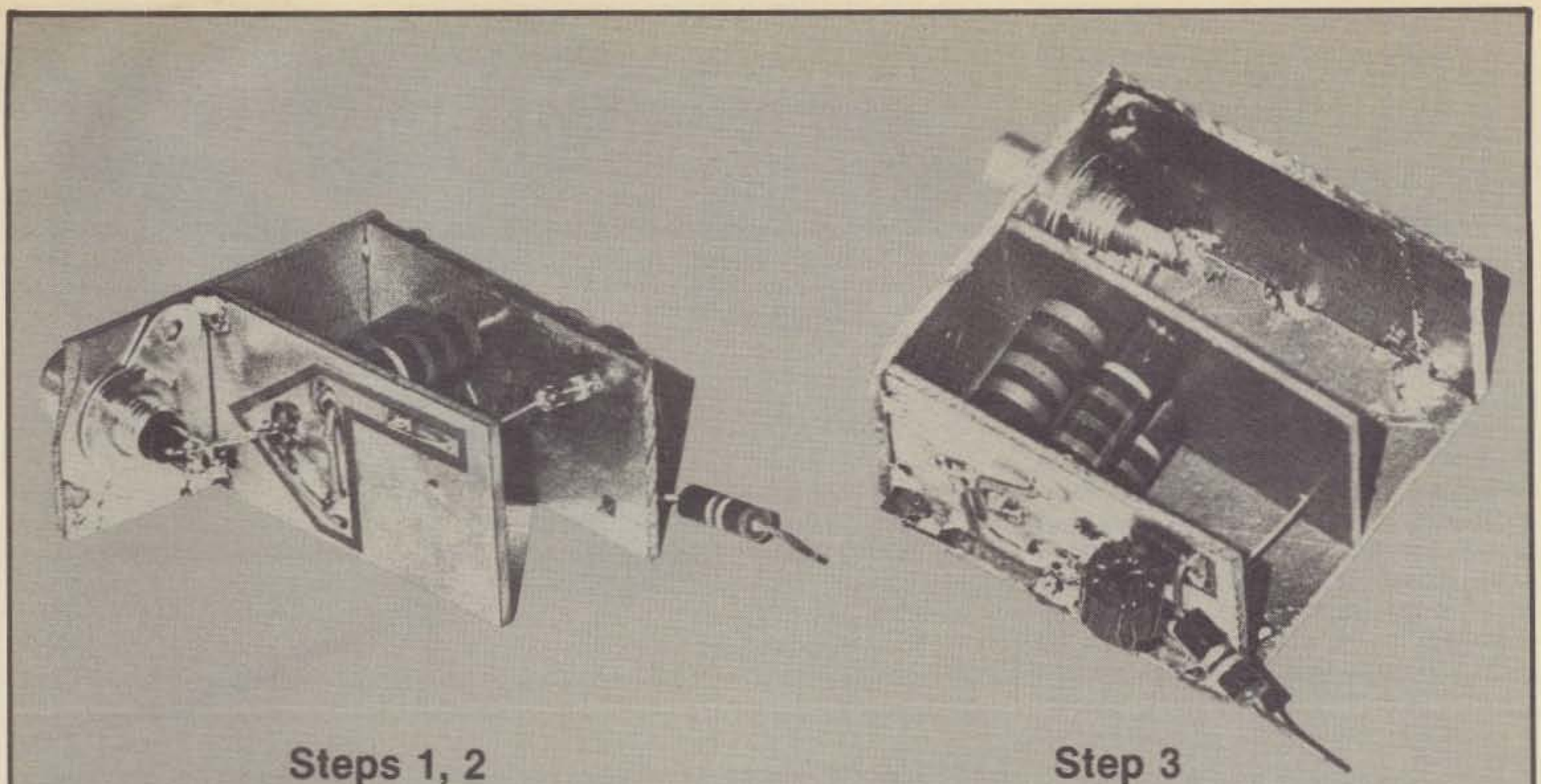
The circuit of the probe is quite simple. C1 is a d.c. blocking capacitor which exhibits a low impedance across the frequency spectrum of signals to be measured. When it is applied to a point to be measured, it permits the r.f. signal to pass and the diode then rectifies, or grounds, the positive half-cycles of the r.f. signal. The remaining negative half-cycles are filtered by the shunt resistor R1-R2 and cable capcitance, and provide a d.c. voltage across the cable leads, which is then measured by the v.t.v.m./FET/d.v.m. That d.c. voltage corresponds either to the *peak* or *r.m.s.* value of the r.f. signal voltage, depending upon selection of the value of R1. R1 is usually selected to provide *r.m.s.* readout. In combination with the input impedance of the v.t.v.m., it forms a voltage divider whose resistance at point A corresponds to 0.707 of the *peak* a.c. voltage. Hence, the input impedance of the v.t.v.m./FETv.m./d.v.m. must be



K8EEG World Record R.F. Probe. The p.c.b. is assembled as per the regular probe above, and then a generous wrapping of black electrical tape provides insulation. Note that the coax braid is split into two leads and tinned, with one lead soldered to the ground foil, and the other inserted between layers of the aluminum foil housing. The aluminum foil housing consists of a generous wrapping of standard kitchen foil. The coax ground lead and the ground clip lead are inserted between layers of the foil wrapping. Finally, another tight winding of electrical tape over the foil winding compressed the two leads into place and stabilizes the unit. Avoiding contact between the probe tip and foil wrapping.



A shot of the SWR/Wattmeter housed in the HW-8. At board center can be seen L1-2, with C1-2 trimmers and R1-2 resistors to the sides. The R3 range set potentiometer is at the upper right corner, with D1-D2-C5 to the left. RFC1 is mounted on the underside of the p.c.b., as well as C3-C4. The leads to the meter and SW1 can be seen leaving the top edge of the p.c.b.



Steps 1, 2

Step 3

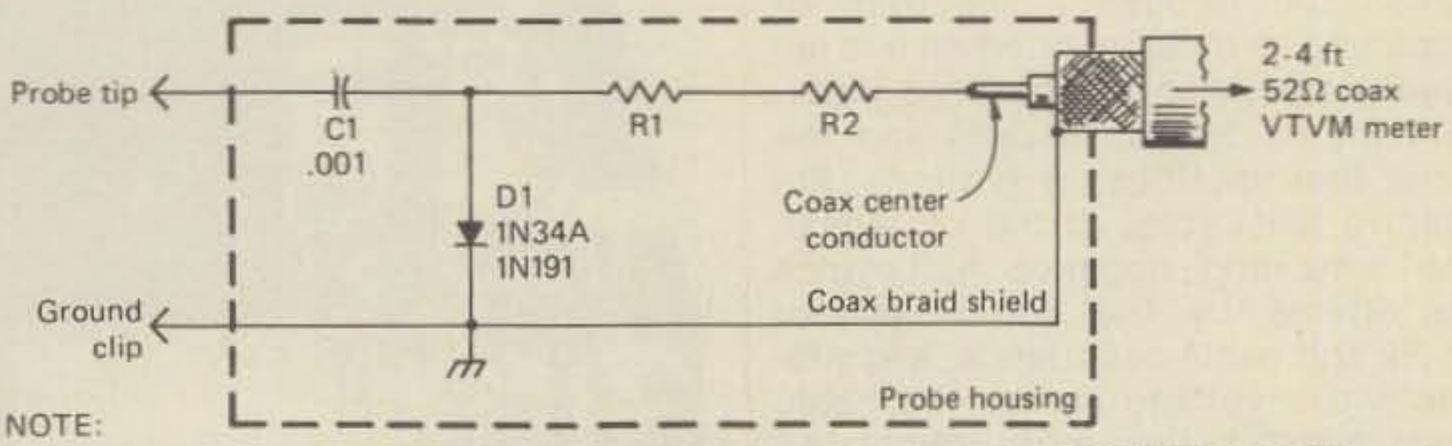
Step-By-Step Construction Of The K8EEG Output Power Meter

R.f. power wattmeter construction, steps 1 and 2. The dummy walls have to be etched, the three dummy load resistors sandwiched between them, and soldered in place. D1 can be seen going into the upper right corner of the rear wall, with the meter series dropping resistor sticking out. In **step 2,** a front wall has been added with a phono jack center connector soldered by means of a short piece of #18 wire to the input pad of the load. **Step 3** shows the addition of a third wall parallel with the dummy load walls in order to completely enclose the r.f. input side of the load. A bottom has been added to complete four of the six sides of the enclosure. Note RFC1 mounted on the outside of the dummy load wall along with R1. C1 can be mounted flush against the wall inside dummy load space. Double-clad p.c. stock is used throughout, so the foil around the mounting holes on the unsoldered side should be cleared away to avoid shorts. When cutting the walls, leave about 1/16 inch extra board for the rear edge of the bottom to permit soldering to the rear wall. Solder joints between wall edges can be either inside or outside the enclosure. **Step 4** shows the addition of the front panel which serves as a meter-mount. It is soldered at the inside edges to the dummy load walls, as well as to

known in order to select the value of R1. Since standard value resistors are not available to provide the exact resistance needed, two 1/4 watt resistors can be put in series to come up with the exact value. The maximum r.f. voltage which can be placed across D1 is about 30 volts r.m.s., which limits the single-diode probe to that level. However, two or more diodes may be placed in series to increase the maximum limit, but this will slightly disturb low-level readings. Generally, a single diode is adequate for QRPp work. Crystal diodes such as the 1N34A or 1N191 should be used. Readout is negative, *i.e.*, the meter must be set to read negative d.c. voltages.

Construction

The probe circuit is mounted on a



NOTE:
Selection of R1 + R2 to form RMS voltage divider in conjunction with VTVM/FETVM/DVM impedance.

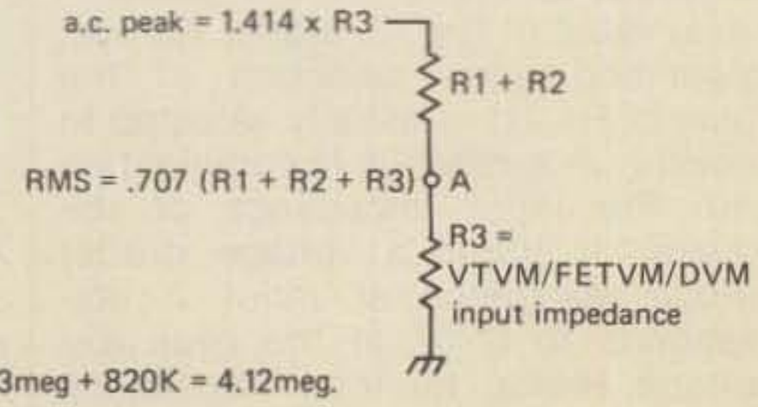
R3	R1 + R2
10meg	4.14meg*
11meg	4.57meg*
20meg	8.28meg*

*measure actual R1 + R2 until desired value is obtained

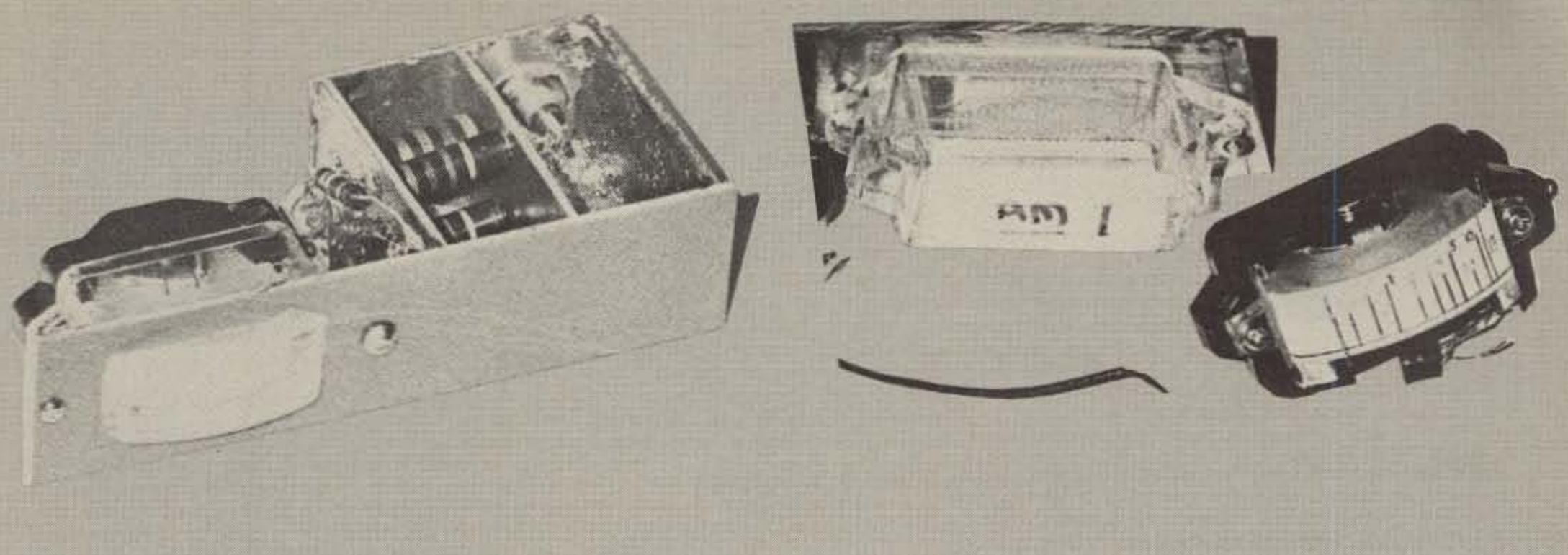
For 10megohm R3:

10meg x 1.414 = 14.14megohm

14.14 – 10 = 4.14megohm for R1 + R2, use 3.3meg + 820K = 4.12meg.



(A)



Step 4

the bottom plate. All that remains is to add the top plate. A complete enclosure may be fashioned using this technique, eliminating the need for a chassis minibox. If this approach is followed, the bottom plate added in **step 3** should be extended beyond the dummy load wall to match up with the width of the front panel. The rear wall is matched up similarly to form a rectangular enclosure. As shown here, the unit fits into a small 4.25 x 2.25 x 1.25 inch (LMB #101), but the phono jack input must be removed and remounted after the unit is in the box. If a minibox is used the meter-mounting front panel can be replaced with a wall cut to fit the width of the dummy load, and the meter mounted directly on the front panel of the minibox. Further, if a minibox is used, the dummy load walls can be cut to establish a snug fit inside the minibox, using the minibox as the shielding element. Although **step 5** is not really a "step" in the building procedure, it is included here for completeness. This step is illustrated by a photo which shows the meter body removed from its clear plastic housing (shown mounted on the front panel) the original scale face removed, an address label face added and calibrated in watts. The "crowding effect" mentioned in the text exists at the high end of the scale, where the first full-face line is at 13 watts; the next line at 10 watts; 5 watts at the next 3/4 face line. One watt is at about 30% full scale, 5 watts at about 70% and 10 watts at about 95% full scale. After very careful calibration, accuracy of about 3% can be had with the unit, both in terms of resetting calibration voltage test and when compared to measurements taken on a more elaborate version of the unit.

Step 5

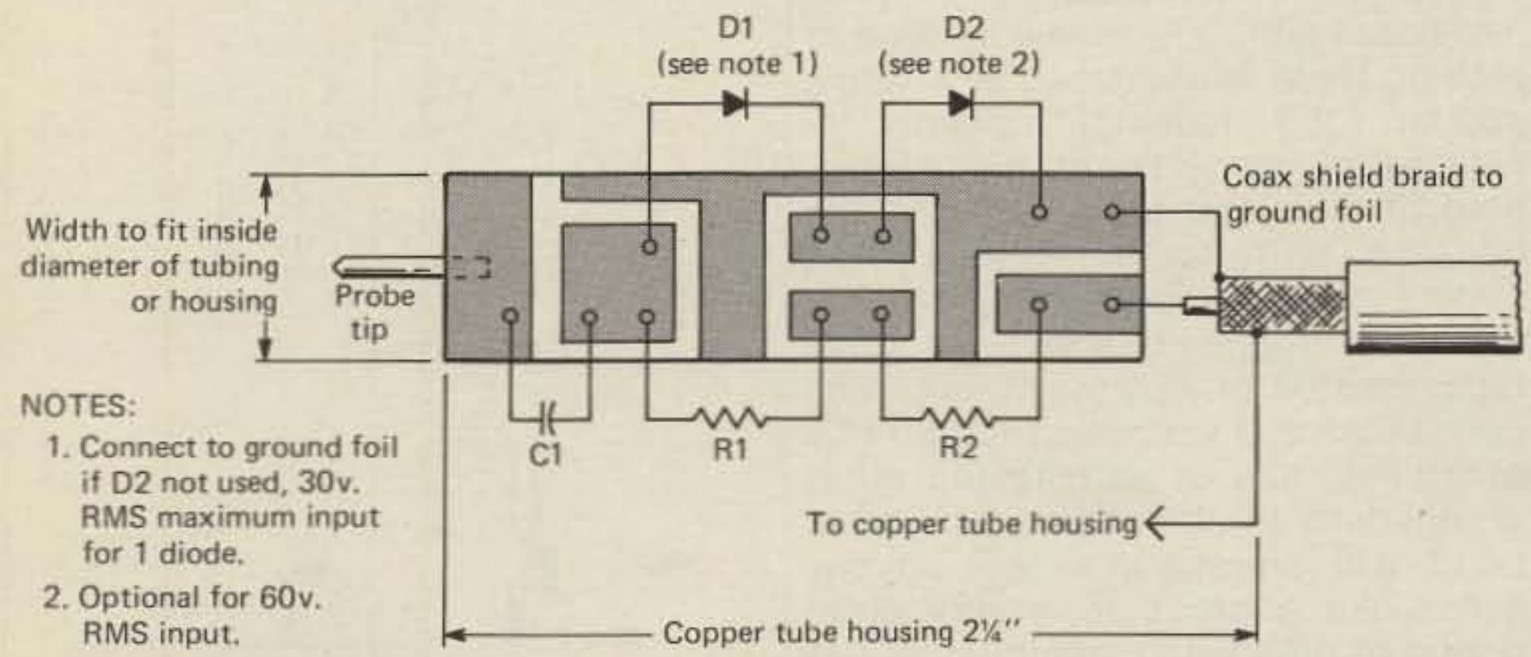
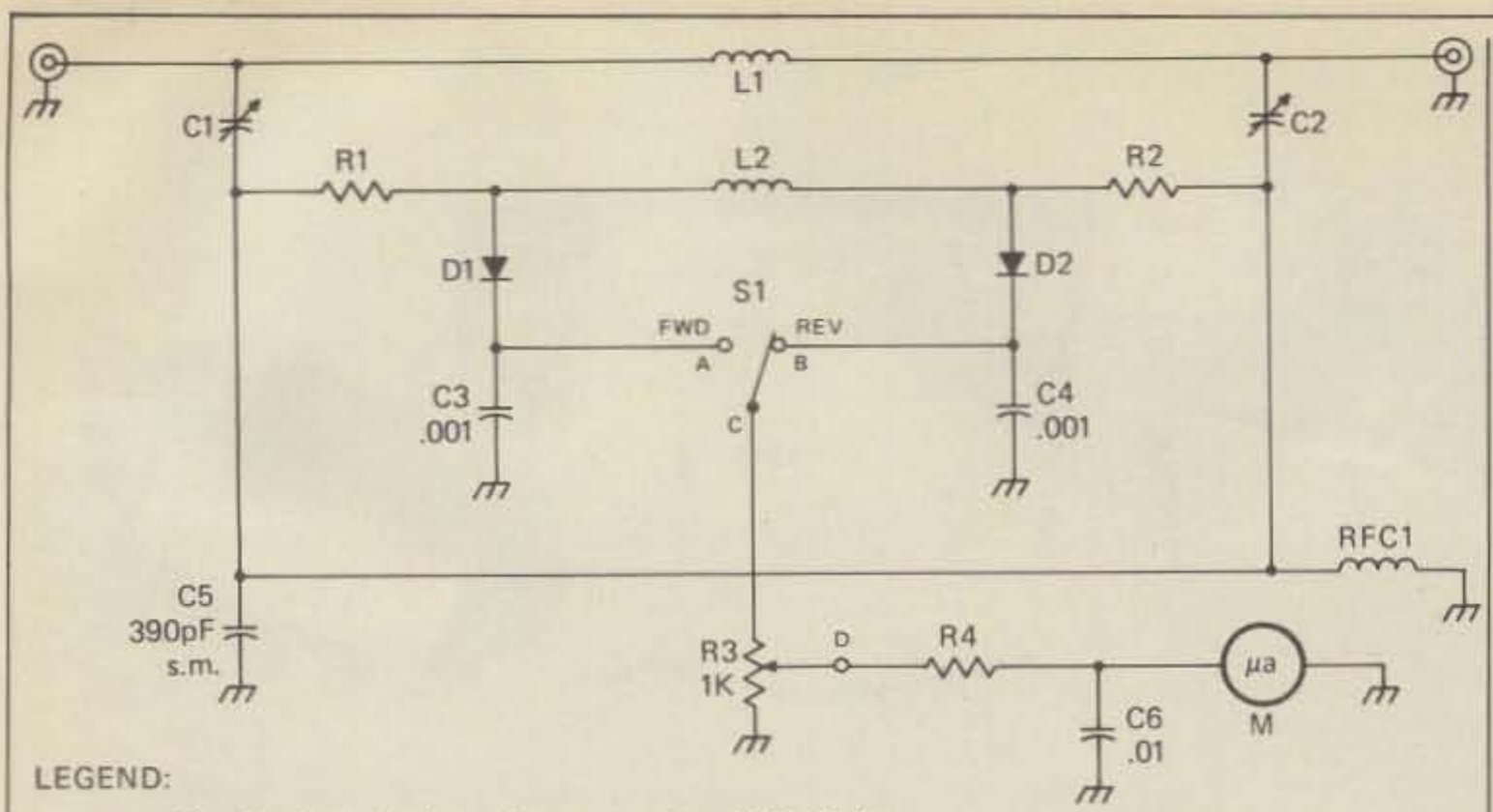


Fig. 4 - In (a), on the preceding page, the schematic diagram of the r.m.s. voltage r.f. probe. In (b), above, the printed circuit board layout.

small section of double-clad p.c. board on isolated pads, and housed in a short piece of 0.5" dia. copper tubing (plumbing variety). End caps for the probe are cut from single-clad p.c. stock, and filed to the diameter which will provide a tight fit into the ends of the copper tubing. The best approach is to file the end cap to the approximate diameter of the tube end, then place the cap on a hard surface, center the end of the copper tube on the cap, and hit the other end of the tube soundly with a hammer until the cap is inserted in the tube end. The probe tip cap is then soldered to the tube. The probe tip is simply a one inch piece of #12 or #16 solid copper wire soldering directly to the input pad of the p.c. board.

Once the p.c. board is assembled and the probe cap soldered in place, the



LEGEND:

L1 = 2t plastic hookup wire over center of L2 winding
L2 = 54t, No. 28, T-50-2 core
C1 and C2 = Elmenco 402, 1.5-20pF trimmer
C3, C4, C6 = Ceramic discs
D1 and D2 = 1N34A/1N191 crystal diode
RFC1 = 1mH miniature RF choke (J.W. miller 70F103A1)
R3 = Vertical mount PC board pot. R4 selected to give full scale meter deflection at desired maximum power output level with M
M = Microammeter or 1ma milliammeter

Fig. 5 - The in-line s.w.r./wattmeter and parts list.

p.c. unit is slipped into the tube and forced flush against the end cap. A second end cap is then slipped over the probe tip and soldered to it to keep the board in place. The coax shield is both soldered to the ground of the p.c. board, and bolted to the copper tube housing. The ground clip is similarly bolted to the copper tube housing. Banana plugs are used to mate the unit with the v.t.v.m. input receptacles. Again, a v.o.m. will not provide accurate readings.

Measurements

Measurements of r.f. output power from a transmitter or exciter is simple. A dummy load (nominally 50 ohms) is measured to establish its actual resistance, and output from the transmitter is placed across it. The resulting r.f. voltage developed across the load is then measured, and the resistance value and measured r.f. r.m.s. value plugged into the formula of fig. 4 to calculate the power in watts.

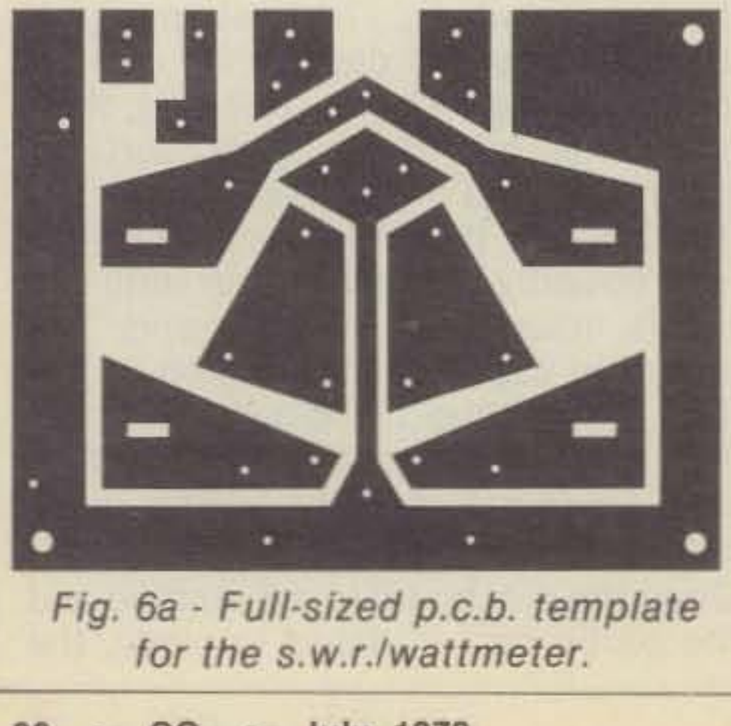


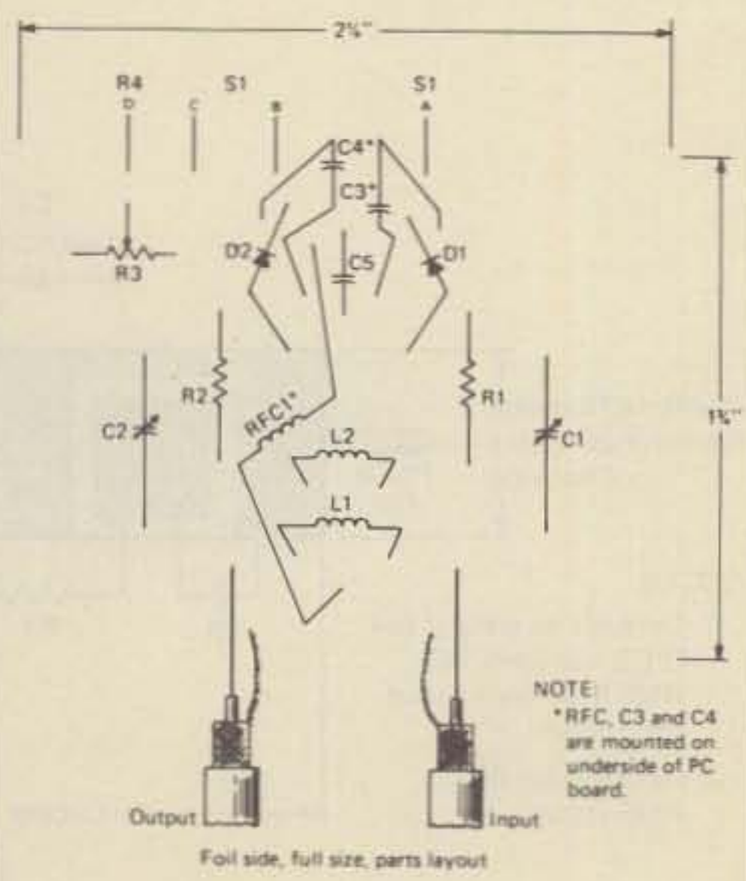
Fig. 6a - Full-sized p.c.b. template for the s.w.r./wattmeter.

The K8EEG World Record R.F. Probe

I always wanted to hold a world record in something, and now I do. I hold the world record for r.f. probe construction—24 minutes from walking into the office until the first actual r.f. power measurement! I challenge anyone to better this. The photos show the r.f. probe in question. It is a totally functional unit, as accurate as the above unit. The trick, of course, was to cut the isolated pads into the p.c. board with a hacksaw instead of etching them, and instead of fitting a copper tube housing, I simply insulated the probe board with a wrapping of electrical tape, replaced the housing with a four-layer thick, generous wrapping of aluminum foil, and then wrapped that with electrical tape. Presto! Very compact, excellent performance, a veritable triumph of a quarter-century or painstaking effort at ingenuity in electronics. The other point of this probe is simple: anyone can make a probe in a very short period of time with a minimum outlay of parts and cash. And further, anyone who claims that he can't measure his output power is admitting to willful ignorance and sloth. 'Nuff sed.

Breune In-Line SWR/Wattmeter

The third method of measuring r.f. output power provides a continuous monitoring of output to the antenna during operation, or, in conjunction with a 50 ohm dummy load, measurements of transmitter output during testing and alignment. This instrument has been discussed in earlier issues (*CQ*, January, 1974; *CQ*, August, 1977; *CQ*, May, 1977) in detail. Fig. 5 shows the basic circuit. In operation, r.f. output to the antenna is fed through the L1 link, which induces a sample current in the much larger L2, and this current is then rectified by D1 or D2, depending upon whether "forward" or "reverse" power is being read. This rectified current is then used to drive the meter through a voltage divider potentiometer which is selected in conjunction with meter sensitivity to produce the proper readout range. The insertion of the unit in the feedline introduces a small amount of reactance which is cancelled out by the circuitry comprised of C1-C2-RFC1-C3. Once nulled, the bridge had negligible effect upon feedline impedance. The values of R1-R2 work in conjunction with the value of L2 to produce the upper and lower frequency range limits of the bridge. Fig. 6 shows a p.c. board layout for the unit and parts placement. RFC1 may be a commercial lmh choke, or fabricated on an Amidon jumbo bead. D1-2 are preferrably crystal diodes such as 1N34A/1N191, but high speed switching diodes such as the 1N989/1N914 may be used.



Foil side, full size, parts layout

Fig. 6b - Foil side parts layout diagram for the s.w.r./wattmeter.

Construction

The construction of the unit is straightforward. The unit may be housed in a minibox or similar enclosure. Feedline lead lengths inside the enclosure should be an absolute minimum, with the optimum situation consisting of mounting the input pads of the board directly opposite the coax receptacles' center conductor posts. Leads to the switch and meter are non-critical.

Calibration

The first step in calibration requires a nulling of the bridge in both directions by adjusting C1-C2. Connect the r.f. source (transmitter) to the input side, and a 50 ohm dummy lead to the output. With SW1 in the "forward" position, adjust R1 for full-scale meter reading after peaking the transmitter to the desired full-range output level. Then put the switch in the "reverse" position, and adjust the input trimmer (C1) for a null in meter reading. Next, this procedure is reversed to null the output trimmer. Connect the r.f source to the output terminal, dummy load to input, SW1 in the "forward" position, and null readout with C2. Repeat both steps until the bridge is nulled in both directions.

The second step involves calibration. To accomplish this step, use either the wattmeter described above, or the r.f. probe plus dummy load. Apply r.f. power and adjust it, according to the readout of the wattmeter or r.f. probe and dummy load, to selected wattage levels, and mark the meter face scale, or mark readout *vs* watts on a table.

Conclusion

Hopefully, this paper will have convinced many readers of the importance of output r.f. power as a standard of performance, and the description of three instruments that can be used in measuring r.f. output power will motivate many to obtain means of making such measurements. Ultimately, the widespread use of r.f. output power as a standard will raise the level of technical excellence in the amateur radio field.

An Open Letter To All Radio Amateurs

Recently the Editorial office of CQ received the following letter from Victor C. Clark, W4KFC. We thought that, although the thoughts contained in the letter are League-sponsored, since any possible outcome will affect every amateur (League and non-League member), it might be well to publish it for all to see.

Vic Clark is the First Vice President of the American Radio Relay League and the Chairman of the Long Range Planning Committee.

BY VICTOR C. CLARK, W4KFC

April 5, 1979

Dear Fellow Amateur:

For more than sixty years Amateur Radio in the United States has grown like Topsy, carried along on the wave of a galloping technology, without a great deal of thought being given to its long range future. Having established during this initial half-century an impressive record of technical innovation and a growing repertoire of services to society, we have not done too badly.

But where are we going from here, and what will be our "Basis and Purpose" in the years ahead? Some express concern, for example, that the character of Amateur Radio in this country has been moving away from the technical aspects of yesteryear—the designing, constructing and subsequent testing of homebuilt equipment. If, in fact, our technically oriented justification for spectrum occupancy is declining, there is little evidence that the impact of such a trend upon our long range future is being given a great deal of thought. Most of us recognize that amateur radio is changing and will continue to change, for our activities are closely linked not only to a rapidly changing technological field, but to a dynamic society that confronts us with new obstacles, challenges and opportunities for providing useful public service.

With a steadily increasing number of new amateurs, the specter of more Government intervention and pressures on our frequencies and erstwhile freedoms (via WARC, changes in licensing regulations, revision of the Communications Act of 1934, the growing rash of restricitive antenna legislation, RFI problems, etc.) it becomes increasingly apprarent that *all* of us—ARRL members and non-members alike—need to give much serious thought about where the Amateur Radio Service is or should be going in the decade ahead.

Long range planning is hardly an exact science, but it *is* possible to anticipate some problems, to perceive certain distant opportunities, and to develop appropriate recommendations. If we put our collective heads together, perhaps we can do something to establish positive courses, rather than simply drifting and reacting to external events. But it will require a substantial amount of effort on a continuing basis by a number of concerned amateurs who are willing to assess the past for the guidance it may provide in planning for the future, rather than merely criticizing past decisions of failures.

As a method of providing a focus for a long range planning effort, the ARRL's Directors at their January board meeting created a Long Range Planning Committee (LRPC), set aside initial funding for its operation, and gave it the responsibility of "...reviewing and making recommendations to the Board concerning the programs which the League is and should be providing to its members and to the Amateur Radio Service..."

At its initial meeting in February, the members of the LRPC—Dick Baldwin, W1RU, Hazard Reeves, K2GL, Charles Dorian, W3JPT, Vic Clark, W4KFC, Lary Price, W4RA, Jay Holladay, W6EJJ, and Herbert Hoover, III W6ZH (with ARRL President Harry Dannals, W2HD, ex-officio)—agreed upon a number of critieria governing its activities: No fact of the ARRL's operation was exempt from scrutiny and/or recommendations; the general welfare of the entire Amateur Radio Service was to be served, not just parts of it; and that a subject as complex and far-reaching as the future of Amateur Radio and the ARRL could not be thoroughly appraised without the input of many different people...ARRL members or not.

Therefore, if *you* have some thoughts, comments, and/or reccommendations about the future of the Amateur Radio Service and/or the ARRL in general, or some very specific portions thereof, please let the LRPC have the benefit of your thinking. A letter or card sent to me at the address given below, marked for the attention of the LRPC, will be acknowledged, and I will make sure that your comments are made available to each of the members of the committee.

73,

Vic Clark, W4KFC
Chairman, LRPC
12977 Popes Read Road
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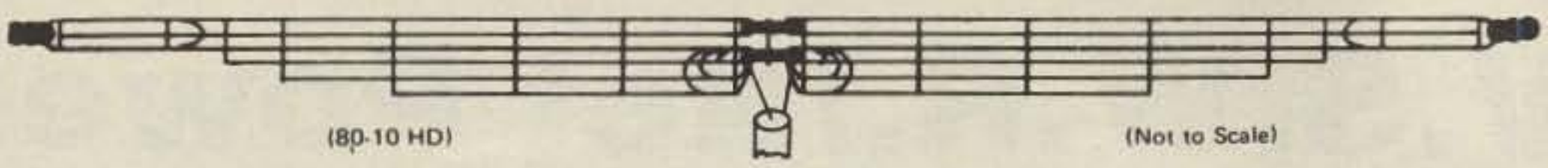

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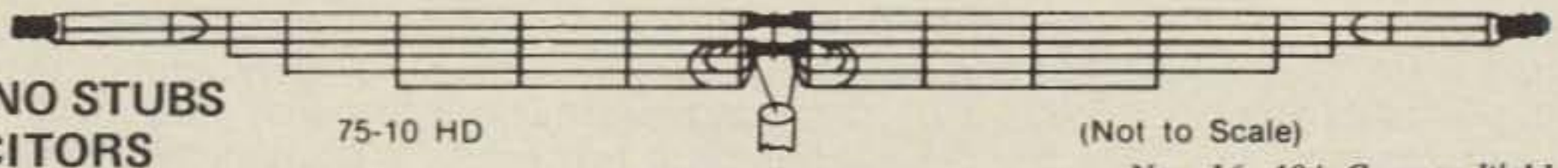

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75-40 HD (SP)	75/40	57.50	40/1.12	66/20.1
75-20 HD	75/40/20	66.50	44/1.23	66/20.1
75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
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CIRCLE 39 ON READER SERVICE CARD

CQ Reviews: Electronic Research Corp.'s SL-65 V.S.W.R./Net Power Indicators

BY IRWIN SCHWARTZ*, K2VG

The s.w.r./wattmeter has become a regular fixture on the modern amateur radio station operating table. Optimum matching of source to load (along with the means to see it happenning) has become somewhat of an international mania during the past score of years or so. And the commercial manufacturers have responded to this phenomenon with unrestrained elan.

The odyssey toward a 1:1, coupled with the advent of digital techniques, has culminated in a marriage of the two at the capable hands of Electronic Research Corporation of Virginia. Their new SL-65 Digital V.S.W.R. and Net Power Inidcator is their latest effort at satisfying the amateur radio community's need for observing the perfect match.

In addition to being the first to market a practical digital s.w.r./power indicator, ERV has reared its ingenious and beneficent head to make a version of the SL-65 for sightless amateurs. More on this latter accomplishment later.

The two pound SL-65 is housed in a 5.5 x 3.5 x 7.5 inch gray metal cabinet. The front panel has on it two toggle switches - one for OFF/ON and the other for going from the v.s.w.r. function to the net power function. In addition to the two switches, there is a two-digit 0.33" high red LED readout. It is this LED readout that lets the user know of his progress toward that 1:1 and, at the flip of a switch, the net power accepted by the antenna can be seen. (Net power = forward power - reflected power). So not only does the SL-65 give information regarding s.w.r., it also does the arithmetic necessary for computing net power.

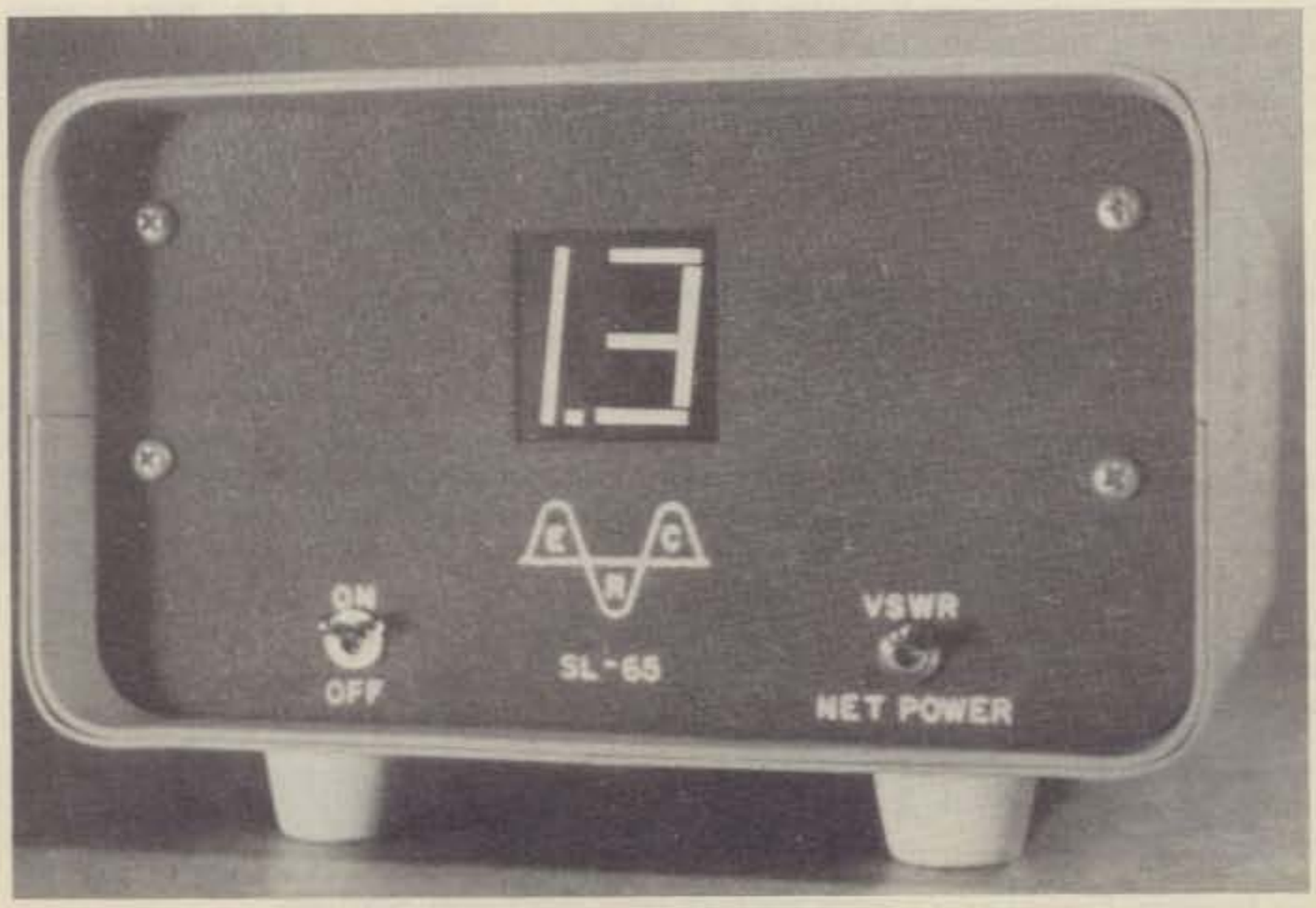
Installation is simplicity itself. Merely connect the SL-65 as you would any s.w.r./wattmeter - the transmitter output goes to one SO-239 connector on the back of the unit; the antenna lead-in goes to the other SO-239 connector.

Operation of the unit is easy to learn by using the very complete and informative instruction manual supplied with the indicator. The instruction booklet is, in fact, a short course in antenna and antenna matching theory. It is recommended reading, even for the most practiced among us.

The SL-65, in concert with a matchbox, makes tuning your transmitter short work. Tune as you usually would while keeping watch on the s.w.r. readout. When you have achieved minimum s.w.r. (as close to 1:1 as possible), flip the switch to NET POWER and tune for the power level at which you want to operate. One of the nice things about the unit is that you can continuously monitor the s.w.r and net power while transmitting. Easy to read because there is no thin meter pointer to squint at.

The SL-65 will display v.s.w.r. values between 1.0 and 6.2 and its useful power range is 20 to 2000 watts. It can be used anywhere between 1.8 and 30 MHz.

Managing Editor, CQ



Electronic Research of Virginia's Model SL-65 V.S.W.R./Net Power Indicator

A low power version of the SL-65 is available (SL-65A). This unit is similar in every respect to its brother except for power handling capability. The power range for the SL-65A is 0.2 watts to 20 watts.

The SL-65M is an audio version of the SL-65. Sightless amateurs will immediately appreciate its value in their shacks. In order to test the unit's effectiveness in my all-Drake station, I first read the instructions (which, incidentally, will be available on cassette tape). Then, after having gotten a good mental picture of where all the controls are on my equipment (it's surprising how we take this for granted. Sit down at your operating position and try finding 14.265 with your eyes closed!), I endeavored to tune up my rig. I must admit that, at first, I was gun-shy. But after a few tries it became easy.

The SL-65M generates two audio tones which are used against each other to tune your rig. Minimum s.w.r. is indicated by zerobeat of the two tones. So, with eyes closed, I keyed the rig, turned up the gain a bit and listened. Two tones (one of shorter duration than the other) were emitted from the speaker on the front panel of the unit. (This speaker replaces the LED readout on the SL-65). Dip the final (listen to the tones); tune the matchbox (listen for the tones getting closer and closer together); dip again (closer yet); tune the matchbox (getting there); dip; tune; dip; tune (now my ear says my s.w.r. must be very close to 1:1). This is the best I can do. The two tones are almost zerobeat. Increase power (that's monitored by flipping the front-panel switch on the SL-65M to NET POWER). The closer the two tone get to an octave apart, the closer I get to 200 watts net power. Since my Drake transceiver peaks at about 200 watts, I tune for maximum separation of the two tones. Now for the touchup. Flip back to VSWR. Dip; tune. Get those tones as close together as possible. Ah, there!

After that episode was over, I substituted the SL-65 (LED version) for the SL-65M to see where I was. *185 watts net power along with an s.w.r. of 1.2:1.*

In sum, Electronic Research Corp. of Virginia has, with its SL-65 family, added some useful and interesting products to its growing line of amateur radio equipment.

Each member of the SL-65 sells for $189.50 and can be obtained from Electronic Research Corp. of Virginia, P.O. Box 2394, Virginia Beach VA 23452. For more information, write them or circle number 78 on the reader service card.

a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

I must admit that Doctor Livingston I. Presume looked unhappy. He sat across the desk from me and didn't say a word as I finished up a batch of QSL cards to go overseas. Finally, in order to get the conversation off dead-center, I said, "Well, how was your vacation trip? Do any hamming?"

Dr. Liv sighed. "Yes", he replied slowly. "But not very much. I ran into a real problem."

"Tell me about it", I suggested, sweeping the cards to one side of the table. "Let me be your shrink. Tell me all".

c/o CQ

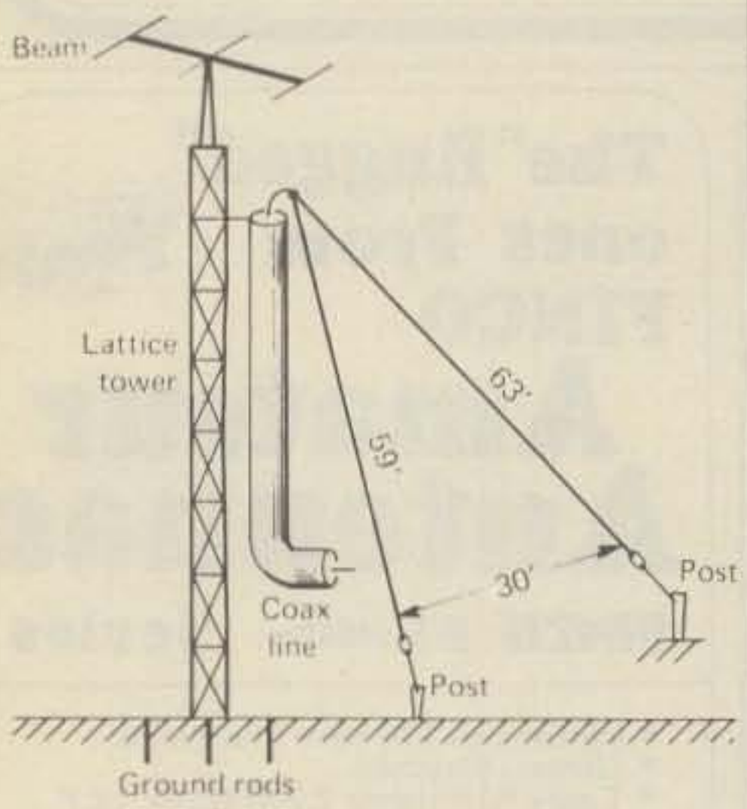


Fig. 1-The wideband 80 meter sloper antenna of WB4PVT. Charles uses two sloper wires connected in parallel at the feed point. One wire is cut for 3650 KHz. and the other one for 3975 KHz. Separation of the wire ends near ground level is about 30 feet. Resonance and s.w.r. curve can be varied by moving the ends farther apart, or changing height above ground. End height of about 10 feet is suggested. Parallel connected wires are fed from center conductor of RG-8/U feedline and outer shield is grounded to the tower. A No. 10 ground wire runs from ground rods at base of tower up to the point on the tower at which the shield is attached.

My friend laughed. "I had a terrible time, ham radio-wise. I took my portable rig along, the transceiver, antenna tuner and a random-length wire for an antenna. I ran the wire from the living room across a yard to the next building and hooked it onto a stairway balcony. It was a nice antenna, about 40 feet high. And I laid out a bunch of radial wires for 20, 15 and 10 meters on the porch. It was a pretty good setup, but I never used it".

Doctor Liv stopped, so I asked the inevitable question.

"Why not?"

"I'll tell you! As soon as I got the transceiver loaded up properly and hit the key, all the *smoke detectors* in the building next door went off! What a racket! It scared the hell out of me and all my neighbors! Can you imagine the racket made by eight smoke detectors going off at once?"

"I can imagine", I replied.

Doctor Liv. continued. "The neighbors were mad, frightened and puzzled. And I don't blame them. I was unhappy, too. Luckily, no one jumped to the conclusion that the antenna wire had anything to do with the problem. I sneaked back into the living room while the neighbors were milling around and hit the key again, and the smoke detectors went off—bang! Just like that."

Fig. 2 — The dual-polarity Avanti 10 meter Quad at WD9ABG. This novel antenna provides either horizontal or vertical polarization at the flick of a switch. Matching sections are folded into a loop at the center of the director. Switchable polarization is very useful for DX work says Marty.

"Well, what did you end up doing about it?"

"I stayed off the air the rest of the day. A repairman came around to look at the smoke detectors, but he didn't do anything and finally went away. That night, I took down the long wire and moved it at right angles to the building. Next morning I went on the air—very timidly, I assure you—but the problem seemed over. The smoke detectors were quiet.

"But it seems a damned shame that I was caught in such a bind. I was only running about 180 watts, but I guess the strong r.f. field around the end of the wire was enough to set off the smoke detectors. It's just too bad that junk like that is allowed on the market! Why should a smoke detector be sensitive to r.f.?"

"I don't know", I replied. "I've never seen the schematic of one. But perhaps one of the readers of my *CQ* column has the answer. How do you clean up a smoke detector so that it doesn't go off when exposed to a nearby r.f. field?"

"Whoever has the answer to that question can certainly do a public service by helping fellows like myself that have run afoul of the beasties". Liv. frowned, and then turned to a more happy subject: antennas.

"Look at this letter I received from Charley, WB4PVT (fig. 1). He wanted a sloper antenna that would cover the whole 80 meter band. So he tried the idea of using two parallel-connected slopers, one cut for 3.7 MHz. and the other cut for 4.0 MHz. The wire ends were separated by about 30 feet. The sloper was mounted to the side of his tower at about the 50 foot level. As you know, the sloper is a quarter-wave wire that uses the tower itself

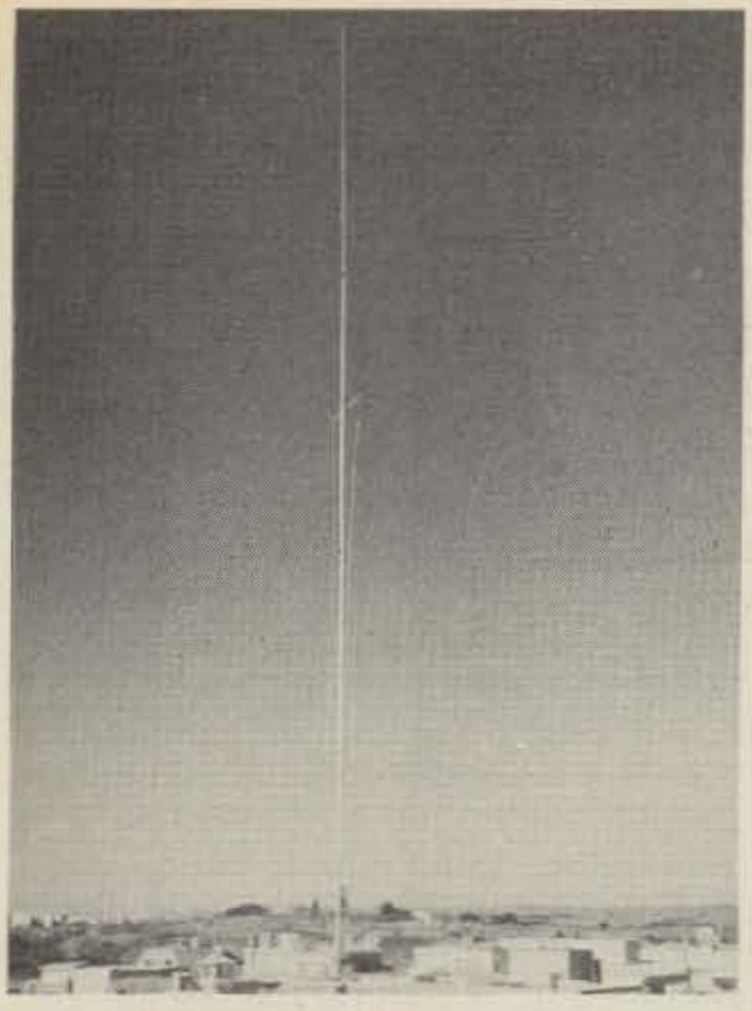


Fig. 3-The "all-band" vertical antenna of I0ZV in Rome, Italy. The antenna consists of a 33'10" whip with auxiliary vertical antenna wires connected in parallel at the base. Radial wires are run on the roof of the building.

as a counterpoise, or ground system. WB4PVT ran a #10 wire down the tower to ground rods at the base. The wire was grounded both to the tower and to the braid of the coax cable at the top. The center conductor was connected to the two antenna wires. Not a bad idea for a wideband 80 meter antenna".

"Yes", I agreed. "I've never seen a wideband sloper antenna before. Nice going, Charlie."

I handed Doctor Liv. a photo (fig. 2). "This will be of interest to a 10 meter DX bug, such as yourself. This was sent to me by Marty, WD9ABG. This is the new Avanti PDL 5X10 dual-polarity Quad, Model ARD-122. Avanti is getting into the ham antenna field, after many years dominating the CB market.This is one of their first ham designs.

"Basically, it is a two element Quad whose polarization can be controlled from the operator's position. Your choice of either horizontal or vertical polarization at the flick of a switch! The antenna has two gamma matches, two feedlines and a coaxial switch. Marty has his PDL array cut for 29.6 MHz. and uses it on 10 meter FM. He finds that polarity switching is very effective in reducing phase distortion that shows up on FM skip signals. Some signals that are completely unreadable due to phase distortion are completely readable when antenna polarization is changed. And, of course, vertical polarization comes in handy when working local mobile stations".

"Which is best for DX work, horizontal or vertical polarization?", queried Doctor Liv.

"Ah, that's the question", I replied. "Theory has it that ionospheric-reflected high frequency waves lose their original polarization and that the reflected wave is randomly polarized. That may be true. It certainly is interesting to switch back and forth from horizontal to vertical polarization on a DX signal and watch the S-meter. On some very long skip signals, the vertical polarization produces a good signal which completely drops out when the antenna is switched to horizontal polarization. In any event, it is very convenient to able to switch polarization at will. It can really pay off on 10 meters, regardless of the mode of transmission".

I reached into the desk drawer and produced a letter which I tossed to Doctor Liv.

"Look at this "all-band" vertical antenna that Francesco, I0ZV is using on the Via Flamina in Rome, the Eternal City. I'm sure that you've heard his robust signal on the bands. It is a very simple and effective installation (fig. 3). Francesco has a 33'10" aluminum whip antenna which is resonant at about 7080 kHz. There are two 33 foot radial wires running across the roof of the building to form a ground return. The whip element diameter at the base is 1-5/8", tapering to 7/16" at the top. The antenna also operates as-is on the third harmonic at 21 MHz".

"That takes care of two bands", observed Doctor Liv as he studied the photographs (fig. 4 and 5).

Fig. 4-The base of the I0ZV antenna showing the radial wires, antenna support and 80 meter loading coil. Note the 20 and 10 meter vertical wires running parallel to the aluminum tube.

"The antenna is base loaded for 80 meter operation by a coil made of aluminum fence wire (1/8-inch diameter). The coil has 17 turns, 2-3/4" diameter and is about 3-1/2" long. Resonance is at 3.7 MHz. The number of turns can be adjusted to move the resonance point about in the band. One 135 foot radial is used for 80 meters. It is run around the roof in a haphazard fashion.

"An aluminum cross-bar is clamped to the antenna at the 20 foot level. This supports the 20 and 10 meter verticals, which are 16'6" and 8'2" long respectively. The aluminum

Fig. 5-The base loading coil of the vertical antenna is placed in a plastic cup as is the relay which places the coil in the circuit. Francesco reports good DX with this antenna on all high frequency bands: 80 through 10 meters.

wires are fastened to the cross-bar with nylon rope. The bar is two feet long so that the wires are spaced away from the vertical aluminum element. The wires and the tubing are all connected together at the base of the antenna. Two radials for each band are added at the base; their lengths are 16'6", 11'2" and 8'4" respectively for 20, 15 and 10 meters.

"The vertical is guyed at the 20 foot level by nylon ropes to counteract the winter winds and the base is held to a supporting structure by an insulating plate.

"Francesco notes the s.w.r. is less than 2.5-to-1 from 3.6 to 3.8 MHz., with a minimum of 1.2-to-1 at resonance. S.w.r. minimum on 40 meters is 1.4-to-1; 20 meters, 1.2-to-1; 1.9-to-1 on 15 meters and 1.4-to-1 on 10 meters".

"Very good!", exclaimed Doctor Liv. He looked at the letter and photographs. "I see Francesco has had the antenna up and working with no problems since 1971. It must be a good design to stay up all that time!"

"Many DXers use a vertical antenna of this type", I replied. It is about the only answer if you are space-limited. If you have the space to run the radials out below the antenna, your problems are solved".

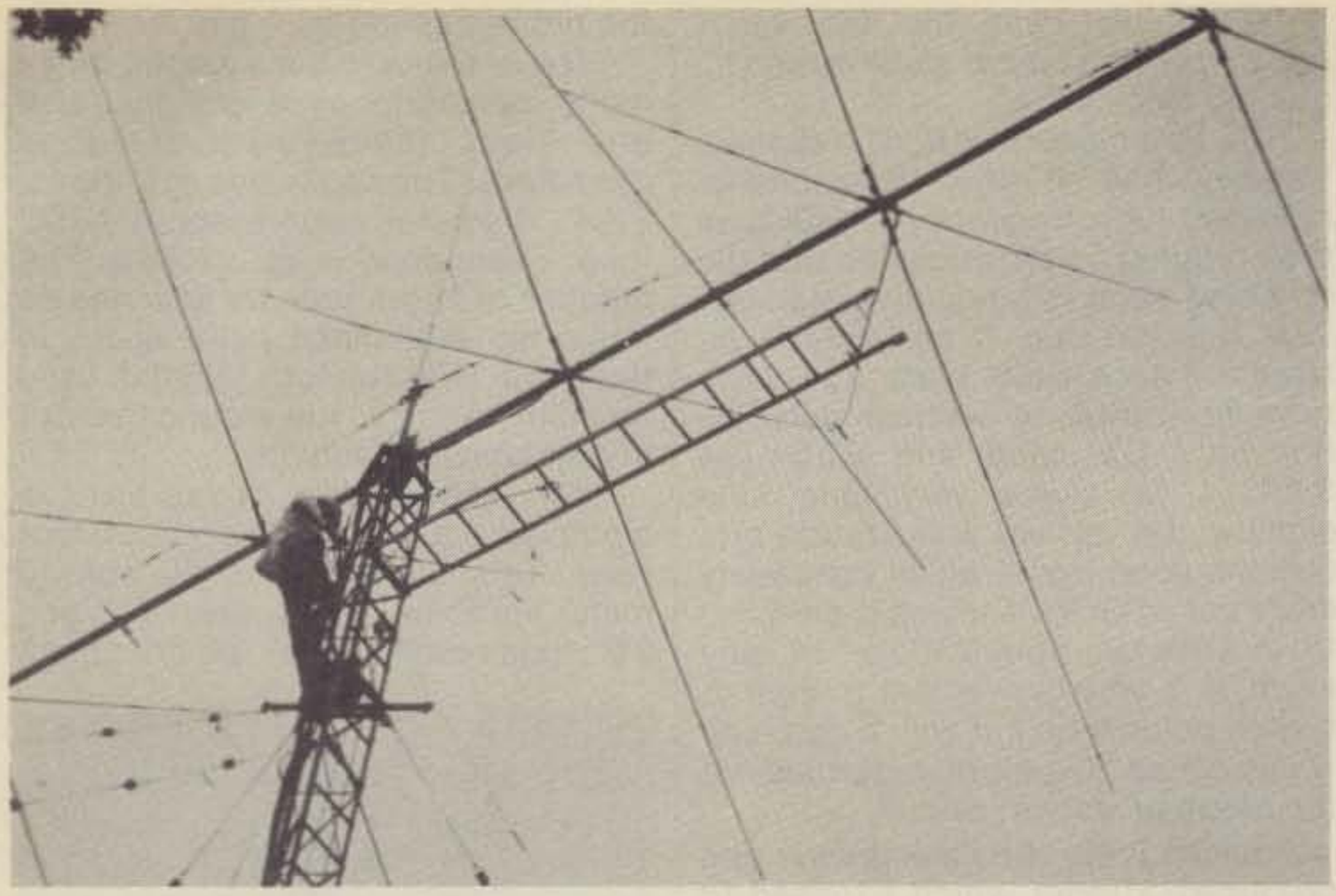


Fig. 6 – Lew, K4VX, installs temporary outrigger at top of his 100 foot tower so that he can repair his Monster Quad without having to lower it to the ground. Aluminum ladder is bolted to the tower and free end is guyed back to the top of the tower. Outrigger was tested at 3 foot level before it was installed at 96 foot level!

"Let me see the letter you got from Lew, K4VX", urged Doctor Liv. "I understand he has a nifty way of repairing a Monster Quad without taking it down from the tower".

"That's right", I replied." Lew writes that a lot of information about Monster Quads has appeared in this column but not much advice on how to repair the broken elements that are beyond reach from the tower".

"It's a real hassle to take down a four element Quad", agreed Doctor Liv. "How did Lew handle the problem?"

"Lew says last year his 10 meter driven element opened up at the feedpoint. The Monster Quad was on top of a 100 foot tower and he hated to think of hauling the antenna down for repairs.

"Lew decided to repair the element in place. He disassembled one section of an aluminum extension ladder and mounted the bottom of it to a section of angle iron which was drilled to bolt in place of one of the tower steps. The ladder projected out from the tower and the free end was guyed back to the top of the tower by means of 3/16-inch diameter aircraft cable.

"Before Lew put this outrigger atop his tower he mounted it about 3 feet clear of the ground and worked with it until he was satisfied it was safe. He then remounted it at the 96 foot level on the tower (fig. 6) and slowly crawled out on the ladder with a bag of tools to repair the feed point. His buddy, K4EBY, took these shots with a telephoto lens".

"Wow", said the good Doctor as he studied the photos. That takes plenty of nerve to crawl out on that ladder 96 feet up in the air (fig. 7). I get a nosebleed even thinking about it!"

"I agree", I replied, "But I'm not as young as I used to be". "Lew said he put the Quad up originally with a messenger cable strung from the top of the tower to another tower about 150 feet away. A pulley which could ride as a trolley along the messenger cable held a 3-pulley block. A rope at the pulley block went to the Quad tower. The Quad was assembled on the ground between the towers and a 2-pulley block was secured to the Quad boom at the center of gravity. Two hams hauled the six element Quad up into the clear between the towers and then walked slowly towards the Quad tower, pulling the Quad along with them. Once the Quad boom could be reached by a small winch cable, W3GRF and K4VX winched the Quad in place and set the bolts. The guys on the ground were K7ZZ, N4SW, K6BRB and some s.w.l.'s.

"One other item of interest: Lew used 8 foot spacing between Quad elements which worked fine on all bands, however on 10 meters he mounted a 15'6" long Yagi director element between the driven loops and the first set of Quad directors. This improved the 10 meter pattern and also reduced the feed point impedance on 10 meters from 120 ohms to about 55 ohms.

"Lew says he is a contest operator primarily and that this antenna takes a back seat to no one on the East Coast, including checks with W3AU and his element, 10 meter Yagi.

"Finally, Lew says that an ice-covered Quad makes a very good rotary dummy load in the winter months, and the last few storms proved that!"

"Amazing", said Doctor Liv as he studied the photographs. "I would hate to tangle with K4VX. I wonder what all the Monster Quad enthusiasts in Cow Town (Fort Worth) think of this East Coast competition?"

"They must be aware of K4VX. I guess they are just too modest to comment", I replied.

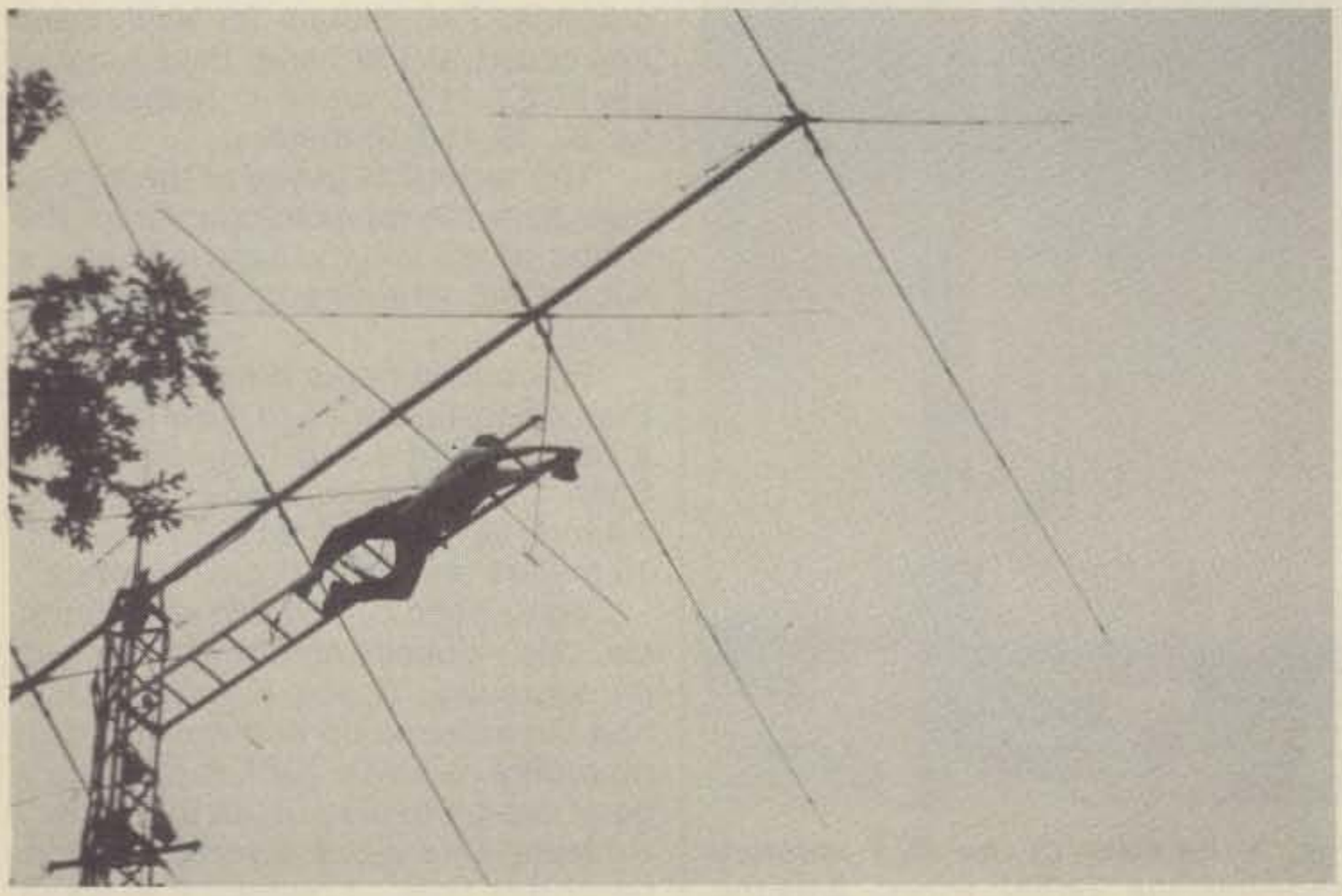
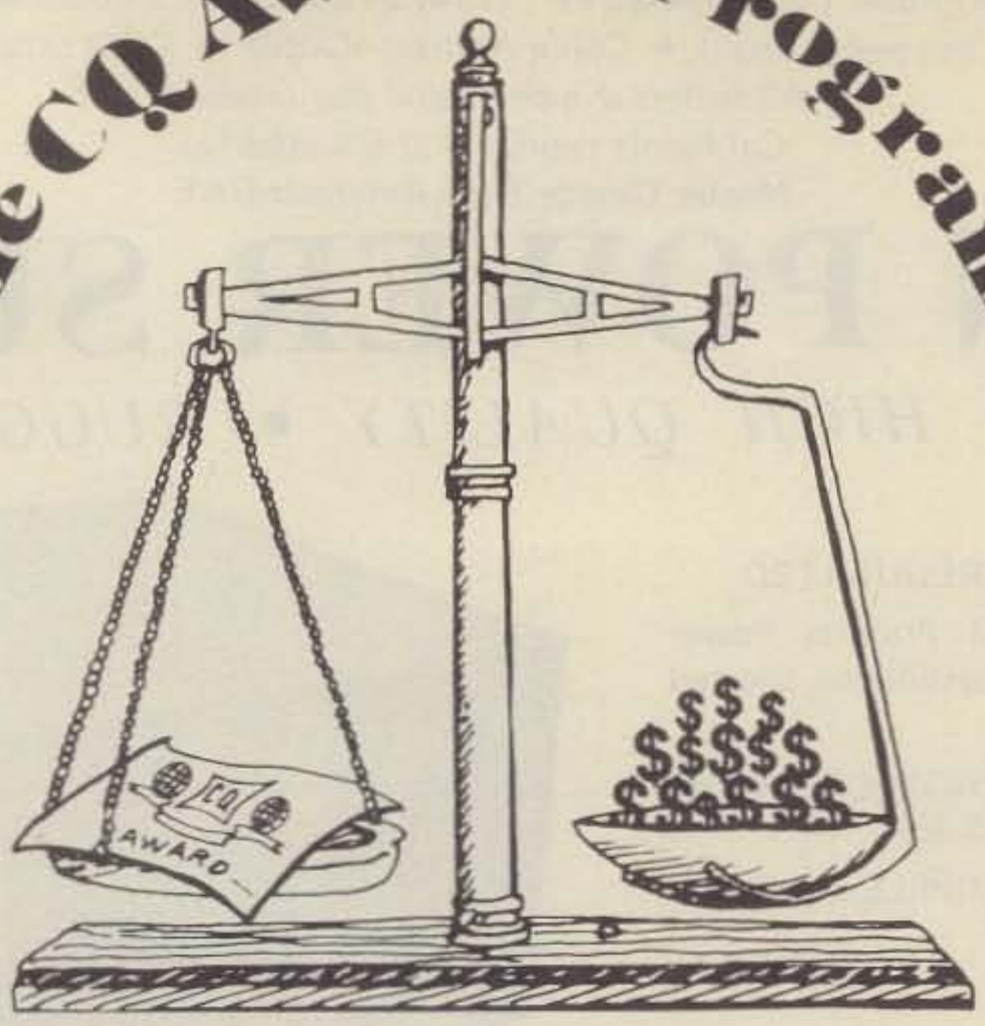


Fig. 7 – K4VX repairing his Monster Quad! Note the extra 10 meter Yagi director element (behing Lew). This improves coupling to the first 10 meter director, providing better front-to-back ratio and lowering impediance of driven element to about 55 ohms on 10 meters.

The CQ Awards Programs



ALAN M. DORHOFFER, K2EEK
EDITOR, CQ

Everyone is keenly aware that prices for goods and services have increased tremdndously over the past few years. Wages cannot keep up with prices and everyone feels the pinch whether at the supermarket or at the gas pump. Our Award Program is no different in that respect. Over the years we have tried to retain a low basic price for administration and awards themselves while maintaining the integrity and desirability for the achievement. We have in the past underwritten the rising costs and happily noted the rising interest in the Awards Programs, due in great part to the tremendous efforts put forth by our Award Managers.

While the number of applicants remained small, the overall expenditure for the Program did not add up to a significant amount. Through increased popularity for our Awards, the number of applicants has increased dramatically and thus the individual cost becomes quite apparent when we determine our budget. To process and deliver an Award to an applicant (certificate only) costs between $3.00 and $4.00. This is "out-of-pocket" cost by *CQ*. The current application "fee" of $2.00 remains with the Award Chairman to offset his costs for the processing. This amount is both earned and deserved, and does not enter into our cost accounting. In fact, this amount had been increased from $1.00 to $2.00 this year to compensate for rising costs.

With regard to special plaques offered by *CQ*, initial costs were based on estimates at the time and never updated to par value. This means that we are currently charging $15.00 for the average plaque that now costs us $24.00 and will increase to about $30.00 from our supplier shortly. We must work towards closing this cost gap.

In order to meet this increased demand we will be forced to raise the application fee in accordance with real costs. An application fee of $5.00 will be put on each Award offered by *CQ*. Plaques will go to $30.00 to cover their cost. The breakdown of funding will basically be the same. The $2.00 portion of the fee will go to the Award Chairman as usual and the remaining $3.00 will be used to pay internal costs. For the time being we will absorb those costs over $3.00.

To allay the argument that our Programs be available to subscribers only, and that through increased circulation the matter of funding will take care of itself, be advised that the argument is fallacious. We are in no way "crying poverty" but the simple economic facts say that we do not profit $3.00 to $4.00 per subscription nor do we make enough on a $9.95 subscription to underwrite $15.00 towards a $30.00 plaque. With regard to some form of exclusionary clause whereby only subscribers are eligible for our Awards doesn't seem right to me and seems to defeat the purpose of all around achievement. We welcome all new subscribers to our ranks and work very hard to give all subscribers both new and old an on-time, dependable journal of which we can be proud. The fact that we can offer meaningful and prestigious Awards for operating achievement does not lessen or diminish our primary responsibility as publishers. Unlike our brethern in Newington, we must show a financial responsibility for our actions that transcends membership (readership) to include management, the IRS, Columnists, authors and vendors let alone yours truly and the *CQ* Staff.

These very same principles of accountability will shortly be applied to our Contest Program. We have been very fortunate in that Trophys and Plaques are donated generously each year by dedicated and enthusiastic DXers and clubs. We will probably make up log and cover-sheet packages which will now be offered at a nominal price depending on quantity. The number of entrants from a given area will determine the number of certificates to that area thus reducing the number of certificates awarded. The given activity will determine the number.

So, rather than put a larger bite on our subscribers by substantially raising our subscription price (a la Newington) inorder to spread the cost over each reader, we thought it only fair to have those people involved in the Program pay for it. Hopefully we can institute these changes shortly, certainly before the years end. Check the DX Column and Awards Column for starting dates and other details.

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a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Code Part II of III

The first portion of this three-part article appeared in last month's issue. It covered the advantages of code, what code is, word count system, and code tests. Each part of this article contains information that is useful by itself but the entire article must be read to derive maximum benefit.

Learning Code

Learn code by sound, not by sight. It is not unusual for students to make flash cards with the printed character on one side and the code symbol on the other side. These cards are helpful if you are going to practice code with another person. However, one should not just use flash cards to visually learn code; they must be used in conjunction with an oscillator and key used to send each character. The use of blinker light or flashlight as a code learning aid is a bad practice. Copying code by sight is entirely different than copying it by sound. Do not use visual practice because it will slow down your progress in learning to copy code by sound.

There are no dots and dashes in code, there are only dits and dahs. Do not learn code by dots and dashes because it would seriously hamper your efforts to increase receiving speed. If you have learned the code as combinations of dots and dashes, you make two transpositions each time you copy a symbol. If you hear dit-dah, you convert that to dot-dash and then recognize dot-dash as the letter A. Avoid this unnecessary extra step. Learn to directly associate each dit and dah code symbol with the specific character it represents.

Another common error is learning the code symbols for the alphabet in sequence from A through Z. Do not do this because you would tend to run through the entire alphabet in your mind each time you hear a symbol. Code practice sessions must be short and regular to be most effective. Practice 20 to 40 minutes at a time and no more than twice per day. However, it is necessary to hold practice sessions at least 5 days per week. Most new students mentally convert printed signs into code wherever they are seen. This is good practice as long as one mentally changes them into dit and dah symbols, not dot and dash symbols. Send a few code symbols and you will quickly convince yourself that you are listening to dits and dahs, not dots and dashes.

The following combinations of symbols are helpful to people learning code. It is better to learn the code in a random fashion instead of in sequences or combinations. However, I know that most students will resort to combinations so they are included here for your convenience.

If one is just learning the International Morse Code, it may help to learn some of the letters in pairs. Each letter appears twice in the following alphabetical list.

A	.-	N	-.
B	-...	V	...-
D	-..	U	..-
F	..-.	L	.-..
G	--.	W	.--
L	.-..	F	..-.
N	-.	A	.-
Q	--.-	Y	-.--
U	..-	D	-..
V	...-	B	-...
W	.--	G	--.
Y	-.--	Q	--.-

A	.-	N	-.
U	..-	D	-..
V	...-	D	-...
4	....-	6	-....
E	.	T	-
I	..	M	--
S	...	O	---
H	....	-	(none)
5	.....	Ø	-----

Some students find it easier to use the following examples, the harder symbol is produced by running together the two easier symbols following the first letter (the more difficult symbol) in each word.

F	Fin	F*IN*	..-./.. -.
J	Jam	J*IAM*	.---/.- --
L	Led	L*ED*	.-../. -..
P	Pan	P*IAN*	.--./.- -.
V	Via	V*IA*	...-/.. .-

The code symbols for the letters Q and Z sound like "here comes the bride" from the wedding march and "daddy did it", respectively.

The preceding aids are just intended to help those who are trying to become familiar with the code. These aids are quickly forgotten as one becomes familiar with the sound associated with each code symbol.

Taped Code Checks. One of the best ways to improve your code proficiency is to record an item and listen to it at a later date. I advise my students to clip articles out of newspapers and magazines. Select articles that contain quite a few numbers and punctuation marks. Cross out punctuation marks you do not have to know to pass the FCC code exam and insert work signs and punctuation marks that are required. Record about a 20 minute code run. Then, put the cassette tape and printed material away for 7 to 14 days. Record several of these runs per week, if you have time to do it. When you take a tape out to listen to it, do not read the printed material before you listen to the recording. Carefully copy exactly what you previously recorded and listen a second time through to check that you copied everything as it was taped. Afterwards, check what you copied against the original article you meant to tape. Check each letter, number, work sign, and punctuation mark. You will quickly learn which letters you must improve to become a better operator. You can effectively and constructively criticize your own sending by using this procedure. Im-

**2814 Empire Ave., Burbank, CA 91504.*

proper spacing causes most of the trouble. When a symbol is spaced apart, it becomes two (or more) other symbols. When letters are run together, they can form other symbols or characters with no meaning. When words are run together, or separated in the middle, the resultant copy can be difficult to understand. Frequent use of cassette recordings can help anyone become a much better operator in a short time. A major advantage to using this system is that you can do everything yourself; you do not need anyone to help you improve your code capability.

Operating. Once you have your code proficiency up to about 7 words per minute (35 letters per minute), you should make arrangements with a local volunteer examiner (General class amateur, or above) to take your FCC 5 w.p.m. Novice code test. The best code practice is obtained by operating on the air, and it is a lot more interesting than any other code improvement system.

Sending Tips. Whenever you practice sending code with a handkey, place a heavy coin on the flat wrist area of the hand you send with. The correct sending motion involves raising and lowering the wrist. If your sending motion is correct, the coin will stay on the flat of your wrist. If your motion is wrong, the coin will fall off. If you make the mistake of sending code with your fingers, your symbol spacing will be poor and other operators will not like the disjointed sound of your sending. The nail of the forefinger should overlap the forward edge of the key knob. The knuckle of the forefinger should always bend out to accommodate normal extra wrist pressure. If the forefinger knuckle is bent in (back), it indicates that the operator is finger tapping instead of sending with the wrist. Grasp the key knob between the thumb and middle finger and just hold it tight enough to prevent your hand from coming off the key. Curl your two small fingers loosely out of the way and keep your arm, wrist, and hand relaxed and in a straight line. Mount your key on a piece of wood or plastic that is no more than one quarter inch thick. If your key has a skirt, take it off to avoid bad sending habits. A skirt is a flat washer about the size of a half dollar and located immediately below the knob. Adjust your key to have about one sixteenth of an inch of space between the contacts and set the return spring to a point where a reasonable amount of force is needed to close the keying contacts. These adjustments will help you avoid finger tapping tendencies because finger tapping requires very light spring tension and very close contacts.

Correcting Sending Errors. There are two accepted ways to indicate that a sending error has been made and that a correction will be sent. One way is to send 7 or more consecutive dits. The other (preferred) way is to send a question mark which, when sent out of normal context, indicates that a word or group is immediately going to be repeated. If the error occurs in the first letter of a word, or in a single letter word such as A or I, send the error sign and repeat from the start of the preceding word or group. If the error occurs after the first symbol has been correctly sent, send the error signal and start again at the beginning of the word or group in which the error occurred. If you even think you might have made an error, there is nothing wrong with sending the repetition sign and repeating the word or group you do not think was sent well enough.

Summary

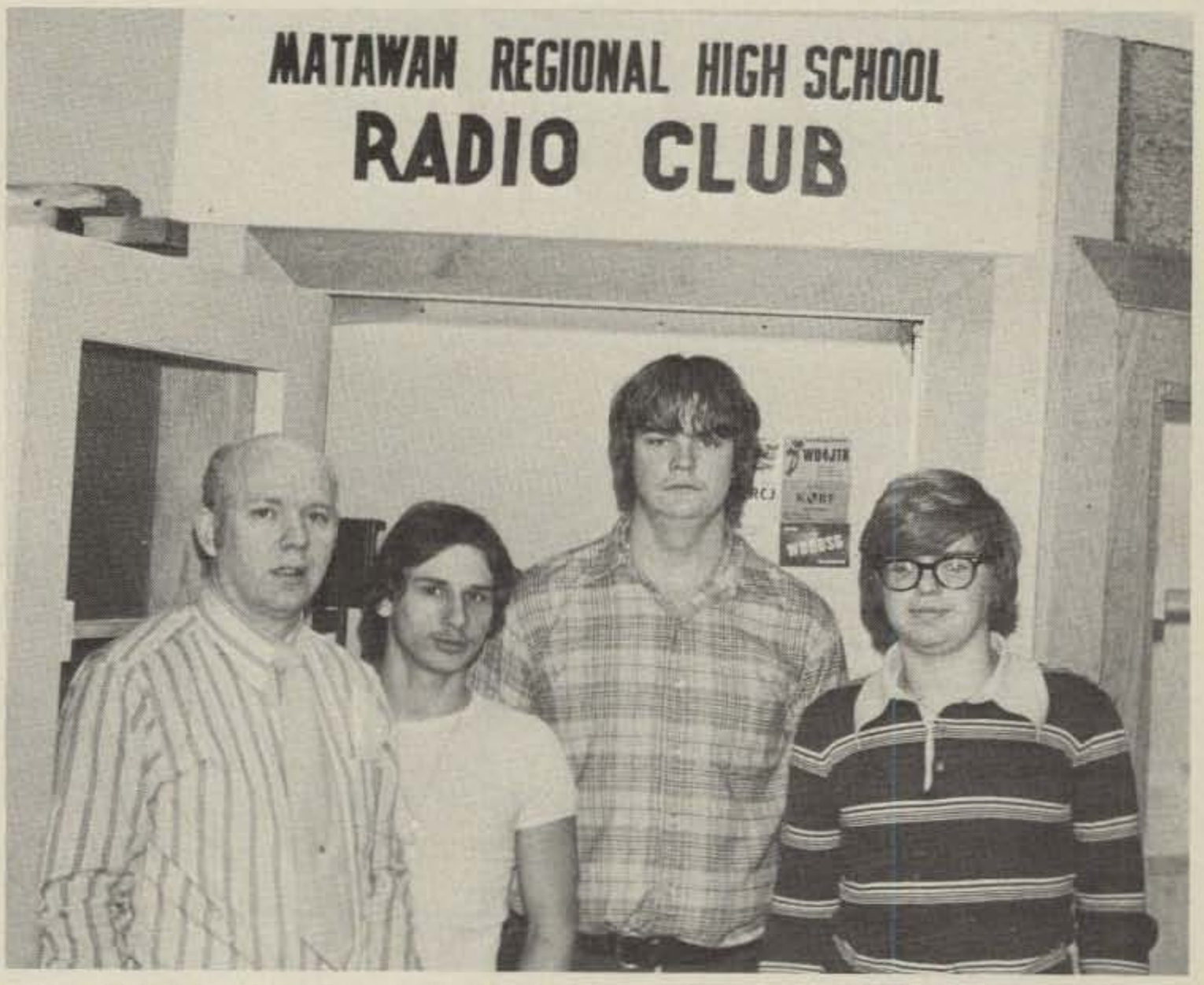
This completes the first two parts of this three part article on code and the remainder of the article will appear in next month's issue. It will cover code practice equipment, dit-to-dah relationship, and codes.

Rick Todd (KA8AKL) of Newbury, Ohio advises that a Novice Worked All States Net meets Saturdays at 1400 UTC on 21,125 kilohertz. Check in with KA8AKL or WD8RUH, give your location, and advise which states you want to contact.

Novices are urged to submit good black-and-white pictures of themselves at their operating positions. If your photograph is printed in a future Novice column, you will receive a one year subscription (or renewal) to *CQ*. A brief description of operating activities and some personal background information are needed with your picture.

Some of the stations I've recently worked on the novice bands are:
KA1BIJ Walt @ Meriden, Conn.,
WB2IUI Bob @ Belvidere, N.J.
WB3HVS Bill @ Maple Glen, Penn.,
KA4BCH John @ Savannah, Ga.
KA5BJY Charlie @ Garland, Texas,
KA6BCD Frank @ N. Hollywood, Ca.
KA7AWH Phil @ Seattle, Wash.,
WD8KSL Keith @ Gary, West Virginia
WD9FYD Arnie @ Fowlerton, Indiana,
KA0ATL Bill @ Brainerd, Minn.

73, Bill, W6DDB



Here are Charles Burke (WA2SLK), David Kneuppel (KA2DRB), Mike James (KA2DRA), and Doug Jones (KA2DVH), left to right of the Matawan Regional High School Radio Club in Aberdeen, New Jersey. Charles is the instructor of the school electronics program and he recently formed the radio club, featuring both amateur radio and CB activities. The amateur station includes a Yaesu FT-101-F set up on a junked door converted into an operating table. Their radio shack is a six by eight foot room that previously served as a photography dark room. The group is anxious to receive a callsign for their club but the FCC has not been issuing new club station licenses, pending revision of the requirements.

TS-180S SERIES

TL-922A

SM-220

For the ultimate in quality and performance

TS-180S with DFC*

All solid-state, this innovative 160-10 meter SSB/CW/FSK transceiver with DFC (*Digital Frequency Control) includes four memories which can be digitally tuned up or down in 20-Hz steps, slow or fast, by means of memory-shift paddle switches. The original stored frequency can be recalled, and the newly tuned memory frequency can also be stored. The memories are usable in transmit, receive, and transceive modes. It's like having four remote VFO's, but with even more flexibility. Separate VFO and memory RIT controls are provided. The solid-state final requires no dipping or loading, and runs up to 200 watts PEP input. It covers 50 kHz above and below each band (100 kHz with the tunable memories) and is adaptable for three new bands (to be considered at WARC). The built-in microprocessor-controlled digital display shows the actual VFO frequency, or the fixed-channel frequency, or the remote VFO frequency (if the optional VFO-180 is used), and it also shows the RIT frequencies. When a frequency is stored in the "M1" memory, the digital display can be switched to indicate the stored frequency and the difference between the stored and VFO frequencies simultaneously. Other features include IF SHIFT, selectable CW receive bandwidths, tunable noise blanker, RF AGC, and improved RF speech processors. Optional accessories, besides the VFO-180 remote VFO, include the DF-180 Digital Frequency Control; SP-180 external speaker; YK-88SSB SSB filter; YK-88CW CW filter; AT-180 antenna tuner/SWR and power meter/antenna switch; PS-30 base station power supply; MC-50 base station microphone, and HS-4 head phones.

TL-922A

Linear amplifier for 160-15 meters runs maximum legal power with 80 watts or more drive. RF input power is 2000 watts PEP on SSB and 1000 watts DC on CW and RTTY. Features include variable threshold level ALC, turn-off delay circuit for blower, and hefty construction.

SM-220

Station monitor combines a wideband (10 MHz) oscilloscope and built-in two-tone generator to monitor all transmitted and received waveforms. It also shows a trapezoid pattern for checking linearity. Pan-display option allows observing number of signals in ±20 or ±100 kHz band segments.

Specifications for Model TS-180S

	Model TS-180S
Frequency Range:	160m 1.80-2.00MHz 80m 3.50-4.00MHz 40m 7.00-7.30MHz 20m 14.00-14.35MHz 15m 21.00-21.45MHz 10m 28.00-29.70MHz WWV 10.00-10.50MHz (receive only)
Modes	SSB (LSB and USB)/CW/FSK
Power Requirements:	R: 13.8 VDC, 1.8 A T: 13.8 VDC, 20 A
Final Power Input:	160-15m 200 W PEP (SSB) 160 W DC (CW) 100 W DC (FSK) 10m 160 W PEP (SSB) 140 W DC (CW) 100 W DC (FSK)
Audio Input Impedance:	500Ω-50kΩ
RF Output Impedance:	50Ω
Frequency Stability:	Within 100Hz during any 30-min. period after warmup. Within ±1kHz during first hr. after 1 min. warmup.
Carrier Suppression:	Better than 40dB
Sideband Suppression:	Better than 60dB
Spurious Radiation:	Better than 50dB
Harmonic Radiation:	Better than 40dB
Audio Frequency Response:	400-2600Hz, within -6dB
Receiver Sensitivity:	0.25μV at 10dB S/N
Image Ratio:	Better than 60dB
IF Rejection:	Better than 80dB
Receiver Selectivity:	SSB, CW Wide: 2.4kHz (-6dB) 4.2kHz (-60dB) *CW Narrow, FSK: 0.5kHz (-6dB) 1.8kHz (-60dB) *(CW Filter Option)
Audio Output Impedance:	4-16Ω
Audio Output:	2W (4Ω)
Dimensions:	13-1/2 (343)W x 5-11/14 (147)H x 14-3/10 (363)D in. (mm) (Inc. heat sink, knobs, etc.)
Weight:	11.5 kg (25.35 lbs.)

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DFC

(DIGITAL FREQUENCY CONTROL)

in the TS-180S HF Transceiver features four memories with digital up/down paddle-switch tuning.

TS-180S

How will four memories improve operating efficiency on the HF ham bands?

The TS-180S with DFC features four memories, each one digitally tunable up and down in minute 20-Hz steps by means of dual-speed paddle switches. It's like having four remote VFO's in addition to the built-in VFO.

The serious DX chaser, for example, can program various DX pileups into the four memories, and periodically check those frequencies to determine if the DX station is listening for calls from his call area. The memories are usable for transmit, receive, or transceive operation. Therefore, a memory can be used on transmit and the VFO on receive, or vice versa, either of which can be tuned up or down in frequency, for working DX stations who are listening for calls several kilohertz away from their transmitting frequency. With the push of a button, the operator can listen on his transmit frequency, which he can tune, and be ready for a perfectly timed call to the DX station, immediately after another station finishes working the DX station.

The memories are also extremely convenient for contest operating. Pileups can be stored and periodically checked for improved propagation or other conditions for "getting through". A "CQ CONTEST" frequency could also be stored.

The memories are also very useful for storing net and schedule frequencies.

What frequencies are displayed on the digital readout during memory operation?

The digital display shows the memory frequency being used, whether in receive or transmit mode. It also shows the actual VFO frequency when the VFO is activated, or the fixed-channel frequency, or the remote VFO frequency (if the optional VFO-180 is used). Separate RIT (receiver incremental tuning) controls are provided for VFO and memory/fixed-channel operation, and the RIT frequencies, when RIT is utilized, are displayed.

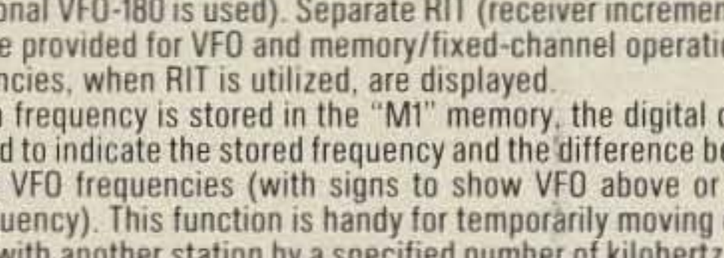
When a frequency is stored in the "M1" memory, the digital display can be switched to indicate the stored frequency and the difference between the stored and VFO frequencies (with signs to show VFO above or below the stored frequency). This function is handy for temporarily moving off of a net frequency with another station by a specified number of kilohertz, and, after completing the conversation, moving back immediately to the net frequency stored in the "M1" memory.

What are the differences between the four memories in the TS-180S with DFC?

The M1 memory is intended for fast or temporary memory operation such as moving off of a net frequency. The [M], M', and M" memories are used for relatively longer storage applications, such as for net frequencies, schedules, etc. Any of the memories can be used for storing DX or contest "pileup" frequencies or transmit or receive frequencies when working "split frequency" operation with a DX station.

How are frequencies stored in memory, and how are they recalled?

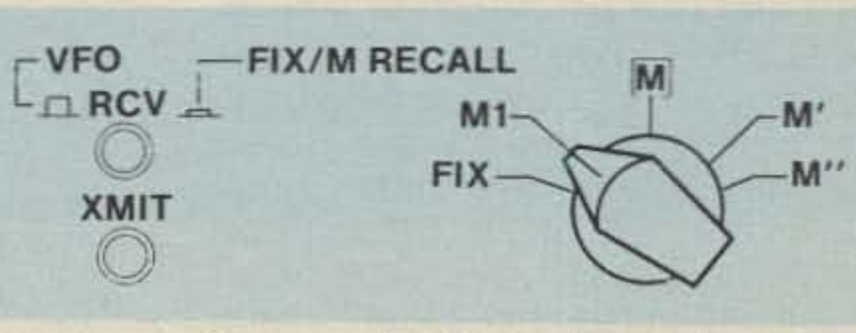
The DFC memories can store frequencies from the TS-180S internal VFO, the fixed channel, and the optional remote VFO. The RIT frequency can also be stored, and frequencies can be shifted from one memory to another. To store an operating frequency in M1, simply set the main tuning to the desired frequency and push the DSP/M1 switch; a "beep" will be heard.



To recall the frequency stored in M1, set the M RECALL switch to M1.

To receive on the memory frequency, the RCV switch should be in. To transmit on the memory frequency, the XMIT switch should be in. To transceive on the memory frequency, both the RCV and the XMIT switches should be in.

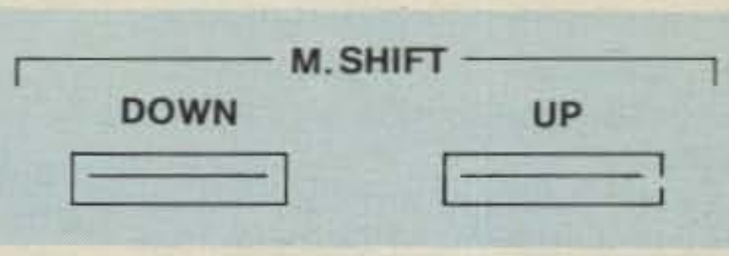
To store frequencies in the other three memories, the main tuning is set to the desired frequency (which we will call frequency A for this explanation) and the [M] switch is pushed in (a "beep" will be heard). To store frequency B, push the [M] switch to release it, and then push again ("beep"). Now frequency B will be stored in the [M] memory and frequency A will shift to the M' memory. To store frequency C, push the [M] switch to release it, and then push again ("beep"). Frequency C is now stored in [M], frequency B in M', and frequency A in M".



Storing another frequency in [M] will shift the memories again, and frequency A will be lost, unless it is recalled and stored in [M] again before another frequency is stored. Therefore, as stations in memory are worked or, for some other reason, a memory frequency is no longer needed, it can be erased automatically as it shifts out of M" where another frequency is stored in [M]. This method of moving memory frequencies "up the stack" retains the chronological order of entry for easy operation, which is particularly important in a contest. The operator, then, does not need to remember which memory in which he stored a particular frequency. To recall any of the stored frequencies, simply set the M RECALL switch to the appropriate position.

How can the memories be tuned up or down in frequency?

On the front panel of the TS-180S are a pair of paddle switches for digitally tuning any of the memories up or down in frequency.



A memory frequency can be stepped up or down 20 Hz at a time. If the UP or DOWN switch is kept depressed, the frequency changes continuously in 20-Hz steps. The rate of change can be increased by depressing the opposite switch while the appropriate switch remains depressed.

The original frequency can be recalled after it has been digitally tuned by the UP or DOWN switch, by moving the M RECALL switch to any position other than the one on which it is memorized, and then resetting it to the original memory position.

The memory frequency, after it is digitally tuned, can be stored by pushing the DSP/M1 or the [M] switch.

Will memory frequencies be retained after power is shut off?

All memorized frequencies will be retained for approximately 30 seconds after power is shut off. Memory backup batteries (Panasonic WL-14 or G-13, Eveready 357, Duracell 10L14, or RAY-O-VAC RW-22 or RW-42) may be installed to retain memory frequencies for an indefinite period after power is shut off. These batteries will function for about one year of normal operation. The batteries provide backup voltage for the [M], M', and M" memories.

The M1/DSP memory is intended for temporary applications, but can be modified for backup battery operation. The batteries are silver-oxide type and are not supplied by Trio-Kenwood. They are commonly available at local stores.

a regular feature by

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The ins and outs of the Washington scene

Russian Over-The-Horizon Radar Continues to Jam Amateur Bands

For almost two years, a high-frequency (HF), over-the-horizon (OTH) radar operated by the Soviet Union has interrupted communications on the HF bands. Nicknamed "The Woodpecker," this OTH radar produces 10 pulses per second, each of which is 100 microseconds in length. The signal so produced occupies a band of 20 kHz., and effectively disrupts worldwide communications in this band.

Amateur operators and other users of 1978, and many of these governments complained to the Russians, and the ITU, about the illegal operations of the OTH radar. In particular, the U.S Department of State took the matter up on two occasions with its counterpart in the Soviet Union; on both occasions, the Russians expressed an unwillingness to cooperate.

It has now been almost a year since the Department of State last approached the Russians on the OTH radar problem. Meanwhile, there are indications that the Russians are experimenting with more sophisticated modulation schemes, which, unfortunately, will cause the radar's signal to occupy bandwidths even larger than the 20 kHz. bandwidth discussed above.

Despite the problem with the OTH radar, however, spokesmen for the Office of International Communication Policy, Department of State, and for the Federal Communications Commission (FCC) indicated that the number of complaints they have received on the OTH radar has fallen significantly during the past 12 months. This is due, no doubt, to the feeling among Amateurs and others that "nothing can be done."

Yet, this is just the response the Russians seek. By continuing to operate is flagrant violation of the international rules and Regulations governing the use of the radio spectrum, and by continuing to frustrate those who would complain of their operations, the Russians hope, eventually, to be able to claim that they are operating on a "non-interference basis." That is, if the world radio community tires of complaining, the Russians will effectively gain "de facto" recognition of their right to operate the OTH radar in the HF band, and they will do so with impunity.

The solution to the problem, of course, is to complain...loud and often! When you hear the OTH radar, note the time and frequency (as best it can be determined). Then, call the FCC's main Watch Officer at (202) 632-6975, and state that you wish to file a complaint against the Soviet Union for operation of an HF OTH radar which is interfering with your operations.

Give your name, call, the time you heard the OTH radar, and the frequency of operation. And be sure to note the fact that a complaint was filed in your station log.

One complaint is not enough. True, the call will be a long distance call for many Amateurs. But with station-to-station telephone charges being relatively low, it is not unreasonable to expect that a complaint could be filed every two to four weeks, or so. And if you have second thoughts about making such a call, ask yourself this: "Is it worth a buck to save the use of those portions of the spectrum allocated to the Amateur Service?"

Again, the FCC's Watch Officer can be reached at (202) 632-6975. Call him when you hear the Russian OTH radar, anytime of the day or night, for the Watch Office is manned 24-hours a day. If enough people complain, we just might be able to stop "The Woodpecker."

No Chinese Amateur Radio Organization in Existence at Present

Responding to an inquiry into Amateur Radio activities in the People's Republic of China, Mr. Xie Qimei, a Counselor for the Embassy of the People's Republic of China in Washington, D.C., indicated that such activities are not well developed at this time, and indeed, there was no Amateur Radio operators organization in existance in China of which he was aware.

The above notwithstanding, some observers of worldwide Amateur activities indicate that Mr. Lambert Moos, HB9APN, has been assigned to the Swiss Embassy in Peking, and may have operated under the call-signs HB9APN/A/BY and HB9APN/BY as recently as March 1979.

Given the benefits which can accrue to a country which supports the development of a viable Amateur service, it is hoped that the People's Republic of China will shortly join the

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8603 Conover Place, Alexandria, VA. 22308

international Amateur Radio community.

ARRL Seeks Thoughts on Long-Range Planning

Elsewhere in this issue you will find material on the American Radio Relay League's Long-Range Planning Committee (LRPC)...a committee which was formed "...for the purpose of reviewing and making recommendations to the Board concerning the programs which the League is and should be providing to its members and to the Amateur Radio service."

Victor (Vic) C. Clark, W4KFC, Vice President of the ARRL, was named by the Board to be the chairman of the LRPC. In this capacity, Mr. Clark has issued a call to all Radio Amateurs... ARRL members or not...to convey the LRPC their thoughts, comments, and recommendations on the future of the Amateur service and the ARRL. More specifically, Mr. Clark requests that you write to him at the address below, and that you share with the Planning Committee at the address below, and that your share with the Planning Committee your considered opinions on any and all matters which pertain to the future of our service. Send your comments to:

Mr. Vic Clark, W4KFC
Chairman, LRPC
12927 Popes Head Road
Clifton, Virginia 22024

In sending your comments to Mr. Clark, do not merely criticize past decision or failures. As once stated by Paul Starr:

"Purely negative criticism is eventually self-destructive; it ends only in ... cynicism. The number of people all too ready to believe the worst is staggering; the number ready to believe that something can be done about it is very small." (see Hayes, Memo for Management, *Management Review,* March 1979).

Something will be done; if you doubt this statement, review the composition of the LRPC. But the LRPC needs your comments and constructive criticism if it is to better address as complex and far-reaching a subject as the future of Amateur Radio.

FCC Releases Data on Radio Frequency Interference (RFI)

According to Mr. Jeffrey Young, Chief, Investigations Branch, FCC, the Commission received 17,583 RFI complaints during the first quarter of Fiscal 1979 (October, November, and December, 1978). This number represents a slight decrease from the number of complaints reported for the same period a year earlier; however, because of seasonal variations, any downtrend in the number of complaints reported annually will not be evident for some time.

With respect to the alleged sources of the RFI, Amateur operations were apparently involved in 722 of the cases reported. On the other hand, 13,928 RFI cases were attributed to CB operations.

As to "victim" devices, 379 of the complaints which involved Amateurs were related to so-called "television interference," or TVI. CB operations, though, were involved in 11,539 cases of TVI, suggesting that many operators are still using power levels in excess of those provided for under the rules governing CB operations. In all, 13,190 of the 17,583 complaints received by the Commission involved television receivers; thus, alleged interference to TV receivers is still the FCC's major RFI problem.

Given the above, it seems obvious that the RFI problem still remains a threat to Amateur and CB operations.

Your Editor extends his appreciation to Mr. Lewis Strauss, AH6I, for his contribution to this month's column.

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Helping that "special person" to become a ham can often be frustrating. In this article husband and wife describe how learning can be made more palatable for the neophyte.

The *Heath* and *Radio Shack* Novice License Study Materials

BY JOHN J. SCHULTZ*, W4FA AND ELISABETHA SCHULTZ*, KA3CNF

Many companies now produce Novice Class study materials. Some companies produce only code study items while others produce only theory or F.C.C. examination "check-out" materials. A number of companies produce more complete study materials for both the code and theory parts of the examination. This article reviews two such widely available sets of study materials as produced by the Heath Co. and Radio Shack. Both companies have sort of a vested interest in producing effective study material. Obviously, they can profit not only from the sale of the study material but from any further equipment or parts purchases a Novice, who has been successful using their study material, might be inclined to make.

The study materials were looked at from several aspects. But most particularly from the aspects of being complete enough for a person working alone having complete enough study material available and if the material did not simply "dump" phrases in the head of the student but rather laid a logical foundation for further study and license advancement.

The Heath Co. material comes in the form of their ER-3701 Novice Course which contains a textbook, two wall charts and two cassettes or their ERS-3701 course which is the same as the ER-3701 but also includes a code practice oscillator and key.

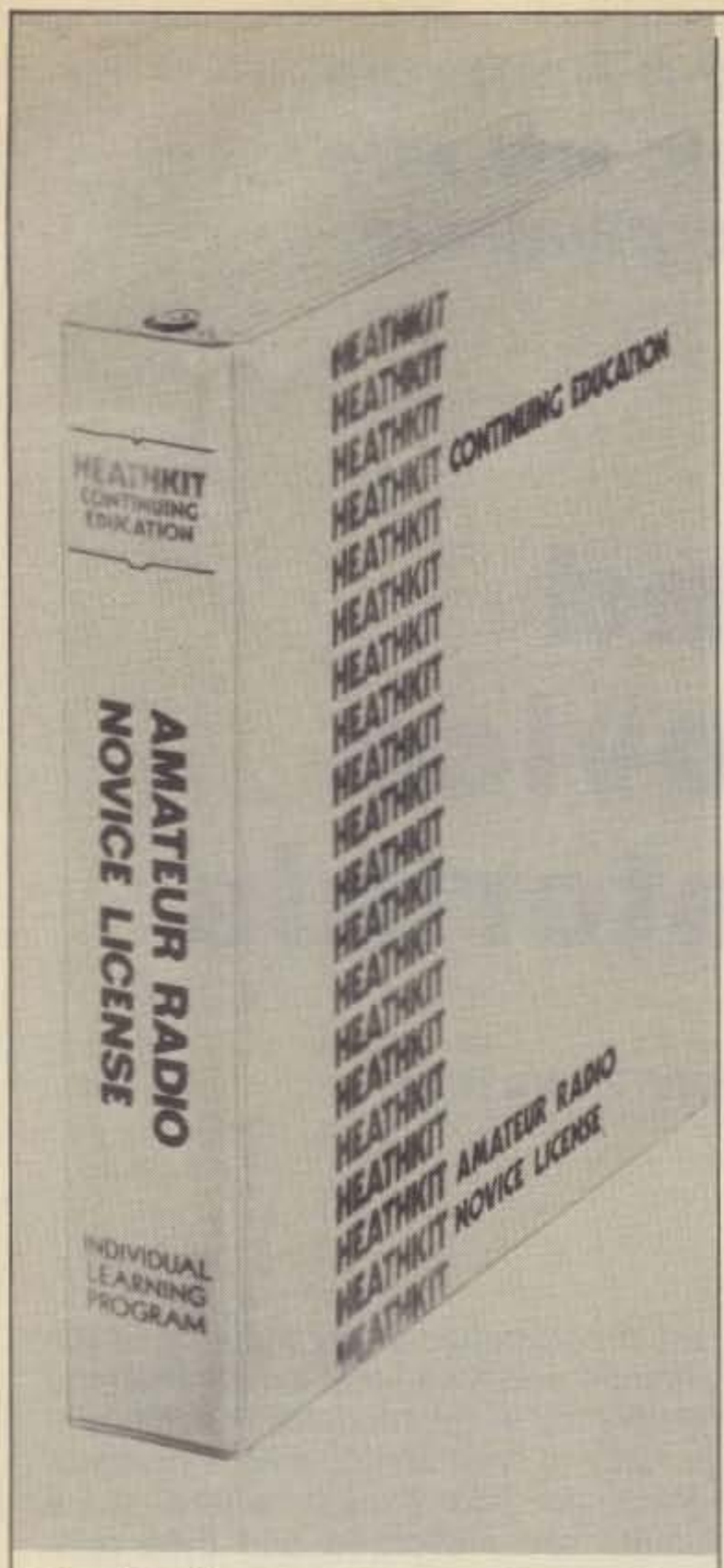
*c/o CQ Magazine

The appearance of the Heath material is rather ponderous. The textbook measures roughly 11 x 12 x 3 inches and gives the initial impression one is going to study for a law degree. However, once one organizes the material as Heath suggests, things take on a better perspective. The textbook is divided into an introductory section plus nine chapters or "modules", as Heath refers to them. The introductory material is read along with listening to the first side of one cassette which gives a general introduction to the various facets of amateur radio via simulated QSO's, etc. The chapters or "modules" of the textbook are divided as follows:

1. Rules and Regulations
2. Radio Phenomena
3. Operating procedures
4. Emission Characteristics
5. Electrical Principles
6. Circuit Components
7. Practical Circuits
8. Antennas and Transmission Lines
9. Radio Communication Practices

The modules range in size from about 28 to 64 pages each. However, there is a generous amount of white area on each page and the type is of large size. So, the number of pages in itself should not be regarded as so impressive. Each module is well constructed and follows the same format of explaining the objectives of the module, an initial pre-test to check if one really needs to read the module, the programmed study material of the module and a self-test on the material presented in the module. The material is easy to read and follows a true programmed text format where study points are presented and then reinforced by restatements and questions on individual study points. One should easily enough be able to develop a study routine where the smaller modules can be done in one to two evenings and the larger modules in two to three evenings each. The second side of the first cassette included with the course provides a further "school room" type of reinforcement of the main teaching points included in some of the modules. There is a generous amount of diagrams in the modules but no photographs. Two wall charts are used. One depicts the general radio frequency spectrum for v.l.f. through u.h.f., broken down into the v.l.f., l.f., m.s., h.f., etc. ranges. The other chart is a call district chart of the U.S.

The second cassette included in the Heath course presents Morse Code instruction. The first side of the cassette runs through learning the alphabet, numbers and commonly used signals. Letters are learned by grouping them according to their dot and dash build-up sequence, e.g.—E, I, S, H. The other side of the cassette presents three typical QSO's, conducted at about 6 w.p.m. The code material thus presented makes a good start but it should be supplemented by further off-the-air copy. The three QSO's

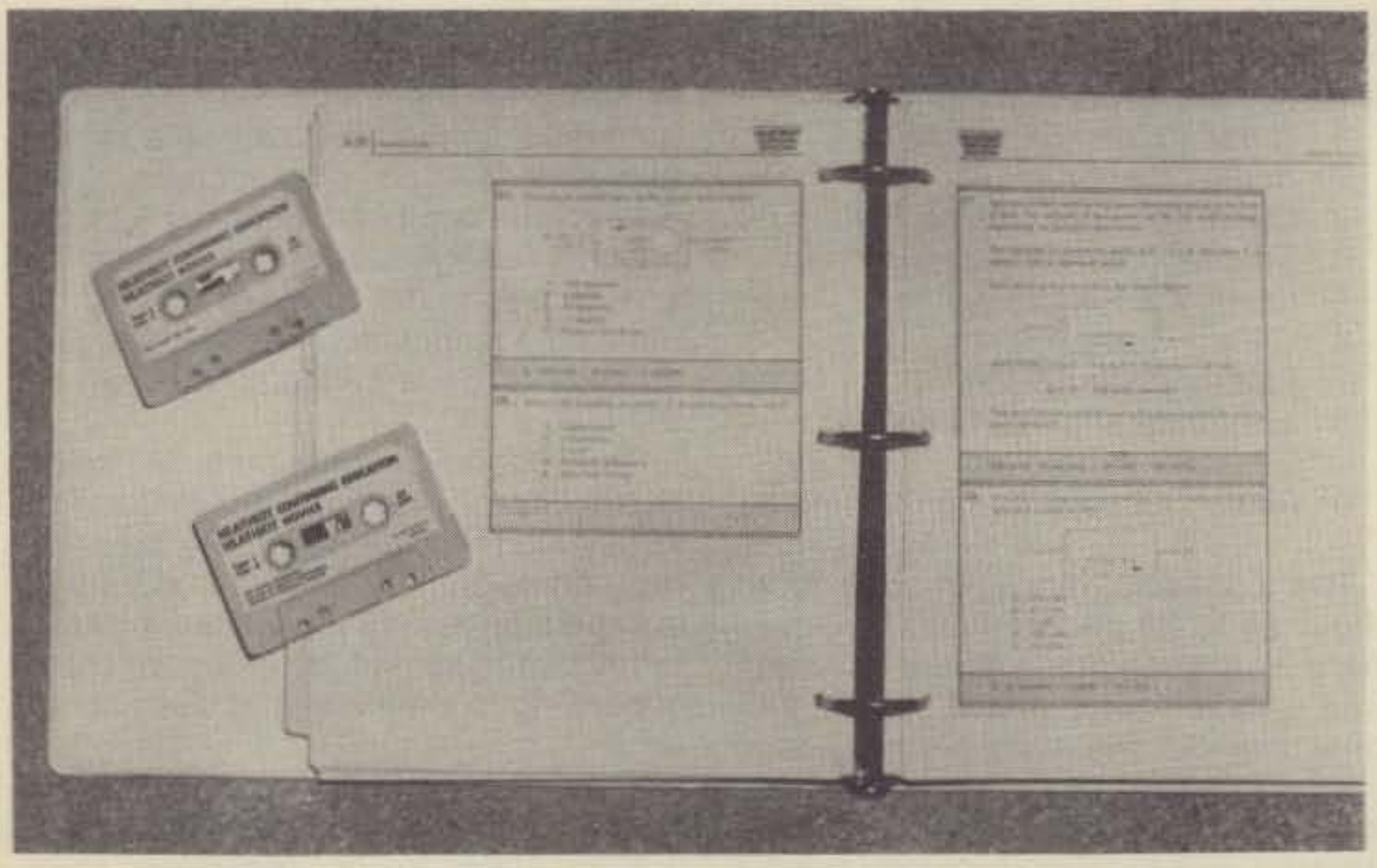


The Heath course comes in a rather impressive large loose-leaf type book.

presented can be too easily memorized and might lead one, after repeated listening to them, into a false sense of really knowing the code.

The code practice oscillator kit and key available for only five dollars extra in the ERS-3701 course represents a good buy. The oscillator has a three transistor circuitry, is powered by a 9 volt battery and has both an internal tone control and external volume control. The key supplied is a simple type but adequate for Novice Class speeds. The assembly of the oscillator kit is quite easy and the assembly manual includes a number of hints on how to properly hold a key while sending, learning the Morse Code, etc. The only possible exception to recommending the oscillator kit might be in the case of a person who has never soldered anything together before. The kit is easy to assemble; nonetheless, it would be a pity to have a prospective Novice discouraged from study of the Novice Class study material itself due to a possible stumbling block in getting a simple oscillator working.

The Heath textbook includes two practice Novice theory examinations. Also, there is a "sealed" theory examination included that one can mail in to Heath for grading. There should be absolutely no doubt that anyone who can pass all the practice theory examinations included will have absolutely no difficulty on the real F.C.C. examination. Heath, in fact, makes a guarantee on this. If one fails the F.C.C. theory examination within two years after purchasing the course and returns the course material, Heath will refund the course purchase price.



The pages in the Heath course have a lot of "white" area to make for easy reading. Also shown are the two cassettes (one of which is for code practice) that come with the course.

The Radio Shack amateur radio course is contained in the book "From 5 Watts to 1,000." The spiral bound book contains about 150 pages and is actually intended to take one from the Novice Class through General Class licenses. The book is a very handy 11 x 9 x ½ inch size and since pages can be completely folded over, it can be easily carried about and studied at one's leisure. The first 60 pages are devoted to the Novice Class license. First, there is a detailed explanation of how to learn the Morse code and how to hold and adjust a key for sending. Then the text progresses into basic Ohm's law, builds up into basic block diagrams of receivers and transmitters and ends up with a discussion of rules and regulations. The book is not divided into formal chapters. Rather, the text material flows very smoothly from one general subject area to the next. In fact, it is amazing how easily the transitions are from Ohm's law to a discussion of reactive components or from the block diagram of a transmitter to the effects of the ionosphere.

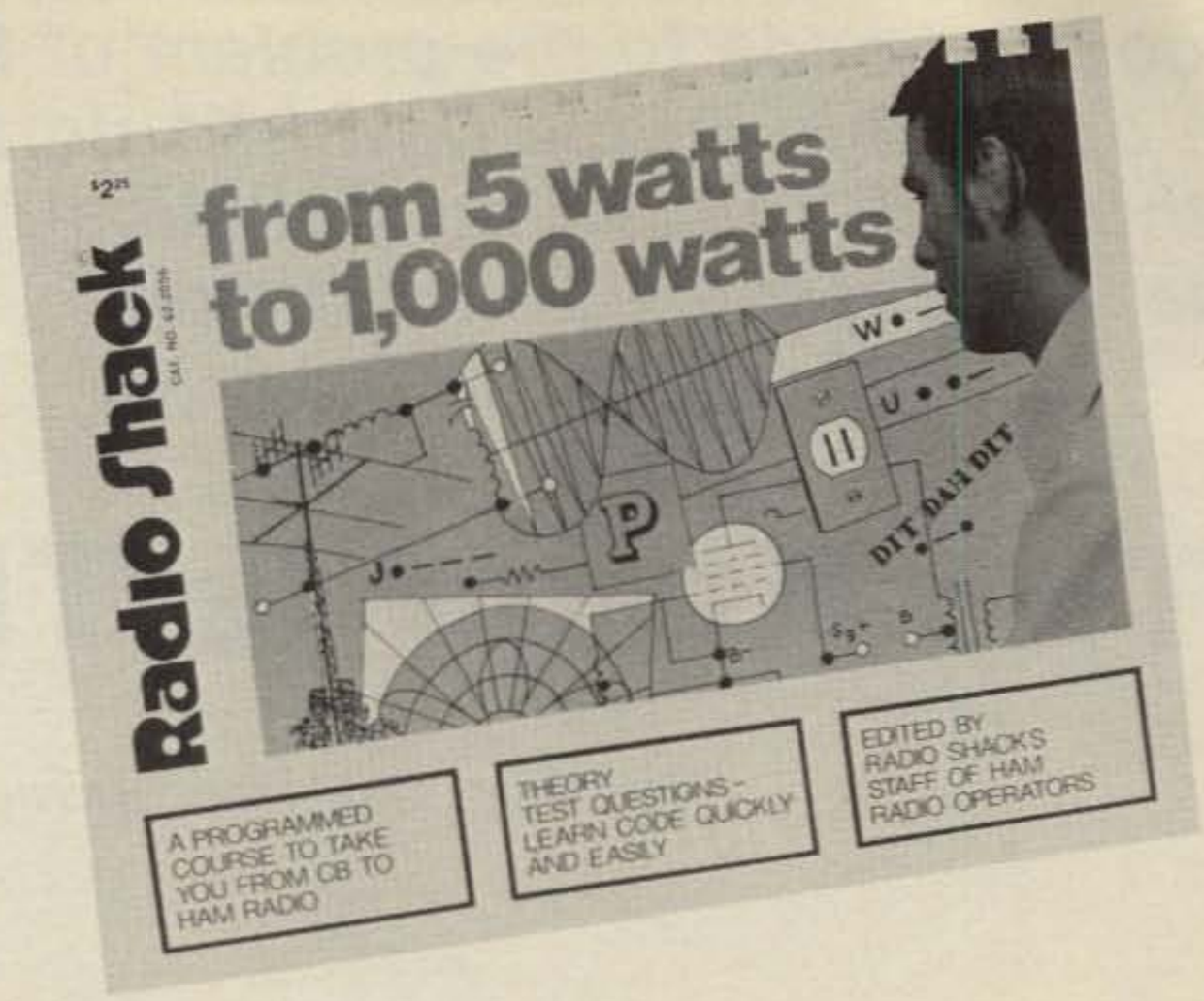
The text is arranged in a sort of semi-programmed learning format. Instead of continued restatements of learning points and questions regarding them, there are self-examination questions after the presentation of each few major learning points. One might, for instance, find half a page of text discussion and then half a page of short, simple questions pertaining to the text. There is a lot of white area on the pages and the type, although not extra large, is easy on the eyes. There are numerous diagrams and even a good variety of photographs. Seeing photographs of Messrs. Hertz and Ohm, for instance, certainly makes one remember those terms, as they pertain to electrical circuits, much more easily as compared to their "cold" presentation in most texts (including professional ones).

There is a 35 question practice Novice examination at the end of the Novice part of the book. Although one cannot send in answers for grading, the answers are given at the extreme end of the booklet. Anyone who has been honest in answering (and reviewing!) the text questions as they appear, should have absolutely no difficulty in doing the Radio Shack practice final examination nor the real F.C.C. examination.

As to code learning, Radio Shack offers a 12 lesson code cassette (#20-026) which goes up to 15 words per minute. However, almost all of the lessons (10 of them) are at 7 words per minute so the cassette is very well suited for the prospective Novice. The

lessons started out by the usual grouping of letters such as E, I, S, H, then goes on to numbers and the commonly used signals, such as "Q" signals. The complete practice lessons are sent in code groups so one cannot memorize them. If one can do the 7 word per minute practice lesson easily, the only difficulty in taking the plain text Novice examination at 5 words per minute will be to avoid falling asleep! A small booklet comes with the cassette. It contains a short discussion of each lesson and also gives a write-out of the code group practice lessons.

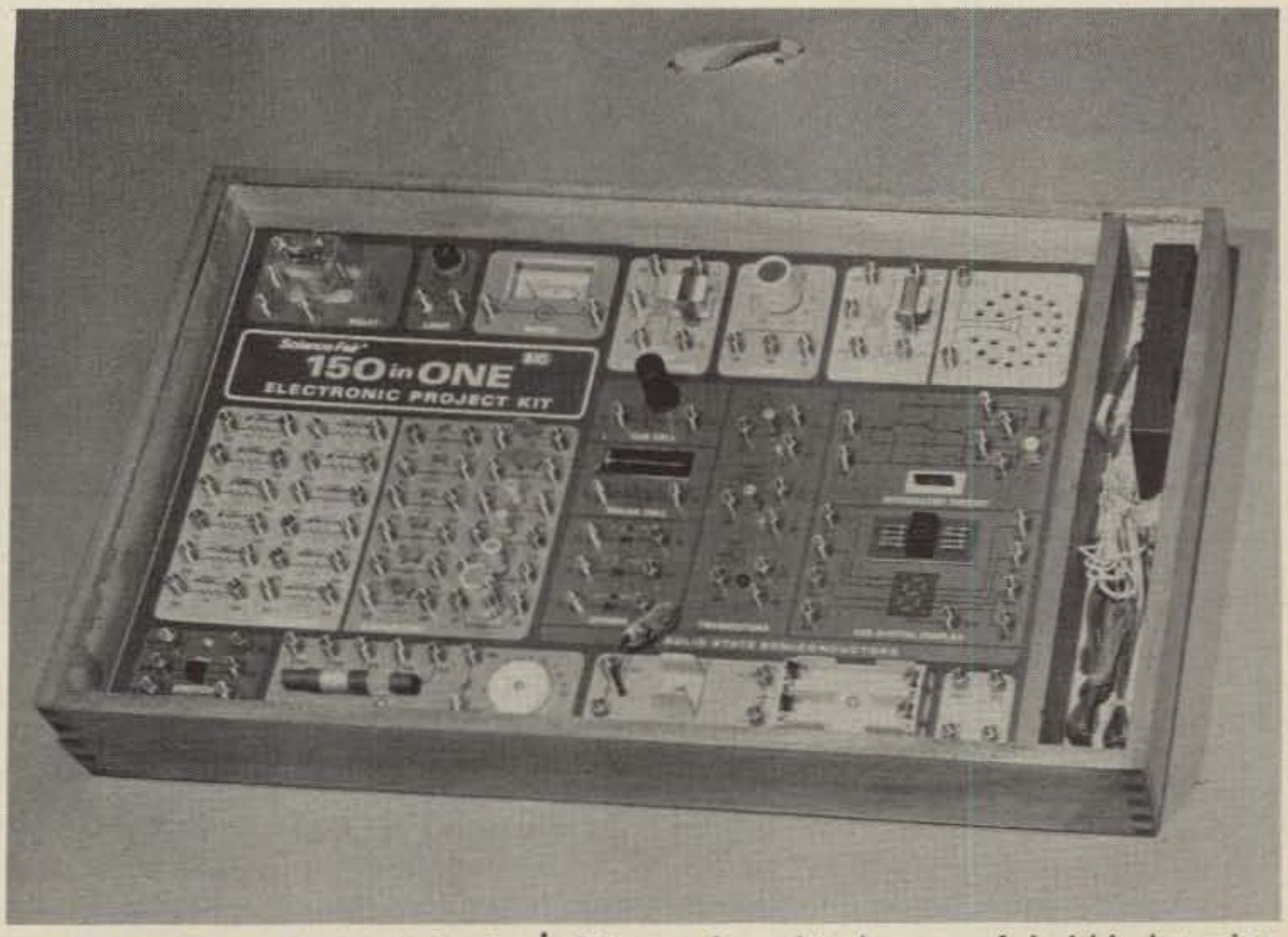
Radio Shack offers a code practice oscillator (#20-005) which comes assembled. It has a built-in key and can be used as a self-contained unit. However, the purchase of a conventional key is recommended—preferably a brass type where one can adjust the pivot points for pressure as well as having the usual weight and contact spacing adjustments. Such keys are available for $5 or so (e.g. Radio Shack #20-1084) and are much better than the "toy" type keys.



Radio Shack's "from 5 watts to 1,000 watts" Novice training book.

Although the foregoing material, from either Heath or Radio Shack will get one well started on the road to a Novice license, a further step was tried with Elisabetha. She, incidentally, was used as the subject for experimentation in reviewing the Novice study materials. She was interested in amateur radio but had no idea what a resistor looked like, much less how it functioned. The "extra" step was to purchase an experimenter's laboratory kit (the Radio Shack #20-248, 150-in-1 Project Kit). One tends to associate such kits with youngsters who have no "serious" interest in electronics but who just want to make electronic sounds, etc. But, such kits can be useful for the prospective Novice who has had no previous exposure to electronics. For one thing, one immediately learns to associate circuit symbols with the actual components mounted next to the symbol on the breadboarding layout. Although the kit contains a lot of circuit experiments that do not relate to study for a Novice license (e.g. metal detector and siren circuits), there are still a number of very useful circuit setups where one can construct various amplifiers, oscillators, mixers, etc., and also study such circuit fundamentals as Ohm's law. For someone who is starting from the point of not even knowing what a resistor does, such a simple kit can add a lot of meaning to the "dry" learning process of basic circuit fundamentals. The kit came with a very detailed instruction book. In fact, it was amazingly detailed in explaining the various experimental circuits in practically engineering lingo! Elisabetha was encouraged not to try to understand the circuit theory so much as just to gain an appreciation of how basic components can be interconnected to perform different functions and to associate the component symbols with the actual components. In this regard, the kit was very valuable indeed.

Both the Heath and Radio Shack study materials are good. Both lay a good foundation in electronic fundamentals that one can build on to study for an advanced class of license. Elisabetha was successful using a mixture of both the Heath and Radio Shack materials but there is no reason to believe one could not easily be successful using either just the Heath or Radio Shack offerings. HI



The Radio Shack 150-in-1 Projects Kit was found to be a useful aid in learning component symbols and to illustrate basic electronic circuits.

Learning the Morse Code is hard enough. Developing a good fist adds to the problem of becoming a good c.w. op. In this article David Kaufman suggests a method (with supporting statistics) for sending perfect code — from the very beginning.

The Keyer Is The Key

BY DAVID KAUFMAN*, WA3WBI

One of the most exhiliarating and joyous sounds in amateur radio is crisp, clean, well-ordered c.w. It is a pleasure to hear and is simple to copy. Sending it is an enviable skill, and it is maddening that we hear it so seldom. As its antithesis, one of the saddest sounds is "accent" code. It is difficult code to comprehend, is irregular in speed, in bit spacing, in punctuation. It is code that only a good friend will put up with, and it takes familiarity with it to comprehend its eccentricities. It is to be avoided by the precise amateur at all costs.

For as long as I have been an amateur it has been a belief of mine that the use of an electronic keyer from the *start* of one's career in radio is necessary to avoid "accent" code. Using a keyer helps avoid delays in learning good c.w. and in cultivating good sending practices—it may, indeed, keep the amateur from *hating* c.w. Poor code and poor sending practices, incidentally, once learned, are difficult to correct. Using a hand key exclusively, or as is suggested by some teachers, a hand key and then later an electronic keyer, seems to me to allow for an inordinate delay in progressing toward whatever goals you may wish to achieve with the code. It is like travelling great distances by horse and buggy when automobiles and airplanes are available. Hand keys are praised extravagantly and obstinately by amateurs who will see no irony in tying one into the latest transceiver, linear, and beam antenna.

In an effort to define any difference in the quality and speed of code sent by amateurs using hand keys and by those using electronic keyers, I conducted a six month investigation of the code produced by Novice ticket holders, and I wish to summarize my findings.

To begin, I chose Novice ticket holders for subjects of the study for two significant and related reasons: 1) Due to successes at recruitment, there are large numbers of *new* Novices (including many converts from CB) available for study, and 2) because Novices *are* new to ham radio, their code speed and its quality must be a truer function of procedures or equipment—they will not, in fact, have succeeded in spite of bad habits or the wrong equipment, just because they kept at it, as so many of us have done.

I did not participate in any QSO's, but *listened only* to the Novice portions of 40 and 80 meters, judging the fists of both participants in a contact. The invesitgation continued until I had some 300 amateurs who partook of a QSO that lasted at least ten minutes. This phase of the study, as I have noted, took approximately six months—October, 1977 to March, 1978.

Through April and May I sent each Novice (I assumed they were Novices, at this point) a questionnaire, and received an extraordinarily high response (were you ever more excited about and anxious to participate in amateur radio than as a Novice?). I then tabulated and correlated both sets of data.

Concerning the evaluation of the fists, I used the following areas of interest, rating each point from worst to best—0 to 5.

1. Correct bit spacing.
2. Continuous speed; no speedups or slowdowns.
3. Correct punctuation.
4. Format/Conventions—here the proper form for a QSO, with accepted abbreviations, etc.
5. Speed itself.
6. Overall average by call.

The questionnaire, which I tried to keep as simple as possible, and which was responded to by approximately 70% of the sample, after a short explanation, included the following questions:

1. Are you a Novice ticket holder YES_____ NO_____
   (If no, please do not fill out this questionnaire; just return it in envelope provided. Thank you.)
2. How fast (in w.p.m.) can you comfortably send and receive code? _____w.p.m.
3. Do you use a (check one)
   Hand Key_____
   Electronic Keyer_____
4. If an electronic keyer (check one)
   Iambic _____
   Single Paddle_____
5. If an electronic keyer, did you begin with (check one)
   Electronic Keyer_____
   Hand Key_____
6. If you began with a hand key and switched to an electronic keyer, was your experience with the hand key (check one)
   Beneficial_____
   Not Beneficial_____
7. When you get a higher ticket, do you intend to spend more time on fone or c.w. (check one)

The results can best be defined by looking at the charts.

*80 Shady Drive, Indiana PA 15701

Chart 1: There is no question but that the electronic keyer helps the sender to avoid the maddening habit of sending CQ's and his call at one speed and the text at a far slower speed. There was no discernable difference between types of electronic keyers.

Chart 2: Again, the electronic keyer is clearly superior to the hand key in bit spacing. There is a *slight* superiority in iambic over single paddle keyers. I would *suppose* this to be due to the fact that some single paddle keyers do not have both self-completing characters—iambic keyers tend to have this feature.

Chart 3: There are no significant differences for any key here. Discounting aberations in speed (*i.e.*, **Chart 1**), it would seem that the essential factor in speed is *skill* rather than equipment. One might wish to wager, however, that the faster the *average* amateur goes, the more likely it is that he is going to be using an electronic keyer.

Chart 4: There is just the slight superiority of the electronic keyer to be noted. The reasons for this difference are not apparent—a likely one would be that since there is ease of learning in the use of an electronic keyer, more time can be spent where it belongs—on the *code* and *format*.

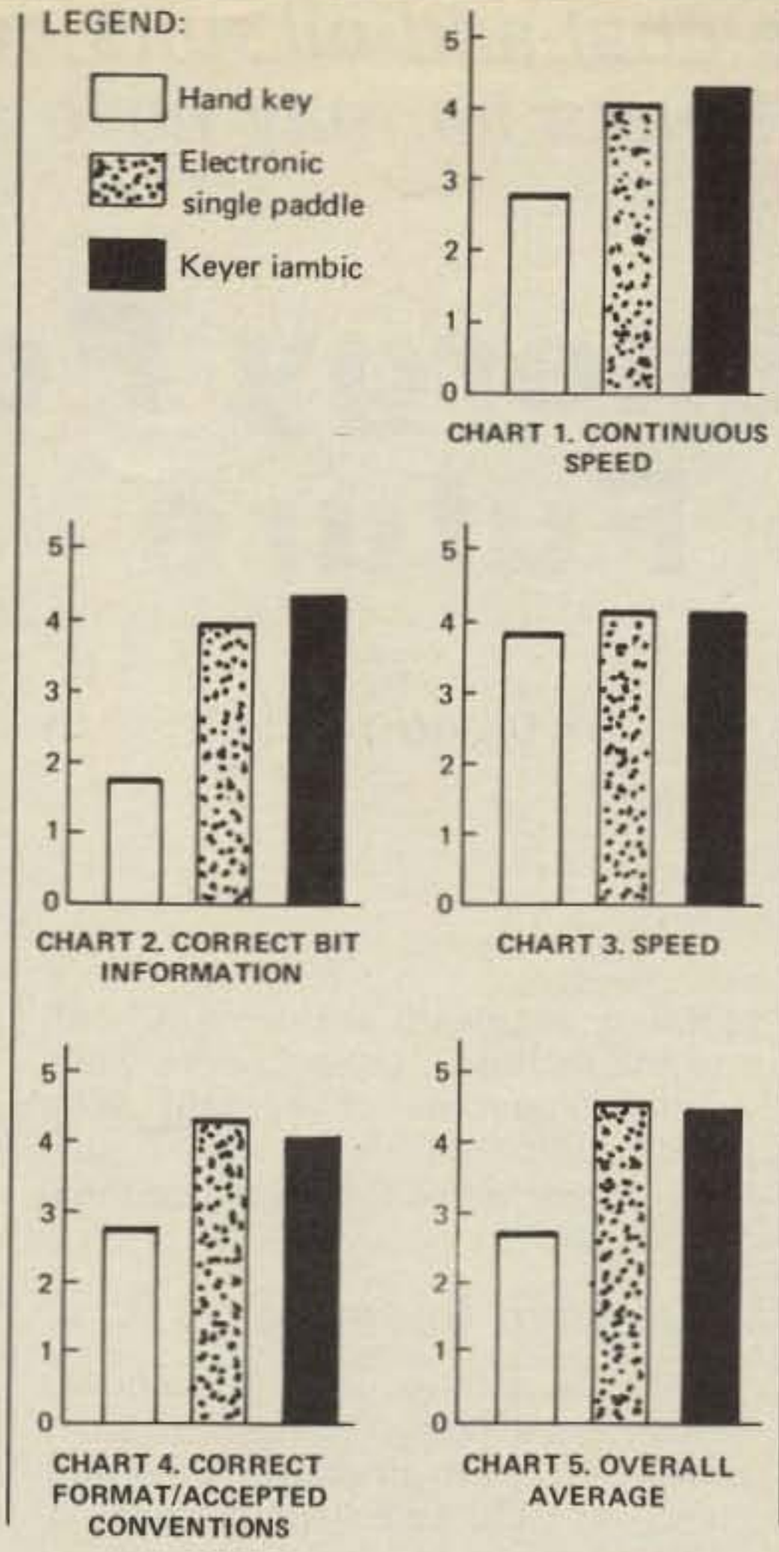


CHART 1. CONTINUOUS SPEED

CHART 2. CORRECT BIT INFORMATION

CHART 3. SPEED

CHART 4. CORRECT FORMAT/ACCEPTED CONVENTIONS

CHART 5. OVERALL AVERAGE

Chart 5: The implication of the average is apparent.

I have not included a chart to deal with *question seven* on the questionnaire, but it is interesting to note that while most hams intend to spend more time on fone than c.w. of those who did specify c.w., by far the largest portion were electronic key users. Too, of those who switched from a hand key to an electronic keyer, more than half did not feel that the hand key experience was of benefit to them.

While it is obvious that the study (213 Novices—88 hand key, 51 single paddle keyer, 74 iambic key users) placed a good deal of weight upon my subjective ranking of the factors noted, it is also obvious that at the other end of *any* contact is a ham who, knowingly or not, makes these same subjective judgements. It is humans we amateurs deal with, not statistics.

To conclude, it would seem that there is a discernable superiority in the code sent by electronic keyer users. Whether the added expense involved in securing one is worth it is a matter for each Novice to decide. It *is* probable that the use of one will create a better amateur—one who will carry a love for c.w. throughout his career in amateur radio. 73

What to do when the coal and oil runs out? Eighth-grader David thinks he may have an answer.

Solar Energy For Our Future

BY DAVID TOMERE*

It is obvious that one day all of Earth's fossil fuels will be exhausted. If we do not start now to convert to some other source of energy, when that time comes it will probably be too late.

A few possibilities are: nuclear energy, coal energy, and solar energy. Nuclear energy is not a good solution. It is expensive and nuclear use hazards and waste are definite problems. On the other hand, coal is a major pollutant in its procurement and burning. Besides that, it is impractical. So, it turns out, solar energy is the best answer for the future and present energy crisis. It is free, clean, and has a virtually inexhaustible source (for three billion or so years anyway). However, it is difficult to use on Earth and therefore creates an inconvenience. Though solar energy is always available in space, on Earth it is limited to the daytime, and we are always at the mercy of the weather (clouds, etc.), besides other of Earth's peculiarities. That leaves less than twelve hours of sunlight. To tackle the problem, engineers at Boeing Aircraft and the Arthur D. Little Co. are working on blueprints of a giant solar power station (fig. 1) in orbit around Earth where sunlight is available most of the time.

*2109 Broadway, New York NY 10023

Microwave Beaming

With the solar collectors the power station would collect energy and beam it down to Earth in microwaves (efficiency of 54% and system losses of 32% have been demonstrated) to receiving antennas (fig. 2) for conversion to conventional electricity followed by distribution. The beam is formed by an antenna using microwave generators and phase shifters. An estimated 25 square miles of antennas will capture the beam. Since microwaves are fairly dangerous, special signalers would keep the beam on target. The good thing about microwaves is that they can beam through any weather, and you can be sure that the antennas won't freeze during the winter!

The Station

The power station would be about one hundred miles across, with two solar panels on each side of a long cylinder (possible accomodations). On one end of the cylinder would be the microwave transmitter. The collectors would be motorized for better efficiency. Because of it's large size it would, of course, have to be built in space and take approximately ten years to build.

Microwave Relay

While I was writing this, a thought came: How would the beam keep on target if the solar station somehow drifted? The answer came to me: "microwave relaying." A microwave relaying station (in orbit) would beam microwaves from the power station directly to Earth (fig. 3).

Of course, there are still many stumbling blocks (like an estimated 500 billion dollar building cost!), but I believe that with determination this well-talked of scheme could be in orbit by 1990.

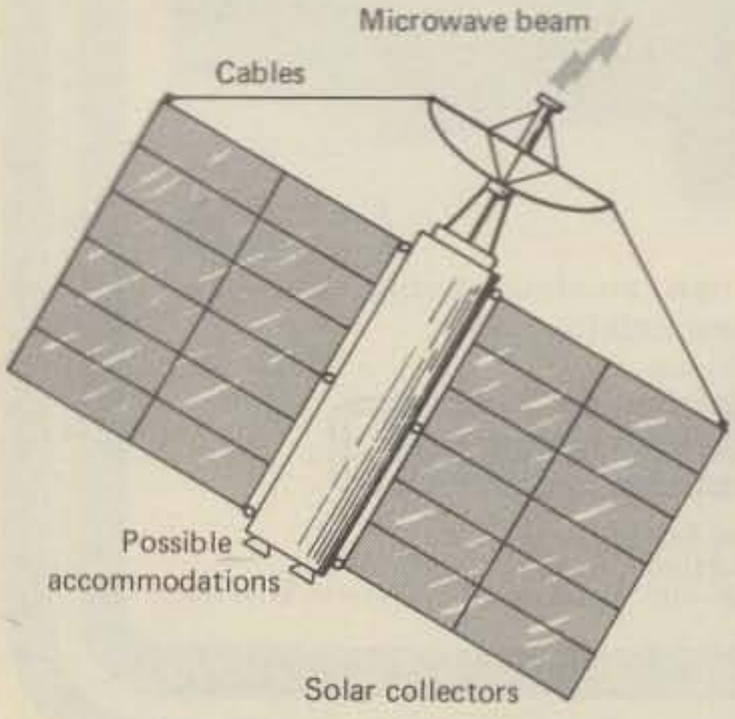


Fig. 1 - The power station in orbit.

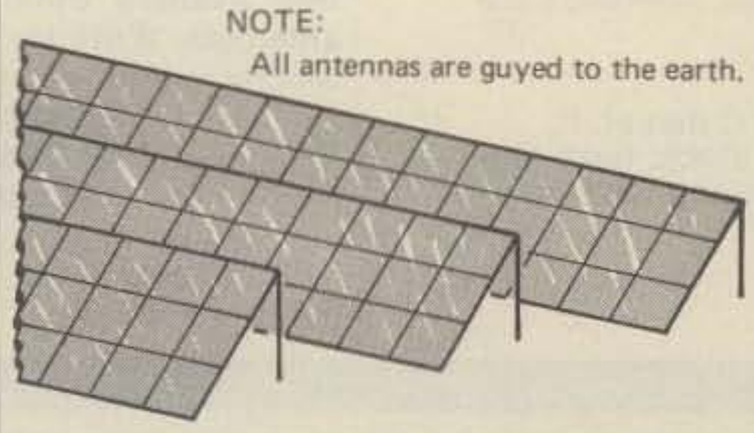


Fig. 2 - The receiving antennas.

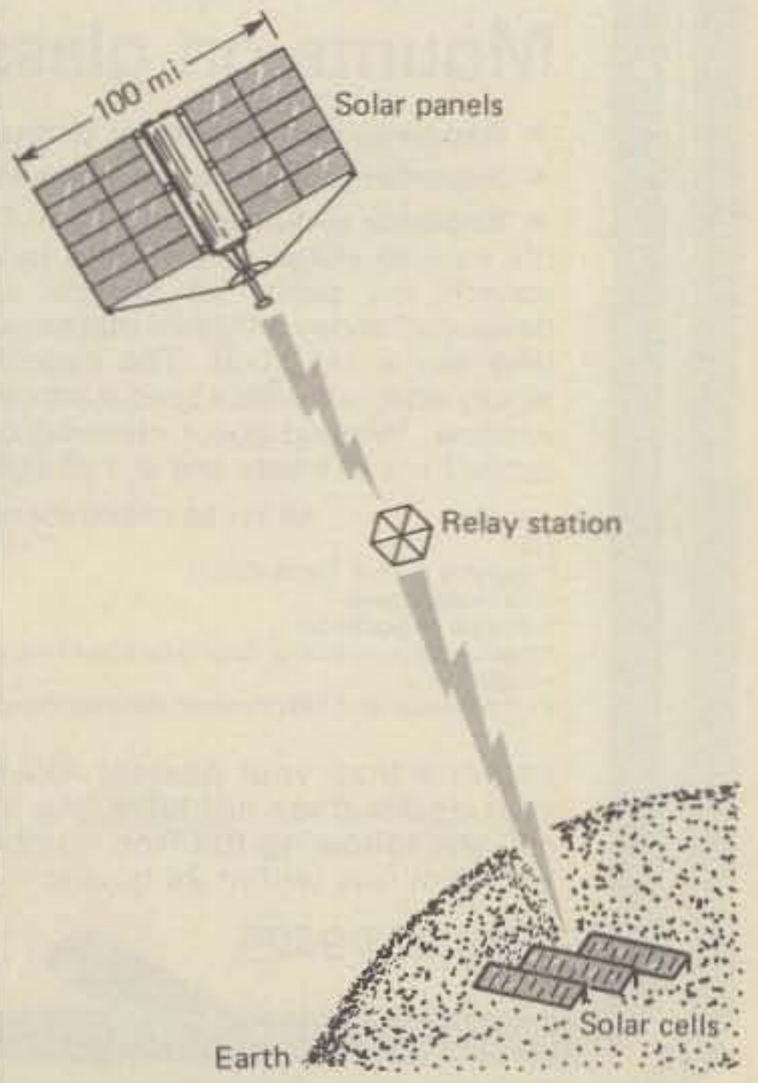


Fig. 3 - The complete solar power system.

DIODES/ZENERS

QTY.			
1N914	100v	10mA	.05
1N4005	600v	1A	.08
1N4007	1000v	1A	.15
1N4148	75v	10mA	.05
1N4733	5.1v	1 W Zenner	.25
1N4749	24v	1W	.25
1N753A	6.2v	500 mW Zener	.25
1N758A	10v	"	.25
1N759A	12v	"	.25
1N5243	13v	"	.25
1N5244B	14v	"	.25
1N5245B	15v	"	.25
1N5349	12v	3W	.25

SOCKETS/BRIDGES

QTY.					
8-pin	pcb	.16	ww	.35
14-pin	pcb	.20	ww	.40
16-pin	pcb	.25	ww	.45
18-pin	pcb	.30	ww	.95
20-pin	pcb	.35	ww	1.05
22-pin	pcb	.40	ww	1.15
24-pin	pcb	.45	ww	1.25
28-pin	pcb	.50	ww	1.35
40-pin	pcb	.55	ww	1.45
Molex pins .01		To-3 Sockets		.35
2 Amp Bridge		100-prv		.95
25 Amp Bridge		200-prv		1.50

TRANSISTORS, LEDS, etc.

QTY.		
2N2222M	(2N2222 Plastic .10)	.15
2N2222A		.19
2N2907A	PNP	.19
2N3906	PNP (Plastic)	.19
2N3904	NPN (Plastic)	.19
2N3054	NPN	.55
2N3055	NPN 15A 60v	.60
T1P125	PNP Darlington	1.95
LED Green,	Red, Clear, Yellow	.19
D.L.747	7 seg 5/8" High com-anode	1.95
MAN72	7 seg com-anode (Red)	1.25
MAN3610	7 seg com-anode (Orange)	1.25
MAN82A	7 seg com-anode (Yellow)	1.25
MAN74	7 seg com-cathode (Red)	1.50
FND359	7 seg com-cathode (Red)	1.25

9000 SERIES

QTY.		QTY.	
9301	.85	9322	.65
9309	.50	9601	.30
		9602	.45

MICRO's, RAMS, CPU's, E-PROMS

QTY.	
8T13	2.50
8T23	2.50
8T24	3.00
8T97	1.75
74S188	3.00
1488	1.25
1489	1.25
1702A	4.50
AM 9050	4.00
ICM 7207	6.95
ICM 7208	13.95
MPS 6520	10.00
MM 5314	4.00
MM 5316	4.50
MM 5387	3.50
MM 5369	2.95
TR 1602B	3.95
UPD 414	4.95
Z 80 A	22.50
Z 80	17.50
Z 80 P10	10.50
2102	1.45
2102L	1.75
2107B-4	4.95
2114	9.50
2513	6.25
2708	11.50
2716 D.S.	34.00
2716 (5v)	69.00
2758 (5v)	26.95
3242	10.50
4116	11.50
6800	13.95
6850	7.95
8080	7.50
8085	22.50
8212	2.75
8214	4.95
8216	3.50
8224	4.25
8228	6.00
8251	7.50
8253	18.50
8255	8.50
TMS 4044	9.95

— T T L —

4-1-79

QTY.		QTY.		QTY.		QTY.	
7400	.20	7492	.45	74H20	.25	74LS76	.70
7401	.20	7493	.35	74H21	.25	74LS86	.95
7402	.20	7494	.75	74H22	.40	74LS90	.85
7403	.20	7495	.60	74H30	.30	74LS93	.85
7404	.20	7496	.80	74H40	.35	74LS96	2.00
7405	.35	74100	1.15	74H50	.30	74LS107	.90
7406	.25	74107	.35	74H51	.30	74LS109	1.50
7407	.55	74121	.35	74H52	.20	74LS123	1.95
7408	.20	74122	.55	74H53	.25	74LS138	2.00
7409	.25	74123	.55	74H55	.25	74LS151	.95
7410	.20	74125	.45	74H72	.35	74LS153	1.15
7411	.25	74126	.45	74H74	.35	74LS157	1.15
7412	.25	74132	.75	74H101	.95	74LS160	1.15
7413	.45	74141	.90	74H103	.55	74LS164	2.90
7414	.75	74150	.85	74H106	1.15	74LS193	2.00
7416	.25	74151	.95	74L00	.30	74LS195	1.15
7417	.40	74153	.95	74L02	.30	74LS244	2.90
7420	.25	74154	1.15	74L03	.35	74LS259	1.50
7426	.25	74156	.70	74L04	.40	74LS298	1.50
7427	.25	74157	.65	74L10	.30	74LS367	1.95
7430	.20	74161/9316	.75	74L20	.45	74LS368	1.25
7432	.30	74163	.85	74L30	.55	74LS373	2.50
7437	.20	74164	.75	74L47	1.95	74S00	.45
7438	.30	74165	1.10	74L51	.65	74S02	.45
7440	.20	74166	1.75	74L55	.85	74S03	.35
7441	1.15	74175	.90	74L72	.65	74S04	.35
7442	.55	74176	.95	74L73	.70	74S05	.45
7443	.45	74177	1.10	74L74	.75	74S08	.45
7444	.45	74180	.95	74L75	1.05	74S10	.45
7445	.75	74181	2.25	74L85	2.00	74S11	.45
7446	.70	74182	.75	74L93	.75	74S20	.35
7447	.70	74190	1.25	74L123	1.95	74S22	.55
7448	.50	74191	1.25	74LS00	.40	74S40	.30
7450	.25	74192	.75	74LS01	.40	74S50	.30
7451	.25	74193	.85	74LS02	.45	74S51	.35
7453	.20	74194	.95	74LS03	.45	74S64	.15
7454	.25	74195	.95	74LS04	.45	74S74	.70
7460	.40	74196	.95	74LS05	.45	74S112	.60
7470	.45	74197	.95	74LS08	.45	74S114	.85
7472	.40	74198	1.45	74LS09	.45	74S133	.85
7473	.25	74221	1.50	74LS10	.45	74S140	.75
7474	.30	74298	1.50	74LS11	.45	74S151	.95
7475	.35	74367	1.35	74LS20	.45	74S153	.95
7476	.40	75491	.65	74LS21	.45	74S157	.98
7480	.75	75492	.65	74LS22	.45	74S158	.80
7481	.85	74H00	.20	74LS32	.50	74S194	1.50
7482	.95	74H01	.30	74LS37	.45	74S196	2.00
7483	.95	74H04	.30	74LS38	.65	74S257 (8123)	2.50
7485	.75	74H05	.25	74LS40	.70	8131	2.75
7486	.55	74H08	.35	74LS42	.95		
7489	1.05	74H10	.35	74LS51	.75		
7490	.55	74H11	.25	74LS74	.95		
7491	.70	74H15	.45	74LS75	1.20		

C MOS

QTY.		QTY.		QTY.		QTY.	
4000	.15	4017	.75	4034	2.45	4069/74C04	.45
4001	.20	4018	.75	4035	.75	4071	.25
4002	.25	4019	.35	4037	1.80	4081	.30
4004	3.95	4020	.85	4040	.75	4082	.30
4006	.95	4021	.75	4041	.69	4507	.95
4007	.25	4022	.75	4042	.65	4511	.95
4008	.75	4023	.25	4043	.50	4512	1.50
4009	.35	4024	.75	4044	.65	4515	2.95
4010	.35	4025	.25	4046	1.25	4519	.85
4011	.30	4026	1.95	4047	2.50	4522	1.10
4012	.25	4027	.35	4048	1.25	4526	.95
4013	.40	4028	.75	4049	.65	4528	1.10
4014	.75	4029	1.15	4050	.45	4529	.95
4015	.75	4030	.30	4052	.75	MC14409	14.50
4016	.35	4033	1.50	4053	.95	MC14419	4.85
				4066	.75	74C151	2.50

I²L, LINEARS, REGULATORS, ETC.

QTY.		QTY.		QTY.	
MCT2	.95	LM320K24	1.65	LM373	3.95
8038	3.95	LM320T5	1.65	LM377	3.95
LM201	.75	LM320T12	1.65	78L05	.75
LM301	.45	LM320T15	1.65	78L12	.75
LM308	.65	LM323K	5.95	78L15	.75
LM309H	.85	LM324	1.25	78M05	.75
LM309 (340K-5)	1.50	LM339	.75	LM380 (8-14 Pin)	1.19
LM310	.85	7805 (340T5)	1.15	LM709 (8-14 Pin)	.45
LM311 (8-14 Pin)	.75	LM340T12	.95	LM711	.45
LM318	1.50	LM340T15	.95	LM723	.40
LM320H6	.79	LM340T18	.95	LM725	2.50
LM320H15	.79	LM340T24	.95	LM739	1.50
LM320H24	.79	LM340K12	1.25	LM741 (8-14)	.45
7905 (LM320K5)	1.65	LM340K15	1.25	LM747	1.10
LM320K12	1.65	LM340K18	1.25	LM1307	1.75
LM320K15	1.65	LM340K24	1.25	LM1458	.65

LM3900	.95
LM75451	.65
NE555	.45
NE556	.85
NE565	1.15
NE566	1.25
NE567	.95
TA7205	6.95
76477	2.95
95H90	9.95

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a monthly feature by

ADRIAN WEISS, K8EEG

QRP

The art of very low power operating

QRP-420XC Transceiver Corrections

In a series of four articles in past issues of *CQ*, we desribed the circuit and construction of a solid state transceiver for 7-14 Mhz., and some further notes and corrections are in order at this time. The series of articles is as follows: "Solid State V.F.O. Transmitter for 7-14 MHz.: Part I, 1 Watt Exciter, *CQ*, Nov., 1977, p. 54; Part II, 7 MHz. Seiler v.f.o., Dec., 1977, p. 88; Part III, 15 Watt Final Amplifier, May, 1978, p. 34; Part IV, The QRP-420XC 4-20 Watt Transceiver for 7-14 MHz, Receiver Section, Oct., 1978, p. 44." The first two parts are correct as printed.

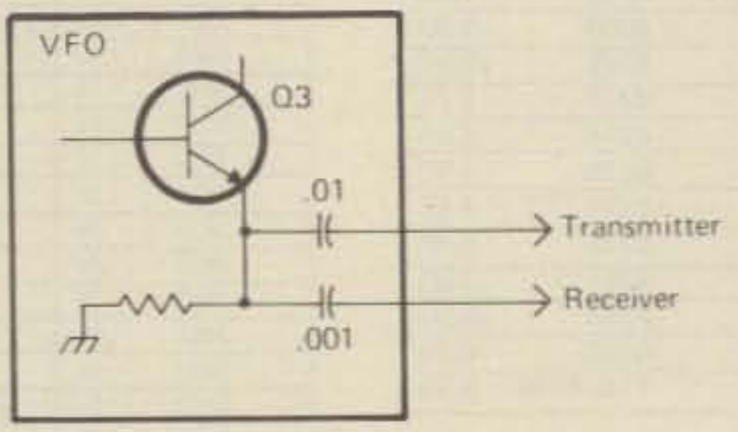
In regard to Part III, several corrections and changes apply.

1.) On p. 38, an incorrect formula appears in Figure 3, where the incorrect formula for calculating inductive reactance as the reciprocal of $2\pi fL$ (uh.). The correct formula is: $X_L = 2\pi fL$(uh.).

2.) Referring to fig. 1, an r.f. choke across the output antenna terminals has been omitted from the schematic. See fig. 1 below for correction. Without the r.f. choke, the reactive component presented by an antenna feedline can cause self-oscillation in the final amplifier, depending upon the nature of that reactance. In some cases, no problem will be encountered, but the choke should be included.

83 Suburban Estates, Vermillion, S.D. 57069

3.) Fig. 1 also shows the "Simplest T-R Switch" as part of the final amplifier circuit. Degradation of final amplifier operation occurs with the circuit shown when certain types of receiver front-ends are hooked into the circuit. It is recommended that the mechanical T-R switch approach suggested in Part IV, p. 45, be incorporated and the diode switch shown eliminated.



In regard to Part IV, several notes apply.

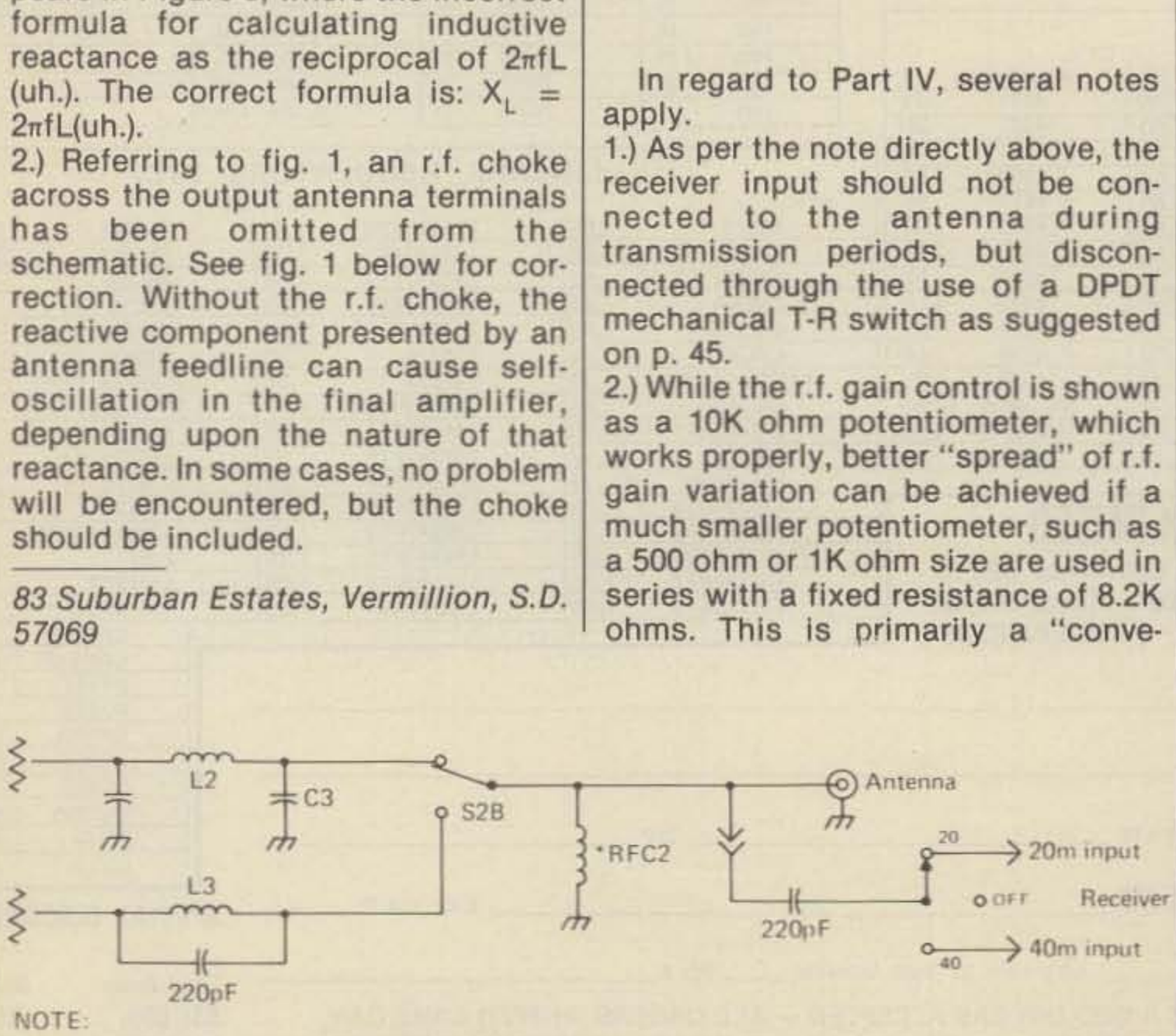
1.) As per the note directly above, the receiver input should not be connected to the antenna during transmission periods, but disconnected through the use of a DPDT mechanical T-R switch as suggested on p. 45.

2.) While the r.f. gain control is shown as a 10K ohm potentiometer, which works properly, better "spread" of r.f. gain variation can be achieved if a much smaller potentiometer, such as a 500 ohm or 1K ohm size are used in series with a fixed resistance of 8.2K ohms. This is primarily a "convenience" modification.

3.) In fig. 1, hook-up to the v.f.o. is shown only in block diagram form. Actually, the v.f.o. output to the receiver should not be taken from the same .01 output coupling capacitor as the transmitter, but through a separate .01 coupling capacitor as per fig. 2 below. Otherwise, T1 directly grounds the output from the v.f.o., resulting in no drive being applied to the base of Q1 in the exciter unit.

4.) fig. 5, p. 50, shows the correct details for winding T1. The entry for T1 shown in the "Coil Winding Data" table, p. 51, incorrectly lists "T1 12/24 FB-43-2401." This entry is incorrect and should be ignored.

5.) D6-7 are high speed switching diodes, 1N914 or similar.



NOTE:
*Add RFC2, 12t, No. 26, FB-73-801 core

Letters and News

de...VE6CMR, R.D. Bowers, 1411-3600 Brenner Dr. NW, Calgary, AL, CANADA: "Thanks very much for the QRPp articles, although I have missed most of them. As a new ham, I have just started buying *CQ* Magazine, so I've missed earlier articles. I have an HW-8, and it is a good little rig and I enjoy using it. My success rate at making contacts isn't bad, but it could be better. What I am interested in is modifications and accessories for this rig. Could you supply, if possible, necessary information on this matter?"

Ed. Note: Modifications for the HW-8 were featured in a two-part article entitled "Super-Modified HW-8 Contest Machine." Part I, **CQ**. *(August, 1977), covered modification of the 15 meter receiver coil to improve sensitivity on that band, addition of an MFJ audio filter to provide cascaded four section selectivity, and converting the original HW-8 relative power meter to a Breune type s.w.r./Power meter. Part II* **CQ** *(October, 1977), covered the addition of receiver incremental tuning, and the incorporation of a loudspeaker and dial light.*

de. . .Terry A. Ward, 5310 Joe Sayers #211, Austin, TX, 78756: "I am new to amateur radio, but I greatly enjoy your QRPp column in *CQ*. However, I have several questions. First, is *The Milliwatt* available?

ED: We still have a supply of back issues, although the magazine discontinued publication in June, 1975. At present, we have 24 issues available, at a cost of $.75 each.)

Second, are you aware of any publications devoted to QRPp operating hints, procedures etc?

(ED: **The Milliwatt** *is perhaps the only source of this type of information except for this QRPp column and periodic notes in the newsletter of the QRP-ARC-I).*

Finally, I am interested in getting started in QRPp operation, but I am hesitant in my situation. I live in an apartment that does not allow antenna structures etc. I have thought of perhaps using mobile whips mounted on the window sill in a temporary fashion, but am concerned that such antennas will render QRPp activity futile. Do you have any advice for the antenna problem, if, in fact, it is a problem? Incidentally, my equipment will include an Argonaut 509 xcvr.

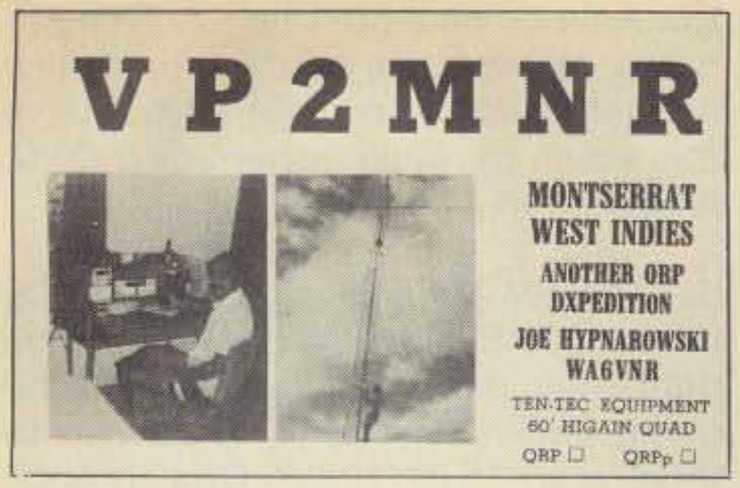
(ED: You are in a difficult situation, Terry. With regard to the use of a mobile whip, you may run into problems, although I have known situations where this approach was successful. On the lower bands—80 and 40 meters—a mobile whip is quite inefficient due to the small physical size, although on the higher bands, efficiency increases as the length of the antenna approaches a quarter-wavelength. The key to success in such a setup is the type and quality of groundplane that can be established under the whip. The greater the area of the groundplane, the better the chance of success. In practical terms, if the apartment does not use aluminum-foil type insulation in the walls, then erecting the whip inside the apartment will be satisfactory, since the brick walls will not result in more than a dB or two of loss in dry weather. If the whip can be mounted inside the apartment, the rug can be temporarily pulled back, and the floor covered with strips of aluminum foil to form a metal plane which serves as the ground plane. Some type of base for mounting the whip which allows easy removal can be fabricated—a cement block or couple of bricks could be used to stablize the whip in a vertical position, and then the whole thing removed during non-operation periods. Or, if you can get an apartment on the top floor with access to the attic, normal dipoles or Vees can be erected in the attic, with the feedline brought through a hole in the ceiling in the dark corner of a closet. I've used this approach with success myself. Sneaky, but effective.)

de. . .WA6VNR, J.F. Hypnarowski, 3785 Mt. Blackburn Ave., San Diego, CA 92111: "I am a QRPp operator, but a special kind. Perhaps you have noticed these calls in various DX columns: VP2MNR, PJ8JH, FG0CSC, ZF1JH, ZF2AH. Well, I have made these DX'peditions and done them all with QRPp, in fact, the various QSL cards which I've used always include the note "another QRPp DX'pedition." Anyway, it sure is a neat way to do DX'peditions! And it makes the entire ham population, or at least those who work contests and DX, a little more aware that we QRPpers can do it too! One memorable expedition to VP2MNR netted me about 100,000 points in the *CQ* WW CW Contest in 1976. Now, I am sure that if I'd have had a handicap for that contest, I would have taken a lot of top honors, but it is the fun of it that counts anyway. I take pride in the fact that although I don't make it to the top score in a contest, I do it with a lot less power. I usually ran the Argonaut, but lately I also use the TS820 at somewhat less than 100 watts. When I ran the Argonaut, we were at the QRPp level and the DX still kept calling and asking me to repeat the power level! I'm sure that in the future there will be more expeditions, and I hope to make them to more exotic places than before. I intend to run QRP also. I think the greatest advantage in doing DX'peditions this way is in the exposure that QRP gets. Hams hear the QRPp DX station, proving that it can be done with QRPp. So, in case any of your readers worked me at the above stations, note that I QSL 100% for the expeditions. Now you know of one of the more unique QRPp operators, and my motto is: "Watch out you Goliaths, the Davids are coming! Another interesting note that I wanted to pass along to see if anyone can equal it. I believe that I must have set some sort of record for the following contact. I QSO'd VE7DLY (B.C.) on February 23, 1975, under the following conditions: while using the Argonaut with an output of about 3 watts s.s.b. to a Hustler mobile whip on 40 meters, at a speed of 90 m.p.h., on HWY 18, Mt Laguna, at an altitude of 6500 ft. So there you have it—the lowest power, highest altitude, fastest speed, longest distance, QSO ever made with s.s.b! 73's, Joe."

ED: Anyone else out there desiring to make known unique "record" type oddball contacts with QRPp known to the world, perhaps better Joe's QSO, please drop us a line!)

de. . .OA8V, Paul Wyse, Casilla 2492, Lima 100, Peru: "I'm not too active right now, except in contests. I'll be going QRT in June, 1979, for two to three years to get the Jr. Ops. through college. I was pleased that *CQ* put a QRPp section in the Fall contest. As you can see from my letter to K3EST, I found QRPp kind of rough in the DX phone contest (see below). Do you know anyone who would enjoy operating OA8V during CW contest weekends? I would want it to be a QRPp entry, of course, trying for the QRPp trophy now offered by *CQ*. I was happy with my score in the *CQ* WPX Contest last spring. I ended up with 658 QSO's and 204 prefixes for a final score of 397,800. I am still getting a number of comments on the April, 1977 "Jungle QRPp" Story in *CQ* and lots of the fellows ask if I'm still on QRPp when we QSO in the contests. The following excerpt from a letter to K3EST gives the rundown on my results in the 1978 *CQ* WW Contest which included a QRPp sec-

Joe, WA6VNR, at the operating position of ZF1JH, with the Argonaut and bug set on the typical motel table. As Joe notes in his story, he has operated QRPp from a number of DX locations during DX'peditions. Most of us dream of doing this type of operation, with thousands of stations waiting to call us, with runs of 120 QSO's per hour for hours on end. Joe is to be commended for his efforts at making QRPp very visible in the world of DX contests. We wish him great success in the future!



tion for the first time. 'I had seen a note in the August *CQ* that there was a new QRPp category in the Contest, so I had WB4GSE read me some of the rules on the air so I could get in on the fun. Thank you for including the QRPp category. I'm anxious to see how many QRPp'ers enter. I did talk to a number who were running QRPp in the contest. I was really quite frustrated this time trying to operate QRPp. I guess the main reason was that I was overly optimistic in setting my contest goals and then I missed them by a long margin. I was shooting for 1000 contacts and only made 666! Last year I made 828 contacts on 10 meters alone! I believe the reason for not making as many this year was that the band conditions were too good. QRM level was very high, as the band seemed to be open into 3-4 continents all the time. This does not help the QRPp'r! In all other contests, I can usually come up with a pile-up on 10 meters where I can average 120 QSO's per hour for at least an hour or two, but this year, the longest run I had in the whole contest was for only ten minutes. I was counting on those runs to bring up my score. It looks like I will have to find a new strategy! In spirit of all my woes, I did end up with a score 65,000 points higher than in previous WWDX contest. I did manage to work 3 new countries, bringing my QRPp DXCC total worked to 188. I worked 17 new "band-countries" bringing my totals on 20, 15, and 10 meters all well over 100 each. Results of this contest follows:

Band	QSO's	Points	Zones	Countries
3.8MHz	8	22	3	2
7	4	9	3	2
14	112	316	17	34
21	148	417	16	35
28	394	1152	23	57
TOTALS	666	1916	62	130 = 367,872 POINTS

DX Contests—QRPp Sections

As you may have gathered from OA8V's letter above, *CQ* Magazine has once again pioneered the way for a new area of amateur radio. *CQ* was the first to officially recognize QRPp as the important, growing facet of the hobby that it was and is by initiating a column devoted entirely to under-five watt amateur radio. And now, *CQ* Magazine has taken another milestone step by introducing separate QRPp Sections in each of its major DX contests—The *CQ* WW DX CW and SSB Contests held in the fall, and considered by veteran DX'ers as *the* DX contests of the year, and also in the WPX SSB and CW contests held in the spring. Check the Contest Calendar and official announcements for these contests for details on entries etc. In each, the QRPp entries/scores will be listed in their own special section, and awards will be given in the form of trophies and certificates. QRPp stations will be competing against other QRPp stations. I

suspect that, at first, there won't be many entries, partly due to the fact that these QRPp sections have been introduced without adequate publicity in this column and elsewhere. But once the word gets around after the first year or two, we'll see a burgeoning list of QRPp entries—get with it gang, and don't make a liar out of me! The proper attitude is this: no matter how meager your score is, send it in in order to show interest in the QRPp sections. Even if you don't intend to the air just to generate an entry, since my antenna situation is really poor. But I didn't cancel out just because off that! I sure wished I had my quad up though so that I could really burn up some ether! After a couple years, if participation in the QRPp sections of the DX contests warrant such a move, we'll try to figure out a "QRPp handicap" in the scoring so that QRPp stations can compete directly with the QRO "big guns." In ten years, who knows? Perhaps the big guns will have to switch to QRPp to just manage to stay in the competition for the big trophies once we get handicaps into the scoring system. We'll end up taking over the DX contest world etc. Dream on. But let's start right here and now, however modest our efforts are as an individual operator!

DXCC QRPP/Milliwatt Standings

Early warning! In December, 1979, I would like to compile a listing of the standings of the efforts of QRPp stations in working DX. Also, if you've worked 25 countries or more, please take the time to drop me a card indicating the number of countries that you have worked/confirmed. Let's get a good list of all active QRPp DX'ers to show the gang what we're all doing. Also, pictures, stories, anecdotes and the like are all welcome material for this column.

Some updates on the DXCC awards. Most recently (12/4/78), GM3OXX has qualified for the second, "most difficult," highly coveted DXCC MILLIWATT Trophy, having submitted QSL proof of having worked 103 countries to date with 950 milliwatts output, measured and verified by a commercial testing company. And G4BUE, who was introduced to QRPp through the efforts of OA8V via an 80 meter c.w. QRPp QSO, has been awarded DXCC QRPp Trophy #8 (11/19/78). Stories and photos are forthcoming in an early issue. I am sure that OA8V will take special pride in G4BUE's accomplishment, since he motivated G4BUE to enter QRPp in the first place! OA8V is at about 188 countries now; W8ILC is somewhere around 280 with under one watt; N2AA has QSL's from about 215 countries and has worked somewhere arond 240 overall. W6PQZ, winner of *DXCC QRPp Trophy* #4, 1st All-SSB, has over 200 confirmed and has worked about 220, including the first QRPp WAZ! N2AA/K2KUR has also made the difficult QRPp WAZ! The day when QRPp works over 300 countries is near at hand. I would have never believed this possible when I instituted the DXCC awards back in 1971! But there it is—300 countries operate the whole contest, get into each one and make at least a few contacts so that you can submit an entry. Follow my example—the CW and SSB sections netted 3 QSO's here at K8EEG/Ø, and I put the rig on

within the reach of several QRPp stations!!! The awards are not easy—8 DXCC QRPP awards in seven years, two DXCC MILLIWATT awards in the same time. That shows how difficult it can be, but because these awards have been made shows that it can be done with QRPp! So, to repeat, get your DXCC standings in sometime in the future so that we can run a whole list.

QRPp Net

K8IF has been NCS'ing a QRPp net on 40 and 80 meters for over a year now. He issues a certificate for 20 check-ins. By the end of August, 1978, about 15 stations had checked into the 40 meter session more than 5 times, and some as high as 20 times. So, there is activity on the net and it would be a good opportunity to meet other QRPp stations and have QRPp-QRPp contacts for your log and QSL's. The details on sessions follow. 80 meters, 3560KHz, Thursday morning, 0200Z (Wednesday evening, 2200EST). 40 meters, 7060KHz, Saturday afternoon, 1800Z (Saturday afternoon, 1300EST). Tom has apparently been carrying all the NCS load himself, with Pike, W8MGF also involved. This is a very praiseworthy contribution to the QRPp effort on K8IF and W8MGF's part, and their efforts should be supported by individuals who are able to make the nets. So, give it a try!!

The Milliwatt

A constant stream of inquiries about *The Milliwatt: National Journal of QRPp* has been arriving since it went out of publication in June 1975 after a run of 33 issues. Each issue is 16 pages long (two are 32 pages), and includes theory, stories, construction articles, operating news reports, and activities reports. We now have a stock of about 25 issuses at $4.00/6 issues, or 75 cents each. The money from sale of back issues is used to purchase the awards which The Milliwatt initiated, namely, The Milliwatt Field Day Trophy and the two DXCC QRPp and DXCC MILLIWATT trophies. We've just received four applications for DXCC trophies, so we can use some cash to pay for these awards.

Well gang, that's the news for this month. Let's see some operating reports and letters and photos for future columns of this type. In the meantime, good QRPp'ing and 73.

Ade, K8EEG/W0RSP

This month by

ROD LINKOUS, W7OM

DX

News of communications around the world

When we launched our 2-step, Five Band WAZ award on Jan. 1, 1979, little did we expect to receive results so soon. It was our feeling that it would be the end of the year before any substantial number of applications were received. After all, the simple logistics of making the contacts, sending the QSLs, and receiving QSLs in return would seem to preclude any activity in the award for months. After all, everybody knows that the mail is very slow and unreliable these days.

Well, we were wrong! Interest in the award has been phenomenal, and 3 of the world's top DXers ended in a virtual dead heat for the 100 zone, first step certificate *before the end of Feburary*. The winner of certificate number one had to be decided by the traditional postmark, with Angelo Mendes, D4CBS, barely nosing out Steven Orland, AA6AA, by one day. Angelo's envelope was dated Feb. 22, 1979 and Steve's was dated Feb. 23, 1979. Extremely close behind was Ken Bolin, W1NG, whose postmark on Feb. 26, 1979 qualified him for certificate number three. Other winners with low numbers include John Devoldere, ON4UN, #4, L.D. Bevan, N6DX, #5, Bob Dixon, K4MQG, #6 and Dan McLean, WA4JTI, #7.

Remember, this is only step one, the first 100 zones. A full, 5-band WAZ requires all 40 zones on each band 80 - 10 meters for a total of 200. The race for # 1 at the 200 level is still in progress. Any of the above may win, or it may be someone who hasn't yet submitted a card. The competition is fierce and exciting. Who will be the first to earn a full 5-band WAZ?

See the December '78 issue of *CQ*, page 77, for the complete rules for 5-Band WAZ.

De Extra

Just a short personal note on a problem affecting the *CQ* DX Awards Program.

We have worked very hard to develop a program which would provide a challenge for both new and old DXers alike. Over the past 10 years we have introduced the WPNX award for the novice and the DX Hall of Fame for that tiny handfull at the pinacle of DX success. We brought out VPX for the shortwave listener and 5-Band WAZ to challenge the world's best operators. Single Band WAZ is in there for those who specialize in a particular band plus separate s.s.b. and c.w. certificates for those who most enjoy a single mode.

The awards have been very well

9H4M, John Cassar, Gozo Island, 5 miles N. W. of Malta, favorite band is 20 meters. John looks for stateside QSO's after 2000Z near 14200kc to 14230kc. needs Wyoming, Utah and North Dakota to complete his WAS. OSL's 100% via 168 Main Street Sannat, Gozo, Malta, Europe. (photo via Jack, W2LZX)

The CQ DX Awards Program

S.S.B.

668 .....WB8RFN
669 .....JY5US
670 .....WD8LVQ

C.W.

358 .....VE7CNE
359 .....JG1HOM
360 .....WA4DOU

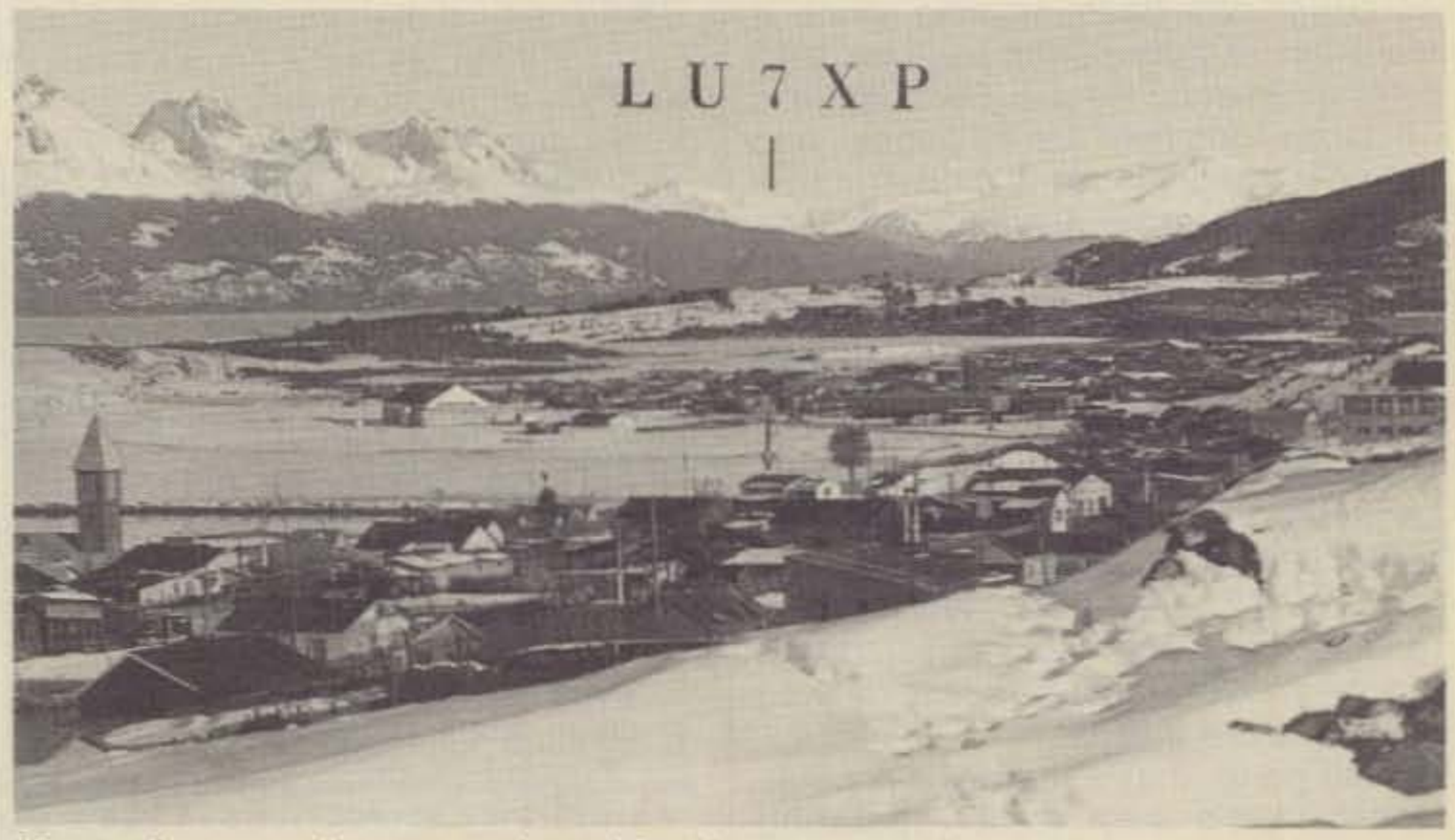
S.S.B. Endorsements

310 .....K8DYZ/317
310 .....W3CWG/317
310 .....K4MQG/316
310 .....W9DWQ/316
310 .....W9JT/316
310 .....K6WR/315
310 .....W4SSU/315
310 .....K6EC/312
310 .....K9MM/311
310 .....I4ZSQ/310
300 .....VE7WJ/304
250 .....W4BQY/271
250 .....PT2TF/256
150 .....JY5US/164
150 .....WB8RFN/150

C.W. Endorsements

310 .....K6EC/316
300 .....W9DWQ/308
300 .....W4BQY/307
250 .....JH1VRQ/250
150 .....VE7CNE/150

Complete rules and application forms for the *CQ* DX Awards Program can be obtained by sending a business size, No. 10, envelope, self-addressed and stamped to: "CQ DX Awards", 5632 47th Avenue S.W., Seattle, Washington 98136 U.S.A..



Most of us would guess that this photo was taken in northern Norway or perhaps Iceland, but we would be wrong. Its south, not north, this is Tierra del Fuego, the QTH of Jorge Vrsalovich, LU7XP, in southern Argentina. Its not all balmy breezes and orange blossoms in Argentina after all.

P.O. Box 205 Winter Haven, FL 33880

received, and it has become commonplace to issue over 100 certificates each month. Therein lies the problem. With rapidly escalating costs the program is no longer able to support itself financially, and we are faced with the problem of either reducing the number of certificates we offer, lowering the cost of producing each certificate, or somehow generating more income. The *CQ* DX Awards Advisory Committee is wrestling with the problem. We will keep you informed regarding their decisions. Meanwhile, what are your thoughts?

Those Unusual Countries

In the March issue, page 89, we presented the various factors which make Desecheo Island a separate country for amateur radio award's purposes. This sparked a lot of interest among readers so this month we are offering the following story on OH0, Aland Island, a rare country located between Sweden and Finland. The following story was written by Thorvald Eriksson for *Long Skip,* the publication of the Canadian DX Association.

THE WPX Program

Mixed

729...W9JR/M
730...JY5US
731...W1HSP
732...WB8ZRL
733...AE1T
734...JE1BSD

S.S.B.

1142...WA4DPU
1143...WB0BMB
1144...WA4TLI
1145...WA2SRM
1146...WB8RFN
1147...DL7QG
1148...WB8YQX
1149...I0WDX

C.W.

1810...W5VJT
1811...DL7WL
1812...DJ4ES
1813...VE1AJP
1814...ZS3BT
1815...EA8LK
1816...DM3NKF
1817...F6CWA
1818...WB2IOB

WPNX

147...WB2IOB
148...WB1HKV
149...WD9GAB
150...WD0HWU
151...WD4MRP
152...KA0ASU

VPX

160...OK2-14713
161...DL-I14/168177

Endorsements

Mixed: 400 W9JR/M, JY5US, WB8ZRL, AE1T, JE1BSD. 450 AB4Z. 500 WA4TLI. 550 JH3XCU. 600 I5AFC. 650 I4BFY. 700 N4UF, W2HAZ. 900 4X4FU. 950 JH1VRQ. 1250 N2AC.

SSB: 300 WA4TLI, WA2SRM, WB8RFN, WB8YQX. 350 WA4DPU, G3TSZ/M, WA4OIB. 450 WB8RFN. 500 I5AFC, I0WDX. 1100 K5UR. 1150 K2VV. 1600 W4UG.

CW: 300 W5VJT, DL7WL, DJ4ES, ZS3BT, F6CWA. 350 OK3YCA, VE1AJP. 450 W1IHN, SM6AYM. 550 EA2OP, W3OGY. 650 W1DMD. 1000 YU1AG.

15 Meters: I2DMK, JH1VRQ, WB8ZRL.
20 Meters: OK3YCA, WA4OIB.
40 Meters: EA2OP.
Asia: 4X4FU, EA2OP, DM3NKF.
Europe: JH3XCU, AE1T, DM3NKF.
No. Amer.: 4X4FU, WA2SRM, WB8ZRL. JE1BSD, W6YMH.

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", 5014 Mindora Dr., Torrance, Calif. 90505. U.S.A.

ALAND - An Autonomous Province

As the First World War was nearing its end and the Russian Empire was on the point of disintegrating, the idea was born in the minds of the aland leaders that, as an ancient Swedish province, the Aland Islands ought to be reunited with their mother country, Sweden. On August 20, 1917, representatives of the Aland rural districts and the township of Mariehamn met in the Aland adult educational college and decided to petition the King and the Government of Sweden to take action to reunite Aland and Sweden.

Finland, which had declared its independance on December 6, 1917, and had been recognized by Russia as an independent republic on January 24, 1918, opposed the reunification on the ground that Aland constituted a part of Finland. The dispute over which country Aland rightly belonged to went on for several years. Following a statement by the French Premier, Georges Clemenceau, in the Chamber of Deputies, which was interpreted that the peace conference would return Aland to Sweden, the Government of Finland appointed a national committee to draw up draft proposals for the autonomy of Aland in the hope that the Alanders would abandon their demands for reunion with Sweden, which were based on the new international principle of national rights of self-determination.

The first DXer to work and confirm 100 zones on 5 bands, Step 1 of the 5-Band WAZ award program, is Angelo Mendes, D4CBS, of the Cape Verde Islands. Angelo's station includes a TS-820S with an SB-200 linear.

The Alanders, however, considered that only Aland's reunion with Sweden would prevent them from losing their national identity, and their demands were strongly supported by the Government and people of Sweden. When the Finnish Government had two of the Alanders arrested, Julius Sundblom, an Editor, and Carl Bjorkman, a Deputy District Judge, the Aland question was submitted to the League of Nations.

The Council of the League of Nations set up an impartial commission of jurists which in its report declared that Finland enjoyed no national sovereignity over the Aland Islands, since the Alanders for national reasons had expressed a wish to be reunited with Sweden after the Russian Empire had disintegrated and before Finland had become a fully constituted state. The Council was thus competent to consider, and settle, the question of the nationality of the Aland Islanders.

Albert Lausecker, ZS5LB, is one of the world's top DXers. Albert recently worked all 40 zones on 80 meters, a fete which took 4 years to accomplish with zones 23 and 40 being the toughest to confirm. His 80 meter antenna is a 190 ft. long wire. Albert's 5-Band DXCC certificate was the first for South Africa. He is a native of Austria and emigrated to South Africa in 1952 where he operates a radio and TV repair shop.

The Council of the League of Nations decided the Aland question on June 24, 1921. As a result of its ruling, Finland was granted sovereignity provided that certain important nationality guarantees were included in the autonomy legislation offered by Finland, and that the Islands were neutralized. Sweden protested, but the question had now been finally settled.

The Alanders acted promptly to take advantage of their autonomy. Elections were held in accordance with the new legislation, and the first Provincial Council held its first plenary session in Mariehamn on June 9, 1922. This day is commemorated as "Aland Independence Day."

Aland's "Magna Charta" and National Status

Aland's linguistic and cultural background and its geographical position are the basis for its autonomous status. The decision of the Council of the League of Nations on June 27, 1921, to secure and guarantee to the people of the Aland Islands their Swedish language, culture and local traditions: in perpetuity is a recognition of this. Finland undertook to do this and both Finland and Sweden accepted the Council's decision. This undertaking therefore constitutes a basic obligation for Finland and a basic right for Aland, a kind of Aland's Magna Carta, which overrides divisions of power in detail. The autonomy legislation also lays down specifically that Aland shall be unilingually Swedish, and it also contains certain important special safeguards designed to preserve the national identity of the islands.

Luciano Glarey, I1YRL, of Naples. Lus works c.w. only and has qualified for WPX. All-Band WAZ and Single Band WAZ. (Photo courtesy I8KDB)

The Terms "Province of Aland" and "County Administrative District of Aland"

"The Province of Aland", therefore, denotes something more than the word "province" usually indicates. It stands for a community with a high degree of self-government, with its own national identity, its own elected Parliament and its own central administration, "a State within a State", with independent powers of legislation, independent administration and the right to levy taxes, on the basis of the constitution embodied in the Autonomy Act which Aland cannot alter and which cannot be amended without the consent of the Aland Parliament.

In addition to the Province of Aland, however, there is what is known as "The County Administrative District of Aland", with administrative powers only and subordinate to the central authority of Finland. Territorially the limits of the two coincide. However, most of the functions performed by County Administrative Councils elsewhere

Juan Repiso Conde, EA2CA, of San Sebastian, Spain. Look at that station and eat your heart out. The rig includes a Henry 10K, Collins 30S1, Collins 30L1 and Drake L4B linears; a KWS1 and 75A4; a KWM-2A, Kenwood 820 digital, Drake TR4C and Atlas 210 transceivers plus assorted VHF gear and general coverage receivers. The antenna farm is also complete. Juan's DXpedition calls include EA9DE (Rio de Oro), EA9DE (Ifni) and PX1DE (Andorra).

The WAZ Program

10 Meter Phone

4...JH7DNO
5...YU2RTW

15 Meter Phone

13...VK3OT
14...JJ1CUB

20 Meter Phone

210...W4WW
211...LA9LS
212...VE3JF
213...I8ACB
214...WB3HAZ
215...WB7BFK
216...WA1AER
217...KL7IWE

10 Meter C.W.

2...9H1CH

20 Meter C.W.

73...W4HET

40 Meter C.W.

9...K7UR
10...DL1PM
11...SM0AJU

All Band WAZ S.S.B.

1611...JA2CXH
1612...JH1QOJ
1613...WD4EYD
1614...DL2OW
1615...DJ1NY
1616...DK9QD
1617...K4CXY
1618...EA8LO
1619...KL7IWE
1620...WA0HMP
1621...N3II
1622...WA2LNG
1623...KG6JIA
1624...W6CRE
1625...WA1AER
1626...DJ9LI
1627...K9HA
1628...WA7KNK
1629...G8PX
1630...WA1TPR
1631...WA9CYV
1632...KA4D

C.W. Phone

4493...W4WW
4494...AA4M
4495...SP2FAP
4496...G3TXE
4497...W0SEL
4498...K5BDS
4499...OK1CIJ
4500...OK1MAW
4501...OK3BT
4502...OK1AUG
4503...JA1HUL
4504...GM4DKO
4505...DJ3BE
4506...DL6SN
4507...DL7MX
4508...DL6VW
4509...DL2AW
4510...PA0UV
4511...WA4DAN
4512...K4LQ
4513...W4OVU
4514...LA9GV
4515...OK1IAR
4516...YU3GI
4517...K6DSK
4518...DF6TR
4519...DJ4AV
4520...WA9CYV

The Complete rules for WAZ are found in the May 1976 issue of CQ Magazine application blanks and reprints of the rules may be obtained by sending a self addressed stamped envelope, size 4¼ X 9½ to the WAZ manager. Leo Haijsman 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards direct to the QSL manager should include sufficient postage for the safe return of their QSL cards. Please note that effective January 1, 1979 the processing fee for CQ DX certificates was raised to $2.00

devolve on the provincial administration, with the Provincial Executive Council as the central administrative authority, though the administration of justice is in the hands of the ordinary national courts of law. To deal with the residual county administration which the State still retains in Aland and which mainly concerns the collection of taxes, the administration of the Penal Code, and so on, there is a County Administrative Council with a County Governor at its head, and a County Administrative Court, consisting of three members, to deal with particular administrative appeals. The county Governor also has certain supervisory functions relating to the legality of the Provincial Administration, in which connection he represents the national Government in the Province. He also has the duty of opening and closing the annual sessions of the Provincial Parliament. The County Governor is appointed by the President of the Republic after agreement with the Speaker of the Provincial Parliament. If the President of the Republic and the Speaker of the Provincial Parliament fail to agree, the President appoints a County Governor from a list of five names drawn up by the Provincial Parliament.

The Aland Flag

Aland possesses a symbol of its autonomy in its flag, which consists of a yellow and red cross on a blue ground. It is a symbol of the freedom, integrity and love of the Alanders for their beautiful island realm situated between Sweden and Finland, with its 6,500 islands and skerries and its permanent population of little more than three times that figure and, being a Nordic cross flag, it is at the same time a symbol of Aland's close ties with the rest of Scandinavia. These ties were strengthened still more in 1969, when Aland was represented in the Nordic Council, an organization on Parliament level for inter-Scandinavian questions.

Here and There

1S, Spratly - At presstime, the big DXpedition news is 1S1DX from superrare Spratly Island. If all went well this expedition will be history by the time you read this issue, but as it was a very expensive trip contributions will be accepted and appreciated. The South Jersey DX Association is handling the donations which may be sent in care of Erich Schmidt, K2TJ, 33 Shore Drive, Manahawkin, NJ 08050. *QSLs* go to VK2BJL, *not* to K2TJ.

Desecheo - The KP4AM/D expedition by KP4AM, KP4Q, N4EA, KP4DSD,

This tiny bit of land with the airport runway extending from beach to beach is rare DX country, Marcus Island, JD1. (Photo courtesy JA8IEV, Marcus DXpeditioner)

KV4KV and N4ZC made over 21,000 contacts using both s.s.b. and c.w. They worked 110 countries using all bands 160 - 2 meters.

Fernando de Noronha - Gerson Rissin, PY1APS, and Paulo Rabelo, PY1MAG, were on the island for the last 2 weeks of May. They operated 10 - 160 meters using the calls PY0APS PY0MAG. QSLs go to their home addresses.

VU4ARC/Laccadives - N. Rajagopalan, VU2GO, informs us that despite 2 years of planning, the major DXpedition to the Laccadive Islands by the Bangalore Radio Club was terminated before it began, thanks to a bureaucratic snafu over permission for the group to land. The necessary permits had been obtained from the Home Ministry and the Communications Office, but the local Administrator in the islands would not allow them ashore because the Prime Minister had scheduled a visit to the Laccadives shortly after the DXpedition was scheduled to depart. Later it was found that the Prime Minister cancelled his trip so it was all for nought.

S79/Seychelles - S78MC and S79WHW (Wild Horse Willie) are the only 2 stations still active. The new government is no longer issuing licenses.

Franz Josef Land - If you worked R1FJ recently you had a QSO with the very rare Franz Josef Land. QSLs go via Box 88, Moscow.

UR2 QSLs - QSLs for UR2 stations may be routed to the Estonian Central Radio club, P.O. Box 125, Tallinn, Estonia.

Shortwave Propagation - If there is something you don't understand about long skip, short skip or any other facet of DX propagation, we recommend that you obtain a copy of the new *Shortwave Propagation Handbook* by George Jacobs, W3ASK, and Ted Cohen, N4XX. It answers all the questions and can be ordered through the *CQ* office at 14 Vanderventer Ave., Port Washington, NY 11050.

SV Call Areas - Call signs in Greece now indicate the station's region as follows: SV1 - Athens & vicinity, SV2 -Macedonia and Thessaly, SV3 -Peloponnesus, SV4 - Central Greece, SV5 - Dodecanese, SV6 - Epirus, SV7 -Thrace, SV8 - Aegean Islands, SV9 -Crete and SV0 - reciprocal licenses. There are 4 licensed stations on Crete and SV9JI and SV9KI have been frequently heard in the general portion of the 20 meter band.

First U.S. 10 Meter S.S.B. WAZ - Steven Orland, AA6AA, is the first U.S. DXer to receive the 28 MHz. s.s.b., Single Band WAZ award. Steve

The DXers gather in Uruguay. Around the table from left to right are CX2CS, CX1BBL, CX1AW, CX6CW, CX1CO, CX1CU, CX6CH, Mr. Perera (not a CX yet), CX7BBB, CX2AQ, CX8DT and CX3AN. (Photo courtesy CX2AQ)

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV DXers are also listed. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Total number of countries currently on the DXCC list as of this listing is 319. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted any time, in any number. Update indicating "no change" will be accepted to meet the annual requirement.

C.W.

W6PT	319	N4PN	313	W4BQY	307	K9MM	300	N6CW	292
ON4QX	317	W8KPL	309	N6AV	305	DL3RK	295	DJ7CX	280
K6EC	316	W9DWQ	308	W2GT	305	K4CEB	293	W4OEL	275
W6ID	314	K6JG	307						

S.S.B.

WA2RAU	319	VE3MJ	315	I4ZSQ	310	WB6DXU	302	OE3WWB	288
DL9OH	318	W4SSU	315	SM6CKS	310	I5WT	300	I6PLN	287
I0AMU	318	G3FKM	314	W4UG	310	N6AV	300	N6AW	287
W2TP	318	VE3MR	314	ZS6LW	310	W9SS	300	OK1MP	286
K2FL	317	W9KRU	314	EA4LH	309	HP1JC	299	W7OM	286
K8DYZ	317	I8YRK	313	YV1KZ	309	F9MS	295	WA4WTG	286
W3CWG	317	K6JG	313	F2MO	308	K8LJG	295	YS1O	286
W4EEE	317	F9RM	312	K5OVC	307	W9DQ	295	W4MWT	285
W4UG	317	K6EC	312	OZ3SK	307	K8PYD	294	W8ILC	285
W6EUF	317	W3AZD	312	W6YMV	307	N2SS	294	I3LLD	283
XE1AE	317	W4DPS	312	XE1KS	307	DK6KG	293	WB2RLK	280
K4MQG	316	W6RKP	312	ZL1AGO	306	K4LSP	292	JA6GDG	277
K6YRA	316	I0ZV	311	N4MM	305	K9RF	291	AA4A	276
W3NKM	316	K9MM	311	W3GG	305	9H4G	291	DJ2AA	276
W9DWQ	316	OE2EGL	311	W0SD	305	VE7CE	290	K9PPY	276
W9JT	316	VE2WY	311	VE7WJ	304	VE7HP	289	VE3FJE	276
I8AA	315	VE3GMT	311	DK2BL	302	DJ7CX	288	WA4JTI	276
I8KDB	315	W9QLD	311	K6XP	302	JH1VRQ	288	W0SR	275
K6WR	315	DJ9ZB	310	W0SFU	302				

SSTV

W6WYEK	108	G3IAD	101

is #3 for the world, #1 for the U.S. He is also #2 in the world to make the first step fo 5-Band WAZ.

Top Band in Spain - Spanish amateurs, including EA6 and EA9, have received permission to use the 160 Meter Band so look for them 1.8 MHz. soon. In the past, 160 operation had been limited to contest operations by special permit.

Robby, VQ4ERR - The DX Department is saddened to confirm the death of E.R. "Robby" Robson, VQ4ERR. Robby was active from Kenya for many, many years and was the world's very first winner of the Phone WAZ Award back in 1954. The DX fraternity has lost a great friend.

QSL Information

A6XB - Via K1DRN
A7XAH - To DJ9ZB
A51PN - c/o W1JF
AP2LJ - Via WA8AJG
C5ABK, C5AAR & C5AAJ - To Roger Brown, G3LQP, 32 Albert Rd., Sutton Surrey SM1 4RX England
CF2YM/2 (Zone 2) - c/o Guy Bourgie, VE2YM, P.O. Box 35, Dorion, Quebec J7V 5V8 Canada
D68AD - To G3RWU via the RSGB Bureau
FM7AV - Via F6BFH
FR7ZL/T - c/o N4NX, 305 Alpine Drive, Roswell, GA 30015
FY7AK & FY8BHI - Via Richard Gemehl, F2QQ, 25 rue Mauriceau, 92600 ASNIRES, France
HR0QL - To YASME Foundation, P.O. Box 2025, Castro Valley, CA 94546
HV5GH - *NOT* via SP5GH
K1CO/PJ7 - c/o K3RYA
KA1IW - Via K8DYZ
KH6XX - To W3HNK
KJ6DN - c/o WB6YIQ, 8139 Franciscan Way, Sacremento, CA 95829
KP4AM/D(Desecheo) -Via Northern California DX Foundation, P.O. Box 717, Oakland, CA 94604
LU3ZY - Via LU2CN
PJ8USA - To W1CDC
PJ9CDC - c/o W1CDC
ST0RK - Via DL7FT, 1 Berlin 47, Petunienwegg 99, Germany
SV0AA - c/o Charles H. Jackson, Box 722R, APO, New York, NY 09223
T2T - To W5RBO
VK2AGT - c/o Dick Hoffman, Lord Howe Island, New South Wales, Australia 2898
VK9N (Norfolk Island) - Via Al Egli, HB9AAA, Box 17, CH-2500 Bienne 4, Switzerland
VP1KG - To YASME, Box 2025, Castro Valley, CA 94546
VP2DAY - c/o WA4DWN
VP2DXA, VP2DXB, VP2DXC, & VP2DXD - Via WB8LDH
VP2MBC - To W1CDC
VP2MM -c/o W1CDC
VP8SO - Via G3KTJ
VQ9MR - All QSLs and correspondence to N5GU, 14525 Encantado Rd., NE, Albuquerque, NM 87123
VR3AL - c/o W3HNK
VR6TC - Via W6HS
VS5CW - To Box 398, BSB, Brunei
YA2MI - c/o WA8AJG
YI1BGD - Via YU1NZV
YV0AA - To Venezuelan Amateur Radio Club, Box 2285, Caracas, Venezuela
ZB2G - c/o Kenneth R. Palmer, K2FJ RD #2, Williston Rd., E. Aurora, NY 14052
ZD7PL - Via P.O. Box 4, Jamestown, St. Helena
ZF2BP - To W4YKH
ZF2BY & ZF2CJ - c/o K4VYN, Box 279, McLean, VA 22101
ZM7AJ - Via WA7ABK
1S1DX - To VK2BJL, Box 85, Round Corner, New South Wales 2158, Australia
3X1IX - c/o Box 477, Conakry, Guinea
3Y1VC - Via LA5NM
4W2AA - To I2MVS
5A3ED - c/o Box 34, Zaroka, Libya
5V7AH - Via DL1HH
5V7HM - To DF5FD
601FG - c/o I0DUD
6Y5MB - Via VE2AUF
6Y5GL - To VE2RD
6Y5SS - c/o VE2YM, P.O. Box 35, Dorion, Quebec J7V 5V8, Canada
6Y5YM - To VE2YM
9N1MM - c/o N7EB, 12802 Sun Valley Drive, Sun City, AZ 85351
9V1TE - Via WA0TKJ

73, John, K4IIF

MESSAGE FROM THE PUBLISHER

on Sweepstakes and Lotteries and Giveaways

BY RICHARD COWAN, WA2LRO

It's been a long time coming, but we've finally gotten *CQ* back to where it belongs in the Amateur market as the best read independent magazine. Between subscribers, newsstand buyers and store buyers, this issue will be read by well over 85,000 hams. Of course, we're still a long way from catching *QST*, but that's pretty hard to do. A membership in an organization sells a lot more easily than a magazine all by its lonesome.

Just recently we held a staff meeting to discuss ways to even further improve *CQ*'s sales at the reader level. Needless to say, more and better articles and features are the prime objective; you can expect to see some pretty good looking issues of *CQ* this next year. And during that brain-storming session, someone brought up the idea of running a sweepstakes prize giveaway. My immediate reaction was, "why?" What advantage is there to making a big mailing to everyone in the callbook offering a lot of free prizes just to get the reader's attention. After all, if your message is worth reading, it's worth reading without bribing the reader.

Then someone pointed out that the biggest reason people use sweepstakes is that most people figure that unless they actually buy something with their sweepstakes entry, they just can't win. Matter of fact, I recall a conversation I had a few months ago with a ham who told me that his entire club signed up for a magazine that none of the members read just because they wanted to improve their chances of winning a prize in the sweepstake. This blew my mind. Hey guys, it's illegal for a company running a sweepstakes to give extra consideration to whether the winner buys something or not. If you want the product, by all means buy it. But if you're simply hoping to win a prize, just send in the sweepstake entry card. The outfit that runs a sweepstake *must* put your entry in with all the others on a totally impartial basis. That's the law. And most states that allow sweepstakes enforce that law pretty stringently.

So much for that. At any rate, *CQ* won't be running a sweepstakes. But you will be getting some pretty hefty mailings announcing some pretty big bonus incentives for subscribing to *CQ*. And a sure bonus prize is better by far than a maybe chance of winning a bonanza. So watch your mailbox and our advertising pages. There are some big things about to break loose.

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The July, "Story of The Month" as told by Gar is:

GARNET H. DOWNING, W7CUJ
ALL COUNTIES #210, 1-17-79

"I was born in a log cabin outside a little railroad town, Eldon, Iowa in 1906 on June 5th. Yes, it is true, I was born in a log cabin and the doctor came by horse and buggy and brought me into the world squalling like crazy, so they tell me.

Spent part of my time with my grandparents on a farm (actually several farms as they were always moving) and the rest of my early school years in Ottumwa, Iowa, the county seat.

My beautiful mother was one never to stay put very long, so I had several stepfathers and all of them were "Macho" guys. In 1923 my mother and stepfather moved to Omaga, Nebraska and I later left high school to follow them. But I guess I took after my mother and I wasn't one to stay put, so at 17 I up and joined the Navy to see the world.

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

CT1UA, Miro, N9WA, Wayne, CT1BY, Charlie sightseeing in Viseu, Port. Feb. '79. (Foto courtesy of Dorothy, WB9RCY)

Gar, W7CUJ relaxing like the doctor told him.

I ended up at the San Diego Training Station, where I was sent to the radio school. Actually I talked myself into the school as one old salt told me that the "Radio Girls" was the softest job in the Navy.

I spent time on the Old USS Melville and was later sent to the Asiatics, (meaning you were assigned to Orient duty).

I was at Tiensien-chine when I was first bitten by the ham bug. While on the Wm. B. Preston destoryer, the Chief Radioman and the second class radioman built a ham transmitter for 80 meters and converted a Navy receiver. I was the "gofer", I go for this and that and coffee while they did all the experimenting. They finally got an old 211D from one of the Chief's friends on a submarine. They used part of a Navy transmitter - 2 300 volt generators in series to get 600 volts for the 211D. A couple of days were spent calling CQ without any answers, then I was allowed to pound the key and one day I got an answer and I believe it was W6AWT in Los Angeles-what excitement. That was my first taste and I never got over it.

I got out of the Navy in 1927 and returned to school at Oregon State College. There I majored in Aero Engineering with a minor in Radio Engineering. I was always experimenting in the radio lab and there with the aid of the instructor, we built our first beam transmitter and receiver, we were able to trigger relays and lights, with the beam. The instructor came up with another project - now they call it TV. We built up a transmitter and used the old scanning disc method of transmitting pictures. My first picture was that of a pair of pliers, transmitted from one end of the physics lab to the other end, what a thrill. My instructor used to give me H 1 for not properly attending to my studies, I was having too much fun. While there at school, I took ROTC and came out with 2nd Lt. Reserve rating in the Field Artillery.

I finally got a job with the USLHS Airways Division in my chosen work and everything was rosy. As an assistant Airways Inspector, I had the job of going to the emergency airfields, weather stations, checking equipment and when necessary I stood watches with the men, learning all about weather, radio beacons, beams and airport operation. It was a wonderful job until the depression. President Roosevelt took over and economized. I was low man on the totem pole so I got bumped down until it got so low I was making half what I started out with, so I quit.

I went to trade school, learned the radio service business. I had my first class ticket (the old pink ticket), but I did not want to go to sea so I went into the radio service business. In the meantime I also got my ham ticket in 1931, upgraded to Class A a year later. So when I found time I was either building or tearing down and doing some operating. I even built a transmitter using a single 210 in TNT

Special Honor Roll
ALL COUNTIES

#218 Kenneth C. Johnson, K9DZG 3-19-79.
#219 Ron Toller, W4MNZ 3-21-79.
#220 Henry L. Timme, WB9SPD 3-23-79.

circuit and I even got a heard card from Australia, on 80 meters. That started me all over again and I've been at it ever since, except for a short period when we first got TV- went to 2 meters then.

I had just got my business going great guns when Uncle Sam said he wanted me in the Army to train selectees. Well he got me in September 1940 and I didn't get out for 5½ years.

After I came back, I went to school and got my Radio 1st Phone and went back to enjoying my freedom. I opened my own Electronic Repair Business fixng all kinds of things, including Marine, C.B., home entertainment equipment and TV. After 20 years in my own business and much fun boating, hunting, fishing, haming, chasing DX and getting DXCC, WAZ, WAS on 10, 20, 40 and 80 (now working on 15), I had a heart attack and ended up with a triple bypass. I'm now in my 6th year (from the operation) and according to the doctors, I beat the odds, so far.

I'm active in the YLISSB besides having had a great ball chasing Counties. I never knew anything could be so rewarding and aggravating at the same time, as County Hunting. I have a tendency to get up tight and at times my XYL pulls me off the air as the doctor "sez" do *not* overdo it, no matter what it is. Everything in moderation, and even though I'm in my 70s, I have quite a few young ideas and I carry them out a little above the moderation point the doctor was talking about.

Our household, who all have been interested in my County Hunting endeavors, consist of XYL, WB7DHO, Zelpha Monafaye (Colt) Downing, BS degree in music, teacher until a year after I retired due to my operation.

Daughter, Zelpha Mae Downing, RN, now attending University of Hawaii working for - darned if I know? She has enough credits for PHD in something if they could all apply.

Son, Michael Stephen Downing, 36, Maui Hawaii, University of Portland Civil Engineer, now Downing and Associates Engineering. He was a Novice, WB7BES but let it expire.

Mother-in-law, Minna A. colt, 93 years old, music teacher until about 6 years ago, now need 24 hour care. She is the one who took the phone call that got me on the ball to get my last county.

Thanks to all for all the help so I could make all counties". (*Note:* When I have space I'd like to tell about Gar's experiences in the military. Ed.)

Awards Issued

Ken Johnson, K9DZG added to his fine collection, USA-CA-2000, 2500 and 3000 endorsed All SSB, All Mobiles. All Counties endorsed All SSB.

The Northern Lights Award

Ron Toller, W4MNZ (that man with the *big* signal) gained All Counties endorsed All 2XSSB.

Hank Timme, WB9SPD waited until he had them *all* and received USA-CA-500 through 3000 endorsed *all* SSB, All Mobiles. All Counites endorsed All SSB.

Floyd Bowman, WA0UHC acquired USA-CA-500 through 1500 endorsed All SSB, All 20. USA-CA-2000 and 2500 endorsed All SSB. Then USA-CA-3000 endorsed Mixed.

Lee Foster, VE3RN was sent USA-CA-3000 endorsed All SSB.

Ray Teeter, N2RT (ex W2NCI) picked up USA-CA-2500 endorsed All A-1.

Paul Wells, W4LQF obtained USA-CA-500 endorsed All SSB, All 20. USA-CA-1000 and 1500 endorsed All SSB.

Basil Gould, VE3-9094 (ex G9094) was issued USA-CA-500, 1000 and 1500 endorsed All A-1. He is the proud holder of over 660 Awards.

Bob Craig, K6XZ claimed USA-CA-1500 endorsed Mixed.

Margaret Williams, KI4W qualified for USA-CA-500 endorsed All SSB.

USA-CA-500 Certificates endorsed All A-1 were sent to:

Dave Brodmann, WA2OTC.

Kibbee "Dean" Streetman, W4DGX.

USA-CA-500 Certificates endorsed Mixed, went to:

Helmut Hoschek, OE3HOW,

#3 Award to Austria.

Tom Sundstrom, W2XQ.

Al Armitage, WD4HVZ.

Awards

Bromsgrove Silver Jubilee Award: Sponsored by the Bromsgrove & Dist. Amateur Radio Club to celebrate 25 years of the reign of Queen Elizabeth II. Open to Amateurs/SWLs World wide. So check your logs!. 25 points needed any band, any mode and even mixed. For QSOs during the period 0001 GMT 4th June 1977 to 2359 GMT 12th June 1977 (coincided with special GE licenses). GE3VGG *must* have been worked/heard = 1 point. Members worth 2 points are: G2CLN, G3NOY, G3RBL, G4AAL, G4DHH, G6WI, G8IO, G8JTK, G8LJM, G8KLO, G8LXT. Cost: Cheque/P.O. 50p or 4 IRCs or $1.00. Send log data to: Awards Manager, J. K. Harvey, G8KLO, 38, Bodenham Road, Birmingham B31 5DS, West Midlands, Great Britain before 31 December 1979.

The Northern Lights Award: Offered by the Northern Lights Chapter QCWA. It is available to QCWA Members only, who are located outside the State of Alaska who make confirmed contacts with three (3) members of the Northern Lights Chapter. It is a one-time Award, the contact may be any mode, any band, and any time after November 11, 1975. send Log data to: J.W. "Mac" McQueen, KL7AVX, 1928 East Dimond Boulevard, Anchorage, Alaska USA 99507.

Notes

Due to the big increase cost of materials, postage and just about everything else, starting September 1, 1979, the cost of the *CQ All Counties Plaque* will be $30.00 (at present $15.00).

JARL, P.O. Box 377, Tokyo Central, Japan have some new awards and I hope to have the date in next month.

Cliff Evans, K6BX, passed away this past April. Cliff started CQ's USA-CA program in 1961. In recent years, he published his own newsletter from his home in Bonita, California.

73, Ed., W2GT.

Bro

USA-CA Honor Roll

3000		2000		1000	
K9DZG	244	K9DZG	357	W4LQF	530
WB9SPD	245	WB9SPD	358	VE3-9094	531
WA0UHC	246	WA0UHC	359	WB9SPD	532
VE3RN	247	1500		WA0UHC	533
2500		W4LQF	409	500	
K9DZG	310	VE3-9094	410	WA2OTC	1330
N2RT	311	K6XZ	411	VE3-9094	1331
WB9SPD	312	WB9SPD	412	OE3HOW	1332
WA0UHC	313	WA0UHC	413	W4LQF	1333
				KI4W	1334
				W4DGX	1335
				WB9SPD	1336
				W2XQ	1337
				WD4HVZ	1338
				WA0UHC	1339

No -70 -71

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The Swiss Federal Observatory at Zurich, the world's official keeper of sunspot records for more than 200 years, reports a monthly mean sunspot number of 137 for March, 1979. Daily values ranged between a high of 170 recorded on March 12th and a low of 110 on the 29th.

March's observations result in a *smoothed* sunspot number of 108 centered on September, 1978. This is an increase of 4 points in the monthly growth of the present sunspot cycle, Cycle 21. The Swiss Observatory expects solar activity to continue to climb, reaching a level of approximately 160 by this month. It is almost certain, therefore, that Cycle 21 will go down in history as at least the *second* most intense cycle ever recorded. It remains to be seen how close it may come, or perhaps even surpass, the record breaking peak of 201 which occurred in March, 1958.

July Propagation

Both the *15* and *20* meter bands are expected to share honors for optimum DX propagation conditions during July.

Excellent worldwide openings are expected on *15* meters throughout most of the daylight hours, and through the evening hours as well to about Midnight. Conditions should peak, with openings expected to most areas of the world, during the late afternoon and early evening hours.

Twenty meters is expected to remain open to one area of the world or another just about around-the-clock. Although DX openings should be possible at almost any hour, optimum worldwide conditions are forecast for the early evening hours, during the hours of darkness, and for about an hour or two after local sunrise. Exceptionally strong signal levels are likely to occur during the hours of darkness.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for July, 1979

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 7, 10, 25, 28	A	A	B	C
High Normal: 1-2, 4, 8-9, 23-24, 26, 29, 31	A	B	C	C-D
Low Normal: 3, 5-6, 12-13, 16-17, 21-22, 27, 30	B	C	D	D-E
Below Normal: 11, 14-15, 18, 20	C	C-D	D-E	E
Disturbed: 19	C-E	D-E	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for and day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on July 1st and 2nd, fair (C) on the 3rd, good again (B) on the 4th etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD. 20902.

As a result of the present high level of solar activity, some exceptionally good *10* meter openings are expected to many areas of the world during the daylight hours. Conditions are expected to peak during the afternoon hours, and openings should favor southern and tropical regions.

During the hours of darkness also look for some good DX openings on *40* meters, but seasonally high static levels may often make this band very noisy. High static levels are also likely to dampen DX openings on *80* meters, but some should be possible during the hours of darkness. Not many DX openings are expected on *160* meters during July, because of seasonally high levels of static and increased solar absorption in the northern hemisphere.

Check last month's column for comprehensive band-by-band DX propagation predictions for July.

Short-Skip Openings

This month's column contains *Short-Skip* Charts for July and August, 1979. Optimum short-skip conditions on most bands are expected during July, mainly as a result of the seasonal peak expected in sporadic-E propagation. During the daylight hours considerable short-skip openings are forecast for *10* and *15* meters over distances ranging between approximately 500 and 1300 miles, with some double-hop openings extending out to as much as 2300 miles. Excellent short-skip openings on *20* meters, ranging between approximately 250 and 2300 miles, are expected almost around-the-clock, with conditions expected to peak during the late morning hours and again during the late afternoon and early evening.

Good daytime short-skip openings can be expected on *40* meters, for distances ranging between approximately 100 and 600 miles. Excellent nighttime openings should be possible on this band for distances between 250 and 2300 miles. Good *80* meter short-skip openings are forecast for the daylight hours up to distances of about 300 miles, with the range extending out to 2300 miles during the hours of darkness. While no *160* meter short-skip openings are expected during the daylight hours, some openings should be possible during the hours of darkness for distances up to approximately 1300 miles. When static levels are low, *160* meter nighttime openings may extend considerably beyond this range.

V.h.f. Ionospheric Openings

With a seasonal peak expected in sporadic-E propagation, look for fre-

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distances column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

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

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

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. etc. On the Short-Skip Chart appropriate *daylight time* is used at the *path midpoint.* For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are HST. To convert to daylight time in other USA time zones *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to covert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone, 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave length above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

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

quent short-skip openings on the *6* meter band. Most openings should fall within the 600 - 1300 mile range, but some may be as long as 2300 miles, and others may be somewhat shorter than 600 miles. The best times for these openings are a few hours before noon and again during the early evening hours, although they can take place at any time of the day or night. During many *6* meter sporadic-E short-skip openings, signal levels may reach exceptionally strong levels.

Be sure to check the *2* meter band during intense *6* meter openings. Generally, *2* meter short-skip openings can take place when the shortest skip heard on *6* meters is on the order of 600 miles or less. *Two* meter openings, when they occur, are likely to range in distance between 1000 and 1300 miles.

Chances are good for meteor-type ionospheric openings on the v.h.f. bands during the last days of July. A major meteor shower, the *Delta Aquarids,* should take place between the 28th and 31st.

Although not expected to reach peak intensity until mid-August, the *Perseids,* another major meteor shower is expected to begin during the last days of July, and should provide some openings on the v.h.f. bands.

Considerably fewer Trans-Equatorial (TE) openings are expected on *6* meters during July, but some may still be possible from locations in the southern tier states. The best time to check for TE openings to Latin American should be between 8 and 11 p.m., local daylight time.

Some v.h.f. short-skip openings may be possible during July as a result of auroral ionization. The best dates to look for such openings are shown as DISTURBED or BELOW NORMAL in the "Last Minute Forecast" at the beginning of this column.

CQ Short-Skip Propagation Chart
July & August, 1979
Local Daylight Savings Time At Path Mid-Point

Band Meter	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	08-10 (0-1)* 10-14 (0-3)* 14-18 (0-1)* 18-22 (0-2)* 22-08 (0-1)*	08-10 (1)* 10-14 (3)* 14-18 (1-2)* 18-22 (2-3)* 22-08 (1)*	08-10 (1-0)* 10-14 (3-1)* 14-18 (2-1)* 18-20 (3-2) 20-22 (3-1)* 22-08 (1-0)*
15	*Nil*	08-10 (0-2)* 10-14 (0-3)* 14-18 (0-2)* 18-20 (0-3)* 20-22 (0-2)* 22-08 (0-1)*	08-10 (2)* 10-14 (3)* 14-18 (2)* 18-20 (3)* 20-22 (2)* 22-00 (1-2)* 00-08 (1)*	08-10 (2)* 10-14 (3)* 14-18 (2-3) 18-20 (3-4) 20-22 (2-3) 22-00 (2) 00-08 (1-0)
20	10-01 (0-1)*	07-10 (0-2)* 10-18 (1-4)* 18-22 (1-3)* 22-00 (1-2)* 00-07 (0-1)*	07-10 (2-4) 10-18 (4) 18-22 (3-4)* 22-00 (2-4)* 00-02 (1-3)* 02-07 (1-2)*	08-10 (4) 10-16 (4-3) 16-00 (4) 00-02 (3) 02-07 (2) 07-08 (4-3)
40	08-10 (2-4)* 10-15 (3-4) 15-20 (4) 20-22 (2-4) 22-00 (1-3) 00-08 (1-2)*	08-10 (4) 10-12 (4-3) 12-17 (4-2) 17-18 (4-3) 18-22 (4) 22-02 (3-4) 02-05 (2-4) 05-08 (2-3)	09-10 (4-1) 10-12 (3-1) 12-17 (2-1) 17-18 (3-1) 18-21 (4-3) 21-05 (4) 05-06 (3-4) 06-08 (3) 08-09 (4-2)	09-18 (1-0) 18-19 (3-0) 19-20 (3-1) 20-21 (3-2) 21-22 (4-3) 22-06 (4) 06-07 (3-2) 07-08 (3-1) 08-09 (2-0)
80	06-12 (4) 12-16 (4-3) 16-00 (4) 00-06 (3-4)	07-08 (4-2) 08-10 (4-1) 10-12 (4-0) 12-16 (3-0) 16-18 (4-1) 18-20 (4-2) 20-22 (4-3) 22-07 (4)	07-08 (2-1) 08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-19 (2-0) 19-20 (2-1) 20-21 (3-1) 21-22 (3-2) 22-05 (4) 05-06 (4-3) 06-07 (4-2)	07-19 (0) 19-20 (1-0) 20-21 (1-0) 21-22 (2-1) 22-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (-)

160	18-19 (0-1) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 08-09 (1) 09-10 (1-0) 10-18 (0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 06-08 (2-1) 08-09 (0-1) 09-19 (0)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0) 08-21 (0)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0) 07-21 (0)

*Predominantly Sporadic-E Openings

HAWAII
July & August, 1979
Openings Given In Hawaiian Standard Time

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

ALASKA
July & August, 1979
Openings Given in GMT

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

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

See explanation in "How To Use Short-Skip Charts" which appears in the box at the beginning of this column.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter openings, use the preceding Short-Skip Propagation Chart.

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

Writing about something that took place over three months ago can hardly come under a topical subject, however a few words about our WPX SSB Contest last March certainly is not out of order.

Propagation was not at its peak but conditions were good and any lack of DX activity was more than made up by all those unusual stateside prefixes. When things got a little dull you could concentrate on looking for new stateside prefixes to fatten your multiplier.

The cooperation of the fellows had to be commended since the fellows with a high QSO total had little to gain in stateside exchanges.

QSO totals in the four figures were commonplace. Working stateside stations is a must in the WPX Contest. Bernie, W8IMZ and I found the 40 meter band very productive.

If the many written and over the air inquiries are any indication I have a feeling that the new WPX C.W. Contest that took place in May was also a big success.

It will be interesting to see the outcome.

73 for now, Frank, W1WY

Venezuelan Contest
Phone: July 7-8 C.W.: July 28-29
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is a world wide type contest, therefore work other countries as well as YV stations.

There are four categories, single operator, single and all band, and multi-operator, single and multi transmitter. There is also a s.w.l. division

Exchange: RS(T) report plus a 3 figure QSO number starting with 001.

Points: Contacts between stations in different countries 2 points. Between stations in the same country zero (0) but permitted for multiplier credit.

Multiplier: One for each country, each YV call area and each USA call district worked on each band.

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

Awards: There are a large variety of contest awards as follows:

Plaques: to the top scorers in each of the 4 categories.

Medals: To the highest scoring station in each of the following areas. North America, Central America, South America, Caribbean, Bolivarian Countries, Europe, Africa, Asia, Oceania and s.w.l.

Certificates: To all station having contacted the following totals. (a) 15 YV's plus 10 different countries, for stations in North, Central, South America, Caribbean and Bolivarian countries. (b) 10 YV's plus 10 countries for Europe and Africa. (c) 5 YV's plus 10 countries for Asia and Oceania. (d) S.w.l. report 50 complete QSO's including at least 10 YV's. (Both exchanges must be reported.)

Log times in GMT, indicate

Calendar of Events

July 7-8	Venezuelan Phone Contest
July 14-15	IARU Radiosport Champ.
July 14-15	Colombian DX Contest
July 14-15	10-10 Net QSO Party
July 21-22	VHF Space Net Contest
July 21-22	AGCW-DL QRP Contest
July 28-29	Venezuelan C.W. Contest
July 28-30	County Hunters Contest
July 28-30	New Jersey QSO Party
July 28-30	Rhode Island QSO Party
Aug. 11-18	Brancoft "Homecoming"
Aug. 25-26	All Asian C.W. Contest
Sept. 8-9	CLARA AC/DC Contest
Sept. 15-16	Scandinavian CW Contest
Sept. 22-23	Scandinavian Phone Contest
Sept. 29-30	Delta QSO Party
Oct. 6-7	VK/ZL/Oceania Phone
Oct. 13-14	VK/ZL/Oceania C.W.
Oct. 20-21	WADM DX Contest
Oct. 27-28	**CQ WW DX Phone Contest**
Nov. 24-25	**CQ WW DX C.W. Contest**

(Sept. 1 - Nov. 30 RTTY Art Contest)

This is the happy group that manned IZ4VEQ in the '78 CQ WW Phone Contest last October. They must have been pleased with their score. Check next month's issue to see if they had reason to be happy. L to R. - I4ADS, I4LCK, I4ZSQ, I4RYC, I4USC and I4VEQ. I4LEC did not make it. (Photo by I5NSR)

14 Sherwood Road, Stamford, CT 06905

multiplier only first time it is worked on each band, and use a separate sheet for each band. Include a summary sheet showing the scoring, category and etc., the usual signed declaration, and your name and address in Block Letters.

Disqualification regulations for duplicate contacts in excess of 3%, logging irregularities and other violations will be strictly enforced.

A remittance of $2.00 or its equivalent in IRC's is requested with each certificate application. (Repeat certificate winners will be issued a colorful endorsement sticker.)

Stateside participation was very poor in last year's contest. This is rather surprising since you do not have to be a contest winner to qualify for a certificate. (see above requirements). The certificate is the most colorful I have ever seen and is worth your effort.

Mailing deadline is Sept. 15th for phone, and Oct. 15th for c.w. entries. Mail to: Radio Club Venezolano, P.O. Box 2285, Caracas 101, Venezuela.

IARU Radiosport Championship

Starts: 0000 GMT Saturday, July 14
Ends: 2400 GMT Sunday, July 15

This one has become a permanent fixture since its initial start three years ago.

It's a worldwide competition, all bands, 160 thru 2 meters, single and multi-operator, single xmtr. only.

There are three categories, c.w. only, phone only, and mixed c.w. and phone. Multi-operator entries used mixed mode only.

Each station may be worked once per band only regardless of the mode. Crossband contacts are not permitted except via Oscar which counts as a separate band.

A maximum of 36 hours of operating time for single operator stations. Off times must be at least 30 minutes and indicated in your log. There is no time limit for multi stations but operation must remain on the same band for at least 10 minutes.

Exchange: Signal report and your ITU zone.

Points: One point for QSOs with stations in your own zone, 3 points if station is outside your zone but on the same continent, and 5 points if on a different continent.

Multiplier: Sum of different ITU zones worked on each band.

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

Awards: Certificates to the top scorers in each category, in each ARRL section, each ITU zone, and each DX country. Additional achievement awards are available for making 250 QSOs, 1000 QSOs and/or contacting 50 or more zones. In case of multiple award levels achieved only the highest award will be issued.

U.S. and Canadian entries must use official log and summary sheets which may be obtained from ARRL. Also request forms CD-77, CD-175 and the ITU zone list. A large s.a.s.e. with at least 28¢ postage will get you a good supply.

All entries worldwide go to: IARU Headquarters, Box AAA, Newington, CT 06111 USA. Mailing deadline is August 30th.

Colombian Contest

Starts 0001 GMT Saturday, July 14
Ends: 2359 GMT Sunday, July 15

This year's contest will be commemorating the 169th Anniversary of Colombia's Independence. Exchange will be on a world wide basis.

All bands, 3.5 thru 28 MHz., phone and c.w. Three classes, single operator, single band and all band; multi-operator single transmitter.

Exchange: RS(T) plus a 3 figure QSO number starting with 001.

Scoring: QSOs with HK's 5 points, with stations in North America 3 points, other DX countries 2 points, and with same country 1 point. The multiplier is determined by sum of DX countries worked on each band

Final Score: Sum of QSO points from all bands multiplied by sum of different countries worked on each band.

Awards: A silver plate to the overall world winner. There are nine diplomas, six to the continental winners and three to the top scoring station in each category. Certificates will be issued to the top scoring station in each country.

A minimum of 50 QSOs must be shown by all award winners.

Use a separate log sheet for each band, indicate the country only the first time it is worked, Also include a summary sheet with your entry showing the scoring and a signed declaration. The usual rules of disqualification will be enforced.

Mailing deadline is September 30th to: L.C.R.A. Concurso Independencia, Apartado Postal 584, Bogota, Colombia

Ten - Ten Net QSO Party

Starts: 1900 GMT Saturday, July 14
Ends: 1900 GMT Sunday, July 15

This is the summer edition of the Ten-Ten International Net QSO Party. Activity of course is on 10 meters only. It is open to all amateurs but only members are eligible for awards. (No mention was made if non-members should submit a report.)

Classes: Single operator and QRP stations using 20 watts or less PEP.

Exchange: Call, name, city, state and 10-10 number.

Scoring: One point per contact, add an additional point if QSO is with 10-10 member. Total QSO points is your score. There is no multiplier.

Awards: First place certificates for each class in each U.S. and Canadian call areas, and to 11 continental and sub-continental areas including KL7 and KL6 and other Pacific islands.

Time on your log must be in GMT and a station may be counted only once. Include the name of your local chapter for club credit.

Logs must be received no later than August 4th and go to: Robert C. Mugherini, WA1AKS, P.O. Box 169, Randolph, Mass. 02368. Results will be published in the Fall Quarterly Bulletin.

VHF Space Net Contest

From 6 P.M. Saturday, July 21 to 9 P.M. Sunday, July 22. (Local Time)

Like previous VHF Space Net activities this one is in commemoration of an event in the Space program. This one honors the 10th Anniversary of Apollo II, "Man's first landing and walk on the Moon."

Activity will be on all v.h.f. and u.h.f. bands, all modes but no repeater contacts.

Exchange: Signal report and Zip code, P.O. location for out of country contacts.

Points: Each contact is worth 2 points. The same station may be reworked in a different mode for 2 additional points. And 2 more points if worked on a different band.

Multiplier: Each different Zip Code and/or P.O. location worked. (Counted once only)

Score: Total QSO points multiplied by the number of Zip Code and/or P.O. locations.

Awards: Plaques to each of the following:

I. Station using 100 to 500 watts
II. 25 to 100 watts input.
III. 5 to 25 watts input.
IV. Less than 5 watts input.
V. YL's only, any power.
VI. Club competition.

Also certificates to 2nd and 3rd place winners in all classes.

There is a special certificate for all stations working contest organizer K4AWS. (Tony has indicated that this may be the last of the Space Net contest program. Therefore it is highly suggested that you do not pass up this one.)

Mailing deadline for all entries is

August 17th to: VHF Space Center, Att: A.W. Slapkowski, K4AWS, P.O. Box 15, Sumterville, FL 33585

AGCW-DL QRP Contest
Starts: 1500 GMT Saturday, July 21
Ends: 1500 GMT Sunday, July 22

There have been some modifications to the rules in this year's contest, so I would suggest you look them over carefully.

It's still a c.w. only, all bands 10 thru 160, and the same station can be worked once on each band for QSO credit.

There are 5 classes as follows:

A. - Single Opr., 3.5 watts or less input.

B. - Single Opr., 10 watts or less input.

C. - Multi-Opr., 10 watts or less input.

D. - QRO stations, over 10 watts input.

E. - S.W.L. entries.

Multi-opr. stations may operate the full 24 hours, all others must take a 9 hour break.

Exchange: RST, QSO no., and power input. Add X if crystal-controlled. (559001/5x) (579001/QRO for QRO stations)

Points: QSO with own country, 1 point. With stations in own continent, 2 points. With DX outside own continent, 3 points. Crystal-controlled stations double above.

Crystal-controlled stations are limited to 3 crystals for each band.

Multiplier: One for each country worked. And one for each DX contact.

Final Score: Total QSO points times the sum of the multiplier on that band. Then add the sum of the score from each band.

For scoring purposes call areas in JA, PY, VE, VK, W, and ZS are counted as a multiplier.

Awards: Certificates to the first three place in each class and country.

Special log sheets are available from the Contest Mgr. (s.a.e. plus 2 IRCs)

Submit your log no later than 6 weeks after end of contest to: Siegfried Hari, DK9FN, Spessartstrasse 80 - D-6453 Seligenstadt, Fed. Rep. of Germany.

County Hunters C.W. Contest
Starts: 0000 GMT Saturday, July 28
Ends: 0200 GMT Monday, July 30

The County Hunters invite and encourage mobile and portable operation from the less active counties during this contest.

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

Exchange: QSO. no., category (P -portable or M - Mobile) RST, state, province or country, and county for U.S. stations.

Scoring: QSO's with a fixed station 1 point, 3 points if it's a portable or mobile. Multiply total QSO points by number of U.S. counties worked. Mobile and portables calculate their score for contacts made within a state.

Frequencies: 3575, 7055, 14070, 21070, 28070, KHz. It is requested that P or M stations use frequencies below 7055 and below 14070, others spread out above those frequencies.

Awards: Certificates in three categories:

F - Top fixed or fixed portable in each state, province or county with 1000 or more points.

P - Top score in each state by a portable operating from a county other than its normal location with 1000 or more points.

M - Top scoring mobile in each state operating from 3 or more counties with a minimum of 10 QSOs from each county.

There are also Trophies for the single operator Portable and Mobile in the United States. Additional awards where deemed appropriate.

Stations with 100 or more contacts *must* include a check sheet of countries worked. Enclose a large s.a.s.e. if results are desired.

Mailing deadline is Sept. 1st to: C.W. County Hunters Net, c/o Jeffrey P. Bechner, W9MSE, 673 Bruce Street, Fond du Lac, Wisc. 54935

New Jersey QSO Party
Two Periods GMT
2000 Sat. to 0700 Sun. July 28/29
1300 Sun. to 0200 Mon. July 29/30

This is the 20th annual party sponsored by the Englewood A.R.A. The same station may be worked on each band and mode, and N.J. may work in-state stations for QSO and multiplier credit.

Exchange: QSO no., RS(T) and QTH. County for N.J., ARRL section or country for other.

Scoring: N.J. stations score 1 point for W/K and VE/VO contacts, 3 points for DX. Multiply total by ARRL sections worked. (max. of 75) KP4, KH6, KL7, KZ5 etc. are 3 point contacts and also a section multiplier.

Out-of-state stations multiply total N.J. QSOs by N.J. counties worked. (max. of 21)

Frequencies: 1810, 3535, 3905, 7035, 7135, 7235, 14035, 14280, 21100, 21335, 28100, 28600, 50-50.5, 144-146. Phone on even hours, 15 on odd hours and 160 at 0500 GMT.

Awards: Certificates to the top scorers in each N.J. county, ARRL section and DX country. Second place awards if 4 or more logs are received from that section. Also Novice and Technician awards.

Use GMT, indicate the multiplier only the first time it is worked and include a summary and QSO check sheet. A large s.a.s.e. if you wish a copy of the results.

Stations planning activity in N.J. are requested to advise E.A.R.A. by July 7th so that coverage of all counties may be planned.

Logs must be received no later than Aug. 25th and go to: Englewood A.R.A., P.O. Box 528, Englewood, N.J. 07631

Rhode Island QSO Party
Two Periods (GMT)
1700 Sat. to 0500 Sun. July 28/29
1300 Sun. to 0100 Mon. July 29/30

The East Bay Amateur Wireless Association is sponsoring this one. The same station may be worked on each band and mode, and R.I. stations may work other in-state stations.

Exchange: RS(T) and QTH. County for R.I.; state, province or country for others.

Scoring: *For R.I.* - Two points per QSO, 5 points for R.I. Novice and Techs.

All Others - Two points for each R.I. QSO, 5 points if it's with a Novice or Tech. (Novice and Techs must sign /N or /T to identify their class.)

Contacts with Club station N1RI are worth 10 points.

Final Score: *For R.I.* - Total QSO points X (R.I. counties + states + provinces + DX countries.)

All Others - Total QSO points X R.I. counties worked. (Max. of 5. Bristol, Kent, Newport, Providence and Washington.)

Frequencies: C.W. - 1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110. Phone - 3920, 7260, 14300, 21360, 28600, 50.3, 145.1 (No Repeaters.)

Awards: Certificates to top scoring stations in each R.I. county, state, province and DX country. And to Novice and Tech. winners in each R.I. county and each state. There is a Club award for clubs in each state, province and DX country. (min. of 3 logs per each club.) This year a plaque has been added for the Top R.I. and Top out of state score.

Include a summary sheet with your entry showing the scoring, club affiliation and other information.

Mailing deadline is August 31st to: East Bay A.W.A., P.O. Box 392, Warren, R.I. 02885. Include a s.a.s.e. for copy of the results.

CQ Showcase

The ICOM IC-280 2-Meter Mobile F.M. Transceiver

The versatility of a microprocessor is exemplified in the new ICOM IC-280 2-meter mobile f.m. transceiver.

A cable allows remote control operation of the unit so that the operator and radio need not be within touching distance.

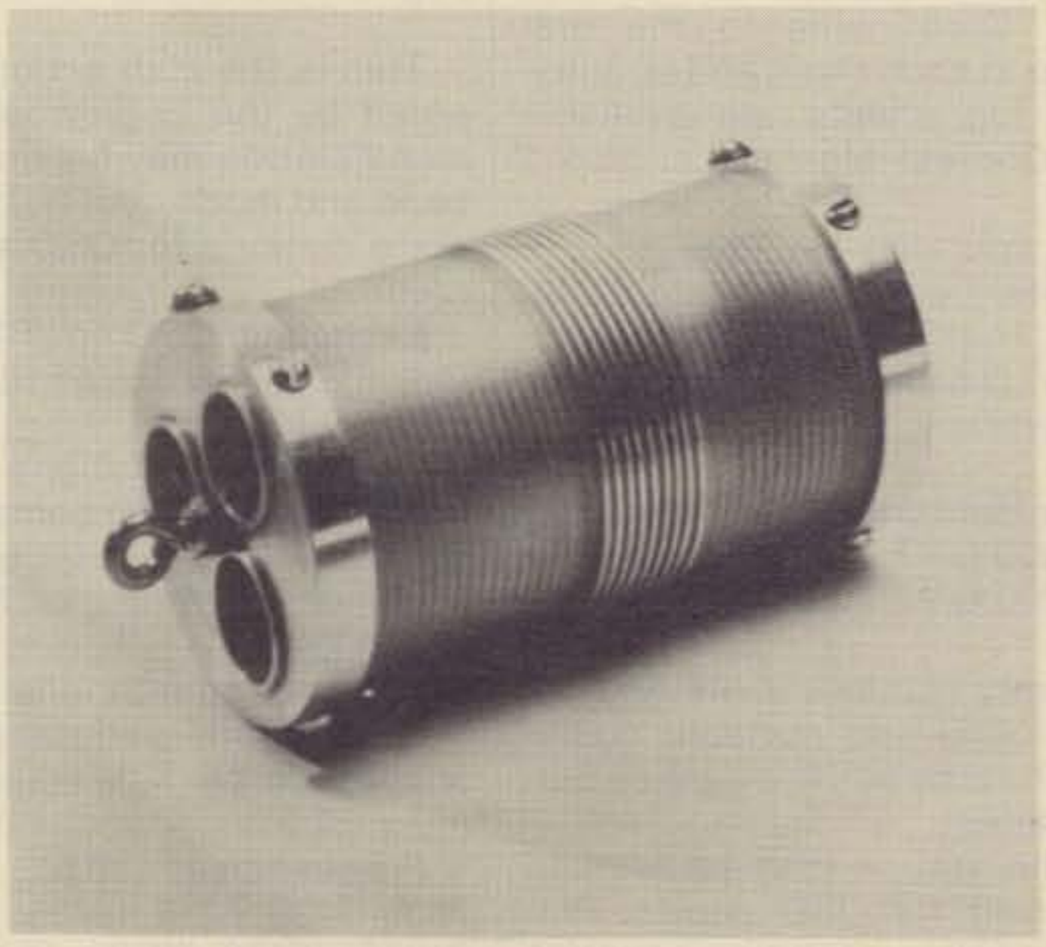
The microprocessor covers all the 4 MHz of the two meter band, plus some at both ends in 15 or 5 kHz steps which are either user selectable or processor selectable. In addition, there are three memory channels which can store any frequency which can be programmed into the dial. The unit is rated at 10 watts.

For more information about the IC-280, contact ICOM East, Inc., 3331 Towerwood Dr., Dallas TX 75234, or ICOM West, Inc., 13256 Northrup Way, Suite 3, Bellevue WA 98005, or circle number 73 on the reader service card.

Microwave Filter Co., Inc.'s 80-Meter Antenna Traps

Microwave Filter (Unadilla/ Reyco Division) has added a pair of 80-meter antenna traps (the KW-80) to its line of 10-15-20-40 meter series. The KW-80 takes maximum legal power, is weatherized and is available for the c.w. band (KW-80C) or for the phone band (KW-80F). Price and delivery for the made-to-order KW-80 is $169 a pair and two weeks, respectively.

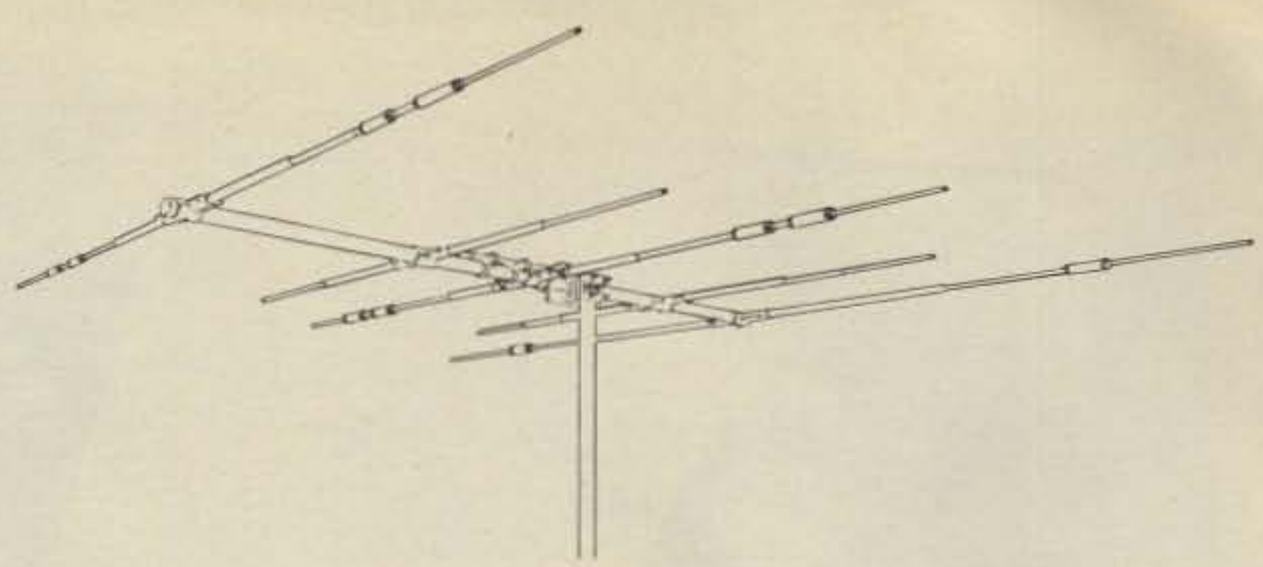
For more information contact Microwave Filter Co., Inc. at 6743 Kinne St., East Syracuse NY 13057, or circle number 76 on the reader service card.



The Peripheral People's "Data Dubber"

Many tapes produced for the Radio Shack TRS-80 are done on high speed duplicators. Invariably, some form of distortion is introduced by these machines. Recordings that have waveform distortion, noise, hum and minor dropouts can be regenerated by the "Data Dubber" to produce data pulses identical with the TRS-80 CSAVE data stream. These idealized pulses can either CLOAD the TRS-80 or feed a second recorder for duplicating tapes. The regeneration technique employed works equally well on Level I or Level II recordings.

The "Data Dubber" is priced at $39.95 and is available from The Peripheral People, Box 524, Mercer Island WA 98040, or circle number 63 on the reader service card for more information.



Hy-Gain's Model TH5DX 10-15-20 Meter Antenna

Hy-Gain Electronics, a division of Telex Communications, Inc., introduced its newest member of its Thunderbird line of triband antennas.

The TH5DX features five elements on an 18 foot boom, with three active elements on 15 and 20 meters and four active elements on 10 meters. The TH5DX also features separate air-dielectric hi-Q traps for each band, thus allowing the antenna to be set for the maximum front-to-back ratio and the minimum beam width possible for a tribander of this size.

Standard on the antenna are Hy-Gain's unique beta match, rugged boom-to-mast bracket, taper-swaged elements and improved compression clamps.

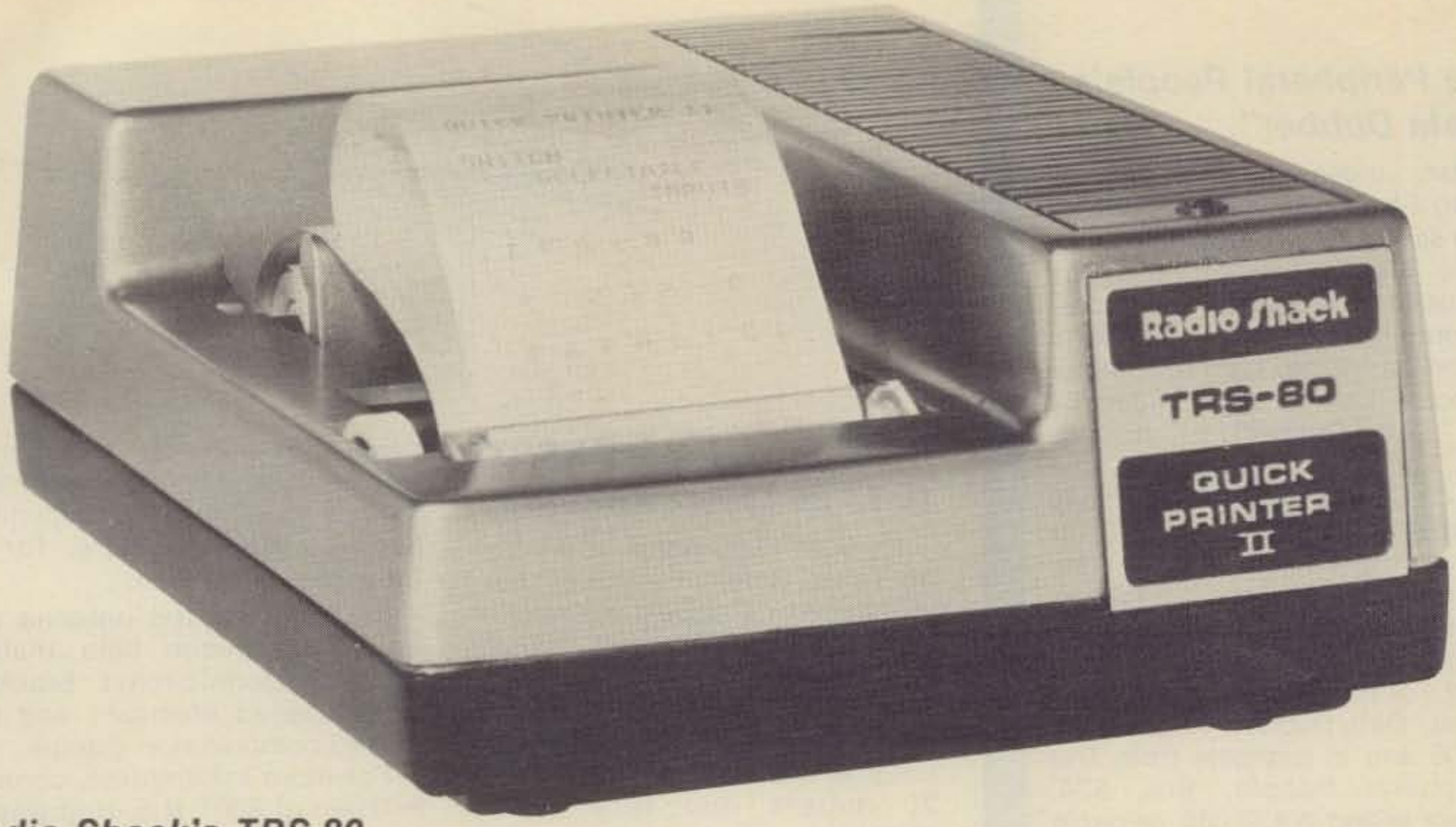
For more information, contact Hy-Gain at 8601 N.E. Highway 6, Lincoln NE 68505, or circle number 77 on the reader service card.

SST Electronics' DL-1 (K4RLJ) Dummy Load

The SST DL-1 is a new concorrosive chemical dummy load which has been developed and tested by K4RLJ for 12 years. The DL-1 will not leak; it is sealed and ready for use.

The DL-1 is rated at 1000 watts p.e.p. for 15 seconds. S.w.r. is less than 1.5:1 from 1 to 225 MHz. Its size is 3-1/8" x 4-3/8" and costs $17.95.

For more information, contact SST Electronics at P.O. Box 1, Lawndale CA 90260, or circle nmber 72 on the reader service card.



Radio Shack's TRS-80 Quick Printer II

Radio Shack has introduced a new printer that produces low-cost hard-copy output on 3-3/8″ wide aluminum paper.

The Radio Shack TRS-80 Quick Printer II prints both upper and lower case characters, as well as double-size characters and double-spaced characters to allow for special effects such as tilting pages or printing headings.

Automatic *wraparound* prevents data loss due to overflow when the text exceeds the maximum line length. The printer is software selectable for 16 or 32 characters per line, and produces 120 lines per minute, 64 characters per second.

The Radio Shack TRS-80 Quick Printer II is priced at $219.

For more information, contact your local Radio Shack dealer, or circle number 69 on the reader service card.

Centurion International's Line Of "Rubber Duck" Replacement Antennas

Centurion International has introduced a comprehensive line of flexible replacement antennas for hand-held transceivers.

Four styles are available, one each for low band and high band and a 6″ whip or a 2″ "shorty" for u.h.f. All styles are available on any of 13 different connector terminations to fit virtually any model. Impedance is 50 ohms, with a 35 watt power rating.

To get more information, contact Centurion International, P.O. Box 82846, Lincoln NE 68501, or circle number 62 on the reader service card.

Cincinnati Electrosystems, Inc.'s Debounce Switch

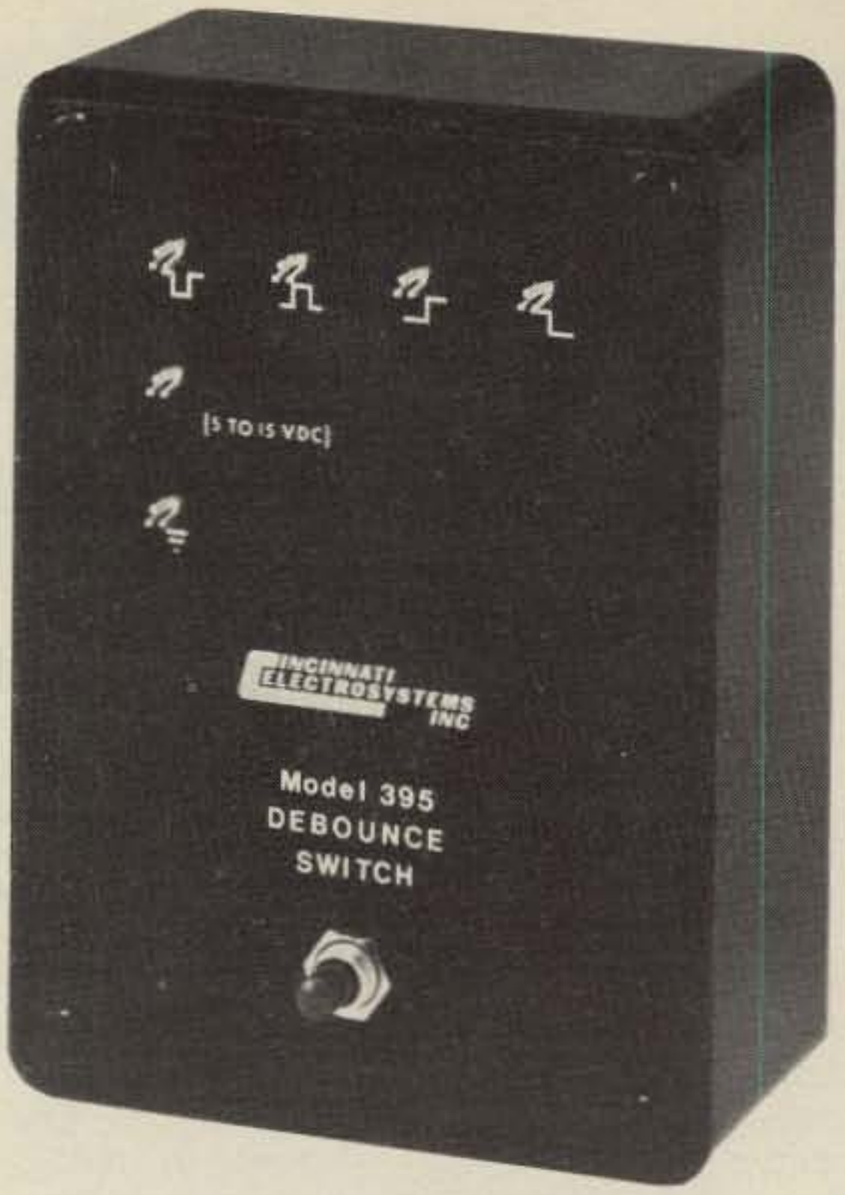
Cincinnati Electrosystems, Inc. announces a new "black box" that provides a convenient method for clocking logic circuits without contact bounce.

A push button switch generates a choice of a positive or negative 10 microsecond pulse or a level change. The instrument has numerous applications from breadboarding circuits to checking electronic systems.

This latest addition to Cincinnati's *Black Box* series of compact lab instruments is priced at $7.95.

The Debounce Switch measures 4″ x 2-7/8″ x 1-9/16″ and is powered from a 5 to 15 volt source.

For more information, contact Cincinnati Electrosystems, Inc., 469 Ward's Corner Road, Loveland OH 45140, or circle number 71 on the reader service card.



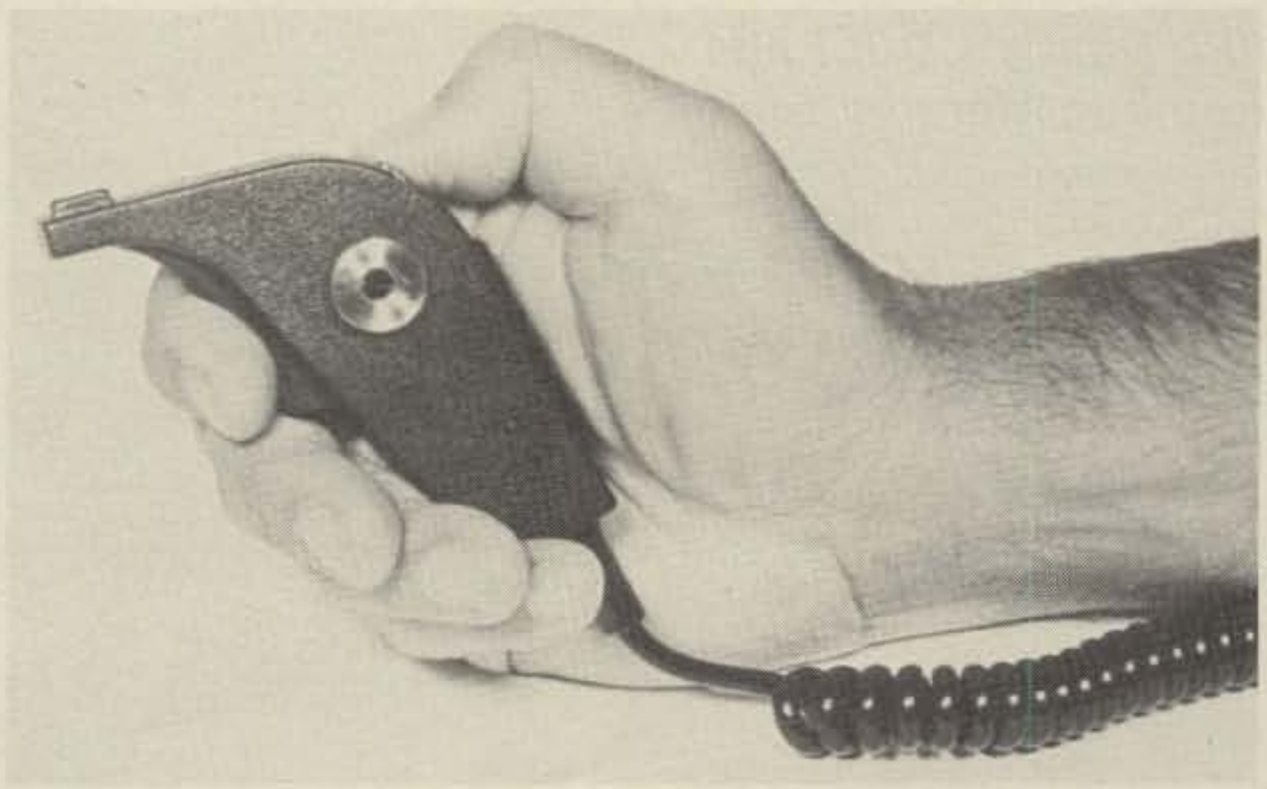
JMR Systems Corp.'s Pistol Grip Microphone

A hand-held noise cancelling microphone has been introduced by JMR Systems Corp.

The JMR Model 45 Silencer™ is a compact microphone that utilizes a noise cancelling electret capacitor to permit clear, crisp voice communications in noisy environments. It features a slim cartridge design for maximum noise cancelling and a pistol-grip shape that places the talk switch and variable gain control at your fingertips. It is offered in rising frequency or flat response models for radios with our without voice processing.

Incorporating a FET amplifier, the Model 45 adapts to any transceiver impedance. The microphone cancels more than 15 dB of ambient noise. It is conveniently stored on a velcro pad, or on a standard mounting lug.

The JMR Model 45 Silencer™ is priced at $54.95 and is available from JMR Systems Corp., 168 Lawrence Rd., Salem NH 03079. For more information, circle number 75 on the reader service card.



Sinclair Radionics, Inc.'s Model 450 Multimeter

Sinclair Radionics, Inc. announces the release of its latest digital multimeter, the DM-450, which provides a total of six functions in 34 ranges.

Basic accuracy of this 4½ digit LED instrument is 0.05% and the display intensity is adjustable.

In addition to the standard 10M ohm input impedance, the basic d.c. range can be selected with an impedance, the basic d.c. range can be selected with an impedance greater than 1000M ohms, which is essential in use with most MOS circuits.

The DM-450 measures d.c. voltage from 10 μV to 1200 volts, a.c. voltage from 100 μV to 750 volts (upt to 20 kHz), a.c. and d.c. current from 1nA to 10A directly, and resistance from 10m ohm to 20M ohms. The instrument is housed in an ABS case and is 1.6" high, weighing one and one-half pounds.

The DM-450 costs $199.

For more information contact Sinclair Radionics, Inc., 66 Mount Prospect Ave., P.O. Box 1528, Clifton NJ 07015, or circle number 68 on the reader service card.

Cornell-Dubilier Electric Corp.'s CDE Antenna Rotor Systems Catalog

Cornell-Dubilier Electric Corp. has released a new eight page color brochure presenting their complete line of antenna rotor systems. Each of the six rotor systems is illustrated and described.

The systems include the Tailtwister™, designed for large sized antenna arrays of up to 30 square feet wind load area, the new Ham IV™, the new CD-45, the Big Talk™, the AR-40, and the AR22XL.

A complete specification chart is also included covering all six models.

For additional information, contact Cornell-Dubilier at 150 Avenue L, Newark NJ 07101, or circle number 74 on the reader service card.

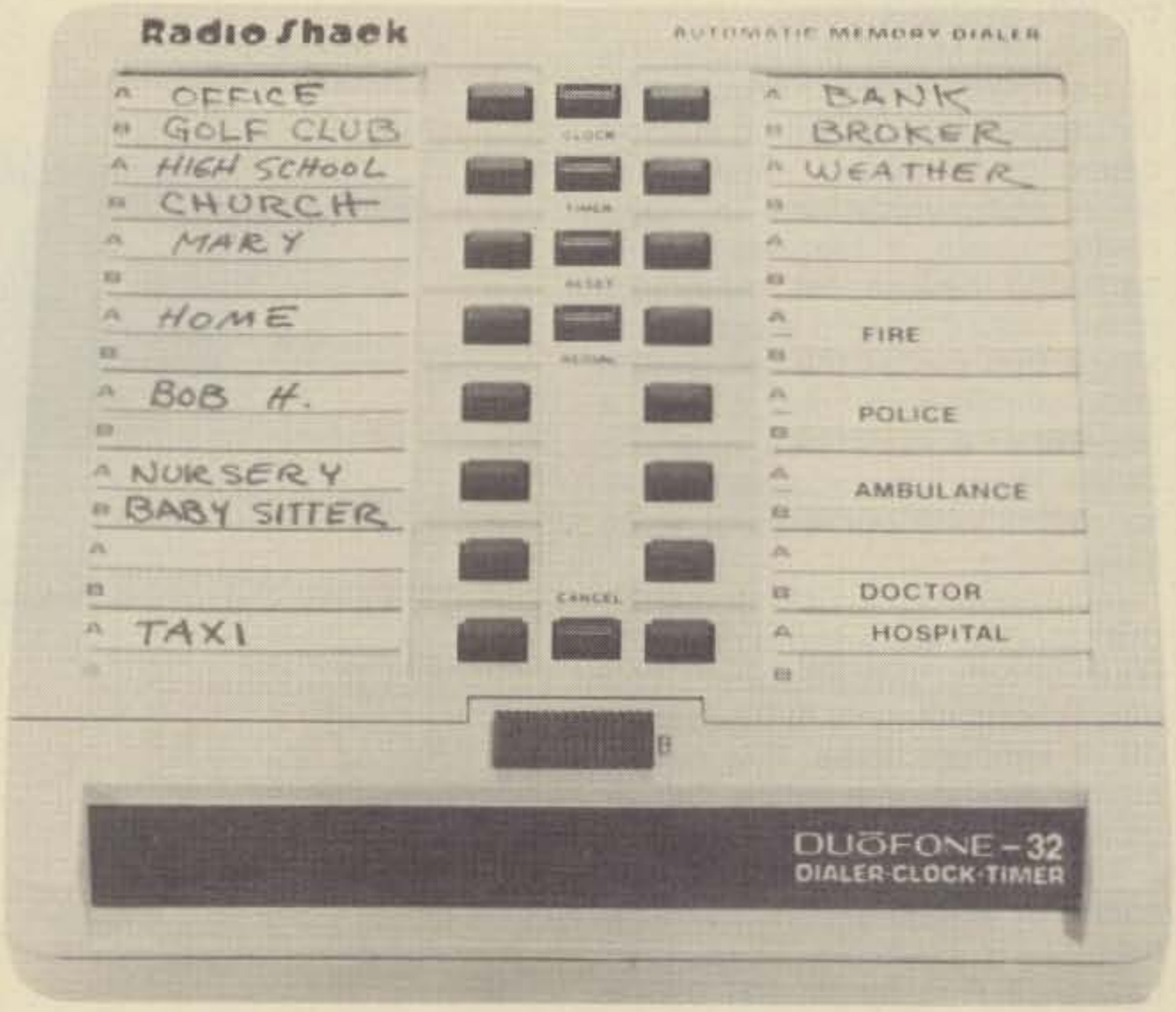
Radio Shack's DuoFone *Automatic Memory Dialer*

Now you can dial frequently called or emergency telephone numbers, and even long distance, at the touch of a single button with Radio Shack's new *DuoFone*-32 can store up to 32 different telephone numbers of up to 14 digits each. This allows instant one-button dialing of long-distance numbers even on phone systems using an access digit or dial "9" for an outside line feature.

The *DuoFone*-32 includes a built-in LED digital clock, and a timer that indicates elapsed time up to one hour. It can be used on single-line phones only, either dial or push-button types.

The unit operates on 120 v.a.c. and on three "AA" batteries for auxiliary power to prevent loss of stored numbers in the event of power failure or if the unit is moved to another location.

The *DuoFone*-32 costs $99.95.



For more information see your local Radio Shack dealer, or circle number 65 on the reader service card.

Karedon, Ltd.'s Electric Plug Anchor

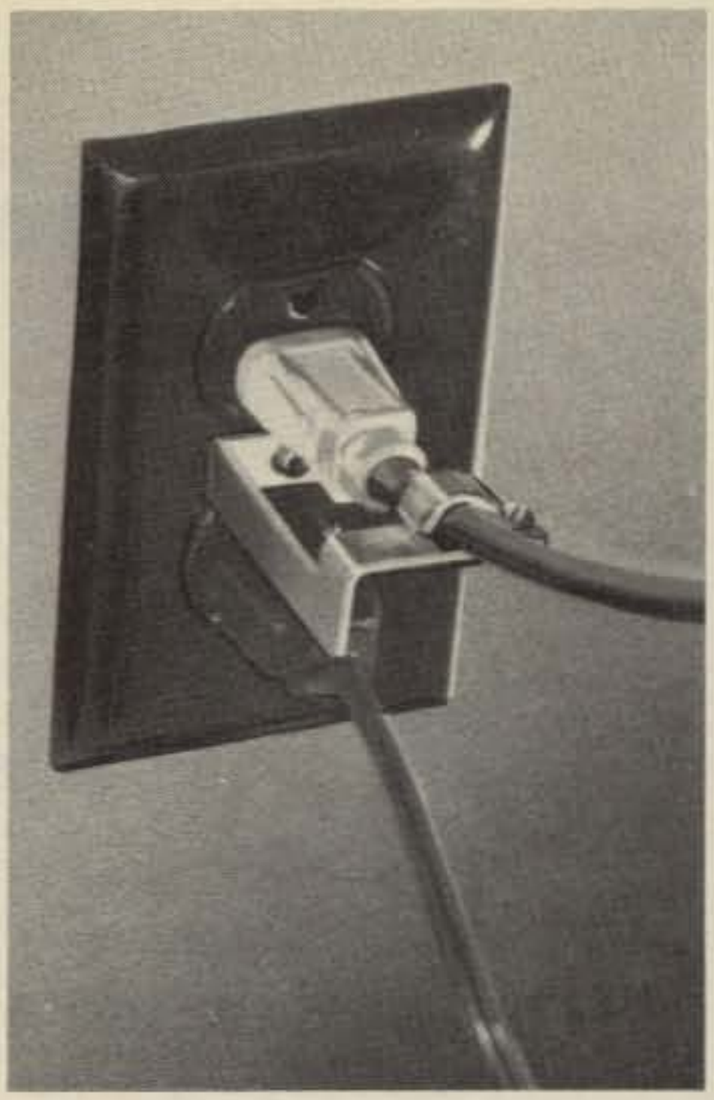
Karedon, Ltd. has introduced a product called *Plug-Lock*, which provides a means of anchoring small and large electric cords when plugged into wall sockets.

Made of aluminum, it is secured to the outlet using the existing face plate screw. Made to handle extra large plugs, it extends outward from the outlet where a screw-clamp secures the cord against strain.

Plug-Lock is particularly useful when using electrically powered tools or for instruments which must not come unplugged.

Plug-Lock is available in hardware and electrical supply store as 79 cents each.

For more information, contact Karedon, Ltd., 6000 Cornhusker Hwy., Lincoln NE 68507, or circle number 64 on the reader service card.



Percom Data Co.'s Add-On Mini-Desk Systems For The Radio Shack TRS-80

Percom has announced the expansion of its "add-on" mini-disk data storage systems for the Radio Shack TRS-80 microcomputer to include both 40 and 77 track drives.

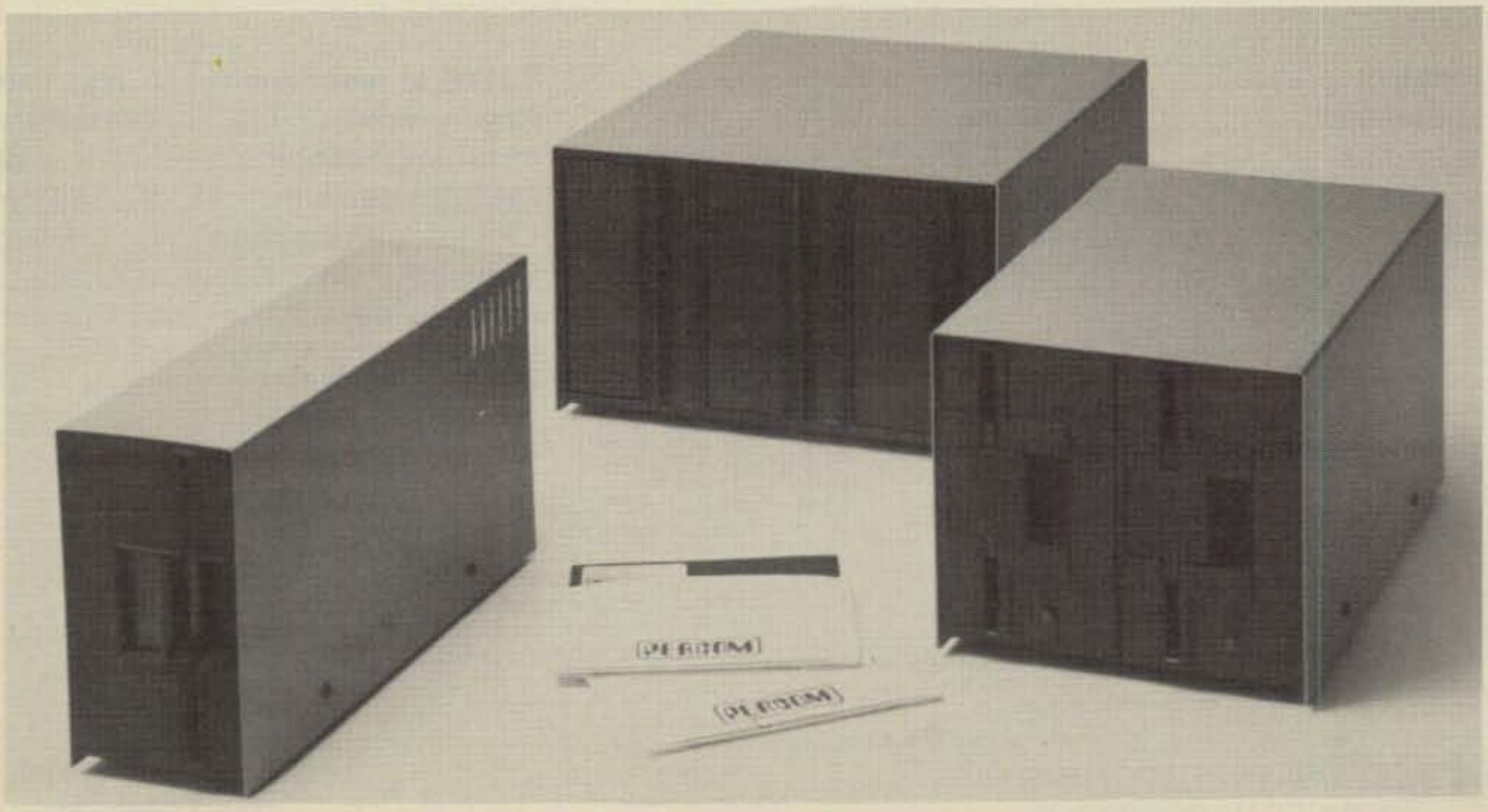
One-, two-, and three-drive systems can be supplied with either 40-track TFD-100™ drives or 77-track TFD-200™ drives.

The capability of the TFD-100 units to accomodate "flippy" mini-disks increases disk storage capacity to almost 250k bytes compared to only 90k bytes for the usual single-sided 35-track units.

The 77-track TFD-200 stores up to 197k bytes and a three-drive system provides 591k bytes of on-line storage. The 77-track mini-disks are single-sided.

With each disk system sold, Percom supplies a Patch Pak #1™ mini-disk which includes programs to patch TRSDOS™, the TRS-80 disk operating system, for 40 and 77 track operation.

For more information, contact Percom Data Co., 211 N. Kirby, Garland TX 75024, or circle number 60 on the reader service card.



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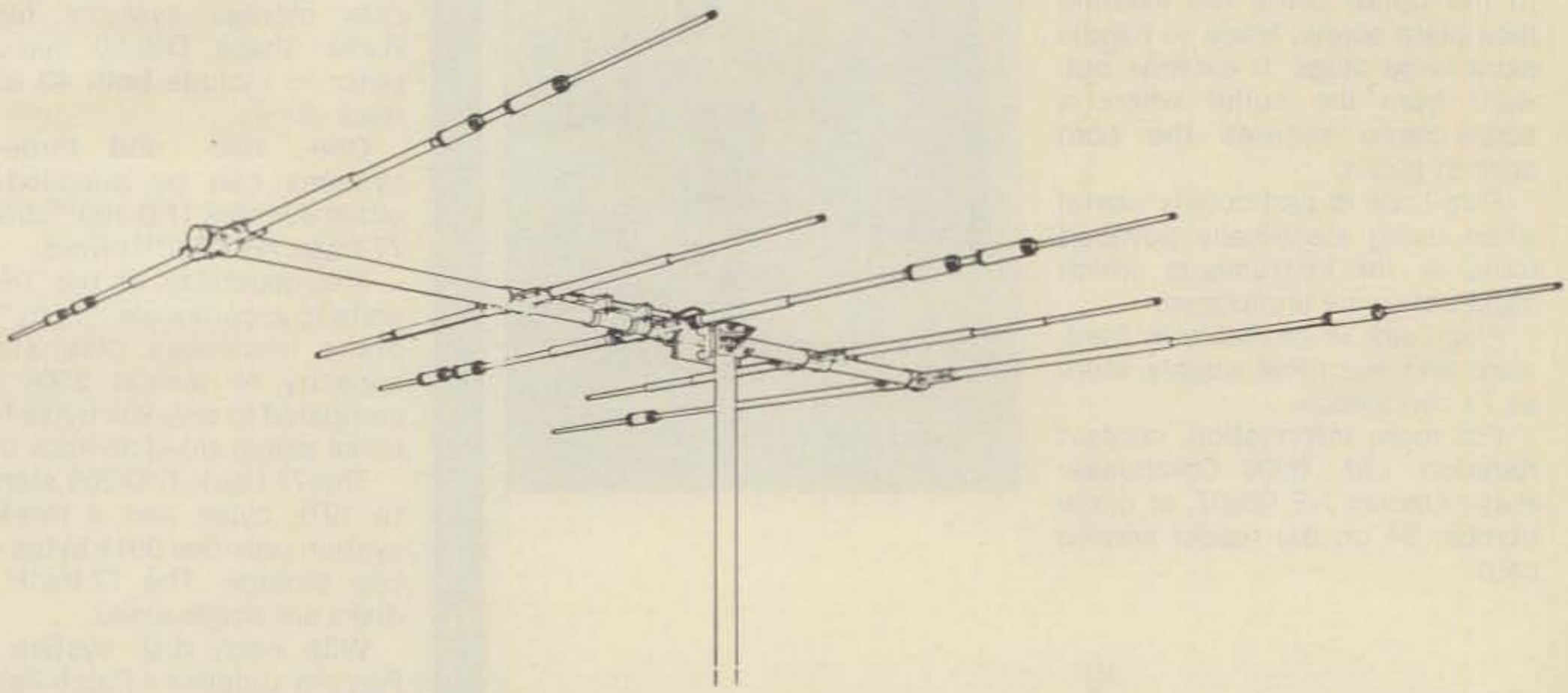
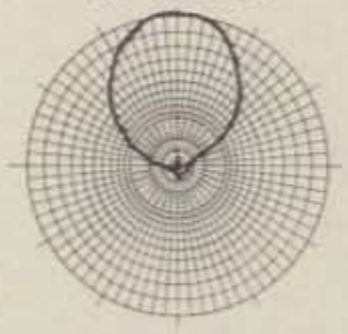


We are proud to introduce the newest member of our famous Thunderbird line of Tri-Band antennas. The TH5DX offers outstanding performance on 20, 15, and 10 meters. It features 5 elements on an 18 foot boom, with 3 active elements on 15 and 20 meters and 4 active elements on 10 meters. The TH5DX also features separate air-dielectric Hy-Q traps for each band. This allows the TH5DX to be set for the maximum F/B ratio and the minimum beam width possible for a Tri-Band antenna of this size. Also standard on this antenna are Hy-Gain's unique Beta-match, rugged Boom-to-mast bracket, taper-swaged elements and improved element compression clamps.

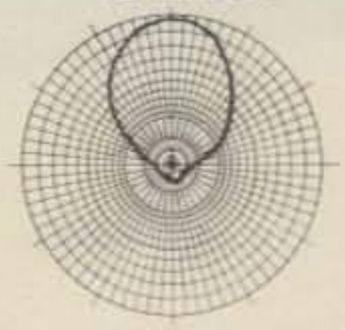
Boom length	18 feet
Longest Element	31 feet
Turning Radius	18 feet
Surface Area	6.4 sq. feet
Wind load	164 lbs.
Weight	50 lbs.

VSWR at resonance	less than 1.5:1
Power Input	Maximum Legal
Input Impedance	50 ohms
-3dB Beamwidth	66° average
Lightning Protection	DC ground
Forward Gain	8.5 dB
Front-to-Back Ratio	25 dB

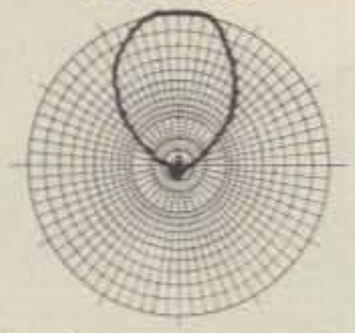
20 Meter



15 Meter



10 Meter



NOTE: These are original Polar Charts on file at Hy-Gain Electronics

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WANTED: Pre-1925 wireless gear, books, magazines, spark transmitters, and tubes. Jim Kreuzer, 1428 Main, Corfu, NY 14036.

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ROHN TOWERS - Buy wholesale direct from distributor 20G sections, $28.82 each - 25G sections $37.62 each - 45G section $57.20 each - 100 foot tower kit complete $646.02 - 40 foot free standing BX tower $179.45 - 48 foot 25G foldover freight paid $565.00. Hill Radio, 2503 G.E. Road, Bloomington, IL 61701, (309) 663-2141.

EZ DEALS are hard to beat. Try me and see for new or used ICOM, Cushcraft, KLM, Yaesu, Drake, Wilson, VHF Eng., Ten-Tec, Swan, DenTron, CDE, Hustler, Larsen and more. W0EZ, Bob Smith Electronics, RFD 3, Fort Dodge, Iowa 50501, (515) 576-3886.

FREQUENCY ALLOCATION CHART. See how the entire radio spectrum is used. 2 kHz to 200 Ghz. Send $3.00 to: Collins Chart Co., Box 935, Coronado, CA 92118.

WANTED: General coverage short wave receiver. Prefer older, non portable type with tubes. R. Taber, 459 Center St., Winona, Minn. 55987.

KITS FOR SCANNER USERS. Preamplifiers, tone decoders, others. Free catalog. Capri Electronics, Route 1A, Canon, GA 30520.

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WANTED: Yaseu FT620-B transceiver. Call or write C. Perry, WD5DEI, 1401 St. Johns Dr., El Paso, TX 79903, (915) 565-8174.

FOR SALE: HW101 complete station set up. Also two meter rig, both $700. 8119 Meadow, Apt. 131, Dallas, Texas 75231, (214) 363-6037. Randy Anderson.

WILSON ANTENNAS and handhelds - Big Discount! Bearcat 250 scanners $259.00! KDK FM2016A $335! Alda 103 discounted! SASE brings more super specials! Ben Franklin Electronics, Box H, Hillsboro, KS 67063, (316) 947-5751.

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SIMPSON 4" Sq. Line Monitor Meters in case, 0-150 or 0-300 VAC $20 ea. Send $2 for lists of other items. Bill Williams, P.O. Box 7057, Norfolk, VA 23509.

OHIO: Second Annual Salem Area Hamfest, 9AM-3PM, Sunday, August 5, Kent State Salem campus, Salem. Advance tickets, $1.50, $2.00 at door. Inside tables, $5.00, space for yours, $2.00. Fleamarket space, $1.00. Air conditioning, wheelchair ramp, free parking, refreshments, prizes: Grand Prize: Atlas RX-110, TX-110, PS-110. Check in 146.52 simplex. Details: Harry Milhoan, WA8FBS, 1128 West State, Salem, 44460.

WWVB RECEIVER. The Elemek Model LXK receiver receives the 60 kHz WWVB signal and provides the following outputs: 60 kHz and 100 kHz, phase locked to WWVB carrier, and the demodulated WWVB time code. Send for brochure describing the receiver to Elemek, Inc., Dept. C, 6500 Joy Rd., East Syracuse, N.Y. 13057.

FOR SALE: HW-8 and p.s., excellent for $75.00. Also HD-1410 keyer, excellent for $30.00. Greg Gross, WB3AMB, 104 Church, Danville, PA 17821.

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FOR SALE: Complete set of Time-Life camera books, 17 volumes plus master index and Photographers Handbook, $125. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

QSL—QSL—QSL: Please send QSL Cards to: Philip Steven Kurland, Post Office Box 1686, New Haven, CT 06507.

The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June 1976. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., NW, Albuquerque, NM 87114. Please enclose $1 to cover the cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters over 600 photographs. Order your autographed copy, or a gift copy from W5RZJ, $3.50 postpaid.

FOR SALE: Cushcraft A147-22, stacked 11 element 2 meter beam. New in carton, $70.00. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

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FOR SALE: Ham gear, test equipment, books, magazines. Cleaning house. Send SASE for list. I. Schwartz, K2VG, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Antique glass-Looking for old milkglass-purple, slag, carmel, and greentown. Tell me what you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

SALE: Heath IM-28 VTVM kit. New, perfect. Ordered by mistake. $40. John Schultz, Box "L", FPO NY 09544.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp., M.D., K1EEG, 44 Main St., Saugus, MA 01906. (617) 233-1234.

LOOKING FOR old Lionel trains. Interested only in "O" Guage, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write: Dick Cowan c/o CQ Magazine, or call (516) 883-6200.

FOR SALE: Old issues of Ham Radio, 73, CQ, QST. Some complete runs. Send s.a.s.e. for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extra to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

SALE: Sony ICF-5900W multi-band receiver designed for SWLs. Like new condition w/ manuals. $100. Schultz, W4FA, Box "L", FPO NY 09544.

FOR SALE: Tektronix 535 oscilloscope with dual trace and fast rise-time plug-ins. Very good condition. $425. Prefer local pick-up. Irwin Schwartz, K2VG c/o CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Pre-war issues of Short Wave Craft Magazine. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Collins 51-R receiver (VHF). Bill Orr, W6SAI, 301 Industrial Way, San Carlos, CA 94070.

FOR SALE: Collins mobile mount with cables and 516E-1 mobile power supply for KWM-2, $125. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

CQ AND QST 1950-1975 issues for sale. Send s.a.s.e. if ordering 73, Ham Radio, or other CQ and QST issues. One dollar minimum order and all issues cost 25 cents each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire Ave., Burbank, CA 91504. Available issues and refund sent within one month.

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SELL: Hallicrafters SX115 receiver, triple conversion, anl, notch, very clean $275 plus ship. WB9JHS, 7720 W. 162 Pl., Tinley Park, IL 60477.

FOR SALE: All brand ndw: Wired HW-8, HWA Power supply, HD 1426 Field Strength Meter. R.L. Walden, 783 Foxkirk, Glendale, CA 91206.

ELECTRONIC Equipment for sale, send SASE (large) to Eugene Patrick, 2146 Carver St., Philadelphia, PA 19124.

WESTERN ELECTRIC Teletype test set. Needs monor work, $25 plus shipping. Bob, 1-615-676-3639.

SELL: SX101A BO over $100. Prop Pitch motor, also pair 115 volt selsyns, best offer. You pay shipping. M.E. Knowles, 9 Brown St., N. Billerica, MA 01862.

HUNDREDS of old CQ, QST, HR, 73s, for sale cheap. 1950s to present. SASE for list. N5UX, 1432 Pamela, Hurst, TX 76053.

SCANNER OWNERS! It's here! "Top Secret" registry of U.S. Government radio frequencies 25 to 470 MHz, by K2AES. First and only book of its kind ever published! Lists 2,250+ freqs. of Military, FBI, Treasury, FCC, Border Patrol, Customs, Secret Service, NASA, FAA, CIA, Federal Prisons, U.S. Marshals, satellites, National Park Service, Fish/Wildlife, and much more! Only $4.95 postpaid (USA, APO, FPO order only, please); from CRB Research, P.O. Box 56-CQ, Commack, NY 11725.

WANTED: Matching 8-ohm speaker for Heath HW-16 transceiver. Also freq. counter, minimon 6 digit, 30 MHz. State price. Caswell Davis, Jr., CET, 601 Delmar, Apt. 2, San Antonio, TX 78210.

FOR SALE: Heathkit SB-614 Station monitor new (mint) condx with manual, $125. postpaid. J.L. Hamilton, 414 Augusta St., Elmore, OH 43416.

NRI Conar 2 mtr. FM xcvr, $185. Clem Duval, 33727 Brownlea, Sterling Hgts., MI 48077, 1-313-268-2467.

WANTED: 6 meter FM equipment. Send price and condx. Sell Clegg 66, mint, $59. Lenus Schuck, RR 1, Edmond, KS 67636.

COLLINS 100 CPS mechanical filter for 75A4 $125. 250 CPS xtal filter, $100. R. Sherman, 83 Fox Blvd., Massapequa, NY 11758.

FOR SALE: ICOM IC-MM mobile mounting bracket. Fits, 60, 230, 22, 22A, 22S, 245 and 30A. K9BSL, 122 Country Club Dr., LaPorte, IN 46350.

HW-8 AC supply stock, $120. HR-2A with 5 sets of rocks, $170 220 2m, 6m cavity filters, $35 ea. Want any National receiver, working or not. T.N. Colbert, 1800 Rhodes 612, Kent, OH 44240.

WANTED: Pair new 3-500Zs. Larry Kleber, K9LKA, 922 Whitney, Belvidere, IL 61008.

STEEL RACK FRAME, ideal for repeater housing, 19" wide x 16" deep x 72" high, $35. WA2SLK, Charlie Burke, RR 1, Box 164A, Farmingdale, NJ 07727.

TWO ORIGINAL all telephones. One super tall, other regular size. WA9IYF. (812) 273-5379.

BACK ISSUES of CQ, QST, and Ham Radio wanted for cash. Ken Miller, K6IR, 16904 George Washington, Rockville, MD 20853.

WOULD LIKE TO HERE from hams who are former C.C.C.ers from the N.Y.C. area. Joseph Schwartz, K2VGV, 43-34 Unio St., Flushing, NY 11355, (212) 461-5933.

SALE: Kenwood SM-220 station monitor and BS-8 pan display combined, brand new in original box, $370 and multiband 10-80 meter by Mor-Gain, dipole antenna $45. Please phone: (201) 471-3798.

HW2021 Handy Talkie $110. Kirk 15m beam $100, mini beam $30. Gabe Gargiulo, 160 Elm, North Haven, CT 06473.

INTERNATIONAL ISLAND DX Net. Fri-Sat 0500Z on or about 14.285 MHz, sponsored by the Whidbey Island DX Club. Special Awards and contests, too. SASE to WB7BFK, 2665 No. 1250 East, Oak Harbor, WA 98277.

TEN-TEC PM3A QRP CW-5 watt 20 & 40m transceiver/Power supply. Recently factory overhauled and modified. Mint condx., $40 pp. Mark Pistiner, 4206 Arthur St., Hollywood, FL 33021, WA4ZJZ.

RTTY Modulator PC Board. See Feb '79 Ham Radio. Drilled $5. F.E. Hinkle, 12412 Mossy Bark, Austin, TX 78750.

WANTED: Transfer relays and switches and coaxial bulkhead lighting arrestors all w/ 'N' connectors. WB8NLM, C. Huth, 146 Schonhardt, Tiffin, OH 44883.

RADIO BOY BOOKS by Chapman wanted. R.W. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

YAESU FT-221R all mode 2m, Yaesu YC-221 digital readout, like-new. UPS pre-paid with receipt of $630 certified check. G. Alfred Dodds, Jr., 874 Pepperwood Lane, Brunswick, OH 44212.

TS-820 $765. FT-901DM $1150. Both new, mint condx. DenTron super tuner $195. Mint. Roger Greenburg, W1ABJ, 1751 Beacon St., Brookline, MA 02146.

FOR SALE: Collins 75A4 receiver and matching speaker, excellent. R. Sever, W8IM, 248 Sheraton Dr., N.W., North Canton, OH 44720.

FOR SALE: Valiant, extra special, $175. KWM2A, 516F2, extra xtals, $900. E. Erickson, 343 Catherine St., So. Amboy, NJ 08879, (201) 721-6579.

FOR SALE: Round Emblem Collins Equipment. KWM-2, never used, still in original seals, new, 516F-2 a.c. supply, (used, very good condition), 312B-4 (used very good condition), Mobile supply and mounting bracket with cables, Collins Dummy Load (winged emblem), Noise Blanker, Spectronics digital readout for KWM-2, DX Engineering speech processor for KWM-2, Collins SM-3 microphone. $2,00 for all. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: 6 meter SSB transceiver, Kenwood or Yaesu, WA4GUW, Geo. Taylor, 209 Lakeshore Dr., Muscle Shoals, AL 35660.

SELLING OUT—SX101A, HT32B, TST eqp., miks, antiks, tubes, etc. SASE to: J. Davis, W3FBT, 802 Chain St., Norristown, PA 19401.

TELETYPE model 19, mint condx, $150. Pick-up only. Drake TR-4C, AC-4, MS-4, speaker, mint, $495. I ship UPS. DS, Box 48, Ballardvale, MA 01810.

WANTED: Noise blanker for Drake R4C no. N4B. For Sale: Drake R4, new filters, etc. $249. Telephone- (703) 373-7967.

WANTED: Hallicrafter Louden boomer II amplifier, uses single 4-400A. Must be in good condx and un-modified. WB7AVO, 468 E. Lancaster Blvd., Lancaster, CA 93534. 1-800-948-5528.

CUBEX QUAD with matching transformer for 20-15-10 meters. Complete and never assembled, $100. Pick- up. George A. Collet, Box 390, Lakeside Ave., Lakeville, MA 02346.

WANTED: SB-200, state price and condx. WA5DTK, 300 Marshall No. 29, Jacksonville, AR 72076.

FOR SALE: HQ 110C, good condx, $110 or best offer. W2WHK, 210 Utica St., Tonawanda, NY 14150.

FOR SALE: Roberts 6000S port. stereo tape recorder, $175. Johnson Valiant, $175. Heath HP-23A, $50. W2CVW, 343 Catherine St., South Amboy, NJ 08879, (201) 721-6579.

WANTED: 40 to 50 in. 19" enclosed cabinets. WB8NLM, C. Huth, 146 Schonhardt St., Tiffin, OH 44883.

WANTED: Rheostat panel for A.K. 20, Cabinet for RCA 25, Crosley 5-50, Crosley Harko and Audion Units or panel rubbings. J. N. Clapp, DeWitt, Iowa 52742.

SELL: Johnson KW matchbox w/meter, $170, Xfmr 3600-0-3600 at 1 apm 110/220 Pri $40; Clegg Thor 6M xcrv, mint $70. W0AIH, Paul Bittner, 1616 South St., Eau Claire, WI 54701.

SELL: QST (20s and 30s) handbooks. ARRL Pubs, IRE Pubs, Want Ham Radio, W0KC, 10 Taylor Estates, Kirkwood, MO 63122.

FOR SALE: Teknik combination frequency counter and clokc, DC/nicads/AC operation, needs repair, $35. Karl Thurber, W8FX/4, 631 N. Overlook Dr., Ft. Walton Beach, FL 32548.

WANTED: Hallicrafters SX-28 or 28A. State price and condx. C. Klawitter, 4627 N. Bartlett Ave., Milwaukee, WI 53211.

SEND LARGE SASE for list Xmtrs/rcvrs/transceiver, converters, test gear excess my needs. Cleaning out shack! W4API, Box 4095, Arlington, VA 22204.

WANTED: Don Chesser's "DX Bulletin" copies 1 thru 64 and n. 85. Any of these appreciated. Jock, ZL2GX, 152 Lytton, Gisborne, New Zealand.

SELL: HT-37, 80-10 SSB/CW/AM, 180W. Xmtr, Exc, want $145. 160-6 HQ-170C receiver, exc., asking $145. Ranger II CW/AM 75W. Xmtr, 160-6, good, $125. Rick, N4APK (703) 961-6997 days, (703) 639-0977 or 951-2262 evenings.

HALLICRAFTER SX-111 $50 plus shipping. DenTron Super Tuner, $70. WA2EWC, Bob Kaefer, 4211 Forestview, Fayetteville, NC 28304.

HEATH SB-104A, SB-104-1, SB-104-3, SB-604, SB-614, SB-634, SB-644A, and HP-1144A wired and aligned, $1,300. G. Alfred Dodds, 874 Pepperwood Lane, Brunswick, OH 44212.

FOR SALE: 1 Yaesu FRG-7 communications receiver, $300. Art Williams, Jr., 576 Springtown Rd., New Paltz, NY 12561, (914) 658-9467.

OLD KEYS WANTED: State condx and price. R.W. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

WANTED: SP-600 JX-17 must be in good mechanical condx. WB7AVO, 468 E. Lawrence, Lancaster, CA 93534, (805) 948-5528.

WANTED: 365-pF tuning capacitor with long shaft. Jim Southwick, KA7AWO, 3443 Fowler Ave., Ogden, UT 84403.

SELL: Vibroplex "Vibro-keyer", mint, $20. Astatic GD-104, $12. Telex CS-7 headphones, mint, $18. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

CHEAP BADGES $1.25 for two lines. Peter O'Dell, AE8Q, 1427 23rd St., Pakersburg, W. Va. 26101.

WANTED: Eico 753 any condx with or without power supplies. D. Schnell, W9LJM, Noble, IL 62868.

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COMPARISON GUIDE to most new HF transceivers, $1. K. Weatherman, 6971 Lawnhaven, Huntington Beach, CA 92648.

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WANTED: SSB Transmitter or transceiver for physically disabled ham. Need not work, I can do my own repairs. Ed Maher, 489 Grand Blvd., Brentwood, NY 11717, (516) 231-5077.

HALLICRAFTER HA-6 transmitter with power supply and cable, $175. Heath osc. calibrator, $15. Adjustable crossover network $8.50. Maverick II 6 mtr. tuneable filter with output meter, $30. Goldline signal hunter for transmitter hunts, new, $6.50. Heath Electronic switch to display dual trace on asc., $25. T.K. Brown, RD 1, Box 102, Forksville, PA 18616.

WANTED: Old radio catalogs. Bell, Box 562, Deming, NM 88030.

FOR SALE: Excellent Viking 2 and VFO $80. Excellent NC 270 receiver, $70. Prefer local sale but will ship collect. Dick Mills, W7AMH, 630 W. Jacinto, Tucson, AZ 85705.

BEARCAT 210. Complete, perfect, mint in guarantee, $195 firm. W1JSS, 9 Winter Ter., Westwood, MA 02090.

SELL: Ten-Tec 544 and 262M w/blanker, filter, and full 10M. Excellent 6 months old, $650 FOB. K4FQ, (615) 245-4929.

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COMPLETE tielphone switching system, rack mounted will handle up to 50 phones, in working condx, $250 or trade for Ten-Tec Century 21. Matawan Regional High School Radio Club, Matawan, NJ 07747. Att: Burke.

HARVEY-WELLS xmtr 80-2m., $35 I ship. Teletype model 19, excellent, $150, pick-up only. S. Press, Box 48, Ballardvale, MA 01810.

HEATHKIT Laboratory 5-inch oscilloscope, Model 10-18, manual, probes. Old but good! $75 FOB. E. Stacy, 103 E. Bartlett Ave., Selah, WA 98942.

NOVICE ALL-AMERICAN certificate: Work a novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

FOR SALE: Gonset GSB-100 SSB transmitter, good condx. Sell to highest offer or first $100. K6ZTG, 8874 Wheeler Ave., Fontana, CA 92335.

YAESU FL101, $400. FR101D $450, both 900s, 3 months old original caton and guarantee. Al Bonasera, 39 Woodberry Rd., New Hartford, NY 13413, (315) 724-3009.

SELL: HQ-170-A 2 to 160 meters. All Ham Bands. $200. Nathan Rosen, 2440 Olinville Ave., New York, NY 10467.

WANTED: Footswitches; 6DQ6 and 6GJ5 tubes, new banana jacks and plugs, any quantity. Al Bernard, P.O. Box 14576, Orlando, FL 32807, (305) 277-1992.

FOR SALE: Clegg 22 and Clegg 22 Mark II, etc. J. Schwartz, 43-34 Union St., Flushing, NY 11355.

RCA model TK-60A broadcast TV studio black and white camera system in like new condx., with lenses, etc. G. Alfred Dodds, 874 Pepperwood Lane, Brunswick, OH 44212.

FOR SALE: Realistic 0 to 30 MHz receiver DX-160 w/speaker, like new, only $75. Call 704-825-8085 or QSL KA4EFW.

SELL/TRADE: Heath HD-10 keyer, mint w/manual. Want GDO (Eico, Heath, etc.) or Shure 444 mic. N4ATM, 938 Grove Park Dr. N., Orange Park, FL 32073.

TRADE: SP-600JX clean, for HF linear or parts, Bearcat 250 scanner or $275. K0TDO, 511 So. 13th St., Ft. Dodge, IA 50501.

WILL TRADE Ariz. lots for Ham station. Ken, 2256 Claude, S.E., Salem, OR 97301.

WANTED: Parts and info for completion of 11 meters on FT-101E. Will pay reasonable price. Box 24, LaSalle, IL 61301.

WANTED: Argonaut 509 or Century 21. Write to: Frank Eldredge, KA8BHD, 5151 Corvallis Dr., Mt. Pleasant, MI 48858.

WANTED: ARC-27 xceiver and following control boxes for ARC-27, C-626, C-628, C-853, C-905, C-1015, and C-1024 w/plugs. C. Huth, 146 Schonhardt, Tiffin, OH 44883.

GENUINE WHISPER fans with grill, like new, 115V, 60Hz, ideal for transceiver, exciters, TV and stereos, $9.50 including shipping, USA. J. Hoffer, W1DL, 24 Cherry Rd., Farmingham, MA 01701.

WANTED: Your 40, 80, 160 meter FT-243 crystals. Hand keys and Bird 43 slugs. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

SELL: MFJ SBF2 SSB Filter $15, SST T-1 long wire tuner, $15. H. Di Iulio, 147-14 45th Ave., Flushing, NY 11355.

NC-303 w. xtal cal. and manual, $185. Ranger II w. manual, $120. Thunderbolt (3.5 to 30 MHz) w. manual and extra pr. 4-400A, $350. K2UVV, Warren, (914) 357-2167.

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NC27Q true porduct detector, IFNL, perfect 6 mtrs., $120; PR9FM police alarm, 150-175 MHz (FM), A1, $25; Mint Minox IIIs, meter, flash, $65; New RCA cassette recorder, $25. Chester Benson, 732 So. 14th, Richmond, IN 47374.

FOR SALE: One Yaesu FRG-7 communications receiver, $250. Also Electronics parts, Send SASE for list of parts. Arthur E. Williams, Jr., 576 Springtown Rd., New Paltz, NY 12561 (914) 658-9467. Call 12 noon to 9 p.m.

FOR SALE: HW-7 CW rig, power supply, manual. $65 postpaid. M. Beha, 4719B Cardinal Ct., E., Richmond, VA 23228.

WANTED: Early amateur equipment. State condx, price, make and model. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

SPEECH PROCESSOR per SSB Handbook, complete kit $29 ppd. K2VAH, 4 Pinewood Dr., Hamburg, NY 14075.

NEW ELECTRONICS kits for the Hobbyist. $1 for catalog and monthly kit news. Hobbi Shack, P.O. Box 235, Jersey City, NJ 07303.

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WANTED TO BUY OR TRADE: For RTTY, Teletype machine, ASR 28, 35, 37, or similar. State make, model, condx and price. S.L. Hart, 545 West End Ave., New York, NY 10024.

WANTED: Tempo 8/20 external speaker. For sale; New Heath SB634 console $150, HW-8 $85, 10D203 5MHz, triggered scope, $150. N0WB, 7429 Frederick St., Omaha, NE 68124.

KIRK 3 element 15 meter beam. B.O. over $100. Pick-up. G.F. Gargiulo, WA1GFJ, 17 Whitney St., E. Hartford, CT 06118.

FOR SALE: Valiant, perfect, SS rectifiers, $175. KWM2A, 516F2, extra 10M xtals, $900. W2CVW, 343 Catherine St., So. Amboy, NJ 08879, (201) 721-6579.

QSLs and Rubber stamps-top quality, card samples and stamp catalog, 50 cents. Ebbert Graphics, D-2, Box 70, Westerville, OH 43081.

WANTED: Manual for AX-190 receiver. Sale: Hallicrafters S-85, $35. Mike, 2749 Symphony Way, Dayton, OH 45449.

FOR SALE: Teknik FC-106 combination frequency counter and clock. Works off of 12 VDC or internal Nicads. Needs work. Karl Thurber, W8FX, 631 N. Overbrook Dr., Walton Beach, FL 32548.

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WANTED: Tunnel Diode Handbook and a few tunnel diodes suitable for low power oscillators at VHF. J. Foss, P.O. Box 805, Benicia, CA 94510.

HP525C frequency converter 100-500 MC like new, $75. Motorola, RCA, GE, 200 old factory manuals, $3 to $6 ea. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

TRS-80 Radio Shack computers wanted! Any condx, any quantity. Immediate cash available. Portacom briefcase ASCII printing terminals w/integral modem, $595. ASR-33 teletypes $495 and $595. DEC PDP8E and all peripherals. Also repair/buy and custom design DEC equipment/peripherals. Tom Perera, Box 632, W. Caldwell, NJ 07006, (201) 226-9185.

FOR SALE: Kenwood 700SP, FT101E, VHF Amp 10-130 out. Send SASE for info. 7602 Timberwood Dr., Jacksonville, FL 32224.

NEED: Bird Model 43 wattmeter. K9BSL, 122 Country Club Dr., LaPorte, IN 46350.

COAXIAL SWITCH, B and W model SS1A new $25. 10 MF 2500 volt heavy duty capacitor for that linear, $7. Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

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AR-22R rotor and control box, $20, Rockhound QRP transmitter, $10. C.W. monitor, $5. All for $30. I ship. WB4FJO, Sherman A. Harrison, Rt. 13, Edens View, Kingsport, TN 37664.

WANTED: Pilot radios of 1920s (super wasp, etc) and other early radios. Troe, Skyline Dr., Morristown, NJ 07960.

WANTED: Amateur Radio postage stamps, circula 1964-new. Skip Westrich, WB8OWM, 1309 24th St., NW, Canton, OH 44709.

TELEGRAPH keys wanted in any condition. Please send to Bob, 345 Lombard, Columbus, OH 43228.

WANTED: 2000 pf vacuum variable. Sell 3600-0-3600 xfmr 1 A. with 110/220 Pri, $40 FOB. Paul Bittner, W0AIH, 1616 So. St., Eau Claire, WI 54701.

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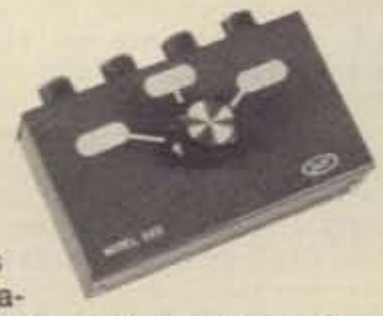

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SELL: HR-2A with 5 sets of rocks, $160. HW-8 with HW7A01 power supply, no mods $130. KW amp and power supply parts. Want: Any National receiver. T.N. Colbert, 1800 Rhodes, No. 612, Kent, OH 44240.

TV TEST EQUIPMENT precision E-400 Sig-Gen, RCA 7" scope, Sencor CA-122 color anal., tube checker, $175 or trade for VHF or UHF HT. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

MILLEN 90651 Grid Dip, $90; Eico 710 Grid Dip, $30; FT221R w/internal Janel preamp, new $450; Vibrokeyer chrome unused $40; Galazy AC/DC power unit DP300 $50. FOB, Art Ford, 2903 Emory St., Melbourne, FL 32901.

FOR SALE: Hallicrafter HT-46 xmtr, SX-146 receiver excellent condx, $300. Wanted: Drake MN-2000 Ant. tuner. 1-800-948-5528.

SPPECH PROCESSOR per SSB handbook, Complete kit, $29 p.p.d. K2VAH, 4 Pinewood Dr., Hamburg, NY 14075.

SELL: Heath SB301 rcvr, $160, SB600 speaker, $15, Palomar 500 wattmeter, $30. N0AJZ, (314) 838-7285.

YAESU FTDX560, $350, FT901DM, $1150, Kenwood TS820, $775. Mint condx. W1ABJ, 1751 Beacon, Brookline, MA 02146.

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FOR SALE: Teknik combination frequency counter and digital clock. Works off internal nicads or external DC power. Needs some work, $35. Karl Thurber, W8FX/4, 631 N. Overbrook Dr., Ft. Walton Beach, FL 32548.

MINT Omega D2V Var. Cond. enlarger, 4 lenses (Schneider Wollensac) 50, 90, 135, 162 mm, best cash offer. W5NVU, 5718 Chatham Dr., New Orleans, LA 70122, (504) 283-5795.

FOR SALE: Heathkit SB401, 2L trap 40m beam, Heath crystal filter no. 404-32B, Accu-keyer, MFJ CWF-2 CW filter. Doug Renwick, Box 50, Clavet, Sask., Canada S0K 0Y0.

WANTED: Good usable ham gear for overseas missionaries in Africa and South America. Need s.s.b. rigs and ants. and rotators. K5LBU, C. Frost, PO Box 248, Waxhaw, NC 28173.

DRAKE TR4-C, AC-3, MS-4, $500. K0FA, 634 W. Plumb, Aurora, MO (417) 678-5778.

SELL: Gonset G-50 6m AM xcvr. 50w. with VFO, mic., manual, $55. Eric Nelson, WB2CAU, (516) 271-5896.

WANTED: Echo 70cm transceiver in good condx. Bob, WA2QVI, 24 Sheraton Oaks, North Little Rock, AR 72116, (501) 835-6839.

HEATHKIT capacitor and resistor substitution boxes IN47 and IN37, $10 FOB, Quemont SWR bridge, $8 FOB. All good condx. Earl Stacy, 103 E. Bartlett Ave., Selah, WA 98942.

SELL: Tecraft TR20/144 2m transmitter, $15 PPD. Sever, 248 Sheraton Dr., NW, North Canton, OH 44720.

SELL: Argonaut 509, 206 calibrator, 208 filter. Pkg only. Clean little used, $350 PPD. Sever, 248 Sheraton Dr., NW, North Canton, OH 44720.

WAR GAMERS: If you are into wargaming or sci-fi games and want an opponent who is a ham write: Steve, WD8DAS, 823 Irvington NE, Massillon, OH 44646.

SELL: 160-10m Heath Mohawk rec. with manual, $90. p.p.d. on best offer. WA9WVV, 812 W. Spring St., Kingston, TN 37763, (615) 376-4148.

SELL: Eico 753-752-751, Com IV 6m, SR34 AC, JRC425, Globe 62, TX-1, Bendix CW rcvr., 160 xvtr., 50w CW xm. Joe Bedlovies, 30 Ridge St., Milford, CT 06460.

WANTED: Pioneer PL6-A turntable. Skip Westrich, WB8OWM, 1309 24th St.. N.W., Canton, OH 44709.

WANTED: Wilson 15 meter beam. K5JZY, 1945 Thomas Rd., Beaumont, TX 77706.

WANTED: Drake R4C, FS-4, crystals, other accessories. Mont, reasonable. J. Bedlovies, 30 Ridge St., Milford, CT 06460.

FOR SALE: Eico tri-band xcvr with PS, good condx, $100. DX60B with VFO, $100. Prices firm, u ship. J. Case, 1013 Byron, Pleasanton, TX 78064.

DIAGRAM on a 1924 radio service laboratory receiver, type R-212 needed. R. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

CANADA: for sale-Heathkit SB401 xmtr, $300. Hallicrafters SR46 6m AM xcvr, $55. D.J. Belbas, Box 1963, Winnipeg, MB R3C 3R2.

FOR SALE: 75A4, $350. 51S1, $1350. 75A3 $200. NCX5/MKII, ACPS RV501 $499. NCX3, ACDC $299. TR22C $150. DenTron 160-10AT $95. Ham-M $70. Viking Matchbox, $65. W1FBG, POB 615, Portsmouth, NH 03801.

CLEGG FM-27A tx needs work shipped UPS. $50. WB8TCT/4, Box 141, Shaw, AFB SC 29152.

TRADE: New Bird 43 with (4 new) elements, for a new Wilson Mark IV or trade a mint Drake 2B, 2BQ, for Wilson Mark IV. Jim, W1VYB, 53 Lothrop St., Beverly, MA 01915.

SELL: Hallicrafters SX115 receiver, mint, manual, $275 plus shipping. WB9JHS, 7720 W. 162 Pl., Tinley Park, IL 60477.

HW-7 w/PS, $70. Spectronics DD-1K digital display, $100. Astatic D104 mike w/desk stand. $25. N2ACZ, 70-64 45 Ave., Woodside, NY 11377, (212) 478-8310.

WANTED: Navair 00-500, Army PAM 310-4, TM 11-580 series, and similar; recent or outdated. D.F. Huie, 18 Pine Close Street, Somerset, England.

WANTED: Ten—tec 40-80 mrt. module, TX-1 and 40-80 mrt. VFO. Price and condx first letter. WB8VMF, Jan. L. Kemp, RR 3, Box 98, West Alexandria, OH 45381.

GONSET G76 transceiver 80-10m. one with AC PS and one with DC PS 100w. AM good units, $150 each. R. Romeo, 12 Forge Court, Freehold, NJ 07728, (201) 431-5796.

TV CAMERA Sony CVC-100, $60. Regency HR0440 VHF transceiver new, $230. Trade/sell list 70 items, FM, Ham, misc. K6KZT, 2255 Alexander Ave., Los Osos, CA 93401.

SELL: Heathkit HM-102 SWR wattmeter. Make offer. Turner SR-90D H1-Z mike, $15. Postpaid. Bob Craig, 4950 Sunshine Ave., Santa Rosa, CA 95405.

ELECTRONICS and Ham equipment for sale. Good prices. Send SASE for list to: Robert G. Romeo, 12 Forge Ct., Freehold, NJ 07728.

WANTED: Small Lathe (Unimat, Taig, etc.) and/or accessories (chucks, tools, attachments, etc.) Al Bernard, WA2JTN/4, P.O. Box 14576, Orlando, FL 32807, (305) 277-1992 or 678-5969.

TEN-TEC Century 21 and calibrator, mint, 6 months old, $237.50. Norman Sullivan, WB8VLG/DU2, PSC no. 1, Box 5142, APO, San Francisco, CA 96286.

SELL: Heath HP-13 DC $35, HW-32A $75, or trade for SX-100 receiver. A.M. Fox, Box 895, Greeley, CO 80632.

SELL: Ameco 62 $25 and other equipment. Send SASE to Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355. (212) 461-5933.

FOR SALE: HW-7 cw rig, power supply, manual, $60 postpaid. M. Beha, 4719B Cardinal Ct. E., Richmond, VA 23228.

SELL: Heathkit SB-614 station monitor new condx used very little, $120. J.L. Hamilton, 414 Augusta St., Elmore, OH 43416.

WANTED: Panasonic RF-2200 or RF-2800 or one with LED freq. readout. Joe, 51625 Chestnut Rd., Granger, IN 46530.

SELL: Autek Filter QF-1, $25. Astatic GD-104, $15. Vibroplex "Vibro-keyer", $20. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

WANTED: Diagram and information on descrambling TV pictures. Emile Courcy, 15 Garfield, Taunton, MA 02780.

MUST SELL: Panasonic RF 2800 SW receiver digital readout, $229. and RF-2200 SW receiver, $145. Both brand new. Joe, 4734 E. 26th St., Tucson, AZ 85711.

6 METER Transceiver, SB110A, HP 23 P/S, 3 element beam, $250. Don Bostrom, N6IC, (213) 78402590.

BETTER THAN NEW: All manuals included. KWM2A, 516F2, $900. Valiant $175. Tape Deck 4 speed, $175. E. Erickson, 343 Catherine St., South Amboy, NJ 08879. (201) 721-6579.

TELREX TC99 tri-band beam needs driven element insulator. B.O. over $25 also 5 ele. Telrex 6 mtr. beam, $15. You pay shipping. M.E. Knowles, 9 Brown St., No. Billerica, MA 01862, (617) 663-3743.

FOR SALE: New Heathkit HW-8 transceiver and HWA-7 power supply. Assembled and tested, $120 postpaid. Frank Varano, 37 South Market St., Shanokin, PA 17872.

WANTED: Bird 43 slugs, hand keys, bugs, used Novice crystals. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

CLEANING SHACK of unusual items, send large SASE for list. W4API, PO Box 4095, Arlington, VA 22204.

WANTED: Ham car plates, will pay postage, etc., please write to: Bert Farmer, VE6PW, 1155 Reader Cresent N.E., Calgary, Alberta, Canada T2E 5J8.

SELL: Realistic DX-160 with speaker used 1 month as Novice, $135. I pay shipping. Send SASE for return of check if sold. Ron Hames, WA2YEX, 1222 E. 7th St., Plainfield, NJ 07062.

WANTED: DEN-35 demodulated and following control boxes for ARC-27; C-626, C-628, 853, 905, 1015, 1024. C. Huth, 146 Schonhardt, Tiffin, OH 44883.

RIDERS MANUAL volume XIX for sale for best offer. Covers HRO 50. A.R. Merrill, 138 Middle St., Oakland, ME 04963.

SALE: HW-32A, HP-13A pwr supply, mike, speaker, cables, manuals, recent factory aligned. All new tubes, I ship. $125 work perfectly. WB4FJO, S.A. Harrison, Rt. 13, Edens View, Kingsport, TN 37664.

WANTED: Hallicrafters SX-42. State price and condx. C. Klawitter, 4627 N. Bartlett, Milwaukee, WI 53211.

FOR SALE: 100's of new boxed tubes and relays, $1 each postpaid. Max Powell, Jr., Box 500, Carbonear, Nfld., Canada.

SELL: Mint TS-520S, 10 hrs., $600. HW-2036A, mont, Micoder, $225. WA5THJ, Box 409, Liverpool, TX 77577.

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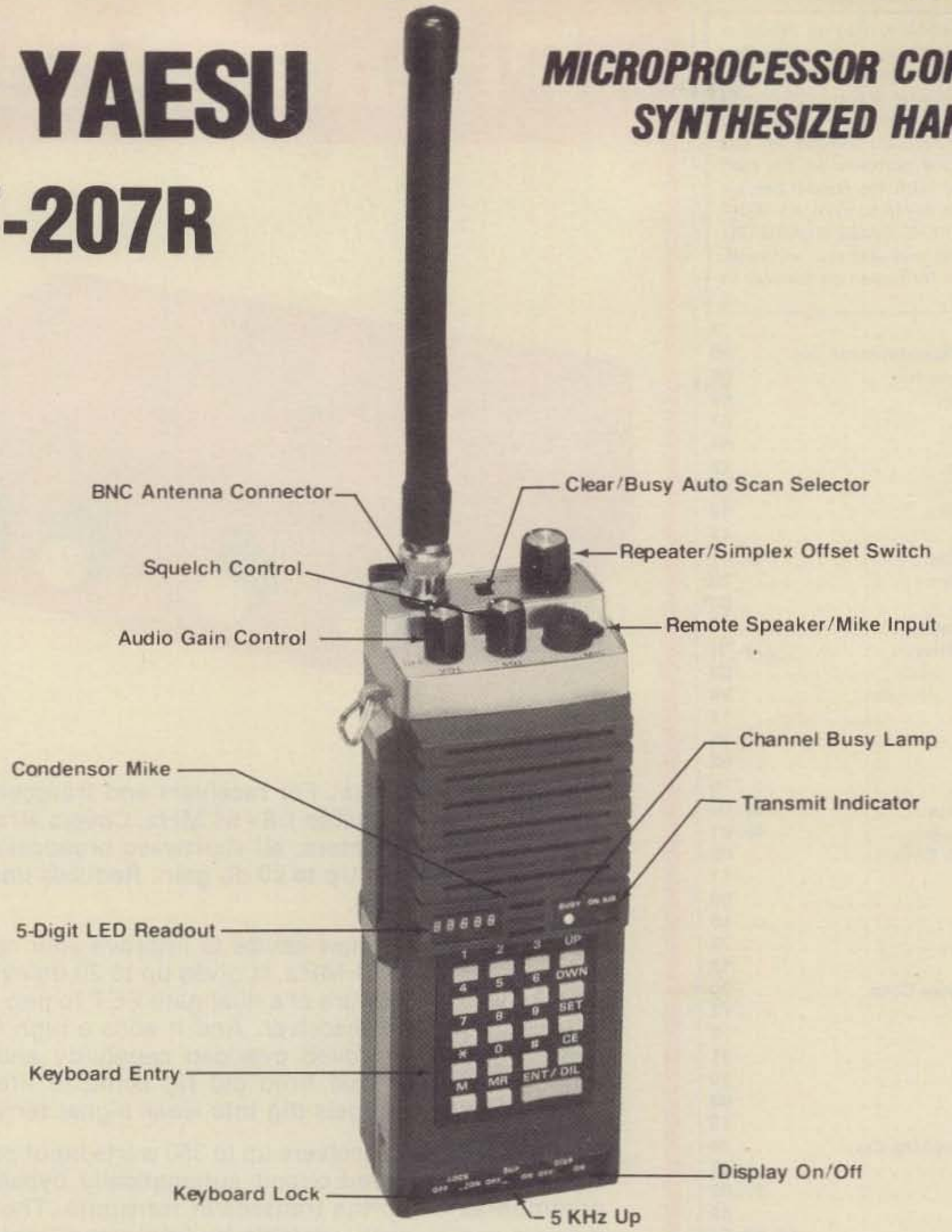

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