Amateur Radio CQ

SERVING AMATEUR RADIO SINCE 1945

JUNE 1981 $2.00

A Three-Band Ice Cream Hole Vertical Antenna...page 8

1981 CQ WW 160 DX Contest High Claimed Scores...page 21

A Solid State RIT Switch...page 46

THE RADIO AMATEUR'S JOURNAL

"Cents-ational."

IF shift, digital display, narrow-wide filter switch

TS-530S

The TS-530S SSB/CW transceiver is designed with Kenwood's latest, most advanced circuit technology, providing wide dynamic range, high sensitivity, very sharp selectivity with selectable filters and IF shift, built-in digital display, speech processor, and other features for optimum, yet economical, operation on 160 through 10 meters.

TS-530S FEATURES:

- **160-10 meter coverage, including three new bands**
  Transmits and receives (LSB, USB, and CW) on all Amateur frequencies between 1.8 and 29.7 MHz, including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- **Built-in digital display**
  Large, six-digit, fluorescent-tube display shows actual receive and transmit frequencies on all modes. Backed up by analog subdial.
- **IF shift**
  Moves IF passband around received signal and away from interfering signals and sideband splatter.
- **Narrow/wide filter combinations**
  Any one or two of three optional filters . . . YK-88SN (1.8 kHz) SSB, YK-88C (500 Hz) CW, YK-88CN (270 Hz) CW . . . may be installed for selecting (with "N-W" switch) wide and narrow bandwidths on CW and/or SSB.
- **Wide receiver dynamic range**
  Greater immunity to strong-signal overload, with MOSFET RF amplifier operating at low level for improved IMD characteristics, junction FETs in balanced mixer with low noise figure, and dual resonator for each band.
- **Built-in speech processor**
  Combines an audio compression amplifier with change of ALC time constant for extra audio punch and increased average SSB output power, with suppressed sideband splatter.
- **Two 6146B's in final**
  Runs 220 W PEP/180 W DC input on all bands.
- **Advanced single-conversion PLL system**
  Improved overall stability and improved transmit and receive spurious characteristics.
- **Adjustable noise-blanker level**
  Pulse-type (such as ignition) noise is eliminated by built-in noise blanker, with front-panel threshold level control.
- **RF attenuator**
  The 20-dB RF attenuator may be switched in for rejecting IMD from extremely strong signals.
- **Optional VFOs for flexibility**
  VFO-240 allows split-frequency operation and other applications. VFO-230 digital VFO operates in 20-Hz steps and includes five memories and a digital display.
- **RIT/XIT**
  Front-panel RIT (receiver incremental tuning) shifts only the receiver frequency, for tuning in stations slightly off frequency. XIT (transmitter incremental tuning) shifts only the transmitter frequency, for calling a DX station listening off frequency.

More information on the TS-530S is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

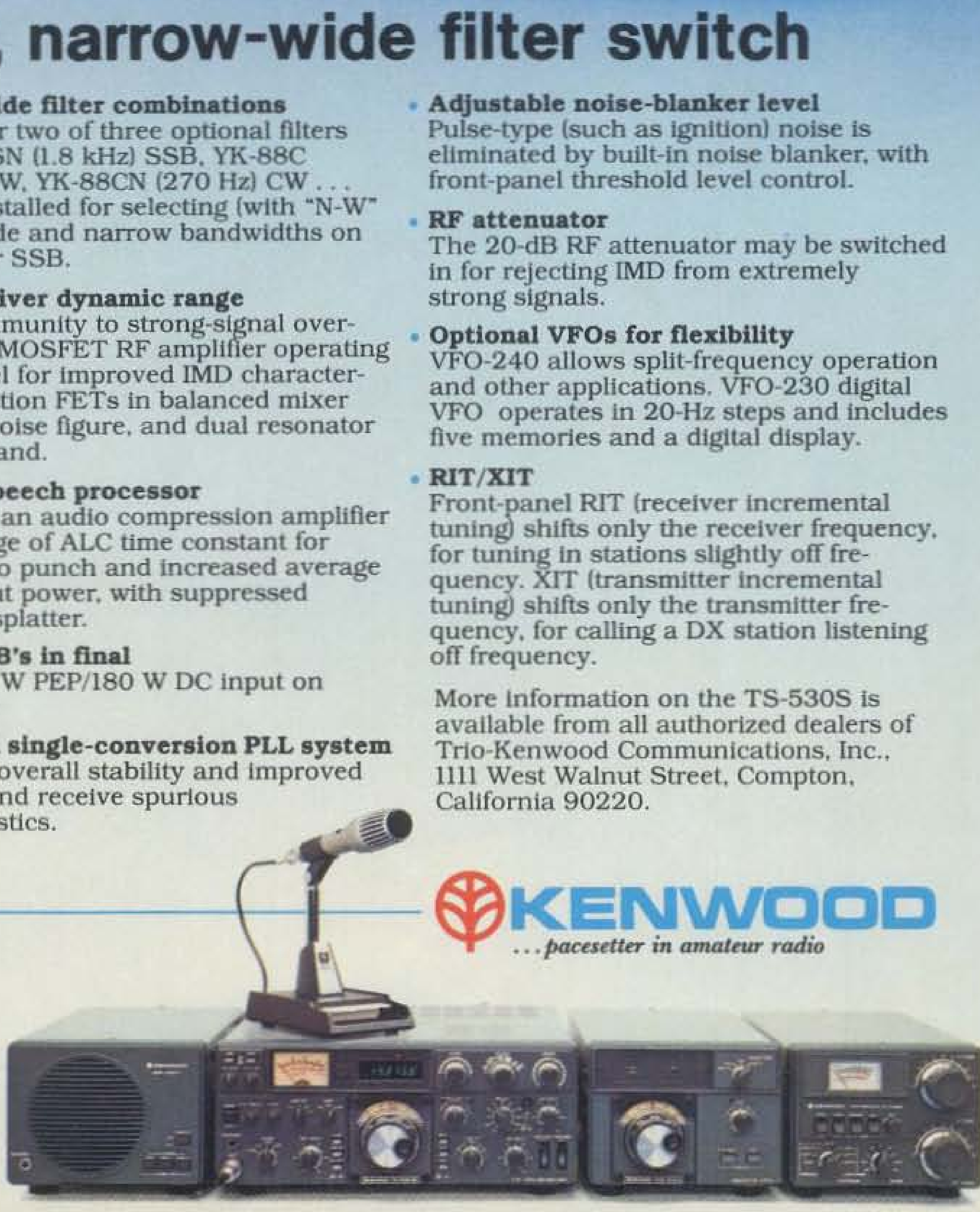
KENWOOD
. . . pacesetter in amateur radio

Matching accessories for fixed-station operation:

- SP-230 external speaker with selectable audio filters
- VFO-240 remote VFO
- AT-230 antenna tuner/ SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- VFO-230 remote digital VFO with 20-Hz steps, five memories, digital display
- TL-922A linear amplifier
- SM-220 Station Monitor
- KB-1 deluxe VFO knob
- PC-1 phone patch
- HS-5 and HS-4 headphones
- HC-10 digital world clock
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters and YK-88SN (1.8 kHz) SSB narrow filter
- MC-30S and MC-35S noise-canceling hand microphones



Specifications and prices are subject to change without notice or obligation.

Power up.

40 W, 15 memories/offset recall, scan, priority, DTMF touch-pad

TR-7850

Kenwood's remarkable TR-7850 2-meter FM mobile transceiver provides all the features you could desire, including a powerful 40 watts RF output. Frequency selection is easier than ever, and the rig incorporates new memory developments for repeater shift, priority, and scan, and includes a built-in autopatch touch-pad (DTMF) encoder. A 25-watt output version, the TR-7800, is also available.

TR-7850 FEATURES:

- **Powerful 40 watts power output**
  Selectable high or low power operation. High 40-watt output provides reliable signal for wide area coverage.
- **15 multifunction memory channels, easily selectable with a rotary control**
  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 operation.
- **Internal battery backup for all memories**
  All memory channels (including transmit offset) are retained when four AA NiCd batteries (not Kenwood supplied) are installed in battery holder inside TR-7850. Batteries are automatically charged while transceiver is connected to 12-VDC source.
- **Extended frequency coverage**
  143.900-148.995 MHz, in switchable 5-kHz or 10-kHz steps.
- **Priority alert**
  M0 memory is priority channel. "Beep" alerts operator when signal appears on priority channel. Operation can be switched immediately to priority channel with the push of a switch.
- **Built-in autopatch touch-pad (DTMF) encoder**
  Front-panel touch pad generates all 12 telephone-compatible dual tones in transmit mode, plus four additional DTMF signaling tones (with simultaneous push of REV switch).
- **Front-panel keyboard**
  For frequency selection, transmit offset selection, memory programming, scan control, and selection of autopatch encoder tones.
- **Autoscan**
  Entire band (5-kHz or 10-kHz steps) and memories. Automatically locks on busy channel; scan resumes automatically after several seconds, unless CLEAR or mic PTT button is pressed to cancel scan.
- **Up/down manual scan**
  Entire band (5-kHz or 10-kHz steps) and memories, with UP/DOWN microphone (standard).
- **Repeater reverse switch**
  Handy for checking signals on the input of a repeater or for determining if a repeater is "upside down."
- **Separate digital readouts**
  To display frequency (both receive and transmit) and memory channel.
- **LED bar meter**
  For monitoring received signal level and RF output.
- **LED indicators**
  To show: +600 kHz, simplex, or -600 kHz transmitter offset; BUSY channel; ON AIR.
- **TONE switch**
  To actuate subaudible tone module (not Kenwood-supplied).
- **Compact size**
  Depth is reduced substantially.
- **Mobile mounting bracket**
  With quick-release levers.

More information on the TR-7850 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

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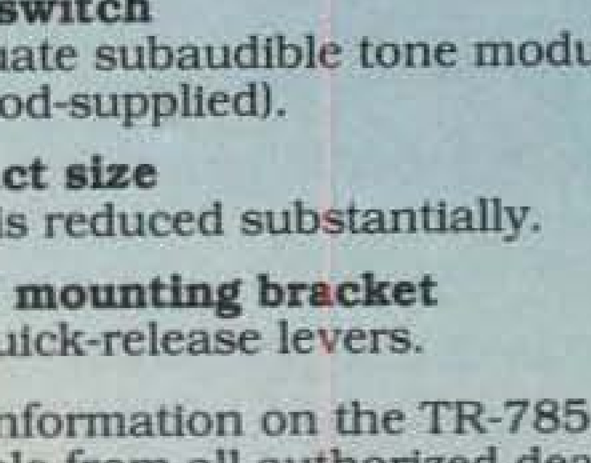
...pacesetter in amateur radio

Matching accessory for fixed-station operation:
- KPS-12 fixed-station power supply for TR-7850

Other accessories not shown:
- KPS-7 fixed-station power supply for TR-7800
- SP-40 compact mobile speaker



TR-7850 is subject to FCC approval.

Specifications and prices are subject to change without notice or obligation.

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160 W OUTPUT
SSB, FM, CW.

Freq. range: 144-148MHz • RF out:160W nom. (10W in). • RF power in: 5-15W • DC operating pwr: 13.8VDC @ 20-25A • Intermittent duty cycle • Built-in receiver pre-amp. Automatic internal or external relay keying.

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Allow six weeks for change of address. Printed in the United States of America.
Postmaster: Please send change of address to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

CQ The Radio Amateur's Journal

ON THE COVER: Our cover shot by Debbie Bone shows KQ4X inspecting the Ice Cream Hole Vertical and his handiwork.

JUNE 1981 **VOL. 37, NO. 6**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

This part is written from some random notes jotted down on the plane coming back from the Orlando Convention in March. It was an unbelievable scene on Saturday morning as the people lined up waiting to get into the exhibit area at the Twin-Towers hotel. In order to get that far, one had to get through the giant indoor fleamarket area, cross a small lobby, and enter the exhibit hall. It was wall to wall people. By 9:00 a.m. the closest parking to the hotel was about one-half mile away.

At 9:00, when the exhibit area officially opened, a sea of hams flooded in and they kept coming all day long. The aisles were a bit narrow and traffic jams ensued but it was a frenetic pace all day long. We usually bring over a two-day supply of *CQ*'s for each show. All but three or four copies were gone by 3:00 that afternoon. It was like a mini-Dayton with hams looking to have fun and spend some money. There was a lot to see and a lot to buy if you were in the mood, and even the fleamarket held innumerable treasures waiting to be taken home.

Sunday was a lighter day with everyone trying to recover from Saturday. I did manage to get a 16 switch touch tone pad that I was looking for from Hal-Tronix, though, and that capped the weekend. It was one of the most hectic hamfest weekends I've spent in a long time.

Of course I only had a few days to recuperate before the intrepid *CQ* staff was off again on the hamfest trail down to Charlotte. One very positive benefit of these two events was that they took us out of the chilly north to the sunny south.

I'm adding this part after coming back from Charlotte, and I can tell you first hand that the last paragraph is in error. Charlotte was not the sunny south that I expected. The weather there was the very same weather we had in New York, and Sunday was considerably worse.

The weather, however, didn't daunt the crowds who came to see, hear, and take part in their favorite pastime—amateur radio. The fleamarket was good with some terrific bargains alongside the usual albatrosses. The exhibit area was adjacent to the fleamarket and people wandered back and forth all weekend. The distributors seemed to be sharing a brisk business as hams trekked off with lots of new equipment. There did seem to be more people there on Sunday than on Saturday, which is unusual, and there was that rush of last-minute buying as the show closed down.

One side benefit to traveling is the chance to say hi to some of the *CQ* staffers who reside all over the country. During the last few weekends I ran across Karl Thurber, W8FX, Leo Haijsman, W4KA, Billy Williams, N4UF, John Attaway, K4IIF, and a few DX Committeemen, including John Kanode, N4MM. The only problem, however, is that the amount of time at shows is too limited to really spend a lot of time with individual people.

Since Charlotte, I did manage to get a few days of work in at the office this week, but I'll be leaving in a few days for Washington D.C. for a meeting of the Amateur Radio Services Subcommittee at the FCC. It will be a good chance to scout the hallowed halls for future interviews. The response to our FCC interviews has been very positive even by the amateurs who apparently disagree with some of the comments. I think that by taking some of the mystery out of this august body, bringing it down to a level where we can relate to the people and problems involved with amateur radio, we all stand a better chance of making the system work for us. It's up to all of us as individuals to get involved in the process. The age of amateurs being petulant or adamant over issues has passed. This was graphically proven during the last administration and from all accounts will be even more true with the present administration.

The following snippet is being added after the Washington meeting. The Subcommittee is primarily charged with advising the FCC in matters relating to emergency broadcasting and effecting plans to be used in times of disaster, whereby amateurs can supply a vital link in providing communications when and where needed to help save lives and property.

This last point, which concerned itself with providing emergency communications to help save lives and property, has traditionally been the amateur's role and how we've seen ourselves. That proviso, in fact, is spelled out in Section 97.1 of the Rules and Regulations as a fundamental purpose of amateur radio. The new "plain language" rules, however, leave this aspect out of our service whether by design or simply by oversight. This fundamental purpose is an important keystone of our very being and sets us distinctly apart from other personal radio services. The original description of 97.1 must be preserved intact. It is clear and "plain language" as it stands and is one of the best descriptions of amateur radio to date.

The Subcommittee will be presenting an appropriate comment on the proposed plain language rules. I urge those of you who care about our future to write to the FCC (Docket # Private Radio 80-729) and ask that 97.1 be retained in full. The old 97.1 and the proposed new 97.1 are reproduced below. There is a very distinct difference in how we are defined, our purpose, and the apparent seriousness or value we have or might have in the eyes of the government.

SUBPART A—GENERAL

§ 97.1 Basis and purpose.

The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

(e) Continuation and extension of the amateur's unique ability to enhance international good will.

PROPOSED RULE

§ 97.1 (AR Rule 1) What is the Amateur Radio (AR) Service?

The AR Service is for persons interested in the technical side of radio communications. They use the service only for their own personal satisfaction and get no financial benefit from its use. They learn about radio, communicate with other operators around the world, and find better ways to communicate by radio.

In my spare time in between putting out *CQ* each month, traveling to ham-

(continued on page 6)

fests, and visiting manufacturers, I've been putting in some time at the workbench on a Heathkit VF-7401. This is an updated digital scanning version of their HW-2036 which I built several years ago. Like its predecessor, the VF-7401 is an ambitious project in time alone. It's a great project, and if you don't go at it with a passion (where you're bound to make mistakes), it can be a very relaxing, enjoyable experience.

If you're at all like me, the onset of warmer weather or even the promise of warmer weather brings out the urge to put up another antenna, improve the old one, or just start over from scratch. For a lot of us the weather is still on the cold side, but the signs of spring are here, and the promise of warm weather is just ahead. The influx of antenna articles that I receive is sharply up from the warmer states already, so I know that this year's season has started. It's going to be a great year.

73, Alan, K2EEK

Announcing

• K8UZW to Operate from the U.S.S. Cod -Members of the Parma Radio Club will be operating from the WW II submarine the U.S.S. Cod using the club call K8UZW. The sub is on permanent display in Cleveland, Ohio. Operations will start on May 30th and run through September 6th every weekend except Field Day weekend. A certificate will be awarded for 2-way contacts from the ship upon receipt of a QSL card and 30¢ postage. All bands 10 to 80 meters will be operated. QSL's should be sent to Don Winner, WD8RZG, 8927 Torrance Ave., Brooklyn, OH 44144.

• Western Michigan University Calls for Papers - The 27th Annual Amateur VHF Conference will be held on Saturday, October 17 from 2:00 to 5:00 pm at Western Michigan University, Kalamazoo, MI. Papers are invited for the conference, and principal emphasis will be on engineering developments applied to radio communication, design, and construction on the 30 to 1200 MHz frequencies. Included in the topics being solicited are antennas, propagation, Novice and beginner topics, receiving, RTTY, satellites, transceiving, and much more. Authors wishing to present papers should send a synopsis (one or two pages with diagrams) to Dr. Glade Wilcox, W9UHF/8, Program Chairman, VHF Conference, Department of Electrical Engineering, Western Michigan University, Kalamazoo, MI 49008. Deadline for submission of synopses is June 30, 1981. Final drafts may be given to the chairman the day of the conference.

• Olympia ARC Aboard the U.S.S. Olympia - The first amateur radio station aboard the U.S.S. Olympia will operate from the sub on May 30-31 from 1300Z Saturday to 2000Z Sunday. Frequencies: CW—3590, 7050, 14050, 21090, 28150 kHz, ±10 kHz; SSB—3890, 7235, 14285, 21360, 28600 kHz, ±10 kHz. A special certificate will be issued (U.S. stations send 25¢, foreign 1 IRC). For more information, contact Cruiser Olympia Assoc., c/o Olympia ARC, P.O. Box 928, Philadelphia, PA 19105 (include an s.a.s.e.).

• Submarine Memorial Day - On June 13, Submarine Memorial Day, the Mancorad Amateur Radio Club, Station W9DK, will be on the air from 0900-1600 GMT, bottom of all general bands, 10-80 meters, calling directly from the submarine Cobia. A special commemorative QSL will be sent upon receipt of an s.a.s.e. Send to W9DK, c/o Red Cross, 1816 Washington St., Manitowoc, WI 54220.

• Nebraskaland Days - In honor of Buffalo Bill and Nebraskaland Days, the North Platte Amateur Radio Club will operate a special station, WØCXH, from 1800 to 0000Z on June 13-14. Frequencies used will be: SSB—21.400, 14.290, 7.250 MHz; CW—21.250, plus or minus QRM. A certificate will be available. Send s.a.s.e. to North Platte ARC, P.O. Box 994, North Platte, NE 69101.

May 30-31, **Tri-City Hamfest and Computer Fair.** Contact Tri-City Hamfest, Inc., P.O. Box 533, Richland, WA 99352.

May 31, **Muncie Area ARC Hamfest.** Contact MAARC, P.O. Box 3111, Muncie, IN 47302.

June 7, **Rome Radio Club Ham Family Days.** Contact Pat Daily, KA2DAI, Rome Radio Club, P.O. Box 721, Rome, NY 13440.

June 7, **Manassas Hamfest.** Contact The Ole Virginia Hams ARC, P.O. Box 1255, Manassas, VA 22110.

June 7, **Chelsea Swap and Shop.** Contact William Altenberndt, 3132 Timberline, Jackson, MI 49201.

June 14, **Egyptian Radio Club, W9AIU, Hamfest.** Contact Gordon A. Nelson, 4 Covey Court, Florissant, MO 63031.

June 14, **Monroe County Radio Communications Hamfest.** Contact Fred Lux, WD8ITZ, P.O. Box 982, Monroe, MI 48161.

June 14, **Clinton County and Highland County Radio Clubs' Hamfest and Flea Market.** Contact Bob Lewis, KE8E, 192 Northview Rd., Blanchester, OH 45107.

June 20, **Yankee Hamfest '81.** Contact Edward M. Fahey, Jr., W1OKS, 19 Farwell St., Lewiston, ME 04240.

June 20, **Raritan Valley Radio Club, W2QW, Hamfest and Flea Market.** Contact KB2EF at 201-369-7038, 9-4 pm.

June 20-21, **Eastern Montana Hamfest.** Contact Ron Martini, N7BMR, Box 449, Sidney, Montana 59270.

June 21, **Lake County ARC Hamfest.** Contact Mike Evanson, KA9COM, 8037 Monaodi Drive, Munster, IN 46321.

June 21, **Frederick, Maryland Hamfest.** Contact Rick, N3RO, 9425 Glade Ave., Walkersville, MD 21793.

3 recent additions to the DRAKE family

Model 1554
Drake L75
160-15* Meters

1.2kW Linear Amplifier

1.2kW PEP, ssb continuous, 1kW cw 50% duty cycle.

160-15* meter amateur band coverage, plus expanded ranges for any future hf band expansions or additions within FCC rules. These ranges also include increased coverage for MARS, embassy, government, or other such services.

The Drake L75 utilizes an Eimac 3-500 Z triode for rugged use, and lower replacement cost compared to equivalent ceramic types.

Built-in relative power reading for output indication.

Temperature controlled two speed fan is a high volume low noise type and offers optimum cooling.

Adjustable exciter agc feedback circuitry permits drive power to be automatically controlled at proper levels to prevent peak clipping and cw overdrive. Front panel control.

By-pass switching is included for straight through, low power operation without having to turn off amplifier.

Bandpass tuned input circuitry for low distortion and 50 ohm input impedance.

Built-in power supply.

Operates from 120/240 V-ac, 50/60 Hz primary line voltage.

Drake L75 Specifications:

• **Frequency Coverage*:** Ham bands 160 through 15 meters*. Non-amateur frequencies between 6.5 and 21.5 MHz may be covered with some modification of the input circuit. • **Plate Power Input:** 1200 watts PEP on ssb and a-m. 1000 watts dc on cw. • **Drive Power Requirements:** 60 watts PEP on ssb and 50 watts on cw, a-m, RTTY, and SSTV. • **Input Impedance:** 50 ohms. (Bandpass tuned input) • **Output Impedance:** Adjustable pi-network matches 50 ohm line with SWR not to exceed 2:1. • **Intermodulation Distortion Products:** In excess of −33 dB. • **Power Requirements:** 240 volts 50-60 hertz 10 amperes, or 120 volts 50-60 hertz 20 amperes. • **Tube Complement:** One 3-500Z. • **Dimensions: Amplifier** 13.69"W x 6.75"H x 14.25"D (34.8 x 17.1 x 36.2 cm). • **Weight:** Amplifier 42.2 lbs (19.2 kg), Power Supply 42.5 lbs (19.3 kg).

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

Model 1540

Drake MN75 Matching Network

- **Frequency Coverage:** 1.8 - 30 MHz
- **Antenna Choice:** Matches antennas fed with coax, balanced line, or random wire. (For balanced line use optional B-1000 Balun.)
- **Antenna/By-Pass Switching:** Allows matching unit by-pass regardless of antenna in use, and selects various antennas.
- **Extra Harmonic Reduction:** Employs "pi-network" low pass filter type circuitry for maximum harmonic rejection.
- **Built-in Metering:** Accurate Rf Wattmeter and VSWR Reading, pushbutton controlled from front panel.
- **Input Impedance:** 50 ohms (resistive).
- **Power Capability:** 200 watts average continuous duty (0-300 W scale).
- **Dimensions:** 13.1"W x 4.53"H x 8.5"D excluding knobs and connectors (33.26 x 11.5 x 21.6 cm).
- **Weight:** 8 lbs (3.6 kg).

Drake MN75 Specifications:

• **Frequency Coverage:** 1.8 to 30 MHz. • **Input Impedance:** 50 ohms (resistive). • **Load Impedance:** 50 ohm coaxial with VSWR of 5:1 or less at any phase angle to 23 MHz, 4:1 at 23 to 26 MHz, 3:1 at 26 to 30 MHz. 75 ohm coaxial at a lower VSWR can be used. • **Balanced Feedlines:** With the Drake B-1000 accessory balun, which mounts on rear panel, tunes feed point impedances of 40 to 1000 ohms, or 5:1 VSWR referenced to 200 ohms (3:1 on 10 meters). • **Long-Wire Antennas:** Feed point impedances up to 5:1 VSWR referenced to 50 ohms. Also, 5:1 referenced to 200 ohms with the Drake B-1000 accessory balun (3:1 on 10 meters) • **Meter:** Reads VSWR or forward power. • **Wattmeter Accuracy:** ±5% of reading ±1% of full scale. • **Front Panel Controls:** Provide for the adjustment of resistive and reactive tuning, antenna switching, range switching, VSWR calibration, and selection of watts or VSWR calibration, and selection of watts or VSWR functions of the meter. • **Rear Panel Connectors:** The rear panel has four type SO-239 connectors (one for input and 3 for outputs), three screw terminal connections (for long-wire and open-wire feeder systems), and a ground post.

Model 1507 CW75 Keyer

• Iambic keying. • Built-in side tone. • Optically coupled keyline for grid block or direct keying. • Speed and volume control. • Self completing dots and dashes. • Operates from external 7-14 volt supply or 9 volt battery (internal optional). • 5-50 WPM. • Squeeze keyer, semi-automatic "bug" or straight key operation • **Size:** 6.25"W x 2.25"H x 7.0"D (15.9 x 5.4 x 17.3 cm). • **Weight:** 1.4 lbs (.63 kg).

Specifications, availability and prices subject to change without notice or obligation.

R. L. DRAKE COMPANY DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA
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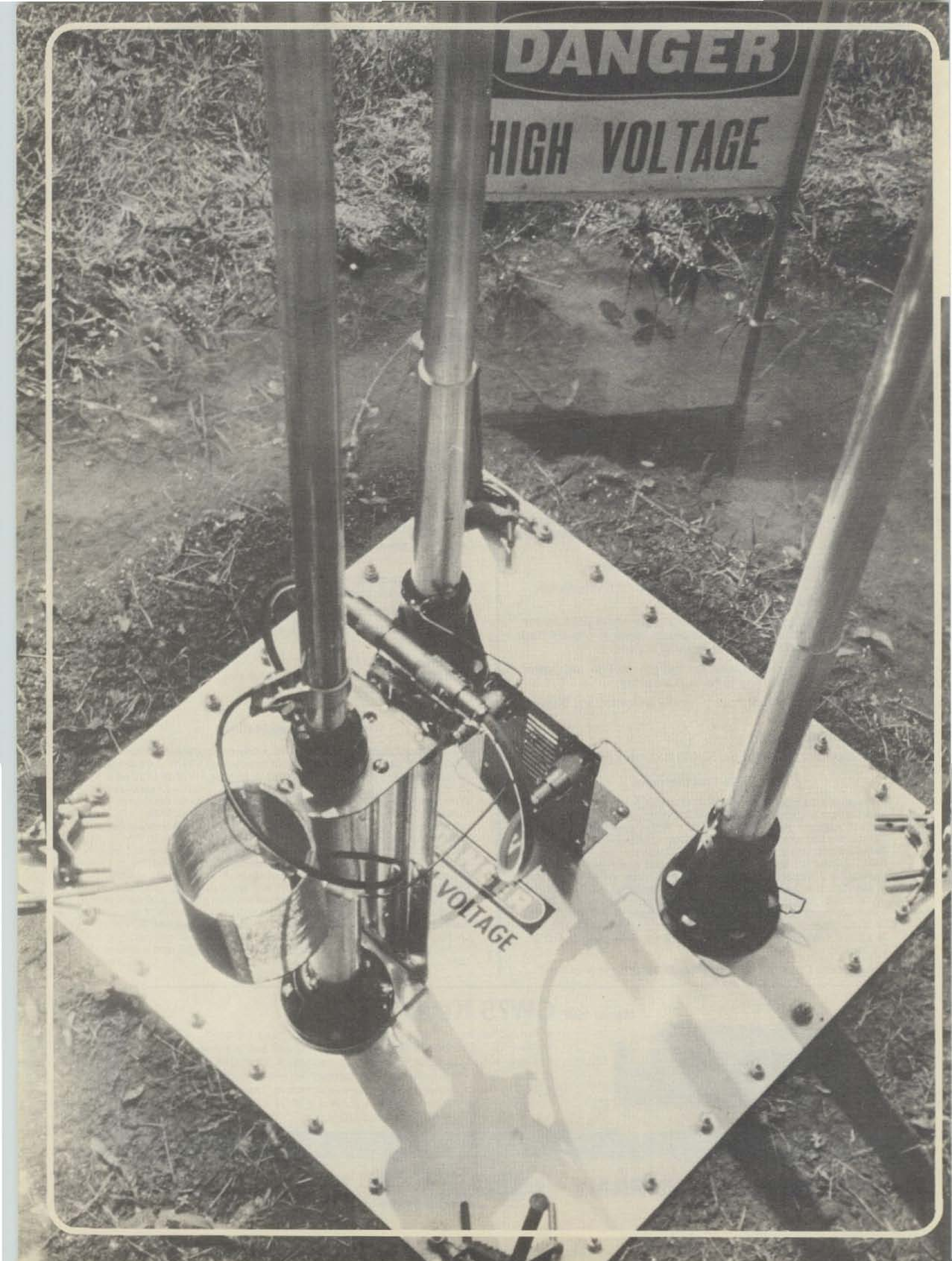

DANGER
HIGH VOLTAGE
VOLTAGE

With a little ingenuity and dazzling footwork, KQ4X managed to put theory into practice, save some money, confuse the local populace and build a three-band vertical antenna.

A Three-Band Ice Cream Hole Vertical Antenna

BY WARREN L. BONE*, KQ4X

In honor of Dayton and the hundreds of other amateur radio fleamarkets during the year, we present the results of one man's heroic achievements. To my knowledge, Warren is the first man to actually make use of items bought at a flea market. He single-handedly made use of an "it would be nice to have for someday" item and turned a fantasy into reality. We salute you, KQ4X, as a man to be reckoned with.
—K2EEK

It all started at a hamfest. Stopping at one table, I cautiously put my left hand into a box of old hardware and stirred through the contents stopping to withdraw an odd-looking coax connector.

"What do you use these things for?" I asked. The connector was a "T" shaped one—had one male side and two females for the familiar PL259 connection. (For the purist, it is an M-358 "T" adapter.)

"Well, you could screw several of them together and make a network looking thing. Kinda looks like plumbing, doesn't it?" he was explaining as he joined two or three together.

"That's real good," I joked, "but what can they be used for, transmitting on two or three antennas at once from one feedline?

He admitted that he really didn't know any practical use for it; said there must be something or they wouldn't have made them.

Looking down at the base you can see the four ground rods used to stabilize and mount the base plate. The "ice cream" moat surrounds the plate.

*721 Brownlee Dr., Nashville, TN 37205.

"See you later," I said, and walked on to the other tables.

Moments later I was looking over a vertical antenna which another ham had for sale. It was a Hy-Gain 18V coil-loaded type for 80-10 meters. I kept thinking to myself, "You know, I've always been curious about using a vertical—to put one out after using those dipoles for so many years. But then everyone says they don't work very well unless you put down all those radials. Well, maybe they work okay for DX, if you have a lot of radials buried or mount it on the roof. It's really a lot of trouble."

But the vertical looked so new and my curiosity got the best of me, so I grabbed it, paid the guy, and left. (I knew I wouldn't win the main prize given away at the hamfest anyway!)

Leaving the hamfest behind, my "new" vertical in the car with me, I thought, "Why would anyone *sell* a vertical antenna if it worked? Maybe he just likes wires."

Trying To Get By The Easy Way

My vertical remained on the floor in my radio room while I sat there and stared at it for an eternity trying to figure out what to do with it. Climb up on the roof and move the coil tap every time I want to change bands? No way! It was a matter of deduction; I was going to ground mount it.

I began planning. Maybe it would "see" a good ground if I mounted it to my chain link fence behind the house! Yeah! . . . Noooo! I did just that. It was a fast mount but the antenna didn't know if the fence (4-foot-high model) was a ground plane for 2000 meters or was supposed to be a short run to earth ground! Bad s.w.r. readings all the way around.

I *thought* it would probably come down to this. I'd have to ground mount it on a pipe and put out four million radials! "Well, let's just do it and do it right," I thought.

The Plan Snowballs

I've driven 4-foot ground rods into the ground before, and I know how difficult it is to finish up with one being straight up and down—plumb, they call it. So how was I ever going to get a big pipe driven in, and especially straight? I could see my 17-foot vertical leaning over at a 45 degree angle because the pipe wouldn't go in straight!

Another deduction—no pipes. But how, then, would I mount thing thing? A metal plate would be nice—one big enough to be able to bolt the base of the vertical to it, and one that could be set on *ground level*. I could make a few holes, at the corners of the plate, and use a few ground rods to hold it in place . . . through the holes!

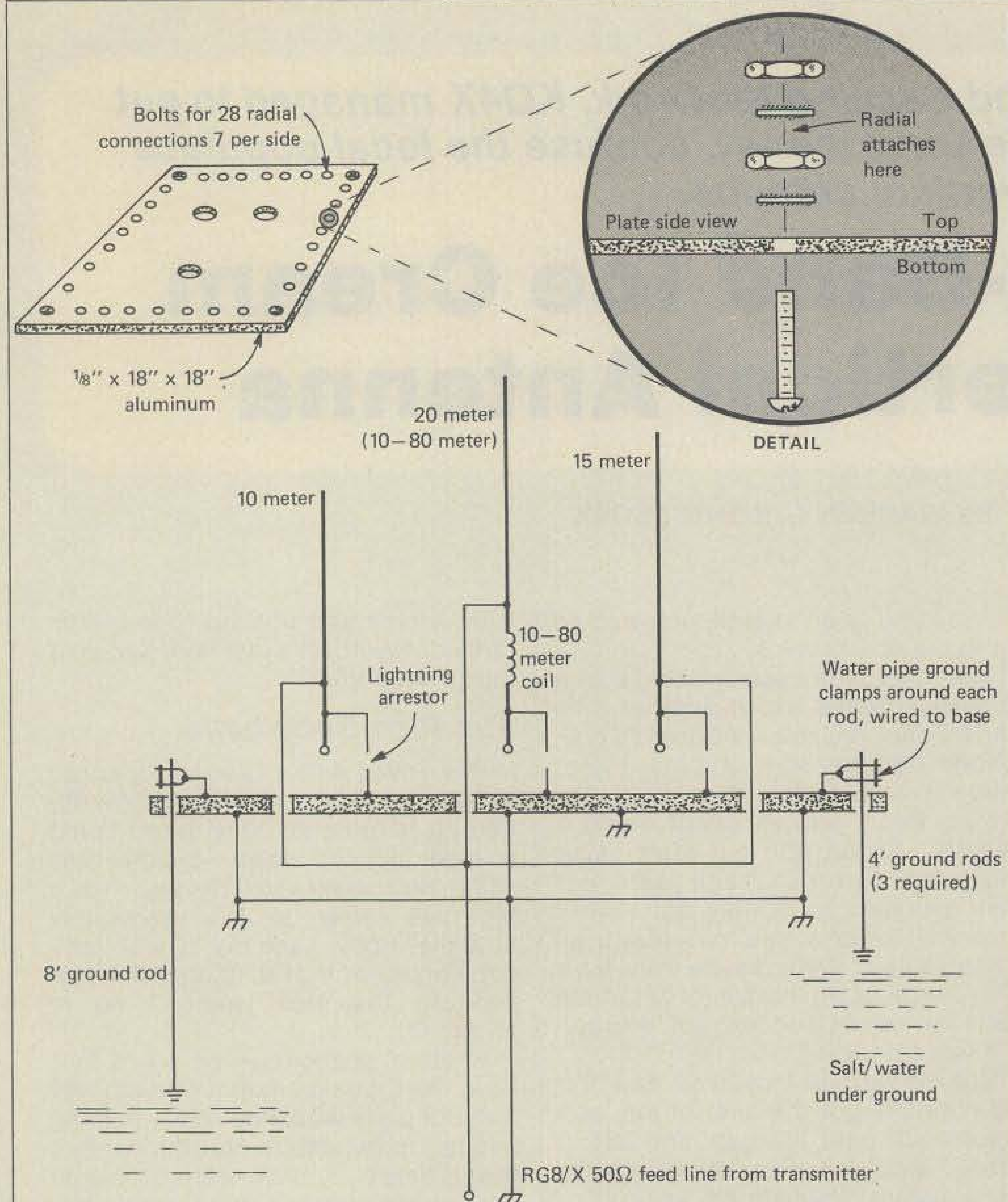
Wait a minute! *What* level ground? *My* ground wasn't level! And I wasn't going to install it in someone else's yard! "I'll work that out later," I thought, "but first I'll get my base and parts."

Why Have A One Element Vertical, When Three Will Do?

A few phone calls to "yellow-pages metal sellers" located an aluminum distributor who would let me browse through his scrap boxes and would sell me all I wanted for $1.00 a pound, minimum $10.00. I could afford that, so I found a gold mine—aluminum mine—an 18-inch-square piece of 1/8-inch aluminum! Perfect! I selected two more smaller pieces to get my money's worth at the 10 pound mark.

Now, I had the base for my antenna, and it was plenty big—in fact, big enough to mount *several* verticals on it.

Wow! I could use the two driven element pieces from that old yagi beam a



NOTE:
No parts list is being provided as it must be determined by the type of antenna bases being used. I used 1/4" x 1 1/4" bolts and 3/16" x 1 1/4" bolts. Some 3/16" x 3/4" with appropriate lock washers and nuts.

Fig. 1- The three-band ice cream hole vertical antenna configuration.

guy gave me a few years ago and match the insulated support ends with all the other tubing to come up with one element for 10 meters and one for 15 meters! (The traps were bad, and the pile of tubing was in my garage waiting to come to life again anyway.)

I quickly moved all the old aluminum tubing out to the backyard (to the curious amazement of my wife and neighbors) in the dark clangin' and bangin'! With flashlight in hand, I measured and matched pieces to make sure I would have enough tubing to get a 10 meter and a 15 meter element configuration. It was back to the garage with the proper tubing and on to the workbench.

The Calculations

Now it was time to make a perfect triangle with each point 10 inches apart, one to represent the center point for each of the three verticals. Think that wasn't fun for a non-mathematician! It was more of an exercise as the dimensions are not critical.

Somehow I came up with the triangle, cut it out on a piece of paper, and then found the center of the triangle and of the base plate (by connecting lines from corner to corner, where they cross is the center). I centered the triangle center point on the square plate center point and marked the plate at each triangle point. This is where the verticals would stand. (Yeah! About 1987 if I was lucky!)

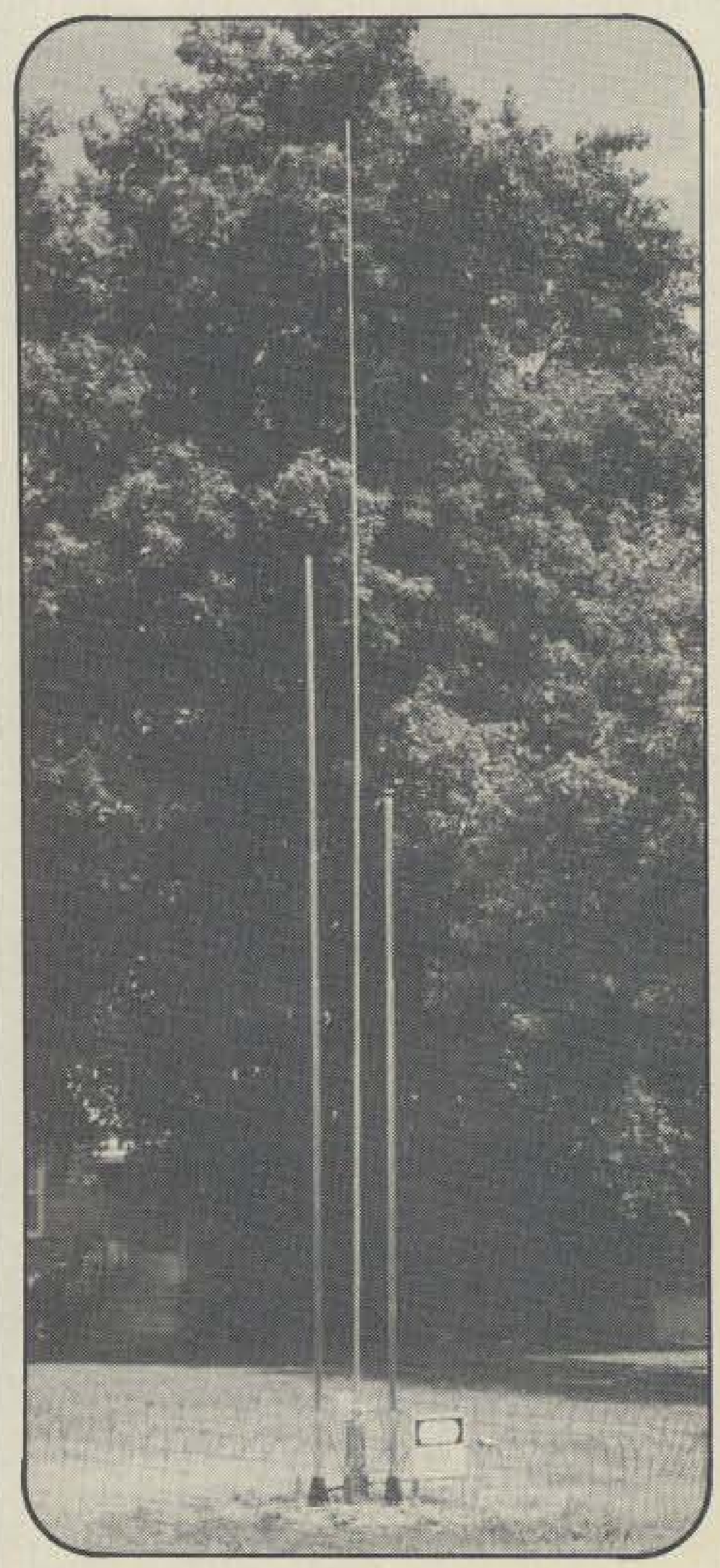
I also needed to plan for bolts and nuts along the edge of the plate for the radial connections to be installed later (room for 32 connections). I marked and punched and drilled for about 8 years and finally had my base plate ready to accept all the vertical element bases. Now all I had to do was figure out how many bolts and nuts and washers I needed and go buy them. Done—easy.

Ready to bolt it all up? No . . . what if I bolted everything on the base and then had trouble getting the base plate leveled on the ground while trying to get those crooked, left-handed ground rods through the holes in the plate? (It would be hard to maneuver three verticals on an 18-inch plate!)

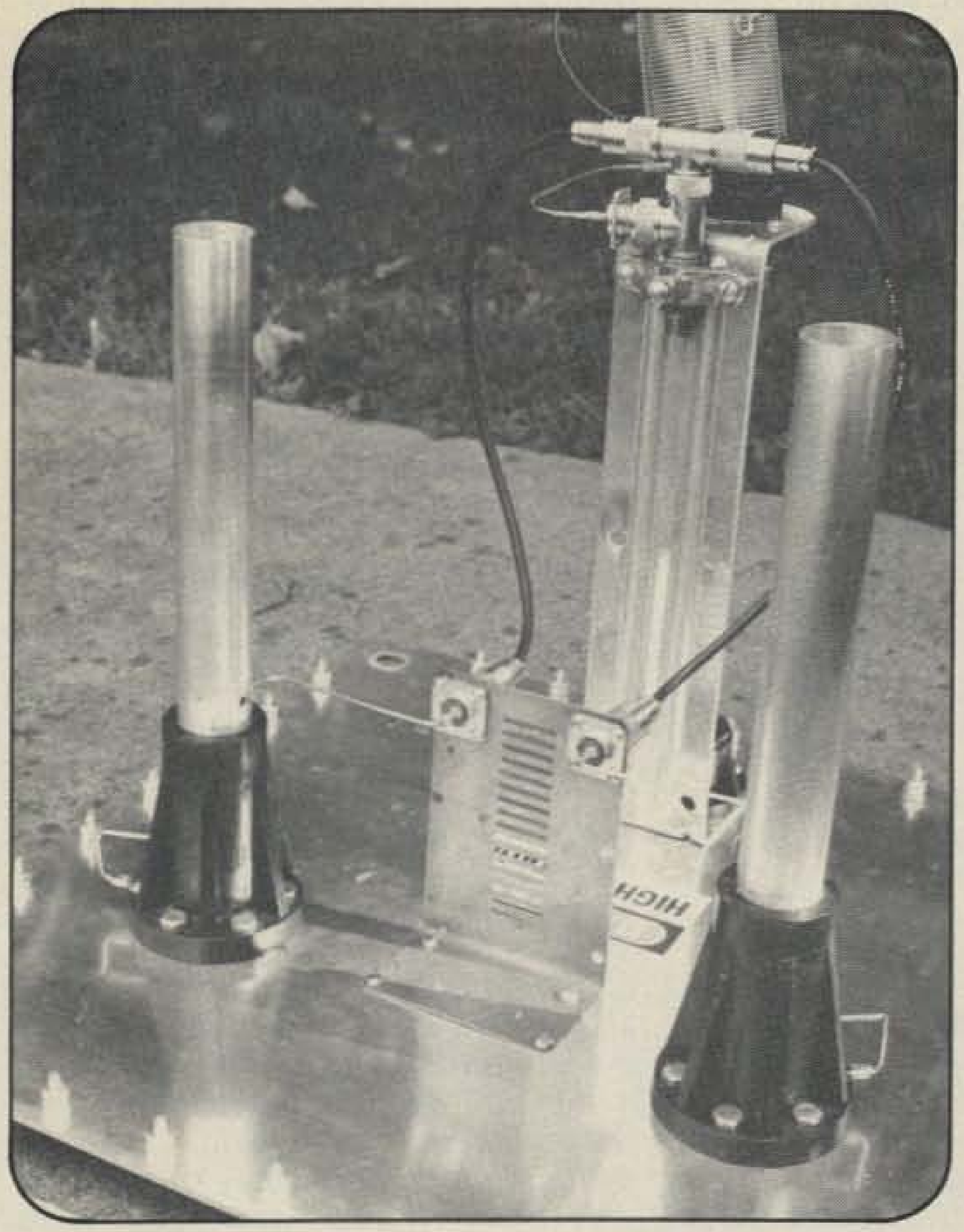
The Backyard Ice-Cream-Hole

The ground!! I forgot about the unlevel ground! I had to stop working on antennas for a while and go into the earthmoving business!

Still determined (and still not believing that verticals were a lot of trouble), I dug up a big bush in the center of my backyard (It was right where the antennas needed to be and was probably going to die someday anyhow!), and then proceeded to prepare a level ground base for the antennas. Since I had a pretty good hole dug now—about 4 feet wide, one and a half feet deep—I shoveled the dirt back in, but only into the center of the hole, just room enough to place the plate on top,

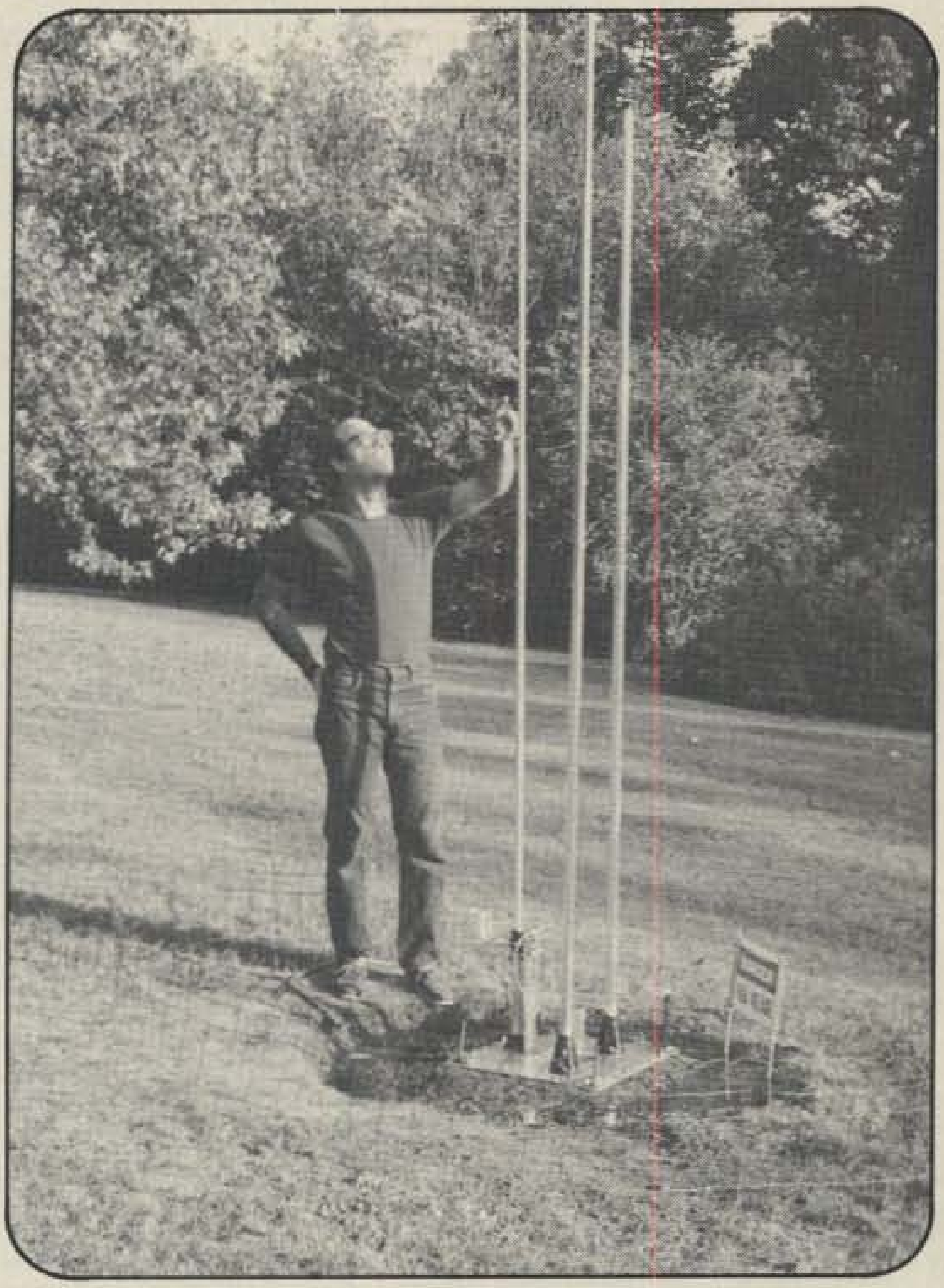


The three-band vertical stands tall like a piece of modern sculpture.



The simple base configuration for the antennas along with the infamous "T" connectors which started it all.

A man justifiably proud of his work points with pride.



The author, keeping one hand in his pocket for safety (better safe than sorry), makes some last minute adjustments.

tamping the dirt with a concrete block, and leveling it with a leveler every few inches.

Now I had a little trench around the base—a moat. I thought, "I'll put some rock salt in the trench to help electrical conductivity." (Five 5 lb. boxes cost about $2.50 from the grocer or drug store.) "You gonna have a big ice cream party or something?" the store manager asked. "You gonna make ice cream in that hole in your backyard?" the neighbors blurted. Never mind them. What did *they* know?

So, the salt was in, dirt was back on top of the salt, and we still had a pretty good trench to catch rainwater or water from the water hose (hosepipe if you're a Southerner). The plate was placed on level ground and I marked the four holes for my ground rods, one 8 foot rod, and three 4 foot rods. Then I removed the plate (at this point you still don't have anything bolted to the base plate).

The "Upset" Dipole Theory

The rods were all in! Crooked, as I expected, but in! *Now* I could bolt the three vertical bases to the aluminum base plate and put in all those bolts around the edge for the radials. (I first used some steel-wool soap pads to clean up my three aluminum antennas—really shines them up nicely.)

All bolted up, I was ready to go install it on the level ground at the "ice-cream-hole." But wait. How was I going to feed those three antennas? Coax, of course, but I was not about to run three separate cables out to that antenna 100 feet from my house!

Another awakening! It all kept coming back—all that good theory from the *ARRL Antenna Handbook* and from my past experiences with all those multi-wire, multi-band dipoles, which use only one feed point! Right. I've used that theory for so long! It makes sense; if a *dipole* can have several wires cut for different bands and only one feed point (letting the frequency select its own resonant element), then I could turn the dipole on its *end* (vertical, up-set, or set-up), put half of it under ground, and it would be *just like* my three-element vertical mounted over an ice-cream-hole! (I decided to just leave my dipoles up in the air so I could make comparative on-the-air tests later.)

One coax feed point, three vertical aluminum tubes, 10 inches apart. Ten inches of center conductor (once it leaves the grounded shield of the coax) would really add a lot of length to my antennas at those frequencies. So I decided to run coax connectors close up to each antenna.

But how would I split the coax from the antenna base to the three elements? I remembered the funny looking "T" shaped coax connector I looked at at the hamfest. You got it! All I needed was *two* of those hooked together to have one input point and three out. A water pipe ground clamp would hold the coax-junction in place nicely to the grounded base of one of the antennas. (Luckily, the multi-band

18V had a grounded support piece which even had holes in it that matched the ground clamp.) A piece of scrap copper from an old TV was bent and drilled and mounted between the other two antennas to form a holder for the other two connectors, and then wires were run from these to their respective elements.

Lightning strikes again! Another brilliant deduction! If I didn't have any lightning protection for these skyscrapers, I could blow the salt right out of the ice-cream-hole!

Simple enough. I attached a heavy wire (#12 or larger) to the bottom of each antenna radiator, and another on a bolt which was grounded to the base (which was grounded to the rods, etc.), and bent the wires as close together as possible without the transmitter power arcing across them.[1] (I used my wire cutters at a sharp angle to get each wire pointed; lightning likes to jump across pointed gaps!)

Now everything was hooked up out at the ice-cream-hole—coax in place, lightning arrestors adjusted, moat filled with water, "Danger—High-Voltage" sign in place, and fence in place. (The fence is only about 18 inches high and might only warn of danger. It should be higher.) A ground clamp at each corner ground rod was bolted on to hold the base plate in place; the clamps were then wired to the plate to ensure a good connection between the two.

Ready to go on the air—finally! And no, I didn't forget the radials; I was just tired. I decided I would test first without the radials and then see how things would change as I added them. That's Phase II.

KQ4X Goes On The Air

Now I could take my right hand out of my pocket! First thing to do was to check the s.w.r. on these three antennas at different frequencies to see how close my length calculations were.[2] "Just look at that," I thought to myself, "not bad at all!" I had "cut" 20 meters for 14.025 and the s.w.r. was 1.5:1 there, increasing to only 1.8:1 at 14.325 MHz. 15 meters was "cut" for 21.025 and the s.w.r. was 1.5:1 there, going up to 1.9:1 at 21.425! 10 meters was "cut" for 28.525 MHz and showed a 2.0:1 s.w.r. up to 29.125; at 28.025 it was 2.2:1. (These readings were made at the station. I haven't measured them at the antenna yet, but I would expect them to be a bit higher there, since your feedline loses some of the reflected power coming back to your station. Also, remember that the non-perfect s.w.r. doesn't mean that the elements are not cut for proper resonance; since a vertical will usually have a lower impedence than your feedline, you can expect even higher s.w.r. readings as a more efficient ground system is installed. Ironic, isn't it? Maybe someone has an idea of how I can "match" these three verticals to my feedline after I get my radials in!)

Enough of this gloating over such superb engineering excellence on my part! It was time to *talk* to somebody!

I made about 86 total QSO's, of which 33 were DX and 53 were local. I got 32 comparisons, 20 on 20 meters comparing to my 20 meter dipole at 30 feet, and 12 on 15 meters comparing to my 40 meter dipole at 50 feet.

I couldn't compare on 10 meters as I don't have another antenna for that frequency, but I did make about 10 good contacts, 5 of which were DX.

For the two bands together (15 and 20 meters), the results look like this: 17 said the vertical was better or equal to the dipoles, and 15 said the dipoles were better (and in almost all cases the differences either way amounted to only 1 to 2 S-units, or dB's). Here's an interesting further breakdown: Of the 15 who preferred the dipole, 8 were local and 7 were DX; of the 17 who preferred the vertical or said it was the same, 10 were DX and only 7 were local.

A lot of figures, I know, but what does it all mean? It means this: About half the time, either local or DX, the vertical will do as well as the dipoles (or better), and a little more than half the time the vertical will do better than the dipole for DX. And that's *without ground radials*! Just ground rods and an ice-cream-hole! And don't believe all you hear about not being able to receive well on verticals. The same statistics held true for reception: Sometimes I received better on one, sometimes on the other, and it didn't correspond to how well the other guy received me either! Funny things these antennas!

Not bad for no radials! By the time this gets into print I'll have some radials in . . . but that's another story. Ice cream anyone?! (A piece of cake!)

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[1] *With the arrestors at the base of the antennas at the feed points the voltage is minimum (or zero) there, and I could get no arc at 100 watts output, so just left them about one-sixteenth inch apart.*

[2] *My element tubing was 1.25 inches in diameter. 21 MHz half-wave in free space would be 281 inches long. This divided by 1.25 inches yields a length/diameter ratio of 225, which, from the* Handbook *charts, shows a factor of .968 to be used. Apply the same logic to 28.5 MHz and the factor is .965. The antenna radiators then were "cut" for 11 feet 4 inches and 8 feet 4 inches, respectively. The 20 meter 18V was "factory fixed."*

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The rugged coastline of Navassa Island.

QSL card issued for the 1978 Navassa Island Dxpedition.


One of the four h.f. stations with Dave, WØRJU at the key.


Navassa's lighthouse rises to 395 feet above sea level.

The DXpedition to Navassa Island was particularly popular with new DXers (since the 1974 DXpedition), c.w. enthusiasts (for the 1978 CQ WW DX CW Contest), 5 Band DXCC seekers, Europeans, and the JA's. With the support and assistance of many, the group made 22,303 QSO's and a lot of paperwork!

DXpedition To Navassa Island -Part I

NØTG/KP1 (S.S.B.) - WØRJU/KP1 (C.W.)

BY RANDY ROWE*, NØTG

After two years of planning, the reality of being DX and working a record of 22,303 stations in 6½ days became fact. I have been hamming for 25 years, and to be a part of the 1978 DXpedition to Navassa Island was the pinnacle experience of my ham radio career. This experience, however, could not have been realized without the full participation of all members of the DXpedition team and the clubs, organizations, and individuals who supported and assisted us in many ways.

Navassa Island is one of the smallest of the United States' possessions, lying 90 miles south of Guantanamo Bay, Cuba and 110 miles east of Jamaica. Other than hams, few Americans know of the existence of the island. Navassa has an area of approximately 1.5 square miles and is uninhabited except for rats, wild goats, and many species of birds. The island's only importance today is its lighthouse rising 395 feet above sea level.

The seed for going on a DXpedition was planted a couple of years prior to the DXpedition when Myron Kern, WØZH, and myself found ourselves assigned to the same project by our employer. During lunch breaks, we would discuss ham radio and DX in particular, comparing notes as to what we had worked, what was coming up, and all the angles of competing for the rare ones. I mentioned to Myron one day that we should consider going on a DXpedition somewhere. We talked about it, but realizing how big a task it was, neither of us thought that it would ever come to pass. Some months later I met Tony Trice, ADØP, who was just getting into DX chasing and was naturally very enthusiastic. Tony introduced me to Dave Bowker, WØRJU. Dave, a little later on, brought the subject up again concerning the planning and going on a DXpedition. He and I took a positive approach of "let's do it." I am sure some would think that this was rather forward and premature on our part. We think the same thing. At this time, we had no particular place in mind and no idea of all the problems, details, and work ahead of us. I started looking for a place to consider and Dave began preliminary equipment planning.

High ranking in the DX standings is my friend Bill Wiese, WØHBH, whom I asked for suggestions as to what place would be a good consideration. Out of the discussions and research came the selection of uninhabited Navassa Island. We knew it was not in the most needed status by those who had been chasing DX for a long time. However, by the same token, we knew any place that had not been active for four years would be very popular, naturally, by new DXers, c.w. enthusiasts, 5 Band DXCC seekers, Europeans, and in particular the JA's. The previous DXpedition to Navassa was in 1974, and they worked 7,000-plus stations. Navassa, being reasonably close to the U.S. mainland, was attractive from an economical standpoint. Transportation cost to Navassa would be easier for us to handle than traveling to some other hemisphere. The island, being owned by the U.S., would pose no licensing problem. So, WØRJU and myself, NØTG, decided that we would continue in our plan to form a team and head for Navassa Island. Tony Trice, ADØP, a mechanical engineer and freelance photographer, joined us along with Myron Kern, WØZH, an electrical engineer. Tony's cousin Jon Lindsay, W6OIG, is an adventurous outdoor type always looking for an interesting project. After a phone call from Tony, ADØP, Jon, an oral surgeon, joined us and naturally became our chief medical officer. I had known Joe Markowski, NØWL, for a number of years. Joe had a lot of outdoor living training and became our facilities and accommodations expert. He joined us

*3237 Connecticut Drive, St. Charles, MO 63301.

(Left) The DXpedition's 2,000 pounds of cargo was hoisted up in 100 pound increments via a pully rigged on the cantelevered catwalk. At this point the sea was very calm after the all night storm the night before. It was never this calm again. (Center) Looking out to the gulf from "Main Street" Navassa Island. The ANANCY is anchored off shore. (Right) Part of the DX group with special friends (left to right): Joe, W2ORA, Iris, W6QL, Lloyd, 6Y5LA, Randy, NØTG, Lloyd, W6KG, 6Y5LA's XYL, Juanita, and Tony, ADØP. Kneeling are Sy, K2KA, Joe, NØWL, and Brownie, W2PAU.

and further contributed to working out the software program for our computerized beam heading chart which we promoted as a fund raiser. I should mention that without Joe's son, Paul, WAØZGV, the software may never have been developed. Paul is quite an expert. Joe, NØWL, and Jon, W6OIG, each have a computer. Joe and I attended to the program details and promotion and Jon did most of the production of the runs on his computer. The funds from this project were used toward offsetting the tremendous boat and shipping expense. At this point in time, we now thought of ourselves as a team consisting of NØTG, WØRJU, WØZH, ADØP, NØWL, and W6OIG.

In January 1978, after many telephone transfers, I finally was able to make contact with the appropriate U.S. Coast Guard office in Miami, Florida concerning landing permission on Navassa. After warning me of all the dangers involved in landing, the officer assured me verbally that there would be no problem as long as we would be willing to sign a formal release of risk and liability statement. As most people know, this statement was worked out by early DXpeditioners to Navassa with the U.S. Coast Guard. The wording in this statement is quite emphatic that landing is a risk, a danger, and each landing is considered a potential assistance case by the U.S. Coast Guard. All of us in our own idividual ways had already convinced our XYL's that we should go on this DXpedition, and we knew better than to cause them any more anxiety than they already felt; so to this day, none of the XYL's know of the wording in the statement we signed. As plans became firm, we scheduled late November as the time for the DXpedition. We knew it would be impossible for us to be ready to go by June. June through September is the hurricane season in the Caribbean. So we chose late November as the appropriate time.

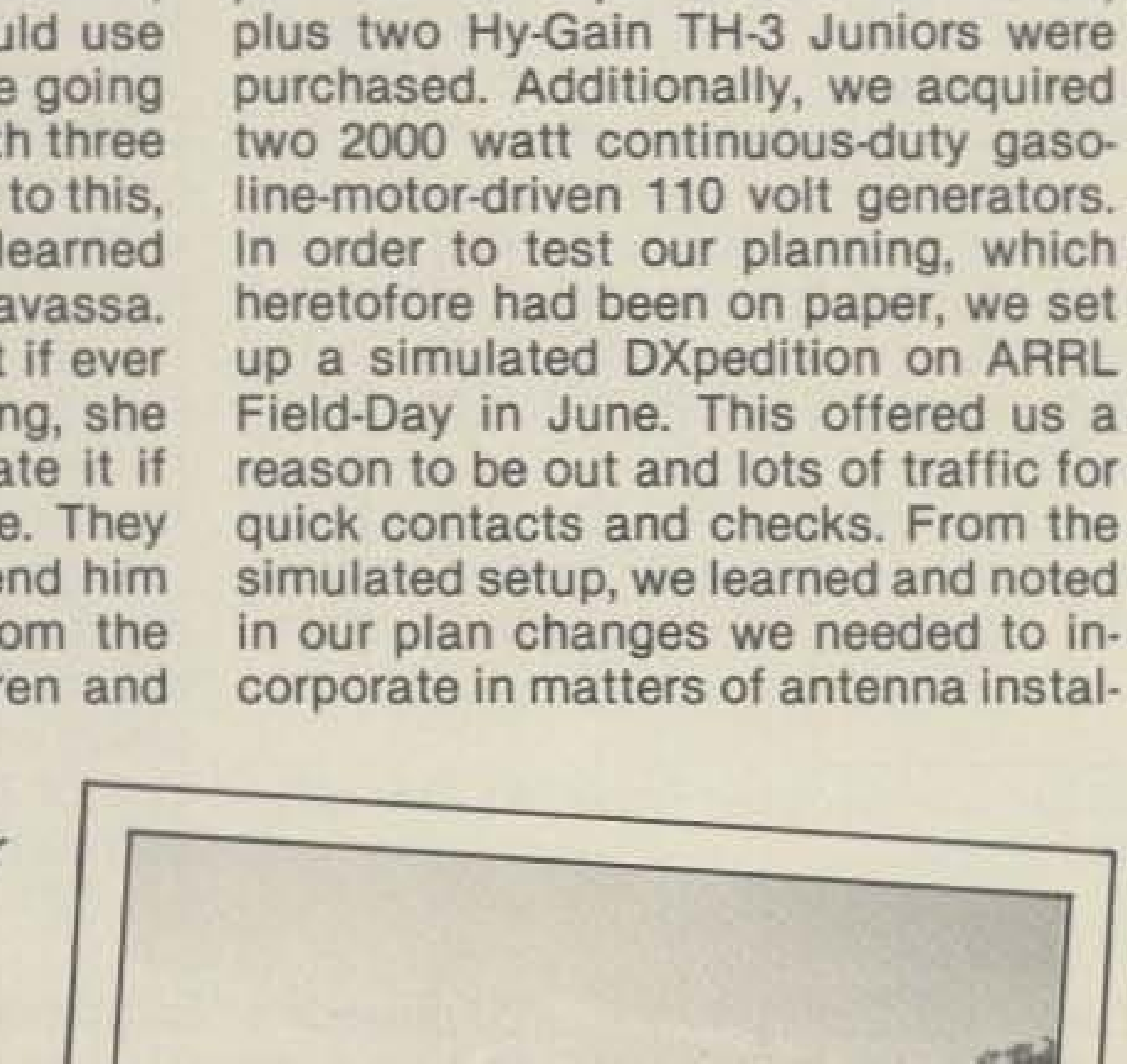
It soon became apparent that we needed a point of contact in dealing with making boat arrangements from Jamaica to Navassa Island. Previously, I had written to several possible resources to inquire about such arrangements, but I was getting no response. By this time, I had read and nearly memorized everything that had ever been written about Navassa. From the information in the *CQ* magazine article describing the 1974 DXpedition, I picked up the telephone and called Sy Adler, K2KA, a key member of that DXpedition. This was my first opportunity to get acquainted with Sy, who received me very warmly and offered his assistance. Sy cogenially agreed to help us obtain a boat, and he also made arrangements to introduce me to Lloyd Alberga, 6Y5LA. Lloyd is a prince of a fellow and did more things in Jamaica to assure our passing through that country with a minimum of difficulty than can be elaborated on here.

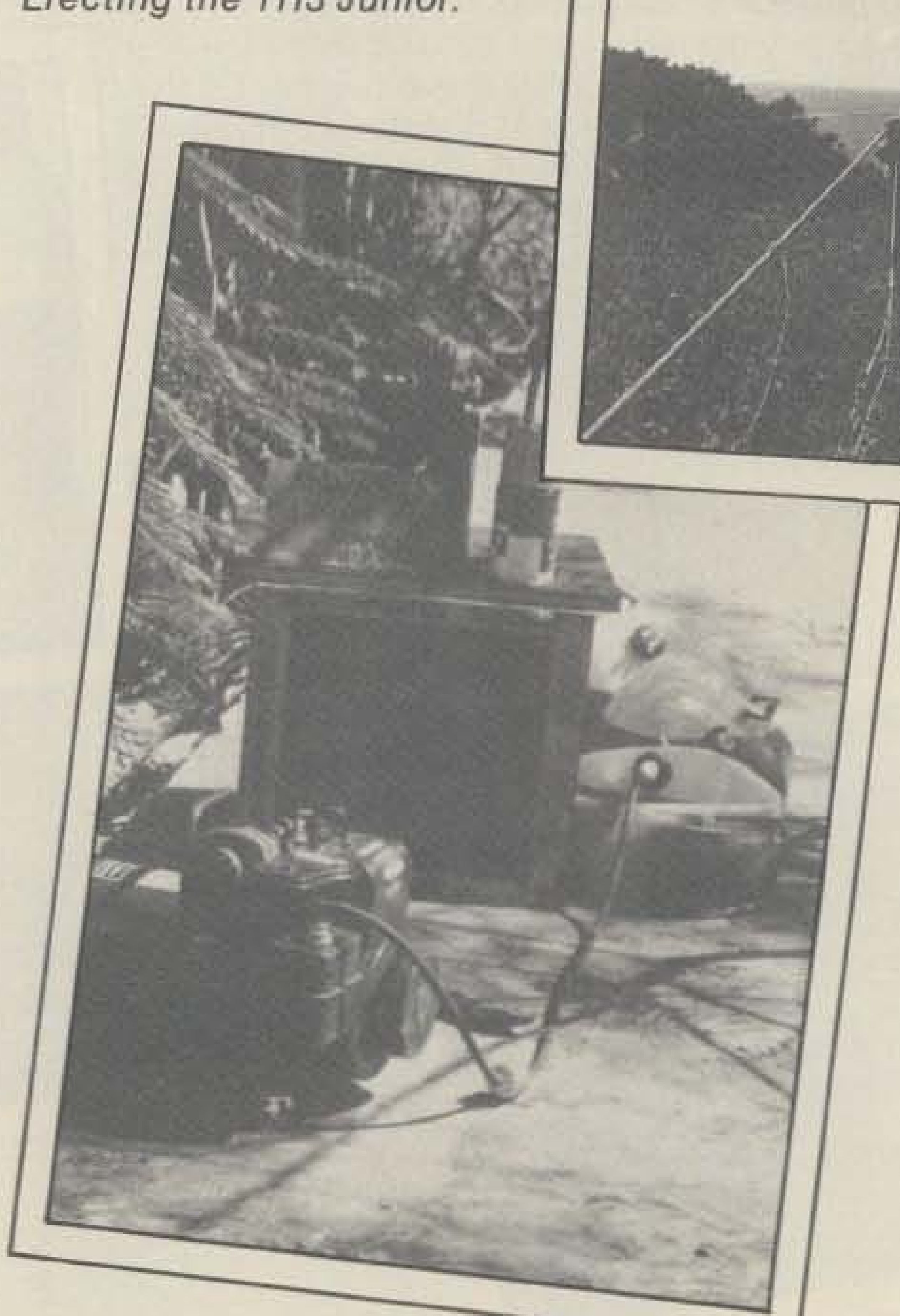
Sy was doing a lot of work for us, and we determined that rather than have him on the outside, why not invite him to join us and become an integral part of the team. Sy happily accepted our invitation to revisit Navassa. He mentioned that Miles Brown, otherwise known as Brownie, W2PAU, would enjoy going if there were room. We took a poll and gladly received Brownie into the group. Brownie also had been to Navassa in 1974. As we continued to study our operation plan and look at the propagation forecast, it was determined that we could use an additional person if we were going to operate around the clock with three to four rigs. Sometime previous to this, Joe, W2ORA, Duffin's XYL had learned of Sy's invitation to go to Navassa. She called Sy and advised that if ever there was an additional opening, she and the family would appreciate it if we could consider inviting Joe. They wanted to surprise Joe and send him on a DXpedition as a gift from the family. Joe has thirteen children and his whole life has been dedicated to giving and caring for others. We found this very heartwarming and were delighted to provide Joe's family the opportunity to give this experience to Joe.

Meanwhile, as administrative matters were being dealt with, Dave, WØRJU, was busy designing and fabricating shipping containers. Dave designed the station crates in a manner that would serve a dual function. They would not only contain equipment for shipping purposes, but each crate would convert into an operating desk. This worked out extremely well, and we appreciated Dave's creative design. We planned for a four station simultaneous operation. Two complete sets of dipoles were fabricated, plus two Hy-Gain TH-3 Juniors were purchased. Additionally, we acquired two 2000 watt continuous-duty gasoline-motor-driven 110 volt generators. In order to test our planning, which heretofore had been on paper, we set up a simulated DXpedition on ARRL Field-Day in June. This offered us a reason to be out and lots of traffic for quick contacts and checks. From the simulated setup, we learned and noted in our plan changes we needed to incorporate in matters of antenna instal-

The Navassa "Light and Power Company."

Erecting the TH3 Junior.





lation, cable length, and station setup. I think this setup was invaluable, and I recommend it to any DXpedition. Because of this test, there was not one surprise or tool or spare or equipment that we needed but did not have upon our arrival on Navassa. Everything there went smoothly. Within forty minutes after landing, we had the first station on the air.

As was mentioned earlier, we had learned that Navassa Island was in great demand by the Europeans and the Japanese. The terrain on Navassa from the usual Dxpedition operation site did not favor Europe. In fact, a 200 foot high hill of rock shadows a clear path toward Europe. We, therefore, planned to set up two stations on top of the hill near the lighthouse. As far as we know, we are perhaps the only DXpedition to have placed a station setup on top. We now know the reason—it was a monumental task getting the equipment to the top in extremely rough terrain in 90 degree temperatures and then keeping it supported. But we did it! As it turns out, though, we set up only one station on top, and the other three stations were set up at the typical landing site at Lulu Bay. Although we did work the Europeans from the lower site, the upper site was amazingly more effective, and it was clearly beneficial in working Europe. Signals from Europe were two to three "S" units stronger there.

Navassa was very high on the needed list by the JA's. The Carribean has always been a difficult matter for the JA's. The propagation forecast indicated that the possibilities for good open paths to Japan during our planned dates in 1978 would be the best in history for an operation from Navassa Island.

To assist us with publicity and to coordinate DXpedition operation information in Europe and Japan, we established coordinators in each of those areas. In Europe Franz Langner, DJ9ZB, volunteered. Franz did a tremendous job disseminating information in all the European bulletins and periodicals. In Japan, it was a pleasure to have Naoki Akiyami, JH1VRQ, coordinate matters for us. Nao organized an effort in which the JA's helped support the operation financially. This was very heartwarming for us to experience the fraternal spirit of ham radio and the mutual respect, concern, and assistance hams can have for one another. Words are not sufficient to express our deep sense of appreciation for all who helped us and in particular for the efforts headed up by DJ9ZB and JH1VRQ. The several thousand Europeans and the 1,000 JA's we worked would not have been possible without the help of these fellows.

(To Be Continued)

W4FA presents some ideas on building one of the most useful station accessories. Once you understand how it works, you can tackle it section by section as a project that will take a few weekends. Best of all you can build just as much as you need.

A Step By Step Approach To Constructing An S.S.B. Monitor Scope

Part I—The CRT/Power Supply

BY JOHN J. SCHULTZ*, W4FA

When all is said and done, there is really no substitute for an oscilloscope to monitor s.s.b. transmissions. This is especially true if some form of speech processing is being used and you like to operate on that thin borderline between squeezing the last bit of power out of a transmitter and not causing splatter. Most amateurs think of building a monitoring scope as a major project. But it does not have to be if you are willing to do without the frills and construct the scope for just one purpose—modulation monitoring—without trying to make a general-purpose test instrument out of it. Also, it need not be an expensive project. The main expense will be for the CRT, and perfectly suitable 2- or 3-inch CRT's can be had for $5 to $15 by judicious hunting at surplus outlets and fleamarkets. The tube socket and tube shield will run another $5 or so. But with these basic items in hand, you can actually construct the rest of the unit from commonly available parts, many of which will probably be found in any well-stuffed junk box. The cost savings will be considerable as compared to purchasing a monitor scope, although the home-constructed unit may not have all the versatility of a commercial unit.

There are many ways to construct a monitor scope. Rather than just describe one complete unit, it is easier to break the monitor scope down into its major sections and describe some of the options available for each section. Then you can construct an actual monitor scope according to the options desired and according to the parts available.

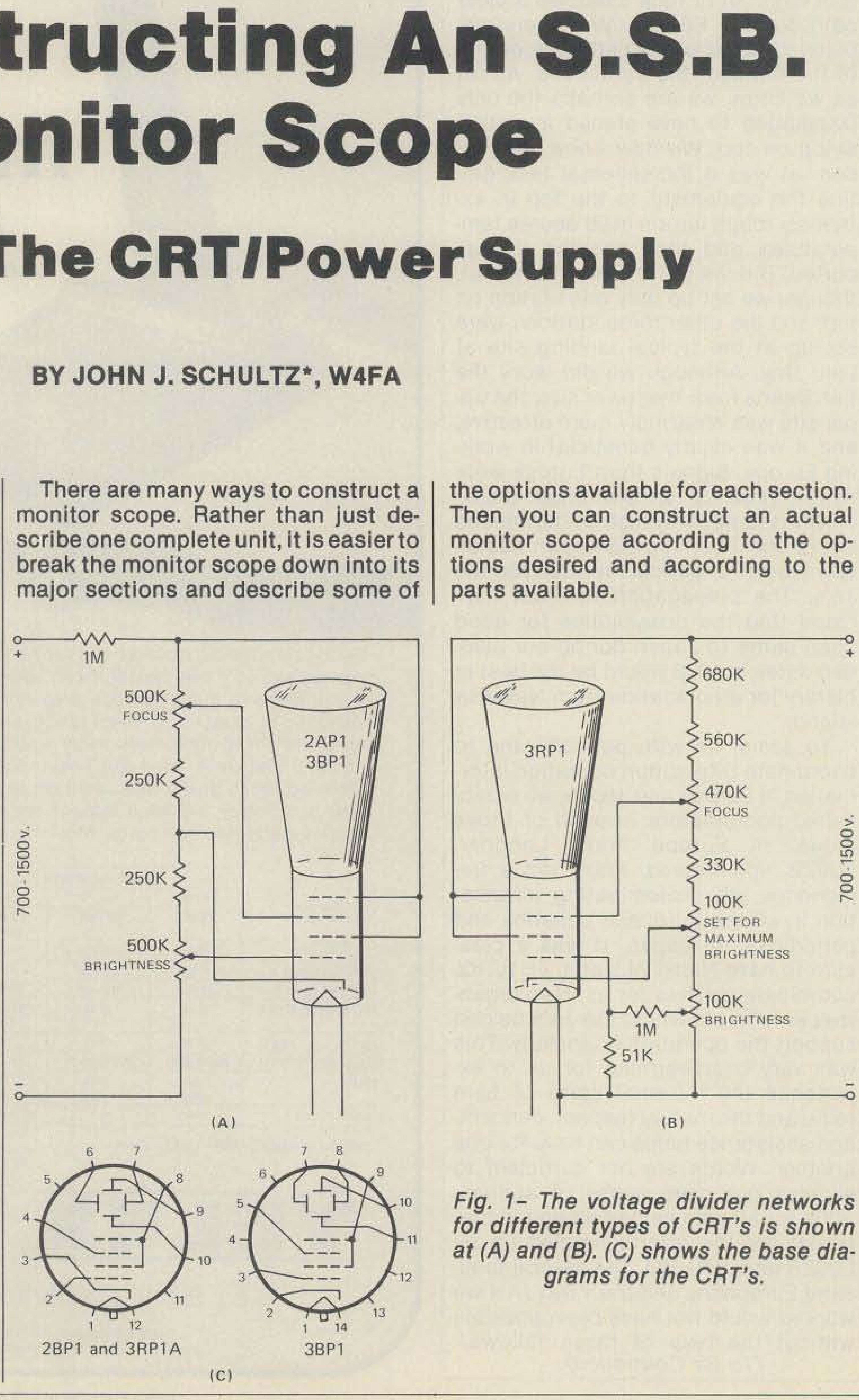


Fig. 1- The voltage divider networks for different types of CRT's is shown at (A) and (B). (C) shows the base diagrams for the CRT's.

*c/o CQ Magazine

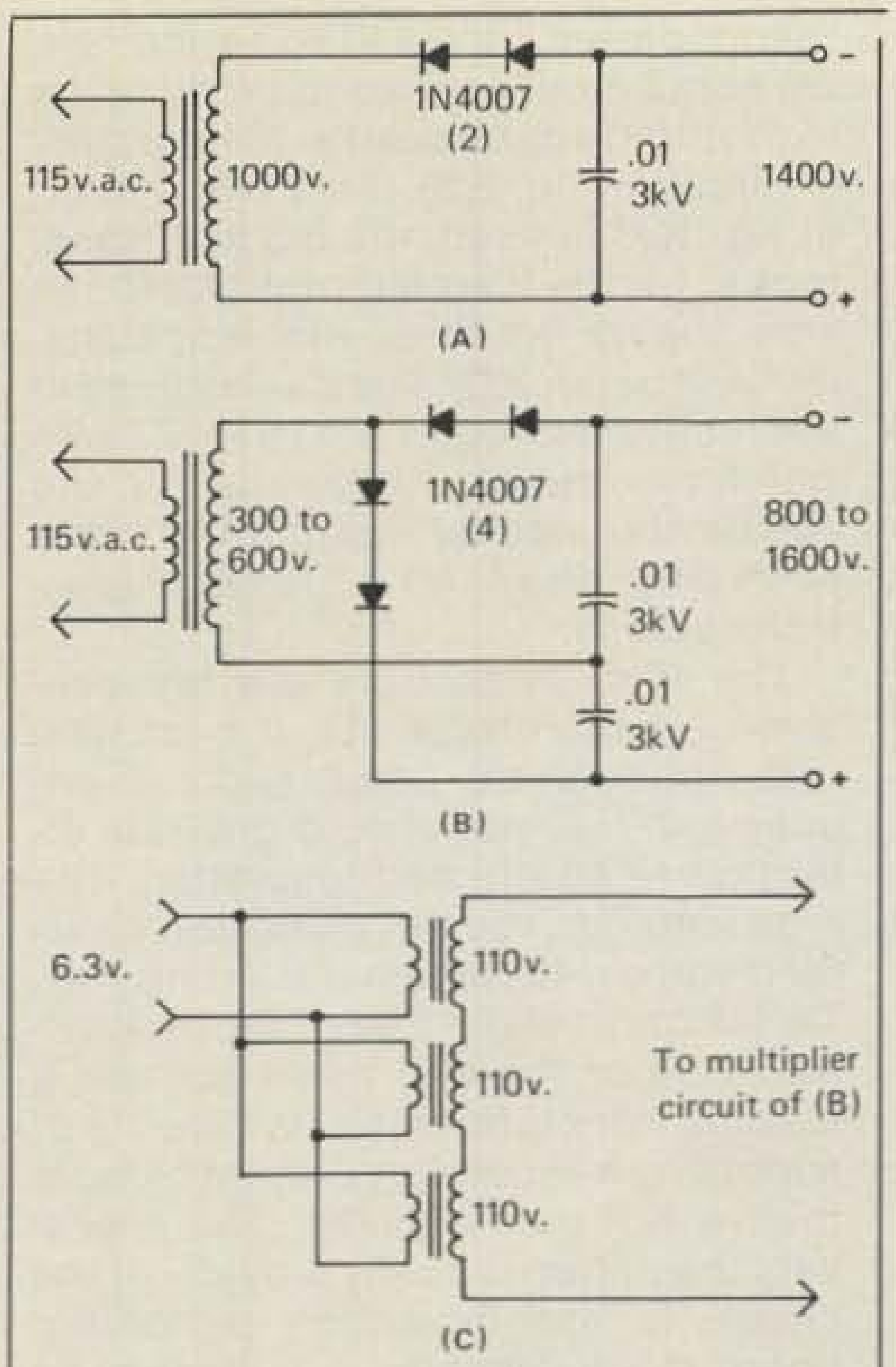


Fig. 2- Three power supply possibilities to obtain the high voltage needed for a CRT. The transformers at (C) are 6.3 volt filament types with the lowest available current rating.

A monitor scope can be broken down into basically three sections—a CRT/power supply section, a sweep section, and an r.f. coupling section. The CRT/power supply section compromises the circuit to supply filament and anode voltage to the CRT. The sweep section provides a means of sweeping the scope trace horizontally across the screen. The r.f. coupling section applies a sample of the transmitted r.f. to the vertical deflection plates of the CRT. Although not a section, of course, there is then the final mechanical assembly of the scope.

CRT/Power Supply Section

This usually is the part of building a monitor scope, or a simple oscilloscope for that matter, that many amateurs shy away from because a high voltage is involved and one thinks special transformers, etc., are required. In fact, it is a very simple part of the scope to build if you stay with a basic circuit and remember that the high voltage power supply needed has to supply only milliamperes.

Fig. 1 shows two simple arrangements for the high voltage divider chain which supplies the necessary voltages to the grids of a CRT. Only *brightness* and *focus* controls are used. There is no *astigmatism* control in order to simplify the circuitry. The two controls may interact a bit, but nonetheless you can obtain a sharp display on the screen at the desired brightness without critical adjustment. A range for the supply voltage of from 700 to 1500 volts is indicated. Slightly lower voltages, even down to 500 volts, will work with a 2-inch CRT, but brilliance and definition will both decrease. If possible, you should provide at least 700 to 900 volts from the power supply.

There are a number of possibilities for building the necessary power supply as shown in fig. 2. If you obtain an inexpensive oscilloscope high voltage transformer, a simple half-wave rectifier circuit will suffice as shown in fig. 2(A). If a surplus transformer with only a low voltage secondary can be obtained, a multiplier circuit such as that shown in fig. 2(B) can be used. If all else fails, you can even take three 6.3 volt filament transformers of the smallest size available and wire them up as indicated in fig. 2(C). The "primaries" become the 6.3 volt windings which are connected in parallel. The "secondaries," the 110 volt windings, are connected in series to produce the high voltage to be used in the multiplier circuit of fig. 2(B). If the CRT circuit of fig. 1(A) is used, the 6.3 volt transformer for the filament of the CRT can also supply the three filament transformers of fig. 2(C). The diodes used in the rectified circuits are IN4007 units which are rates at 1,000 volts PIV and can be obtained for less than 15 cents each (Poly Paks, MHz, Jameco Electronics, etc.).

The filter capacitors are inexpensive ceramic disc units, 0.1 mf/1000 volt. Although the power supplies are easy to build, you should give due attention to safety and insulation. The high voltages you are using can be fatal if you contact them the wrong way. This is particularly true of the multiplier circuit of fig. 2(B) when you use a surplus transformer that is capable of supplying a secondary current of more than a few milliamperes. The necessary insulation is easily provided if the circuit is assembled on perforated board stock. Usually, it is easiest to assemble the power supply and resistor divider chain circuits on one piece of board stock. Then plastic extension rods are used to connect to the brilliance and focus potentiometers located on the board.

(To Be Continued)

1981 CQ WW 160 DX Contest High Claimed Scores

BY DON McCLENON*, N4IN

Following are the high claimed scores as of March 13, 1981.

C.W.

	Score	QSOs	Mult.
NP4A	439,200	533	90
KV4FZ	354,942	473	81
W8LRL	164,912	537	88
N2NT	164,256	544	87
G3SZA	131,538	309	66
N5JJ	116,250	511	75
W2IB	107,920	458	76
K5GO	104,874	529	77
K5RC	97,236	514	73
N4WW	96,778	355	83
G3RPB	96,580	398	55
K6SE	92,862	409	63
KØRF	86,430	465	67
KB4I	85,880	453	76
AA1K	84,056	328	79
AD8P	75,600	460	70
W7RM	75,274	357	61
K1KI	72,416	236	73
N1EE	68,380	342	65
K5MM/7	68,090	347	55

S.S.B.

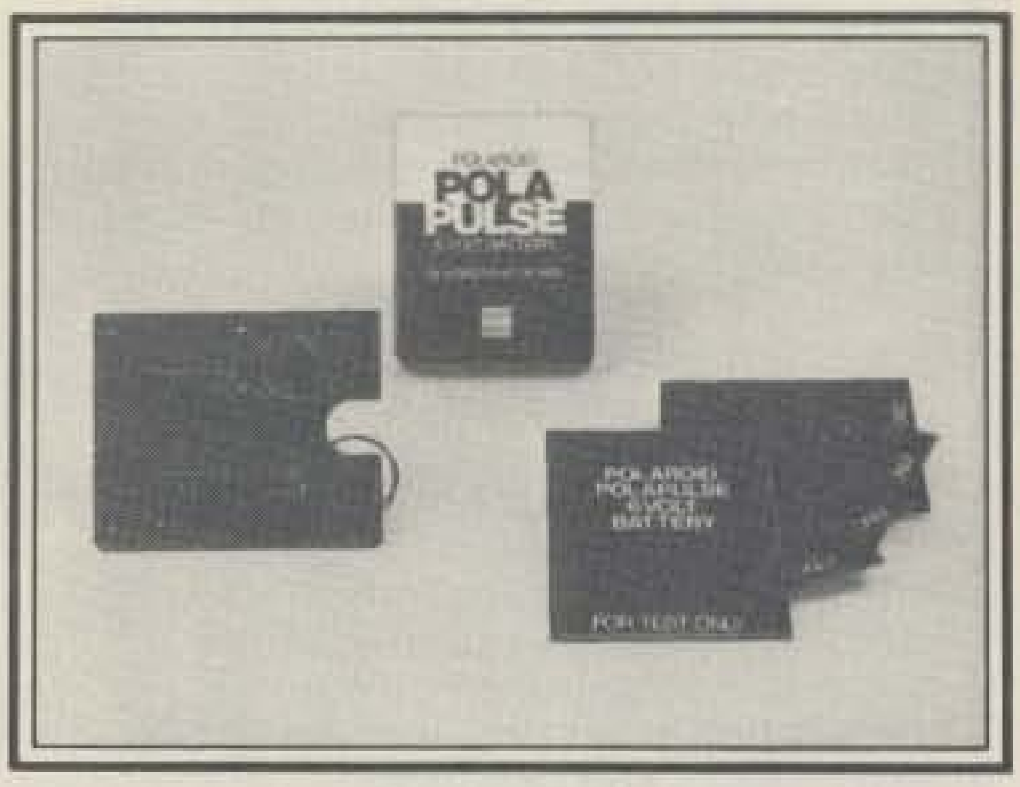
	Score	QSOs	Mult.
WB3GCG	125,550	757	75
W9RE	62,496	526	56
N4IN	38,308	246	61
K1KNQ	36,608	308	52
N7DF	35,676	324	52
KB8AC	35,530	295	55
W9UP	34,200	261	60
KB9OF	32,946	273	57
N4ARO	30,464	248	56
K2BQ	30,086	264	57

**3075 Florida Ave., Melbourne, FL 32901.*

The Polaroid* Polapulse Battery Designer's Kit

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

Here's an item from a manufacturer not in the amateur radio business itself but apparently with the amateur in mind. These batteries lend themselves to all sorts of tinkering and experimentation and only your imagination will fix a limit on the number of possibilities. —K2EEK



The Polaroid Pola-Pulse designers kit.

Before we begin, here's a tip that won't quite get you something for nothing, but will get you something extra for nothing extra: Before you throw away the "empty" cartridge from any of Polaroid's flat instant color films—the kind used in their motorized cameras, like the SX-70—peel the plastic holder apart and rescue the battery inside. Read on and you'll see how much of a prize you've earned!

Polaroid has made available a Polaroid Polapulse 6 Volt Battery Designer's Kit, #4155, which includes five of their P100 batteries, a battery holder, and a technical brochure, all for $16.75. With that out of the way, we can depart from the mundane and get into one of the most exciting new batteries to come along in quite some time, with excellent prospects for making things easier for amateurs.

The start of all the commotion is the unusual configuration of the battery. Its dimensions are 3.73 × 3.04 × 0.18 inches—a stack of five is less than an inch thick! Imagine what this could mean for any kind of pocket electronics, from a monitor receiver to a handie-talkie to a digital dohickey that raises and lowers your shorts! There's not much stress on that pocket either, since the P100 weighs less than an ounce.

But the performance from this battery isn't lightweight in any respect. First, the battery delivers a full 6 volts. Second, the electrolyte is gelled and the package is sealed, so unless you puncture it there's virtually no chance of leakage. Third, it can deliver up to 26 amps instantaneously (!), 5 amps after 30 seconds, 2½ amps after a minute.

Take a look at these constant-discharge life specifications, which reflect how long the P100 can deliver each of the specified currents continuously before being discharged to 3.0 volts:

5 amps for 24 seconds (33 maH)
1 amp for 5 minutes and 42 seconds (95 maH)
500 ma for 14 minutes and 42 seconds (123 maH)
100 ma for 1 h our and 42 minutes (170 maH)
50 ma for 3 hours and 54 minutes (195 maH)
20 ma for 11 hours and 30 minutes (230 maH)

When tested against the standards (numbers 30, 41, 47, 50, and 61) of the American National Standards Institute (ANSI), the P100 showed up well again:

High rate discharge: 6 minutes
Toy battery discharge: 36 minutes
Motor test for toy and movie cameras: 32 minutes
Transistor radio and electronic equipment: 4 hours
Electronic photo flash: 28 cycles

Now, we should note that the ANSI ratings were designed for 1½ volt unit cell batteries, whereas the 6 volt Polapulse delivers more power at the same current. These figures can only be offered as one basis of comparison.

A Planar Battery

The reason this lightweight battery can deliver so much "punch" when it needs to is that it's designed like a Dagwood sandwich, with flat layers of electrodes, chemistry, separators,

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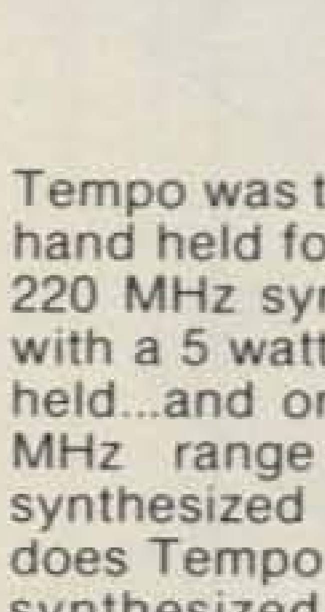

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*For use with S-1 and S-5

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S-20...$89.00

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Antenna Impedance: 50 ohms
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RF output Power: Nominal 3 watts high or 1 watt low power
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10W	80W	80A10	$149
30W	80W	80A30	$159
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vents, adhesives, and carrier web stacked on top of each other, which makes for a very large surface area at the electrodes, permitting a very low battery impedance (on the order of 0.05 ohm) and high current capability. See fig. 1 for construction details.

The chemistry is what we usually refer to as carbon-zinc (actually zinc and manganese dioxide) or Leclanche, with four cells in a laminated stack. Between aluminum anode and cathode collectors, each laminated on one side with a conductive plastic sheet (the anode plastic sheet is then coated with zinc, the cathode with manganese dioxide), are gelled electrolyte-coated separators (with adhesive sealing their perimeters) and duplexes (aluminum electrodes coated with zinc on one side, manganese dioxide on the other). A vent permits only gases to escape. The entire battery is then sealed in an overwrap of paper and polyester with two holes on *one* side allowing access to anode and cathode terminals.

Fortunately, for those of you who were less than thrilled with this chemistry/manufacturing review, the battery is so well designed that you'll probably never have to think about how the heck they did it.

Here's what Polaroid's construction technique translates into in terms of the performance you can expect out of this battery. First, it offers excellent shelf life—on the order of three years or more. Second, it offers the same kind of low-drain-rate chemical efficiency you get with alkaline batteries, but a much better performance at high drain rates as we've seen.

As far as safety, Polaroid reports having followed the test protocols of suggested Federal Hazardous Substances Act regulations, where the battery performed "extremely well even under severe conditions," and did not explode when exposed to fire or when recharging (which is definitely *not* recommended) was attempted.

The P100 is not *quite* the same battery as the ones found inside SX-70 film packages, even though their electrochemistry is virtually identical.

The SX-70 film pack battery is laminated to a 3½ × 4¼ inch (approximately) card in order to be dimensionally compatible with the film packs, and its contacts are accessible through round ports equidistant from one edge. The P100 is sealed in a smaller envelope, and its elongated contact ports are staggered.

By the way, there have been over 300 million SX-70 style batteries manufactured so far.

Getting It

You don't have to tear film packs apart to get Polapulse batteries. Pola-

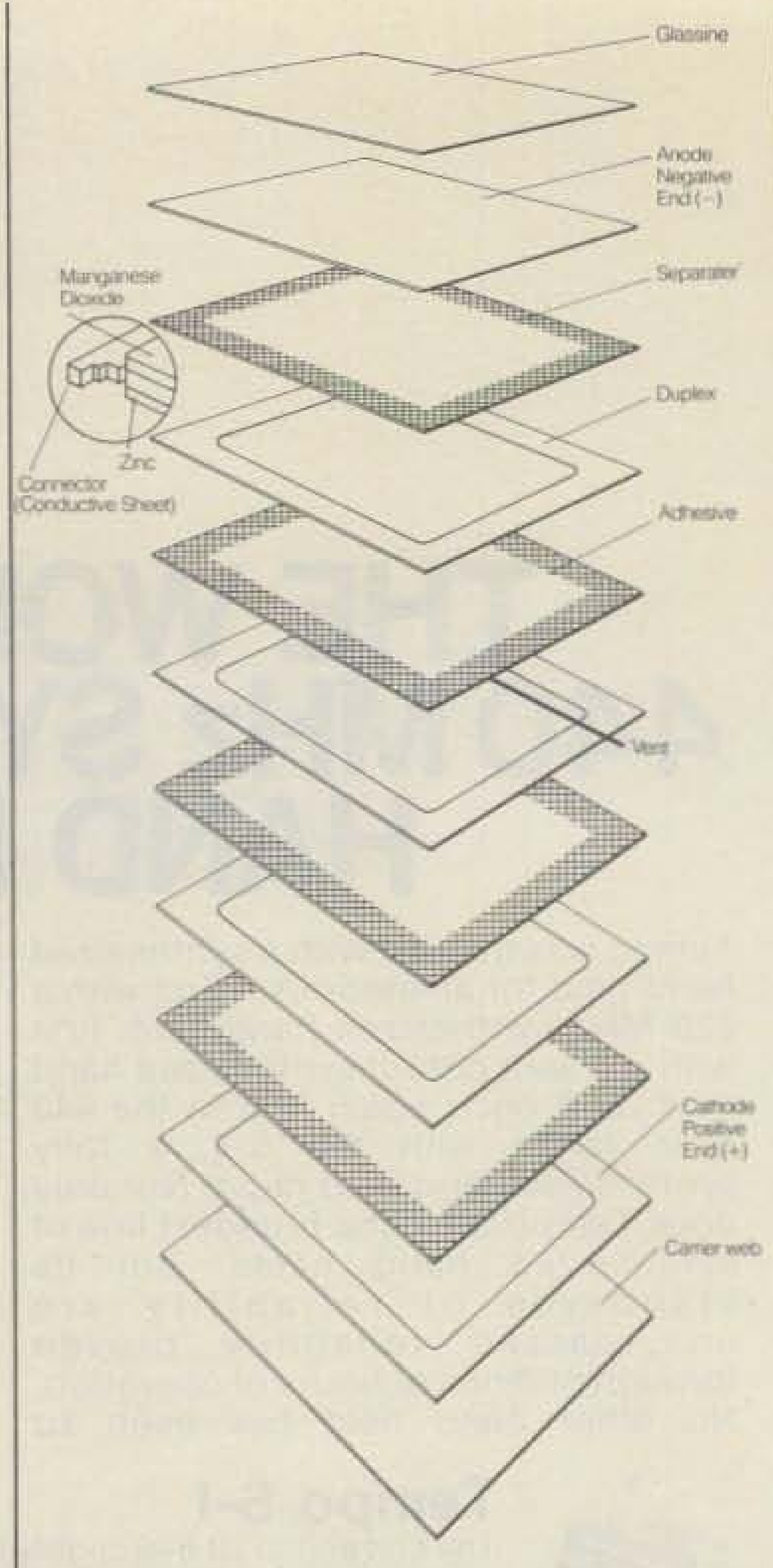

Fig. 1–Basic construction technique for the Polaroid battery.

roid is negotiating with distributors to make P100 batteries available over the counter across the country (and world, we assume), an absolute requirement since they're now busy convincing manufacturers to design in the P100 in new product designs instead of conventional cylinder or button cells.

Part of this "convincing" process involves giving designers a chance to get their hands on the P100, which is why the #4155 designer's kit came into being. To get one, send a check or money order for $16.75 (plus any applicable taxes) to: Polaroid Corporation, Commercial Battery Division, 784 Memorial Drive, Cambridge, MA 02139. Additional molded battery holders are available, too, at $1.55.

I heartily urge that you try using the P100 on one of your upcoming projects. It's especially well-suited to TTL and microprocessor voltages, and offers extraordinary merits as a memory-protect backup battery. You'll probably want to try it with tone encoders, handheld wireless remote controls, code practice oscillators, test gear, pocket "pen" lights, repeater monitor receivers, mosquito repellers, etc.

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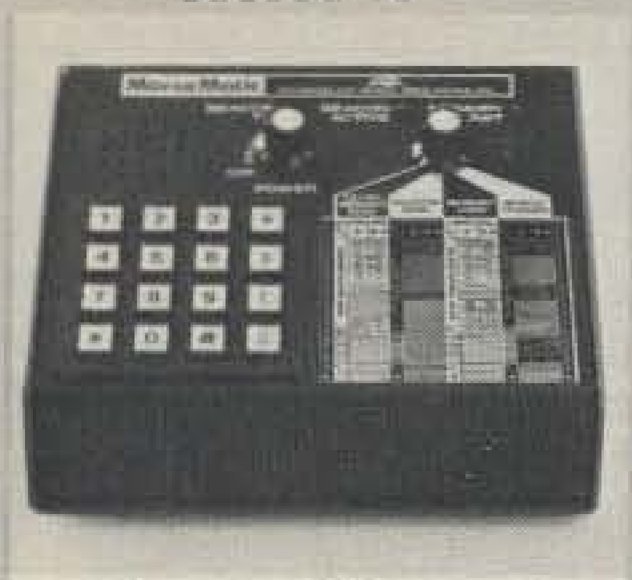

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Message Partitioning	Soft			Soft		Hard	Hard	Hard	
Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 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
Random Practice Mode	Yes	Yes	Yes						Yes
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Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Tidbits

Code Is Not C.W.

It has long been common practice to refer to code as c.w. This incorrect term is so well accepted that it appears in textbooks and on communications equipment. A couple of previous Novice columns mentioned the fact that code is not c.w. However, not one of those letters provided any factual support that code is c.w., and the existing facts clearly show that code is not c.w. You are invited to consider the comments in the following paragraphs and to check your own data sources to confirm or refute what appears in this article.

The dictionaries of electronic terms and the standard dictionaries support my claim that telegraphy (code) should not be called c.w. Continuous waves (c.w.) are defined as being electromagnetic waves that are generated in a continous train of identical oscillations. The wavetrain can be interrupted in a known sequence (telegraphy) or it can be modulated in amplitude, frequency, or phase (a.m., f.m., or p.m. voice) to convey information. In other words, continuous wave is the basic carrier (AØ, FØ, or PØ) before it is changed to convey intelligence.

The term *c.w.* does not accurately apply to any type of emission that conveys intelligence. However, it applies more to voice transmissions than to code transmissions. As an example, when operating an a.m. voice transmitter, the output is pure c.w. at all times when no modulation exists, such as during pauses when the operator is not speaking. When the operator is speaking and the output carrier is amplitude modulated, the carrier frequency remains constant and just the amplitude is varied in accordance with the speech pattern. Unless modulation reaches or exceeds 100 percent, the carrier wave is continuous. Frequency and phase modulation transmitter output carriers are similarly closer to c.w. than the output of a radiotelegraph transmitter.

Here are J. Elwin Tyson, KAØHPW, and his wife Billie, KAØHPV, who live in Plains, Kansas. Both were licensed in May 1980, thanks to the help of Darwin Thompson, WDØGFI. They operate a Hallicrafters HT-32A transmitter and a Hammarlund HQ-180A receiver with a dipole antenna on 40 and 15 meters. Elwin is the manager of a grain elevator. He was ill last winter and finally had time to study for his amateur license, which is something he had wanted to do since high school. His wife helped him study and she decided to also become an amateur radio operator. I know from experience that amateur radio is more fun when both the wife and husband share that interest. My wife (Marie, W6JEP) has kept amateur radio an essential part of our lives. We recommend it to all couples.

Radiotelegraph is also called interrupted continuous waves, interrupted c.w., or i.w.c. No matter which of these three terms is used, these emissions are defined as continuous waves that are interrupted at an audio frequency rate. These terms are contradictory, since the transmitter output wavetrain is not continuous if it is interrupted.

A similar poor term that is often applied to telegraphy is continuous wave telegraphy, or c.w. telegraphy. As detailed in a previous paragraph, it would make more sense to refer to c.w. voice than it would to refer to c.w. telegraphy. It is interesting that most dictionaries of electronic terms omit this term, despite the fact that it is more accurate than most of the other terms that are used. Telegraphy is a matter of keying by manual (handkey), semiautomatic (bug), or fully automatic (electronic keyer and others) means. C.w. telegraphy could easily be understood to mean keying a carrier wave (not a continuous wave) on and off in a known code sequence.

Telegraphy is a system in which known sequences of presences and absences of signal are used to convey intelligence, since the telegraph symbols are transmitted in a code. A dictionary definition of code is that it is a system of symbols used to represent letters, numbers, etc.; the various telegraph codes include symbols that represent letters, numerals, work signs, and punctuation marks. The Novice column in the December 1980 issue of *CQ* shows telegraph codes that match alphabets or several languages.

Dictionary definitions of codes and ciphers do not impart the same meaning as is implied in FCC regulations and communication textbooks. We consider that codes are based on known language alphabets and thus have no secret meaning unto themselves. Dictionaries state that codes often have secret meanings, and that ciphers provide a method of transforming text to conceal the real meaning. Ciphers are not legal on the amateur radio bands because they have meaning that is not generally understood to all operators. Telegraph codes based on other than internationally known languages are similarly prohibited in amateur radio because all operators do not understand their meanings. In other words, if two or more operators produced a telegraph code based on a little known language, such as the language of the Black Foot Indians, it would not be le-

2814 Empire Ave., Burbank, CA 91504.

Sixteen-year-old Keith Leite, KA1AQB, of Fall River, Massachusetts, is in the third year of the electronics course offered by the Dimah Vocational High School in Fall River. His station includes a Yaesu FT-101-E transceiver and a roof-mounted Hy-Gain 18AVT vertical antenna that is 70 feet above ground. Keith already has 48 states and 45 countries confirmed. He passed the 20 wpm code test. He received a certificate for errorless copy of the 25 wpm message from the Secretary of Defense on Armed Forces Day last May. Keith operates the 15 meter Novice band most of the time, and he is available for scheduled contacts with anyone who wants to work Massachusetts.

gal to use it on the air because most operators would not be able to copy the text even if it were sent in forward-reading plain language. Similarly, two or more operators are not allowed to send messages in plain language or mixed group formats that have hidden meanings which are generally unknown to other operators. Such messages are not permitted even if they are transmitted using a well-known telegraph code.

If the code transmission is in the form of an audio or visual signal that can just be copied in the immediate vicinity of where it is being sent, it is simply called a telegraph signal.

If the code transmission produces a signal that can be heard or seen at some remote point (or points) interconnected to the transmission site by wire, it is called wire telegraphy.

If the code is transmitted by radio, it is a radiotelegraph signal, which used to be called wireless telegraphy.

No matter which form of transmission is used, no code signal is c.w. Webster's New Collegiate Dictionary defines code as a system of signals used to communicate and defines continuous waves as radio waves that continue with unchanging intensity and whose intensity continues unchanged except for modulation.

When I questioned an equipment manufacturer's design engineer about the poor radiotelegraph emission characteristics of his unit, he said that only its s.s.b. and c.w. capabilities were mentioned in the advertising. He clearly differentiated between c.w. (A0) and code (A1).

Telegraph (code) is not c.w., but there are continuous factors of frequency and amplitude associated with a.m. and f.m. voice transmissions, respectively.

No matter how many people call code c.w., it is incorrect. I hope a few readers will consider the facts detailed in this item and refer to telegraphy by its correct names in lieu of the incorrect and contradictory terms that have been used for about one century. *Code is not c.w.*

The International Telegraph and Telephone Consultative Committee (CCITT) and the International Radio Consultative Committee (CCIR) function under the auspices of the International Telecommunication Union (ITU), as does our International Amateur Radio Union (IARU). If you want to know more about telegraph technique use the IARU, ITU, CCIR, and CCITT publications. Volume VII of the CCITT blue book (Geneva, 1964) is particularly useful in regard to both unipolar (one polarity, code) and bipolar (two polarities, teletype signals).

Novice Roundup Activity

It was a pleasure to work several Novice column readers during the last ARRL Novice Roundup Contest. I was surprised to have many amateurs include brief complimentary remarks in their transmissions. I had 395 contacts on the Novice bands during the NR, but only about 330 useful contest contacts. About 30 amateurs with General, Advanced, or Extra licenses answered my CQ NR calls. Some did not understand that General and higher class licensees are only supposed to work Novices and Technicians in the NR. Others simply called to say hello and I was glad to meet them. Several Novices and Technicians called me more than once, and one Washington Novice called me at least ten times. I have been in all 30 NR contests with either my own callsign or a club callsign. It was fun. If I worked you, and your address is correct in the callbook, you can be sure I have sent you a card. Whether or not I was lucky enough to contact you in the NR, I hope to have a chat with you on the Novice bands. Most of my Novice band operation is on 10 and 15 meters, but I do also get on 80 and 40 meters sometimes. I usually operate close to 11 kiloHertz above the low end of each Novice band. I like to chat on the air (ragchew), and no one has ever sent code so slowly or badly that I would not work them. Please call me when you hear me. If I'm already working someone else, stick around and call me when that contact is finished. I frequently operate 4 to 6 hours continuously.

On-The-Air Code Practice

The October and November 1980 Novice columns provide information about code transmissions that can be copied to help increase code reception proficiency. Additional information on this subject is trickling in, and it will be printed in future columns after it has been confirmed.

Army radio station WAR is located at Fort Detrick in Frederick, Maryland. They advise that they transmit a weekly message from the Chief of the Army Military Affiliate Radio System (MARS) to all MARS members and worldwide stations. This message is sent at 0130 and 0430 UTC Tuesday (Monday evening, local time) on 3348.5, 5217, 6998.5, and 14403.5 kiloHertz at 25, 20, and 15 words per minute (wpm). Following the code transmissions, the message is transmitted twice by radio teletype at 60 wpm. The first radioteletype transmission employs 850 Hertz spacing between the mark and space signals. The second radioteletype transmission uses 170 Hertz shift between mark and space frequencies. These WAR transmissions occur at the same local time throughout the year. In other words, they start at 0030 and 0330 UTC when daylight savings time is in effect. The antennas for 3347 and 5217 kiloHertz were not operable when this item was written, so it may be necessary to listen on 6997.5 or 14405 kiloHertz or WAR. AN/FRT-52A transmitters are used to simultaneously transmit these messages at 10,000 watts output on each frequency. You will have ample time to tune in WAR before these transmissions. VVV VVV VVV DE WAR WAR WAR is sent at 15 wpm for about 30 minutes before the scheduled message begins.

Ron Martin, W6ZF, advises that he transmits the West Coast Bulletin simultaneously on 3540, 7040, and 14040 kiloHertz at 0400 UTC on the first and third Mondays of each month. These 22 wpm transmissions are another excellent code practice source.

U.S. Navy stations transmit code practice on 5870, 8090, 12135, 16180, 20225, and 25590 kiloHertz. These simultaneous code transmissions are quite regular, but occasional heavy traffic loads can cause them to not be sent by any of the several participating stations. The times and speeds of these code practice transmissions are as follows:

Time (UTC)	Speed (wpm)
0000–0030	5
0115–0200	8
0400–0500	11
0600–0630	14
0715–0800	18
1200–1230	22

Coordinated Universal Time (UTC) is the same time that is often called Greenwich Mean Time (GMT), Greenwich Civil Time (GCT), Zebra Time, or Zulu (Z) Time. If you live in the Eastern time zone, UTC is 4 hours ahead of your local time when you are on daylight savings time (EDT/EDST), and it is 5 hours ahead when standard time (EST) is being used. Similarly, UTC is 5 and 6 hours ahead of CDT/CDST and CST, respectively. UTC is 6 and 7 hours ahead of MDT/MDST and MST, respectively. UTC is 7 and 8 hours ahead of PDT/PDST and PST, respectively. If you live in the Eastern time zone and you want to know when to listen for a code transmission scheduled at 2300 UTC, you would listen at 1900 (7 p.m.) EDST or 1800 (6 p.m.) EST. It is a good idea to leave a clock set to UTC in your shack; 24-hour digital clocks are excellent for this use.

This is Bill Acito, Jr., KA2EPS, of Auburn, New York. He was licensed as a Novice 6 March 1979 and he upgraded to General 16 January 1980. While operating as a Novice, Bill had 412 conacts with American amateurs and 26 DX (foreign) contacts. He is a 16-year-old Junior in high school. His station includes a Ten-Tec Omni-A transceiver used with a 10 meter vertical antenna and dipoles for 15, 20, and 40 meters. Bill is a member of a local radio club and a marching band. He advises new amateurs to operate as much as possible to increase code proficiency and to enjoy amateur radio.

Amateur Radio Frequency Segments (Bands)

The amateur service has exclusive or shared use of 64,506,750,000 Hertz of frequency between 1.8 megaHertz and 250 GigaHertz, plus frequencies above 275 GigaHertz. The following list shows these frequency segment limits and widths.

Segment Limits	Width (MHz)
1800–2000 kHz	0.2
3500–4000 kHz	0.5
7000–7300 kHz	0.3
10,000–10,150 kHz	0.05 (A)
14,000–14,350 kHz	0.35
18,068–18,168 kHz	0.1 (B)
21,000–21,450 kHz	0.45
24,890–24,990 kHz	0.1 (B)
28,000–29,700 kHz	1.7
50–54 MHz	4
144–148 MHz	4
220–225 MHz	5
420–450 MHz	30
1215–1300 MHz	85
2300–2450 MHz	150
3300–3500 MHz	200
5650–5925 MHz	275
10,000–10,500 MHz	500
24,000–24,250 MHz	250
48–50 GHz	2000
71–84 GHz	13000
152–170 GHz	18000
200–220 GHz	20000
240–250 GHz	10000
275 and above	(infinite)

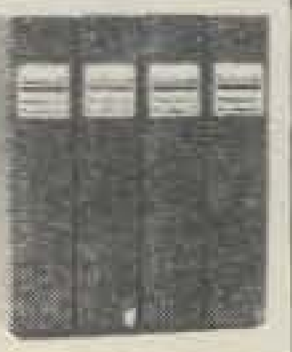
(A) *Expected to become available starting 1 January 1982.*

(B) *Expected to become available starting sometime between July 1984 and July 1989.*

With the addition of the 10, 18, and 24 megaHertz frequency segments, amateurs will enjoy use of 3.55 MHz of frequency in the crowded 3 to 30 MHz high frequency (h.f.) band. This amounts to more than 13 percent of the entire h.f. spectrum.

Wrap-Up

Notice that the following list of amateurs recently contacted is intentionally restricted to just females. It is nice to find that amateur radio continues to attract more females all the time. Checking my log disclosed that



Dave Shakley, KA8JRC, of Sawyer Air Force Base, Michigan, is a Captain in our U.S. Air Force and he flies on B-52 bombers as an Electronic Warfare Officer. He was first licensed in 1968 as WN8AOI, and he was surprised by all the Novice changes when he recently became licensed again as a Novice. No more one year license term (now 5 years and renewable), crystal control (VFO now optional), or 75 watt limitation (now 250 watts maximum). Dave was most favorably impressed with the superior equipment that is now available to beginning amateurs. His station includes a Ten-Tec Century 21 transceiver and a random wire antenna used with a tuner. He operates all Novice bands but has had his best results on 15 meters. Guillermo Schwarz, KP4DDB, and Jim Newman, KA8BGB, got Dave interested again in amateur radio, and Rick Swain, K8AIT, helped him get started on the air as a Novice retread. Dave has his code speed proficiency up past the 13 wpm requirement for the General license, and he will probably have upgraded by the time this picture is printed. He obtained the last 36 issues of CQ *to help him in his self-study program. He studies and operates while on alert.*

48 of my 634 Novice band contacts last month were with female amateurs. That is an encouraging sign, but the percentage should be about 50 percent instead of 7.6 percent.

Shirley, KA1EWT, Easton, Mass.; Debbie, KA2HJO, W. Webster, N.Y.; Eleanor, KA3DXR, Bristol, Penn.; Cynthia, WD4EUV, Midlothian, Virginia; Linda, KA5FBG, Norman, Oklahoma; Elizabeth, KA6BPR, Benicia, Calif.; Mary, KA7HDE, Tacoma, Washington; Dorothy, WB8YHT, Lima, Ohio; Linda, KA9CHM, Sextonville, Wisconsin; Kathaleen, KAØIQM, Aurora, Colorado.

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

73, Bill, W6DDB

Here's some plain speaking, non-formularized aspects of antenna life as seen through the eyes of W0AGD. John Magnusson of Telex/Hy-Gain eases us into the antenna season with some very sound and easy to understand advice.

Improving Antenna Performance

BY JOHN E. MAGNUSSON*, W0AGD

It is about that time of year again to take a look at the antenna system to see how well it weathered the winter. It's also a good time to get rid of some of the problems that were revealed during the past season's operating activity. This will be especially true if you were lucky enough to find a new v.s.w.r. bridge under the Christmas tree and made a few simple measurements since then. Inspection might indicate why the antenna isn't doing too well or perhaps any better than the reports you've been receiving confirm.

Whether you build your own antenna from scratch, using the *Handbook*, or assemble a commercially designed antenna; the overall performance *can be easily improved upon*. It will, however, require an established procedure to follow and some accurate documentation to determine where to start and which direction to go in to make the indicated improvements.

Very often the dimensions obtained by your own calculations, or those furnished with a commercial product, are influenced to a great extent by the variables that appear at each installation site. These effects on the antenna must be compensated for by minor changes in the original dimensions. Unfortunately, the state-of-the-art is not at the level at which you can buy a 50 ohm 1000 watt antenna, just as you can buy a power resistor or a similar component. Every antenna installation is influenced by one or more of the following conditions, and these must be taken into consideration:

*5329 Gladstone St., Lincoln, NE 68504

A. The physical height of the antenna.
B. The soil conditions below the antenna.
C. The type of support structure used.
D. The proximity effect of nearby objects.
E. The quality of feedline, balun.

The height above ground is not necessarily the number of feet from the antenna top to the earth below. Soil conditions, water tables, and soil conductivity determine the true height of any antenna. This explains the different loading characteristics experienced with amateur equipment between dry and wet seasons. These variations can be eliminated to a large degree by installing a ground radial system below the antenna, whether it is a beam or a dipole.

The support structure used to install a beam or support a dipole will have a measurable effect on the overall antenna performance. This is more noticeable with guyed towers than with self-supporting towers. To eliminate the pyramid effect of the guys extending from the ground anchors to the top of the tower, strain insulators should be installed to "break" the guys. After the guys have been broken by strain insulators into non-resonant lengths, each guy section should be checked with a neon indicator to determine if there is any r.f. energy absorption.

Finally, there is the proximity effect of nearby objects over which you have little or no control. If you're fortunate enough to live on an acre or so and have a large clear area available for the installation of a self-supporting tower and antenna, or a vertical antenna with adequate ground plane, proximity effect is reduced to a minimum, unless, of course, you install so many antennas that it looks like an aluminum orchard, and the proximity effect of one antenna affects the other.

A house with an abundance of electrical wiring, conduit, plumbing, vents and duct work, and siding, will have a noticeable detuning effect on a ground mounted vertical antenna installed near the house or a beam antenna mounted near the roof on a short roof mount.

Most of us are not fortunate enough to have an unlimited amount of real estate. Therefore, prior to installing any antenna some consideration must be made as to the proximity effect of the house, trees, power lines, fences, or whatever else exists within the primary field of the antenna. In the case of ground mounted vertical antennas, whenever possible, the distance from the vertical to the nearest object should be ¼ wavelength at the lowest frequency. By the same token, a beam antenna should not be installed less than ½ wavelength above ground at the lowest operating frequency. Contrary to what you may have read in the past, when installing more than one antenna on a common mast, a minimum separation of 10 feet should be provided between each antenna. Ideally, the electrically largest antenna should be at the greatest height.

Let's consider only two antennas on a common mast as an example. If you have a 4 element full sized 20 meter beam, and a 6 element 10 meter beam,

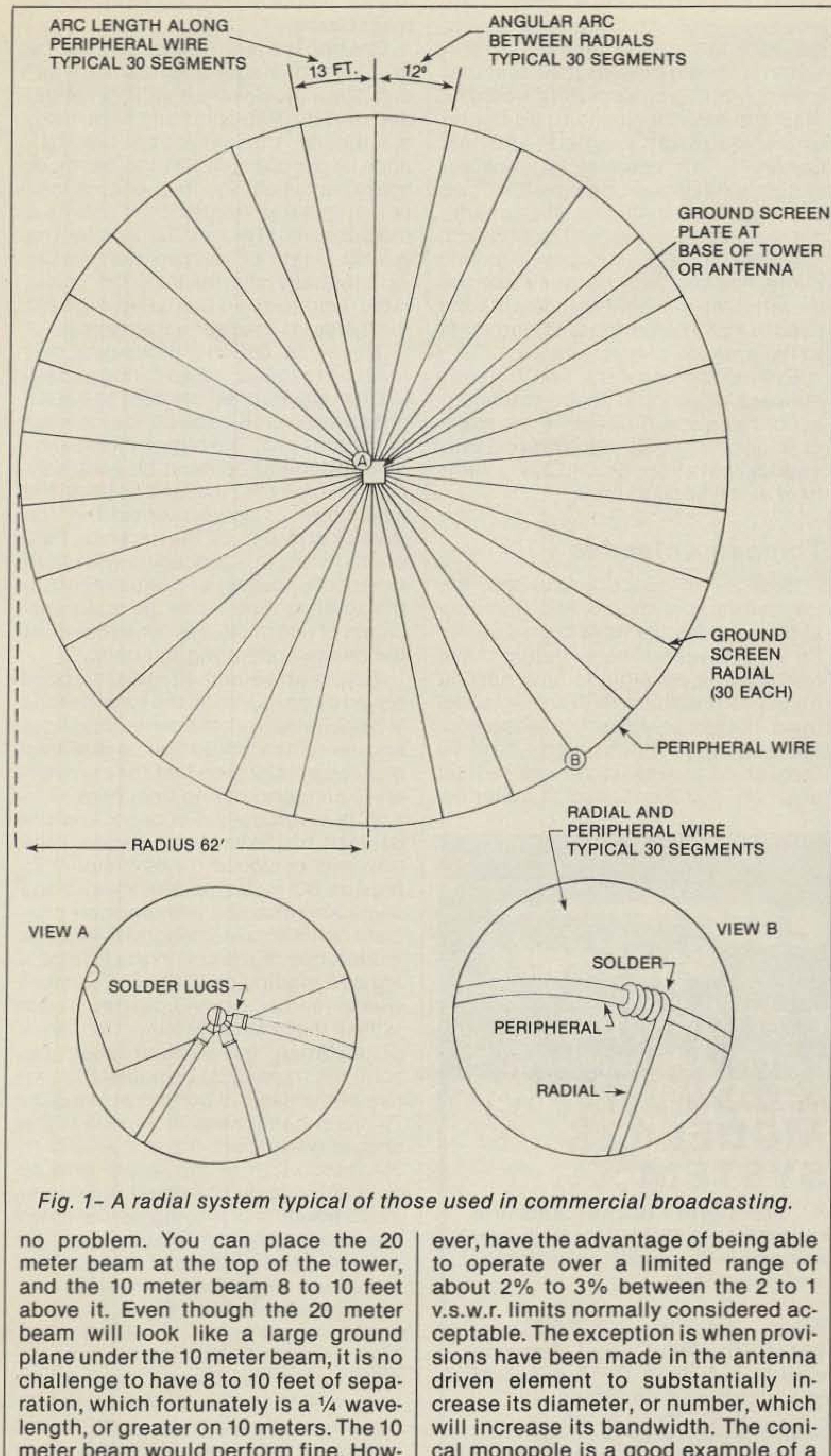


Fig. 1– A radial system typical of those used in commercial broadcasting.

no problem. You can place the 20 meter beam at the top of the tower, and the 10 meter beam 8 to 10 feet above it. Even though the 20 meter beam will look like a large ground plane under the 10 meter beam, it is no challenge to have 8 to 10 feet of separation, which fortunately is a ¼ wavelength, or greater on 10 meters. The 10 meter beam would perform fine. However, what if you had a 40 meter beam and 10 feet above it the 20 meter beam? This would be almost the same as installing the 20 meter beam on a clothesline pole.

Antenna Bandwidth

Every monoband antenna is actually a one frequency device. We do, however, have the advantage of being able to operate over a limited range of about 2% to 3% between the 2 to 1 v.s.w.r. limits normally considered acceptable. The exception is when provisions have been made in the antenna driven element to substantially increase its diameter, or number, which will increase its bandwidth. The conical monopole is a good example of a broad-band radiator. The basic conical monopole will provide a four octave bandwidth, or 4:1 frequency range, because of the ratio of its diameter to overall length. The discone antenna is another example of the same technique used to provide broad-band operation. Table I has been prepared for your convenience in making v.s.w.r. measurements and is based on 2% of the operating frequency. (It has been my experience that you seldom obtain greater than 2% bandwidth between the 2:1 limits.) As all of the amateur bands are harmonically related to each other, it would be normal to expect twice the bandwidth on a 40 meter antenna as compared to an 80 or 75 meter antenna, and twice the bandwidth on 20 meters as compared to a 40 meter antenna. A great deal is being done to make a good broadband h.f. amateur antenna for each band, including some work started at Collins Radio Company over 20 years ago. Presently you will find multiple driven elements and log-yagi's, to mention a few. We can look for additional work to become evident as the demand for greater bandwidth and the freedom to operate in both the c.w. and phone portions of the bands is increased by the end users.

Vertical Antennas

The vertical antenna is technically a monopole because it is one-half of a dipole antenna. The monopole works against the automobile body in mobile operation, against ground when it is ground mounted, or against a radial system when roof mounted. The car body, the ground, or the radials make up the other half of the antenna. Therefore, they are an important consideration in obtaining the optimum performance from the vertical. Most verticals will give adequate results working against average ground regardless of the soil conditions. Nevertheless, the efficiency of the antenna can be improved upon by improving the soil conditions.

Soil Conditions

The actual ground conductivity of the soil has been of primary concern to the broadcast industry for decades, since the a.m. broadcast band primarily uses vertically polarized monopole antennas. In addition to soil conductivity measurements, the broadcasting vertical antenna is usually located in a low, wet area whenever possible. This is not because a marsh or swamp is the cheapest piece of real estate available, but rather it is because they're interested in the most efficient ground system that can be provided. In addition to the selection of a good site, a large number of radials are installed at the base of the broadcast vertical antenna to supplement the existing soil conditions. Fig. 1 is an example of a radial system. The reason for the ground plane, or radial system, is to improve the efficiency of the vertical radiator. The efficiency can be easily visualized as follows. If you have a 60% efficient radial system, then it stands to reason that for every 100 watts fed into the feedline for the vertical antenna, 60 watts will reach the radiator itself, and the other 40 watts will be lost in the ground system, accomplishing nothing more than making life miserable for the earth worms. The greater the number of radials installed, the more efficient the ground plane becomes, and subsequently the percentage of power radiated by the vertical radiator increases. The optimum ground plane would have a total of 120 radials, or one radial every three degrees around the base of the antenna. This is impractical or impossible for most installations. However, it helps point out the importance of the radial system for a vertical antenna, and may help explain the common evaluation of the vertical antenna, which says: "A vertical antenna is one that operates equally as poorly in all directions at the same time."

To give additional credibility to this long-established comment, take a look at the actual soil conductivity measurements throughout the continental United States. The soil conductivity throughout the United States varies from a low of 0.5 millimhos to a maximum of 30 millimhos. That in itself is a 60:1 variation, and would tend to confirm the first impression that amateurs in some parts of the country are really fortunate to be located on top of a 30 millimhos soil condition. However, when you compare that to the 5000 millimhos reading of salt water, it should be easy to accept that a good radial ground system would be time and effort well spent, no matter where you install a vertical antenna. Generally, all commercial amateur verticals have been designed to give acceptable performance when operating against existing soil conditions. The installation of a substantial ground plane, however, will certainly improve its efficiency, even if it indicates the need to make some minor adjustments to the antenna dimensions.

Even in the case of a horizontal dipole or a directional beam antenna, a set of radials at the base of the tower or under the dipole will assure a constant height above ground over a variety of weather conditions.

Trapped Antennas

Because of space limitations, the trapped vertical, dipole, and directional beam antennas have been popular for over 20 years. The evolution of the trap made it possible to have several bands of operation with a single element. In the case of vertical antennas, the trap made it possible to have 80 through 10 meters in a single vertical antenna, and 20, 15, and 10 meter operation with a single two or three element beam.

The trap is a relatively simple device in theory. It is a parallel resonant circuit that provides an infinite impedance at the trap operating frequency, electrically disconnecting the balance of the element. On the bands of operation where the frequency is lower than the trap frequency, it acts as a loading coil. This explains why the overall length of trapped elements is substantially shorter than the calculated length of an unloaded element for the same operating frequency.

There's a definite procedure that must be followed in measuring and adjusting any trapped element to obtain proper operation on all bands inherent to the antenna. The highest frequency band of operation must be established first, then the next, and so on all the way down to lowest operating frequency provided by the antenna. Failure to follow this procedure will result in a lot of unnecessary adjustments to the antenna later on as the additional bands of operation are "fine-tuned" at the desired operating frequency.

Taking an 80 and 40 meter trapped dipole as an example, the length of the element wire from the center insulator and feedline connection to the trap must be established first for the desired 40 meter operating frequency. (The trap is electrically disconnecting the balance of the element because the trap was designed for 40 meters.) To provide 80 meter operation with the same antenna, the element now consists of the 40 meter length of wire, the inductance of the coil in the trap (acting as a loading coil), and the element wire extending beyond the trap. To establish the desired 80 meter frequency of operation, the element length beyond the traps must be adjusted to arrive at the desired portion of the 80 or 75 meter band. Keep in mind that you should not expect more than 2% to 3% bandwidth in the single wire dipole antenna, which doesn't give you much freedom in moving up and down the band as seen in Table I.

In an all-band trapped vertical, the distance from the base to the first trap must be adjusted initially to establish proper operation on 10 meters. Next the distance between the first trap (10 meters) and the second trap (15 meters) would be adjusted to establish 15 meter operation, followed by the same procedure for 20, 40, and finally 80 or 75 meters. Ignoring the 10 and 15 meter performance of the antenna and establishing the overall length of the vertical radiator for optimum performance on 80 or 75 meters is a waste of time. Any dimensional change made between the base and the first trap at a later date will automatically change the overall length of the entire radia-

Table I

80 and 75 Meters

3.6 MHz × 2% = 72 kHz
3.7 MHz × 2% = 74 kHz
3.8 MHz × 2% = 76 kHz
3.9 MHz × 2% = 78 kHz

40 Meters

7.0 MHz × 2% = 140 kHz
7.1 MHz × 2% = 142 kHz
7.2 MHz × 2% = 144 kHz
7.3 MHz × 2% = 146 kHz

20 Meters

14.1 MHz × 2% = 282 kHz
14.2 MHz × 2% = 284 kHz
14.3 MHz × 2% = 286 kHz

15 Meters

21.1 MHz × 2% = 422 kHz
21.2 MHz × 2% = 424 kHz
21.3 MHz × 2% = 426 kHz
21.4 MHz × 2% = 428 kHz

10 Meters

28.2 MHz × 2% = 564 kHz
28.4 MHz × 2% = 568 kHz
28.6 MHz × 2% = 572 kHz
28.8 MHz × 2% = 576 kHz
29.0 MHz × 2% = 580 kHz
29.2 MHz × 2% = 584 kHz
29.4 MHz × 2% = 588 kHz
29.6 MHz × 2% = 592 kHz

6 Meters

52.0 MHz × 2% = 1.04 MHz

2 Meters

146 MHz × 2% = 2.92 MHz

Table I– Bandwidth based on 2% of operating frequency.

tor, thereby influencing *all* bands of operation. The same is also true of a trapped beam antenna element, as it too must be set up for 10 meter operation first, followed by 15 meter operation, and finally the extension beyond the traps to obtain the desired 20 meter operating frequency. As outlined earlier, no two installations are the same because of all of the factors that influence the operation of the antenna. The dimensions that you obtain either by your own calculations, or that are provided in the assembly instructions, *basically only get you into the ball park*. To arrive at the desired center operating frequency on each band of operation requires you to "fine-tune" the antenna as indicated by additional measurements using a v.s.w.r. bridge. Increasing or decreasing the original dimensions to compensate for the installation site will adjust the antenna to the desired operating frequency on each band and give you the best performance possible.

A dipole antenna is basically a series resonant circuit made up of the inductance of the antenna element and the capacitance from the element to ground. The impedance of the dipole is a function of height above ground and may vary from a few ohms to a value in excess of 100 ohms. Very few 80 meter dipoles are actually 72 ohms, as most of the 80 meter antennas are seldom over 35 to 40 feet off the ground. Therefore, the input impedance would be closer to 50 ohms than 72 ohms.

With the exception of the vertical antenna, which is fed against ground, the feedpoint of the dipole or directional antenna should be fed with a balanced voltage unless provisions have been made in the antenna to allow the driven element to be fed with an unbalanced voltage. With the invention of the pi-network, the pi-L section, unbalanced coaxial feedline, coaxial rotary joints, low-pass filters and co-axial relays, the use of an r.f. coil made from coax cable, or a balun, is needed to transform the unbalanced voltage of the equipment output to the balanced voltage of the antenna element.

The V.S.W.R. Measurement

The v.s.w.r. bridge is one of the most useful accessories you can possess. It allows you to determine which direction any antenna should be adjusted in to have the minimum v.s.w.r. on the portion of the band where you need optimum performance. Three simple measurements, even though they are made at the equipment end of the coaxial cable, will indicate whether or not the antenna favors a frequency lower or a frequency higher than the desired operating point. From this information it's a simple matter of making a small adjustment in the overall length of the element to move the minimum v.s.w.r. to the center of the desired operating range. The only word of caution is that any v.s.w.r. measuring device, regardless of the initial cost, is only as accurate as the isolation provided in the unit between the reflected and forward power readings. Getting overly concerned about a 2:1 v.s.w.r. reading is not a legitimate reason for alarm. A 2:1 v.s.w.r. measurement represents a loss of 0.38 dB when using 100 feet of coax at 30 MHz, and the loss is less at lower frequencies. Big deal! It takes almost 10 times that amount of loss to detect a noticeable change in the signal at the other end of the contact. However, some of the newer solid state equipment on the market today will not handle a mismatch in excess of 2.5:1, and *does* require reduction of the v.s.w.r. below 2:1 as terminated at the equipment.

Granted, you can install a line flattener, antenna tuner, or similar device at the equipment end of the coaxial cable. While this doesn't accomplish anything to improve the performance of the antenna, it does satisfy the requirements of some equipment and psychologically satisfies one's desire to have a low v.s.w.r. meter reading. The same is true of attempts to cut the length of the coax cable so as to use the transformation effect of the cable itself to match the impedance of the antenna to the equipment. The subject of coaxial cables is a complete article in itself.

In most cases, the newly installed antenna can be measured and a v.s.w.r. curve established by making three measurements at the equipment end of the cable. After all, you are only interested in knowing if the antenna favors the low end or the high end of the band. There's no need to concern yourself with the design engineers approach whereby the antenna is measured through a ½ wave line section and rotated back to the input terminals using a Smith Chart. This cannot be done with a v.s.w.r. bridge or equipment commonly available to a majority of amateurs. Now let's get onto the business of finding out what the installation looks like.

Initial Measurements Of Your Antenna

In the comfort of your own shack using Table I make a measurement with your v.s.w.r. bridge at the desired operating frequency, another measurement 2% lower in frequency, and a final measurement 2% higher in frequency. From these three measurements you will determine if the original dimension must be *lengthened to lower* the frequency of the antenna, or if it must be *shortened to raise* the frequency of the antenna.

On a 20-15 or 10 meter antenna shorten or lengthen the element one inch and make another set of v.s.w.r. measurements to see how many kHz a one-inch change represents for your particular installation.

1. On a beam, which is a half-wave element, this would be one inch on both halves of the driven element.
2. On a vertical, which is a quarter-wave element, it would be one inch on the dimension outlined.

After you have determined the amount of change the initial adjustment provided, another change in the same dimensions should put you on, or very close to, the exact center frequency desired.

Example: The antenna appears to be resonant 350 kHz lower than desired. A one-inch dimensional change caused a 150 kHz change in the resonant frequency within 50 kHz of the desired frequency, close enough for all practical purposes, unless you are willing to make another adjustment.

On an 80 or 40 meter antenna, a one-inch dimensional change isn't going to produce a very noticeable improvement in the antenna. It is too small a percentage of the overall element length to be effective. The dimensional change should be two or three inches, depending upon how far the frequency must be changed. This change will produce a reference as to how many kHz the antenna changed as a function of the adjustment made. From this information it is possible to make the next adjustment and obtain the desired center operating frequency.

If your v.s.w.r. bridge must be set to a calibration point in the forward position before reading the v.s.w.r., the bridge should be recalibrated prior to each measurement, even if the measurements are only 100 kHz to 200 kHz apart. If you do not recalibrate the v.s.w.r. bridge each time, you destroy the accuracy you are attempting to maintain between each measurement.

Another consideration is the useful frequency range of the v.s.w.r. bridge itself. If it was designed for h.f. only, 3 to 30 MHz, it cannot be used to determine how well a 6 or 2 meter antenna is matched to the feedline. The marketplace has an abundance of v.s.w.r. bridges for 27 MHz; however, some of these may be inadequate at 3 to 14 MHz.

No attempt has been made to express theoretical or mathematical calculations regarding an antenna. Basically it's the application of the simplest approach to the improvement of an antenna system by the use of an inexpensive accessory and measurements that can be made in the comfort of the ham shack. This approach, plus a minimum amount of documentation as to the progress being made with each dimensional change, makes it possible to obtain the maximum performance from any antenna installation. It is time well spent. It is also a far less expensive approach to improving the entire system as compared to a substantial investment in additional power to compensate for the inefficiency of the existing antenna installation. ▣

MFJ GRANDMASTER MEMORY KEYERS

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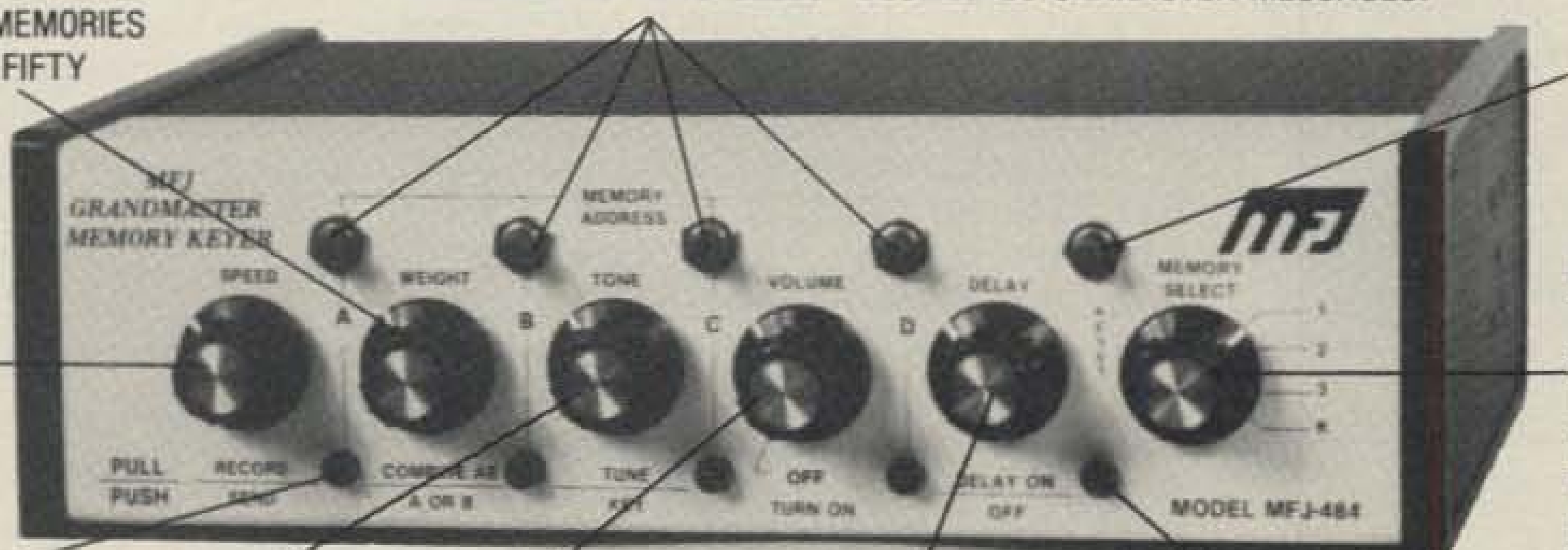
So easy to use you can probably use all its features without reading the instruction manual. Has all the features you'll ever need.

WEIGHT CONTROL TO PENETRATE QRM. **PULL** TO COMBINE MEMORIES A AND B FOR 1, 2, OR 3 FIFTY CHARACTER MESSAGES.

MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.

RESETS MEMORY IN USE TO BEGINNING.



SPEED CONTROL, 8 TO 50 WPM. **PULL** TO RECORD.

MEMORY SELECT: POSITIONS 1, 2, 3 ARE EACH SPLIT INTO MEMORY SECTIONS A, B, C, D (UP TO TWELVE 25 CHARACTER MESSAGES). SWITCH COMBINES A AND B. **POSITION K** GIVES YOU 100, 75, 50, OR 25 CHARACTERS BY PRESSING BUTTONS A, B, C, OR D.

LEDs (4) SHOW WHICH MEMORY IS IN USE AND WHEN IT ENDS.

TONE CONTROL. PULL TO TUNE.

VOLUME CONTROL. POWER ON-OFF.

DELAY REPEAT CONTROL (0 TO 2 MINUTES). **PULL** FOR AUTO REPEAT.

LED INDICATES DELAY REPEAT MODE.

MFJ Grandmaster series memory keyers make sending perfect CW almost effortless.

They are so easy to use that you can probably utilize all its many features without reading the instruction manual.

Controls are logically positioned and clearly labeled. Pots are used for speed, volume, tone and weight because they are human oriented and remember your settings with power off.

Up to twelve 25 character messages plus a 100, 75, 50, or 25 character message (4096 bits total).

A switch combines 25 character messages for up to three 50 character messages.

To record, pull out the speed control, touch a message button and send. **To playback,** push in the speed control, select your message and touch the button. That's it!

You can repeat any message continuously and even leave a pause between repeats (up to 2 minutes). **Example:** Call CQ. Pause. Listen. If no answer, it repeats CQ again. To answer simply start sending. LED indicates Delay Repeat Mode.

Instantly insert or make changes in any playing message by simply sending. Continue by touching another button.

Memory resets to beginning with button, or by tapping paddle when playing. Touching message button restarts message.

LEDs show which 25 character memory is in use and when it ends.

Built-in memory saver. Uses 9 volt battery, no drain when power is on. Saves messages in memory when power loss occurs or when transporting keyer. Ultra compact, 8x2x6 inches. All IC's in sockets.

PLUS A MFJ DELUXE FULL FEATURE KEYER.

Iambic operation with squeeze key. Dot-dash insertion.

Dot-dash memories, self-completing dots and dashes, jamproof spacing, instant start (except when recording).

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Weight control lets you adjust dot-dash-space ratio; makes your signal distinctive to penetrate QRM.

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MFJ-482 "Grandmaster"

MFJ-482 $99.95 (+$4)

Store four 25 character messages or a 50 and two 25 char. messages in 1024 bits of memory.

Repeat function repeats messages. Memory resets with button or paddle. Memory LED.

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Weight control for QRM penetration. Tone control for pitch. Speaker. All ICs in sockets.

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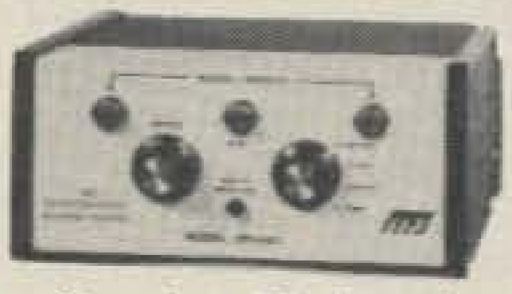
MFJ-481 "Grandmaster"



MFJ-481 $89.95 (+$4)

Store two 50 character messages.

Repeat function lets you repeat any message continuously. LED indicates when memory is in use. Resets with button or paddle.

Tune function keys transmitter for tuning.

Linear speed control on front panel. 8 to 50 WPM. Volume control adjustable from rear panel. Internal tone control. Speaker.

Memory saver saves messages in memory when power is lost. Uses 9 volt battery. Reliable solid state keying. 5x2x6 inches. 12 to 15 VDC or 110 VAC with optional AC adapter, $7.95.

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The Bearcat 150

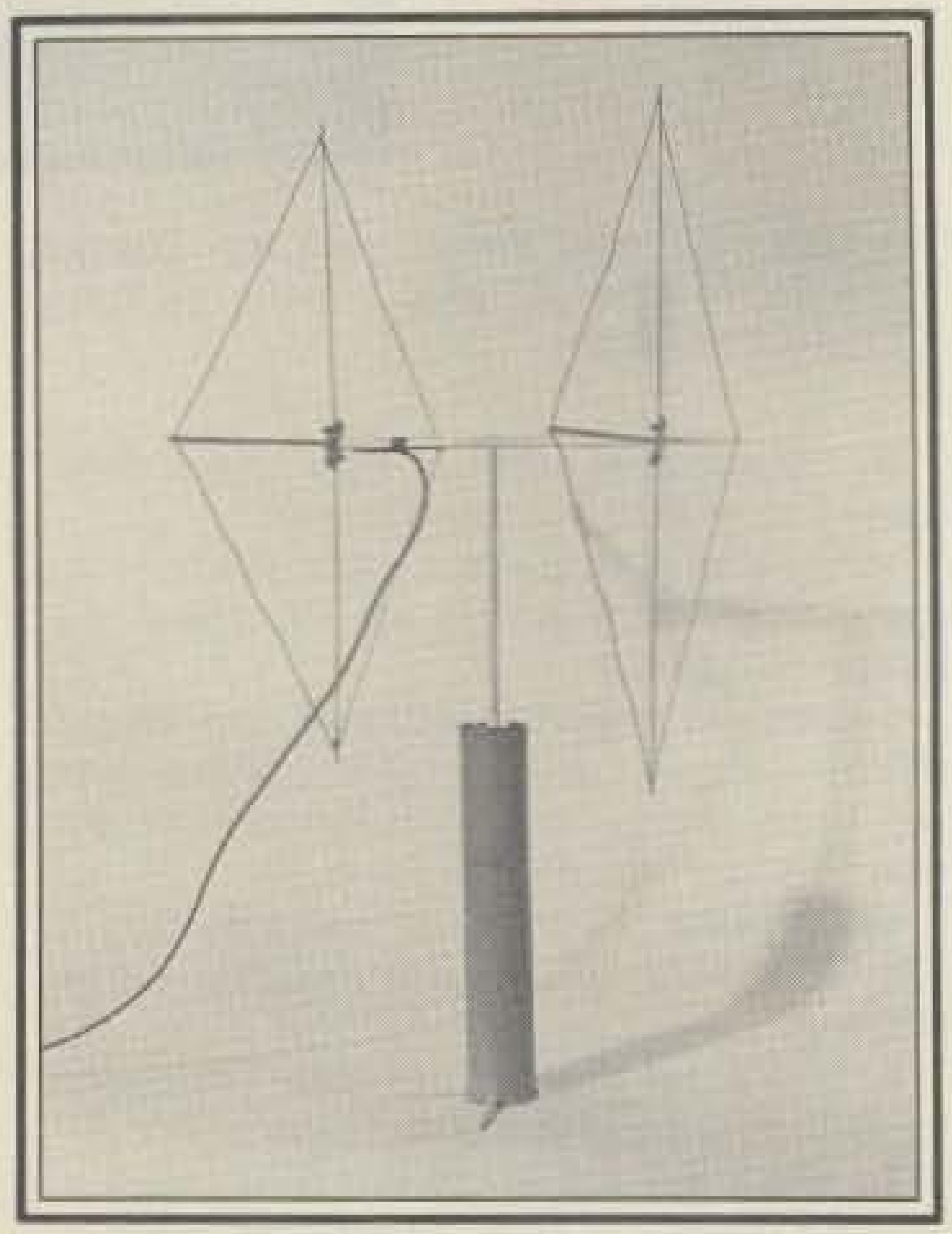
The Bearcat 150, a new scanner, has a suggested retail price of $259.95, the lowest ever for a synthesized scanner from Electra. It has 10 channels and a bright, vacuum fluorescent display that shows the exact frequency being received with digital accuracy. Also featured is a unique one-piece flat-plane panel that controls all functions with fingertip ease. The volume is controlled by simply touching up and down positions on the panel, completely eliminating conventional knobs. Molded, raised key locator positions on the panel are designed for easier operation.

The radio covers 5 bands from 30 to 512 MHz, including low and high band v.h.f., u.h.f., and u.h.f.-"T" land mobile and public safety bands, plus the entire 2-meter and the 440 MHz portion of the 70 cb amateur bands. 10 memory channels provide automatic scanning of those frequencies of most interest. In addition to automatic scanning, direct channel access permits quick recall of any individual channel. The radio also features automatic lockout of any channel when desired and patented selective scan delay. For more information, contact Electra Company, 300 East County Line Rd., Cumberland, IN 46229, or circle number 108 on the reader service coupon.

E&L Instruments BreadBUS Designer

E&L Instruments has announced The Bread*BUS* Designer, a new development concept for the Microcomputer Systems Designer. The Bread*BUS* Designer allows the user quick access to plug in cards while the system is in operation. The Series incorporates several of the most popular microcomputer buses—STD, Multibus™, LSI-11™, and S100. A proprietary mechanical structure allows the user to inspect, wire-wrap, and debug cards without the use of extender cards or cables. A high current, multi-voltage, fully protected power supply is self contained in the unit.

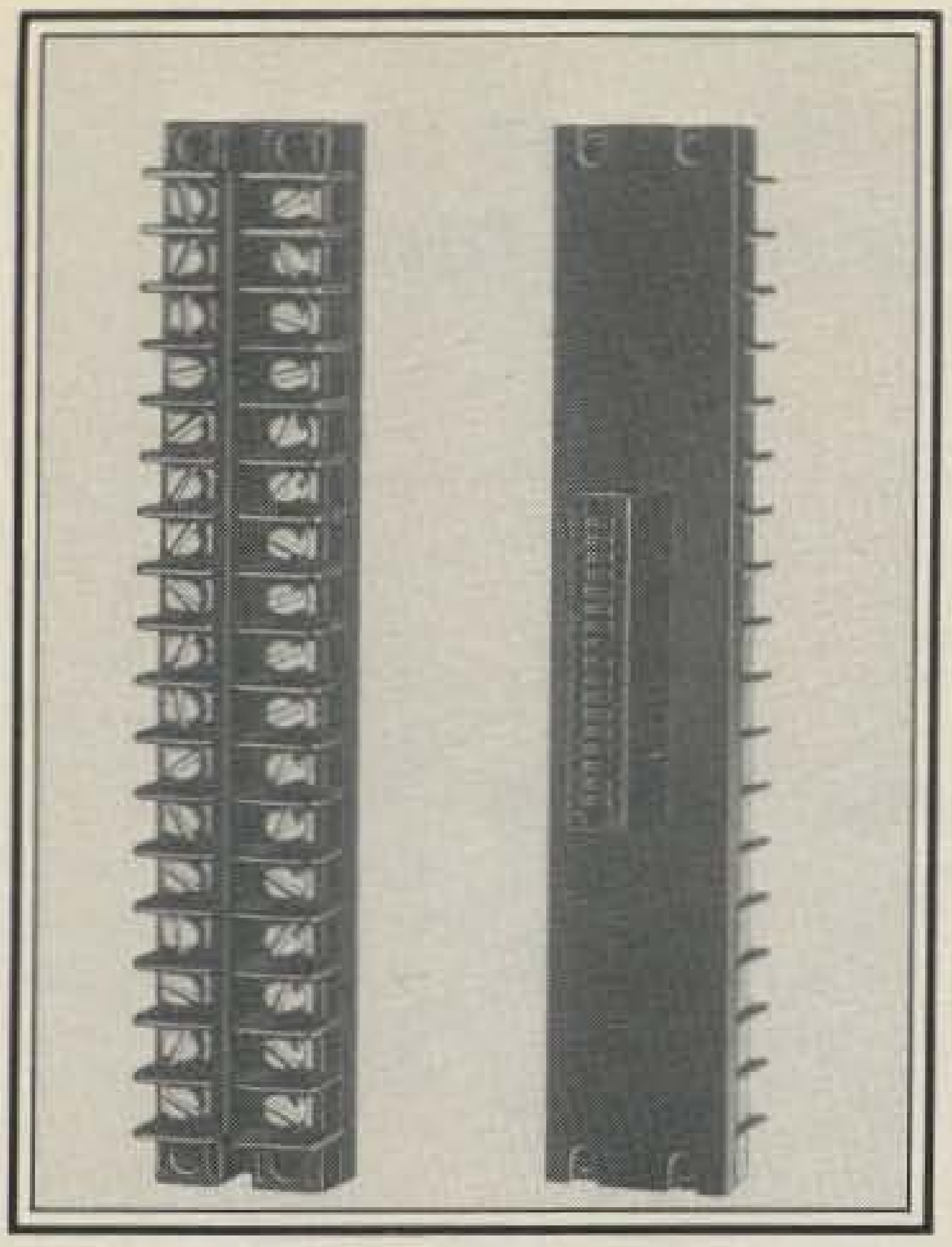
The Bread*BUS* is encased in an attractive metal cabinet providing a stand alone table-top work-station for the system designer, development engineer, or student. For more information, contact E&L Instruments, Inc., 61 First St., Derby, CT 06418, or circle number 105 on the reader service coupon.



Palomar Portable Two Meter Quad

A new collapsible antenna has been introduced by Palomar Engineers. It extends the range of low power two meter transceivers by providing the gain and front-to-back discrimination of a two element quad. For portable applications, it gives the gain of a linear amplifier but does not require additional battery power.

The entire beam assembly is housed in an 18″ carrying case that will fit in a suitcase. For use, it unfolds to form a two element full size quad complete with stabilized mounting stand. The Portable Two Meter Quad sells for $67.50. For more information, contact Palomar Engineers, 1520-G Industrial Avenue, Escondido, CA 92025, or circle number 109 on the reader service coupon.

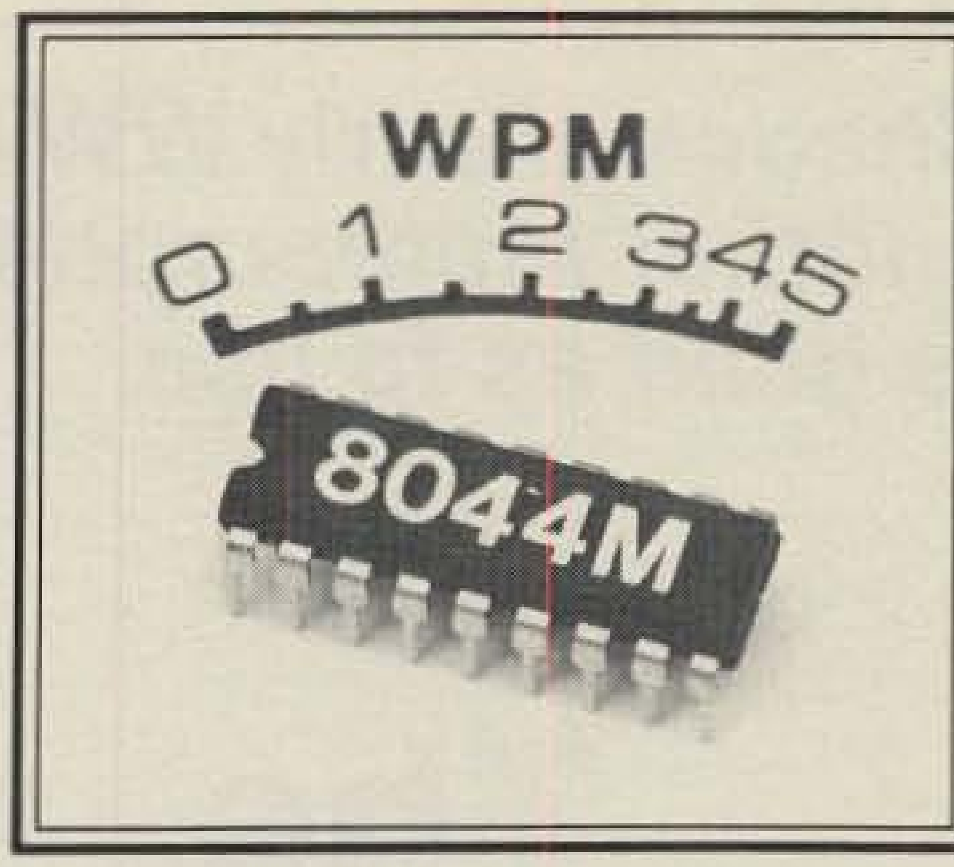


Magnum Mag-Master™ Interface Devices

Two new Mag-Master interface devices have been designed by Magnum Electric Corporation to offer efficient, low cost interconnect of field wiring with electrical and electromechanical circuits, equipment, and systems. Type 10 and Type 12 Mag-Master devices have two rows of terminals strips on one side and an edge card connector on the other side, connected directly through. Mag-Master features a variety of circuits and quickly plugs into mating edge card terminations. Screw terminations are then made easily to any field wiring desired.

Type 10 Mag-Master interface devices offer a choice of 20, 30, 34 and 36 circuits on .100″ × .200″ edge card centers. Screw connections are on .325″ centers. Type 12 Mag-Master devices have 20, 24, 30 or 36 circuits on .156″ × .200″ edge card centers. Screws connections are on .325″centers. Applications include computers and data processing equipment, telecommunications, control systems, instrumentation, alarm systems and similar uses. For more information, contact Magnum Electric Corp., 6385 Dixie Hwy., Erie, MI 48133, or circle number 107 on the reader service coupon.

Curtis Electro Integrated Circuit



The 8044M integrated circuit adds an output designed to drive an analog meter for speed indication. Speed indication from 6 wpm to as high as 100 wpm can be accomplished by adding two capacitors, a resistor, and a 100 uA meter. The meter indication can be calibrated to be well within a 5% tolerance. The addition of two extra pins allows for pin-to-pin fit with the standard 8044. The keyer function of the 8044M remains the same as in the 8044 design providing dot and dash memories, iambic operation, key debouncing, weight control, monitor oscillator, and low power dissipation.

Housed in an 18-pin plastic package, the 8044M is priced at $19.95. For more information, contact Curtis Electro Devices, Inc., Box 4090, Mountain View, CA 94040, or circle number 103 on the reader service coupon.

Shades of early WW II radar antennas. K3WBH brings us another multipurpose antenna that's just as much fun to build as to use.

The Poor Man's Radar

A Signal Seeking And Satellite Tracking Antenna For 432 MHz

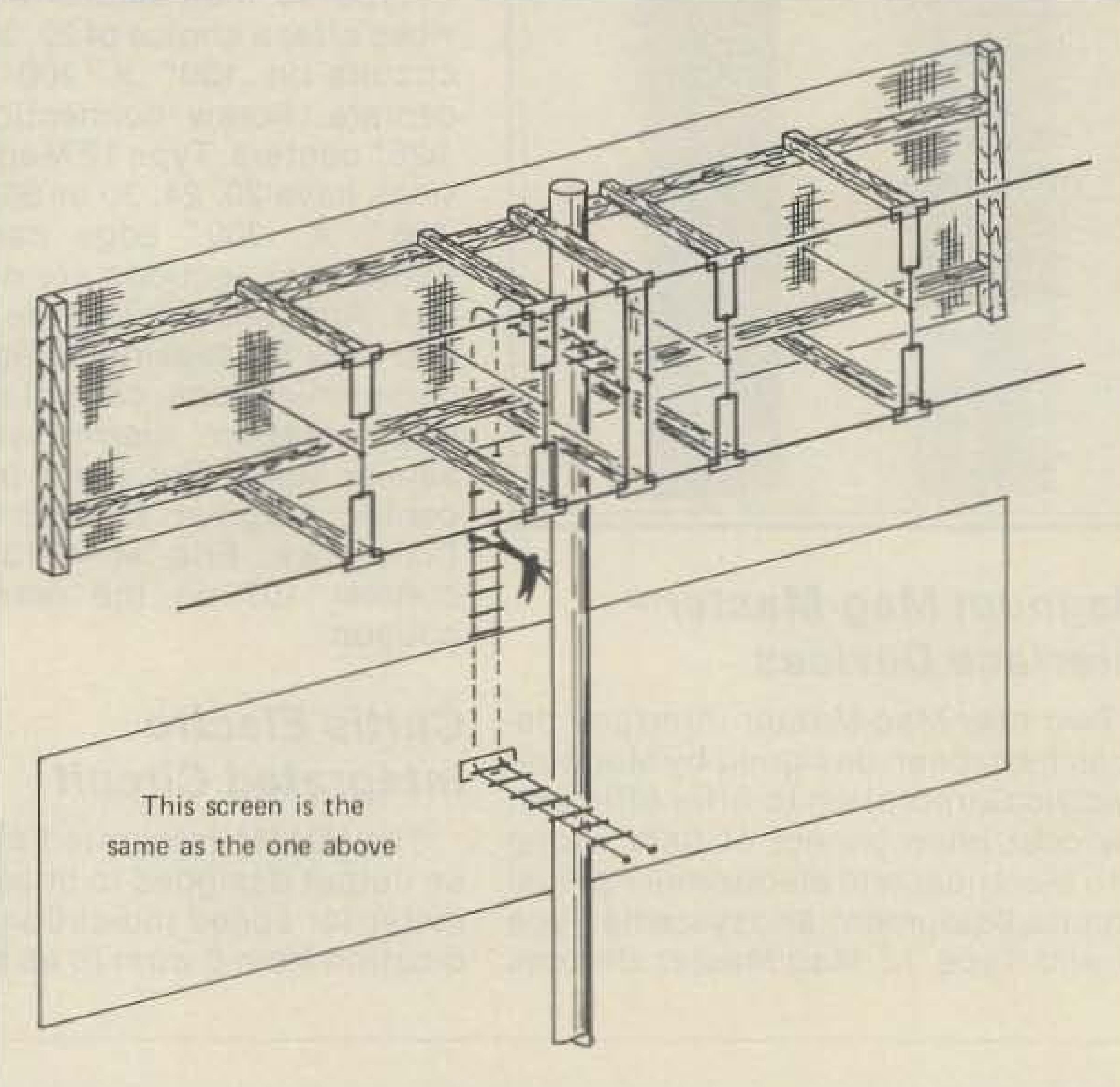


Fig. 1– Overall view of the poor man's radar antenna.

BY T.E. WHITE*, K3WBH

The u.h.f. amateur who wishes to have a multipurpose antenna that will serve equally well for earthly QSOs, space object tracking, storm warning, and OSCAR repeating may be interested in The Poor Man's Radar.

Parabolics are fine if you work for a government agency or government contractor and can beg, borrow, or steal one. However, home construction of one is somewhat difficult for just plain Sam the Ham. A plane reflector backing up a billboard of dipoles is easier, but their feed harnesses may waste more power than they deliver.

A simpler and more efficient solution is to obtain uniform current flow by judicious use of stubs which are physically integral parts of the elements themselves. This system is "self-grounding," providing built-in static drain and lightning protection. Used commercially for years on h.f. bands, there is no reason why it cannot serve well at u.h.f.

The compact array shown in fig. 1, with its provision for changing elevation as well as azimuth as in fig. 6, is worth considering. Construction is straightforward and feeding is "low loss." The capture area of the double curtain is around 470 square feet which translates into about 9 square λ. This measure is more important than any sheer gain figure as, at u.h.f., what counts most is presenting the maximum possible pickup or intercepting "surface" to an advancing wave front.

I wish more antenna manufacturers (and book and magazine editors) would remember ye olde wavelength factor. If a dipole at 6 meters delivers 1 uv of a given signal to a receiver antenna terminal, it takes 9 dipoles at ¾ meter to deliver an equivalent voltage.

This antenna also makes an excellent summer storm-warning "radar." Hook it up to your TV set, select channel 2 (yes, 2), turn it on, wait 30 seconds, turn down the brightness until the picture just goes black, switch to 13, and watch for "spikes." Rotate the antenna for maximum "flash" and you have direction of approaching thunderstorm.

Although "pulsed" transmissions are supposedly illegal by amateurs on ¾ meter, you can, if you can develop a fair amount of power, say 100 watts, key a c.w. character or two with the antenna pointed toward an approaching front or squall line, switch to receive, and watch for a return on a panadaptor hooked to your "hearing aid." Don't laugh . . . it's entirely possible. You don't need a 50 kw magnetron.

Another experiment would be to try some diversity reception on RTTY, siting two of these curtain sets 25λ apart

*36 Lake Ave., Fair Haven, N.J. 07701

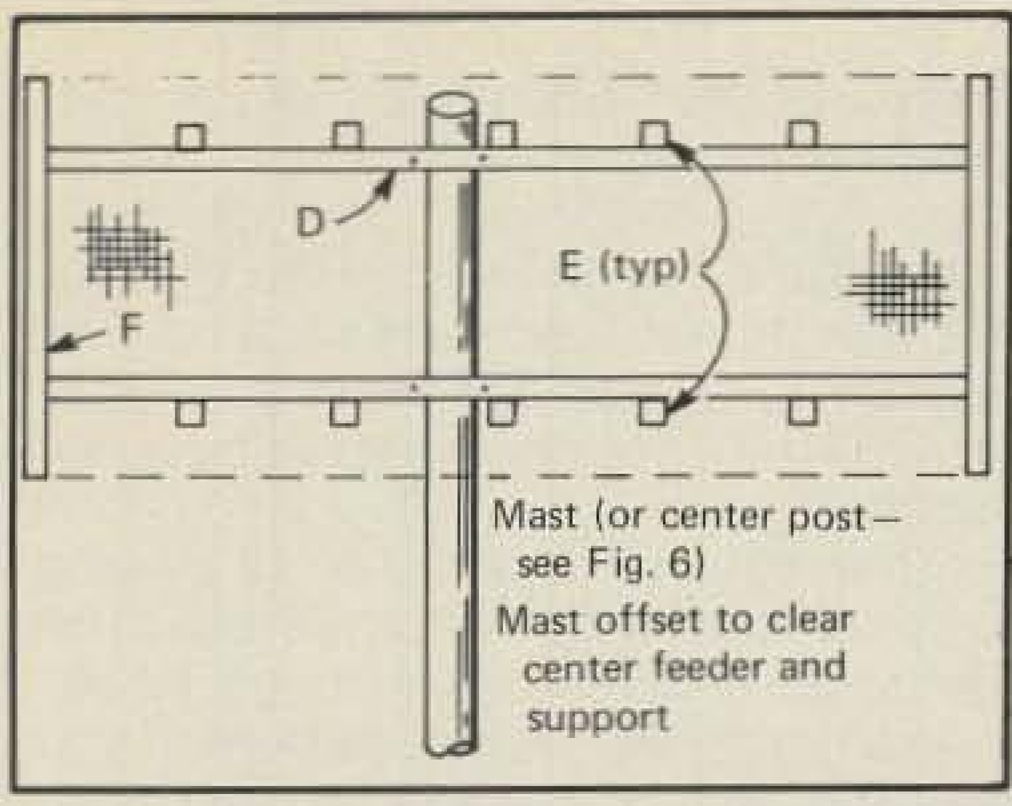


Fig. 2- Assembly of the screen frame and element outriggers (2 required).

(± 60 feet). Or, study Doppler effects from a satellite. Or, orient one beam vertically and another horizontally with switching provisions.

Construction

Two reflectors, of 30-inch wide chicken wire with 1-inch mesh, each 78 inches long, are made up on a wood frame (fig. 2). Two insulated "windows" are provided to pass the feeder branches through the screens. Spacing of elements to screens is 5-5/8 inches. Spacing between screens is 12 inches.

The dipoles and stubs are of 1/8-inch s.h.d. rod, preformed in groups, each containing one ¼- and two ½-wave elements, and two ¼-wave stubs (fig. 4).

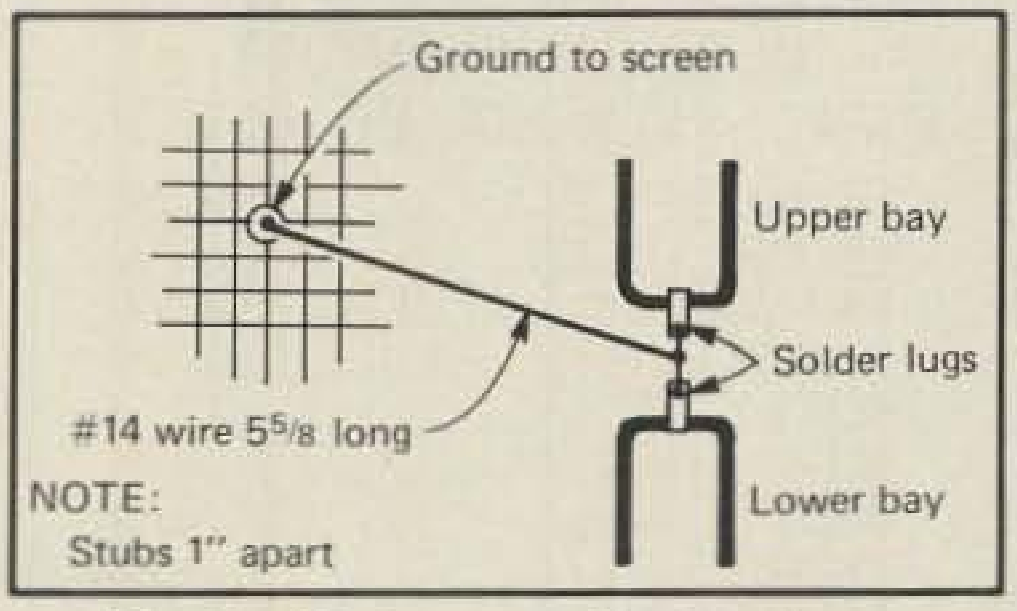


Fig. 5- Stub grounding system.

Key	Part	Lgth. (ins.)	# Req.	Mat'l
A	¼λ sec.	6½	8	⅛" alum. rod
B	stub	7	"	"
C	½λ sec.	13	"	"
D	longeron	76½	4	1 x 1 spruce
E	outrigger	6	20	"
F	end piece	30	4	"

Table I- Physical dimensions for keyed letter designations.

The center of each upper stub is shorted to its mate below by wrapping a solder lug around the rod and running a common wire to the screen, where a nut, bolt, and washer make connection (the galvanizing must be scraped off the screen). (See fig. 5.) All connections are "doped" with a suitable protective spray.

Fig. 6 shows a means of adjusting

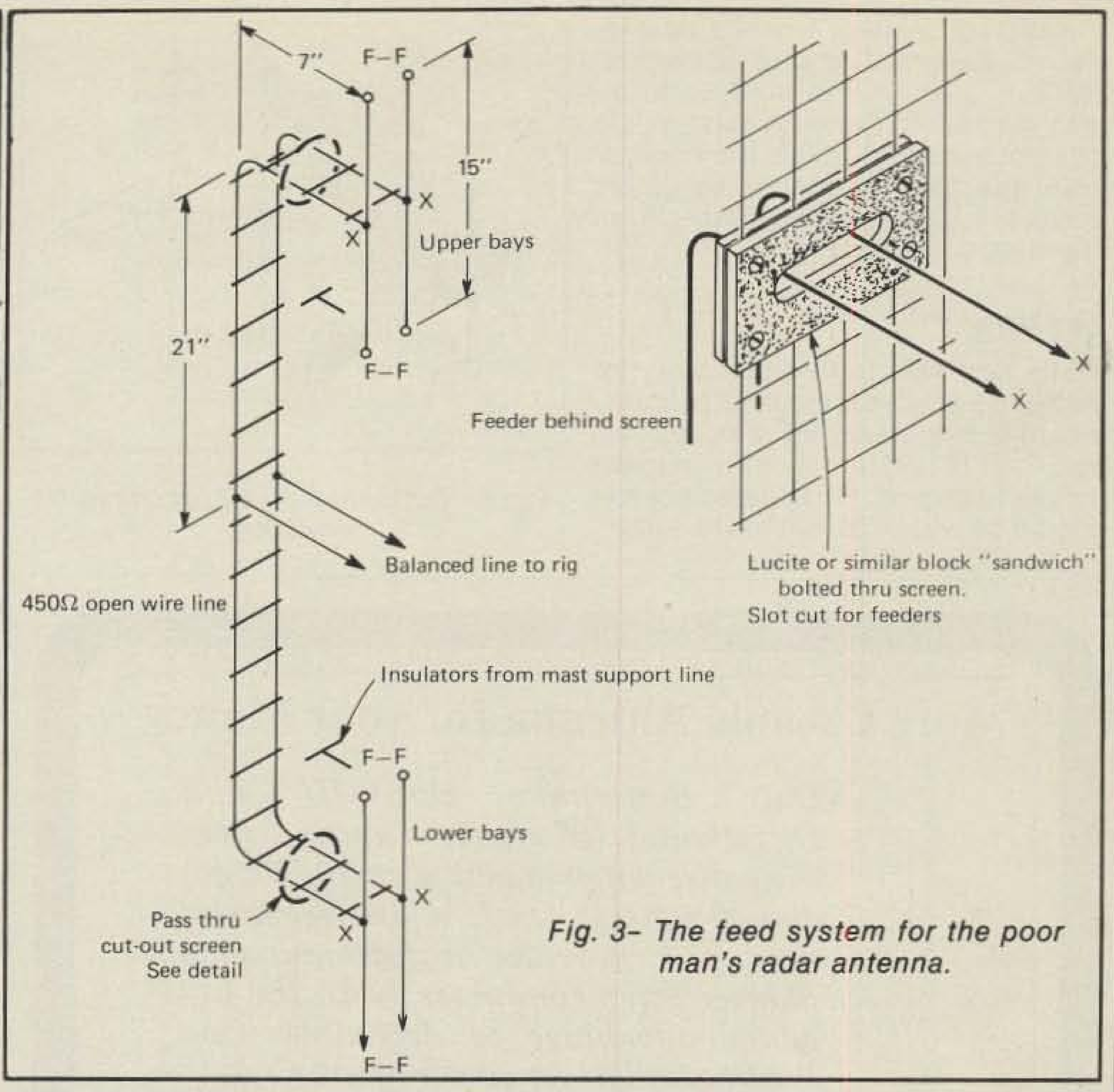


Fig. 3- The feed system for the poor man's radar antenna.

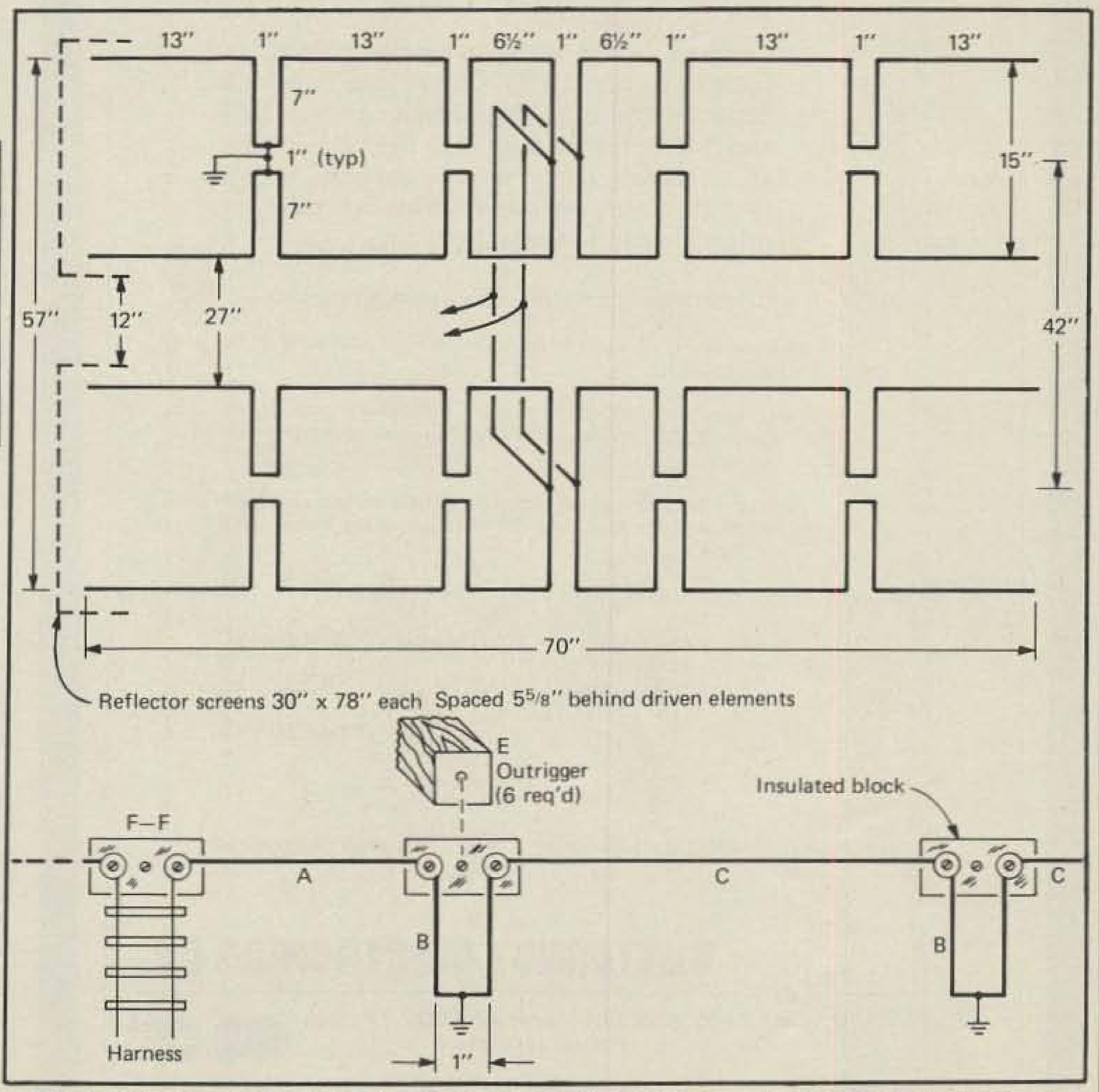


Fig. 4- The basic electrical schematic of the antenna. (B) The typical dipole and stub section (8 required).

elevation, if desired. A center post replaces the mast and a shoe and brackets assembly is built up to attach the post to the main mast. While it is necessary to climb the mast or lower the array to change elevation, this is far cheaper than a motor-driven elevating screw system.

Testing

The best way to test this array for gain and pattern data is to temporarily mount it in a clear, flat area, with no less than 10 feet from bottom of lower screen to ground. No metallic objects should be within 20 feet of the array.

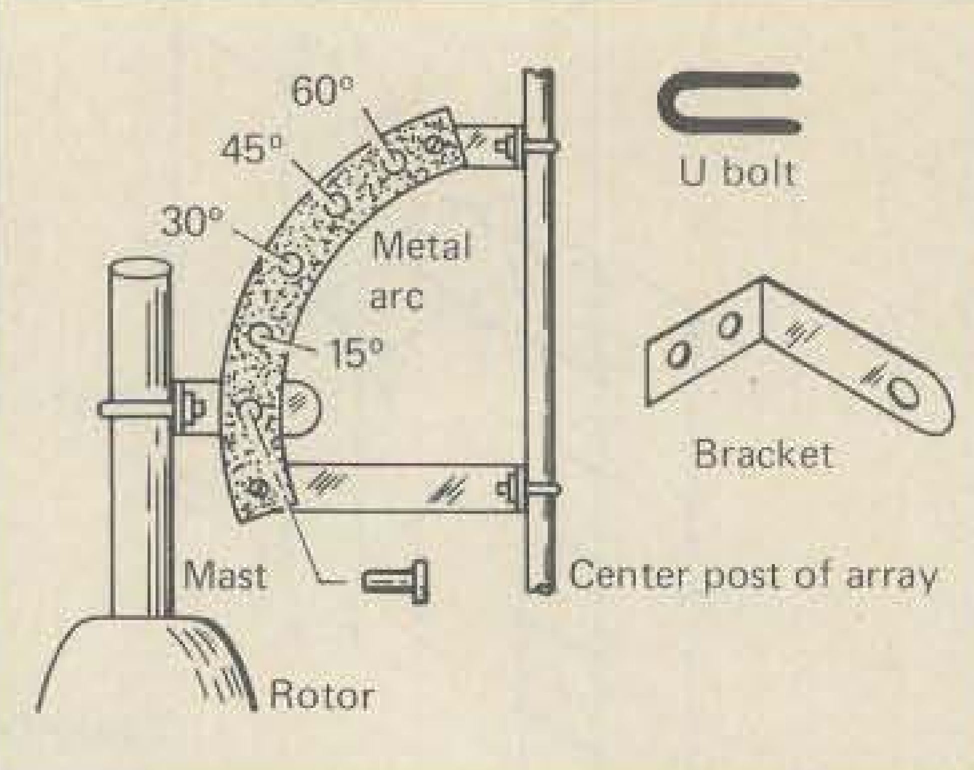


Fig. 6- Optional method for changing elevation.

Mount a target dipole or corner reflector at the same height as the middle of the array at least 60 feet away. Connect a calibrated field strength meter tuned to 428 MHz. Turn on your transmitter and generate a c.w. or f.m. signal. Take readings every 2 MHz up to 438 MHz. Plot a gain versus frequency chart.

Then rotate the array in 15 degree segments off target each side up to 60 degrees, and repeat readings to obtain a horizontal "nose" pattern. If you will be using a variable elevation mount, you can check the H-plane (vertical) pattern by taking readings at each 15 degree step.

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Try the new Mini RG-8 from Belden or other quality brands. Good for a KW to 30MHZ. RG-59 outer diameter. Flexible and clearer than RG-8. 95% braid, foam, easy to put connectors on.

Be sure to try Coax-Seal. New product on market for wrapping coax connectors. Works great on air leaks on my truck!

New items/ideas. Watch for radios with more features at cheaper prices to come along. Example; TS820S replaced by TS830S which is a better set.

One notable exception, the Rockwell KWM 380, the quality is there regardless of price.

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See you next month!

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		100	1.8	5.9
		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
RG8/u Foam .81VF	8214 36 c/ft.	50	1.2	3.9
		100	1.8	5.9
		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
RG8/u Regular .66VF	8237 32 c/ft.	100	2.0	6.6
		200	3.0	9.8
		400	4.7	15.4
		900	7.8	25.6
RG 213 Non-contaminating	8267 43 c/ft.	100	2.0	6.6
		200	3.0	9.8
		400	4.7	15.4
		900	7.8	25.6

8448 27 c/ft.
No. of Cond. 8
AWG (in mm)
6 22 (7x30)
2 18 (16x30)

9405 45 c/ft.
No. of Cond. 8
AWG (in mm)
2 16 (26-30)
6 18 (16-30)

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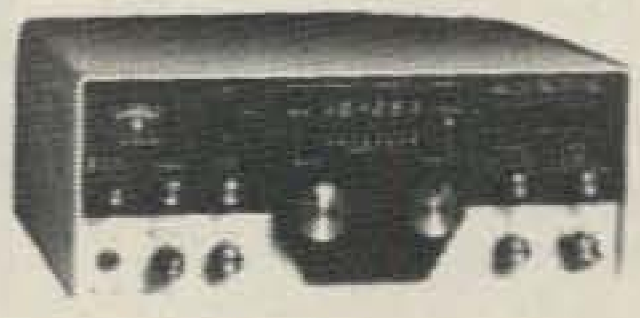

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Shortwave Viewing, An SWV Report

BY BILL CIKAS*

Back in October of 1977 we ran as part of our In Focus column (amateur television) a report on an active shortwave "viewer" named Bill Cikas. Although Bill is not an amateur, he does avidly monitor the SSTV frequencies and photographs what he sees. His receiving gear is quite unassuming and certainly inexpensive, which once again proves that ingenuity and initiative are worth a lot of money. Recently we heard from Bill again with an updated report on what he's looking at. —K2EEK

"Just a quick note to let you see how well I am doing with my SSTV monitor. I have a couple of photographs of Radio Israel's recent slow scan television broadcasts.

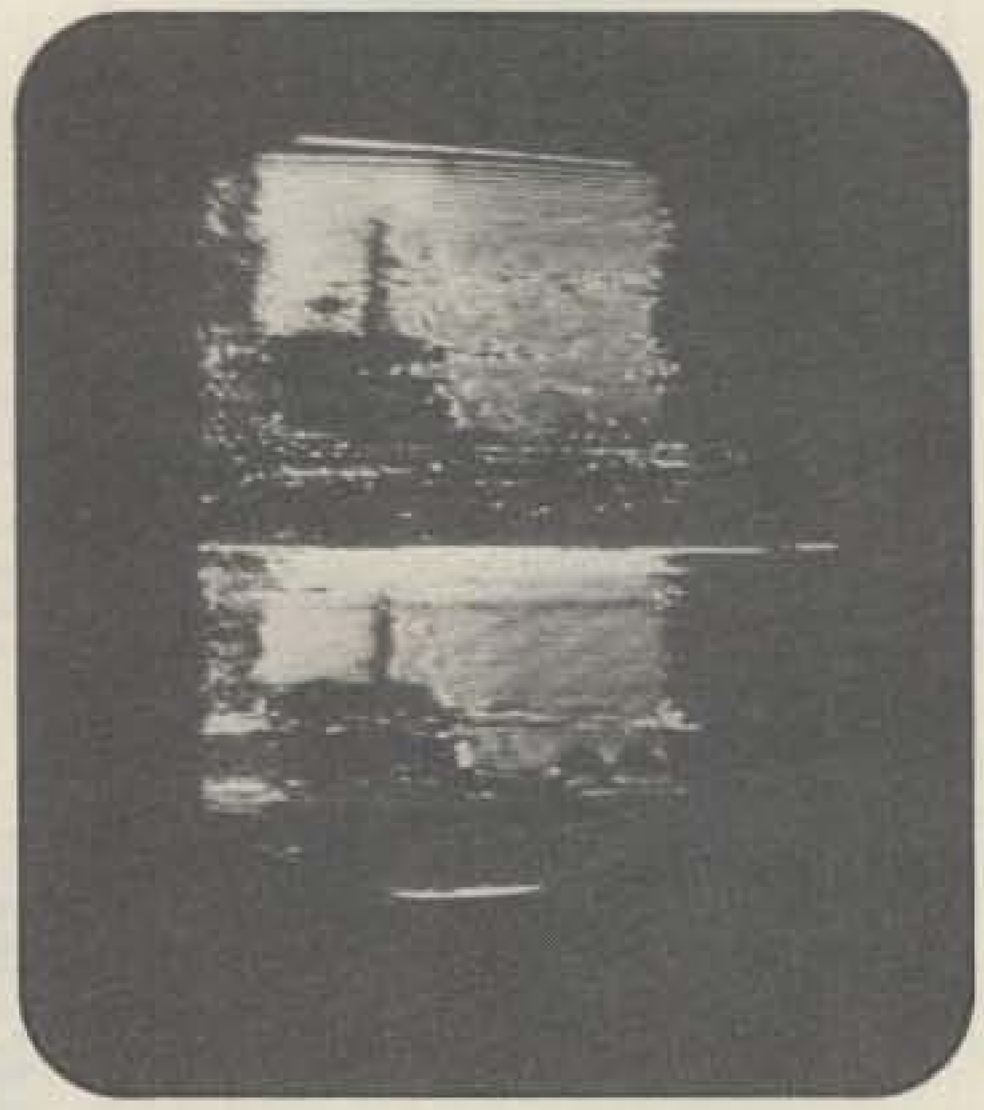
"The broadcast of November 2, 1980 included the image of Ben Dalfen's personal QSL card. Visible in this double-frame photograph is the Tower of David and two apparently domed structures.

"The menorah, or candelabrum, is the subject of the photograph sent on February 15, 1981. This particular candelabrum is located near the Israel Parliament building. I found a good picture of it in my local library in a book about Jerusalem.

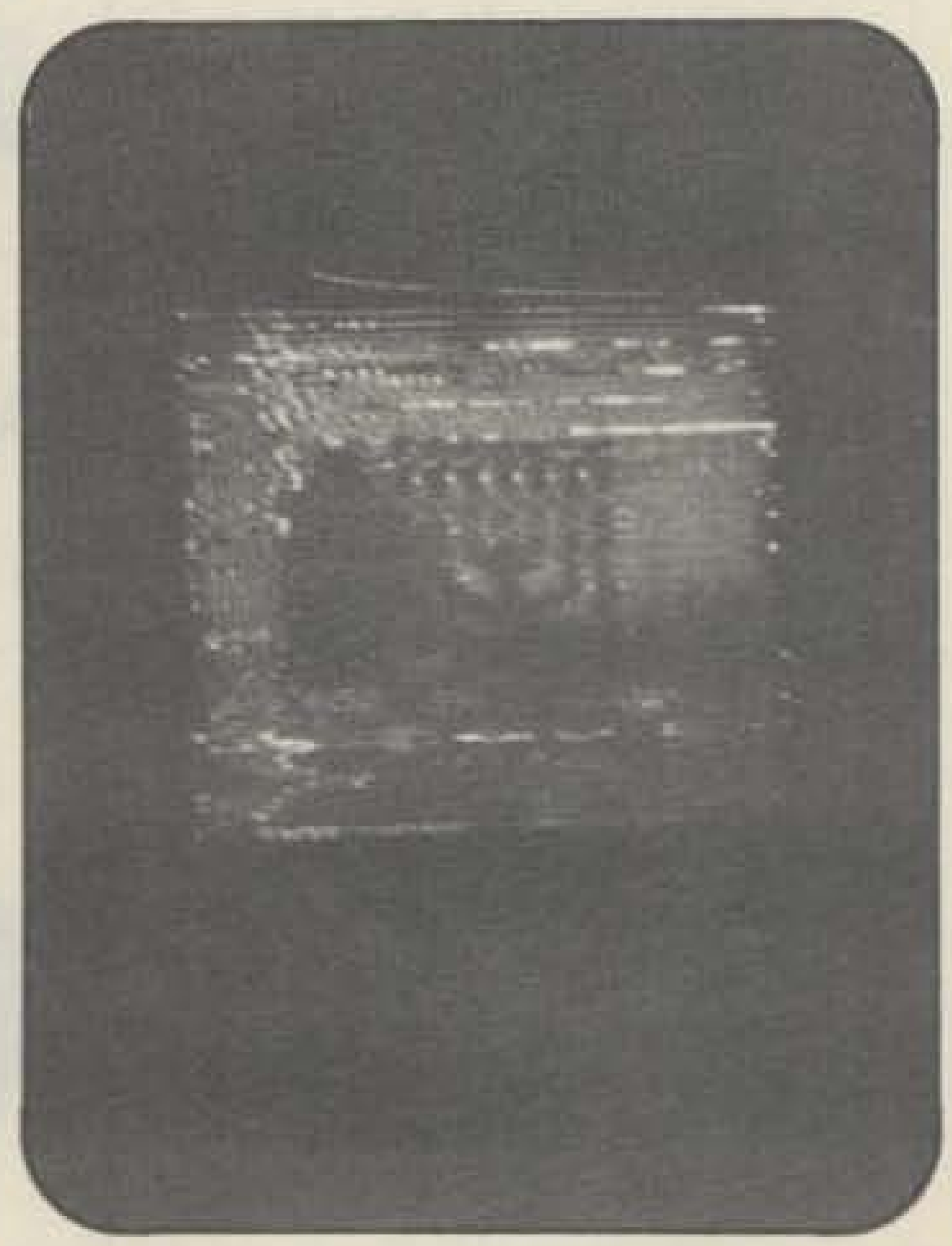
"I still monitor SSTV here with my converted Dumont 304A oscilloscope. I have all the bugs ironed out and it is fun to operate even after four years. Receivers here are the BC-348R for the November broadcast and a Hammarlund HQ-200 for the February broadcast.

"Thanks once again for the nice write-up in the October 1977 issue."

*1627 Paradise Blvd., Rockford, IL 61103



A double frame exposure showing the Tower of David as broadcast on SSTV by Radio Israel on November 2, 1980.



The picture of the menorah as sent on February 15, 1981.

Here's an interesting project that's cheap and easy to build (and fun too). In a short while you too can have a quiet, simple break-in system to increase your c.w. operating efficiency.

A Solid State RIT Switch

BY ANTHONY F. JAPHA*, N2UN

This article presents a simple design of a solid state replacement for a typical Receiver Incremental Tuning (RIT) relay. It will be useful to those amateurs seeking a quiet c.w. break-in system. The design presented here can contribute one component of such a system. It has been used successfully in a station having a separate receiver and transmitter with the receiver driving both the receiver and transmitter in the transceive mode. It has also been used successfully in an external v.f.o. used to drive both a receiver and transmitter in the transceive mode.

The station into which the solid state RIT switch has been incorporated originally included a standard mechanical relay to switch the RIT out of the v.f.o. tank circuit during transmit periods. It was during a long search for a quiet and reliable break-in system that the solid state substitute was designed and tested.

The original circuit is shown in fig. 1. It is typical of RIT circuits found in the recent amateur literature. Fig. 1(a) shows the frequency determining components of the v.f.o. and the point to which the RIT components are connected. Either the original mechanical RIT or the solid state substitute can be used with v.f.o. designs that differ from the one shown in fig. 1(a). A common circuit is shown for the convenience of readers who are likely to recognize it. I have used the solid state switch with this and other v.f.o. circuits.

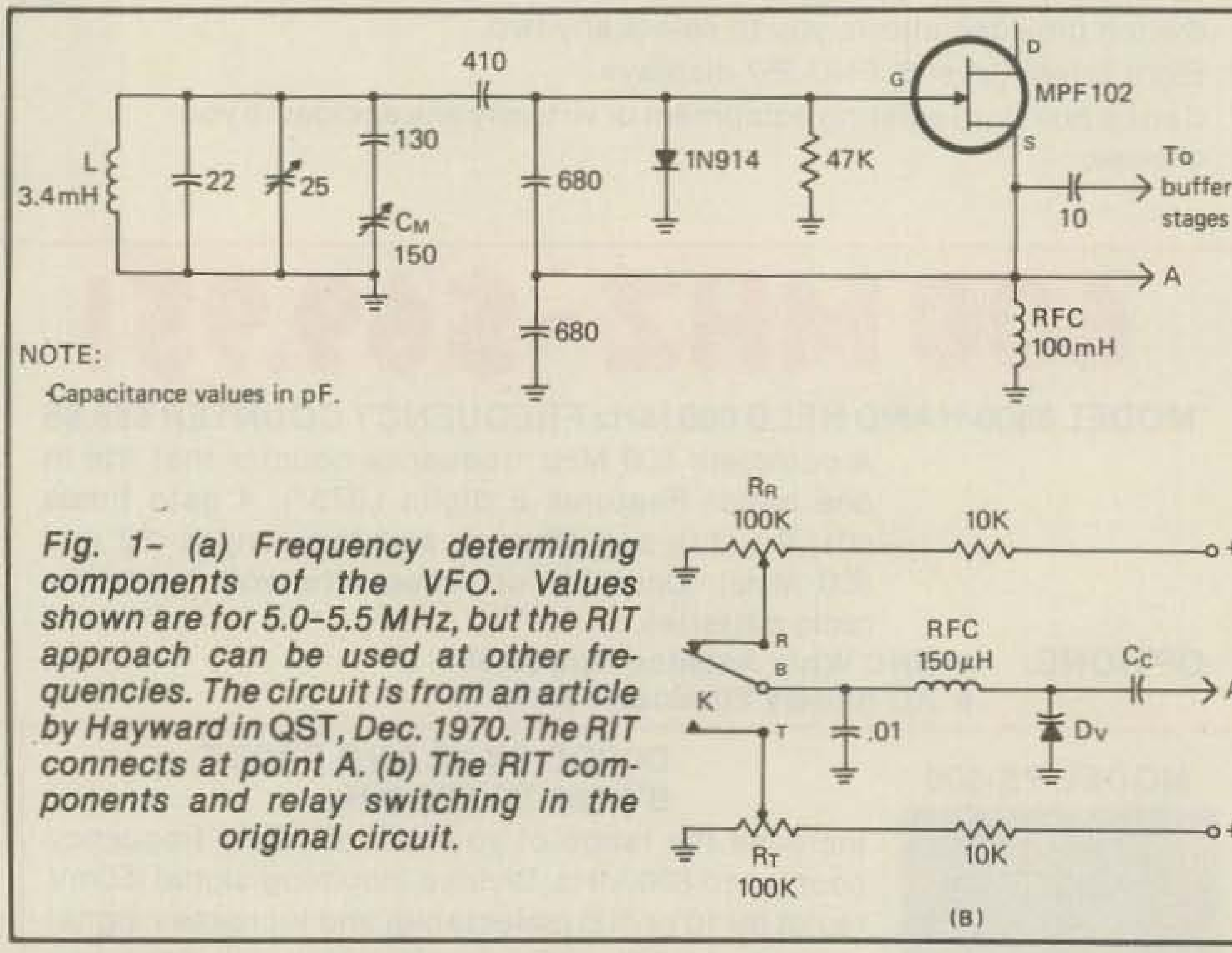


Fig. 1– (a) Frequency determining components of the VFO. Values shown are for 5.0–5.5 MHz, but the RIT approach can be used at other frequencies. The circuit is from an article by Hayward in QST, Dec. 1970. The RIT connects at point A. (b) The RIT components and relay switching in the original circuit.

Capacitor C_M is the main tuning capacitor. Inductor L is the tank coil. Point A is to be connected to the RIT circuit. In v.f.o.'s of other design, the RIT circuit should be connected to a point comparable to point A that provides coupling into the tank circuit.

Fig. 1(b) shows the RIT circuit itself and the original relay used to switch the RIT out during transmit periods. This circuit and the solid state adaptation described below should be applicable to v.f.o.'s covering any of the commonly used frequencies in the high frequency bands.

Capacitor C_C is the coupling capacitor, usually in the 5 pf to 25 pf range. Polystyrene or silver mica types are recommended to ensure reasonable stability. The higher the value of C_C, the greater will be the frequency range of the RIT. Diode D_V is a varactor diode, which has the property of changing capacitance as the voltage applied to it varies. A typical diode for this application is the HEP R2500, which has a capacitance of 6.8 pf with 4.0 d.c. volts applied and a tuning range of roughly 5 pf to 13 pf as voltage is varied from 2.0 to 30.0 volts d.c. The r.f. choke (150 uh) is required to isolate the v.f.o. tank circuit from the d.c. voltages present in the RIT switch.

Relay K is either part of the main transmit/receive relay or a separate relay driven by the main relay. In my case, K was a separate crystal can relay within the v.f.o. enclosure. In the receive position, as shown in fig. 1(b), the RIT circuit connects to potentiometer R_R. This potentiometer is the RIT control on the front panel. In the transmit position, the RIT circuit is disconnected from R_R and connected to potentiometer R_T. This pot is an internal control that is adjusted (while the transceiver is in the transmit mode) so that the v.f.o. frequency during transmit periods is exactly the same as the receive frequency when the front panel RIT control (R_R) is in its center position.

The Solid State Substitute

In c.w. operation it is highly desirable to be able to listen to signals in the receiver between your own dits

*300 Mercer St., Apt. 8J, New York, NY 10003

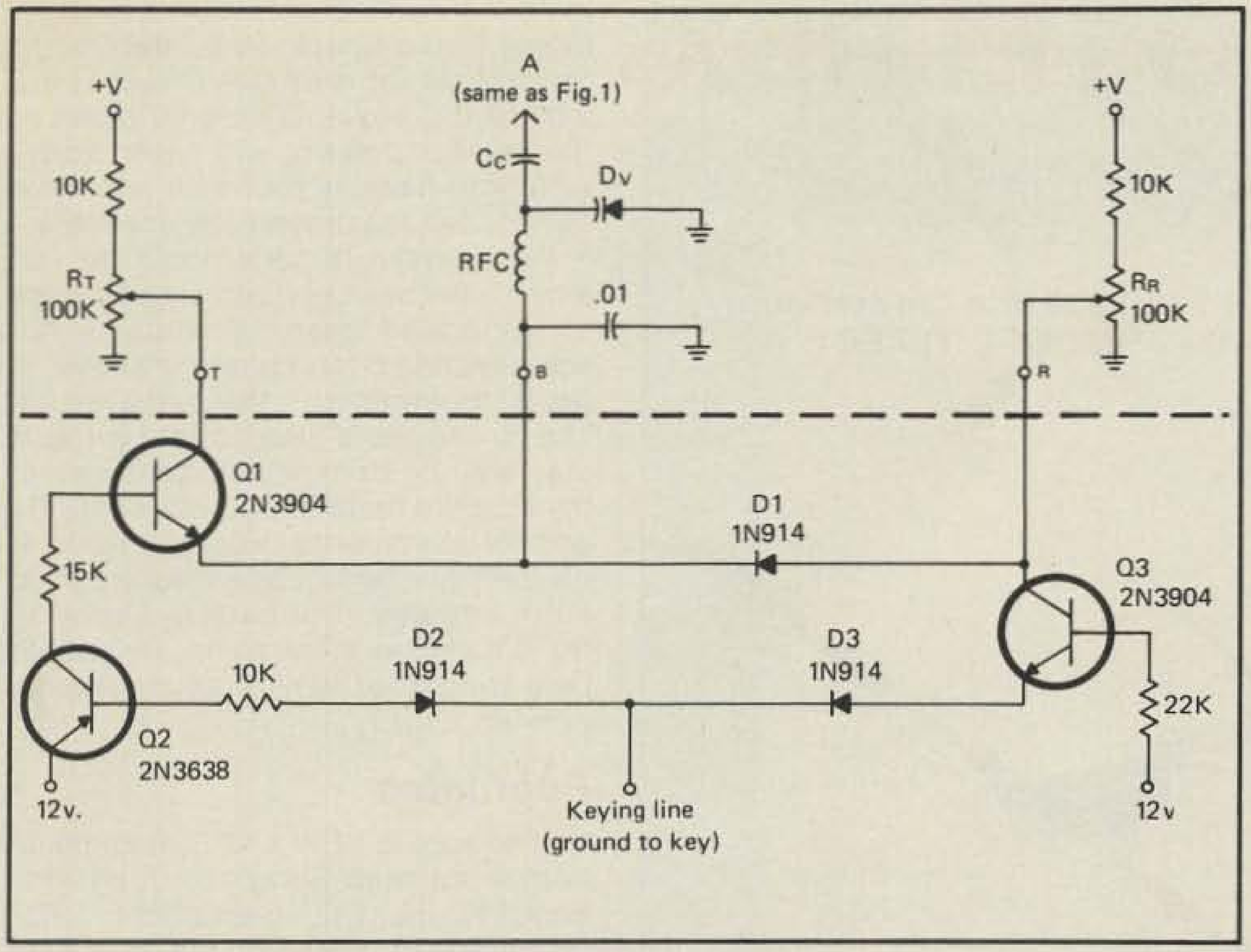


Fig. 2- Solid state substitute for the mechanical relay. Components above the dashed line and points T, B, A, and R correspond to the same components and points of fig. 1(b).

and dahs, or between individual letters. Such operation is known as full break-in, or QSK. During conversational QSO's, QSK allows the listening station to indicate instantly to the sending station that he wants to say something; in contest or DX operation, particularly in pileups, QSK makes it possible to hear when the desired station begins to transmit. QRM is reduced by an order of magnitude and the speed with which QSOs can be made is increased substantially.

In actual practice, full break-in is difficult to achieve. Several functions must be switched at once, very quickly and in the proper sequence. Antenna switching, receiver muting, RIT disabling, and transmitter keying must all be controlled. Over the years, numerous QSK systems have been described.[1] A completely solid state system is presented in the 1981 *Amateur Radio Handbook*.[2] That system, however, does not include an RIT switching method. RIT switching must be available if the station is used in transceive (unless the station uses no RIT, in which case flexibility would be severely reduced).

Break-in can be achieved by using mechanical relays to switch each of the necessary functions.[3] But even with fast reed relays, this type of system is very cumbersome and noisy. The clatter of relays is disconcerting and offsets the great advantages of QSK.

The circuit shown in fig. 2 represents the solid state equivalent of the original RIT scheme of fig. 1(b). The circuit connects the four RIT components between points A and B to potentiometer R_R during receive periods and to pot R_T during transmit periods. Here is how it works.

During receive periods the keying line is above ground. Transistors Q1 and Q2 are cut off. Transistor Q3 is saturated, but is effectively turned off because its emitter is not connected. The voltage from the wiper of pot R_R flows through diode D1 and is applied to the RIT circuit at point B.

During transmit (key down) periods, two things happen:

1) Grounding diode D3 forces the voltage from pot R_R to ground through Q3, and NPN small signal type used as a switch. This removes the RIT voltage from point B.

2) Grounding diode D2 saturates PNP transistor Q2, thus applying 12 volts to the 15 k ohm base resistor of Q1. Transistor Q1 turns on, thus conducting the voltage from the wiper of pot R_T to the RIT circuit at point B. (Diode D1 blocks this voltage from Q3 and ground.)

Switching with this circuit is instantaneous, quiet, and far more reliable than the mechanical relay that was replaced.

Components and Construction

This is one circuit that can be built for peanuts! The transistors specified

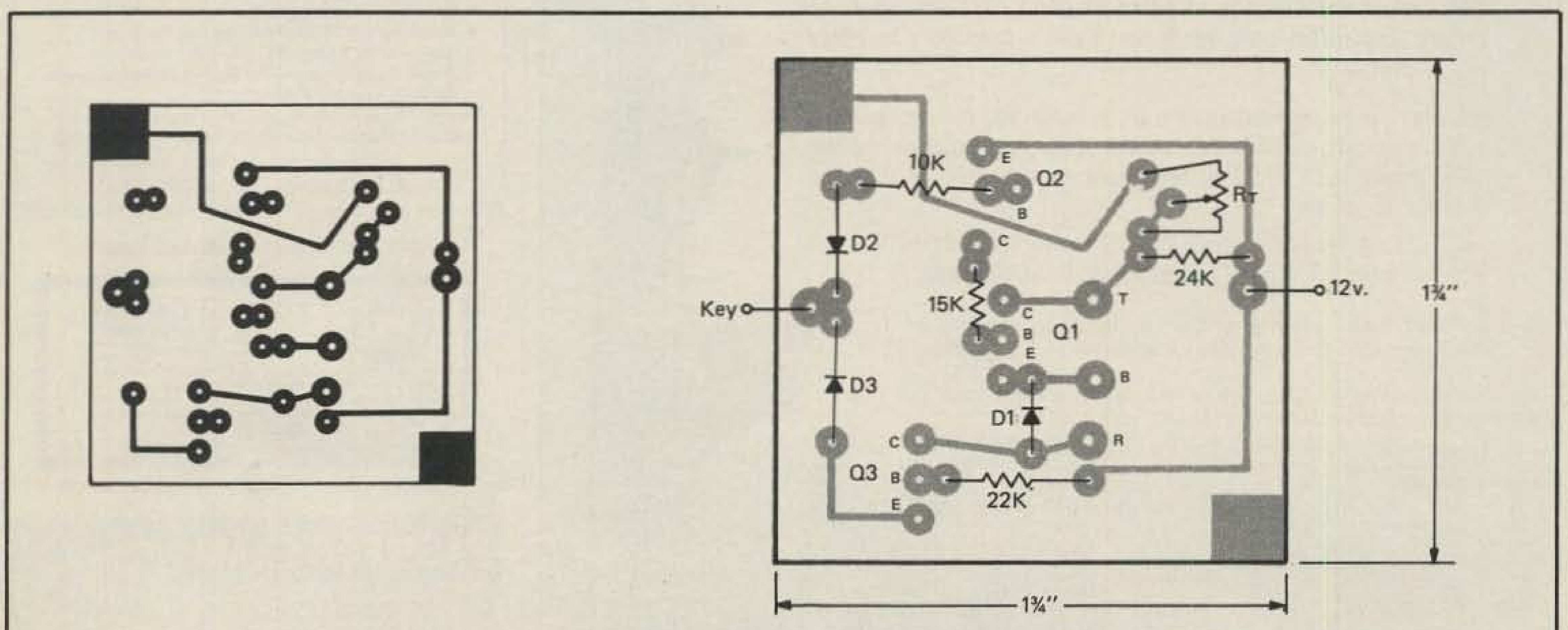


Fig. 3- Full scale printed circuit pattern for the solid state RIT switch. On the right is the parts layout. The shaded circles and lines represent copper remaining after etching. Both views are of the foil side of the boards.

in fig. 2 are cheap and easily available. Check Radio Shack, MHz, and Circuit Specialists for example. Chances are that nearly any small signal types of the correct polarity will work, so try what you have in your own junk box. The diodes are universally available.

Parts layout is not critical. My versions have been built on small pieces of perforated board. A suitable full scale etched circuit board is shown in fig. 3, together with the parts layout. The circuit could also be hard wired. It may well be convenient, as it was in my case, to include potentiometer R_T and its associated dropping resistor on the same circuit board as the solid state circuitry. The pattern shown in fig. 3 includes these parts. R_T should be a trimpot or similar small potentiometer.

Footnotes

[1]For example, "CW and SSB Break-In With A Vacuum Relay" by Joe Hertzberg, K3JH, *CQ*, September 1975; "High-Speed Break-In via a Keyed Vacuum Relay" by Donald B. Lawson, WB9CYY, *QST*, February 1973; "A New High-Power Keyed Antenna Relay" by VE3AU, *QST*, August 1967. Also check the QSK articles by Richard Klinman, W3RJ, which have appeared in *CQ*.

[2]There is also an excellent discussion of break-in systems in "Solid State Design for the Radio Amateur" by Wes Hayward, W7ZOI and Doug DeMaw, W1FB, ARRL, 1977, pp. 174-180,

[3]For example, "A Fast QSK System Using Reed Relays" by Aegidius Pluess, HB9ABH, *QST*, December 1976; "An Integrated Keyer/TR Switch" by James H. Fox, WA9BLK, *QST*, January 1975.

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

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Antennas For The Listener: Part I

"What?" you say. Shortwave antennas on the pages of CQ Magazine, the Radio Amateur's Journal*? Yes, and for several reasons. Many s.w.l.'s* do *read* CQ*, since a good deal of the information in the magazine is transferable to shortwave doings. And, after all, receiving* is *half the two-way communications equation. Also, many longtime hams are shortwave listeners at heart; you will discover that W8FX is one too!*

A listening antenna can be just about anything: a small loop or telescoping whip atop the receiver, a wire hung out of a window, a few yards of bell wire stapled to a picture molding, a window screen or bedspring—you name it. Almost anything and everything has been used.

While the simpler antennas may be fine for casual listening to strong shortwave signals—being a lot more forgiving of poor installation than their transmitting counterparts—simple types leave a lot to be desired. Even the finest receiver works better with a well-designed, preferably outdoor, antenna.

This month, then, we begin a series on listening antennas. We will consider basic types such as the randomwire, dipole, and vertical antennas. Next month, we'll introduce some interesting and useful tuneup aids.

The Randomwire Revisited

In a recent column, we described the randomwire and closely related "antennas of chance," such as the singlewire, longwire, Windom, etc. We don't want to get hung up on terminology; suffice it to say that, regardless of feedline used, most of these antennas are truly random in nature since they are rarely cut for optimum performance on a given band, and as listening antennas, they are usually used on more than one band, anyway.

For the travelin' ham who is used to communications receiver quality, new-breed digital portables such as the Panasonic RF-2900 shown here have much to offer. Set covers five bands, including three SW ranges from 3.2 to 30 MHz continuously, features double conversion superhet circuitry, and boasts 5-digit readout. The 8-pound 10-ounce set has a dual-bandwidth ceramic i.f. filter and includes a BFO for c.w. and s.s.b. reception. (Photo courtesy Panasonic.)

Probably more s.w.l.'s use the end-fed randomwire (fig. 1) than any other type of antenna. The flattop can be of any convenient length, usually from 30 to 150 feet; normally, the vertical lead-in that runs down from the antenna to the house is an *active part* of the antenna system and must be considered integral to it. As a rule, the longer the antenna, high and in the clear, the better; very long antennas may take on tricky directional characteristics that prove undesirable on the higher bands, while extremely short antennas may not develop enough signal pickup on the lower ranges. The antenna and its feedline should be located well clear of possible interference sources such as power lines and busy thoroughfares. Avoid crossing under or over power lines and never attach one end to a power pole. *Play it safe!*

The antenna must be insulated from its supports at each end using glass or porcelain insulators. The lead-in, actually a part of the antenna, should be held a few inches from the house using TV or electrical-type standoffs. Keep the lead-in away from metal objects and power cords in your radio shack.

As with any singlewire, this kind of antenna works best when used in conjunction with a good ground system. A short, heavy wire should be run from the receiver (and antenna tuner, if used) to the nearest r.f. ground. This can be a metal grounding rod driven into the earth at the point where the antenna comes inside or a cold water pipe that has a direct connection to ground. Simply running a wire to the faceplate of the electrical outlet in the radio shack isn't good enough; this may be a good *electrical* ground, but a very poor one for *r.f.*

The antenna should also be protected against lightning strikes and static discharges. A commercial lightning arrestor can be installed, or one can be constructed from a few simple parts. In any case, it should be located outside the house and a direct connection made to the outdoor ground. A heavy grounding switch can also be used.

In that the end-fed randomwire's feedline is an integral part of the antenna; the antenna usually takes on the physical appearance of an upside-down letter "L." As a result, it's often known as an *inverted L*. In practice, the feedline can be connected to any convenient point on the flattop span, if the available supports for the antenna are more favorable for a center-fed or off-center-fed lead-in. Let the shape of your property, the location of your house on it, and the locations of suitable supporting trees determine where you connect the feedline. If fed

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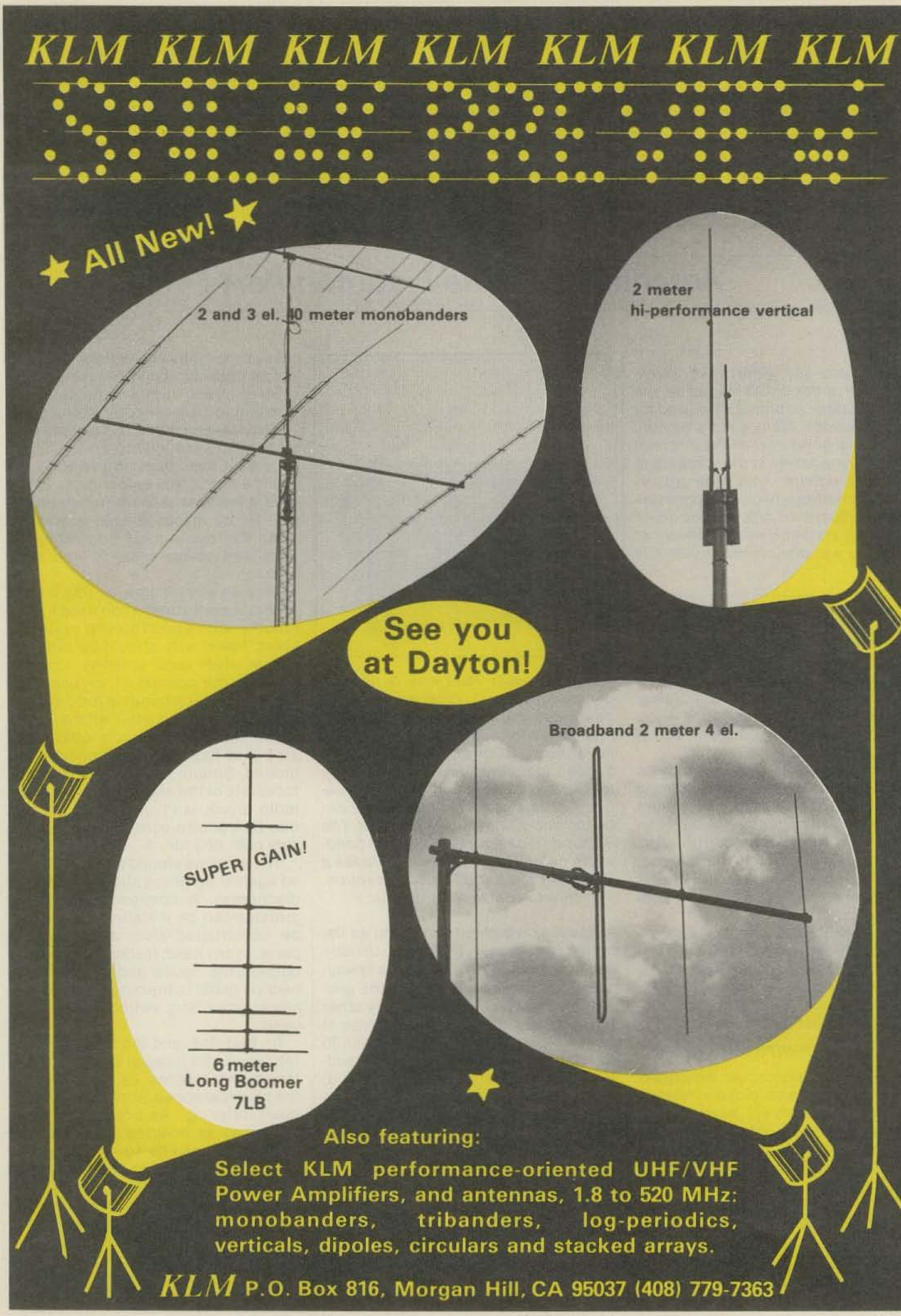
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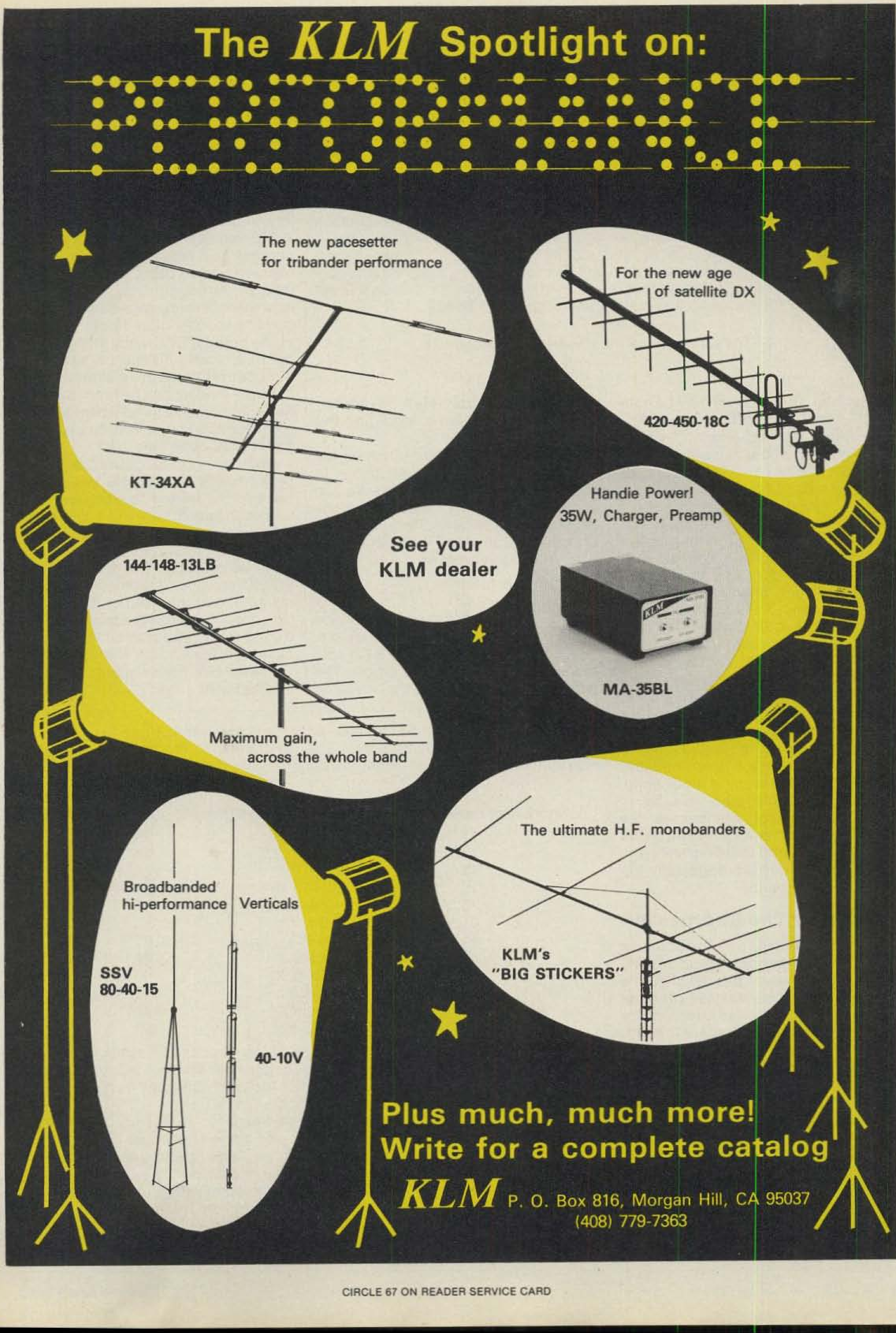

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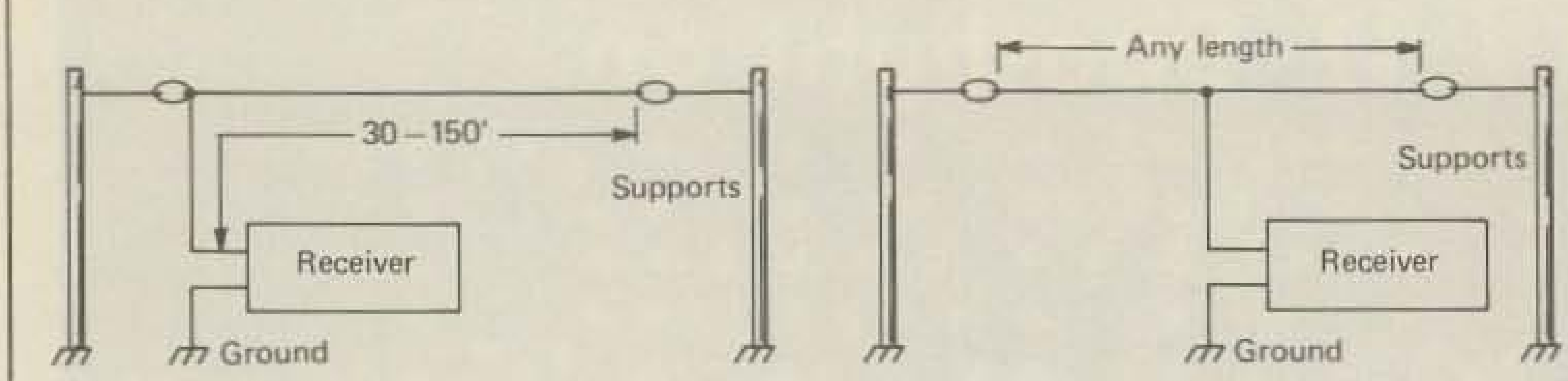


The randomwire, as shown above, is perhaps the simplest of all antennas to install. Normally 30–150 feet long, its effective length includes the feedline; an antenna tuner is almost mandatory for good results. Installed normally as an inverted-L (above), it may also be formed into the shape of a "T" or even erected vertically for onmidirectional coverage. The Windom, or off-center-fed arrangement, can also be used, although this is not strictly a randomwire, since it is cut for optimum performance on a specific band or group of bands.

Fig. 1– The randomwire for all-band shortwave use.

in the center, the antenna may be called a "T," and if fed off-center, a Windom. Unlike the "L" and "T," which probably work about equally well on all the SW bands, the Windom works best on the band for which it was designed, or over a certain group of bands. Normally, this antenna is cut for one-half wavelength on the primary band of interest (fig. 2) and fed at a point about one-third in from the end. Alhough its performance is optimized for a single band, it will also work fairly well on the other SW bands.

Although most receivers will work reasonably well with any kind of antenna system connected to its antenna terminals and will tolerate almost any degree of mismatch, randomwire performance will be a good deal better if the antenna is fed through a tuner to allow the system to be resonated and matched to the receiver's input impedance. More on this later.

For the beginner, companies like Radio Shack and several *CQ* advertisers sell simple and inexpensive s.w.l. antenna kits. They are especially designed for beginners.

Dipoles On The Shortwaves

The randomwire is popular because it produces reasonably good results over a wide range of frequencies; it's forgiving of the most serious off-band use and impedance variations since these things can be compensated for by a good wide-range antenna tuner.

On the other hand, the dipole is designed to be used on a specific, single band (with a few exceptions). A dipole cut for one band usually won't do well on other bands. However, on the band for which it's cut, it's a superior performer for a number of reasons: its reception pattern is predictable (broadside to its length); it's resonant and has a known feedpoint impedance, meaning that easy-to-handle coaxial cable can be used to feed it; and its construction lends itself to center-supported DX versions, including the Vee and inverted-Vee.

For broadband performance an improved version is the *folded dipole*. In one popular design, both the flattop and the lead-in are made from common (and inexpensive) TV-type lead-in with the flattop cut to the standard dipole formula length of

$$L \text{ (in feet)} = \frac{468}{f(\text{MHz})}.$$

At the midpoint of the span, *only one* of the two wires of the twinlead is cut. The feedline is connected to each side of the cut as in the simple dipole. The two wires of the twinlead that make up the flattop should be twisted together and soldered at each end. The folded dipole should yield especially good results over the wider shortwave bands. Since its resonance curve is a broad one, it's very tolerant of off-frequency use. Nevertheless, the fact remains that both types of dipole are single-band affairs. This is true with the exception of dipoles used on *odd-harmonics* of the design frequency, such as a 41-meter dipole used on 13 meters.

Dipoles can also be constructed *in parallel* and fed with a single transmission line, as described in an earlier column. Although a mechanical problem to construct, this design allows one to use individual dipoles for each of the popular SW bands and get near-optimum performance on each. If a high center support is available, the multiple dipoles can be fanned out in a turnstile or spokes-of-a-wheel arrangement for easier installation and omnidirectional coverage.

Another way to obtain multiband performance in a dipole is to install traps in the flattop to electrically isolate each band's half-wave dipole from adjacent sections; this allows each section to function as a dipole on each band of interest. The traps may be homebrewed or purchased commercially. Western Radio Electronics (Kearney, NE 68847) sells a 65-foot, 6-band horizontal trap antenna that is designed for use on the 49- through 13-meter SW bands using two traps and fed with either 72-ohm twinline or

As with amateur-band antennas, optimum performance can usually be obtained if the antenna is cut to frequency, or close to it. The table below lists approximate half-wave dipole lengths according to the formula $L(\text{feet}) = \frac{468}{f(\text{MHz})}$

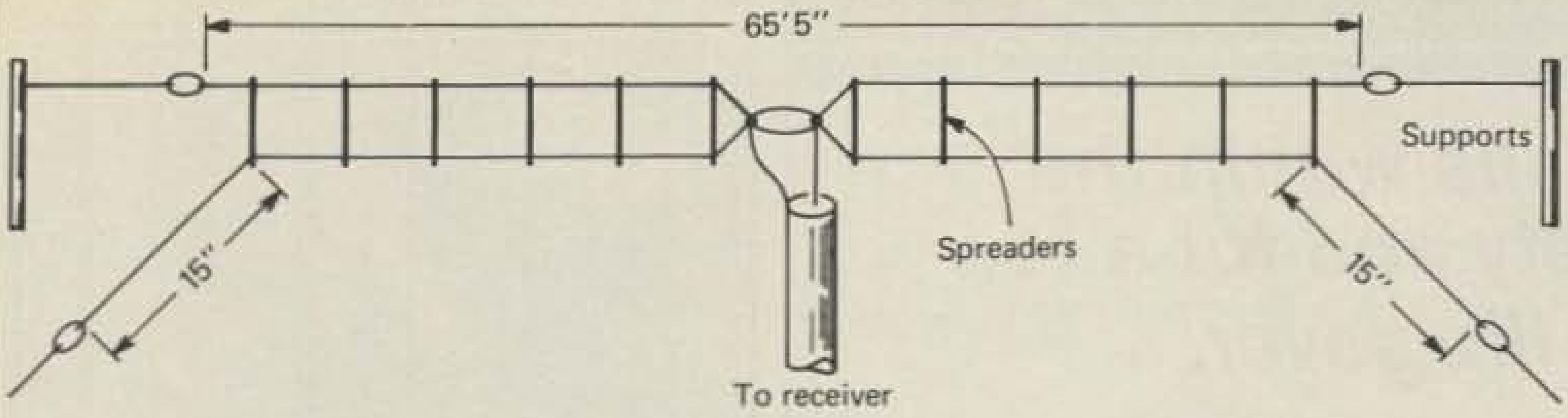
Shortwave band (meters)	Nominal range (MHz)	Dimension (feet)
11	25.6–26.1	18
13	21.45–21.75	21′8″
16	17.7–17.9	26′4″
19	15.1–15.45	30′6″
25	11.7–11.975	40′
31	9.5–9.725	49′
41	7.1–7.3	65′5″
49	5.95–6.2	78′
60	4.75–5.06	95′6″
75	3.9–4.0	118′6″
90	3.2–3.4	141′10″
120	2.3–2.5	195′

The doublet or dipole should be hung as high as possible, although it may be installed indoors (taped to walls or under a rug) if necessary. Ideally, it should be hung outdoors between two tall trees with the coax run away from the antenna at a right angle directly to the radio shack.

The antenna will work most efficiently on the center frequency of the band for which it is cut, but in practice it will work well across the entire band. Although instruments such as the antenna noise bridge (ANB) may be used to achieve exact resonance, this is not necessary in receiving antennas.

The dipoles may be used on other bands with some reduction in performance. This will be especially noticeable if shorter (higher frequency) antennas are used on the lower bands.

Fig. 2– Dipole antenna dimensions for the shortwave bands.

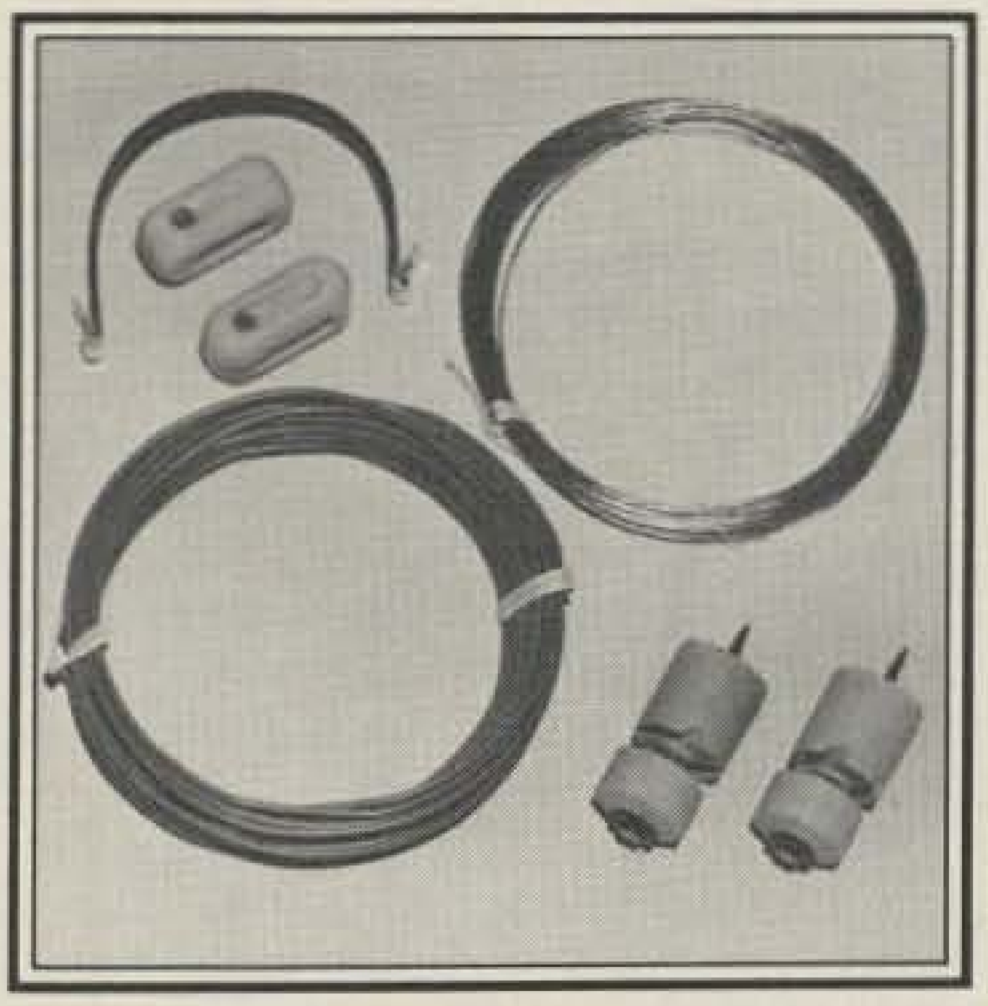


The antenna shown above is a simple parallel dipole that resonates in or very close to four of the major international shortwave broadcast bands. The antenna consist of two dipoles, one 65′5″ long that resonates on 41 meters, and a longer one of 95′6″ that is resonant on the 60-meter band. Since the dipole works well on odd harmonics of the design frequency, the 41-meter dipole will yield good results on the 13-meter band, while the 60-meter span will give a good account of itself on 19 meters.

The antenna can be cannibalized from a length of 300- to 600-ohm TV or open-wire transmitting-type transmission line; it can also be made of ordinary antenna wire with lightweight spreader bars inserted at appropriate points to keep the wires from coming into contact with one another. TV twinline can even be used for the center portion, if desired. The ends can be drooped down as shown in the sketch to conserve horizontal space, or run straightaway if room exists.

The four-band affair can be fed with coaxial cable as shown, or with 72-ohm twinline. Lightning protection should be provided.

Fig. 3– Efficient four-in-one SWL antenna.

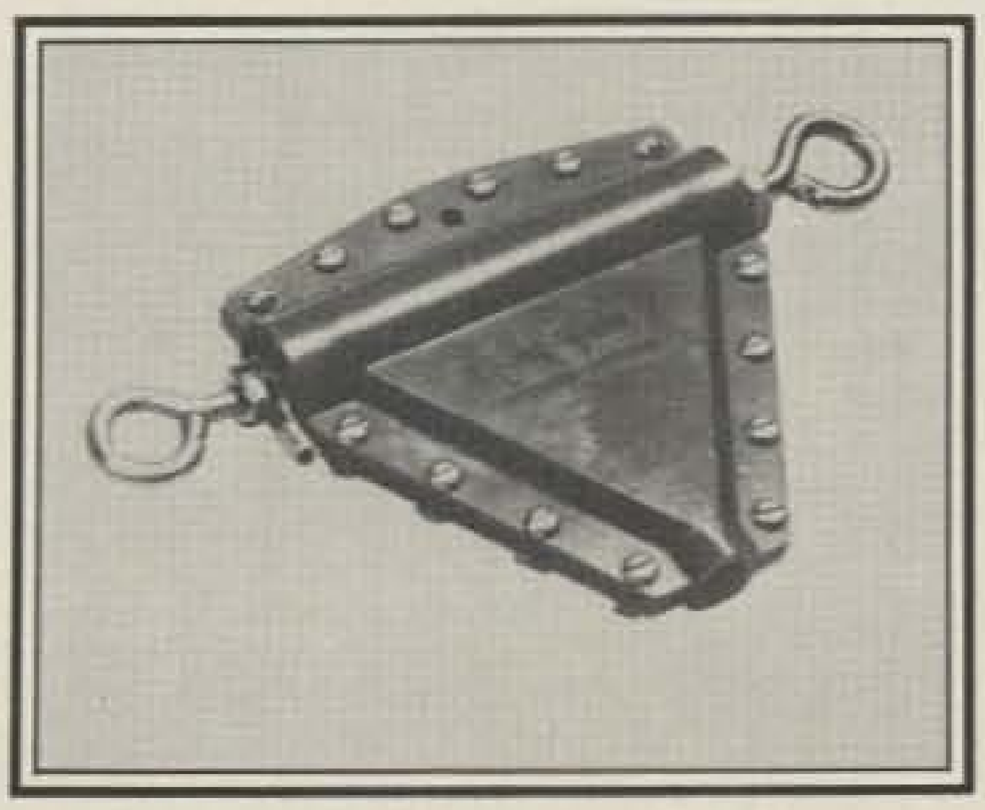


The basic ingredients of the simple singlewire antenna: 75′ antenna wire, lead-in, window feed-through strap, end insulators, and standoffs. Complete outfit is sold by Radio Shack stores for under $8. (Photo courtesy Radio Shack.)

coaxial cable. A shorter, 37-foot version is available that covers 31 through 13 meters. Since only two traps are used, these antennas operate on multiple-harmonic relationships on the higher bands to produce a cloverleaf-shaped reception pattern and some gain on these bands. The antennas are fed at current points to allow low-impedance feed and resultant low s.w.r. An antenna tuner is not required to match the trap antenna to the receiver, although one may be used if desired. The same firm also sells single-band dipole kits made to order for each of the popular SW and amateur bands. Dentron, for example, sells an all-band, tuned-feeder doublet kit; although designed for transmitting use, it can be used on any frequency from 160 through 10 meters when fed through a transmatch designed to accommodate balanced feedline.

Verticals

The vertical is a logical choice when space is at a premium and when good DX performance is a must. The vertical has a low angle of radiation and reception, it can be mounted on the ground or in the air (as a ground plane), and it can be directly fed with coaxial cable. One disadvantage is that it must be worked against a very good ground system for reasonable efficiency (though a poor ground would not affect receiving nearly so much as it would transmitting). Also, the antenna's low angle of radiation (or, more properly, *reception*) and vertical polarization make it more susceptible to man-made noise marring reception.



Center insulator for doublet antenna makes for easy installation and feed with coaxial cable. Lightweight Hy-Gain CI insulator is weatherproof, being molded from high impact cycolac material. Unit accepts ¼″ or ¾″ cables (normally the thinner cables would be used in receiving work). (Photo courtesy Hy-Gain Electronics.)

The basic vertical is a quarter-wavelength in height; this works out to about one-half of the dipole lengths indicated in fig. 2. At least four radials are used. If buried, they should be as long as possible and used in conjunction with a ground rod under the antenna. If the antenna is mounted above ground as a so-called *ground-plane vertical*, the four or more radials should each be ¼-wavelength long, plus about 5%. The feedpoint impedance is between 35 and 50 ohms, so a good impedance match should be attained if standard 50-52 ohm cable is used.

The vertical is essentially a single-band affair, like the dipole. However, the antenna can be used on all the SW bands (and lower, if necessary) by installing a loading coil at the base and tapping the coil for best match (or received signal) on the desired band. This type of base loaded antenna can be constructed easily and inexpensively from little more than a few lengths of aluminum tubing and some coil stock.

This simple device falls within the realm of mobile safety and for a few bucks can be a real life saver.

How To Build A Simple Auto Back-Up Alarm

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

There are several disadvantages to giving strangers, family, and friends that run-down feeling. Especially when you're backing the car up and they don't appear in the rear view mirrors. Murphy, you know.

Well, here's a quick little circuit that will beep a warning to shoo them away—just as an extra ounce of prevention.

The task could be solved more simply than this, of course. One of the new solid state piezoelectric beeper-buzzers (Radio Shack and others have them) could easily be connected between a tap in the voltage (+) feed to the back-up lights and ground. But this one-IC circuit adds a lot of attention-grabbing features to the idea.

The idea, in fact, came from my Advance chrono-alarm watch. Instead of simply beeping its alarm, an extra bit of modulation chops it into the chirp of a police whistle.

That's accomplished here by the dual timer circuit. I used a 556, but you could just as easily use a pair of 555's.

The first section times a beep-da-beep-da-beep rhythm with a 2/3 duty cycle. The second section chops the tweet at 15-20 bursts per second.

You can mount the whole thing in a small weatherproof box inside (or underneath) the rear bumper by using a strong magnet glued to the case or by using an epoxy or cyanoacrylate adhesive.

In any case, let the backer beware.

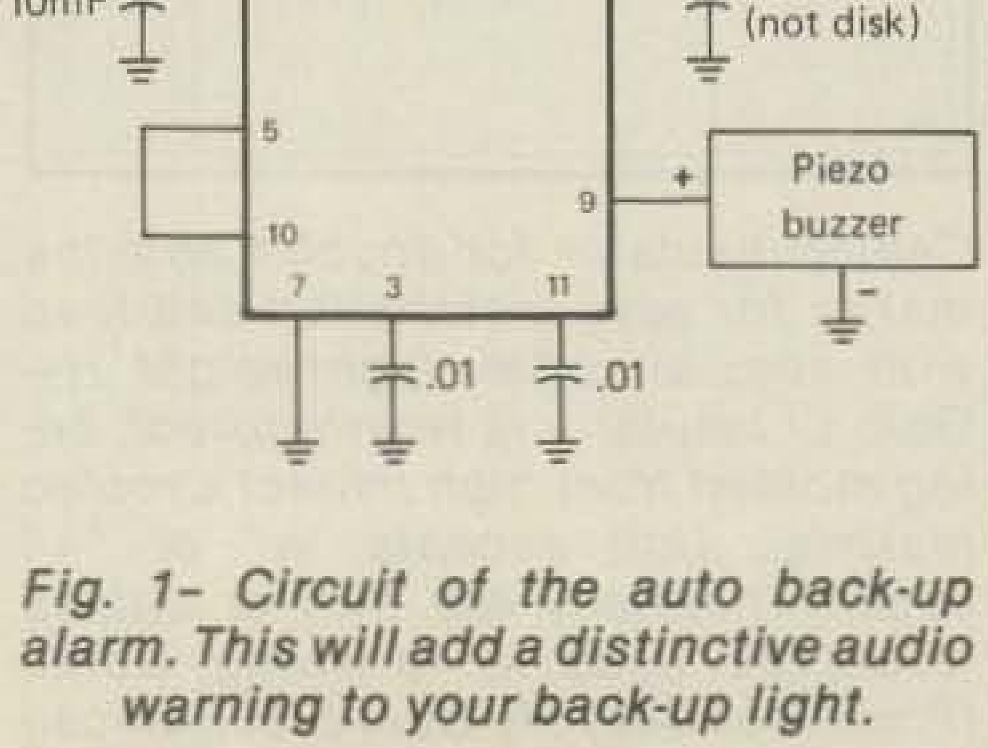
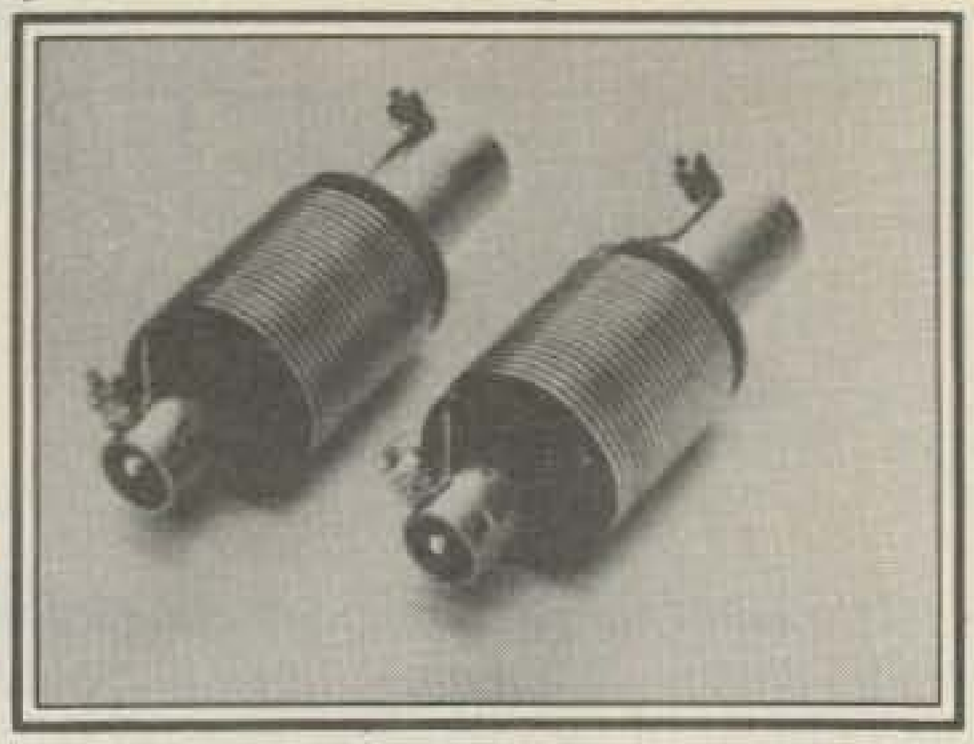


Fig. 1- Circuit of the auto back-up alarm. This will add a distinctive audio warning to your back-up light.

*c/o CQ Magazine

(Antennas continued)



For amateur band listening, the trap dipole efficiently makes use of a single flattop for reception of up to 6 bands. At resonance, the trap is an open circuit for r.f. and effectively cuts your dipole to resonant length for that frequency. Representative transmitting-type trap is shown here; at least one manufacturer sells a complete trap SWL antenna optimized for the foreign broadcast bands. (Photo courtesy Unadilla/Reyco.)

A trap vertical makes an excellent receiving antenna, as long as the resonances set up by the traps hit the desired SW bands. Mosley Electronics made a popular trap vertical for a number of years called the SWV-7. It was designed especially for use on the major international SW bands. The 13-foot antenna resonated automatically to the center of the 11, 13, 16, 19, 25, 31, and 49 meter ranges. It was designed to be used at ground level but could also be used on a rooftop in conjunction with seven user-supplied radials of varying lengths (9 to 38 feet). These show up from time to time at electronic fleamarkets.

Next month we'll pick up our discussion of receive-only antennas with a look at tuneup aids. Some of the items we'll consider are the grid dip oscillator, the antenna noise bridge, and the antenna tuner.

(To Be Continued)

Classic Yaesu FRG-7 (known affectionately as the "Frog" by s.w.l.s the world over) is an excellent standby or portable receiver for the amateur and listener alike. Set covers 500 kHz to 30 MHz in 1 MHz increments and is powered by 117 v.a.c. or an internal 8-cell "D" pack. (Courtesy Yaesu.)

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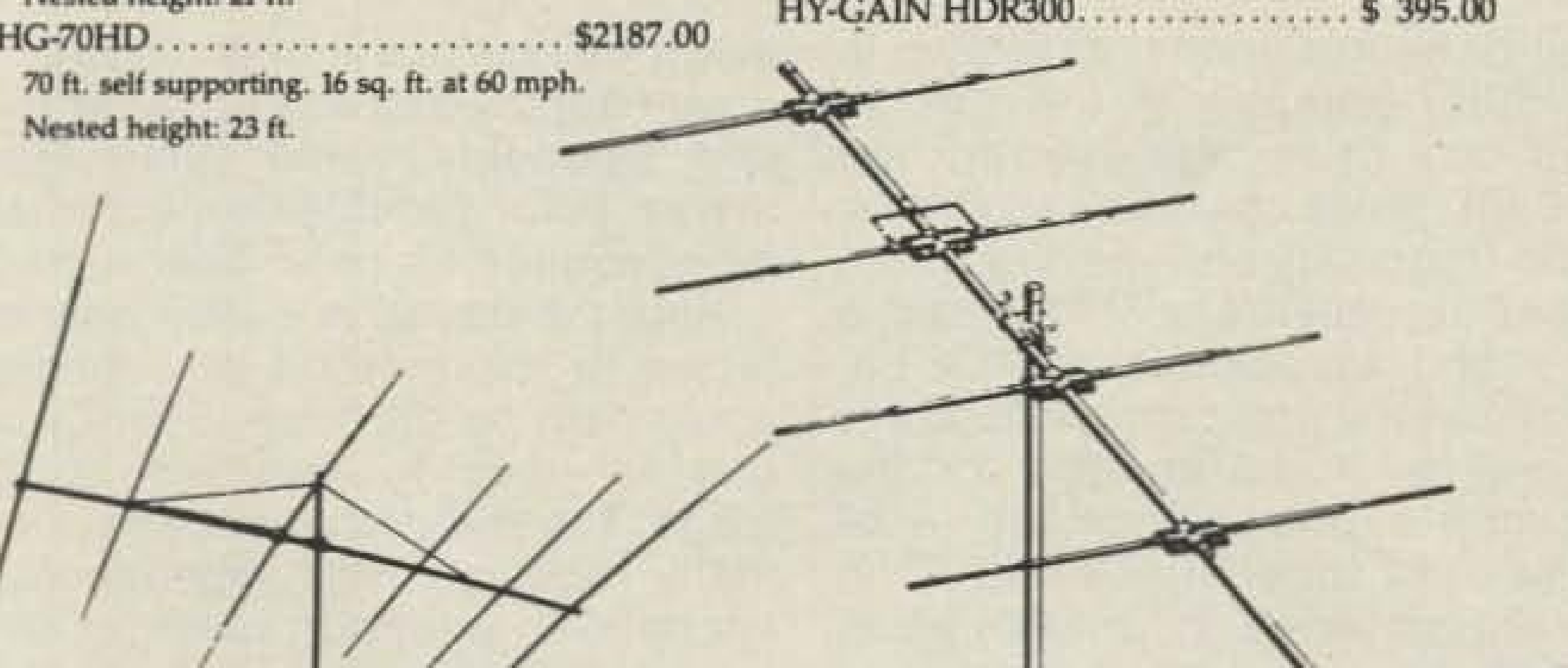

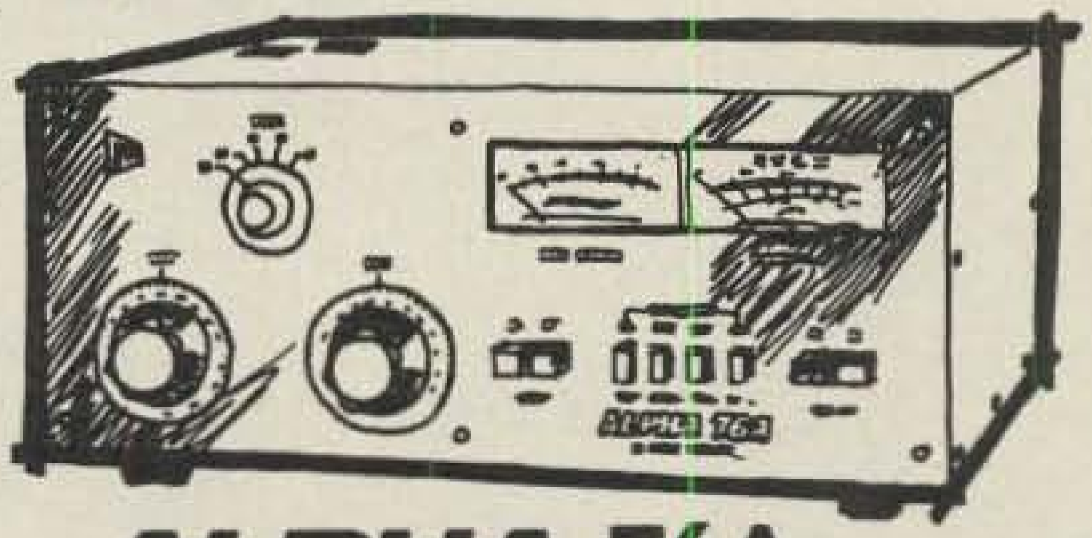

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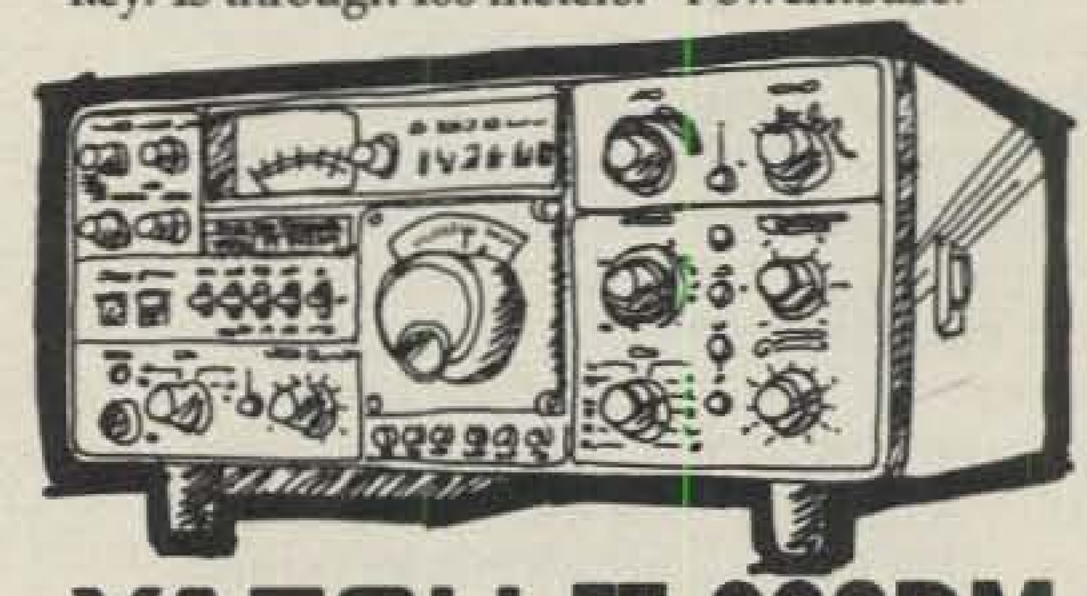

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CIRCLE 1 ON READER SERVICE CARD

Interface is more than a buzzword used around Washington D.C. these days. In RTTY terms, it's getting several pieces of equipment to use a signal when, how, and if you want to, all at the same time.

RTTY Interfaces— An Overview

BY ARTHUR H. WERTZ*, N5AEN

Interfaces are the common voltage and current levels used for transmission of signals between separate pieces of electronic equipment. Due to changes in technology and the unique designs of various manufacturers, a large number of "standard" interfaces exist. Interconnections between equipment having different interfaces will require modification of the equipment or the use of converter circuits to match the various signal levels. The major variations in interfaces are current or voltage, polar or neutral, shunt or series, high-level or low-level, and positive or negative MARK.

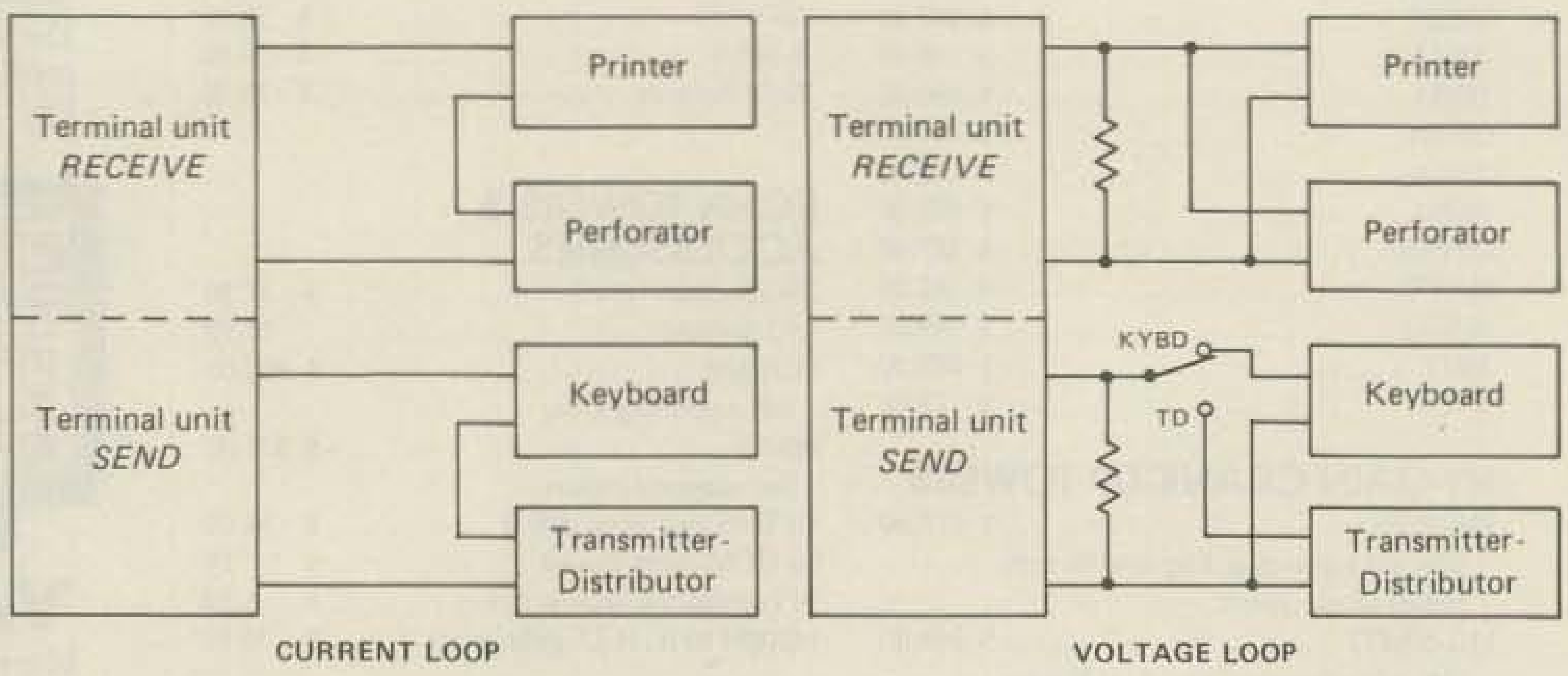


Fig. 1- A current loop and a voltage loop.

Current or voltage loops, as shown in fig. 1, differ primarily in their method of connecting equipment to the loop. In the current loop, a constant specified current (for example, 20 or 60 milliamperes) is maintained throughout the loop, and the various pieces of equipment are connected in series. In the voltage loop, a specific voltage level is used for the MARK and SPACE bits (for example, +6 volts and −6 volts), and the pieces of equipment are connected in parallel across the loop. Even current-operated equipment (such as relays or printer selector magnets) can be connected in parallel, if internal series resistors are used to obtain the proper operating current from the voltage used in the loop, and if the voltage loop power supply is large enough to handle the total current load.

*8019 Riata Drive, San Antonio, TX 78227

Polar or neutral loops, as shown in fig. 2, differ primarily in the voltage level or lack of voltage used for the SPACE bit. Polar operation is similar to audio frequency shift keying where one tone represents a MARK and a second tone represents a SPACE bit. In a commercial polar loop, a negative voltage (−60 volts) is used for the MARK and a positive voltage (+60 volts) is used for a SPACE bit. Polar loops are preferred for transmission of signals over long distances, since the alternating current minimizes the deterioration of the signal due to the capacitance and inductance in the lines, and the presence of a specific voltage for a SPACE bit rather than an open circuit (as in neutral operation) minimizes the possibility of noise pulses on the line being recognized as MARK signals. The neutral loop is similar to c.w. operation, with on and off signals. The neutral system is simpler, electrically, since it only requires one power supply and uses regular relays and solenoids, rather than the bistable polar (double-throw contacts) type required for polar operation.

Shunt (parallel) or series operation refers to the method of connecting equipment to the loop. Shunt operation is usually used with voltage loops. The shunt connections are normally relatively high-impedance (100 kilohms) to minimize changes in the loop as equipment is connected or removed. The shunt system is similar to home electrical wiring where 110 volts is provided to each a.c.outlet, and various combinations of appliances and lights can be plugged in. Series operation is usually used with current loops. The series connections are low-impedance (130 ohms) to minimize changes in the loop current as equipment is connected or removed. The series system is similar to television set vacuum tube filament strings where each tube draws the same current, and the total voltage drop for the string is the sum of the tube filament voltages. If a tube burns out or is removed, the loop is no longer a complete circuit and the tubes stop operating. Another tube or its equivalent resistance must be put back into the loop to complete the series path. Adding or removing equipment in a series RTTY loop requires either the substitution of an equivalent resistance or readjustment of the loop current to its normal value. If a constant-current power supply (one which produces a specific current regardless of the connected load impedance) is used, loop current adjustment will not be required for changes in equipment.

High-level operation refers to the use of loop voltages of 48 volts or higher. 130 volt neutral loops and ± 60 volt polar loops are common for high-level operation. The two primary disadvantages of high-level operation are the use of dangerous voltages and radio-frequency interference. The voltages used are comparable to a.c. line voltages and can produce a bad shock or even electrocution. The high pulse levels associated with making and breaking contacts carrying high voltages and currents generate a large amount of static and RFI, and the square wave nature of the RTTY signals creates harmonics up into the v.h.f. range. Low-level operation means the use of loop voltages of 24 volts or less. In addition to being far less dangerous, the RFI is greatly reduced and is fairly easy to filter out completely.

Commercial and military equipment has differed for years in the use of positive or negative sensing for MARK signals. Most commercial equipment uses a negative MARK, where the presence of a negative voltage represents a MARK bit, and the presence of a positive voltage represents a SPACE bit. Military equipment is designed just the opposite. There is no particular benefit or disadvantage to either system. The commercial system probably evolved due to the telephone company use of negative battery (−48 volts) for all telephone equipment. When teletypewriter signals were first sent over telephone lines (landlines), neutral current loops were used and the −48 volt power source was already available. When they started to use polar loops, a +48 volt supply was added for SPACE battery. The military system was developed by radio communications engineers who were used to "thinking positive," that is they thought in terms of B+ and negative grounds. In their designs, the desired or active state is represented by a positive value. For example, a MARK bit is +6 or +60 volts, a digital "high" is +5 volts, a radio receiver is activated by turning on B+ voltage. The MARK sense is of little significance in neutral loop operation, but it must be taken into account when trying to interconnect military and commercial equipment for polar operation. Many military units have built-in power supplies which will be of the wrong polarity, and many have contact filters using polarized components (diodes and capacitors). If the military sets have electronic keyers (tube or transistor), they will operate only with positive MARK sensing.

The most common interface used in amateur RTTY, shown in fig. 3, is the 130 volt, 60 milliampere, current loop, neutral operation, series connected. Although individual pieces of equipment do not have to be turned on (a.c. power on), they must be connected in the loop to complete the circuit. The series current in the loop is 60 ma. (20 ma. is also used) to operate the relays and solenoids. Both send and receive devices are usually connected in series in a single loop, but separate send and receive loops may be required for some types of terminal units. In this system, all loop connection terminals on the equipments are above-ground (hot), and must be insulated from chassis and cable shields. This interface was used in older model military equipment.

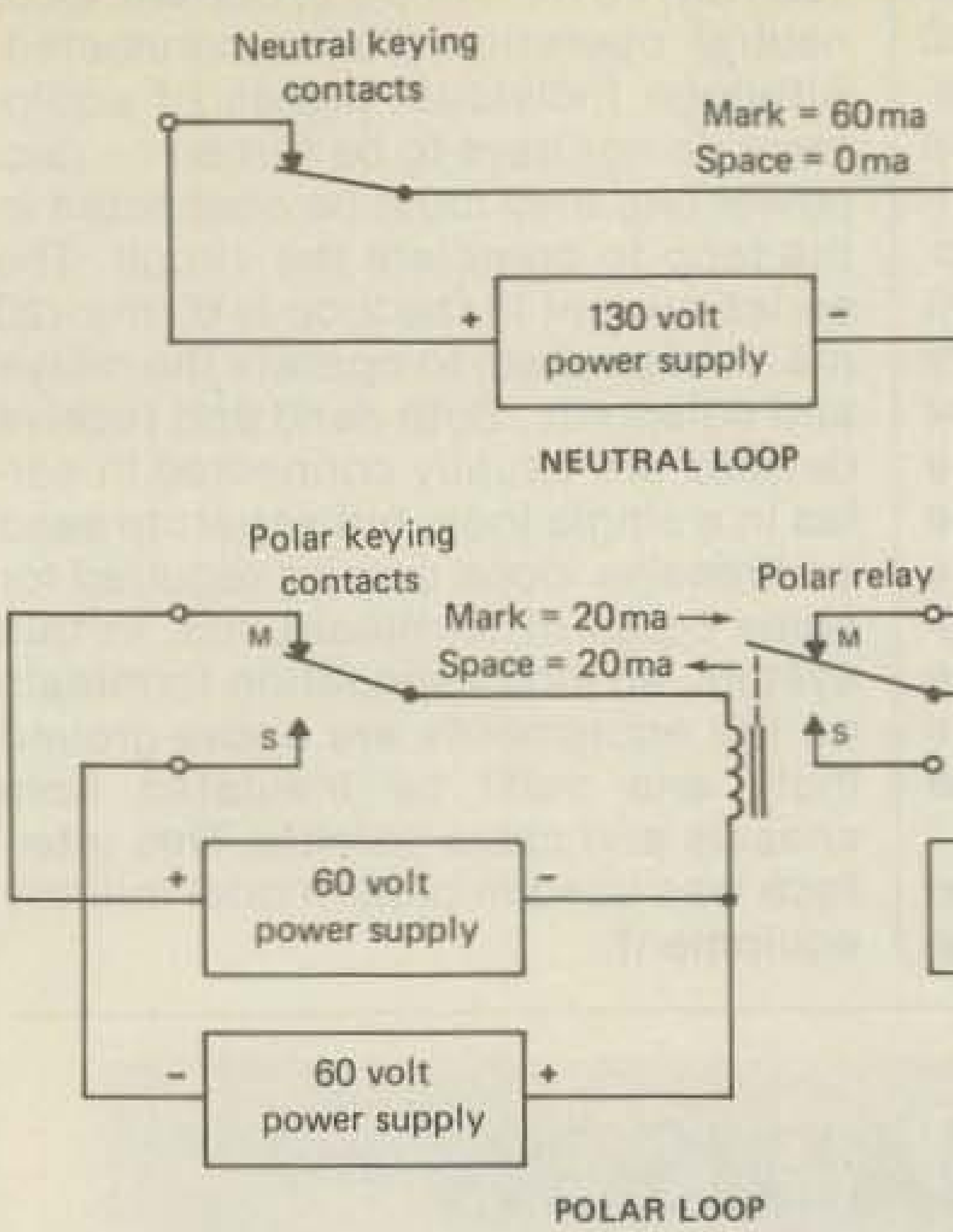


Fig. 2– A neutral loop and a polar loop.

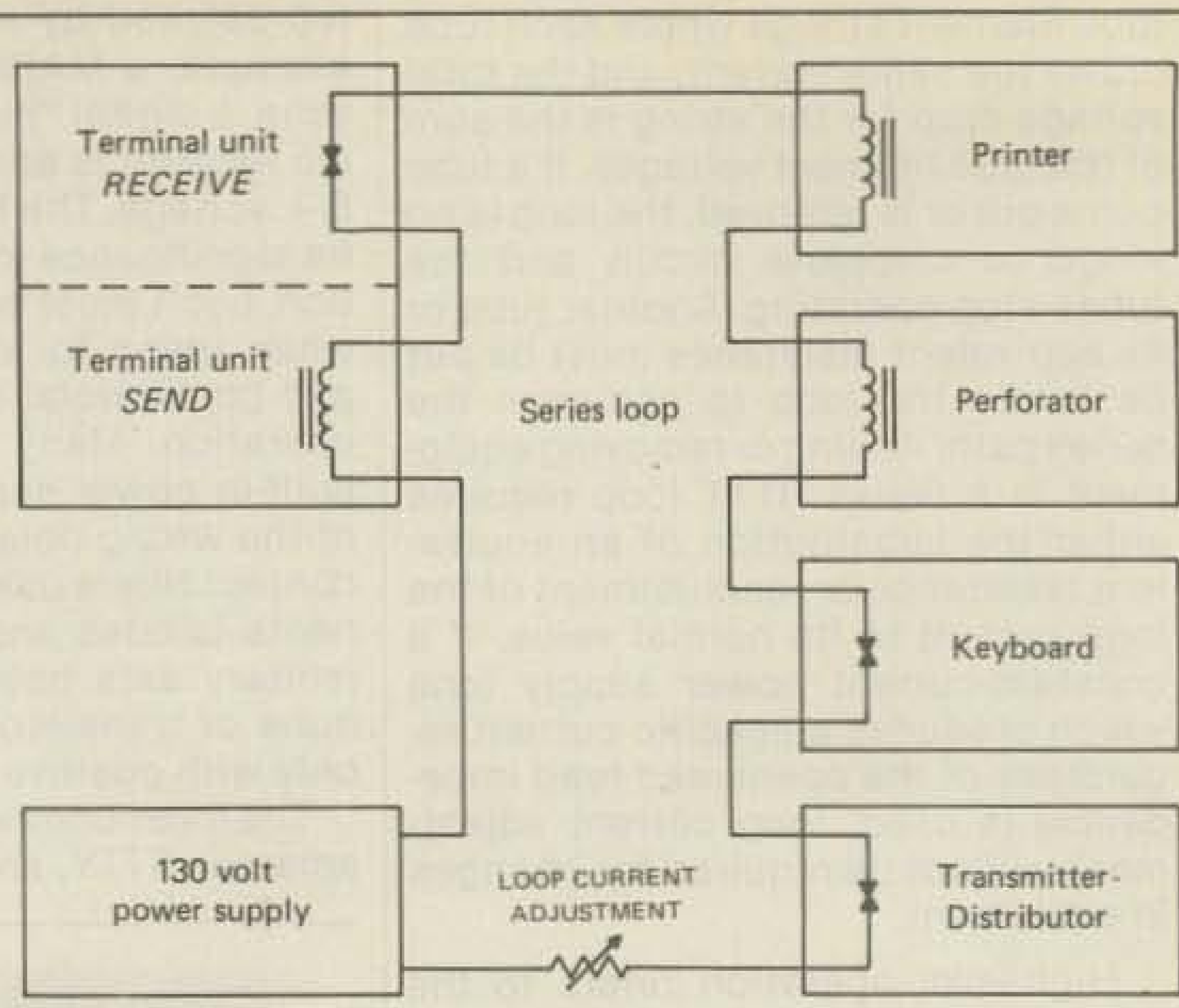


Fig. 3– The series connected, 130 volt, 60 ma, current loop for neutral operation.

The most common interface used in later military surplus equipment is ±60 volt, 20 milliampere, current loop, polar operation, series connected, positive MARK. Polar operation requires separate send and receive loops. If more than one set of contacts (for instance, the terminal unit receive relay output and the keyboard contacts) are connected to the same loop, and one of the sets of contacts is switched to the SPACE side, these contacts will put −60 volts on the line in direct opposition to the +60 volts being supplied by the other set of contacts in the MARK position. This will result in a direct short between the positive and negative power supplies and demolish the contacts, if not the power supplies! Polar contacts are normally referred to as MARK (+60 volts), SPACE (−60 volts), and Tongue (output). The tongue is the armature which swings between the MARK and SPACE contacts. The "tongue" term is a carry-over from telephone company practices, similar to the use of "E" (ear) and "M" (mouth) designations to distinguish between the connections to a telephone instrument. The "tongue" (talk) was used to prevent confusion with the "mouth" (for audio). During the past ten years, most military circuits and equipments have been converted to polar operation, so any "new" surplus equipment will be equipped for this mode. Later models with electronic keyer units use a ±60 volt voltage loop with high-impedance shunt connections. Polar operation requires the use of electronic keyers or special bistable polar relays. These relays are double-throw relays, and the direction of current flow through the coil determines which contact is made. The contacts are equipped with magnets, which keep the contact closed until the coil current forces the armature to the other contact. This bistable switching action reduces contact bounce and ensures that the relay will not stop in an open-circuit condition. Signal bias distortion caused by armature spring tension is also eliminated. Polar send devices (keyboards, transmitter-distributors) can be used in current loops by only connecting the MARK and TONGUE contacts, but the printer or perforator relays or keying units will have to be replaced or modified for neutral operation. The polar interface is shown in fig. 4.

A commercial low-level interface, introduced by the computer industry, is the RS-232 interface shown in fig. 5. This is a ±5 to 15 volt polar system, negative MARK, shunt connected. Separate RS-232 output drivers (integrated circuits) are used for the output to each device. Separate send and receive loops are used in many cases, but some systems will transmit and receive over the same wires by using digital signals to switch the drivers and receivers in and out of the loop. The RS-232 system permits the transmission of digital signals over relatively long distances without deterioration of the signal. The low voltage levels used minimize RFI and crosstalk between the leads. Some versions of this system use two-wire, twisted-pair cables to provide balanced lines, using special differential line drivers and receivers. The balanced lines reduce, even further, the RFI, crosstalk, and effect of the cables on the signal.

The standard military low-level interface, Military Standard 188 (MIL-STD 188) is ±6 volt, polar operation, positive MARK, shunt connected system, similar to RS-232 except for the voltage levels. All military equipment for the past five years or so has been procured with this new standard interface. The low voltage levels used require electronic keyers for printers and perforators, and special precious-metal contacts for keyboards and transmitter-distributors. Regular metal contacts will soon oxidize and prevent operation at these low voltages and currents. Later versions of MIL-STD 188 sets use photocells and mechanical shutter assemblies, with electronic keyers, to eliminate the contact problems. Transmitter-distributors use photocells and lamps to "read" the holes in punched tape rather than mechanical sensing pins.

The advent of digital logic systems and equipment has popularized the TTL (transistor-transistor-logic) interface. This is a 5 volt, neutral system, current loop, but shunt connected, as shown in fig. 6. The TTL integrated circuit line drivers will feed up to 10 standard TTL inputs in parallel. Although low voltage levels are used, a large amount of RFI is created by the fast (10-20 nanoseconds) transitions of the TTL devices. The harmonics generated by these fast rise and fall times extend up into the u.h.f. range. This is the primary cause of the high RFI levels encountered with home computers, code converters, and similar digital devices. Overall shielding with a metal enclosure and bypass filtering of all terminals is usually the only way to reduce RFI to acceptable levels. The TTL interface should only be used for short distances to minimize RFI and to prevent deterioration of the signal. The harmonics involved will make the interconnecting cable act like a transmission line, and the result of a long line will be phase distortion, standing waves, and ringing of the signal. Equipment connections using TTL levels should be limited to three feet or less.

A relatively rare interface that may be encountered in surplus military equipment is known as "low-level key-

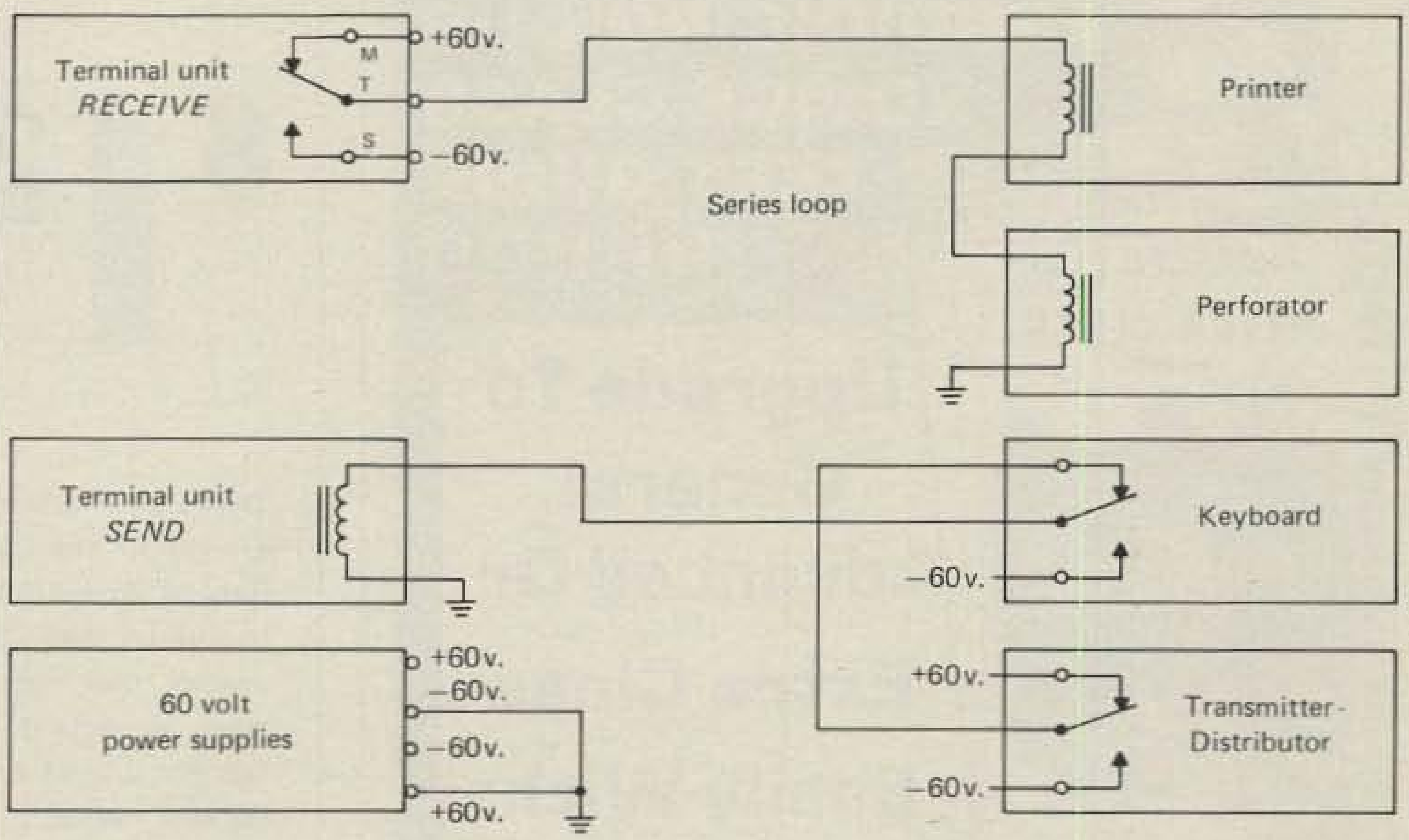


Fig. 4- The polar interface.

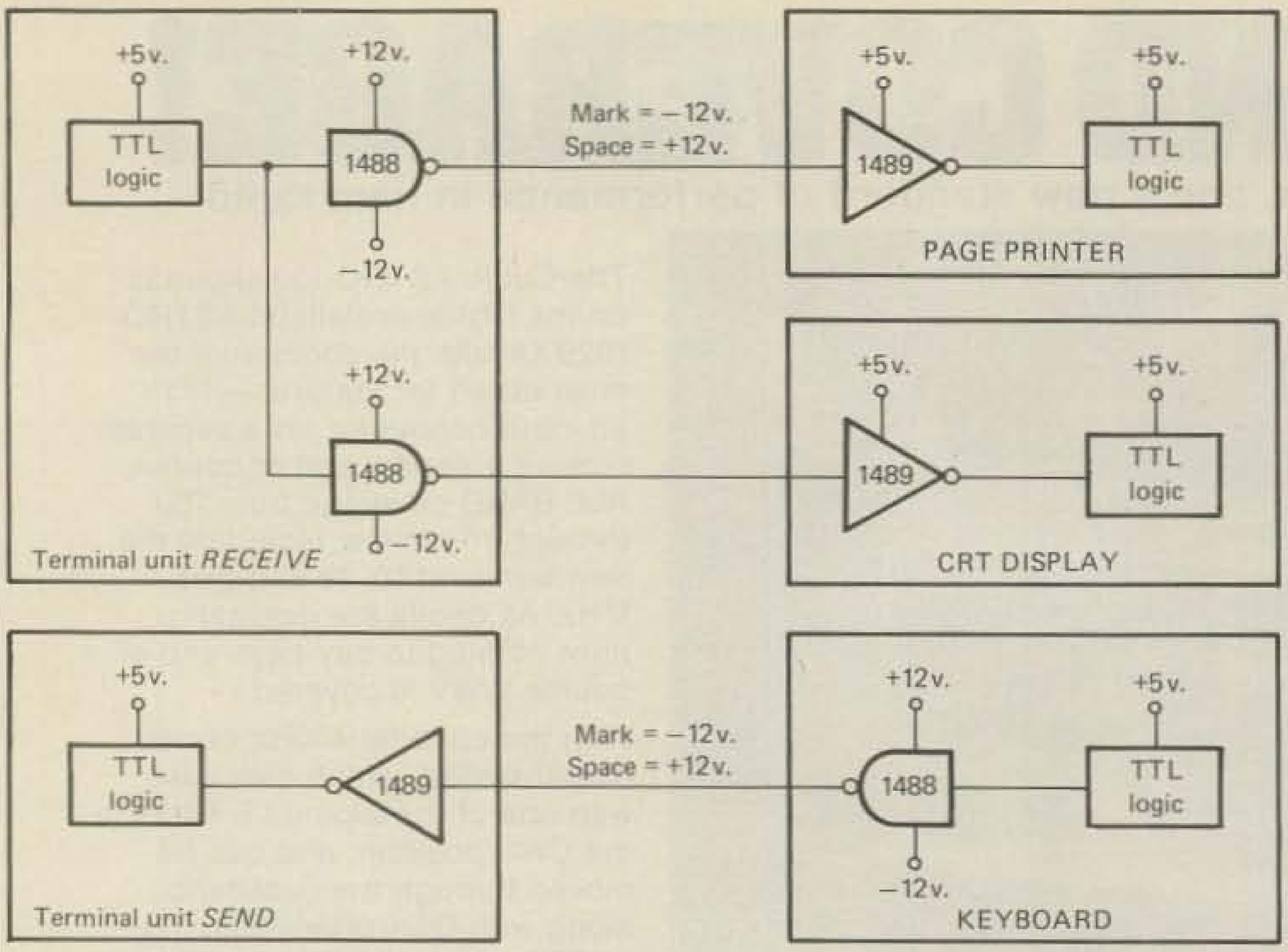


Fig. 5- The RS-232 low-level interface.

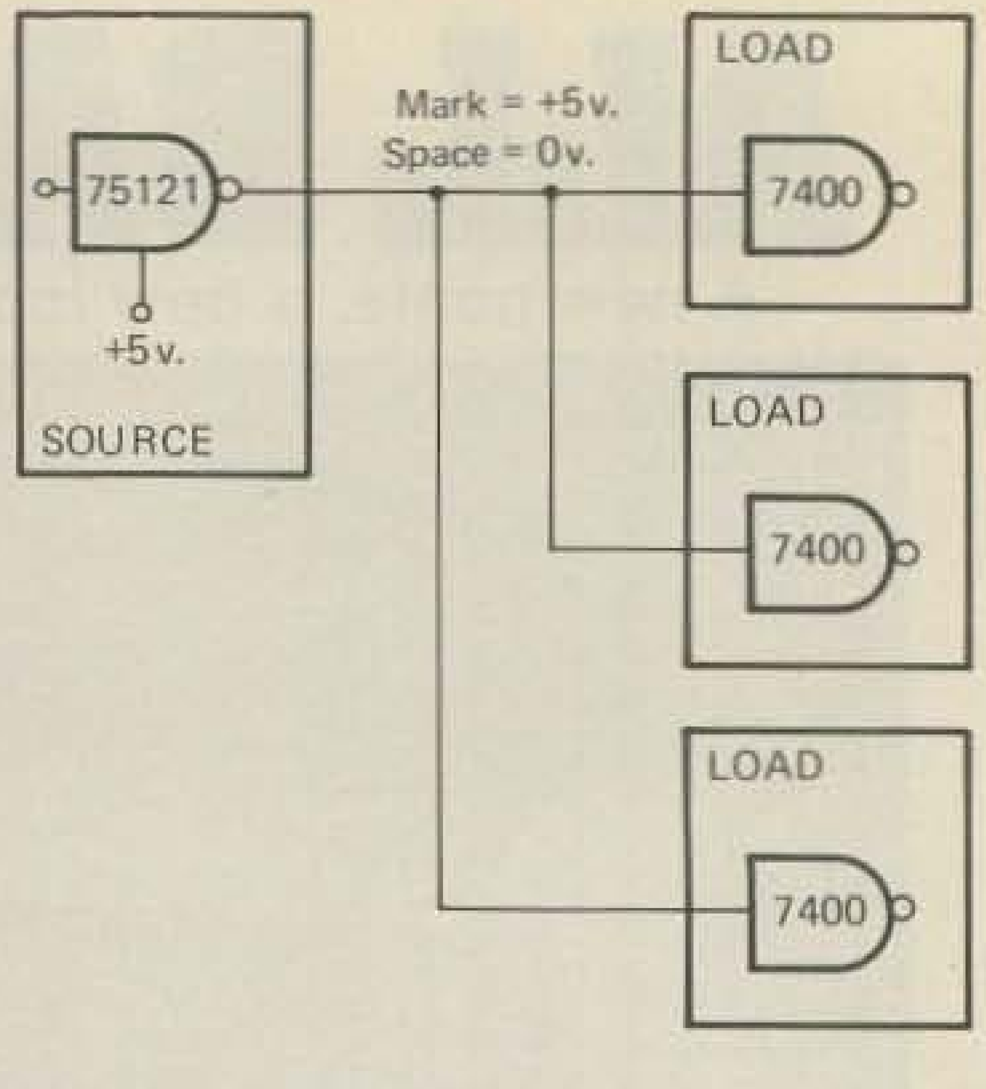


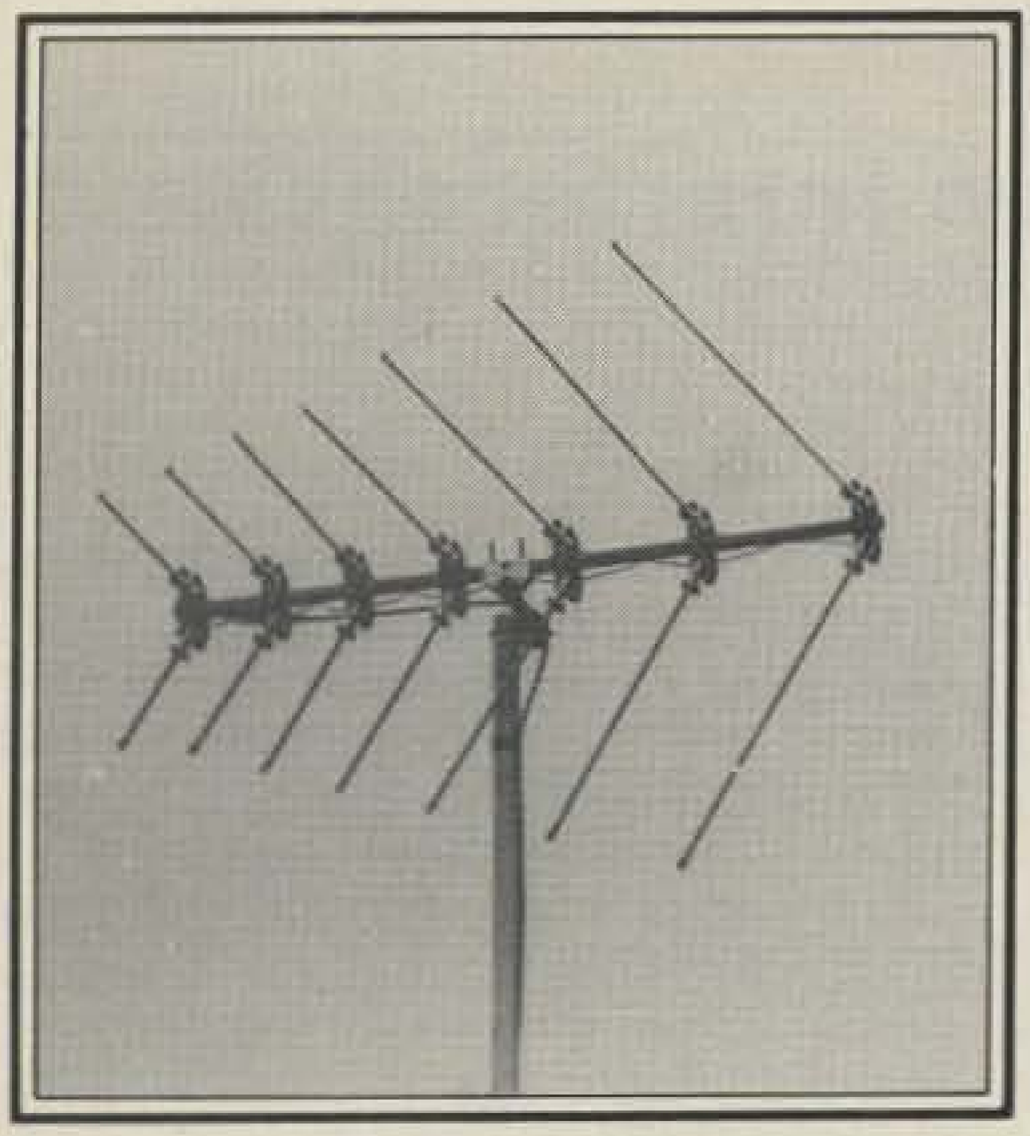
Fig. 6- The TTL (Transistor-Transistor-Logic) interface.

ing". This is a 2 volt, 100 microampere, neutral system used to interface with special purpose keyers. Again, the low voltage and current levels involved require the use of precious-metal contacts. Some sets included electronic keyers to interface with MIL-STD 188 loops, for connection to external circuits. The maintenance problem with the contacts is severe with this equipment, and it should be converted to a higher voltage system by replacing the send contact assemblies and electronic keyers.

This article has provided you with the basic characteristics of the various RTTY signal interfaces. The associated RTTY control signals, such as the character step pulse for transmitter-distributors, will use similar interfaces. In order to make it easy to patch and troubleshoot your equipment and interconnecting wiring, you should select one of the interfaces as your station standard interface, and convert or modify all your non-standard equipment to meet the standard.

CQ Reviews: The Grove Enterprises Scanner Beam

BY DAVID ROMNEY*



With some six million scanners now in American homes, it is not surprising that some manufacturer has come out with a high-performance directional beam antenna designed primarily for scanner reception.

The Scanner Beam is advertised as offering up to 8 dB gain above a dipole from 108–512 MHz. While not having a range available, some simple measurements confirmed that gain at several, although not all, points in the antennas 108–512 MHz active region. Directivity was quite good, pinpointing reception from some distance away, and bringing some signals which were quite noisy on a conventional vertical dipole scanner antenna nearly to full quieting. An additional 15 dB front-to-back ratio permits an even greater degree of single-signal reception by helping reduce interference from co-channel users off the sides of the antenna. V.s.w.r. measurements vary over such a wide frequency excursion, but an average 1.92:1 ratio assures a reasonable match for receiving purposes.

The manufacturer also suggests the Scanner Beam for low-powered transmitting applications. A TV-type balun transformer is included as standard, which would limit the r.f. power to a few watts, but we would conclude that a sustained level of about ten watts could probably be tolerated by the small balun. If a high-power balun were substituted for the receiving-type balun, power-handling capability of the Scanner Beam would approach the maximum amateur limit.

The antenna is lightweight at only 2¾ pounds and only 44 inches long, making it suitable for rotation by an inexpensive TV type rotator. It is a seven-element, log-periodic dipole array. Elements are swept forward, enhancing gain at u.h.f. by merging the pattern of the radiation lobes.

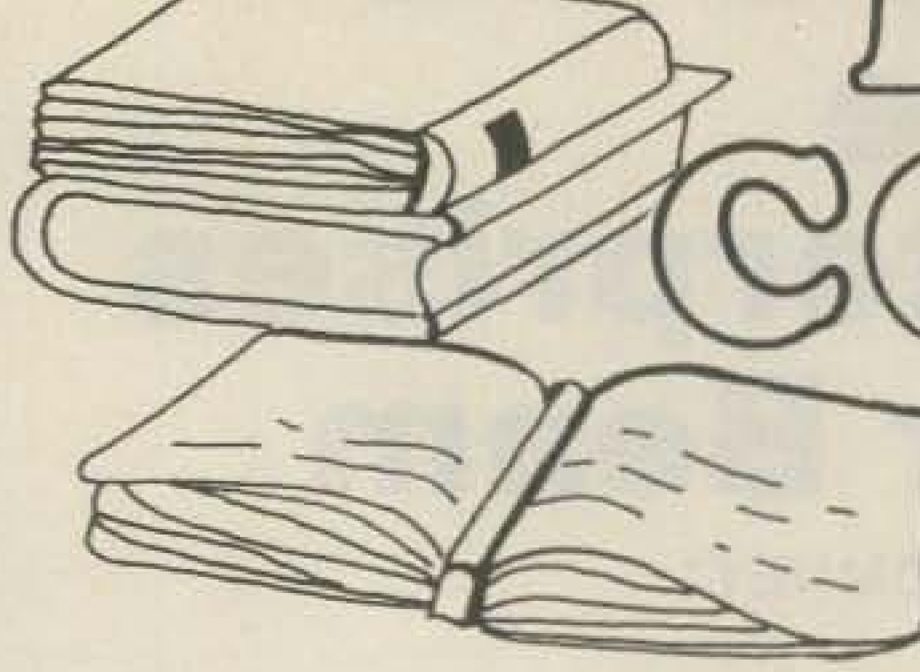
Although Grove claims that the antenna works as a non-directional antenna on low band (30–50 MHz), they recognize that this is due only to the presence of the dipoles acting as a probe for the signals. Matching at those lower frequencies is very poor, and the antenna is not as good a performer there. Still, it works well on local low band signals.

While the manufacturer states that the Scanner Beam is essentially non-directional at low band, there is a small amount of directivity. We would recommend that it be rotated while using it on low band although headings are not as critical as at the higher frequencies. All antennas used at v.h.f. and above require a good grade of coaxial transmission line. This is especially true when transmission line lengths exceed 50 feet or so.

Grove Enterprises also provides a matching 65-foot length of low-loss coax, complete with plugs and weather boot, as an accessory to the Scanner Beam. For the serious scanner listener, and for the v.h.f./u.h.f. enthusiast who requires maximum antenna performance over a wide frequency range, the Scanner Beam offers an economical alternative to single-band Yagis and simple, omnidirectional verticals.

The Scanner Beam sells for $39.95 plus $4 shipping. The matching coax assembly is $14.95 plus $4 shipping. Both are available from Grove Enterprises, Dept. W, Brasstown, NC 28902.

*c/o CQ Magazine



EXAM CORNER

BY DICK BASH*, KL7IHP

Intermodulation Interference

This month we will examine a problem the FCC lists on their syllabus for the Advanced Class applicant, **Intermodulation Interference**. Here at Bash Educational Services, we have received reports from many students who indicate that we should possibly delve into this area a bit more than has been done in the past. Additionally, this subject is repeatedly mentioned on both the local repeater and on the h.f. bands, so a little discussion of it here might enlighten us when on the air.

Intermodulation is referred to in *Electronic Communication* (4th edition, published by McGraw-Hill) by Robert L. Shrader, W6BNB, on pages 413 and 414. If you haven't purchased this book yet, I can strongly recommend it as an easy-to-read text that is one of the best you can get. It's not cheap ($26.95) but neither are most things of high caliber. It is available through technical bookstores. If you can't find it, try *CQ*'s Book Shop.

Anyway, intermodulation interference occurs when two (or more) transmitters are close together and both are on the air stimultaneously. Transmitter #1 is sending out its signal on frequency X and transmitter #2 sends its signal out on frequency Y. If these two transmitters are physically close enough (such as might be the case with a hill full of repeater transmitters), then the first transmitter can possibly send part of its energy into the antenna system of the second transmitter. Within the final of this second transmitter we find frequency X and Y "intermodulating," or mixing together. The result of this mixing is the classic mathematical sum of X and Y as well as the mathematical difference between the two frequencies. We'll call these frequencies S (for "sum") and D (for "difference"). As if this isn't enough, we also get the harmonics of frequencies S and D!

By itself this is not a concern for the FCC, but the mixing in the final amplifier circuit isn't the end of the problem. The FCC gets concerned because some of these harmonics of S and D could be radiated by the antenna system of the unit and then go on to create interference in the frequencies allocated to other services, such as the authorized commercial frequencies. Not only might the problem be brewing up in the final of transmitter #2, but transmitter #2 might be doing the same thing in transmitter #1's final amplifier circuit!

Bob Shrader points out that if you put a **Wavetrap Filter** that's tuned to transmitter #2's frequency (in this case, frequency Y) on the first transmitter between the transmitter and the antenna, you'll eliminate the interference. Likewise, on transmitter #2, you'd install a wavetrap filter set to frequency X (the first transmitter's frequency). What these wavetrap filters will do is prevent the other transmitter's energies from entering the "protected" transmitter's amplifier area. So, the transmitter that's having the problem is the one which really needs the filter.

The above information should give you more than enough information to answer the test questions and, more importantly, will allow you to discuss it more comfortably on the air. Please direct your questions and comments to me at Bash Educational Services, or call me between 1800 and 0200 UTC, Monday through Saturday. Good luck, and we'll see you again next month in this column.

*Bash Educational Services, P.O. Box 2115, San Leandro, CA 94577.

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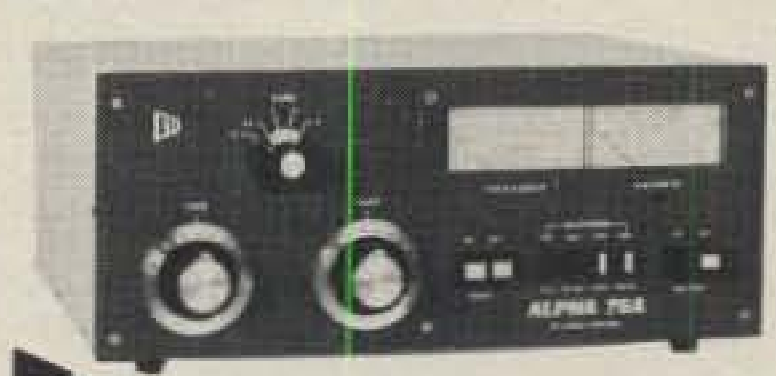

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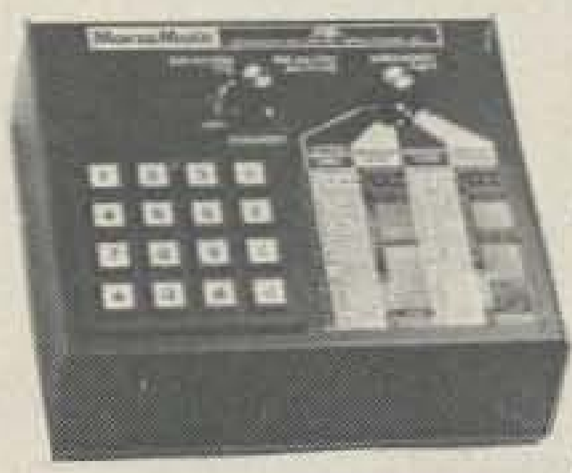

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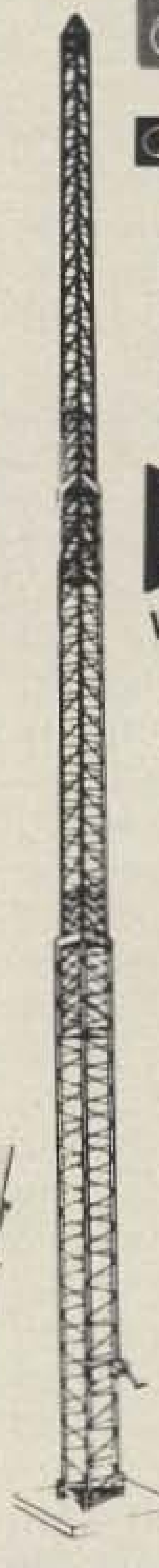

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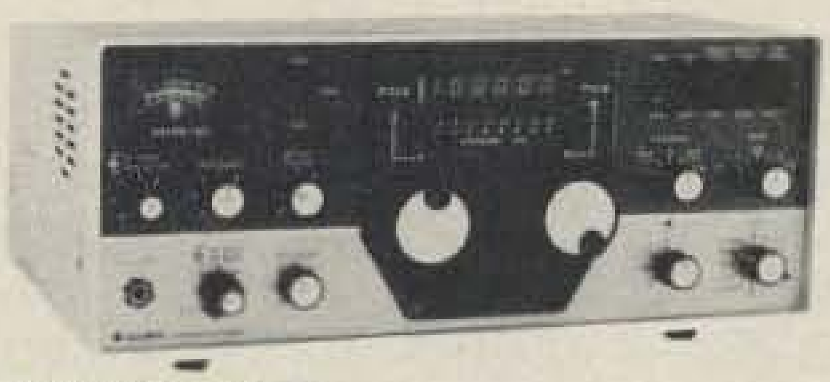

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CIRCLE 26 ON READER SERVICE CARD

a monthly feature by
ADRIAN WEISS, K8EEG

QRP

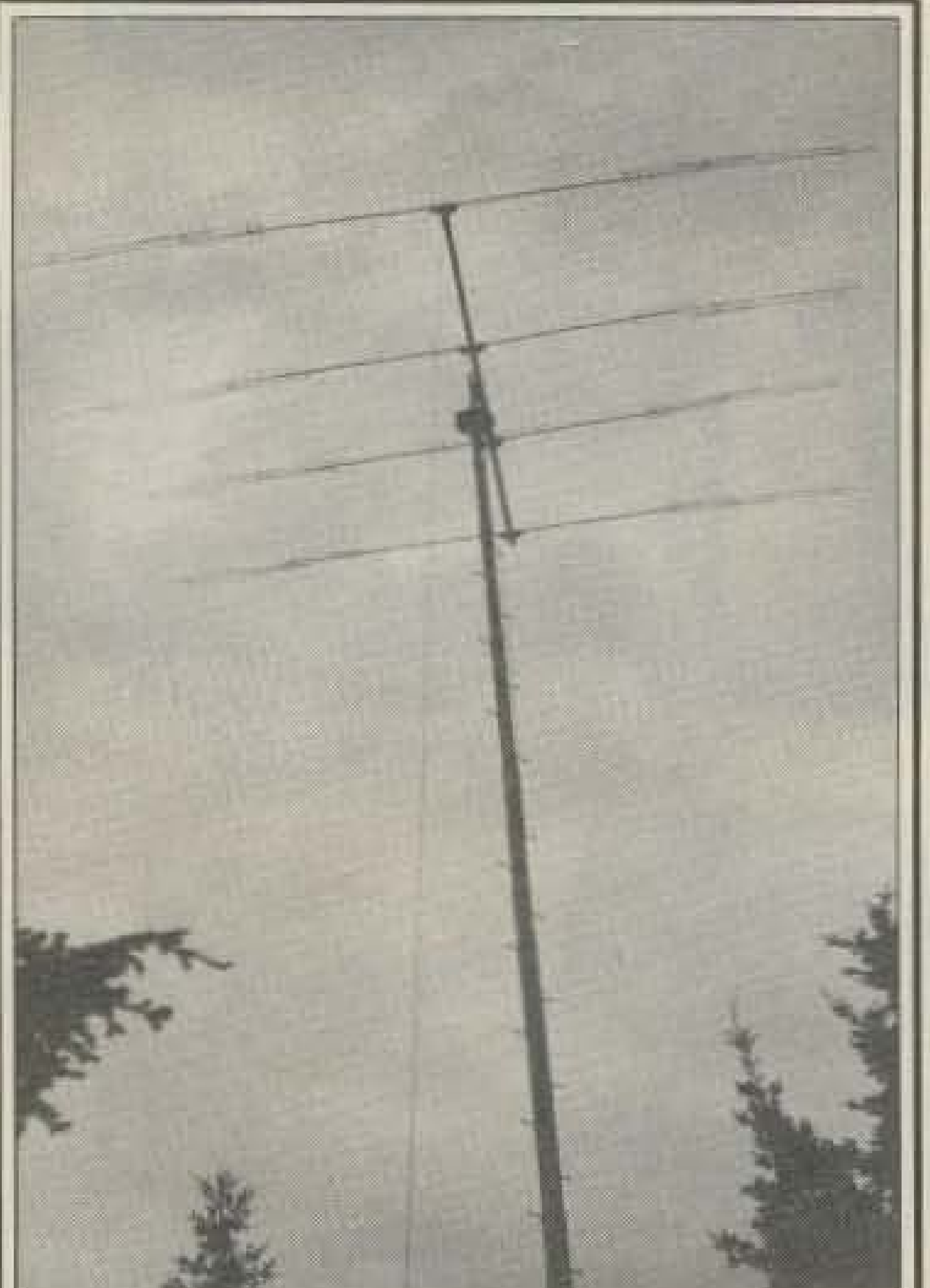
THE ART OF VERY LOW POWER OPERATING

1980 Milliwatt FD Trophy—K1JX Expanded Awards for 1981 FD!

Believe it or not, it's time to get ready for Field Day again. Preparations are of the utmost importance because Murphy ranges widely to disrupt the enjoyment hams can have out in the field. We'll provide some tips later. But the 1980 event produced some real surprises. First off, K1JX, operated by Clarke Greene, who you may recognize as the former "How's DX" column Editor in *QST*, and K3KU posted an incredible total of 741 QSO's, not only taking the Milliwatt FD Trophy, but beating all ARRL entries in the one transmitter class—QRP and QRO alike! But, K1JX/K3KU might have had a real run for their top honors if WA6OEY/WB6KQI had taken QRP seriously, and instead of operating over the 5-watt output limit on 40-20 meters, had kept output under the limit to make all of their 762 QSO's count toward the trophy! As it turned out, only 475 QSO's were within the power limit—enough to give them the second all-time highest score in our competition. One of the greatest surprises for me was the total of 33 entries, only two years after I threatened to discontinue the award.

I want to express my deepest gratitude to all of you fellows who took the time to send in your entries in support of the award program. That's what the award is all about—to show the world that QRP *can* get through. Or, as trophy winner K1JX put it, "Both Art and I were quite pleased with the fact that we not only won the class (1B-Bat.) but also beat all the other 1 transmitter entries, 1A, 1B, or otherwise. Obviously, this shows that the use of QRP is a real viable means of communication even under emergency (like) conditions." That's the point.

*83 Surburban Estates, Vermillion, SD 57069



WA6OEY antenna installation featuring the KT-34 at 50 feet, site at 2300-foot elevation. 761 QSOs (475 at under 5 watts output).

Inspired by all of the above, I've decided to provide fresh results via SASE's included with future entries as soon after the deadline date as possible. So, we'll all have the run-down shortly after August 31, 1981, for this year. Of course, I'll save the *CQ* story until May or June of next year for motivational purposes. But the BIG NEWS is that everyone will have a chance at an award in 1981 because the Michigan QRP Club and the QRP ARC I, our two American under 5-watt QRP groups, have added their support to the original Milliwatt FD Trophy program, and we can now offer awards in three categories as well as certificates to 2nd to 4th placers in each category (provided there are a minimum of 10 entries in that category).

The two new categories are: (1) the QRP Club FD Plaque, for entries exceeding the two-operator/one-transmitter class, under 5 watts output; and (2) the One Watt FD Trophy, two-operator/one-transmitter limit, under 1-watt r.f. output. We require 10 entries in each category for awarding the plaque and trophy. Scoring is the same with *one difference*: the power multiplier for the 1-watt category is now X8 (X4 for 5 watts). Actual comparison of the ratio of past 1-watt entry scores with top 5-watt entries suggests that this multiplier is a valid equalizer. Entrants for the QRP Club FD Plaque may choose to operate at the 1-watt level and use the X8 multiplier. But enough business, and let's hear what the fellows have to say about FD 1980.

Multiple Facets of Murphy's Law

FD can be a breeze—except Murphy's Law exists to militate against that eventuality. Read on and learn of Murphy's multifarious tricks. A "new" one from George Dorner, W9ZSJ, a late entry from last year—after setting up on an ideal site at the Harper College Campus, the following transpired: "As I was setting up, I was suddenly surrounded by 40-50 young people—members of a Drum and Bugle Corps which practices on the campus all summer. Their leader, a former ham, asked if I was going to operate phone, and my "no" answer apparently justified his setting up practice about 40 feet from my operating position. For the first 40 minutes of the contest, I had QRM from a Drum and Bugle Corps. I wonder if this is a first!!" After practice ended, George found that life improved considerably: "Imagine my delight at finding how easy it was to make a contact and get a good report—over 80% of our 117 QSOs were S8-9, and virtually all were R5 even though all contacts were in the Novice band."

Overall, George comments: "Well, Ade, thanks for cajoling me into my FD/QRP/40 celebration. It was a ball, one of the biggest kicks I have gotten from hamming and definitely to be urged upon newcomers and oldtimers alike!" Why the late entry? George celebrated his 40th birthday during FD, and to top that off, he is Dean of Technology, Math and Science at the college. Those of you who are college faculty will understand the connection.

A fairly common error which renders FD operators prime targets for Murphy relates to housing versus weather. Tom, WA3FNK, reports: "All went well until about 0230 Sunday when wind and thunderstorm set in. No tent . . . locust trees not very reliable in storm. So packed it up and finished the contest at home. Glad I did because that afternoon we got one-half inch of rain in 10 minutes. Hope everyone had as much fun as I did. Next year look for a run for the top!" Tom used an Argo and HW-8 with all-band dipole and 40 meter sloper.

Solar Power Entrants

John Akiyama, W6PQZ, holder of DXCC QRPp #4, S.S.B. #1, has been into solar power as means of working DXCC. He has worked 255/246 countries regular power. His solar panel can be seen on the cover of the August, 1980, issue of *CQ*. Operating FD from the home station with the 4-element yagi (at 70 feet) fixed at 75°, and rotating the solar panel manually, the Argonaut produced 493 QSO's—enough to win the trophy in past years which produced top scores to date. Carl Rayman, WAØRLY, and John Schaefer, WBØGGM, used an HW-8, 12AVQ vertical, and 110-foot dipole with solar power for 108 QSOs.

Carl provides these details: "The solar panels are homebrew from Poly Paks Inc. "solar boat" cells, 38 per panel, five panels. The car battery was an old one which had been out of the car for a year at the time we began charging it. It started at a voltage of 6.5 volts and went up to 12 volts three days before FD after charging for a two-week period via the panels. It dropped back to 9.5 volts by the end of FD.

Terry Young, K4KJP/W4ZBB, reports: "Station consisted of an Argonaut 509, MFJ keyer, and a solar array consisting of eight 10-volt solar panels in series-parallel configuration to supply 20 volts at 1.2 amps to an LM-340T-12 12-volt regulator. We had only one hour of sunshine Sunday morning; it rained on us for the rest of the FD period. While only 9 QSOs were completed using the solar panel, the remainder of the 48 contacts were made with my solar-charged nicad battery pack. See the photo for the solar panel layout." Another form of natural power was used by K5VOL/9—a bicycle and generator which expired after 5 QSOs. It seems to me that these solar and natural power approaches offer a special type of satisfaction. More ought to try it!

K4KJP displaying his solar array used as the sole power source for 9 QSOs and for charging the nicads used during the remainder of his activity. More fellows should try this approach.

What They Used—Details

Ken Gould, WAØSLU, reports: "Operation took place in the Tipton City Park using a lawn-mower battery for power in our portable setup. The rig was a modified Triton I transceiver with the PA disconnected. Power output was 4 watts as measured by a Bird wattmeter. The antenna was a center-fed Zepp double-extended on 15 meters at a height of 25 feet." Mike, W3TS, notes: "Enjoyed QRP FD this year. Other years I tried talking the club into QRP but no luck. Wasn't much club interest this year, and WB3IDP and I were the only ones going out for FD, so we went QRP battery and are going to do the same next year. We used the Omni-D powered-down to a 130-foot dipole at 60 feet fed with 65 feet of 300 ohm tuned feeders. I was surprised at how well we did and how little we drained the big old car battery even with a digital readout rig."

Warren, AF9Q, is a newcomer to QRP: "Attached to this letter is my entry—not very impressive, but better than I thought possible with such low power. My total operating time was 12 hours and 28 minutes. This was my first attempt at QRP operation. I bought a used Ten Tec PM2B about one week before FD, and set it up for the first time on Saturday afternoon! (*That's real faith—ed.*) I found a nice shade spot, set up a card table for the rig, and used an old, mostly discharged battery on the ground next to the table for power. I had a pretty good dipole at 35 feet. *Although most QSOs were made by hunting for strong stations calling CQ, a surprising number of answers were obtained by my CQ's.* God Bless the patient operators on the other end who repeated what I needed, sometimes two or three times!"

WB1DKX used a 300 ohm TV-twin-lead half-wave dipole through an MFJ antenna tuner with his Argonaut. Stu Cowan, W2LX, ran into a bit of a problem: "Only operated a few hours but it was a great experience and I held my own (almost) with the big boys running 100 watts output and more—with my 1-2 watts? I used 1 × 1 calls and got 90% of the fellows I called! I had antenna problems—a random-length wire put too much r.f. into the Argo ad I then had to string up a trap dipole which took a lot of time. But it worked fine once I got it up. Had no radials to cure the r.f. problem. Anyway, I was probably the oldest OT in QRP—48 years a ham and age 63. Congrats on encouraging QRP Ade—a great way to go, more should try it."

Paul, N2RI, was another who turned to the antenna tuner plus wire antenna. He used an extended double-Zepp cut for 40 meters and fed with open-line through a homebrew tuner. Dan Tomcik, K4OU, of Ten Tec used an Argo 515 and a unique homebrew antenna for 20-15-10 meters using bamboo fishing poles (see photo): "I operated from my moored houseboat, the "Love Barge," with single dipoles up about 12 feet above water level. With the antenna shown in the photos, I could change bands in less than a minute. The setup worked fine. No antenna tuner was needed and no r.f. problems were encountered. Worked just about everything heard except a few ex-

WA3FNK at the operating position under a shade tree. Thunderstorms closed down the operation Sunday morning. Note the outstanding publicity effort in the form of the sign!

tremely strong stations that must have had wooden receivers."

Winner Clarke Greene, K1JX, operating with K3KU, notes: "A local farmer generously offered the use of his hilltop fields, where we set up our tower and tent. For antennas we used a 2-element quad at 50 feet for 20–15–10 meters, and a 136-foot center-fed for 80–40 meters. The rig was a modified TS-120; when the sun shone (only on Saturday) we charged the battery with a Spectrolab Inc. solar panel delivering 2.4 amps at 14 volts under full sun. Except for traveling to and from the site, no fossil fuel was used at all. Next year we plan to go 1B-Battery QRP again with only wire antenna (no tower at all) or go with a local club to try to beat the local competition, CWA, at 2A-Battery QRP. Maybe we'll try a V-beam for 20–15–10 meters."

Finally, Jim Murch, WA6OEY, offers some suggestions: "From our DX'ing experience, we knew that three things were essential to successful operation. First, use the best antenna sys-

1979 Late Entry W9ZSJ (left) and K9BCM (right), with base of 18AVT and battery in front of the very restricted operating position consisting of a small camp table. Camp cook stove on ground beside Daisy for heating coffee. An 80–10 meter dipole in background with feedline coming out of George's right ear.

Official Results
1980 Milliwatt FD Trophy

Station	QSOs CW/SSB	Score
1. K1JX	**740/1 1w**	**4596**
2. WA6OEY	-/475	3000
3. W6PQZ*	-/493 1w	2958
4. KC8P	-/311	2016
5. WB4AEG	101/205	1836
6. W3TS	244/-	1614
7. K6TG	180/62	1602
8. N2RI	174/- 1w	1455
9. W5LXS	193/-	1308
10. WA2DFI/7	188/-	1278
11. K4OU	176/-	1206
12. WB0UXP	87/79	1146
13. WA0SLU	164/-	1134
14. AB5N	142/7	1044
15. N8AUC	93/20	828
16. WA0RLY*	108/-	798
17. WB6BYH	35/71	786
18. N4DP	103/-	768
19. WA4UQA	97/4	732
20. WB1DKX	-/90	690
21. AF9Q	82/-	642
22. W2LX	78/-	618
23. AD5F	14/45 1w	592.5
24. K5VOL/9	73/-	588
25. W4ZBB* (K4KJP /op.)	48/-	438
26. WA3FNK	21/-	348
27. VE4ADS	-/28	318
28. KA1CZF	28/-	318
29. N0BQW	-/12	222
30. KA9GMV	3/-	168
31. N3BDN/4	14/-	56

MULTI-CLASS

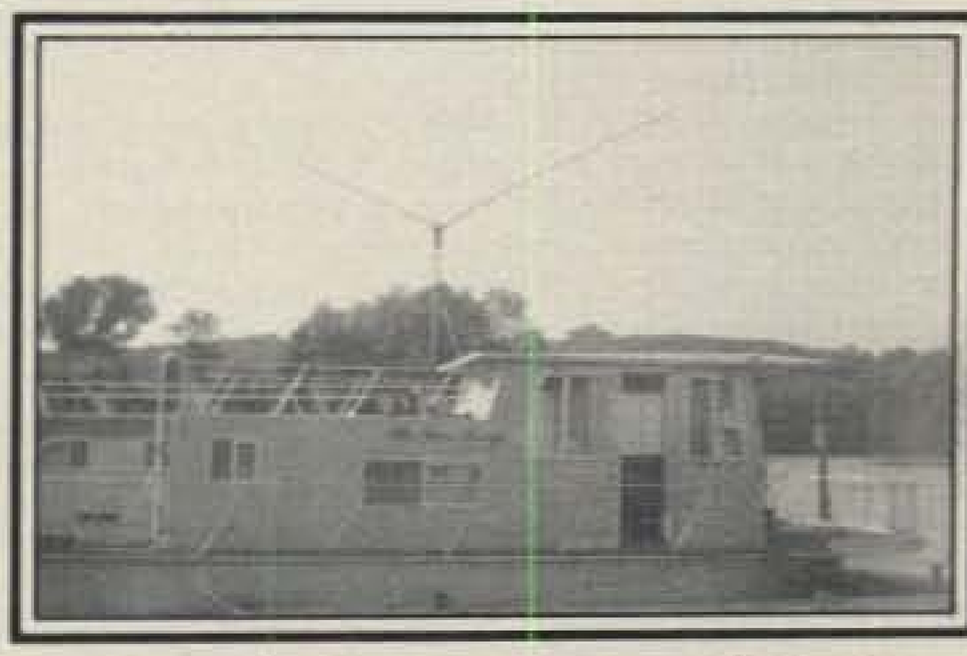
OP/XMTRS	QSOs	Score
1. K8BX 4/1 1w	378/	2985
2. W6JTH 2/2	152/	1062
1979 Late Entry: W9ZSJ	117/	852

*Indicates solar power source

tem that is available and practical. Second, choose the best location you can obtain permission for. And third, pay attention to creature comforts. You can't operate effectively or concentrate if you are sitting on a cold rock or a bumpy log. A table, chairs, operating aids, scratch paper, good checksheets, and a case of cold beer all fit into this category. I attribute our success this year to the antenna system and location. The 4-element KT-34 is an outstanding antenna, but any proven directional system should work. The clear, 2300-foot elevation site was also of great benefit. One small tip that seemed to work very well for us: we found out very early in the contest that we could not really compete in the pile-ups. We would eventually get through, but we were only making a contact every 5 minutes or so. Our best approach was to find as clear a spot as possible and try to attract attention by calling CQ QRP FD. We would work a frequency until we got no more responses, and then we'd move 25 kHz or so and start calling again. This method produced contact rates of one to three contacts per minute for long periods of time. It is difficult for a single operator to maintain both logs and check sheets, especially when the contact rate is high. Except for short rest breaks, one of us concentrated on the radio and the other maintained the paperwork. We enjoyed our first QRP FD!

Well gang, that's space again for this month. You're missing something if you don't get out for FD this year (June 27–28, 1981)! Send your entries directly to me for the awards mentioned earlier. Good luck!

73, Ade, W0RSP



The K4OU site. The moored "The Love Barge" sporting the 10–15–20 meter dipole fabricated from a pair of 12-foot collapsible fishing poles. Despite the low height of about 12 feet above water level, the antenna performed excellently at 176 QSOs.

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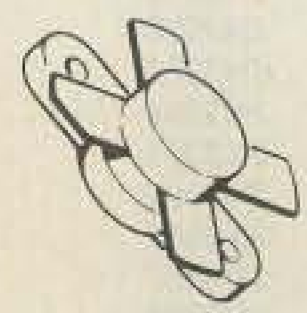

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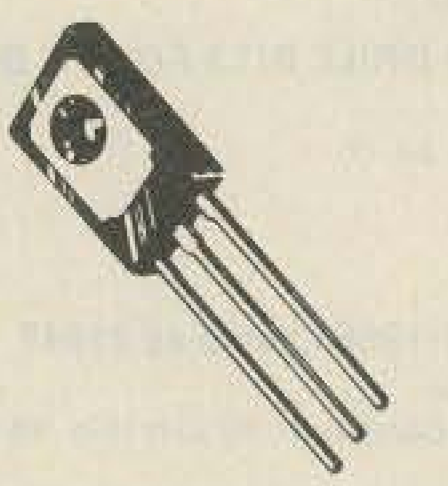

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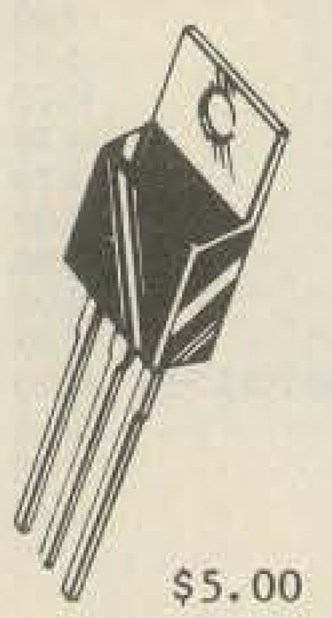

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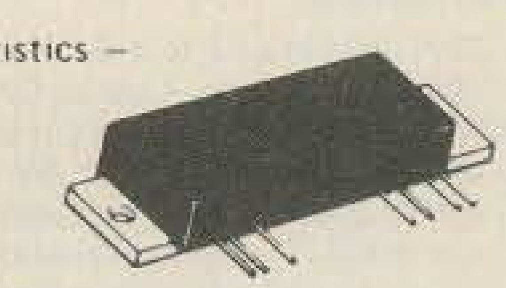

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H487B	100 ohms Neg. Thermistor Mount (USED)	100.00
477B	200 ohms Neg. Thermistor Mount (USED)	100.00
X487A	100 ohms Neg. Thermistor Mount (USED)	100.00
X487B	100 ohms Neg. Thermistor Mount (USED)	125.00
J468A	100 ohms Neg. Thermistor Mount (USED)	150.00
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
NK292A	Waveguide Adapter	65.00
8436A	Bandpass Filter 8 to 12.4 GHz	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
809A	Carriage with a 444A Slotted Line Untuned Detector Probe and 809B Coaxial Slotted Section 2.6 to 18 GHz	175.00
X347A	8.2 to 12.4 GHz Noise Source	500.00
S347A	2.6 to 3.95 GHz Noise Source	600.00
G347A	3.95 to 5.85 GHz Noise Source	500.00
J347A	5.85 to 8.2 GHz Noise Source	500.00
H347A	7.05 to 10 GHz Noise Source	540.00
349A	400 to 4000 MHz Noise Source	310.00
P532A	12.4 to 18 GHz Frequency Meter	400.00
M532A	Frequency Meter	500.00
P382A	0–50dB Attenuator	520.00
355C	.5 watts 50 DC to 1000 Mc Attenuator	132.50
NK292A	Adapter	100.00
3503	Microwave Switch	100.00
33001C	PIN Absorption Modulator	295.00
11660A	Tracking Generator Shunt	50.00
11048C	Feed Thru Termination	25.00
10100B	Feed Thru Termination	25.00
H421A	7.05 to 10 GHz Crystal Detector	75.00
H421A	7.05 to 10 GHz Crystal Detector Matched Pair	200.00

Merrimac

AU-26A/	801162 Variable Attenuator	100.00

Microlab/FXR

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
3033	Coaxial Hybrid 2 to 4 GHz 3dB Type N	125.00
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
22377	Waveguide to Type N Adapter	35.00
720-6	Fixed Attenuator 8.2 to 14.4 GHz 6 dB	50.00
3503	Waveguide	25.00

PRD

U101	12.4 to 18 GHz Variable Attenuator 0 to 60dB	300.00
X101	8.2 to 12.4 GHz Variable Attenuator 0 to 60dB	200.00
C101	Variable Attenuator 0 to 60dB	200.00
205A/367	Slotted Line with Type N Adapter	100.00
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

COMPUTER I.C. SPECIALS

MEMORY	DESCRIPTION	PRICE
2708	1K x 8 EPROM	$ 5.00
2716/2516	2K x 8 EPROM 5Volt Single Supply	15.00
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 10 For $20.00 100 For $100.00	4K x 1 Dynamic RAM	2.99
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
7141-2	4K x 1 Static RAM 200ns	14.99
MCM6641L20	4K x 2 Static RAM 200ns	14.99
9131	1K x 1 Static RAM 300ns	10.99

C.P.U.'s ECT.

MC6800L	Microprocessor	13.80
MCM6810AP	128 x 8 Static RAM 450ns	3.99
MCM68A10P	128 x 8 Static RAM 360ns	4.99
MCM68B10P	128 x 8 Static RAM 250ns	5.99
MC6820P	PIA	8.99
MC6820L	PIA	9.99
MC6821P	PIA	8.99
MC68B21P	PIA	9.99
MCM6830L7	Mikbug	14.99
MC6840P	PTM	8.99
MC6845P	CRT Controller	29.50
MC6845L	CRT Controller	33.00
MC6850L	ACIA	10.99
MC6852P	SSDA	5.99
MC6852L	SSDA	11.99
MC6854P	ADLC	22.00
MC6860CJCS	0-600 BPS Modem	29.00
MC6862L	2400 BPS Modem	14.99
MK3850N-3	F8 Microprocessor	9.99
MK3852P	F8 Memory Interface	16.99
MK3852N	F8 Memory Interface	9.99
MK3854N	F8 Direct Memory Access	9.99
8008-1	Microprocessor	4.99
8080A	Microprocessor	8.99
Z80CPU	Microprocessor	14.99
6520	PIA	7.99
6530	Support For 6500 series	15.99
2650	Microprocessor	10.99
TMS1000NL	Four Bit Microprocessor	9.99
TMS4024NC	9 x 64 Digital Storage Buffer (FIFO)	9.99
TMS6011NC	UART	9.99
MC14411	Bit Rate Generator	11.99
AY5-4007D	Four Digit Counter/Display Drivers	8.99
AY5-9200	Repertory Dialler	9.99
AY5-9100	Push Button Telephone Diallers	7.99
AY5-2376	Keyboard Encoder	19.99
AY3-8500	TV Game Chip	5.99
TR1402A	UART	9.99
PR1472B	UART	9.99
PT1482B	UART	9.99
8257	DMA Controller	9.99
8251	Communication Interface	9.99
8228	System Controller & Bus Driver	5.00
8212	8 Bit Input/Output Port	5.00
MC14410CP	2 of 8 Tone Encoder	9.99
MC14412	Low Speed Modem	14.99
MC14408	Binary to Phone Pulse Converter	12.99
MC14409	Binary to Phone Pulse Converter	12.99
MC1488L	RS232 Driver	1.00
MC1489L	RS232 Receiver	1.00
MC1405L	A/D Converter Subsystem	9.00
MC1406L	6 Bit D/A Converter	7.50
MC1408/6/7/8	8 Bit D/A Converter	4.50
MC1330P	Low Level Video Detector	1.50
MC1349/50	Video IF Amplifier	1.17
MC1733L	LM733 OP Amplifier	2.40
LM560	Phase Lock Loop	10.00
LM562	Phase Lock Loop	10.00
LM565	Phase Lock Loop	2.50
LM567	Phase Lock Loop	2.50

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a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

Here is the June "Story of The Month" as told by Ralph:

Ralph G. Alley, W9JR All Counties #188, 6-20-78

"My father had been a ham before me, and my visits to the Providence Radio Association and getting there early enough to participate in the code practice sessions resulted in my getting my license in 1938.

"Three and a half years during World War II gave me welcomed c.w. operation as a radio operator, and schooling helped the technical end.

"My mobile operating got started big in 1958, mainly on 10 meters on a.m. during the peak of the cycle. In mid 1959 I did complete WAS/mobile, all 10 meter a.m. That certificate plus WAS (also all 10 meters, a.m. and mobile) were the incentives I needed to start chasing certificates. The major ones I received during the next few years (and I refer only to mobile operating throughout this story) were highlighted by YLCC and DXCC.

"When the late Clif Evans started the County Hunting Award, I counted up my QSLs and found I only had about 400 (about 395 were with fixed stations, as there were few mobiles around prior to that time). During my chase of DXCC I had modified my Johnson Mobile AM Transmitter to provide c.w. as well and had changed the final tube to a 6146 (and later to an 8230, I believe). I also built the d.c. to d.c. converters to eventually run 130 watts input on c.w. The receiver was an all-transistorized one that I also built and operated on 3.5–29.7 MHz. In my start into county hunting, I was honored to give W2QHH (All Counties #5, 6-15-66) his last county in Wisconsin. I finally earned USA-CA-500 #230 in May 1963. Not too long after that, I became fairly inactive with a dead receiver and other activities.

"Returning to county hunting in 1971, my county total rose but too slowly. At times I would return to chasing DX, eventually getting the DXCC confirmed total to 152.

John Alley, W9JR, with TS 520S on back seat.

"In early 1978, with Arnie, K9DCJ alerting me to the presence of a needed county, he gave me the last one in Iowa. I wish I could thank personally those mobiles who helped so much near the end, but, that not being possible, "thank you" to each of you. If I may, I would like to issue added thanks to the following for the extra large number of counties, out-of-the-way trips, etc.: Dorothy, WB9RCY who finished 3 states for me; Dick, WAØDCQ who finished two states for me; Lyle, WDØEHB who drove around the whole state of Missouri to give me at least 12 counties to finish the state; to WA7KKN for my next to last (in Montana); and to the many can't-do-it-without-'em NCs—Bud, W7SU and Carl, WA7MAR (just to name two).

"Between 1972 and 1978 I was privileged to complete 8 amateurs for the "whole ball of wax"; K1OAZ, W8ZCV; completed 5 on an 8 day trip—K1IIK, WØGQR, W9ABM, K5JBC, and WAØKQQ; then finally K7LQI.

"After receiving All Counties #188, I drifted back to the low end of the c.w. bands, chasing prefixes and back to 10 meters, wondering if WPX/mobile (both mixed and c.w.) and 5BWAS/Mobile were possible. Found that they were—#729, #1800, and #540, respectively, in early to mid 1979.

"At that time I had a decision to make. Should I continue to meet challenges or retire? Guess I'm too young to retire. The company I had worked with for 24 years closed it's doors and I felt fortunate in finding employment in the same electronics field that I have been associated with most of my working life here in North Carolina. So I am presently feeling out DX to decide whether 5BDXCC/Mobile is possible. Besides working for a living and bringing up five fine children, which takes up most of every week (I do very little operating on the weekends), not too much time is available for hamming (particularly with a new wife to keep up with).

"To all of you: Thank you for your help."

John Alley, W9JR, nice license plate, Pine Level, N.C.

Awards Issued

"Fran" Seamster, WA6GQY waited unti she had them All and collected USA-CA-500 through 2500 endorsed All S.S.B., All 20; USA-CA-3000 endorsed All S.S.B; and All Counties Mixed.

Al Armitage, WD4HVZ added All Counties endorsed Mixed to his fine collection.

Ruso Fish, W7KWI also added to his fine collection All Counties endorsed All S.S.B.

Ruel Samuels, 6Y5RS acquired USA-CA-2500 and 3000. He has the only USA-CA to Jamaica.

Richard Goodall, G2AFQ claimed USA-CA-2500 endorsed All S.S.B.

Dave Lott, VE3BHZ applied for USA-CA-500 through 2500 endorsed Mixed.

Bayard Smack, W3NB (ex-W3AYS) picked up USA-CA-2000 endorsed Mixed.

Donald Conrad, N4CCJ obtained USA-CA-1500 endorsed All 20, All 2X S.S.B., and USA-CA-2000 endorsed Mixed.

Bob Sawinski, WB9LXA applied for USA-CA-500 through 2000 endorsed All S.S.B.

Henry Zimmerman, KB7W qualified for USA-CA-1500 and 2000 endorsed Mixed.

Lars Bohm, SM5CAK won USA-CA-2000 #3 to Sweden. (There have been 36 Awards issued to Sweden, one being All Counties, SM4EAC.)

"OB" Corning, N4AIG requested USA-CA-500 and 1000 endorsed All 2X S.S.B.; All Mobiles.

USA-CA-500 Certificates, endorsed Mixed, gained by:

William Byrne, EI1DH #2 to EI.
Marshall Killen, VE3KK.
Alain Duchauchoy, F6BFH (a member of that famous DXpedition to Clipperton in March 1978).
Park Ha Il, HM2JN (#1 to Korea).
Yoshio Haga, JA7PL #1 to JA7. (There have been 32 Awards sent to Japan.)
Leo Psotka, OK2RN.

USA-CA-500 Certificates, endorsed All S.S.B., won by:

Karel Sokol, OK1DKS, who, as OK1-15835, got #1164 in March 1977.
Munehiro Nakamura, JH1ARC, also endorsed All 28 MHz.
Joe Reisert, W1JR.
Massy Inami, JH1ARJ, also endorsed All 28 MHz.

USA-CA-500 Certificates, endorsed All A-1, to:

Rudolf Kaderabek, OK1DKR.
Freidrich Schmidt, DL7CT.
James Henearling, WB5LUU, also endorsed All Novice Bands.
"Gun" Sandnes, LA1SV.

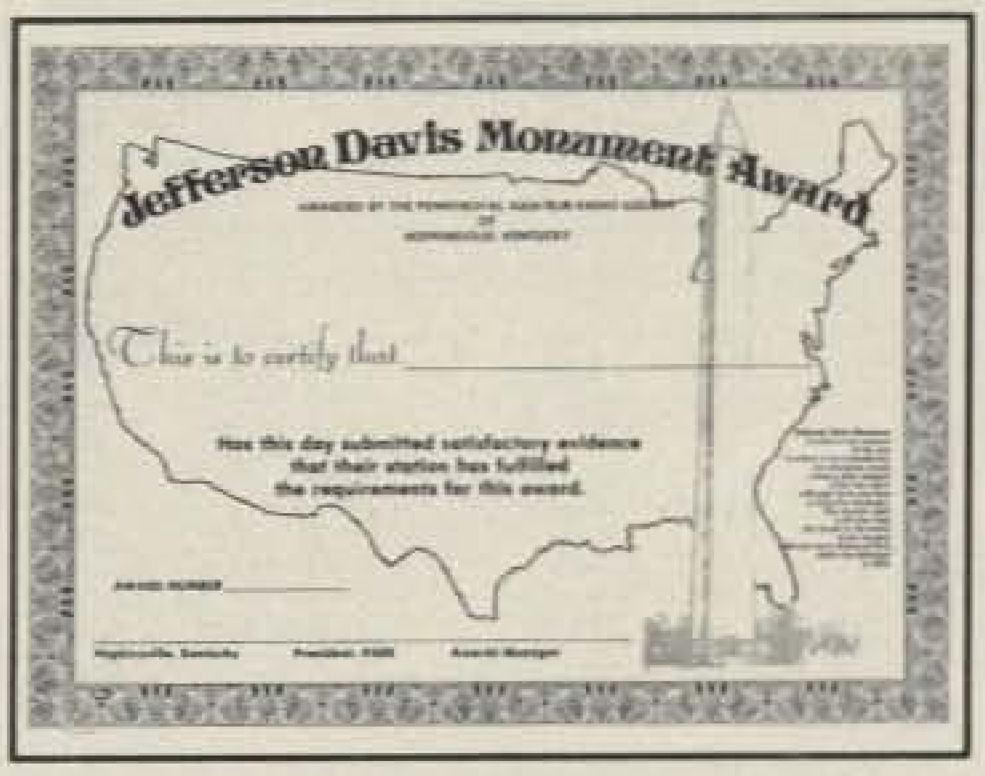
Special Honor Roll
All Counties

#312 Frances Seamster, WA6GQY 2-3-81.
#313 Albert Armitage, WD4HVZ 2-6-81.
#314 E. Russell Fish, W7KWI 2-12-81.

Awards

Morse Clube Gaucho: This c.w. club, located in Southern Brazil, offers this Award for contacts with five different members of the club from 1 May 1980. Members include: PY3AVF, AKS, AZ, AZL, AO, BC, BYC, BVI, BOC, CEM, CFD, BCD, CJI, CKI, CGJ, CGW, CMH, CNY, COR, FMC, FJ, FS, HR, HS, IO, JJ, MU, OH, OS, PO, TT, and ZZ. Send log data to: Morse Clube Gaucho, P.O. Box 2180, 90 000 Porto Alegre - RS, Brasil. Thanks to PY3FS for this data.

OE6 Aichfeld Award: Issued by Radio Amateur Club Judenburg in Styria for contacts made after 1 January 1978. OE amateurs must work 5 stations; European stations need 3 from Amateurradio Club Judenburg and 1 other OE station; and DX stations need 2 from Amateurradioclub Judenburg and one other OE station. Also available to SWLs. Stations of the Amateurradioclub Judenburg include: OE6MOG, ESG, HUG, EMG, KDG, CAG, FKG, JMG, WVG, BVG, OPG, ZAG, US, HMG, UKG, YAD, YMD and OE6YKG. Austrian stations please send log data and OS 100.--; foreign stations send log data and 7 US dollars to: OE6MOG, Hans Mayeri, dr. Korner Strasse 16, A-8761 Pols, Austria. Thanks to Ruth, K5OPT and Gerda, OE6YKG for this data.

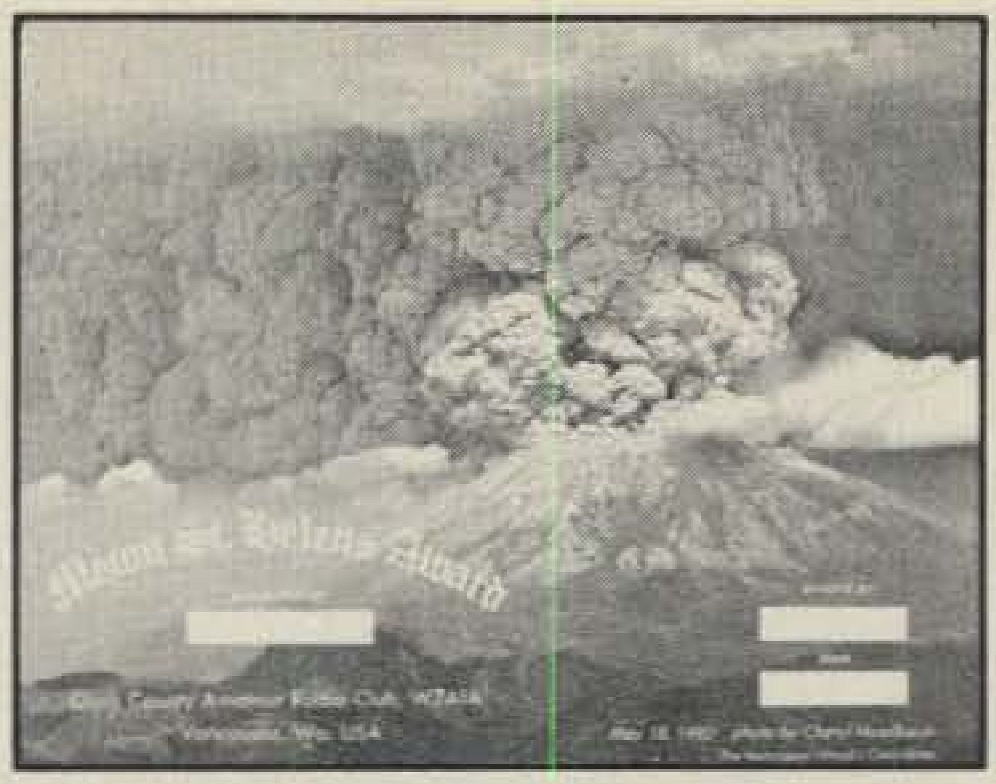


Jefferson Davis Monument Award.

Jefferson David Monument Award: This award is sponsored by the Pennyroyal Amateur Radio Society, Hopkinsville, Kentucky. The Jefferson Davis Monument was erected to the memory of the only President of the Confederacy. This monument stands within a short distance of the site where Jefferson Davis was born in Fairview, Kentucky (Christian County). The Pennyroyal Amateur Society will be operating portable from the park June 6, 1981. This certified sequential award will be issued to any amateur presenting written confirmation of contact with a PARS member during the QSO period, or any five Kentucky amateurs during the year. Awards may be obtained by sending $1.00 plus three 18¢ stamps to PARS, P.O. Box 1077, Hopkinsville, KY 42240. The QSO begins at 1500Z to 2359Z June 6, 1981. Frequencies to be monitored are as follows: Novices—21.140, 28.140; Other—3.970, 7.270, 14.310, 21.370, 28.610.

Mount St. Helens Award: Offered by the Clark County Amateur Radio Club, W7AIA, to commemorate the 1980 eruption of this active volcano in the Cascade Range of North America. A unique full color photographic award of the awesome eruption on May 18, 1980 is available to all radio amateurs throughout the world.

1. Contact eight or more amateurs in the Mount St. Helens area of southwest Washington State (Clark, Cowlitz, Skamania, or Lewis counties) after March 27, 1980, the date of the mountain's first eruption in the past 123 years.

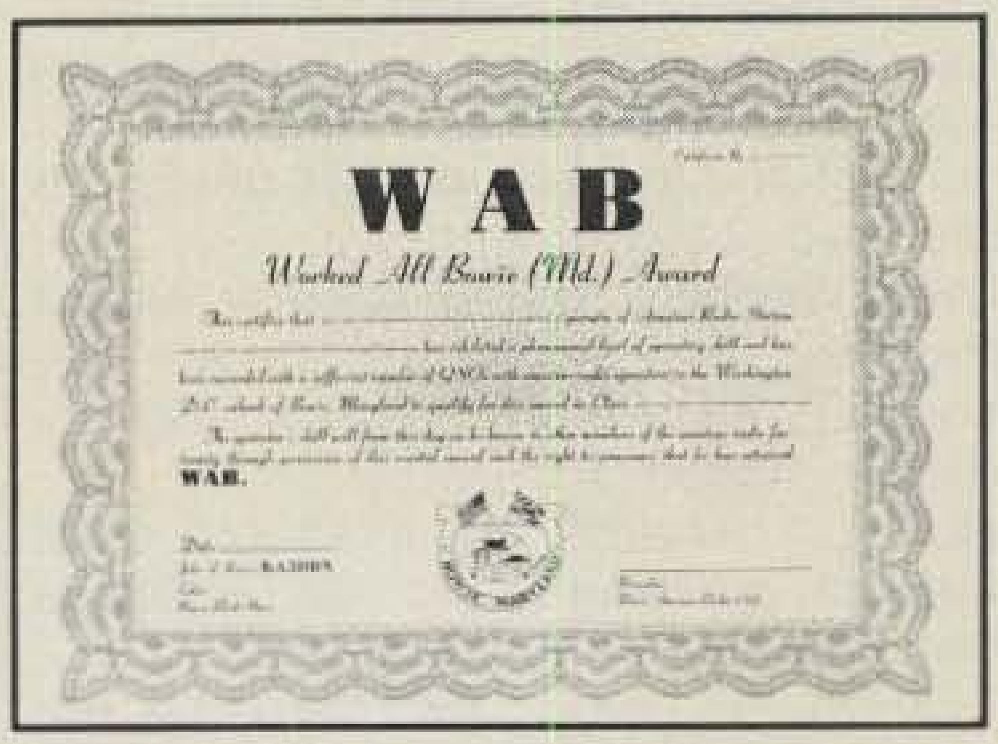


Mt. St. Helens Award.

2. Make one contact with W7AIA during its operation from 0200 UTC May 16 until 0200 May 18, 1981, to mark the first anniversary of the disastrous eruption which took the life of Reid Blackburn, KA7AMF, who was a member of the club.

Send log information (no QSLs, please) including call of station worked, date, signal report, and $2.00 or 9 IRCs to Awards Manager, CCARC, P.O. Box 1424, Vancouver, Washington, 98668, U.S.A.

Proceeds from this fund will go to the Reid Blackburn Memorial scholarship fund which has been established by *The Columbian*, a Vancouver newspaper. A brief resume of the mountain's volcanic activity and a short report of Mr. Blackburn's involvement will be included with the award. Thanks to John, AE7P for this data.



Worked All Bowie, Maryland Award.

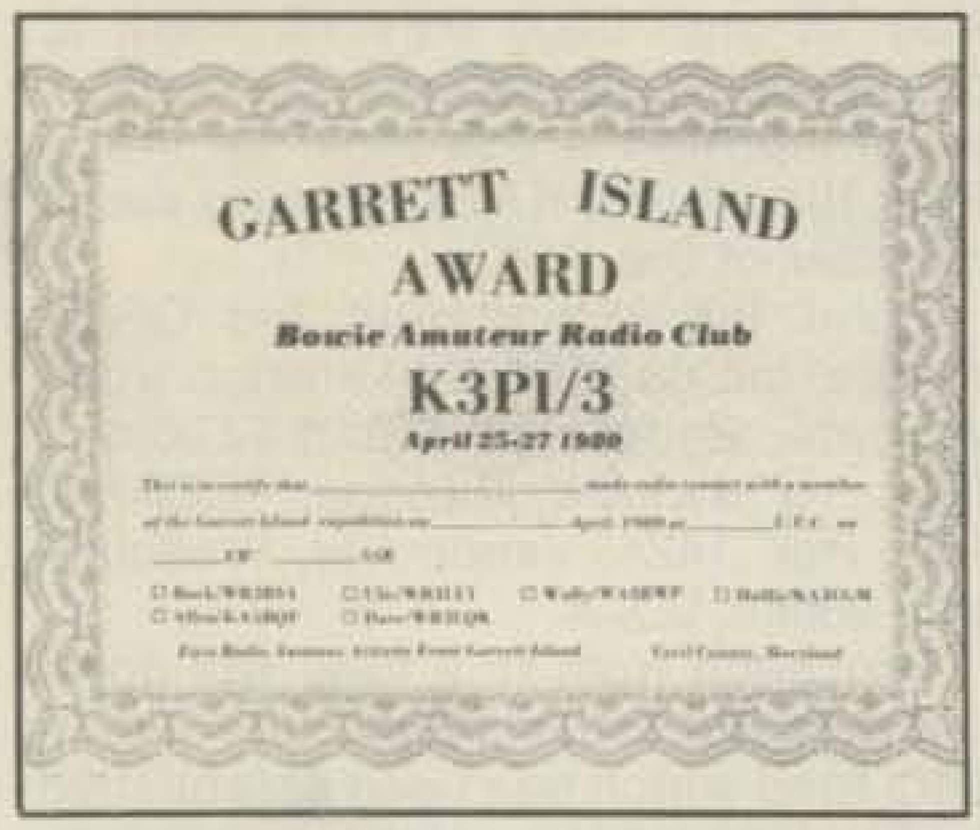
Worked All Bowie Award: The Bowie, Maryland Amateur Radio Club offers this award in two classes to amateurs who make contact with stations located in this Washington, D.C. suburb.

Class 1. For contacts with four stations in the city.

Class 2. For two contacts.

DX Stations should work two Bowie amateurs for Class 1, and one Bowie amateur for Class 2.

Send self-addressed, stamped, large envelope and log data to: John L. Rouse, KA3DBN, P.O. Drawer M, Bowie, Maryland 20715.



Garrett Island Award (K3PI/3).

Garrett Island Award: The Bowie ARC is still offering the Garrett Island Award to amateurs who worked K3PI during the recent mini-DXpedition to this uninhabited island located near the Chesapeake Bay in Cecil County, Maryland. A large s.a.s.e. to KA3DBN will get you the award; QSL cards are required.

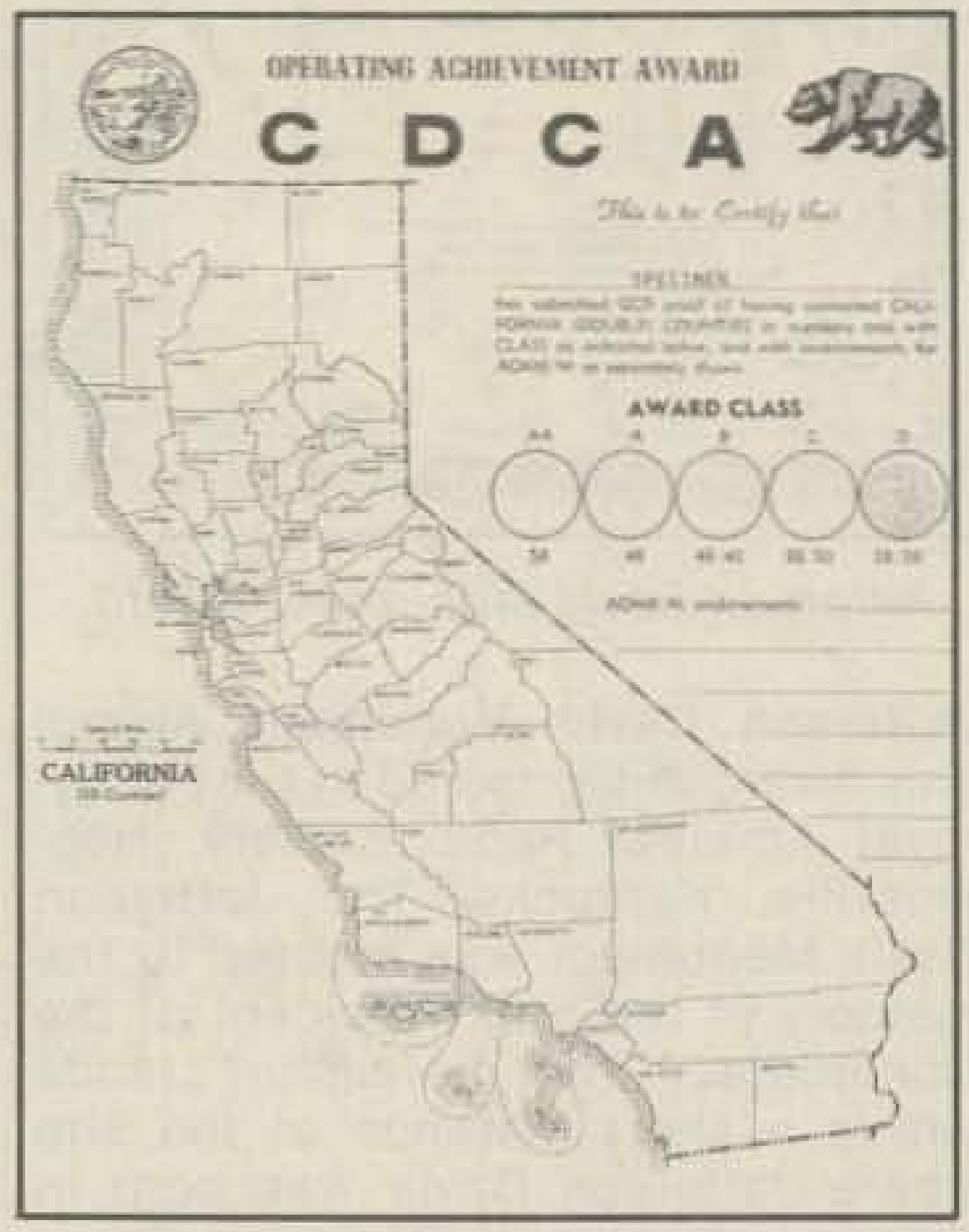
CHC Western States County Award Program: Has apparently taken over some 11 Awards that used to be handled by K6BX.

Rules: 1. Awards are available to licensed amateurs and SWLs (on a heard basis).

2. Do not send QSL cards. A list showing full details of the contacts, signed by your local club official or two licenses amateurs, should be submitted.

USA-CA Honor Roll

3000	
WA6GQY	337
6Y5RS	338
2500	
WA6GQY	401
G2AFQ	402
VE3BHZ	403
6Y5RS	404
2000	
WA6GQY	453
VE3BHZ	454
W3NB	455
N4CCJ	456
WB9LXA	457
KB7W	458
SM5CAK	59
1500	
WA6GQY	513
VE3BHZ	514
N4CCJ	515
WB9LXA	516
KB7W	517
1000	
WA6GQY	652
VE3BHZ	653
WB9LXA	654
N4AIG	655
500	
EI1PH	1575
WA6GQY	1576
VE3BHZ	1577
VE3KK	1578
F6BFH	1579
WB9LXA	1580
HM2JN	1581
N4AIG	1582
OK1DKS	1583
JH1ARC	1584
OK1DKR	1585
DL7CT	1586
JA7PL	1587
WB5LUU	1588
LA1SV	1589
W1JR	1590
OK2RN	1591
JH1ARJ	1592



Worked California Award.

3. Certificates will be endorsed for various bands and modes as requested, providing such requests accompany application and necessary listings are made.

4. Award fee is $3.00, world wide.

5. Endorsements after original applications are $1.00.

6. Send application to: Awards Manager, KB7SB, Scott R. Douglas, Jr., P.O. Box 46032, Los Angeles, California 90046, U.S.A.

Washington State: Issued in 5 classes.
- D. 10 to 15 counties.
- C. 15 to 20 counties.
- B. 20 to 30 counties.
- A. 30 to 43 counties.
- AA. 44 counties.

Oregon State: Issued in 4 classes.
- C. 10 to 15 counties.
- B. 20 to 26 counties.
- A. 30 to 35 counties.
- AA. 36 counties.

California State: Issued in 5 classes.
- D. 20 to 28 counties.
- C. 30 to 38 counties.
- B. 40 to 48 counties.
- A. 48 to 57 counties.
- AA. 58 counties.

Arizona State: Issued in 3 classes—data later.

Nevada State: Issued in 3 classes.
- C. 8 to 10 counties.
- B. 10 to 15 counties.
- A. 15 to 17 counties.

Utah State: Issued in 3 classes.
- C. 7 to 10 counties.
- B. 18 to 24 counties.
- A. 22 to 29 counties.

Wyoming State: Issued in 3 classes.
- C. 7 to 10 counties.
- B. 15 to 20 counties.
- A. 20 to 23 counties.

Idaho State: Issued in 4 classes.
- C. 15 to 20 counties.
- B. 20 to 30 counties.
- A. 30 to 43 counties.
- AA. 44 counties.

Montana State: Issued in 5 classes.
- D. 15 to 20 counties.
- C. 20 to 30 counties.
- B. 30 to 40 counties.
- A. 40 to 55 counties.
- AA. 56 counties.

Alaska State: Issued by actual counties contacted, and can be obtained for two or more counties confirmed.

Hawaii State: Issued by actual counties contacted, and can be obtained for two or more counties confirmed.

Notes

We lost some more friends:
Bob Smolenski, W2OST, All Counties #41, also member of the North Jersey DX Association.
John Criner, Jr., WB4WBP, who had USA-CA-500 through 2000.
Norman Maguire, W5NXF/KH6FQB, USA-CA-500 #14 of 9-8-61.
Dick Keeth, WØTNW.

Hope this has been a good month for all of you, please keep well, we need ALL of you.

73 and DX, Ed, W2GT

Lenny Mendel, K5OVC (ex-W2OVC), famous DXer, received the #4 Para Award featured in the February 1981 issue of CQ. He also has 10M S.S.B. WAZ #8, 15M S.S.B. WAZ #17, and 20M S.S.B. WAZ #55.

To wind up our series on BASIC, K8BG provides us with a remind program that will help us remember birthdays, anniversaries, appointments, and even when to renew your CQ subscription.

INTRODUCTION TO BASIC

A Computer Programming Language

Part XVIII—A Remind Program (Conclusion)

BY BUZZ GORSKY*, K8BG

This month we wrap up our formal series on BASIC by Buzz Gorsky, K8BG, with a remind program. CQ will have many more articles for you computer buffs in subsequent issues by Buzz and other contributing authors. —K2EEK

This little program will keep track of appointments, birthdays, and other commemorative dates, and in fact any type of calendar-related material. It permits storage of two categories—a perpetual slot where items are retained from year to year, and a single slot where an item is presented only once. The program has been written for a disk system, since I feel that it will be most useful that way, particularly if the file is a long one. However, it has been written for sequential data input and output so that only a few modifications would be required in the input and output statements to change to a cassette-oriented storage system.

*712 Hillside Drive, Carlisle, PA 17013

Line 220 has a line input statement which is not available in Level II; changing this to an input statement will not affect the program as long as the user remembers not to use commas in the data strings.

Well, let's see what the program does. The material up to line 100 merely does a bit of advertising. In line 100 the required housekeeping is taken care of. The size of the dimensioned string variables and the amount of string space cleared can of course be modified to fit available memory. In lines 110 to 120 the data are input from disk in sequential fashion. **ND** is the number of items in the file, while each of the **DD(I)** is the date and category for each item, and the **DI(I)** are the text messages indicating what is to be remembered for the particular date.

In line 150 things begin in earnest. **JØ** is a variable which will indicate whether any items have been deleted from the data list—implying that the list needs to be saved on disk. Here it is set to zero to indicate that nothing has yet been deleted. The user then sees a menu screen giving the opportunity to enter new material or look at a month's worth of reminders.

Lines 200 through 260 take care of entering new data. First the user can indicate an **"s"** or a **"p"** to specify the category in which the item will be stored—*single* or *perpetual*. This is saved as **D** for the moment. Then **D1** is input as a six-digit number to indicate the date. If this is not exactly six digits long, the user gets to try again. Then in 220 the user can type in the message that is to be saved (i.e., WIFE'S BIRTHDAY), and this is saved as D2. In 230 ND, the number of items in the data list is incremented and then DD(ND) is set equal to the concatenation (string sum) of D1 plus D. Thus, if the 35th item is being entered for December 20, 1980, and this item goes in the perpetual file, DD(35) would be 122080P. DI (ND) is then set equal to D2, the actual message. In 240 the user can then indicate that more data is to be entered, in which case the program branches back to 200. Otherwise the new data list is saved on disk beginning in line 250, after which control returns in line 150 with the menu.

Line 500 begins the final part of the program where a month's worth of reminders can be displayed. The user specifies the month and year for which data is to be selected. This must be entered as a four-digit number. To see items for December 1980 one would enter 1280. Then in 510 the

no - 75 - 76

```
10 REM PROGRAM TO KEEP TRACK OF CALENDAR EVENTS
20 REM EVENTS CAN BE IN A ONE-TIME-ONLY OR PERPETUAL FILE
30 REM BY BUZZ GORSKY KBBG PROGRAMMED IN RS DISK BASIC 2.2
40 J=140:CLS:PRINTCHR$(23):FOR I=0 TO 9:READ Z$:PRINT@J+I*66,Z$:NEXT
50 DATA "R","E","","UH??!!","","M","I","N","D"," BY BUZZ GORSKY"
60 FOR I=1 TO 4000:NEXT
100 CLEAR5000:DEFINT I,J,N:DEFSTR D:DIM DD(100),DI(100)
110 OPEN "I",1,"REMIND/TXT":INPUT#1,ND
120 FOR I=1 TO ND:INPUT#1,DD(I),DI(I):NEXT:CLOSE
150 J0=0:CLS:PRINT"ENTER 1 TO PUT IN NEW DATA":PRINT"ENTER 2 TO SEE CALENDAR":INPUT N:IF N=2 THEN 500
200 CLS:INPUT"ENTER CATEGORY--'S' FOR SINGLE OR 'P' FOR PERPETUAL";D
210 INPUT "ENTER DATE IN MMDDYY FORMAT (NO PUNCTUATION)";D1:IF LEN(D1)<>6 THEN 210
220 LINEINPUT "ENTER TEXT OF REMINDER  ";D2
230 ND=ND+1:DD(ND)=D1+D:DI(ND)=D2
240 INPUT"ANOTHER (Y/N)";D:IF D="Y" THEN 200
250 OPEN "O",1,"REMIND/TXT":PRINT#1,ND:FOR I=1 TO ND:PRINT#1,DD(I);",";DI(I);",";:NEXT:CLOSE
260 GOTO 150
500 CLS:INPUT "ENTER MONTH AND YEAR IN MMYY FORMAT";D
510 CLS:PRINTTAB(10)"REMINDERS FOR ";LEFT$(D,2);"/";RIGHT$(D,2):FOR I=1 TO 31
520 FOR J=1 TO ND
530 D1=LEFT$(DD(J),2)+MID$(DD(J),5,2):IF D<>D1  THEN 540 ELSE IF I=VAL(MID$(DD(J),3,2)) THEN GOSUB 1000
540 NEXT:NEXT:INPUT"HIT 'ENTER' TO CONTINUE";Z$
550 IF J0=1 THEN 560 ELSE 150
560 Z9$="":INPUT"DO YOU WISH TO DELETE SINGLE ENTRIES (Y/N)";Z9$:IF Z9$="Y" THEN 250 ELSE 150
1000 PRINTI;"  ";DI(J)
1010 IF RIGHT$(DD(J),1)<>"S" THEN RETURN
1020 J0=1:ND=ND-1:FOR I1=J TO ND:DD(I1)=DD(I1+1):DI(I1)=DI(I1+1):NEXT:RETURN
```


screen is cleared and a short heading is printed to indicate the selected month. Then a FOR/NEXT loop runs I from 1 to 31 to cover all of the possible days of any month. In 520 J has a loop running from 1 to ND to run through all of the data items in the file. In 530 D1 is set equal to a particular portion of each stored date—D1 equals the left 2 characters of each DD(J) plus the mid-portion beginning with the fifth character and running two characters. This then will be the two-digit month specification and the two-digit year indication. Then if D, the month/year we wish to search, is not equal to D1, the month/year of a particular data item, we go to 540 and look at the next data item. However, if a match is found, we then check to see if I, the day of the month being checked, equals the date specification in DD(J). If not we continue with the NEXT in 540; otherwise we go to the subroutine in 1000 before the NEXT. In 1000 we print I and then DI(J). This then shows the day of the month and the reminder message. The program then checks to see if the last character of DD(J) is an S, which would indicate that this is a single display item. If not we return from the subroutine, but if it is an S then the item will be deleted from the data list in memory. First J0 is set to 1 to indicate that a deletion has been made. Then ND is decremented and each DD and DI from the Jth to the NDth is set equal to the item one higher in the list. This effectively deletes the Jth item and keeps the list tight with no gaps. After the deletion is made we return from the subroutine.

In 540 we eventually get to the point where the entire list has been scanned for each date. The input statement in this line is merely a delay to keep the items on the screen until the user hits enter to continue the program. In 550 if J0 is one, indicating that deletions have been made, we go to 250 storing the data on disk and then to 150 for the menu; otherwise we shoot directly to 150.

As you can see this program is quite straightforward and there are many little features that could be added. For example, I have not put in any provision for printout, since I have a machine language program (which is always running) that lets me print the screen by hitting a few keys simultaneously. However, while the program is quite simple, I have found that it works well and is helpful in keeping things straight. The first time you run the program add line 105 GOTO 150 so that the machine will not try to read a disk file that does not exist yet.

I want to thank all those who have followed the series and those who have taken the time to write and share their thoughts and comments. Like any teaching experience, the teacher learns as well as the student. ■

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Two new Trophies have been added to this year's WPX SSB Contest which took place last March.

U.S.A., Single Operator, Top score on 21 MHz. Donated by Ted Pauck, Jr., K8NA.

Japan, Single Operator, Top score on a Single Band. Donated by Ken Ruddock, K6HNZ.

Bernie, W8IMZ, has advised me that there are a limited number of spots open for Trophy donors in the WPX Contest, especially in the rapidly growing C.W. section. Those interested should contact W8IMZ for details and availability. Contest Trophies make excellent memorials, especially for club members who have become "Silent Keys."

We are quite proud of our Trophy program, which is sponsored by prominent contesters and DX clubs. Our contest program—World Wide, WPX, and 160 contests—provides upward of 80 Trophies available in world competition. Bill Leonard, W2SKE, and Larry LeKashman, W2IOP, started these awards over 20 years ago. When Larry became a "Silent Key" a couple of years ago his spot was taken over by his friend Al Kahn, K4FW, and a Trophy was donated as a Memorial for Larry. Bill is still very interested in contesting in spite of his very demanding schedule. Nice write-up about Bill in the March issue of *QST*.

So, I will make this an open invitation to you avid contesters to join a very elite group.

73 for this time, Frank, W1WY

Calendar of Events

*May. 30-31	**CQ WW WPX CW Contest**
Jun. 6-7	NY State QSO Party
Jun. 13-14	ARRL VHF Contest
Jun. 19-21	SMIRK QSO Party
Jun. 20-21	All Asian Phone Contest
Jun. 27-28	ARRL Field Day
Jun. 27-28	Milliwatt Field Day
July 1	Canada Contest
July 4-5	Venezuelan SSB Contest
July 11-12	IARU Radiosport Contest
July 17-23	SWOT QSO Party
July 18-19	Colombian Contest
July 18-19	Seanet C.W. Contest
July 25-26	Venezuelan CW Contest
July 25-27	County Hunters CW Contest
Aug. 8-9	European C.W. Contest
Aug. 15-16	Seanet Phone Contest
Aug. 22-23	Ohio QSO Party
Aug. 22-23	All Asian C.W. Contest
Sep. 12-13	European Phone Contest
Sep. 26-27	Delta QSO Party

*See May Calendar for details.

New York State QSO Party

1700Z Sat., June 6 to 0500Z Sun., June 7
1200Z to 2359Z Sun., June 7

This year's party is again being sponsored by the A.R.S. of the State University at Buffalo, New York (WA2NPQ).

The same station may be worked on each band and mode, mobiles and portables in each county change, and NY stations may work other NY stations for QSO points.

Exchange: RS(T), QSO no., and QTH. County for NY; state, VE province, or DX country for others.

Scoring: Five points per QSO. NY stations multiply total QSO points by the sum of states, provinces, and DX countries worked.

Out-of-state stations multiply total NY QSO points by the number of NY counties worked (maximum of 62).

Frequencies: C.W.—1810, 3560, 7060, 14060, 21060, 28060. S.S.B.—3900, 7275, 14285, 21375, 28550. Novice—3725, 7125, 21125, 28125.

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

Indicate each new multiplier in a separate column as it is worked, include a summary sheet with all the essential information, and a large s.a.s.e. if you desire a copy of the results.

All entries must be received no later than July 10th. This year they go to: Scott J. Bauer, WA2LCC, 816 East Fillmore Ave., East Aurora, NY 14052.

Six Meter QSO Party

Starts: 0000Z Saturday, June 20
Ends: 2400Z Sunday, June 21

This is the 7th annual QSO Party sponsored by the Six Meter International Radio Klub. The party is open to all, members and non-members. Cross band contacts are not permitted and competition is for single operator stations only. Operation of course is confined to the 6 meter band only.

Exchange: Call, state, province, or country, and SMIRK number for members.

Scoring: Contacts with members count 2 points, with non-members 1 point. Multiply your total QSO points by the number of states, provinces, and countries worked for your final score.

Awards: Certificates to the top scoring stations in each state, province, and country. There is a Trophy for the overall winner. At least three valid entries must be received from that area to qualify for an award.

Detailed copies of the rules and log forms are being sent to all members and new applicants for membership. Include an s.a.s.e. with your request.

Mailing deadline for all entries is August 1st to: Don E. Abell, WB5SND, 6821 West Avenue, San Antonio, TX 78213.

All Asian Contest

Phone: June 20–21 C.W.: Aug. 22–23
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 22nd year for this JARL activity. The exchange is between Asian countries and the rest of the world.

Classifications: Single operator, single and all band. Multi-operator, single transmitter, all band only (no multi-transmitter).

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

Scoring:
3 points for contacts on 160.

14 Sherwood Road, Stamford, CT 06905

2 points for contacts on 80.
1 point on all other bands.
(KA contacts do not count)

Multiplier: For Asians it is determined by the number of different countries worked on each band (DXCC list).

For non-Asians, it is determined by the number of different Asian prefixes worked on each band (CQ WPX list).

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

Note: JD1 Stations on Ogasawara are in Asia. JD1 stations on Minamitori Shima are in Oceania.

Awards: Certificates to the top scorers, both phone and c.w., in each country and each US call area. In each classification, both single band and all band, up to the 5th rank depending on the returns.

Medals to the all-band continental leaders, both single and multi-operator.

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

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

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

Asian Country List: A4, A5, A6, A7, A9, AP, BV, BY, CR9, EP, HL/HM, HS, HZ/7Z, JA, JR, JD1, JT, JY, OD, S2, TA, UA/UK/UV/UW9 - Ø, UD6/UK6C, D, K, UF6/UK6F, O, Q, V, UG6/UK6G, UH8/UK8H, UI8/UK8A, G, I, L, O, T, Z, UJ8/UK8J, R, UL7/UK7, UM8/UK8M, N, VS6, VS9M/8Q, VU, VU (Andaman & Nicobar), VU (Laccadive), XU, XV/3W, XW, XZ, YA, YI, YK, ZC4/5B4, 1S (Spratly), 4S, 4W, 4X/4Z, 70 (S. Yemen), 70 (Kamaran), 8Z4, 9K, 9M2, 9N, 9V (AbuAil).

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

ARRL Field Day

1800 to 2100 UTC Sat./Sun., June 27 & 28

The ARRL Field Day positively generates more stateside activity than any other operation.

No changes in rules from last year except for one minor modification regarding changing of bands within a 15-minute period.

The May issue of *QST* had all the details, and they are quite extensive, so

1980 All Asian Contest Results

Phone

U.S.A.

*K6HNZ	AB	364,188
*N6AW	AB	225,621
*K1KI	AB	55,924
*N5JB	AB	40,836
*N4UH	AB	16,800
WA4QMQ	AB	15,708
*N8II	AB	11,766
K1BV	AB	8,904
W5SOD	AB	6,125
K8EF	AB	1,920
*W2CKR	AB	1,740
*KBØJX	AB	1,520
KA2BBZ	AB	728
W5EIJ	AB	195
*WØZV	28	522
*W6OK	14	6,600
W6SZN	14	6,006
*W2CC	14	1
*W4KO	Multi-Op.	2,016
*W7WA	21	129,952
*N6RO	21	98,210
*W1NG	21	27,108
*N3GB	21	12,299
*W2FG	21	8,036
K1CC	21	5,733
AF1O	21	4,640
WA3DMH	21	4,136
WB2QEU	21	3,800
W1QV	21	1,455
*WB4UBD	21	800
*KBØC	21	650
*W5IYR	21	410
W7ERH	21	70

Canada

*VE2RV	21	11,800
VO1AW	21	60
*VE3BMV	28	2,233
*VE7IQ	AB	2,820

Dom. Rep.

*HI8LC	AB	240

C.W.

U.S.A.

*N6RO	AB	370,360
*K7RI	AB	317,790
*W6BB	AB	199,850
*K6XT	AB	168,000
*N6AW	AB	164,444
K6RU	AB	159,511
W7NI	AB	134,736
*AI9J	AB	103,620
*N5JB	AB	90,450
*K1KI	AB	81,192
*W8UVZ	AB	41,067
AI1J	AB	31,488
N6AN	AB	26,880
WA1FCN	AB	22,796
K1BV	AB	20,898
N8II	AB	19,580
*KØRWL	AB	15,111
WBØGOB	AB	13,452
*WA4QMQ	AB	11,005
W5OB	AB	10,725
W1END	AB	10,360
WA4OML	AB	10,125
W4KO	AB	10,106
*W3AP	AB	7,076
K6CSL	AB	6,438
WØKEA	AB	6,136
K8LJG	AB	5,886
W5NR	AB	4,442
W8MJG	AB	3,330
W3ARK	AB	2,484
N6GL	AB	1,782
WØBMM	AB	1,260
WA3DMH	AB	690
W5TVX	AB	670
WB1HIH	AB	550
*KA2CGV	AB	180
W7JKA	AB	156
WA6VNR	AB	132
W1OPJ	AB	90
W2HL	AB	90
W6NNV	AB	78
*WØZU	28	2,755
*N7BVM	28	266
*K6LL	21	46,540
*W9OA	21	20,296
K9BG	21	14,850
*N3RL	21	1,276
*KAØCLS	21	1,152
*WA2LWT	21	504
*W5EIJ	21	195
N2CM	21	165
*N6TU	14	25,025
*N5JJ	14	17,812
*WB4IAE	14	16,994
W6SZN	14	10,148
K4RZ	14	7,820
K4JYS	14	7,293
K4IEX	14	5,719
N4TZ	14	5,002
*WB1HJF	14	1,458
*N6BT	7	24,633
*K7WA	7	10,600
*AA1M	7	6
*W7DRA	3.5	32
*AE6V	1.9	27
*K3RL	Multi-Op.	104,302

Dom. Rep.

*HI8LC	AB	2,016

Panama

*HP1AC	AB	4,350

Canada

*VE3MFT	AB	16,683
VO1KO	AB	3,471
VE7IQ	AB	3,403
*VE3XK	14	1,140
VO1CA	14	128

Alaska

*KL7AF	AB	63,570

**Certificate Winners*

1980 C.W. European Contest Results

U.S.A.

K1VTM (Opr. K1JX)	**956,900**
W1ZM	**923,244**
WB2FZO (Opr. WB2SJX)	**776,720**
K1GQ	**773,694**
K1UA	**506,064**
K3FD	**440,608**
WB2VYA	**418,026**
K2IGW	**304,524**
N6AR	**262,114**
AK1A	**255,432**
AC2U	**253,638**
K5KLA	**216,204**
N6AW	202,510
K5NW	178,192
K9BG	**175,764**
K5MM/7	168,268
K1KI	164,302
K4BAI	**146,250**
K2SX	117,610
K9CLO	114,119
AA4NC	111,780
W3ARK	94,400
N6ZZ	87,963
W8LU	**87,125**
WA1FCN	82,169
N4SA	82,106
K8MR	78,936
AF2L	77,880
N6AA	70,896
W9OA	59,040
W7JYW	**52,299**
K7ZA	40,832
WA4OML	37,312
WA1UAX	35,720
WA4QMQ	34,080
W9RE	32,760
W4BV	31,058
AK1B	30,080
W4KO	28,776
KA2EAO	28,749
W4YN	26,180
N6JM	22,620
W3ICM	21,350
K6RU	21,280
W9QWM	21,060
K6OQ	19,584
W9AG	18,308
N4TZ	14,892
WA1YVT	13,790
WD4SIG	12,672
K3TX	9,900
WD9GGY	9,504
W2SQ	7,811
WB1HIH	6,394
W1CNU	4,800
KA2CGV	4,784
W1OPJ	4,554
K6ZH	4,416
K2TW	3,380
N5AIL	3,320
W5NR	3,132
K7WA	2,196
N1NN	2,091
AA6EE	1,908
W7JKA	1,408
AE6U	297
W7QK	216

Canada

CZ6OU	**275,796**
VE1MX	**132,396**
VE3MFT	**55,719**
VE3KZ	42,912
VE3CXL	32,195
VO1CA	5,984

Multi-Opr.

K3EST	**984,256**

K1VTM was World High. K3EST 2nd High non-European.

it's advisable that you check them carefully.

Any questions or requests for log forms, etc., should be directed to Tom Frenaye, K1KI, at ARRL Headquarters, 225 Main Street, Newington, CT 06111.

Milliwatt Field Day Trophy

With the tremendous increase in QRP activity, the two American QRP organizations, The Michigan QRP Club and the QRP Amateur Radio Club International, have added their support to the Milliwatt program by sponsoring two new categories and an expanded awards offering.

The Milliwatt, National Journal of QRPp, encourages QRP operators to participate in the ARRL Field Day, but to score their operation separately and submit it to Ade Weiss, WØRSP.

Scoring: QSO's × power multiplier (5 watts × 4, 1 watt × 8) × 1.5 if emergency power used + 150 for full portable installation.

Refer to Ade's QRP Column in *CQ* for additional information and awards details.

Mailing deadline for all entries is August 31st to: Ade Weiss, 83 Suburban Estates, Vermillion, SD 57069.

ARRL VHF Contest

1900 to 0600 UTC Sat./Mon., June 13–15

The May issue of *QST* also has the details about this summer VHF competition which has a big following and could be very interesting if propagation is favorable.

Canada Contest

0001 to 2359 UTC Wed., July 1

Sponsored by the Canadian Amateur Radio Federation, this contest follows the same pattern as the Canada Day Contest last December.

Everyone can work anybody, 2 through 160 meters, both phone and c.w. Single operator single and all band, multi-operator all band only.

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

Exchange: RS(T) and QSO number starting with 001.

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

Multiplier: Number of VE provinces/territories worked on each band and each mode. (12 prov./terr. × 8 bands × 2 modes for a maximum of 192 possible.)

Contacts with stations outside Canada count for QSO points but no multiplier. VE1's are requested to identify their province.

Frequency: Phone—1810, 3770, 3900, 7070, 7230, 14150, 14300, 21200, 21400, 28500, 50100, 146.520. C.W.—1810, 3525, 7025, 14025, 21025, 28025, 50100, 144.100. Try phone on even hours, c.w. on odd hours.

Awards: A Trophy to the overall single operator winner. Certificates to the top scorers in each category, in each VE province/territory, U.S. call area, and each DX country. Also to the highest score from a Canadian non-Advanced amateur. (No phone on 3.5–21 MHz)

Include a summary sheet showing all the scoring and also a dupe sheet with your log.

Mailing deadline is July 15th to: Canadian Amateur Radio Federation, 203–1946 York Avenue, Vancouver BC, Canada V6J 1E3. Include a large s.a.s.e. for a copy of the results.

a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

Proposed Cuts Slash FCC Budget

While hearings are yet to be held on the Reagan Administration's proposed budget cuts, shock waves are already being felt at federal agencies and commissions throughout the U.S. At press time, information available from a highly placed spokesperson for the government suggests that two bureaus within the FCC—the Private Radio Bureau and the Field Operations Bureau—will be hard hit. Furthermore, the budget cuts faced by these bureaus will affect significantly their ability to support the amateur service.

With respect to the Private Radio Bureau, the government now is proposing to eliminate fourteen positions during FY81, with an additional eight positions scheduled for elimination in FY82. If these proposals are adopted, it could, for example, result in delays of up to 63 days in processing licensing renewals, modifications, etc. (currently, the average processing time is 40 days). The backlog in rulemaking matters and petitions, too, will increase.

In so-called "compliance" areas, the effect of budget cuts will be two-fold:

1. There will be lessened availability of FCC personnel for attendance at amateur events (these people normally come from the Education Branch of the Private Radio Bureau).
2. There will be lessened availability of legal personnel for the follow-up of enforcement proceedings.

Budget cuts faced by the Field Operations Bureau will have an equally severe effect. While the FOB is currently authorized 508 positions nationwide, its current strength is at a level of 457 positions. Furthermore, because of proposals by both the Carter and Reagan Administrations, this Bureau will only be authorized 441 positions by the end of FY82. If the Administration proposals are adopted (and much could change by the time this column is printed), it is probable that the FOB will close at least six field offices, including Cincinnati, OH; Pittsburgh, PA; Washington, DC; Savannah, GA; St. Louis, MO; and Little Rock, AR. The Anchorage, Alaska, monitoring station may also be closed and abandoned.

By taking the above actions, it should be possible for the Commission to maintain reasonable staff levels at the FCC's other field offices. This, in turn, will ensure that the Commission's enforcement capability remains viable.

Personnel cuts are not the only losses facing the FOB. Up to 70% of the Bureau's budget for equipment may be eliminated, while funds allocated for automobile use could drop off $115,000 to $70,000 in FY81.

Clearly, budget cuts proposed by the new administration in Washington will have a significant impact on the FCC *and* on the amateur service. What cuts are actually imposed, however, will only be known after hearings are held on the Hill.

R.F.I. Complaints Continue To Rise

Jeffrey Young, Enforcement Division, FOB, FCC, reports that during the first quarter of FY81 (October, November, and December 1980), r.f.i. complaints to the Commission totalled 20,851. This is up from the 19,444 complaints filed during the same period in FY80, and indicates that r.f.i. is still one of the major problems facing the FCC today.

Of the 20,851 complaints received, Young noted that television receivers were the victim devices in 16,407 cases. Of these, CB operations were alleged to be involved in 12,753 cases of t.v.i., while amateurs were cited in 686 cases.

In all, CBers were alleged to be involved in 14,420 r.f.i. complaints, while amateurs accounted for 1,215. Of great significance to the Commission was the fact that 491 of the r.f.i. cases received cited interference to amateur operations by other amateurs. Put another way, over 40% of amateur-related complaints cite amateurs as both the sources and victims of interference. As reported here last month, such high levels of interference within the amateur service have resulted in a top-down review of enforcement proceedings within the Commission—proceedings which will almost certainly result in new procedures for handling cases of malicious interference.

Commission Poised to Move On Amateur Violators

For several months, two U.S. amateurs—one in the southeast and one in the northeast—have been alleged to be causing intentional interference to the Maritime Mobile Net. According to the Commission officials, the interference has produced a "virtual avalanche of complaints," and several Congressional inquiries have requested clarification in the matter. When sufficient evidence is collected, one or both amateurs will be cited for causing deliberate interference to legitimate amateur operations. Note, too, that this case may result in a total re-evaluation of the type of evidence needed by the FCC to cite amateurs.

**8603 Conover Place, Alexandria, VA 22308*

Mark Fowler Tops List Of Potential Chairmen

At this writing (early spring), the leading contender for Chairman of the FCC is a 39-year-old Washington communications lawyer, Mark Fowler. Fowler's firm represents a number of broadcast interests in Washington, and so Fowler is very familiar with the Commission and its operations.

Whether Fowler will actually get the chairman's position, however, is not certain. The longer it takes to appoint the chairman, the greater will be the competition for this job. The reason for this is that as more and more posts are filled in the Federal city, losing candidates for these positions will cast about for other jobs, including the one that Fowler seeks.

Until a new chairman is appointed, the FCC's Acting Chairman is Commissioner Robert E. Lee, whose term expires in June 1981.

Pay-TV Company Considers Legal Action Against Radio-Electronics

Reminiscent of the "blue box" scandal that hit amateur radio some years ago is one involving the publication of a schematic for a pay-TV decoder in *Radio-Electronics*. These decoders are used to unscramble signals radiated by subscription television stations around the country. According to *New York* magazine, Larry Steckler, publisher of *Radio-Electronics*, is quoted as saying, "there may be questions about the legality of *using* such a device, but there's no problem with printing information about one."

Actually, the use of illegal decoders to pirate subscription television signals is a violation of Section 605 of the Communications Act of 1934 (as amended), and may involve violations of a civil nature, as well.

ON-TV, a subscription television service in Detroit, is considering legal action against *Radio-Electronics* because of the decoder article.

FCC Tells Clairol To Clean Up Its Act

In February 1980, Clairol, Inc. filed a petition with the Commission to permit Clairol to market an ultrasonic denture cleaner that does not comply with the conducted radio frequency limit for ultrasonic equipment. Specifically, the r.f. voltage conducted from the unit back into the power line exceeded the 1000-microvolt limit for devices operating at frequencies below 490 kHz (the Clairol denture cleaner operates at 58 kHz).

In its petition, Clairol claimed that the failure of its device to meet the Commission's technical standards was the result of their being unaware that this type of household appliance was considered by the Commission to be a piece of ultrasonic equipment which was subject to Part 18 of the Commission's Rules. Clairol also indicated that they have made an extensive effort to comply with the Rules, but that no redesign or filter installation produced a unit that could meet the technical standards without a significant increase in the total cost of the denture cleaner.

In denying Clairol's petition, the Commission stated, "We believe that it is in the public interest to provide denture wearers a low cost denture cleaner which takes advantage of ultrasonic technology, but not at the expense of the public who may want to use this part of the spectrum for communications purposes."

This month by
ROD LINKOUS, W7OM

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

What do old DXers do when they have most of the rare QSL cards? Seems like many become dormant until the next new one comes along. The pileup on Desecheo proved they're still around—most take to other interests. Some take the DX slot on the band to reminisce about the tough ones; some go on chasing DX to keep their hand in; some keep in contact with their DX-oriented friends; some keep on collecting the DX awards. Chasing the five band awards is a choice of many. Getting another DX station in the log on those other bands takes more than luck. It takes . . .

Knowing Where And When

Did you ever wonder why your DX buddy always seems to be at the right place at the right time? It's probably what he reads. I am one who doesn't believe it is blind luck. It takes patience and knowing the DX game.

Most of us have heard "the key to good DX is a good DX bulletin." Then, like most, we take that at face value. Generally, the next question is "to what bulletin do you subscribe?" The avid DXer will usually reply with a couple of names. Whichever bulletin he uses, one thing he is most interested in is *when is DX on and where is the DX*? And that doesn't mean geography. The operating habits of the sought-after DX station are more important than a backup transceiver. The schedule for a DXpedition and their operating plans are often essential to scheduling the DXer's vacation and other means of being at the rig when the guys get to that rock in the middle of nowhere. Those are the obvious!

Recently, a new DXer caught me on the air. (Yes—the antennas are back up.) This bright young lad living in the midwest wasn't near a DX club. His first question was about DXing in general. Then after telling me he had worked his first 200 countries in 18 months, he wanted to know how to make getting the next hundred a little easier. (At first I thought I should be asking for advise, not giving it.) I discussed the *how* of using a good DX bulletin to do just that—be at the right place at the right time. This article is written as a result of that QSO. It is *a* way of doing it easier and not necessarily *the* way.

Phil Weaver, VS6CT, used a KWM-2A plus a 30L1 linear with an interswitchable Drake 'B' line to the linear and out to a long wire or the Telerex Monarch 6 element tribander as CR9CT in Macao. A super station setup giving a DXpedition a taste of luxury. His host Fernando Pinto, CR9AK, and his XYL were fantastic hosts. Phil spent seven solid days at the rig only to be dragged away to eat and sleep occasionally on the first trip. With a second operator, the next trip made operating around the clock easier.

Any weekly DX bulletin must contain a sufficient data base worthy of being read, for it is not only a newsworthy publication, but one giving statistical data as well. A DX bulletin without multiple DX reports is like the *Wall Street Journal* without the New York Stock Exchange results.

Table I is a sample extract from *QRZ DX* edited by K5FUV. Since many are interested in the low bands, I selected the 75 phone listing. (I bet a lot of you didn't know this much DX was on 75 in a one-week period.) Besides telling you the obvious—who has 75 capability (which is a big item in itself)—it gives you great insight into the when and where question. Since 75 is a darkness band for long-haul communications, the time a station was heard is reduced to a typical 12-hour window. Unlike 20 meters, where the band is open around the clock, "when" becomes an easier question. To narrow the window down with respect to a given country or station is even easier using the table. From the list you know when a given call area in the U.S. heard the station and probably had propagation. Propagation to an area is reflected by looking at several countries in a geographical area. The table reflects that the British Isles opened to the east coast as early as 2314 and remained opened until 0518. Long path openings were not noted in these reports as they occur at sunrise on the west coast, around 1400 GMT.

A quick scan of the list will allow you to identify a specific station or country. With two or more consecutive lists you can better narrow the time down. For example, if on three lists you should note the following;

JY5XX	3789	0445	02 Feb	W1
JY5XX	3788	0532	02 Feb	WØ
JY5XX	3788	0440	26 Jan	W3
JY5XX	3788	0430	19 Jan	W4
JY5XX	3788	0518	19 Jan	W5

you can draw some general operating conclusions: (1) JY5XX is a creature of habit, (2) he has a good 75 meter capability, (3) he is a loner. How can you deduce this? From the three reports we know for three consecutive Mondays he was on the same frequency (not too quick—two different receivers) around the same time. He was heard by more than one call area, thus he probably has a good setup. Since he was the only one reported around that frequency at that time, he is not prone to group events, although he may have had an MCEE.

So if you need JY5XX on 75 s.s.b., start listening at 0430 around 3788 on

*5632 47th Avenue S.W., Seattle, WA 98136

Call	Freq	GMT	Date	Area	Call	Freq	GMT	Date	Area
3A2EE	3.778	0509	31 Jan	W1	FO8DF	3.793	1150	24 Jan	W4
5T5CJ	3.799	0752	01 Feb	W1	GJ3AME	3.791	2321	01 Feb	W1
5T5JD	3.789	0119	30 Jan	W4	GM3TCW	3.791	2314	01 Feb	W1
6Y5MJ	3.790	0300	01 Feb	W5	GU3KFT	3.784	0239	02 Feb	W4
8P6KY	3.785	0641	01 Feb	W1	GW4ELI	3.790	0518	01 Feb	W5
9Y4VU	3.796	0525	26 Jan	W9	HK4EZ	3.784	0610	07 Feb	W5
C5ACO	3.795	0620	01 Feb	W1	HR3JJR	3.790	0211	31 Jan	W9
CO2CI	3.798	1159	27 Jan	W4	HT1MAT	3.803	0553	31 Jan	W1
CO3VR	3.792	0223	31 Jan	W9	JA7NX	3.798	1204	31 Jan	W4
CP6EL	3.780	0737	31 Jan	WØ	JY5ZM	3.789	0445	02 Feb	W1
EA8LS	3.781	0625	05 Feb	W5	KC6MW	3.798	1414	27 Jan	WØ
FGØFOK	3.784	0233	02 Feb	W2	KG4ET	3.792	0437	31 Jan	W4
FGØFOK	3.780	0254	04 Feb	W5	KH6ND	3.789	1147	31 Jan	W4
FK8CR	3.796	1206	30 Jan	W4	KP4KK/DU2	3.790	1130	03 Feb	W1
FK8DR	3.793	1150	27 Jan	W4					

Table I - Typical band report.

Harvey "Harv" Sandal, KH6GB, of Wake Island DXpedition fame as KH6GB/KH9. He gave many their first chance at Wake Island in a long time. He also operates from other rare Pacific spots when time permits.

Mondays. It doesn't mean you'll work him, but you'll have a good chance of being at the right place at the right time. It is an especially good thing to know if you're getting up in the middle of the night.

This scheme works well on all bands. The key to success in DXing is like most endeavors—*do your homework.* When I said that to my young friend in the midwest, he said, "Maybe now I can get my school homework done too." I know in my case, when I am still hunting for a few, it is a vital tool in the pursuit. As I chase 5BWAZ, this is expecially true. Unfortunately, the system also indicates if I want a lot of good DX on 10 meters I need to

Shin-ichi "Kan" Kano, JH1GZE, holds on while working the high bands. The location of the TV set resolves the TVI inquiries fast. Like W7PHO, Kan doesn't miss much on the bands or the tube. (Photo via K7ZA)

CQ DX Awards Program

S.S.B.

987 . . . . JA9DDM	993 . . . . DK4ZZ
988 . . . . N2BQL	994 . . . . GI6YM
989 . . . . WD6EQP	995 . . . . I5JHW
990 . . . . SM7CQY	996 . . . . I8WY
991 . . . . KB2TY	997 . . . . I1SNW
992 . . . . P29DP	998 . . . . WD6BNH

C.W.

485 . . . . W9NUD	488 . . . . EA5QR
486 . . . . GI6YM	489 . . . . OE5AHL
487 . . . . OK1KZ	490 . . . . WB8OGM

S.S.B. Endorsements

310 . . . . . . W3GRS/317	275 . . . . . . G4CHP/294
310 . . . . . . F2MO/314	275 . . . . . . K8HV/278
310 . . . . . . OZ3SK/314	275 . . . . . . XE1NI/278
300 . . . . . . N6AV/309	250 . . . . . . K9QVB/271
300 . . . . . . N6AW/307	250 . . . . . . K1VHS/262
300 . . . . . . WA4WTG/305	250 . . . . . . WØULU/250
300 . . . . . . OK1MP/304	200 . . . . . . K9TI/211
275 . . . . . . JH1VRQ/298	200 . . . . . . I5JHW/201
275 . . . . . . AI8S/297	200 . . . . . . W9MYG/200
275 . . . . . . LA7JO/296	

C.W. Endorsements

310 . . . . . . N6AV/314	275 . . . . . . W4BV/275
310 . . . . . . W3GRS/314	250 . . . . . . K1VHS/252
275 . . . . . . W4OEL/299	150 . . . . . . EA5QR/181
275 . . . . . . JH1VRQ/281	150 . . . . . . OE5AHL/155
275 . . . . . . 4Z4DX/280	150 . . . . . . W9MYG/150
275 . . . . . . K9QVB/281	150 . . . . . . OK1KZ/150

The total number of active countries is 318. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement fee for stickers is $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, 911 Rio St. Johns Dr., Jacksonville, Fla. 32211 U.S.A. Foreign stations should include extra postage for air mail reply.

operate from the east coast. That is so I can get with the gang on 28,750 around 1300, which isn't open on the west coast at that time.

This brings up a couple of other things you might have missed if you didn't look closely at the list. The Russian stations operate in a window between 3618 and 3648. The VK's are around 3695. On several 10-meter lists I noted the gathering of many on the high end of the band, where I usually never tune in. Now I do!

In summary, a good DX bulletin with detailed reports can tell you where and when to listen. It also will tell you where the water holes are (nets, etc.), and last, but not least, what propagation is like. It will eliminate looking for a one-in-a-country station on a band he doesn't work. General long-term operations can be reported by the magazine columns. We try to do that here. But the day-to-day DX game is enhanced by a *good* DX bulletin. Remember the bulletin you choose is only as good as the reports it gets. So report the ones you heard to the bulletin of your choice. And send us the general news you'd like to share with others.

QSL Help Wanted

After trying the call books and the bureaus, a couple of our fellow DXers are still having a tough time chasing down the following: KX6NB (78); VP2VEH (78); XW8CO, and ZE8AX (77). If you can shed some light on the correct mailing route please drop us a note. Some other dark horses: AC5PN (56); KM6BI, Paul, (60); 7Q7CY (71); 5A2TY (58); FQ8AP or FQ8HA (59) or A6XG (74).

DX Clubs

The 1981 officers for the Madison DX Club, Madison, Wisconsin are: Don Bucholtz, WD9CWJ, President; Ken Dixon, W9XM, Vice President; Gary Turner, WD9CPX, Secretary; and Denny Ruskin, K9BIL, Treasurer. (Thanks *QRZ DX)*

Missing QSL Cards

If you think you were the only one not getting a TG9CH card back from the 1979 CQ Worldwide CW Contest, the note from W4QO may explain. "TG9CH operation DISALLOWED! Seems multi-op operation not allowed except at TG0AA. TG9CH had her license revoked and rig confiscated. I have been trying unsuccessfully to resolve. Sorry!"

DX Extra

DE KH6GB (This note was in response to my request for a card and photo for the DX column.) BT I'm an Air Force Captain on active duty in the

The WAZ Program

10 Meter Phone

116	WA2IFS	122	W6KUT
117	SM0AJU	123	JA1WVK
118	HK3AXT	124	FG0DYM/FS7
119	I2MQP	125	W2ARQ
120	G4CHP	126	JH1HGC
121	JH1IZA		

15 Meter Phone

82	SM0AJU	84	WB8ZRL
83	N6AWD		

20 Meter Phone

350	K2CL	353	WA4ZEC
351	SM0AJU	354	AB8L
352	I3PQM	355	NL7P

80 Meter Phone

8	W6KUT

10 Meter C.W.

17	K5RU	19	SM3EVR
18	K5AQ		

20 Meter C.W.

134	EA2IA	135	N8MC

40 Meter C.W.

6	JA8DWR	14	JR1AOQ
7	W8AH	15	SM3EVR
8	JA8EAT	16	ON5NT
9	K7UR	17	DL7AA
10	DL1PM	18	JA1DUH
11	SM0AJU	19	W8UVZ
12	W4DR	20	K0ZZ
13	YU2RTW	21	W6KUT

All Band WAZ S.S.B.

2153	WB8YQX	2167	JA1EHA
2154	W6SJC	2168	K3ZUF
2155	WA2IFS	2169	WB7RGN
2156	WD9JKT	2170	JA3RWJ
2157	WA7MOK	2171	JH8MXH
2158	K9LWT	2172	N8MC
2159	LU3AJW	2173	G3MJT
2160	PA0HBK	2174	KE4E
2161	SM6CTQ	2175	K1RB
2162	W5SGT	2176	WA5ZGI
2163	HS1ALP	2177	AB8L
2164	WB5QBV	2178	N9LE
2165	HK0EHM	2179	KB9BR
2166	HK3DDD	2180	KB8DC

C.W. and Phone

5062	JA4AO	5081	IT9XNM
5063	EA3JJ	5082	W6MUL
5064	W9NUD	5083	N4BQD
5065	WD0FSI	5084	K1RB
5066	WA2FUE	5085	WB9MSV
5067	WA2ORX	5086	JA6CBY
5068	G3GNM	5087	YU2OM
5069	WD8IFX	5088	YU2XIM
5070	SM6JHO	5089	JH1NTG
5071	SM7CLZ	5090	K8OM
5072	SM6CTQ	5091	F6DZO
5073	SM6DEC	5092	YU4FRS
5074	K5VWW	5093	AB0M
5075	VE3JKZ	5094	W1AIN
5076	W0CYY	5095	AB8L
5077	ON6RR	5096	WD8RIN
5078	YU2RJT	5097	AE8W
5079	EA7ATE	5098	W0TU
5080	JA2IIG	5099	HA8UB

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 safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

communications field. I received my original Novice ticket in 1954, but it lapsed for nonactivity in 1955. I've been pretty much all over the world, including a three-month tour of duty on Spratley (yes, *the* Spratley) in 1957, but didn't realize the significance to the DX world at the time. Shortly after being assigned to Hawaii in 1977, I re-tested and was granted Novice call KH6JUO. I upgraded in 1978 and got a new call, KH6GB. One month later I was sent to Canton Island (/KH1) for a week where I spent my evenings operating my newly-purchased Argonaut.

I was involved in the Enewetak nuclear debris cleanup, made six trips there in three years, and got a Trust Territory call of KX6PW. Each trip to Enewetak went via Wake Island, and I managed to spend my spare time there also operating QRP. Thus far I have made four separate trips to Wake Island and have been fortunate to be allowed to operate /KH9 each time. However, I don't call the shots on my trips. I have business to conduct, and ham radio takes a back seat. It's sometimes difficult to convince other stations that I can't stay on the air around the clock. By and large, most are understanding and I try to set up schedules to benefit as many as possible.

Just prior to my last Wake trip I upgraded again. However, much of the fun of operating the lower portion of 20-meter phone was lost, as I was quickly told I caused intolerable interference to the Wake Island v.h.f. air/ground radios located just a few feet away from my setup.

Official business also took me to Johnston Island (/KH3) last November. I managed to get in a few evenings of operating through the kindness of Bill, KH3AB. Again, my primary business kept me from going around the clock, and I apologize to the many operators who kept shouting "... just one more, one more ...," when I announced my intention to QRT soon. $\overline{\text{AR}}$ Harv gave many a new country from the rare Pacific islands and hopes to give out a few more before he returns to the mainland later this year.

From The Pileup

The tidbit source is given in parentheses. The stack was a little shallow this time around as the bands were good and the DX was plentiful. That's what happened to the photos too. So keep those cards and photos coming.

Watch for 9U5WR, Burundi. The call sign is issued to the club station at the local technical school in Bujumbura. The custodian is George, SP6BAA. Permission is granted for c.w. operation only. This is because the local

THE WPX HONOR ROLL

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

MIXED

2055	YU2DX	1577	YU7BCD	1350	KE4I	1148	JH1VRQ	902	K6DT
2031	F9RM	1575	W2NUT	1332	W9FD	1130	WØSFU	851	K8CH
1923	K6XP	1566	K5UR	1309	SM7TV	1115	IN3ANE	801	KL7AF
1882	K6JG	1538	PAØSNG	1300	N6AV	1114	WA1JMP	753	N3RL
1805	W4WV	1525	DJ7CX	1260	I2PHN	1108	K2FO	750	I2MQP
1801	VE3GCO	1514	W9DWQ	1236	YU1AG	1019	PY4OD	727	K7AGJ
1773	K2VV	1468	N6CW	1205	DL1MD	1018	SM3EVR	725	WB8YQX
1740	W2NC	1434	YU2RTW	1190	N6FX	1002	PA2TMS	710	WB8ZRL
1693	W3PVZ	1411	N4NO	1186	K6ZDL	1001	YU3APR	661	K2QF
1670	N4UU	1403	N9AF	1179	YU1ODS	1000	K8LJG	650	KA3A
1635	W7LLC	1383	N6JV	1168	I6SF	968	W7CB	647	W6YMH
1610	ON4QX	1375	N2AC	1155	W8CNL	920	WØIUB	644	DK7XX
1604	N4MM	1360	AA4A	1151	UK3AAO	914	N6JM	603	WD4IHV
1587	W4BQY								

S.S.B.

1941	F9RM	1331	I4ZSQ	1023	WA4QMQ	909	PY3BXW	750	I2MQP
1764	IØAMU	1300	PAØSNG	1016	WØYDB	893	YU1AG	716	EA3KW
1708	IØZV	1268	YU7BCD	1010	N4NO	867	I6ZJC	710	I6NOA
1686	K6XP	1250	IØMBX	989	DJ7CX	851	W2NC	699	IØRIZ
1632	K2POA	1222	N4UU	989	OE2EGL	850	ZP5RS	690	WB8YQX
1605	K6JG	1207	W9DWQ	967	PA2TMS	840	CT1UA	657	I5AFC
1454	I8KDB	1163	AA4A	962	YU7ODS	804	WA2AUB	650	KL7AF
1450	K2VV	1105	WB2NYM	950	JH1VRQ	802	I4LCK	633	N3RL
1428	N4MM	1100	N2SS	939	W4BQY	790	N2AC	629	YU3APR
1348	ZL3NS	1072	DL1MD	938	N6FX	770	WA2FKF	605	WB8ZRL
1336	K5UR	1071	OZ5EV	932	W6YMV				

C.W.

1606	W8KPL	1305	K2VV	1175	DJ7CX	900	VE7CNE	750	JH1VRQ
1540	W2NC	1291	G2GM	1140	N4MM	886	LZ1XL	745	DJ3LR
1505	ON4QX	1288	YU7BCD	1126	VO1AW	854	PY4OD	735	DL1MD
1454	DL1QT	1235	W3ARK	1031	K6ZDL	851	KH6HC	703	K2FO
1440	WA2HZR	1234	W9FD	1016	W1WLW	834	VK4SS	700	K8LJG
1437	K6JG	1222	K5UR	1002	YU1AG	827	JE1JKL	679	I1YRL
1398	K6XP	1220	N4NO	964	N6FX	813	YU3APR	662	AA4A
1385	N4UU	1216	N2AC	928	I6SF	808	I5IZ	601	KL7AF
1350	N6JV	1205	W4BQY	925	YU7ODS	756	SMØGMG		

government is afraid of political overtones from s.s.b. operation. Equipment is expected around mid February . . . should be on now . . . or shortly. George advises that the papers on 9U5WR have gone to ARRL. (9L1CA) Pradhan, A51PN, has been reported on the W7PHO, 10-meter, Family Hour on 28575. He will take c.w. callers on the frequency. (*QRZ DX*) Fresno is on again! May 1, 2, and 3. TS-830 for early registration door prize. Should be the normal big one. (*The DXer*) Jim, VK9NS, of Norfolk is regular on 40 and 80. Watch 7062, 7005 and 3505. (*QRZ DX*) VK0JS, Heard Island, is temporarily off again. The Australian government wants the group to wait for summer their time. A winter landing was considered too dangerous, thus the postponement. (*Long Skip*)

I am no longer the QSL manager for KP2A or 4S7DX. All inquiries should now go to Henry, WB2MSH. (WB2VFT) Steve, VK3OT, now has cards printed for the VK9ZD operation, Willis Island. Be patient as there is one big backlog. (*QRZ DX*) The new editor of *Long Skip* is Yuri Blanarovich, VE3BMV. (VE3FRA) We concluded operation from FG0FOK with 9,000 QSOs in the log and 150 countries. On to FM0FOL. (W6KG/W6QL) Bob, S79MC, reports that the only active stations from the Seychelles are S79RD, S79NLB, S79GM, and S79WHW. Bill, S79WHW, who was quite active a little over a year ago, had an equipment failure and now has no rig. Also, if you ever thought the five dollar license fee is bad, how about the $85 Bob just paid to have his license renewed. At one time, the government considered terminating amateur radio, but has since decided to continue to renew licenses. They also will issue a new license to a permanent resident after six months' residency, but no license to visitors. (*QRZ DX*)

OH2BAD, Miika, says the next, *and possibly the last*, operation from Market Reef will start July 6, 1981 and last for one week. It is not clear just why this might be the last operation from there. (*The DXB*) The situation with the G3JKI/5A is still up in the air. Ann, F6CYL, was reported to have the logs but that proved false. The DXCC desk has yet to validate the operation. So think positive and wait. (*Long Skip*) Recent rumors regarding an operation from 4W, 7O, and YI by the Royal Jordanian Radio Society and others have surfaced again. A call to Amman, Jordan by K6LPL in February indicates there is no such operation planned in the near future and the YI operation planned earlier is postponed indefinitely. (*QRZ DX*) K5LBU/ST0 logs for the period from 6 to 24 June 1980 have been mislaid. Confirmations will be sent out, if and when they are found. (*CANADX*) Frank, VK9NYG, is expected to be on Cocos-Keeling for about two years. He is a Novice and as expected is very inexperienced in handling pile-ups, so don't get too rowdy when calling. (*QRX DX*) KH0AC has his antennas back up, a little lower in height but effective. (QRM)

The WPX Program *

Mixed

885	AF7M	889	AI6Z
886	DL3HC	890	UB5LCV
887	K8HF	891	AK1A
888	AC6V		

S.S.B.

1340	VK6NAT	1351	UK6JAL
1341	JF1CCH	1352	UA6UDB
1342	EA6GK	1353	UK6LAI
1343	WA3PMI/7	1354	UI8FAI
1344	KA3A	1355	UW3DH
1345	WA7JUJ	1356	CT4NH
1346	F6CXB	1357	AJ7Z
1347	KB8RJ	1358	OE3RGB
1348	I5JHW	1359	DL9JH
1349	AI9U	1360	DF2SE
1350	UA1AET		

C. W.

2028	WA3PMI/7	2041	UA6YR
2029	OK1AXT	2042	UA0WAE
2030	OK1AYQ	2043	UB5UDG
2031	KR6Q	2044	UB5JIM
2032	K8HF	2045	UB5UBV
2033	AI6Z	2046	UB5UCH
2034	W4DGX	2047	UB5UDG
2035	UA3DEF	2048	UF6FN
2036	UA3RAO	2049	UW3WZ
2037	UA4OZ	2050	UY5EI
2038	UA6AHX	2051	WA4RRB
2039	UA6AKT	2052	W4WJ
2040	UA6LAH	2053	EA7TV

WPNX

191 . . . . WB3BVL

VPX

209	UA1-113-191	215	UA9-154-1134
210	UA3-137-88	216	UB5-073-1916
211	UA3-142-1733	217	UL7-028-66
212	UA4-156-417/MM	218	UP2-038-672
213	UA6-101-720	219	UQ2-037-26
214	UA9-134-89	220	DL-L05/150455

Endorsements

Mixed: 400 AF7M, UB5LCV. 450 WB3DNA, K8HF. 500 WD9IIC, K7PJO, AC6V. 550 AI6Z. 600 VE3DUS, AK1A, UW9SG. 700 DL3HC. 850 K9ZD. 1000 UK3AAC. 1100 UA3FT. 1200 SP9AI. 1400 N4NO.

S.S.B: 300 VK6NAT, EA6GK, KA3A, KB8RJ, UA6JAL, UA6UDB, UK6LAI, UI8FAI, AJ7Z, DF2SE, WA7JUJ. 350 JF1CCH, WA3PMI/7, UA1AET. 400 F6CXB, I5JHW. 450 XF4MDX, AI9U, UW3DH, CT4NH, OE1RGB. 500 DK5WQ, DK3EG. 550 VK3NDY, UK5WAZ. 600 I2OMF, DF7QD. 700 EA3KW. 800 ZP5RS, UK3AAC. 850 I6ZJC, DL9JH. 900 SM5CMP. 1000 N4NO.

C.W.: 300 WA3PMI/7, OK1AXT, OK1AYQ, W4DGX, UA3DEF, UA3RAO, UA4OZ, UA6AKT, UA6LAH, UA6YR, UB5IDK, UB5JIM, UB5UBV, UB5UCH, UB5UDG, WA4RRB, EA7TV. 350 DJ2CT, KR6Q, K8KPM, K8HF, UA6AHX, UA0WAE. 400 W0OGJ, JA5SIX, UK6LAH. 450 K7PJO, AI6Z, UF6FN. 500 SM6INC, WA4QMQ, DK5NM. 550 SP6FER. 600 KL7AF. 650 SP1ADM, OK1DKW, W4WJ, UB5VK. 700 DK7XX. 800 KL7MQ, N4YB. 850 UA3GO. 1200 N4NO.

10 meters: W2CC, G2GM, AI6Z.
15 meters: AI6Z.
20 meters: KA3A, UI6FAI.
40 meters: SP6FER, DK8NM.
80 meters: W4MNZ.

Asia: DF7QD.
Europe: OK1AYQ, JA5SIX, UA3RAO, AI6Z.
No. America: AI6Z.
Oceania: I6ZJC.

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.

*These award winners were inadvertently left out of the May DX column.

The WPX Program

Mixed

907	JH1XUP	912	DK4ZZ
908	N3RW	913	KE5J
909	WB2QEU	914	F6FMO
910	JA7AWZ	915	WB1GCO
911	JA1AJA		

S.S.B.

1377	OK3CEE	1384	OK1KZ
1378	I2SQO	1385	YC1GJ
1379	I3DUB	1386	DJ2UU
1380	WB8AAX	1387	DJ6VM
1381	KB9TO	1388	JR2XJO
1382	JR6GEJ	1389	K0SE
1383	K7CE	1390	EA6GP

C. W.

2061	OK3CEE	2067	AJ7Z
2062	JA2LMY	2068	K7CU
2063	K8MVZ	2069	HA5BA
2064	OE5AHL	2070	JH8MFS
2065	AK9Z	2071	N2AIF
2066	JE3SAE		

WPNX

192	WB3LUI	194	KA1CZF
193	KA8FWE	195	KA8FDW

CQ WPX Award of Excellence

W1JR

Endorsements

Mixed: 400 N3RW, WA3FWA, DK4ZZ, KE5J, F6FMO. 450 JH1XUP, WB2QEU, JA7AWZ, WB1GCO, JA7RPC. 500 JA1AJA, W1GD. 600 AE1T. 750 WB8YQX. 800 K9UQN, I2DMK. 850 DJ8WD. 900 W2HAZ. 1050 WA0TKJ, SM3EVR. 1150 IN3ANE, N4UH. 1200 N6FX, DL1MD. 1300 DJ6VM. 1400 N2AC.

S.S.B: 300 OK3CEE, I3DUB, KB9TO, JR6GEJ, EA6GP. 350 WB8AAX, K7CE, KA3A. 400 W5SGT, W1GD, OK1KZ, YC1GJ. 450 WB0LXM, KB9QL. 500 WB0OQV, I2SQU, JR2XJO. 600 XE1XF, K4CKS, W3GXK, DJ2UU. 700 WB8YQX, I0RIZ. 800 AK0A, G4CHP. 850 ZP5RS. 900 N6FX. 1050 DL1MD. 1650 K2POA.

C.W.: 300 JA2LMY, K8MVZ, AJ7Z, K7CU, HA5BA, JH8MFS. 350 AK9Z, JE3SAE. 400 WB3JRU, N2AIF. 450 DF9FM, W2XQ. 500 G3JTO, F5DE. 550 DJ2IW. 600 EA7AAW. 650 I2DMK. 700 HP1AC. 750 OE5AHL. 850 OK3CEE. 950 N6FX, VE7CNE. 1000 K9QVB. 1100 YU7SF. 1250 N2AC.

10 meters: I0RIZ, VE7IG, K0SE, N0AJZ.
15 meters: OK3CEE, JH1XUP, JE3SAE, YC1GJ.
20 meters: OK3CEE.
80 meters: OK3CEE.

Asia: JH1XUP, K9QVB, DJ2UU, JA1AJA, OE1KJW, YC1GJ.
Africa: I0RIZ, DJ2UU.
Europe: OK3CEE, JH1XUP, AC2J, K4CKS, WB2QEU, JA1AJA, W2XQ, JE3SAE, YC1GJ.
No. America: OK3CEE, K4CKS, WA3ZMY, KB8EC, DJ2UU, OK1DVK.
Oceania: JH1XUP, WA7OBH, JA1AJA.
So. America: K9QVB, VE7IG, DJ2UU.

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 Northwest DX Convention is scheduled for Portland, Oregon the first weekend of August. Drop the W7 QSL bureau an s.a.s.e. for details. (QRM) The QSL bureau in Guam for the KG6 and AH2 gang is still in operation despite the new call books. The KH0 bureau as listed is *also* in operation for the Marianas. With all the new calls being issued in the U.S.A., confusion runs rampant. Sending the cards to the ARRL finds them going to the U.S. 6 and 0 bureaus. So you Guam and Marianas guys and gals better have envelopes on file there too. QSLers should take note of possible

5 Band WAZ

Standings as of March 1, 1981

Plaques have been won by the following stations:

Plaque No. 1, ON4UN, John Devoldere (Belgium)
Plaque No. 2, K4MQG, Gary Dixon (U.S.A.)
Plaque No. 3, SM4CAN, Kent Svensson (Sweden)
Plaque No. 4, AA6AA, Steve Orland (U.S.A.)
Plaque No. 5, W8AH, Albert Hix (U.S.A.)

The top 10 contenders for 5 Band WAZ:

1. W8GT, 195 zones
2. EA8AK, 195 zones
3. N6DX, 191 zones
4. W8UVZ, 190 zones
5. DL3RK, 190 zones
6. W8GT, 189 zones
7. SMØAJU, 189 zones
8. N4WW, 186 zones
9. K7UR, 183 zones
10. WA4JTI, 180 zones

long delays in replies for bureau or service emitted cards. (K7ZA) ZL3AFH/A, Campbell Island, has been reported operating up as high as 14104 on c.w. (*QRZ DX*) (*Ed—Might be too late but anyway.*) Ted, N4XX, is offering a copy of the *Shortwave Propagation Handbook* to the first person supplying information leading to a QSL card from 5A1TG (8 Dec 57) and 5A4TT (28 Jan 58). (*QRZ DX*)

Open House

Visitors are welcome at the W6AM Rhombic Farm. This year one of America's top DXers will host an open house on June 20, 1981 from 1 until 5 p.m. local. Fill your car with hams, spouses, and YLs. Go south on the Harbor freeway to Anaheim Street, turn right (west) one mile to the Palos Verdes Hills (5 corners), bear left up the hill on Palos Verdes Drive north, 3.8 miles to Hawthorne Blvd. Turn left up the hill 2 miles, to the top of the hill onto Highridge Road. Go left ¾ of a mile to: 28503 Highridge Road, Rancho Palos Verdes. The Rancho Palos Verdes Amateur Club is handling the parking and their XYLs are manning the coffee table. QCWA is planning on joining the event. If you want to see one of the top DX stations, drop by and join Don Wallace, W6AM, for an afternoon.

DX Awards Checkpoint

VK3AMK is no longer checking QSL cards for the CQ DX Awards program. Douglas Jones, VK3NDY, is now on board as the VK land checkpoint for that area. Doug can be reached at 21 Sandy Street, Glen Waverly, Victoria, Australia.

For a complete list of checkpoints, drop an s.a.s.e., business size envelope to any of the awards program managers.

73 and the best of DX, Rod, W7OM

QSL Information

Thanks to the following for the QSL information: *W6GO/K6HHD List; QRZ DX; Long Skip;* K2FJ; K2TV; KK8K; VE7DZR; and WB6GFJ.

A22PS/ZE to ZS6MI
A22ZM to KA2GNJ
A35EA to ZL1AMO
A35XX to DJØFX
A4XIH to G3KER
A9XCW to DL2CB
CN8AT to WB3JRL
CR9C to KB9N
CT2DF to N8BKB
CT2DP to W4PKM
D68AP to WB2OHD
DA2AL/LX to KA3B
DF4FM/5NØ to DF3FN
DL7ABY/ST to DF3NZ
DU1JB to JA2MWX
EC9DP to LA5NM
EC9BV to EA9GD
ED2PIN to EA2ADU
ED5CSE to EA5TX
EL2FY to JA1BGS
EL8H to SM3BU
EM6CR to UF6CR
FC6FCH to G8KA
FGØFIS/FS to K6LPL
FGØFOK to YASME
FGØFOL to YASME
FO8DF to WB6GFJ
FO8FB *not* to WB6GFJ
FOØFB to WB6GFJ
FOØVU to DL2RM
FP8DX to FRØFLO
FPØFJW to K8BTH
FPØFXP to K8BTH
FWØVU to DL2RM
G5DSL to K2FJ
GJ5DEL to W6EJJ
GW3CDH to K9AIG
H44MM to K1MM
HI8KW to VE3LNW
HI8PGG to K9AUB
HKØEHM to WD9DZU
HP1BXO to W4USL
HZ8ZZ to DK2OC
IAØKM to IØMGM
IMØMIE to I8XIU
J2ØA to W6ORD
J2ØCO to K6LPL
J2ØCP to DJ9ZB
J28BX to F6CYG
J6LJN to WA1ZEF
J87BL to W1JP
J87BM to W1JP
J87BN to W1JP
J87BO to W1JP
JX2AY to SM7CRW
JY3ZH to DJ9ZB
JY4MB to DJ3HJ
K2FJ/EA9 to K2FJ
K3OX/VP9 to W2PD
K4BF/CN8 to K4CEB
K5LBU/STØ to WA4UNZ
K6LNP/DU2 to W7HPI
K8MPO/6Y5 to W8TPS
KA6AD to K4XG
KC4USR to KD7P
KC6DC to AD1S
KC6DY to W5UR
KG4DI to WD4CAX
LA3WAA to K4XGLX3AH to DL7AH
N2KK/ST2 to K2FV
OA8AX to KA7DBS, W7QMU, or JH8DSC
OE2VEL/KH8 to OE2DYL
OX3NB to W7EDA
OX3PT to WA2TTI
P29JA to WA7OPZ
P29RY to WA4WTG
PP2ZDD to W2BAK
PX1PF to DL7AH
STØAS to DK2OC
SVØAZ/9 to SVØAW
T3ØAT to G3XZF
T32AB to W7OK
TA8BE/TA1 to TA1NAG
TG9EW to IØWDX
TI2JIC to AG1K
TJ1BF to WA4WTG
TU2HH to WA4VDE
TU4AT to HB9BTQ
VE7AAZ/4U to VE1BWV
VK9NYG to VK6NE
VK9ZD to VK3OT
VP1CBT to JI1CVC
VP1MW to K1AMJ
VP1WP to G8YVN
VP2E to K8ND
VP2EX to WB8VPA
VP2EZ to AA4GA
VP2KAO to K2AOQ
VP2KAP to WB2JVM
VP2KAU to N6ST
VP2KAV to N6ST
VP2MIX to G6HC
VP2MJH to VE3FOY
VP2MZ to WD4NBX
VP5BVA to N4KE
VP5RAC to WB5UEP
VP5SDA/HK1 to G3KVM
VP8AEO/CE9 to G4CSE
VQ9NN to AA6AC
VQ9TO to AH4AA
VS6IM to K1MM
VU2RAK to KBØU
W9RBD/VP9 to W9VNG
W7KEM/OA8 to KA7DBS, W7QMU, or JH8DSC
WD9IHD/HK4 to WD4PTO
XL3LON to VE3IAE
XW8BP to JH1ARJ
XW8DG to JH1ARJ
XW8DV to JH1ARJ
XW8HK to VU2WTR
XW8ZS to JH1ARJ
Y21UJ to DM2AUJ
Y29LM to YU2LM
Y52WG to DM4OLG
YB1AEE to VE7DZR
YB9ADE to WA7ILC
YJ8NMB to WA2MNM
YJ8NPS to KB2KN
YS1X to DJ9ZB
YS9YS to KK8K/WD8RGU
ZB2G to K2FJ
ZD9GE to ZS6YE
ZD9GF to ZS6BQL
ZF1DA to N4AJO
ZF1RD to K3MBF
ZF1SB to N8AG
ZF2AD to K3MBF
ZF2CK to KA9EBG
ZF2EX to K4PJ
ZK1CF to ZL2AQF
ZK1CW to W4BAA
ZK2TW to ZL1AZV
ZLØAAG to ZL2HE
ZM7AA to 4X4TT
ZP5KS to WA4WTG
3A2EE to F9RM
3D6BB to W5UKS
4Z4RU to WØMJN
5B4LP to SK2AU
5N3PJR to G4GIR
5N6ENU to WA1ZFS
5N6ENV to K4PVZ
5NØWRA to DF3FN
5W1BZ to ZL1AIZ
5W1DD to OE2DYL
5W1DE to JA1FX
5Z4VU to JA2AJA
6TIYP to OH2BH
6W8AR to JH1ARJ
6W8IC to KBØQA
6Y5MJ to K8ZBY
7XØAH to DL7AH
8P6CZ to VE2YG
8P6JJ WB3HZC
8P6KQ to N7RO
8P6KX to K2QIE
8P6M to VE3JTQ
8P6MH to WB2WSV
8Q7BC to JH8SCA
9G1GC to WA1ZFS
9M2BH to W6RIA
9M2HG to JA3XYM
9M6MA to JA1RJU
9Q5AB to DL7AH
9U5AV to K5VT
9X5DR to ON8TU
9Y4JW to K2QIE
9Y4LL to WB2WSV
All **HP5** prefix stations to HP5FI, Box 153, Chitze, Rep. of Panama

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The present sunspot cycle, Cycle 21, continues to decline slowly. The Royal Observatory of Belgium reported a monthly mean sunspot number of 143.5 for February 1981. This results in a smoothed sunspot number of 150.5 centered on August 1980. A smoothed number on the order of 130 is forecast for June 1981.

Solar Flux

There is another indicator which is being used more and more in the scientific world to measure solar activity. This is called the *solar flux* level. Solar flux is a measurement of radio waves, or radio noise, emitted from the solar atmosphere. Such radio frequency radiation is due principally to the random collisions of electrons. By international agreement, frequencies have been set aside for listening to solar flux emissions on 245, 415, 606, 1415, 2695, 4995, 8800, and 15.400 MHz.

Solar flux levels can be more easily measured than sunspots, since a clear sky is not required. They can also be determined with a higher degree of accuracy and more objectively than can sunspot numbers. For these reasons, solar flux levels are rapidly replacing sunspot numbers as a measure of solar activity.

Solar radio noise at the earth's surface is monitored at several observatories throughout the world. Official values are published based on observations made at the Ottawa, Canada observatory every day at 1700 GMT on 2695 MHz, or 10.7 cm.

In order to smooth out fluctuations in monthly mean values, a 5-month smoothed solar flux number is used as an index for solar activity.

Table I is a list of such numbers for the present solar cycle. These values can be compared with the 12-month smoothed sunspot numbers given in last month's column. Note that according to solar flux measurements, the peak of Cycle 21 occurred between November and December 1979. Smoothed sunspot numbers indicate that the peak took place during December 1979.

11307 Clara St., Silver Spring, MD 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for June 1981

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

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on June 1st-3rd, good (B) on the 4th and 5th, excellent (A) on the 6th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

June Conditions

June marks the beginning of summertime propagation conditions on the h.f. amateur bands. The sun is high in the northern sky and this will result in a considerable increase in daytime signal absorption, and somewhat lower maximum usable frequencies. During the hours of darkness, however, maximum usable frequencies should be at their highest values of the year. Expect increased static levels on all bands as a result of increasing thunderstorm activity.

Expect excellent daytime propagation on the *10 meter* band, although there will be considerably fewer east-west openings than during the winter and early spring months. Best bet will be for openings towards South America, Africa, and the Pacific areas, with conditions peaking during the late afternoon. There should also be some good short-skip openings between approximately 500 and 1300 miles or more.

Fifteen meters should provide excellent worldwide propagation to most area of the world during the daylight hours, and into the early evening hours on most days of the month. This should be the best DX band during the hours of daylight, with conditions peaking during the afternoon. For openings towards the south and to the west, the band should remain open to Midnight on several days! Excellent short-skip conditions are expected for openings between approximately 400 and 2300 miles or more.

Twenty meters should open to some area of the world or another for the entire 24-hour period on most days during June. The band should peak in all directions just after local sunrise, and again towards the east and the south during the late afternoon. Excellent conditions to most areas of the world should be possible throughout the hours of darkness as well. In fact, *20* meters should be the best band for nighttime DX propagation during June.

During the hours of darkness the band should peak first towards Europe and remain open to about Midnight. Shortly before Midnight, signals should begin to peak towards Asia and the Far East, and a few hours later towards the Pacific and Australasia. Excellent openings should be possible towards the Caribbean and Central and South America throughout the nighttime period. Short-skip openings during the day should extend from about 350 to 2300 miles, and during the hours of darkness from approximately 500 to 2300 miles.

Fewer hours of darkness and the expected sharp seasonal increase in static levels should make propagation spotty at times on *40* meters, noisy on *80* meters, and very difficult on *160* meters. Yet, some good openings to many areas of the world should be possible on *40* meters during the hours of darkness. The band won't sound as good as it did during the winter and spring months, but signals may still be exceptionally strong at times. DX openings to many areas of the world are also forecast for *80* meters during the period of darkness, but expect signals to be mainly weak and noisy. Not much DX is expected on *160* meters until the fall, but an occasional opening may be possible during the hours of darkness, with chances best just before local sunrise on the *easternmost* terminal of a path.

Daytime skip on *40* meters should extend out to approximately 750 miles. At night, as solar absorption decreases, the skip should lengthen, with openings possible from about 500 miles to beyond the one-hop limit for 2300 miles. On *80* meters short-skip openings out to approximately 250 miles should be possible during the day, and out to and perhaps beyond 2300 miles during the hours of darkness. The *160* meter band is not expected to open during the hours of daylight, but short-skip openings out to approximately 1000 miles or more should be possible between sundown and dawn.

This month's *CQ* Propagation Charts contain DX predictions for the period June 15 through August 15, 1981. Short-skip Charts for June for openings between 50 and 2300 miles and from Hawaii and Alaska appeared in last month's column.

V.h.f. Ionospheric Openings

Sporadic-E propagation should peak during June, and this is expected to improve chances considerably for short-skip openings on *6* meters between a range of 1000 to 1400 miles. During intense and widespread sporadic-E ionization, which could happen on several days, two-hop openings well beyond 1300 miles should be possible. An occasional sporadic-E opening on *2* meters, over distances of approximately 1200 to 1400 miles, can occur during June, particularly when ionization is very intense.

Not much meteor shower activity expected this month, although a minor one may take place between June 3–6.

Trans-equatorial, or T.E., propagation is usually at its most difficult during June and the summer months. An occasional opening on *6* meters may be possible from the southern states into South America during the evening hours, but at best signals are expected to be very weak with heavy flutter fading.

Check for auroral activity during those periods when h.f. conditions are expected to be Below Normal or Disturbed. The "Last Minute Forecast" at the beginning of this column shows which days during June are likely to be in these categories.

Mail-A-Prop

Since early this year Mail-A-Prop has been under the able editorship of Dr. David D. Meisel. Doctor Meisel is a noted astrophysicist and an ardent shortwave band observer.

While Mail-A-Prop forecasts are designed primarily for use in the continental USA, Canada, and the Caribbean area, there are satisfied radio amateurs, shortwave listeners and enthusiasts, and commercial users throughout the world.

For non-commercial subscribers, an annual subscription of 26 issues is $30, postpaid (add $10 for airmail delivery outside the USA, Canada, and Mexico). Send a legal-sized self-addressed stamped envelope for a free sample copy. Commercial rates quoted on request.

Checks for Mail-A-Prop subscriptions and inquiries should be sent to:

MAIL-A-PROP
Dr. D. D. Meisel, Editor
54 Westview Crescent
Geneseo, NY 14454

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

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

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

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

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

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

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

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

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

June 15—August 15, 1981
Time Zone: EDT
EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Central Europe & North Africa	16-18 (1)	08-09 (1) 09-12 (2) 12-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	09-15 (1) 15-16 (2) 16-18 (3) 18-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-09 (2)	20-21 (1) 21-22 (2) 22-23 (3) 23-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 21-22 (1)* 22-23 (2)* 23-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & European USSR	15-17 (1)	11-15 (1) 15-18 (2) 18-19 (1)	09-15 (1) 15-17 (2) 17-19 (3) 19-22 (4) 22-01 (3) 01-03 (2) 03-06 (1) 06-09 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediterranean & Middle East	16-18 (1)	11-13 (1) 13-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	12-16 (1) 16-18 (2) 18-20 (3) 20-00 (4) 00-01 (3) 01-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	11-13 (1) 15-17 (1) 17-19 (2) 19-21 (1)	10-12 (1) 12-15 (2) 15-17 (3) 17-23 (4) 23-03 (3) 03-04 (2) 04-05 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-03 (4) 03-04 (3) 04-05 (2) 05-07 (1)	20-22 (1) 22-00 (2) 00-02 (1) 22-00 (1)*
Eastern & Central Africa	17-19 (1)	09-12 (1) 12-14 (2) 14-17 (3) 17-19 (4) 19-22 (3) 22-23 (2) 23-00 (1)	14-16 (1) 16-18 (2) 18-20 (3) 20-00 (4) 00-02 (3) 02-03 (2) 03-05 (1)	21-00 (1)

Sunspot Cycle 21

	1976	1977	1978	1979	1980
January	75.4	77.2	118.5	184.0	201.9
February	74.5	78.1	129.7	188.4	197.1
March	73.7	78.7	138.5	186.4	201.2
April	72.9	81.5	145.1	181.8	198.6
May	72.3	81.3	142.2	174.2	195.6
June	71.9	82.8	136.6	171.6	195.2
July	71.3	87.3	138.3	176.9	190.4
August	72.4	90.7	140.7	187.4	186.4
September	72.8	91.2	142.5	197.7	191.4
October	74.7	95.4	151.4	205.2	199.6
November	75.2	100.4	169.2	211.9	201.3
December	77.0	109.5	178.5	211.9	205.6*

**Provisional; all others are final.*

Table I– Smoothed 5-month solar flux numbers based on 10.7 cm measurements made at the Ottawa, Canada solar observatory.

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

Time Zones: CDT & MDT (24-Hour Time) CENTRAL USA TO:

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

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

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

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

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QSLs with Class! Unbeatable quality, reasonable price. Samples: 50 cents, refundable. QSLs UNLIMITED, POB 27553, Atlanta, GA 30327.

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

DX LOG: Awards oriented. New. Unique. Free details. SARS, Box 326B, Montoursville, PA 17754.

STATION PLAQUE: Name, call, awards list. Unique, Distinctive. Free details. SARS, Box 326B, Montoursville, PA 17754.

WANTED: Gold plated connector pins, scrap. Paying $1.00 per ounce and up. Ron Guard, W6TWT, 10105 Stern, Cupertino, CA 95014, (408) 252-5067.

SATELLITE TV . . . HOWARD/COLEMAN TVRO BOARDS . . . Build your own satellite TV receiver. For more information write . . . Robert Coleman, Rt. 3, Box 58-ACQ, Travelers Rest, SC 29690.

TELETYPEWRITER REPAIR PARTS WANTED, unused. Can possibly pick up at your QTH, or bring to Dayton Hamvention. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. Telephone 305-583-1340 after 10 p.m. S.a.s.e. list. Fred Schmidt, N4TT (ex-W4NYF).

MIRROR IN THE LID, Spinning Disc, and other pre-1946 television sets wanted for historical collection. Will pay substantial dollars for R.C.A. TRK-5, #359, or General Electric "HM" series sets. Also looking for pre-war picture tubes such as 12AP4, MW-31-3, and other pre-war T.V. parts and literature. Arnold Chase, 9 Rushleigh Road, West Hartford, Conn. 06117, (203) 521-5280 (collect calls o.k.).

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CUSTOM EMBROIDERED EMBLEMS, your design, low minimum, Emblems, Dept 10, Littleton, New Hampshire 03561.

MAKE HAM RADIO FUN! Supplement your learning programs with motivational self-hypnosis cassettes. Tape #3, Learning the Code; Tape #4, Breaking The Speed Barrier; Tape #7, Electronics Theory. Free catalog. For tapes send $10.95 each to GEM OF THE MOUNTAINS PUBLISHING COMPANY, 3307 North 6th Street, Coeur d'Alene, Idaho 83814.

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CIRCLE 89 ON READER SERVICE COUPON

SELL: Clegg 22 Mark II with manual, $35. Pick up only. K2VGV (212) 461-5933.

FOR SALE: Complete Kenwood T-599D/R-599D/S-599D station. Excellent condition, still in original cartons. $700. WD6CQV, 10210 Wish Ave., Northridge, CA 91325.

CALLSIGN PLAQUE: Your call and name on handmade wood plaque for shack $15, ppd. KA2CGU, 270 Buffalo St., Gowanda, NY 14070.

WANTED: TEN-TEC 405 LINEAR, SW-3 coils or forms, and 24-hour shipboard radio room clock. George Marts, W0TDH, 4201 Colvin Dr., St. Louis, MO 63123.

WANTED: CRT bezel for Waterman S-15-A scope or non-working unit for parts. W7KSG, 1876 E. 2990 So., Salt Lake City, Utah 84106.

TELREX 20M326, 1 yr old, $225. Signal/One CX7, minor problems $850. Trade TR4C even for T4XC. K5TA (505) 898-0515.

WANTED: Icom EX-106 FM adapter, PS-15 power supply, or Astron RS-35, Ten-Tec 252M, or Vista XXXR, and Drake 5200 low pass filter. K0MK, 218-865-6541.

FOR SALE: Heath HW101 W/BW Clipper installed, also pwr sply and mic. Retail $650. Yours for $500 manual inc. (914) 357-5578 p.m., (212) 938-9730 days.

SELL: Heath HR-1680, HX-1681, PS23, cables, manuals. $350 UPS. Al, KA8KCX, 517-686-6187.

WANTED: J-38 straight key with shorting bar. W9GXR, 6915 Prairie Drive, Middleton, Wisconsin 53562.

GR 1001A sig. gen., exc. cond. with GR874 to PL259 adapter cable & manual. $225 FOB UPS. PhD, 5220 Carlingford Ave., Riverside, CA 92504.

WANTED: Used ham radio equipment. Good condition. Call Victor Zimmerman, 601-452-7678.

COLLINS S-LINE: 75S-3B (Round), 32S3 (Round) 516 F2 Power Supply. Recently reconditioned, mint condition. 1st certified check for $1300. Gloria H. McDaniel, W9GHO, 6090 Fall Creek Road, Indianapolis, IN 46220.

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SELL: TS820S w/cw filter, VFO-120, manuals, new finals, mint condx, newly aligned. First $895 check takes all. K8CSG/5.

FOR SALE: Yaesu FT-301. Absolutely mint, perfect. $495. R. Moraine, 1432 Pamela, Hurst, TX 76053.

FOR SALE: HP 205 AG Lab Signal Generator Audio $50, Sonar VHF 8 channel Scanner 12v/110v $35. K6KZT, 2255 Alexander, Los Osos, CA 93402.

CRYSTALS: S.a.s.e. my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

MINT VENUS Slo-Scan Monitor $150, Zeus Xmtr and Interceptor B Rcvr $250. WA9HCU, 317-324-2279 after 6 pm.

DX-BULLETINS, "QRZ-DX" 1979 and 1980 $12. "The DX Bulletin" 1979 and 1980 $12. "Long Island DX Bulletin" 1972 thru 1980 $30. Canadian DX Association "Long Skip" 1978, 79, 80 $15. Geoff Watts "DX Sheet" Sept. 1970 thru Sept. 1976 $15. Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

NATIONAL NC-300, with calibrator and manual, A-1, $135. You ship. Chuck, W9VZR, 4627 North Bartlett, Milwaukee, WI 53211.

WANTED: C-806/GR Indicator and CV-157/UR converter. C.T. Huth, 146 Schonhardt St., Tiffin, OH 44883.

SELL: BD-77-C Dynamotor unit never used. Input 14 volts, out 1100, in crate 35# make offer. W2WQV, 164 Jefferson Ave., Fairport, NY 14450.

DIGITAL MODERNIZATION KIT: Modernize your HW-101, SB-102, SB-110, SB-303, or SB-401 with a completely wired and tested DMK frequency counter digital dial. The DMK digital dial replaces your present analog dial and is adaptable to many other Heathkit models and other brands of receivers, transmitters and transceivers. DMK for the HW-101 or SB-303, $98.95; DMK for the SB-102 or SB-401, $96.45; DMK for the SB-110, $104.95. Enclose $3.50 for shipping and handling. Installation instructions and schematics, $3.50. RECTANGLE BEZEL KIT for the HW-101, $6.95 plus $1.75 for shipping and handling. RIT KIT for the HW-101. Adaptable to other Heathkit models and to other brands of transceivers. $13.95 plus $1.75 for shipping and handling. Installation instructions and schematic, $2.00. Protronics Inc., 20 Monte Vista, Buckley, WA 98321. Phone 206-829-0056. Visa and Master Charge.

WANTED: Golden Falcon Schematic for Model #350 or information on transformer, photostat copy okay. Jim Koepke, 289 Mallard Dr., Rochester, NY 14622. Phone 716-467-7860 after 6 p.m.

TRS-80 HAM RADIO PROGRAMS: Antenna design, conversion tables, design equations, contest dup check, Morse transceive. All for $14.95, 16k-LII. VLA Software Supplies, Box 721, Union Station, Endicott, NY 13760.

DESPERATELY WANTED: Alignment and Circuit information on PALOMAR PTR-130k transceiver. Will reimburse costs. PAØHEL, P.O. Box 639, 2600AP DELFT, NETHERLANDS.

FOR SALE: WILSON 1405SM (1/5 watt) HT with leather case, Rubber Ducky, 6 pr. xtals, speaker, mike, desk charger, extra nicads and tray, very good condition. $125, negotiable. MOTOROLA HT-220 UHF, 2 channel, "PL," 2 batteries. Make reasonable offer or trade. Art Bernstein, N2KA, 387 Avenue "S", Apt. 6D, Brooklyn, NY 11223, (212) 376-1387.

USED EQUIPMENT FOR SALE: A wide assortment of marine electronic equipment for sale including VHF Radiotelephones which can be converted to 2-meter. Write for details: Ron Graham Jr., 12 Roger St., Gloucester, MA 01930.

CALLBOOKS: 1980 U.S. and Foreign with supplements, $8 each set. Include s.a.s.e. in case already sold. Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

WANTED: SBE Sideband Engineers schematic or manual for a very well built DC to AC inverter, Model #SB3-DCP, rated at 1000 watts continuous output. Will pay. Phil Licciardi, 992 Carter St., Rochester, NY 14621. Telephone 716-266-7490.

HEWLETT-PACKARD 100 MHz oscilloscope. New. Model 1740A, with built-in digital DMM, two 10:1 probes included. Send SASE for price, details. G. Konya, 3067 No. 2450 W., Salt Lake City, Utah 84116. (801) 532-3618.

SELL: Drake TR-7 transceiver, PS-7 power supply, RV-7 remote VFO, split rcv. and xmit frequencies. 50 foot Tri-Ex bracketed tower, (5 ten foot sections). HD-73 heavy duty antenna rotor with 2 speed azimuthal console.TH3MK3 3 element Hy-Gain Yagi antenna. HKI hamkey with TRAC CMOS keyer. MFJ943 antenna tuner/coupler. Accessories, etc. A superior radio. Equipment brand new, never used. $2500.00 firm. Don Peters, 631 Rollstone Road, Fitchburg, Mass. 01420. Tel. 617-342-3791.

SSB TRANSCEIVER: NCX-3 for 80-40-20 with Astatic PTT mike, Heath I2V and 110 V power supplies. All A-1 with manuals. $150 plus shipping. W9TGH, 67 Lakeshore, Clarksville, IN 47130.

THE SUPERMARKET OF ELECTRONICS: thousands of items for sale or trade each month. Free classified ad with subscription. Only $5.00 to Nuts & Volts, POB 1111-Q, Placentia, CA 92670.

COMPUTER PROGRAMMING COURSES: Taught in private colleges throughout the U.S. Excellent jobs for graduates. Write Computer Careers, P.O. Box 302C, Rapid City, SD 57709.

SELL: Heath SB-104A with p.s., spkr., n.b., cw filter, and matching SB-230 linear. All mint, $850. Free SB-644 ext. VFO with purchase of above package. W6OWD 415-728-7136.

WANTED: 5 volt, 22 amp filament transformer Raytheon 5950-645-6946 8500 volt insulation as purchased from Fair Radio, Lima, Ohio. Also 4-1000A or 833A, state price and condition. Andrew Craig, 1312 N. 3rd St., Oskaloosa, IA 52577.

WANTED: AN-MS connectors, synchros, etc. Send list. Bill Williams, PO #7057, Norfolk, VA 23509.

BOOKS: Books in Spanish! Volkswagen, construction, diesel motors, radio, electric installations, industrial formulas, television course. $17 copy. Burke Assoc., Box 248, Manchester, MA 01944.

NEW TAYLOR R.S.O. Low Pass Adjustable Filter. 1KW rating. W9WGD, 1002 Forest Road, La Grange Park, IL 60525. New $34, sell $25.

FREE SAMPLE: Ham Radio/Personal Computing Insider Newsletter. Also 4-Line Rubber Stamp: $3.95. VISA/MasterCard. W5YI, Box #10101C, Dallas, TX 75207.

DXERS/ANTENNA BUFFS: Four programs, cassette, for TRS-80Lev2-16K. Great Circle; Sunrise/Sunset calculations; Wind survival of mast with antennas; Yagi surface area and weight. $15.00 postpaid. Ideal Antennas, Inc., 25705 Catalina, Southfield, MI 48075.

SELL: Mint HW-101, HP-23C pwr s.p., SB614 stat. mon., D-104 mic., HM-102 watt mtr. $475.00. Call (717) 275-4389.

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FILMT XFMR: 5.0 VCT @ 60 AMP, 110/220 VAC Pri., 13.4 LBS	$ 75.00
FILMT XFMR: 7.5 VCT @ 21 AMP, 105/117 VAC Pri., 9.5 LBS	$ 37.50
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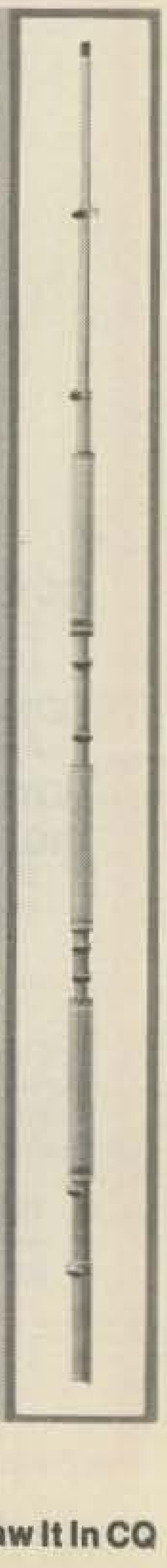

MODEL 370-31 Slim Line Vertical designed for 10, 15, 20 and 40 meters. All traps pretuned. Overall height 21 feet. Can be used with or without ground radials. Model 370-33 — 75 meter add on kit. 75 and 80 meter operation optional with model 370-33 add on kit. Power rating 1 KW-2 KW P.E.P.

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FOR SALE: Daytona Rangar metal detector, perfect condition, $175.00. J.C. Penney's 40 CH SSB/AC/DC Model 6241 CB with base power mike, $125.00. Midland walkie talkie 5 Watt 6 Channel Model 13-779 with speaker/mike and crystals, $65.00. Realistic DX 160, Communications Receiver, new condition, $65.00. Electro Pal depth and fish finder, Model 9010, $50.00. Turner Road king power mike, new, $20.00. Turner + 3B base power mike, new, $25.00. Regency flight scan scanner with crystals, $65.00. Motor driven mobile antenna CB/AM/FM automatic, new, $35.00. All items plus postage. Ronald A. Seitz, 411 W. End Ave., Paris, IL 61944, 217-465-1130.

QSL ECONOMY: $12 per 1000. S.A.S.E. for samples. W4TG, Drawer F, Gray, GA 31032.

FREQUENCY COUNTER: General Radio model 1130A "Digital Time and Frequency Meter." Good condition. Rack mounting. Only $85. Jim Cooper, W2JC, Box 73, Paramus, NJ 07652, 201-265-7075/answer machine.

WANTED: Instructions on how to use the key pad of control box Compu Chess, or name of its manufacturer. Dan Quinn, Route 3 Box 74-B, Palatka, FL 32077.

8-LEVEL ASCII Terminal: Rugged Model 35 Teletype ASR set with printer, keyboard, tape punch, tape reader, and cabinet. Only $350, or make offer. Jim Cooper, Box 73, Paramus, NJ 07652, 201-265-7075/answer machine.

WANTED: Siltronics 1011C or 1011D. Tommy, M.P.O. Box 205, Niagara Falls, NY 14302.

KENWOOD: TR-7625, RM-76, KPS-7 $400; R-1000 $350; Bearcat 220 $200. All mint. Larry, WB2NFJ, 212-545-4917.

FOR SALE: Ameco AC-1 Code transmitter. 10-12 Watts Cw. With manual, crystals, and key. 40 & 80 meter bands. Send S.A.S.E. to C. Ferguson, 91 Northfield Rd., N. Coventry, CT 06238. $40.00,you ship.

AMATEUR RADIO REPAIR: Professional service, reasonable rates, ALL Brands. USA KDK repair center! Amateur Radio Repair Center of I.E.C., Inc., 1020 Brookstown Ave., Suite 5, Winston-Salem, N.C. 27101, (919) 725-7500.

WANTED: Coaxial bulkhead lightning arrestors w/"N" connectors and GRC-27 rcvr & xmtr dust covers (enclosures). C.T. Huth, 146 Schonhardt Street, Tiffin OH 44883.

WANTED: ARRL Handbooks, QST, CQ, 73, Ham Radio, Ham Radio Horizons. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

SELL OR TRADE Yaesu 221 R and QSA-5 $425 or for Canon lenses or Super 8mm equivalent. Call Dean Galitsis 212-353-8485.

CRYSTALS: Send S.A.S.E. for my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

COLLINS MECH FILTERS: F455H31, F455Y31, 455FA21, 455FA31, 455J31, and F455Q-2. $20 each. J.M. Hoffer, W1DL, 24 Cherry Road, Framingham, MA 01701; 617-872-5084.

SELL: Pickering Keyboard keyer model KB 1. Sends perfect cw, $150. Clem Duval, 33727 Brownlea, Sterling Heights, MI 48077.

HENRY 3KA Amplifier w/10 meters. Mint condition, $1295 firm. Prefer pick up only. W1AGA.

FOR SALE: Drake twins "B" line, T-4XB, R-4B, AC-4, and MS-4. Excellent condition. $650, you ship. C. Cooper, KA0GEJ, 3754 Monsols Dr., Florissant, MO 63034; 314-837-4778.

FOR SALE: Kenwood 700SP all mode 2-meter rig. Argonaut 509 for sale. Send s.a.s.e. for info. P.O. Box 518, Whitehouse, FL 32220.

FOR SALE: Antique Hallicrafters "Sky Buddy" receiver and R-42 Speaker (mate for SX-42). Best offer. Bob Schrader, W0PVL, 316-624-3988.

WANTED: Old stock certificates, bonds, and pre-1912 cancelled checks. Barlow, 88 Lincoln B8, Eugene, OR 97401.

CASH FOR Dec. 1919 to Dec. 1921 QST's for my personal collection. Ken Miller, K6IR, 16904 Geo. Washington Dr., Rockville, MD 20853, 301-774-7709.

DAH-DI-DAH-DIT dah-dah-di-dah vinyl bumper sticker $1.00. WB7FDE, D. Mollan, 7805 NE 147 Ave., Vancouver, WA 98662.

FOR SALE: Antique Wave Mater Gen. Radio type 358 in original case, $1,000. Dr. Clarence Johnson, P.O. Box 9696, Mobile, AL 36691.

NOVICE ALL-AMERICAN Certificate: Work a Novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

AMATEUR RADIO REPAIR: Professional service, reasonable rates, ALL Brands. USA KDK repair center! Amateur Radio Repair Center of I.E.C., Inc., 1020 Brookstown Ave., Suite 5, Winston-Salem, N.C. 27101, (919) 725-7500.

COLLINS 75S-3B, with 2.1 mechanical filter, recent factory overhaul, very good condition. $450.00 U.S. firm. You ship. VE3BX, Windsor, Ont., Canada, 519-966-3222.

NEED SCHEMATIC for Kuhn Model 357C VHF receiver and IC-21 DV-21 2 meter VHF service manual. Will copy and return. KB6BO, 5222 Coringa Dr., Los Angeles, CA 90042, 213-627-6731 ext. 206, 208 (days), 213-255-0409 (evenings).

KWM-2, PM-2, 312B-3, $660; CX7a, $975; Hy-Gain Duobander DB-1015A factory sealed carton, $135; Wilson Duobander DB-33, $100; 4-1000A, $40; prepaid UPS. Alpha 77SX, $4225; Homebrew 5 Band 4-1000A Amplifier, $700. Wm. Fulcher, 217 Bluegrass, Hendersonville, TN 37075.

WANTED: Swan VX-2 Vox Unit. Must be in good condition. 815-562-5432 after 6:00 pm.

MOTOROLA MOCOM 70, 2-way Mobile 43980 K/H. Never used. Complete with ant. Best offer. W9WGD, 1002 Forest Road, La Grange Park, IL 60525.

WANTED: CE20A and a Tri-Band Beam. W0NRX, Grant City, MO 64456.

SELL: Kenwood 599 Twins with manuals including matching speaker. Pick up only, $400. Joseph Schwartz, 43-34 Union St., Flushing, NY 11355, (212) 461-5933.

WANTED: Modern Electrics 1908-1916, singles, runs to fill out set. W6ERS, 723 California Dr., Burlingame, CA 94010.

REGULATED LAB SUPPLY: Technipower Model LPC 5.0-5.0; 5V at 5 amps, OVP, remote sensing, with manual, mint. $22 includes shipping. J. Hoffer, W1DL, 24 Cherry Road, Framingham, MA 01701.

WANTED: Used, any condition Collins equipment. State price and condition. H.F. Schnur, 115 Intercept Ave., N. Charleston, SC 29405.

June 1981

QPRers-Get details of the G-QRP-Club and free sample magazine from Rev. G.C. Dobbs G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham. B37. U.K.

CQ 1952, 1958, 1960-1974. QST 1948-1950, 1953-1954, 1956-1963, 1965-1973. 73 1963-1974. Best offer. F. Wojcik, 33 Hughes St., Maplewood, NJ 07040.

FOR SALE: Galaxy V MK2 w/p.s. and mic $350, Drake TR-3 w/spk, p.s., and mic $225, Clegg FM-27B $145. Mike Donovan, KAØJAN, 3405 Dove St., Dubuque, IA 52001.

WANTED: Heathkit SB-10 SSB adapter and instructions on how to connect it to a Heathkit DX-100B Transmitter. Stu. Ballinger, WA2BSS, 57 S. Clinton St., Poughkeepsie, NY 12601.

MOTOROLA STATION MONITOR 150-170 MHz and WWV Receiver $35. Dumount Freq & Dev Meter 25-470 MHz $50. K6KZT, 2255 Alexander, Los Osos, CA 93402.

KNIGHT C-22 XCVR: Need Manual/Schematic. Will reimburse expense. C.E. Bott, P.O. Box 1082, Fairchild AFB, WA 99011.

HEATH HW-16 good cond., $80. Swan 500C with AC-DC VOX fiar cond., $380. I ship UPS. WB6ZOF, 1004 Goodman Ranch Road, Garberville, CA 95440.

FOR SALE: Swan 700-CX with vox and 117/220 volt power supply. Just back from factory with new finals and realigned receiver. First $375 gets it post paid. Also WM-1500 meter, $25. Vibroplex Chrome Lightning Bug, $35. D-104 mic, $30. Milt Lowrey, N5BLU, 2858 Joanna Drive, Dallas, TX 75234, (214) 243-1712.

WANTED: Heath IT-3120 fet/transistor tester. Also schematic and service manual for an EMC RF-AF crystal marker/TV bar generator. Caswell Davis, Jr., 601 Delmar #2, San Antonio, TX 78210.

HEATH HW-8 FOR SALE: Speaker plus sensit. mod. and xmit. switch added. Perfect condx. $110. Craig Bradley, Rt. 1, Box 79G, Trafford, AL 35172, 205-681-4919.

FOR SALE: BEAUTIFUL HQ180AX with many extras; details upon request with SASE. W2CVW, 343 Catherine St., S. Amboy, NJ 08879.

SWAP: Photographic History Civil War 10 volumes by Miller N.Y. 1911 (A1 cond) for ham gear. WA2PCL, 101-23 Lefferts, Jamaica, NY 11419.

MINT HQ 120X for sale $125.00 plus shipping. R.W. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

LOUISIANA SLOW NET WANTS NEW MEMBERS. All interested s.a.s.e. to WD5EAE, Steve Genusa, 2106 Park Ave., Monroe, LA 71201.

WANT FOR CASH: Pre-1923 QST's and ARRL Edition #4 (Dec. 1928) Handbook. Ken Miller, K6IR, 16904 Geo. Washington, Rockville, MD 20853, (301) 774-7709.

CLEANING OUT SHACK: Send SASE for list of bargains. Also one dollar silver certificates sale in short supply. L. Basham, 735 Caves Hwy, Cave Junction, Oregon 97523.

NOVICE ALL-AMERICAN Certificate: Work a Novice in all 10 call areas. Send list and $1. K6AS1, 25 Rudnick Ave., Novato, CA 94947.

SELL: Johnson Model 122 VF Oscillator—all bands. Make offer SASE. D. Testa, P.O. Box 9064-cq, Newark, NJ 07104.

MOTOROLA TEK-1A 2 tone gen. $20; TEK-20 P/L gen. $20; SLN-6222A Reed Tester $20; SASE for test equipment list. K6KZT, 2255 Alexander, Los Osos, CA 93402.

SELL: KENWOOD TS-120S SSB/CW transceiver with CW filter and PS-30 power supply, mint condition, $600. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

FOR SALE: YAESU 2500 CPU. mike with Micro processor mint cond. 25 watts out. Kenwood power supply p-8 6 mo. old. K2RBY 203-264-3666.

BAD TUBES WANTED: Eimac 250TL/VT220, 3C24/VT204/24G, 25TG, HK54, 327A, 100TH/VT218; 416B,C,E, 5894, 6097. Also, gold plated scrap wanted. Ron Guard, W6TWT, 10105 Stern Ave., Cupertino, CA 95014, (408) 252-5067.

FOR SALE: Kenwood 700 SP all mode 2 meter rig mint. Send S.A.S.E. for more info. P.O. Box 518, Whitehouse, FL 32220.

WANTED: Telechron clock/timer for HQ-145. Also original transformer for WRL Globe Chief Xmtr. Ed Morrison, K9HLT, Box 175, Blandinsville, IL 61420.

WANTED: Any Gov't Technical Manuals Re: Teleprinters, Ham Radio Electronics. Wholesale considered. Help! D. Testa, Box 9064, Newark, NJ 07104.

RADIO BOY BOOKS FOR SALE: SASE to R.W. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

SELL: Transceiver 5Band FPM300 MK2 $275; Millen Grid Dip 90651 $65; Low Freq ARC5 RX $20; Shure 444 W/Yaesu Plug $28; FL110 Amp new $195; Collins FM Adapter 146C-1 $20. Art Ford, 2903 Emory St., Melbourne, FL 32901.

WANTED: Ten-Tec AC4 SWR MTR. Skip, WB8OWM.

SEND SASE for list of radio parts and my surplus equipment. L. Basham, 735 Caves Hwy, Cave Junction, OR 97523.

Advertiser's Index

We'd like to see your company listed here too. Contact Jack Gutzeit, W2LZX, our Advertising Manager at 516-681-2922 to work out an advertising program tailored to suit your needs.

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