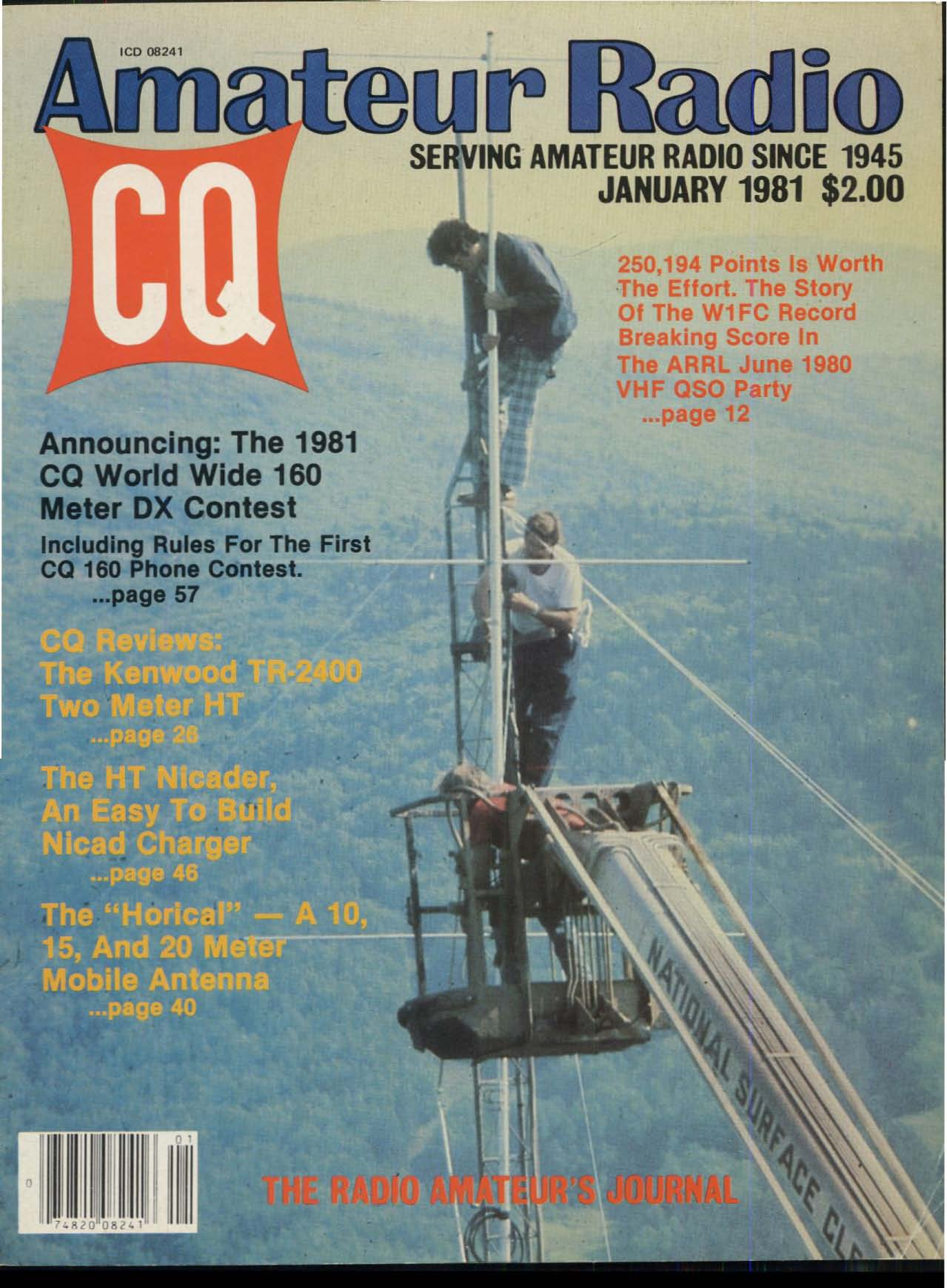
ICD 08241

Amateur Radio CQ

SERVING AMATEUR RADIO SINCE 1945

JANUARY 1981 $2.00



250,194 Points Is Worth The Effort. The Story Of The W1FC Record Breaking Score In The ARRL June 1980 VHF QSO Party
...page 12

Announcing: The 1981 CQ World Wide 160 Meter DX Contest

Including Rules For The First CQ 160 Phone Contest.
...page 57

CQ Reviews: The Kenwood TR-2400 Two Meter HT
...page 26

The HT Nicader, An Easy To Build Nicad Charger
...page 46

The "Horical" — A 10, 15, And 20 Meter Mobile Antenna
...page 40

THE RADIO AMATEUR'S JOURNAL

0 01 74820 08241

KENWOOD
...pacesetter in amateur radio

TR-9000

"New 2-meter direction"...compact rig with FM/SSB/CW, scan, five memories

The TR-9000 combines the convenience of FM with long distance SSB and CW. It is extremely compact... perfect for mobile operation. Matching accessories are available for optimum fixed-station operation.

TR-9000 FEATURES:

- FM, USB, LSB, and CW.
- Only 6-11/16 inches wide, 2-21/32 inches high, 9-7/32 inches deep.
- Two digital VFOs, with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz.
- Digital frequency display. Five, four, or three digits, depending on selected tuning step.
- Covers 143.9000-148.9999 MHz.
- Band scan... automatic busy stop and free scan.
- SSB/CW search of selectable 9.9-kHz bandwidth segments.
- Five memories... four for simplex or ±600 kHz repeater offsets and the fifth for a non-standard offset (memorizes transmit and receive frequency independently).
- UP/DOWN microphone (standard) for manual band scan.
- Noise blanker for SSB and CW.
- RIT (receiver incremental tuning) for SSB and CW.
- RF gain control.
- CW sidetone.
- Selectable RF power outputs ... 10 W (HI)/1 W (LO).
- Mobile mounting bracket with quick-release levers.
- LED indicators... ON AIR, BUSY, and VFO.

OPTIONAL ACCESSORIES:

- PS-20 fixed-station power supply.
- SP-120 fixed-station external speaker.
- BO-9 System Base... with power switch, SEND/RECEIVE switch (for CW), memory-backup power supply, and headphone jack.

PS-20 TR-9000 BO-9 SP-120

TR-8400

"Go synthesized on 440 MHz FM"... 5 memories, memory/band scan

The TR-8400 synthesized 70-cm UHF FM mobile transceiver covers 440-450 MHz in 25-kHz steps and includes five memories, automatic memory and band scan, UP/DOWN manual scan, and two VFOs.

TR-8400 FEATURES:

- Synthesized coverage of 440-450 MHz in 25-kHz steps.
- Five memories and memory backup terminal on rear panel.
- Two VFOs.
- Offset switch for ±5 MHz transmit offset and simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- Automatic scan of memories and of 440-450 MHz band (in 25-kHz steps). Locks on busy channel and resumes when signal disappears. HOLD or mic PTT button cancels scan.
- Up/down manual band scan in 25-kHz steps with UP/DOWN microphone supplied with TR-8400.
- Only 5-3/4 inches wide, 2 inches high, and 7-5/8 inches deep. Weighs only 3.75 pounds.
- TONE switch to activate sub-tone device (not Kenwood-supplied). DTMF (Touch-Tone®) terminal on rear panel.
- Four-digit frequency display and S/RF bar meter. Other LEDs indicate BUSY, ON AIR, and REPEATER operation.
- HI/LOW (10 W/1 W) RF-output power switch.

OPTIONAL ACCESSORIES:

- KPS-7 fixed-station power supply.
- SP-40 compact mobile speaker.

Subject to FCC Approval

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

R-1000

"Hear there and everywhere"... easy tuning, digital display

The R-1000 is an amazingly easy-to-operate, high-performance, communications receiver, covering 200 kHz to 30 MHz in 30 bands. This PLL synthesized receiver features a digital frequency display and analog dial, plus a quartz digital clock and timer.

R-1000 FEATURES:
- Covers 200 kHz to 30 MHz continuously.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock with timer to turn on radio for scheduled listening or control a recorder through remote terminal.
- Step attenuator to prevent overload.
- Three IF filters for optimum AM, SSB, CW. 12-kHz and 6-kHz (adaptable to 6-kHz and 2.7-kHz) for AM wide and narrow, and 2.7-kHz filter for high-quality SSB (USB and LSB) and CW reception.
- Effective noise blanker.
- Terminal for external tape recorder.
- Tone control.
- Built-in 4-inch speaker.
- Dimmer switch to control intensity of S-meter and other panel lights and digital display.
- Wire antenna terminals for 200 kHz to 2 MHz and 2 MHz to 30 MHz. Coax terminal for 2 MHz to 30 MHz.
- Voltage selector for 100, 120, 220, and 240 VAC. Also adaptable to operate on 13.8 VDC with optional DCK-1 kit.

OPTIONAL ACCESSORIES:
- SP-100 matching external speaker.
- HS-5 and HS-4 headphones.
- DCK-1 modification kit for 12-VDC operation.

SP-100 R-1000 HS-5

HC-10

Digital world clock with two 24-hour displays, quartz time base

The HC-10 digital world clock with dual 24-hour display shows local time and the time in 10 preprogrammed plus two programmable time zones.

HC-10 FEATURES:
- Two 24-hour displays with quartz time base. Right display shows local (or UTC) hour, minute, second, day. Left display shows month, date, world time in various cities, memory time (QSO starting time), and time difference (in hours from UTC).
- Preprogrammed time in 10 cities around the world, plus two programmable time zones.
- "TOMORROW" and "YESTERDAY" indicators.
- Memorization of present time. Can be recalled later, for logging purposes.
- High accuracy (±10 seconds/month).

DM-81

Dip meter performs many RF measurements

The DM-81 dip meter is highly accurate and features, in addition to the traditional inductive-coupling technique, capacitive coupling for measuring metal-enclosed coils and toroidal coils.

DM-81 FEATURES:
- Measuring range of 700 kHz-250 MHz in seven bands.
- Built-in storage compartment for all seven coils, capacitive probe, earphone, and ground clip lead.
- All solid-state and built-in battery.
- HC-25U and FT-243 sockets for checking crystals and marker-generator function.
- Amplitude modulation.
- FET for good sensitivity.
- Absorption frequency meter function.
- Earphone for monitoring transmitted signals.
- Capacitance probe for measuring resonant frequencies without removing coil shields, and also for measuring resonant frequencies of toroidal coils.

The Radio Amateur's Journal

ON THE COVER: K1RX AND W1DUW help set the antennas for W1FC's record 250,194 point effort.

JANUARY 1981 **VOL. 37, NO. 1**

FEATURES

DEPARTMENTS

MASTHEAD

Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: 516 681-2922. CQ (ISSN 0007-893X) is published monthly by CQ Publishing Inc. Second-Class Postage paid at Hicksville, NY and other points. Subscription prices: Domestic—one year $14.00, two years $25.00, three years $36.00; Canadian/Foreign—one year $17.00, two years $31.00, three years $45.00; Air Mail—one year $51.95, two years $100.95, three years $149.95. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address. Printed in the United States of America.
Postmaster: Please send form 3579 to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

Zero Bias

AN EDITORIAL

Happy New Year! It'll probably take a few more weeks for me to get used to writing 1981 instead of 1980. The Boxborough Convention proved to be a success in that there was a charming lady at the fleamarket who seemed to have an unending supply of egg insulators for sale. She drove a hard bargain for them, but I finally got them. On the way up to the convention we had the HT going and heard a mobile down the road from us talking to a station in Connecticut. The mobile turned out to be a couple on their way to the Convention, Herb Sweet, K2GBH and his wife, Barbara, WA2KCL. Barbara was explaining to the W1 about a computerized loom she had (a modern day version of the Jacquard loom) on which she used punch cards to weave certain patterns repetitively in what she was making. She went on to tell him about the ski hats she had made and was taking to the Convention. To keep in the amateur radio mood, she had made ski hats with CQ all around them in contrasting colors. Well, we broke in and asked about the CQ hats and arranged to meet a little further down the road. We met a few miles up and drove the remaining few miles to the Convention site. We concluded a sale in the hotel parking lot for several of the CQ hats and now the *CQ* staff will be set for the winter.

CQ Mailing Label Is Worth $6.00

For the past several months we have made a check of those applicants for *CQ* Awards as to their status as *CQ* subscribers. It seems that the vast majority of applicants do not subscribe to *CQ* . This is born out when one sees the questions asked by applicants and when application requests, logs, and QSL cards still arrive at the old address. I'm not talking about DX stations or requests from exotic lands, but from local stateside amateurs.

For the most part, the expense for these awards is paid by the applicant. *CQ* still subsidizes (to a much smaller amount) the cost of the award program. What we would like to do is increase the participation of those who wish to take part in the program. This is *not* a simple "across the board" increase for our awards. Our intent is not a money-making scheme nor simply increasing the revenue. We want to increase the number of people who subscribe, and therefore support *CQ*, not just our awards.

We are proposing a dual pricing schedule to take effect on March 1, 1981. From that date on, non-subscribers will pay $10.00 for *CQ* award processing and an award certificate, and *CQ* subscribers will pay $4.00, or a $1 *decrease* in the current rate. *A current mailing label will have to be attached to the application to qualify for the decreased rate.* I'm sure some confusion will occur, but it will occur primarily from non-subscribers who rarely, if ever, see the magazine or its announcements.

Presently there is apparently little or no need to be involved with *CQ* by most of our applicants. Personally, I think we do offer quite a bit for the amateur and it is certainly in excess of our awards program. Our award personnel's involvement and hard work have made these awards popular and a desired mark of achievement by the amateur community. The awards do not come out of thin air or from some mysterious body. They are, in fact, *CQ's* stamp of recognition or approval to some feat of achievement for all to see and acknowledge. They say that we have passed judgment on them and found them worthy of receiving our awards. That's quite a bit.

We feel that by this move we will encourage more and more of our applicants to subscribe and support *CQ*. Those who don't will then, in effect, subsidize those who do, a novel change in our history.

A second note involving our awards is the matter of plaques. We have been obtaining our plaques from a local source and passing them on to the recipients at our cost. That will not change. However, we will be changing suppliers. In the past our present supplier could not always offer the service we needed and time has a way of passing. His work was never in question, just a constant delivery problem. Ed Hopper, W2GT, seems to have come up with a winner in N.J., who seems to be able to do everything we need and in short order. His prices are higher than our present supplier, and so our plaque prices will have to go up accordingly. We already know that the USA-CA plaque will cost $5.00 more, bringing that plaque to $35.00 (including postage). The new 5 Band WAZ plaque will cost somewhere around $60.00 per plaque.

Formula 605

Last month I mentioned an article on Section 605 of the Communications Act of 1934 that delves into the problem of just what is private and privileged information and just what may or may not be divulged. This is a situation arising from the feared attack on the satellite stations by people receiving signals and not paying for them. The basic defense that is being used is that it is okay to receive this programming as long as the station doing the receiving does not divulge the content or in some way commercially capitalize on the reception. The growing number of people who are interested in satellite reception and the growing number of people actually building equipment or buying it represent very few in number as compared to the general population. I haven't seen any 12-foot dish antennas sprout up in my neighborhood as yet, but I suspect that there might be one or two in the vicinity. The satellite argument is nice and probably very academic for most of us and a good exercise in first amendment jail-house law.

The basic concern for amateurs should be in the eventual outcome of any interpretation or rewriting of Section 605. There is a vague section now which excludes some amateur activities from the Section's provisions (Section 27, Radio Act of 1927), but even that is a catch-all statement which can be interpreted in many ways. So, if a strict rewrite or letter-by-letter interpretation is somehow enforced, the following problems may arise.

1. There may be no DX information or bulletins published, as they would divulge information considered private and privileged.

SUPER RIG

NEW TEN-TEC

OMNI-C 9 Band Transceiver + HERCULES Solid-State KW Linear

TEN-TEC SUPER RIG IS READY. For every band, every band condition. With the latest in solid-state hf technology, the latest in features. To make communications easier, more reliable — super.

OMNI-C

The new model in this famous series. With new coverage and new features to make it better than ever!

All 9 HF Bands. From 160 through 10 meters, including the new 10, 18 and 24.5 MHz bands. Coverage you can live with—for years and years.

3-Mode, 2-Range Offset Tuning. Offset the receiver section or the transmitter section or the entire transceiver! In 2 ranges: ±500 Hz or ±4 kHz. For complete flexibility in fine tuning, a DX work, or net operations.

Seven Response Curves. Four for SSB, three for CW. With new switching to select the standard 2.4 kHz filter, optional 1.8 kHz SSB filter, 500 Hz or 250 Hz CW filters, and standard 450 and 150 Hz CW active audio filters. Up to 16 poles of i-f filtering plus audio filtering to handle any situation.

Built-In Notch Filter and Noise Blanker. Notch is variable from 200 Hz to 3.5 kHz with a depth of more than 50 dB. New noise blanker reduces ignition and line noise. Both standard equipment.

"Hang" AGC. New, smoother operation.

Super Specs. *Optimized sensitivity*—a balance between dynamic range and sensitivity (2 μV on 160 to 0.3 μV on 10 meters) *Greater dynamic range*: better than 90 dB. And a PIN diode switchable 18 dB attenuator. *200 watts input* on *all* bands! *100% duty cycle* on *all* bands for up to 20 minutes.

Super Convenient. *Built-In VOX* with 3 up-front controls. *Built-In PTT* control at front and rear jacks. *Built-In Zero-Beat* switch puts you on exact frequency. *Built-In Adjustable Sidetone* with variable pitch and level. *Adjustable ALC* for full control from low power to full output. *2-Speed Break-In*, fast or slow speeds to fit operating conditions. *Built-In Speaker* eliminates desk clutter. *Automatic Sideband Selection*—reversible.

Super Design. *All Solid-State and Broadbanded*—from the pioneer, Ten-Tec. *Modular* plug-in circuit boards. *Functional Styling* with convenient controls, full shielding, easy-to-use size (5¾"h x 14¼"w x 14"d).

Super Hercules Companion. Styled to match, plus separate receiving antenna capability, plus transceiver front panel control of linear's bandswitching (one knob does it all).

Full Accessory Line including filters, remote VFO, power supplies, keyers, microphones, speech processors, antenna tuners—all in matching color.

Model 546 OMNI-Series C.... $1189.

HERCULES

Amateur Radio's first full break-in solid-state kW linear amplifier. With the reliability you'd expect from the pioneer in high-power solid-state technology—TEN-TEC.

All Solid-State. No tubes. Instead, HERCULES uses two 500-watt push-pull solid-state amplifier modules with an output combiner. Super solid.

Broadband Design. No knobs, no tuning. From the pioneer, TEN-TEC. For fast, effortless changing of bands. Super easy.

Automatic Bandswitching when used with OMNI (the OMNI bandswitch also controls HERCULES bandswitching through a motor driven stepping switch). Super convenient.

Full Break-In. HERCULES puts the conversation back into high power CW operation—you can hear between every character you send.

Full Coverage. 160 through 15 meters plus four "AUX" positions for 10-meter conversion by owner and future band additions.

Full Gallon. 1000 watts input on *all* bands, 600 watts output, typical. Built-in forced-air cooling. Driving power: 50 watts, typical. Adjustable negative ALC voltage. 100% duty cycle for SSB voice modulation; 50% duty cycle for CW/RTTY (keydown time: 5 minutes max.) Continuous carrier operation at reduced output.

Full Protection. *Six LED status indicators* continuously monitor operating conditions and shut down the amplifier whenever any one exceeds set limits (the exciter automatically bypasses the amplifier under amplifier shut-down for barefoot operation). The six parameters monitored are: 1) overdrive; 2) improper control switch setting; 3) heat sink temp.; 4) SWR; 5) overvoltage/overcurrent; 6) rf output balance. *Two meters* monitor collector current, voltage, and forward/reverse power. And a highly efficient *automatic line voltage correction* circuit (patent applied for) eliminates the need for selecting transformer taps, prevents applying too high a voltage to final amplifier devices, becomes operative under low line conditions.

Super Power Supply. Provides approximately 45 VDC @ 24 amperes, operates on 105/125 VAC or 210/250 VAC. Tape wound transformer and choke reduce weight (50 lbs.) and size (7½"h x 15¾"w x 13½"d). Separate enclosure.

Super Styling. Designed to match OMNI, the HERCULES has the same height as OMNI, plus matching bail and matching colors. The front panel is simplicity in itself with two push-button switches (power and mode) plus two knobs (meter and bandswitch), and a "black-out" monitor panel (when unit is off, meters are unobtrusive). Amplifier size is 5¾"h x 16"w x 15½"d.

Model 444, HERCULES amplifier & power supply.... $1575.

Experience SUPER RIG at your TEN-TEC dealer, or write for full details.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862
EXPORT: 5715 LINCOLN AVE., CHICAGO, ILL. 60646

2. An Achievement Award would be a self-incriminating piece of evidence that information (even signal reports) was told to a "third party" not involved in the actual QSO.

3. QSL cards would contain illegal information.

4. DX Nets or DX Club repeaters would be illegal.

5. Telling anyone about who you talked to or who was on what band would be illegal.

Let your mind wander a bit and you can probably come up with a lot more. If they tend to go overboard and manage to give a very strict interpretation to 605 in order to satisfy the security of the satellite group, then it is very likely to come down hard on amateur radio. The typical solution or the "quick expedient" seems to ask us once more to pay the price.

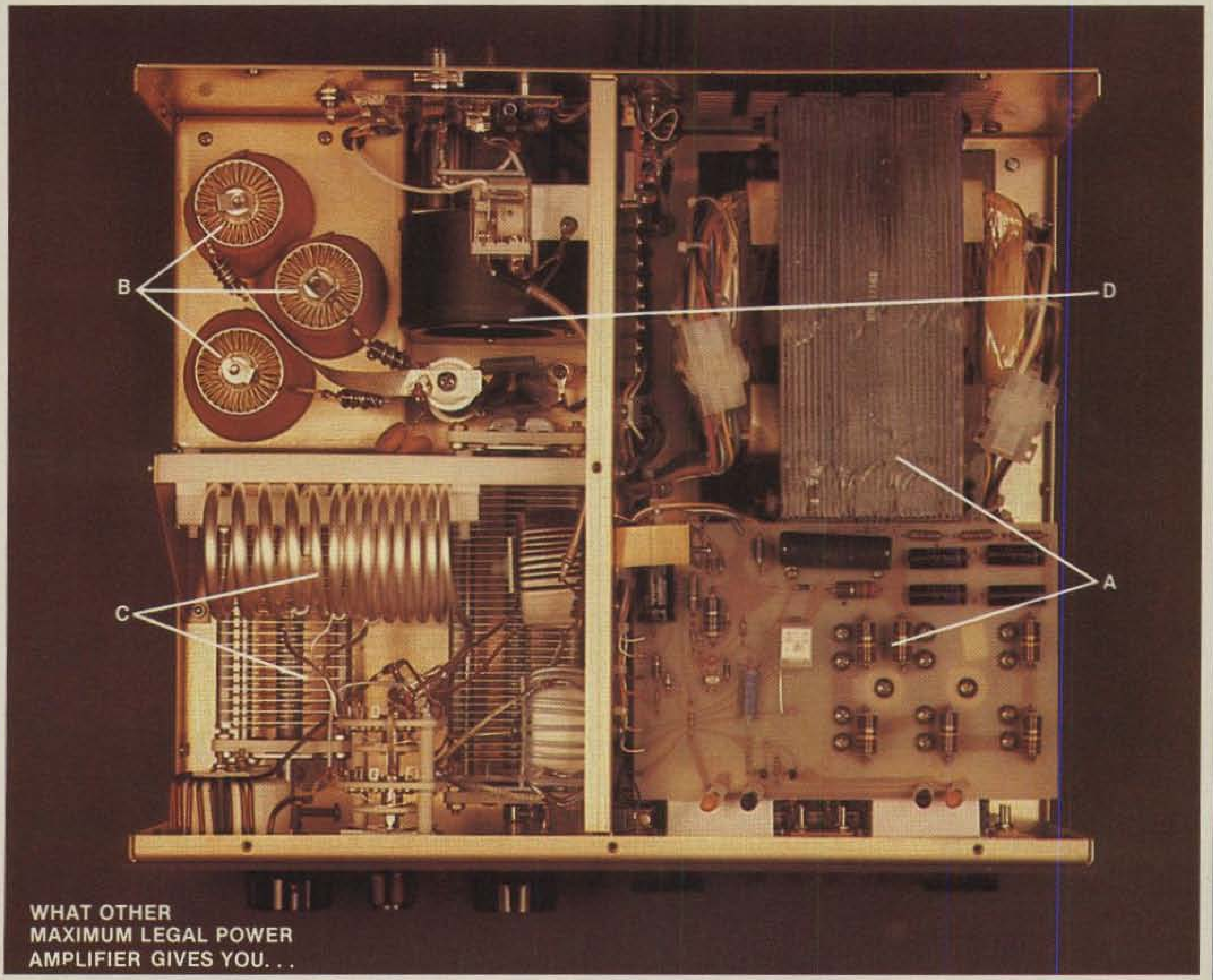
If there is a definite law that is currently on the statute books, and that definable law is broken, then it is up to the governing body to prosecute the offender. If the law is not clearly definable or more importantly not enforceable, you don't solve the problem by introducing more legislation. We all can take a lesson in overkill from the amplifier ban fiasco. If the illegal use of amplifiers cannot be controlled, then the simple solution is ban amplifiers for everyone. I would venture a guess that at least ten or twenty CBers might have been inconvenienced by that amplifier ban.

I think that there are enough laws right now to take care of the few individuals who have ganged video recorders hooked up to their satellite receivers, and are pirating the latest movies for resale. These laws have existed for a long time. People still make home recordings from their f.m. radios (probably even some a.m. recordings, too), use their convenient betamax or equivalent to videotape a cablevision movie or sports event, and some in a clandestine manner even gather associates, friends, and family together on ritualistic pretexts, and while under the influence of good food, strong drink, and a warm sense of camaraderie, run amuck divulging this secret, private, and very privileged information to these unauthorized individuals. The shame of it all.

The question we must always ask ourselves is what is the price we must pay for the protection we think we may be getting and who will suffer under the weight of this protection. When radio in its commercial form came out, it did not need to be stifled in order to protect the struggling movie industry. TV did not put either radio or the movie industry out of

(continued on page 98)

It couldn't be anything but...



(A) A FULL KW CCS POWER SUPPLY WITH A 45 POUND, 1.5 KVA TRANSFORMER that plugs in for easy handling. . .

(B) TOUGH EIMAC CERAMIC TRIODES, THOROUGHLY COOLED by ETO's exclusive full-cabinet ducted air system. . .

(C) HEAVY SILVER PLATED TUBING COIL IN A FULL PI-L NETWORK that extends to 160 meters and provides 10-15 dB better harmonic suppression than the pi networks commonly used. . .

(D) CENTRIFUGAL BLOWER FLOATING ON A FOAM RUBBER "SANDWICH" that absorbs noise and vibration, permitting whisper quiet operation. . .

AND WHO ELSE BUT ETO rates linears for "a full kilowatt key-down forever?"

(ALPHA 76 PA SHOWN)

Alpha!

NOBODY BUT ETO, so far as we know, provides amplifier warranty coverage beyond a scant 90 days. We'd be embarrassed to offer you a 90 day warranty! That's scarcely long enough to become really familiar with your new linear.

EVERY NEW ***ALPHA*** CARRIES A TWO YEAR (limited) FACTORY WARRANTY-just one factor that makes ***ALPHA*** such a sensible investment. Most ***ALPHA*** s command resale prices close to what they sold for new five or even ten years earlier!

To prevent a sad case of linear buyer's remorse later on, your best move now is to investigate ***ALPHA*** carefully before you buy any amplifier. Call or write your dealer or ETO today. Just ask for our full color brochure; it contains inside and outside photographs and detailed specifications for all the famous ***ALPHA*** amplifiers.

Ehrhorn Technological Operations, Inc.
Box 708, Canon City, CO 81212
(303) 275-1613

CIRCLE 10 ON READER SERVICE CARD

ETO

PRICES F.O.B.
HOUSTON

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

ITEMS SUBJECT TO PRIOR SALE

MADISON Electronics Supply

master charge

VISA

ORDER YOUR
KWM 380 NOW!
OLD PRICE & FREE GOODS

KENWOOD PACKAGE

You simply can't buy better reliability, performance and reputation than the 520 series from Kenwood, and the TS520 SE is no exception. This is a just plain good radio at a tremendous savings, when you consider the free CW filter (YK-88) and microphone (MC-50) too.

TS 520 SE	629.95
MC-50 MIC	our gift
YK-88 CW FILTER	
TOTAL	629.95

NEW 4 WATTS

SANTEC HT 1200

SUGGESTED LIST
$379.95

CALL FOR QUOTE

DRAKE TR7

synthesized hf transceiving system

continuous coverage

0-30 MHz — continuous coverage reception no gaps — no range crystals required

160-10 Meters — Amateur Band transmission, including capability for MARS, Embassy, Government, and future band expansions

PASSBAND TUNNING
R. I. T.
INDEPENDENT RECEIVE SELECTIVITY WILL HANDLE WARC BAND EXPANSIONS

CALL FOR QUOTE

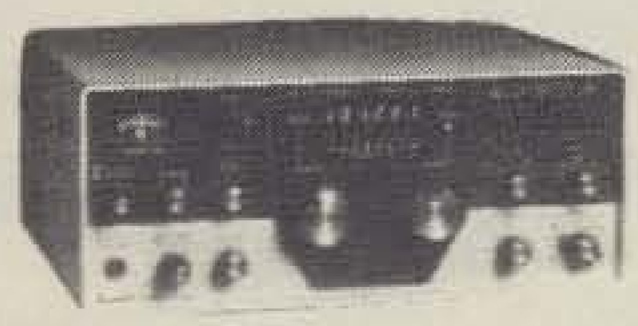
ET CETERA

Cubic-Swan 102BXA	$999.00
Astro 150	779.00
Astro 100MXA	499.00
Mirage B23 1 watt-30 Watt amp	89.95
DSI 5600A w/Ant/Ac	185.00
Cushcraft A3 Tribander	169.00
Bird 43, Slugs	Stock
CDE Ham-4 Rotor	169.00
Ham-X	239.00
FDK Palm 2 Handie with BP/AC	149.00
Cetron, GE 572 B	34.00
GE 6146B	9.95
Fits Kenwood Yaesu	
Kenwood Service Manuals Stock	10.00 ea.
Telrex TB5EM	425.00
Telrex TB6EM	540.00
Telrex Monobanders	Stock
Adel Nibbling Tool	8.95
Janel QSA5	41.95
Sprague 100MFD/450V Cap	2.00
Rohn Tower 25G, 45G Sections	20% off dealer
Alliance HD73 Rotor	109.95
Amphenol Silverplate PL259	1.00
ICOM 255A 2M Synthesized	319.00
ICOM 260A 2M SSB/FM/CW	429.00
Kenwood TS180S/DFC/SSB	Call
ICOM IC2AT/TTP/NICAD	229.00
New-Icom IC720 w/AC/mike	Call
Bearcat 220 - $299.00	300-399.00

ASTRO 103

Professional Grade HF/SSB Transceiver

ALL BAND COVERAGE!
160 THROUGH 10, INCLUDING WARC
9 BANDS FULLY OPERATING



100 WATTS ALL BANDS ALL MODES

AGC DYNAMIC RANGE GREATER THAN 100 dB

SELECTIVITY
16 POLE CRYSTAL FILTER 2.7 kHz at - 6dB; 3.78 kHz at - 100 dB

$1395.00 SUGGESTED LIST
CALL FOR QUOTE

BELDEN

Cable	Part Number	MHz	db/100 ft.	db/100 m
RG8/u Dbl. Shield	9888 56¢/ft.	50 100 200 300 400	1.2 1.8 2.6 3.3 3.8	3.9 5.9 8.5 10.8 12.5
RG8/u Foam .81VF	8214 32¢/ft.	50 100 200 300 400	1.2 1.8 2.6 3.3 3.8	3.9 5.9 8.5 10.8 12.5
RG8/u Regular .66VF	8237 28¢/ft.	100 200 400 900	2.0 3.0 4.7 7.8	6.6 9.8 15.4 25.6
RG8/u Non-contaminating	8267 36¢/ft.	100 200 400 900	2.0 3.0 4.7 7.8	6.6 9.8 15.4 25.6

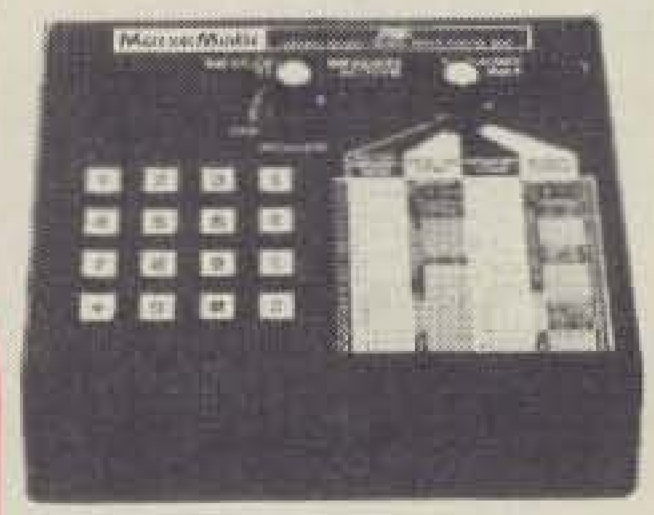
8448
24¢/ft.

No. of Cond. — 8
AWG (in mm) —
6-22, (7×30),
2-18, (16×30), (1.19)

9405
38¢/ft.

No. of Cond. — 8
AWG (in mm) —
2-16, (26×30)
6-18 (16×30), (1.17)

MEMORY KEYER BREAK-THROUGH!



The remarkable AEA Morsematic memory keyer has 35 fantastic features including two AEA designed microcomputers, up to 2,000 character memory, automatic serial number, beacon mode, and automatic morse trainer mode.

199.00

AEA
Brings you the Breakthrough!

713-658-0268

CALL FOR QUOTES

1508 McKINNEY
HOUSTON, TEXAS 77010

CIRCLE 63 ON READER SERVICE CARD

Announcing

• **"Freeze Your Arctic Off"** - The Ford Tin Lizzy Club's North Metro Chapter will endure their third annual "Freeze Your Arctic Off" expedition from 2000Z, January 17th, until 1500Z, January 18th, out on the frozen wastes of Lake Saint Clair. Operating frequencies will be 7.275, 21.380, 146.52, 146.55, and 146.58 MHz as propagation allows, with one station on 7.275 at all times. The call sign is AD8R/8 and a handsome certificate will be awarded to all contacts. QSL to Box 545, Sterling Heights, Michigan 48078. No. s.a.s.e. needed.

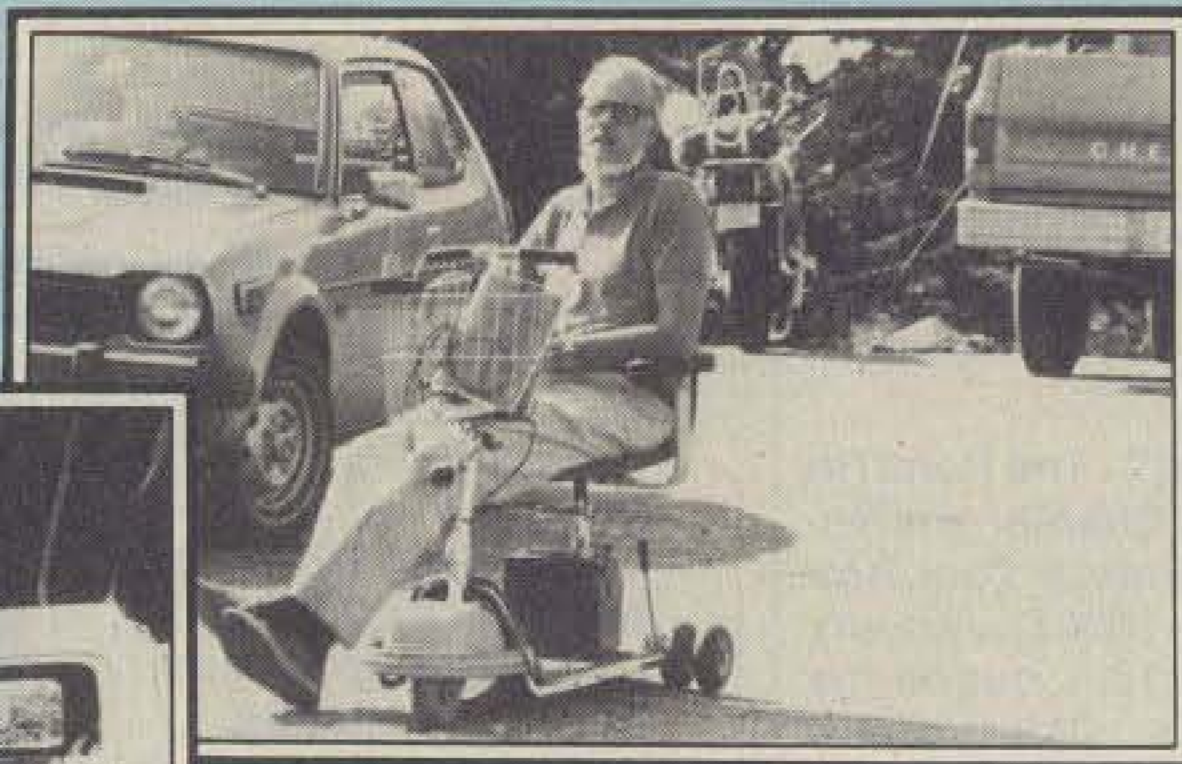
• **21st Annual Tropical Hamboree/1981 ARRL Florida State Convention** - This event will be held in Miami, Florida at Fabulous Flagler Dog Track on February 7-8. Two full days of activities are planned, which include tech talks and forums on all interests in amateur radio, group meetings, QCWA/OOTC/SOWP Luncheon, special DX Forum and dinner, FCC and ARRL Forums, over 100 exhibit booths, 400 swap tables, ladies programs and many awards throughout the two days. The Hamboree is known for its' large international attendance which provides the opportunity to meet that DX station in person and hear about amateur radio operation in other countries. There is free RV parking on the site for self-contained units, advance reservation for RV space is recommended. Registration for the Hamboree/Convention is $3 advance, $4 door. Swap tables are $12 two days, $7 Saturday only, $6 Sundayonly plus registration. For further information and special hotel rates write: Dade Radio Club, P.O. Box 350045 Riverside Station, Miami, Florida 33135.

• **Midwinter Swapfest** - The 9th annual Midwinter Swapfest of the West Allis Radio Amateur Club will be held on Saturday, January 10 from 8 a.m. at the Waukesha County Exposition Center in Milwaukee, Wisconsin. Indoor swapfest, prizes. Tickets are $2 in advance and $3 at the door. Reserved tables, $3. For tickets or information write to 1981 Swapfest, P.O. Box 1072, Milwaukee, WI 53201.

• **Second Annual Sarasota Hamfest** - The Second Annual Sarasota Hamfest will be held on Saturday, January 17th and Sunday, January 18th starting at 8:30 a.m. at the Exhibition Hall, 801 North Tamiami Trail in Sarasota, Florida. There will be a QCWA luncheon, swap tables (advance reservation, no one-day tables, one table for the two days includes one admission ticket, $12), door prizes, forums, commercial exhibits, and computers. Talk-in on 146.13/73 and 146.52 simplex. For more information or reservations contact John Shinkle, WD4BAJ, 1937 N. Allendale Ave., Sarasota, FL 33580, phone 813-953-5818. Tickets are $3 in advance and $4 at the door.

No - 9-10

Cook's tent just outside the 2 meter f.m. position. Left to right are Dorey and Karen, WA1ZPA.



WA1GAQ stopped in for a visit. The cart was fully equipped with a 2 meter f.m.

250,194 Points Is Worth The Effort

The Story Of The W1FC Record Breaking Score In The ARRL June 1980 VHF QSO Party

BY GLEN R. WHITEHOUSE*, K1GW

The Barnstormers Radio Club of Carlisle, Massachusetts is not primarily a contest club, but that would be hard to prove after their tremendous efforts in the field during the 1980 ARRL VHF Contest. The group's contesting activities date back to the early 1960's when as K1OOR they operated from Mount Graylock in western Mass. Mount Graylock, a favorite haunt of VHFers, is now the contest turf of W2SZ/1, the traditional rival of the Barnstormers.

A few of the Barnstormers' members achieved prominence some time ago by participating in the first moonbounce QSO between W1BU and W6HB. Those members are: Fred Collins, W1FC, Steve Davis, K1PEK, Eric Stromsted, W1ZBT, and Dana Atchley, W1CF. Dana is also well known for his h.f. activity; W1CF holds several contest records from the home QTH which boasts a fine antenna farm. W1CF with K1UA at the helm came in 3rd place U.S., all band single operator, in the 1979 CQ WW DX Phone Contest.

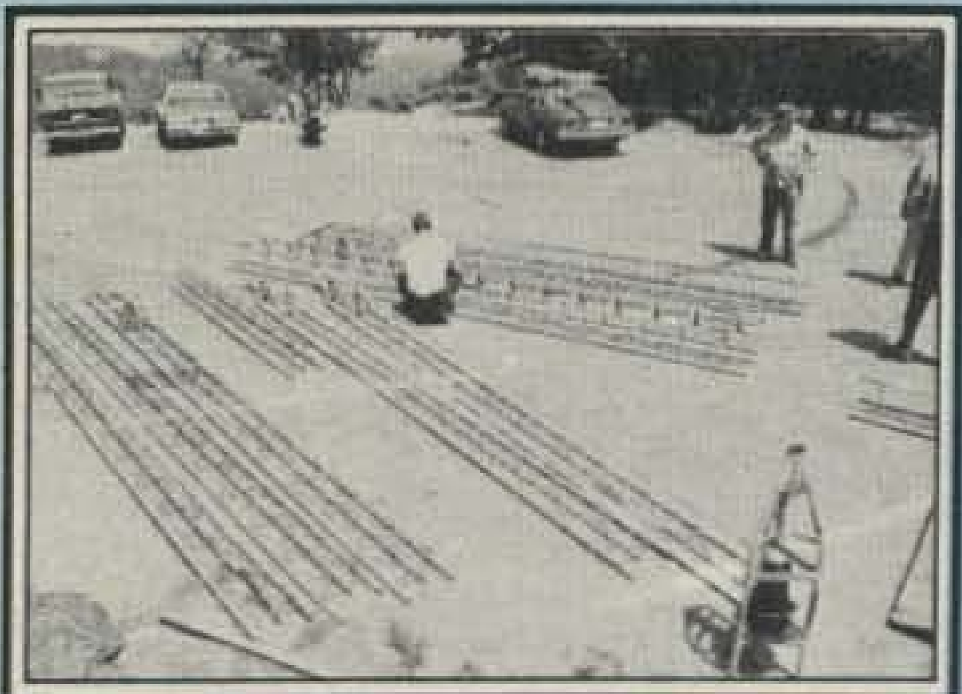
The Barnstormers Radio Club, using the call W1FC, set their sights and site on Pack Monadnock for the 1980 VHF Contest. Pack Monadnock is a mountain located in the lower western part of New Hampshire not too far from the Massachusetts border. If you drew a line between Marlboro and Jaffrey on a map it would fall mid way. It's high, some 3,166 feet above sea level, with a road going to the top. The top is flat with a picnic area and a fire tower as natural landmarks. It's location makes it fairly easy to get to, and in fact it was used for several years by W1DC for their contest activities. The assault on Pack Monadnock by W1FC was long in the planning stages, which payed off handsomely when the chips were down.

The logistics of an operation this size are enormous. While several members did find their way to the h.f. bands during the year occasionally, considerable time was spent on the Carlisle repeater by members organizing the assault. The Barnstormers repeater in Carlisle is a unique installation in that it has a remote receiver linked to the repeater via a 10 GHz microwave link. The winter months were spent building and rebuilding equipment for the contest effort. This preparedness paid off when the 432 MHz station had to be practically replaced during the first hour of the contest.

Approximately 40 people were needed and used for the contest effort. Besides actual station operators, assembly crews, cooks, crews for removal, cherry picker operator, and even their own telephone and electric utility crews were needed.

The "Pack Monadnock Tel and Tel Co." provided dial phone service between operating positions and other locations around the mountain top. If necessary, it should have been (and was) possible to contact the outside world via the landline to iron out any problems that arose. The "Pack Monadnock Power and Light Company" was to provide complete power distribution of 110 and/or 220 v.a.c. at

*12 Newbury Drive, Amhurst, N.H. 03031



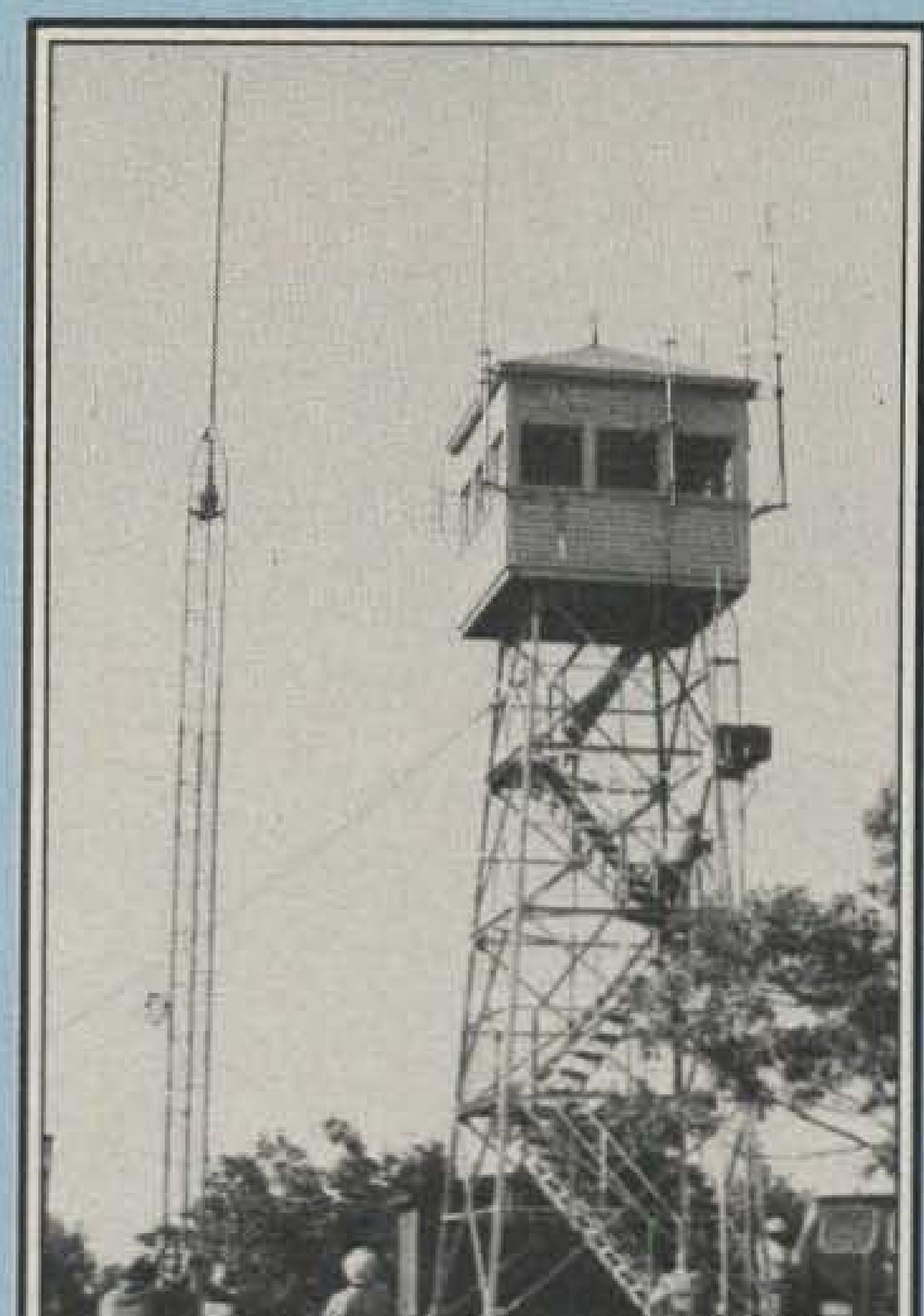
W1LLB and W1HIV oversee the tower sections allocated to each band.

K1KEC, W1LLB and tower carrier.

W1DUW carries off a section for 6 meters as N1AHQ, W1HIV, and W1HNZ look on.

Unloading the tower section are (left to right) N1AR, W1HIV, W1LLB, W1FJH, and K1KEC.

N1ALO and W1LLB check the parts for the towers and rotators.



Erecting the tower next to the ranger station.

At the back of the 220/1296 van are W1DUW on the left and K1DXJ on the right.

On the left are the Boomers for 220, in the center the loop Yagi for 1296, and on the right the 8 Yagis for 432.

fairly well regulated levels, and they did.

Armed with super-charged enthusiasm, a year's worth of new gear, and the motivation needed to set records, we took up the challenge.

Planning, Building, and Operating

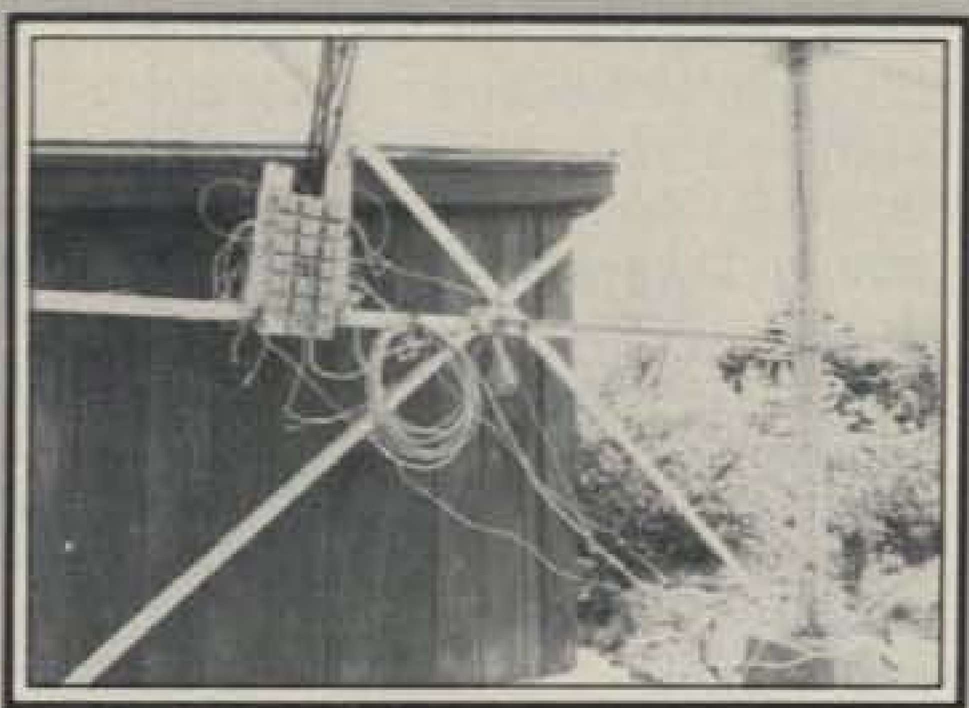
W1FC was designed to operate on all bands from 6 meters through 10 GHz. Based on previous experience over the years, it was decided that Band Managers be selected and used. The top bands were grouped together under the Microwave Band Manager. In addition to the Band Managers, teams were developed to concentrate on specific jobs to be done.

The strategy or goal for the 2 meter band group was typical in that we intended to double the previous year's effort. Pack Monadnock is located at the northern end of a line which includes much of the populated portions of Massachusetts, Connecticut, New York City, and Long Island. We believe that if we could work only the mobiles in New York City, we would achieve record breaking scores.

To accomplish this feat, we erected a tower with eight Cushcraft FM Junior Boomer antennas in phase pointed right down this golden corridor. With 24 dBd of gain and a kw amplifier on 2 meter f.m. we thought we had it made. Just on the offhand chance that we might want to change direction, we covered ourselves with two Cushcraft DX-120 20 element arrays in phase on a rotor. Unfortunate-

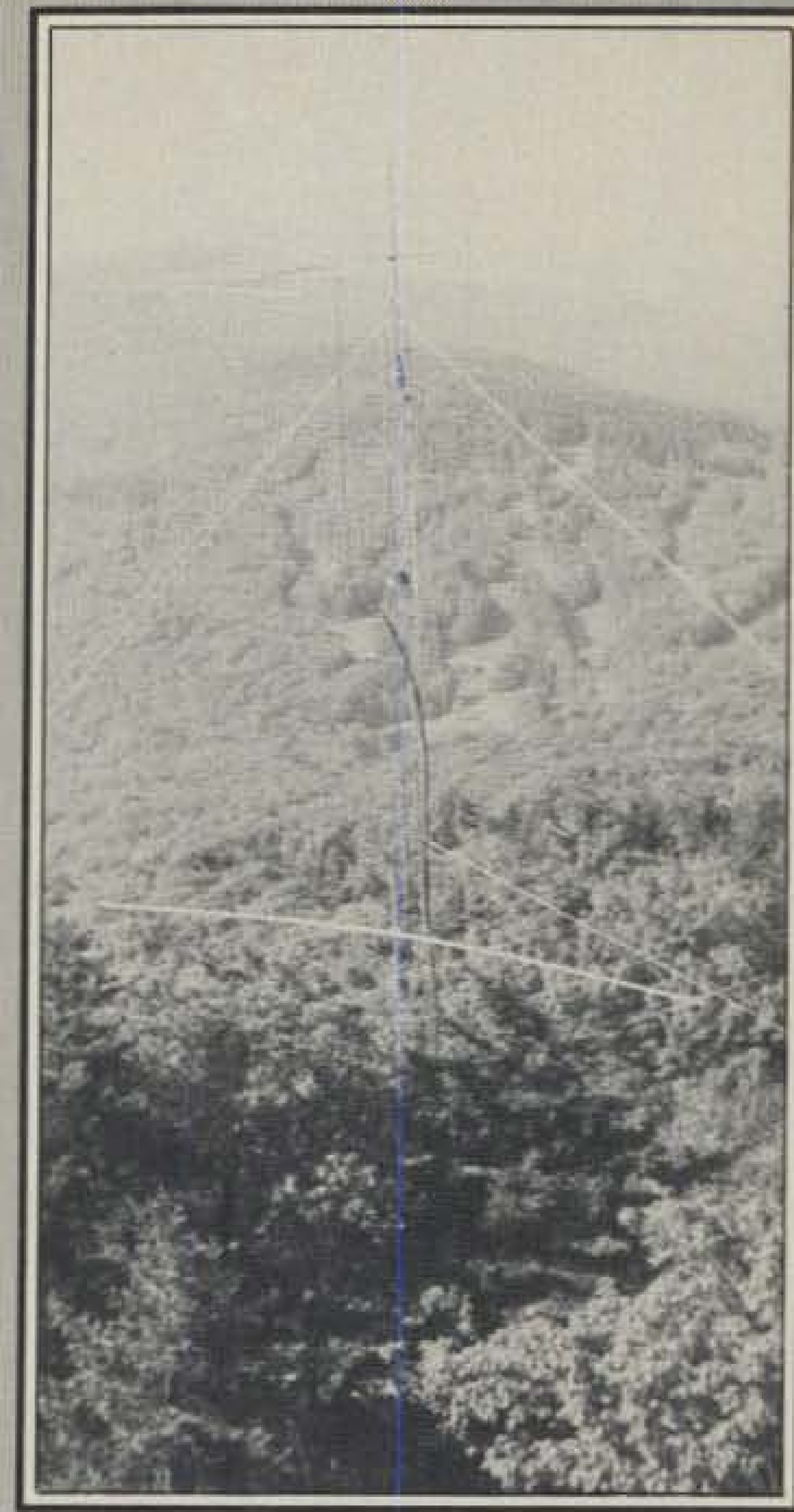
Central office of Pack Monadnock Telephone and Telegraph. Phones at all positions could dial each other, or could be hooked up to an outside line via an autopatch repeater.

At this pep talk were (left to right) K1KA, K1PEK, K1GW, AB1A, K1PQO, WA1ZTC, W1LLB, WA1GAQ, W1FC, K1RX (seated), K1KEC, K1LL, K1WHS, N1RC, and W1LMZ.



Telephone system switching.

The power installation.



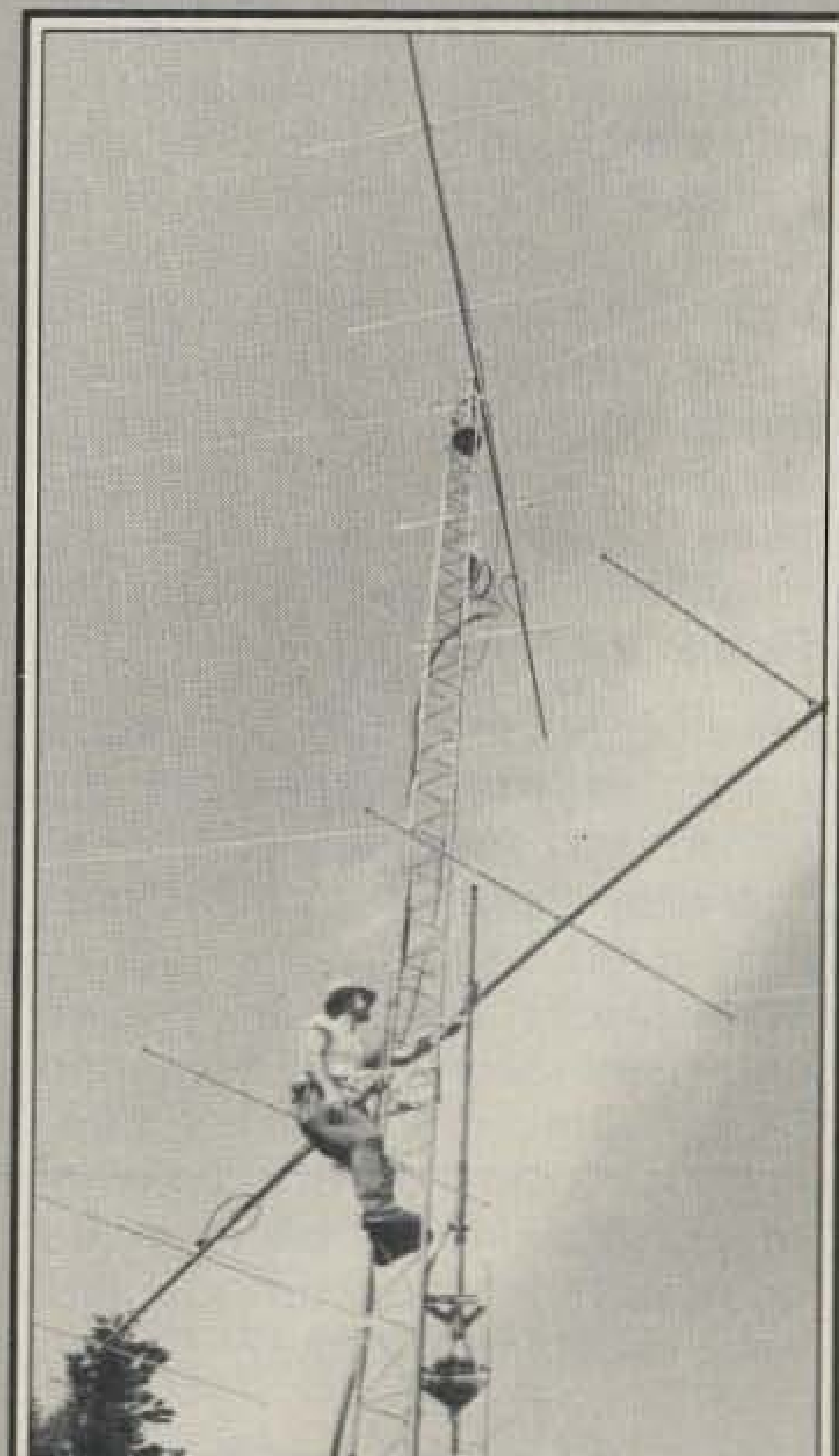
The 6 meter finished product.

Hoisting the 1296 MHz tower are (left to right) W1HIV, WA1YLV, and K1PQO.

ly, the characteristics of f.m. are such that under contest QRM conditions weak signal work becomes very difficult. You still hear only one station at a time. We did, however, make far more contacts than in previous years, but not in the numbers we expected.

The 2 meter s.s.b./c.w. operation included a TS 820 with a 2 meter transverter, plus the kw final feeding four Cushcraft 3219 Boomer antennas. This provided us with the flexibility to work many stations with ease. We had even scheduled some meteor scatter contacts, and a fair number of those were successful.

The 6 meter station consisted of two Drake TR-6 transceivers octopused to one 3-500T amplifier. Whoever pushed the transmit button first got the linear. This also prevented the two transmitters from being on at the

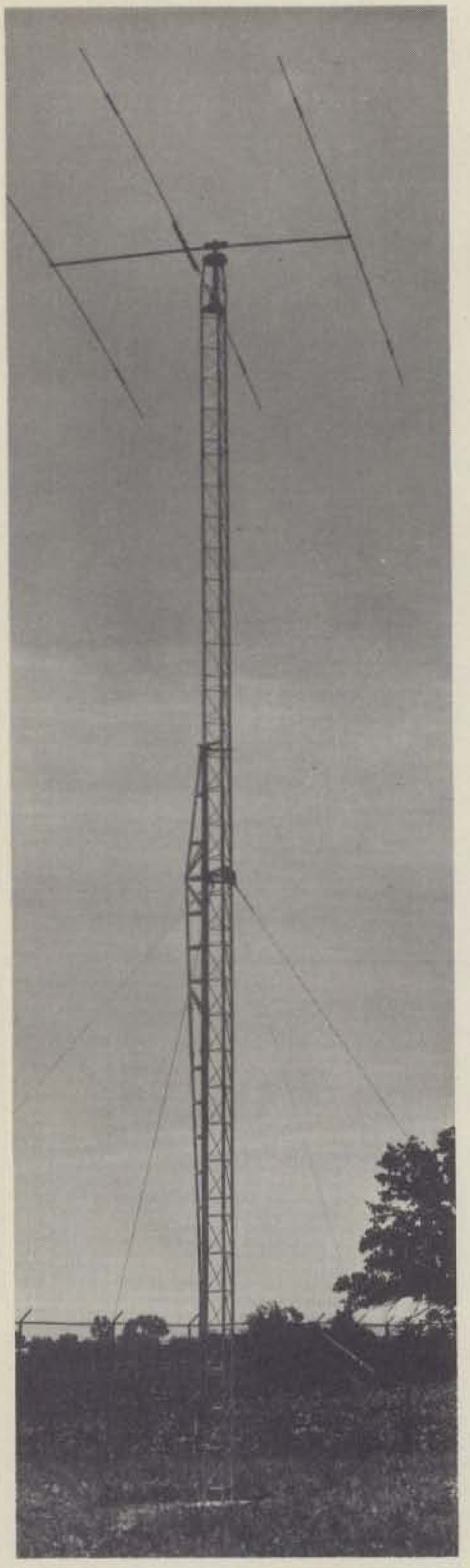


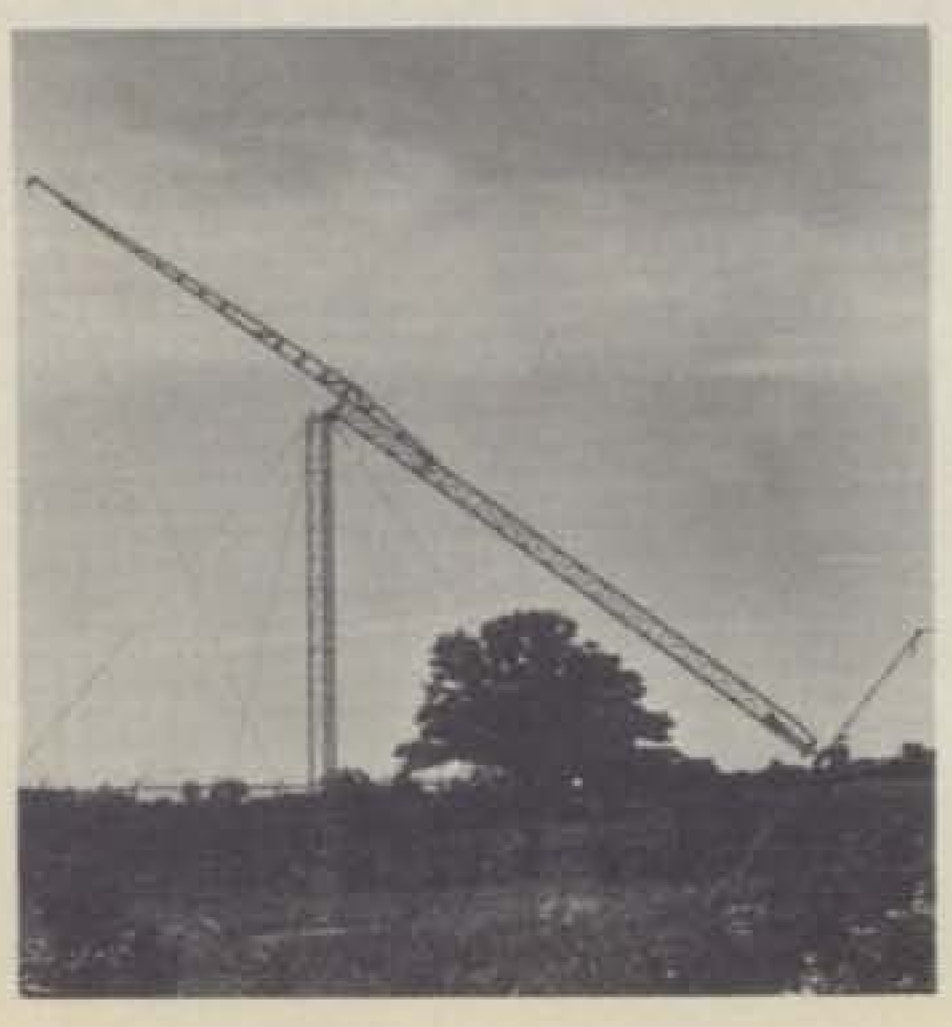
K1PEK works on the lower 6 meter Boomer. Both antennas were independently rotatable so the operator could select upper, lower, or both antennas.

N1BC and N1RC with the 2304 antenna elements.

same time. To also prevent potential fist fights from this configuration, one operator would then make the contact while the other searched for multipliers. The rigs fed two Cushcraft 617-6B Boomer antennas. The bottom one was in a fixed position and the top one was rotatable. Switching was arranged so that upper/lower/both could be selected.

The 220 MHz band gang spent many of their winter hours getting ready for this assault. In the past, equipment, antennas, and perhaps a bit of enthusiasm had been lacking, but 1980 was certainly different. Four new Cushcraft 220B Boomer antennas and new equipment gave the operators a new outlook . . . and a new high score. The 440 MHz operation had its own van with easy chairs, an 8877 amplifier, a new tower for the Yagis, and all





the problems that Murphy could muster. Several hours were lost on Saturday night while the technical crew ironed out the bugs. They too did better than the previous year's attempt when Murphy struck without mercy.

The big benefactor of the long winter activities was the 1296 gang with its tower-mounted equipment. The biggest change of all in terms of equipment was the microwave group. All new transmitters and receivers had to be built for each end of each link on each frequency. From the photographs you can see the lift bucket (cherry picker) that was available to us, and of course the new dish antenna.

As mentioned earlier, each site had a dial telephone available to contact other locations on the mountain and off. The pictures do tell most of the story, so you can see for yourselves what it took to make over 250,000 points. This was the first time that any group ever scored over a quarter of a million points, and I'm sure we'll be the target to beat in next year's outing. You can bet that we'll be out there next year trying to beat that record ourselves. Look for W1FC and crew(s) next June from Pack Monadnock Mountain on all bands and all modes.

W1LMZ and W1FC secure the microwave to the bucket.

MFJ NEW PRODUCTS

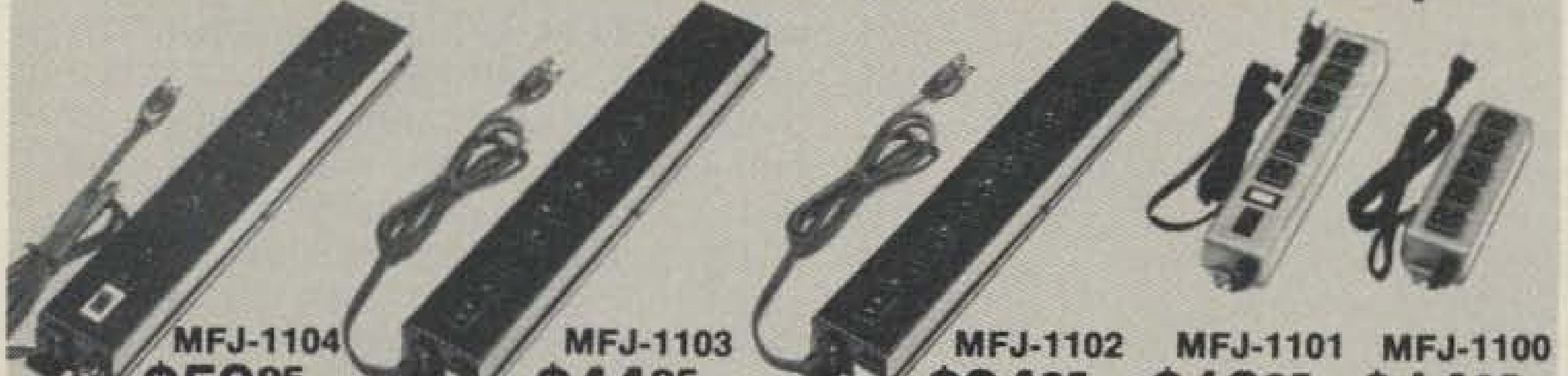
exciting new ideas from the world's leading manufacturer of amateur radio accessories

NEW MFJ-102 24/12 Hour Digital Clock/ID Timer

MFJ-102 **$32.95** (+$4)

The latest in time keeping convenience. Now you can switch to either 24 hour GMT time or 12 hour format! Double usefulness—great for your operating position and great for other family members to use.
Switch to "seconds" readout. For the times when you need the utmost accuracy.
Switch to ID timer. Alerts every 9 minutes after you tap the button (also functions as a snooze alarm).
Switch to "observed" timing. Just start clock from zero and note end time of event; counts up to 24 hours and repeats. (requires resetting clock time after use).
Switch to regular alarm. For skeds reminder or wake-up use (has alarm-on indicator).
Synchronize with WWV. Now you can adjust the MFJ clock to WWV accuracy.
Fast/Slow set buttons for easy setting of time and alarm.
Big, bright, blue digits are 0.6" for easy-on-the-eyes, across-the-room viewing.
Lock function prevents missetting.
Solid-state circuitry for long life.
Operates on 110VAC, 60 Hz (50 Hz with simple modification). UL approved.
Handsome styling with rugged black plastic case with brushed aluminum top and front. Front has sloping surface for easy viewing. Cabinet measures 6x2x3".
Put this new improved MFJ digital clock to work in your shack.

Five NEW MFJ Deluxe Multi-Outlet AC Power Strips



MFJ-1104 **$59.95** (+$4) MFJ-1103 **$44.95** (+$4) MFJ-1102 **$34.95** (+$4) MFJ-1101 **$19.95** (+$4) MFJ-1100 **$14.95** (+$4)

Here's the most convenient, most protected way to power-up radio and computer gear.
MFJ-1104: Varistor protects against voltage spikes (worth the investment alone to guard your transceiver, computer, or SWL radios.
Individual double-pi RFI filters for each of 3 pairs of outlets to completely isolate radios, computers, and computer peripherals from interference.
8 sockets, 4 pairs, all 3-prong; the fourth pair is unisolated and unswitched.
Pop-Out fuse for easy changing (15A, 125VAC), heavy duty 3-wire 6' power cord.
Lighted switch shows circuits are "on."
Deluxe heavy-gauge .063 aluminum case, finished in black, has easy mounting slots. Measures 18"Lx2¾"Wx1⅞"H.
MFJ-1103, similar but 12 sockets (2 unswitched), one RFI filter for all.
MFJ-1102, similar to 1103 but no RFI filter.
MFJ-1101: 6 sockets, all 3-prong type. Fuse protected, 15A, 125VAC. On-off switch. Lighted "On" indicator. 3-wire 6' power cord. Steel case, finished in gray hammertone, has mounting slots, measures 13⅛"L x2⅜"Wx1½"H.
MFJ-1100, similar to 1101 but 5 sockets, less switch, light, and is 8⅝"L.

NEW MFJ Compact 3 KW Antenna Tuner Has Roller Inductor

MFJ-989 **$279.95** (+$10)

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs — only 10¾Wx4½Hx14⅞"D
Matches coax, balanced lines, random wires 1.8-30 MHz.
3 KW PEP — the power rating you won't outgrow. (250 pf-6KV caps).
Roller inductor with a *3-digit turns counter* plus a *spinner knob* for precise inductance control to get that SWR down to minimum every time.
Built-in 300 watt, 50 ohm dummy load.
Built-in 4:1 ferrite balun.
Built-in lighted 2% meter reads *SWR plus forward and reflected power in 2 ranges* (200 & 2000 w).
6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 coax conn., ceramic feed-throughs, binding post ground.
Deluxe aluminum low-profile cabinet with sub chassis for RFI protection, black finish, black panel with raised letters; tilt bail; requires 12 VDC for meter light.

NEW MFJ VHF SWR/ Wattmeter/Field Strength Meters

MFJ-812 **$29.95** (+$4) MFJ-810 **$24.95** (+$4)

New low cost VHF operating aids.
MFJ-812: Reads SWR from 14-170 MHz to keep you informed about antenna/ feedlines. SO-239 coax conn.
Reads forward & reflected power at 2 Meters (144-148 MHz) 2 scales (30 & 300W).
Reads field strength levels from 1-170 MHz. Binding posts provided for antenna.
Easy push-button switch operation.
MFJ-810, similar less field strength function.

NEW MFJ DXer's Communications Filter

MFJ-732 **$69.95** (+$4)

MFJ-732 Puts more presence in SSB/ AM/FM voice communications, brings more signals out of the "mud."
Easy to use, just push up to 4 buttons.
10-pole (5-stage) circuit with *Chebyshev superfast roll-off* (up to 58 dB/octave). First button: On/Off-Bypass, response 300-3000 Hz; second: 500 Hz lower cutoff; third: 2200 Hz upper cutoff; fourth: 1500 Hz upper cutoff. *Built-in speaker,* 2 watt amplifier, LED, 9-18 VDC or 110VAC with optional AC adapter ($7.95+$2), 5x6x1⅝".

TO ORDER PRODUCTS, CALL TOLL FREE 800-647-1800

master charge VISA

For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

- **All MFJ products unconditionally guaranteed for one year (except as noted)**
- **Products ordered from MFJ are returnable within 30 days for full refund (less shipping)**
- **Add shipping & handling charges in amounts shown in parentheses**

Write for FREE catalog, over 60 products

MFJ ENTERPRISES INCORPORATED

Box 494; Mississippi State, MS 39762

CIRCLE 37 ON READER SERVICE CARD

Here's an interesting approach to getting some more mileage out of your scanner.

Build A Scanner Beam From A TV Antenna

BY ROBERT B. GROVE*, WA4PYQ

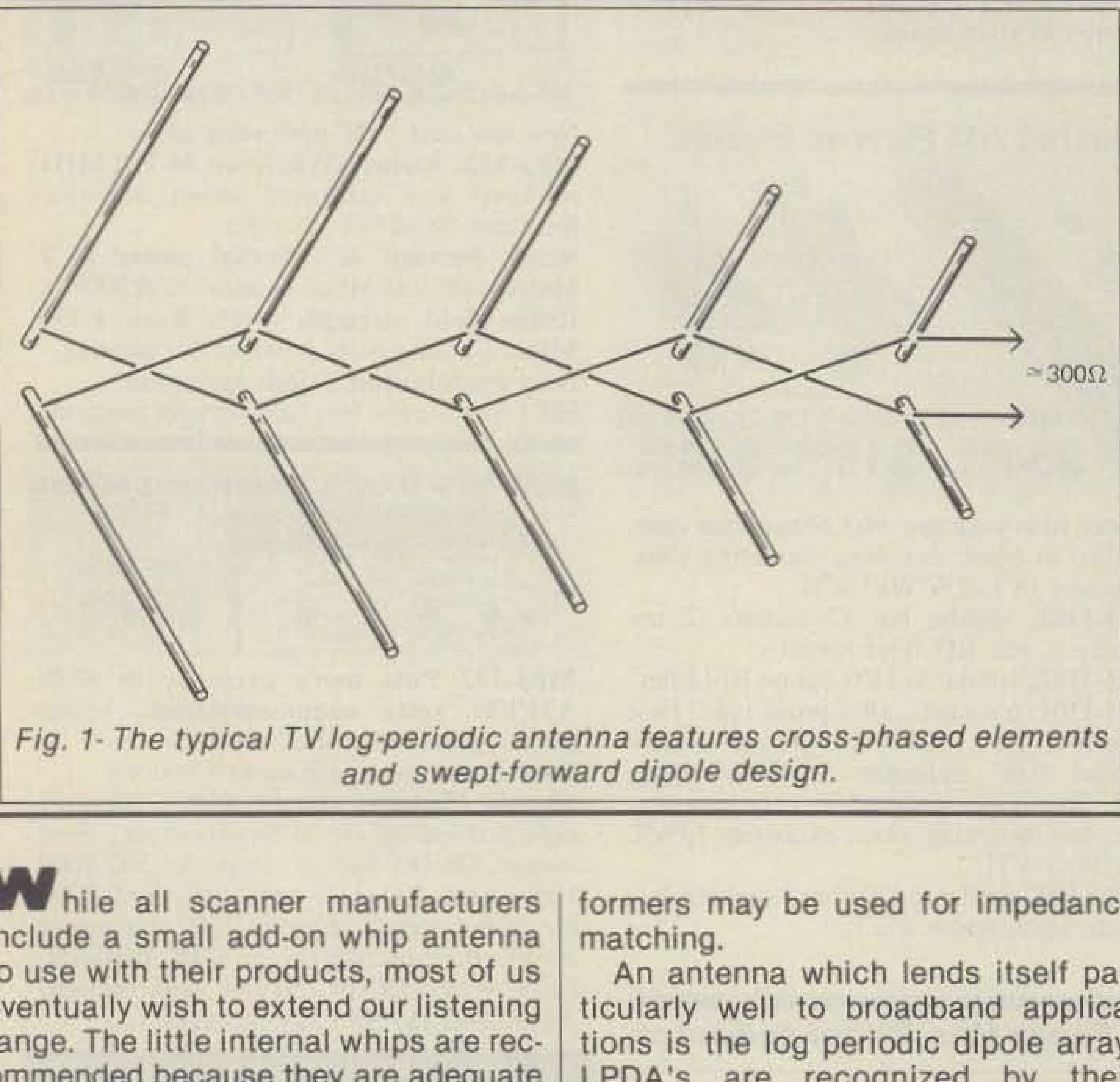


Fig. 1- The typical TV log-periodic antenna features cross-phased elements and swept-forward dipole design.

While all scanner manufacturers include a small add-on whip antenna to use with their products, most of us eventually wish to extend our listening range. The little internal whips are recommended because they are adequate for local monitoring, and they reduce the likelihood of intermodulation from strong signal overload.

The performance parameters of a directional receiving antenna for a scanner are somewhat different from those which would describe a transmitting antenna. Most important, it must be extremely broadband for the variety of services to be intercepted. Fortunately, s.w.r. is not a problem in reception. Power handling capacity is of no consideration, so receiving balun transformers may be used for impedance matching.

An antenna which lends itself particularly well to broadband applications is the log periodic dipole array. LPDA's are recognized by their uniform taper of dipole lengths, progressing from long at the back to short in the front (see fig. 3). It is truly a dipole array as distinguished from a Yagi beam. Each element is active, connected directly to a cross-phase harness. This zig-zag pattern of the interconnecting transmission line assures that successive elements will always be 180° out of phase with the preceding dipole (see fig. 1).

Spacing of dipole elements in an LPDA is typically .1 wavelength, with .05-.15 tolerable. The longest element (rearmost) is usually slightly greater than a half wavelength at the lowest frequency, while the shortest element (forwardmost) is less than a half wavelength at the highest frequency.

The peculiar V-shaped slope of the elements is of importance. If a dipole is operated at its half-wave frequency, the radiation pattern is a figure 8. But these elements are used at their three-half-wave frequencies as well. This creates a clover leaf pattern as shown in fig. 2. By folding the elements forward (theoretically 114.6°) the two forward lobes are merged, providing unidirectional characteristics.

The size of 3/4 wavelength elements also guarantees gain over that of a resonant half-wave element because of the increased capture area of the longer dipole.

LPDA Impedance

While a single half-wave dipole would exhibit a free-space center feedpoint impedance of about 72 ohms, the close spacing and phasing relationship of the LDPA provides an antenna impedance closer to 300 ohms.

. . . And Length

Additional theory indicates that the length of the antenna (main boom) should be at least two—and preferably three—times the length of the longest element. While the total number of elements does not appreciably increase gain, it does smoothe out s.w.r. ripple throughout its usable range by providing a continuous series of incremental frequency-resonant dipoles.

Because our conversion antenna is actually designed for television reception, the longest elements are slightly short for 30-50 MHz low band reception; but in actual practice, reception in that range is excellent. Not only are the elements long enough to capture a great deal of signal, but the

*Rt. 1, Box 156, Brasstown, NC 28902

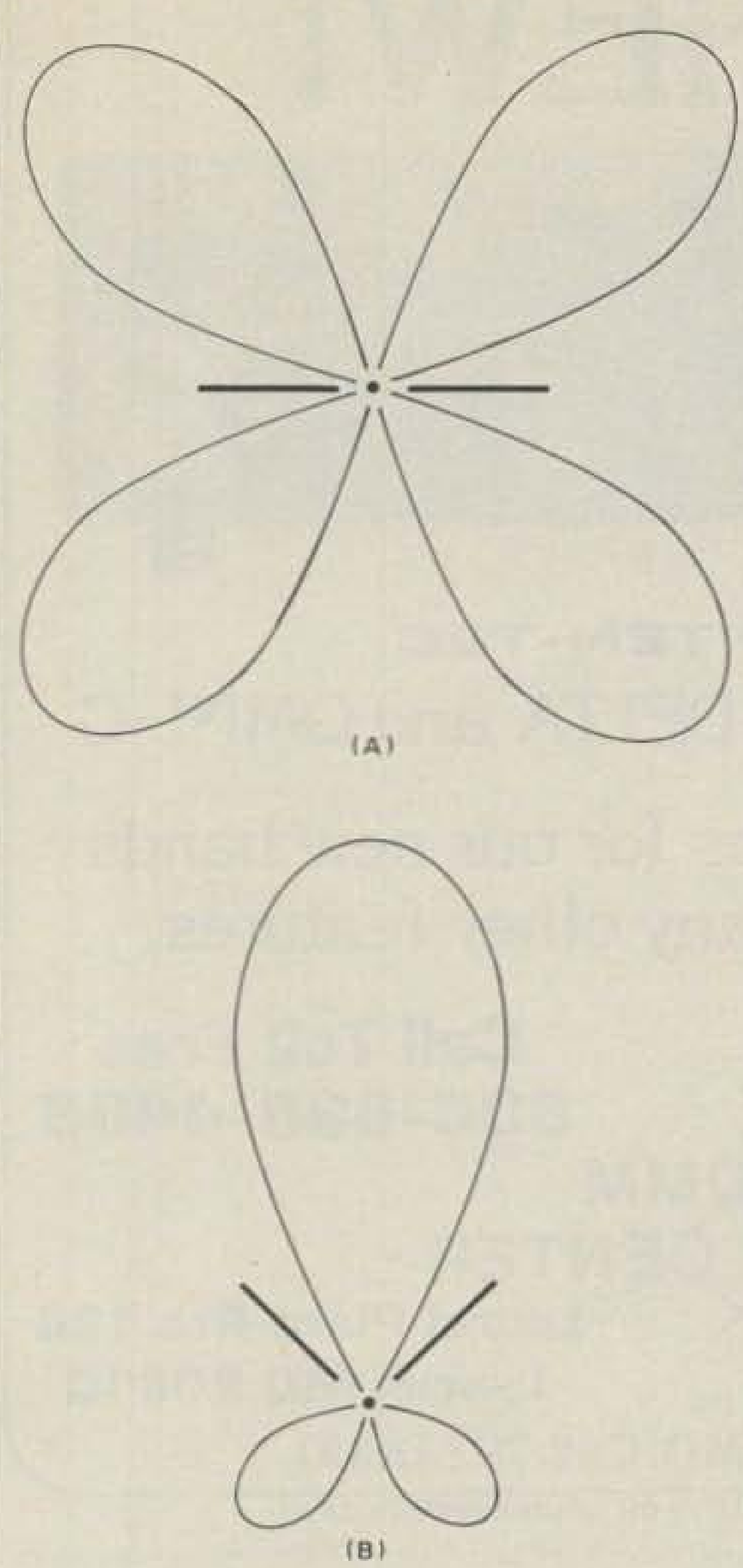


Fig. 2- The normal cloverleaf radiation pattern of a three-half-wave dipole (A) is merged by folding the dipole legs forward (B).

length-to-diameter ratio assures broadband resonance (low Q). But don't expect much directivity on low-band, the elements are too short.

The Conversion

While virtually any log periodic TV antenna should work, we chose a Radio Shack unit because of its universal availability and classical design. Radio Shack manufactures a series of these antennas for various applications. The "V" series is intended for v.h.f. (channels 2-13) reception, and the "VU" models add a u.h.f. corner reflector.

While the shorter (and less expensive) TV log periodics work just fine, the longer ones are recommended for uniform response throughout their ranges. We used the VU-160 for this conversion.

Besides the usual hand tools, you will need a couple of six-inch pieces of scrap aluminum TV elements, a six-foot length of 1 1/2-inch O.D. PVC pipe, and a standard 300:75 ohm TV balun transformer. Provide enough 75 ohm

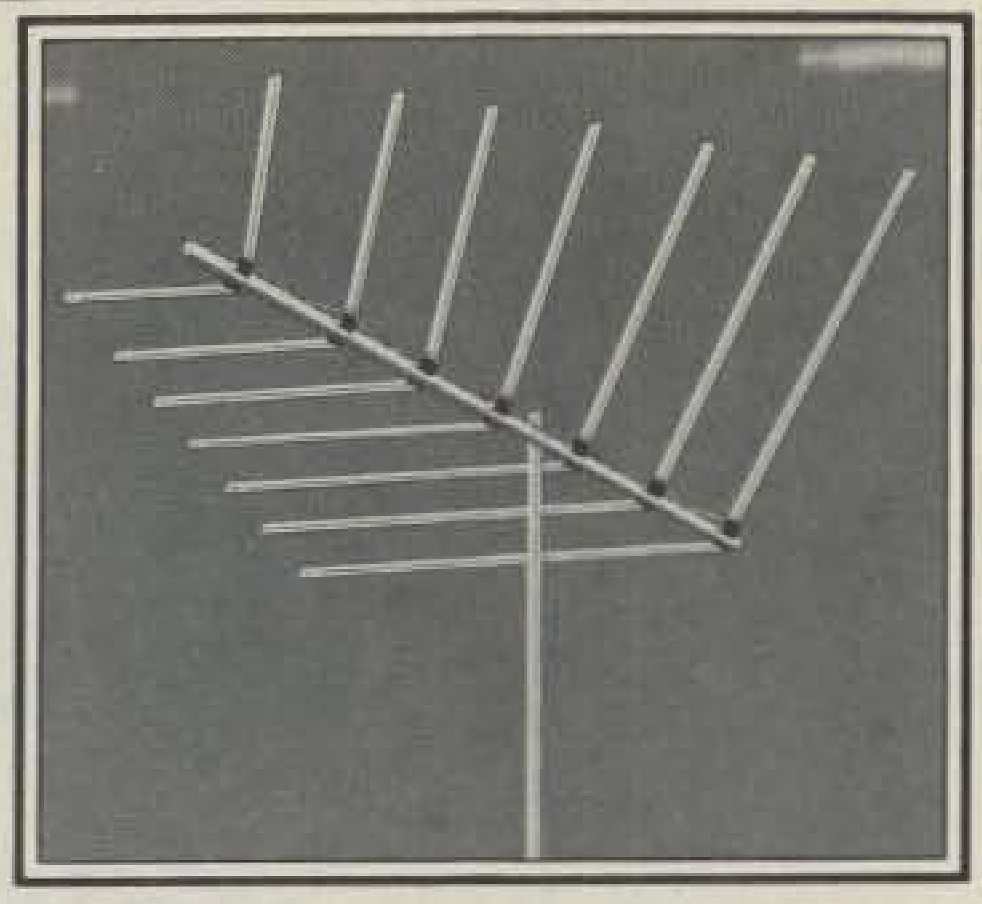


Fig. 3- Typical log periodic dipole array used for v.h.f. television reception.

low-loss coax to the scanner (RG-6U MATV/CATV cable works great), and a type F connector for the balun transformer. A Motorola plug will be needed for the scanner; as an alternative, a PL-259 may be affixed to the cable and used with an appropriate adaptor. This allows the antenna system to be used with a low-power transmitter as well. But don't forget, the balun is a low-power device; don't feed more than a few watts of r.f. through it or you'll wonder where your signals went!

Let's perform a cookbook conversion on one of these TV log periodics; you'll be pleased with the results!

Step By Step

1. Remove the antenna components carefully from the box.

2. With the insulator rows facing upward, note the two main antenna boom sections together. Do not use the cradle boom or H-blocks provided. With the boon sections inserted into one another and bolt holes aligned, pass one long bolt (provided) through the rearmost of the two holes and tighten it securely with the wingnut.

3. Ream out the other bolt hole with a 1/4-inch bit. Measure 1-3/4 inches *forward* from the center of this hole and drill another 1/4 inch hole through the boom. These two holes will accommodate the U-bracket for mounting the antenna to the PVC mastpipe. Refer to fig. 4 for assembly details.

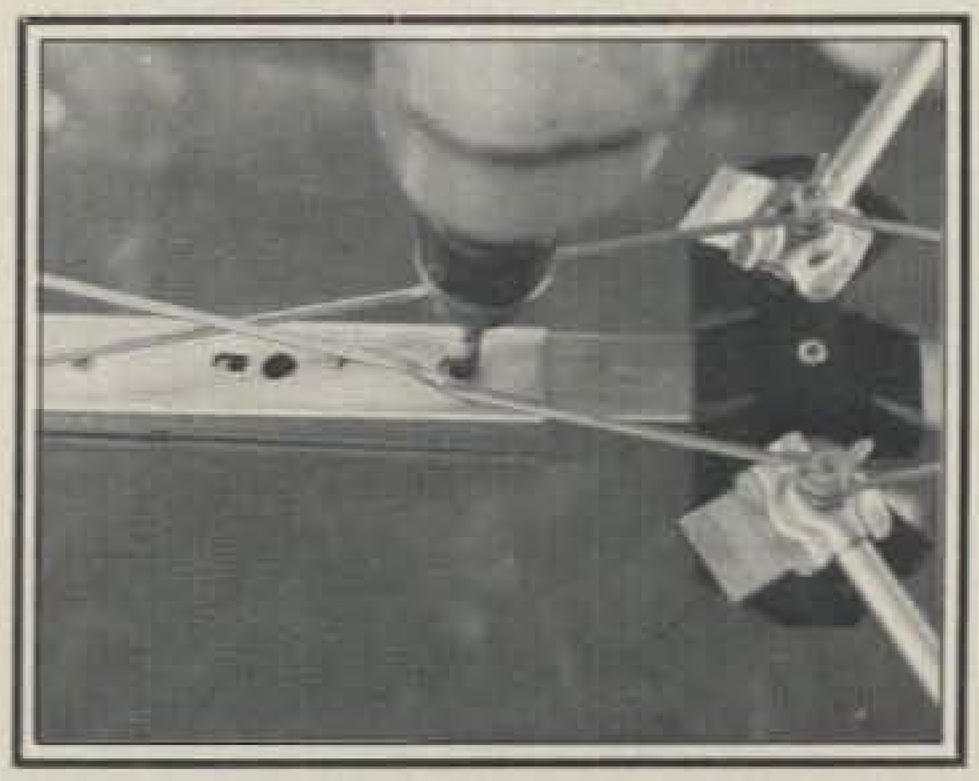


Fig. 4- Two ½-inch holes are drilled through the main boom to accommodate the U-bolt.

4. Connect the two loose harness leads to the screw lugs on adjacent insulator. Be sure to cross the leads, following the pattern of the rest of the crossphase harness. Secure the two leads tightly with the washers and wingnuts provided.

5. Spread the two forward square-tubing corner reflectors fully outward until their locks snap into place.

6. With a hacksaw cut off the square boom with all of its short director elements in front of the u.h.f. dipole as shown in fig. 6.

7. Select two large and two small plastic end caps and tap them into place on the ends of the square tubing.

8. Holding the u.h.f. dipole firmly, saw off the crimped tips from each end. Refer to fig. 5 for details of steps 8 and 9.

9. Select two 6-inch lengths of scrap aluminum antenna element. With vise or pliers, gently squeeze the seam of each so that one edge folds under the other edge. Insert one of these into each end of the u.h.f. dipole, and tap (holding u.h.f. dipole element in hand)

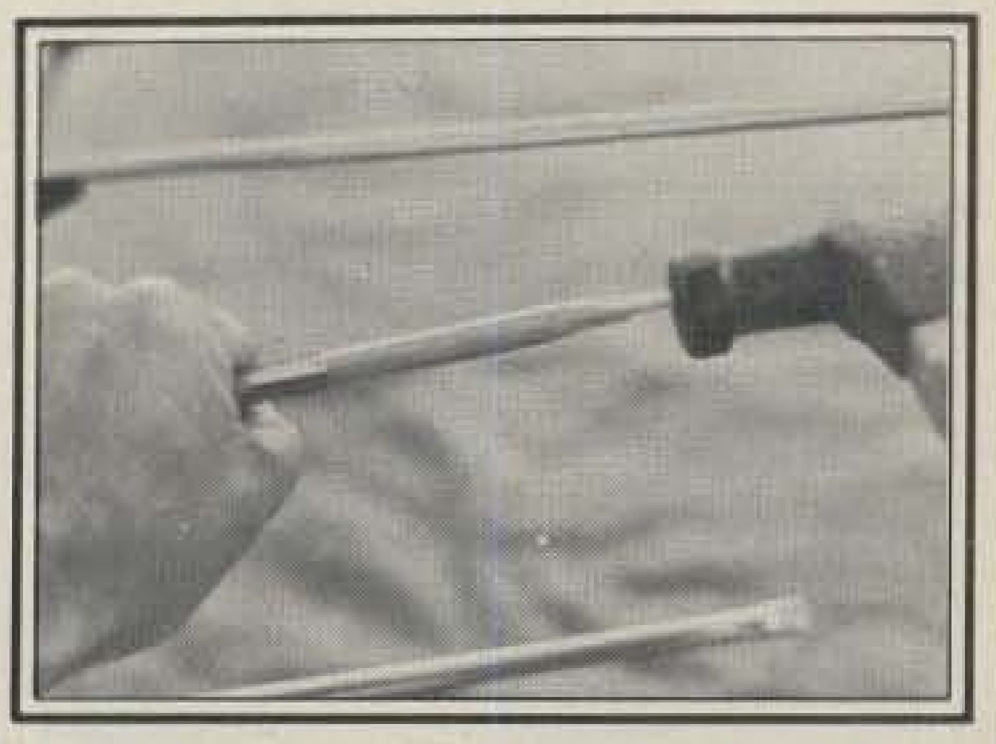


Fig. 5- After the crimped ends are snipped off the u.h.f. dipole, extra tubing is tapped in place to increase the element length.

until seated. Continue tapping until each dipole leg is approximately 9 inches in length from the center insulator. This will make an overall u.h.f. dipole length of approximately 19 inches which is a 3/4 wavelength at 450 MHz for a 300 ohm match.

10. Carefully unfold the remaining elements to their lock position beginning with the rearmost (longest element). Do not apply leverage to the outer ends of the elements; instead, grasp the element near its rivet, lifting gently on the spring lock bracket while gliding the element into position.

11. Mount the antenna assembly sturdily to the end of a 6-foot length of 1½-inch (O.D.) PVC pipe as shown in figure 7. Set the PVC pipe, into the antenna rotator assembly. PVC pipe is

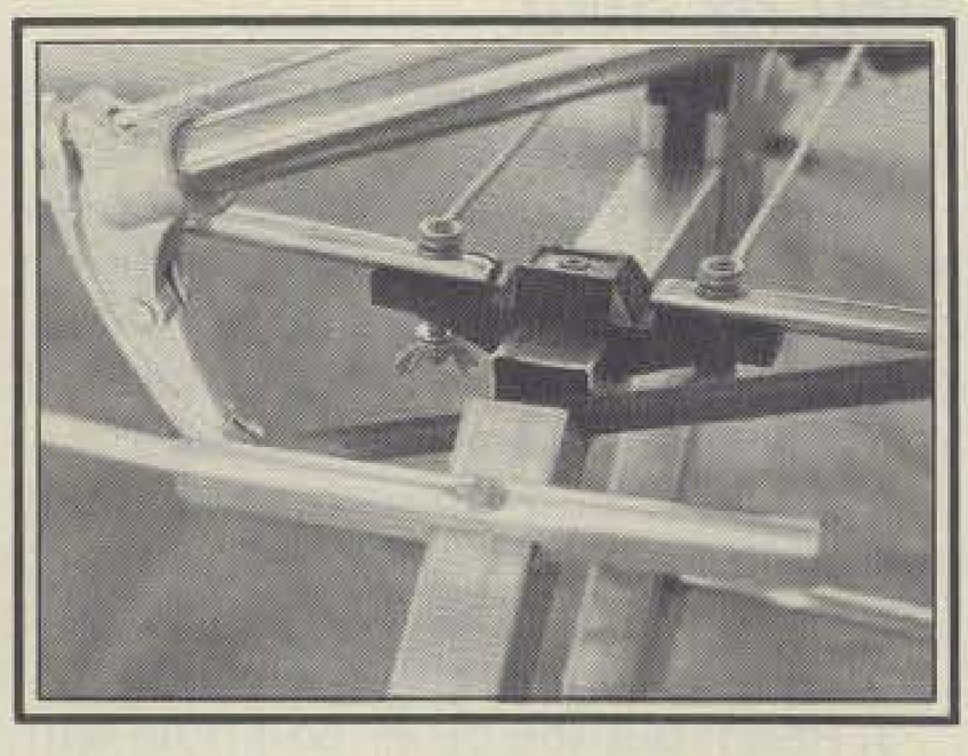


Fig. 6- The u.h.f. directors are of no use at the lower u.h.f. range. Saw them off.

used as the upper mast section because its non-metallic composition will not appear as a parasitic element which could interfere with the pattern of the antenna. It might be a good idea to insert a length of wood dowel such as a broomstick through the PVC to give it rigidity.

12. Select a 300:75 ohm TV balun transformer and connect the twin-lead end to the antenna terminals (u.h.f. dipole). Prepare a 75 ohm coax downlead by affixing a type F connector to it. Mate the connector to the balun transformer. Tape the connector tightly with PVC electrical tape for waterproofing. Tape the balun securely to the antenna boom, and tape the coax to the boom as well so that it doesn't flap in the breeze.

Operation

Considering that the antenna is made for an entirely different service, and that the modification procedure is simple and straightforward, the scanner beam will give an impressive accounting of itself. While directivity is *very* broad on low band, it is quite sharp on high band and v.h.f. The antenna will provide excellent reception for all scanning receivers.

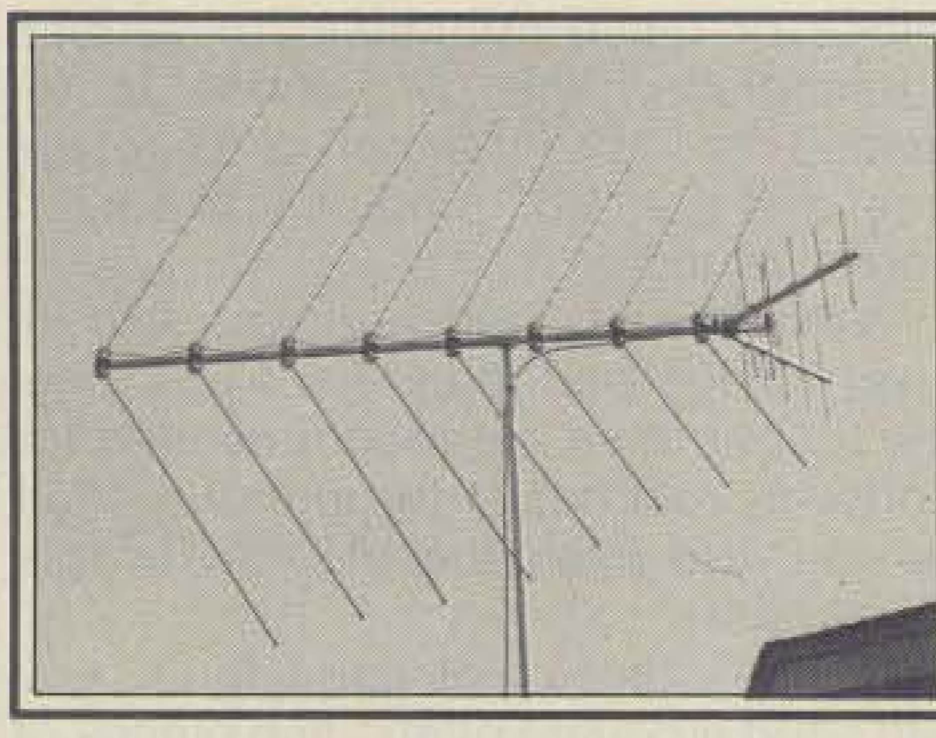


Fig. 7- The modified antenna is mounted in a vertical plane atop a PVC mast pipe to avoid interaction with a metallic mast.

The information here may start you on your way to a Hickok dealer, or it may start you thinking about borrowing a trick or two for your own design.

How the Hickok Model 216 "automated" transistor tester works

The Hickok 216 transistor tester is small enough to fit in the palm of your hand yet is quite an amazing bit of engineering.

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

Here's the scenario. You've just returned from the flea market at the Hartz Mountain Hamfest—or from Sloppy Sam's Buy-Em-By-The-Bag Bargain Junk Parts Bonanza Outlet—and now you have mounds and mounds of adorable little three-legged beasties on your bench. Son of a gun.

So you break out the magnifying glass and your handy-dandy transistor spec look-em-up guide only to find there isn't a single indentifiable or legible device number in the bunch.

Some bargain.

You could break out the curve tracer and the scope if you have one, but you still ought to have some idea of which lead is which.

So you wish upon your favorite star (Loni Anderson, right?), and in the morning there's a flyer describing the Hickok Model 216 Transistor Tester under your pillow.

**c/o CQ Magazine*

Magic

Stuffing a few of those three-lead whatchamacallits into your pocket, you stop in to see Dealer Dan and ask him to demo the 216 for you. And you don't believe what you see.

He plugs your mystery thingamabob into the socket on the front of a box the size of a small v.o.m. The LEDs twinkle for a second, then it tells you that you have a good PNP transistor; it even shows you which is the base lead. And a little further on, I'll show you how to identify the other two leads—in seconds.

Okay, the box has a manufacturer's suggested U.S. resale price of $135, meaning you can get it for something between $115 from a bargain outfit like Fordham to $145 for a retail-plus-tax-plus-shipping outfit like Formal Fred's. You've known Dealer Dan longer than we have, so you know just how far you can swing his price on something like this.

Considering the transistors you bought are worthless unless you can make sense out of 'em (and how much time it would take to test all of them out with an ohmmeter tester) and the fact that you can use the 216 for both in-circuit and out-of-circuit tests on JFETs and bipolars and diodes and more—well, it's your decision. Me, I own one, and I am and was damned happy I do, especially the time the drawer I keep my transistors in spilled.

What It Does

The Hickok 216 performs pass/fail tests on any semiconductor that can be modeled as two diodes (more on this in a minute); identifies PNP versus NPN, NFET versus PFET, can tell you which end is an anode, which a cathode; and identifies the base lead of a bipolar transistor, the gate lead of an FET or the emitter lead of a UJT.

It can tell an open or shorted junction from a good one and fail a bad one every time. And it can work in-circuit as long as there's more than 500 ohms between any pair of leads, or less than 0.2 microFarads, or any combination that comes out to an impedance of 500 ohms at 1000 Hz.

It won't test gain and it won't test leakage (Hickok has other models that will), but it isn't intended to. It's a go/no-go tester intended for troubleshooting, but also useful for people like us who often don't know an emitter from a deceiver.

The Theory Behind The Circuit

For the purposes of testing a semiconductor device, you can consider it to be a combination of diodes. For a diode, the combination is trivial—one each diode. For a transistor, it's two diodes connected anode-to-anode (NPN) or cathode-to-cathode (PNP) with the junction (base) brought out as a third lead.

Now, if a bipolar a.c. signal (or virtually any signal with both positive and negative components to it) is applied to a diode, only half of it gets through, resulting in a rectified signal that can be filtered to produce a d.c. voltage that's either positive or negative, depending on the "direction" of the diode.

If the same signal is applied to an open junction, nothing gets through and the filtered no-signal results in a d.c. voltage of zero. Try again on a shorted junction and both halves get through, cancelling each other out in the filter and again resulting in a net d.c. voltage of zero.

Now suppose we connect two of the three leads together and run our signal into both of them, taking what comes out of the third lead as the input to our

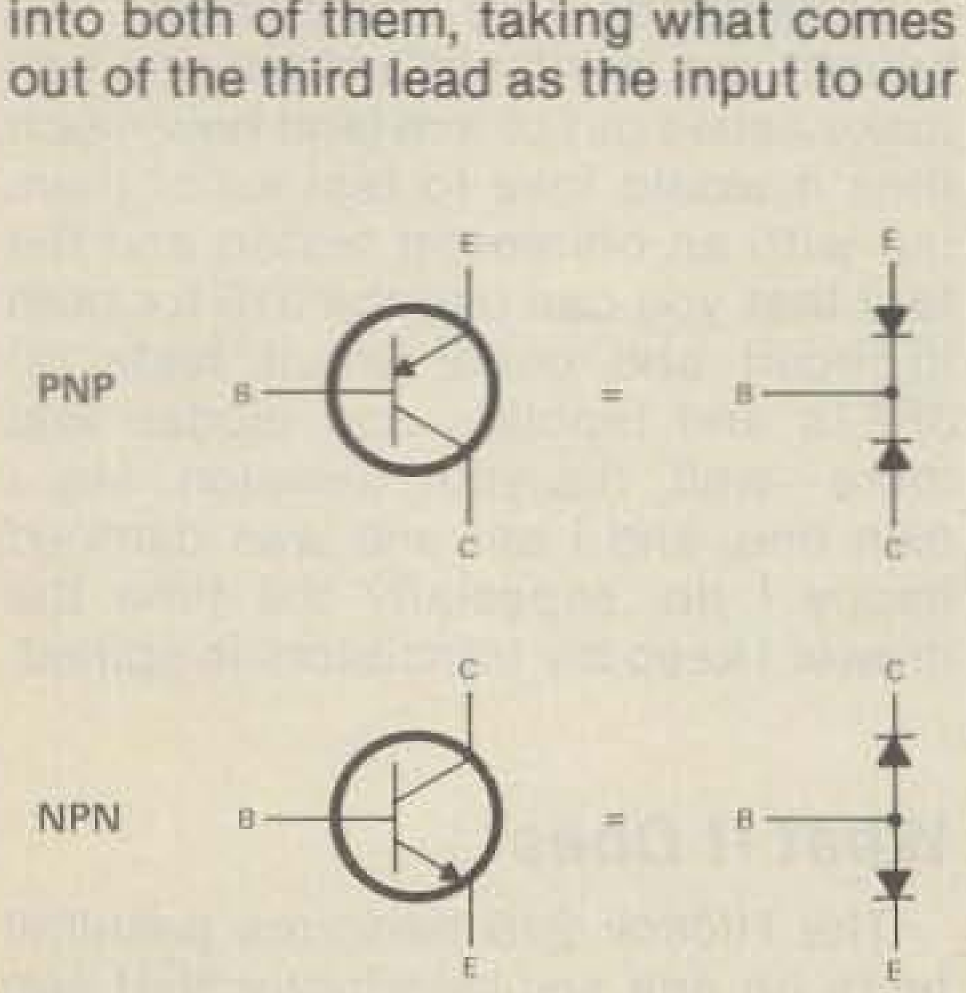


Fig. 1– Two-diode models for PNP and NPN transistors.

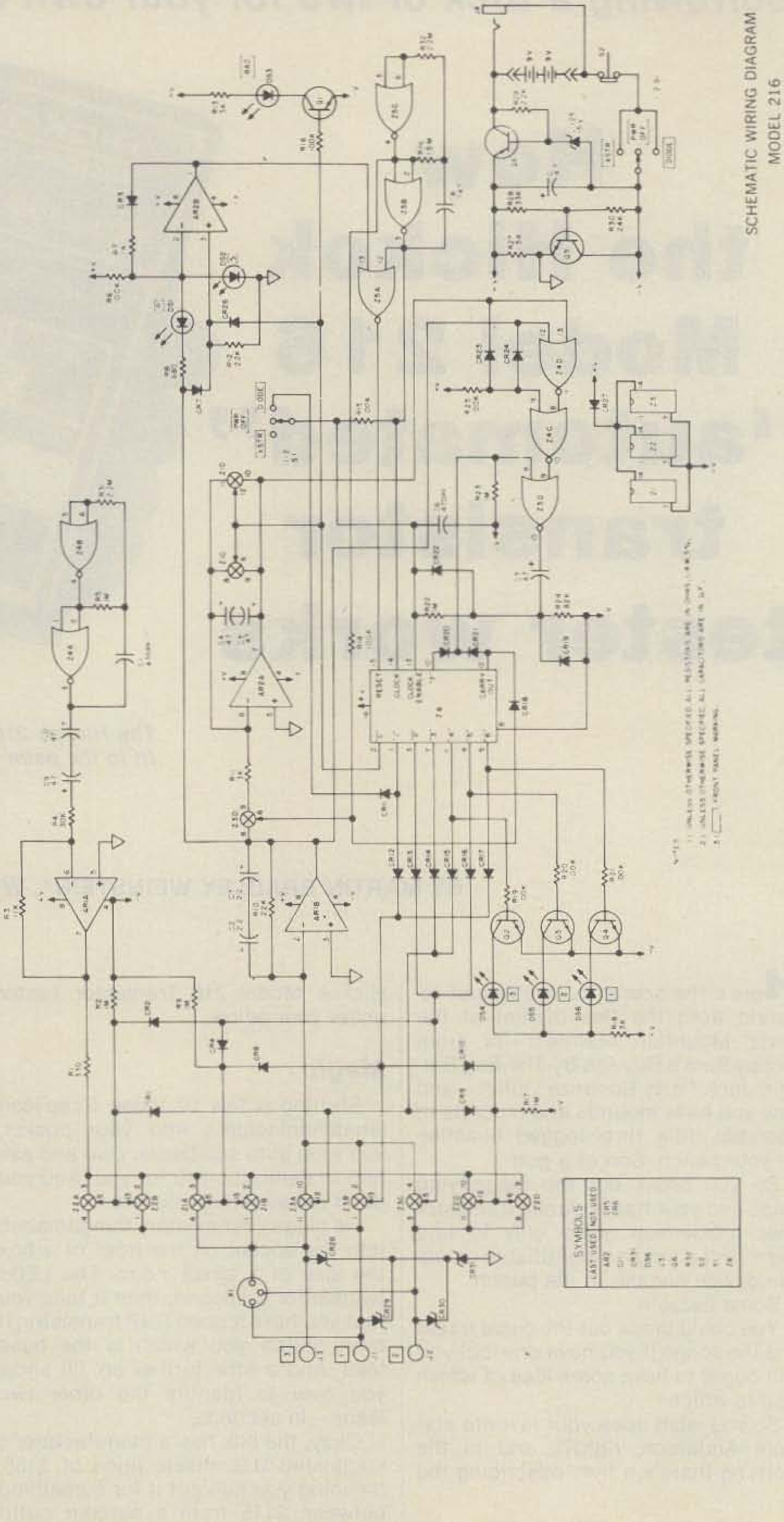


Fig. 2– Schematic diagram for the Model 216 transistor tester.

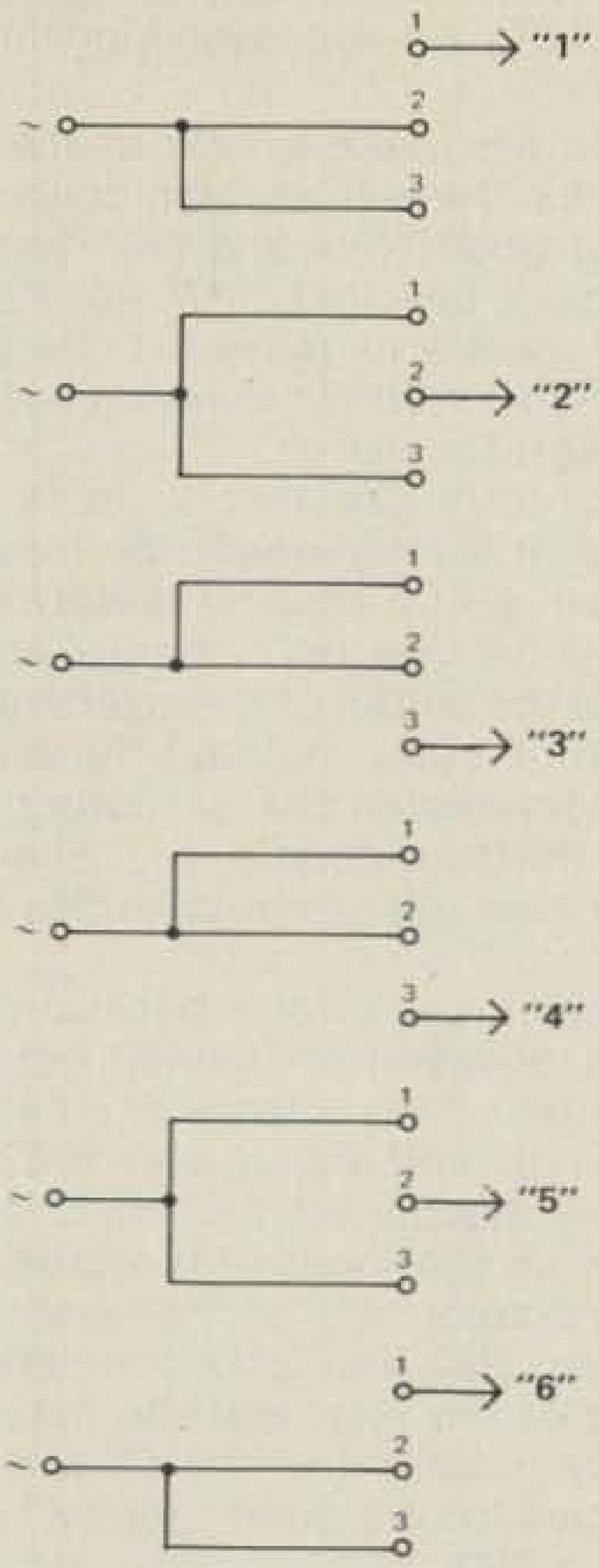


Fig. 3- The bipolar signal from the tone oscillator (Z4A/Z4B) and amplifier AR1A is simultaneously applied to two of the three socket terminals; the third is connected to the input of AR1B, an inverting amplifier with a d.c.-smoothing low-pass filter. Each of the three possible configurations of leads is rotated through twice through the combined action of the 4022 octal counter/driver, 6 steering diodes (CR1-4 and CR8-10) and 9 analog switches (Z1A/B, Z2A-D and Z3A-C). This occurs during sequence steps 1-6 of the 4022.

filter. The arithmetic of this shows that there are only three ways of taking three things two-at-a-time.

There are some diagrams coming up that show the output that results from various lead configurations of good NPN transistors, good PNP transistors, and NPN or PNP devices with either open or shorted junctions.

The Naming Of The Parts

Look at the schematic we've reproduced somewhere along here and I'll try to help you recognize what's happening.

"Master Control" for the testing is directed by the 4022 octal counter/driver, which sequences the tester through a number of steps—details on these shortly. Clocking for this counter is through the astable made up of Z5B and Z5C.

Power supply for the 216 is through a pair of 9 volt batteries and a regulator circuit, providing a bipolar supply with a center ground.

Z4A and Z4B form the tone-generating astable, which is buffered by op amp AR1A. The nine analog switches controlled by the phases of the 4022 determine which device leads are connected to the signal and which to the input of AR1B.

AR1B is an op amp configured as an inverting amplifier with a very low pass filter, used here to smooth the rectified signal into d.c. voltage. Its output goes both to integrator AR2A and a very intriguing three-function driver built around AR2B.

AR2B, if you can follow all the diodes, lights the "P" LED when its input is a negative voltage, the "N" LED when its input is a positive voltage, and resets the 4022 through Z5A when the voltage is zero. The output of AR2B is zero, as we've discussed, when the tester encounters an open or shorted junction. And resetting the 4022 puts it into the "0" count, which both lights the "Fail" LED and resets the integrator.

The Testing Sequence

Before we look at the actions during each count, you should know that the "carry out" pin on the 4022 performs a number of housekeeping functions. It turns on the analog switch (Z3D) between AR1B (the inverting low pass filter) and AR2A (the integrator) during counts 0-3, and turns it off during 4-7. It also inhibits the "gotcha" time delay (C7/R24) through Z5D. This is the time-out circuit that dis-enables the 4022 clock input for about 4 seconds, freezing the display status, when the tester

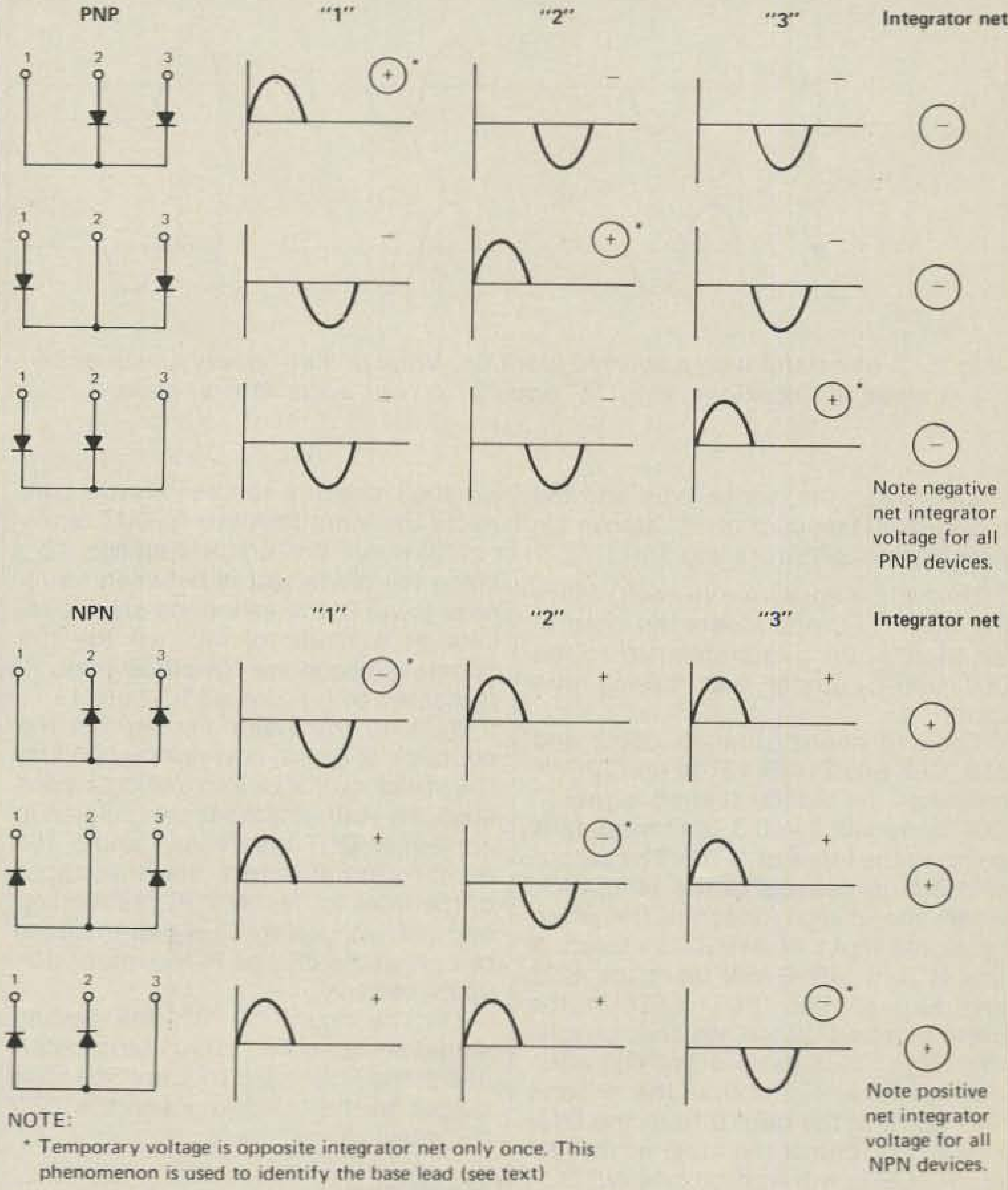


Fig. 4- Models for good transistors when you apply a sine wave to the lead configurations shown. This demonstrates some of the action of the circuit and how clearly it can show whether the device is good or bad regardless of open or short (via the two diode model of a transistor).

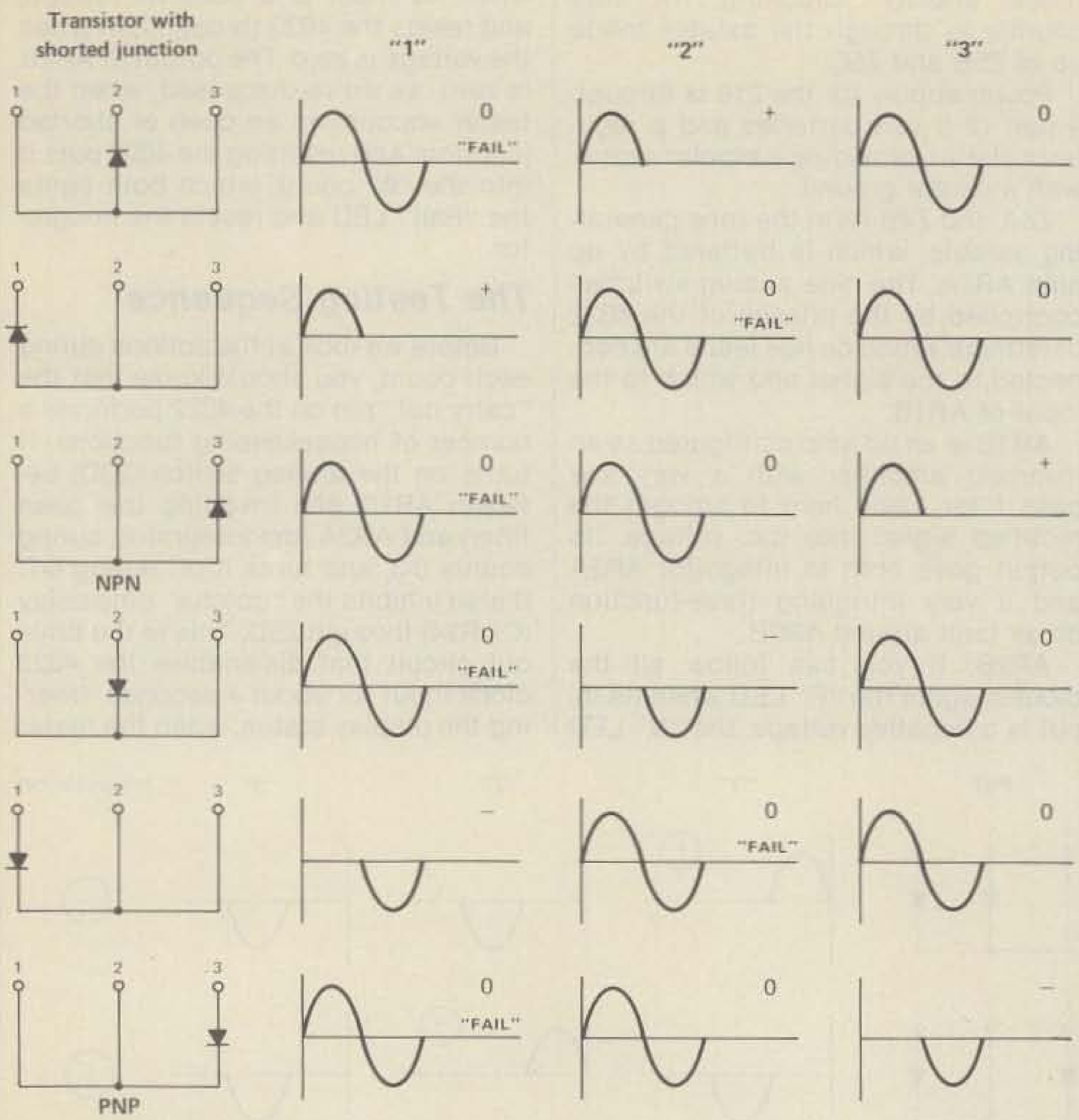


Fig. 5– A transistor with a shorted junction. Note: if "Fail" occurs, sequence does not continue, e.g., "2" and "3" do not occur in first case.

"recognizes" the device type and the base lead. The count of "7" also is bypassed through CR20 and Z5D.

The "0" count, as we've seen, lights the "Fail" LED and resets the integrator; also, nothing is connected to the DUT (device under test) during this count.

The "1" count (through CR12 and Z3B, CR8 and Z1A/B, CR 10 and Z2C/D) connects the bipolar testing signal to DUT terminals 2 and 3, with terminal 1 going to the input of AR1B. The output of AR1B is passed to the integrator, where the charge (opposite the polarity at the input of AR1B) is stored. If this is zero, AR2B will reset the 4022 and turn on the "Fail" LED. In the event of a bad device, we should note, the "Fail" LED flashes rapidly, alternating with one or both of the "P" and "N" LEDs. If the output from the filter is not zero, one or the other of the "P" or "N" LEDs will turn on briefly.

For diode tests, the second pole of switch S1 will pull up the pin 8 input of Z5D during the "1" count, providing the 4 second "gotcha" delay for any good device. A bad device will reset the counter instantly. The sequence (as you'll see in a second) always connects the input to AR1B to DUT terminal 2 when the count reaches "2"; since the diode test is between terminals 1 and 3, the sequence always resets at a count of "2", so the full counting sequence for diode tests is truncated to 0-1-2(reset)0-1-2-etc.

Back to transistor testing. On the count of "2" (from now on you can find the steering diodes and analog switch sections yourself) the testing signal is applied to DUT terminals 1 and 3, the input to the filter to 2, and the output of the filter to the "N"/"P"/reset driver and the integrator. This can increase or cancel the charge in the integrator, you'll observe.

On the count of "3", the testing signal is connected to DUT terminals 1 and 2, the filter input to 3, and the filter output to the integrator and the "P"/"N"/reset driver.

Halftime

If you'll take a look at all of the diagrams for open and shorted junction NPN and PNP devices, you'll see that they always produce a 0 volt output from the filter by the end of count "3", which resets the 4022 and lights the "Fail" LED without ever signaling a "gotcha".

If you also take a look at the diagrams for the various lead configurations of good NPN and PNP transistors, you'll see that PNP transistors always leave a negative net charge in the integrator, NPNs always a positive net integrator charge.

Also, you'll see that there is only one count during which the input to the filter is of a polarity *opposite* the eventual nèt integrator charge—meaning that the output of the *inverting* amplifier/filter stage matches the eventual net integrator charge during only one of the three counts "1", "2" or "3". This is how the gizmo identifies base leads.

Since it can't look backwards in time, it repeats itself instead, but without updating the integrator. The 4022 "carry out" and analog switch Z3D effectively disconnect the output of the filter from the input of the integrator during counts "4", "5", "6" and "7".

Gates Z4C and Z4D compare the output of the filter and the output of the integrator. When there's a match, it triggers the 4 second "gotcha" delay through Z5D.

Back To The Action

On the count of "4", the lead configuration of count "3" is repeated and the LED at terminal 3 is switched on by Q2. If DUT terminal 3 is its base or gate, the "gotcha" circuit freezes everything for 4 seconds, including the "P" or "N" LEDs, which are correctly lighted only during this one time out of three, or whichever time triggers the "gotcha".

The count of "5" duplicates the connections of the "2" count and lights the LED at terminal 2. If this is a "gotcha", well, you know what happens. If not, it just stays on for an instant while the 4022 count advances.

The count of "6" duplicates the signal connections of the "1" count and lights the LED at terminal 1. Again, a "gotcha" freezes everything for 4 seconds, otherwise it's on to the next state.

Yes, a good device will have scored a "gotcha" by now. But don't forget that the "gotcha" only delays the counting cycle. The sequence continues afterwards, each time lighting an LED or two, but only briefly. There is no confusing a "gotcha" with a "next".

The count of "7" is purely a "next" cycle.

Clues For The Rip-Off Set

Okay, some of you want to run through your junk boxes and slap this

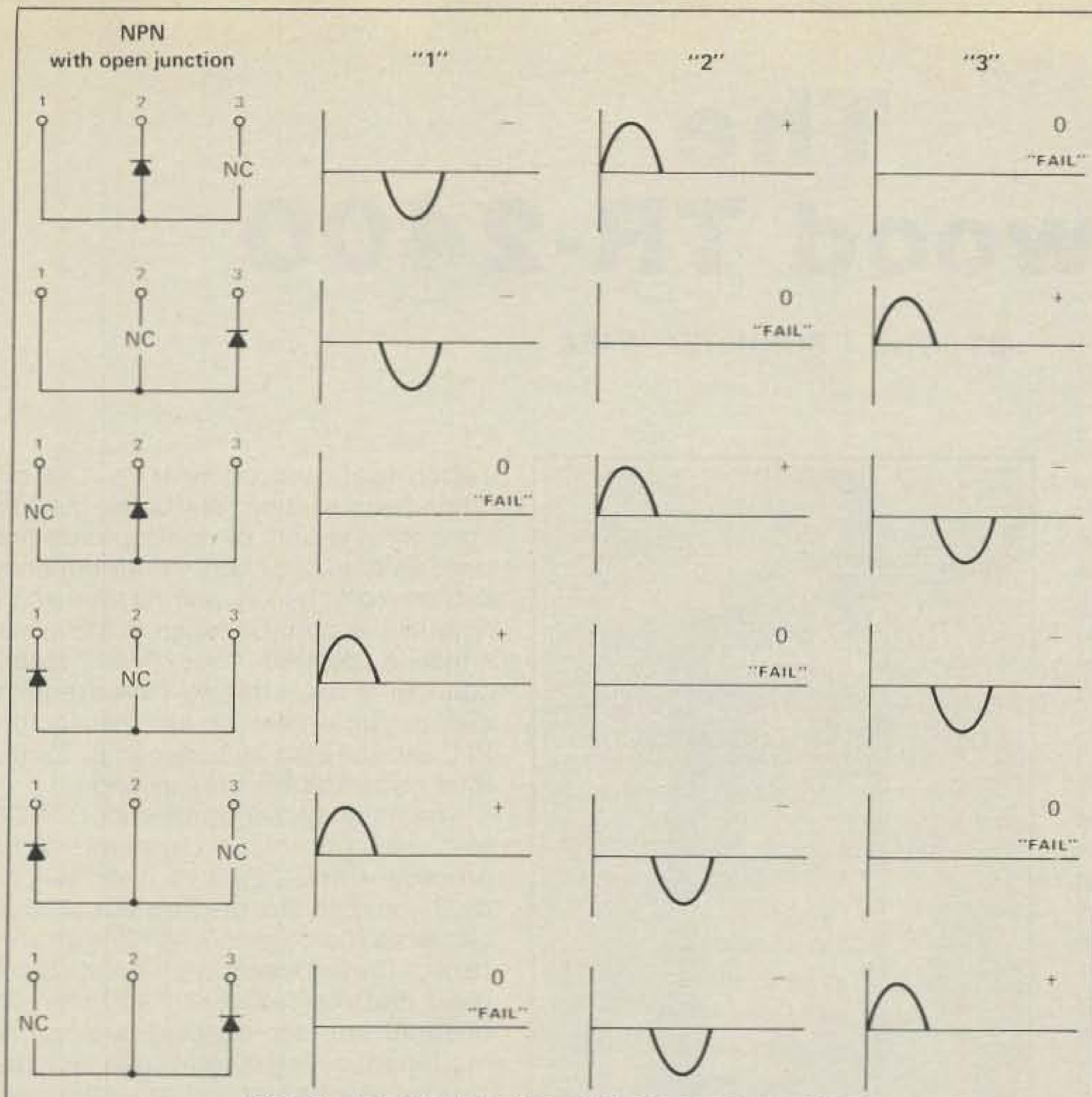


Fig. 6– An NPN device with an open junction.

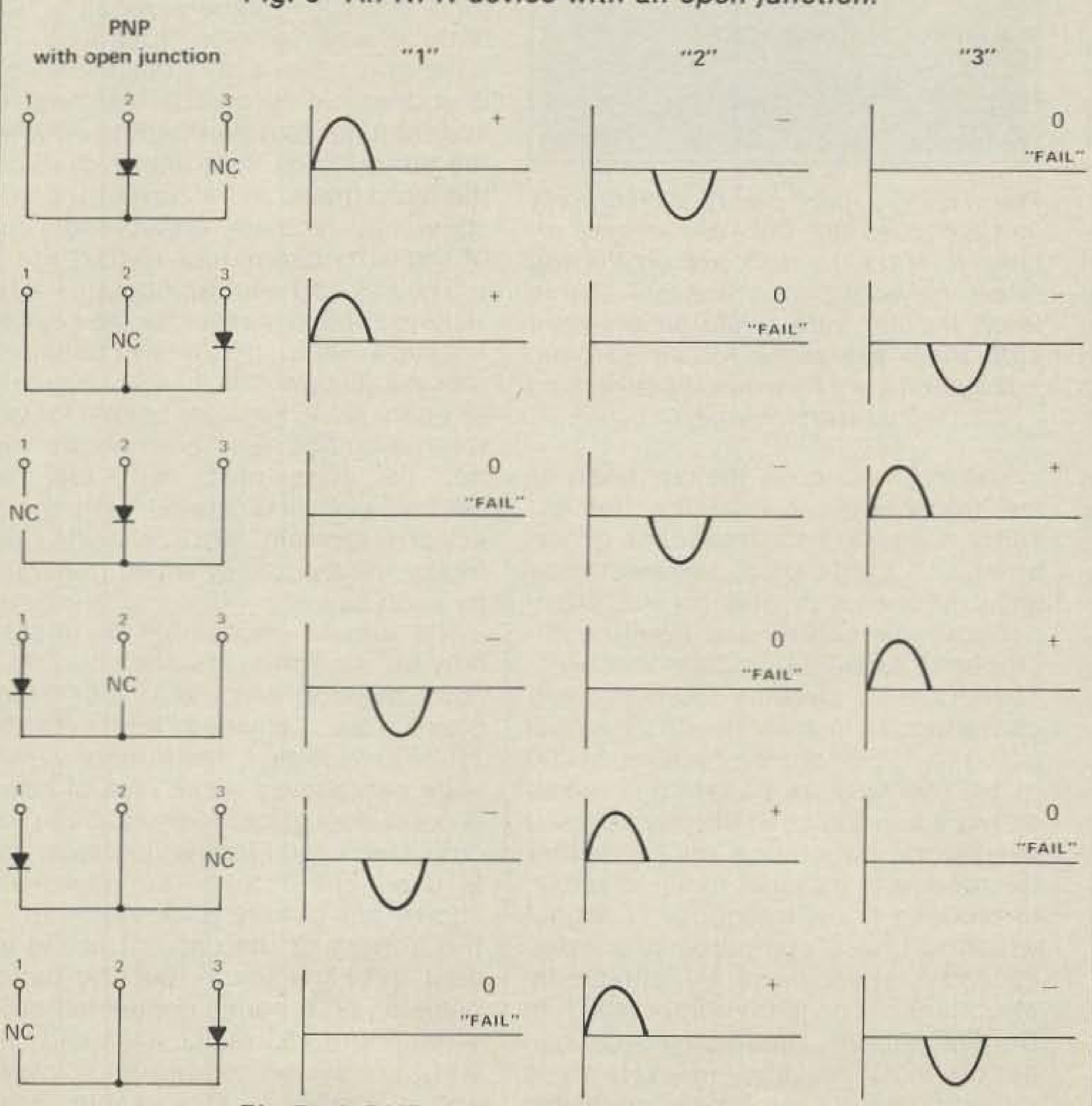


Fig 7– A PNP device with an open junction.

little beauty together yourselves. Good luck. There's nothing obscure about the parts. The analog switches can be 4016s or 4066s. The Op Amps are 4558s. Most of the steering diodes are 1N914s. Everything is strictly off-the-shelf.

The Hickok 216, on the other hand, comes from the factory to your distributor completely assembled and tested with a full-year limited warranty.

Also, Hickok got the whole thing on a 2-3/4 by 2-15/16 inch pc board. It would take me four or five times that area, how about you?

I may be getting lazy in my old age, but this is one time I see build-or-buy as a close decision. For me, it was tilted toward "buy" by the number of connections and the time it would take me to put it together versus the small, nifty package from Hickok.

As Promised, A Bonus

The Hickok Model 216 is only designed to identify the base lead, but with this little trick, you can also identify the emitter and collector.

First, arrange to place the base lead at the middle terminal (the middle LED, #2, will light). The 216 will tell you whether you have an NPN or PNP transistor.

Next, disconnect the base lead from the 216 and touch it to one of the other leads (plugged into either terminal 1 or terminal 3).

If the "P" LED and the "N" and "Fail" LEDs together flash alternately (all at full brightness), you've touched the base to the emitter of a PNP or collector of an NPN.

If the "N" LED at full brightness flashes alternately with the "Fail" LED at full brightness together with the "P" LED at just under half brightness, the base is contacting the collector of a PNP or the emitter of an NPN.

Not even Hickok knew about this trick before they heard about it here!

By the way, the Hickok 217 does everything the 216 does plus a leakage test. The Hickok 220 adds h_{FE} measurement. Of course, unless you're troubleshooting, you could save a lot of money on test equipment just by deciding not to try saving a little on transistors.

Ah, well. That's the amateur spirit for ya!

Addendum

For more information on the Hickok 216 or any of their other products write to Mr. Thomas A. Hayden, Marketing Manager, The Hickok Electrical Instrument Company, 10514 Dupont Ave., Cleveland, Ohio 44108 or circle number 100 on the reader service coupon. Tell him Marty and *CQ* sent you.

The Kenwood TR-2400

BY JOHN J. SCHULTZ*, W4FA

There is no doubt that 2 meter HT's due to microprocessor-based techniques have undergone a revolution that most amateurs would not even have imagined a few years ago. The Kenwood TR-2400 is a good example of the new generation of HT's that we will probably be seeing a lot more of in coming years.

The TR-2400 measures about 8 × 3 × 1 $^{7}/_{8}$ inches and weighs about 1½ lbs. It can be comfortably hand-held for extended periods of time. It does not have any clip for belt mounting but a holster of some sort could probably be easily fabricated. Both of these features are available as options. The front view photograph shows the great variety of controls, which will be described later, associated with this every versatile piece of equipment. The basic TR-2400 comes as a complete package with a ni-cad battery pack, plug type charger, flexible antenna, carrying strap and operating manual. There are even extra plugs for the external microphone and speaker jacks on the TR-2400.

Basically, the TR-2400 is a synthesized HT covering nominally from 144.000 to 147.995 MHz in 5 kHz steps with a variety of memory and scanning features. Fig. 1 shows a block diagram of the unit. There are four main sections to the unit—a TX-RX section, PLL section, display section and tone-pad section. The TX-RX section is fairly conventional in that it shows a straight r.f. amplifying chain for the transmitter and a double conversion receiver i.f.'s at 10.7 MHz and 455 kHz. The transmitter is completely broadbanded. The r.f. signal is derived from a voltage controlled oscillator, in the PLL section, operating at the output frequency and the signal is simply amplified in four stages to its final output level. On the receiver side, both the input and output circuits of the r.f. amplifier stage are varactor diode tuned to the operating frequency by a tuning voltage derived from the PLL section.

*c/o CQ Magazine

The TR-2400 has plenty of controls and switches but they are all well arranged. Most controls are on the top or on the front panel. The PTT switch is on the left side, while on the right side there are jacks for an external microphone, PTT switch, speaker and battery charger.

The PLL section is the real heart of the transceiver. It contains the circuitry necessary for frequency generation, PLL control, key-pad frequency entry, frequency display control, channel scanning control and even the microphone amplifier/modulator stages. The VCO/PLL circuitry itself is fairly conventional in that the VCO signal (133.3 to 137.3 MHz on receive; 144.00 to 147.995 MHz on transmit) is mixed with the harmonics of different crystal oscillators, depending upon whether the receive or transmit mode is active, to produce a low frequency i.f. signal which is phase compared to a reference crystal oscillator. By suitable instructions from a microprocessor in the PLL section, the PLL circuitry can set the VCO frequency in 5 kHz steps directly. There is no 5 kHz "up/down" switch found on many HT's. The microprocessor also contains instructions for a variety of control functions such as to accept only valid frequency entries from the key-pad, to stop scanning in the memory scan mode when either a desired "busy" or "clear" channel is detected, to store frequencies put into memory, etc. Finally, the PLL section also includes an IC for the tone encoding for the key-pad.

The display section accepts BCD frequency information from the microprocessor and displays it on a four-digit liquid crystal display. The display can also indicate the number (from 1 to 0) of the ten memory channels being used, but the frequency and memory channel number displays are not simultaneous. The display also includes "arrow" indicators, two on either side for: "on-air", "memory recall", "low battery" and "lamp-on" functions. The latter may seem a bit unnecessary but it is possible to switch the lamp on and then not to note that it is on when the surrounding light improves. Since the lamp draws more current than the squelched receiver, unnecessary use of the lamp can reduce battery life.

The key-pad section contains a full 16 key unit and, except for the keys associated with frequency scanning, looks and operates like a calculator key-pad. All 16 keys are usable for two-tone encoding. Some amateurs may not be acquainted with the four "extra" keys associated with the 16 key arrangement. Fig. 2 presents a listing of the frequency tones generated by each key.

It's almost impossible to imagine how all the functions shown in fig. 1 could be packaged into a HT or "Hand-Shack" as Kenwood refers to the TR-2400. However, the interior view at least can convey some idea of how it is done. Just about every PC board layout scheme and interwiring technique is used but it fits! The photo also shows the battery pack which fits in the bottom of the case. It is not evident from the photo, but the battery pack is just a series connected string of standard 450 ma/hr AA nicad cells with an overall covering of plastic shrink material. One could easily

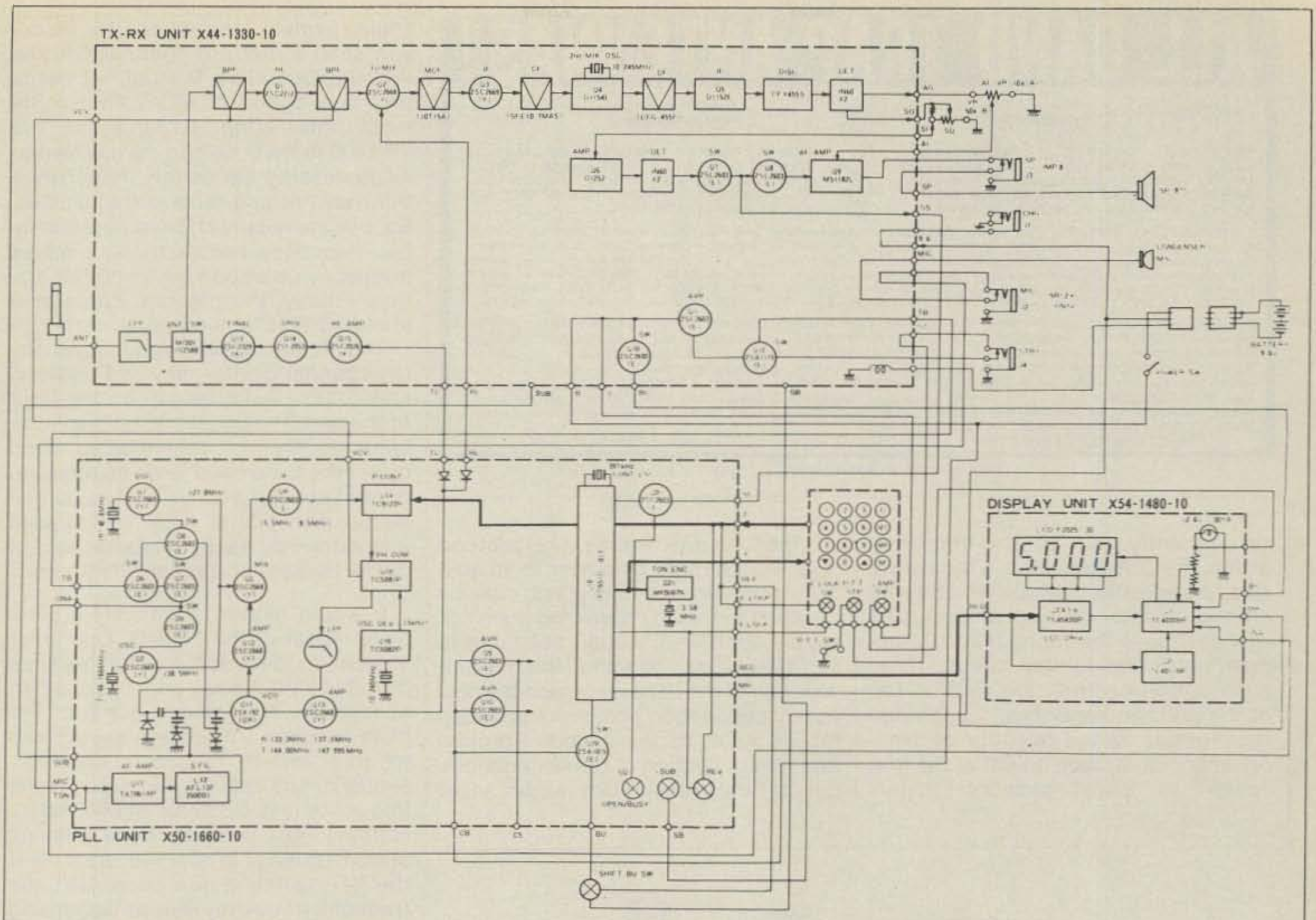


Fig. 1- Block diagram of the TR-2400. For those who like "statistics", it takes 28 transistors, 1 FET, 18 IC's and 55 diodes to implement the functions shown.

home-brew additional battery packs, if desired. Although this feature is a definite plus, it is slightly balanced out by the fact that an in-line wire connector is used with the battery pack instead of spring clip connectors. So, although changing a battery pack is not complicated, it does take a few seconds and cannot be done while wearing gloves.

In operation, the TR-2400 can perform just about any frequency trick desired. However, just to back up a bit, it is worthwhile to comment on the TR-2400 as a basic receiver/transmitter and present some of the "statistics" associated with it. Although not a great deal of formal measurements were made, they did confirm what on-the-air results revealed. Namely, that the TR-2400 is an excellent performer. On the receive side, performance is extremely good with a sensitivity hard to believe—less than 1μ V for a 30 db S/N. The squelch sensitivity is about 0.2 μV. No sign of overloading could be found under normal operation. The audio output of 200 mw into the built-in speaker doesn't

Low Tone (Hz)	High Tone (Hz) 1209	1336	1447	1633
697	1	2	3	C
770	4	5	6	MS
852	7	8	9	MR
941	*	O	#	M

Fig. 2- The complete 16 combination two-tone listing. The number/letter markings are as they appear on the TR-2400.

sound like too much but it is perfectly adequate for most portable operation and the sound is clean and crisp. On the transmit side, the power output varied from about 1.5 to 2.0 watts, depending on the state of the battery charge. Spurious radiations were all at least at the −60 db level. The built-in condensor microphone provides very good audio and reports were consistently excellent. The TR-2400 was not checked over its full rated operating temperature range (−20 to 60° C!) but absolutely no instability or drift could be detected. The unit draws 28 ma in squelched receive and about 500 ma while transmitting. About 0.5 ma is used with the unit off for the memory back-up feature. Much to Kenwood's credit, they do supply a graph of estimated operating time per battery charge (fig. 3). Once the low-battery indicator does come on, one doesn't have a lot of time to terminate a QSO but it is sufficient to get a few quick transmissions in. About the only feature that one might wish for is a high-low power switch to cut the r.f. power back to a few hundred milliwatts. Unfortunately, there doesn't appear to be any simple way to put in such a feature without the risk of doing some damage to one of the PC boards.

The top of the unit contains the normal volume and squelch controls. The "TX Offset" switch allows for the setting of the transmit frequency the same as the receive frequency (simplex), 600 kHz higher, 600 kHz lower or to the frequency which has been entered in Memory "O" (the tenth memory). The latter frequency, by suitable key-pad entry, can be any frequency within the 2 meter band. The switch also has an extra position which turns off the memory backup in case one wishes to save the approximate 0.5 ma drain consumed by that circuit. Three push button controls are also on top of the unit. An "open/busy" push button provides for the selection of memory scanning to stop on either the first "open" or "busy" memory channel scanned, as one desires. The subtone "on" switch turns on power to an auxiliary subtone encoder which can be installed in the HT. Kenwood does not supply such an encoder, but there is sufficient space to install such a unit near one of the PC boards, and the necessary connection points are provided for 9.6 v.d.c. to the encoder, ground and for connection of the encoder output to the transmitter audio input chain. Explicit instructions for installing such a unit are contained in the TR-2400 Operating Manual. A "norm/rev" pushbutton provides one of the most interesting features of the TR-2400 in that one can, by momentarily depressing the switch, interchange the transmit and receive frequencies. So, one can easily check a repeater input frequency before trying simplex frequency operation with another station. Finally, the top also contains a standard BNC antenna connector.

The liquid crystal frequency/memory channel display, key-pad and several control switches are on the front of the unit. The liquid crystal display is continuously on; it cannot be switched off. There is no need to do so since its current consumption is nil. The numerals are about 5/16" high, well spaced and extremely easily readable, except in the darkest of ambient light conditions.

It would require practically a complete repeat of the TR-2400 Operating Manual to describe all the features possible with the key-pad, but one can at least try to highlight some of the main features. To achieve any operating frequency in the 2 meter band one simply enters the last four digits of the frequency (e.g. 5.685 for 145.685 MHz). Nothing else need be done. The receive frequency is now 145.685 MHz. If the PTT switch is now depressed, the transmit frequency will be according to the setting of the "TX Offset" switch as previously described. In any case, the frequency display will indicate the transmit frequency *except* if the transmit frequency is out of band. In that case, the transmit frequency will be indicated to be the same as the receive frequency. To enter a frequency into any memory one simply "punches" in the frequency, the "M" button and then the number button corresponding to the number of the memory into which the frequency is to be read. To reverse the procedure one presses the "MR" button and the number of the memory channel being recalled. The memory number channel then briefly appears on the display before the transceiver circuitry and the display switch to the actual frequency of the memory channel.

The arrow-marked (*)/down (#) frequency scanning buttons can be activated any time a received frequency is displayed. A single depression of either button will move the received frequency 5 kHz. If one continues to hold either button down, the TR-2400 will start to scan at 5 kHz steps. It takes almost a minute to scan the whole 4 MHz of 2 meters. The scanning will not stop if a signal is heard. One has, in such a case, to alternately press the up/down scan button until one "zeros in" on a busy frequency. The scanning mode also provides an interesting feature in that the unit will scan from 143.900 to 148.495 MHz, although frequencies outside 144-148 MHz *cannot* be entered from the key-pad. If one scans to a frequency outside the 2 meter band and then sets the "TX Offset" switch to simplex, one can also transmit outside the 2 meter band to the extent mentioned for scanning. The "MS" button provides for scanning of the memory channels only. By using this pushbutton, the unit will scan only the memory channels according to how the topside "open/busy" switch has been set. Scanning in this mode always starts from memory channel 1 and stops when the next "open" or 'busy" memory channel is encountered, as one selects. There is no priority channel feature as such but almost the same effect can be obtained by proper arrangement of the frequencies in memory. For instance, by reading a priority frequency into memory #1 and setting the "open/busy" switch to "busy", one has only to periodically press the "MS" button to check if the priority channel is active. It is possible to get the key-pad entries mixed up and obtain some rather confused readings on the display (for instance, by an improper sequence of key entries the memory channels apparently cannot be selected as desired). In such a case the "C" (clear) key can always be used. It resets everything so one can start all over again.

There are three slide switches on the front of the unit. Two are "lock-out" switches. A frequency lock switch provides for total inactivation of the key-pad except for push-button tone encoder operation on transmit. It also locks out memory selection. So, one can positively only operate on the last frequency to which the TR-2400 has been set either by memory selection or key-pad entry. The other "lock-out" switch disables the PTT function in case one is transporting the unit. The final switch is a lamp on/off switch to activate side-lighting for the liquid crystal display under extremely low ambient light conditions.

A PTT switch with a firm "click" response is on the left side panel of the unit while the right side panel provides jacks for an external microphone, PTT circuit, battery charger and earphone/speaker. Again to Kenwood's credit, one must mention that all of these jacks are of the standard size as found on consumer type transistor radios. So, there is absolutely no problem finding suitable jacks. The external microphone jack is really meant for an external condensor type microphone as it is both an audio input and 7 v.d.c. volt source. A high impedance dynamic microphone can be used but a blocking capacitor is required for the d.c. voltage. Excellent results have been obtained using an inexpensive Radio Shack condensor microphone wired up as per the instructions contained with the microphone. A Kenwood speaker-mike will be available shortly.

The Operating Manual supplied with the TR-2400 is excellent as far as using the unit is concerned. Many diagrams and illustrations clearly illustrate every operational feature. But, not a single word is said about circuitry theory or even elementary trouble-shooting. It reminds one of the manuals supplied with imported cameras. Well, is this good or bad? One would, unfortunately, have to admit that at least for the moment such an approach is probably correct. An amateur who is not experienced in servicing sophisticated amateur gear with sophisticated test equipment can probably do far more harm than good by "digging into" a unit such as the TR-2400. Still, it is a little sad to note that a manufacturer doesn't give amateurs a little credit and guidance for being able to make simple equipment performance and operating checks.

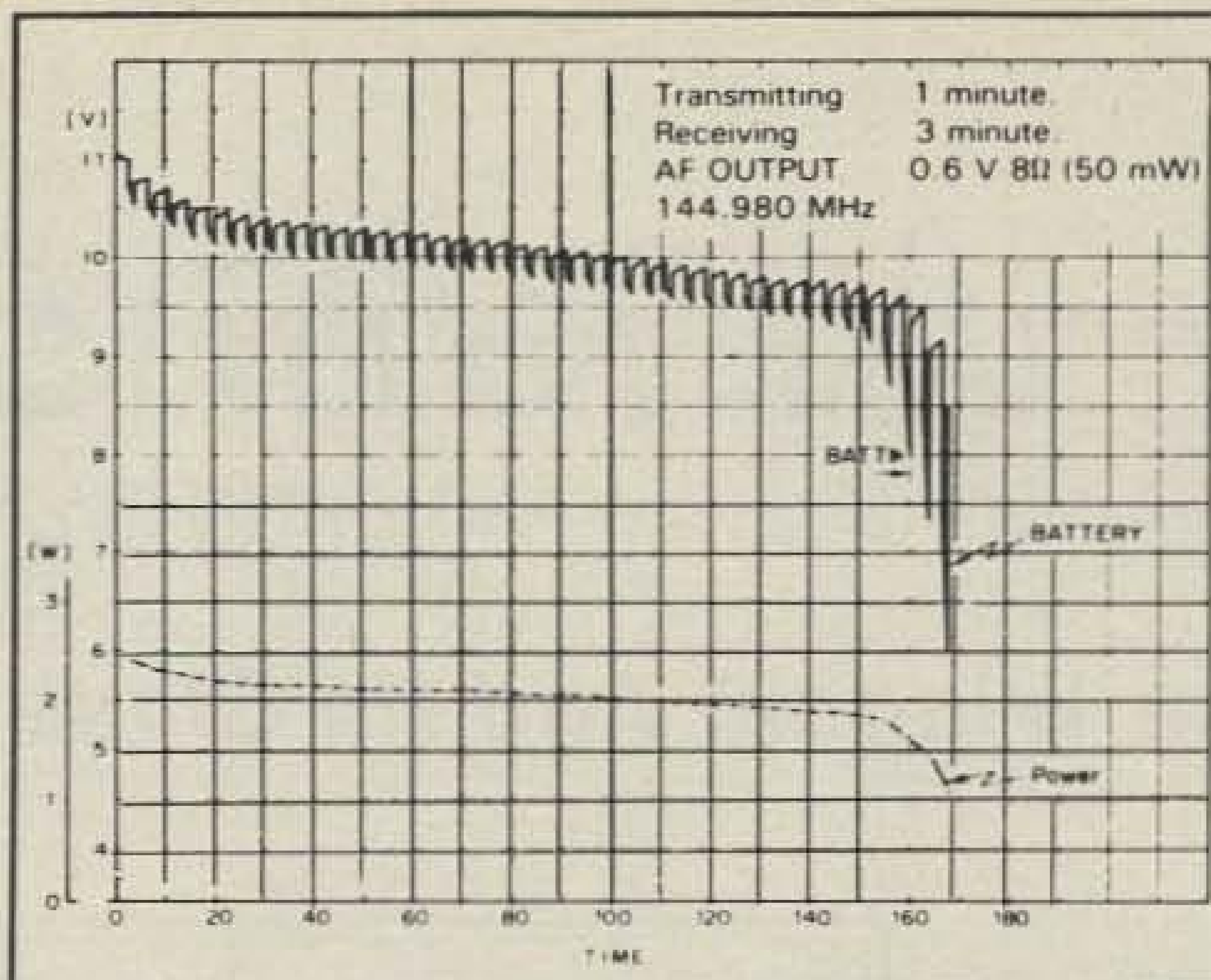
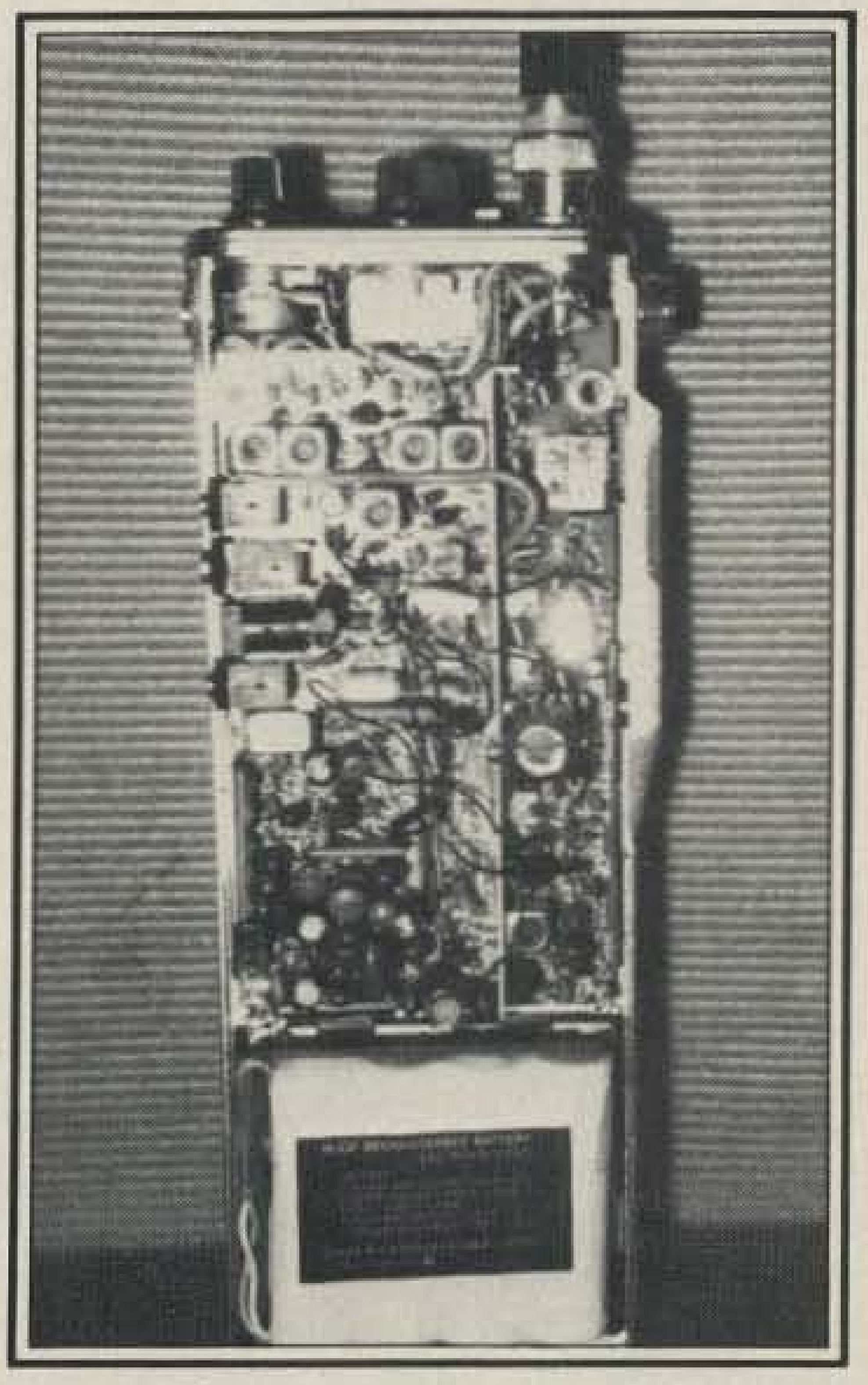


Fig. 3- Watts out and battery voltage versus time for normal operation of the TR-2400. The point marked "BATT" on the upper curve is when the low battery indicator on the TR-2400 is activated.



The back cover has been removed to show a little of the circuitry inside. There is not much room left but enough space is available to put in an accessory tone encoder, if desired.

The standard wall plug charger that comes with the TR-2400 will recharge the battery pack overnight (12-15 hours). An accessory base stand, the ST-1, is available which includes a pulse type quick charger which will recharge the battery pack in only 1½ hours. A 12 volt battery type quick charger which provides the same quick charge feature, the BC-5, is also available. Both are excellent accessories but one should really study fig. 3 before determining that they are really needed in every case.

Overall, the TR-2400 rises above the crowd with extremely high marks as a "new generation" HT. After several months of operation it continues to perform without a flaw. It is hard to imagine a more sophisticated HT until the next generation which will probably "speak for itself" with synthesized speech and "canned" messages.

As a final note to European users: tone access to most European repeaters is 1,750 Hz. However, consistently good results have been obtained by just using the "M" button on the TR-2400 for the required tone burst. Apparently, the tone frequency combination or mixing products thereof are adequate to open any repeaters set for 1,750 Hz tone burst access.

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

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

The Windom And Its Close Cousins

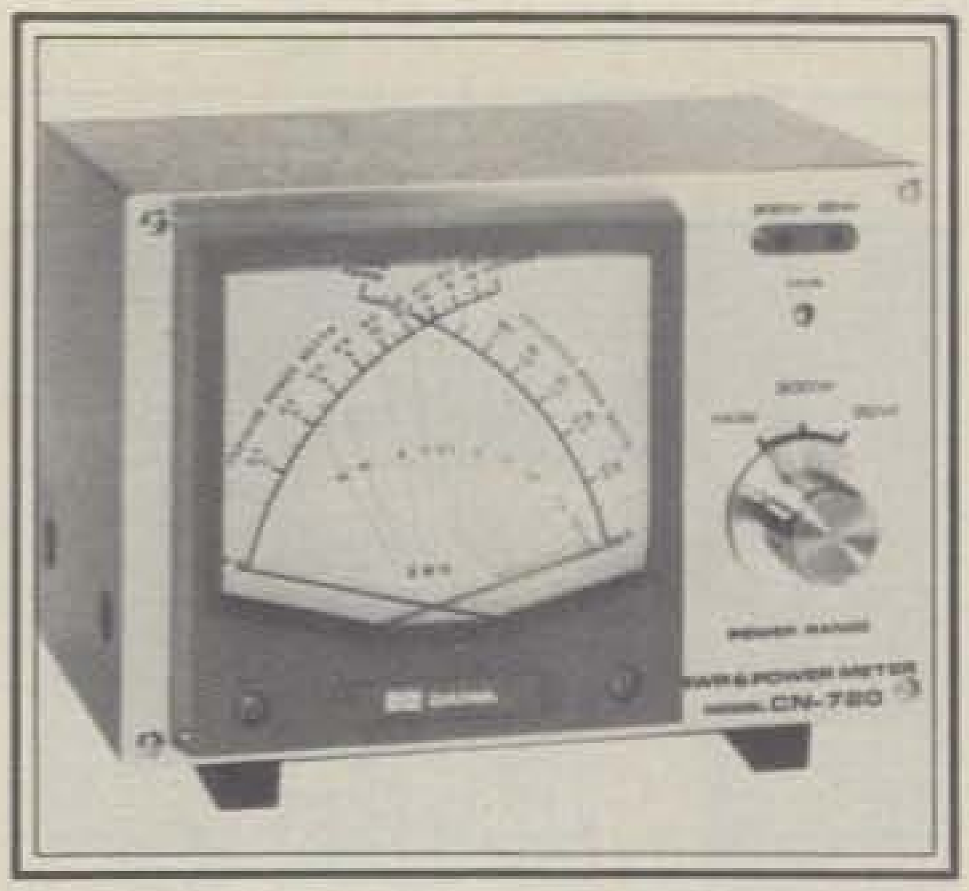
Last month, columnist W8FX expounded upon the multiband dipole and the end-fed Zepp. In this issue, he updates two old-time versions of the off-center-fed Hertz or Windom antenna of 1930s and 1940s vintage as inexpensive, easily constructed skyhooks. As we shall see, there's room for the Windom and its close cousins in today's antenna picture.

Antenna types vary almost as widely as the amateurs who erect them. For single-band work, the coax-fed dipole is as simple and trouble-free an antenna as one can expect to use. For multiband work, it's hard to beat the dipole fed with tuned feeders, described in last month's column. And the random-length Marconi is an "antenna of chance" especially popular with beginners.

Of course, one can't always have one's cake and eat it too, according to the old saw. The dipole is basically a *single-band* antenna. The all-band tuned-feeder dipole is a great antenna, but its feedpoint impedance varies widely, giving rise to awkward matching conditions. And the random-wire's performance is often just that: random in nature.

The **Windom**, or off-center-fed Hertz, is a popular compromise antenna that boasts many of the desirable characteristics of the centerfed tuned-feeder all-bander, yet exhibits a reasonably constant feedpoint impedance that makes matching and transmitter loading easier than with the tuned-feeder antenna. Let's look at the Windom from the standpoint of a practical and inexpensive solution to the "one antenna for all bands" problem.

The off-center-fed Hertz. This is the original Windom, named after the amateur who developed it and wrote it up for publication in the 1930s. Not seen much any more in the original configuration, the antenna is simply a half-wave (at the lowest frequency band) antenna fed at a point about 15% from the center with a single-wire feeder of any convenient length. (This figure is mathematically derived from studying the current and voltage relationships which exist along the antenna on each band).



Multiband antennas fed with open-wire line such as the Windom must be fed through an antenna tuner or "transmatch" for proper loading to modern pi-network transmitter output circuits. A real help in rapid tuner adjustment is a dual-scale s.w.r. and power meter such as the Daiwa CN-720 shown here. The meter displays forward power, reflected power and s.w.r. simultaneously. Forward power is read from the scale on the left, the reflected power from the scale on the right, and s.w.r. is indicated on the lines in the area between the two power scales.

This simple, off-center-fed antenna operates only on *even-harmonic* multiples. That is, an antenna cut for 80-75 meter operation will work only on 80, 40, 20, and 10 meters; 15 meters is not covered. Likewise, a flattop with fundamntal resonance on 40 meters will work on 40, 20 and 10—again, 15 meters, having an odd-harmonic relationship with the fundamental frequency, is not covered.

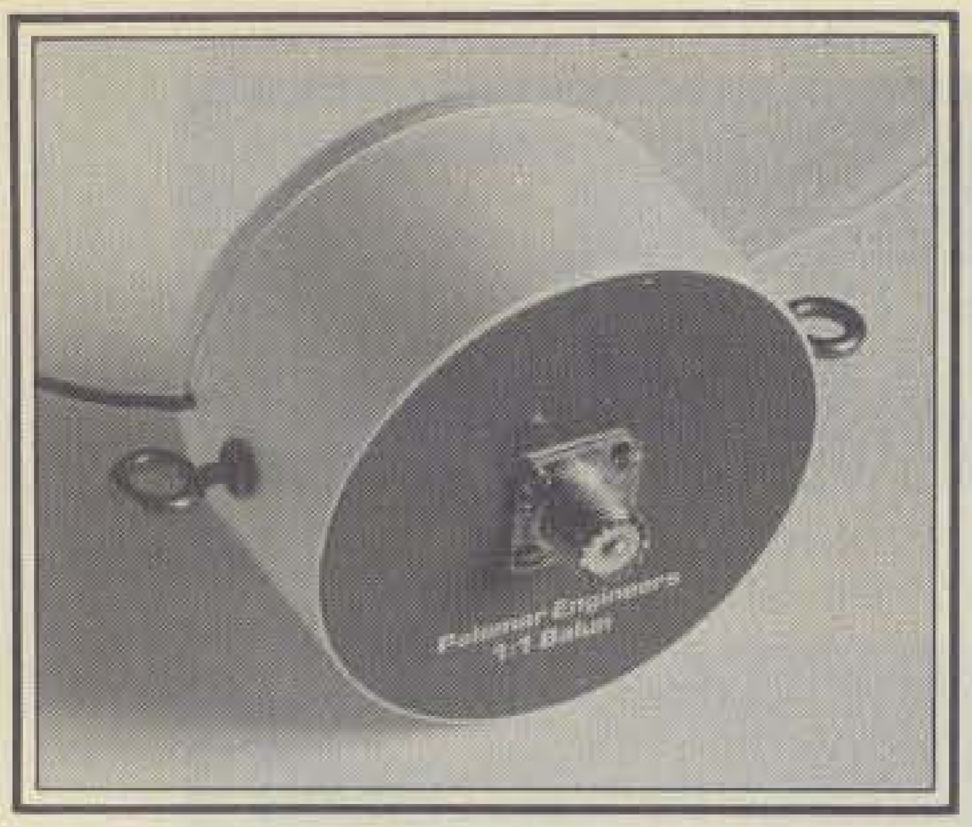
The normal 300-600 ohm feedpoint impedance allows a reasonable match to the nominally 500-ohm single-wire feeder on all even-harmonic-related bands. The impedance will change from band to band; even the optimum spot for the feedpoint appears to vary with height and proximity to other objects. Also, the antenna doesn't exhibit truly "balanced-to-ground" characteristics. For these reasons, resultant performance is hard to predict; some amateurs who have constructed Windoms find that they work fine, while others report that they don't work at all. In other words, when they work, they work great. But when they don't—forget it!

Another problem with the single-wire-fed Hertz (Windom) is similar to that characteristic of all single-wire antennas: the single-wire feed may bring high voltage loops into the shack on some bands, so that you may end up with r.f. on everything in sight. Even with an antenna tuner (a must), you're likely to see this problem rear its head on at least one band, possibly several. Too, the single-wire fed-Windom may aggravate TVI, since the feedline (which radiates to some extent) is brought into the shack, where it has a tendency to pump harmonic r.f. into the power lines, TV leadins, house wiring, etc., triggering r.f.i. and distorting the antenna's radiation pattern. Again, an antenna tuner should be employed, not only to allow proper loading for modern coax-output transmitters, but to increase harmonic suppression and to provide a convenient place to install a lowpass TVI filter (between the transmitter and the antenna tuner or transmatch).

For operation on 80, 40, 20, and 10 meters, a flattop length of about 137 feet can be used, with the feeder tapped at a point 20½ feet (15%) off center. Any convenient single-wire feedline can be used, though feeder lengths of 66 or 132 feet are suggested to minimize loading problems. If 80-meter operation isn't important, an antenna length of 68 feet can be

*317 Poplar Drive, Millbrook, Alabama 36054

No - 31 - 32



Palomar Engineers' 2-K balun is designed for inverted Vees, folded dipoles, and other antennas fed with open-wire or twinlead. The particular unit shown is a 1:1 model, but a 4:1 model is also available for use with lines in the 300-450 ohm range. Since the Windom is not a balanced antenna—despite the fact that it is fed with a balanced transmission line—the use of a balun is questionable. The balun may be used, if desired, if the system has at least 90 degrees (¼-wavelength) of balanced transmission line between the antenna feedpoint and the coaxial cable connection (balun). (Photo courtesy Palomar Engineers)

used to work on 40, 20, and 10 meters. In this case, the feeder is tapped at a point about 10 feet off center. Feeder lengths of 33, 66, or 99 feet should give good results.

Although the antenna can't be operated as a Windom on 15 meters, it can usually be fed as a random-wire worked against ground. This requires a wide-range antenna tuner that can handle the likely high input impedance at the transmitter end. Since the antenna will be working against ground, the quality of the ground system becomes critically important, and if lacking, will result in decreased antenna efficiency and increased probability of annoying "r.f. in the shack conditions." If these circumstances arise, adding or subtracting l/8-wavelength of feedline will normally stabilize the situation, although doing so may "throw out" transmitter loading or create "hot r.f." on another band.

As with other single-wire atennas, care should be taken to properly route and insulate the feedline from nearby objects, particularly metal ones in which currents may be induced. The feedline should be brought away from the flattop at right angles for as long a distance as possible before any bends are made.

Figure 1 shows classic off-center-fed Hertz or Windom construction details.

The Windom. The antenna just described, the so-called off-center-fed Hertz, is the classic Windom of 1930s and 1940s fame. But most of us probably think of the twinlead-fed flattop popular in the 50s and 60s as the contemporary version. In this antenna design, shown in fig. 2, the flattop is broken, again at a point abut 15% off-center, and fed by TV-type 300-ohm twinlead. Still not a truly balanced antenna, this kind of Windom—again with a feedpoint impedance running around 300-600 ohms—gives a decent match to twinlead, though by no means a perfect one on any band.

The feedline can be of any convenient length, though at some point a set of impedance-transforming balun coils must be used to convert to 50-75 ohm coaxial cable, or an antenna tuner employed. As indicated, it's doubtful that the 300-ohm feedline is anywhere near matched on any band, so twinlead feedline losses can run high, especially on 10 meters where matching is most critical. The system is vulnerable to parallel line currents due to the unsymmetrical feeder connection. In fact, the feeder may act more like a single-wire transmission line than a parallel-wire feeder on some bands. Nevertheless, this type of feedline is preferred over single-wire feed for a number of reasons. These include fewer problems with induced r.f., reduced potential for TVI, and less reliance on the ground system for satisfactory performance. As with the single-wire-fed antenna, the feedline should run away from the antenna at right angles as far as possible before bending, and no sharp bends should be made anywhere on the line.

Antenna dimensions are the same as with the off-center-fed Hertz version—137 feet for four-band coverage, 68 feet for three-band coverage. Again, 15-meter operation isn't a feature of the antenna. However, it may be possible to successfully operate on 15 meters, albeit with a high s.w.r., by paralleling a 15-meter *dipole* with the Windom. Since the 15-meter antenna presents a very high feedpoint impedance on all other bands, it would appear to be practically nonexistent on these bands and therefore would not much affect performance of the Windom. I haven't tried this, but can't see why it wouldn't work. I'd be interested in learning the results of any reader's experimentation along these paths.

What's the bottom line on the Windom? It's a fact that various versions of the antenna have been widely and effectively used for many years. But it's wishful thinking to expect that the nominal 300-600 ohm feedpoint impedance makes it suitable for direct coax feed at the antenna (through a balun), or that it's superior to the multiband dipole or Zepp fed with tuned feeders because of better matching to the feedline. If I had the choice between the Windom and tuned-feeder type dipole, I'd opt for the latter as a lot more hassle-free and slightly better from a technical standpoint. Nevertheless, the Windom is a good antenna to consider if the location of the shack makes off-center-feed more direct and convenient. I'd also rate the Windom higher than the Zepp for most purposes.

A Word About Transmission Lines. If the off-center-fed Hertz using single-wire feeders is fair, the twinlead version is better, and the open-wire-fed Windom is best.

We've already covered the drawbacks of single-wire feed. Twinlead allows fair matching to the antenna, but it's a lossy line. Twinlead is useful when feeding antennas with *predictable* feedpoint impedances, such as the single-band folded dipole. In this case, s.w.r. is low and line losses are not aggravated by mismatch. However, when s.w.r. is high, the solid-dielectric line becomes considerably lossier, to the point where, on 10 meters, loss becomes very nearly unacceptable. For example, inexpensive TV-type twinlead may have a loss of up to 4 dB per 100 feet at 10 meters even when perfectly matched. If this isn't bad enough, when the line is operated under conditions of 4:1 s.w.r.—possible in the Windom on certain bands at bandedges—another 1.5 dB or more loss will be in-

The most useful and versatile antenna tuners are the wide-range types that can handle a variety of loads and feed systems, and especially those that incorporate a built-in balun transformer so that antennas fed with open-wire feeders may be properly tuned to the desired frequency of operation. Swan ST-2A tuner has 200-and 2000-watt reflected and forward power meters for simultaneous reading. The unit works over the range 1.7-30 MHz, handling antenna system impedances of from 50 to 700 ohms with a 3 kw pep rating. (Photo courtesy Swan Electronics)

MORE KEYER FEATURES FOR LESS COST

AEA Invites You to Compare the AEA Keyer Features to Other Popular Keyers on the Market.

MM-1	KT-1	MT-1	CK-1	MK-1
				
MorseMatic™	Keyer Trainer	Morse Trainer	Contest Keyer	Morse Keyer

IMPORTANT KEYER AND/OR TRAINER FEATURES	AEA MM-1	AEA KT-1	AEA MT-1	AEA CK-1	AEA MK-1	COMPETITOR A	B	C	D
Speed Range (WPM)	2-99	1-99	1-99	1-99	2-99	8-50	5-50+	?	8-50
Memory Capacity (Total Characters)	500			500		400	100/400	400	
Message Partitioning	Soft			Soft		Hard	Hard	Hard	
Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Calibrated Beacon Mode	Yes			No		No	No	No	
Repeat Message Mode	Yes			No		Yes	Yes	Yes	
Front Panel Variable Monitor Frequency	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Message Resume After Paddle Interrupt	Yes			Yes		No	No	Yes	
Semi-Automatic (Bug) Mode	Yes	Yes		Yes	Yes	No	No	No	No
Real-Time Memory Loading Mode	Yes			Yes		Yes	Yes	No	
Automatic Word Space Memory Load	Yes			Yes		No	No	Yes	
Instant Start From Memory	Yes			Yes		No	No	Yes	
Message Editing	Yes			Yes		No	No	No	
Automatic Stepped Variable Speed	No	No	No	Yes	No	No	No	No	No
2 Presettable Speeds, Instant Recall	No	No	No	Yes	No	No	No	No	No
Automatic Trainer Speed Increase	Yes	Yes	Yes						No
Five Letter or Random Word Length	Yes	Yes	Yes						No
Test Mode With Answers	Yes	Yes	Yes						No
Random Practice Mode	Yes	Yes	Yes						Yes
Standard Letters, Numbers, Punctuation	Yes	Yes	Yes						Yes
All Morse Characters	Yes	Yes	Yes						No
Advertised Price	$199.95	$129.95	$99.95	$129.95	$79.95	$139.95	$ 99.50/ $139.50	$229.00	$129.95

OPTIONS:

MT-1P (portable version of MT-1) with batteries, charger, earphone	$139.95
ME-1 2000 character plug-in memory expansion for MM-1	$ 59.95
AC-1 600 Ma. 12 Volt wall adaptor for MM-1 with ME-1	$ 14.95
AC-2 350 Ma. 12 Volt wall adaptor for all AEA keyer and trainer products except MM-1 w/ ME-1	$ 9.95
DC-1 Cigarette lighter cord for all AEA keyers and trainers except MT-1P	$ 5.95
MT-1K Factory conversion of MT-1 to KT-1	$ 40.00

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

All our keyers (except the MT-1) will operate with any popular single lever or lambic squeeze paddle and will key any type of modern amateur transmitter with no external circuitry required. AEA keyers are as easy to operate as a four function calculator. The internal AEA computers are all pre-programmed for the features shown above. Each AEA product is fully RF protected and receives a complete elevated temperature burn-in and test before it is shipped from the factory.

Ask a friend how he likes his AEA keyer compared to anything else he has ever tried, then JUDGE FOR YOURSELF. See the AEA keyer and trainer family at your favorite dealer.

Advanced Electronic Applications, Inc., P.O. Box 2160, Lynnwood, WA 98036. Call 206/775-7373

AEA Brings you the Breakthrough!

CIRCLE 75 ON READER SERVICE CARD

troduced into the antenna system. Not only that, but the line is quite sensitive to weather conditions so that its characteristics change markedly when wet or when coated with dirt or dust. These problems can be partially overcome by using specially designed, high-quality cables such as heavy-duty transmitting lines or foam-filled tubular twinlead. Either type will substantially reduce signal loss and also increase the transmitter power level the line can accommodate.

A real improvement in feeding the Windom (as well as the Zepp and center-fed multiband antenna) can be had by using a parallel-conductor feeder known as **open-wire** transmission line. By using this type of line, band-to-band feedpoint variations become less of a concern. Open-wire line has mostly air as the dielectric, with plastic or other insulating spacers placed at convenient intervals to maintain wire spacing. This construction results in a very low-loss line; losses on the order of 0.1 dB per 100 feet at 10 meters when matched are typical. A high s.w.r. is relatively unimportant when using open-wire line, since the additional loss caused by the s.w.r. is negligible. Power handling capability depends on the size and spacing of the conductors used to make the line and the insulators used, but even TV-type open-wire ladder line can handle full legal power.

As mentioned in last month's column, parallel-conductor feedlines require special lightning protection, since both conductors are high above d.c. ground. A simply lightning arrestor was described. The ARRL *Antenna Book* design for an arrestor can be used, too.

For maximum flexibility and precise matching to the transmitter, the Windom should be fed through an antenna coupler, preferably one with a built-in balun coil. However, it is *possible* to feed the antenna directly with coaxial cable through a commercially available 4:1 balun transformer. Doing this assumes a constant 300 ohm antenna impedance, not likely to be the case. A 6:1 ratio balun might be a better choice if a fixed balun is to be used. This would presume a nominal 450-ohm antenna impedance when working into a 75-ohm coaxial cable. If you use a balun to feed a Windom, it's best not to mount it at the antenna but to place it back from the feedpoint at least 90 degrees (¼-wavelength) at the lowest band. Thus, an open-wire feeder of at least 66 feet would be used for an 80-meter antenna between flattop and balun coils.

Regardless of matching results, actual antenna performance will vary from band to band since radiation angle varies with the height of the antenna above ground in terms of wavelength. This is true of any horizontal antenna, including the

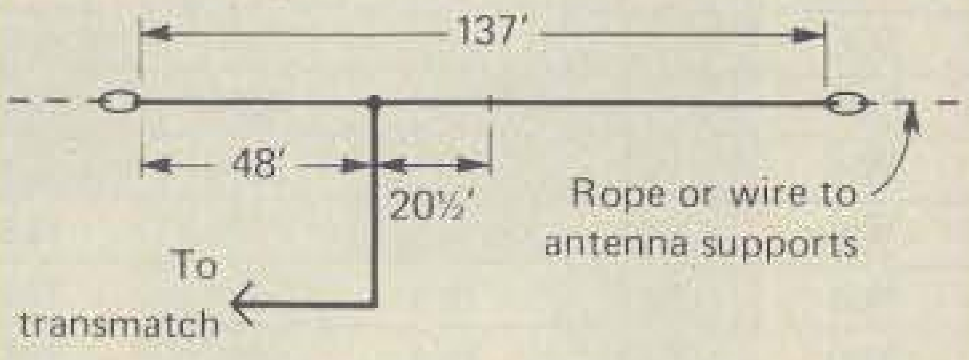


Fig. 1– The off-center-fed Hertz. (Note: The antenna and feedline are constructed of No. 12 or 14 solid wire. Common practice is to use enameled wire for flattop, insulated for leadin.)

The off-center-fed Hertz or "classic" Windom of 1930s and 1940s vintage. The singlewire antenna shown should give a good account of itself on the 80-, 40-, 20- and 10-meter bands with the dimensions listed. Note that the feedpoint is 20½ feet, or 15%, from the center of the flattop. This is equivalent to 48 feet, or 35%, from one end.

If operation on 80 meters isn't required, the horizontal span can be made 68 feet and the feeder connected at a point about 10 feet off center. In either case, any feedline length can be used, but runs of 66 or 132 feet work best with the 80-meter version, and lengths of 33, 66, or 99 feet with the 40-meter antenna.

Since the feedline radiates, bring it away from the antenna at a right angle for as long a distance as possible, carefully routing the line away from metallic objects. Employ a good earth ground system for consistent results.

Although the antenna isn't designed to cover 15 meters, you may be able to get it to load up as a simple randomwire fed against ground.

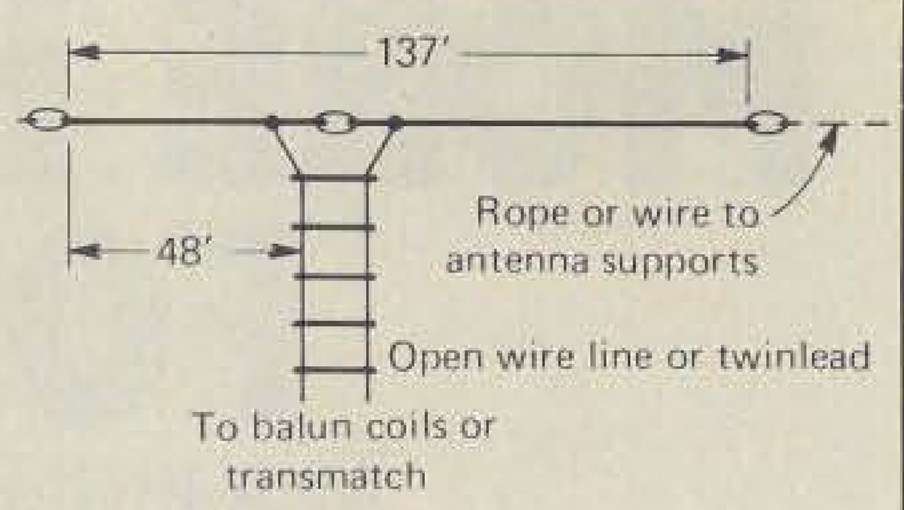


Fig. 2– The basic Windom. (Note: The antenna is constructed of No. 12 or 14 solid wire. Plain enameled is usually used.)

Pictured here is an updated version of the Windom, fed with open-wire line or twinlead. By building to the dimensions indicated, the antenna can be used on 80, 40, 20, and 10 meters with a reasonably stable feedpoint impedance. Note that the feedpoint is selected to be about 15% on one side of the center of the horizontal flattop span, or 48 feet from one end.

If 80-meter operation isn't in your plans, or if there isn't room for the full 137-foot span, a 68-foot antenna can be loaded up on 40, 20, and 10 meters with the feeder connected at the same relative point, as described in the text.

For best results, especially on 10 meters where impedance matching and loading becomes most critical, open-wire feeders should be used. Twinlead, though a popular transmission line, is a poor second choice since most types are lossy and sensitive to weather conditions, dirt and dust. Any convenient feedline length can be used. The antenna should be fed by a balanced antenna tuner or through balun coils.

Although 15 meters isn't normally covered, if you want to work that band, try *paralleling* an ordinary dipole with the Windom. Though it would operate with a fairly high s.w.r. due to the mismatch with the open-wire line, it should enable satisfactory operation on that band without affecting the basic characteristics of the Windom on the other bands.

Windom and multiband antennas described previously. On 80 meters, for example, with the antenna at relatively low heights, the Windom is a high-angle radiator favoring contacts in the several-hundred-mile range. On 40, 20, and 10 meters, the radiation angle decrease comes out about right for DX on each band.

Fig. 3 shows the relationship of wave angle to antenna height.

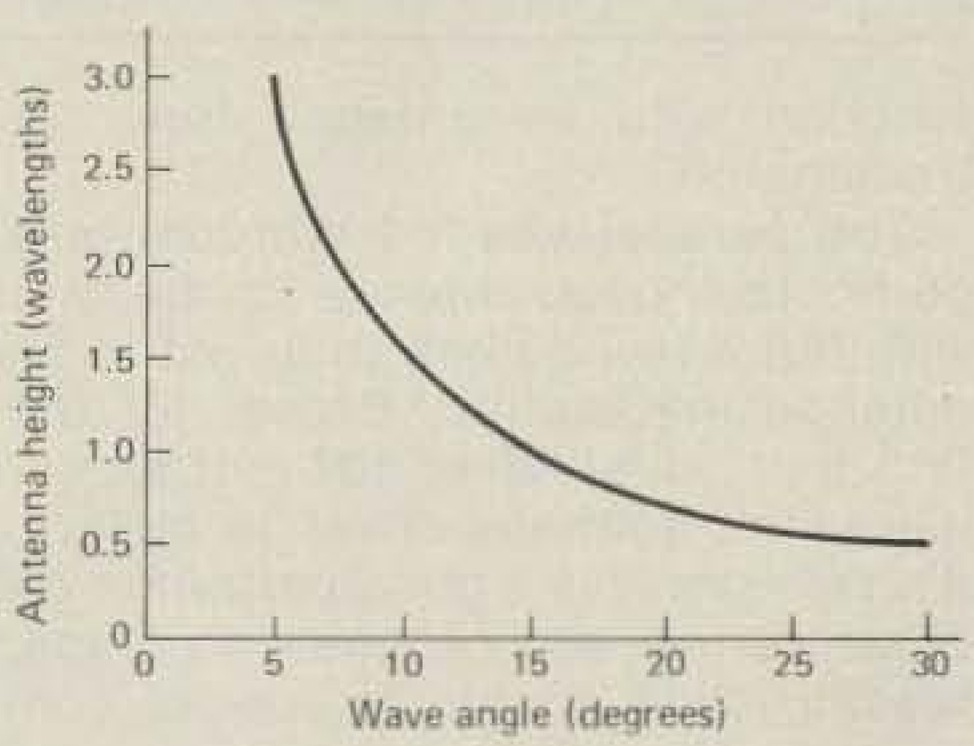


Fig. 3- Antenna height versus wave angle.

Whether we're talking about a Windom, Hertz, dipole, or Zepp, or longwire, the same concepts related to wave (radiation) angle and height-above-ground apply.

As can be seen from a glance at the graph, the greater the antenna height in terms of wavelength, the lower the radiation angle—a "plus" for effective DX work. A point to bear in mind is that while an antenna may take power and "load up" well on any and all bands, its practical performance will vary from band to band as a result of differing height-to-wavelength relationships. Directivity will also vary on different bands.

Readers' Report

In the first of the new Antenna Columns which appeared in the March 1980 issue, we defined some important antenna terms and concepts. High on the list was the *balun*, which we defined as "a device used in feeding antennas that transforms an 'unbalanced' r.f. system to a balance one, or vice-versa. Typically used to 'match' coaxial transmission line to dipole antennas. May also transform impedance."

In later columns, we suggested that a balun was a handy accessory to use in conjunction with, or to be built into, a transmatch or antenna coupler, for effectively working into open-wire transmission lines. We indicated that this capability would be useful in loading up multiband antennas, such as the center-fed dipole, Zepp or Windom, the subject of this month's column.

A puzzled reader wrote in saying that he understood that it was taboo to use a balun when an antenna coupler was in use, that the two, when used together, would somehow lead to disaster. The basis for his belief was the instruction booklet for a popular heavy-duty balun made by one of the leading U.S. antenna manufacturers. The instructions stated: "**Caution**—Do not use this balun with any matchboxes, antenna tuners, trans-matches, or other such devices. When the balun is used with such a device, out of resonance operation causes the break-down voltage of the balun to be exceeded. This is due to the extremely high standing-wave voltage present on the feedline."

This caution prompted me to read up on baluns and transmatch theory. In my view, the balun and transmatch are distinct devices, each with its own function. The use of both in the same antenna system should not have adverse effects on the other, *if properly used.*

This caveat seems to be the basis on which the manufacturer made his statement. When the balun is used to feed a resonant, unbalanced antenna system such as the simple dipole, multiband doublet, or beam, the device performs the simple function of transforming transmission line mode from the unbalanced to the balanced condition, i.e., coax to a balanced feeder or antenna. Some baluns also act as r.f. transformers, usually step-ups with a 4:1 ratio for feeding folder dipoles. The key is that the load impedance must be known precisely for the balun to work correctly and not to be subjected to high r.f. voltages which would be present during out-of-resonance operation. These conditions would likely exist if, for example, a 40-meter doublet were fed through a balun on 20 meters; if a 20-meter beam were fed using coax and a balun on 15; or if r.f. were piped through a balun for all-band use of an 80-meter dipole (okay with tuned feeders, but not with coax). This could also happen if a balun-fed Windom were used on 15 meters.

Thus, I can see nothing wrong with using the transmatch and balun in tandem, as long as the balun is husky enough to take the high voltages which may be present. Many transmatches, in fact, *do* incorporate built-in baluns, as we've said, but they are usually built to take some punishment.

Along different lines, another reader sent in a Xeroxed copy of a list of some 16 succinct "Antenna Facts," included in trap antenna promotional literature from Western Radio Electronics. The 'facts' cover a number of plain-and-simple, no-nonsense statements about s.w.r., feedlines losses, feeder radiation, operating bandwidith, loading, radiation efficiency, patterns, pruning and trimming, height above ground, baluns, and traps. Although a few of the antenna facts are oversimplified and they are of course oriented toward the company's trap antenna products, the list represents good sense. At this writing, the 16-item list is included in the literature sent out by the company in response to reader inquiries from their antenna ads. In fact, the company's trap fact sheets and antenna pamphlets represent a comprehensive short course in multiband antennas, and are well worth requesting. The address is Western Radio Electronics, P.O. Box 400, Kearney, NE 68847. We may reprint the list in a future column.

Summary

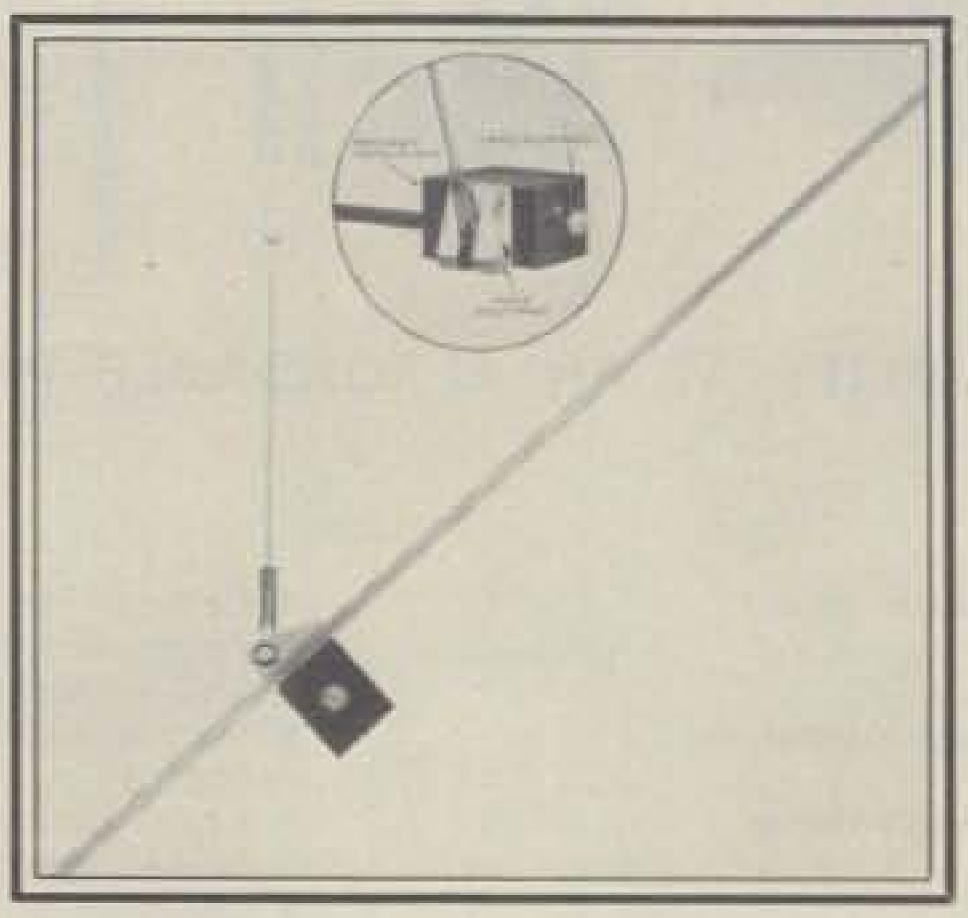
In last month's column, we covered multiband dipole antennas and Zepps using tuned feeders. In this issue, we covered related antennas— the original off-center-fed Hertz and the modern Windom. These antennas are well suited to multiband operation when properly fed and used in conjunction with an antenna tuner or transmatch.

The parallel-wire-fed Windom is a particularly good antenna for the ham with but a few dollars to invest in an antenna installation. Except for the fact that usual 68- or 137-foot antennas won't normally cover 15 meters, it's nevertheless a good performer on other bands and requires no traps, loading coils, stubs, or special connections. The Windom's been around for nearly 50 years in one form or another. Judging from its popularity, it'll likely be around for another 50.

Next month: we take a look at the much-aligned *longwire* antenna. See you then.

73, Karl, W8FX

Antenna Of The Month: Avanti Thru-Glass UHF Mobile Antennas (Model AH 450.3G 3/4 meter mobile antenna)



"Look ma—no holes" is the first thought that crossed my mind when seeing the ads for the new thru-glass mounted antennas. The Avanti series for 2-, 1¼-, and ¾-meters does represent an advance for the amateur who abhors making permanent or semipermanent attachments to his vehicle and who doesn't want any external electrical connections to corrode or weather.

Shown here is the smallest antenna of the group, the AH 450.3G, an end-fed, ½-wave radiator for ¾-meter operation. The DC grounded, shunt fed antenna is only 8 inches long and direct-mounts on the glass using a special "fail-safe" epoxy adhesive. The high-Q impedance coupling and tuning unit mounts inside the glass and is capacitively-coupled through the window to the whip outside. Since it's an end-fed design, a ground plane (normally the car body) is not required; thus, the antenna can be used on fiberglass body autos, such as the Corvette.

The patented design is claimed by Avanti to yield a gain equivalent to that of a 5/8-wave deck mounted antenna and to produce a more uniform omnidirectional pattern; a gain of 3 dB over the referenced ¾-wave whip is also stated, as is an s.w.r. at resonance of 1.1:1.

Besides ease of installation, the antenna does offer some real side benefits. All electrical connections are within the vehicle, so service life should be long. There will be little progressive coaxial cable deterioration caused by corrosion or water seepage. And since no ground plane is needed, the antenna system can be used in marine or base station applications.

The contour mount and 180-degree tilt-angle adjustable whip holder are triple chrome plated. Weight is 14 oz. w/cable.

Bibliography

Source material and an extended discussion of the antenna topics covered can be found in the references listed below. These, of course, are in addition to the standard reference texts, such as the ARRL's *Antenna Book* and *Radio Amateur's Handbook*, and Bill Orr's *Radio Handbook*, which are available from the CQ Book Shop.

1. Drumeller, Carl C., W5JJ. "Antennas for CBers & Hams," in two parts, *Popular Electronics*, September and October 1973.
2. Marriner, Edmund H., W6BLZ. "How to Construct a Multi-Band Antenna," *CQ Magazine*, March 1954.
3. McCoy, Lewis G., W1ICP. "Choosing a Transmission Line," in two parts, *QST*, December 1959 and February 1960.
4. McCoy, Lewis G., W1ICP. "How to Protect Your Station from Lightning," *QST*, December 1962.
5. Noll, Edward M., W3FQJ. *Ham and CB Antenna Dimension Charts*. Indianapolis: Editors and Engineers, 1976.
6. Schoening, Robert W., W0TKX. "Common Sense Antenna Design," *CQ Magazine*, December 1954.
7. Staff article, "Multiband Antennas—How Not to be Trapped." *73 Magazine*, March 1975.
8. Stanley, J.A. *Ham Antenna Construction Projects*. Indianapolis: Howard W. Sams & Co., Inc., 1969.
9. Stocking, William R., W0VM. "Tuned Feeders and Other Good Stuff," *73 Magazine*, December 1978.
10. Stoner, Donald L., W6TNS. Novice column in *CQ Magazine*, April 1959.

CUBIC'S ALL BAND ASTRO-103

A new name, a new look, and a new standard of performance in ham radio!

(and you don't have to be a computer expert to use it!)

- ALL BANDS INSTALLED AND OPERATING! 160 thru 10 including WARC bands
- DUAL ultra stable PTO's
- Fast break-in (QSK)
- RTTY VOX
- Jack for separate receive antenna
- Fully variable AGC decay
- Dual 8-pole filters. 1.4:1 shape factor −6 to −100dB
- True Passband Tuning with width and position indicators
- Built-in VSWR meter
- CW output pulse shaping — hard or soft
- Sophisticated Noise Blanker
- Speech Processor
- Exceptional Dynamics Noise Floor −132dBm 3rd order intercept +15dBm
- RF/IF Gain Controls
- Optional CW Narrow Crystal Filter.

ASTRO-103 — The Professional Ham Rig.

The Cubic ASTRO-103 expands on the highly acclaimed ASTRO-102BXA with the addition of the most asked for features — RTTY, an input connector for a separate receive antenna, and of course, ALL BAND coverage from 160 through 10 meters, including the new bands at 10, 18, and 24.5 MHz. All bands are operating *now*, nothing to buy later, and of course WWV is covered.

With the optional 400Hz crystal filter installed, which cascades with one of the 8-pole I.F. filters and can be moved through the passband, along with QSK provisions, the ASTRO-103 is the CW operator's dream!

Performance under high cross mod conditions found in todays' crowded bands is second to none. With dual independent high stability PTO's for split band DX and all its other features, the ASTRO-103 is the result of American Technology and American Quality combined to bring the best to the American Amateur.

See your dealer for a demonstration — you won't leave the store without one!

CUBIC — Success Built on Excellence

Cubic Corporation with over 3,500 employees world-wide, including more than 1200 scientists, engineers and technicians, has more than one million square feet under roof.

Established in 1951 the company has grown and expanded in high technology fields, including computer based automatic fare collection systems, electronic countermeasures, supersonic pilot training and other defense and space systems, electronic positioning devices and, of course, communications. New Cubic Amateur products reflect this heritage of excellence and is your assurance of the strength and resources to support your purchase in the years to come.

CIRCLE 77 ON READER SERVICE CARD

ASTRO-150A

Another member of the ASTRO family, the ASTRO-150, has been highly acclaimed as the ideal Mobile/Base station. With microprocessor control, VRS tuning and microphone scanning, the ASTRO-150A led the way for competitive radios now appearing on the market.

ASTRO-102BXA

The ASTRO-102BXA provides basically all the fine performance of the ASTRO-103 at a lower cost, but less the WARC bands, which of course may be added later if desired.

CUBIC COMMUNICATIONS, INC.

305 Airport Road, Oceanside, CA 92054

(714) 757-7525

It is said that rules and regulations are for the guidance of fools to be broken only by wise men, but somehow I do not agree with this, so I'll tell you my story.

I have been dubbed eccentric by my fellow amateurs here in Zimbabwe, but I do not think I'm eccentric—only a very avid amateur who likes good results from either the base station (308 countries worked) or mobile (108 countries worked). With this in mind, the development of my "horical" antenna came about.

In 1972, I installed a Heath HW-101 in my car along with a Webster Bandspanner antenna that gave me pretty good results. However, I was never really happy with this set-up and the adjustments that had to be made for a continual low s.w.r. One weekend I drove over to see Tom, ZE6JC. We talked over a cup of tea and Tom showed me a ¼ wave whip for 28,560 MHz he wanted me to try out. I fitted the monoband whip on the car, tuned up, and found a v.s.w.r. of 2.5 to 1. Tom made an adjustment to the top slide portion of the whip (no loading coil) and we brought the s.w.r. down to 1.3 to 1. I decided to move off and try it out under actual conditions. My first CQ pulled in an EA8 who gave me a 5 and 8.

That evening after a lot of reading and calculations, I decided to make another whip antenna. This one was to be 5/16 of a wave long, and also with an adjustable slide portion. The whip when completed turned out to be around 18 ohms, which necessitated the use of a Palomar impedance transformer. After a few more bridge measurements and a final check with the noise bridge, I came up with a s.w.r. of 1.15 to 1 and felt this was pretty good. This antenna gave me very good results and many new countries, all made while driving at about 50 m.p.h.

One evening while I was relaxing with *CQ* magazine and a long cool glass of orange juice, I got to thinking about a 15 meter whip, and came up with the idea of using the existing 10 meter whip with a further extension to put it on 15. This was one a Wednesday, and after many calculations and ideas on frequency, I came up with an extension that would put the 10 meter section onto the 15 meter section with a coupler. The extension was made using standard 3/8 diameter, 24 turns per inch bronze bolts to connect the 10 meter whip to the extension. After the normal check-out, I came up with a 22 ohm antenna and so I used the impedance transformer again to achieve a 1.15 s.w.r. The noise bridge picked up the final tune-point with a small slide adjustment.

By this time ZE6JC had come up with a monoband 20 meter whip about 17 feet long. This was installed on my car with as far as I could judge a 2.5 to 1 s.w.r. On a short run I got a 5 and 7 signal report from a ZS2 station and checked for possible directional properties. As I went through 45, 90 and 180 degree turns we found that the whip did indeed have directional properties probably due to the capacity of the car itself. More importantly I couldn't drive over 20 m.p.h. as the whip tended to

The "horical" antenna mounted and ready to go on ZE6JL's car.

*P.O. Box 605, Gwelo, Zimbabwe, Africa

ZE6JL/M comes up with a horizontal vertical which he calls a "Horical" antenna. He's managed to work over 108 countries from the mobile and has gotten some pretty good results using this unconventional approach.

The "Horical"

A 10, 15, And 20 Meter Mobile Antenna

BY GERRY S. TYNAN-BLUNDUN*, ZE3JL

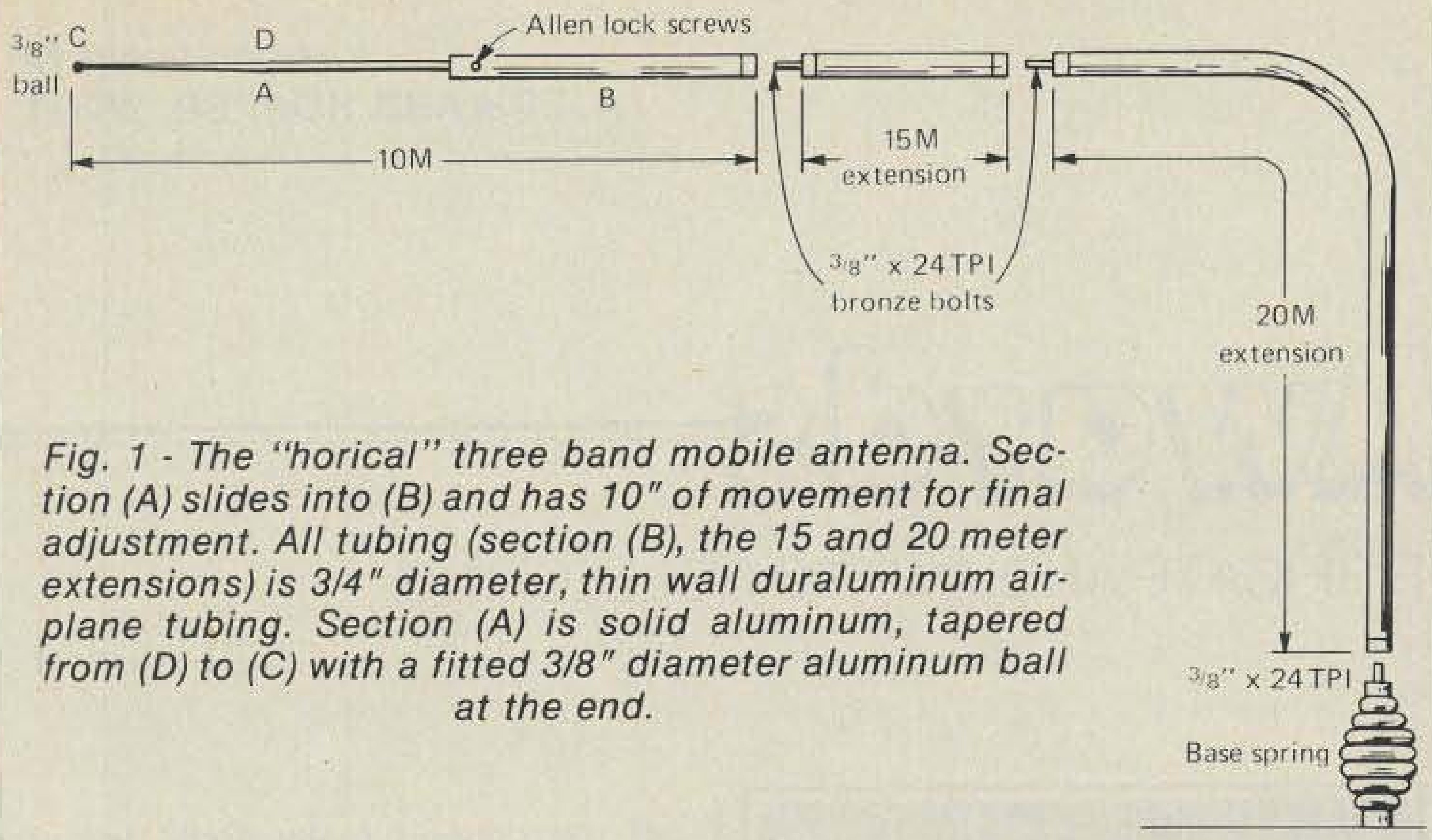


Fig. 1 - The "horical" three band mobile antenna. Section (A) slides into (B) and has 10" of movement for final adjustment. All tubing (section (B), the 15 and 20 meter extensions) is 3/4" diameter, thin wall duraluminum airplane tubing. Section (A) is solid aluminum, tapered from (D) to (C) with a fitted 3/8" diameter aluminum ball at the end.

lean back too far, causing the tuning to change. That evening I got to thinking about a sturdy lower extension to put the existing 10-15 meter whip onto 20 meters.

Here is where the regulations come in that I mentioned earlier. This new antenna would exceed the legal height limitations by two feet. As I said, rules and regulations are for guidance, so trying to be a good citizen I phoned the local police station and asked for a road permit to allow me to use this very tall antenna. This caused a problem in that they had never issued such a permit and cautiously advised that I just use it with care and try to avoid overhead wires. That didn't sit too well with me and so it was back to the drawing boards.

I decided to make a 5/16 wave 20 meter whip and make it in such a manner that I could travel on any road without breaking the law. The solution was simple, fold the antenna. As you can see in the photo, a small steel mast is bolted to the car roof on the passenger side (it's a right hand drive). I used a good ceramic insulator on top plus a strong plated steel spring clip to hold the whip in position. The Palomar transformer was again pressed into service to raise the antenna's 11 ohm impedance and lower the s.w.r. to 1.25 to 1.

Since putting the "horical" on the car I have had some fantastic reports and pile-ups on 20 meters . . . all rolling. By the way in closing, the formula is 292.5 over frequency in MHz, no loading coils, just a slide portion to bring it on frequency, and an impedance matching transformer.

The author seated in the cockpit. The black box houses the impedance matching transformer, spare parts, speaker, and key. The HW-101 has a power meter/s.w.r. bridge on top of it. Up on the dash is an altimeter (we are nearly 5000 feet above sea level). A volt and amp meter to the right measure my power drain.

a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

Nineteen-eighty-one starts off with the "Story of The Month" as told by Ben:

Benjamin J. Harte, Jr., WA3QVJ All Counties #255 *11-13-79*

"I was born on November 8, 1942, in Salisbury, Maryland, the heart of the Delmarva Peninsula. At the age of five, my family moved to Delmar, MD, just seven miles north of Salisbury, and I remained there until my marriage in 1966.

"When I was small I used to look forward to listening to the radio programs that came on around supper time—such programs as "Sergeant Preston of the Yukon," "Sky King," "The Shadow," etc. I really enjoyed those programs, but I also enjoyed another feature of that old radio, and that was its ability to receive shortwave and longwave. This is what started me on the road to becoming a ham.

"Before I go further, let me explain something unique about the town I lived in, Delmar. Half of the town is located in the state of Delaware, and the other half is located in the state of Maryland. The elementary school is located in the Maryland half, and the high school is located in Delaware half of town. The state line was directly in front of our house, the street being called "State Street" for obvious reasons. I used to cross the state line (State Street) every day to go to high school in Delaware. To this day there are signs on the edge of town proclaiming Delmar as "The Town Too Big To Be In One State." Confusing, isn't it?

"Well, back to the topic at hand. When I was in high school, I purchased a regenerative receiver radio from Allied Radio Corp called the "Span Master," and after putting up a long wire antenna, I became an SWL. The Span Master had a coverage of .54 to 30 MHz and did a fairly good job for me except for the loud squeals I encountered in trying to tune in signals. I managed to build up a modest collection of QSL cards from the foreign broadcast stations I heard, and to this day I still have those QSL cards and the Span Master. In fact, I recently hooked up the Span Master again and nothing has changed with its reception, including the loud squeals.

Ben, WA3QVJ and Kathy. Equipment L to R includes Heath SB610, Millen Transmatch, Drake RO4B Rx, Drake Wattmeter, Drake T-4XB Xmtr, Heath SB200 Linear, Drake WV-4 Wattmeter & Kenwood TR-7200A 2 meter f.m. transceiver.

"I graduated from Delmar High School in June of 1961 and then attended college at the University of Maryland at College Park, Maryland. I joined the Maryland Army National Guard in January 1964 and shortly thereafter was sent away for basic training at Fort Gordon, Georgia. After basic training I was trained as a radio operator at Fort Jackson, S. Carolina. This training included one thing needed by all radio amateurs—code or c.w. I had tried to learn the code when I was younger and in the Boy Scouts, but it didn't work out. Now, courtesy of Uncle Sam, I finally got the code. Boy, did I get the code! I really could tell you tales of learning the code via the Army; it's quite a unique experience.

"Upon my return home, I entered Salisbury State College in Salisbury, Maryland. It was here that I met my future XYL, Sharon. In January 1966 I left college to work for The Chesapeake and Potomac Telephone Company of Maryland in Salisbury. In September of the same year I made Sharon my wife, and we moved to our present QTH.

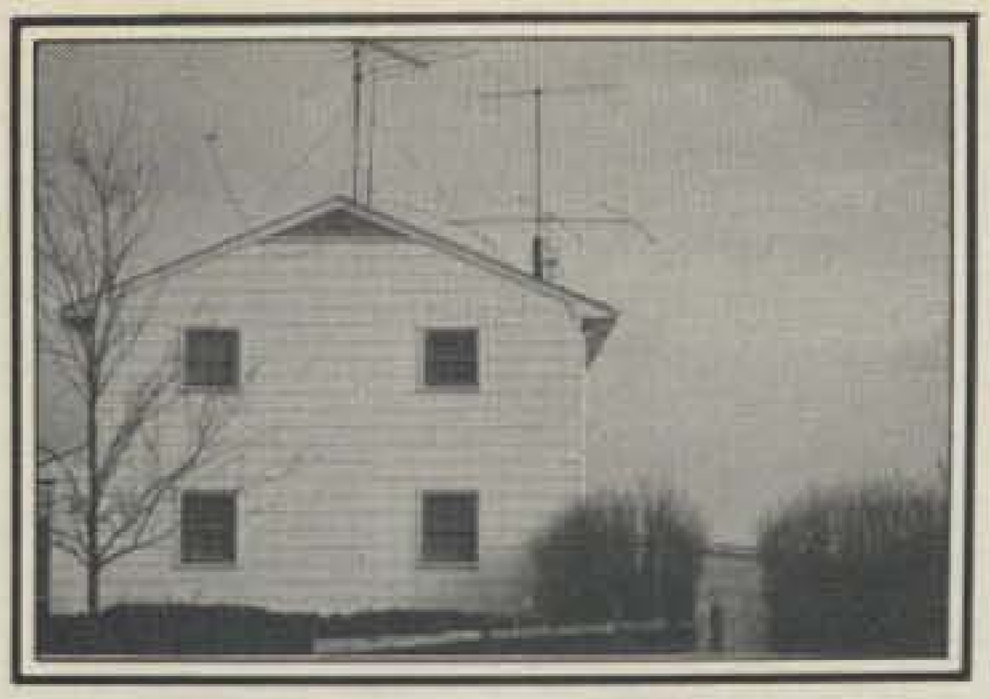
"Around 1970 I met Clay Spurrier, K3CNH, and Harry Thielemann, WA3NHW, through my wife, who was employed at a local radio/television station, WBOC. Clay and Harry tutored me and I got my Novice ticket in the spring of 1971. I then purchased the Heath HR-10 receiver and the Heath DX-60B transmitter along with a Dow Key and some assorted plug-in crystals and hooked it all up. On May 6, 1971, I had my first QSO ever with WN3PAV; I now have that QSL card framed and on the shack wall.

"In January 1972 I got my General Ticket and also a Heath SB-102 Transceiver, and I spent most of the winter putting it together and testing it. In April 1973 I got my Advanced Ticket (which I still hold), and during that summer I completed my WAS Award. On April 2, 1974, the stork delivered a little bundle of joy to our home—our daughter Katherine. Things haven't been quiet since her arrival.

"During the Bicentennial year, 1976, I became fairly active and got several Bicentennial Awards including the ARRL Bicentennial WAS Award #147, the ARRL Bicentennial Celebration Award July 24-25 (with 200 QSOs and All 50 States stickers), and the Bicentennial WAS Net Award (on 3905). They look real neat on the shack wall.

"It was about this time that I met K3YAY, Dave, and he introduced me to County Hunting. I met Dave via our local 2 meter repeater (WR3ABS 146.22-82), and shortly I went by his

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



WA3QVJ antennas: TV antenna, Ringo Ranger 2 meter, Cushcraft 2 meter beam, TA-33, also 40 meter inverted vee and 80 meter dipole.

shack to visit. He showed me his "coloring book" and his MRCs. Then he took me over to the wall of his shack upon which hung numerous Awards including USA-CA with a sticker or two upon it. That was all it took—I was hooked! I made my first contact in Franklin County, Virginia with W4LXB/M4 on March 15, 1977, and about two years and 7½ months later I made my last contact, #3075, in Jefferson County Washington with WA7PHD/M7 on November 3, 1979. This effort also filled 120 log book pages in four log books. During that period, I monitored the County Hunters' Nets all the time. Whenever I was outside working (when practical), I would have an extension speaker with me. I beat many a path from the speaker to the rig to grab a needed County. I also came in contact with a whole bunch of nice folks during that period, folks who added to the enjoyment of County Hunting. I am happy and proud to know them and possess All Counties #255.

"Where do I go from here? Well, I'm not sure, to be truthful, but I would like to get my DXCC Award to begin with. At present I search for DX up and down the bands, primarily on 10 and 15. I hope I am able to confirm my DX contacts as well as I was able to do while County Hunting; it will be hard to top, though, as my confirmation rate was quite close to about 100%—a tribute to all the stations whether fixed or mobile that gave out their counties, and a tribute to W6CCM's bureau and all the efforts of Dave and Barbara.

"Oh yes, I should mention the fact that the stork found our house again, and after safely clearing all my antennas, left us another bundle of joy—a little girl who we named Marcella Denise (January 22, 1980, 7 lbs. 10½ oz). She has turned the household upside down and sleep during the night is a premium item and hard to get. Crawling out of bed to get the baby a bottle reminds me of the time or two a "one ringer" caused me to crawl out of the sack to get one of those Counties

Special Honor Roll
All Counties

#301 Elmer H. Irwin, WA3ZMY 9-26-80.
#302 Robert Thorne, K9DAF 9-29-80.

badly needed "for the whole ball of wax."

"Again I want to thank everyone who made it all possible. The Award is a prized possession for the shack wall and has many pleasant memories associated with it. Be seeing you all down the log!"

Awards Issued

Bill Irwin, WA3ZMY caught up with his paper work and acquired USA-CA-1000 through 2500 endorsed All S.S.B., All Mobiles, All 20; and USA-CA-3000 and All Counties endorsed Mixed.

Bob Thorne, K9DAF submitted proof to gain USA-CA-3000 and All Counties endorsed Mixed.

Marge Moore, WA5ZDZ untangled her records to receive USA-CA-2500 and 3000 endorsed All S.S.B.

Russell Fish, W7KWI applied for USA-CA-3000 endorsed All S.S.B.

Lars Bohm, SM5CAK won USA-CA-1500 endorsed Mixed.

Karel Hercik, OK1TA got USA-CA-1000 endorsed Mixed, #1 to OK.

Boo Atterflod, SM5HPB gained USA-CA-500 and 1000 endorsed All S.S.B. (I tried, by error, to make his call SM5HPD).

Antonin Blaha, OK1APV claimed USA-CA-500 and 1000 endorsed All A-1. He got #2 USA-CA-1000 to OK.

Rudi Hammer, DL7AA (an ole timer) picked up USA-CA-500 endorsed All A-1 and USA-CA-1000 endorsed Mixed.

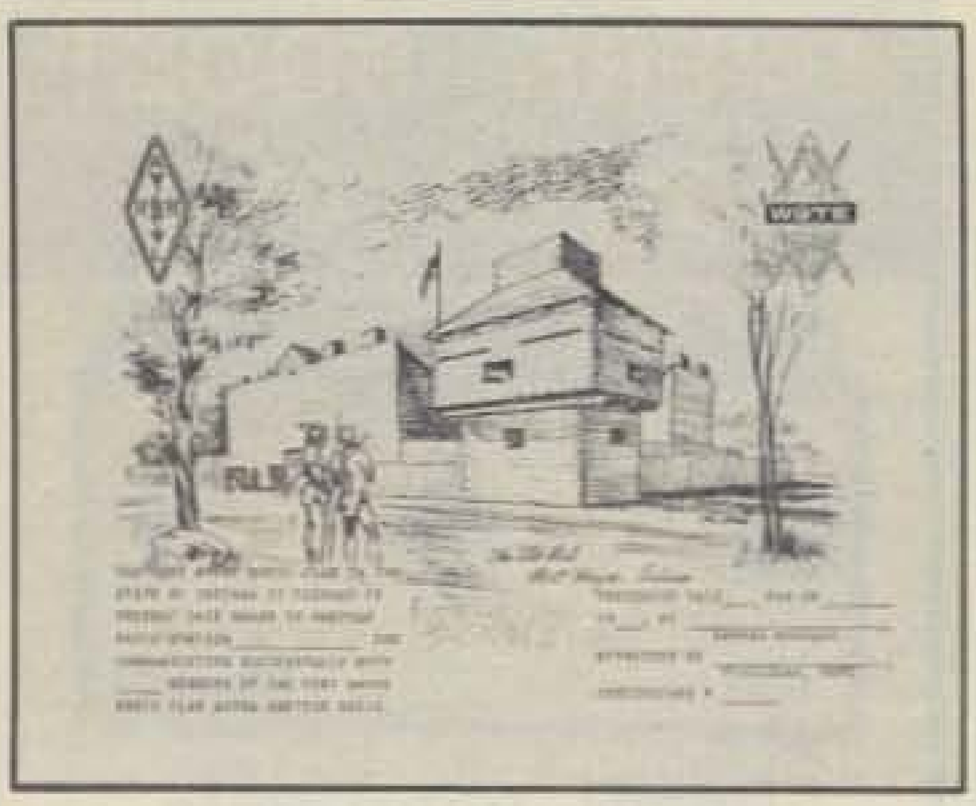
USA-CA-1000 Certificates endorsed Mixed went to:

- John Hallenberg, SMØDJZ.
- John Woodham, G4IJW.
- The Radio Club of Lithuania, UK2BAS—#4 Award to USSR and #1 to Lithuania.
- Solo Yoneyama, JA1SJV who visited me about 7 years ago.
- Karl Fukuchi, JH2CJW.
- Tom Rosebush, VE3KZE.
- Nelson Hayward, WB1CRR.
- Makoto Okawara, JA1SXH.

Lawrie McIntyre, GM3HMU picked up USA-CA-500 endorsed All S.S.B., #5 to GM.

USA-CA Honor Roll

3000	
WA5ZDZ	324
W7KWI	325
WA3ZMY	326
K9DAF	327
2500	
WA5ZDZ	385
WA3ZMY	386
2000	
WA3ZMY	441
1500	
SM5CAK	498
WA3ZMY	499
1000	
OK1TA	621
SM5HPB	622
OK1APV	623
DL7AA	624
WA3ZMY	625
500	
SMØDJZ	1511
G4IJW	1512
UK2BAS	1513
GM3HMU	1514
SM5HPB	1515
JA1SJV	1516
OK1APV	1517
JH2CJW	1518
VE3KZE	1519
WB1CRR	1520
DL7AA	1521
KA2DLK	1522
JA1SXH	1523



Worked Fort Wayne Radio Club Award.

Earl Turner, KA2DLK was issued USA-CA-500 endorsed All A-1, All Novice bands.

Awards

Canceled Awards: Per letter received from Art, W2HAE and by authority of Jack, W4NOK, who was the Custodian, the following Awards are cancelled, as the club which sponsored them has been disbanded: *Sun City Award* (St. Petersburg, Florida); *Worked All Florida Counties; Worked Florida Cities;* and *The Dawn Patrol Award* (A 6m & up VHF Award). Although the Daytona Radio Club of Florida is going to sponsor an *All Florida Counties Award,* no details have been received.

New Hampshire All Counties Award: Sponsored by the Concord Brass-pounders, Inc. The ten Counties of New Hampshire are Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford and Sullivan. Send full data on your QSOs including date, time, frequency, mode, call of stations contacted, and county. Send this data and an s.a.s.e. to: Basil Cutting, W1JB, RFD, Suncook, New Hampshire 03275.

Worked Fort Wayne Radio Club: Sponsored by The Fort Wayne Radio Club, Fort Wayne, Indiana, which was established in 1920. Requirements are: DX Stations need to contact 5 club members; U.S. Stations need to contact 10 club members. Local stations (Allen Co. or Local Members) need 25 contacts. Actually, the rules read 5, 10, 25 contacts with club members (apparently not necessarily different members). Any frequency, any mode and *all* contacts after January 1, 1979 count. Cost: DX free via surface mail or 2 IRCs for air mail. USA: $1.00. Send a list (certified by two other amateurs or an officer of your local radio club) including the QSO data, call, name, date worked, time in GMT (Zulu or UTC) and band. Send to: Fort Wayne Radio Club, P. O. Box 15127, Fort Wayne, Indiana 46885.

Certificate Of Recognition: Sponsored by the Southern California DX Club, Inc. and available to amateurs throughout the world for working club members. Requirements: Work and confirm contacts with 35 current members of the Southern California DX Club on any frequency from 1.8 to 30 MHz. This will qualify for the Basic Award Certificate. Seals—bronze for 75 contacts, silver for 100 contacts and gold for 125 contacts—will also be available. QSL cards not required. Verification by Awards Chairman of ARRL or IARU Clubs will be accepted. All contacts must be made after 1 January 1980. Send list of contacts with

Southern California DX Club Award.

verification and 10 IRCs or $2.00 US to: Norm Friedman, W6ORD, Co-Chairman of Awards Committee, 5400 Lindley Ave., #312, Encino, CA 91316. Current membership list available on request for s.a.s.e. or s.a.e. & 2 IRCs.

Worked All Gozo Award (W.A.G.): Open to all radio amateurs and SWLs with no band or mode restrictions. Only contacts on or after 1 August 1972 are valid. Europeans must work and confirm eight (8) different Gozo Island (9H4) stations. DX stations must work and confirm five (5) different Gozo Island (9H4) stations. Applications with complete log data certified as correct by two other amateurs plus 12 IRCs or U.S. $3.00 or equivalent international currency are to be sent to: Mr. Joe Cauchi, 9H4AL, 20 P.P. Hill St., Victoria, GOZO, Malta, Europe. Issued free to blind/handicapped operators. They reserve the right to request any confirmation.

Notes

A happy and prosperous New Year to all!!!!! I hope your New Years' Resolutions will include a promise NOT to use phone patches, repeaters or satellites for USA-CA contacts nor *wet* County Lines. Also hope you will promise to QSL 100%.

On the start of my 17th year with CQ, I wish to thank *all* for your help and cooperation. How was your month, year?

73, Ed, W2GT

CQ DX Tip

—Your own call should be no more than one character from the very end of a CQ on c.w., and one word on phone—"K" or "listening". The often heard—"calling CQ-DX the 20 meter band for Asia and listening; what say somebody please, diddledy de daw de daw, daw de daw" sounds just as silly over the air. All it is is QRM. —*W4MB*

The 2K Classic represents the culmination of fifteen years experience in developing, manufacturing and improving the 2K series. It remains as always a "workhorse", engineered and built to loaf along at full legal power for days or weeks without rest. A look inside shows why! No expense has been spared to make the 2K a truly "Classic" Amateur amplifier. Heavy duty, top quality components along with its rugged construction assures you of trouble free operation. The 2K Classic offers engineering and features second to none. It will put your signal on the air with greater strength and clarity than you ever dreamed possible. The 2K Classic operates on all amateur bands, 80 through 15 meters (export models include 10 meters).

Features:

- Two rugged Eimac 3-500Z grounded grid triodes
- Pi-L plate circuit with silver plated tank coil
- Resonant cathode pi input circuit
- Maximum legal input on all modes
- Price: $1195.00

***The* 1KD-5** ...Another fine member of the famous Henry Radio family of superior amplifiers. And we're still convinced that it's the world's finest linear in its class. The 1KD-5 was designed for the amateur who wants the quality and dependability of the 2KD-5 and 2K-4, who may prefer the smaller size, lighter weight and lower price and who will settle for a little less power. But make no mistake, the 1KD-5 is no slouch. Its 1200 watt PEP input (700 watt PEP nominal output) along with its superb operating characteristics will still punch out clean powerful signals...signals you'll be proud of. Compare its specifications, its features and its fine components and we're sure you will agree that the 1KD-5 is a superb value at only $695.

***The* 2KD-5** We have been suggesting that you look inside any amplifier before you buy it. We hope that you will. If you "lift the lid" on a 2KD-5 you will see only the highest quality, heavy duty components and careful workmanship...attributes that promise a long life of continous operation in any mode at full legal power. The 2KD-5 is a 2000 watt PEP input (1200 watt PEP nominal output) RF linear amplifier, covering the 80, 40, 20, and 15 meter amateur bands. It operates with two Eimac 3-500Z glass envelope triodes and a Pi-L plate circuit with a rotary silver plated tank coil. Price $945.

And don't forget the rest of the Henry family of amateur amplifiers...the Tempo 2002 high power VHF amplifier and the broad line of top quality solid state amplifiers. Henry Radio also offers the 3K-A and 4K-Ultra superb high power H.F. amplifiers and a broad line of commercial FCC type accepted amplifiers for two way FM communications covering the range to 500 MHz.

★ ★

Announcing!

A brand new "super" linear...the 3K Classic! Designed for the most critical Amateur Radio operator...the individual who wants and appreciates owning the finest. Available in spring 1981.

F.C.C. approval pending

★ ★

53 YEARS OF SERVICE

Please note, as of Dec. 1, 1980 we will occupy our new world headquarters building with a new Los Angeles address and phone number.

2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820-1234
931 N. Euclid, Anaheim, CA 92801 (714) 772-9200
Butler, Missouri 64730 (816) 679-3127

Henry Radio

Prices subject to change without notice

TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.

CIRCLE 31 ON READER SERVICE CARD

Here is a simple, easy to build, ubiquitous charger for your nicads.

The HT Nicader

BY WALT BECKER*, K1QPS

It seems that I have a house full of nicad batteries. They are in calculators, or shavers, or flashlights, or tape recorders. But the ones that always need charging seem to be in my handy talkies. They are either dead, being charged, or need only five more hours when I want to sleep ten hours.

Each gadget has its own charger and its own habits. The dedicated type automatic charger similar to the ST 1 that Kenwood sells for the TR 2400 solves some of these problems. Unfortunately, this type of device is expensive and will work properly only with its own proprietary appliance.

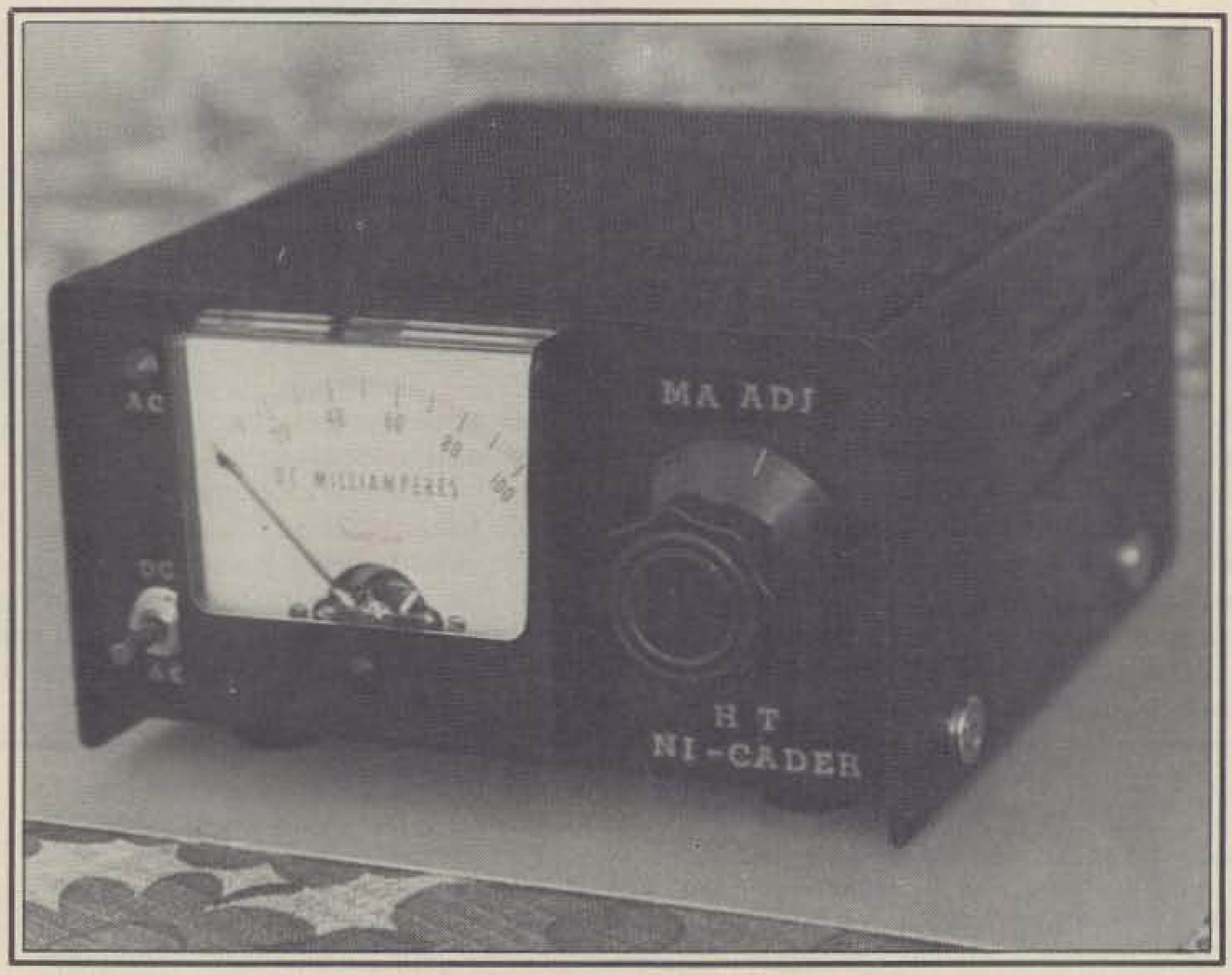
The HT Nicader described here is versatile and easy to build using junk box or inexpensive and readily obtainable parts.

The Nicader will allow checking the normal current delivered by wall-type chargers or mobile supplies. It will charge from the a.c. line, by either the constant voltage or constant current method, with a fully adjustable output. It will allow a trickle charge, or a slower than normal charge, preventing a damaging overcharge if you wish to charge while absent or sleeping.

Battery voltage can be monitored via two built-in jacks and any voltmeter you may happen to have, but this will seldom be necessary once you become accustomed to your battery's habits. You will note that you can obtain easy monitoring or adjustment while using a charger in your auto; this is especially convenient if you wish to build your own mobile charger.

The Nicader is built around the common LM 317 voltage regulator and mounted on perfboard. I used a 300 ma 12.6 v. transformer, adequate for my Tempo S1 and Kenwood TR 2400 HTs, but the LM 317 is capable of operation at 40 v. and 1.5 A, so a 25 volt transformer and a milliammeter with a higher scale are viable options for other uses, such as grass clippers, mixers, etc.

*Box 201, New Castle, N.H. 03854



The front view of the HT Nicader charger. The a.c. indicator is at the upper left; a.c./d.c. switch is on the lower left. A voltmeter can be connected through jacks on the back panel.

Construction is straightforward and the layout is not critical, but be sure to ground the transformer frame or case to prevent r.f. interference if the transmitter is used while charging.

A patch cord with one end fitted for insertion in J2 and the other end adapted for your HT or appliance is easily made.

When you are ready to check it out, plug in a voltmeter and a wall-type supply. Set the center off-type toggle switch to the d.c. position and observe the output for voltage and polarity. Make sure the plug for your radio is polarized correctly and connect the patch cord to the radio. Now you can observe the current drawn using the wall charger and also the battery voltage.

Turn the switch off and unplug the input and output. Now turn the control fully counterclockwise. Plug in the a.c. cord and throw the switch to the a.c. position. The LED should light. You should have smooth control of the voltage using R1, to about the peak value. Back off the control, plug in your HT and again advance the control to the current you require.

Note that the current will peak at about 50 ma. Advancing R1 all the way clockwise will not result in a higher current reading, but full advancement will result in a modified pulse-type constant-current mode, duplicating most wall-type charger operation.

You may set the control to allow, for instance, half current operation for double the time normally required, or set it for about 3 ma or so, resulting in a trickle charge, to maintain a fully charged battery. This is very useful with a rig like the FT 207A, which uses appreciable memory current even while turned off.

Decal lettering on the panel will complete the construction.

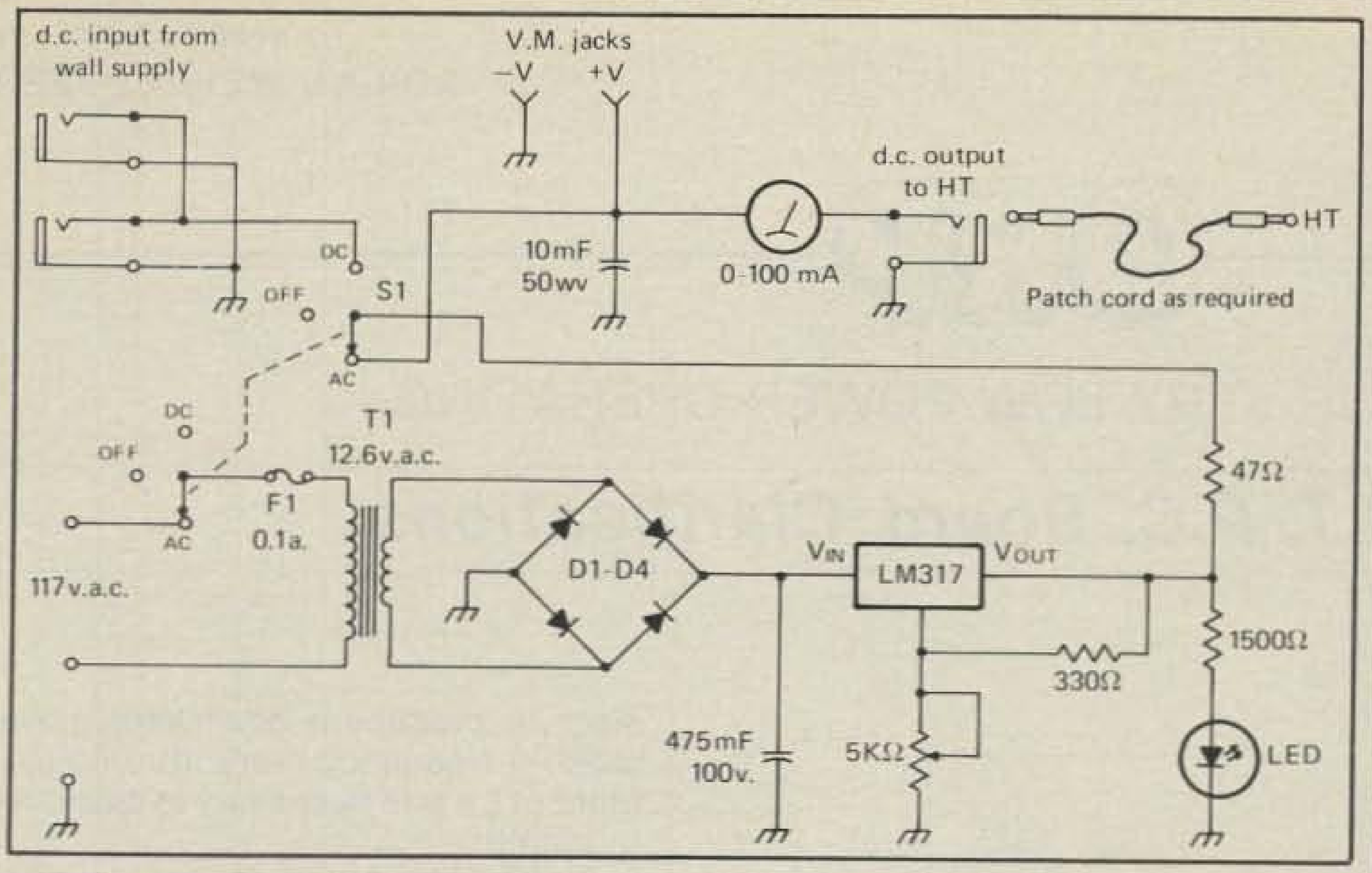
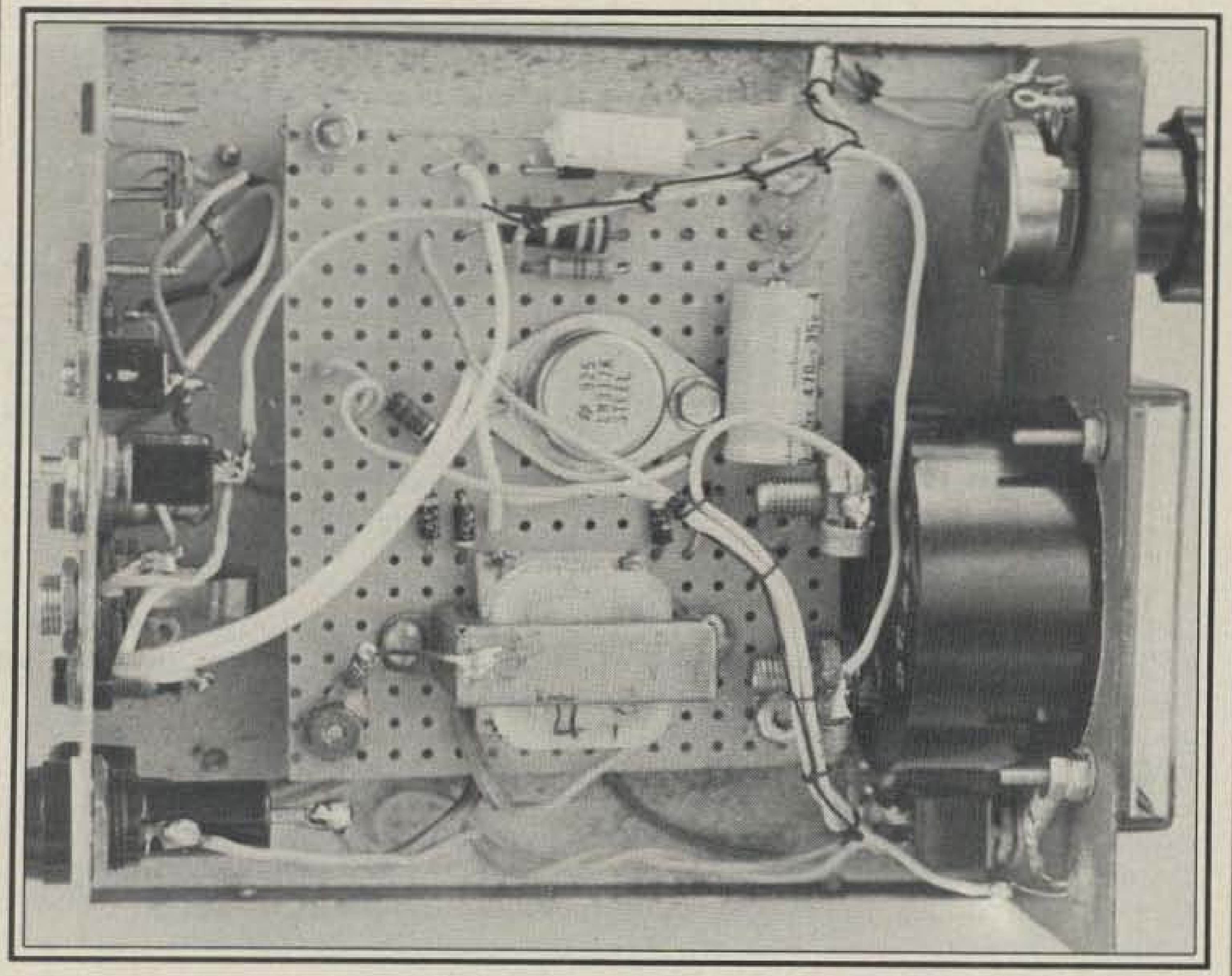


Fig. 1- The HT Nicader circuit. It is made from readily available parts.



Interior view of the Nicader charger showing the simple perfboard construction.

Parts List

(Part numbers are Radio Shack)

C1—470 mf 35 wv.	272-1018
C2—10 mf 50 wv.	272-1013
D1-4—100 piv full wave rect.	276-1171
F1—.1 A fuse	
J1—Jack as req. (274-297 for Tempo S1) (274-1549 for TR 2400) *Note:* must be insulated from chassis. Frame is +.	
J2—Audio type jack	274-340
J3, J4—Jacks as req. for your voltmeter	
LED—Indicator (red)	276-033
LM 317—Regulator	276-1777
M1—Meter 0-100 ma	
R1—5000 ohm linear pot	271-1714
R2—1500 ohm ½ w.	
R3—330 ohm ½ w.	
R4—47 ohm ½ w.	
S1—D.P.D.T. center off toggle switch	275-1545
T1—Power transformer 12.6 v. 300 ma	273-1385
Patch cord plug, 274-1536. Other end to suit radio. (TR 2400, 274-1551. S1 274-286.) (FT-207A 274-290. etc.)	
1 pc zip cord.	
Cabinet	270-253

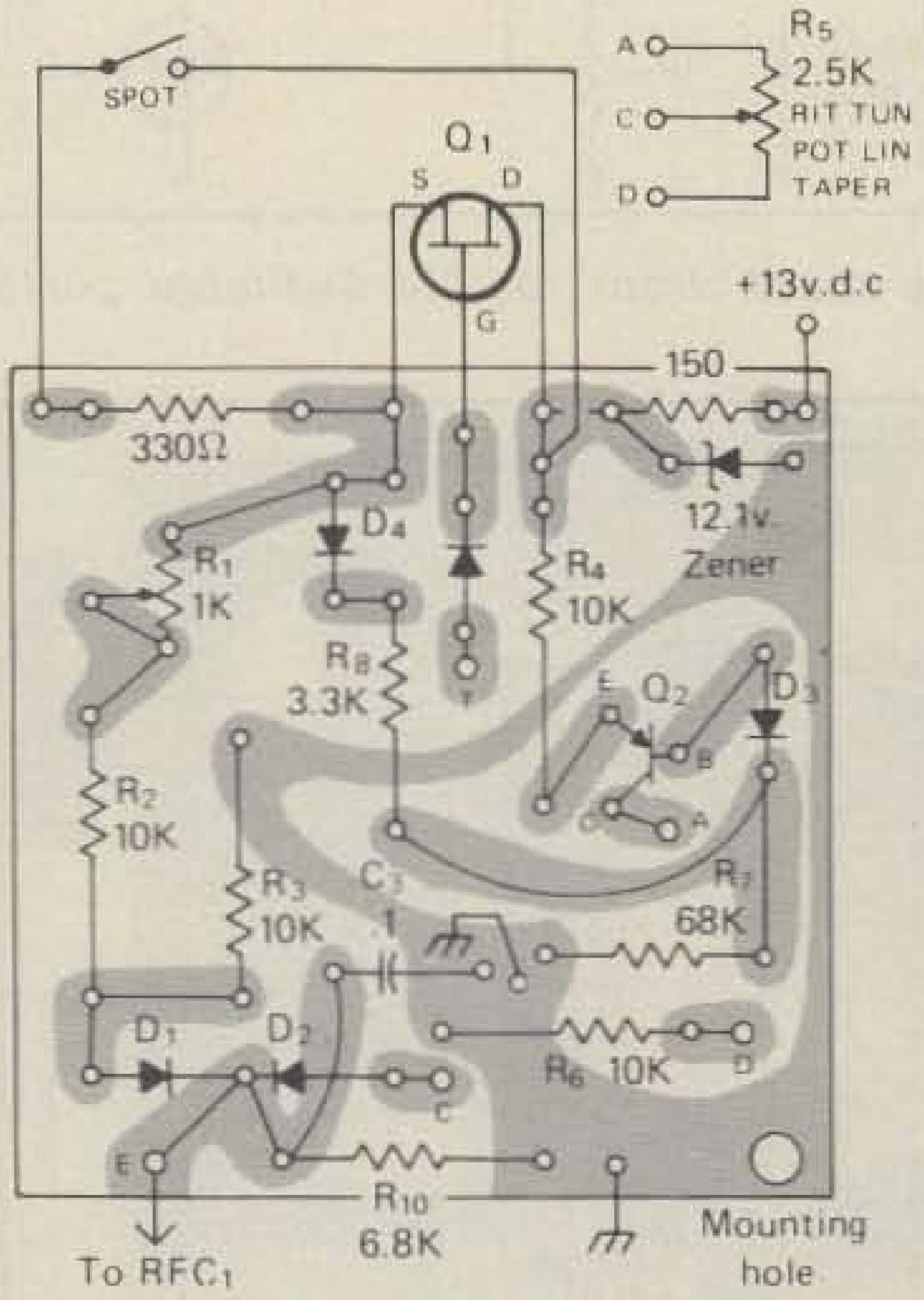
a monthly feature by
ADRIAN WEISS, K8EEG

QRP

THE ART OF VERY LOW POWER OPERATING

HW-8 R.I.T. P.C. Board Clarifications

The original p.c. board template published in the "Super Modified HW-8 Contest Machine" (August, October, 1977) showed only the foil connections for components, and omitted the groundfoil pattern. A corrected p.c. template appeared in May, 1978, *CQ*, p. 8. It is reproduced in this column, since demand for it has continued unabated since the original article appeared. Apparently hundreds of duplicates of the R.I.T. circuit have been incorporated into HW-8's with success. Since a few problems have cropped up, it might be worth mentioning them here. First off, several problems (2 instances) were traced to the use of unmarked "cheapie" transistors as Q1-Q2. Trouble-shooting indicated that the voltages given in the original article were not being achieved. This resulted from low gain (beta) of the "cheapie" devices. A standard rule here is: never use unmarked bargain-basement devices in a circuit and expect to reproduce the results achieved by quality devices. A second problem involved a board that produced the correct transmit-receive voltages and R.I.T. tuning spread control voltage, but when hooked to the tuning diode VR1, the control voltage dropped from the range of about 3.6 v.d.c. to 0.6 v.d.c. This indicated that current was being drawn somewhere in the off-board section of the circuit. Logical analysis suggested either a short somewhere in the off-board circuit, or VR1 inserted with the wrong polarity, and in effect, VR1 was functioning simply as a forward biased diode between the control voltage and ground. A third problem, although not really a problem, arose in a few cases because the original article failed to emphasize the fact that, when the R.I.T. circuit is connected into the existing HW-8 circuit, it *adds* capacitance to the v.f.o. tuning circuit, causing a +200-300 kHz frequency shift. Adding the circuit



has exactly the same effect as adding a 10 pf capacitor to the existing HW-8 tuning circuit. Since the heterodyne frequency generation system of the HW-8 is designed so that an inverse relationship exists between v.f.o. tuning values and heterodyne mixer output (i.e., more capacitance, more inductance, produces an *upward* movement of the heterodyne product frequency), the addition of the 10 pf equivalent capacitance moves the heterodyne mixer output frequency *upward* (7000-7270 kHz). Adjustment of the v.f.o. main tuning capacitor trimmer (C302) is required to bring the frequency back to dial calibration. The tuning capacitor trimmer should be adjusted for *less* capacitance (unscrewed) after insertion of the R.I.T. circuit. In most cases, lessening the trimmer capacitance will permit readjustment to proper dial calibration. However, in a few instances, it has been necessary to readjust the v.f.o. main inductance L9. L9 can be easily located at the board center, since it is mounted in a "can" shield enclosure. Here again, L9 should be *decreased* (unscrew the slug) to produce a downward movement in frequency. Very little adjustment of L9 was necessary in cases requiring it.

Finally, as noted in the original review of the HW-8 in the May, 1977 issue of *CQ*,early production runs of the HW-8 used a seriously defective main tuning capacitor—in fact, several of these were so defective that they actually "fell apart" after a short period of use. There have been several reports of frequency instability and inability to achieve a proper dial calibration spread with early HW-8's. These flaws almost invariably trace to a defective main tuning capacitor (C302). If this capacitor is functioning appropriately, the HW-8 shows a very good dial calibration spread (± 3-5 kHz), and excellentfrequency stability. If you experience this problem, request a a new C302 from Heath.

If you missed the original HW-8 series, they will be reprinted in the forthcoming *QRPp Handbook*. I hesitate to offer to provide Xerox copies, althugh I've been known to do so on occasion for several bucks. Incidentally, if you desire a quick response from someone writing in a magazine with a circulation of 9,000 plus, always enclose an *SASE* with your inquiries.

The foregoing should clarify problems with respect to the Viking 3 × 5 and HW-8 modification.

The Viking 3 × 5

Someday we'll all get our act together and everything will be perfect the first time. This item which should have appeared last month between sections 2 and 3 on page 98 might be considered a lucidation on a clarification. It concerns the value of C2 in the schematic.

One further error has been discovered concerning the value of C2. In the schematic it is shown as 10 mf. The correct value is 10 pf.

73, Ade, K8EEG

83 Surburban Estates, Vermillion, SD 57069

a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

ARRL RFI Task Group Comes Back From The Dead

The ARRL RFI Task Group, dormant for several years, was revived in August 1980 by Hugh Turnbull, W3ABC, Vice-Director of the Atlantic Division and Board Liaison to the Group. At a Washington, D.C. meeting chaired by Turnbull, Hal Richman, W4CIZ, Vic Clark, W4KFC, Stuart Meyer, W2GHK, Paul Rinaldo, W4RI, Perry Williams, W1UED, and your Washington editor discussed the continuing and growing problem of alleged interference to home entertainment devices by amateur operations. While the Group acknowledged that the majority of the 80,000 r.f.i. complaints received each year by the FCC derive from operations associated with the Citizens Band, there was no escaping the fact that amateurs are often blamed in these complaints by a public that is unable to distinguish between the various radio services.

One of the first activities of the Group will be to update the R.F.I. Assistance List previously prepared by Richman. This list, which was published in QST and in the FCC's booklet on r.f.i., is credited with being the most important source of information available to the public for resolving cases of alleged r.f.i. As before, Richman assumed responsibility for contacting the manufacturers of electronic home-entertainment devices and for obtaining information from them as to their policies regarding r.f.i.

On another front, Williams announced that a new edition of the FCC's r.f.i. booklet is now in preparation, and that it will be distributed shortly. Also in preparation is a second edition of the ARRL handbook *Radio Frequency Interference*. The new edition is scheduled for distribution in the spring of 1981.

8603 Conover Place, Alexandria, VA 22308

Finally, Williams pledged the ARRL's continued interest in Docket 78-369, the FCC's r.f.i. study, and in Senate Bill 2827, Rewrite of the Communications Act. The latter contains Sen. Goldwater's provision pertaining to the reduction in r.f.i. susceptibility of television receivers.

FCC To Study R.F.I. Again!

While the Commission's pronouncement on Docket 78-369 is not available at this writing, indications are that the FCC will propose the creation of an advisory committee to more thoroughly examine the r.f.i. problem. In remarks prepared for the IERE meeting in Southhampton, England, on 17 September 1980, Alvin Paul of the FCC noted that it was his belief the Commission presently lacks the authority to proceed with regulation of the susceptibility of receivers (presumably, radio and television receivers). Paul further noted that the 600 comments received by the Commission in response to Docket 78-369 presented a "biased" view of the problem since a heavy response came from amateurs. Only 16% of the replies, however, came from those experiencing r.f.i. In this regard, the Commission can be faulted, though, since no effort was apparently made to examine critically that 16% of the responses which dealt with "victim" devices.

Wrote Paul: "The writer, although rebelling at the idea of establishing another committee in Washington, views with concern the complexity of interference susceptibility and its impact upon economic and manufacturing issues as well as technical and consumer matters. It is, therefore, his opinion that the community of thinking that can be best achieved through the negotiative process and final consensus of an Industry Advisory Committee is appropriate in this instance."

All of which means, in typical Governmentese, that the Commission is going to do nothing!

To their credit, some Commission officials are outraged at the FCC's current thinking on r.f.i. They feel that while the Commission may still have to go slow with respect to some consumer and industrial devices, there is no excuse for delaying action on television receivers.

The fight to resolve the r.f.i. problem in this country is far from over. And while there are those in Washington who believe that the Commission should now proceed to regulate susceptibility levels for TV sets, others are not sure. Given that 1980 was an election year, however, the "easy out" would be to create another committee. . . and that is probably just what the Commission did.

Pirating Of Television Signals Much In The News

Recent articles in the popular press (including *Business Week* and *Parade*) suggest that the pirating of subscription TV signals and of TV signals from satellites will increasingly be in the news as the controversy surrounding Section 605 of the Communications Act intensifies. Specifically, Section 605 prohibits the interception and use of private radio communications for one's own benefit (and, presumably, entertainment is a benefit).

As we have previously indicated, the right of an individual to receive and/or decode signals in the Multipoint Distribution Service (MDS) and other services will be fought out in the courts in during the next several years. Already, judges in Detroit and Phoenix have granted injunctions which bar the sale of unauthorized decoders, and National Subscription Television of Los Angeles is pursuing its case against those who market decoders by appealing a previous decision in a higher court.

What is so disturbing, however, is that a number of amateurs are involved in signal pirating. In fact, beneath a headline that indicated such actions are not legal, the *Parade* article (September 28, 1980) showed a picture of an amateur's satellite antenna with a W5 call emblazened across the parabolic reflector. For a service that has prided itself on adhering to the law (i.e., a self-policing service), our participation in such activities can only lessen our credibility in Washington.

The issue here is not that the signals "are there," and, therefore, that we are entitled to receive them. Rather, the issue is that a section of the Communications Act expressly prohibits such activities; in short, *it's against the law.* Therefore, if the law is outdated, or otherwise misdirected, the burden is on those who seek change to lobby their position. Those who seek to circumvent the law through civil disobedience, however, should know that their actions will, at the least, slow expansion of satellite broadcasting until such time that the problem surrounding Section 605 is resolved.

AMRAD Announces HEX

The Amateur Radio Research and Development Corporation (AMRAD) has announced the activation of the Handicapped Education Exchange (HEX). This Exchange is a computer information storage and retrieval system and is used as a focal point for up-to-date information concerning education of, and communications with, the handicapped. HEX is supported by a Federal grant from the Bureau of Education for the Handicapped (BEH).

Through a dial-up system, HEX provides for the exchange of information related to the handicapped (as recognized by BEH); to the education of, and communications with, the handicapped; and to microcomputer technology.

To communicate with HEX, you will need either a 110- or 300-baud ASCII, or 60-words-per-minute Baudot, terminal. The ASCII terminal may be either a computer or a printer which is equipped with a Bell 103 or 113 originate modem. The Baudot terminal is the type used for communication by the deaf, and it uses a Weitbrecht modem. The HEX will automatically adjust to the type of terminal used.

For more information on HEX and on how to access the Exchange by telephone, contact: Mr. Paul L. Rinaldo, W4RI, AMRAD, 1524 Springvale Avenue, McLean, VA 222101.

ANSWERS TO OFTEN-ASKED

"WHY WORK RTTY?"

RTTY is one of those quickly growing "specialized" forms of amateur communications. The attraction to its devotees is probably a mixture of the magic of modern digital communications coupled with the convenience of written rather than coded or voice communications. If you participate in the popular autostart nets, it's not even necessary to be home when receiving a RTTY message—the printer or display will record the text for you to read at your convenience. RTTY is very popular among "rag-chewers" and "engineers" alike; in fact, you get to do a bit of both. The rapid growth of digital electronics has carried over to both RTTY and the new home computer hobby. ASCII communications between ham computers lacks only final FCC approval. If your "bag" is chasing DX, what could be more satisfying than a DXCC certificate for all RTTY? There are several DX RTTY contests sponsored every year with heavy participation. So, rather than ask "Why?" ask "How?"

"WHAT DO I NEED TO WORK RTTY?"

A ham RTTY station needs a transmitter, receiver, and antenna just like any RF communications system, in addition to some "special boxes" to make the RTTY part work. Some considerations for the equipment are outlined below:

1. RECEIVER-TRANSMITTER

The RTTY receiver and transmitter (or transceiver) should be stable, well calibrated, and capable of *EXTENDED TRANSMITTER OPERATION*. When you are transmitting RTTY, the full carrier is on for longer periods of time than for CW or SSB voice. So, check your manual and manufacturer for RTTY specifications and, if in doubt, reduce transmitter power somewhat. For HF work, a good SSB rig in LSB mode works well with RTTY tones (more on tones, later). Most VHF-FM transmitters work with RTTY, but avoid overloading the transmitter as mentioned above.

2. ANTENNA

A good antenna will buy you the same benefits in RTTY as it does in other modes. One caution though, the traps on some antennas may not handle as much power in continuous RTTY operation as they do for CW or SSB voice. This can especially be true of trap yagi antennas for the HF bands.

3. RTTY DEMODULATOR

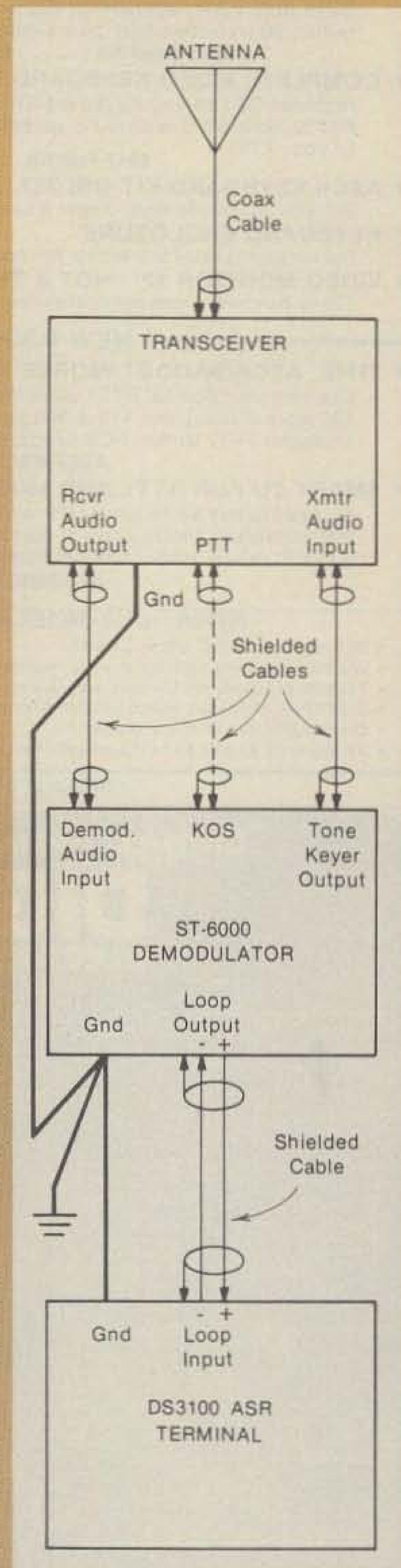
The demodulator connects to the receiver audio output and converts the RTTY tones to keying pulses. The quality of your printed signal is determined more by demodulator performance than by any other portion of the system. Demodulators come in all shapes, sizes, and prices. HAL offers the feature-packed ST-6000 with active filters, scope, autostart, anti-space, ATC, DTH, and KOS, as well as the lower cost ST-5000. The popular ST-5 and ST-6 parts kits are also still available for the skilled technician.

4. TONE KEYER

The tone keyer circuitry converts the keying pulses from your keyboard into audio tones to drive the transmitter. Since this circuitry is closely related to that of the demodulator, both are supplied in the same cabinet in all HAL demodulators.

5. TERMINAL

The terminal is the device that prints or displays the received signals while allowing you to type your transmitted message. The terminal is sometimes divided into a keyboard and a printer or display section. The terminal can be as simple as an old surplus TTY machine or as exotic as the microprocessor controlled HAL DS3100 ASR terminal. An important feature of HAL Communications terminals is that ALL HAL RTTY EQUIPMENT IS LOOP COMPATIBLE WITH TTY MACHINES. This means that you can add HAL electronic equipment to your RTTY system at any time. The advantages of the HAL electronic terminals are many; ranging from lack of noise and oil (keeps the XYL happy and your nerves soothed) to automatic operator features such as real-time editing of typing errors, programmable identification message, and automatic carriage return/line feed operations. Also, the speed of the electronic terminal is easily changed with a front-panel switch. Machines require an expensive gear box or a manual change of gears to change speed. HAL offers the DS3100 ASR and the new DS2000 KSR terminals as well as the popular DS-3000 KSR, RVD-1005, and the DKB-2010. The DS3100 ASR, DS2000 KSR, and the DS-3000 KSR all work the standard ASCII computer code as well as the normal amateur BAUDOT code.



"HOW DO I HOOK IT UP?"

Probably the most frightening thing to the RTTY beginner is the thought of all those wires that must be connected to make it work. A particularly complicated RTTY station can have a real "rats-nest" of wires, but it didn't start that way. Make connections in a logical and step-by-step manner and all will work well. All transceivers are slightly different, but, in general, you will have to make these connections:

1. GROUNDING

Before making any other connections, decide approximately where your equipment will be located and run short, low-inductance ground wires (shield braid recommended) between the cabinet grounds of all equipment AND MACHINES. Do not defeat the AC safety ground on the HAL power cords; run separate RF grounds in addition to the AC safety ground. *LACK OF ADEQUATE RF AND SAFETY GROUNDS CAUSES MORE PROBLEMS IN RTTY INSTALLATION THAN ANY OTHER SOURCE.*

2. RECEIVER TO DEMODULATOR

Use shielded cable to connect a 500 ohm audio output of the receiver to the demodulator audio input jack. If you do not have a 500 ohm output, the 4-8 ohm speaker output will work, but not as well; a speaker to 500 ohm line transformer would be a good part to add when possible.

3. TONE KEYER TO TRANSMITTER

Use shielded cable to connect the tone keyer output of the demodulator to the transmitter audio input. Often, a rear-panel "phone-patch" or "auxiliary" input is provided. If not, connect directly to the microphone connector.

4. DEMODULATOR TO TERMINAL

Use shielded cable to connect the terminal to the demodulator. Use the current loop connection for each. When connecting to a solid-state terminal, be sure to observe the proper polarity as indicated in the operator's manuals. Be extremely careful when wiring the loop circuit—potentially lethal voltages are present when the equipment is turned on (200 VDC @ 60 ma). Also, be sure that no part of the loop circuit is connected to chassis ground in machines or other equipment. All RTTY equipment is connected in series when the current loop output is used.

5. CONTROL CIRCUITS

Since the control requirements differ with manufacturer, study your transceiver manual carefully to determine how to control the transmit-receiver function. Usually, you can control the push-to-talk (PTT) line through a pin on the microphone connector, a front-panel switch, or a rear panel accessory connector. Initially, try to manually switch between transmit and receive until you are familiar with RTTY operation. Eventually, you will probably want to take advantage of the automatic Keyboard Operated Switch (KOS) feature of the DS3100 ASR and ST-6000. KOS is the RTTY equivalent to VOX; typing on the keyboard puts you into transmit mode. If you pause long enough, the KOS "drops-out" putting you back into receive mode. KOS is particularly convenient for short exchanges.

"WHAT IS THIS MARK AND SPACE BUSINESS?"

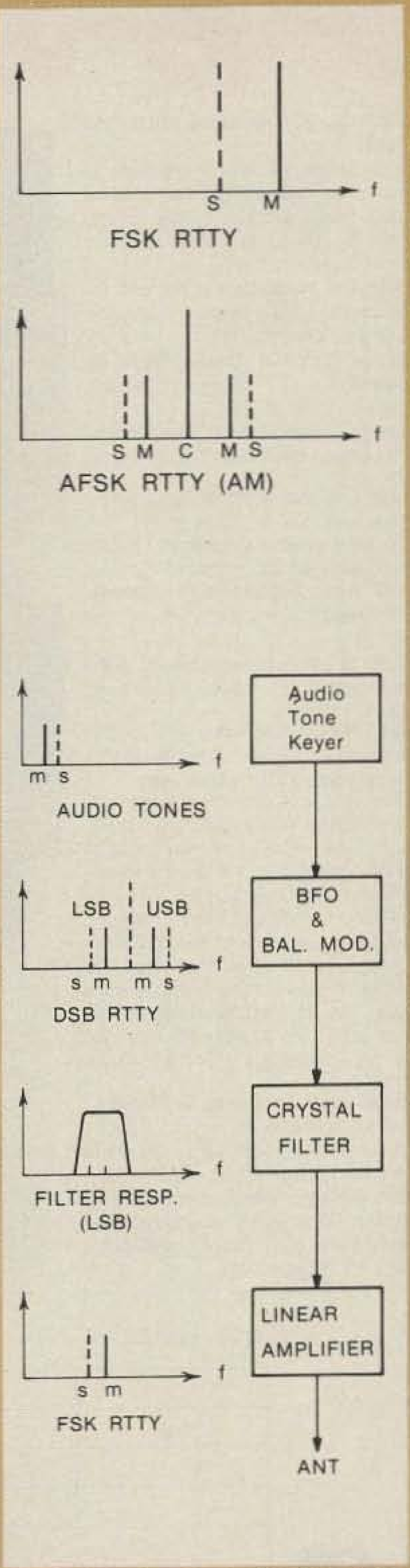
The RTTY signal from the terminal is a series of pulses. The amateur BAUDOT RTTY signal has 7 possible pulses for each character typed or printed, each transmitted one-after-another (serial). Each pulse can be either "ON" (current flow in the RTTY loop) which is called "MARK" or "OFF" (no current flow), the "SPACE" condition. To keep decoders synchronized, the first pulse of a character, the START pulse, is always a SPACE (current off); the last pulse, the STOP pulse, is always a MARK (current on). The 2nd through the 6th pulses can be either MARK or SPACE, depending upon the coding required for a character. The START and all 5 data pulses are the same length; the STOP pulse may be either equal to or longer than the others. The so-called computer ASCII code uses START and STOP pulses but has eight instead of five intermediate data pulses, thus allowing a greater number of characters to be encoded. Although all machines and HAL electronic terminals use pulses, the MARK and SPACE pulse conditions are converted into MARK and SPACE audio tones for easy radio transmission.

QUESTIONS ABOUT RTTY

"WHAT IS THE DIFFERENCE BETWEEN FSK AND AFSK?"

Transmitting RTTY signals via radio could be done like Morse code with on-off keying of the transmitter carrier. However, the interference received during off-times would give badly distorted printout. Rather, HF RTTY is transmitted with Frequency Shift Keying (FSK) so that the mark pulse condition corresponds to one radio frequency and the space to another. Amateur radio convention has it that the mark radio frequency is higher than space and that the separation or "shift" of the signal is standardized at 170 Hz or 850 Hz. (425 Hz shift is also used by commercial RTTY stations.) Most present-day amateur RTTY stations use 170 Hz shift exclusively. The FSK signal is received with the BFO turned on, giving two audio frequency tones for the mark and space conditions. The audio tones are, in turn, detected in the demodulator and the resulting pulses drive the display or printer. Note that changing the transmitter or receiver frequency (on purpose or through frequency drift) will change the audio output frequency to the demodulator. The HF system is therefore quite drift sensitive. Present HF equipment frequency stabilities are quite adequate for FSK RTTY, but it is only very recently that VHF equipment was available with similar stability. Therefore, VHF RTTY has traditionally been transmitted by first keying audio tones with the RTTY pulses and then using these tones as the audio modulation of an AM or FM VHF transmitter. This is called AFSK for Audio Frequency Shift Keying. Current amateur convention is to make the mark audio frequency lower than the space frequency by the amount of the shift. Since the RTTY data is audio modulation of the carrier, frequency drift of either transmitter or receiver is a lot less critical. The audio frequency of the tones transmitted is set to be the same as those in the receive demodulator.

The required radio frequency shift keying can be done in two different ways: shift the frequency of a transmitter oscillator directly with the RTTY pulses or use a SSB transmitter with audio tones. Direct FSK keying circuits are described in most amateur journals and are generally simple, but require modification of the equipment; generation of FSK with a SSB transmitter is as follows: If a Lower Sideband Transmitter (LSB) is driven with a 2125 Hz audio tone, the RF output of the transmitter will be at a frequency 2125 Hz *BELOW* the suppressed carrier frequency. A properly adjusted LSB transmitter will have *NO OTHER* output frequencies. If the input tone is changed to 2295 Hz (170 Hz shift), the RF frequency is now 2295 Hz BELOW the carrier frequency. Thus, audio tones into the LSB transmitter have produced FSK carriers out of the transmitter. Note that, because the LSB mode was used, the 2125 Hz standard mark tone for VHF AFSK has become the higher radio frequency. Thus, the same demodulator and tone keyer can be used for both VHF AFSK and HF FSK operation. Often, this use of audio tones with a SSB transmitter is mistakenly called "HF AFSK"—actually the resulting output is true FSK, IF the SSB transmitter has so spurious outputs (such as carrier or unwanted side-band). Most HF RTTY amateur radio stations use audio tones with a SSB transmitter. Although "standaro" audio tones for VHF amateur operation have long been 2125 Hz for mark and 2975 Hz for space (850 Hz shift), limited audio frequency response of HF SSB transmitters and receivers has recently given rise to a second set of "standard" tones at lower frequencies ("Low-tones").



"HOW ABOUT HIGH- VS LOW-TONES?"

Historically, demodulator tones were set to 2125 Hz for mark and 2975 Hz for space reception of 850 Hz shift. When transmitter stability improved, 170 Hz shift was used and the space frequency changed to 2295 Hz (mark remained at 2125 Hz). These three tones were, and still are, a standard for U.S. Amateur RTTY. However, in the early 1960's, virtually all commercially available transmitters and receivers became filter-type SSB equipment with audio pass-band limited to speech frequencies, sometimes as narrow as 2.1 kHz (300 to 2400 Hz). Obviously, the 2975 Hz (850 Hz shift Space) tone will not pass-through such a filter and 850 Hz shift with these tones is not possible (although the 170 Hz shift is). Therefore, either the SSB equipment must be modified or different, lower-frequency tones must be used if 850 Hz RTTY shift is desired. Both approaches have their advantages and both are currently in use. The so-called "LOW-TONE" standard sets mark at 1275 Hz and space at 1475 Hz (170 Hz shift) or 2125 Hz (850 Hz shift), conforming to the European IARU standard. So, there are now two sets of "standard" tones, LOW and HIGH (as well as a myriad of others), all of which work *INTERCHANGEABLY* on HF RTTY. However, since the actual audio tone is transmitted for VHF AFSK operation, the two sets are *NOT COMPATIBLE IN VHF AFSK* applications. Current U.S. Amateur operation uses the HIGH TONES for VHF. Thus, to use a demodulator and keyer for both HF and VHF operation, it should be set-up for HIGH-TONE operation. Conversely, you may wish to have separate stations for HF and VHF, simplifying the cabling, and providing simultaneous monitor/operation capability, as well as resolving the tone problem. The HAL ST-6000 and ST-5000 Demodulators are available for either HIGH or LOW-TONE operation.

"WHAT FREQUENCIES DO I USE FOR RTTY?"

HF RTTY Operation has evolved to heavy operation on the 80 and 20 meter bands (CW segments) with sporadic operation on other HF bands. 80 meter RTTY stations tend to operate between 3600 and 3650 kHz and 20 meter stations between 14.075 and 14.100 MHz. 170 Hz shift is used almost exclusively with mark being the higher radio frequency. 60 wpm (45 baud) is the most popular RTTY speed, but 100 wpm (74 baud) is gaining in popularity.

VHF RTTY operation in most areas is concentrated on 2 meter FM with 146.700 MHz being the popular operating frequency. Virtually all stations are now using the "High-tones," usually with 170 Hz shift. As with HF RTTY, 60 wpm (45 baud) is most popular on VHF. Some areas now have RTTY-only repeaters on 146.10/146.70 MHz.

"WHO DO I TALK TO ON RTTY?"

RTTY enthusiasts run the full range of ages and interests, but tend to be technically inclined. The typical RTTY'er is always modifying his station, likes to talk, and usually has more ideas than you have printer paper (or display screen)! Some operators are good typists; most aren't. The DS3100 ASR letters-fill and editing modes make even a poor typist look good. Recently, the home computer hobby has become quite popular with RTTY people and you may find a lot of help in debugging your programs if that's your interest. There are an increasing number of DX stations on RTTY.

"HOW MUCH DOES IT COST?"

RTTY is like any other hobby—it can cost as much or as little as you want it to. If you buy used machines and build kits or your own designs, the total RTTY cost can be quite low. Conversely, the DS3100 ASR and ST-6000 offer an *ULTIMATE* RTTY station that is expensive. Because all of the HAL RTTY products are current loop compatible, you can add devices as your interests (and pocketbook) indicate. For the beginner, HAL has the following recommendations:

1. DEMODULATOR

Assuming you already have a good transceiver and antenna, your first major RTTY purchase should be a good demodulator. The HAL ST-5000 makes a particularly good, cost-effective unit. If you select a high-tone ST-5000, it will be usable for either VHF or HF (170 Shift) RTTY operation; if you are only interested in HF RTTY (for short-wave-listening to press stations, for example), the low-tone unit may be a better choice. Conversely, you may wish to "jump-in" and get the ST-6000 from the first. Either way, put high priority on a *GOOD* demodulator.

2. TERMINAL

You can spend very little or a lot on the terminal. A surplus machine can often be acquired at a hamfest for little cash investment. However, by the time you figure out how it works, fix it, and buy parts and manuals the total cost may not be so low. If you do, you'd better be prepared with tools, oil, and patience. Newer machines require less work, but also cost more. On a feature-for-feature basis, either the new DS2000 KSR, DS3100 ASR, or DS-3000 KSR are more cost effective than other terminals presently available. Certainly a "solid" beginner's RTTY station would be the DS2000 KSR and ST-5000.

CIRCLE 92 ON READER SERVICE CARD

HAL COMMUNICATIONS CORP.
Box 365
Urbana, Illinois 61801
217-367-7373

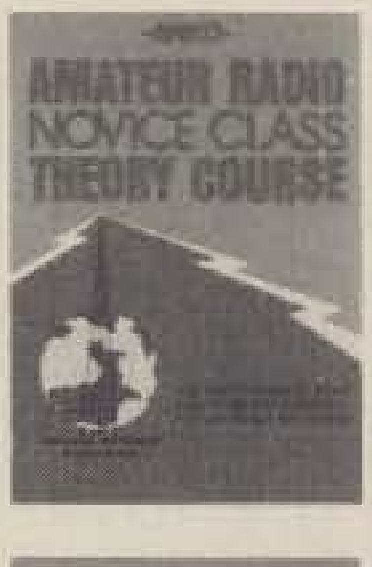
CQ BOOK SHOP

Ameco Amateur Radio Question & Answer Study Guides
Easy-to-understand questions and answers based on the latest FCC study guides, plus sample exams, will help you make sure you're ready to sit for the license tests.
Ameco Amateur Radio General Class Q&A Study Guide, 64 pages, paperback, $1.50. Order #A034.
Ameco Amateur Radio Advanced Class Q&A Study Guide, 64 pages, paperback, $1.75. Order#A035.
Ameco Amateur Radio Extra Class Q&A Study Guide, 64 pages, paperback, $1.50. Order #A036.

Ameco Novice Code and Theory Package
A complete training package containing the 128-page Novice theory course and a 60-minute code cassette, which teaches how to send and receive code up to 8 words per minute, and a 32-page book. Also included are FCC-type code and theory examinations to help even a rank beginner get a ticket fast! $6.95. Order #A024.

RSGB Test Equipment for the Radio Amateur (2nd Ed.)
by H.L. Gibson, G2BUP
Explains the principles of measurement techniques, and gives constructional details of many items of up-to-date equipment of interest not only to the radio amateur but also to the electronics enthusiast. 151 pages, hardcover/dust jacket, $10.95. Order #G050.

The Shortwave Propagation Handbook
by G. Jacobs, W3ASK and T.J. Cohen, N4XX.
Two leading authorities on propagation have teamed up to produce the definitive book on this subject. Propagation is explained in language the reader can fully understand to produce his own propagation data. 155 pages, paperback, $7.50. Order #C137.



Blacksburg Continuing Education Series
This series of books provides an experiment-oriented approach to electronic topics, with step-by-step instructions on how to learn basic electronic concepts and their uses.
Design of Transistor Circuits with Experiments, 509 pages, paperback, $12.95. Order#S128.
Design of VMOS Circuits, With Experiments, 174 pages, paperback, $8.95. Order #S129.
Design of Phase-Locked Loop Circuits, 254 pages, paperback, $8.95. Order #S130.
Design of Active Filters, 238 pages, paperback, $/.95. Order #S131.
Design of Op-Amp Circuits, 221 pages, paperback, $7.95. Order #S132.
555 Timer Applications Sourcebook, 158 pages, paperback, $5.95. Order #S133.
Guide to CMOS Basics, Circuits, & Experiments, 221 pages, paperback, $8.95. Order #S134.
The 8080A Bugbook, 416 pages, paperback, $10.50. Order #S135.

World Radio TV Handbook 1980
The world's only complete directory of international broadcasting and TV stations—the established, authoritative guide endorsed by the world's leading broadcasting organizations. A comprehensive listing of short-, medium-, and long-wave stations revised and updated to reflect actual conditions. Also includes special features on listening gear, how to adapt older receivers for use today, and DX club activities. 560 pages, paperback, $14.95. Order #B097.

RSGB Oscar Amateur Radio Satellites
by S. Caramanolis
A complete introduction to the orbital and electronic principles of communication satellites, with particular reference to the Oscar series of amateur radio satellites. 192 pages, paperback, $12.95. Order #G049.

Tests-Answers for FCC First and Second Class Commercial License
by Warren Weagant
This newly updated FCC testing manual makes getting the First and Second Class Licenses easier and faster. Includes all 15 multiple-choice exams, plus diagrams, illustrations, and a self-study ability test to determine how much time and effort you will have to put in to pass the tests. 197 pages, paperack, $9.95. Order#C139.

Practical Antennas for the Radio Amateur
by Robert M. Myers, W1XT
This down-to-earth manual describes how to go about equipping a station with a suitable antenna. Included are how to build beams, quads, and wire antennas; computer-generated beam headings; charts and tables; OSCAR antennas; antenna safety; a bibliography; and much more. 192 pages, paperback, $9.95. Order #S125.

RSGB Radio Communication Hdbk (5th Ed.)
First published in 1938, and a favorite ever since, this large and comprehensive guide to the theory and practice of amateur radio takes the reader from the first principles right through to such specialized fields as radio teleprinters, slow-scan television, and amateur satellite communication. Two volumes. Expensive, but worth it! Volume 1: 480 pages, hardcover/dust jacket, $23.95. Order #R030-1. Volume 2: 336 pages, hardcover/dust jacket, $21.95. Order #R030-2.

Federal Frequency Directory: 2-420 MHz Inclusive
by Robert B. Grove
Contains more than 100,000 listings of frequencies, agencies, and locations of active U.S. government communications stations operating in the 2-420 MHz portion of the spectrum. Approximately 260 pages, paperback, $14.95. Order#G136.

CQ BOOK SHOP

76 North Broadway Hicksville, NY 11801

Order Date: ____________

Name ______________________
Address ______________________
City ______________________
State ____________ Zip ______
☐ Check ☐ Master Charge ☐ Visa
Card No. ____________ Expires ______
Signature required on all charge orders:
X ______________________

QTY.	ORDER #	TITLE	PRICE	TOTAL

Shipping charges $2.00 per order. Shipping charges waived on orders of $50.00 or more. Books shipped best way. All orders are processed the day they are received, but please allow 30 days for delivery within North America.

Book Total ______
Shipping Charge ______
Grand Total ______

Got time for a circuit quicky? This month we start a new series by WB8LBV on simple one evening projects that are immediately usable.

A Junk-Box Square Wave Generator

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

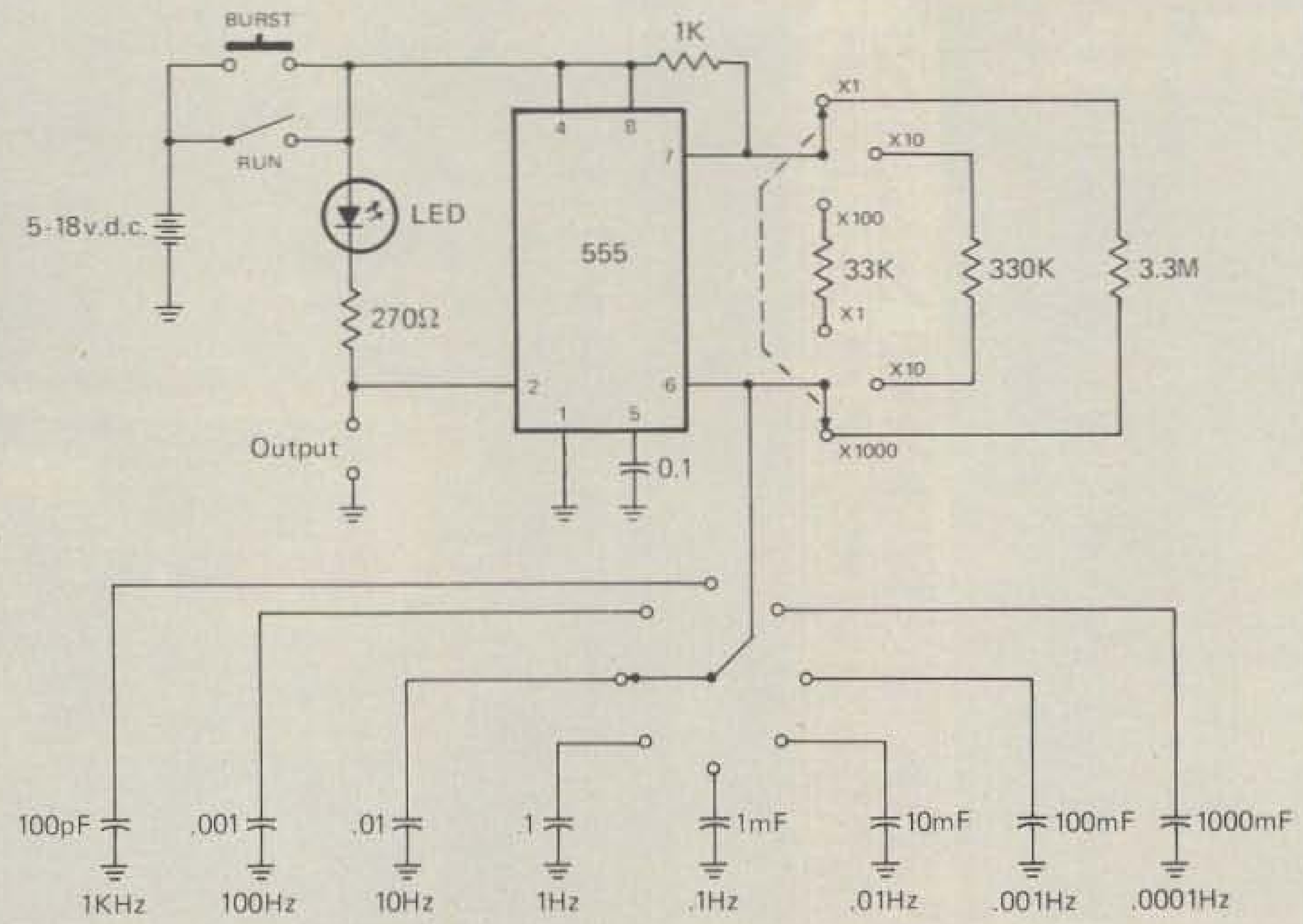


Fig. 1- The junk-box square wave generator covering from .0001 Hz to 100 kHz.

Here's a nice little general-purpose square wave generator you can use as a clock for digital circuits, a timing generator, or a low frequency tone generator.

With the 3.3 Megohm resistor shown, the four ranges are about 0.1, 1, 10 and 100 Hertz. With a 330 K resistor, this becomes 1, 10, 100 and 1000 Hertz. With a 33 K resistor, it's 10, 100, 1000 and 10 K Hertz . . . and so on.

The 555 is the IC that does it all here. Check your junk box for whatever selector switches are there. With more positions, you can add 10, 100 and 1000 microFarad capacitors to add 0.01, 0.001 and 0.0001 (once every 10,000 seconds) to the basic selection; or add 100, 10 and 1 pF caps to add 1 K, 10 K and 100 K (well, actually not—the 10 pF and 1 pF caps would be swamped by stray and wiring capacitance and the 1,000 microFarad cap by leakage). Anyway, the basic idea is okay.

Don't use disk caps. They're too unstable.

If you have a second selector switch, you can add a "range multiplier" by adding the 330 K and 33 K resistors mentioned earlier. A pushbutton in parallel with the power switch provides either continuous or burst operation.

The LED at the output is optional, but it's cheap and provides confirmation of the state of the output (blinks on for low, off for high).

And you thought test instruments were expensive!

*c/o CQ Magazine

Announcing:

The 1981 CQ World Wide 160 DX Contest

C.W.: January 23-25 Phone: Feb. 27-Mar. 1
Starts: 2200 GMT Fri. Ends: 1600 GMT Sun.

As announced last month, we have added a Phone section to the contest. Rules are the same as for previous years for the c.w. contest and apply to both sections.

In the past when it was a c.w.-only contest, on occasion we ran into a QRM problem with the phone stations. Now that the phone contingent will have its own weekend, it is hoped that this will clear-up any previous conflict.

By the same token and in all fairness, we would expect the c.w. boys to refrain from 160 activity during the phone weekend.

Keeping the "DX Window" 1825-1830 kHz free of U.S. and VE activity is even more important during the phone contest. Split frequency operation is a must when working DX. And to make it a successful operation the DX station should always indicate where he will be listening. Hopefully with the phasing out of Loran on 160 and a better distribution of frequencies, we will not have this problem in the not to distant future.

Now to the rules:

Exchange: RS(T) plus a three figure contact number starting with 001. U.S. stations should include their state, Canadians their province. It is not necessary for DX stations to send their QTH; their call will identify them.

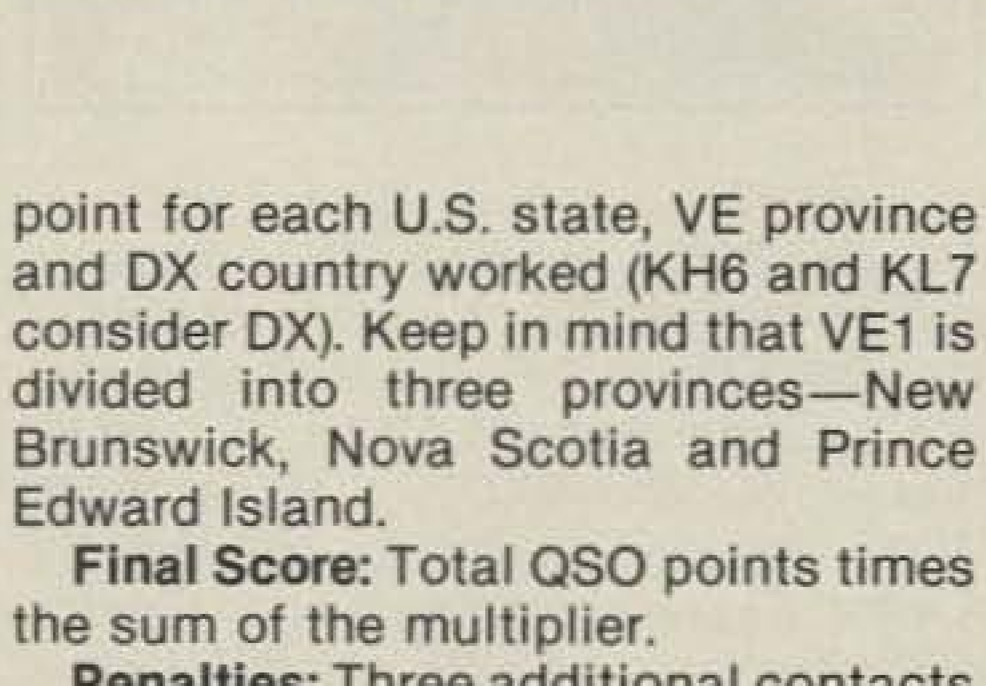
Scoring: *For W/VE/VO stations:* Two points per QSO with other W/VE/VO stations. All DX contacts are worth 10 points.

For DX countries: Two per QSO with stations in the same country, 5 points with stations in other countries, except for QSOs with W/VE/VO, which are worth 10 points.

Multiplier: *For all stations:* One point for each U.S. state, VE province and DX country worked (KH6 and KL7 consider DX). Keep in mind that VE1 is divided into three provinces—New Brunswick, Nova Scotia and Prince Edward Island.

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

Penalties: Three additional contacts will be deleted from the score for each duplicate, false or unverifiable contact removed from the log. A second multiplier will also be removed for each one lost by the above action.



Disqualification: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of the contest, or unsportsmanlike conduct or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification. Disqualification can also result if in the opinion of the Committee the penalty total is considered excessive.

Disqualified stations and operators may also be barred from competing in all *CQ* contests for a period of up to three years.

Awards: Certificates to the top scorers in each state, VE province and DX country. Additional awards if the score or returns warrant.

In addition, there are two plaques being awarded by the West Gulf A.R.C., both for single operators. One is for the highest score in the U.S., and the other for the highest scoring European. The World Champion in the contest will receive the John Doremus WØAW Memorial Plaque donated by "Friends of John Doremus."

The above plaques may be won once only by the same station within a three year period. (Winner of the world plaque will not also be considered for a sub-area award. That award goes to the runner-up in that area.)

Sample log and summary sheets may be obtained from *CQ* by sending a large s.a.s.e. with sufficient postage to cover your request. (A 15¢ stamp wil get you approximately one summary sheet and 4 log forms, 40 contacts to the page.) It is not necessary to use the official form. You can make up your own, 40 contacts to the page, time in GMT, number sent and received, and separate columns for QSO points and multiplier. Indicate the multiplier only the first time it is worked.

Mailing deadline for c.w. entries is February 28th and March 31st for the phone logs.

This year you can send your logs directly to the 160 Contest Director, Don McClenon, N4IN, 3075 Florida Avenue, Melbourne, FL 32901 USA.

And of course they can go to *CQ* Magazine, 160 Contest, 76 N. Broadway, Hicksville, NY 11801 USA. (Indicate c.w. or phone on the envelope.)

a monthly feature by
HUGH CASSIDY, WA6AUD

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

The Great Debates have ended in one arena but DXers will always seek the answer to the eternal question. What does a DXer need most? Patience, longevity or a tall tower with big power? Some find difficulty in reaching a decision because they are firm in their belief that they need all three and a couple more.

The year just ended brought countries onto the air that more than one perspiring DXer missed. Sunk in the pits of despair, hardly finding solace at all in the belief that the station would have been worked if it had only stayed on the air for another hour, the miserable DXer thinks of what might have been but may never be.

Stout DXers are never those of faint heart! The Honor Roll, the top of WPX, WAZ belong to the strong in spirit, long in years and abundant in patience, for most DXers will eventually realize that most DX always knocks twice. It is the 25 or more years between knocks that wears.

But they come. In the last year Abu Ail and Okino Torishima. Juan de Nova and Glorioso. Mt. Athos and a list of others. Heard is being expected and the good Dr. Zelenka in Zurich is bending the curve of the cycle down to meet Cycle 22 some years in the future, and Ted Cohen is tending the DX flux.

Spring is nigh for many DXers; there are some around the curve of the dawn that are waiting for the signs of winter. In January the sun in the northern hemisphere stops its slide to later sunrises and starts to come earlier each day. DXers will greet the longer days and polish their patience, stretch their longevity and wonder about what might be with a new beam.

For years we have heard a fabled DXer in the western regions, this being a tale of the years. "He was without an equal," we would be told, "and he was the youngest one up to that time ever to achieve the Honor Roll!! The youngest ever!!!"

77 Coleman Dr., San Rafael, CA 94901

In 3 years as a ham, Ken Stenback, AI8S/WD8EOJ, worked 295 countries and confirmed 290. He is a member of the CQ Phone DX Honor Roll, holds WAZ, Single Band WAZ for 15 and 20 meters, 5-Band DXCC, 5 Band WAC, WAS and the Satellite (Oscar) DX Award. At press time he has 174 zones confirmed toward 5-Band WAZ. Ken is president of his county amateur radio club and a member of the Northern Ohio DX Association. (Photo courtesy N4UF)

When one is new to DXing one realizes that meeting all the legendary over-achievers in DXing takes time, one being dazzled by the sheer numbers of them. But the years passed, we heard the story again, and again, and finally with a fair share of longevity acquired ourselves without ever sighting the legend, we had our own question. "What ever happened to him?" All we got was an uninformative shrug. "Beats me," replied our DX historian, "the last I heard of him he was crewing on a racing yacht bound for Tahiti."

It figured. When one is young and has worked everything, there is nothing ahead but the empty abyss of the years. For those who missed in 1980, there is still bright hope. What you missed yesterday you can hope for tomorrow. That which has not been on the air since the Truman administration may show next week. Well, next month at the very latest. And what you missed the last time out, the signals are flying that it is coming again. Absolutely! We have the word that a ZL has some inside information, and he needs this one himself, that some-

The WAZ Program

10 Meter Phone

75.....WA2NSM

15 Meter Phone

65.....KB8JF

20 Meter Phone

325	WD8MGQ	328	N5FG
326	VE4IS	329	WD5OBV
327	K8DJC	330	VE1RY

40 Meter C.W.

5.......JA1MCU

20 Meter C.W.

120....W1WLW

15 Meter C.W.

39	WB4RUA	40	WA1FCN

S.S.B.

2033	WA1HHS	2040	JI1NOY
2034	W5TJQ	2041	LZ2SC
2035	I1ZQD	2042	G3JMH
2036	JA9IRH	2043	WB4QFH
2037	KB8O	2044	KE2C
2038	W1CRL	2045	KA5BWU
2039	W7KTI	2046	IØSGF

C.W. and Phone

4921	W8CEU	4932	JA2NKL
4922	AJ5Q	4933	WB2IHN
4923	ZL1PF	4934	WA6TKT
4924	W9ON	4935	LA9EF
4925	HB9BLQ	4936	KA4BFT
4926	W6YQ	4937	G3EZZ
4927	KØEVE	4938	JA3OCD
4928	KØEU	4939	LA7EU
4929	WA9MGK	4940	W4UQ
4930	YU3TRI	4941	K2OB
4931	OZ1DYU		

Application and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 cents) size 4½ × 9½ to the WAZ Manager, Leo Haijsman, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the QSL Manager or to a check point should include sufficient postage for the safe return of their QSL cards. The processing fee for all C.Q. Awards is $5.00 (as of March 1, 1981 the fee will be $4.00 for subscribers and $10.00 for non-subscribers).

thing is moving and they are not ready to announce it yet, but it is something that you'll want to hear. It cannot be told just now, but be a believer.

Meanwhile, fear not about DX, it will be here forever. Adn if 10 meters shows signs of fading as the year grows, know that if 10 goes 80 will return. The canny DXer will look down the long stretch of the rare ones to come in 1981 and prepare. Conditions change; DX is eternal! For, as the poet would often say, "Work DX along with me! The best is yet to be. . . ."

Some DX Notes

With the DX Advisory Committee studying the question of payment for QSLs, something may sharpen the thorns on this question when the ARRL Board of Directors meets late this month. Those who have followed the mounting virulence of the arguments, for or against, suspect it is another expedition into an untenable situation with no winners, no losers, but a lot of disgruntled.

Whatever your convictions, be they for or against, you'll have at your command strong, lucid cogent and irrefutable arguments that things should be one way or another. Precedence can be cited, excesses noted and warnings sounded. Everyone on both sides will be right; no one will admit to error. The only problem might be enforcing any decision. Inevitably, some will differ with the decisions—they went too far, they did not go far enough, they cheated me out of one that would have put me on the Honor Roll, they have favorites who get away with anything but they lurk in wait for we honor-bright, poor but deserving types. And they just do not understand. Blessed need be he who makes the decisions for verily he will be wrong, disputed and maligned for his error.

Anyhow, keep an ear open for possible action at the Board Meeting. It may be the season to rush in where the angels have rushed out. As has been noted, where the dollar sign is rampant on the QSL card, those who need are moved to generosity, those who need most are most generous and those who need not at all are scornful.

The WPX Program

Mixed

866	KB8O	868	K2QF
867	W1JR		

S.S.B.

1313	DF7QD	1318	VK3BLN
1314	KB80	1319	K3VY
1315	K9BIL	1320	S8AAP
1316	KB9AW	1321	TG9GI
1317	PAØTMB	1322	AE9X

C.W.

2005	KB8O	2007	G3EZZ
2006	W9NTY	2008	WD9EJE

WPNX

185	KA9EAT	186	KA4IKH

Endorsements

Mixed: 500 PA3AEB. 550 KB8O, KA3A, K2QF. 600 YU2OP, AA4NC, JA7HMZ, WD4IHV. 650 WB8YQX, OE1RJW. 750 K2OLG. 1000 W1JR. 1400 N9AF, YU2RTW.

S.S.B: 300 K9BIL, PAØTMB, VK3BLN, K3VY, S8AAP, AE9X. 400 KB8O. 450 WB9ZBE. 500 DF7QD. 550 K9HDZ. 600 WB8YQX. 650 TG9GI. 700 I6NOA, 800 I4LCK. 1100 XE1J. 1300 ZL3NS.

C.W: 300 W9NTY, KB8O, WD9EJE. 350 WB9NMN, JA5SIX. 500 KA3A, G3EZZ. 700 W9OYZ. 750 I3HDH. 1000 W1WLW. 1200 N2AC.

10 meters: JH1VRQ, I4LCK, KB8JF, W1WLW, I6NOA.
15 meters: DF7GK, KA3A, KL7AF, I4LCK, KB8JF.
20 meters: DF7GK, WB9NMN, KB8JF, G3EZZ.
40 meters: DF7QD, I4LCK.
Asia: DF7GK, K2OLG, G3EZZ.
Europe: DF7QD, DF7GK, AGØA, AG5C, OE1KJW, G3EZZ, JA7HMZ.
No. America: WØULU, I3HDH, AE9X, I6NOA, JA7HMZ.
So. America: I4LCK.

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.

G-QRP Club

G-QRP Club will be active across the end of next month. They are scheduling two weekends of activity during the year, the other being the 12/13th of September. Next month it will be February 28/March 1st.

The action is changed almost hourly, starting on eighty at 0900Z, twenty an hour later, then on following hours to

Franz Langer, DJ9ZB, of Abu Ail fame listens attentively to a lengthy discourse by W6ISQ at the Fresno DX Convention. (Photo courtesy WA6AUD)

fifteen/ten, forty, twenty, forty, fifteen/ten, eighty (1700-1800), forty, ten/fifteen, twenty and forty. Frequencies are 60 khz inside the band except for forty where the action is 30 khz inside.

PA-QSL Bureau

This moves to a new address the first of this year. The fast-direct route is now: Dutch QSL Bureau, PB 330, 6800 AH Arnhem, Netherlands.

The Colvins

DX Hall of Famers Lloyd and Iris Colvin were on their way a handful of weeks back and probably are still running up their always awesome totals of QSLs. W6KG and W6QL were aiming for the eastern Mediterranean when they left, specifically aiming for SV5 and SV9 and trimming the itinerary as they developed local on the spot knowledge. YASME QSLing.

Short Rejoinders

Franz Langner, DJ9ZB, tried hard during the summer for a Tunisia license. What he got was "...l'autorisation ne pourrait etre accorde, le Ministere de l'Interieur ayant emis un avis defavorable." No!

AD1S, who handles a number of QSL chores, says to watch for some of his clients at:

7X5AH-Algeria—From 0100Z on Thursdays 14210 kHz to 14220 kHz; 3790 kHz or thereabout from 0400 Thursday.

ZK1CE-Southern Cooks—List by AD1S at 0500Z at 14220 kHz or 14270 kHz—this one on Fridays.

KC6DC-Western Carolines—Often on list schedule with AD1S. Watch 14270 kHz on Saturdays, 14270 kHz from 1030Z on Sundays and 3790 from 0900Z Saturdays.

H44SH-Solomon Islands—List operation from 0530Z on Wednesday. Sometimes found around 14220 kHz on Sundays.

Most DXers realize that WARC '79 was basically a meeting to work up a new treaty on international communications and a chance to reward the worthy DXer with some new bands. However, treaties have to be ratified, and the present guess is that this one will not be approved by the U.S. Senate until early next year. Someone mentioned elsewhere that DXers need patience. Some often wonder why, initially anyhow, but they learn.

Faroes On 160

Elsewhere you can check Frank Anzalone's dates for the action later this month, but a month or so back some RSGB types were checking the gear for a 160 contest action. GM3YOR and GM3OLK were shaping the effort, and they have been hitting the 160 test action in recent years.

Once beyond TF in January they are looking at 3A-Monaco and FC-Monaco this summer. And, any time mention is made of 160, a reminder is gratuitously always included that you can keep up with the 160 action if you read W1BB's bulletin. S.a.s.e. with two rates of postage brings it to you like a hot flash. W1BB's QTH is in all Call Books, some say since Marconi sent his first "CQ."

Finishing With A Flourish

Karl Rietz, WB7FAT, is looking for some QSL Manager duties. Karl says that he is disabled to some extent and would like something to help fill in the time. He is DXing every day but could and would like to help with some paper work for DX stations.

K5LBU/STØ. Charles Frost there at Juba is looking for contest activity, and if you missed him in the CQ WW Test, catch him on the next circle of tests. His antenna was not the best a couple of months back and Frosty was dreaming of something better. You might check his dreams by listening around 21275 kHz from 0200Z to 0400Z often. On 27560 kHz he shows at times around 0700Z and regretfully was reporting that while he was hearing many of the Deserving, they were not hearing him. QSL to KC4CD (ex-WA4ZQQ). By this time Frosty may have been heard signing STØCF. The call changes; all the other information is the same.

CQ DX Honor Roll

The CQ Dx Honor Roll recognizes those Dxers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Total number of countries on the list as of deadline is 319. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted at any time, in any number. Updates indicating no change will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00. The basic award fee is $5(as of March 1, 1981 the award fee will be $4.00 for *CQ* subscribers and $10.00 for non-subscribers).

C.W.

W6PT	319	DL7AA	314	K4CEB	307	W1NG	293	JA1GTF	286
ON4QX	318	W3GRS	314	N6CW	305	W4OEL	292	SM3EVR	285
K6EC	316	N6AV	312	W2GT	304	WA8DXA	289	K3FN	283
W9DWQ	316	K6JG	310	K9MM	304	N4MM	289	W1WLW	276
W6ID	315	W8KPL	308	DL3RK	299	DJ7CX	287	JH1VRQ	275
N4PN	315	W4BQY	307	N6FX	298				

S.S.B.

WA2RAU	319	W4SSU	316	DJ9ZB	312	WB6DXU	301	AI8S	287
W6EUF	319	W3CWG	316	W6RKP	311	WØSR	301	YS1O	285
W9DWQ	318	W4UG	316	K6XP	311	DL6KG	300	N5FG	285
DL9OH	318	K6JG	316	K5OVC	311	HP1JC	300	K9HQM	285
K8DYZ	318	ZL3NS	315	VE2WY	310	WA4WTG	300	LA7JO	284
W3NKM	318	VE3GMT	315	I4ZSQ	309	OE3WWB	300	JA5PUL	284
W6REH	318	K4MQG	315	N4MM	309	XE1J	300	I8LEL	283
XE1AE	318	K9LKA	315	K8LJG	309	I5WT	299	K1UO	282
W4EEE	318	SM6CWK	315	W9SS	309	WA4JTI	297	VK4VC	281
W2TP	318	K6EC	315	K9RF	309	I6PLN	296	W6DN	281
IØAMU	318	I8YRK	315	N6AV	309	DJ7CX	295	N3RL	281
K6WR	318	SM6CKS	314	WØSFU	308	F9MS	294	WD8MGQ	278
K2FL	318	OZ3SK	314	YV5AIP	308	W9DQ	294	K3MWV	277
VE3MR	317	ZS6LW	314	XE1KS	306	VE3FJE	294	W4BQY	277
TI2HP	317	EA4LH	314	YV5DFI	305	K5DUT	294	WA4LOF	277
IØZV	317	N4WF	314	LU1BAR/W3	305	W1NG	293	WA6TOO	277
W3GRS	317	YV1KZ	314	N6AW	305	JH1VRQ	292	JA6GDG	276
W9JT	317	K9MM	313	W8ILC	304	W7OM	292	ZL1BIL	276
VE3MJ	317	G3FKM	313	DL6KG	304	K4LSP	291	I8KNT	276
I8AA	317	W4DPS	313	VE7WJ	303	IØMBX	290	YU2RTW	276
W9KRU	317	W6YMV	313	I3LLD	303	K9RF	290	XE1CI	276
I8KDB	317	OE2EGL	313	DK2BL	302	9H4G	290	AA4A	275
W3AZD	317	I5WT	313	N2SS	302	VE7CE	289	DJ2AA	275
WA2EOQ	317	W3GG	313	W6FET	302	OK1MP	289	K9PPY	275
W9QLD	316	F2MO	313	WØYDB	302	VE7HP	289	W8ILC/QRPp	275
F9RM	316	ZL1AGO	312	K8PYD	302	G4CHP	289	WAØTKJ	275
K6YRA	316	WØSD	312						

CQ DX Awards Program

S.S.B.

915	WA4RQH	923	N8BKF
916	WD9BAJ	924	VE3JGT
917	AE9X	925	WA6IPW
918	KT4U	926	GM4DLU
919	S8AAT	927	N7AIF
920	HS1ALP	928	WB2QEU
921	W3OGY	929	N3RL
922	KB8CU		

C.W.

455	W1GDQ	457	N3KR
456	SM3EVR	458	N3RL

S.S.B. Endorsements

310	ZL3NS/315	200	N8ARQ/225
310	F2MO/313	200	WB4YBF/200
275	N3RL/281	200	WB0LXM/200
275	K9HQM/285	150	K9TI/178
275	WD8MGQ/278	150	XE1NI/154
275	WA4LOF/277	150	WA4RQH/153
250	WB4UBD/251	150	WB2QEU/152
250	KB8O/250	28 MHz	WA4RQH
28 MHz	WB4YBF	28 MHz	WD8MGQ
		28 MHz	WA6TOO

C.W. Endorsements

275	W4OEL/292	200	N3RL/209
275	SM3EVR/285	150	K9TI/151
275	W1WLW/276	150	KB8O/150
200	W1GDQ/219	3.5/7MHz	AF5M

The total number of active countries as of deadline was 319. Complete 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 USA.

David Guthrie, 5N0DOG, of Lagos, Nigeria has confirmed both country and prefix for many eager DXers. You may QSL 5N0DOG via John Parrott, W4FRU, 4640 Ocean View Ave., Virginia Beach, VA 23455. (Photo via W4FRU)

John Attaway, K4IIF. A long-time haunter of these parts, John was far afield a few months back promoting the virtues of Florida orange juice and a bit of DX along the way. John visited TF/LA/SM and OH lands, getting in a bit of contest operations and visiting some of the locals. In Stockholm John was able to present 5-Band WAZ #3 to SM4CAN, this at a meeting of the Stockholm DX Club. In Helsinki John was able to put OH2BH's station on the air to check how things sound at that DX magnet in downtown Helsinki.

QSL Information

FR0RX - to DK9KD
FR0CIW - to DK9KD
FW0DD - to VE3ODX
HB0BOE - to DJ9ZB
HS5ABD - to N6ZZ
HV2VO - to I0GPY
H44SH - to AD1S
K4IIF/OH - to W4KA
KC6DC - to AD1S
NP2AF - to WA1GXE
OH2BP/OH0 - to OH2PQ
S79MC - to N4NW
VP1SM - to W4SME
VP8SB - to G3ZMF
VP2VGF - to WA1GXE
WP2ABZ - to WA1GXE
ZK1CE - to AD1S
7X5AH - to AD1S
HK0EHM - Box 842, San Andres Island, Colombia
VK9NL - Box 103, Norfolk Island, 2899 Australia
6Y5MR - VE3KGK, Bx 1703, Station A, London, Ontario N6A 5H9

Miscellaneous

Fred Spies, WP2VEZ/W5HF became a Silent Key a couple of months back. Those who may need a QSL for VP2VEZ should go via Woody, K5GOE, also the route for VP2VEN. Gary Cameron, VE7DZR, is a volunteer for QSL Manager duties. He is looking for either DX or DX Contest QSL chores, and you can catch Gary at 3528 11th Avenue, Port Alberni, British Columbia V9Y 4Y7.

73, Hugh, WA6AUD

One switch and about an hour's time can increase your two meter operating ease.

Simple Inverse Switching For The Kenwood TR-7400A

BY WILLIAM TUCKER,* W4FXE

Invariably, there comes a time in the life of every two meter man when he finds the need or desire to listen to the input side of the repeater.

This need arises often when the other fellow "times out" the repeater and keeps on talking for a minute or two completely unaware of the fact that the repeater is not in operation. With the Kenwood TR-7400A, as in most two meter transceivers, all that is necessary to listen to the input frequency is to turn the 100 kHz knob down or up 600 kHz and *voila,* the other fellow is in there talking, providing of course that you can hear him direct.

Other instances where you might want to turn that knob to the input frequency would be to compare audio quality, check for off frequency operation or hum origination and to find out if you can copy the other fellow so that you can rendezvous to a simplex frequency and leave the repeater free for others to use.

Wouldn't it be nice to be able to just tap a toggle switch and listen to the input quickly without disturbing the frequency selector knob? With the TR-7400A there is a simple method which requires only a miniature d.p.d.t. toggle switch and about an hour's work.

*1965 S. Ocean Drive, 15-G Hallandale, Florida 33009

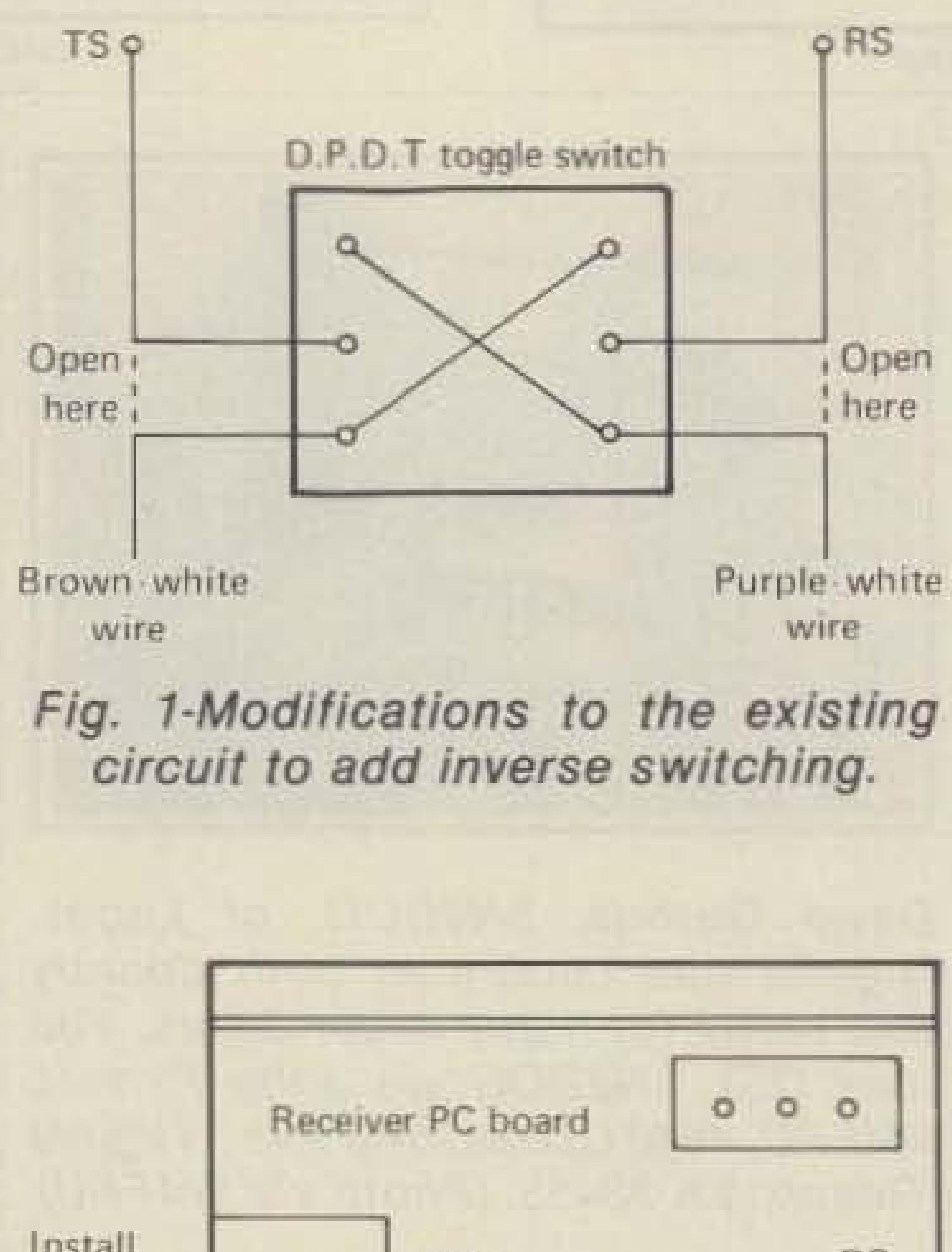


Fig. 1-Modifications to the existing circuit to add inverse switching.

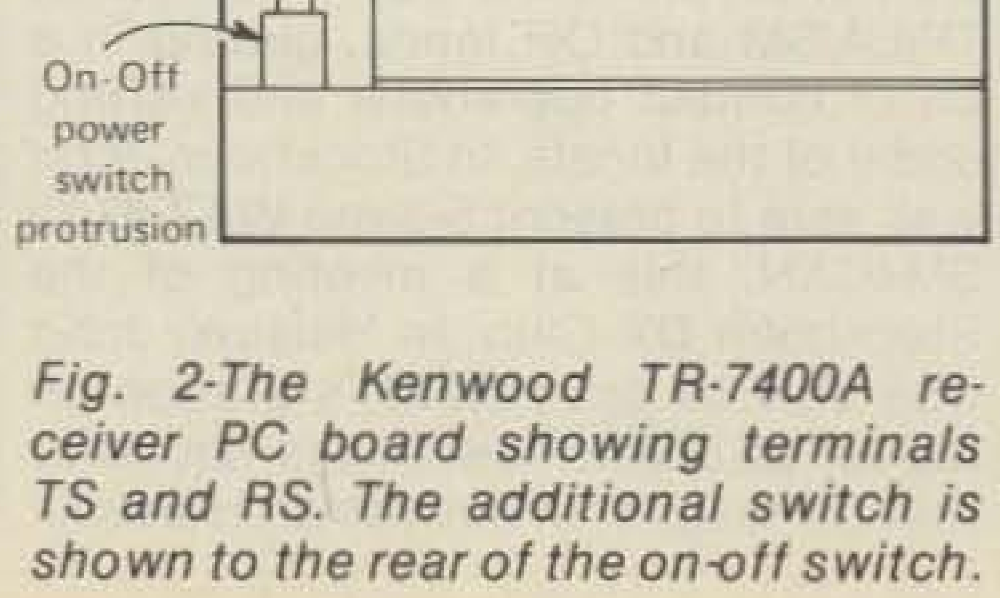


Fig. 2-The Kenwood TR-7400A receiver PC board showing terminals TS and RS. The additional switch is shown to the rear of the on-off switch.

Referring to fig. 1, there are two leads running to terminals TS and RS on the receiver section PC board (shown in fig. 2). Open each lead and connect to the d.p.d.t. switch as shown. The switch is wired so that the two leads will be reversed; that is the entire electrical modification.

When the switch is in the reverse position, the digital readout does not change but will show the transmit frequency instead of the usual receive frequency. The transmitter offset switch (TX) now becomes a receiver offset switch. If you wish, you can use a momentary contact switch so that the transceiver automatically returns to normal operation when you let go.

Fig. 2 shows the location of terminals TS and RS on the receiver PC board and also the best place to locate the miniature toggle switch. Make certain the toggle will clear the ON position of the power switch before marking the mounting hole for drilling. Finally, the bottom cover will have to be notched out to clear the toggle handle.

For those who do not wish to drill a hole in their rig and notch out the bottom cover, the toggle switch can be mounted externally in any convenient manner. The four leads can be brought out via the touchtone pad socket or through the external speaker jack opening if either one is not being used.

Try it, you'll like it.

a monthly feature by
GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The year 1980 was one of the best years recorded for radio propagation on the h.f. bands. Despite decreasing solar activity, 1981 is expected to be another good one for the h.f. bands.

The Zurich Solar Observatory reports a monthly mean sunspot number of 155 for September 1980. This results in a smoothed sunspot number of 162, centered on March 1980. Cycle 21 is now slowly declining from its peak value of 165, recorded during December 1979.

The new year is expected to begin with a smoothed sunspot count of approximately 140 and decrease steadily to a level of approximately 115 by the end of 1981. While a lower level of solar activity is expected during the new year, it should be high enough to assure good conditions on all h.f. bands *10* through *160* meters. The lower level of solar activity, however, will very likely result in considerably fewer DX openings on the *6* meter band.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for January 1981

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

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

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

January Conditions

It should be a toss-up between *10* and *15* meters for DX propagation honors during the daylight hours. Both bands should open to most areas of the world, often with very strong signals. Ten meters may have a slight edge before Noon, with *15* meters being somewhat better after Noon, and becoming the optimum DX band during the late afternoon hours. Short-skip openings, between distances of approximately 1200 and 2300 miles, should be excellent on *10* meters during most of the daylight hours. Excellent short-skip openings are also expected on *15* meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles.

Excellent propagation conditions are expected on *20* meters, for both DX and short-skip openings, almost around the clock. DX conditions should peak during a window of an hour or two following sunrise, and again during the late afternoon and early evening hours. On many days, the band should remain open well past Midnight. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as Midnight. Shorter distant openings should also be possible from mid-morning to mid-afternoon.

The optimum band for DX conditions during the hours of darkness should be *40* meters. Openings to most areas of the world are forecast from shortly before sundown, through the hours of darkness, and until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours, short-skip conditions should be optimum for openings between approximately 100 and 600 miles. Skip will lengthen during the late afternoon, and by nightfall short-skip conditions should be optimum for openings between 800 and 2300 miles.

Atmospheric noise levels are expected to be at seasonally minimum levels in the northern hemisphere during January. This should result in peak conditions on both the *80* and *160* meter bands. Expect some good openings to many parts of the world on *80* meters during the hours of darkness and the sunrise period. Short-skip openings, between distances of 50 and 250 miles, should be optimum on *80* meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

Expect some DX openings on the *160* meter band during the hours of darkness. Openings towards Europe and the east should peak at about Midnight.

Openings towards the South Pacific and in a generally southerly direction should peak just prior to daybreak. Short-skip openings up to 1300 miles should be possible during the hours of darkness, and frequently the skip will extend out as far as 2300 miles. During the daylight hours, intense solar absorption will severely limit openings, although some may be possible at times up to 150 miles or so.

Short-Skip Charts

This month's column contains a Short-Skip Propagation Chart for use in the continental United States for distances between 50 and 2300 miles. Special prediction charts centered on Hawaii and Alaska are also included.

11307 Clara St., Silver Spring, MD 20902

HOW TO USE THE SHORT-SKIP CHARTS

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

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

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

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

3). Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

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

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

CQ Short-Skip Propagation Chart
January & February 1981
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters) — Distance From Transmitter (Miles)

Band (Meters)	50-250	250-750	750-1300	1300-2300
10	*Nil*	*Nil*	07-08 (0-1) 08-09 (0-2) 09-10 (0-3) 10-12 (0-4) 12-15 (0-3) 15-17 (0-2) 17-18 (0-1)	07-08 (1) 08-09 (2-3) 09-10 (3-4) 10-12 (4) 12-15 (3-4) 15-16 (2-4) 16-17 (2-4) 17-18 (1-2) 18-19 (0-2) 19-20 (0-1)
15	*Nil*	07-08 (0-1) 08-10 (0-2) 10-15 (0-3) 15-17 (0-2) 17-18 (0-1)	06-07 (0-1) 07-08 (1-3) 08-10 (2-4) 10-15 (3-4) 15-17 (2-4) 17-18 (1-3) 18-19 (0-2) 19-21 (0-1)	06-07 (1) 07-08 (3-2) 08-18 (4) 18-19 (2-3) 19-20 (1-3) 20-21 (1-2) 21-22 (0-1)
20	09-11 (1-2) 11-14 (1-3) 14-15 (1-2) 15-17 (0-1)	06-07 (0-2) 07-09 (0-3) 09-11 (2-4) 11-14 (3-4) 14-15 (2-4) 15-17 (1-4) 17-19 (0-3) 19-20 (0-2) 20-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-4) 09-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (1-4) 21-23 (1-3) 23-01 (1-2) 01-06 (1)	06-07 (3-2) 07-08 (3) 08-12 (4) 12-14 (4-3) 14-21 (4) 21-23 (3-4) 23-01 (2) 01-04 (1-2) 04-06 (1)
40	07-08 (0-2) 08-09 (1-3) 09-10 (2-4) 10-19 (4) 19-21 (2-3) 21-00 (1-2) 00-07 (0-1)	07-08 (2-3) 08-09 (3) 09-11 (4-3) 11-15 (4-2) 15-19 (4) 19-21 (3-4) 21-00 (2-4) 00-02 (1-3) 02-06 (1-2) 06-07 (1-3)	07-08 (3) 08-09 (3-2) 09-11 (3-1) 11-15 (2-1) 15-17 (4-2) 17-18 (4-3) 18-00 (4) 00-02 (3-4) 02-06 (2-3) 06-07 (3-4)	07-08 (3-1) 08-15 (1-0) 15-17 (2-1) 17-19 (3) 19-02 (4) 02-06 (3-4) 06-07 (4-3)
80	07-08 (2-4) 08-10 (4) 10-15 (4-3) 15-00 (4) 00-04 (3-4) 04-07 (2-3)	07-08 (4-3) 08-09 (4-2) 09-10 (4-1) 10-15 (3-1) 15-16 (4-1) 16-18 (4-2) 18-04 (4) 04-07 (3-4)	07-08 (3-1) 08-09 (2-0) 09-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-06 (4) 06-07 (4-3)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4) 04-06 (4-3) 06-07 (3-1)
160	09-17 (1-0) 17-19 (3-2) 19-06 (4) 06-08 (3) 08-09 (2-1)	17-18 (2-1) 18-19 (2) 19-21 (4-3) 21-05 (4) 05-06 (3) 06-07 (3-2) 07-08 (3-1) 08-09 (1-0)	17-18 (1-0) 18-19 (2-1) 19-21 (3-2) 21-03 (4-3) 03-05 (4) 05-06 (3-2) 06-07 (2-1) 07-08 (1-0)	18-19 (1-0) 19-21 (2-1) 21-03 (3) 03-05 (4-2) 05-06 (2-1) 06-07 (1-0)

The charts are valid through February 1981. See last month's column for detailed DX Propagation Charts for use during January.

HAWAII
January & February, 1981
Openings Given In Hawaiian Standard Time

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

V.h.f. Ionospheric Openings

Solar activity is still expected to be high enough during January to permit unusually good DX openings on 6 meters to many areas of the world. Look for peak conditions towards Europe and Africa an hour or two before Noon, towards the Caribbean area and Central and South America from an hour or two before, to about an hour or two after, Noon. Expect 6 meter openings towards the Pacific, Australasia and possibly the Far East during the later afternoon hours. Trans-continental openings should be possible beginning at about Noon. Chances are best for 6 meter openings on those days expected to be HIGH or ABOVE NORMAL. (See the

ALASKA
January & February, 1981
Openings Given In GMT#

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

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

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

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

Check for 6 Meter openings at times when the 10 Meter forecast rating is shown as (4).

That "experienced" radio amateur look belongs to 6-year-old Brett Gordon, grandson of W3ASK. Brett enthusiastically holds down second op-position, and will soon begin to study for his Novice License under granddad's tutelage.

A not-yet Novice, 4½-year-old Ali Gordon, granddaughter of W3ASK, is well on her way to developing an interest in amateur radio. She's seen here chatting away on granddad's rig.

"Last Minute Forecast" at the beginning of this column.)

Chances for meteor-scatter v.h.f. openings should be pretty good between January 2nd and 4th, coincident with the occurrence of the *Quadrantids* meteor shower. This is expected to be a major shower, which should peak on January 3rd with a count of approximately 40 meteors an hour.

Some auroral-type openingsshould be possible during January. Fairly widespread auroral activity can occur during the month when h.f. conditions are BELOW NORMAL or DISTURBED. Check the "Last Minute Forecast" for appropriate dates.

Not many trans-equatorial (T.E.) openings are expected this month, since a seasonal slump usually occurs during January. Some infrequent openings may be possible, however, between southern tier states and countries well south of the equator in this hemisphere. The best time to check for T.E. openings on 6 meters is between 7 and 10 p.m. local time.

Propagation conditions on the h.f. bands should be off to a good start during January, and they are expected to remain at a high level throughout the New Year.

73, George, W3ASK

This month, K8BG's program lets you enter a DX station's prefix and provides antenna azimuth and distance for long and short path.

INTRODUCTION TO BASIC

A Computer Programming Language

Part XIII The Analysis Of The Generation Of A Program

BY BUZZ GORSKY*, K8BG

There are essentially two hurdles which face the neophyte programmer. The first is becoming familiar with the details of the programming language, and the second is learning how to apply those details to obtain results. Since much of this series has dealt with the former, I am devoting this segment to a detailed analysis of the generation of a program. I will try to show how I developed a program, where changes were made, and what problems occurred along the way. I hope that the analysis of this process will be as useful as the final result—a program that lets you enter a DX station's prefix and provides you with antenna azimuth and distance for both long and short path.

As I began to think of how to accomplish this task, I recognized that much of the required mathematics had been done in my Program For Circular Satellites (*CQ*, Dec. 1980). There I had provided antenna aiming information between a station and a satellite. However, the equations were there if one merely substituted a distant station for the satellite. The two required equations are shown in Table 1.

OK, so much for math (at least that's what I thought—more on this later). How do I proceed with the program? I decided to write the program in modules. First I would take care of the mathematical part to do the actual computation. Then I would write a segment to take care of converting north and south latitudes and east and west longitudes into mathematical terms. Then I would write a part to take station prefixes and find latitudes and longitudes, and finally I would take care of the long path conversion.

Listing One shows the first effort after it was cleaned up as far as typos and incorrect punctuation are concerned. This module was written for testing purposes to take two locations and calculate the antenna azimuth and distance between the two. Let's see how the equations in Table 1 were implemented here. Lines 101 and 102 simply read in four angles—L1, L2, L3, and L4, which will be the home QTH longitude and latitude and the distant station's longitude and latitude, respectively. Lines 110-140 convert these values to radian measure since the TRS80 does trigonometric functions with radians. I have accomplished the conversion using a subroutine. In general it is a good idea to use subroutines wherever a given task must be done repeatedly. It could be argued that this task is so simple, and it is only done a few times, so a subroutine is not really necessary. While that is true, use of the routine is certainly more elegant. In each of lines 110-140 we set A equal to one of the angles and then go to the routine in line 1000. There A is set equal to 0.0174533 times A, thus converting A to radians. Note that line 999 just preceding the routine indicates what the routine does and what variable is used. This practice is helpful in keeping things straight in more complex programs.

Equation One in Table 1 tells us that D, the great circle distance between two points on the globe, is equal to the ARCCOS of a rather complex function. To find D in our program I set AC equal to the quantity whose arccosine we will wish to find. We then go to the subroutine in 1100 to compute the arccosine. We need this subroutine since the TRS80 does not have the ARCCOS function directly, but it can be computed from ATN and SQR as indicated in the Level II Basic manual. When we return from the subroutine, A has the angle we want. We now set D equal to that angle. In lines 170 and 180 we now repeat the process to implement equation Two and thereby find the azimuth that we desire.

Now we must put things into human form for presentation of the answer. Line 190 sets A equal to D and then uses the routine in 1050 to convert the radian value to one in degrees. DI gets this value and then in 200 DI is multiplied by a constant to convert the degree distance to statute miles. Then in 210 we print out the two values. The END in line 220 is required, otherwise the program would continue to line 999 and

*712 Hillside Drive, Carlisle, PA 17013

1000, and there it would see the RETURN and would indicate an error since the RETURN was found before any GOSUB. Line 220 stops execution, avoiding that error.

So to this point, we have implemented these two equations, or at least so I thought. Now, how can we test this. I first ran the program, as is, just to see that it would in fact run and that there were no syntax or other errors that the machine would catch. I then made the few modifications shown in listing Two. This now lets me put in values for L3 and L4. When I did that I began trying various values to see if the answers made sense; they didn't. Thus we have a program which is syntactically correct (that is debugged as far as the machine is concerned) which does not do its task correctly. I put in 81 for L3 and 10 for L4. This gives a DX station location just north of the equator, but just south of my QTH. The azimuth should be 180 degrees; it wasn't. At this point I looked back at the equations and at the program statements to try to find the error. A set of parentheses had been left out of line 170. Listing Three has the corrected statement. Without these parentheses the program was taking the portion of the equation above the fraction line, dividing it by COS(L2) and then multiplying that quotient by SIN(D). With the parentheses correctly placed the program divides the part above the line by the product of COS(L2) and SIN(D) as it should.

I then proceeded with more examples and found that the azimuth would never point to the west of the station. It seemed that the equation actually provided the displacement from north but did not know the direction. That is the azimuth would be 90 for a station due EAST and for one due WEST. If I understood more about solid trig, I would probably have foreseen the problem, but that's life! However, once I understand the problem, I can correct for it. The new line 180 in listing Three has an addition to take care of things. The IF statement asks if L3, the longitude of the DX station, is both greater than L1, the longitude of the QTH, and also less than L1 plus 3.14159. The constant is 180 degrees expressed in radians. This IF statement then asks if the DX station is in the hemisphere to the WEST of the QTH. If so then the azimuth angle is modified to 360 degrees less the calculated azimuth; if not the azimuth is left alone.

At this point, further testing of the program indicated that it seemed to perform appropriately. I then set out to tackle the next problem—how to enter values of latitude and longitude as they are usually expressed with

Table 1 -

*D = ARCCOS(SIN(L2)*SIN(L4) + COS(L2)*COS(L4)*COS(L1 – L3)*
*Az = ARCCOS((SIN(L4) – SIN(L2)*COS(D))/(COS(L2)*SIN(D)*

LISTING ONE

```
100 REM FIRST MODULE TO COMPUTE AZIMUTH AND DISTANCE
101 READ L1,L2,L3,L4
102 DATA 81,41,350,10
110 A = L1:GOSUB 1000:L1 = A:REM CONVERT TO RADIANS
120 A = L2:GOSUB 1000:L2 = A
130 A = L3:GOSUB 1000:L3 = A
140 A = L4:GOSUB 1000:L4 = A
150 AC = SIN(L2)*SIN(L4) + COS(L2)*COS(L4)*COS(L2 – L3):
    GOSUB 1100
160 D = A:REM D IS GT CIRCLE DISTANCE BETWEEN POINTS
    IN RADIANS
170 AC = (SIN(L4) – SIN(L2)*COS(D))/COS(L2)*SIN(D):
    GOSUB 1100
180 GOSUB 1050:AZ = A:REM AZ IS AZIMUTH TO AIM ANTENNA
190 A = D:GOSUB 1050:DI = A:REM DI IS CIRC DIST IN DEG
200 DI = DI*69.0912:REM DI NOW IN STATUTE MILES
210 PRINT"AZIMUTH---";AZ:PRINT"DISTANCE---";DI
220 END
999 REM CONVERT DEGREES TO RADIANS:A SUPPLIED IN DEG RETURNED
    AS A IN RADIANS
1000 A = A*0.0174533:RETURN
1049 REM CONVERT RADIANS TO DEGREES:A SUPPLIED IN RADIANS
    RETURNED AS A IN DEGREES
1050 A = A*57.29578:RETURN
1099 REM COMPUTE ARCCOS:AC SUPPLIED AS ARGUMENT, RETURNS A AS
    ARCCOS IN RADIANS
1100 AC = –ATN(AC/SQR(–AC*AC + 1)) + 1.5708:A =
    AC:RETURN
```

LISTING TWO

CHANGES FOR TESTING

```
101 READ L1,L2
102 DATA 81,41
103 INPUT L3,L4
```

LISTING THREE

FOR NEXT VERSION DELETE LINE 103 AND ADD THIS SECTION

```
10 INPUT"ENTER LONGITUDE OF DX STATION (INC E OR W)";LO$
20 INPUT"ENTER LATITUDE OF DX STATION (INC N OR S)";LA$
30 L3 = VAL(LEFT$(LO$,LEN(LO$) – 1))
40 IF RIGHT$(LO$,1) = "E" THEN L3 = 360 – L3
50 L4 = VAL(LEFT$(LA$,LEN(LA$) – 1))
60 IF RIGHT$(LA$,1) = "S" THEN L4 = 360 – 4
```

LISTING FOUR

```
170 AC = (SIN(L4) – SIN(L2)*COS(D))/(COS(L2)*
    SIN(D)):GOSUB 1100

180 GOSUB 1050:AZ = A:IF(L3>L1 AND L3<L1 + 3.14159)
    THEN AZ = 360 – AZ:REM AZ IS AZIMUTH TO AIM ANTENNA
```

LISTING FIVE

```
5 INPUT"ENTER DX PREFIX";P$
7 FOR I = 1 TO 10:READ CL$,LO$,LA$:IF CL$<>P$ THEN NEXT
10 DATA G, 0.1W, 51.4N, F, 2.2E, 48.9N, CT, 9.2W, 38.6N, DL,
    13.4E, 52.5N, SV, 23.8E, 38N, 4X, 35E, 32N, UK, 37E, 56N, JA,
    140E, 35.5N, ZS, 18E, 34S, ZL, 175E, 37S
20 IF I   10 THEN FOR J = I + 1 TO 10:READ A$,B$,C$:NEXT
```

LISTING SIX

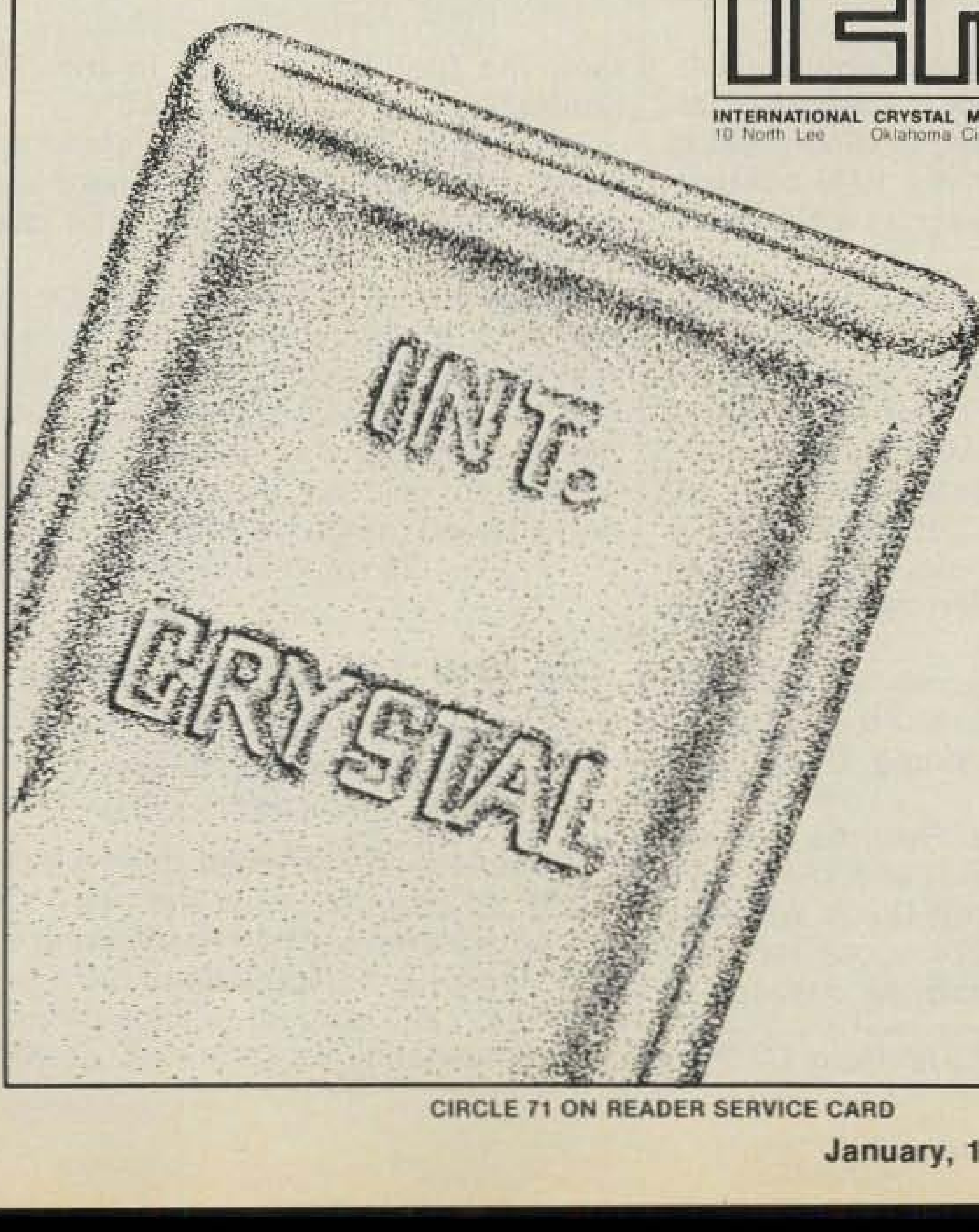
```
220 LZ = AZ + 180:IF LZ >360 THEN LZ = LZ – 360
230 LD = 24872 – DI
240 PRINT "FOR LONG PATH":PRINT "AZIMUTH-----";LZ:PRINT
    "DISTANCE----";LD
250 END
```

N,S,E, and W. Listing Four shows how this was done. Lines 10 and 20 permit input of a latitude and longitude in the usual fashion. We would now have a number such as 80W for longitude and 40N for latitude. For west longitudes we want the number before the W. For East longitudes we want 360 minus the number before the E. (A bit of staring at the globe may convince you this is true.) How do we do that? First I set L3 equal to the numerical value of the number to the left of the E or W. I do this by assuming that the string entered as LO$ consists of a number followed directly by a single letter. The LEFT$(LO$,LEN(LO$)-1) function truncates the single letter leaving a string representation of the number and the VAL function provides the numerical value. Then in 40 we check to see if that right-most character was an E. If so we set L3 equal to 360 minus L3. In lines 50 and 60 we do the analagous thing for the latitude. When this module is added to the program and line 103 is deleted, we can now enter a latitude and longitude from a map and the program will provide the information we want.

That's nice, but most of us would not want to sit with a map and look stations up every time we wanted an antenna heading. Listing Five shows additional statements to take care of this task. I have only done the beginning by providing data for 10 DX call prefixes. To be useful you would have to provide many more. In line 5 we enter a DX prefix. Line 7 then has a FOR/NEXT loop which begins by reading in CL$, LO$, and LA$. After these are read in from the DATA statement, we check to see if CL$ is different from P$. If so we look at the next set of entries. When we find a match we exit the loop. Note that there is no protection for what would happen if none of the prefixes in the DATA list matches. In that case we would get the value for ZL, the last entry in the table. Line 20 then reads through the rest of the data list so that things will be set up correctly for the read in line 101. The old line 30 is simply deleted. The statements in line 20 could be avoided by replacing the READ in 101 with two LET statements.

Finally listing Six has the few statements required to give the long path data. This is done simply by adding 180 degrees to the azimuth and correcting if the sum is more than 360 and by finding the long path distance as the difference between the earth's circumference and the short path distance, DI.

And as they say in the big leagues, that's all there is to it!



a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Add another Trophy to the 1980 list of more than 50 awards in our World Wide DX Contest. This one is being donated by Don Thomas, N6DT for the Top U.S.A. 28 MHz Phone score.

The Yasme Foundation is also donating an award to be known as "The Yasme Award" for the winner of the Multi-operator Phone Contest Expedition.

Doug Zwiebel, WB2VYA previously has been announced as the donor of the U.S.A. Multi-Opr. Single Xmtr. C.W. award.

The new list now reads as follows for the 1980 contest:

U.S.A.—28 MHz Phone—Don Thomas, N6DT (new)

World—Phone Multi-Opr. Contest Expedition—The Yasme Foundation (change).

U.S.A.—C.W. Multi-Opr. Single Xmtr.—Doug Zwiebel, WB2VYA (new).

Bill Schneider, K2TT who has been donating the awards for both phone and c.w. Multi-Operator Expeditions, has agreed to relinquish the phone to the Yasme Foundation, which is quite appropriate, since Lloyd and Iris Colvin of Yasme are constantly on an expedition of some kind.

The Yankee Clipper Contest Club, who is the sponsor of the Single Operator C.W. Expedition, is also picking up the donation for the 1979 contest. This was listed in error as a *CQ* sponsorship.

Now to clear up a few other errors in the C.W. results.

The donor of the Carib./C.A. award is Jim Neiger, N6TJ, *not* N6JT. Same error last year. (Mort Grotenstein, N6JT should donate an award for all the exposure he is getting. Hi!) Sorry about that Jim, an ole' contester like you deserves better recognition. It won't happen again.

TGØAA with a score of 2,411,520 was listed as a Multi-Multi entry, when actually it was a Single Transmitter operation.

In the All Time Records list we overlooked the fact that K1AR's winning score was a new U.S.A. All Band record. His 2,635,224 score replaces W3RJ's old '78 record. As a matter of fact, the first five scorers in the '79 contest all broke the old record.

Hopefully that should clean-up most of the glaring errors. There are always bound to be some that are overlooked.

Since this is being written in October, little thought was given to the fact that you will probably be reading this just before the Holiday season. But I did remember and extend my very best wishes for a most Happy Christmas and all good things for 1981.

73 for 1980, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

Jan. 3-5	ZERO District QSO Party
Jan. 10-11	Hunting Lions Contest
†Jan. 10-11	YU 80 M C.W. Contest
Jan. 17-18	AGCW DL QRP CW
Jan. 17-18	Intern. 160 Meter Phone
Jan. 17-19	ARCI QRP SSB Contest
Jan. 23-25	**CQ WW 160 CW Contest**
Jan. 24-25	Texas QSO Party
Jan. 25-26	Classic Radio Exchange
Jn/Fb 31-1	French C.W. Contest
Feb. 7-8	TWO Land QSO Party
Feb. 7-8	RSGB 7 MHz Phone
Feb. 14-15	QCWA CW QSO Party
Feb. 14-15	YL-OM Phone Contest
Feb. 21-22	ARRL C.W. DX Contest
Fb/Mr 27-1	**CQ WW 160 Meter Phone**
Fb/Mr 28-1	French Phone Contest
Fb/Mr 28-1	RSGB 7 MHz C.W.
Fb/Mr 28-1	G - QRP C.W. Activity
Mar. 7-8	ARRL Phone DX Contest
Mar. 14-15	QCWA Phone QSO Party
Mar. 28-29	**CQ WW WPX SSB**
Apr. 8-9	DX-YL to N.A.-YL C.W.
Apr. 15-16	DX-YL to N.A.-YL Phone
Apr. 25-26	King of Spain Contest

†Not Official

CQ WW 160 Meter Contest

CW—Jan. 23-25 SSB—Feb. 27-Mar. 1
Starts: 2200 GMT Friday
Ends: 1600 GMT Sunday

Complete and detailed rules will be found on page 57. Now that we have added a phone section to the contest, we are giving more details to the rules, especially the disqualification clause. In a one-band concentrated activity like the 160 Contest, operating ethics and a close observance of the rules are a must.

It has been gratifying to us that in the past 99% of the entries submitted were honest logs, and therefore no penalties were imposed. But it's that 1% that we are concerned about. Be assured that all logs will be closely checked.

We expect to get some flack for adding another contest to the Winter Calendar. That makes four of them within a period of three months. But when would you expect to schedule a 160 activity but in the winter months? And who would you expect to run a 160 phone contest but the original organizers of the 1st Top Band competition back in March 1960?

Good luck to each of the three 160 sponsors; at least one of us should come up with a good weekend.

ZERO District QSO Party

Starts: 2000Z Sat., January 3
Ends: 0200Z Mon., January 5

This year's party is again being sponsored by the Mississippi Valley Radio Club. The Zero district covers a lot of territory, so a lot of activity can be expected, hopefully from some of the rarer areas.

Stations outside the Zero district may work Zero stations only, but Zeros may work both in and out of district stations. The same station may be worked once on each band and mode, and mobiles in each county change.

Exchange: RS(T) and QTH. ARRL section and county for Zeros, ARRL section only for others.

Scoring: *For Zeros*—Total QSOs multiplied by (Zero counties + ARRL sections + DX countries) worked.

For others—Total QSOs multiplied by (Zero ARRL sections + Zero counties) worked.

Frequencies: C.W.—3560, 7060, 14060, 21060, 28060. S.S.B.—3900, 7270, 14300, 21370, 28570. Novice—3725, 7125, 21125, 28125.

Awards: Certificates to the top scorers in each ARRL section and each DX country. Also to the top

Novice/Technicians and a special mobile class.

Mailing deadline is February 15th to: Mississippi Valley Radio Club, WØSI, 3518 W. Columbia, Davenport, Iowa 52804. Include a large s.a.s.e. for log forms or copy of the results.

"Hunting Lions" QSO Party

Starts: 1200 GMT Sat., January 10
Ends: 1200 GMT Sun., January 11

Sponsored by Lions International and coordinated by the Lion Club of Rio de Janeiro, Brazil, this activity is between Lions and non-members. The objective: "to create and foster a spirit of international understanding and cooperation" among Lions and amateur radio operators.

Exchange: Call, QSO no. and RS(T). Lions or Leos will also include their club name.

The same station may be contacted once on each band, 10 through 80, both phone and c.w., but each mode is scored separately.

Scoring: One point for contacts between stations within the same continent, 3 points if between different continents. There is a bonus of 1 additional point if QSO is with a member of a Lion or Leo club, and 5 extra points if you contact a member of the Rio de Janeiro Arpoador Club.

Total QSO points is your score.

Awards: Will be made for both phone and c.w. A Trophy for 1st place, Trophy Medallion for 2nd place, and a Plaque for 3rd place. There are also medallions for the 4th through 10th places. Each participant will receive a certificate.

It is suggested that you write to Lions International, Att: Robert Cywinski, 300 22nd Street, Oak Brook, Ill. 60570, or the Arpoador Club for additional information.

Logs must be submitted no later than 30 days after the end of the party to: Lion Club of Rio de Janeiro Arpoador, Rua Souza Lima no. 310, Apt. 802, Rio de Janeiro 22081, Brazil.

YU 80 Meter CW Contest

Starts: 2100Z Sat., January10
Ends: 2100Z Sun., January 11

The YU DX Club is making this an annual affair to stimulate more activity on 80 meter c.w. Both single and multi-operator are permitted.

Exchange: RST plus a progressive QSO number (579001, etc.)

Scoring: Contacts between stations in the same country 1 point. With other countries on the same continent 2 points. With countries on other continents 5 points. With YU stations 10 points.

Multiplier: Each DXCC including your own, and each YU prefix worked.

Final Score: Multiply total QSO points by the sum of DX countries and YU prefixes worked.

Awards: Certificates to the top scorers in each country, 2nd and 3rd place awards were justified. Call areas in W/K, VE, PY, VK, ZL, JA and UA9 & UAØ will be considered separate areas for awards. There are also Trophies for continental leaders.

Include a summary sheet and the usual signed declaration with your entry. Check your log carefully. Taking credit for duplicate contacts in excess of 3% of the total made may mean disqualification.

Mailing deadline is March 1st to: YU DX Club of SRJ, P.O. Box 48, 11001 Belgrade, Yugoslavia.

AGCW-DL QRP Contest

Starts: 1500Z Sat., January 17
Ends: 1500Z Sun., January 18

This is the winter edition of this Contest organized by the AGCW-DL.

It's a c.w. only, all bands 10 through 160. The same station may be worked on each band for QSO credit.

There are 5 classes as follows:
A.—Single Opr., 3.5 watts or less.
B.—Single Opr., 10 watts or less.
C.—Multi-Opr., 10 watts or less.
D.—QRO stations, over 10 watts.
E.—SWL's

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

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

Points: QSO with own country, 1 point. Other countries own continent, 2 points. DX outside other continent, 3 points. Crystal controlled stations double above. Crystal controlled stations are limited to 3 crystals for each band.

Multiplier: One for each country and each DX contact.

Final Score: Total QSO points times the multiplier on that band. Add the sum of the scores from each band for final score.

For scoring purposes call areas in JA, PY, VE, W/K and ZS are counted as multipliers.

Awards: Certificates to the first three places in each class and each band.

Special log sheets are available from the Contest Mgr. (s.a.s.e. and 2 IRCs). Include one IRC with your entry for results.

Your log must be received no later than 6 weeks after end of contest by Contest Mgr., Siegfied Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed. Republic of Germany.

(N4BP with a score of 6149 was the winner of the 1979 Class B summer contest, and the only U.S.A. entry.)

International 160 Phone Contest

Starts: 0000Z Sat., January 17
Ends: 2400Z Sun., January 18

Sponsored by *73 Magazine,* this one made its debut last year. To my knowledge this was the first time there has been a DX phone contest on the Top Band.

There are two classes, single operator and Multi-operator, single transmitter. Single operators are limited to 30 hours out of the 48 hour contest period. Multi's can operate the full 48 hours.

Exchange: RS and QTH. State for the U.S., province for Canada, and country for DX stations.

Points: Each QSO is worth 5 points.

Multiplier: One for each U.S. state (48), one for each VE province (13), and 3 points for each DX country worked.

Final Score: Total QSO points times the total multiplier points.

Awards: Certificates will be issued in each category, in each state, each province and each DX country.

U.S. and VE stations are expected to observe the gentlemen's agreement not to transmit in the "DX Window" 1825-1830 MHz, which by mutual agreement is reserved for DX stations (operation will be split frequency).

A summary sheet, multiplier check list and a dupe sheet for logs with 100 or more contacts is also required.

Disqualification may result if power used is in excess of that authorized for a given area, if there are irregularities in logging, and if there are excessive duplicate contacts that would reduce the final score by more than 2% of the total.

Log forms and additional information are available by sending an s.a.s.e. to WA2GZB.

Mailing deadline for contest entries is February 21st, and they go to: Dan Murphy, WA2GZB, P.O. Box 195, Andover, N.J. 07821.

ARCI QRP SSB Contest

Starts: 2000Z Sat., January 17
Ends: 0200Z Mon., January 19

Sponsored by the QRP Amateur Radio International, this one is open to both members and non-members. (Two QRP contests on the same weekend? That should make it interesting even though they are on different modes.)

Exchange: RS, state, province or country, and QRP membership number for members. Non-members will send their power input.

Scoring: Contacts with a member 3 points, non-member 2 points, stations other than W/VE 4 points. The same station may be worked on each band for QSO and multiplier credit.

There is also a power multiplier:
Over 100 watts input .... 1.
25 to 100 watts input 1.5
5 to 25 watts input .... 2.
1 to 5 watts input .... 3.
Less than 1 watt input .... 5.

Bonus points: Stations powered by solar or wind power can add 300 bonus points to their total score. Emergency power, batteries, etc., add 100 bonus points.

Final Score: Total QSO points × (state + provinces + countries per band) × power multiplier + bonus points.

Frequencies: 1810, 3985, 7285, 14285, 21385, 28885, 50385.

Awards: Certificates to the highest scoring station in each state, VE province and country with more than two entries.

Include a summary sheet showing the scoring, equipment description and other information with your log. Also send a large s.a.s.e. for a copy of the results.

Logs must be received no later than March 25th and go to: QRP ARCI Contest Chairman, Edwin R. Lappi, WD4LOO, 203 Lynn Drive, Carrboro, NC 27510.

Texas QSO Party

Starts: 0000Z Sat., January 24
Ends: 2400Z Sun., January 25

This is a new one organized by the West Texas A.R.C. The same station may be worked on each band and each mode, and mobiles upon each county change.

Exchange: QSO no., and QTH County for Texas. State, VE province or country for others.

Points: Texas stations score 1 point per phone contact, 2 points if on c.w.

Non-Texans same as above, however Texan phone mobiles are worth 5 points, c.w. mobiles 7 points.

Multiplier: Texans use states, VE provinces and DX countries worked for their multiplier. Non-Texans use Texas counties (max. of 254).

Frequencies: C.W.—3575, 7055, 14070, 21070, 28090. Phone—3940, 7260, 14280, 21370, 28600. Novice—3710, 7110, 21110, 28110.

Awards: Certificates to the top scores in each state, VE province and DX country, and top ten Texans. There are also plaques for the overall winners in 7 different catagories: U.S., U.S. Novice, VE, DX, Texas fixed, mobile and Novice.

All logs must be received by March 15th and go to: Tom Horton, K5IID, 2708 Halifax, Odessa, Texas 79762.

Classic Radio Exchange

Starts: 2100Z Sun., January 25
Ends: 0400Z Mon., January 26

This is the winter edition of this unusual activity sponsored by the Southeast A.R.C. of Cleveland, Ohio.

Object is to restore, operate and enjoy older equipment with like-minded hams.

A classic radio is defined as any gear built since 1945, but at least 10 years old, an advantage in the contest but not required in the exchange.

The same station may be worked on each band and mode and with different equipment combinations. Non-contestants may be worked for credit.

Exchange: Name, RS(T), state, province or DX country, and receiver and transmitter type (i.e. home brew, 807 final, etc.). Also any other interesting information.

Scoring: Add number of different transmitters, receivers, and state, provinces and DX countries worked on each band. Multiply that total by the number of QSOs made on all bands. Multiply that total by your Classic Multiplier, total years old of all transmitters and receivers used (3 QSOs minimum per unit). If your equipment is a transceiver, multiply age by two.

Frequencies: C.W.—60 kHz up from band edge. Phone—3910, 7280, 14280, 21380, 28580. Novice—3720, 7120, 21120, 28120. (Try 20 on the half hour and 15 on the three-quarter hour.)

Awards: Certificates will be awarded for the highest scores, longest DX and "unusual achievement."

Send logs with comments, pictures, anecdotes, etc. to: Stu Stephens, K8SJ, 1407 Hollyrood Rd., Sandusky, Ohio 44870.

French DX Contest

C.W.—January 31 & February 1
Phone—February 28 & March 1
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Like last year, the exchange will be limitcd to working French Europeans, French overseas countries and Territories as per the following list:

Continental France, 95 departments (two figures in the exchange).

Armed Forces in DL (DA1/2).

Overseas countries and territories: FB8W Crozet - FB8X Kerguelen - FB8Y T. Adelie - FB8Z St Paul-et Amsterdam - FG Guadeloupe - FG St. Martin - FG St. Barthelemy - FH Mayotte - FK N. Caledonie -FK Loyanté - FK Chesterfield-FM Martinique - FO Iles-du-Vent -FO Iles-sous-le Vent - FO Marquises -FO Gambier - FO Rapa -FO iles Australes - FO I. Touamotou -FO Clipperton - FP St Pierre-et-Miquelon -FR Reunion - FR/E Europa -FR/G Glorieuses -FR/J Juan-de-Nova -FR/T Tromelin -Wallis FW - FW Futuna - FY Guyane -YJ N.Hebrides.

Single operator stations are limited to 36 hours of operation out of the 48-hour contest period.

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

Exchange: RS(T) plus a 3 figure QSO number. French stations will include 2 figures or letters to identify their QTH.

Points: Three points for contacts between stations on the same continent, 10 points if other continents.

Multiplier: Each French department and country worked in above list, on each band.

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

Awards: Certificates to top scorers in each country and each U.S. call area. In the past, contest contacts have been accepted for the many French awards.

Include a summary sheet with your entry showing the scoring, multiplier list for each band, etc.

Logs go to: REF French Contest, Att: Lucien Aubry, F8TM, sq. Trudaine 2, 75009 Paris, FRANCE.

No - 73 - 74

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

FAIRCHILD VHF AND UHF PRESCALER CHIPS

95H90DC	350 MHz Prescaler Divide by 10/11	$9.50
95H91DC	350 MHz Prescaler Divide by 5/6	9.50
11C90DC	650 MHz Prescaler Divide by 10/11	16.50
11C91DC	650 MHz Prescaler Divide by 5/6	16.50
11C83DC	1 GHz Divide by 248/256 Prescaler	29.90
11C70DC	600 MHz Flip/Flop with reset	12.30
11C58DC	ECL VCM	4.53
11C44DC/MC4044	Phase Frequency Detector	3.82
11C24DC/MC4024	Dual TTL VCM	3.82
11C06DC	UHF Prescaler 750 MHz D Type Flip/Flop	12.30
11C05DC	1 GHz Counter Divide by 4	50.00
11C01FC	High Speed Dual 5-4 input NO/NOR Gate	15.40

MUFFIN FANS

Size 4.68" × 4.68" × 1.50" — $8.99

TRW BROADBAND AMPLIFIER MODEL CA615B

Frequency response 40 MHz to 300 MHz
Gain: 300 MHz 16 dB Min., 17.5 dB Max.
50 MHz 0 to − 1 dB from 300 MHz
Voltage: 24 volts dc at 220 ma max. — $19.99

CARBIDE — CIRCUIT BOARD DRILL BITS FOR PC BOARDS

Size: 35, 42, 47, 49, 51, 52	$2.15
Size: 53, 54, 55, 56, 57, 58, 59, 61, 63, 64, 65	1.85
Size: 66	1.90
Size: 1.25 mm, 1.45 mm	2.00
Size: 3.20 mm	3.58

CRYSTAL FILTERS: TYCO 001-19880 same as 2194F

10.7 MHz Narrow Band Crystal Filter
3 dB bandwidth 15 kHz min. 20 dB bandwidth 60 kHz min. 40 dB bandwidth 150 kHz min.
Ultimate 50 dB: Insertion loss 1.0 dB max. Ripple 1.0 dB max. Ct. 0 + / − 5 pf 3600 ohms. — $5.95

MURATA CERAMIC FILTERS

Models:	
SFD-455D 455 kHz	$3.00
SFB-455D 455 kHz	2.00
CFM-455E 455 kHz	7.95
SFE-10.7 10.7 MHz	5.95

TEST EQUIPMENT — HEWLETT PACKARD — TEKTRONIX — ETC.

Hewlett Packard:

491C TWT Amplifier 2 to 4 Gc 1 watt 30 dB gain	$1150.00
608C 10 mc to 480 mc .1 uV to.5V into 50 ohms Signal Generator	500.00
608D 10 to 420 mc .1 uV to.5V into 50 ohms Signal Generator	500.00
612A 450 to 1230 mc .1 uV to .5V into 50 ohms Signal Generator	750.00
614A 900 to 2100 mc. Signal Generator	500.00
616A 1.8 to 4.2 Gc Signal Generator	400.00
616B 1.8 to 4.2 Gc Signal Generator	500.00
618A 3.8 to 7.2 Gc Signal Generator	400.00
618B 3.8 to 7.2 Gc Signal Generator	500.00
620A 7 to 11 Gc Signal Generator	500.00
623B Microwave Test Set	900.00
626A 10 Gc to 15 Gc Signal Generator	2500.00
695A 12.4 to 18 Gc Sweep Generator	900.00

Alltech:

473 — 225 to 400 mc AM/FM Signal Generator — 750.00

Singer:

MF5/VR-4 — Universal Spectrum Analyzer with 1 kHz to 27.5 mc Plug In — 1200.00

Keltek:

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

Polarad:

2038/2436/1102A
Calibrated Display with an SSB Analysis Module and a 10 to 40 mc Single Tone Synthesizer — 1500.00

RF TRANSISTORS

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2N1561	$15.00	2N5590	$8.15	MM1550	$10.00
2N1562	15.00	2N5591	11.85	MM1552	50.00
2N1692	15.00	2N5637	22.15	MM1553	56.50
2N1693	15.00	2N5641	6.00	MM1601	5.50
2N2632	45.00	2N5642	10.05	MM1602/2N5842	7.50
2N2857JAN	2.52	2N5643	15.82	MM1607	8.65
2N2876	12.35	2N6545	12.38	MM1661	15.00
2N2880	25.00	2N5764	27.00	MM1669	17.50
2N2927	7.00	2N5842	8.78	MM1943	3.00
2N2947	18.35	2N5849	21.29	MM2605	3.00
2N2948	15.50	2N5862	51.91	MM2608	5.00
2N2949	3.90	2N5913	3.25	MM8006	2.23
2N2950	5.00	2N5922	10.00	MMCM918	20.00
2N3287	4.30	2N5942	46.00	MMT72	1.17
2N3294	1.15	2N5944	8.92	MMT74	1.17
2N3301	1.04	2N5945	12.38	MMT2857	2.63
2N3302	1.05	2N5946	14.69	MRF237	2.95
2N3304	1.48	2N6080	7.74	MRF245	33.30
2N3307	12.60	2N6081	10.05	MRF247	33.30
2N3309	3.90	2N6082	11.30	MRF304	43.45
2N3375	9.32	2N6083	13.23	MRF420	20.00
2N3553	1.57	2N6084	14.66	MRF421	31.38
2N3755	7.20	2N6094	7.15	MRF422	44.14
2N3818	6.00	2N6095	11.77	MRF426	10.24
2N3866	1.09	2N6096	20.77	MRF450	11.85
2N3866JAN	2.80	2N6097	29.54	MRF450A	11.85
2N3866JANTX	4.49	2N6136	20.15	MRF454	21.83
2N3924	3.34	2N6166	38.60	MRF458	20.68
2N3927	12.10	2N6439	45.77	MRF472	2.50
2N3950	26.86	2N6459/PT9795	18.00	MRF502	1.08
2N4072	1.80	2N6603	12.00	MRF504	6.95
2N4135	2.00	2N6604	12.00	MRF509	4.90
2N4261	14.60	A50-12	25.00	MRF511	8.15
2N4427	1.20	BFR90	5.00	MRF901	5.00
2N4957	3.62	BLY568C	25.00	MRF5177	21.62
2N4958	2.92	BLY568CF	25.00	MRF8004	1.60
2N4959	2.23	CD3495	15.00	PT4186B	3.00
2N4976	19.00	HEP76/S3014	4.95	PT4571A	1.50
2N5090	12.31	HEPS3002	11.30	PT4612	5.00
2N5108	4.03	HEPS3003	29.88	PT4628	5.00
2N5109	1.66	HEPS3005	9.95	PT4640	5.00
2N5160	3.49	HEPS3006	19.90	PT8659	10.72
2N5179	1.05	HEPS3007	24.95	PT9784	24.30
2N5184	2.00	HEPS3010	11.34	PT9790	41.70
2N5216	47.50	HEPS5026	2.56	SD1043	5.00
2N5583	4.55	HP35831E/		SD1116	3.00
2N5589	6.82	HXTR5104	50.00	SD1118	5.00
		MM1500	32.20	SD1119	3.00
				TRWMRA2023-1.5	42.50
				40281	10.90
				40282	11.90
				40290	2.48

CHIP CAPACITORS

We can supply any value chip capacitors you may need.

PRICES

1 to 10	$1.49
11 - 50	1.29
51 - 100	.89
101 - 1,000	.69
1,001 up	.49

1pf	27pf	220pf	1200pf
1.5pf	33pf	240pf	1500pf
2.2pf	39pf	270pf	1800pf
2.7pf	47pf	300pf	2200pf
3.3pf	56pf	330pf	2700pf
3.9pf	68pf	360pf	3300pf
4.7pf	82pf	390pf	3900pf
5.6pf	100pf	430pf	4700pf
6.8pf	110pf	470pf	5600pf
8.2pf	120pf	510pf	6800pf
10pf	130pf	560pf	8200pf
12pf	150pf	620pf	.010mf
15pf	160pf	680pf	.012mf
18pf	180pf	820pf	.015mf
22pf	200pf	1000pf	.018mf

HAMLIN SOLID STATE RELAYS:

120vac at 40 Amps.
Input Voltage 3 to 32vdc.
240 vac at 40 Amps.
Input Voltage 3 to 32 vdc.

YOUR CHOICE $4.99

ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR

5.52-2.7/8
5.595-2.7/8/U
5.595-.500/4/CW
5.595-2.7LSB
5.595-2.7USB
5.645-2.7/8
9.OUSB/CW

YOUR CHOICE $24.95

MICROWAVE COMPONENTS

ARRA

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

General Microwave

Directional Coupler 2 to 4GHz 20dB Type N	75.00

Hewlett Packard

H487B	100 ohms Neg. Thermistor Mount (NEW)	150.00
H487B	100 ohms Neg. Thermistor Mount (USED)	100.00
477B	200 ohms Neg. Thermistor Mount (USED)	100.00
X487A	100 ohms Neg. Thermistor Mount (USED)	100.00
X487B	100 ohms Neg. Thermistor Mount (USED)	125.00
J468A	100 ohms Neg. Thermistor Mount (USED)	150.00
478A	200 ohms Neg. Thermistor Mount (USED)	150.00
J382	5.85 to 8.2 GHz Variable Attenuator 0 to 50dB	250.00
X382A	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	250.00
394A	1 to 2 GHz Variable Attenuator 6 to 120dB	250.00
NK292A	Waveguide Adapter	65.00
K422A	18 to 26.5 GHz Crystal Detector	250.00
8436A	Bandpass Filter 8 to 12.4 GHz	75.00
8439A	2 GHz Notch Filter	75.00
8471A	RF Detector	50.00
H532A	7.05 to 10 GHz Frequency Meter	300.00
G532A	3.95 to 5.85 GHz Frequency Meter	300.00
J532A	5.85 to 8.2 GHz Frequency Meter	300.00
809A	Carriage with a 444A Slotted Line Untuned Detector Probe and 809B Coaxial Slotted Section 2.6 to 18 GHz	175.00

Merrimac

AU-25A/	801115 Variable Attenuator	100.00
AU-26A/	801162 Variable Attenuator	100.00

Microlab/FXR

Y410A	Frequency Meter 12400 - 18000 MC	250.00
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	4K x 1 Dynamic RAM	2.99
10 For $20.00		
100 For $100.00		
4060/2107	4K x 1 Dynamic RAM	3.99
4050/9050	4K x 1 Dynamic RAM.	3.99
2111A-2/8111	256 x 4 Static RAM	3.99
2112A-2	256 x 4 Static RAM	3.99
2115AL-2	1K x 1 Static RAM 55ns	4.99
6104-3/4104	4K x 1 Static RAM 320ns	14.99
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

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

(602) 242-8916

2111 W. Camelback
Phoenix, Arizona 85015

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

F.L. Mosley/Hewlett Packard

3S	X Y Recorder 0.5 mv to 10 v	225.00
60D	Logarithmic Converter	100.00

Fluke

80E	High Voltage Divider	250.00
102	VAW Meter	150.00
710A	Impedance Meter Bridge	250.00
845AB	DC Null Detector/High Impedance Voltmeter	250.00
853A	Differential Meter	250.00
871A	DC Differential Voltmeter	250.00

General Microwave

454AR	Microwave Power Meter	100.00

General Radio

546C	Audio Frequency Microvolter	25.00
631D	Strobe	50.00
670F	Compensated Decade Resistor	50.00
740B	Capacitance Test Bridge	75.00
1203A	Power Supply	40.00
1203B	Power Supply	60.00
1208B	Oscillator 65 to 500 MHz	75.00
1211C	Oscillator 0.5 to 50 MHz	100.00
1212A	Null Detector	50.00
1214AS2	Unit Oscillator	50.00
1214D	Unit Oscillator	50.00
1215B	Unit Oscillator 50 to 250 MHz	100.00
1215C	Unit Oscillator 50 to 250 MHz	200.00
1216A	IF Amplifier	75.00
1217B	Unit Pulse Generator	50.00
1231P3	Tune Circuit	15.00
1269A	Power Supply	100.00
1363	Unit Oscillator 50 to 500 MHz	300.00
1382	Noise Generator	275.00
1390B	Noise Generator	200.00
1391B	Pulse, Sweep Time Delay Generator With 1391P2 Power Supply	450.00
1604B	Comparison Bridge	125.00
1617A	Capacitance Bridge	500.00
1652A	Resistance Limit Bridge	100.00
W50HM	Variac	200.00

Gertsch

SB-4C-4R	Synchro Bridge	50.00
ST-100	Transformer	15.00

Heathkit

IO-4560	Oscilloscope	75.00

Hewlett Packard/F.L. Mosley

2DR2	X Y Recorder 0.1 to 20 v	350.00

Hewlett Packard

AC-60K	Barretter Matching Transformer	15.00
196A	Scope Camera	200.00
214A	Pulse Generator 10 Hz to 1 MHz	650.00
216A	Pulse Generator to 100 MHz	650.00
350D	Attenuator Set	100.00
354A	Attenuator	250.00
400DR	VTVM 10 Hz to 4MHz	50.00
403A	AC Transistor Voltmeter	150.00
410B	VTVM	125.00
411AR	RF Millivoltmeter	250.00
413AR	DC Null Voltmeter	100.00
415B	VSWR Meter	50.00
416A	Ratio Meter	100.00
417A	VHF Detector 10 to 500 MHz	125.00
425A	DC Microvolt/Ammeter	250.00
428A	Clip On DC Ammeter	275.00
430C	Microwave Power Meter DC to 10 GHz 10mw	100.00
431B	Microwave Power Meter 10 MHz to 40 GHz 10 uw to 10 mw	200.00
431C	Microwave Power Meter 10 MHz to 40 GHz 10 uw to 10 mw	350.00
434A	Calorimetric Power Meter DC to 12.4 GHz 10 watts	450.00
457A	AC DC Converter	75.00
500BR	Frequency Meter	100.00
508A	Motor	25.00
1105A	Pulse Generator	50.00
1111A	AC Current Amplifier	75.00
1510A	Electromyograph Plug In	250.00
1752A	High Gain Vertical Plug In For 175A Scope	50.00
1780A	Auxiliary Plug In For 175A Scope	25.00
2470A	Amplifier	100.00
2772A	Power Supply	100.00
3301A	Auxiliary Plug In	25.00
3310A	Function Generator	500.00
3406A	Broadband Sampling Voltmeter 10 KHz to 1.2 GHz	750.00

Model	Description	Price
Hewlett Packard		
3430A	Digital Voltmeter	150.00
3434A	Comparator	250.00
3441A	Range Selector For 3439A/3440A	75.00
3442A	Plug In For 3439A Automatic Range Selector & 3440A	50.00
3443A	High Gain Auto-Range Plug In For 3439A/3440A	200.00
3445A	AC-DC Range Plug In For 3439A/3440A	175.00
3446A	AC-DC Remote Plug In For 3439A/3440A	150.00
3450A	Digital Voltmeter	750.00
4260A	Universal Bridge	900.00
4910F	Open Fault Locator	250.00
5252A	Prescaler For 5245L/5246L to 350 MHz	250.00
5260A	Frequency Divider to 12.4 GHz	1000.00
5327B	Timer Counter DVM to 512 MHz	1000.00
5383A	520 MHz Frequency Counter	300.00
5480A	with a 5486A and a 5485A, Memory Display, Control, and a Two Channel Input	3500.00
8005B	Pulse Generator	750.00
8007A	Pulse Generator	750.00
8402A	Calibrator For 431A and 431B	250.00
8601A	Generator/Sweeper	1200.00
8802A	Medium Gain Amplifier	100.00
10405	Vertical Response Tester	100.00
10407B	Plug In Extender	100.00
10411A	Horizontal Gain Calibrator	100.00
H03-353A	Attenuator Set	100.00
Hickok		
CA-4	Compactron Adapter For Tube Tester	150.00
DP100	DC Plug In	25.00
Hughes/Cobilt		
TCB-440/PE-100	Die Bonder (Like New)	1000.00
ITT/Standard Telephones and Cables Ltd.		
74834SG	Distortion Measuring Equipment	100.00
Kay		
110A	Mega Sweep	100.00
570A	Rada Pulse Sr. 10 to 80 MHz	100.00
990A	Utilator 4.5 to 220 MHz	100.00
Keithley		
200B	DC VTVM	50.00
250	Static Meter	300.00
416	Pico Ampmeter	100.00
600A	Electrometer	200.00
Keltec		
XR630-100	TWT Amplifier 8 to 12.4 GHz at 100 watts 40 dB Gain	5000.00
Krohn Hite		
310ABR	Band Pass Filter 20 Hz to 200 KHz	100.00
350A	Ultra Low Frequency Rejection Filter 0.02 Hz to 2 KHz	100.00
360AR	Rejection Filter 20 Hz to 200 KHz	100.00
Leeds & Northrup		
Spectray 90	Temp. Detector	100.00
8686	Millivolt Potentiometer	250.00
Meguro		
MSG2282A	Signal Generator	500.00
Military		
AN/URM90	Impedance Bridge	150.00
SG-103/URM25F	HF Signal Generator 10 KHz to 50 MHz	250.00
ME180B/USM116B	RF Voltmeter Multimeter	100.00
TV-7DU	Tube Tester	125.00
Millivac		
828A	RF Microvoltmeter Solid State (NO PROBE)	100.00
Nelson Ross		
PSA-023	Spectrum Analyzer 0 KHz to 500 KHz	300.00
PSA-034	Spectrum Analyzer 1 KHz to 2 MHz	300.00
NLS		
FM-7	Frequency Counter	100.00
MS-215	Scope	200.00
SC-5	Prescaler	150.00
North Atlantic		
RB-503C/S-1177	Ratio Box	75.00
VM-204	Phase Angle Voltmeter	100.00
Singer		
MF-5	Spectrum Analyzer with a UR-3 and a VR-4 1 KHz to 27.5 MHz	1200.00
Philco/Sierra		
470A-500	High Power Signal Generator 200 to 500 MHz 50 watts	1100.00
Polarad		
SD-1	Multi Pulse Spectrum Analyzer	75.00
1001M4	Modulator	150.00

Toll Free Number
800-528-0180
(For orders only)

MHz electronics
(602) 242-8916
2111 W. Camelback Phoenix, Arizona 85015

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

Model	Description	Price
Polarad		
1107	Signal Generator 3.8 to 8.2 GHz	500.00
1108	Signal Generator 6.95 to 11 GHz	500.00
1108M4	Signal Generator 7 to 11 GHz	500.00
1206	Signal Generator 1.95 to 4.2 GHz	500.00
PRD		
680/X670	Calorimetric Power Meter with Dry Calorimeter 8.2 to 14.4 Ghz	300.00
Radio Ometer Cophenhagen		
SMG-1	Stereo Generator	500.00
Ramcor		
1200	Densitometer	250.00
RCA		
WV-98C	Senior Volt Ohmyst	75.00
RFL		
107A	Magnet Charger	500.00
541A	10 KHz to 1100 KHz Crystal Impedance Meter	400.00
541C	2.5 KHz to 1100 KHz Crystal Impedance Meter	500.00
942A-8/HB7778	Magnet Charger with Transformer	1000.00
Rohde & Schwarz		
KRT	Capacitance Meter	500.00
SLRD	UHF Power Signal Generator 275 to 2750 MHz 20 watts	1000.00
Sencor		
CA122B	Color Circuit Analyzer	200.00
Siemens		
3D3325	Selective Voltmeter	250.00
Spectra		
UBD 1/2°	Photo Research Spotmeter	1500.00
Stoddart		
NM-10A	RFI Meter 10 to 250 KHz	200.00
NM-40A	RFI Meter 30 Hz to 15 KHz	300.00
Teca Corp		
CH-3	Variable Pulse Generator & Chronavie Meter	150.00
Tele Signal Corp		
320	Test & Meter Unit	100.00
Telonic		
SM2000	Sweeper	300.00
Tektronix		
B	Wideband High Gain Plug In	35.00
CA	Dual Trace Plug In	100.00
D	High Gain Differential	25.00
H	Wideband High Gain DC	50.00
K	Fast Rise DC	35.00
M	Four Trace	200.00
N	Sampling	200.00
Q	Transducer & Strain Gage	200.00
R	Transistor Risetime	75.00
TU-2	Test Load	35.00
W	High Gain Differential Comparator	100.00
1A2	Dual Trace	200.00
1A5	Differential Comparator Amplifier	250.00
1S1	Sampling Unit with 350 ps Risetime DC to 1 GHz	300.00
2A61	AC Differential	75.00
2A63	Differential	75.00
2B67	Time Base Single Sweep	200.00
3A75	Wideband DC	75.00
3S3	Dual Trace Sampling DC to 1 GHz	250.00
3S76	Dual Trace Sampling DC to 875 MHz	200.00
3T4	Programmable Sampling Sweep	300.00
3T77	Sampling Sweep	200.00
3T77A	Sampling Sweep	250.00
4S1/4S2/4S3/5T1/661	Sampling Scope with Dual Trace Sampling Units (3) and Timing Unit	1000.00
7A15AN-11	Vertical Amplifier DC to 80 MHz	450.00
10A1	Differential Amplifier	250.00
10A2A	Dual Trace	250.00
RM15	Oscilloscope Same as 515 15 MHz	200.00
RM31A	Oscilloscope Same as 531A with Dual Trace Plug In 15 MHz	300.00
RM35A	Oscilloscope Same as 535A with Dual Trace Plug In 15 MHz	300.00
RM41A	Oscilloscope Same as 541A with Dual Trace Plug In 30 MHz	350.00
50	Amplifier	50.00
51	Sweep	50.00
53A	Wideband DC Plug In	20.00
53B	Wideband High Gain	25.00
53/54B	Wideband High Gain	30.00
53/54C	Dual Trace	75.00
53/54D	High Gain Differential	20.00
53/54K	Fast Rise DC	45.00
63	Differential	65.00
81	Plug In Adapter For 581/A & 585/A	65.00

Tektronix		
81A	Adapter For 581/A & 585/A	90.00
84	Test Unit	75.00
107	Square Wave Generator	50.00
RM122	Preamplifier	50.00
123	AC Coupled Preamplifier	20.00
131	Current Probe Amplifier	75.00
240	Control Unit	150.00
280	Trigger Countdown Unit	75.00
RM503	Oscilloscope 450 KHz	200.00
535	Oscilloscope with Dual Trace Plug In 15 MHz	325.00
535A	Oscilloscope with Dual Trace Plug In 15 MHz	375.00
543	Oscilloscope with Dual Trace Plug In 33 MHz	350.00
543A	Oscilloscope with Dual Trace Plug In 33 MHz	400.00
545A	Oscilloscope with Dual Trace Plug in 30 MHz	450.00
555	Dual Beam Oscilloscope with Dual Trace Plug In 33 MHz	500.00
561	Oscilloscope 10 MHz	100.00
RM561	Oscilloscope 10 MHz Same as 561	100.00
RM561A	Oscilloscope 10 MHz Same as 561A	175.00
561B	Oscilloscope 10 MHz	250.00
564	Split Screen Storage Oscilloscope	450.00
RM565	Oscilloscope Same as 565 Dual Beam 10 MHz	650.00
581	Oscilloscope with 81 Adapter and Dual Trace Plug In	550.00
601	Storage Display	250.00
611	Storage Display	1000.00
1791	NC Program Verifier	1500.00
067-0513-00	Calibration Fixture	100.00
067-0591-00	Calibration Fixture	100.00
067-508	Calibration Fixture	100.00
TIC		
T-10A	DME Pulse Generator	200.00
T-10M	DME Speed Indicator Adapter	200.00
Teradyne		
ACT1	Analogical Circuit Tester with Boards	500.00
Texscan		
HS-85	Sweep Generator 400 to 1000 MHz	250.00
VS-73	Sweep Generator 400 to 450 MHz	100.00
Theta		
SSB-11E	System Error Bridge	75.00
Wandel u Golterman		
LDE2 & LDS2	Measuring Set For Group Delay Attenuation and Receiver and Attenuation Generator	Make Offer
Weinschel Eng.		
BA5	Attenuation Calibrator	100.00
675	Thermistor Mount	100.00
935N	Thermistor Mount	100.00
Western Reserve		
RFI RF-204U	RFI Receiver	200.00
Wiltron		
321/322/326/327/640G50	Phase & Amplitude Indicator with Local Oscillator 2.5 to 100 MHz, Time Delay Unit, High Resolution Time Delay Unit, Modulation Unit	750.00
640G50	Sweep Generator to 500 MHz	750.00
LATE ADD ON's		
Textron		
N160	X Y Recorder	200.00

All prices are in US dollars. All equipment shipped air freight or UPS FOB Phoenix, Arizona. All equipment working unless otherwise stated. 60-day warranty on all equipment. We do not take P.O.'s unless COD, or check with order. Manuals not included, but some in stock at a small charge.

Toll Free Number
800-528-0180
(For orders only)

MHz electronics
(602) 242-8916
2111 W. Camelback Phoenix, Arizona 85015

a monthly feature by
IRWIN MATH, WA2NDM

Math's Notes

A LOOK AT THE TECHNICAL SIDE OF THINGS

Before beginning this month's column, I would like to apologize for the short lapse in Math's Notes. I had some last-minute details that had to be completed pertaining to a new book that I have just finished and I simply ran out of time for this column. The new book is called *Wire and Watts* and is being published by Charles Scribner's Sons of New York. The book should be available some time in January of 1981. Those of you who are familiar with my previous book, *Morse, Marconi and You*, will be pleased to hear that it is written in the same style and format as that book, but is oriented toward basic electricity rather than communications. At any rate, the book is finished and we can now hopefully get back to Math's Notes.

This month, I would like to discuss a topic that we have gotten some mail about, and that is scrambled "pay TV" type signals. While I am not familiar with the legal aspects that apply to equipment for receiving and unscrambling these signals, there is certainly nothing wrong with explaining the way that the actual scrambling is done, as it is quite interesting.

Most readers of this magazine are familiar with the methods of commercial TV transmission, and fig. 1 is a diagram of part of the so-called composite video signal as normally transmitted. The figure shows two lines of video with the sync and blanking pulses. As you know, the sync pulses lock the 15.75 kHz oscillator in the TV set so the picture is stable, and the blanking portion eliminates the retracing of the horizontal scanning lines. The way that this composite signal is prepared for transmission is shown in fig. 2. You will note that the sync signals are actually added to the video signals by a special "adder" circuit. The sound portion, on the other hand, is a standard f.m. system.

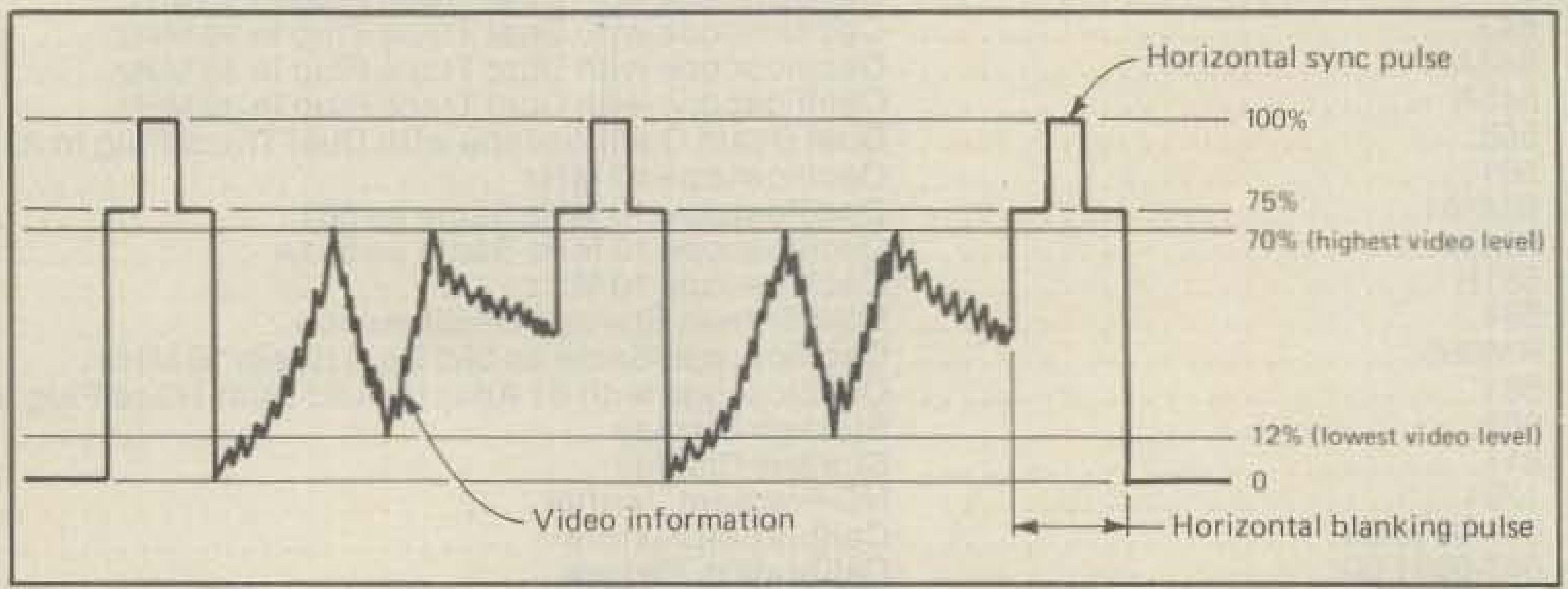


Fig. 1– Two lines of video information as transmitted by a normal TV transmitter.

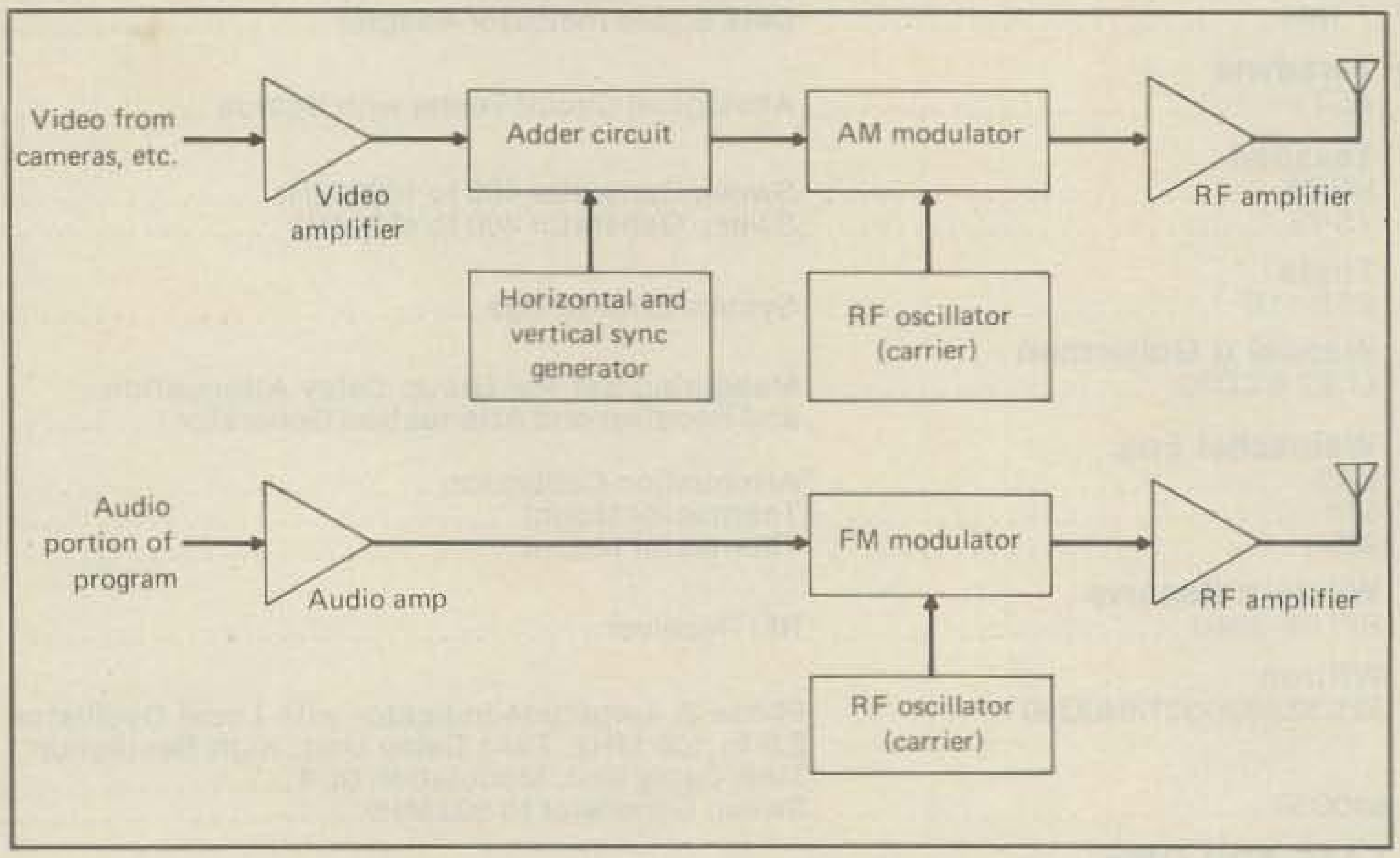


Fig. 2– A normal TV transmitter arrangement.

When these signals are transmitted and received by a standard TV set, the sync signals are detected and used to synchronize local oscillators so that the appropriate video information is displayed on the CRT at the proper time. The sound is received much in the conventional way that any f.m. signal is received.

To accomplish effective picture scrambling, all that is necessary is to somehow do something to the sync pulses so they cannot normally be received. In that way the local oscillators will not lock, and a distorted picture will result. What is actually done is shown in fig. 3. An attenuator is inserted in the sync signal path of the transmitter so that the level of sync applied to the adder circuit is less than the highest video level. The video signal that results from this operation is shown in fig. 4. Now when the TV set tries to lock onto sync pulses, it only has actual video information present, and there is nothing for the local oscillators to lock to. The result is that the picture is totally unsuitable for watching.

To further complicate matters, the normal f.m. sound is mixed with a separate sub-carrier, usually at 15.75 kHz, so that the resulting audio goes from 15.76 kHz to 30.75 kHz, rather than from 0 to 15 kHz. Since the audio bandpass of the receiver does not ever extend to the first 15 kHz, there is also no audio.

When both "scrambling" methods are in use, the entire channel is nonusable. The decoders normally sup-

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

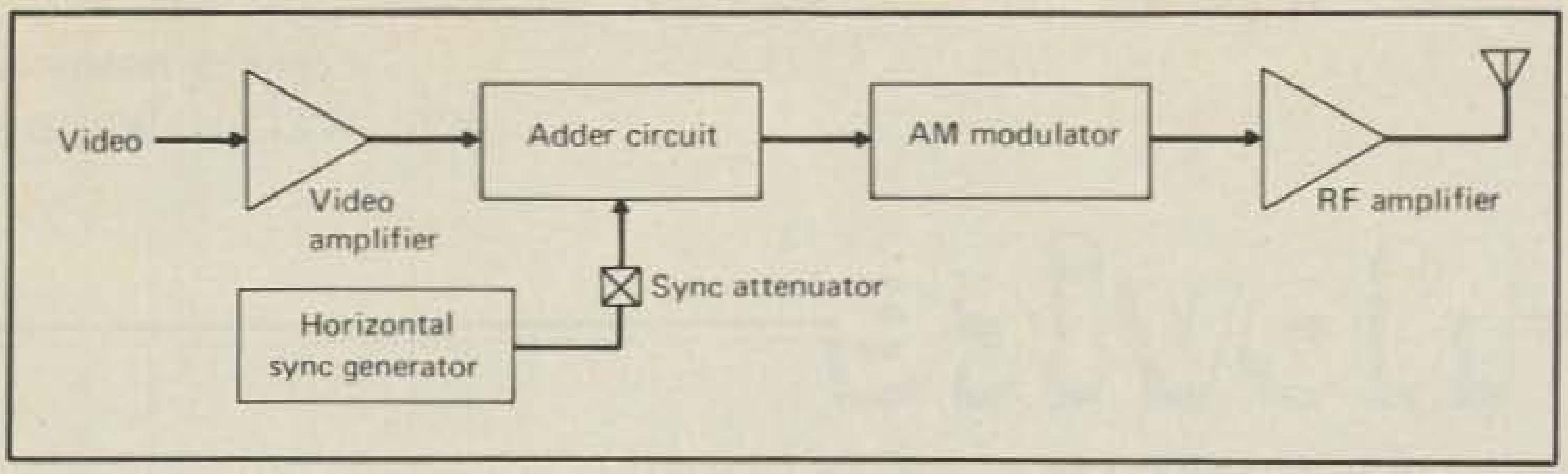


Fig. 3- One method of sync suppression.

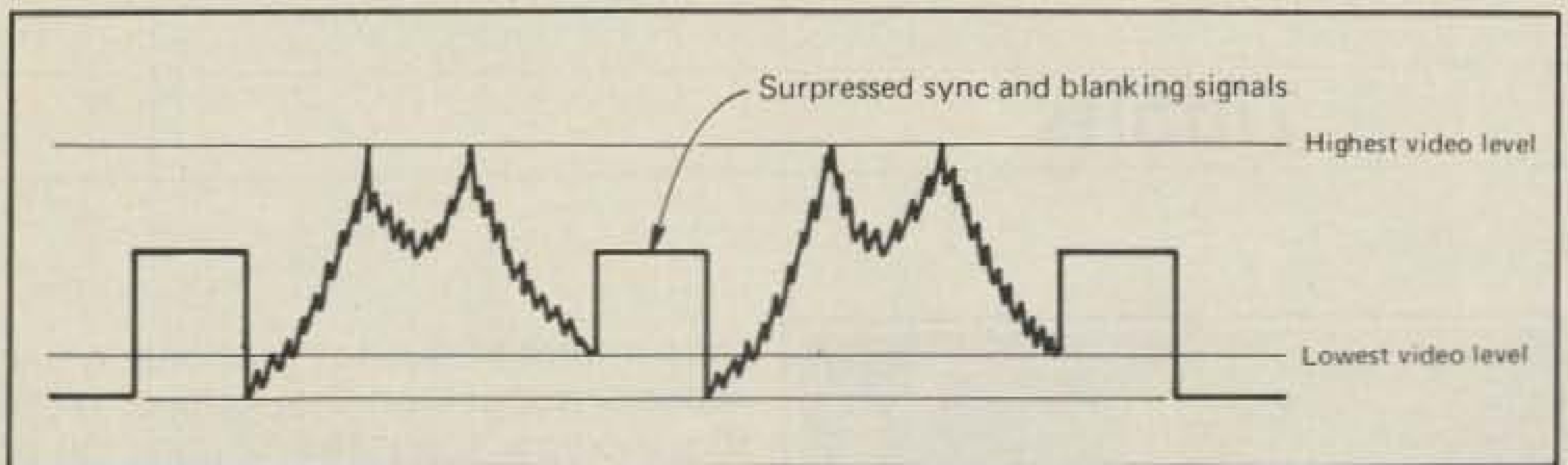


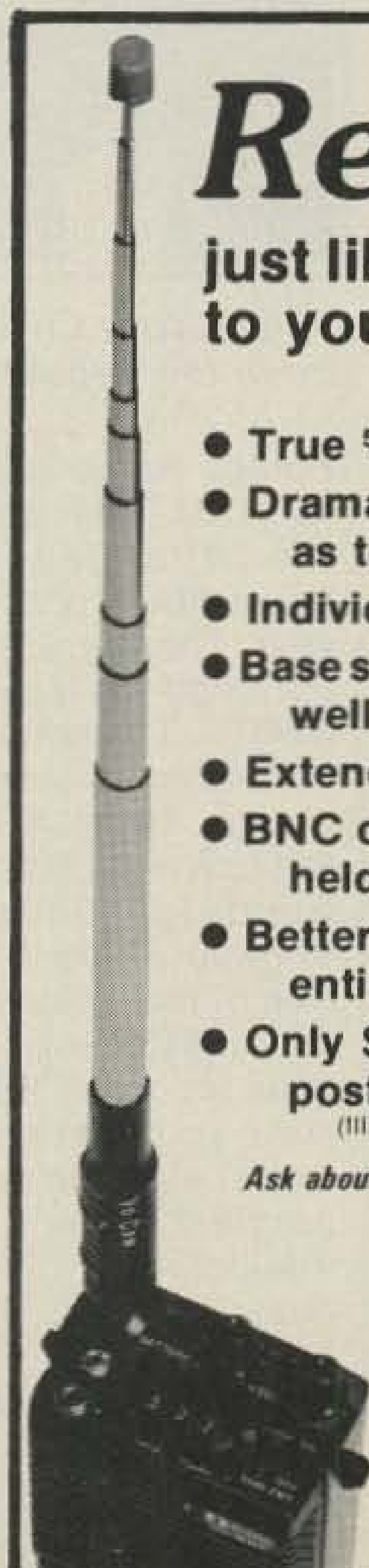
Fig. 4- The resulting "scrambled" TV signal.

plied (for the monthly fee) in function reproduce the proper sync pulses and decode the audio. Since, as I have mentioned, there may be legal problems with publishing decoding circuitry, this area will be left to the reader to think about. The result, however, of using a decoder is, of course, perfect signals.

In conclusion I would like to point out that the method explained is one of a couple of variations that are in use. If you are really interested in this type of scrambling, you might wish to connect an oscilloscope to the output of the video amplifier in an old TV set and observe the actual waveshapes to determine just how the system in your area operates.

Until next time,

73, Irwin, WA2NDM



a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Tidbits

The September 1980 potpourri Novice column produced a very favorable response from a few readers. Consequently, this month's Novice column is another collection of miscellaneous items. It is always difficult to find room for the tidbits of information when so much space is occupied by major articles. One dictionary definition of tidbits is that they are choice pieces of news. I hope you enjoy this month's column and benefit from reading it.

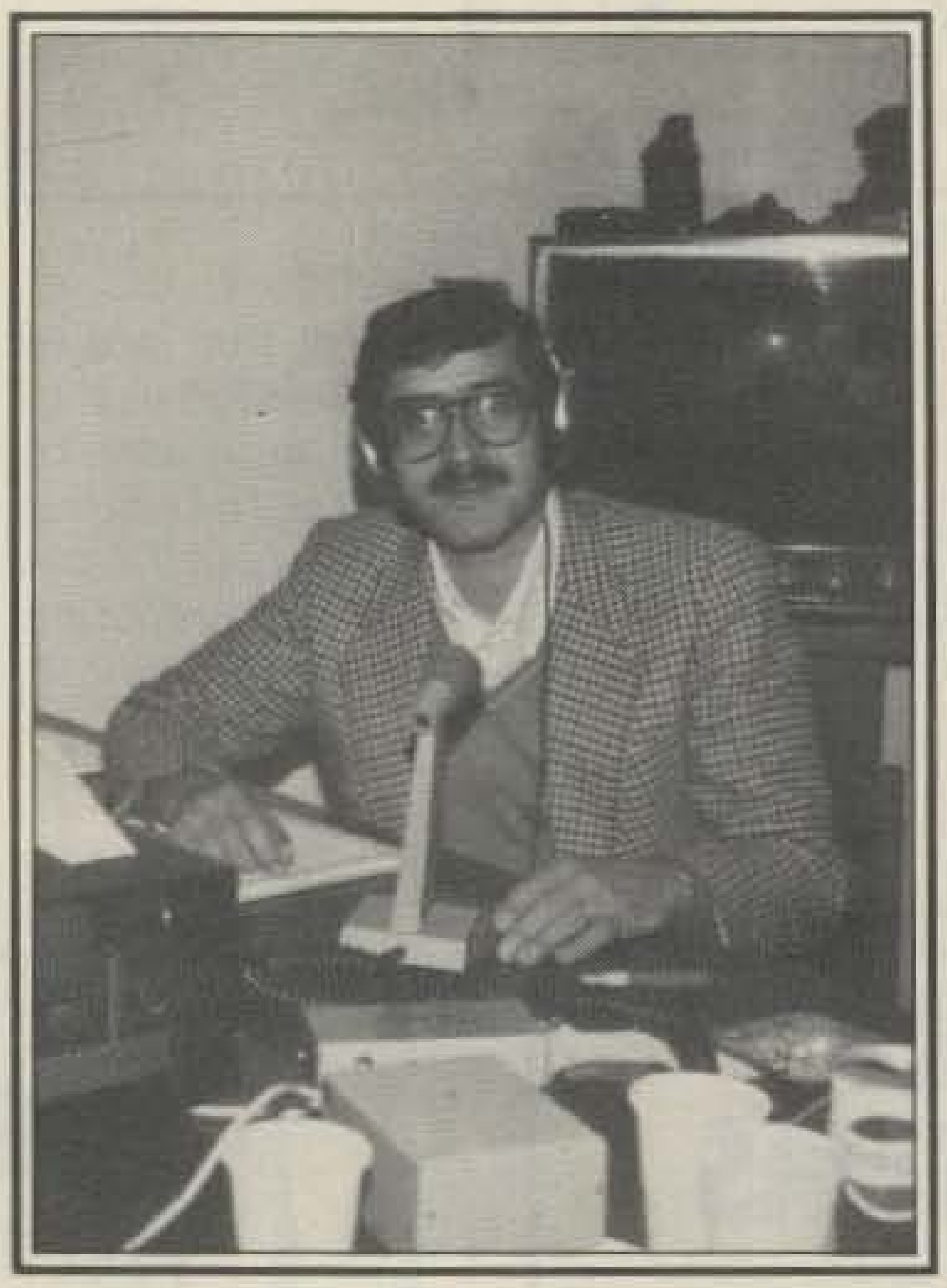
Eyeball QSO

Ed Nissen, KAØEBP, of Pacific, Missouri is one of several recent visitors who were kind enough to stop in while in my area. The other visiting amateurs were all from Southern California. If you are going to be in the Los Angeles area, I hope you will call or visit. The telephone number is 213-842-1863, and the address is 2814 Empire Avenue, Burbank, California 91504. If you can spare the time, I'll show you our fine local amateur radio club, W6LS.

AFRTS—Shortwave Listening

Many amateurs first become interested in radio due to listening to distant stations on the standard broadcast (AM, 535-1605 kHz) band. As the daytime-only stations close down and the reception range lengthens out in the evening, it becomes possible to hear stations up to several thousand miles away. This form of DX (distance) listening sometimes gets a listener interested in shortwave listening. Most of the interesting shortwave listening occurs in the high frequency range, which is 3 to 30 MegaHertz. A popular series of h.f. broadcasts with SWL'ers is the programming offered by the Armed Forces Radio and Television Service (AFRTS). Their broadcast frequencies are changed in March, May, September, and November of each year. The current frequencies can be obtained by requesting them from AFRTS. The annual AFRTS broadcast schedule is also available at no charge from AFRTS - Washington, 1117 North 19th Street, Pomponio Building, Suite 300, Arlington, Virginia 22209. If you want a verification of reception report (QSL) card for an AFRTS broadcast you hear, send your report to the same address. Be sure you state your name and address, plus the date, time, frequency, program subject, signal strength, and intelligibility of the broadcast you hear.

2814 Empire Ave., Burbank, CA 91520



This is Tony Ceccoli, M1C, of Dogana in the Republic of San Marino.

Time Signal Stations List

The October and November Novice articles about worldwide sources of code practice included a brief table of time and/or frequency stations. A few readers suggested that others might like to know about the 52-page list of time signal stations that is published by Gerd Klawitter, D-4430 Steinfurt, Ochtruper Strasse 138, Federal Republic of Germany. I recently purchased the ninth edition of this list at a cost of $4.50, including airmail postage fees. The price is one dollar less for boat mail, but that can be very slow.

Novice DX Net

Al Fetzer, WD9EJE, advises that the Novice DX Net began operations at 1430 UTC (6:30, 7:30, 8:30, and 9:30 AM, PST, MST, CST, and EST, respectively) on Saturday, 11 October 1980. Al is a Novice DXer who already has 122 countries confirmed, and he ran the National Novice DX Net last year. The net frequency is 28,103 kiloHertz, and DX amateurs are invited to move down to this frequency to help make operating a lot more interesting for Novices. Net Q signals will be used, so become familiar with them. These special signals appear in various ARRL publications, as well as on a separate ARRL operating aid. They are also detailed in the February 1980 Novice Column of *CQ*. If you want a data sheet about this net, send your request to Al Fetzer, WD9EJE, 1444 Wilmette Avenue, Wilmette, Illinois 60091. Remember to enclose the usual s.a.s.e. (self-addressed, stamped envelope) with such a request. Net control volunteers are needed in as many countries as possible, plus in different parts of this country.

DX Organization

Many Novices are avid DX'ers who spend most of their operating time chasing contacts with amateurs in foreign (DX) countries. Even those of us who are not real DX'ers enjoy occasional contacts with DX operators.

If you are really interested in DX, you may be interested in supporting the International DX Foundation, which promotes international goodwill and increased DX operation. A single copy of the IDXF Newsletter can be obtained by requesting it from the International DX Foundation, P.O. Box 117, Manahawkin, New Jersey 08050. As usual, it is best to enclose a self-addressed and stamped envelope (s.a.s.e.) with your request. It might help to suggest that it would be greatly appreciated if DXpeditions would devote some time to Novice band operation.

San Marino—Rare DX

One of the rarest DX (foreign) contacts for American amateurs is tiny San Marino, but Tony Ceccoli, M1C, does his best to make it available. Tony operates code and voice on 10, 15, and 20 meters, including some time in the 10 and 15 meter Novice bands. He has worked more than 40,000 contacts since becoming an amateur in 1973, with more than half of those contacts with American amateurs. He is often on 15 meters from 1400 to 1600 UTC and his 20 meter operation usually starts after 2300 UTC. Tony wants to provide a San Marino contact for as many amateurs as possible. If you contact him, please limit your transmission to your name and QTH (location), plus his signal report. Do not drive DX (foreign) amateurs out of the Novice bands with long transmissions. Some of us make an extra effort to get DX amateurs to operate in the American Novice bands. Most of these fine people are glad to slow down to any desired speed, so do not hesitate to call them, no matter how slow your code speed is. Please do not waste time with information about your equipment, antenna, and weather.

Bob Carbonell, KA2CNM, helps keep Ozone Park, New York easy to contact on the Novice bands. He is a 32-year-old credit analyst who has worked for Dun and Bradstreet for the past 11 years. His main gear is the Kenwood TS-520-S Transceiver. His antennas include a 3-element 10-meter beam and a 60-foot dipole that he uses on all bands with a homebrew tuner and open-wire feedline. Bob has 23 countries and all 50 states confirmed, and he particularly enjoys operating the 10- and 15-meter bands in the late afternoon. He credits the CQ Novice column with helping him get started in the amateur radio service. His wife is still active in CB and Bob is also a shortwave listener.

This is 32-year-old Karel Karmasin, OK2BLG, of Hodonin, Czechoslovakia. He started as a shortwave listener in 1963 and progressed through Novice by 1966. Karel has had more than 50,000 contacts as OK2BLG. His homebrew all-band 250-watt code transceiver is to the left and his homebrew s.w.r. meter and digital readout are above the Otava 77 Transceiver. The unit in the lower right corner is a memory keyer. Class C (Novice) amateurs in Czechoslovakia are permitted to run up to 25 watts on 10 meters, and their code band is the same as the Novice band in this country, 28.1 to 28.2 MHz. Their Novices also have code (only) operating privileges on 160 meters and 80 meters (3525 to 3600 kHz). Class B OK licensees may operate all bands and modes up to 150 watts input. Class A OK operators are allowed to operate all bands and modes up to 500 watts input. Most OK activity is on code. Listen for OK2BLG about 0400 UTC near 21,140 kHz when 15 meters is open between America and Europe. Karel is also on this frequency about 1800 UTC Wednesdays. When 10 meters is open between Europe and this country, he can be heard around 28,140 kHz about 1800 UTC. OK2BLG worked about 120 American Novices on 15 meters during 1980. His present antenna is a 2-element HB9CV array, and he is erecting a log periodic that he plans to use on several bands with low power. There are about 40 amateurs within a 30 kilometer radius of his South Moravia location, and he is active in the local club. They plan to use some ideas taken from the Novice article on running amateur radio shows. As is true in many countries, it is more difficult to obtain an amateur radio license in Czechoslovakia than in America, but they may appreciate their privileges more since they work harder for them. Listen for OK2BLG, because Karel wants to contact you.

Novice Band DX Operation

Donald Simmonds, K5BDX, makes it a point to do some of his DX operating in the Novice bands. During his September 1979 operation from Montserrat, he provided many Novices a contact with VP2MFL. Donald advised that the went through a nightmare handling the QSL cards for the Novices he contacted, and he advises Novices to read the January through March 1979 Novice Column article about QSL cards. If nothing else, remember that busy operators prefer to QSL via the bureau. If you wish to receive a card by direct mail, send a self-addressed envelope with your card and check the information on your card to be sure the date and time are correct. If the DX operator's QSL manager is located in this country, attach first class U.S. postage to your self-addressed envelope; if he is in some other country, enclose an International Reply Coupon (IRC), which can be purchased at post offices. Most of the operators understand how anxious a Novice can be to receive a card from a DX location. If they did not want to help you, they would not be in the Novice bands. However, they do not want to spend possible operating time addressing cards. Appreciate their efforts on your behalf and make it as easy as possible for them to send cards to you. I have been to the DX station and I know what a problem QSL cards can be. I also remember how I felt when someone would make a long transmission while several other stations were impatiently waiting for a contact. Keep contacts short to let the DX operator work as many stations as possible. Time is extremely valuable during DXpedition operation. Do not send information about your weather, equipment, or antenna; just give a report, your name, and your location. Similarly, do not identify more than once at the start and end of a transmission. If you are familiar with the use of the break signal (BK), use it to eliminate identification after the contact has been established; it is legal as long as the associated transmission is less than three minutes long. Keeping each contact short enables the DX station to work more contacts and that is the object of any DXpedition. The preceding abbreviated contact system does not apply when a station answers your general call to all stations (CQ); many of the DX operators like to chat.

Donald will be operating from VP2A (Antigua and Barbuda), VP2K (St. Kitt's and Nevis Islands), and VP2M (Montserrat) on 23 November (2000-2200 UTC) and 25 November (0100-0300 UTC). This Leeward Islands operation will be on 21,150 kiloHertz. He may also operate at other times on other Novice frequencies, but he promises to at least keep the stated schedule.

Donald is QSL manager for TG9ML, VS5AR, 3B8DB, and his own VP2A, VP2K, and VP2M operations. His 1981 plans include code operation (including Novice bands) from FP8 (St. Pierre and Miquelon Islands), EA6 (Balearic Islands), C3 (Andorra), or ZB2 (Gibralter). Perhaps he will give us his Novice bands operating schedule after his plans have been finalized.

If you are fortunate enough to contact Donald from one of his DX locations, I hope you will write a note on your card thanking him for his consideration and patience. I would welcome similar reports of Novice band DX operation. I help license a few hundred new amateurs each year, and I know how thrilled they are to work DX. Frankly, I've never gotten over that thrill either.

Amateur Radio Calendar

Large wall calendars with room to note events of importance have become hard to find. Consequently, the Lockheed E.R.C. Amateur Radio Club purchases 13.5 by 19.5 inch calendars imprinted with large Amateur Radio lettering, plus the ARRL address (for information about amateur radio). If you want one, send three dollars and an addressed label to W6LS, 2814 Empire Avenue, Burbank, California 91504. Payment can be by check, cash, IRC's, or U.S.A. postage. The price includes U.S.A. shipping. Calendars are mailed individually in sealed wrappers. They are a great addition to a radio shack.

Comments Wanted

If you are either a prospective amateur or a new amateur, I want to know what you would like to see in future Novice columns. Most of the recent ones have covered a single subject in detail, often requiring an item to be split up into several consecutive issues. There is practically no end to subjects that can be covered in this fashion, and changes occur that make it worthwhile to update articles from time to time. Most of the amateurs who write to me about subject articles are not Novices or Technicians; they are usually General, Advanced, or Extra class licensees.

The Novice column has been devoted to a variety of small items a few times in the last three years, as is true this month. These miscellaneous information columns have brought a good response from newcomers to amateur radio.

I teach amateur radio licensing courses and I have an excellent set of notes on the material I cover with our students. This material is arranged in a logical study sequence and it is updated as changes occur. Future Novice columns could include information that would help those who wish to obtain any class of amateur radio operator's license, from Novice through Extra.

If you have an opinion regarding the content of future Novice columns, I will be glad to hear from you.

Code Tips

Art Ford, W2HAE, is an Extra Class amateur radio operator with 48 years of operating experience. Art has been working the 40 meter Novice band about two hours every day to meet new amateurs and to provide them with contacts and code practice. He advises Novice and Technician

David Knapp, KA9EDP, of Elizabeth, Illinois, is an 18-year-old high school senior. He received his Novice license in April 1979 and upgraded to General in March 1980. His first station included a Johnson Viking Valiant Transmitter and a Hammarlund HQ-145-E Receiver. His present station features the Ten-Tec Century 21 Transceiver. Dave has worked all states, 27 countries, and 4 continents on code. His antenna system consists of an end-fed random wire and a 3-element 10-meter Yagi. Dave holds the 20 wpm ARRL code proficiency certificate and he is a League member. I know he participated in the last Novice Roundup because I worked him. Dave credits previous Novice articles in CQ for helping him get a good start in amateur radio. He looks forward to serving his community for many years with his station and knowledge.

licensees to make a determined effort to form each code symbol well and to leave a space between adjacent words. The excessively long CQ (call to all stations) calls bother him, and he strongly recommends short calls with careful listening and tuning for answers. All beginning amateurs are urged to read the June through August 1979 Novice columns covering code. That three-part article can do a lot towards getting newer amateurs started right on code.

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

73, Bill, W6DDB

EXAM CORNER

Time Constants

BY DICK BASH*, KL7IHP

Dick Bash is the Publisher of the now famous Final Exam *series of amateur radio license manuals. These manuals, or test guides, are marketed through Bash Educational Services. The books have caused a stir in the publishing world in that they have forced some of us to rethink our definition of license manual.*

Dick has prepared a series for CQ which we are calling Exam Corner. In this section he will take one subject at a time, dissect it and hopefully teach it with full understanding and comprehension.

An applicant for the Extra Class license should understand how to solve time constant problems. They appear on the examination, and a foundation in the details of the subject will make your task of solving the problems that much easier and will also broaden your understanding of electronics.

A **time constant** is a term used to describe the number of seconds that it takes a capacitor to go from zero charge state to 63% of its final value. It is also the time required for the capacitor to go from a fully charged state to 63% of its fully charged value. The time constant is found by using this formula:

$$TC = RC$$

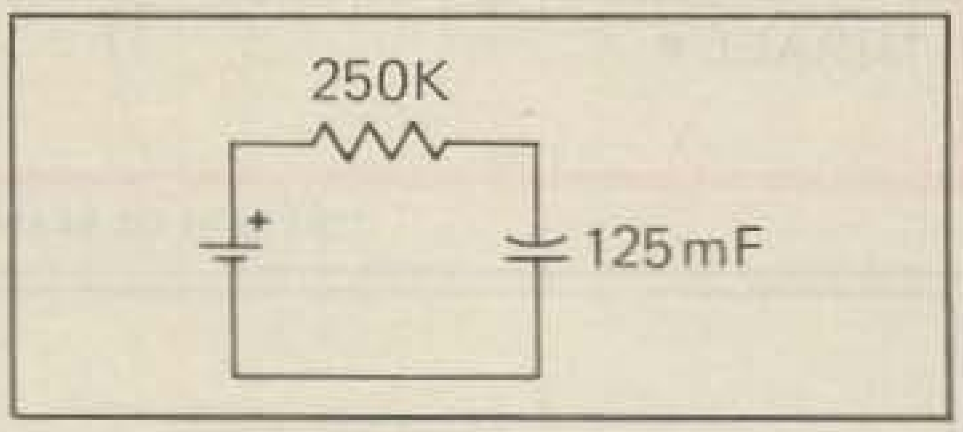
where:

TC = Time constant in seconds
R = Resistance in ohms
C = Capacitance in farads

So, if we have the following schematic, how would we determine the time constant?

*P.O. Box 382, San Leandron, CA 94577

Well, our formula says to multiply the resistance in the circuit (which is 250,000 ohms) by the capacitance (which is 125 microFarads). Doing so gives us 31.25 seconds. This means that it will take 31¼ seconds for our little capacitor to charge up to 63% of its final value. This is one time constant and (in this case) one time constant is equal to 31¼ seconds.



Now we can continue to charge up our capacitor. After two time constants (31.25 × 2 = 62.25 seconds) we will charge up the capacitor the original 63% of its final value plus 63% of the remaining 37% (or 63% + 63% of 37%= 86.31% of the final value). After 3 time constants (3 × 31¼ = 93.75 seconds) we will have charged the capacitor up to 63% + 63% of 37% + 63% of 14% = 94.93% of the final value. After 4 time constants we have built up to 98.13% of the final charge, and after 5 time constants we have achieved 99. 31% of the final charge. Thus we can now say that in any circuit you will be within 1% of the final value after 5 time constants.

But 5 time constants in this circuit takes 156.25 seconds or a little over 2½ minutes. What if we wanted our capacitor to charge faster than this? Then we have two choices: We can either reduce the value of the resistor or decrease the value of the capacitor (or both, but let's not make things complicated!). If we replace the 125 microFarad capacitor with one of 0.10 microFarads, then we would have 250,000 × 0.0000001 = 0.025 seconds. Thus our time constant is now about 3/100ths of a second, and five time constants (the time required to reach about 99% of the final charge) would be 5 × 0.025 = 0.125 or one-eighth of a second. That's a big change from 156.25 seconds!

What if we wanted to know how much charge our original capacitor would have after two time constants (62.5 seconds)? That also has a formula for it! It looks like this:

$$\text{Final voltage} = \text{Source voltage} \times (1 - 0.37^n)$$

where:

n = number of time constants

Well, by plugging in the number 2 for the time constant and the source voltage from the schematic (48 volts), we see that we would get:

$\text{Final voltage} = 48 \times (1 - 0.37^2)$
$\text{Final voltage} = 48 \times (1 - 0.1369)$
$\text{Final voltage} = 48 \times 0.8691$
$\text{Final voltage} = 41.4288$ volts

There was nothing tough there (except perhaps having to remember what to do with the "2" when we were working our calculator). So time constants with capacitors are easy!

As it applies to coils, a time constant is the time required for the current to increase from zero to 63% of its final value. The formula for use with a coil is a bit different:

$$TC\ (\text{coil}) = \frac{L}{R}$$

where:

L = Inductance in Henrys
R = Resistance in ohms

That concludes our discussion of time constants and how we work with them. Any problems you encounter now on the exam will surely be easier to deal with, right?

G.I.S.M.O.

2305 CHERRY ROAD
ROCK HILL, S.C. 29730

Featuring

ICOM · YAESU · cushcraft · Larsen · DenTron · DRAKE · KDK · HUSTLER · apple computer · KENWOOD · BIRD · TEMPO · Henry Radio

IN ADDITION TO THE PRODUCTS LISTED ABOVE, WE ARE ALSO FACTORY AUTHORIZED DEALERS OR DISTRIBUTORS FOR **B & W, UNIVERSAL TOWERS, BERK-TEK CABLES, BENCHER PADDLES,** THE NEW **CES DIALER** AND MANY OTHER ACCESSORIES. OUR SERVICE SHOP, STAFFED BY FIRST PHONE, EXTRA CLASS TECHNICIANS, OFFERS EXPERT SERVICE ON ALL MAKES AND MODELS AND FACTORY AUTHORIZED SERVICE ON SWAN, YAESU AND KENWOOD PRODUCTS.

73, THE GISMO GANG

SERVICE DEPT.
CALL
803-366-7158

ORDER TOLL FREE!
800-845-6183

CIRCLE 23 ON READER SERVICE CARD

RAPID MOBILE CHARGER

The DEB-TED Rapid Mobile Charger is a constant voltage charger that will charge your batteries off a 12 Volt source in 4-6 hours. You may use the charger at all times, this includes transmit and receive periods. It is equipped with a cigarette lighter plug on the input side and the appropriate charging plug on the output side. Models available now for the Kenwood TR2400, Yaesu 207R, Tempo S1, S2, S5 and the Wilson Mark II and IV. Other models available also please call or write for info .... $34.95.

COMING SOON THE NEW AC VERSION

"SEE THE WORKS" CLOCK

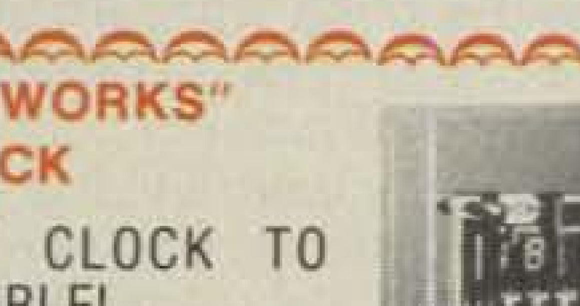
OUR EASIEST CLOCK TO ASSEMBLE!

6 Digits 12 or 24 Hour Format Clock rests between two pieces of clear plexiglas A GREAT CONVERSATION PIECE! Kit is complete including top quality PC board, all componets, pre-cut and drilled plexiglas and all hardware $29.95
Wired and Tested $39.95

VEHICLE INTRUSION ALARM

An easy to assemble and install kit that offers options not normally found in other alarm systems. Hidden switch mounts under the dash. Kit has provisions for sensors and remote control switch. Programmable time delays for exit, entry and alarm periods. Basic hook-up utilizes dome light circuit activating when doors are opened. The alarm will drive a siren or pulse horn at a 1HZ rate. Not prone to false alarm do to reliable CMOS circuitry. No external switch required! Complete kit with easy to follow instructions and diagrams $12.95
Wired and Tested $19.95

SPECIAL



SPECIAL

MODEL 5314 CLOCK KIT 12 or 24 hour format 6 large .''5 Digits. Kit is complete with all parts, pc board and custom designed cabinet. (Specify White or Black) $29.95

DEBCO ELECTRONICS
P.O. BOX 9169
CINCINNATI, OHIO 45209

Phone: (513) 531-4499

- Add 5% Shipping for U.S. & Canada
- All foreign orders add 10%
- COD orders add $1.25
- Master Charge and Visa Welcome
- Orders under $20.00 add $1.00 handling
- Ohio residents add 4½% Tax

Dealer Inquiries Invited

CALL OR WRITE FOR CATALOG

CIRCLE 58 ON READER SERVICE CARD

CQ SHOWCASE

Benjamin-Michael Portable Clock

The Benjamin-Michael digital clock is ideal for proper logging in home, mobile, or portable use. It features 24-hour military time with quartz crystal accuracy, a large, easy to read LCD display, and front-mounted controls with hold switch that permits precise setting to time standard. A single penlight cell provides one-year operation. The clock is designed with attractive aircraft instrument styling. Price is $29.95. For more information, contact Benjamin-Michael Industries, P.O. Box 173, Prospect Heights, IL 60070, or circle number 103 on the reader service card.

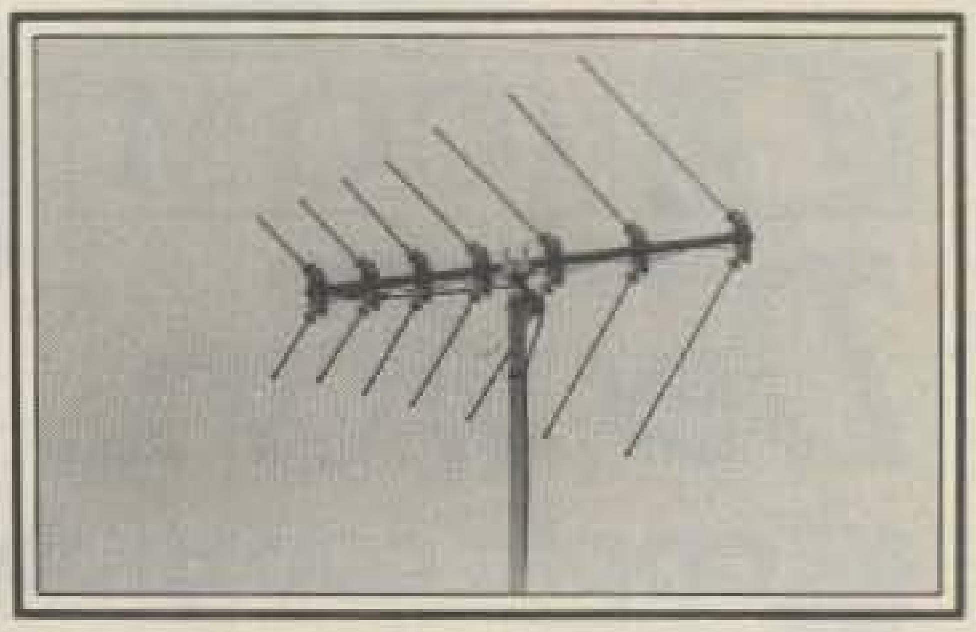
Palomar 1750 Meter Transmitter Kit

Palomar Engineers' new transmitter kit for the 160-190 kHz experimeters' band operates at one watt input power with a 50 foot maximum antenna length (no license required by the FCC). The transmitter is in two parts: The main transmitter assembly contains the frequency generator, power supply, and the control panel. It is located at the operating position. The antenna tuning assembly mounts at the base of the antenna.

All the difficult assembly and wiring is factory completed. Wiring of the kit takes about an hour with simple tools. Instructions are supplied. The transmitter is for c.w. operation but can easily be a.m. modulated if desired. Price is $145. For more information contact Palomar Engineers, Box 455, Escondido, CA 92025, or circle number 102 on the reader service card.

Grove Enterprises Scanner Beam

Intended primarily for the hobby scanner radio market, the Scanner Beam is designed to work over the continuous frequency range 108 through 512 MHz. This 7-element log-periodic dipole array offers gain ap-



proaching 8 dB above a dipole on high band and u.h.f. An additional 15 dB front-to-back ratio makes the Scanner Beam particularly suited for long distance, weak signal directional reception. Average v.s.w.r. is 1.92:1. On low band (30-50 MHz) the antenna resembles an omnidirectional vertical pole.

The antenna is constructed of heavy duty aluminum tubing and has a universal offset mount. The beam sells for $39.95 plus $4.00 shipping. A matching coaxial cable assembly is also available. For more information, contact Grove Enterprises, Inc., Route 1, Box 156W, Brasstown, NC 28902, or circle number 106 on the reader service card.

Decibel Products Broad Band Antenna

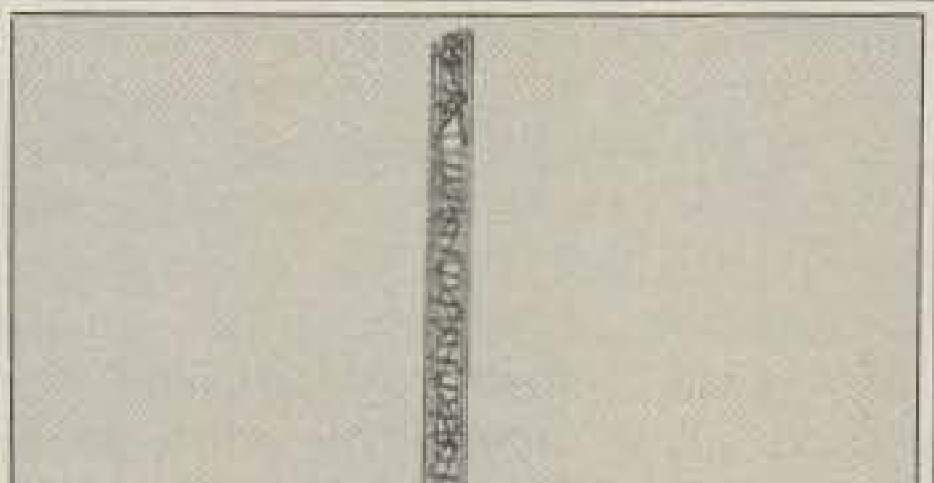
The Model DB-410 is a heavy duty, light weight, high gain antenna for use in the 406-512 MHz band. It is suitable for mounting to the top or on the side of a tower. Clamps for top mounting are supplied, but an additional side mounting kit is required (Model DB-5012) for side mounting. The DB-410 can be used as an omni-directional antenna having a maximum gain of 9.2 dBd, or as an elliptical pattern antenna having a maximum gain of 10.4 dBd. The antenna will withstand winds up to 100 mph. Since it is constructed of metal, all elements operate at DC ground, the antenna is almost immune to lightning damage.

Dual and quad antenna models are available which include multiple independent antennas on a common mast, each with a separate feed line. For more information, contact Decibel Products, Inc., P.O. Box 47128, 3184 Quebec St., Dallas, TX 75247, or circle number 110 on the reader service card.

J.W. Miller AT-2500

J.W. Miller Division of Bell Industries has introduced the automatic antenna tuner Auto-Track Model AT-2500. Power capability is 2500 watts p.e.p., and frequency range is 3.0 to 30 MHz (including WARC bands). Impedence matching is 10 ohms to 50 ohms resistive, and the direct reading SWR meter reads 1.1 to infinity. The direct reading power meter has two meter scales from 0 to 250 watts and 0 to 2500 watts; front switch selects FWD or Reflected Power.

A "Linear Disable" circuit protects the linear from excessive SWR. The antenna tuner is packaged in a 17" W × 5¼"H × 14"D cabinet. For more information, contact J.W. Miller Div., Bell Industries, 19070 Reyes Ave., P.O. Box 5825, Compton, CA 90224, or circle number 108 on the reader service card.



Aluma's Light Towers

Aluma Tower Company has available a line of all aluminum maintenance-free towers. Because of aluminum's inherent corrosion resistance and high strength/weight ratio, the towers are easily installed and need no further maintenance. They are available in heights of 20 feet, 25 feet, and a 50 foot crank-up model. They are tungsten inert gas welded for strength, and can be tilted over easily due to the tower's light weight. For more information, contact Aluma Tower Company, 1639 Old Dixie Highway, Vero Beach, FL 32960, or circle number 104 on the reader service card.

Mirage All Mode Low Power Amplifier

The B23 2-meter All Mode low power amplifier is designed to be used with all available HT's and low power s.s.b. transmitters. It will provide 30 watts output with 2 watts drive. The B23 is linear and may be keyed with as little as 100 mw and as much as 5 watts. Five watts input will give 40 to 45 watts output. It is packaged in a rugged compact enclosure that may be mounted anywhere or left unmounted for portability. Frequency range is 144 to 148 MHz. Size is 4¾" × 4" × 2¼", and weight is 1¼ pounds.

The B23 comes with the company's 5 year warranty (1 year on the r.f. power transistor). For further information, contact Mirage Communications Equipment, Inc., P.O. Box 1393, Gilroy, CA 95020, or circle number 107 on the reader service card.

Zero Bias

(from page 6)

business. The TV video recorder boom will not put the others out of business either. Who then are we protecting with the attacks on 605 and what will be the price?

We have a basic freedom to receive what is being transmitted. What we do with the information we receive may be up for scrutiny, but a basic denial of the fundamental right to receive signals is untenable. The state of Connecticut will soon stop (if they haven't by now) confiscating those "illegal" 10 GHz receivers called radar detectors and refrain from prosecuting individuals who are "caught" with one in their possession under the theory that they are being used illegally to circumvent the law even when they are turned off.

In California recently a law was signed by the Governor which would now make it illegal to even sell the components to build your own satellite receiver. Picture yourself standing at the counter of XYZ Distributors, or even a local Radio Shack, trying to buy a 47K ¼ watt resistor when suddenly you are "busted," indicted, and sentenced or fined for illegal trafficking of satellite components. Magazines reaching California will have to be censored so as to remove all ads for components and by extension so will all teaching articles which in the long run may teach you how to use those illegal components. Probably to be on the safe side, Governor Brown also should close down the engineering schools, technical schools, and some of the libraries. You can't be too safe you know.

So the rash of laws is promulgated. It would appear that these laws are designed to intimidate, threaten, and in some way act as a stop-gap measure to demonstrate that there is some action taken to "curb" the potential menance. Something of some value "must be protected." This is basically the same philosophy we faced during the great amplifier purge. Instead of protecting the poor defenseless satellite industry from the few thousand viewers, the poor defenseless home entertainment industry had to be protected from crazed amplifier owners. After all, think of the $1.00 or $2.00 that might have to be put into a bill of materials to eliminate r.f.i. or make a better product. It's easier to just ban amplifiers.

We seem to be a people who thrive on new laws—the more the merrier. . . regardless of the ultimate damage. Amateurs are like everyone else, with continued requests for special "laws" or considerations from the FCC. Almost none of this considered brainpower goes into present or future enforcement. There are laws that do exist to protect industry from "theft of services." If I copy material off the "air" and mass produce it and try to sell it, I can be in trouble with existing law. After all, there was existing law in effect on the illegal use of amplifiers, but it wasn't enforced. The amplifier laws are a good analogy to 605 in that we have immediate feedback of the results of "protective" laws.

The FCC in effect "threw up their hands" at Congress and mandated an amplifier ban as a public demonstration that they "did something." What they were saying tacitly was that Congress wanted something from the FCC that they (Congress) weren't willing or able to pay for, namely enforcement. In a drastic move and grand gesture, the FCC determined that the amplifier ban would put a stop to the r.f.i. complaints and halt the illegal use of the amplifiers by unauthorized personnel. Well, time has proven that the illegal use is just big and the number of complaints has risen since the ban. Probably a new law will be suggested to put a stop to this also. Nothing, however, is done to support the concept of enforcement. By the way, I have mentioned in the past that r.f.i. legislation has been pending in some form or other in Congress since 1945. These laws which put the onus of responsibility and culpability on easily identifiable companies have never seemed to gather momentum. Who exactly are we protecting and from whom?

Well, back to 605. If 50 state governments and a federal government want to create 51 different laws and interpretations for the same offense or deemed offense, then who am I to argue? After all, all of these legislators need to keep creating heroic laws and statutes in order to put food on the table. Lawyers need employment, and what better way than to spend several years on the actual meaning of where a comma is placed. Why should anyone take any of this seriously when in fact none of this can actually be enforced.

Well, when that W6 reaches furtively for his (or her) 47K ¼ watt resistor and feels the cold steel handcuffs snap around his wrist and hears his sentence and is finally shipped off to San Quentin, then and only then will I believe that the government is finally putting our money where their mouth is.

73, Alan, K2EEK

Ham Shop

FREE TO CQ SUBSCRIBERS

Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non subscriber) will be printed unless accompanied by full remittance. Non-commercial ads free to CQ subscribers (maximum 3 lines per month). All ads must be typewritten double spaced. Recent CQ mailing label must accompany ad. **Closing Date:** The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 76 N. Broadway, Hicksville, NY 11801.

WANTED: HEATH SB-230 Linear. Any condition, including unassembled, considered if fairly described and priced to move. Schultz, W4FA, U.S. Consulate, APO NY 09108.

REPLACE RUSTED ANTENNA BOLTS with stainless steel bolts. Small quantities, free catalog. ELWICK, Dept. 399, 230 Woods Lane, Somerdale, N.J. 08083.

ROHN TOWER: Buy direct from Worldwide Distributor of all Rohn products. Sample prices—25G sections $38.72 each; 45G sections $88.00 each; FK2548 foldover tower with freight paid $693.00; BX48 free standing $218.90. Hill Radio, Box 1405, Bloomington, IL 61701, 309-663-2141.

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 to GEM OF THE MOUNTAINS PUBLISHING COMPANY, 3307 North 6th Street, Coeur d'Alene, Idaho 83814.

WANTED BY COLLECTOR: KWM1 accessories—399D1 DX Adaptor; 312B2 or 312B1 Speaker Console; 13C1 Crystal Plug-in Unit. Jock, ZL2GX, 152 Lytton Road, Gisborne, New Zealand.

DRAKE C-4 STATION CONSOLE, excellent, complete—$350. CLASSIC-33—$75. WILSON 1402, 2 set nicad, 3 ant. spkr-mike, charger, case, etc., $125. Art Bernstein, N2KA, 387 Avenue S, #6D, Brooklyn, NY II223.

COMPLETE B-line Drake station. T-4XB, R-4B, MS-4, MN-2000, FS-4, FR-4, W-4, L-4B, TV-3300, DL-1000. All cables necessary for hookup. All owners manuals, and boxes. Complete service record $2100. Jim, (817) 295-8307.

DECODE Morse automatically. Improve speed, measure difficult signals. Microcomputer electronics, features unavailable commercially. SASE please. TELECRAFT, Box 1185, East Dennis, Mass. 02641.

WANTED: Field Strength meter covering VHF-UHF-FM Bands with instruction manual. State condition and price. Also want Riders Radio Manuals Vol II, III, IV, V and above XXIII, also Index manuals for complete set. T. K. Brown, RD 1 Box 102, Forksville, PA 18616.

SELL: Leece-Neville alternator, 100 amp. @ 6 v., with regulator, $30. Also, alternator w/open field and spare regulator; offer. W6NHT, 1700 Pine, Martinez, CA 94553.

WANTED: Calibration instructions for Heathkit V-7 VTVM. H.M. Glasgow, 516 Misty Lane, Friendswood, TX 77546.

FOR SALE: Galaxy V, Mark 3 Transceiver, 500 watts P.E.P. 10-80 meters. $250. H. Parks, 293 Warburton Avenue, Yonkers, NY 10701, 914-963-0689.

TA2TAT wrk ur DXCC, pse callsign, adr, mode w/3 IRC or $1.—I'll send to you my QRX Card. QSL & QRX INF, P.O. Box 133, Ankara/Turkey.

SELL: Hallicrafters SX-101 MK III, A-1, with speaker and manual, $175. You ship. Chuck, W9VZR, 4627 N. Bartlett, Milwaukee, WI 53211.

DESPERATELY NEED second hand illuminated sextant for ocean voyage. Fair price for 1946 onwards. S. Roberts, VE3LEH, 3664 Autumn Harvest Drive, Mississauga, Ontario L4Y 3S3 (416) 279-4388.

SELL: Yaesu FT-301S, FL-110Amp, FP-301 MFJ Proc. FB! $650. WB2MJQ, 5 Sunny Lane, Monroe, NY 10950.

YAESU World Clock QTR-24, new, $29.50; AKAI 4000DS Stereo Tape Deck, like new, $250. UPS prepaid on both. Write DS, Box 48, Ballardvale, MA 01810.

TRADE SWAN 350 D digital rig (1 mo. old) for YAESU FTDX 400 or similar rig. Fred, N2ACZ, 212-478-8310 or 203-877-3038.

TRADE: Collector Items for Receiver. Trade Paco VTVM for Eico V.F.O. Helman, 416 W. Main St., New Port Richey, FL 33552.

SELL: Two R390A's very good condition. Recently tubed and aligned $350 each. Jim, WA4MYF, 904-434-5763 or 478-0018.

CASH FOR pre-1924 QST's; ARRL Handbook Editions 1, 3, 4, 5; Jones/Radio Handbook Edition 1. Ken Miller, K6IR, 16904 Geo. Washington Dr., Rockville, MD 20853.

WANTED: Director element for Mosley TA33, TA33JR or TA36 tribander. Will Roberts, P.O. Box 907, Roseboro, NC 28382.

WANTED: Manual, schematic, power supply information for a Northeastern Engineering R-593/GRR UHF receiver. Will gladly pay all copying charges. Ed Fluehe, WA7DAX, 3509 Muriel Way, Granger, UT 84119.

SELL: 1943 Hammarlund Receiver, $150. 1953 WRL Globe Champion Transmitter, $100. WA9IYF, RR # 1, Box 109A, Madison, IN 47250.

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

SELL: Conar Model 452 synthesized 2-meter transceiver, mint, $100. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

SELL: Pair 115 v. selsyns with indicator dials, Delco Type II-4, $40 or offer, exc. condition. W6NHT, 1700 Pine, Martinez, CA 94553.

ANTIQUE: Westinghouse AC Voltmeter, Type PC, Circa 1916, in a mahogany wooden case, $25. Also, Leeds-Northrupt, Newark Standard resistance box, mahogany case, $10. Doug Jones, Radio Club, Matawan Regional High School, Atlantic Ave., Aberdeen, NJ 07747.

WANTED: CQ May 1979 to complete file. VE3AAZ, 146 Deloraine Ave., TORONTO, Canada M5M 2A9.

WANTED: Paperback copy of James Bond's "Casino Royale" by Ian Fleming. WB4PIQ, Rt. 4, Box 348-A, Glen Allen, VA 23060.

SELL: General Radio 650A Impedance Bridge. RLC at 1000 Hz. Reconditioned, calibrated, manual. $65 plus UPS 30 lb. Ph.D., 5220 Carlingford, Riverside, CA 92504.

WANTED: RTTY Freq. Shift. Converter (audio) or Navy CV-89/URA-8A; D.T. RTTY, P.O. Box 9064-CQ, Newark, NJ 07104.

WANTED: Icom RM-2, EX-106 FM adapter, Low pass filter for 6 meters, MFJ-101 clock, Heath digital thermometer. SELL: Johnson roller inductor. $35. KØMK, 218-865-6541.

SELL: Atlas 180 with NB, clean, mint $285. SST Ultra Tuner 160-10 meters $25. WB6VNR (213) 346-5871.

FOR SALE: Kenwood all-mode 700SP 2-meter rig. Kenwood ST-1 H.T. 144-148. Send sase. P.O. Box 142, Jacksonville, FL 32224.

SELL: 300 mmfd vacuum variable capacitor (14000 v.) with counter dial, $50 FOB. Basham, 735 Caves Highway, Cave Junction, OR 97523.

WANTED: KWM2(A) w/ps any condition. State condition and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

WANTED: Operator/Repair Manuals for 2 MHz to 5000 MHz Dummy Load, type AN/URM-58. Federal Stock Number: 6625-519-5488. Manufacturer: WacLine Inc, Dayton, Ohio. Mfg Part Number: 22650. With adapters marked UG-1166/U, UG-1167/U; would like to know what type of connector they are and or what might be used with these adapters to convert to BNC or UHF connectors. CPT Paul W. Morich, CAP, c/o Headquarters, New Jersey Wing, Civil Air Patrol, P.O. Box 16099, McGuire AFB, NJ 08641.

WANTED: AN/FRA-86 demodulator, Hallicrafters HA-1 calibrator, and CM-22A/URA-8A comparator (part of CV-89), AN/URA-17 converter. C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

FOR SALE: Ten-Tec Omni-D ser. B with N.B. and Shure 444 mic. $800. WAØTIZ, Judy, 314-225-3498.

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

FOR SALE: Electronic equipment. For a list and prices, send an S.A.S.E. to Klaus, WB9YBM, 8502 Oketo, Niles, IL 60648.

HALLICRAFTERS SERVICE MANUALS. Amateur and SWL. Write for prices. Specify model numbers desired. Ardco Electronics, P.O. Box 95, Dept C, Berwyn, IL 60402.

NEED HELP for your Novice or General Ticket? Recorded Audio-visual Theory Instruction. No electronic background required. Free information. Amateur License, P.O. Box 6015, Norfolk, Virginia 23508.

PRINTED CIRCUIT BOARDS from sketch or artwork. Kit projects. Free details, DANOCINTHS, INC. Dept. CQ, Box 261, Westland, MI 48185.

LINEAR AMPLIFIER PLANBOOK, Thirteen Complete Transistor Amplifiers from 2-400 MHz, 15-1000 watts, 92 pages $11.95 plus $1.50 Shp. MC/VISA. A.P. Systems, Box 263CQ, Newport, R.I. 02840, tel. 401-846-5627.

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

FREE SAMPLE Ham Radio Insider Newsletter! Send large SASE. W5YI; Box #10101-C; Dallas, Texas 75207.

WANTED: Hallicrafter S-1 through S-7, DD-1, 8 HPA, SX-10, SX-12, and other early Hallicrafter gear, parts, manuals, and accessories. Any condition. For my collection, please write, even if in doubt on Model No. Chuck Dachis, WD5EDG, 4500 Russell Dr., Austin, TX 78745.

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

COUNTY HUNTERS MAP showing 48 states all counties $2.50, WA-3-JFK.

RUBBER STAMPS: 3 lines w/call sign $3.25 ppd. Send check or MO to G. Pierce, 5521 Birkdale Way, San Diego, CA 92117.

SELL: Clegg FM-28, 25 Watts, synthesized, 2 meter FM $225. N9RC, 8377 Chestnut Dr., Newburgh, IN 47630.

WANTED: Case enclosures for GRC-27 units (3), and Hallicrafters HA-7 unit and AN/FRA-86 demods. C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

HAPPY NEW YEAR fellow DXers de WB8OWM/QRPp.

SELL: Brand new Taylor R.S.O. 1kw Low Pass Filter. Five adjustable circuits for custom notching all TV channels. Size 13¼ × 2½ × 2½. Cost $34, will sell for $24. W9WGD, 1002 Forest Road, La Grange Park, IL 60525.

WANTED: Antique (pre-1950) television sets. Will pay top dollar for pre-war or unusual sets. A. Chase, 9 Rushleigh Road, W. Hartford, Conn. 06117; (203) 521-5280.

SELL: 10 Meter QRP Rig $110.00. 40 watt 2 meter CW/SSB Transverter $200.00. WB6GFJ, Box 1, Los Altos, CA 94022.

TUBES, TEST EQUIP., MISC. Cleaning "Junk Box". Send s.a.s.e. for list, Bryner, Rt 1, Box 141, Mulvane, KS 67110.

WANTED: Yaesu FV101B VFO. Send condition and price to KA9AUS, John Bayne, 3912 Rugen Rd., Glenview, IL 60025.

CASH & CARRY: Hallicrafters S41W $25.00; S41C $20.00; Truetone, Model D2663 $50.00. R.W. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

SELL: HA 2 and HA 6 each with power supply and manual. $125.00 each plus UPS. George A. Onsum, 6418 So. Admiralty Way, Freeland, WA 98249.

NOVICE ALL-AMERICAN Certificate: Work a Novice in all 10 call areas. Send list and $1. K6AS1, 25 Rudnick Ave., Novato, CA 94947.

TELREX, 3EL-20M56112 - $150.00; 5EL-20M536 -$350.00. Both in excellent shape, will ship plus freight. K2IGW, Bob, 341 Tracey, Grand Island, NY 14072.

4 KW electric start, Commercial-duty gas generator. 14 HP Wisconsin engine, battery charger, fuel pump for remote tank. Used only 10 hours. Ideal for serious field day. 120-240 Volts. Wanted: Any National Receiver, working or not. T.N. Colbert, WA8MLV, 1800 Rhodes # 612, Kent, OH 44240.

QRPers: 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.

SELL: New 826 Kodak with matching Permaflash (electronic) New Galaxy Rejector + PS, $30. B&H # 22-8mm movie camera plus Syl. New Sun Gun, $30. Speco new Stereo Phones, $10. 9" 24 hr. world clock, $10. Mint Ronson 401 Shaver, $10. Many 73's, QST, and Ham Radio Magazines, sase for list. All FOB UPS. Chester M. Benson, 732 South 14th Street, Richmond, IN 47374.

Hams with calls with suffix ending in "ARE" look for K6ARE, on cw, in Cal QSO party, Oct 4 & 5, 1980.

SELL complete mint collection Ham Radio Magazine (142 issues through 1979). Make offer. W9SS, D. Eksten, 5006 N. Second St., Loves Park, IL 61111.

COLLINS OWNERS: I have a few 6BA7 tubes. SASE Pse. W4JGO, 643 Diamond., Salem, VA 24153.

WANTED: Info on WW II British receiver type R 1147 A, possibly used in fighter aircraft of that period. WD8DAS, Steven Johnston, 823 Irvington NE, Massillon, OH 44646.

WANTED: Rider's "Perpetual Troubleshooter's Manuals." Please state volumes available, condition, price. Bill, N5KR, 1808 Pomona, Las Cruces, NM 88001.

WANTED: Used amateur equipment. State Condition, make, model, and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

SELL: Drake TR4C with AC-4 and MS-4 speaker. No reasonable offer refused. WA4TKG, 904-246-8173, Jacksonville, Florida.

SPECIAL: QSL's printed 300/$5, 500/$9. White and colored stock! Postpaid; samples s.a.s.e. D. Testa, P.O. Box 9064-CQ, Newark, NJ 07104.

FOR SALE: 700SP All-mode 2-meter rig, cw/fm/ssb. HT 144-148 Tempo S-1, Clegg FM-DX 2-meter rig. For more info send s.a.s.e. to P.O. Box 142, Whitehouse, FL 32224.

CASH FOR Pre-1924 QST's; ARRL Handbook Editions 1, 3, 4, 5; Jones Radio Handbook, Edition 1. Ken Miller, K6IR, 16904 Geo Washington Dr., Rockville, MD 20853, (301) 774-7709.

URGENT-URGENT-URGENT: Please send QSL cards to Philip S. Kurland, 1811 Downsville Pike, Apt. #21, Hagerstown, MD 21740.

SELL: Drake TR4-C w/o power supply/speaker. No reasonable offer refused. WA4TKG, Matt Stennett, 315 Country Club Lane, Jacksonville, Florida, 904-246-8173.

YOUNG OM wants to hear from YL's worldwide. My interests 'RTTY" and... Write: Dan, Box 9064, Newark, NJ 07104, U.S.A.

LOOKING for persons experienced in information on the marine radio bands, regulations, licensing, etc. Especially hf-mf and vlf. WA1GXE, Box 1003, Fairfield, CT 06430.

WANTED: VFO for Johnson Viking Adventurer Transmitter. N4ACS, 7304 Dixon Ave., Tampa, FL 33604.

SELL: 51S1, $850. 312B4, $250. TR4-C, AC4, $475. 32S3, ACPS, $425. IC230, 1525-EM, $185. PS500-DC, $35. Bird RF Switch, SP4T, $25. Dow-Key DPDT (115 VAC), $55. TS820S, CWF, $700. NEW: I455FA-31, $35. 351D-2, $50. L/S 400-12, $50. J.W. Craig, W1FBG, Box 615, Portsmouth, NH 03801.

MFJ SBF-2, and CWF-2 FILTERS. Both $28 postpaid. Bob Craig, K6XZ, 4950 Sunshine Ave., Santa Rosa, CA 95405, (707) 539-1007.

FOR SALE: Kenwood 700SP all-mode 2 meter rig, FM-DX 2 meter rig, ST-1 HT. Send s.a.s.e. for info to 7602 Timberwood Dr., Jacksonville, FL 32224.

SELL: UCS 375 mmfd 14000 volt vacuum variable capacitor with counter dial, $50. FOB Basham, 735 Caves Hwy., Cave Junction, OR 97523.

SELL: 4-1000A Excellent. Used about 12 hours, $60. Basham, 735 Caves Hwy., Cave Junction, OR 97523.

CRYSTALS: S.a.s.e. for my list. K8LJQ, 355 Mower Rd.,Pinkney, MI 48169.

GLOBE SCOUT, Model 680A manual & diagram wanted. R RANDALL, K6ARE, 1263 LAKEHURST RD., LIVERMORE, CA 94550.

WANTED: Millen 90672 Ant. Bridge, complete. Drake: WV-4 wattmeter. Jim Gysan, W1VYB, 53 Lothrop Street, Beverly, Mass. 01915.

WANTED: CPI FA-70 frequency converter adaptor to mesh Ten Tec Triton IV and CPI FC-70. WB1HIH, P.O. 591, Williamstown, Mass. 01267.

SELL: Eico 710 Grid Dip $25; Millen 90651 Grid dip $65 Icom 22S w/chn xpander, AC pwr $200; HW22A HP23A $125; Vibroplex delux chrome paddle new $45; Shure 444 w/Yaesu plug $25. Art Ford, 2903 Emory St., Melbourne, FL 32901.

NOVICE ALL-AMERICAN certificate: Work a Novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

SELL: Kenwood TS-120S with cw filter and PS-30 power supply, mint, $600. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

WANTED: Used COLLINS Equipment any condition. State condition and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

WANTED: Card guides for Altair, coaxial bulkhead lighting arrestors w/"N" connections, and enclosures for GRC-27 equip. C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

FOR SALE: Yaesu FT-227R Memorizer. Nearly new, perfect condition. $275. R.J. Moraine, 1432 Pamela, Hurst, TX 76053.

SELL: 4KW, 120-240 Volt, Electric start, commercial duty WINCO gas generator. 1800 RPM, skid mounted, fuel pump, 14 hp WISCONSIN motor. Used about 10 hours. Pick up only. T.N. COLBERT, WA8MLV, 13663 Seco Blvd., Burton, Ohio 44121.

TTY WANTED: 33 ASR, KSR or RO, also 28 ASR or KSR Typing Unit. B.J. Brown, P.O. Box 791, Benton Harbor, MI 49022.

NOVICE ALL-AMERICAN certificate: Work a novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

TRS-80 owners at last...the long awaited amateur radio programs are now available. Super Log, Micro-DX, Micro-Clock, much more. SASE to Bill Gosney, WB7BFK, Q-2665 No. Busby Rd, Oak Harbor, WA 98277.

FOR SALE: Yaesu FT-227R. Absolutely perfect condition, nearly new. $265 postpaid. R. J. Moraine, 1432 Pamela, Hurst, TX 76053.

SELL: Heath HW-101, CW Filter, AC Supply, two DC supplies, mobile mount, all manuals. $375.00. W4OWY, 404-973-4021.

WANTED: CM-22A/URA-8 comparator, AN/URA-17 converter, and coaxial lightning arrestors (bulkhead w/"N" conn). C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

SELL: Tempo S-1 Handheld, accessories, 30 watt amplifier. $325. 609-693-6598, WA2NEM.

FOR SALE: Drake TR-7 Transceiver. Includes Power Supply, Fan, Auxilliary Program Board, AM Filter, Speaker, MN-4 Antenna Matcher, Service Manual. Great deal for $1200.00 add extra shipping. Certified bank check only. Also two Hammarlund Superpro BC-1004 Receivers. Local pickup preferred, as too heavy for shipping, both work. $250.00. Bill Coleman, Jr., KA4DAP, 114 Circle Drive, Rocky Mount, NC 27801. Prepaid calls 1-919-443-7282, best 7pm-0200 daily.

SELL: Hammarlund H Q 110c Ham Receiver 6 to 160 Meters $110 You Pay Shipping. W2WQV, 164 Jefferson Ave., Fairport, N.Y. 14450.

SELL: As new Robot 70A and 80A, $400. SASE for electronic list. W7KSG, 1876 E. 2990 So., Salt Lake City, UT 84106.

SELL: Motorola Motrac control and mike, $20. RCA CX-35 mobile test set, $25. Heath GDO, $30. 4-400 Fil. Trans. new, $10. K6KZT, 2255 Alexander, Los Osos, CA 93402.

SELL OR SWAP: Yaesu FT 221R 2M Multimode w/Janel built-in preselector, mint orig. box w/book, $425, or swap for TR4C, older FT 101B. Art Ford, 2903 Emory St., Melbourne, FL 32901.

KW Linear, 80 to 10, SB-230, spare final, mint $500. WA2OVG, 212-490-2160 days. 796-8617 eve.

1943 HAMMARLUND RCVR, $150. 1953 Globe Champion, $100. Heathkit DX-60, H6-10 VFO, $150. WA9IYF.

PLATE TRANSFORMERS: Send S.A.S.E. for list. Want: P.A. or stereo amplifier 30 watts or more. L.G. Basham, 735 Caves Hwy, Cave Junction, OR 97523.

FOR SALE: Dentron Clipperton L 2KW Linear excellent condition, less than 30 hours on air $550. WB2EFB, Dave Brownell, 16 Cook St., Worcester, N.Y. 12197. LICENSED AMATEURS ONLY PLEASE!

WANTED: Used Amateur Equipment any condition, state condition and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

SELL: Newtronics Cliff Dweller Antenna $25. No shipping. Needs repair. Clem Duval, 1-313-268-2467.

WANTED: Any National equipment, working or not. George Misic, WA8LEM, 4147 Mayfield, South Euclid, Ohio 44122.

FOR SALE: Gonset 2 meter Sidewinder, SSB, CW, AM, with matching AC and DC supplies, mike and manual. Premium condition. $260.00 Bank M.O. Jim Gysan, W1VYB, 53 Lothrop St., Beverly, Mass. 01915, (617) 922-3850 after 5:30 pm.

SELL: 1943 Hammarlund rcvr, $150. 1953 Globe Champion, $100. DX-60, H6-10 VFO, $150. WA9IYF.

GOV'T SURPLUS EQUIPMENT, Parts and Tubes. Catalog 50¢. G & G RADIO, 47 Warren St., New York, NY 10007; (212) 267-4605.

NEED MANUAL OR DIAGRAM for 2m freq. synthesizer model MK-1 and National model HFS Receiver. Buy or copy and prompt return. Jung Y. Lem, KB6BO, 5222 Coringa Dr., Los Angeles, CA 90042.

SEND SASE for list amp. parts, power packs, tubes, and misc. L. Basham, 735 Caves Highway, 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.

Please send all reader inquiries directly.

2A Versatility

10 Options Guaranteed to Make the Extremely Popular 2A and 2AT Even More Popular!

ICOM