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TS-830S

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

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

TS-830S FEATURES:
- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter (high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Built-in digital display (six digits, fluorescent tubes), analog subdial, and display hold (DH) switch.
- Noise-blanker threshold level control.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit to check transmitted audio quality.
- RIT (receiver incremental tuning) and XIT (transmitter incremental tuning).

OPTIONAL ACCESSORIES:
- SP-230 external speaker with selectable audio filters.
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display.
- AT-230 antenna tuner/SWR and power meter/antenna switch; 160-10 meters, including three new bands.
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF.
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW filters for 8.83-MHz IF.

(VFOs for TS-830S, TS-130 Series, and TS-120S are compatible with all three series of transceivers.)

SP-230 TS-830S VFO-230 AT-230

TS-130S/V

"Small wonder"...processor, N/W switch, IF shift, DFC option

The compact, all solid-state HF SSB/CW mobile or fixed station TS-130 Series transceiver covers 3.5 to 29.7 MHz, including the three new bands.

TS-130 SERIES FEATURES:
- 80-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- TS-130S runs 200 W PEP/160 W DC input on 80-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands.
- Built-in speech processor.
- Narrow/wide filter selection on both CW (500 Hz or 270 Hz) and SSB (1.8 kHz) with optional filters.
- Automatic selection of sideband mode (LSB on 40 meters and below, and USB on 30 meters and above). SSB REVERSE switch provided.
- Built-in digital display.
- Built-in RF attenuator.
- IF shift (passband tuning).
- Effective noise blanker.

OPTIONAL ACCESSORIES:
- PS-30 base-station power supply.
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 compact antenna tuner (80-10 meters, including three new bands).
- SP-120 external speaker.
- VFO-120 remote VFO.
- MB-100 mobile mounting bracket.
- PS-20 base-station power supply for TS-130V.

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120 and TS-830S.)

PS-30 SP-120 TS-130S VFO-120

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT / COMPTON, CA 90220

TR-7800

"Easy selection"...15 memories/offset recall, scan, priority, DTMF (Touch-Tone®)

Frequency selection with the TR-7800 2-meter FM mobile transceiver is easier than ever. The rig incorporates new memory developments for repeater shift, priority, and scan, and includes a built-in autopatch Touch-Tone® encoder.

TR-7800 FEATURES:

- 15 multifunction memory channels, selected with a rotary switch. M1-M13 . . . memorize frequency and offset (±600 kHz or simplex). M14 . . . memorize transmit and receive frequencies independently for nonstandard offset. M0 . . . priority channel, with simplex, ±600 kHz, or nonstandard offset.
- Internal backup for all memories, by installing four AA NiCd batteries (not Kenwood-supplied) in battery holder.
- Priority channel (memory "0") and priority alert.
- Covers 143.900-148.995 MHz, in 5-kHz or 10-kHz steps.
- Built-in autopatch DTMF (Touch-Tone®) encoder.
- Front-panel keyboard for selecting frequency, transmit offset, and autopatch encoder tones, programming memories, and controlling scan.
- Automatic scan of entire band (5-kHz or 10-kHz steps) and memories.
- Manual scan of band and memories, with UP/DOWN microphone (standard).

SP-40

Compact, high-quality mobile speaker

- Matches all HF, VHF, and UHF radios for mobile operation.
- Only 2-11/16 inches wide by 2-1/2 inches high by 2-1/8 inches deep.
- 4-ohm input impedance.
- Handles 3 watts of audio.
- Mounting bracket with ferrite magnet. Adhesive-backed steel plate supplied for mounting virtually anywhere.

- Repeater REVERSE switch.
- Selectable power output. 25 W (HI)/5 W (LOW).
- LED S/RF bar meter.
- TONE switch to actuate subaudible tone module (not Kenwood-supplied).

OPTIONAL ACCESSORIES:

- KPS-7 fixed-station power supply.

TR-2400

"Hand-shack"...synthesized, big LCD, scan, 10 memories, DTMF (Touch-Tone®)

CONVENIENT TOP CONTROLS

The TR-2400 has the most convenient operating features desired in a 2-meter FM hand-held transceiver.

TR-2400 FEATURES:

- Large LCD digital readout. Readable in direct sunlight (virtually no current drain) and in the dark (lamp switch). Shows receive and transmit frequencies and memory channel. "Arrow" indicators show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- Keyboard selection of 144.000-147.995 MHz in 5-kHz increments. No "5-UP" switch needed.
- UP/DOWN manual scan in 5-kHz steps from 143.900 to 148.495 MHz.
- 10 memories. Retained with battery backup. "M0" memory may be used to shift transmitter to any frequency for nonstandard-split repeaters.
- Built-in autopatch DTMF (Touch-Tone®) encoder, using all 16 keyboard buttons.
- Automatic memory scan.
- Repeater or simplex operation. Transmit frequency shifts ±600 kHz or to "M0" memory frequency.
- Reverse switch. Transposes receive and transmit frequencies.
- Subtone switch (tone encoder not Kenwood-supplied).
- Two lock switches to prevent accidental frequency change and accidental transmission.
- External PTT microphone and earphone connectors.
- Rubberized antenna with BNC connector, NiCd battery pack, AC charger, PTT and mic plugs, handstrap, and earphone included.
- Extended operating time with LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output).
- High-impact case and zinc die-cast frame.
- Compact and lightweight. Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

OPTIONAL ACCESSORIES:

- ST-1 Base Stand (provides 1.5-hour-quick, trickle, and floating charges, 4-pin microphone connector, and SO-239 antenna connector).
- BC-5 DC quick charger.
- LH-1 leather case.
- BH-1 belt hook.
- PB-24 extra NiCd battery pack.
- ***NEW*** SMC-24 speaker/mic.

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CQ The Radio Amateur's Journal

ON THE COVER: N3DF came up with this historic gem for copying code. Read all about the Omnigraph on page 6.

FEBRUARY 1981 **VOL. 37, NO. 2**

FEATURES

DEPARTMENTS

DELTA RIG

THE TEN-TEC STATION FOR CHANGING TIMES

DELTA—symbol of change—and the first HF transceiver with all nine bands—offers more of the features you need for these changing times.

Tennessee Technology Leads The Way.

Today's operating demands the changes a DELTA station offers. All nine HF bands in all solid-state design with optimized receiver sensitivity and selectivity, 200 watt, 100% duty cycle no-tune transmitter, QSK, VOX, PTT, ALC, Notch, Offset, and more. All in a compact, ready-to-go-anywhere functional design that offers light weight, thorough shielding, and operating ease. And a price that permits affording the full complement of accessories. TEN-TEC put it all together—in DELTA—for you.

For The Change in Bands.

DELTA with all nine bands—another TEN-TEC "first." 160 through 10 meters, including the new 10, 18 and 24.5 MHz bands. (Crystals optional for 18 & 24.5 MHz). DELTA is ready.

For The Change in Band Conditions.

Optimized design for the ideal balance between sensitivity (0.3 μV for 10 dB S+N/N) and dynamic range (85 dB or better) plus switchable 20 dB attenuator that puts you in control of even extreme situations. No matter where you live or what power your neighbor is running, DELTA can handle it.

Super selectivity permits narrowing DELTA bandpass to suit the crowds. The four-position switch selects the standard 2.4 kHz SSB filter, adds a section of the 4-stage active audio filter, cascades an optional CW filter (for 14 poles of filtering), and cascades both filters with 4 stages of audio filters to give you the passband window you need with the virtually ultimate skirt selectivity required to knife through strong adjacent signals.

Built-ins to quiet the world. A *variable notch* filter is standard on DELTA. Vary from 200 to 3500 Hz to notch out interfering carriers or CW signals to a depth of 50 dB or more. *Offset tuning* for moving the receiver frequency ±1 kHz to reach that DX or to fine tune. *"Hang" AGC* to give you smoother receiver operation.

For The Change in Operating Styles.

Variety is the word for today, and DELTA offers it.

For a rag-chew with an old friend, 200 watts of SSB to the proven solid-state amplifier (designed by the leader, TEN-TEC) with built-in VOX and PTT.

For the fun of operating 200 watts CW with QSK—full, fast break-in that makes CW a conversation, saves time, and opens a window on DX.

Power up or down. Adjustable threshold ALC and drive let you choose power levels with full ALC control.

DELTA accepts what you have, what you want . . . from separate antennas to linears, transverters, remote VFO, 12 VDC, keyers and more—just plug in.

For The Change In Lifestyles.

DELTA moves with you. "At home" anywhere—on your operating desk, in the field, on a boat, plane, camper, wherever. Its neat small size (4¾"h x 11⅜"w x 15"d) and light weight (12½ lbs.) make it a good traveling companion. Yet compact as it is, DELTA panel size and knob spacing make it comfortable to use hour after hour in your home station.

For The Change In Economics.

These days, everyone wants more value for his money. And DELTA offers it. More features and performance per dollar. Quality that's American-made. Service you can count on. A solid warranty—one year on the transceiver plus an extra five year pro-rata warranty on the amplifier transistors. And low prices!

The DELTA Rig

Model 580 DELTA Transceiver	**$869.00**
Model 283 DELTA Remote VFO	**189.00**
Model 280 DELTA Power Supply	**169.00**
Model 282, 250 Hz CW Filter	**50.00**
Model 285, 500 Hz CW Filter	**45.00**
Model 234 RF Speech Processor	**139.00**
Model 214 Electret Microphone	**39.00**
Model 645 Dual Paddle Keyer	**85.00**

Other Optional Accessories

Model 670 Single Paddle Keyer	**39.00**
Model 227 Antenna Tuner	**79.00**

Isn't it time for you to change? Check the DELTA rig at your dealer or write for full details.

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Zero Bias

AN EDITORIAL

Logs, logs, and more logs are coming in to *CQ*. It looks like another record turnout for our WW Contest. Quite apropos to last month's editorial, the first log to arrive went to the old QTH. It came in three days after the Contest. You might think it somehow was sent airmail by a European or Asiatic entrant who didn't see *CQ* during the last year, or didn't get one of our all new log and summary sheets with the new QTH, or even missed seeing a copy of the new rules. NO, none of the above was operant. The official first entrant for the Contest (with a fairly thick envelope) came from New Jersey, our next-door neighbor.

On The Road

November saw us on the move again, only not so far away. The Hudson Amateur Radio Council (HARC) sponsored a Convention at the Pines Hotel in New York's Catskill Mountains. This was a departure from the usual site at the Playboy Club in New Jersey. About 1000 people and 10 exhibitors showed up to have a good time and eat too much while enjoying our favorite pastime. I have to say that I did miss the bunnies.

In a special edition of *Ham Radio Report* brought out for the Convention, it was announced that *Ham Radio Horizons* magazine would cease publication with the December issue. Naturally, talk that weekend centered on the announcement and the consequent loss to amateur radio.

Serendipity Strikes Again

When I described our December cover and my meeting with John Rogers, W2ADC, through a mutual friend who owns an art gallery, I didn't expect a second chance meeting to occur for some time to say the very least. I'm here to report another chance meeting via our mutual friend.

A few weeks ago I went to visit my friend's gallery and entered just as a customer was leaving. He had left his business card in plain sight next to his order and curiosity got the best of me. The name, Norman Kjeldsen, didn't ring a bell, but the company sure did, Cardwell Condenser Corp. Now there was a name that rang bells and brought back all sorts of memories of my early days in amateur radio. Most of us see Cardwell Condensers at flea markets and the like and still respect the quality of construction. Like myself, most of the people I mentioned this to later were unaware that Cardwell was still in business and thriving. I was sorry that I was a few minutes too late to meet Mr. Kjeldsen, who turns out to be President of Cardwell, but I did give my friend my business card to give Mr. Kjeldsen upon his return. About a week later I received a nice letter from Mr. Kjeldsen along with a copy of the company's current catalog.

Cardwell, according to the letter, now produces roller inductors, air inductors, edge wound inductors, and high voltage contactors. They also produce five lines of variable air capacitors, including those formerly manufactured by E.F. Johnson, Hammarlund, F.W. Sickles, Oak, LRC, and Erie, plus the Cardwell line. They have purchased the Multronics operation line of inductors and turn counter dials too.

I'm glad to announce that they are alive and well and that their address is 80 E. Montauk Highway, Lindenhurst, L.I., N.Y. 11757.

Close Calls

I got a note the other day from Alan K. Green, W5GAJ, concerning the freighter *Poet* which was lost in early November. It seems that Alan had been the ship's radio operator and decided to remain off the ship during the hurricane season for safety reasons. We're all glad he did for obvious reasons.

Next Month

Next month we plan on presenting the S.S.B. results for the CQ WPX Contest. It looks like another record-breaking year with an all-time high number of entrants. This year it should be even bigger (and better).

On a Contest note, let's not forget a little common courtesy. I know it may seen hard to believe, but there are a few amateurs out there who don't get caught up in the spirit. A few even go so far as voicing their complaint to me saying that for our Contest weekends, the whole world is on the amateur bands (less them of course) and they can't talk to each other. Let's not forget that they too have their rights with regard to spectrum and are entitled to the same courtesies and considerations. It's the same "Golden Rule" for everyone. In other words, don't encourage or participate in bad behavior.

CQ To The Rescue

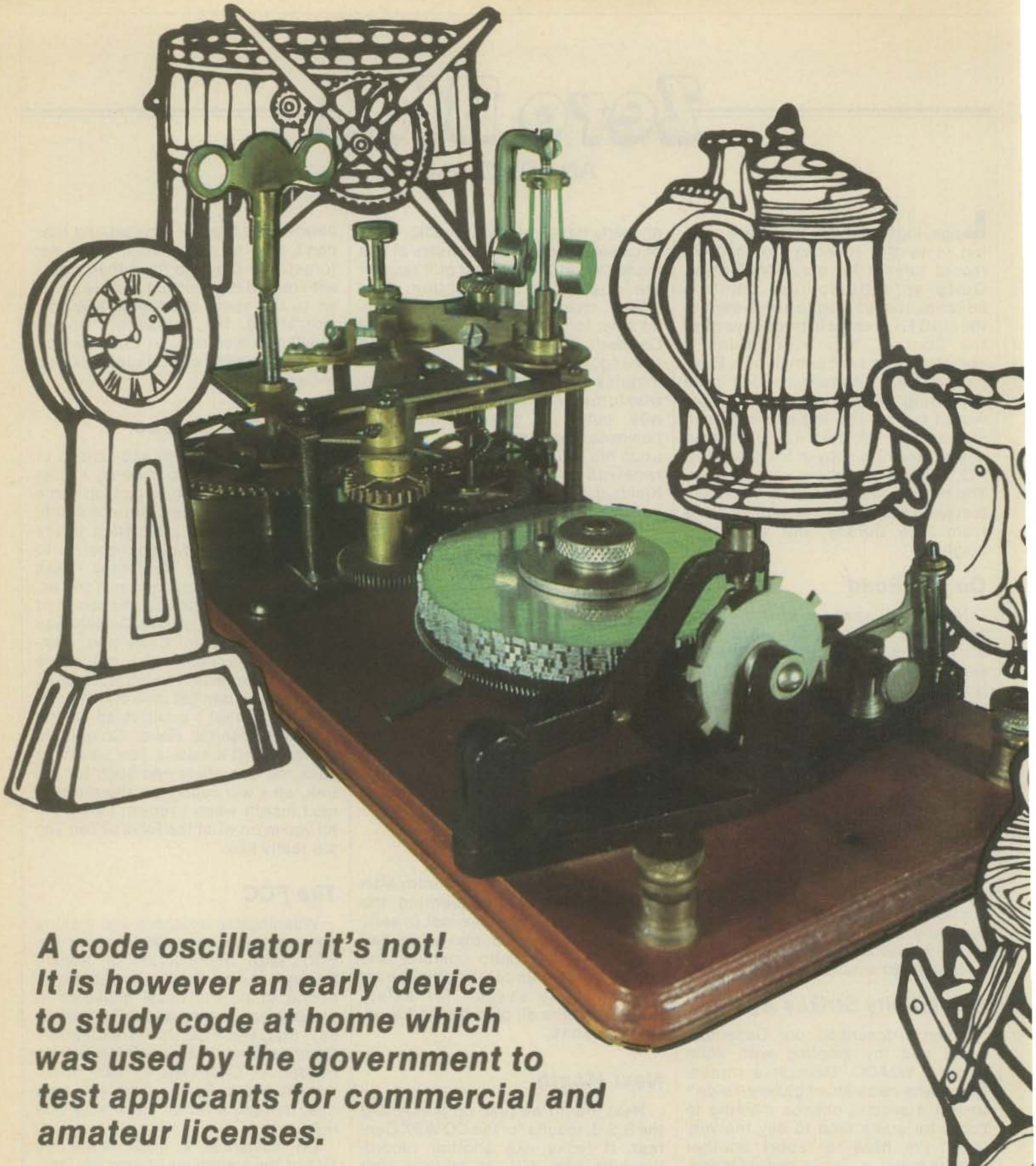
As winter settles in and visions of glistening snowfalls abound, I stopped off this morning to pick up some plane tickets heading sort of south. No, it's not really a vacation in the sun, but is rather a simple gesture to help out a friend. Yesterday I was talking to Jack Birchfield of Ten-Tec, and he was bemoaning the fact that the winter supply of Jack Daniels was trickling down in Sevierville, Tennessee. This morning I got plane tickets to Knoxville, which is about as close as you can get on a commercial airliner, so that I could head up the *CQ* Jack Daniels Relief Column to Sevierville. It'll take a few weeks to pack the dog sleds and such for the trek, so I will report on the mission next month when I return. I also will fill you in on what the folks at Ten-Tec are really like.

The FCC

Washington watchers are making bets as to the new Chairman of the FCC. With the election of Ronald Reagan to the Presidency, there is bound to be the usual shake-up in government posts, and it is safe to say that the FCC is no exception. Commissioner Lee has all the criteria needed for Chairman, at least on an interim basis. By the time you read this, though, we'll all know who was right.

On November 4, 1980, while the fate of the Nation was being decided, the FCC took time to appoint me as a member of the Amateur Radio Service Subcommittee, National Industry Advisory Council (NIAC). NIAC provides the FCC with advice and assistance in national emergency communications planning. I'll report on these activities as they develop.

73, Alan, K2EEK



A code oscillator it's not! It is however an early device to study code at home which was used by the government to test applicants for commercial and amateur licenses.

A Clockwork Omnigraph

BY NEIL D. FRIEDMAN*, N3DF

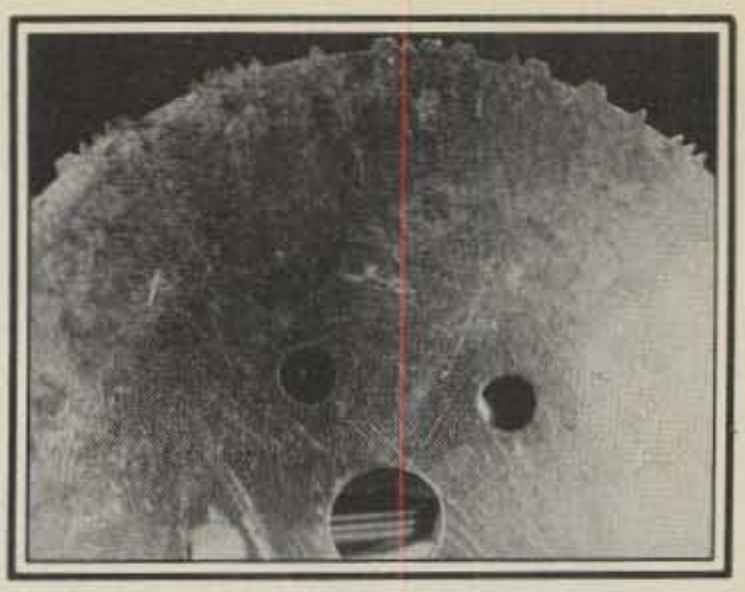
The spring-wound motor and maze of gears on this month's cover is an Omnigraph recently acquired, with 39 code disks, for my collection of vintage communications equipment. The need for a source of perfect code—an accurately timed, portable instrument ready on demand to test or increase an operator's proficiency—predates amateur radio. The Omnigraph was an early attempt to meet this need.

The Omnigraph's steel spring and brass gears rotate a small, phonograph-like turntable upon which rests one or more aluminum code disks. Ridges with sloping shoulders cut into the circumference of each disk represent the elements of the Continental or American Morse code. A stylus, moving up and down the ridges as the disk revolves, opens and closes a circuit to which the operator adds a battery and buzzer (or sounder for American Morse). The speed at which code is sent depends on the setting of the motor and the distance between code elements on the disk played.

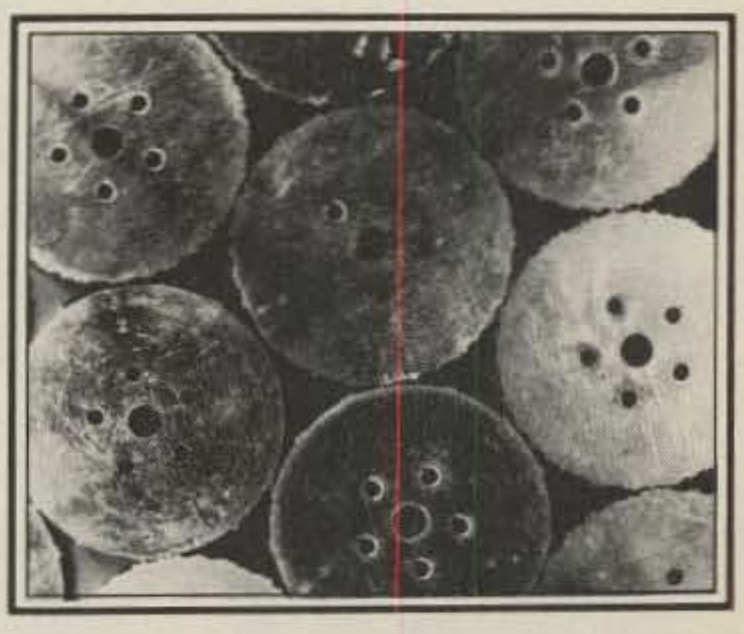
The disks in my collection each contain between 12 and 36 code characters. The simplest Omnigraph plays only one disk at a time, but most incorporate a changing device that pushes the stylus up along a stack of disks as the turntable completes each revolution. The most popular model (the one on the cover) allows for a stack of five disks, while some provide for as many as fifteen. A deluxe model included a pulley system for an auxilliary electric motor drive, while a prototype (or limited production) Omnigraph in the Antique Wireless Association's museum has a vertically-oriented turntable.

The Omnigraph Manufacturing Company of New York began adver-

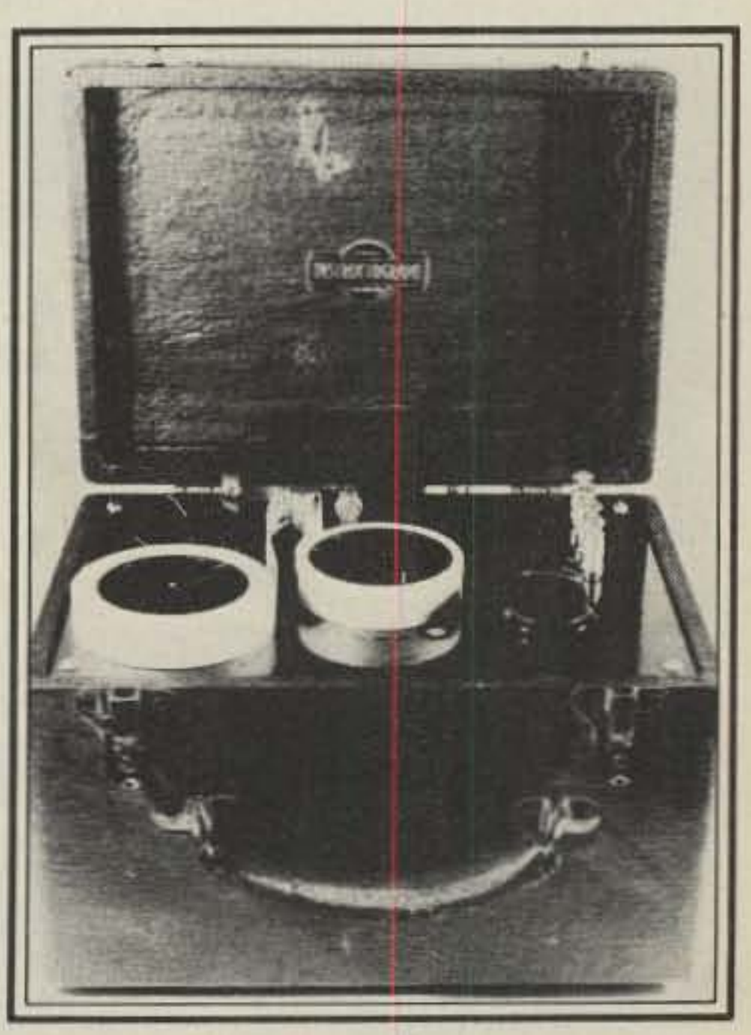
6616 River Trail Court, Bethesda, MD 20034



The pointed peaks on the circumference of the Omnigraph disks represent the "dit" code elements while the flat-topped ones represent the "dahs." A stylus on the Omnigraph traces these ridges up and down while opening and closing a keying circuit.



The spacing of the code elements varies among the disks. Along with the setting of the motor, this determines the speed at which code is generated.



Paper-tape code machines replaced the Omnigraph in the 1920's and are still available today. The Instructograph pictured above was manufactured in the late 1940's.

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tising its devices in landline telegraph journals about 1910 and met with good acceptance. The 1914 and 1919 rulebooks of the U.S. Department of Commerce's Radio Service required that each amateur and commercial operator license code test

> *shall consist of messages with call letters and regular preambles, conventional signals and abbreviations, and shall in no case consist of simple, connected reading matter. The test will be conducted by means of the Omnigraph or other automatic instrument wherever possible.*

For more than a decade, the Omnigraph was widely used for code training by the military and classroom and correspondence schools. The latter sometimes distributed Omnigraphs to students under proprietary trade names.

As useful and popular as they were, Omnigraphs nevertheless have severe limitations. They are difficult to calibrate and maintain at precise speeds (ask any old-timer who took his exam from one!). The disk-changing mechanism is unreliable. Most importantly, a stack of disks provides no more than a few minutes of code practice.

The last Omnigraph advertisement that I have found was published in 1927.[2] By that time, Teleplex was marketing a clearly superior device that sensed code elements punched in rolls of double-sided waxed paper tape. Instructograph soon followed with a similar instrument. A single tape provided more code practice than dozens of Omnigraph disks and cost far less.

Many different kinds of paper tape code devices have been marketed over the years. We also have code phonograph records, magnetic tapes, and now even microprocessor-based code practice machines. These newer types of instruments may be easier to use and more effective than the Omnigraph, but they cannot recreate the almost hypnotic effect of watching the Omnigraph's brass gears spin and its stylus bounce along the ridges of the code disks. It's fun to demonstrate!

Are you interested in vintage communications gear? Then you belong in the Antique Wireless Association.[3] The $6.00 annual dues includes the quarterly *Old Timer's Bulletin.*

[1] *Holcomb, New York.*

[1] QST, *November, 1927, p. 86.*

[3] *Membership applications from: Secretary, 9 Belden Road, Sodus, NY 14551.*

The Omnigraph Manufacturing Company advertised widely in its heyday. This ad is from the December, 1919 issue of Radio Amateur News.

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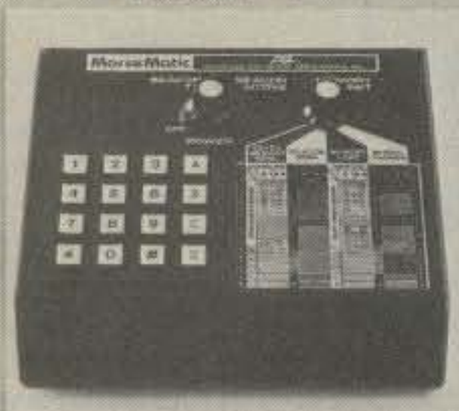				
MorseMatic™	Keyer Trainer	Morse Trainer	Contest Keyer	Morse Keyer

IMPORTANT KEYER AND/OR TRAINER FEATURES	AEA MM-1	AEA KT-1	AEA MT-1	AEA CK-1	AEA MK-1	COMPETITOR A	COMPETITOR B	COMPETITOR C	COMPETITOR D
Speed Range (WPM)	2-99	1-99	1-99	1-99	2-99	8-50	5-50+	?	8-50
Memory Capacity (Total Characters)	500			500		400	100/400	400	
Message Partitioning	Soft			Soft		Hard	Hard	Hard	
Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Calibrated Beacon Mode	Yes			No		No	No	No	
Repeat Message Mode	Yes			No		Yes	Yes	Yes	
Front Panel Variable Monitor Frequency	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Message Resume After Paddle Interrupt	Yes			Yes		No	No	Yes	
Semi-Automatic (Bug) Mode	Yes	Yes		Yes	Yes	No	No	No	No
Real-Time Memory Loading Mode	Yes			Yes		Yes	Yes	No	
Automatic Word Space Memory Load	Yes			Yes		No	No	Yes	
Instant Start From Memory	Yes			Yes		No	No	Yes	
Message Editing	Yes			Yes		No	No	No	
Automatic Stepped Variable Speed	No	No	No	Yes	No	No	No	No	No
2 Presettable Speeds, Instant Recall	No	No	No	Yes	No	No	No	No	No
Automatic Trainer Speed Increase	Yes	Yes	Yes						No
Five Letter or Random Word Length	Yes	Yes	Yes						No
Test Mode With Answers	Yes	Yes	Yes						No
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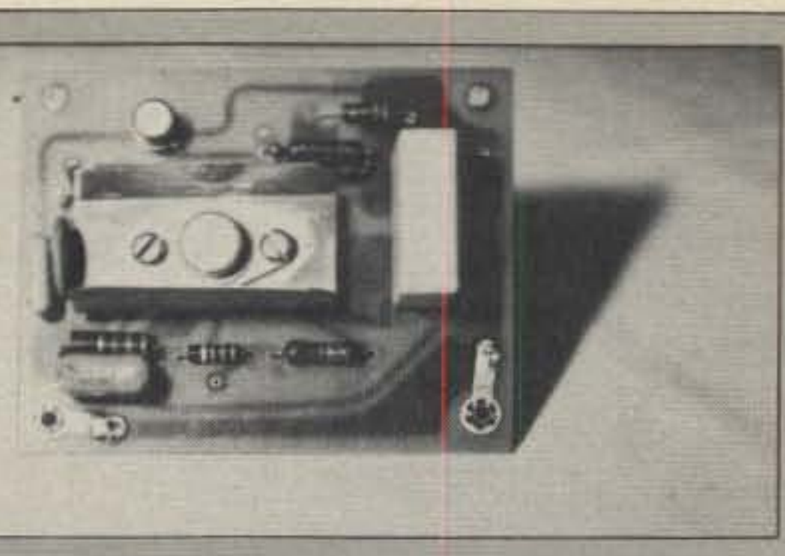
Problem solving is part of the fun of amateur radio. W6AXT's problem prompted this solution and enabled him to get on 2 meters while giving us an interesting construction project.



The basic power supply as shown in fig. 1. Pass transistors are added to enable high current regulation.

A Voltage-Regulated, High-Current 13.8 Volt Power Supply

BY GEORGE F. MOYNAHAN, JR.*, W6AXT

My interest in constructing a well-regulated 13.8 volt power supply, capable of comparatively high current output, resulted from my decision to get back into operation on the 2-meter band. Twelve or fifteen years ago, when some of my students in electrical engineering at San Jose State University had participated in the establishment and operation of one of the early repeater stations on a nearby mountain top, I caught some of their enthusiasm and built a couple of hybrid a.m. 2-meter rigs and was fairly active on that band. However, those men graduated, and the members of the incoming class displayed little inclination to become involved in amateur radio. Also, at about that time the commonly used mode of operation in the 2-meter band shifted from a.m. to f.m. Consequently, my interest waned and my sturdy and dependable home-made rigs have lain idle for years.

At the moment I really am not quite sure what happened to rekindle my interest in the 2-meter band, but a few weeks ago, I began to get the urge again and so toyed with the idea of modifying the long-neglected old equipment to permit f.m. operation. At the same time I began to look, rather casually at first, at some of the new breed of factory-built transceivers. Before long I came to the inevitable conclusion that, while the old gear surely could be revised to operate satisfactorily in the f.m. mode, it would never provide the flexibility and other features of the new generation of frequency-synthesized, microprocessor-controlled factory-built models.

Having come to this conclusion, I began more serious inspection of the 2-meter transceivers on display at some of the local dealers. I was somewhat surprised to find that the models designed for mobile use and for operation from a nominal "12-volt" automotive storage battery were considerably less expensive than those intended for fixed station operation on 115 volt a.c. This set me thinking about designing and building a suitable power supply that would allow one of the mobile type units to be operated from a.c. power. It also prompted me to check over my collection of components to determine what was on hand that could be used. Like most radio amateurs, I have managed to accumulate a variety of transformers, capacitors and other parts that are sometimes a problem to store and catalog, but which often prove invaluable when a new building project is undertaken. Luckily, my survey revealed that I had nearly everything required to build a suitable power supply, although the secondary of the power transformer would have to be rewound in order to obtain the required voltage. This presented no problem, for I have been disassembling surplus filament transformers and rewinding their secondaries for years in order to satisfy my requirements. The principal difference between the required characteristics of this supply and most of the others that I have built was the need for rather close regulation of its output voltage, holding it rather tightly to the same value even when going from full load down to the nearly no-load condition that it would have when in the receive mode. Present-day automobile electrical systems, from which mobile transceivers are designed to operate (particularly those using solid-state devices), are quite tightly regulated, and I felt that my power unit should be at least as good.

Fortunately, now there are available some excellent and inexpensive IC devices that make design and construction of a well-regulated, high-current power supply a relatively easy task. My specific design goal ws set by the decision to buy one of the ICOM IC-255A models which require an input of 5.5 Amperes at 13.8 volts, the actual terminal voltage of a well-charged "12-volt" automotive lead-acid battery. As a regulator, I selected the MC-1569/MC-1469, which is a monolithic IC capable of holding its output at any predetermined level between about 3.5 and 37 volts d.c. with a minimum voltage differential, between input and output, of as little as 3 volts or perhaps even less. This required voltage differential is a very important parameter because it determines both the amount of heat dissipated in

*133 Piazza Way, San Jose, CA 95127

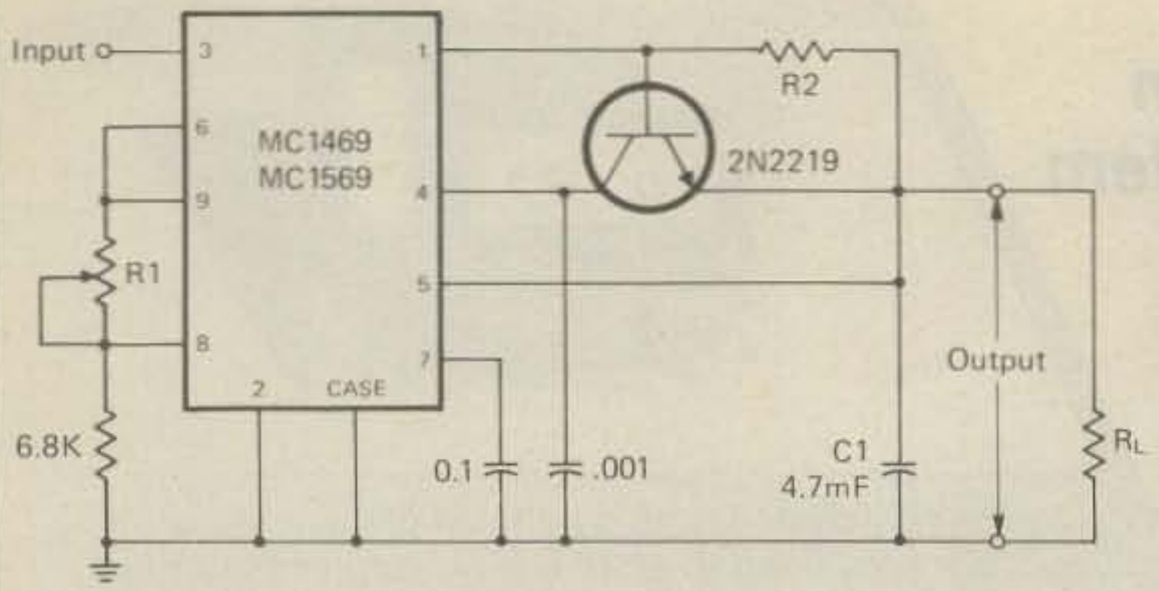


Fig. 1- The basic voltage regulator without the pass transistors. Note: R_1 is approximately 16k and should be adjusted for 13.8 volt output.

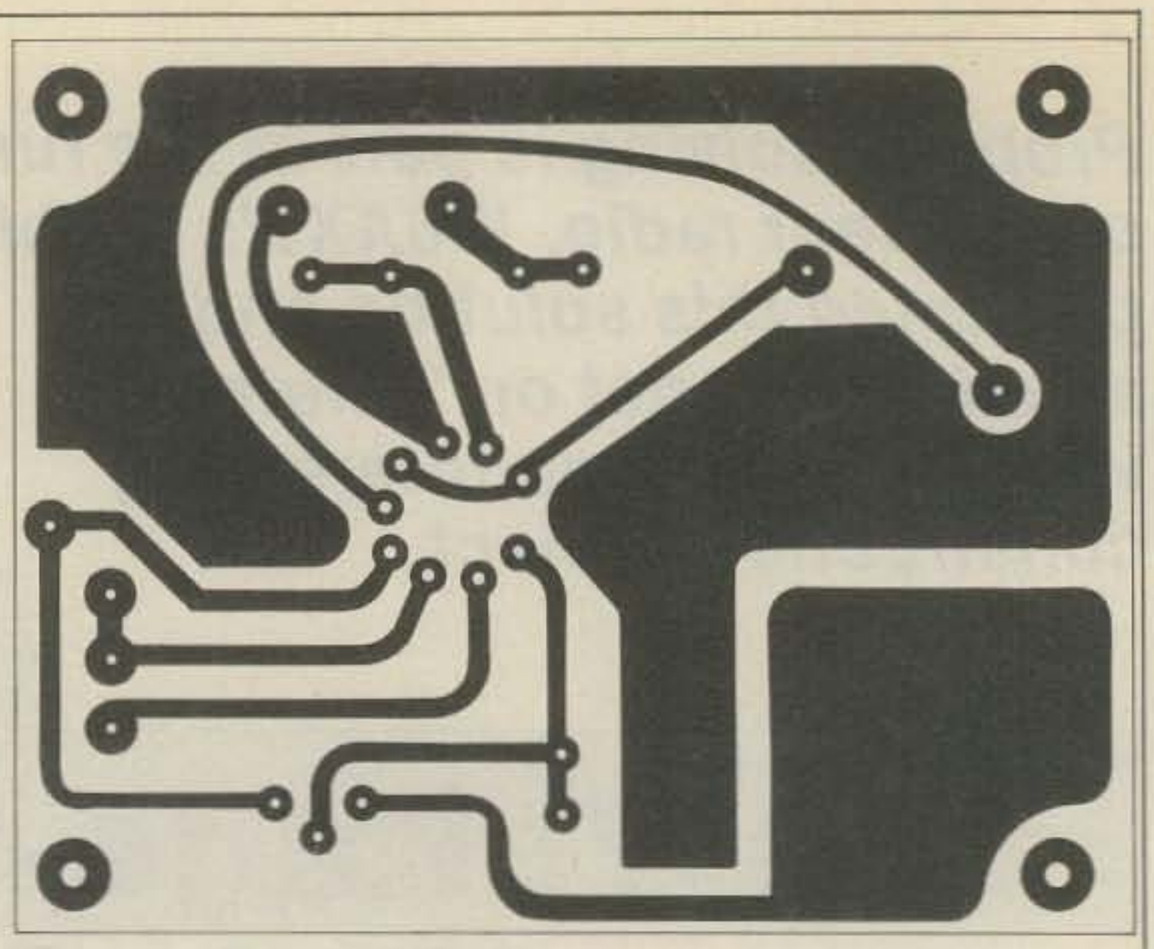


Fig. 2- The circuit board shown from the foil side.

the regulator and the ability of the regulator to function properly. For example, under full load conditions, when a transceiver such as mine is drawing 5.5 Amperes, a 3 volt input-output differential requires the regulator to dissipate 16.5 watts, while the same load results in a loss of 55 watts when the input-output differential is 10 volts. On the other hand, an insufficient differential would result in loss of regulation. Moreover, there is another danger involved in applying excessive voltage to the regulator; if the unregulated voltage at the input of the regulator exceeds the maximum rating of the regulator under low or no load conditions, the regulator may be ruined. Consequently, either too high or too low an input voltage to the regulator must be avoided.

Since the maximum current limitation of the MC-1569/MC-1469 is only 500 mA, even with adequate heat sinking, it was evident from the first that my power supply would require one or more pass-transistors in order to handle the required 5.5 Ampere load. However, in order to familiarize myself with the device, I built up an experimental model without transistors. This version of the regulator, which is limited to 500 milliAmperes, is shown in the schematic of fig. 1 and in the photo. The circuit board is shown in fig. 2. Anyone wanting a regulated voltage source of 13.8 volts, but with a current limitation of 500 milliAmperes, may want to stop at this point. However, the same board can be used for the high-current regulator with only minor modification. To do this the 4.7 uf capacitor, indicated as C_1 in fig. 1, is removed and pass-transistors are added as described in the following.

The manufacturer of the MC-1569/MC-1469 recommends the use of a Thermalloy Type 61688 heat-sink, but I decided to try making one from a piece of sheet copper. This heat-sink, which has proven adequate is illustrated in fig. 3 and can be seen in the three views of the completed supply. My chief difficulty in making this was drilling the copper so that the leads of the regulator could pass through without danger of contacting the sink and still have small enough holes so as to provide maximum area of contact between the heat-sink and the body of the device. I solved this problem by using a header, taken from a defective MC-1569, as a template to permit a precise drilling pattern. Specifically, I first used a hacksaw to remove the cap of the Type 914 case that housed the defective regulator. Then, using pliers, I removed the leads and next punched out the glass or ceramic material that had been used to insulate the leads from the case. When this had been accomplished, I fastened the header to the copper sheet and drilled pilot holes using a number 51 drill. This was followed by enlarging each of the holes with a number 34 drill and carefully removing any burs. The heat-sink was then bent into shape of a "U" and the regulator applied to it, using a thin coating of silicone grease to ensure adequate thermal contact. Had my sink proven inadequate, I would have added another copper element in contact with the top of the can, but all indications are that the device runs reasonably cool and that improved heat-sinking is unnecessary.

The next step in my project was the addition of pass transistors. If I had happened to have a suitable silicon NPN transistor, rated at about 10 Amperes, that is probably what I would have used. I did not happen to have one but did have a number of General Electric Type DTS power transistors, which are excellent 100 watt devices but are rated at only 3.5 Amperes. The obvious thing to do was to experiment with parallel combinations of two or more of these and so determine whether a reasonably even distribution of current could be obtained. Consequently, I placed two of these in separate identical heat-sinks, connected them in parallel, with the MC-1569 connected to control the voltage drop between emitter and collector. I then applied an unregulated but Variac-controlled rectifier and filter to the input and as a dummy load used a pair of Type 1157 automobile stop lamps, which drew between 5 and 6 Amperes at 13.8 volts. The results exceeded my expectations and hopes. Measured regulation was excellent from no load to full load, and after running full load for about 15 minutes, both the respective transistors and their heat-sinks were, so far as I could determine, at the same temperature, and the measured currents carried by the two pass transistors were equal. Moreover, the temperature of the MC-1569 was only mildly elevated. So it seemed that all was well and that paralleling transistors in the final version of the power supply would present no particular problem. Just to be on the safe side, when I built the final working model of the power supply, I used three of the Type DTS-410 transistors in parallel and placed 0.10 ohm resistors in series with their emitter leads to equalize the load in case of any possible variation in the characteristics of individual devices. Since the sensed voltage was taken after these resistors, their use did not adversely affect voltage regulation. As a matter of fact, the regulation of this supply is excellent, with a drop of less than 150 millivolts from no load to a full 5.5 Ampere load. This is considerably better than that of most automobile electrical systems on which the IC-255A and similar 2-meter transceivers are designed to be used. Under test, this power supply has been operated continuously for over two

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		100	1.8	5.9
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		300	3.3	10.8
		400	3.8	12.5
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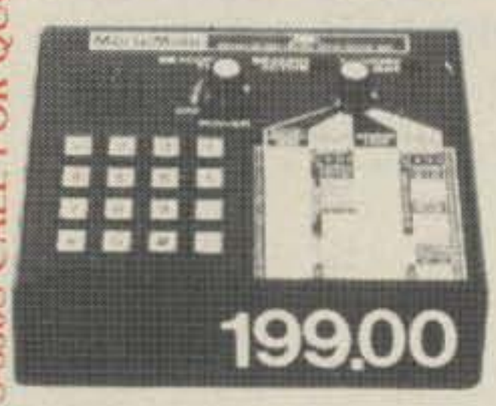

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hours with an output of 5.5 Amperes and for shorter periods at 8 Amperes. Fig. 4 represents the circuit of the complete regulated power supply.

Referring to the photos and noting my practice of mounting my gear on standard 19-inch panels, a scheme which is no longer very common or popular, it seems unlikely that many amateurs will wish to follow the mechanical arrangement of this power supply. However, the physical layout of the unit is not at all critical or even important, and anyone needing a similar regulated supply should feel free to build it and to incorporate a wide range of changes in the layout. Moreover, there is nothing critical about the selection of pass transistors so long as rugged silicon NPN power types of sufficient current and power rating are used. Recently, I built another similar power supply that uses two parallel Type 2N3902 pass transistors, and these seem to be quite satisfactory as probably would be the popular Type 2N3055. With respect to the somewhat unusual panel-chassis on which I mounted this power supply, there are some advantages in using 3/16th-inch aluminum as I did. The heat conductivity of the aluminum is very high, and the scheme provides a large radiating surface so that no additional heat-sinking is needed. The system runs reasonably cool, and the open nature of its construction permits easy access to all components.

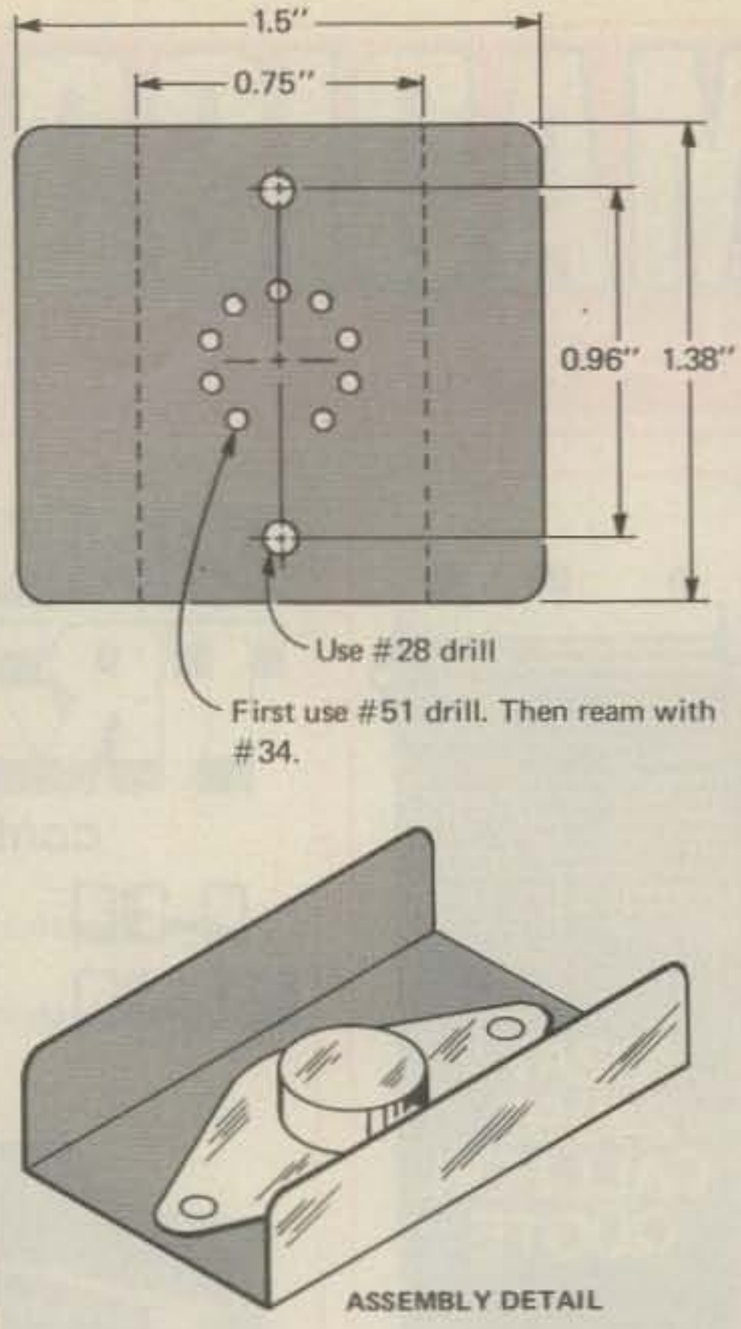


Fig. 3– The heat-sink for the MC-1569/MC-1469. It is made from #20 gauge copper. Bend on the dotted lines to form a "U".

Perhaps some words are in order about the transformer, rectifier and filter used on the input side of the regulator. Using the Variac, mentioned earlier, to control the voltage supplied to the primary of my power transformer while measuring the secondary voltage, I found that 18 volts a.c. rms was about the optimum value to be supplied to the 4-diode bridge rectifier. With that a.c. voltage the input-output differential of the regulator was about 5 volts under the 5.5 Ampere full load, while the highest d.c. voltage under no load conditions was only about 25 volts. So, 18 volts satisfied the two worst case conditions and allowed a margin of safety in case of variation in line voltage. Rather then try to find an on-the-shelf transformer that would match my requirements, I disassembled an on-hand surplus 6.3 volt 20 Ampere Triad filament transformer, removed the 6.3 volt secondary winding and replaced it with an 18 volt winding using two parallel strands of #18 gauge Formvar enamel insulated copper. The use of these two strands in parallel and a 4-diode bridge results in better utilization of the transformer winding than

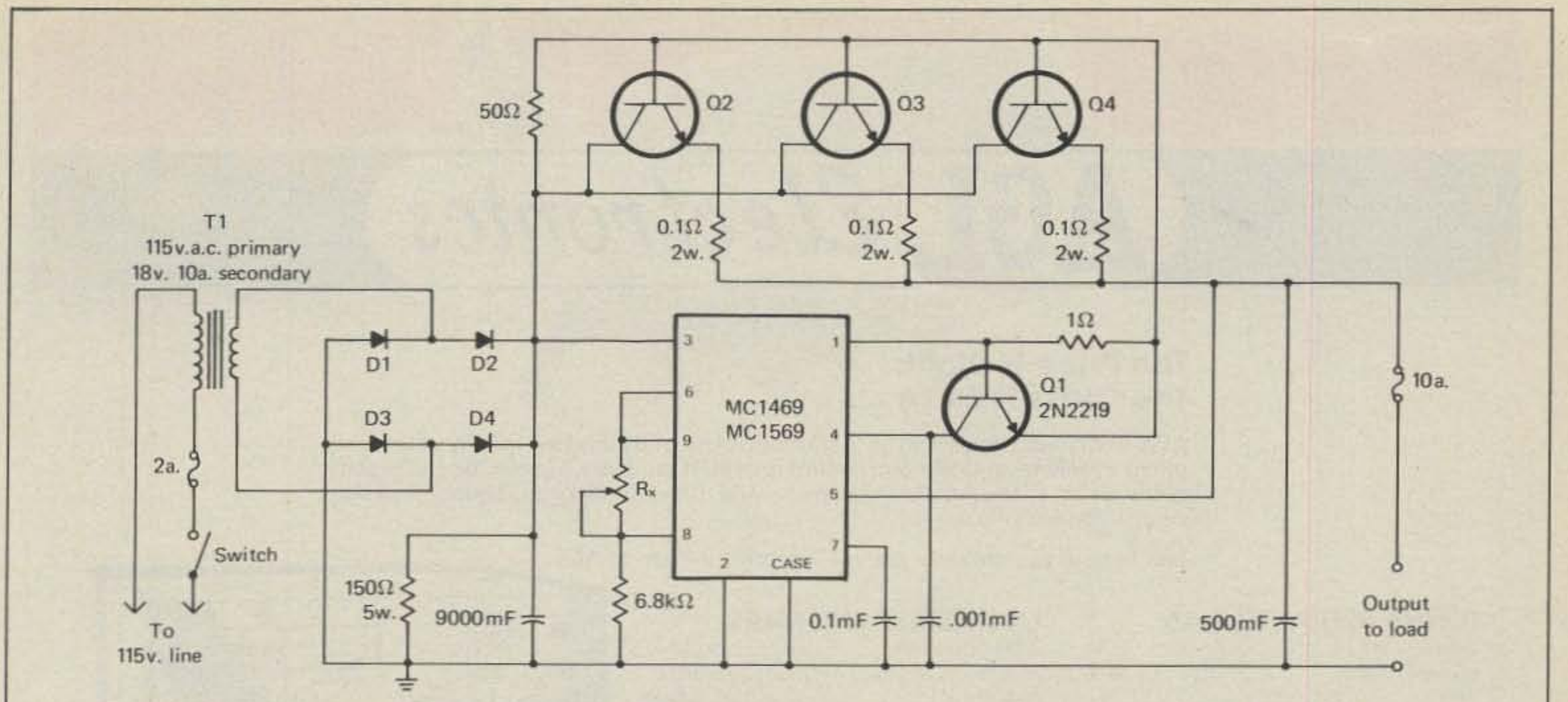
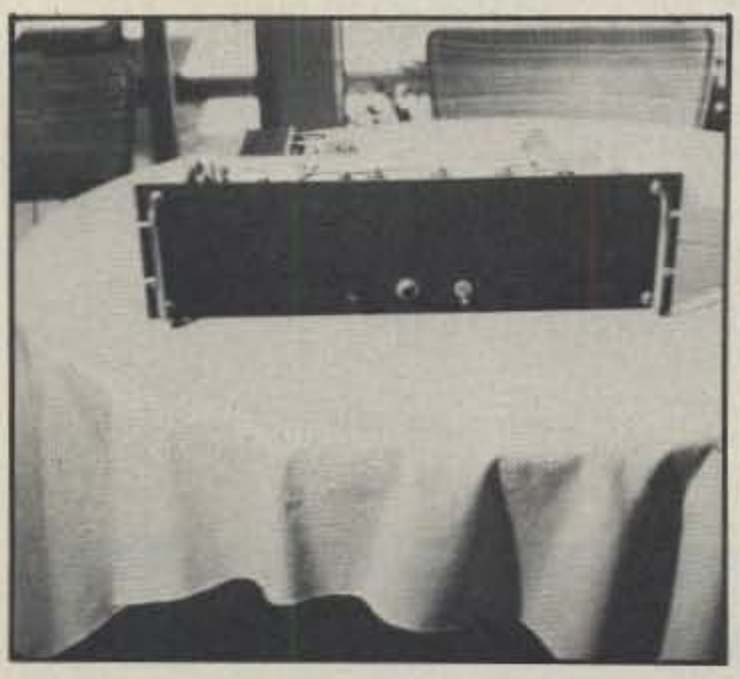


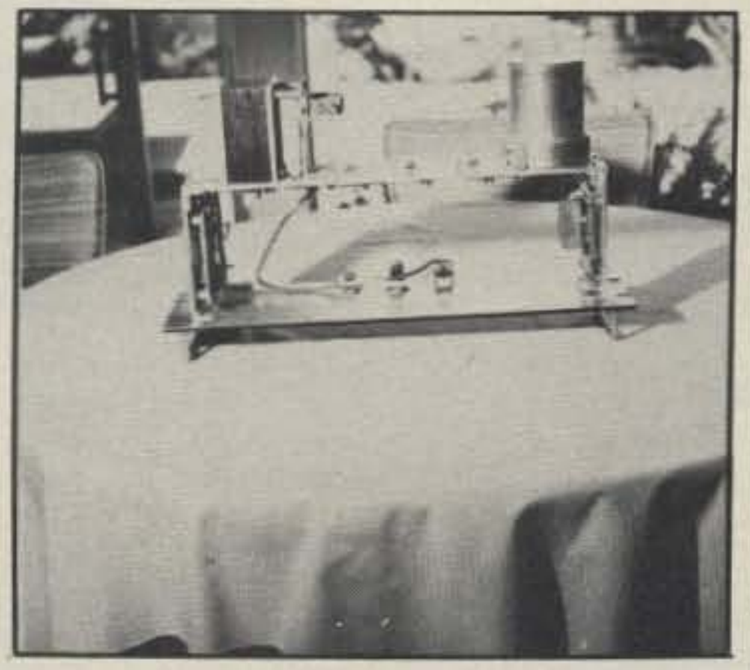
Fig. 4– The complete circuit for the regulated power supply with three pass transistors. Notes: D_1-D_4 are 10 Amp diodes; Q_2-Q_4 are 3.5 Amp NPN power transistors; R_x (approx. 16k) is adjusted for desired output voltage; all resistors are ½ watt except where indicated.

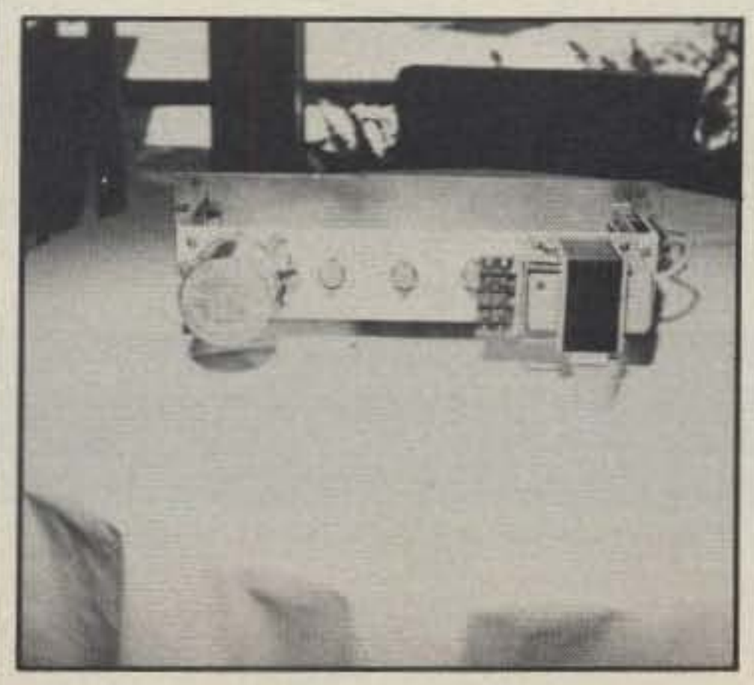
would the same amount of copper with the usual 2-diode center-tapped arrangement in which only half of the winding is used each half-cycle.

The completed unit is presently doing an excellent job of powering my IC-255A, and it should perform satisfactorily with any similar transceiver requiring 13.8 volts at 10 Amperes or less. Many parts used in this regulated power supply were selected mainly because they happened to be on hand, so that anyone building a unit of this kind should feel free to make changes. For example, any similar filament transformer could have been rewound and used, or if one were lucky enough one might have a multi-winding transformer which could be connected to supply the required voltage. A word of caution though: The actual output voltage of the transformer should be measured rather than taken from the nominal voltage marking. Otherwise, there is a good chance that higher than intended output voltage will be obtained.

I do recommend strongly testing the unit on a dummy load of inexpensive lamps, or something similar, before applying it to an expensive transceiver.







Three views of the complete power supply. Layout is not critical and can be modified to suit available components.

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105BA	$ 86.00
155BA	$ 133.00
205BA	$ 219.00
204BA	$ 166.00
402B	$ 159.00
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18HT	$ 260.00
BN86	$ 12.00

HY-GAIN CRANK-UP TOWERS

HG-52SS ..... $ 777.50
52 ft. self supporting. 9 sq. ft. at 50 mph.
Nested height: 20½ ft.

HG-50MT2 ..... $ 627.50
50 ft. side supported. 6 sq. ft. at 50 mph.
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HG-54HD $1513.00
54 ft. self supporting. 16 sq. ft. at 60 mph.
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70 ft. self supporting. 16 sq. ft. at 60 mph.
Nested height: 23 ft.

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20-3CD	$ 165.00
20-4CD	$ 240.00
15-3CD	$ 83.00
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10-4CD	$ 75.00
ATV-4	$ 85.00
ATV-5	$ 90.00
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ARX-450	$ 30.00
A-147-11	$ 34.00
32-19 Boomer	$ 75.00

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HBX56	$ 335.00
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3/16 EHS guy wire, 500 ft.	$ 63.00
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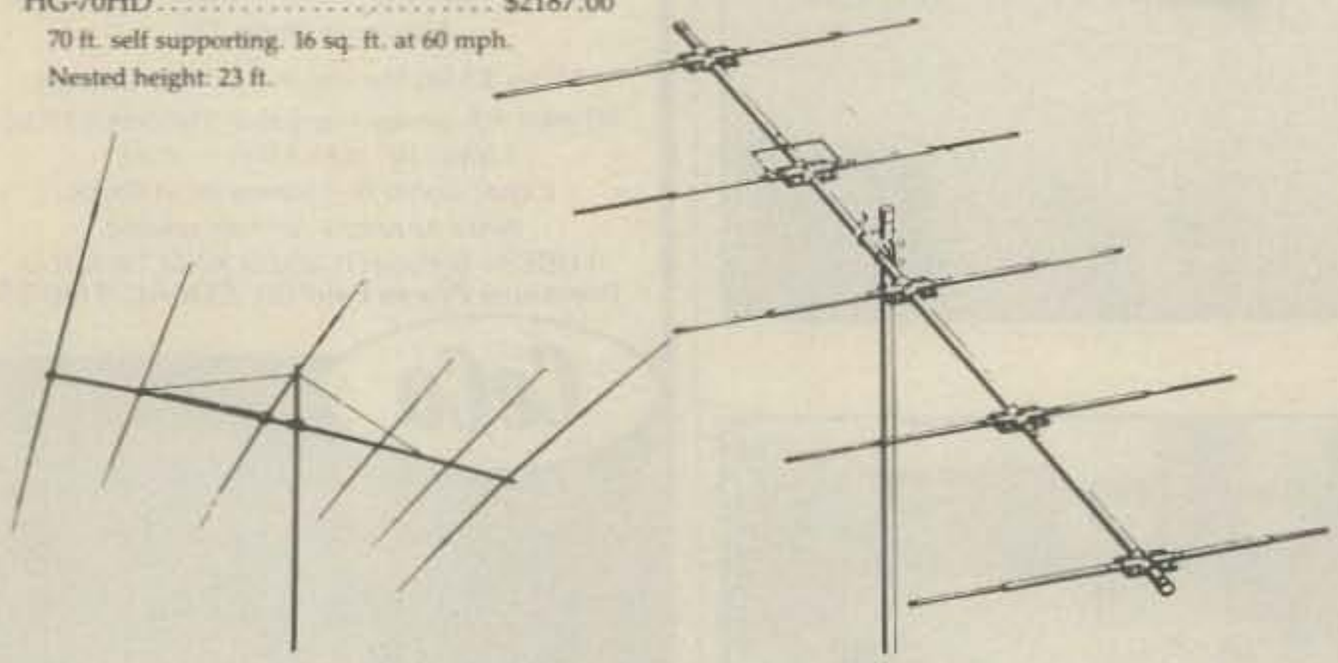
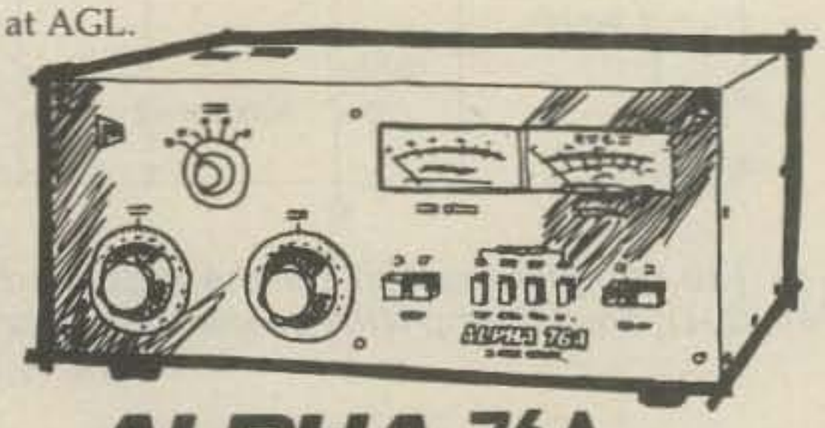
3/8 Turnbuckle, eye & eye	$ 5.39
M200H 10 ft. H.D. galv. mast	$ 36.99

ROTATORS

CDE Ham IV	$ 149.00
CDE Tailtwister	$ 219.00
HY-GAIN HDR300	$ 385.00





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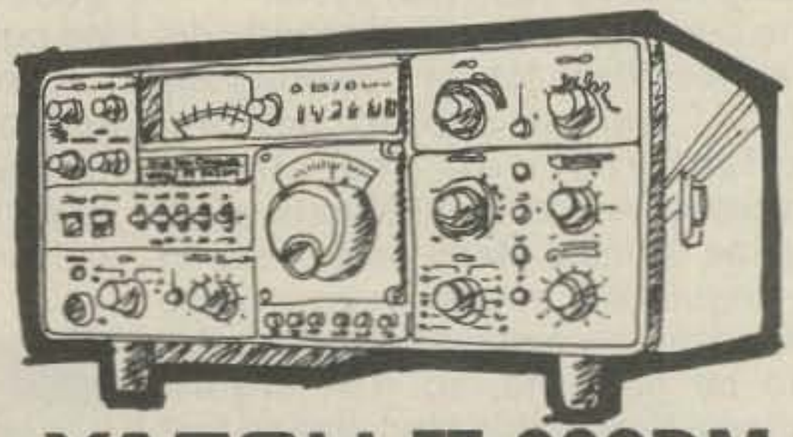

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CIRCLE 1 ON READER SERVICE CARD

$2.70 per dB, not a bad trade off! Here's how K5QY solved his 20 meter antenna problem for only $27.00 and a little ingenuity.

Rotate That Side-Mounted Antenna

BY DICK SANDER*, K5QY

Recently I decided to experiment with a 20-meter beam and side-mount it on my tower to see if there would be any improvement in signal strength. I did this so that if a DX list should occur, I would stand a better chance to get on it. I found that from my QTH (Texas) to the east coast, sometimes there was as much as 10 dB improvement. I also found that sometimes Europe was as strong at the lower height as at the taller height. Later, I turned the beam to the Caribbean with similar results. Since I couldn't climb the tower each time I wanted to change direction, a rotatable side mount was necessary.

Being neither a super mechanic nor rich, I took the hardware-store approach. Having recently purchased a heavy-duty rotator to replace my previous one, I had the most expensive part that is needed; everything else came from the hardware store. Fig. 1 shows the assembled side mount and the parts needed to build it and contains sufficient explanation for assembly. I had the joints spot-welded after assembly. The top hinge is formed by a 1½-inch, 90° elbow that is well lubricated and not tightened down completely. My cost, excluding the rotator, was $27.

My 20-meter beam is a three-element; about 120 degrees rotation is all I'm able to obtain, because the driven element is too close to the mast clamp (fig. 2). A four-element beam with greater spacing between the driven element and mast clamp could permit as much as 270° rotation. The load on the tower and rotator does not seem to have any ill effects. Caution must be exercised while turning the antenna, because it is possible to drive the antenna into the tower. I have not built any limit switches, but they easily could be inserted in series between the motor leads if extra safety is desired. My tower is Rohn 45. The dimensions reflect this size tower, but the same design can be scaled to whatever tower is used.

*110 Starlite Dr., Plano, Texas 75074

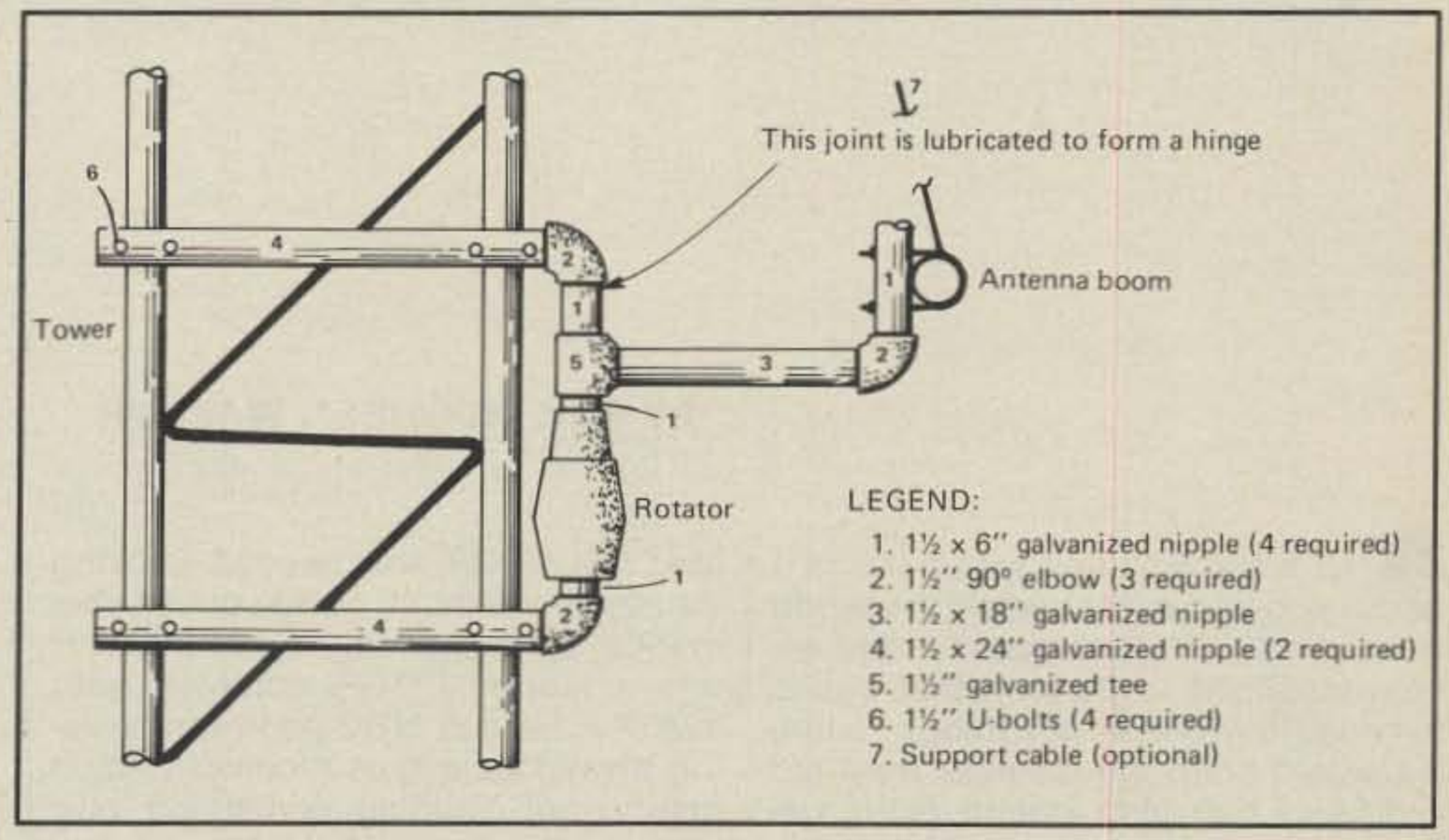


Fig. 1– Side-mounted rotator assembly and parts list.

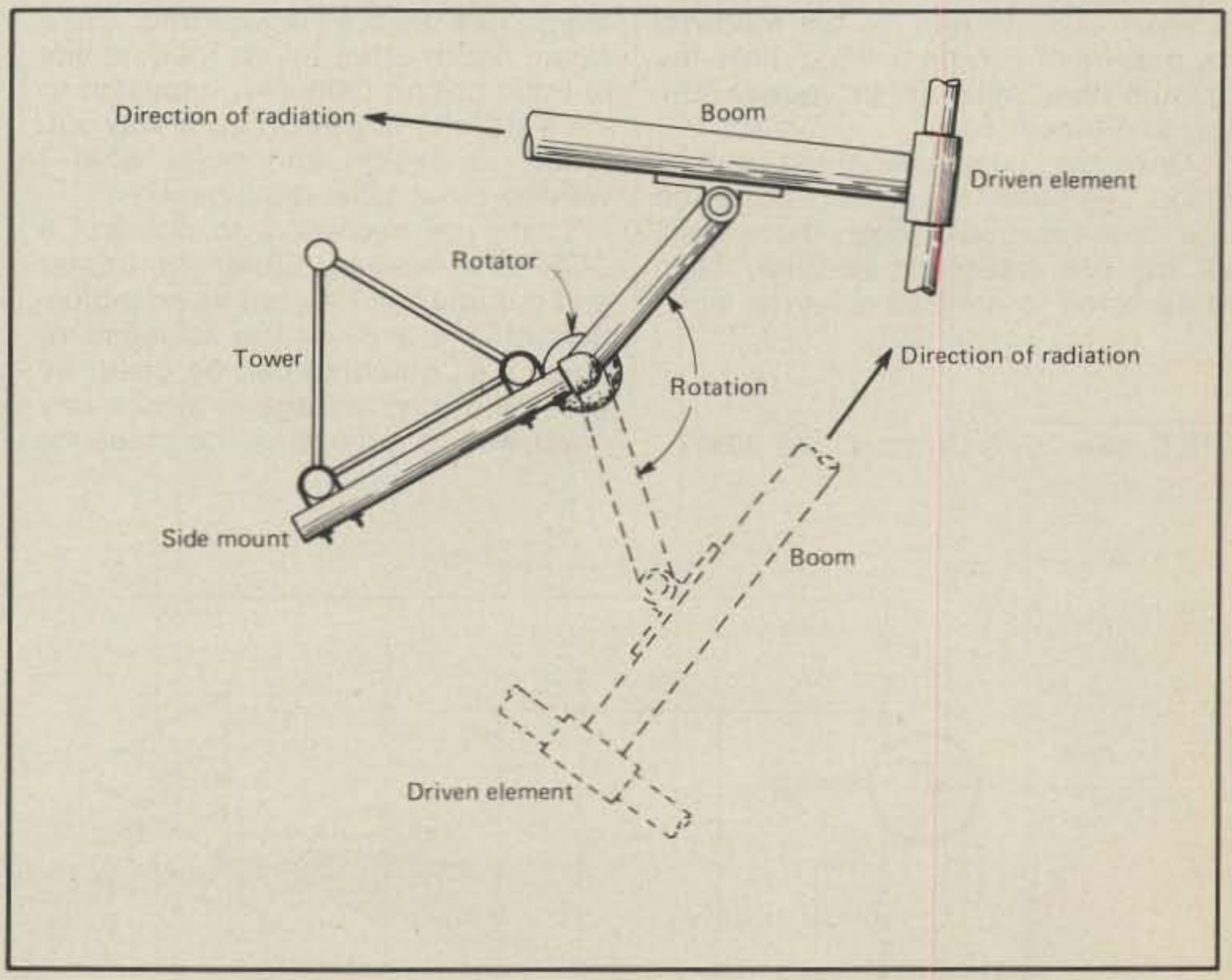


Fig. 2– Top view showing approximately 120° rotation for a three-element beam, while keeping it as far away from the tower as possible.

Here's a solid state, noise activated COR with its own noise amplifier that can be built with readily available parts.

A Noise Operated COR (Carried Operated Relay)

BY PHIL HUGHES*, WA6SWR

After a conversation with a friend it became obvious that what the world needed was another repeater and we were destined to perform that public service. In order to get things rolling we would build the repeater from old radios we had lying around, get it running and then work on the world's finest one that would dazzle everyone. I volunteered to furnish the receiver. This seemed simple enough; just take apart the old GE MC306 that had seen 5 years of service in my car followed by 5 years of service holding down my garage floor, build an a.c. power supply and tune it up.

One day later everything looked good. The power supply was done and the receiver could hear the output of my one transistor tweeker. Then it occurred to me that a carrier operated relay (COR) was needed. Looking through my old f.m. accessories schematics produced only one circuit. It was a Motorola COR, complete with 12AT7 tube and NE-2 neon lamp. Using an old tube type receiver I could justify, but building something new with a tube was a little too much. I would just have to build a modern COR to show I had a little class.

Looking through the handbook and about 100 back issues of various magazines resulted in eyestrain and a whole list of other things I would like to build but no COR that appealed to me. This left me with only one way out. I had to design and build what I wanted. Now, what did I want?

There are two ways to connect a COR to a receiver. Either the limiter grid voltage can be used as an indication of a signal or the absence of noise (i.e., quieting) can be used. As the limiter grid voltage is also a very good way to determine the presence of a chain saw and I intended to only repeat f.m. signals, this method was out. The squelch circuit of most f.m. receivers is noise operated so I grabbed the receiver schematic to see if there was a nice d.c. level available as part of the squelch circuit. There was, but it was after the squelch control. GE used a pot in the cathode of the noise amplifier to adjust the squelch. The d.c. level would be usable but adjusting the squelch would require readjusting the COR. If I was going to build exactly what I wanted, I would have to build my own noise amplifier and rectifier.

This pretty much firmed up the requirements. A solid state COR, noise activated, with its own noise amplifier. This should be universal as it can be connected to the discriminator output of any receiver. There is one other consideration. I live in a small town, therefore it should be possible to build the COR with readily available parts.

*P.O. Box 2847, Olympia, WA 98507

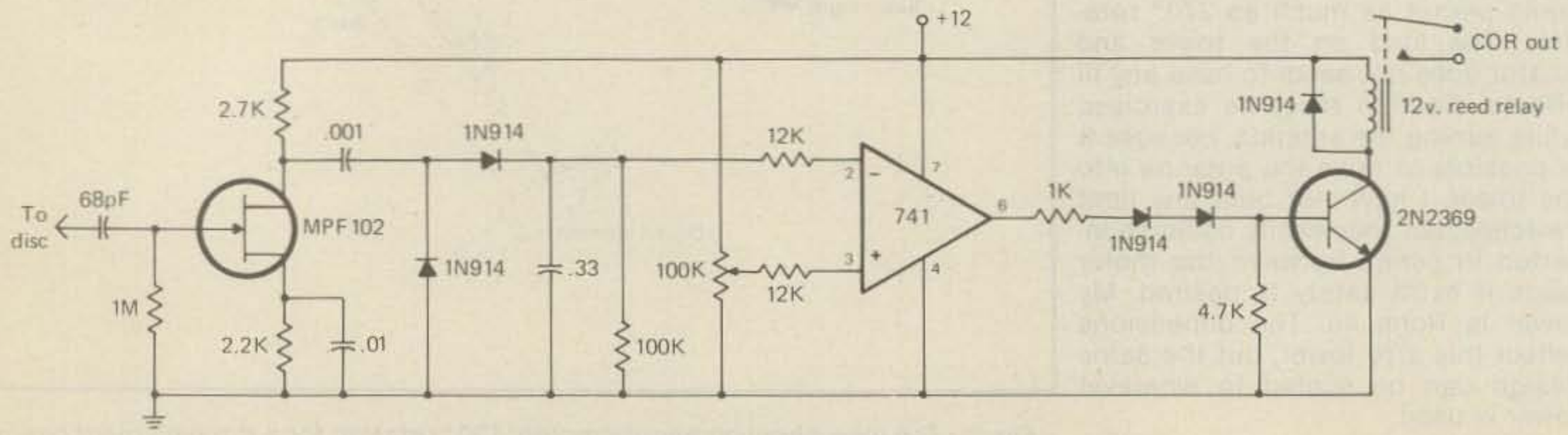
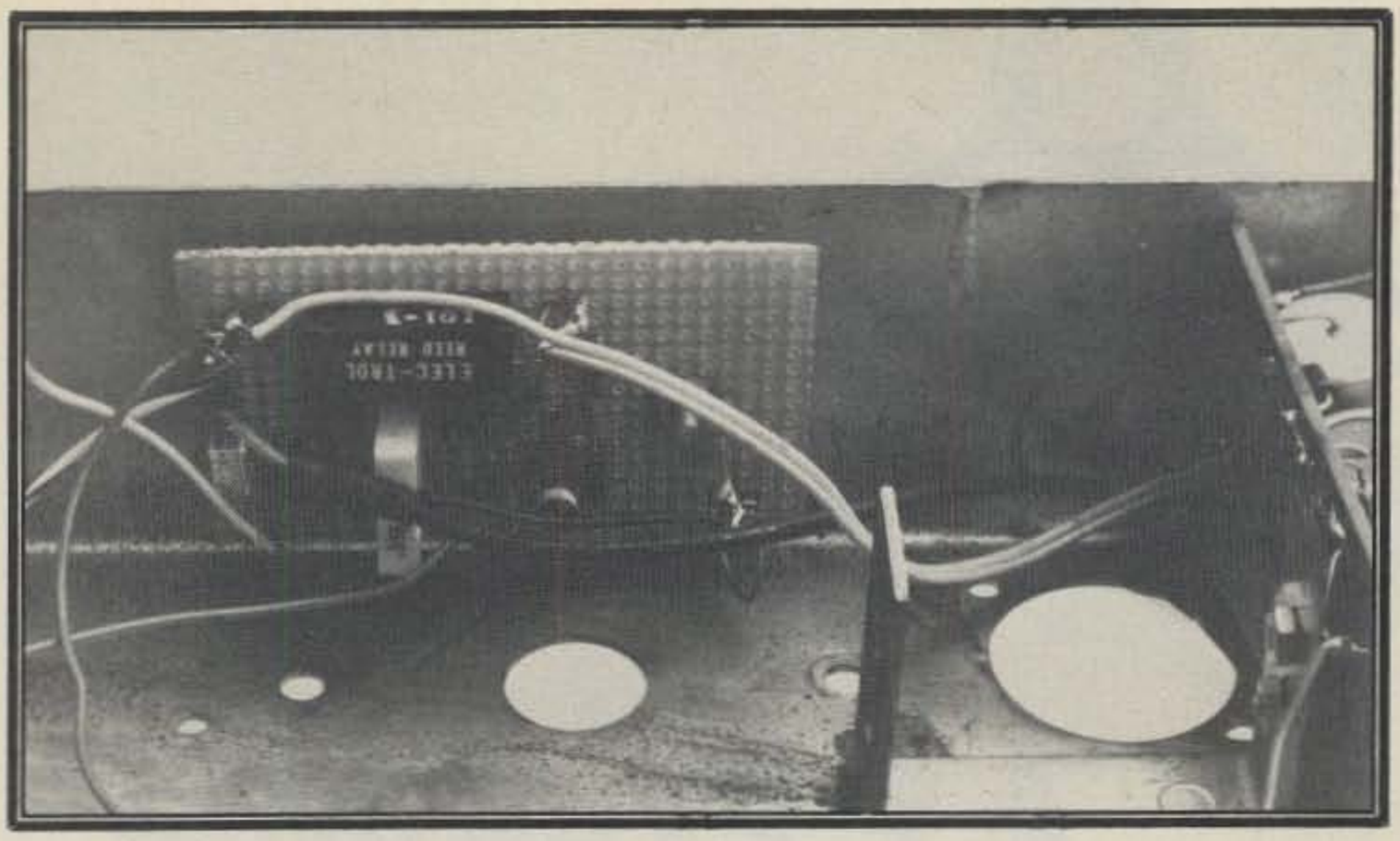
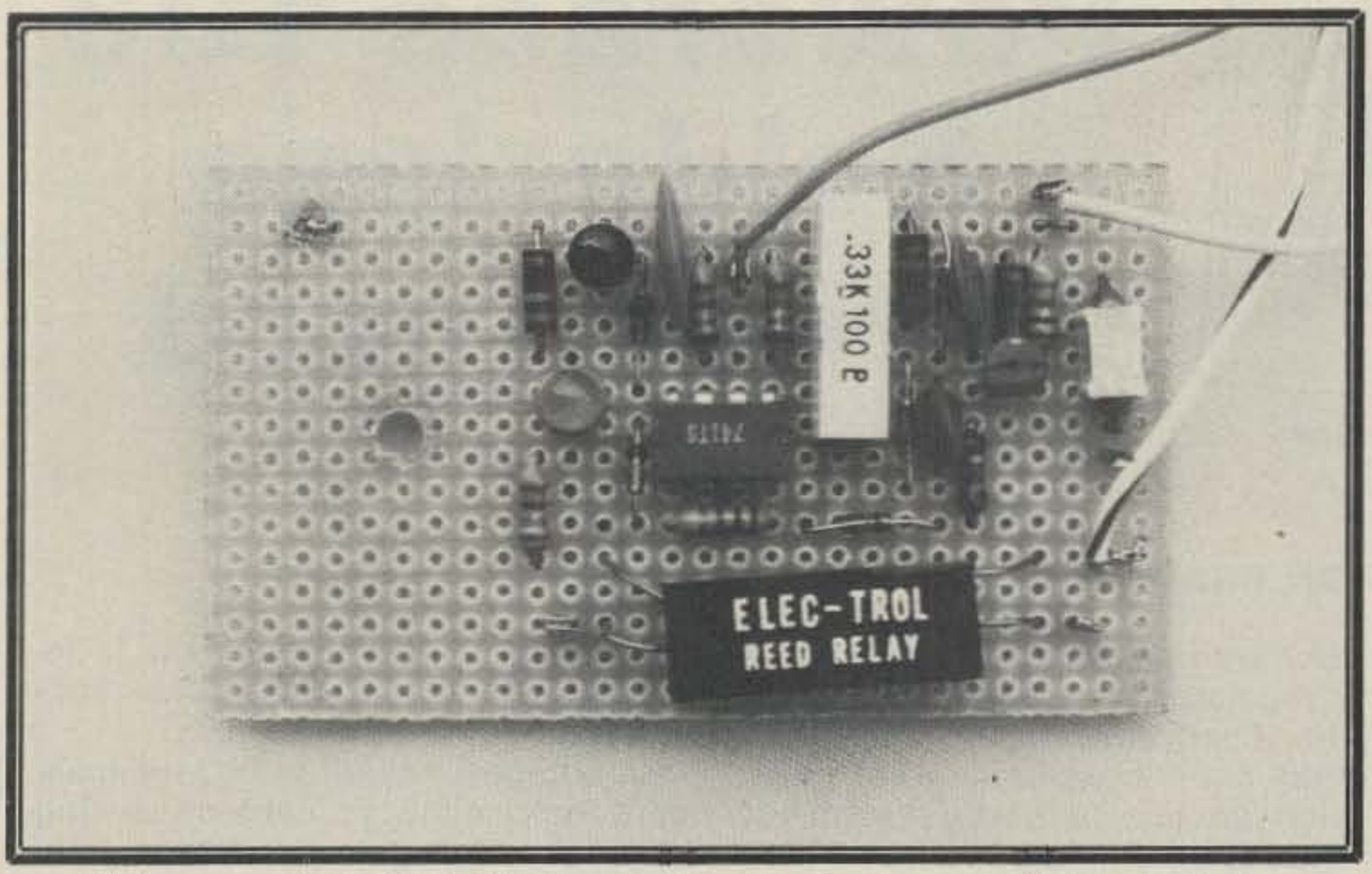


Fig. 1-The schematic diagram for the noise operated COR.



COR circuit board mounted in the power supply chassis of a GE pre-prog radio.



Noise operated COR. The three wires go to the sensitivity control.

Fig. 1 shows the result of my work. The MPF102 is used as a noise amplifier. I chose a FET for its high input impedance. This prevents excessive loading of the discriminator output. The input and output coupling capacitors were chosen to cause high losses in the audio range but pass the higher frequency noise. Also, the .01 uf source bypass capacitor causes a much lower amplifier gain at audio frequencies. This method appeared to be adequate and avoided the use of an inductor (which I didn't have in my junk box).

A pair of 1N914 diodes are used as the noise rectifier. A 741 operational amplifier is used to compare the output of the noise rectifier to an adjustable reference. This reference is used to set the trip level of the COR.

Finally, the NPN switching transistor is used to drive a 12 volt reed relay. The two 1N914 diodes between the 741 output and the base of the transistor prevent the small output of the 741 in its off state from turning on the transistor.

Connecting the COR to the receiver was very simple. I just plugged the COR input into the discriminator test point. This test point is connected to the cathode of the discriminator through a 100K resistor. The COR could also be connected directly to the cathode which is either pin 1 or 5 on a 6AL5. One of these pins is grounded which makes the other one an easy choice.

The result is a reliable COR that is independent of squelch setting and local chain saws. In fact, it works so well that I am considering adapting it to replace the squelch circuit in my Swan FM-2X. You see, my Swan thinks that the ignition system of a passing car is the kind of signal I want to listen to.

The Powerace 103 console shown "breadboarding" a typical circuit.

A P Products Powerace 103 Solderless Breadboard

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

It used to be that breadboarding a new circuit involved gathering together a lot of test equipment, a power supply, and some kind of breadboard. During the last decade, thanks to their introduction by A P Products, solderless breadboards have helped make the prototyping process "faster and easier," as the company's slogan declares. Now they've added these elements together in a useful and attractive package, the Powerace. There are three models of Powerace available; this one, the Model 103, is exceptionally versatile for most linear and digital circuit designs.

Three Power Supplies

The Powerace 103 has three a.c. power supplies built in, all offering less than 10 mV ripple and noise at full load, plus line and load regulation better than 1%.

For logic circuits, there's a 7805-derived +5 v.d.c. supply offering 750 milliAmps. The 2200 microFarad capacitor at the input to the regulator promises good surge-demand performance, and the .1 at its output good bypassing. (Still, good design practice calls for a .1 from Vcc to ground on the board for every IC or two.)

For linear and memory circuits, there are both + and − tracking 15 v.d.c. supplies, each rated at 250 milliAmps. An NE5554 tracking ±15 v.d.c. regulator and two pass transistors do their duty here.

These supplies are made available at solderless tie-point blocks on the sloping front panel of the unit. These are clearly marked with ground, +, and − symbols and the value of the voltage available. The grounds of both supplies are connected internally.

Logical Indicators and Voltmeter

Also mounted on the sloping front panel is an edge-reading zero-center voltmeter capable of indicating ±15 v.d.c. full scale and graduated in 2½ v.d.c. increments. It, too, is brought out to well-labeled front panel solderless tie-point blocks and is internally connected to the power supply ground.

In addition, there are two independent logic monitors, each consisting of a very high gain Darlington transistor incorporating input (base) current limiting driving an LED. Presenting less than a microAmpere load on the circuit point being monitored, the LED will light when connected to a high logic level.

These two logic indicator LEDs are mounted to the front panel in white plastic mountings that include single solderless test points. These test points are the input connections to each logic indicator.

Data and Logic Switches

There are four small slide switches on the front panel of the Powerace 103. Two of these (S1 and S2) connect their respective front-panel tie-point blocks either to logic high (+5 v.d.c. through a 470 Ohm resistor), labeled "1," or to ground, labeled "0." These double-throw switches have unlimited sinking capability, or can source up to 10 milliAmperes.

The operation of switches S3 and

*c/o CQ Magazine

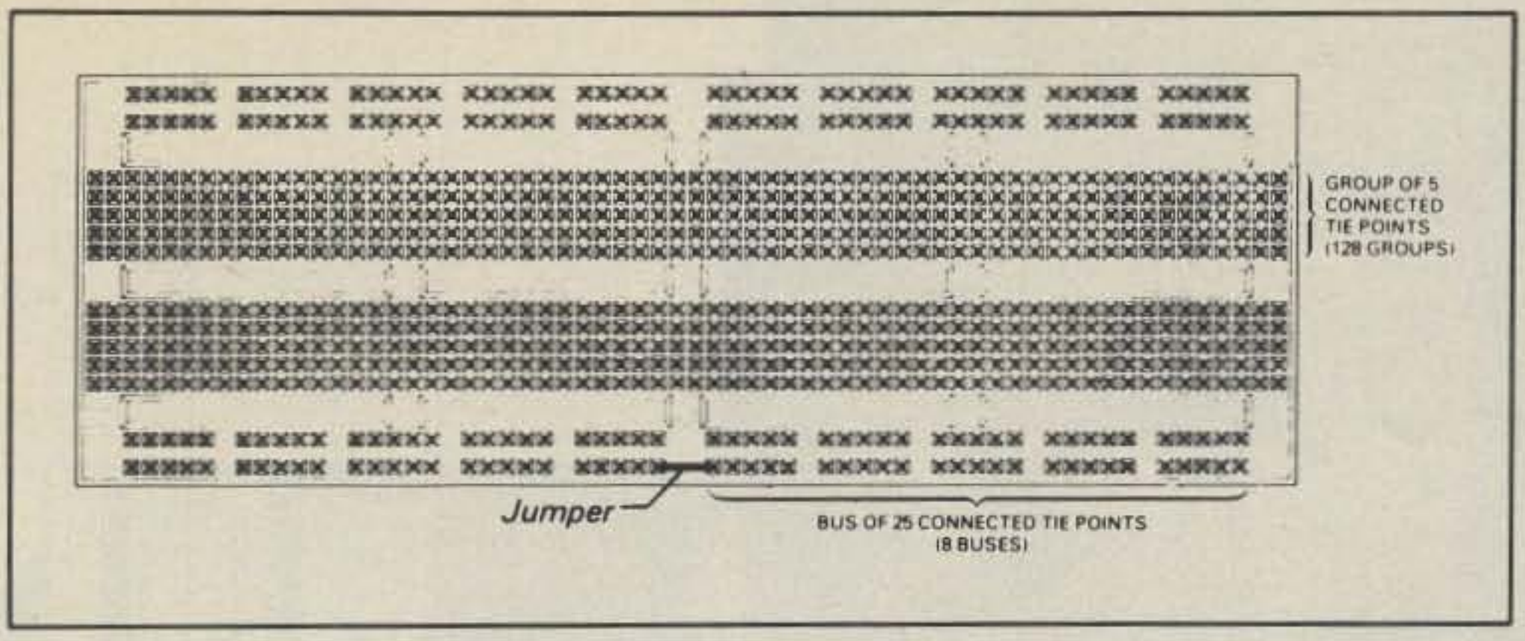


Fig. 1– The Super-Strip layout.

S4 is a little more complicated. These are momentary switches, normally in a position labeled "$\overline{Q}$," but they can be switched to a position marked "Q." Internally, these are connected to a flip-flop made from two sections of a 7403 quad two-input NAND gate package cross-connected with each other. The flip-flop is of the set-reset variety and provides both true and complement outputs, labeled "$\overline{Q}$" and "Q" on front-panel tie-point blocks.

With the switch in its normal $\overline{Q}$ position, the row of $\overline{Q}$ outputs is high and the row of Q outputs is low. With the switch pressed to its Q position, the Q tie points are high and the $\overline{Q}$ tie-points low.

These bounceless switched outputs are capable of sinking 15 mA or sourcing 5 mA.

Plenty of Breadboard Area

The solderless breadboards atop the Powerace 103 are A P Super-Strips, a virtual breadboarding standard. There are two Super-Strips mounted on a ground plane to aid in high frequency, high speed or low noise designs. The diagram shows the Super-Strip layout.

For numbers fans, the two Super-Strips offer 1680 solderless tie points, providing room for up to eighteen 14-pin DIPs, or combinations with virtually any style package. There are 128 twin rows of five connected tie-points each arranged on either side of an 0.3-inch center channel; these are surrounded by sixteen signal or power distribution buses with 25 connected solderless tie points each.

Components plug into and easily unplug from this matrix to allow easy substitution of parts and values. Interconnections are made with ordinary hookup wire; A P breadboards will accept any gauge of solid wire from #20 to #30, but the manufacturer recommends using #22. Personal experience strongly recommends the purchase of a breadboard wire jumper kit, which provides fully prepared, stripped, and bent wires in 14 lengths from 0.1-inch to 5.0-inch (.1 to 1 in tenths, then 2, 3, 4, and 5 inches) with insulation color coded to the wire length.

Comments

The first reaction to the sleek 103 is an unabashed "Wow—It looks great!" Its lines are sleek, well thought-out, and stylishly attractive.

The second reaction is another "Wow—look at all the utility they've managed to provide!" Obviously, this is more than just a pretty face; this is a professional piece of equipment that thoughtfully anticipates the needs of a designer.

The scene at UK3AAH/RK3AH/RM3O during July 1980. The author, W6SN, is at the upper right. Oleg, UA3DHH, is seated at the right, with other club members gathered around.

A close-up view of one of the transceivers at RM3O/RK3AAH.

The RM3O/RK3AAH club station in Moscow. There are transceivers at either end of the operating desk with a linear towards left center.

Summer in Moscow, the Olympics and amateur radio. Read about W6SN's great working vacation.

The Moscow Connection

BY WILLIAM A. LIPPMAN*, W6SN

In July, 1932 at the age of 24 I found myself putting together at the request of the Los Angeles Chamber of Commerce an amateur radio station in a bungalow in the new Olympic Village atop the Baldwin Hills, with the help of five local amateurs who pooled their equipment and operating—W6ANN, W6CII, W6CUH, W6CUU and W6ETJ. Through our two Senators in Washington, D.C., I applied for and was issued (for six months) the call W6USA, the very first special-purpose call using the letters "USA." From April to October we handled 6,000 messages from athletes in the Xth Olympic Games.

In July, 1980, now at age 72, I found myself in Moscow, U.S.S.R., as guest operator at RM30/RK3AAH, the club station of the Moscow Telecommunications Instutute, whose regular call is UK3AAH. Many such special prefixes were issued, points given for contact, and certificates made available for certain scores. The XXII Olympic Games were about to begin.

After retiring from business in 1968 my full-time efforts have been turned to volunteer work in the administration of amateur swimming. My son was an All American swimmer in school. This "other" hobby fitted in nicely with amateur radio, as it often took me to foreign countries for meetings or competitions—mostly at my own expense. This left me comparatively free to look up amateur friends while there, and I have thus enjoyed operating from over 30 countries in the past three years.

My international commitments as Swimming Secretary of the International Swimming Federation (FINA) required that I be in Moscow early to make last minute preparations for scheduling the officiating personnel, work as an official in the competition, and remain afterwards for the quadrenniel Congress and other committee meetings. Thus I was in town for three weeks, with ample opportunity to move around town.

It should be pointed out, in view of the situation of which all were highly conscious, that in all of the Olympic sports the international federations for each had a contract to conduct their own competitions in the Olympic Games wherever they were held and regardless of who was entered in them. The commitment was to the athletes—all of them. In swimming there were 45 countries competing. My presence was not as a representative of any country. I had a job to do, which I did, and left.

Prior to departure for the Soviet Union I had talked several times to the club station, and soon after arrival in Moscow I contacted them. My mentor, Oleg Solntsev, UA3DHH, visited my hotel, met me at the Metro stations, guided me through strange and often

*921 Iliff St., Pacific Palisades, CA 90772

dark streets, fed me beer and cheese and sausages, and saw that I was on the right subway train when I left at night. He was assisted by other club members: Alex, UA3DNV and his wife Galina; Yuri, UA3AJR; Vlad, UA3DDF; and yet another Alex, UA3DQE. But Oleg was my guide and watched over me like a father (although he was about one-third my age) and could not have been a more gracious host. The club members are shown in one of the photos together with a portion of the equipment at the club station.

Although I did not inquire too closely—and language difficulties somewhat inhibited such discussion—it was obvious that proper clearances had been obtained to enable me to operate the station freely. It was okay to identify my home call over the air and my reasons for being in Moscow. I could work anybody I wished, although propagation was such that only 15 meters was in shape at the hours I was able to be there and 90% of the 150-odd QSOs were made on that band—all s.s.b., as I do not understand automatic keys and they do not understand me.

Once or twice my CQs were answered by Soviets speaking in Russian, and when I told them "Sorry, English only!" the club members fell on the floor and howled in glee. I guess it must have sounded strange, at that.

It seemed to me that if *I* were able to walk into a Russian radio club station—and there are many in Moscow—and operate it without filling out papers and getting visas, others also must be doing it. But on inquiry I was told that only a couple of foreign amateurs had visited other club stations during the Games, but neither did any operating. Many European operators told me they had visited Moscow often but were never able to get permission to operate a radio.

In Moscow the bands sound just like they do in Singapore, Madrid, Cairo, Lima and Nuku'alofa, Tonga—noisy, full of loud Italian and German stations and the Russian Woodpecker. Oh, yes. It bothers them just as much as it does us. Well, maybe not *quite* as badly, because it is beamed away from them and *at* us. But it is still a headache to them, and I presume they can't even complain about it, which we can. Ten hours away from California time, what's easy DX for them is rare to us, and vice-versa. A lone VK4MM—the only Australasian I heard—had the club members hanging on his every word when we talked on 21 MHz and the contact made everybody happy.

Not being an engineer, I made no effort to check out what lay behind the hand-lettered panels on the rack-and-panel equipment in the station. It all appeared to be formerly GI—Signal Corps boxes—which had been gutted and refilled with more sophisticated gear. Mostly tube jobs, and solid state is somewhat rare. Circuit boards here and there, but a lot of hand-made transformers and chokes. Took me back to the 30s and 40s. But you will note in the photo of the two transceivers with the linear in the middle (200 watts pep), they had digital readouts on both. There are also floor switches underfoot to go from receive to transmit. And it all works very well.

Japanese equipment and U.S.-built gear are not available. No "800" numbers to call and order by mail. No Radio Shack down the street, or Henry Radio nearby. No Akihabara section, like Tokyo, where there are entire shops selling transformers, speakers, CB sets. Bear this in mind when you hear those clean-cut signals from the U.S.S.R.

The economics and plans of the country being what they are, the amateurs must "make do." One reason there are so many club stations (all calls with prefixes starting with "UK" are clubs) is the difficulty in setting up a decent rig at home. Most homes in Moscow are one or two room apartments, with up to four residents. Absolutely no room for radio. So, the boys get together, pool their gear, efforts, and talent, and put the resultant club station on the air, sometimes around the clock.

The antenna at UK3AAH is atop a five-story building. A heavy, steel tower supports a big boom holding a quad with 3 elements on 20 meters and 4 elements on 15 meters.

The direction indicator is a steel rod protruding from the center of a great circle map on which the U.S.A. is a *very* strange shape—sort of like a long piece of liver—and the rod has a hand-made arrow on the end. It works well. Unfortunately, being unable to read Russian, and not recognizing a single hemisphere from that angle, I was forever yelling "Where are we pointed, the States or Africa?"

I had brought along with me a list of Russian QSL cards I am still shy for s.s.b. contacts. I showed them to Oleg. He smiled. I asked if he could help me get cards from the UJs, UIs, UMs, etc., on the list. He smiled, and the other lads smiled. Some even laughed, politely. Then they told me about Post Office Box 88. The Bureau to end all Bureaus.

Box 88, it seems, is a large five-story building in Moscow, the home of the Central Radio Club, which has the contract from the government to handle *all incoming and outgoing amateur radio correspondence for a country of 250 million people and the Lord knows how many amateurs.* The system has broken down to the extent that even the U amateurs themselves have made official complaints. "How many people do the work on cards?" I asked. The answer was that there are supposed to be ten, but it is usually three to five, and they don't work very hard at it. The simple fact is that the bottleneck is just as tight for the Soviets as it is for the rest of the world. The don't get our cards, either. Box 88 must have literally millions of cards in it. Let's hope they don't have a fire until at least a few of them leave the building.

In beautiful downtown Moscow, around the corner from the Bolshoi Theater, is the General Post Office. In front stands a large, bronze statue of a lady in robes holding a pigeon in her outstretched hand. The bird is green with time and weather, looks tired, and probably has sore feet from all the walking it has done. I am very much afraid, friends, that in spite of the communications advances Russian amateurs have made under difficult conditions, the transportation and delivery of amateur radio mail there is in the hands of this bird, and we are stuck with it.

ANNOUNCING

"Important Rule Changes"

The 25th Annual CQ World Wide WPX Contest

(Silver Anniversary Event)
SSB: March 28-29, 1981
& C.W.: May 30-31, 1981

Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

I Contest Period: Only 30 hours of the 48 hour contest period permitted for Single Operator stations. The 18 hours of non-operating time may be taken in up to 5 periods anytime during the contest, and must be clearly indicated on the log. Multi-operator stations may operate the full 48 hours.

II Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III Bands: All bands, 1.8 thru 28 MHz may be used.

IV Type of Competition: 1. Single Operator (a) All Band, (b) Single Band. 2. Multi-operator, All Band *only*. (a) Single Transmitter (only one transmitter and one band permitted during the same time period, defined as 10 minutes, no exception), (b) Multi-Transmitter, (one signal per band permitted). **NOTE:** All transmitters must be located within a 500 meter diameter or within the property limits of the station licensee's address, whichever is greater. The antennas must be physically connected by wires to the transmitter.

V Exchange: RS(T) report plus a progressive three digit contact number starting with 001 for the first contact. (Continue to four digits if past 1000.) Multi-transmitter stations use separate numbers for each band.

VI Points: 1. Contacts between stations on different continents count 3 points on the 14, 21, and 18 MHz bands, and 6 points on the 7, 3.5 and 1.8 MHz bands.

2. Contacts between stations in the same continent but not in the same country count 1 point on 14, 21 and 28 MHz and 2 points on 7, 3.5 and 1.8 MHz. (Exception: Contacts between different North American countries count 2 points on 14, 21 and 28 MHz and 4 points on 7, 3.5 and 1.8 MHz. This applies to North American countries **only**.)

3. Contacts are permitted between stations in the same country for the purpose of obtaining a Prefix multiplier, but have no QSO point value.

4. A Station in a call area different than that indicated by its call sign is required to sign portable. The portable Prefix would be the multiplier as indicated in Section VII (below).

VII Multiplier: The multiplier is determined by the number of different prefixes worked. A **"PREFIX"** is counted once during the entire contest regardless of how many times the same prefix is worked.

A "**PREFIX**" is considered to be the three letter/number combination which forms the first part of an amateur radio call. (N1, W2, WB3, K4, AA6, WD8, 4X4, DL7, G3, IT9, KH2, AL7, NP2, WP4, 9M2, CT9, 4J9, PY7, VK4, JE3, VE3, Y32, H31, AN8, AB8, H44, KT4, etc.). See the WPX Awards Program information if additional clarification is necessary. It is available from K6XP.

Special event, commemorative and other unique prefix stations are also encouraged to participate.

VIII Scoring: 1. Single Operator (a) All Band score, total QSO points from all bands multiplied by the number of different Prefixes worked. (b) Single Band score, QSO points on the band multiplied by the number of different Prefixes worked. See VII.

2. Multi-Operated stations. Scoring in both these categories is the same as the All Band scoring for Single Operator.

3. A Station may be worked once on each band for QSO point credit. However, prefix credit can be taken only **once** regardless of the number of different bands on which the same station and/or prefix has been worked during the entire contest.

IX QRPp SECTION: (Single Operator Only). Power must not exceed 5 watts output to qualify for QRPp section competition. You must denote QRPp on the summary sheet and state the actual maximum power output used for all claimed contacts. Results will be listed in a separate QRPp section and certificates will be awarded to each top scoring QRPp station in the order indicated in Section X. These certificates will be marked QRPp and show your power output. QRPp stations will be competing only with other QRPp stations for awards. All other information contained in these rules is applicable to this section.

X Awards: Certificates will be awarded to the highest scoring station in each category listed under Sec. IV.

1. In every participating country.

2. In each call area of the United States, Canada, and Asiatic USSR.

All scores will be published. However, to be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must show a minimum of 24 hours.

A single band log is eligible for a single award **only.** If a log contains more that one band it will be judged as an all band entry, unless specified otherwise. However, a 12 hour minimum is required on the single band.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

XI Trophies, Plaques and Donors.

S.S.B.

Single Operator, All Band

WORLD - North Florida DX Assn.
U.S.A. - Bob Epstein, K8IA
CANADA - Garth Hamilton, VE2VY
CARIB./C.A. - Ray Alea, KB8JF
EUROPE - Bernie Welch, W8IMZ
JAPAN - Palm Garden Radio Club
WORLD QRPp - Dayton A.R.A.

Single Operator, Single Band

WORLD - John N. Reichert, N4RV
U.S.A. - Richardson Wireless Klub.
(Joe Johnson, W5QBM Memorial)
CANADA - Gene Krehbiel, VE7KB
EUROPE - Myron E. Crofoot, WB4VQO
WORLD - 21 MHz-Lee Wical, KH6BZF

Multi-Operator, Single Xmtr.

WORLD - Mike Badolato, W5MYA

Multi-Operator, Multi Xmtr.

WORLD - Henry Thel, VE7WJ

Contest Expedition

WORLD - Northern Ohio DX Assn.

• • •

C.W.

Single Operator, All Band

WORLD - Canadian DX Assn.
U.S.A. - Corker A. Rhines, W8EAO
(Charles Rhines, W7VIU Memorial)
CANADA - Canadian A.R.F.
EUROPE - Sig. Jakobsson-TF3CW
JAPAN - Palm Gardens Contest Club
WORLD QRPp - Nevada A.R.A.
(George Hewitt WB700Q Memorial)

Single Operator, Single Band

WORLD - Pedro Piza, Jr., KP4RF
U.S.A. - Kansas City DX Club
S. AMERICA - John Kroll, K8LJG

Multi-Operator, Single Xmtr.

WORLD - Ron Blake, N4KE
CANADA - Tehrahedral Contest Circle
EUROPE - Jonas Bjarnason, TF3JB

Multi-Operator, Multi-Xmtr.

WORLD - North Florida DX Assn.

Contest Expedition

WORLD - Northern Ohio DX Assn.

Club (S.S.B. & C.W.)

WORLD - Canadian DX Assn.
(Bud Abraham, VE1VR Memorial)

Trophy and Plaque winners may win the same award *only once* within a **TWO** year period. This does not apply to any QRPp, Club, Expedition or CQ Special Awards. A station winning a World Trophy will not be considered for a sub-area award. That Trophy will be awarded to the runner-up for that area.

XII Club Competition: A trophy will be awarded each year to the club or group that has the highest aggregate score from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area. ***(Exception: DXpeditions especially organized for operation in the contest and manned by members.)*** Indicate your club affilliation. To be listed, a minimum of three logs must be received from a club.

XIII Log Instructions: 1. All times must be in GMT. The 18 hour non-operating periods must be clearly shown.

2. Prefix multipliers should be entered only the FIRST TIME they are contacted.

3. Logs must be checked for duplicate contacts and prefix multipliers. Recopied logs must be in their original form, with corrections clearly indicated.

4. An alphabetical/numerical check list of claimed PREFIX multipliers must be sent along with your contest log. (A prefix is counted one time only.)

5. Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition and the contestant's name and mailing address in BLOCK LETTERS.

Also submit a signed declaration that all contest rules and regulations for amateur radio in the country of the contestant have been observed.

6. Official log and sample summary sheets are available from *CQ*. A large self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available you can make your own with 40 contacts to the page.

XIV Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts, unverifiable QSO's or multipliers will be deemed sufficient cause for disqualification. Actions and decisions of the *CQ* WPX Contest Committee are official and final.

XV Deadline: All entries must be postmarked no later than May 10, 1981 for the S.S.B. section and July 10, 1981 for the C.W. section. Indicate S.S.B. or C.W. on envelope. From rare isolated areas the deadlines will be made more flexible. Your support is appreciated.

Logs go to: CQ Magazine, WPX Contest, 76 N. Broadway, Hicksville, N.Y. 11801.

or to

CQ WPX Contest Director
Bernie Welch, W8IMZ
7735 Redbank Lane
Dayton, Ohio 45424, U.S.A.

Please remember to send in early for the WPX Contest Logs and Summary Sheets.

No - 25 - 26

The MFJ Versa-Tuners

BY JOHN J. SCHULTZ*, W4FA

Front view of the MFJ-962 Versa-Tuner III.

MFJ Enterprises brought out a series of antenna tuners dubbed "Versa-Tuners." Units in the series differ according to the power level they can handle and whether they include metering facilities or a built-in dummy load for the lower power units. However, they all use the same basic circuitry for impedance matching. This review only goes into detail about a Versa-Tuner III unit (rated at 1500 watts), which falls in between the Versa-Tuner II and IV units (rated at 300 and 3000 watts respectively), but the general performance features noted should be applicable to all units in the series. The features of the IV are discussed, however, as a basis of comparison.

The Versa-Tuner III, Model MFJ-962, is a full feature unit. As can be seen from the front view, the front panel contains quite a few controls. Aside from the three controls directly associated with the impedance matching network (Antenna Matching, Transmitter Matching and Inductor), there is an antenna selector switch and two meter controls. The antenna selector switch allows one to select either one of two output coaxial lines either directly, without going through the internal impedance matching network, or through the matching network. Also the switch can route the input through the matching network to a single wire output or to a balanced line output via a built-in balun. Regardless of which output is selected, the metering circuitry remains active. The meter switch allows the usage of the metering circuitry as either a conventional s.w.r. meter, where one has to set the meter for full scale deflection in the forward reading position using the s.w.r. set control, or as a direct reading r.f. wattmeter for both forward and reflected power requiring no meter adjustments. The wattmeter is calibrated to measure r.f. power either in the forward or reflected directions in two ranges—200 and 2000 watts. On the 200 watt range, the lowest power level which can be read is about 5 watts. The tuner itself is rated to handle 1500 watts r.f. output into most antenna loads.

The rear view shows the rear panel of the tuner. SO-239 connectors are used for all input and output coaxial line connections. Generously dimensioned ceramic feed-through insulators are provided for the connection of a balanced transmission line and/or a single wire feeder. There is also a small jack provided for an external 9-12 volt source to power a lamp which provides back-lighting of the panel meter, an option not found in the IV.

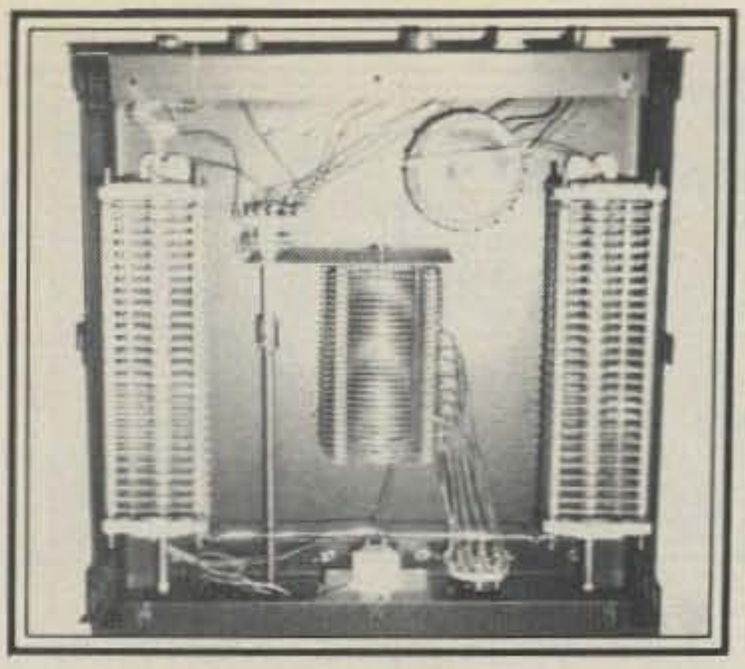
Fig. 1 shows the schematic diagram of the tuner. Note that the basic configuration of the impedance matching network is a T network with two variable capacitor arms. This network is not as commonly found in tuners as perhaps some variation of the familiar pi-network. However, the T network usually can match a wider range of complex impedances over the h.f. range with more reasonable component values than those required by a pi-network. The pi-network, particularly on the lower frequency bands and when working into low load impedances, can require very high values of capacitance, which usually necessitates the switching in of fixed capacitors across the variable ones used for tuning purposes. Such an arrangement is awkward and can introduce additional loss in the matching network. The author makes no particular claim for being the first to point out the advantages of the T network configuration. However, his first articles on the subject appeared in *CQ* almost 13 years ago! (See references at end of the article.) The only real disadvantage of the T network is in its construction in that both variable capacitor arms have to be insulated from ground.

The schematic also shows the details of the s.w.r./power metering circuitry. A balanced r.f. sampling transformer, which is wound on a ferrite core, is used. Adjustments, which are all factory calibrated, provide for nulling out stray capacitance in the transformer and for calibrating the meter on its two power ranges. Finally, the schematic also indicates how a 4:1 ferrite core balun is used to couple the output of the tuner to a balanced transmission line.

The inside view of the tuner reveals a very sturdily built unit. The cabinet consists of two rolled steel sections. One is a bottom section to which the front and back panels are attached, while the other is a top cover section. The cabinet measures about 5 1/8 ×

The rear view of the Versa-Tuner III. A fourth coax connecter is added in the IV which will be seen in a later photograph.

*c/o CQ Magazine

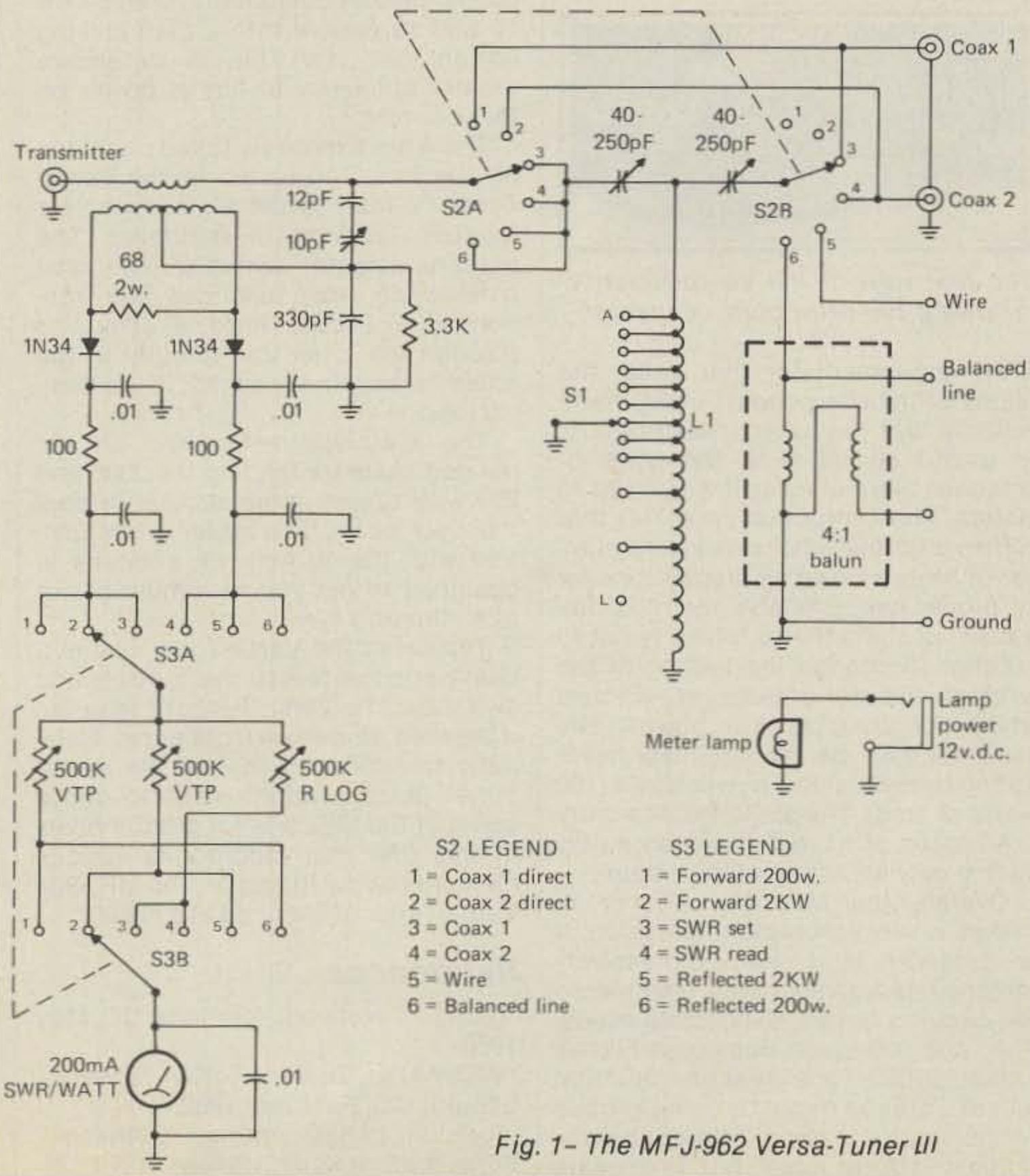


Interior view of the Versa-Tuner III.

14 1/8 × 14 5/8 inches. As can be seen, the two 250 pf/6000 volt variable capacitors dominate the interior of the unit. The 3-inch diameter air inductor has its own support bracket in the middle of the enclosure and is well spaced from all other components. The antenna selector switch (rated to carry 9 Amperes) is located to the left of the inductor. The potted 4:1 balun, which is about 3 inches in diameter, is located to the right of the inductor. A PC board, which contains the s.w.r./power metering circuitry, is not visable but is located on the back panel above the variable capacitor on the left. Both capacitors, of course, are completely insulated from ground by means of standoff mounting insulators and teflon insulated front panel shafts. All r.f. wiring is done with plated, solid conductor wire.

In putting the tuner into operation, the first thing that was checked was the accuracy of the s.w.r./power metering circuitry. Using various value dummy load resistors, the s.w.r. meter scale checked out exactly over the 1:1 to 1:3 s.w.r. range. The r.f. power measuring circuitry checked out to within a few percent over its various ranges as compared to an industrial wattmeter, although the 2000 watt range could only be checked to 1200 watts because of the equipment available.

In operation the tuner was easy to use and seemed able to match a linear having 1200 watts output to any "reasonable" antenna load on the 80-10 meter bands without any signs of arcover or component overheating. By a "reasonable" antenna is meant coaxial fed dipoles used on their designed



S2 LEGEND	S3 LEGEND
1 = Coax 1 direct	1 = Forward 200w.
2 = Coax 2 direct	2 = Forward 2KW
3 = Coax 1	3 = SWR set
4 = Coax 2	4 = SWR read
5 = Wire	5 = Reflected 2KW
6 = Balanced line	6 = Reflected 200w.

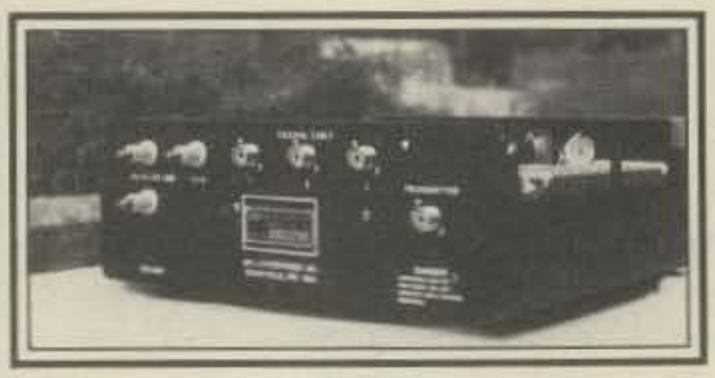
Fig. 1- The MFJ-962 Versa-Tuner III

band as well as on a band higher or lower, various length long wires operated against ground and 1/4 λ or longer on the operating frequency and dipoles

Front view of the Versa-Tuner IV.

fed with a balanced transmission line where the total dipole length was at least 1/4 λ on the lowest operating frequency. The tuner will probably match into a far greater range of loads than could be tried at the 1200 watt level. Its usage would undoubtedly allow many amateurs to operate what normally would be single band antennas on two or more bands as well as provide a constant load to a linear across the entire extent of any band when a single band antenna is used.

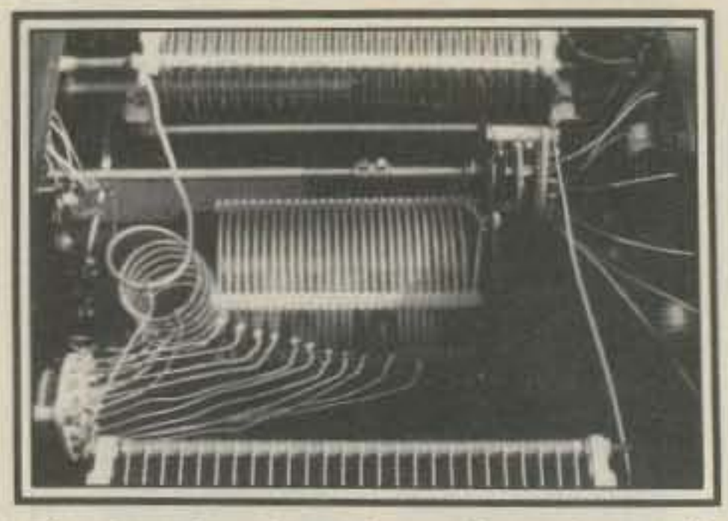
One should not expect unreasonable results out of this or any antenna tuner. For instance, one cannot expect efficient operation of a 16-foot whip on 80 meters even if the tuner seems to provide proper loading for a transmitter or linear amplifier. Because of the extremely low base impedance of such an antenna, only a fraction of the power which can be generated at the output of a transmitter or linear will be radiated. Ohmic losses that cannot be avoided in the ground system, connectors, tuning network components, transmission line, etc., will consume the major portion of the output power. Although 160 meter operation could not be tried because of lack of high-



The rear view of the Versa-Tuner IV showing the extra coax connector.

power equipment for that band, the values of the components used would indicate that the tuner should be just as useful on 160 with the types of antennas mentioned as it was on 80-10 meters. The instruction pamphlet that comes with the tuner provides a number of hints as well as precautions for its proper use. Probably the most important of the latter to follow is not to attempt to change the setting of the antenna selector or inductor switches while operating at full power. The switches can be manipulated freely during tune-up at low power levels (100 watts or less). The switches can carry 9 Amperes of r.f. but they can safely switch only a fraction of that value.

Overall, the MFJ Versa-Tuner III makes a very favorable impression. It is ruggedly built with impressively dimensioned components. The metering circuitry covers all possible needs. The antenna selection possibilities should suffice for almost any situation where a station might be using various forms of antennas on different bands. It doesn't tune itself, but it appears



The interior view shows the extra coil for 10 and 15 meters. The dummy load resistor can be seen to the right.

capable of doing just about anything one might expect out of a high-power antenna tuner up to that point.

The MFJ-984 Versa-Tuner IV

The MFJ-984 Versa-Tuner IV is the big gun of the MFJ line. It is rated at handling power up to 3 kw and will match coax, balanced or random wire feedline. Several nice features are included in this model. They include a built-in 200 watt, 50 ohm dummy load, and a unique 10 Amp r.f. ammeter.

As can be seen from the internal view of the Versa-Tuner IV, a separate coil is used in conjunction with L1 for 10 and 15 meters rather than picking up another tap. This is to ensure greater efficiency at higher power on these bands.

There are 6 more switched positions on the inductor switch in the Versa-Tuner IV than in the III, allowing for greater flexibility in matching. The antenna selector switch (7 positions) can switch from balanced line, random wire, 3 coax lines, 1 coax line through the tuner and directly to the antenna, and finally switch in the dummy load.

The s.w.r./wattmeter has an expanded scale for reading the 2000 and 200 watt ranges more accurately plus the s.w.r. scale. This meter in conjunction with the 10 Amp r.f. ammeter is designed to get you maximum power at minimum s.w.r.

Typical in the Versa-Tuner line is a heavy positive feel to the controls and switches. The Versa-Tuner IV features a brushed aluminum front panel. Cabinetry is similar to that of the Versa-Tuner III. You might want to check some of the MFJ ads for other models in this line that incorporate various elements of the III and IV. The MFJ-984 Versa-Tuner IV is priced at $299.95.

References

"Using a T Network," Schultz, *CQ*, May 1968.
"W8NWU's Teeter Totter Tuners," Schultz, *CQ*, February 1969.
"Random Length Antenna Couplers," Schultz, *Ham Radio*, January 1970.

When you haven't a trace of an idea of why that circuit's misbehaving, this signal tracer can give you one.

A Simple Signal Tracer

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

Circuit tracers are no big mystery. Basically they're audio amplifiers with very sensitive inputs and some means of detecting i.f. and r.f. signals.

That's what we have here.

The IC is a National Semiconductor LM-386 audio amplifier. The nice thing about it is that it requires only a single supply and it's a tiny 8-pin DIP IC. A handful of caps and resistors make it a working audio amp.

The JFET is a 2N5458 or equivalent used as a preamplifier. It's incredible—it gives the circuit an amazingly high input impedance—near 10 MegOhms.

The diode between preamp and amp acts as a detector and provides some demodulation for virtually any form of signal.

*c/o CQ Magazine

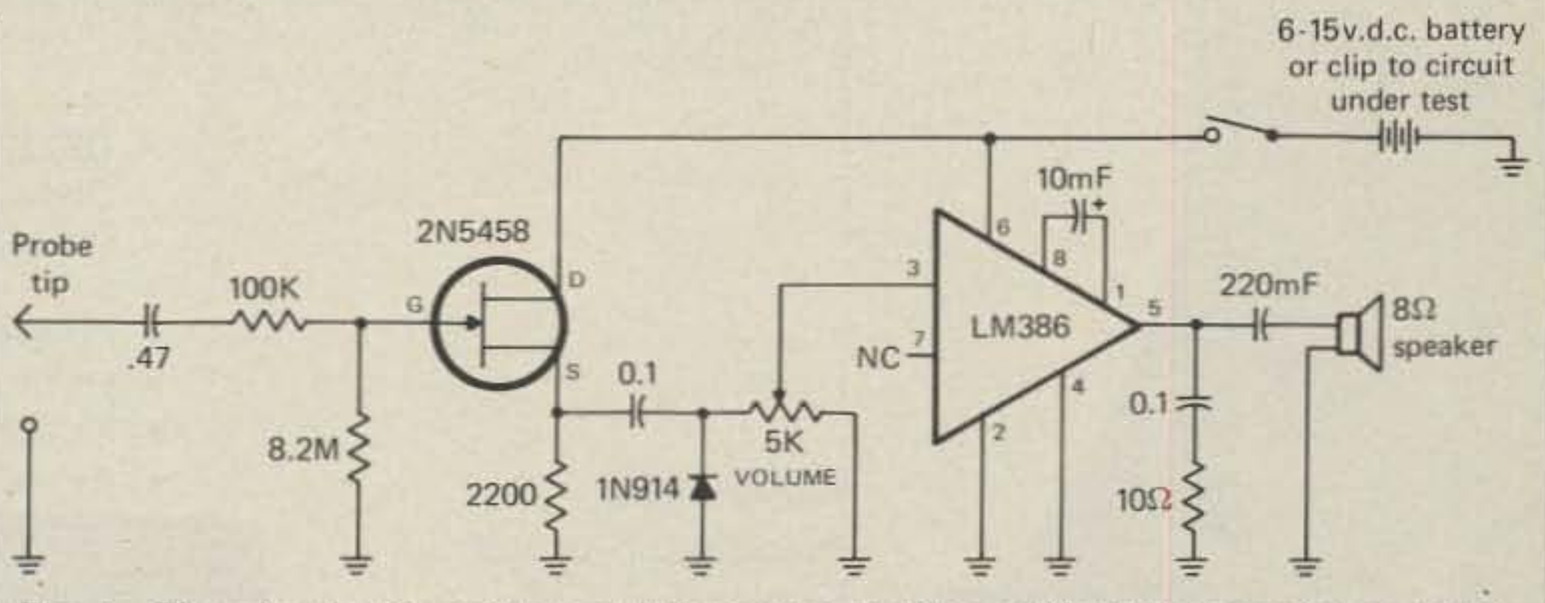


Fig. 1- The simple signal tracer. It is very sensitive, with high impedance input, and substantial audio output.

Yes, lots of signals will overload this little guy and distort. But it's a test device, not high fidelity. You could help the situation somewhat, though, by using a ×1/×10 attenuating oscilloscope probe with it.

You may even be able to locate a teeny-tiny speaker or audio transducer and house the whole circuit—switchable attenuator and all—into something like a Global Specialties probe case and let the circuit you're testing power it, or clip to an outboard battery.

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- EXIT
- FILEHELP
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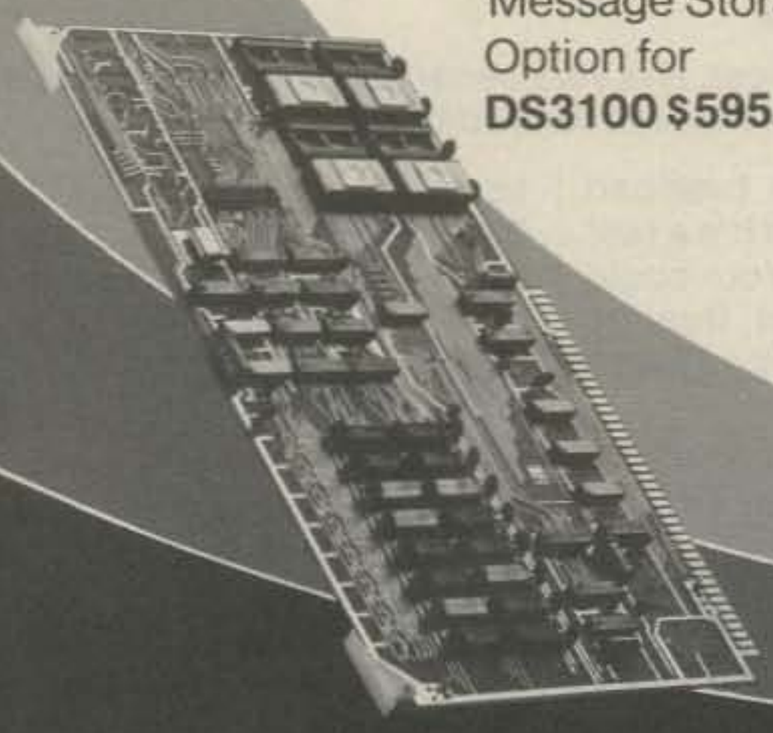
- PRINTOFF
- QBF
- READF
- RYS
- WRITEF



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The DS3100 Super Terminal is now even more versatile with the addition of the new MSO-3100.

The Message Storage Option (MSO) adds mass storage to the DS3100 so that relatively long messages may now be stored and replayed at will. For example, the MSO-3100 will provide more than 32,000 characters of additional storage—approximately 450 lines for messages. Messages are stored in variable length files with user-assigned file names and pass-words for file protection if desired.

The MSO feature may be accessed from either the DS3100 keyboard or by other users through the WRU feature of the ASR terminal. Thus, messages can be written, played, and relayed with either remote or local control.

Automatic TX/RX relay control, CW ID, and user help messages make the "electronic mailbox" easy for all to use. This factory installed option may also be used for brag-tape and net bulletin preparation and storage.

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CIRCLE 5 ON READER SERVICE CARD

What the heck is a dupe sheet? Is it just some nuisance or is it an operating aid? Doug Zwiebel, WB2VYA of our CQ WW Contest Committee explains and teaches the proper use of dupe sheets.

Dupe Sheets From A-Z

BY DOUGLAS S. ZWIEBEL*, WB2VYA

All *CQ* contest participants making 200 or more QSO's on a band are required to include "dupe sheets" with their log entries. Many entrants send in their logs without including dupe sheets. One reason for this may be that many stations do not understand just exactly what a "dupe sheet" is and why it's required.

A dupe sheet is any method of cross-checking *every* QSO made during the contest period to verify that each station worked is worked only *once* per band. It is not a list of duplicate-only QSOs. If you work a station two or more times on a band, you have duplicate contacts, or "dupes." As outlined in the *CQ* contest rules, duplicate contacts are not allowed. If you have an excessive number of dupes, around 3% of all your QSOs, you are going to be reviewed for disqualification. If you have less than 3% dupes, you are still in trouble because any duplicate contact discovered by the *CQ* committee will be deducted from your score. There is an additional penalty (deduction) of 3 QSOs per duplicate contact. If you leave 4 duplicate QSOs in your log at 3 points each, you will lose 48 QSO points. This may not seem like much, but remember that this number is multiplied by your **multiplier score.** If you had 300 multipliers, you have lost 14,400 points off your final score! Take a look at the 1979 CQ WW C.W. results. Note that NP4A and R6F (multi-single) are nearly in a dead heat for first place and that both are new world records. Only four duplicate QSOs would have switched the results! So it is important to check those dupes. It can also be helpful. If you're so inclined, you can keep up a dupe sheet as you work the contest. When QSO rates drop and you have to search across the bands for QSOs, you won't waste lots of time working people two, three, or more times. It's a lot faster to look at your dupe sheet than to call a station 2 times and then receive "sri, QSO B4." But whether you dupe as you go or wait until the contest is over and then do a dupe check, please remember that if you make over 200 QSOs on a band, a dupe sheet is required and that each band worked needs its own dupe sheet.

The exact mechanics of setting up your dupe sheet can and will vary widely depending on your location, the contest, and the areas you expect to work. Remember, every QSO must be dupe-checked. If you're a U.S.A. station located on the east coast, you'll pro-

*620 Navaho Trail Drive, Franklin Lakes, NJ 07417

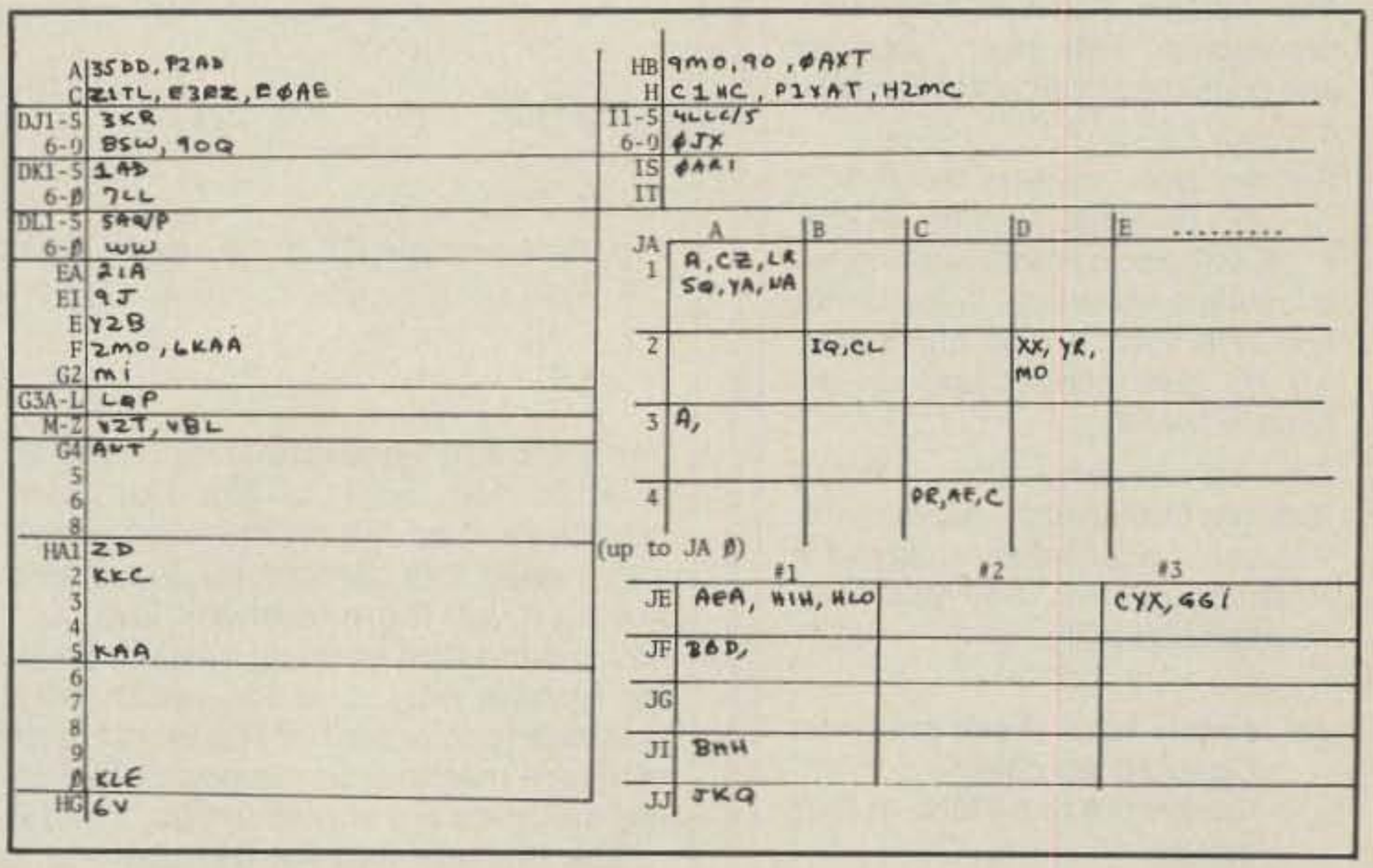


Fig. 1- A sample west coast dupe sheet.

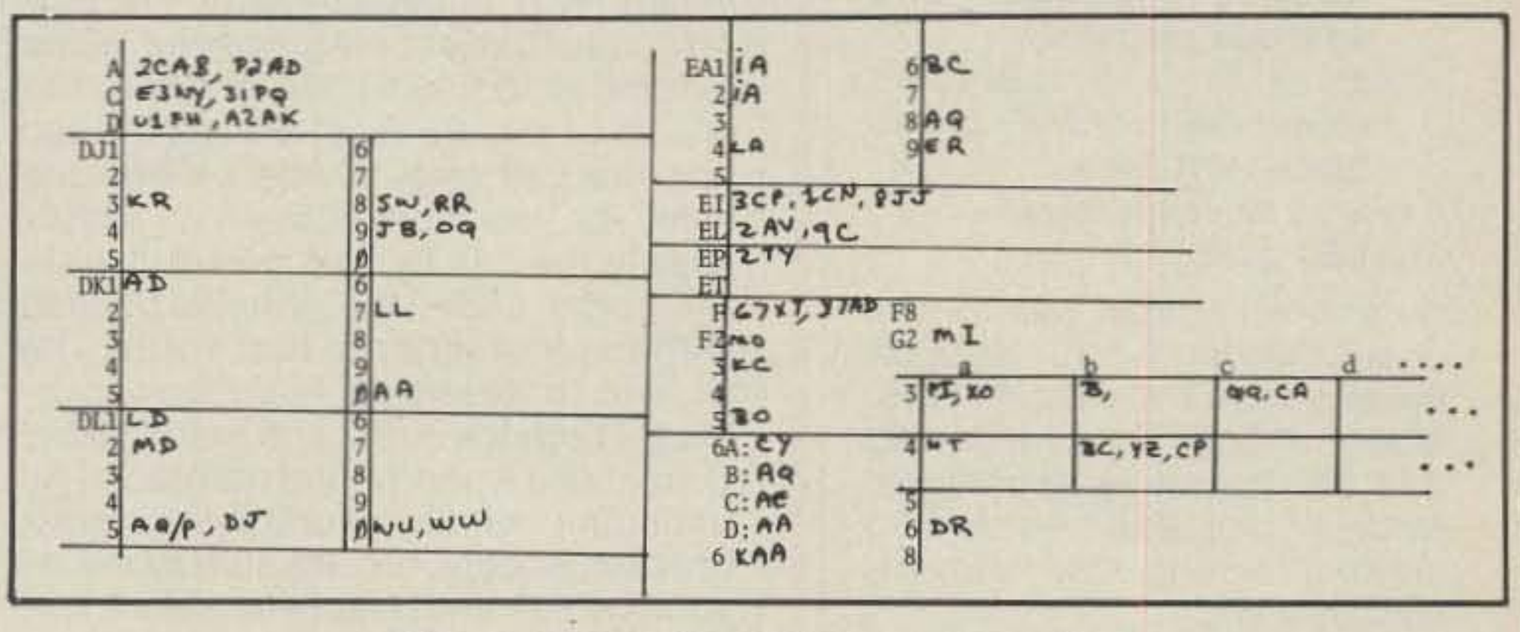


Fig. 2- A sample east coast dupe sheet.

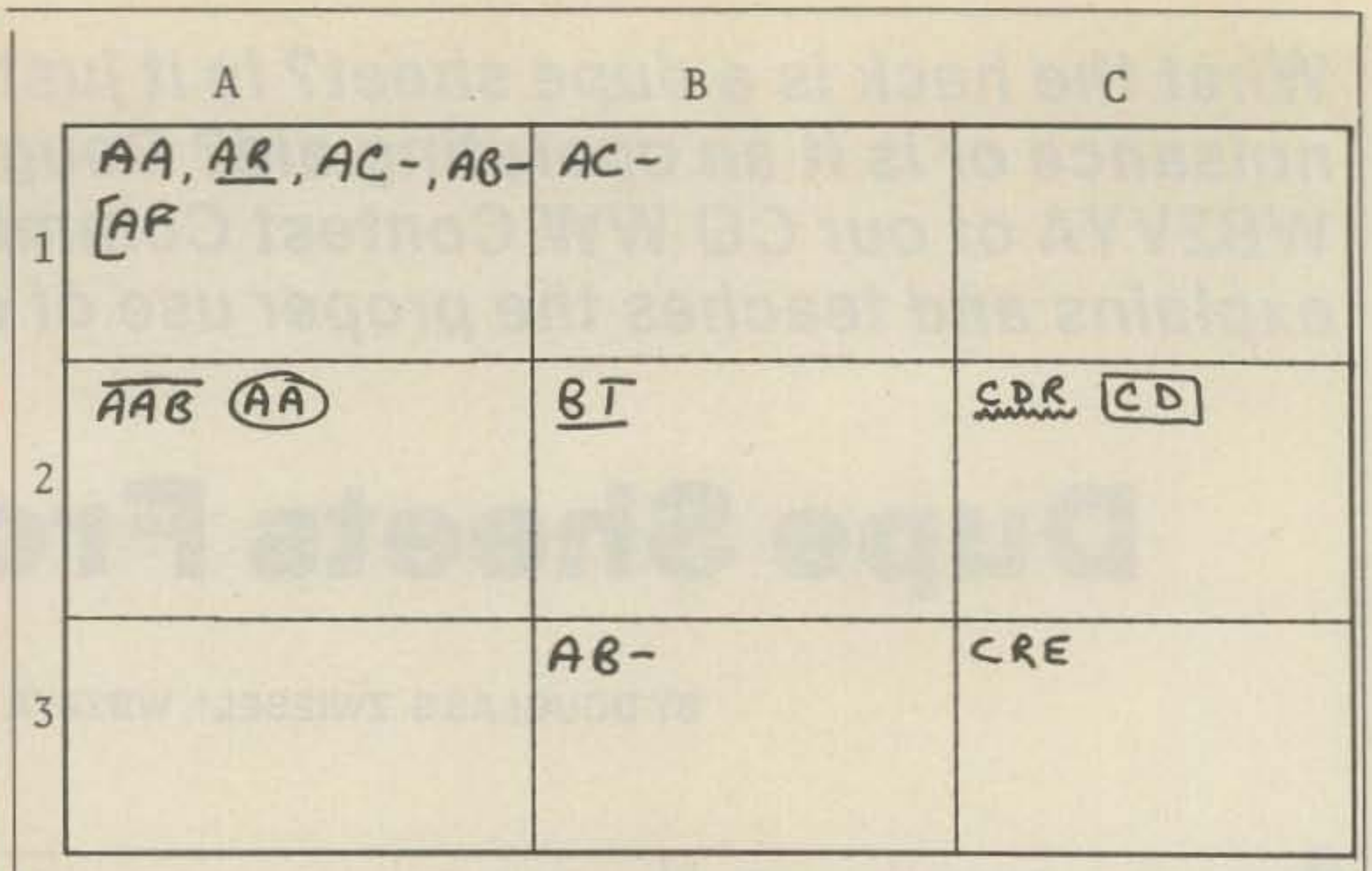


Fig. 3- A sample DX dupe sheet. This one depicts the efforts of G4XYZ working U.S. stations on 20 meters.

bably want to leave lots of room and be specific for most of the European countries. If you're on the west coast, you'll need lots of room for Japan and not so much room to check Europe. I have found that keeping one big sheet for Europe only, one for Japan only, and one for the rest of the world is an efficient method. Some possible duping methods are shown in figs. 1 and 2.

The big problem for DX stations is developing a method to keep track of all the W's, especially with the new prefix/suffixes being issued. One method is to make a big grid with the letters of the alphabet across the top and the call area numbers down the side. As you work a station, simply plug in the call by call area and write the suffix under the column headed with the first letter of that suffix. The trick is to develop a technique to indicate both the suffix and prefix. Many people use a short-hand method of an underline, circle, overline, squiggle, bracket, square, etc. Be sure to define your system and be sure to make a key. You can use any symbol to represent any prefix you want. Here's how one group of symbols might work.

W2AA	=	AA	AA2AA	=	A[A]
N2AA	=	(AA)	KB2AA	=	[AA]
K2AA	=	AA	AA2A	=	AA-
KA2AA	=	⌞AA⌟	AB2A	=	AB-

Key: W = N = ◯ K = ‾ KA = ⌞⌟
KB = □ AA = ⌋ etc.

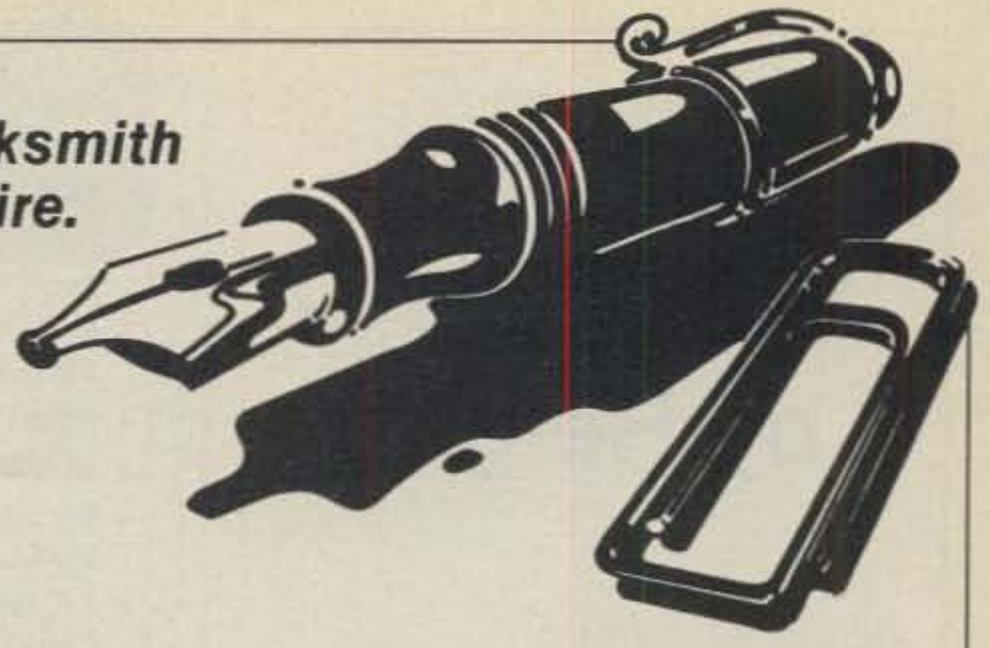
Note that the last two calls, AA2A and AB2A, show the **prefix** followed by a dash. This indicates that the suffix was the single letter "A."

In fig. 3 the following calls are dupe checked: W1AA, K1AR, AC1A, WA2AAB, WB2CDR, KB2CD, N2AA, W3CRE, K2BT, AB3B, AB1A, AB1AF, and AC1B.

Remember to use enough pages to give yourself as much room as you will need. If you plan on 6000 QSOs, you had better have more than one page. If you plan on 200 QSOs, one page will probably be fine. Plan out the dupe sheet—how many QSOs you will make, on what bands, and to what parts of the world. There are lots of W2's, 4's, and 6's. The W7 and 0 call areas are much less populated so it's unlikely that you will work too many! A little thought about your dupe sheets will help make your duping easier and more efficient and your log legal.

By the way, as of the 1979 *CQ* WW contest, *CQ* is utilizing a computer to check many logs. In fact, the *CQ* committee has the use of two computers, one on each coast. They are very accurate, very unforgiving, and powerful tools. In 1979 the east coast machine was used to check selected logs for the *CQ* contest (as well as a contest sponsored by another group). Just to give you an idea, it will store about 1 million call signs and will keep a cross reference of who worked what, where, and when. It checks for things that you never even thought of. Oh yes, it also checks for dupes!

It's too late to write Hamlet, The Village Blacksmith and the Decline And Fall Of The Roman Empire. They've all been done. It's not too late to become a budding author for CQ; the world awaits what you have to offer.



Writing Articles For CQ or Let Your Fingers Do The Talking

BY ALAN M. DORHOFFER*, K2EEK

The primary purpose of writing an article is to communicate an idea and to exchange the author's experience or accomplishment for the reader's time. Therefore, whatever is published or written should have about it the quality of being worth the time to examine or read it. It is the Editor's job and the Art Director's job to make that material even worthier and more attractive to the reader.

First there is a form of introduction. The introduction is some method of defining the objective or problem to be solved by the article. It establishes the need and the method of satisfying the need.

The main body of the article develops the theory, construction techniques, the basic "how-to" information or "how we did it" type of data. Here you relate how the piece of equipment or gadget is built or how you got to some island and set up that extraordinary station. It's the place for anecdotes, hints and kinks and the personal touches.

The concluding part gives the reader a summation of what was accomplished. In the case of a piece of equipment or gadget, you would include the results you achieved by using it and how the reader can use it if he builds it. A DXpedition concludes with the number of contacts, recapping the adventure, possible plans for another one and finally the ship or plane departing as the sun sinks on the horizon.

Footnotes, addendum and "thank-you's" tail-end the manuscript. If everyone does his job correctly, the reader has an enjoyable experience. He knows "what it feels like" to build the whatever without actually building it, or he has taken the trip with you in spirit.

The Manuscript

If you think of the manuscript as a term paper, you won't go wrong. Include a title page. The title page simply has the title you have selected on it, your name and call and your address. Leave plenty of space between them.

The main body of the manuscript should be typed, double spaced and on 8½ × 11 paper. Leave considerable side margins. The margins will serve as work space for the Editor to write instructions to the typesetter should your article be accepted for publication. It is also the place where additional material can be written to enhance an article. Whatever the eventual use for that space becomes, leave enough of it; it's important.

If you plan to footnote material, indicate the proper reference number by raising it over the word or phase that is footnoted (for example, Marconi[1]).

Illustrations

If you've built something, try to photograph it in its various stages of construction. If it's physically small or unusually shaped, try to have an easily recognizable object of identifiable size photographed with it, so the reader can appreciate its size in relation to something familiar. Photographs can be supplied to *CQ* in three basic forms: prints, slides and negatives. Obviously, prints or slides are preferred for their ease in handling. The prints do not have to be any specific size, but they should be clear and not too dark. Color shots are also nice to include, especially in DXpedition articles, as they may be considered for a cover position. All photographs or slides submitted with an article must

*Editor, CQ

be keyed to a caption or some distinct place in the article where all of the pertinent things that are seen are described. This includes names and calls of people, geographic data, technical data on specific components or circuits that are discussed in the text, and so on.

Drawings are a little bit easier to handle. You do have to be a better photographer than an artist. *CQ* drawings are all redone to our style, and all lettering is also redone to our specifications. All drawings, mechanicals and lettering should be neat and easy to read. Where possible, the author is given a chance to examine the new drawing for his corrections or additions. This is done especially in complicated material. As with photographs, drawings should have descriptive captions telling the reader what he is seeing.

Drawings are designated by figure numbers and should be keyed to specific text areas where they are discussed. Photographic illustrations are not keyed by figure numbers unless they happen to have a specific mechanical sequence.

Captions for both photographic illustrations and drawings can be keyed by number on a separate page at the end of the manuscript. This page lists all of the captions in some order and should easily relate to the particular illustrations.

Construction Articles

If you are planning to write a construction article, please consider the reader who may live off the beaten path. Wherever possible, indicate the source, manufacturer and part number for components that you have used. If it is not especially critical, or if you found the little gem in your junkbox, give an equivalent value or alternative component.

Try to remember also that we all may not be as smart as you and may need a little more explanation or just a hint of the theory of why you did what you did. Part of this process involves teaching to some degree and the peaking of the reader's curiosity to find out more.

Size

Without illustrations, it takes normally about three type-written pages to fill one printed page. Short articles, two or three printed pages, are always in demand. Long articles are fit in as space permits. The size is really up to you—how much interesting material can you write?

Payment

One of the nice things about writing is that if your article is accepted for publication, you will be paid for it. Now sometimes it is nice and ego satisfying to write for the sheer pleasure of it. It is pleasant to see your name in print and to be recognized as an author. It's also a boost to receive reader mail from people who enjoyed your work and appreciated your effort. It is possible to have all of the above and be paid for your work at the same time.

Now you won't get rich writing for *CQ* or any other magazine for that matter, so give up those early retirement thoughts. You will make money to pay for your projects and to pay for those extra goodies for you and your family.

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Not everyone is a born writer. Most have to work at it quite hard. Not everything you eventually write will sell; that's a fact. You'll never know unless you try.

The next time you're tempted to write a letter asking why a particular subject you're interested in isn't covered in greater depth in *CQ*, think about writing about it yourself. Give it a shot; it's worth the effort.

Finale

In case you're interested and would like a basis of comparison, the typed manuscript for this article (less the title page) is 4¾ pages. It was typed on an IBM Selectric II, 10 pitch typewriter.

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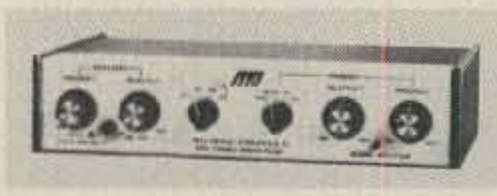

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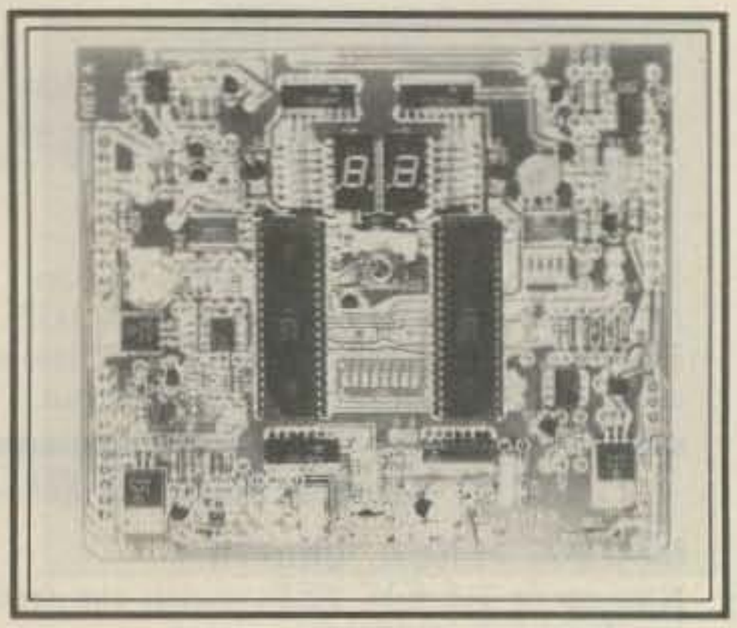
The Ham-SP is an amateur rotor system that is specially designed for sight-impaired amateurs. The system is a combination of the Ham-IV rotator and an advanced solid state control unit. All operation functions of the control unit—360 degree compass dial, on/off switch, push-to-start switch, and push-to-start button—are marked visually as well as in Braille. The electronics provide an ease of operation never before achieved by a heavy-duty amateur rotor system.

The Ham-SP system is unique. Neither the rotator nor the control unit are compatible with other CDE rotor systems. The unit is available for $250. For more information, contact Cornell-Dubilier Electronics, 118 East Jones Street, Fuquay-Varina, NC 27526, or circle number 104 on the reader service coupon.

AEA Isopole Jr.

The Isopole Jr. is a v.h.f. antenna that is available in a 2 meter model (Isopole 144 Jr.) and a 220 MHz model (Isopole 220 Jr.). The antenna incorporates the same decoupling characteristics as the Isopole antenna, but has a broader beam width (and 3 dB less gain) than the Isopole. The Isopole Jr. is an end-fed half-wave dipole with a single decoupling sleeve. In addition to providing a stronger signal where desired, it also reduces the potential for TVI by eliminating radiation from the feedline.

The Isopole Jr. is approximately 64 inches long when tuned to 146 MHz, and can be used for emergency or mobile use, assembling in minutes. It has a greater than 10 MHz bandwidth when centered on 146 MHz. It can be adjusted for a center operating frequency from approximately 125 MHz to 162 MHz with an s.w.r. of better than 2:1. The antenna is designed to withstand most severe weather conditions. For more information, contact Advanced Electronic Applications, Inc., P.O. Box 2160, Lynnwood, WA 28036, or circle number 106 on the reader service coupon.

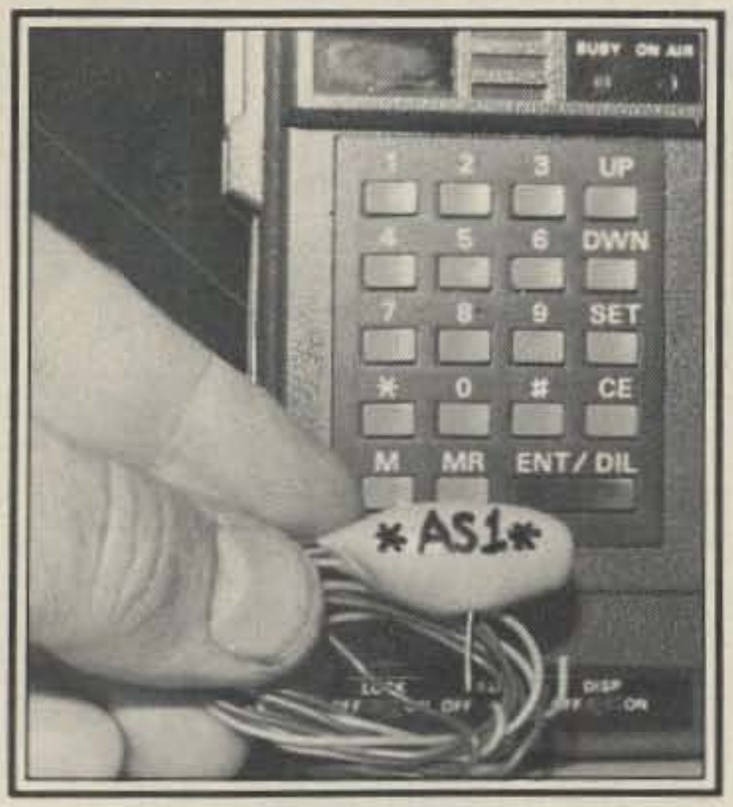


Xitex ABM-200

Xitex Corporation has announced the introduction of the ABM-200, an ASCII/Baudot/Morse converter. It is a multi-purpose data converter for translating between ASCII and Baudot or between Baudot and ASCII and for sending and copying Morse code. An additional benefit is its ability to convert from one speed to another. Features of the ABM-200 include ASCII data rates of 110 and 300 baud, Baudot rates of 60, 66, 75, and 100 wpm plus Morse rates of 1 to 150 wpm. Voltage required is a single plus 5 volt supply.

A built-in 32 character buffer allows editing in the send mode and acts as a storage buffer in the receive mode. The ABM-200 is shipped fully assembled and tested with a complete operations manual. All control switches and display LEDs are in-

stalled. It sells for $189. For more information, contact Xitex Corp., 9861 Chartwell Dr., Dallas, TX 75243, or circle number 105 on the reader service coupon.



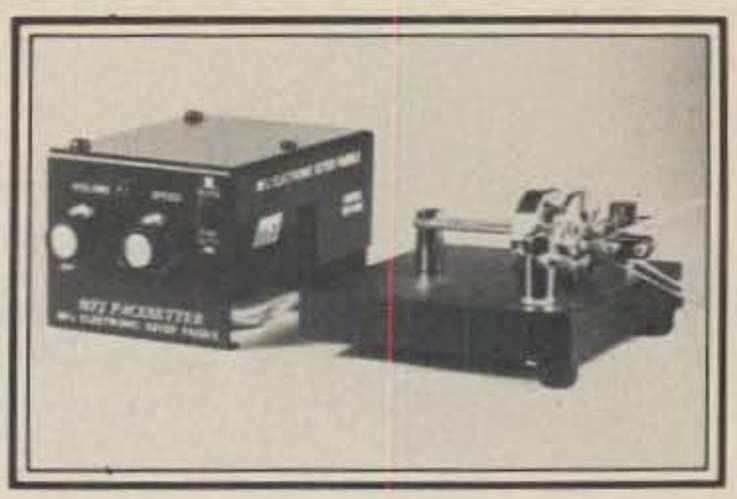
Engineering Consulting Scan Module

Users of the Yaesu FT-207R can now automatically scan both the four memory channels and the entire band without pushing the "up" or "down" buttons each time the carrier drops off. Easy installations off the AS-1 module requires rewiring the busy-scan switch and installing four wires. Heat shrink and all necessary wires are provided, along with complete instructions.

The only sacrifice is that you can no longer scan for a "clear" channel. The "clear" position becomes the normal mode of operation which was the "busy" position of the switch. The "busy" position becomes the automatic scan mode. Once switched into this mode, the unit will pause for 0.5 seconds after the carrier disappears or when squelch action occurs. The scan can be disabled by momentarily pressing the push-to-talk button. The AS-1 is available for $25. For more information, contact Engineering Consulting Service, P.O. Box 94355, Richmond, B.C., Canada, V6Y 2A8, or circle number 107 on the reader service coupon.

MFJ Keyer/Paddle

The MFJ-422 "Pacesetter" combines a deluxe MFJ Keyer and the Bencher iambic paddle in one compact package. The features include Curtis 8044IC, front panel speed and volume controls (8-50 wpm), adjustable weight and tone, dot-dash memories,



speakers, sidetone, and push-button selection of semi-automatic/tune or automatic modes.

The MFJ-422 has solid state keying and is fully shielded and uses either a 9-volt battery or optional a.c. adapter. The Bencher paddle features fully adjustable, gold-plated silver contacts, lucite paddles, chrome-plated brass, and a heavy steel base with non-skid feet. The entire combination takes up no more space than the paddle by itself (4-1/8W × 2-5/8H × 5½L inches). The MFJ-422 Pacesetter is available for $99.95 plus $4.00 shipping and handling. For those who already own Bencher paddles, the MFJ-422X is available for $69.95 plus $4 shipping and handling. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 102 on the read service coupon.

a monthly feature by
KARL T. THURBER, JR., W8FX

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Multiband Antennas: The Trap Dipole, Part I

One of the most widely used h.f. antennas is the trap dipole. The trap is extremely popular for several reasons, foremost among them the fact that it can often singlehandedly replace a small antenna farm. In this article, our columnist W8FX gives traps the plain-vanilla treatment.

In 1955, Chester Buchanan, W3DZZ, popularized in *QST* a little-known but technically excellent technique for adapting the dipole for multiband use. The concept was originally developed, back in 1940, it is said, by an intrepid radio engineer named Howard K. Morgan, who published his concept in *Electronics* magazine. This involved the introduction of lumped constants, or tuned circuits, at strategic points in a wire antenna to allow it to *simultaneously* develop resonance on two or more amateur bands.

These tuned circuits soon took on the nickname of "traps." Antennas designed along these lines included trap doublets, beams, and even verticals. By the late 50s and early 60s, just about everybody was into traps, since their development culminated a long search for a single, coaxial-fed antenna that could be used on several bands with the newfangled band-switching transmitters of the day.

The trap antenna is increasingly popular today, especially in view of shrinking urban real estate lot size, trends to apartment and condominium living, and restrictive covenants on land use that suggest or even dictate that a minimum number of antennas serve one's hamshack.

In this month's column, we will continue where we left off in our discussion of the doublet to focus on the **trap dipole**. We will highlight the "why" behind the trap antenna, describe how it works, discuss feeding and matching procedures and techniques, and point out some important installation considerations. We'll leave trap verticals and beams for another time.

317 Poplar Drive, Millbrook, Alabama 36054

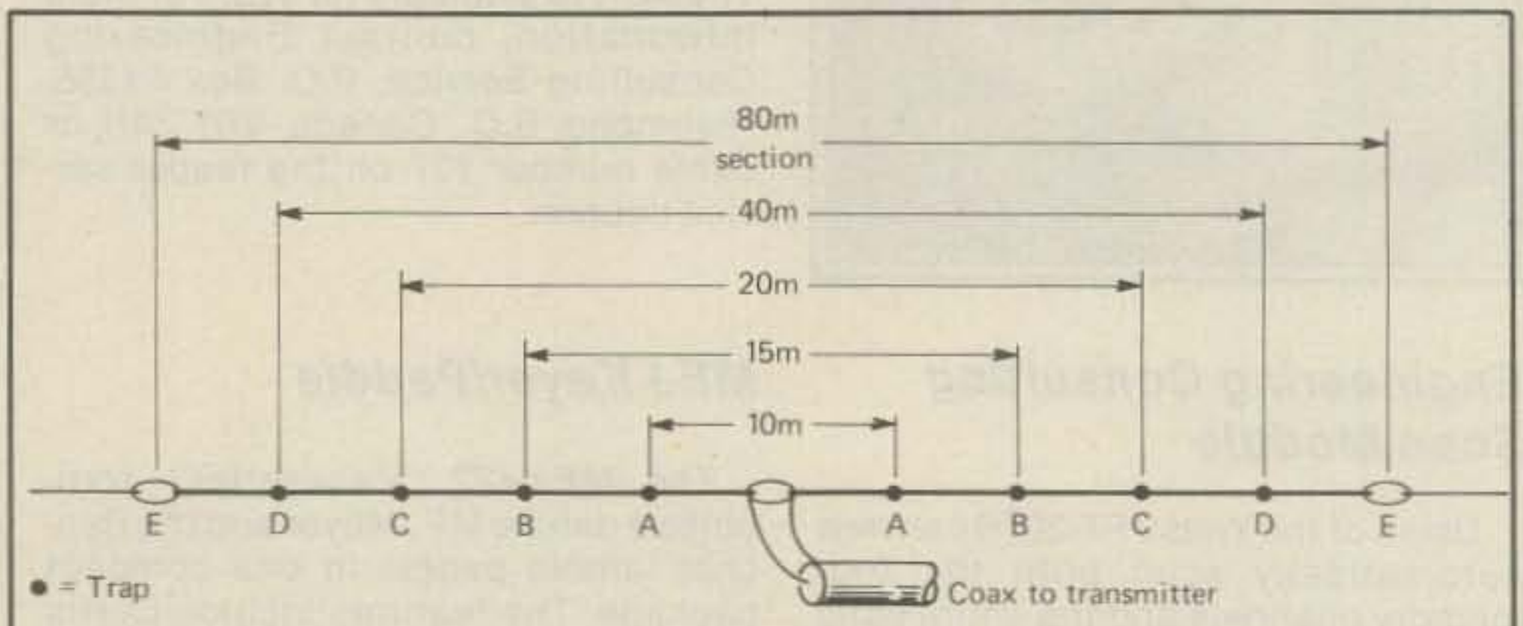


Fig. 1– The horizontal trap dipole.

How traps work in a typical, 5-band multiple-trap antenna. The antenna uses *four pairs* of traps, for a total of eight, for simultaneous resonance on the five bands.

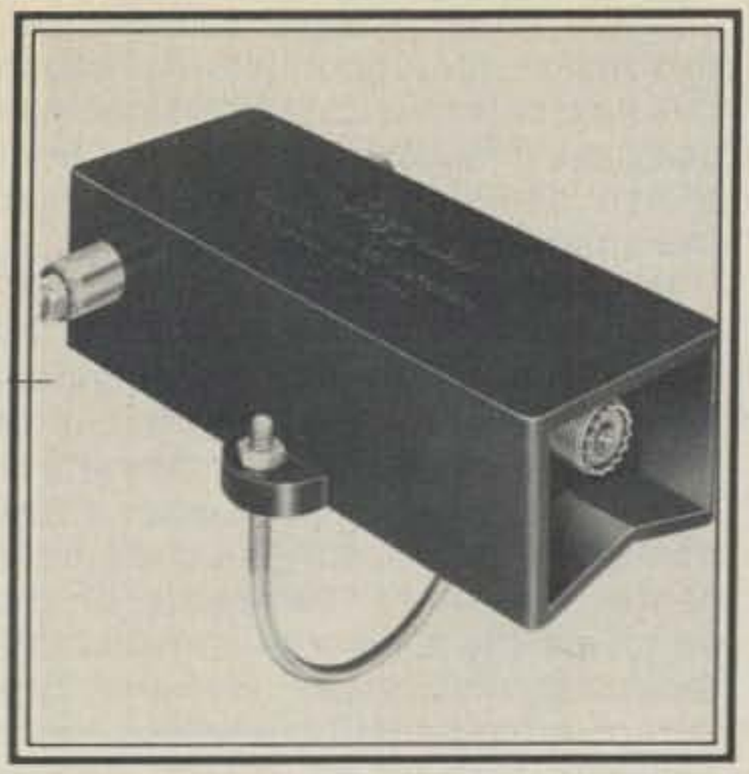
The innermost section, A:A, makes up the 10-meter antenna. The traps at the end of this dipole section make up a resonant L/C circuit that isolates the outer portions of the antenna when working on 10. The outer sections B:B, C:C, and D:D function in similar fashion for the lower bands. On the lowest band, 80 meters in this case, the full antenna (E:E) resonates as a half-wave dipole, but it is somewhat shorter than formula length due to the loading effects of the traps.

A five-band dipole can be constructed with as few as one pair of traps, but operation on the higher bands (20, 15, and 10) is somewhat chancy, since the traps cause the antenna to operate in a harmonic mode on those bands, with actual resonance and resultant s.w.r. not easily predictable.

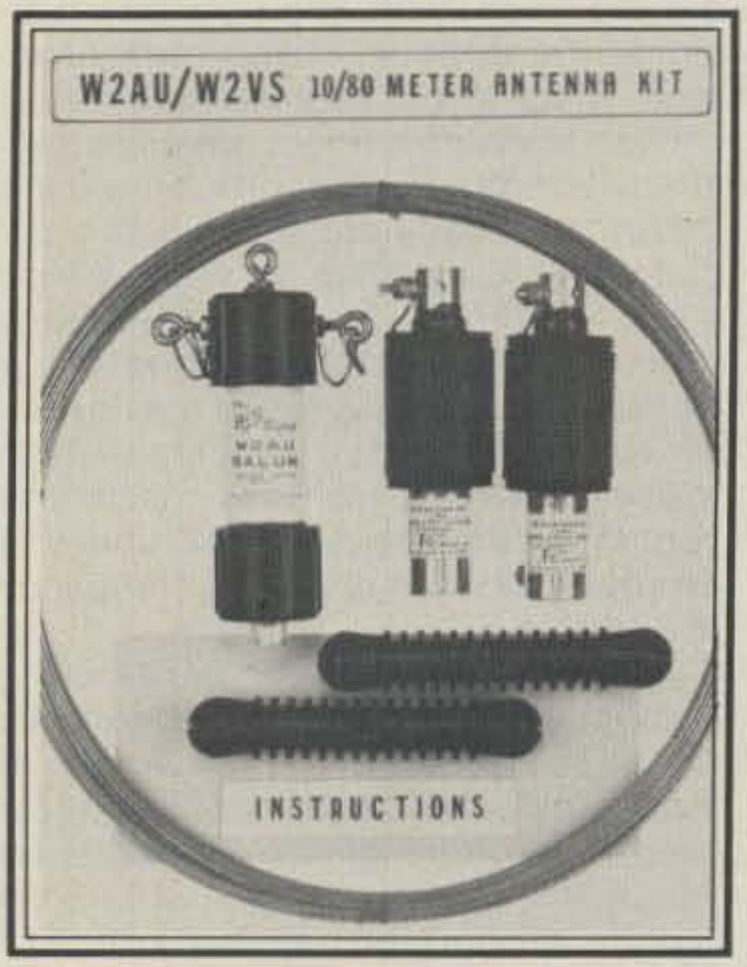
The trap antenna is usually fed with coaxial cable, but transmitting-type 72-ohm twinlead may also be used. A balun is not required for coax feed, but may be installed if desired.

Why The Trap Antenna?

Most amateurs who want to conveniently operate on the popular h.f. bands are faced with the problem of finding space or overcoming zoning or landlord restrictions to erect a number of separate antennas to cover each of the six bands—not to mention the additional three segments potentially gained as a result of WARC-79. For the amateur who is space limited—and that's most of us—there are several options. He can erect a singlewire or randomwire type antenna using the longest flattop that his property can accommodate. He can use a long dipole, cut for resonance on the lowest band to be used, feeding it with open-



A balun is usually recommended with trap and other type dipoles when fed with coaxial cable to correct unbalanced conditions. Shown here is a Hy-Gain ferrite balun that permits coupling of a 52-ohm unbalanced transmission line into a 50-ohm balanced system for beam or doublet antennas. The unit is frequency independent and will therefore operate properly over all the h.f. amateur bands. (Photo courtesy Hy-Gain Electronics)



Complete 5-band trap antenna kit based on the W2AU/W2VS trap design. Primary half-wavelength resonance is achieved on 80 and 40 meters, and the antenna operates on multiple half-wavelengths on the three highest bands—10, 15, and 20 meters. Result is an effective antenna with very low s.w.r. on 40 and 80 and somewhat higher s.w.r. on the higher bands. The traps used are the basic KW-40 (40 meter) traps; if a lower s.w.r. is desired on one or more of the higher bands, the appropriate pair(s) of traps can be added. Accompanying sketch shows the kit installed. (Photo courtesy Unadilla/Reyco)

wire line as a tuned doublet. Or he can hook several dipoles in parallel and feed them through a single coaxial transmission line.

All of these are practical solutions to the problem of operating on multiple bands with one antenna. However, there are very real drawbacks. The singlewire antenna's feedline radiates, it's very much dependent on the ground system for good performance, and an antenna tuner is required. The tuned doublet requires inconveniently handled open-wire line, as well as an atenna tuner. And the multiple dipole is physically cumbersome and sometimes plagued with interaction between the several paralleled dipoles.

The trap antenna eliminates most of these problems and represents an excellent choice for the amateur who wants relatively hassle-free multiband operating capability. A single trap antenna can take the place of six or more dipoles individually cut to resonance. The trap system will have essentially similar radiation pattern, efficiency, and characteristics as if it were erected as separate antennas. Although there is some loss in the traps, this is usually insignificant when weighed against the *overall* losses of other systems, such as loss from feedline radiation, inefficient grounding, poor matching, etc.

Let's turn now to a discussion of *how* the traps work.

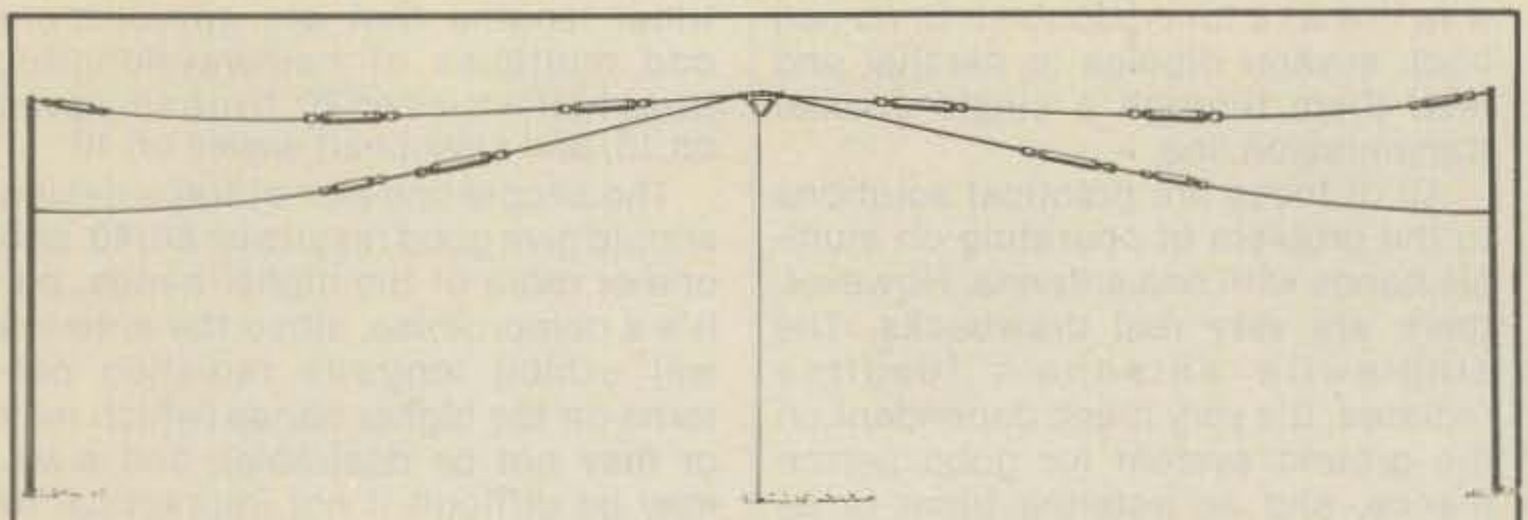
The Trap: How It Works

The trap dipole uses lumped constants (capacitors and inductors, forming tuned circuits) the function of which is to electrically connect or disconnect the outer sections of the dipole as bands are changed. The parallel-tuned L/C circuit presents a very high impedance to r.f. current flow at the resonant frequency; thus it acts as a "trap" for r.f. so as to electrically chop off the flattop beyond that point. At frequencies above and below trap resonance, the trap acts as a short-circuit so r.f. readily passes through it.

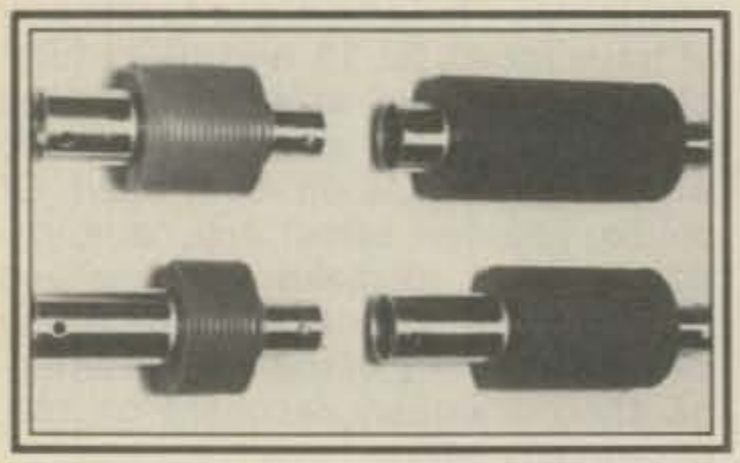
Several different trap arrangements are possible. In one of the simplest, a single pair of traps is used to secure operation on all bands from 80 through 10 meters. Using a flattop length of 100-110 feet for 80 meters (the shortening being due to the loading effect of the trap), the antenna operates as a full-size dipole. On 40, the traps divorce the outer wire sections so that the antenna behaves, electrically speaking, as a 40-meter dipole. However, on the three highest bands (20, 15, and 10), the antenna functions like a centerfed longwire, with electrical lengths that are *approximate* odd multiples of half-wavelengths: three half-waves on 20, five half-waves on 15, and seven half-waves on 10.

The simple one-pair-of-traps design should give good results on 80, 40, and one or more of the higher bands, but it's a compromise, since the antenna will exhibit longwire radiation patterns on the higher bands (which may or may not be desirable), and s.w.r. may be difficult if not impractical to control on those bands. Trap adjustment to bring a particular band to resonance may throw off another band. To remedy this situation, *multiple* traps can be installed, one being required for each band except the lowest. To cover the five bands, for example, you would need a separate *pair* of traps for 40, 20, 15, and 10—a total of eight. In this arrangement, the antenna works as a true half-wavelength dipole on each band. Of couse, you can select any combination of traps to make a specialized multiband antenna. For instance, you can use two pairs of traps for an antenna simultaneously resonant on 160, 80, and 40 meters.

Trap antenna efficiency is good. While the efficiency of the trap dipole is somewhat lower than separate



Representative Hy-Gain trap doublet is shown here. Unit is a 94-foot dipole designed for operation as a true half-wavelength on each band (10, 15, 20, 40, and 80 meters). Large diameter coils contribute to a favorable L/C ratio and high-Q performance. The antenna can be installed horizontally or in an inverted Vee configuration. (Drawing courtest Hy-Gain Electronics)



Representative transmitting dipole traps. At resonance, the trap is an open circuit and cuts the dipole to resonant frequency. In the W2AU/W2VS trap system, distributed by Unadilla/Reyco, two traps (1 pair) are required for 80-10 meter compromise operation. Use of five full pairs of traps will allow primary half-wave resonance on all bands, 160 through 10 meters.

dipoles for each of the bands (due to the fact that the traps are not perfect insulators), the loss is not significant in a carefully adjusted multiband trap antenna using good dielectric quality, high-Q traps, though operating bandwidth may be restricted as opposed to full-size, unloaded dipoles. The traps can be homebrewed, although commercial versions are inexpensive and probably feature better mechanical construction than most of us can duplicate.

While we're mainly concerned with the basic trap dipole this month, we should point out that traps can be used in a variety of multiband antennas in much the same way they are used in the doublet. Traps can be combined with loading coils to produce physically short multiband antennas, used to make up high-gain collinears for the higher bands, incorporated in vertical antennas, and employed in multiband parasitic beams. With only slight reduction in operating efficiency, the traps can allow a single antenna, whether it be a dipole, vertical, or beam, to take the place of five or six separate antennas—more when the new WARC-generated bands phase in.

Fig. 1 shows typical trap dipole configuration and technical details.

Feeding The Trap Antenna

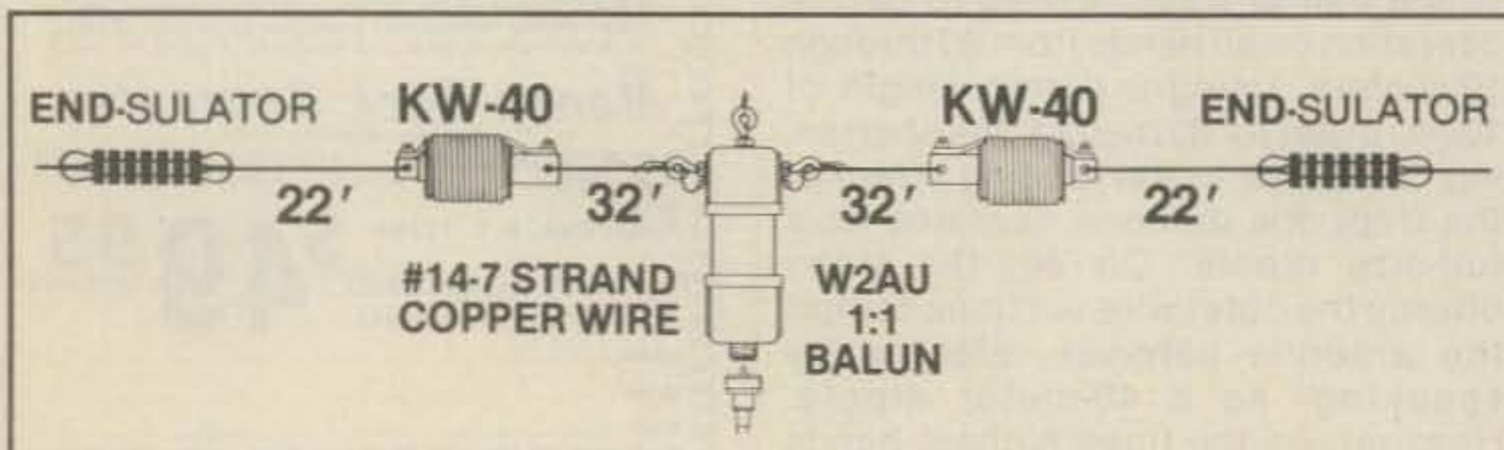
The beauty of the trap dipole is that bandswitching inherent in the trap design is a natural for the no-tune solid state amplifiers found in newer transmitters and transceivers.

Normally, the trap dipole is fed with 50- to 75-ohm coaxial cable. Losses are low enough to use the smaller cables (RG-58/U or RG 59/U) on runs up to about 100 feet at moderate power levels. For longer runs and when high power is used, lower-loss (preferably polyfoam) RG-8/U or RG-11/U should be installed. The new thin-body, lightweight RG-8X cable is just right for trap dipole feed, especially since its weight doesn't make an already heavy antenna sag even more. Low-impedance twinline (72 ohm) can be used, also. Since it's a balanced line and the antenna itself is balanced, this makes for a good match, though this kind of leadin is often lossier than coax and it radiates more. If you want to use twinline, stick to the low-loss, transmitting-rated kind.

What about the use of a balun? Since the trap dipole, like others of the family, is a balanced or symmetrical antenna, if you use coaxial cable for the transmission line you may want to install a 1:1 balun transformer at the center of the flattop in lieu of a simple center insulator. The merits of the balun are the subject of considerable technical discussion. However, the use of a high-quality, low-loss balun can help equalize r.f. current flow in the system and prevent antenna currents from flowing down the *outside* of the coaxial cable, with possible distortion of the antenna's radiation pattern and possible TVI and BCI as results. Use your own judgment; use of the balun is *not* an absolute requirement.

With a reasonably well-adjusted antenna and a short feedline using low-loss coax, it's not necessary to worry unduly about achieving a perfect s.w.r. on all bands. With single-pair trap antennas, it's virtually impossible to achieve a 1:1 s.w.r. on all bands; even with multiple-trap versions, it's difficult. If you have problems loading up your solid-state rig (whose transistor finals are quite sensitive to high s.w.r. conditions and are therefore usually protected with a circuit which cuts them off when a high s.w.r. is sensed), you'll want to use a coax-to-coax antenna coupler or transmatch in tandem with the rig. Use of the transmatch will facilitate loading, although it does mean that two or three additional knobs have to be adjusted when changing frequency or switching bands.

Most modern amateur transmitting equipment has adequate harmonic radiation protection. However, while most single-band antennas will reject *even* harmonics of the fundamental frequency, the trap may efficiently radiate *all* harmonics; that's its job. For this reason, the use of a transmatch in the line is especially recommended even if high s.w.r. and loading aren't a problem with your antenna. This is particularly important for Novice trap antenna operation on 80 and 40 meters using older tube-type equipment. Too-heavy loading of the pi-network output circuits in these rigs can destroy harmonic suppression and cause second-, third-, and higher-order harmonics to be smartly radiated with unncessary interference and an FCC citation as possible results.



The W2AU/W2VS kit, installed. (Drawing courtesy Unadilla/Reyco)

(To Be Continued)

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CIRCLE 6 ON READER SERVICE CARD

Announcing

● **Plateau A.R.A. Hamfest** - The Plateau Amateur Radio Association will hold its third annual Hamfest on Sunday, February 15th at the Memorial Building in Fayetteville, West Virginia. Doors open at 9 a.m. Admission is $2.50, children free. Flea market tables $2. All activities indoors. Hot food, refreshments, and free parking available. Activities include ARRL displays, forums, exhibits, door prizes, and XYL entertainment. Talk-in on 52 or 19/79. For more information, contact Bill Wilson, WA8YTM, 302 Central Ave., Apt. 2, Oak Hill, WV 25901, phone 304-469-9910 or 574-1176.

● **1981 Charlotte Hamfest** - The 1981 Charlotte Hamfest, ARRL Roanoke Division Convention, will be held on March 21-22 at the Civic Center in Charlotte, North Carolina. For more information, write to the Mecklenburg Amateur Radio Society, Inc., 2425 Park Road, Charlotte, NC 28203, or call (704) 376-4162.

● **"The W6WQC Keyer"** - Re the article "The W6WQC Keyer" by Alfred Lorona in the December 1980 issue of *CQ*, several errors were made in figs. 1 and 2. (1) The series diode in the power supply prevents LED current from being drawn from an external battery when a battery is used for portable operation. (2) The 275-004 Radio Shack part number refers to the keying relay and not the diode. (3) The jack shown across the TUNE switch is for a hand key, of course. (4) The U1B-U2D speed generator requires a 47 K resistor as shown in order to make the circuit operate as the text describes.

● **Special Event Station W4HBB** -Special Event Station W4HBB (Amateur Radio Club of Savannah) will operate from Fort Jackson, Georgia near Savannah on February 14th from 1300 UTC until 2400 UTC and February 15th from 1300 UTC until 2000 UTC. Frequencies of operation are: Phone—7.225 to 7.240 MHz, 14.275 to 14.290 MHz, 21.350 to 21.365 MHz, 28.6 to 28.615 MHz; C.W. Freq.—7.1 to 7.150 MHz, 14.1 to 14.115 MHz, 21.140 to 21.170 MHz. An 8 × 10 Certificate will be awarded upon request. Please send 45 cents postage or 2 IRCs for DX stations. Mail to Amateur Radio Club of Savannah, Box 13342, Savannah, Georgia 31406.

● **Mansfield Mid-Winter Hamfest** -The Mansfield Mid-Winter Hamfest auction will be held February 15 at the Richland County Fairgrounds in Mansfield, Ohio. Prizes, auction, fleamarket. Large heated building. Doors open to the public at 8:00 a.m. Talk-in on 146.34/.94 MHz. Tickets are $1.50 in advance, $2.00 at the door. For additional information or advance tickets and/or tables, send s.a.se. to: Harry Frietchen, K8HF, 120 Homewood Road, Mansfield, Ohio 44906. Phone (419) 529-2801.

● **Vero Beach, Florida** - The Treasure Coast Hamfest will be held February 21 and 22 at the Vero Beach Communi-

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1981 Charlotte Hamfest

MARCH 21-22
CIVIC CENTER - CHARLOTTE, N.C.

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Charlotte, N.C. 28203
(704) 376-4162

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ty Center. Prizes, drawings. Q.C.W.A. luncheon. Admission $3 per family in advance, $4 at the door. Talk in on 146.13/73, 146.04/64, 146.52/52, 222.34/223.94. For information write P.O. Box 3088, Beach Station, Vero Beach, Florida 32960.

● **Livonia Swap 'n Shop** - The 11th Annual Livonia Amateur Radio Club's Swap 'n Shop will be held on Sunday, February 22 from 8:00 a.m. to 4:00 p.m., at the Churchill High School in Livonia, Michigan. There will be plenty of tables, door prizes, refreshments and free parking. Talk-in on 146.52 simplex. Reserved table space of 12-foot minimum available. For further information, send s.a.s.e. to Neil Coffin, WA8GWL, c/o Livonia Amateur Radio Club, P.O. Box 2111, Livonia, Michigan 48150.

● **Vienna Wireless Society Winterfest** - The Vienna Wireless Society, Vienna, Virginia, will hold their annual Winterfest™ hamfest on February 22. It will be held at the Vienna Community Center on Park St. in Vienna, Virginia beginning at 8 a.m.

a monthly feature by
IRWIN MATH, WA2NDM

Math's Notes

A LOOK AT THE TECHNICAL SIDE OF THINGS

From time to time, we have discussed that most versatile of components, the operational amplifier, in this column. Most of those discussions and circuitry have been concerned with conventional linear signal amplification. There are uses for these devices that are not quite so conventional, however, and some of these will be our topic for the next couple of months.

Fig. 1 is the basic op-amp schematic that at this point should be familiar to most experimenters. The gain of this circuit is, of course, the ratio of Rf/R1. In addition, the voltage, with respect to ground, at the – or inverting input is zero (or very close to zero). When positive or negative signals are applied to the input, the output rises so that the current flowing through Rf equals (and cancels) the current flowing through R1. This is how the gain is achieved and also why the voltage at the input is zero. Most split power supply op-amps are completely symmetrical. That means that input signals can be handled regardless of polarity. A bipolar sine wave applied to the circuit of fig. 1 for example, will result in an amplified bipolar sine wave at the output.

Now let us look at fig. 2. The circuit is the same as in fig. 1 with the exception of the diode added across the feedback resistor. What happens in this circuit is shown in the figure. The positive half cycle of the input is inverted and reverse biases the diode (cutting it off) so that amplification takes place in the normal manner. The negative half cycle, however, is also inverted, but here the diode is forward biased and conducts immediately. The result is that the output cannot exceed the forward drop of the diode and the output, as shown, is clamped. Such a circuit is really not much more than a half-wave rectifier (with gain), but it illustrates the technique of clamping op-amps with diodes.

Now let us look at fig. 3. As per our last discussion each half of an input sine wave is amplified by its own independent gain, and furthermore, if the feedback resistors are made variable, they can be adjusted separately with no interaction. The two diodes in the output serve to cancel the diode drops so that the output goes to zero. By using such a technique, all sorts of interesting wave shaping circuits can be achieved.

By carrying the technique a bit further we come up with the circuit of fig. 4. This circuit is essentially a full-wave rectifier and will be found quite useful in all sorts of signal processing applications, as it is quite linear—far more so than a single diode bridge. Also, unlike the bridge, both inputs and outputs are referenced to ground.

Operation of this circuit is quite interesting. A negative input is applied to A, and, when inverted it is clamped by diode D_2 so that the output of A is

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

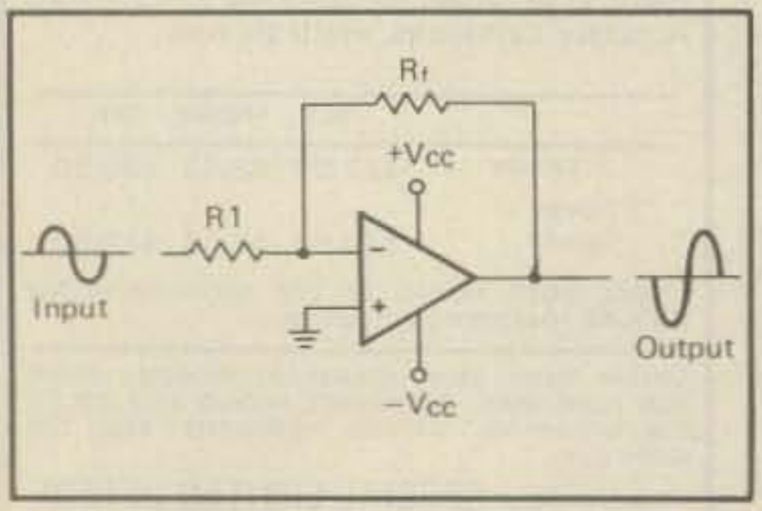


Fig. 1– A basic op-amp circuit.

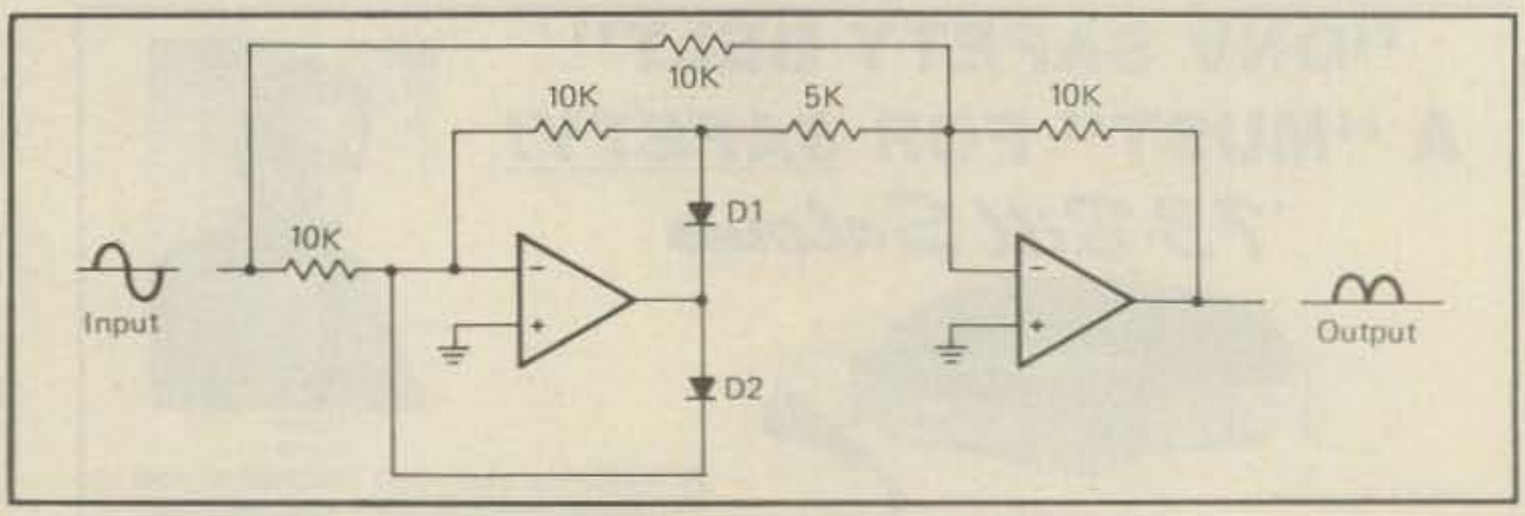


Fig. 4– A full wave op-amp "rectifier."

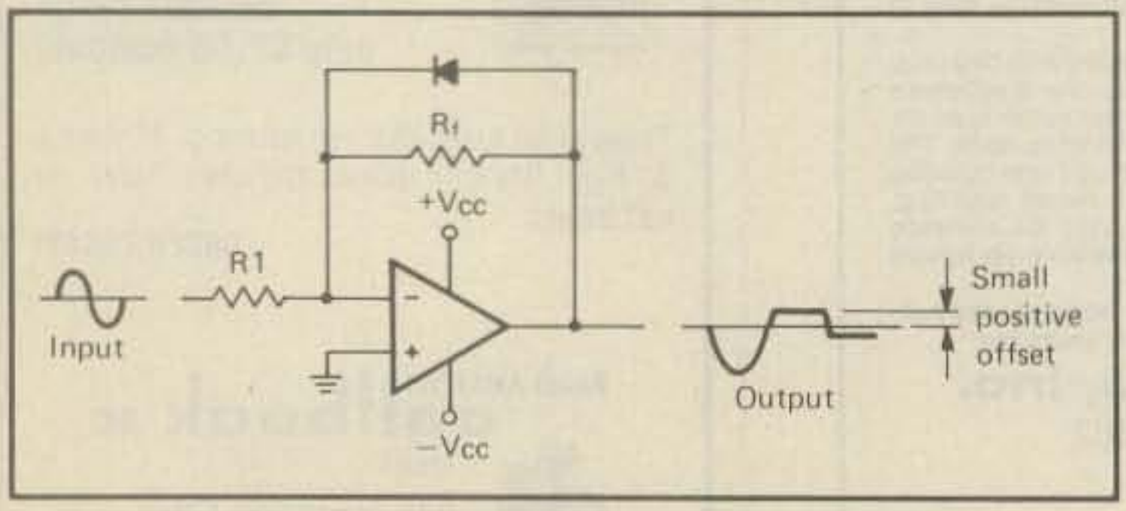


Fig. 2– An op-amp circuit giving half-wave rectifier characteristics.

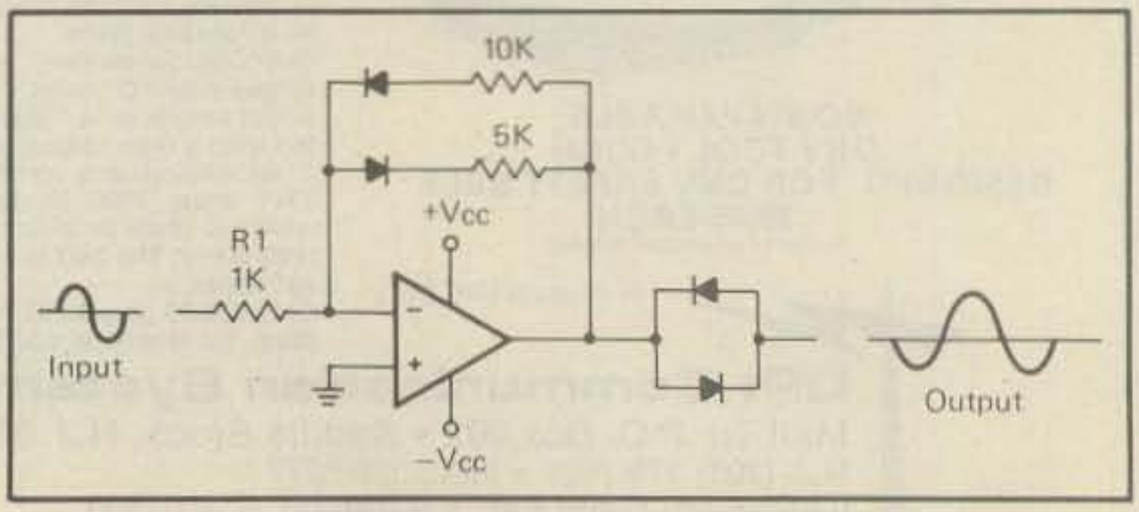


Fig. 3– An op-amp circuit with different positive and negative characteristics.

zero. Amplifier A2 now has as its input, zero (from A1) and the normal negative input. Since its gain is one, the output of A2 is the inverted negative half cycle, or a positive half cycle. When the positive half cycle comes along, A1 now inverts it as D_1, conducts, and the output of A1 becomes a negative half cycle with a gain of 1. The input to A2 is again the original positive half cycle and a negative half cycle from A1. Gain in A2 is 1 for the positive half cycle and 2 for the negative half cycle. (Note the 5K resistor.) All of this results in an output from A2 that is a positive half cycle. You might wish to go over this a couple of times to see the relationships, but after all is said and done, a neat, rectified output results. It is important to note that since the output from A1 is taken after D, any nonlinearity is canceled with the result that the circuit is very linear, even for signals of only a few millivolts. Also frequency response is a function of the amplifiers used. With LM 741's, operation well above the audio range is possible, and with op-amps such as LM 318's, you can operate in the MHz region.

Next month we'll continue this discussion with several additional circuits.

73, Irwin, WA2NDM

a monthly feature by

HUGH CASSIDY, WA6AUD

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

Many DXers who have been around the track more than once have noted and commented on the great burst of growth in DX activity during Cycle 21. Where there were areas where DXers were sparse, a rare item and often a lonely life, one now finds layers of DXers, numerous DX clubs and a multitude of DX bulletins. DX is in!

All this brings up questions. Recently, a person on the scene asked why at most DX clubs there is always the solid core of the senior-type members. Old in years, long in memory, sure in judgment, they are always there to advise those who have come late to the action. "Why is it?" he asked, and we had to stop and wonder about this one ourselves.

"But there are a lot of young DXers," we countered, and all we got was a slow shaking of the head. We knew then that this one was not going to be easily answered. "Some," he acknowledged, "but who dominates the DX scene?" We did not try to answer, for who can argue with truth. But we also know that no DXer ever considers himself old. Always there with the zeal and enthusiasm of the young, able to scale tall towers in a single bound, tireless in their pursuit of the possible new one, DXers never weary and the joy of DX is always new. And thinking things over we knew that we had the answer for the question.

"Tell us," we said, "do you ever listen to music?" We got the expected quick nod of the head.

"Maybe like Lawrence Welk...or maybe even Arthur Fiedler when he was around?" we continued and got some more quick nods.

"And Roy Acuf and Roy Clark and Slim Whitman," the seeker of knowledge added. "I listen to them all, all the time." We knew then for sure that we had the answer.

"And all of these are young people?" we asked. "And what theme marks the music they play?" The questioner laughed.

"Young?" he said, and we heard that half-laugh of his. "Young? Hardly at all. Most of them seem to be skidding on the downhill side from the prime of life, maybe a bit further than they'd want to admit. And the music? A lot of romantic ballads I'd guess. Mostly the same theme, but it sure is nice to listen to, that's for sure." By now we were the one's who were smiling.

"Love songs?" we quickly asked, and the seeker was nodding his head vigorously. "That's it," he said, "mostly love songs." We knew then that we had him.

Leaning close so he could not escape, for surely we intended to answer this question only once and never again, we asked, "Why is it that you have so much trouble understanding that a DXer can grow old chasing DX and never lose any of the thrill and enthusiasm, but you can listen to old men playing love songs that properly belong to the young and you have no questions at all? Tell us!"

We had him!! His eyes lost their focus as he struggled to get his thinking aligned. His lips moved but no sound came forth. "Tell us," we ordered again, the edge on our voices getting a bit harder. "Tell us why the old men still play the young love songs." He could not.

Maybe he will one of these days when he is an older DXer, filled with the wisdom of the years and a secure spot on the Honor Roll. But for now he would have to think about it and with that effort would come enlightenment. Eventually he would know the answer. It usually comes to all DXers whether or not they seek it. Some acknowledge its arrival; some know it is there but hardly think about it at all. But it comes.

A DXer eventually learns that DX never grows old but comes fresh with each golden dawn. And DXers are always the timeless and eternal lovers.

77 Coleman Dr., San Rafael, CA 94901

What does a well-known DXer do when he's not on a DXpedition? Works DX naturally! KP4AM, Dave Novoa, says that the brick wall is only symbolic. The KLM beams up on the 80-foot tower crack through like an episode on "That's Incredible!!". "Not at all," says Dave, "just routine."

CQ DX Awards Program

S.S.B.

930	K4BYK	937	K9BWQ
931	WB3IGR	938	I5JFG
932	WD0BKT	939	IV3YRN
933	KC4BX	940	PA3AEB
934	K3VY	941	SM5BDV
935	N4AOC	942	N6BTY
936	KB9KD	943	K9MDO

C.W.

459	G3EZZ	463	SM5BDV
460	K2OB	464	SM6CST
461	VE2BP	465	AA6DP
462	I3OBO	466	WB2IOB

S.S.B. Endorsements

310	ZS6LW/317	275	K9UAA/275
310	W9QLD/317	275	WA4DAN/275
310	K6EC/316	250	IV3YRN/270
310	VE2WY/315	250	VP9CP/264
310	DJ9ZB/314	200	KB9KD/242
310	I4ZSQ/314	200	XE1OW/228
310	K9MM/313	200	XE1NI/208
310	DK2BL/312	200	K4BYK/202
300	I3LLD/309	200	I0SGF/200
300	W0YDB/306	150	K9MDO/172
300	OK1MP/300	150	WB3IGR/153
300	W2CC/300	28 MHz	K9TI
275	K9BWQ/293	28 MHz	K4BYK
275	LA7JO/291	28 MHz	WB3IGR
275	WA4TLI/276	28 MHz	IV3YRN

C.W. Endorsements

310	N4PN/316	200	SM6CST/222
310	K4CEB/311	200	KB8KW/201
310	N6CW/310	150	AA6DP/153
300	K9MM/309	28 MHz	I3OBO
250	I3OBO/260		

The total number of active countries as of deadline was 319. Okino Torishima (7J1) was deleted from CQ DX records as of 1/1/81 and all totals will be adjusted to reflect this in the next listing giving 318 countries on the countries list. Effective March 1st, the basic award fee for non-subscribers to *CQ* will be $10, or 50 IRCs. The fee for subscribers will be reduced to $4.00, or 20 IRCs. Please include your latest *CQ* mailing label with your application to qualify for the $4.00 rate. Applications without the mailing label will be charged $10.00. Endorsement fee for stickers remains at $1.00. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope self-addressed and stamped to CQ DX Awards Manager, Billy Williams, N4UF, 911 Rio St. Johns Dr., Jacksonville, Florida 32211 U.S.A.

A4XIU in Oman says to watch for him at 0300Z and 1500Z and from 2000Z to 0200Z on 15. Look for him on 15 around 21295 kHz. A4XIH may also be found around these times. Sometimes A4XIU tries 10 meters 0600-0700Z. Listen! There is activity around these times.

Should someone someday again ask why most DXers seem to be old DXers, just the question itself will remind you that DXers are forever young, forever in the action playing the always new DX tunes. And harldy listen at all should someone come asking why the old codgers are playing the young love songs. As a DXer you will understand,

What's Happening

P29JS/VK9NS and friends were aiming for a January effort at Heard Island. Some VP8's from the Falklands were also looking for a South Sandwich effort. N2KK planned a Cyprus effort around the turn into February, all this depending on other plans on his trip jelling. If he showed from Sudan and Lebanon as planned, Cyprus should be heard for sure. W1BB says that 160 is the last refuge of the ever optimistic DXer. Stu says that he'll even give you a copy of his latest game plan if you send an s.a.s.e. K8ND is aiming at Anguilla for the C.W. Test on February 21-22nd. Jeff will be signing VP8E during the test, but he may be found before the test signing VP8EEV and mostly on 160, 80 and 40. CN8BI says his license is good until August, and he is active on RTTY most days at 1500Z. Pietro did not give a frequency for that mode, but he says to look for him on s.s.b. at 14155 kHz around 1500Z. QSLs for CN8BI go to I0UWG.

For those who dream of the big stacked antenna array, OH2BN notes that in three years he has 262 worked/251 confirmed on c.w. for DXCC, his antenna being an end-fed random length wire.

CT1OF is a valid check-point for verification in the *CQ* Awards. Jim was left off the list some months back through an oversight, but he has been doing business at the Lisbon checkpoint for over ten years. He was also doing some business in other lines, signing CS7OF during some of the contest activity last fall.

The ARRL CW DX Test will be with us over the weekend of February 21-22nd, and the DX Phone Test will follow on March 7-8th. Prepare!

Glorioso is a possibility during February. FR7AI was aiming for some activity there during this month.

Dave Novoa, KP4AM and Desecheo and a couple of other stops, would like it known that NP4A (ex-KP4Q-exKP4RF, ex-KP4AST) goes to W3HNK for QSL purposes. Sometimes cards show up at KP4AM's mailbox. Send them to Joe, not Dave. But if you are looking for one of Dave's QSLs, such as KP4AM or WD4BDL, you go to W7PHO.

Shortly Noted

Hugh Vandegriff, WA4WME, now down in the Texas Territory, has all the makings for some good DX program presentations. His widely acclaimed and eagerly awaited show "22 Great DXpeditions in Amateur Radio" is a combination of slides and live narratives. He runs in some material on three of the Clipperton operations, and you might write to him if you want to get his story of the joy of DXing. You can find him at 2308 Zinnia Court, Killeen, Texas 76541. Here we remember years back when Hugh was in Germany and looking for information on Rockall. He's still looking.

The Eastern Iowa DX Assn. has Wade Walstrom, W0EJ doing the presiding for the coming year. Anyone in the area wanting to know more about the EIDXA can drop a line to Gary Letchford, K0LUZ.

In the Midland-Odessa area in Greater Texas a recent arrival on the scene is the West Texas DX and Contest Club. Who's the ramrod? Try writing a line to Tom Horton, K5IID in Ft. Worth. Tom knows all!

Also in the midlands, the Kansas DX Association came into existence last fall, and John Shoultys, WD0BNC ended up as president of the deserving Kansas types. Salina is the core of this DX activity; if you have to have more information drop a line to Dean Lewis, WA0TKJ.

Yasu, JH1EYS is quite active on the high bands with a TS-520 transceiver and a 4-element tribander 8 meters high. His QTH is Ichikawa, Japan. (Photo via W3YFI)

W6AM, W6GC, WA6BGE and K2BPR were in China last fall carrying the banner of amateur radio and assuring most everyone they could corner that amateur radio was the secret to almost everything that might be needed, including longevity, good looks and DXCC. They met with a variety of government organizations and on returning home felt that the efforts were well received. As Don Wallace said on his return home, "We all felt that China will be heard on the amateur bands one of these days." All that was good to hear, but when the specifics were sought, Don just replied, "Just don't ask me when! It's coming!!" So there you are. It's coming. Mount to the ridgepole in the dawn's light and watch for it.

The WPX Program

Mixed

869...WA3NQJ
870...OH2KP
871...JE3EPK
872...DL3JU
873...JH2CJW
874...K9TI
875...YU4VBR
876...K7CU

S.S.B.

1323...IV3TQE
1324...Y54VA
1325...JH2CJW
1326...I8WES
1327...DJ6OY
1328...K7CU

C.W.

2009...DM2AHB
2010...WB7SKL
2011...JE1REU
2012...AB0M
2013...DF9FM
2014...KA7T
2015...K9TI
2016...JR2IEG
2017...JA9DCP

WPNX

187...WB5LUU
188...N1BCV

VPX

206...JA1-23967
207...Y2-5238-H
208...DC2YJ

Endorsements

Mixed: 400 WA3NQJ, JE3EPK, DL3JU, K9TI. 450 JH2CJW, WB0LXM, K1RB, K7CU. 500 WB0YMR, PA0ASD. 600 OH2KP, KA3A, YU4VBR. 650 W9MYG, I1ZEU. 700 ONL-4003. 800 KI7AF. 1000 SM3EVR. 1050 W1JR, WA4QMQ.

S.S.B: 300 Y54VA, JH2CJW, DJ6OY, K7CU. 350 DA1MV. 400 WB0LXM. 450 IV3TQE, JH4PRU, AC2J, K1RB, WB0PLY. 550 I8WES. 600 IV3YRN. 750 WA2FKF. 800 WA4OIB. 850 DK2BL. 900 W4BQY. 950 W2CC. 1000 WA4QMQ. 1350 I4ZSQ. 1800 I0AMU.

C.W.: 300 WB7SKL, KA7T, K9TI, JA9DCP. 350 DM2AHB. 400 JE1REU, DF9FM, VE1ANU, WD0AVG. 450 AB0M. 500 JR2IEG. 700 SM6AYM. 850 VE7CNE. 1200 K8MFO. 1250 W4BQY. 1400 WA2HZR.

15 meters:	OH2KP
20 meters:	OH2KP
40 meters:	KL7AF
160 meters:	AB0M

Africa:	W1JR
Asia:	OH2KP, W1JR, WA4OIB
Europe:	OH2KP, DF9FM, W1JR
No. America:	W1JR
Oceania:	W1WLW, W1JR
So. America:	W1JR

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.

The Intruder Watch notes that it appears that more than one CB-type has upgraded to the amateur bands, especially 10 meters. On the lower edge of 10 meters, 28.0 to 28.2 MHz, they are often found using lower sideband. Some manufacture amateur calls, some are known as "Unit 926," "Fantasma," etc. All appear to be questionable. There's a lot of DX there. Usually if an amateur callsign is given, you'll have difficulty locating it in any Call Book. You can find some up-to-date information on possible intruders by checking in on the Intruder Watch Net on Sundays; listen for net control DLØIW at 7065 kHz. 0900Z is the best time to listen.

Two Canadian amateurs received permission late last year to try the 30 meter band. They were authorized to experiment with narrow band, low bit rate digital communications in the 10.1 to 10.15 MHz area, this the amateur band to come. They will be signing VE9 callsigns, and if you just happen to be checking the band for possible future use, you may hear something mixed in with the present users. Then again, you may listen and not hear them at all, or understand them if you do. The important thing is that someone is thinking of the needy DXer and is looking for ways to fill his needs. Look for the day when 20 may be dead but 30 is hopping. Actually, it will be 1989 before the new bands are exclusively amateur worldwide, but the FCC will be moving the present occupants in the U.S. out of the 10, 18, 24 MHz bands, this probably starting sometime in 1982 and being completed two or three years later. So while you may hear some special permission activity such as the VE9s, amateur use of the new bands will not come for a handful of years.

Recently, we received from DJ9ZB a spiral-bound compilation of some of the mementoes of his wide-ranging DX activities. Franz not only works a lot of DX, but has been heard from a number of exotic spots in recent years. From what must be a mass of correspondence, Franz selected letters for reproduction and ended up with an interesting item. When one looks over something such as DJ9ZB produced, one can be impressed with the courtesy of many big-name DXers who not only work DX, but who will take the time to acknowledge fast QSLing and a needed contact. More than one well-known call is represented by a note of thanks. It was also noteworthy that the response is worldwide, and that DXers everywhere can be appreciative and considerate. The moment taken to express one's thanks can be long lasting.

DJ9ZB's effort also points up that there are a lot of things DXers get beside QSL cards that can bring pleasure when saved and cataloged for fu-

Last July the local amateurs in the Spokane, Washington area participated in some on-going Sister City efforts noting the existing program with Nishinomiya. In the photo Mayor Ron Bair of Spokane holds up the Spokane DXCC Award issued to JA3CZY for working 100 Spokane amateurs. Holding up the other end of the certificate is JA3CZY himself, Elvin Miura. Ohers in the photo are Ryota Ieiri, JE3UCN, on the far left, on the far right is Mel Ellis, K7AOZ, chairman of the Sister Cities Program and the emcee for the gathering. Taka Tsudaka, JA3VXH, is the hand reaching out from behind JA3CZY. Some say that he was reaching for the check.

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. No fee required for additions to Honor Roll totals.

MIXED

2016	YU2DX	1577	YU7BCD	1332	W9FD	1129	N6FX	902	K6DT
1920	F9RM	1575	W2NUT	1287	N4NO	1126	K5DB	851	K8CH
1855	K6XP	1561	W4BQY	1286	AA4A	1114	WA1JMP	758	UA3FT
1814	K6JG	1538	PAØSNG	1275	N6AV	1098	JH1VRQ	754	KL7AF
1805	W4WV	1531	K5UR	1260	I2PHN	1019	PY4OD	753	N3RL
1739	VE3GCO	1525	DJ7CX	1236	YU1AG	1018	SM3EVR	700	I2MQP
1687	W2NC	1514	W9DWQ	1179	YU1ODS	1010	IN3ANE	668	N8II
1678	W3PVZ	1468	N6CW	1168	I6SF	1008	WA2AUB	656	WB8YQX
1626	N4UU	1434	YU2RTW	1155	W8CNL	1002	PA2TMS	649	K7AGJ
1610	ON4QX	1403	N9AF	1151	UK3AAO	950	K8LJG	647	W6YMH
1604	N4MM	1383	N6JV	1146	DL1MD	920	WØIUB	644	DK7XX
1604	W7LLC	1350	KE4I	1139	K6ZDL	918	W6ANB	603	WD4IHV
1600	K2VV	1335	N2AC	1130	WØSFU	914	N6JM	602	WB8ZRL

S.S.B

1828	F9RM	1300	K2VV	1017	DL1MD	908	IØMBX	770	WA2FKF
1764	IØAMU	1300	PAØSNG	1016	WØYDB	893	YU1AG	759	ZP5RS
1708	IØZV	1288	K5UR	989	DJ7CX	890	N6FX	710	I6NOA
1649	K6XP	1268	YU7BCD	989	OE2EGL	881	N4NO	700	I2MQP
1548	K6JG	1207	W9DWQ	967	PA2TMS	851	W2NC	657	I5AFC
1532	K2POA	1176	N4UU	962	YU7ODS	821	CT1UA	633	N3RL
1454	I8KDB	1105	WB2NYM	950	JH1VRQ	804	WA2AUB	616	WB8YQX
1428	N4MM	1102	AA4A	939	W4BQY	802	I4LCK	615	KL7AF
1348	ZL3NS	1100	N2SS	932	W6YMV	780	N2AC	602	YU3APR
1331	I4ZSQ	1071	OZ5EV	909	PY3BXW				

C.W.

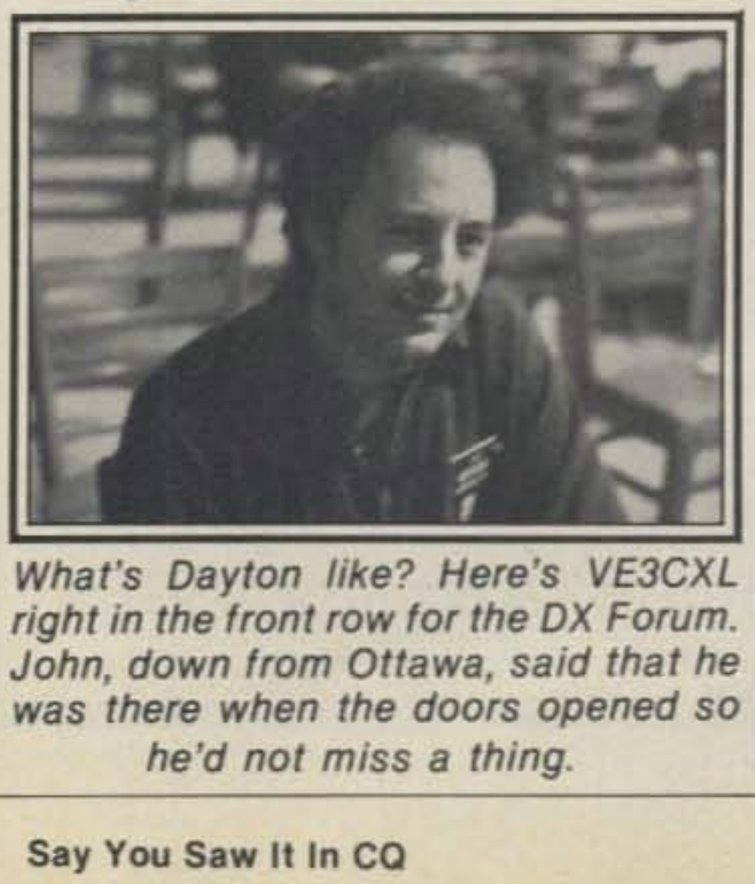
1583	W8KPL	1344	N4UU	1150	K2VV	912	N6FX	756	SMØGMG
1505	ON4QX	1288	YU7BCD	1140	N4MM	886	LZ1XL	750	JH1VRQ
1492	W2NC	1254	G2GM	1126	VO1AW	854	PY4OD	745	DJ3LR
1434	DL1QT	1234	W9FD	1123	N4NO	851	KH6HC	709	DL1MD
1418	K6JG	1205	W4BQY	1013	K6ZDL	834	VK4SS	700	K8LJG
1390	WA2HZR	1184	K5UR	1002	YU1AG	827	JE1JKL	679	I1YRL
1357	K6XP	1176	N2AC	928	I6SF	808	I5IZ	658	EA2OP
1350	N6JV	1175	DJ7CX	925	YU7ODS	777	YU3APR		

ture review. Possibly nothing else could be so personal yet so rewarding when you have it arranged for permanent reviewing in future years.

Vic Clark, W4KFC, one of the taller DX types in the Potomac tidewater area, stepped down as president of IARU Region II at their meeting just before the holidays, but ended up as vice-president for the coming four-year term. Vic was honored for his fine work in the last four years and will continue for the next four years in an influential position. IARU Region II also discussed the new amateur bands and do not be surprised if they come forth with some higher requirements in some instances, possibly some limits on the modes that can be used. All of this may be some years in the future, but the decisions are being made now. It may not be amiss to advise W4KFC of your views as well as to keep yourself aware of developments. The IARU meeting also discussed phonepatch problems and non-amateur use in the amateur bands.

KA1EAP up in the northeast corner at Old Orchard Beach is getting a lot of QSLs via the bureau. However, Dave is not jumping for joy. Apparently, someone is or was using his call last summer. In three shipments from the QSL bureau Dave found one card for his activity and several handfuls for his collaborator. He'd just as soon not have them. Many are European contacts, and Dave's biggest worry is how to keep his name untarnished when he cannot return a QSL for a tarnished one received.

Dick Dorrance, who once signed W2LEJ and patrolled Madison Avenue in New York, is currently in Brazil signing PP2ZDD. "Z" for it being a reciprocal license, "DD" because someone liked the sunshine of his smile, the firmness of his grip. Dick is in Goiania, in the Goias province, and is lining up a QSL Manager to help with his QSLing. Dick says he will be in Brazil for a long time and plans to do things right. He'll work the DX and let a QSL Manager handle the cards.



What's Dayton like? Here's VE3CXL right in the front row for the DX Forum. John, down from Ottawa, said that he was there when the doors opened so he'd not miss a thing.

The WAZ Program

10 M Phone

76...K0SE
77...N0AIT
78...SM4JEL
79...DF2NJ

20 M Phone

331...K8VFV
332...KB8JF
333...XE1OX
334...K8LJG
335...SM5HPB

15 M Phone

66...N3VA

20 M C.W.

121...N4RR
122...N4SX
123...AA4M

All Band WAZ S.S.B.

2047...WD4GSF
2048...N0AMI
2049...K4TFI
2050...DM2BJJ
2051...Y21RA
2052...K8VFV
2053...KB3KV
2054...W7AHX
2055...W5SGI
2056...WB2QVP
2057...K4GXH
2058...WB8SRD
2059...I2PKF
2060...I5JFG
2061...WB4SWI
2062...DJ4ZD
2063...I5EFO

C.W. and Phone

4942...W6MYP
4943...KD0Q
4944...WB2FIZ
4945...K8VFV
4946...JA7FSB
4947...K6FM
4948...JH4UYB
4949...JJ1AOS
4950...WA3NQJ
4951...W6OUL
4952...YU2CCY
4953...KP4L
4954...I5LCC
4955...SM6CRH
4956...SM5BDV
4957...SM0CMH
4958...G3CCZ
4959...DF3FI
4960...K6LPL

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the W A Z manager or to a check point should include sufficient postage for the safe return of their QSL cards. The processing fee for all C.Q. awards is $5.00. (As of March 1, 1981, the processing fee will be $4.00 for subscribers and $10.00 for non-subscribers.) Subscribers please include your latest *CQ* mailing label with your application.

Keep in mind the DX information window that has been opening at 0200Z on Mondays at 14002 kHz. It has been there longer than some living DXers can remember. An activity of the Northern California DX Club, it is a good source for late breaking information. Even DX stations listen to this one.

QSL Information

CN8BI-To I0UWG
DJ0IA-To WA1UVX
EA6DI-To KA4KIA
EA6EA-To KA4KIA
EI9CB-To KA4KIA
FG0FIS/FS7-To K6LPL
FG0GBL/FS7-To W8ATK
FO8DF-To WB6GFJ
FO8FB-To WB6GFJ
FR7BP-To W0AX
FR0DZ/G-To DK9KD
F0AHY/FC-To DJ0UP
GB2CPM-To G3WMU
GJ5DEL-To W6EJJ
GU5DQR-To DK5SF
GU5DQT-To DJ5PA
KP4Q-To W3HNK
KP4AM-To W7PHO
NP4A-To W3HNK
VP2EA-To KB4QB
VP2KAQ-To N0TG
VP2MFL-To K5BDX
VQ9RS-To N6BLN
WP4BDL-To W7PHO
XE1RL-To WD8NKT
XE1LCH-To WD8MKT
ZS6N-To WA1UVX
3B8DB-To K5BDX
5T5NC-To G3TXF
9M2RQ-To WA2VWG
9U5AV-To K5VT

Volunteers For QSL Manager Duties

KA2EGO, Bob Magro, 23 Bridge St., Milford, New Jersey 08848.
K4YSF, Charles Douglas, Box 421, Alma, Georgia 31510.
N8AKF, Dick Hale, 3437 So. Sanford Ave., Stow, Ohio 44224.

73, Hugh, WA6AUD

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PC BOARD ASSEMBLED AND TESTED	$99.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY, POWER SUPPLY AND ANTENNA	$159.99
POWER SUPPLY ASSEMBLED AND TESTED	$49.99
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YAGI ANTENNA 4' WITH TYPE (N, BNC, SMA Connector)	$64.99
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Includes converter mounted in antenna, power supply, Plus 90 DAY WARRANTY	$259.99
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OPTION #2 2N6603 in front end. (5 dB noise figure)	$359.99
2300 MHz DOWN CONVERTER ONLY	
10 dB Noise Figure 23 dB gain in box with N conn. Input F conn. Output	$149.99
7 dB Noise Figure 23 dB gain in box with N conn. Input F conn. Output	$169.99
5 dB Noise Figure 23 dB gain in box with SMA conn. Input F conn. Output	$189.99
PC BOARD FOR 5 dB UNIT WITH DATA	$35.00
PC BOARD FOR 5 dB UNIT WITH ALL PARTS FOR ASSEMBLY	$139.99
DATA IS INCLUDED WITH KITS OR MAY BE PURCHASED SEPARATELY	$15.00

Shipping and Handling Cost:
Receiver Kits and $1.50, Power Supply add $2.00, Antenna add $5.00, Option 1/2 add $3.00, For complete system add $7.50.

HOWARD/COLEMAN TVRO CIRCUIT BOARDS

DUAL CONVERSION BOARD $25.00
This board provides conversion from the 3.7-4.2 band first to 900 MHz where gain and bandpass filtering are provided and, second, to 70 MHz. The board contains both local oscillators, one fixed and the other variable, and the second mixer. Construction is greatly simplified by the use of Hybrid IC amplifiers for the gain stages. Bare boards cost $25 and it is estimated that parts for construction will cost $270. (Note: The two Avantek VTO's account for $225 of this cost.)

47 pF CHIP CAPACITORS $6.00
For use with dual conversion board. Consists of 6-47 pF.

70 MHz IF BOARD $25.00
This circuit provides about 43 dB gain with 50 ohm input and output impedance. It is designed to drive the HOWARD/COLEMAN TVRO Demodulator. The on-board band pass filter can be tuned for bandwidths between 20 and 35 MHz with a passband ripple of less than ½ dB. Hybrid ICs are used for the gain stages. Bare boards cost $25. It is estimated that parts for construction will cost less than $40.

.01 pF CHIP CAPACITORS $7.00
For use with 70 MHz IF Board. Consists of 7-.01 pF.

DEMODULATOR BOARD $40.00
This circuit takes the 70 MHz center frequency satellite TV signals in the 10 to 200 millivolt range, detects them using a phase locked loop, deemphasizes and filters the result and amplifies the result to produce standard NTSC video. Other outputs include the audio subcarrier, a DC voltage proportional to the strength of the 70 MHz signal, and AFC voltage centered at about 2 volts DC. The bare board cost $40 and total parts cost less than $30.

SINGLE AUDIO $15.00
This circuit recovers the audio signals from the 6.8 MHz frequency. The Miller 9051 coils are tuned to pass the 6.8 MHz subcarrier and the Miller 9052 coil tunes for recovery of the audio.

DUAL AUDIO $25.00
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11C70DC	600 MHz Flip/Flop with reset	12.30
11C58DC	ECL VCM	4.53
11C44DC/MC4044	Phase Frequency Detector	3.82
11C24DC/MC4024	Dual TTL VCM	3.82
11C06DC	UHF Prescaler 750 MHz D Type Flip/Flop	12.30
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612A	450 to 1230 mc .1 uV to .5V into 50 ohms Signal Generator	750.00
614A	900 to 2100 mc. Signal Generator	500.00
616A	1.8 to 4.2 Gc Signal Generator	400.00
616B	1.8 to 4.2 Gc Signal Generator	500.00
618A	3.8 to 7.2 Gc Signal Generator	400.00
618B	3.8 to 7.2 Gc Signal Generator	500.00
620A	7 to 11 Gc Signal Generator	500.00
623B	Microwave Test Set	900.00
626A	10 Gc to 15 Gc Signal Generator	2500.00
695A	12.4 to 18 Gc Sweep Generator	900.00

Alltech:

473	225 to 400 mc AM/FM Signal Generator	750.00

Singer:

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Keltek:

XR630-100	TWT Amplifier 8 to 12.4 Gc 100 watts 40 dB gain	9200.00

Polarad:

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2N1693	15.00	2N5641	6.00	MM1601	5.50
2N2632	45.00	2N5642	10.05	MM1602/2N5842	7.50
2N2857JAN	2.52	2N5643	15.82	MM1607	8.65
2N2876	12.35	2N6545	12.38	MM1661	15.00
2N2880	25.00	2N5764	27.00	MM1669	17.50
2N2927	7.00	2N5842	8.78	MM1943	3.00
2N2947	18.35	2N5849	21.29	MM2605	3.00
2N2948	15.50	2N5862	51.91	MM2608	5.00
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2N3301	1.04	2N5945	12.38	MMT2857	2.63
2N3302	1.05	2N5946	14.69	MRF237	2.95
2N3304	1.48	2N6080	7.74	MRF245	33.30
2N3307	12.60	2N6081	10.05	MRF247	33.30
2N3309	3.90	2N6082	11.30	MRF304	43.45
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2N3755	7.20	2N6094	7.15	MRF422	44.14
2N3818	6.00	2N6095	11.77	MRF426	10.24
2N3866	1.09	2N6096	20.77	MRF450	11.85
2N3866JAN	2.80	2N6097	29.54	MRF450A	11.85
2N3866JANTX	4.49	2N6136	20.15	MRF454	21.83
2N3924	3.34	2N6166	38.60	MRF458	20.68
2N3927	12.10	2N6439	45.77	MRF472	2.50
2N3950	26.86	2N6459/PT9795	18.00	MRF502	1.08
2N4072	1.80	2N6603	12.00	MRF504	6.95
2N4135	2.00	2N6604	12.00	MRF509	4.90
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2N5589	6.82	HXTR5104	50.00	SD1118	5.00
		MM1500	32.20	SD1119	3.00
				TRWMRA2023-1.5	42.50
				40281	10.90
				40282	11.90
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3.9pf	68pf	360pf	3300pf
4.7pf	82pf	390pf	3900pf
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6.8pf	110pf	470pf	5600pf
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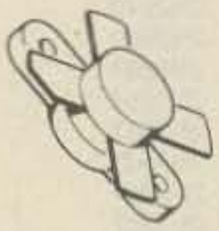
. . . designed for power amplifier applications in industrial, commercial and amateur radio equipment to 30 MHz.

- Specified 12.5 Volt, 30 MHz Characteristics –
  Output Power = 80 Watts
  Minimum Gain = 12 dB
  Efficiency = 50%



MRF458 $20.68

NPN SILICON RF POWER TRANSISTOR

. . . designed for power amplifier applications in industrial, commerical and amateur radio equipment to 30 MHz.

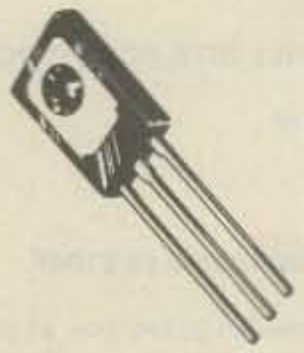
- Specified 12.5 Volt, 30 MHz Characteristics –
  Output Power = 80 Watts
  Minimum Gain = 12 dB
  Efficiency = 50%
- Capable of Withstanding 30:1 Load VSWR @ Rated P_{out} and V_{CC}

MRF472 $2.50

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in large-signal output amplifier stages. Intended for use in Citizen-Band communications equipment operating at 27 MHz. High breakdown voltages allow a high percentage of up-modulation in AM circuits.

- Specified 12.5 V, 27 MHz Characteristics –
  Power Output = 4.0 Watts
  Power Gain = 10 dB Minimum
  Efficiency = 65% Typical



MRF475 $5.00

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in single sideband linear amplifier output applications in citizens band and other communications equipment operating to 30 MHz.

- Characterized for Single Sideband and Large-Signal Amplifier Applications Utilizing Low-Level Modulation.
- Specified 13.6 V, 30 MHz Characteristics –
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  Minimum Efficiency = 40% (SSB)
  Output Power = 4.0 W (CW)
  Minimum Efficiency = 50% (CW)
  Minimum Power Gain = 10 dB (PEP & CW)
- Common Collector Characterization

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440 to 470MC

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- Specified 12.5 Volt, UHF Characteristics –
  Output Power = 13 Watts
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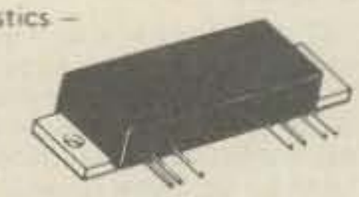
  Harmonics = 40 dB



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TU-2	Test Load Plug In for 530/540/550 Main Frames	50.00
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51	Sweep Plug In	50.00
53B	Wideband High Gain Plug In	25.00
53/54B	Wideband High Gain Plug In	45.00
53/54C	Dual Trace Plug In	112.50
53/54D	High Gain DC Differential Plug In	38.00
53/54G	Wideband DC Differential Plug In	68.00
53/54L	Fast Rise High Gain Plug In	68.00
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131	Current Probe Amplifier	50.00
184	Time Mark Generator	363.00
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455	Portable Dual Trace 50MHZ Scope	2000.00
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503	DC to 450KHZ Scope Rack Mount	250.00
535A	DC to 15MHZ Scope Rack Mount	263.00
543	DC to 33MHZ Scope	300.00
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561A	DC to 10MHZ Scope Rack Mount	200.00

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2E26	$ 5.00	4CX350FJ	$116.00	6146W	12.00
3-500Z	102.00	4CX1000A	300.00	6159	13.60
3-1000Z	268.00	4CX1500B	350.00	6161	75.00
3B28/866A	5.00	4CX15000A	750.00	6293	18.50
3X2500A3	150.00	4E27	50.00	6360	6.95
4-65A	45.00	4X150A	41.00	6907	40.00
4-125A	58.50	4X150D	52.00	6939	14.75
4-250A	68.50	4X150G	74.00	7360	12.00
4-400A	71.00	5728/T160L	39.00	7984	10.40
4-1000A	184.00	6LF6	5.00	8072	49.00
5-500A	145.00	6L06	5.00	8106	2.00
4CX250B	65.00	811A	12.95	8156	7.85
4CX250F/G	55.00	813	29.00	8226	127.70
4CX250K	113.00	5894/A	42.00	8295/PL172	328.00
4CX250R	92.00	6146	5.00	8458	25.75
4CX300A	147.00	6146A	6.00	8560A/A5	50.00
4CX350A	107.00	6146B/8298A	7.00	8908	9.00
				8950	9.00

CIRCLE 82 ON READER SERVICE CARD

MICROWAVE COMPONENTS

ARRA

2416	Variable Attenuator	$ 50.00
3614-60	Variable Attenuator 0 to 60dB	75.00
KU520A	Variable Attenuator 18 to 26.5 GHz	100.00
4684-20C	Variable Attenuator 0 to 180dB	100.00
6684-20F	Variable Attenuator 0 to 180dB	100.00

General Microwave

Directional Coupler 2 to 4GHz 20dB Type N		75.00

Hewlett Packard

H487B	100 ohms Neg Thermistor Mount (NEW)	150.00
H487B	100 ohms Neg Thermistor Mount (USED)	100.00
477B	200 ohms Neg Thermistor Mount (USED)	100.00
X487A	100 ohms Neg Thermistor Mount (USED)	100.00
X487B	100 ohms Neg Thermistor Mount (USED)	125.00
J468A	100 ohms Neg Thermistor Mount (USED)	150.00
478A	200 ohms Neg Thermistor Mount (USED)	150.00
J382	5.85 to 8.2 GHz Variable Attenuator 0 to 50dB	250.00
X382A	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	250.00
394A	1 to 2 GHz Variable Attenuator 6 to 120dB	250.00
NK292A	Waveguide Adapter	65.00
K422A	18 to 26.5 GHz Crystal Detector	250.00
8436A	Bandpass Filter 8 to 12.4 GHz	75.00
8439A	2 GHz Notch Filter	75.00
8471A	RF Detector	50.00
H532A	7.05 to 10 GHz Frequency Meter	300.00
G532A	3.95 to 5.85 GHz Frequency Meter	300.00
J532A	5.85 to 8.2 GHz Frequency Meter	300.00
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Merrimac

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AU-26A/	801162 Variable Attenuator	100.00

Microlab/FXR

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X638S	Horn 8.2 - 12.4 GHz	60.00
601-B18	X to N Adapter 8.2 - 12.4 GHz	35.00
Y610D	Coupler	75.00

Narda

4013C-10/	22540A Directional Coupler 2 to 4 GHz 10db Type SMA	90.00
4014-10/	22538 Directional Coupler 3.85 to 8 GHz 10dB Type SMA	90.00
4014C-6/	22876 Directional Coupler 3.85 to 8 GHz 6dB Type SMA	90.00
4015C-10/	22539 Directional Coupler 7.4 to 12 GHz 10dB Type SMA	95.00
4015C-30/	23105 Directional Coupler 7 to 12.4 GHz 30dB Type SMA	95.00
3044-20	Directional Coupler 4 to 8 GHz 20dB Type N	125.00
3040-20	Direcitonal Coupler 240 to 500 MC 20dB Type N	125.00
3043-20/	22006 Directional Coupler 1.7 to 4 GHz 20dB Type N	125.00
3003-10/	22011 Directional Coupler 2 to 4 GHz 10dB Type N	75.00
3003-30/	22012 Directional Coupler 2 to 4 GHz 30dB Type N	75.00
3043-30/	22007 Directional Coupler 1.7 to 3.5 GHz 30dB Type N	125.00
22574	Directional Coupler 2 to 4 GHz 10dB Type N	125.00
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3032	Coaxial Hybrid 950 to 2 GHz 3 dB Type N	125.00
784/	22380 Variable Attenuator 1 to 90dB 2 to 2.5 GHz Type SMA	550.00
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720-6	Fixed Attenuator 8.2 to 14.4 GHz 6 dB	50.00
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X101	8.2 to 12.4 GHz Variable Attenuator 0 to 60dB	200.00
C101	Variable Attenuator 0 to 60dB	200.00
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195B	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	100.00
185BS1	7.05 to 10 GHz Variable Attenuator 0 to 40dB	100.00
196C	8.2 to 12.4 GHz Variable Attenuator 0 to 45dB	100.00
170B	3.95 to 5.85 GHz Variable Attenuator 0 to 45dB	100.00
588A	Frequency Meter 5.3 to 6.7 GHz	100.00
140A,C,D,E	Fixed Attenuators	25.00
109J,I	Fixed Attenuators	25.00
WEINSCHEL ENG.	2692 Variable Attenuator +30 to 60dB	100.00

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MEMORY	DESCRIPTION	PRICE
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2114/9114	1K x 4 Static RAM 450ns	6.99
2114L2	1K x 4 Static RAM 250ns	8.99
2114L3	1K x 4 Static RAM 350ns	7.99
4027	4K x 1 Dynamic RAM	2.99
10 For $20.00		
100 For $100.00		
4060/2107	4K x 1 Dynamic RAM	3.99
4050/9050	4K x 1 Dynamic RAM	3.99
2111A-2/8111	256 x 4 Static RAM	3.99
2112A-2	256 x 4 Static RAM	3.99
2115AL-2	1K x 1 Static RAM 55ns	4.99
6104-3/4104	4K x 1 Static RAM 320ns	14.99
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MCM6641L20	4K x 2 Static RAM 200ns	14.99
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MK3852N	F8 Memory Interface	9.99
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AY3-8500	TV Game Chip	5.99
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PR1472B	UART	9.99
PT1482B	UART	9.99
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8251	Communication Interface	9.99
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MC14409	Binary to Phone Pulse Converter	12.99
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MC1406L	6 Bit D/A Converter	7.50
MC1408/6/7/8	8 Bit D/A Converter	4.50
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MC1733L	LM733 OP Amplifier	2.40
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CIRCLE 83 ON READER SERVICE CARD

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Novice Roundup

The American Radio Relay League (ARRL) sponsors the Novice Roundup (NR) Contest each February. The Novice class of license came into existence in 1951 and this year's NR is the 30th one to be held.

The name "Novice Roundup" began many years before Technician licensees were granted code operating privileges in the so-called Novice bands. The name remains appropriate because operation remains confined to the frequency segments (bands) available to Novice class licensees on a shared basis with all other classes of American amateur radio licensees.

Participants

This contest is primarily for American Novice and Technician class licensees, but General, Advanced, Extra, and foreign (DX) operators are also invited to operate in it. Novices and Technicians can work all amateurs (Novice, Technician, General, Advanced, Extra, and DX), but General, Advanced, Extra, and DX amateurs only are allowed to work Novices and Technicians in the contest. This is a good rule because it guarantees that at least one Novice or Technician is involved in each NR contact.

Benefits

I advise you to operate in the NR even if you have a poor station and/or low code proficiency. It will be nice if you get a certificate for working at least 200 NR contacts, and you will have just cause to be extremely proud if you are the top scorer in your ARRL section, or one of the ten top scorers in the country. However, you do not need to achieve these lofty accomplishments to benefit from NR activity. This contest provides a great opportunity to contact amateurs in many counties, states, and countries. You probably can work more different contacts during one day of the NR contest than you normally work in a month. These contacts can help you qualify for hundreds of operating awards.

NR operation will let you judge your operating skills and station performance against those of other operators. NR participation also can help you increase code receiving and sending proficiency. You will benefit in many ways by operating in contests, and there are contests every week, as listed in the Contest Calendar of this magazine.

2814 Empire Ave., Burbank, CA 91520

Stewart Ausema, who operates KA8HTS in Wyoming, Michigan, is a 27-year-old dairy and frozen foods manager in a market and he served as a radioman in the Navy. Stewart received his Novice license in January 1980 and has already contacted amateurs in 41 states and 12 countries using a Ten-Tec Century 21 Transceiver with a 40 meter dipole. He holds the Rag Chewer's Certificate (RCC) and he thanks Dave Gordon, WD8PDA for helping him get started in amateur radio. Stew expects to hold the General license by the time this picture appears in the Novice column.

Competition And Awards

This contest provides a unique opportunity for Novices and Technicians to compete on the air against other Novices and Technicians in their own ARRL sections, plus those who operate from other ARRL sections. Novices just compete against Novices and Technicians only compete against Technicians; Novices and Technicians do not compete against each other in this contest.

The ARRL issues a nice certificate to each Novice and Technician who makes at least 200 NR contacts. An ARRL certificate is awarded to the top scoring Novice and Technician in each ARRL section. The ARRL also issues appropriate certificates to the ten top scorers in the country.

General, Advanced, Extra, and foreign amateurs are invited to take part in the NR contest, but they are not eligible for NR certificates. These operators provide contacts, cards, and code practice for Novices and Technicians.

Multi-operator stations (two or more operators using the same callsign at one location, including loggers) are also ineligible to win NR contest awards. This rule keeps it a one-on-one contest and prevents a group (such as a club) from competing directly against an individual Novice or Technician operator.

No certificates are awarded to DX Novices who operate in the NR. However, American Novices will greatly appreciate opportunities to contact DX amateurs, and I hope many will be on the air. Very few (150) Novices and Technicians will earn a contest certificate, but the others are likely to be happy with a few DX contacts.

Dates And Times

The NR contest starts at 0001 UTC on the 31st of January and it ends at

2359 UTC on the 8th of February. To state it more simply, it starts Friday evening January 30th (local time) and it ends Sunday evening February 8th. The NR starts one minute past 4, 5, 6 and 7 PM PST, MST, CST, and EST, respectively. Similarly, the NR ends one minute before 4, 5, 6, and 7 PM Pacific, Mountain, Central, and Eastern Standard Times, respectively.

The NR contest length is 215 hours and 58 minutes. Novices and Technicians are allowed to work a maximum of 30 hours in the NR. The NR log must show each time one goes on and off the air during the contest, and the minimum allowable time off the air is 15 minutes. Listening time on the air counts as contest operating time and it must not be shown as time off the air. I advise you to be completely honest in all contest matters; it helps you to accurately gage your improvement in subsequent contests.

Operating

Bands. All NR contacts must be made in the 80, 40, 15, and 10 meter Novice bands. No crossband contacts are allowed, such as listening on 10 meters and calling or answering on the 15 meter Novice band. It does not help to work the same station more than one time on a band, or on more than one band, since credit allowed is just for one contact with each different station worked. It is fairly common to have DX amateurs call American Novices using voice (usually s.s.b) on the 10 and 15 meter Novice bands; these cross-mode (voice-code) contacts do not count in the NR. Keep an up-to-the-minute alphanumeric check list of all stations contacted during the NR to help you avoid working the same station more than one time.

Identification. Novices add /N and Technicians add /T to their callsigns during this contest to indicate their eligibility to all amateurs participating in the NR. As examples, a Novice with a callsign such as KA4ABC uses KA4ABC/N, and a Technician with a callsign like WA6FNM uses WA6FNM/T during the contest. Out-of-area operation is also indicated in callsigns to minimize confusion. As an example, if a Technician with an apparent California callsign such as WA6FNM is operating in the NR from Louisiana, he would identify as WA6FNM/5T to indicate that he is operating from the ARRL Louisiana section instead of the Los Angeles section.

General, Advanced, and Extra class licensees are not required to indicate class of license as part of the callsign used in the NR. However, many of us use /G, /A, or /E to make it very clear to other General, Advanced, Extra, and DX amateurs that we are not valid NR contacts for them; we are only valid NR contacts for Novices and Technicians. This additional identification is particularly useful in cases where callsigns such as KA6CUT and WB6PNY are used. Such callsigns might lead one to believe that these amateurs are Novice or Technician licensees, whereas they are both Extra class amateurs.

Objective. The idea is to work as many amateurs as possible in all the countries and ARRL sections you can contact. It is very helpful to maintain a check sheet to let you see at a glance which countries and ARRL sections you still need to multiply your NR score as you operate in the contest. It is simple to start with a list that shows all ARRL sections grouped by callsign areas and to cross out each section as it is worked to show that it is no longer needed as a contest multiplier. The following list of ARRL sections can be reproduced to serve as an aid during the NR.

ARRL 75 Sections Check-off List

(1)	CT	CONN	Connecticut
	EM	E MASS	Eastern Massachusetts
	ME		Maine
	NH		New Hampshire
	RI		Rhode Island
	VT		Vermont
	WM	W MASS	Western Massachusetts
(2)	ENY		Eastern New York
	NLI		New York City and Long Island
	NNJ		Northern New Jersey
	SNJ		Southern New Jersey
	WNY		Western New York
(3)	DEL	DE	Delaware
	E PA	E PENN	Eastern Pennsylvania
	MDC	MD or DC	Maryland or District of Columbia
	W PA	W PENN	Western Pennsylvania
(4)	ALA	AL	Alabama
	GA		Georgia
	KY		Kentucky
	NC	N CAR	North Carolina
	N FLA	N FL	Northern Florida
	SC	S CAR	South Carolina
	S FLA	S FL	Southern Florida
	TN	TENN	Tennesse
	VA		Virginia
	WI		West Indies (KG4, KP4, KV4, etc.)
(5)	ARK	AR	Arkansas
	CZ		Canal Zone
	LA		Louisiana
	MISS	MS	Mississippi
	NM		New Mexico
	N TEX	N TX	Northern Texas
	OK	OKLA	Oklahoma
	S TEX	S TX	Southern Texas
(6)	EB	E BAY	East Bay
	LA		Los Angeles
	ORG		Orange
	PAC		Pacific (KH6, etc.)
	SB	S BAR	Santa Barbara
	SCV		Santa Clara Valley
	SD		San Diego
	SF		San Francisco
	SJV		San Joaquin Valley
	SV		Sacramento Valley
(7)	AK	ALAS	Alaska
	AZ	ARIZ	Arizona
	ID	IDA	Idaho
	MT	MONT	Montana
	NEV	NV	Nevada
	OR	ORE	Oregon
	UT		Utah
	WA	WASH	Washington
	WY	WYO	Wyoming
(8)	MI	MICH	Michigan
	OH		Ohio
	W VA	WV	West Virginia
(9)	ILL	IL	Illinois
	IND	IN	Indiana
	WI	WIS	Wisconsin
(Ø)	CO	COLO	Colorado
	IA		Iowa
	KS	KANS	Kansas
	MN	MINN	Minnesota
	MO		Missouri
	NE	NEBR	Nebraska
	ND	N DAK	North Dakota
	SD	S DAK	South Dakota

Canadian Provinces

VE1	MAR/NFLD	Maritimes or Newfoundland
VE2	QUE	Quebec
VE3	ONT	Ontario
VE4	MAN	Manitoba
VE5	SASK	Saskatchewan
VE6	ALTA	Alberta
VE7	BC	British Columbia
VE8	NWT/YUKON	Northwest Territories or Yukon

Each time a new section or country is worked, it must be indicated (in sequence) in the NR log. Simply start with number one and continue up as you earn multipliers, including countries.

More than one section abbreviation is shown in the preceding list, if more than one is known to be commonly used. Very few foreign amateurs usually are contacted during this contest, and it is common practice to simply add the callsign of the first amateur contacted in each country to the check-off list to show it is no longer needed for NR multiplier credit.

Typical Contact. As is true in all contests, NR contacts should be as brief as possible. A typical good NR contact between KA4ABC and W6JEP could be as follows:

CQ NR CQ NR CQ NR CQ NR CQ NR DE KA4ABC/N

CQ NR CQ NR CQ NR DE KA4ABC/N KA4ABC/N

CQ NR CQ NR CQ NR DE KA4ABC/N KA4ABC/N KA4ABC/N NR K

KA4ABC KA4ABC DE W6JEP W6JEP NR K

W6JEP DE KA4ABC $\overline{BT}$ 579 NC 579 NC $\overline{BK}$

$\overline{BK}$ R 589 LA 589 LA DE W6JEP $\overline{BK}$

$\overline{BK}$ R 73 CQ NR CQ NR CQ NR DE KA4ABC/N KA4ABC/N NR K

Look at the preceding typical exchange and evaluate it very carefully with regard to the comments in the rest of this paragraph. In the initial call, KA4ABC included the /N each time with his callsign to indicate contact eligibility to all other amateurs. Notice also that the number of CQ NR transmissions decreased from 5 to 3 and station identification increased from one to three during the calling sequence and that NR contest activity was again indicated prior to the invitation to transmit (K). When W6JEP answered the call, she just identified both stations twice, left off the /N, and indicated contest participation by sending NR before the invitation to transmit. Once the two-way contact has been established, there is no need to continue using /N or /T. The KA4ABC reply to W6JEP is very brief; the callsigns are just sent one time each and only at the beginning of the reply. The RST report and ARRL section are sent twice to minimize possible requests for repeats. Neither the term *RST* nor the word *section* precedes the report and League section, since it is obvious what both are, and the break sign ($\overline{BK}$) is used to eliminate unnecessary identifications. It is legal to use the break sign as long as each transmission in the series of two-way transmissions is less than 3 minutes long and identification is transmitted at least every 10 minutes during a long series of short transmissions. During contest activity, a series of short transmissions is not likely to extend 10 minutes, and the identification shown in the sample exchange suffices. Note that the W6JEP response is short; the R advises that the KA4ABC contest data has been received. W6JEP then sends the report (RST) and her section twice, identifies with just her callsign to give KA4ABC assurance that he is copying the correct signal, and sends the break sign to invite KA4ABC to respond. When KA4ABC answers, he sends R to indicate the contest data has been received, he may send best regards (73), and he then sends a short contest call in case another station is waiting for a contest contact. When the short call is sent, the /N is again added to indicate contest eligibility to all amateurs. This indicated brief exchange is further abbreviated by experienced operators in other contests, but the sample exchange is suitable for Novice band use.

Brevity. Do not routinely exchange normal contact information during contest contacts. In other words, do not send your name, location (QTH),

rig, antenna, weather (WX), or mailing address information as parts of contest contacts. Keep each contact brief. Do not send faster than you can receive accurately; let the other fellow slow down to a speed you can copy. If the other operator sends too fast, tell her/him to send more slowly (QRS).

If you contact a state or country you need to have confirmed, simply request a QSL when you send your card. I send a card to each amateur contacted for the first time, which is not a common practice among most amateurs. However, most amateurs send a QSL in response to each card received. If all amateurs just responded to cards received, none would be exchanged. Nevertheless, if received cards initiate completion of the QSL exchange, that is okay; the person who wants the other amateur's card is simply the one who begins the exchange.

Logging

Required Entries. Your NR log must show the time each contest contact started and the type of time (EST, CST, MST, PST, or UTC) being indicated. It is preferable to use Universal Time Coordinate (UTC) when logging radio contacts, since it eliminates possible time zone confusion. Most experienced amateurs only use UTC. UTC still is called Greenwich Mean Time (GMT), Greenwich Civil Time (GCT), Zebra time, or Zulu (Z) time by many amateurs, and they are all meant to indicate the same time. However, UTC has been the correct term for several years and it should be used. The other amateur's callsign (/N and /T indicators not required) and ARRL section (or country) must be logged for each contact. Received and sent signal (RST) reports must both appear in the NR log. Your station callsign and dates of contest operation are also required.

Forms. Special NR contest log sheets can be requested from the American Radio Relay League, 225 Main Street, Newington, Connecticut 06111. The NR logs do not have to be mailed to the ARRL until one month after the contest ends, so you should have time to request logs from the ARRL, fill them in, and mail them. ARRL entry forms and summary sheets also should be requested to accompany your contest logs. Send a self-addressed and stamped envelope (s.a.s.e.) with your request for these ARRL forms and send your request without delay. The ARRL also has contest check sheets, but it may be too late for you to request them for use in this contest by the time you read this column; if so, it is a good idea to get them for use in future contests.

Submitted Material. The contest material submitted to the ARRL is not returned, so do not send your only (original) log sheets. It is a simple matter for most of us to duplicate material before mailing it to the ARRL. Take your time and try to submit correct material that is easy to read. Checking contest entries is a tough job, but you can make it easier for League checkers by turning in good material.

The League appreciates receiving check logs from General, Advanced, Extra, and DX operators who take part in the NR.

Scoring

Contact Points. One point is earned for each station contacted while on the air in the NR, whether or not contacted amateurs are participating in the contest, as long as the report and ARRL section are obtained.

Code Proficiency Points. If you have an ARRL code proficiency certificate, your stated receiving speed (words per minutes) is added to your point total for the stations you contacted. If you do not hold an ARRL code proficiency certificate, or if you want to increase the rate shown on your certificate, you can submit your January or February W1AW or W6OWP qualifying copy with your NR material to claim these extra points.

Multipliers. The total number of points derived from your contest contacts and your ARRL (not FCC) certificated code proficiency rate are multiplied by the number of foreign countries and ARRL sections you contacted during your NR contest operation. Remember that Alaska, Canadian Provinces, Hawaii, and the West Indies (Guantanamo Bay, Puerto Rico, and Virgin Islands) are ARRL sections and they do not count as countries.

Summary

I hope to contact you on one of the Novice bands. I was never a Novice because that class of license did not exist when I was getting started in our amateur radio service. Nevertheless, I work about 1000 Novice band contacts every year and I have participated in each Novice Roundup. When the NR contests were held in the 1951 through mid-1970 era, the Novice license ws just valid one year. It could not be renewed, and it was not available to anyone who had previously held any class of amateur radio operator license. In that time frame, no Novice could compete in more than one NR as a Novice and newer Novices seldom participated at all. Novice licenses now are valid a maximum of five years and they can be renewed, which means that Novices can be experienced in previous NR contests and improved scores should result. Enjoy this contest by putting your station in good condition and reserving adequate good operating time during the NR.

NR contest activity has always been slow at the start, and it is common to have other operators request an explanation of contest rules. I advise you to direct them to NR coverage in this column or in other magazines; it is simpler and better than trying to give all this information to each amateur who requests it. NR activity continues to build as the days pass and more amateurs become aware of it. By the last day of the contest, activity is excellent. If you get this issue before the contest starts, please mention the Novice Roundup to every amateur you contact in the Novice bands to let them prepare for this excellent contest.

73, Bill, W6DDB

No-59-60

K8BG now takes us through a short program that can be used to demonstrate some of the computer's graphic capability, as well as show how various patterns can be drawn.

INTRODUCTION TO BASIC

A Computer Programming Language

Part XIV—The Computer's Graphic Capability

BY BUZZ GORSKY*, K8BG

Some months ago (June to be exact), I mentioned the **SET, RESET,** and **POINT** functions. These three functions permit the TRS-80® user to **print, erase,** and **test** graphics patterns drawn on the computer screen. In this installment I will present a very short program that can be used to demonstrate some of the computer's graphic capability as well as show you how various patterns can be drawn. The program may also remind you of some of the things you learned about in high school mathematics.

The program draws the upper right quadrant of the graph of a **function.** A **function,** you may recall, is a mathematical entity indicating the relationship between two variables. For example, Y = X is a very simply function indicating equality between X and Y. Similarly, U = SIN(W) is a function indicating that for every value of W, U must equal the sine of that value. The upper right quadrant of a graph represents that part of a function where both variables haved non-negative values. Typically, this quadrant is drawn with the 0,0 point at the lower left corner, and one variable increases along the vertical axis and the other along the horizontal axis. Alas, the designers of the TRS-80® keyed the graphic functions in a pattern where the 0,0 point is at the upper left of the screen, and while one variable increases along the horizontal axis, the other increases down (rather than up) the vertical axis. This fact will present some problem in presenting graphs in their proper orientation.

With that brief background, let's take a look at this little program and see what it does. Lines 1 and 2 simply print directions on the screen, and the END in line 3 halts execution. The instructions tell the user to write line 300, which will have the function to be graphed in the form where U is a function of W. The user then types "RUN 100" to cause execution to resume at line 100. In line 100 the screen is cleared, and then a line is drawn to represent the horizontal axis. To draw a horizontal line we want the value of X to increase (or decrease) along its range while Y stays constant, as we set (X,Y). Here X runs from 5 to 127 while Y stays at 44. This high value of Y means that the line is drawn near the bottom of the screen. In lines 120 to 131 the opposite happens as we draw a line to represent the vertical axis. Here Y runs through a series of values while X remains constant at 5.

Line 290 begins the FOR/NEXT loop that will draw the function. W will run from 0 to 122. U is set equal to the chosen function of W; here the square root function is used as an example. Lines 310 and 320 take care of the screen orientation problem by "translating" or moving the origin from the upper left to the intersection of the two lines drawn on the screen. W1 is set to W plus 5 to move things over a bit and not crowd the left edge of the screen. U1 is set equal to 42 minus U so that the zero point for the function will now be near the bottom of the screen rather than at the top. In line 340 we first set U2 equal to the integer part of U1 since the set function will deal with integers. Then we look to see if U2 is within or outside of the limits that the set function will accept. If outside then we try the next value of W. If the point is "settable" then we turn on the graphic block at the point defined by W1 and U2 and then go to the next value of U2. After the FOR/NEXT loop has run its course we go to 510 and stay there! This merely prevents the screen from being disturbed by the appearance of the word "READY." Hitting the break

*712 Hillside Drive, Carlisle, PA 17013

key will stop execution whenever the user wishes.

You will find that as you think of functions to enter in Line 300, many will not show well. This will occur because the values of U2 are not settable. Try modifying the equation you enter in line 300, and eventually you will find something that will graph well. For example, if you try W = SIN(U) and you don't see much try W=10 * SIN(10 * U) or W = 10 * SIN(0.1 * U) and see how that changes things. The point of this program is to help you see how the form of what you provide as line 300 will change what you see on the display. This should help you learn how to create particular graphic patterns.

I hope that you enjoy playing with this little program. Next we will revisit the world of disk and take a closer look at the structure and utility of random access files.

```
1 PRINT "THIS PROGRAM WILL
  GRAPH THE UPPER RIGHT
  QUADRANT OF AN EQUATION"
2 PRINT "THE EQUATION IS IN THE
  FORM U = F(W), AND YOU ENTER
  THE FUNCTION WHEN THE WORD
  READY SHOWS BY TYPING 300
  AND THEN THE FUNCTION AND
  THEN ENTER RUN 100"
3 END
100 CLS:FOR X = 5 TO 127
110 SET(X,44)
111 NEXT
120 FOR Y = 44 TO 0 STEP -1
130 SET (5,Y)
131 NEXT
290 FOR W = 0 TO 122
300 U = SQR(W)
310 W1 = W + 5
320 U1 = 42-U
340 U2 = INT(U1):IF( U2<0 OR U2>44)
   THEN 500
350 SET (W1,U2)
500 NEXT
510 GOTO510
```

a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

The "Story of The Month" as told by John:

John B. Irwin, K7SE, K6SE/2 All Counties #274 4-4-80

"Back in 1929 I thought the world would be my oyster if only I could take c.w. at 25 wpm. I was wrong. I got my ham license sort of incidentally, as a step to a second-class radiotelegraph commercial ticket. I was second op on the SS Wapama, San Francisco to Los Angeles, for a few weeks—dullest job I ever had. As W6DBZ, I worked two stations on 20 meters in my first two years, J2CL and VK5HG, so that county hunting brought down my average distance on 20 meters by an order of magnitude! I had about ten QSOs from Poughkeepsie, New York in 1932 as W6ZZAC. If anyone has one of those old QSL cards with a picture of the California crew on it, I'd appreciate having it back. I was a substitute for this Olympic gold-medal crew later on.

"I was a visiting prof of astronomy at UCLA from 1968-70, and the club station there, W6YRA, with a Yagi up 120 feet, revived my ham interests after a 36-year drought. At Newark State College (later Kean College of New Jersey), I put a 14 AVT on the roof of the physics building and worked my first county on 14336 in November 1971. I found county hunting a very easy habit to break—gave it up a dozen times, once for three years. I retired to Tucson, Arizona in 1977, and after obtaining 5B WAS No. 427, I finally finished up all the counties with WD8CKP giving me Hancock, Tennessee. Eight days later I was off on my fourth Caribbean suitcase DXpedition—5 weeks on Antigua, Saint Eustatius and the British Virgins. Being a Christian, I've always believed it was better to give than receive. To put it another way, it's far more fun to be at the business end of a pileup! I've also operated from Saba (PJ6), Dutch and French St. Martin

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

John Irwin, K7SE.

and Anguilla. On Anguilla in 1975 I worked 105 countries with an ailing transceiver putting only 20 watts into a vertical. I've also operated from HC2YL (Darlene had a real deep voice for three days!), OA6BW and HK3BLD.

"Very many thanks to the 397 stations who cooperated to give me 3,074 counties. Special thanks to WB9RCY (92 counties), W5AWT (81), WØBK (46), WD9ITQ (45), WB4TNY (42), W4UVP (41) and W8WUT (37). I will miss Karl's 'We'll give it a go,' Dave's 'Negatory,' Ben's 'Anyone else?', Mike's 'That's a good one,' Tom's 'Two two, bang bang, shotgun' and Bud's 'Rodney,' plus his maximizing of information with a minimum of words and time. I especially will remember Arnie, K9DCJ, for the many times he waited on county lines, giving up his turn; for his refusals to go longer than a 10-minute run; for his many phone calls when a last county turned up; and Dorothy, WB9RCY, for being a perfect lady as Net Control for hours one afternoon during a period of vicious intentional QRM.

"I never did learn to get counties without wasting a lot of time, but I wore out two egg timers trying. I had 5 antennas stolen from in the 8¼ years—something perhaps for the *Guinness Book of Records.* My patient and understanding wife wishes to thank you all for finally releasing me back to the real world again.

"My other hobbies are backpacking, mountain climbing, Kodachroming, travel and writing popular articles and book reviews on astronomy. I've hiked the 220-mile John Muir Trail in the beautiful Sierra Nevada four times. My collection of color portraits of fellow astronomers is over the thousand mark. I've been in 82 ARRL countries and wish I had cards from some of them, especially Zanzibar, Uganda, Sudan, Egypt, Aden, Vatican City and Liechtenstein. The latter country is the only one I've walked across twice; the second time it took twice as long—four hours."

Awards Issued

Bob Craig, K6XZ acquired USA-CA-3000.

Maury Mead, W9FBC claimed USA-CA-2000.

John Irwin at VP2EEB.

Karl Fukuchi, JH2CJW USA-CA-500 #1518.

Jerry Burkhead, N6QA collected USA-CA-1500 endorsed All 2×CW.

Owen Ottossom, SM5CMP won USA-CA-500 and 1000.

Don Conrad, N4CCJ got USA-CA-500 endorsed All 20 2×S.S.B. and USA-CA-1000 endorsed Mixed.

Dr. Harry Cincurs, OK3EA, who had received #1 USA-CA-500 to Czechoslovakia back in July 1963, added USA-CA-1000 to his collection, this being #3 to OK.

Pavel Henzl, OK1MIN had me send him USA-CA-1000 endorsed All 2×C.W.

Gene Goffriller, OE2EGL, who had received #1 USA-CA-500 to Austria back in November 1969, received #1 USA-CA-1000 to Austria and it was endorsed All 2×S.S.B.

USA-CA-500 Certificates went to:

Don Coppedge, KC4AD endorsed Mixed.

Stefano Cipiani, IØMWI endorsed All 2×S.S.B.

Mario Ambrosi, I2MQP endorsed Mixed.

USA-CA Honor Roll

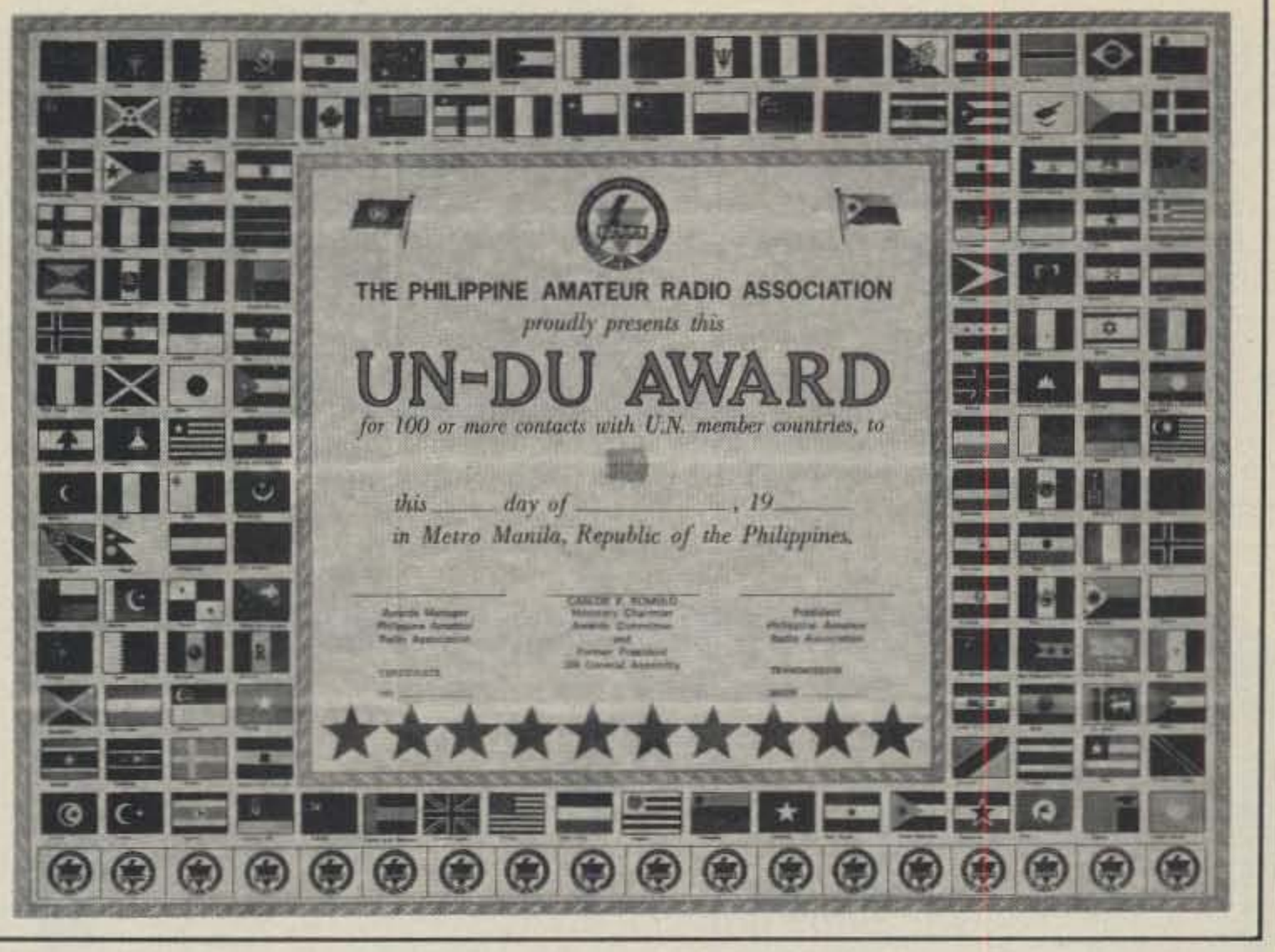
3000		1000		500	
K6XZ	328	SM5CMP	626	SM5CMP	1524
2000		N4CCJ	627	KC4AD	1525
W9FBC	442	OK3EA	628	N4CCJ	1526
1500		OK1MIN	629	IØMWI	1527
N6QA	500	OE2EGL	630	I2MQP	1528

Awards

The UN-DU Award: Offered on a permanent basis by the Philippine Amateur Radio Association to commemorate the formation of the United Nations in 1945.

1. To qualify, one must be a licensed radio amateur in any country whether or not such country is a member of the UN.

2. You must acquire 100 or more QSL cards for contacts after the formation of the UN, October 24, 1945, with at least 100 UN member nations (see item 8), which may include one from your own country, if it is a UN member.



The Philippine UN-DU Award.

3. You must mail the QSL cards along with a fee of $6.00 U.S. QSL cards may be photocopies (Xerox or similar). You may pay in equivalent amounts of Japanese Yen, HK $, Malaysian or Sinapore $, British Pounds, German DM, French and Swiss Francs, Dutch Guilders, or Scandinavian currencies. A bank draft is the acceptable form. If in U.S. $, a money order will be suitable.

4. An initial application may be made for 100 countries. If additional countries are applied for, they shall be in groups of five. No additional fee is charged for this.

5. Awards will be assigned a serial number according to the date of mailing.

6. No Philippine application will be acted upon until at least ten awards are made to amateurs of other countries.

7. All submitted cards will be returned after checking.

8. The UN-DU list of countries includes:

(1) All countries who are regular members of the UN. To be valid, contacts must be made on or after the date of its admission to the UN.

(2) All UN agencies count as one country—such as 4U1UN, 4U2UN or any UN authorized amateur station in UN occupied territory or in a country occupied by a UN peace-keeping force.

(3) If for any reason a country loses its UN membership, or any UN agency ceases operation, such country or agency shall have to be deleted from the UN-DU Award Certificate effective on the date the membership is lost.

(4) Contacts with colonies will not be considered as contacts with the governing nation, nor shall any colony qualify as a country under this Award.

9. The Awards may be granted for each of the single modes or mixed modes: S.S.B., C.W., RTTY, SSTV, Mixed, or Satellite Relay (also mixed).

Apply to: The Philippine Amateur Radio Association, Inc., 17th Floor, Philippine Communication Center Building, Ortigas Avenue, Pasig, Metro Manila, Philippines.

The Japanese WANC Award.

Worked All Numeral City Award (WANC) (JAPAN): Some Japanese cities' names are including numeral (number) when written in Japanese character. Here are the rules for this Award:

Confirm five or more cities from different groups of numerals such as:

1. Ichinomiya, Ichinoseki.

2. Nihonmatsu, Ninohe.
3. Iyomishima, Mihara, Mikasa, Miki, Misato, Misawa, Mishima, Mitaka, Miura, Miyoshi, Sanda, Sanjoo.
4. Shijoonawate, Yokkaichi.
5. Gojoo, Gosen, Goshogawara.
6. Hitachioota, Mutsu, Rikuzentakada.
7. Nanao.
8. Hachinohe, Hachiooji, Oomihachiman, Yachiyo, Yame, Yao, Yashio, Yatsushiro, Yawata, Yawatahama, Yookaichi, Yookaichiba.
9. Kitakyusyu.
10. Tookamachi, Towada.

1,000. Chiba, Chitose, Ojiya, Yachiyo.

10,000. Imari.

Send QSO data, certified that you have the QSLs by two other amateurs and $2.00 or 7 IRCs to: JA3AER/N2ATT, Mr. Taizo Arakawa, 444 Westminster Place, Lodi, NJ 07644, U.S.A.

The Key Station Certificate.

Key Station Certificate: Issued by the Louisiana Slow Net which meets at 00:30 UTC on 3.703 MHz, Monday through Friday. At selected net meetings, a message will be sent over the net which tells what the letter for that night will be. Contestants are to collect the various letters with the dates that each letter was sent. The letters form a word, such as "traffic." The high scorer wins, although there may be more than one winner. The letters and dates are to be sent to WD5EAE, Steve Genusa, 2106 Park Ave., Monroe, Louisiana 71201.

Iowa Counties Award: Sponsored by the Mississippi Valley Radio Club, it will be issued to any amateur who has worked 19 Iowa Counties. Cost is $1.00. Each additional 20 Counties will be issued a new award at the cost of $.50. Send the usual log data certified by two other amateurs or one club officer to: The Mississippi Valley Radio Club, 3518 Columbia, Davenport, Iowa 52804. (Thanks to Arnold Adams, WBØUCP for the data.)

Gene Goffriller, OE2EGL, who received #1 USA-CA-500 and #1 USA-CA-1000 to Austria.

Notes

As per the data in "Zero Bias" by Alan M. Dorhoffer, K2EEK, Editor of *CQ*, effective March 1, 1981, the cost of all *CQ* Awards will go to $10.00 for non-subscribers and $4.00 for subscribers, or a $1.00 *decrease* in the present rate. The cost for the All Counties Plaque will go to $35.00.

How was your month? Write and tell me about it.

73, Ed, W2GT

Please send all reader inquiries directly

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The present sunspot cycle continues to decline slowly from its December 1979 peak level of 165. The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 162.9 for October 1980. Daily values ranged widely from a low of 96 recorded on October 5th to a high of 260 observed on the 11th. This results in a 12-month running smoothed sunspot number 159, centered on April 1980. A smoothed sunspot number in the low-to-middle 130's is forecast for February 1981.

Solar activity continues at a high level, and this should produce generally *excellent* DX conditons on *three* bands during the daylight hours of February. *Fifteen* meters should be the best band from shortly after sunrise through the late afternoon hours, with *20* and *10* meters not very far behind. On days when propagation conditions are High Normal or better, look for bonus DX openings on *6* meters as well. Openings should be possible towards Europe, Africa, and in a generally easterly direction before Noon, towards the South Pacific and the west during the late afternoon, and towards Central and South America throughout most of the daylight hours. A ** in the DX Propagation Charts on the following pages indicates the best times to listen for DX openings on *6* meters. This may be the last season during the present solar cycle when widespread *6* meter DX openings may be possible.

From sundown to Midnight there often may be as many as *five* different bands simultaneously open for DX. *Fifteen* meters is expected to hold up well past sundown for DX openings to Central and South America, Antarctica, the Pacific area, and the Far East and Asia. *Twenty* meters should be open for DX to most areas of the world during this time period, with signals strongest in southerly and westerly directions. Good DX conditions towards the east and the south should also be possible on both *40* and *80* meters. Some openings in the same directions also should be possible on *160* meters, but with considerably weaker signals and higher noise levels.

Between Midnight and sunrise it should be a toss-up between both *40* and *20* meters for DX honors, with both bands open to many areas of the world during this period. Fairly good DX conditions to many areas of the world should also be possible on *80* meters. Be sure also to check the *160* meter band for some unusual DX openings during this period, particularly towards the south and the west.

All in all, February should shape up as a really good month for DX conditions on all the amateur h.f. bands between *160* and *6* meters!

This month's Propagation Charts contain band opening predictions for major DX paths for the period February 15 through April 15, 1980. A short-skip propagation forecast for February appeared in last month's column.

11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for February 1981

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 12, 22-23		A	B	C
High Normal: 1-3, 11, 20-21, 24-26	A	B	C	C-D
Low Normal: 4, 6-7, 9-10, 13-14, 18-19, 27-28	B	C	C-D	D-E
Below Normal: 5, 8, 15, 17	C	C-D	D	E
Disturbed: 16	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 any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) Feb. 1st-3rd, fair (C) on the 4th, fair-to-poor (C-D) on the 5th, etc.

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

V.h.f. Ionospheric Openings

The big news this month should continue to be the DX openings expected during the hours of daylight on the *6* meter band. Some openings also may be possible towards South America between 7 and 10 p.m., local time, as a result of an expected seasonal improvement in *trans-equatorial scatter* propagation (TE).

There are no significant meteor showers expected during February. Radio storminess, however, generally increases during February, with associated increases in auroral displays. Such storms improve chances for short-skip openings on both *6 and 2* meters during the month, up to distances of approximately 1300 miles. Check the "Last Minute Forecast" which appears at the beginning of this column to determine on which days during February radio storminess is likely to occur. These are shown as Below Normal or Disturbed in the forecast.

Shortwave Propagation Handbook

Stock is dwindling rapidly, and copies may not be available for too much longer. A few dozen personalized copies, signed by both W3ASK and N4XX, are still available for the regular price of $7.50, postpaid. (Add one dollar for surface shipment outside the USA, and $3 for air shipment.)

The *Shortwave Propagation Handbook* explains the many facets of shortwave propagation in simple, understandable language. It is also full of do-it-yourself information for predicting propagation openings to all areas of the world on the shortwave bands, as well as forecasting day-to-day conditions. The book is the first of its kind for the radio amateur, shortwave listener, commercial user, and all others who derive pleasure or profit from the shortwave spectrum. Personalized copies can be obtained directly from: MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

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

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

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

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. etc. Appropriate *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

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

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

February 15 - April 15, 1981
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

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

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

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

Time Zone: PST (24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	08-09 (1) 09-11 (2) 11-12 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1) 19-21 (1)	00-06 (1) 06-09 (2) 09-11 (1) 11-14 (2) 14-16 (3) 16-19 (2) 19-22 (1) 22-00 (2)	19-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*
Central & Northern Europe & European USSR	08-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-12 (1) 19-21 (1)	05-06 (1) 06-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*

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

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

**Indicates best times to listen for F-2 layer openings on 6 Meters.

a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

Canadian Government Investigates Improvements To Television Receivers

For almost a year, the Canadian Government, through its Department of Communications, has been investigating the need for improving the performance of television receivers. The ongoing study resulted from the realization that the television receiver is a key element in a variety of systems that use video displays...systems such as TV broadcast receivers, data and video processing systems, satellite and cable distribution systems, video recording devices, and equipment used for interactive consumer services.

The specific objectives of the study are many, and include the need:

- to determine what improvements are technically possible for existing and planned designs of television receivers.
- to gather information on the effect of receiver improvement on spectrum planning, frequency allocations, interference ratios and other performance parameters.

The Department noted that "as the number of services using the radio frequency spectrum continues to increase, the resulting congestion produces a greater number of interference complaints, (a great proportion of which) are due to spurious responses in the TV receiver." Specifically, it noted that today's television receivers are susceptible to interference from sources such as f.m. broadcast stations, other TV broadcast stations, land mobile radio systems, general radio service systems (including CB), and amateur radio systems.

In its original solicitation for comments ("Discussion Paper on the Need for Improvements to Television Receivers," March 1980), the Department stated that it considered improvements in television receivers to be essential to the efficient utilization of the r.f. spectrum.

Canadian Radio Technical Planning Board Whitewashes TVI Issue

In response to the Canadian Department of Communications' request for comments on television receiver design (see item above), the Television Broadcasting Committee of the Canadian Radio Technical Planning Board (CRTPB) provided what can only be termed a "whitewash" of the issues involved!

Despite the fact that the DOC issued the request for comments in March 1980, with responses due 1 September 1980, the CRTPB claimed that it did not have the time to provide specific answers to the questions and conceptual proposals included in the DOC document. Instead, the Committee discussed some general principles involved in television receiver design, although it avoided any mention of the problem of poor rejection of out-of-band signals by today's receivers.

The lack of response on the part of the Committee can be traced directly to the fact that it is not convinced that a need exists for improving television receivers. In fact, members of the Committee are said to hold widely divergent views on the matter, ranging from "let the marketplace decide" to "if the government wants standards, let them go ahead and make them."

It is hoped that sponsor organizations of the CRTPB (which includes the Canadian Radio Relay League [CRRL]) have responded to the DOC in a more responsible and objective manner than did the Television Broadcasting Committee.

Haggling On TV Receiver Specs Hurts Consumers, Industry

The continued haggling between government and industry in both the U.S. and Canada in the matter of susceptibility standards for television receivers and other electronic home-entertainment devices certainly hurts consumers in both countries. But it also hurts the manufacturers as consumers turn to products that are better designed and assembled, and that can operate in today's r.f. environment. In many cases, these products come from abroad. Thus, the poor performance of many domestic television receivers in the area of r.f. susceptibility is but one more example where an industry (here, the electronic home-entertainment industry) has failed to recognize that attention to performance standards is essential to improving its reputation and sales.

This problem...that is, of a battle between government agencies and various industries regarding consumer-related issues...was the subject of an editorial in *Business Week* by Robert B. Reich, Director of Policy Planning for the U.S. Federal Trade Commission (*BW*, 27 October 1980). Wrote Reich, "While American business and government have been fighting tooth and nail over consumer protection, other nations have been using consumer protection as a means of improving industry performance and enhancing national reputation for commercial quality."

While manufacturers in Sweden, France and West Germany have

**8603 Conover Place, Alexandria, VA 22308*

pioneered exacting standards for product performance, noted Reich, "American business has deluded itself into spending millions of dollars to stall new regulations." The result has been a steady march away from shoddy products, with many U.S. businesses losing the battle of the marketplace.

We would only comment that the U.S. home-entertainment industry could, if it wanted to, turn the matter of r.f. susceptibility into a "plus" by building and marketing devices that could operate without interruption in today's r.f. environment. The German manufacturer Grundig did this in the mid-1970's with the introduction of its Super Color television receiver (a device that could operate properly even with an operating amateur transmitter connected to its antenna terminals!). Regardless, if the problem of interference to electronic home-entertainment equipment is ever to be solved, Government and industry must take joint responsibility for protecting the consumer, and for improving the quality of products produced and/or marketed in the U.S.

R.F. Interference From Consumer Products A Growing Problem

As noted in an article which appeared in the *Wall Street Journal* ("Should Uncle Sam Stick His Nose Into Uncle Jake's Teeth: FCC Defends Plan to Control Such Ultrasonic Devices As False-Teeth Cleaners), the number of devices that may cause r.f. interference is growing rapidly. Among the devices now being examined for incidental radiation is a false-teeth cleaner produced by a major manufacturer of hair-coloring products. While the manufacturer is yelling "regulatory overkill," however, the FCC claims that it is chartered to protect communications and that it has the right to regulate the product's incidental radiation.

The *WSJ* article stated that incidental radiation can wreak havoc in the radio spectrum, and can interfere with such critical operations as those related to flight-control communications at major airports.

In response to the *WSJ* article, the ARRL, in a letter to the *Journal*, noted that r.f.i. is a hidden problem in that in most cases, the consumer does not know the source of interference to his or her home-entertainment products. Further, continued the League, manufacturers have shown little willingness to filter their products so that they don't radiate energy that could cause interference. In short, marketplace forces have simply not worked.

What's the "bottom line"? According to the League, the incidental radiation problem can only be solved at this time through strong regulatory action on the part of the FCC.

AMRAD Seeks Technically Oriented Members

The Amateur Radio Research and Development Corporation (AMRAD) is a technically oriented club of about 300 radio and computer amateurs. The purposes of the organization are:

- to develop skills and knowledge in radio and electronic technology
- to promote basic and applied research
- to organize forums and technical symposia
- to collect and disseminate technical information
- to provide experimental repeaters and other services to its members

AMRAD currently operates the WD4IWG/R repeater, an open "machine" for data communications (including RTTY), voice and various experimental modes. The organization also provides an S-100 computerized bulletin board system, and has recently begun operation of a handicapped education exchange (HEX). A newsletter (AMRAD Newsletter) is mailed monthly to all members.

If you wish to join one of the groups working on the state of the art in amateur radio today, contact:

Mr. Paul Rinaldo, W4RI
President, AMRAD
1524 Springvale Avenue
McLean, VA 22101

Carlos Roberts, FCC Receives 1980 Presidential Award

In September 1980, President Carter selected three FCC employees for Presidential Rank Awards. One of those selected was Carlos V. Roberts, Chief, Private Radio Bureau (PRB).

Roberts, 33, was cited for his leadership in fostering innovative changes in regulatory philosophy, especially in the area of deregulation, and in improving the operating efficiency of the Private Radio Bureau. The PRB regulates such private radio services as land, maritime and aeronautical mobile, CB, and amateur radio, areas that comprise the majority of licenses issued by the Commission.

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Just a reminder calling your attention to our 160 Meter Phone Contest at the end of the month. The rules should present no problem to those of you who have participated in our C.W. Contest. If your 160 activity has been confined to lower s.s.b., however, and you want to join in the fun, you will find complete rules in last month's issue. Even if you do not plan to operate on a competitive basis, you might try building your total for WAS on 160. We might even be able to provide you with a couple of new 160 DX countries, provided the "DX Window" is kept free of U.S. and VE contest activity. You're just not going to hear those weak DX stations if you clutter up the "DX Window" with stateside QRM.

I may be wrong, but I anticipate that there will be a lot of ruffled feathers for you fellows who plan to participate in one or more of the many contests and QSO parties scheduled for the short month of February. I don't propose a cutback in the number of contests, but I would suggest that the organizations who have scheduled their activities on the same weekend should get in touch with each other and plan their suggested frequencies so that there will be a minimum of conflict. This especially applies to stateside QSO parties.

There are at least three or four more contests that are usually scheduled for February that I have not heard about even though I have written to them requesting information. Add them to those already listed, and we've got ourselves an almost impossible operating schedule. Good luck; you'll need it.

73 for now, Frank, W1WY

White Rose SWL Contest

From 1500Z Jan. 24 to 0900Z Jan. 25

Here's another one for the shortwave listener. This one is organized by the White Rose Radio Society of Great Britain.

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	**Jan. 23-25**	**CQ WW 160 Meter C.W.**
	Jan. 24-25	White Rose SWL
*	Jn/Fb 31-1	French C.W. Contest
	Feb. 7-8	RSGB 7 MHz Phone
	Feb. 7-8	CWSP C.W. Contest
	Feb. 7-9	Two Land QSO Party
	Feb. 7-9	Vermont QSO Party
	Feb. 9-10	Land O Lincoln Party
	Feb. 14-15	QCWA C.W. QSO Party
	Feb. 14-15	YL-OM Phone Contest
	Feb. 14-15	Dutch "PACC"
	Feb. 21-22	ARRL C.W. DX Contest
*	**Fb/Mr 27-1**	**CQ WW 160 Mtr Phone**
*	Fb/Mr 28-1	French Phone Contest
*	Fb/Mr 28-1	RSGB 7 MHz C.W.
	Fb/Mr 28-1	YL-OM C.W. Contest
	Fb/Mr 28-1	G-QRP C.W. Activity
	Mar. 7-8	ARRL Phone DX
	Mar. 14-15	QCWA Phone QSO
	Mar. 14-15	Virginia QSO Party
	Mar. 21-22	Bermuda Contest
	Mar. 21-22	Commonwealth Phone
	Mar. 21-22	BARTG RTTY Contest
	Mar. 28-29	**CQ WW WPX SSB**
	Apr. 4-5	ARRL Open CD Phone
	Apr. 4-5	Polish C.W. Contest
	Apr. 8-9	DX-YL to N.A.-YL C.W.
	Apr. 11-12	ARRL Open CD C.W.
	Apr. 15-16	DX-YL/N.A.-YL Phone
	Apr. 18-19	Polish Phone Contest
	Apr. 25-26	King of Spain Contest

* Covered last month.

Logging is limited to the 1.8, 3.5, and 7 MHz bands. Phone and c.w. require separate logs; use a separate sheet for each band.

Score 1 point for each station heard on each band from one's own continent, and 5 points if station heard is outside own continent.

Multiply total points by number of different countries logged on each band, added together for your final score.

Call areas of the U.S., VE, VK, and ZL will be considered as separate countries for scoring purposes.

The practice of logging a series of contacts made by one station is not allowed.

Your log should show the following: date, time in GMT, band, station heard, station being worked, and report at the SWL's location. If points are claimed for both stations, the call sign of each must appear in the station-heard column.

Certificates of Merit will be awarded at the discretion of the White Rose Radio Society.

Entries should be sent to: David MacGregor, G4IDJ, 8 Manor Court, Shadwell, Leeds LS17 8JE England, and should arrive no later than March 17, 1981.

RSGB 7 MHz Contest

Phone: Feb. 7-8 C.W.: Feb. 28-Mar. 1

The same rules as used last year have been retained with one exception: the contest now ends at 0900 GMT.

Bands: Phone—7.04 to 7.10 MHz. (This will require split frequency operation for the U.S.) C.W.—7.00 to 7.04 MHz.

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

Scoring: Stations in Europe score 5 points for each QSO with a British Isle station.

Multiplier: One for each different British Isle country prefix worked. (G2, GC3, GD4, GW4, etc., a maximum of 42 possible. No credit for GB prefixes.)

Final Score: Total QSO points times the multiplier prefixes worked.

There is also an s.w.l. section with the scoring same as above. Overseas listeners to log British Isles stations only.

Awards: Certificates to the 1st, 2nd, and 3rd place scorers in the British Isles, Europe, and non-Europeans.

The phone entries must be received no later than April 4th, the c.w. April 25th. They go to: The RSGB HF Contest Committee, c/o P.A. Miles, 28 Scotch Orchard, Lichfield, Staffs, WS13 6DE England.

CWSP DX Contest

Starts: 0000 GMT Sat., Feb. 7
Ends: 2400 GMT Sun., Feb. 8

This is the second contest organized by the CWSP, "Grupo de CW de Sao Paulo."

All bands, 3.5 through 28 MHz, C.W.

only. Single operator, multi-operator, and QRP single operator (limited to 10 watts input).

Exchange: RST plus a QSO number starting with 001. CWSP members will add CWSP to the report.

Points: Same country 1 point per QSO, other countries same continent 2 points, countries in other continents 3 points.

Multiplier: Each DXCC country and each Brazilian prefix (PY1, PT7, PS8, etc.) counted once only regardless of band.

Final Score: QSO points from all bands times the final multiplier (all band scoring only).

Awards: Cup to the world winner, medals for each continent, and certificates for each country. Also special awards for CWSP members, QRP winner, Brazil, and Clubs.

Mailing deadline is March 15th to: CWSP Contest Committee, P.O. Box 15098, Sao Paulo 01000, Brasil.

In the 1980 contest WA4OML was the top scoring single operator U.S. entry, and W1OPJ was the multi-operator winner.

Two Land QSO Party

Two Periods (GMT)

2100 Sat. Feb. 7 to 0800 Sun. Feb. 8
1300 Sun. Feb. 8 to 0300 Mon. Feb. 9
Rest period from 0800 to 1300 on Sun.

Again sponsored by the South Jersey Contest Coalition, it's the states of N.J. and N.Y. working the rest of the world.

The same station may be worked once per band and mode, mobiles and portables each time they change counties.

Exchange: RS(T) and QTH. County and state for Two Land stations. States, province, or country for others.

Scoring: Each QSO is worth 2 points. Two Landers multiply total QSO points by number of (states + VE provinces + countries + Two Land counties) worked. (N.J., N.Y., and the U.S. are multipliers).

All others multiply total QSO points by the number of Two Land countries worked per band (83 per band, max. total of 498 possible).

Frequencies: C.W.—1805, 3560, 7060, 14060, 21060, 28060. S.S.B.—1815, 3900, 7230, 14280, 21355, 28600. Novice—3725, 7125, 21125, 28125.

Awards: Certificates to the top scorers in each Two Land county, each state, VE province, and DX country. Also top mobiles, portables, novice, multi-operator, and club.

Logs with 200 or more contacts should include a dupe sheet. Indicate each new multiplier as worked. A summary sheet and the usual signed declaration are also requested. A large s.a.s.e. will get you a copy of the results.

Logs go to: South Jersey Contest Coalition, c/o John Bokales, W2KI, 270 Landing Road, Clarksboro, N.J. 08020.

Vermont QSO Party

Starts: 2100Z Sat., February 7
Ends: 0100Z Mon., February 9

This party is again being sponsored by the Central Vermont A.R.C.

The same station may be worked on each band and mode for QSO credit, and mobiles in each county change.

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

Scoring: Vermont stations score 1 point for each contact and multiply total by the number of ARRL sections and countries worked.

All others score 3 points for each Vermont station worked and multiply total by the sum of Vermont counties worked on each band (14 per band possible).

Frequencies: C.W.—3685, 7060, 14060, 21060, 28100. Phone—3909, 3932, 7265, 7290, 14290, 14325, 21375, 28600. Also 50260, 50360, 144-144.5, 145.8.

Awards: Certificates to the top scoring stations in each ARRL section, DX country, 2nd, 3rd, and 4th places in Vermont, and top multi-operator station.

The top scoring Vermont single operator station picks up a Trophy and also will have his name and call engraved on the W1EOB Memorial Plaque donated by Mrs. Doris McGrath. (The Plaque will be retired in 10 years to the station with the highest score or most wins during that period).

Contacts made in the party may be credited for the W-VT Award for working 13 out of the 14 Vermont counties (for stations who have not previously won it).

Mailing deadline for logs is March 31st, and they go to: Gerald W. Benedict, W1BD, 23 Foster Street, Montpelier, VT 05602. Include a large s.a.s.e. for copy of results.

Land O Lincoln QSO Party

From 0000Z Feb. 9 to 2400Z Feb. 10

In cooperation with the Central Illinois Radio Club, The Land O Lincoln Chapter of 10-X International is sponsoring this QSO party in commemoration of Lincoln's birthday.

Operation will be on the 10 meter band, both c.w. and phone.

Exchange: Name, QTH, signal report, serial number, 10-X number if any, and LOL certificate number if any.

Scoring: For LOL certificate holders worldwide and CIRC members: 1 point per QSO, 2 points per QSO with 10-X number exchange, and 3 points for LOL exchange.

All others score 1 point per QSO with LOL certificate holder, 2 points if with local LOL or CIRC member.

Multiplier for both is U.S. states, VE provinces and DX countries worked.

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

Mailing deadline for logs is March 15th to: Dave Meiser, AG9E, 1112 Andover, Bloomington, IL 61701. Include a large s.a.s.e. for a special QSL and/or results.

(I have made no attempt to edit these rules; here they are verbatim. Hope you don't find them as confusing as I did—Ed.)

QCWA QSO Party

C.W.: Feb. 14-15 S.S.B.: Mar. 14-15
Starts: 0001 GMT Saturday
Ends: 2400 GMT Sunday

This is the 24th annual QSO Party for the Quarter Century Wireless Association. This year's party is being sponsored by the Pelican Chapter.

The theme is to renew old acquaintances and meet new members. It also offers an excellent opportunity to build up your totals for the many QCWA awards. Work members in 50 states, 60 chapters, 100 members, and 500 members.

Exchange: QSO no., your name, and Chapter I.D. (name or number, members with no affiliation use "at large" or AL).

Scoring: One QSO point for each QCWA member contacted. One multiplier point for each Chapter worked. Your final score is total QSOs times number of Chapters worked.

The same station may be worked once only on each weekend regardless of the band. Separate logs must be submitted for c.w. and phone.

Frequencies: C.W.—3545, 7045, 14045, 21055, 28055. S.S.B.—3915, 7245, 14295, 21365, 28615. Plus or minus 15 kHz. (A suggestion to DX members: Try the lower edge of each section).

Awards: There will be certificates for the Top 5 scorers in each party, and Plaques for the overall winner in each section, c.w. and s.s.b.

The QCWA Newsletter will give more detailed information and have a sample log form, so all members should be well informed.

Non-members who have been licensed for 25 or more years can write to QCWA, 1409 Cooper Drive, Irving, Texas 75061 for application and information.

Mailing deadline for your logs is March 31st. It is suggested, however, that you submit your c.w. entry by Feb. 28th.

This year they go to: Pelican Chapter QCWA, Att: Arthur Monsees, W4BK, 1407 48th Ave., N.E., St. Petersburg, FL 33703.

YL-OM Contest

Phone: Feb. 14-15 C.W.: Feb. 28-Mar. 1
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

It's the YLs working the OMs in this annual activity organized by the YLRL. All bands may be used, but cross-band or contacts with stations on Net frequencies do not count.

Exchange: QSO no., RS(T), and ARRL section or DX country. (See QST for section list.)

Scoring: Each QSO is worth one point. Multiply total by number of ARRL sections and DX countries worked. The same station may be worked once only regardless of band.

There is also a power multiplier of 1.25 for stations running 150 watts or less on c.w., and 300 watts p.e.p. if on s.s.b. Multiply your score by the above factor for your final score.

Phone and c.w. are separate contests and require separate logs.

There will be a penalty of 3 contacts for each duplicate contact that is removed from the log by the contest committee.

Awards: Certificates to the highest scoring YL and OM, both on phone and c.w., in each U.S. and VE call area and each DX country. There are also four Cups to the top scoring YL and OM in each contest.

Logs must be mailed by March 16th and received no later than April 6th to be eligible. This year they go to the YLRL V.P., Kay Eyman, WA0WOF, RR #2, Garnett, Kansas 66032.

Dutch "PACC" Contest

Starts: 1400Z Sat., Feb. 14
Ends: 1700Z Sun., Feb. 15

The main purpose of this contest is to help amateurs to obtain the PACC Award. QSL's or other written confirmation is needed of 100 different PA stations. However, applicants for this award will not have to submit cards for QSO's made in the contest, provided that the station claimed has submitted a log.

Use all bands 1.8 through 28 MHz, phone or c.w. The same station may be worked on each band but one mode only for QSO and multiplier credit.

Exchange: RS(T) plus a QSO number starting with 001. PA/PI/PE stations will also include two letters which will indicate their province (579001/GR). There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, ZL.

Scoring: Each QSO with a PA/PE/PI counts 1 point. DX stations determine their multiplier by the number of provinces worked on each band (max. of 72 possible).

Final Score: Total number of QSOs multiplied by the sum of provinces worked on each band.

Awards: Certificates to the top scoring station, single operator, multi-operator, and s.w.l. in each country and call areas of JA, LU, PY, UA9/0, VE/VO, VK, W/K, ZL, and ZS.

There is also an s.w.l. section. Call of the Dutch station heard and the serial number as well as the station being worked must be logged. Scoring is same as above.

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

Mailing deadline for logs is March 30th to: PACC Contest Mgr. D.J. Hoogma, PA0DIN, Schoutstraat 15, 6525 XR NYMEGEN, Netherlands.

ARRL International DX Contest

C.W. Feb. 21-22 Phone: March 7-8
Starts: 0000 UTC Saturday
Ends: 2400 UTC Sunday

The basic format of this contest has been returned to that used in 1979 and prior years. It's the world working the Ws and VEs only, not DX to DX. The world-wide format used last year was a noble experiment, but after a lot of controversy it was decided to return to the old format but to retain the single-band classification. Briefly, this is what it now looks like.

Categories: Single operator, both single and all band. Multi-operator, single and multi-transmitter, and QRP, 5 watts or less output.

Multi single transmitter stations must remain on a band at least 10 minutes once a contact is made on that band, with one exception. One other band may be used during the 10 minute period if the station worked is a new multiplier only. Multitrans—no limit but only one signal per band.

Exchange: RS(T) and state or province for W/VEs RS(T) and power input for DX stations.

QSO points: W/VEs earn 3 points for each DX contact. DX gets 3 points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VEs. DX stations will use U.S. states (48) and VE1-8, VO for their multiplier (max. of 57 per band).

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

Awards: Certificates in each category in each country and ARRL section, plus a wide selection of plaques. Also certificates to DX stations making over 500 QSOs.

There are several disqualification rules. It is recommended that you write to the ARRL for a detailed copy of the rules and contest forms (large s.a.s.e., 2 IRCs for DX).

Mailing deadline for all entries is April 7th and of course go to: ARRL DX Contest, 225 Main Street, Newington, CT 06111.

G - QRP C.W. Activity

Saturday, Feb. 28 to Sunday, Mar. 1

The G-QRP Club devoted to low power communications invites QRP amateurs to join in the c.w. activity on this weekend starting at 0900Z Saturday and continuing to 2300Z Sunday.

There will be an hourly change on the band being used, depending of course on the propagation for that time of day.

The activity will be found on the International QRP frequencies: 3560, 7030, 14060, 21060, 28060. In addition to the above, members of the Club have a weekly schedule on the above frequencies on Sundays from 1100-1230 and 1400-1530 GMT.

It is suggested that you write to the club's secretary, George Dobbs, G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham, B37 7QX England for more details of their program.

Reports of stations contacted during the weekend activity should be sent to: Gus Taylor, G8PG, 37 Pickerill Road, Greasby, Wirral, Merseyside, L49 3ND England.

Although the above hardly comes under the heading of a contest, it should be of interest to the ever-increasing ranks of QRPers.

The next scheduled weekend of concentrated activity is September 12-18, same times as for this one.

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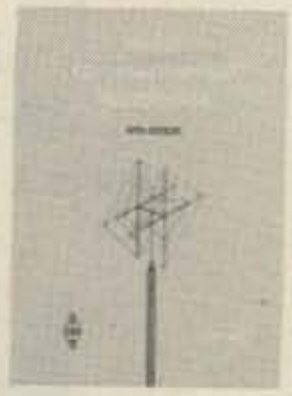

World Radio TV Handbook 1980
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RSGB Radio Communication Hdbk (5th Ed.)
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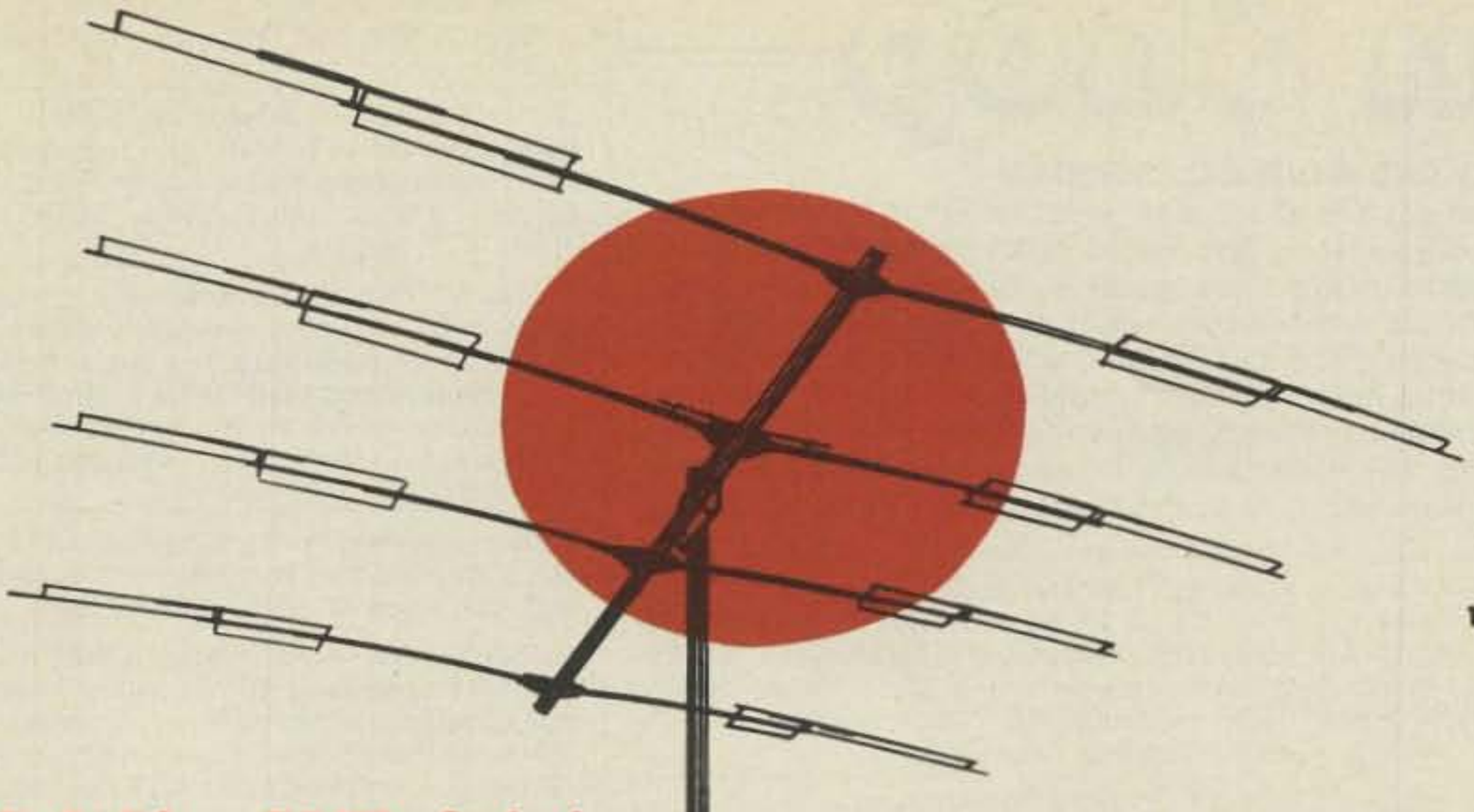

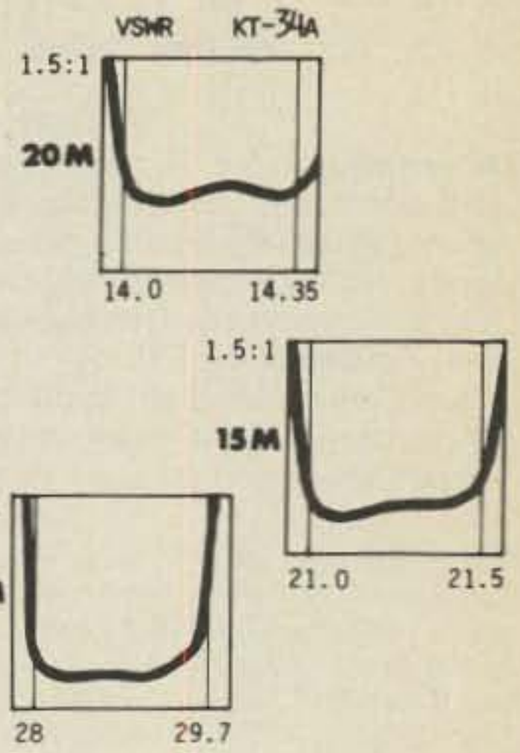

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What makes the KT-34A so different from a conventional tribander? Basically, the traps, coils, and capacitors have been discarded in favor of lossless linear-loading and Hi-Q air capacitors, all composed of aluminum tubing! These allow the KT-34A to handle 4KW PEP at an unusually high level of **efficiency**. The linear loading also makes full 1/4-wave elements possible on 10 and 15 meters, and brings 20 meters much closer to the desireable 1/4-wave than any conventional tribander (the sketch below shows the remarkable metamorphosis of the KT-34A design).

Two driven elements are employed to make the KT-34A unusually **broadbanded** (a concept applied to most KLM antennas). VSWR and performance remain nearly constant across each of the three bands (see the VSWR charts). A KLM balun is supplied to allow direct feed from your 50 ohm coax.

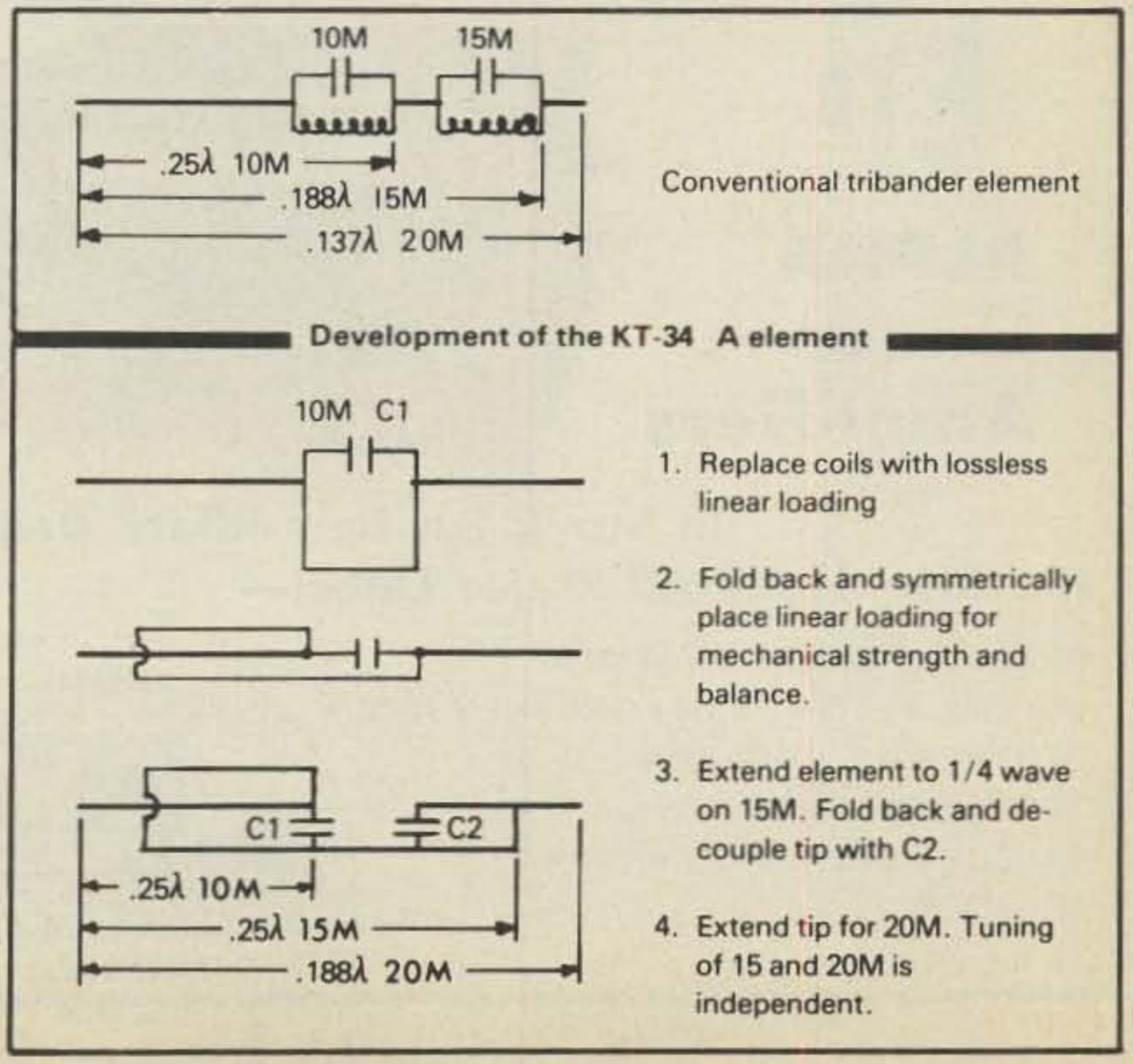
Structurally, the KT-34A is built tough. No boom support is required. All the aluminum, including the boom, is strong weather resistant 6063-T832 alloy. All the hardware is stainless steel except for the mounting U-bolts. Virtually indestructable Lexan insulators support the elements and insulate them from the boom. Rotation is possible by most any ham rotor. Wind balance and wind survival are excellent. Boom length is only 16 feet.

To meet your future needs, the KT-34A is easily expandable. The KT-34XA Upgrade Kit, which adds two new elements and doubles the boom length, produces substantial increases in performance. Your KT-34A cannot become obsolete!

A great deal of thought and care has gone into the design of this antenna. It's not just another "me too" tribander, but one developed from modern techniques, materials and engineering. We hope you will give it a try. We know you won't be disappointed . . . .

KT-34A SPECIFICATIONS

Frequencies of operation:
14.0-14.350 MHz
21.0-21.450
28-29.750
Gain: 7 dBd ± .3 dB across each band
F/S: 30 dB
F/B: 20 dB
Feed impedance: 50 ohms with balun supplied
Power rating: 4KW PEP
Boom: 16 ft. x 3" O.D.
Mast: for 2" O.D. (standard)
Element length: 24 ft. average
Turning radius: 16 ft.
Wind area: 6 sq. ft.
Wind survival: 100 MPH
Suitable Rotors: TR-44, Ham "M", HD-73, KR-400, etc.
Price: $389.95



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QSL CARDS: 500/$10. 400-illustration catalogue, free! Bowman, 743 Harvard, St. Louis, MO 63130.

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WANTED: Hammerlund HQ120 and Heathkit DX100. Both must be in good condition. Thomas J. Donabedian, 765 Main St., Worcester, MA 01608.

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SELL: SWAN 500CX SS-16 SPECIAL, 508 VFO, 117XC Supply/Speaker, Mic, $400. KLM Multi 2700 with preamp, $425. All equipment in mint condition. Paul Herink, Somerdale St, Spotswood, NJ 08884.

FOR SALE: ICOM 701 with power supply and Dentron Super Tuner Plus. Mint condition, used approx. 5 hours, in original cartons. $1100 firm. Will ship UPS. Contact Tom Oskiera, KA3DCX, 3176 Miller St., Phila., PA 19134.

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With 12 button touch tone pad...$399.00
With 16 button touch tone pad...$419.00
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13.8 VDC power amplifier...$149.00

Specifications:
Frequency Coverage: 440 to 449.995 MHz
Channel Spacing: 30 KHz minimum
Power Requirements: 9.6 VDC
Current Drain: 17 ma-standby 400 ma-transmit (1 amp high power)
Antenna Impedance: 50 ohms
Sensitivity: Better than .5 microvolts nominal for 20 db
Supplied Accessories: Rubber flex antenna 450 ma ni-cad battery pack, charger and earphone
RF output Power: Nominal 3 watts high or 1 watt low power
Repeater Offset: ± 5 MHz

Tempo S-I

The first and most thoroughly field tested hand held synthesized radio available today. Many thousands are now in use and the letters of praise still pour in. The S-1 is the most simple radio to operate and is built to provide years of dependable service. Despite its light weight and small size it is built to withstand rough handling and hard use. Its heavy duty battery pack allows more operating time between charges and its new lower price makes it even more affordable.

Tempo S-5

Offers the same field proven reliability, features and specifications as the S-1 except that the S-5 provides a big 5 watt output (or 1 watt low power operation). They both have external microphone capability and can be operated with matching solid state power amplifiers (30 watt or 80 watt output). Allows your hand held to double as a powerful mobile or base radio.

S-30...$89.00* S-80...$149.00*

*For use with S-1 and S-5

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S-20...$89.00

Optional Accessories for all models

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10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
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WANTED: IC-225, 1980 U.S. Callbook. SELL: POZ-1220-20 amp power supply, $60. Johnson roller inductor, $35. National 500 pf. .125 spacing variable, $20. Heath HDP-21A desk mike, $15. K0MK, 218-865-6541.

SALE: Best offer Hy-Gain 8 23 channel SSB/home base crystals for 40 channel hookup, Silver Eagle mic, DC adaptor/RF/SWR/MTR. John DiSalvo, N2AOF, Box 823, Rocky Point, NY 11778.

WILSON System One Tri-Bander, $195; CDE Ham III Rotor, $115; Heath 2 KW Linear SB-220 80 thru 10, $550. All equipment new, unused. Send SASE for full list. Write: DS, Box 48, Ballardvale, Mass. 01810.

SELL: Swan 350D Digital 6 months old. Hardly used, with QSK circuit added. $300. N2ACZ (212) 478-8310.

PRE 1924 QST's; ARRL Handbook editions 1, 3, 4, 5. Jones Radio Handbook, Edition 1, wanted for cash. Ken Miller, K6IR, 16904 Geo. Washington, Rockville, MD 20853, (301) 774-7709.

SELL: Browning Golden Eagle with extras, $400. Swan 350 with 117xc Power Supply, new finals, etc., $335. You ship. WB1GMH, Box 637, Pittsfield, VT 05762, tel: 802-746-8334.

FOR SALE: B.T.I. Model LK 2000 Linear Amplifier. No shipping. Bob Shull, W7FIM, 12349 36th Ave. N.E., Seattle, WA 98125, tel: 206-362-6661.

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WANTED: Used Trio TS-120V QRP Xcvr, Skip, WB8OWM, 1309 24th St NW, Canton, Ohio 44709.

HAMMARLUND SP-600 JX-6 RCVR. $125. (Pickup only) Detroit area. Clem, W8VO, 1-313-268-2467.

WANTED-Novice Freq Crystals, Hand Keys, Hustler Mobile Antennas and Resonators. K8LJQ, 355 Mower Rd., Pinckney, Mich. 48169.

WANTED: ALTAIR card guides, AN/URA-17 converter, and Hallicrafters HA-7 calibrator. C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

SELL: Telrex 5 el 10-15-20 mtr Yagi $210. 100' Rohn 25G Tower complete with extras $600. WA3WRD, 717-566-6098.

WANTED: Any National Equipment, working or not. George Misic, WA8LEM, 4147 Mayfield Rd., S. Euclid, Ohio 44122.

WANTED: All types of service manuals. SASE for list of electronic items for sale. W7KSG, 1876 E. 2990 So., Salt Lake City, UT 84106.

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WANTED: Cheap RTTY equipment. Please help a poor fellow scratch his itch. Marti, Bx 6113, Hilton Head, S.C. 29928, 803-785-6280 eves.

YAESU FT-301 200 W. PEP transceiver. Like New. $550. R.J. Moraine, 1432 Pamela St., Hurst, TX 76053.

CHEAP-CHEAP! Drake, Swan, Yaesu, other used gear. Antique radios, literature. SASE for list. Ed Howell, Folly Beach, SC 29439.

SELL: CQ 1945 thru 74, 73-65/74, QST 54/74. Send SASE for list. DePew, 3514 Aberdeen, Alton, IL 62002.

SELL: Swan 350B, nine months old, still under warranty, hardly used. Built-in power supply, 2 CW filters, crystal calibrator. $450. Sold for $649.50 new. Ron Kramer, WD8POA, 4949 Rudgate, Toledo, Ohio; 419-882-0373 evenings.

WANTED: Hallicrafters HA-7 calibrator, J-390 and C-806/GR panels, and AN/GRC-27 housing covers. C.T. Huth, 146 Schonhardt St., Tiffen, OH 44883.

FOR SALE: No. 26 RTTY machine with stand, Electrocom No. 250 converter. All with manuals. $100. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355, (212) 461-5933.

TRI-EX 71-foot Crank-up Tower with guys, insulators, winch. $300. Jack Nichols, 1105 Dallas, Plainview TX 79072, (806) 293-8067.

WANTED: Heathkit Linear HA-14 "KW Kompact" with or without finals. K8LJQ, 355 Mower Road, Pinckney, MI 48169.

SELL: HR1680 RCVR, mint, $150, you ship. W2EZ, 9 Whitney Farms Circle, Fairport, NY 14450.

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SELL: General Radio 546C audio freq. microvolter, converts audio oscillator into calib. sig. gen. Manual. $55. Ph.D., 5220 Carlingford Ave., Riverside, CA 92504.

SELL: National NC-125, $120, and NC-57, $75 with manuals. You ship. Chuck, W9VZR, 4627 N. Bartlett, Milwaukee, WI 53211.

WANTED: Conversion Manual for WWI military surplus. ARC-5 etc. Norrie, 1174 Yale Ave., Wallingford, CT 06492.

4-1000A, excellent, $55 or trade for guns. Send SASE for parts list of ham items. Basham, W7TCT, 735 Caves Hwy., Cave Junction, OR 97523.

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SELL: New Galaxy Rejector plus PS, $30. New WRL King DB68 Preselector, 80 thru 6 meters, $30. New rare Regency ATC 1 Converter, 80 thru 10 meters on car radio, $40. Mint RCA WV98B VTVM, $45. 24 hr. world clock, 8-inch diameter, $10. You ship UPS. Chester Benson, 732 So. 14th, Richmond, IN 47374.

WANTED: 1980 USA Callbook, Heath ID-1390 Digital thermometer, ICOM IC-255A, Astron RS-35M or Sel SPS-30M. K0MK, 690 Vermilion Trail, Gilbert, MN 55741.

WANTED: Hallicrafters manuals, catalogs, incomplete sets for parts. Gil Barber, P.O.B. 31654, Aurora, CO 80041.

FOR SALE: Kenwood SP700 all mode 2 meter rig, ICOM 215 2 meter rig, Tempo S-1 HT 2 meter 144-148, video tape machine. Send SASE for more info to: P.O. Box 142, Whitehouse, FL 32220.

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SELL MAGAZINES: QST 1961/79, some bound, CQ 69/79, HRH 77/79, FAMILY HANDYMAN 66/79, NATL GEO 69/79. Sold in year lots only. Best offer. K2MFY, 2 Nutley Court, Plainview, N.Y. 11803.

WANTED: Icom RM-2, Astron RS-35, Ten-Tec 252M. SELL: Regency Aircraft scanner $75; Regency 30-50 MHZ. Tuneable FM receiver $35. Hy-Gain V-SSB-CB xcvr $85. K0MK/WA0GGU, 218-865-6541.

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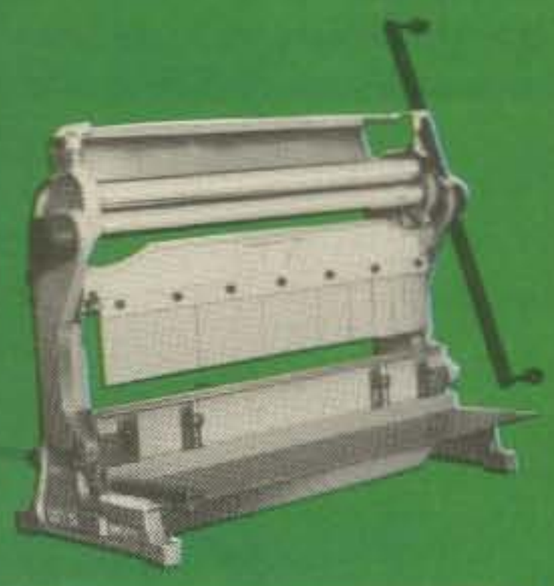

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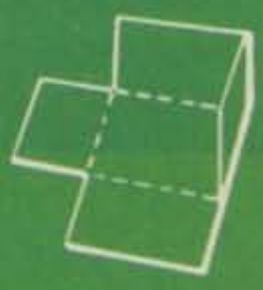

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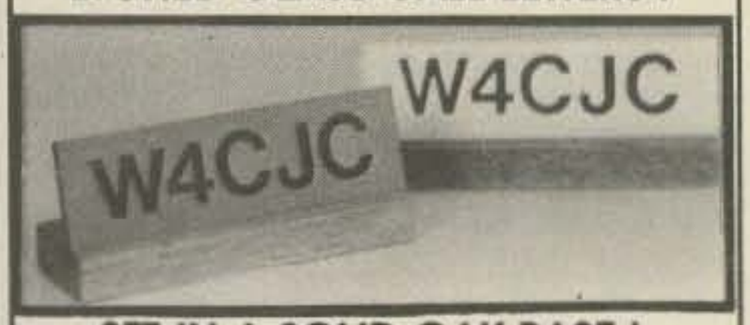

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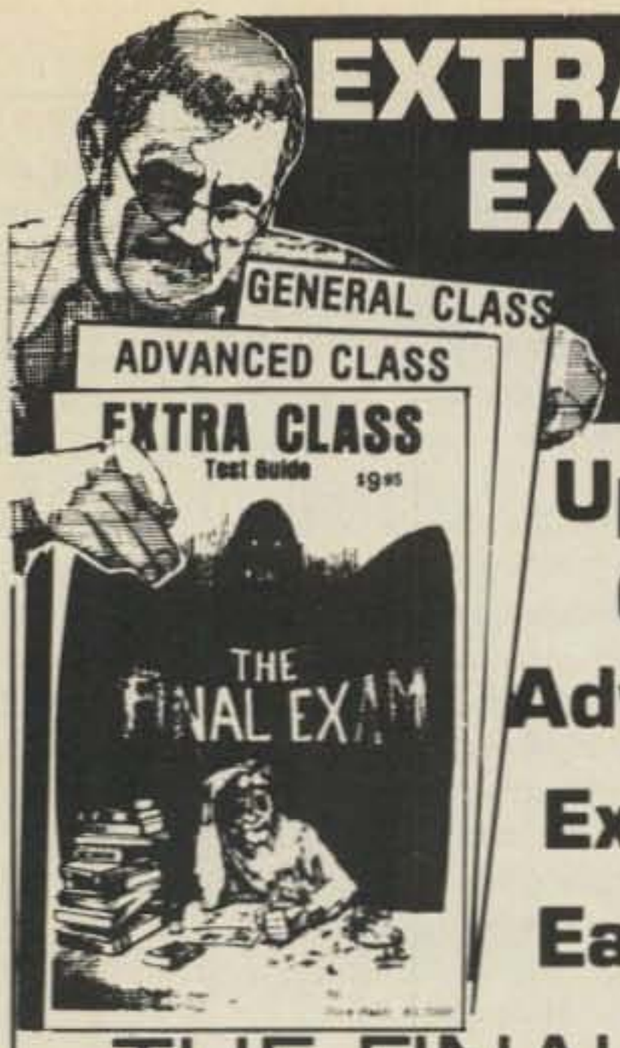

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NEW HAL 2304 MHz Down Converters (freq. range 2000MHz/2500MHz)

2304 model #1 kit	$69.95
2304 model #2 kit (with pre-amp)	$79.95
2304 model #3 kit (with High Gain Pre-Amp)	$89.95

All above models with Coax fittings In & Out and with Weather Proofed Die Cast Housings

Factory Wired & Tested	$50.00 additional
Power supply kit for above	$19.95

FREQUENCY COUNTERS:

COMPLETE KITS: CONSISTING OF EVERY ESSENTIAL PART NEEDED TO MAKE YOUR COUNTER COMPLETE. **HAL-600A** 7-DIGIT COUNTER WITH FREQUENCY RANGE OF ZERO TO 600 MHz. FEATURES TWO INPUTS: ONE FOR LOW FREQUENCY AND ONE FOR HIGH FREQUENCY; AUTOMATIC ZERO SUPPRESSION. TIME BASE IS 1.0 SEC OR .1 SEC GATE WITH OPTIONAL 10 SEC GATE AVAILABLE. ACCURACY ± .001%, UTILIZES 10-MHz CRYSTAL 5 PPM. **COMPLETE KIT** **$129**

HAL-300A 7-DIGIT COUNTER (SIMILAR TO HAL-600A) WITH FREQUENCY RANGE OF ZERO TO 300 MHz. **COMPLETE KIT** **$109**

HAL-50A 8-DIGIT COUNTER WITH FREQUENCY RANGE OF ZERO TO 50 MHz OR BETTER. AUTOMATIC DECIMAL POINT, ZERO SUPPRESSION UPON DEMAND. FEATURES TWO INPUTS: ONE FOR LOW FREQUENCY INPUT, AND ONE ON PANEL FOR USE WITH ANY INTERNALLY MOUNTED HALTRONIX PRE-SCALER FOR WHICH PROVISIONS HAVE ALREADY BEEN MADE. 1.0 SEC AND .1 SEC TIME GATES. ACCURACY ± .001%. UTILIZES 10-MHz CRYSTAL 5 PPM. **COMPLETE KIT** **$109**

HAL/79 Clock Kit **FREE** with every Counter
Plus A **FREE** In-Line RF Probe.

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(Pre-drilled G10 board and all components)

HAL 300 A/PRE **$24.95**
(Same as above with preamp)

HAL 600 PRE **$29.95**
(Pre-drilled G10 board and all components)

HAL 600 A/PRE **$39.95**
(Same as above but with preamp)

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For those who wish to mount the encoder in a hand-held unit, the PC board measures only 9/16" x 1 3/4". This partial kit with PC board, crystal, chip and components.
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ACCUKEYER (KIT) THIS ACCUKEYER IS A REVISED VERSION OF THE VERY POPULAR WB4VVF ACCUKEYER ORIGINALLY DESCRIBED BY JAMES GARRETT, IN QST MAGAZINE AND THE 1975 RADIO AMATEURS HANDBOOK. **$16.95**

ACCUKEYER—MEMORY OPTION KIT THIS ACCUKEYER MEMORY KIT PROVIDES A SIMPLE, LOW COST METHOD OF ADDING MEMORY CAPABILITY TO THE WB4VVF ACCUKEYER. WHILE DESIGNED FOR DIRECT ATTACHMENT TO THE ABOVE ACCUKEYER, IT CAN ALSO BE ATTACHED TO ANY STANDARD ACCUKEYER BOARD WITH LITTLE DIFFICULTY. **$16.95**

ORDER ACCUKEYER KIT AND ACCUKEYER MEMORY OPTION FOR $32.00.

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COMPLETE KIT CONSISTING OF 2 PC G10 PRE-DRILLED PC BOARDS, 1 CLOCK CHIP, 6 FND READOUTS, 13 TRANSISTORS, 3 CAPS, 9 RESISTORS, 5 DIODES, 3 PUSH-BUTTON SWITCHES, POWER TRANSFORMER AND INSTRUCTIONS.
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CLOCK CASE Available and will fit any one of the above clocks. Regular Price . . . $6.50 **But Only $4.50 when bought with clock**

SIX-DIGIT ALARM CLOCK KIT for home, camper, RV, or field-day use. Operates on 12-volt AC or DC, and has its own 60-Hz time base on the board. Complete with all electronic components and two-piece, pre-drilled PC boards. Board size 4" x 3". Complete with speaker and switches. If operated on DC, there is nothing more to buy.*
PRICED AT **$16.95**
Twelve-volt AC line cord for those who wish to operate the clock from 110-volt AC. $2.95
*Fits clock case advertised below.

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CIRCLE 43 ON READER SERVICE COUPON

Advertiser's Index

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What's so new about the 902?

- **WARC Bands Factory Installed!**
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CIRCLE 3 ON READER SERVICE CARD

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