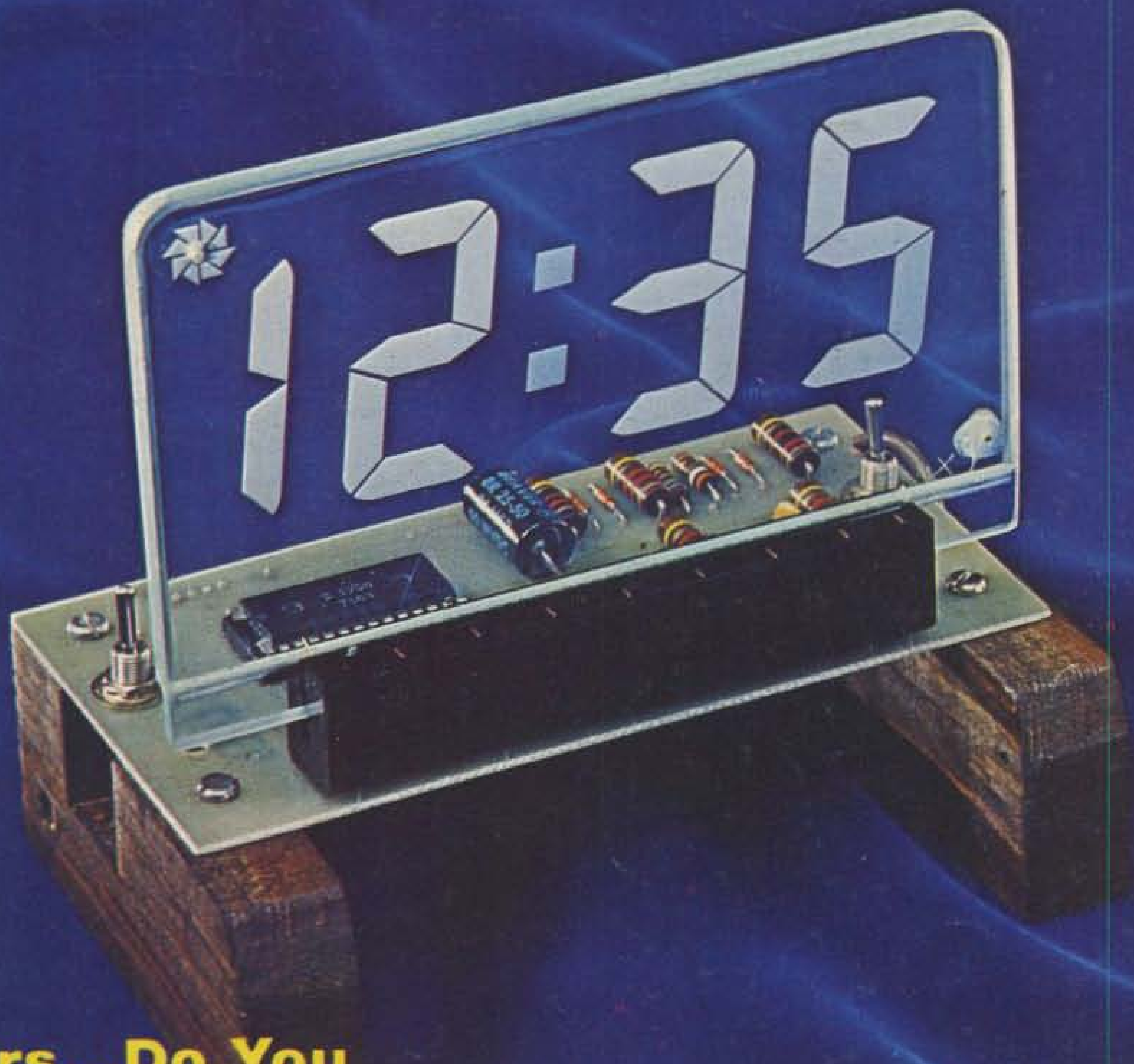
ICD 08240

Amateur Radio CQ

SERVING AMATEUR RADIO SINCE 1945

FEBRUARY 1978 $1.50

The Giant LCD Clock...p.18



Computers...Do You Really Want One?...p.29

A Screen Reflector Array for 220 and 432 MHz...p.24

Television Interference and the Citizens Band Radio Service...p.27

ADIO AMATEUR'S JOURNAL

KENWOOD
...pacesetter in amateur radio

Here's a new and versatile accessory from Kenwood that belongs in every station. The AT-200 is an antenna tuner, but it's also much more. It's an antenna switch, an SWR bridge and an in-line wattmeter. The AT-200 reduces the clutter and increases the operating efficiency of your station . . . and at a surprisingly moderate price.

The AT-200 features a seven position rotary switch that selects 1 of 3 antennas and connects it through the antenna tuner circuit or directly to the transceiver. The 7th position allows you to connect a dummy load directly to your transceiver for tune up and testing. Two of the antenna inputs are fitted with SO-239 type coax connectors. A third input allows for easy hook up of a wire antenna with an inpedance of 10 to 500 ohms. The AT-200 may be used on all HF amateur bands from 160 to 10 meters. It's handsomely styled to match the TS-820S and TS-520S Series (and TS-820 and TS-520), but can also be used with any HF transceiver or transmitter with less than 200 watts output.

Frequency Coverage: Amateur bands 1.8 to 30 MHz • Input Impedance: 10 to 500 Ohms • Maximum Power Capability: 200 watts • Insertion Loss: 0.5db • Power Meter: 20 watt/200 watt full scale • SWR Meter measures up to 10:1 • Dimensions 6-1/2" W x 7-3/8" D x 6-9/16" H • Weight: 6.2 lbs.

AT-200 WITH THE TS-820S

The MC-50 dynamic microphone has been designed expressly for amateur radio operation as a splendid addition to any Kenwood shack. Complete with PTT and LOCK switches, and a microphone plug for instant hook-up to any Kenwood rig. Easily switched for high or low impedance. (600 or 50k ohm).

The TS-820S . . . still the Pacesetter. It has proven itself to be the performer we promised, proven itself through thousands of hours of operating time, worldwide and under the most difficult conditions. Unique features, superb specifications and top quality construction . . . all hallmarks of Kenwood amateur products are eminently displayed in the TS-820S. But then, you've probably heard all that on the air by now.

Trio-Kenwood Communications Inc.
1111 W. Walnut, Compton, CA 90220.

This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines.

BRAND NEW

$79⁹⁵

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941 Versa Tuner II with all these features at this price:

A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balance lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balance line, or random wire.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

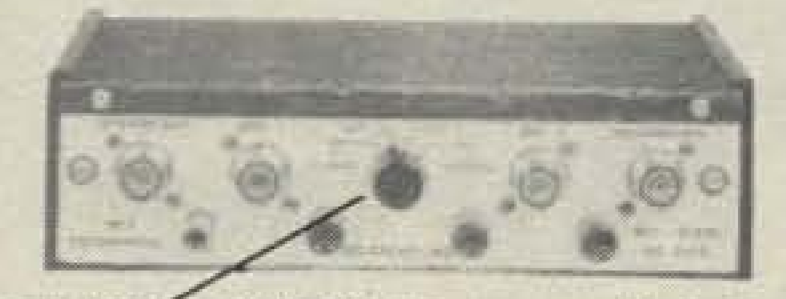
You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

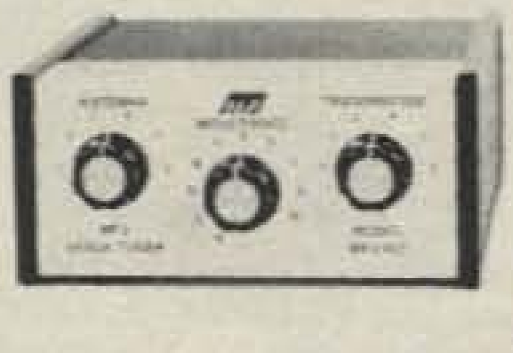
It travels well, too. Its ultra compact size 5x2x6 inches fits easily in a small corner of your suitcase.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balance line inputs (2), random wire input (1), and ground (1).



ANTENNA SWITCH lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.



$59⁹⁵

BRAND NEW

MFJ-901 VERSA TUNER

New efficient air wound coil for more watts out.

Only MFJ uses an efficient air wound inductor (12 positions) in this class of tuners to give you more watts out and less losses than a tapped toroid. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF output. 1:4 balun for balance lines. Tune out the SWR of your mobile whip **from inside your car.** Works with all rigs. Ultra compact 5x2x6 inches. SO-239 connectors. 5 way binding posts. Ten Tec enclosure.

$49⁹⁵

BRAND NEW

MFJ-900 ECONO TUNER

Same as MFJ-901 Versa Tuner, but does not have built-in balun for balance lines. Tunes coax lines and random lines.

$39⁹⁵

MFJ-16010 RANDOM WIRE TUNER

Operate 160 thru 10 Meters. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. SO-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz.

$49⁹⁵

BRAND NEW

MFJ-202 RF NOISE BRIDGE

This MFJ RF Noise Bridge lets you adjust your antenna quickly for maximum performance. Measure resonant frequency, radiation resistance and reactance. Exclusive range extender and expanded capacitance range (± 150 pf) gives you much extended measuring range.

Tells resonant frequency and whether to shorten or lengthen your antenna for minimum SWR. Adjust your single or multiband dipole, inverted vee, beam, vertical, mobile whip or random system for maximum performance. 1 to 100 MHz. SO-239 connectors. 2x3x4 inches. 9 volt battery.

For Orders Call toll-free 800-647-8660

For technical information, order and repair status, and in Mississippi, please call 601-323-5869.

Order any product from MFJ and try it. If not delighted, return within 30 days for a prompt refund (less shipping).

Order today. Money back if not delighted. One year unconditional guarantee. Add $2.00 shipping/handling.

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MFJ ENTERPRISES
P. O. BOX 494
MISSISSIPPI STATE, MISSISSIPPI 39762

KENWOOD

...pacesetter in amateur radio

Kenwood's exciting 2-meter transceiver . . . still the most powerful. 800 channels, repeater offset over all 4 MHz (144-148 MHz), dual frequency readout, easy to read 6 digit display, Kenwood's unique continuous tone coded squelch system and outstanding receiver performance. All in a rugged, compact package.

The TR-7400A lets you go anyplace on the 2-meter band . . . covers the entire band without compromise. It exceeds all FCC emission requirements for amateur transceivers. Its RF output is factory spec'd at 25 watts . . . but is typically over 30! It offers a dual frequency readout with large easy to read 6 digit LED display plus a functional dial readout system, fully synthesized 800 channel operation and repeater offset over all 4 MHz (144-148 MHz). The unique Continuous Tone Coded Squelch system is a Kenwood exclusive.

Outstanding sensitivity, large-sized helical resonators with High Q to minimize undesirable out-of-band interferance, and give a 2-pole 10.7 MHz monolithic crystal filter combine to give your TR-7400A outstanding receiver performance. Intermodulation characteristics (Better than 66dB), spurious (Better than −60dB), image rejection (Better than −70dB), and a versatile squelch system make the TR-7400A tops in its class.

(Active filters and Tone Burst Modules optional)

TR-7400A

The TR-7400A is shown with its furnished hand mike and the PS-8 DC power supply (optional). Take your TR-7400A out of the car and you can use it as a powerful base station. The PS-8 is rated at 8 Amps and is among the most rugged, well-regulated supplies available for VHF transceivers requiring 12V DC.

TR-7400A Specifications

Range: 144.00 MHz to 147.995 MHz
Mode: FM
800 Channels: 5 KHz spaced
Sensitivity: Better than 0.4 uV for 20 dB quieting
Better than 1 uV for 30 dB S/N
Squelch Sensitivity: Better than 0.25 uV
Selectivity: 12 KHz at −6 dB down
40 KHz at −70 dB down
Image Rejection: Better than −70 dB
Spurious Interference: Better than −60 dB
Intermodulation: Better than 66 dB
Receive System: Double conversion
First IF: 10.7 MHz
Second IF: 455 KHz
Audio Output: More than 1.5 Watts (8 ohm load)
RF Output Power: 25 Watts (High) 5-15 Watts (Low-adjustable)
Antenna Impedance: 50 ohms
Frequency Deviation: ±5 KHz
Spurious Response: Better than −60 dB
Microphone: Dynamic, with PTT switch. 500 ohms
Current Drain: Less than 1A in receive (no input signal)
Current Drain: Less than 8A in transmit

Trio-Kenwood Communications Inc.
1111 W. Walnut, Compton, CA 90220.

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The Radio Amateur's Journal

FEATURES

DEPARTMENTS

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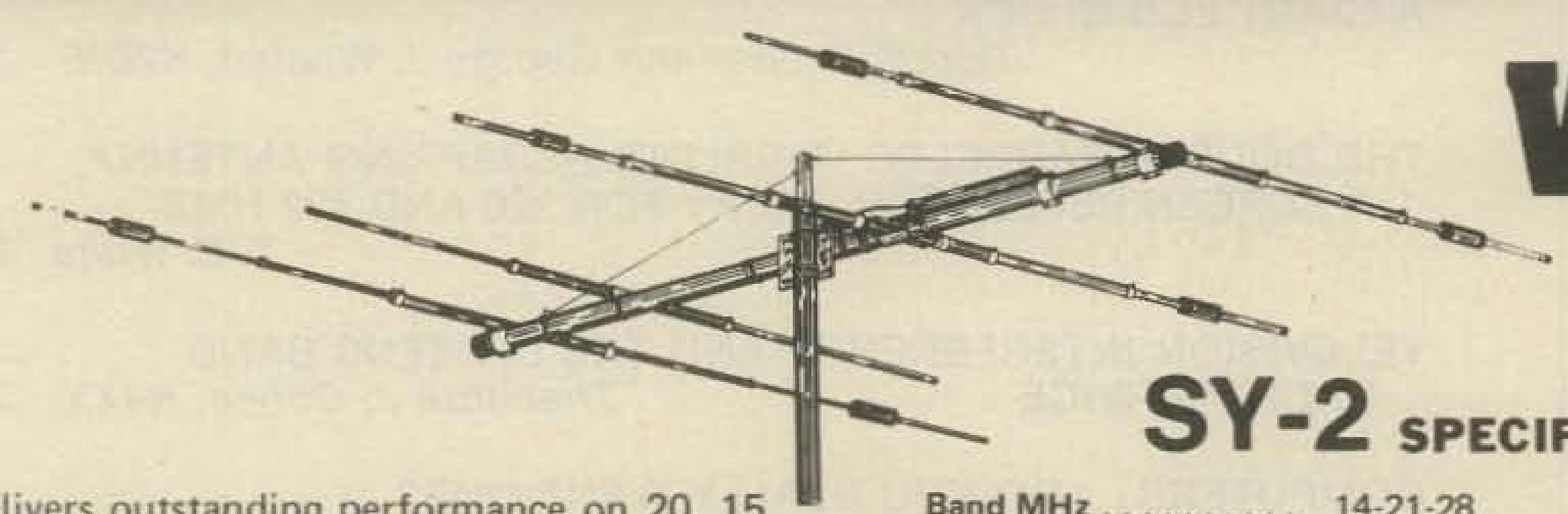
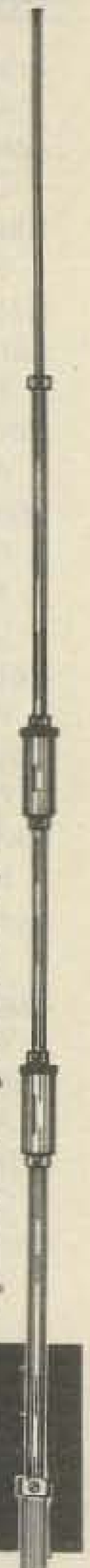
THE SYSTEM TWO™ TRIBANDER ANTENNA . . .

Top Performance for 20 - 15 - 10 Meters!





Wilson

SY-2 SPECIFICATIONS

Delivers outstanding performance on 20, 15 and 10 meters. Features Wilson's large diameter High-Q Traps, feeds with 52 ohms coax, a beta match method presents tapered impedance which provides most efficient 3 band matching and DC ground to eliminate precipitation static. The result is SWR less than 1.5 to 1 at resonance on all bands and maximum front-to-back. An added feature is the separate 10 meter reflector for correct monoband spacing. Add to this the rugged boom to element mounting, heavy duty taper swaged elements, and you have

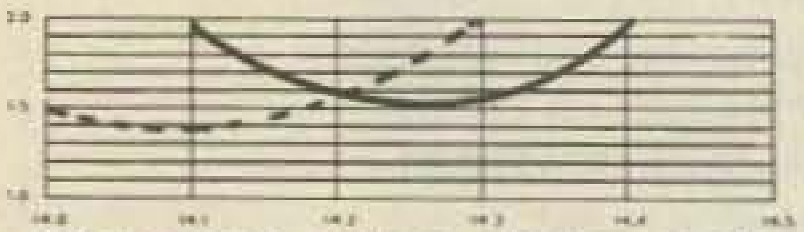
SYSTEM TWO™

. . . a space efficient, high performing, cost effective new tribander . . . value priced at $199.95!

Band MHz	14-21-28
Maximum Power Input	4 Kw
Gain (dB)	8.5
VSWR (at Resonance)	1.5:1
Impedance	50 Ohms
F/B Ratio (dB)	20-25
Boom (O.D. x Length)	2" x 18'6"
No. Elements	4
Longest Element (Ft.)	26'7"
Turning Radius (Ft.)	16'4"
Mast Diameter	2" O.D.
Boom Diameter	2" O.D.
Surface Area (Sq. Ft.)	6.15
Wind Loading at 80 mph	153
Assembled Weight (Lbs. - Approx.)	47
Shipping Weight (Lbs. - Approx.)	50
Matching Method	Beta

Only One Feed Line Required

SHIPS BY U.P.S.!!!



20 METERS - MODEL SY-2

15 METERS - MODEL SY-2

10 METERS - MODEL SY-2

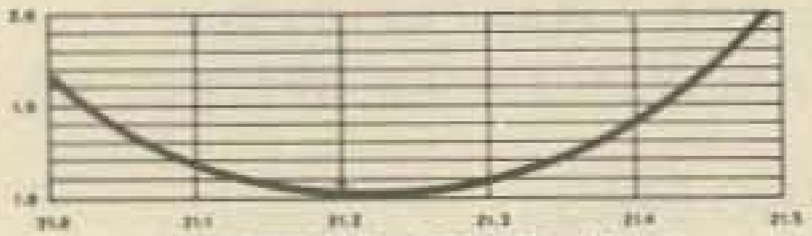
DEALERSHIPS AVAILABLE!!!

We are looking for new Dealers for certain areas of the country. If you are interested, contact us for details.

40 THRU 10 METERS VERTICAL TRAP

40 METERS - MODEL WV-1

20 METERS - MODEL WV-1



15 METERS - MODEL WV-1

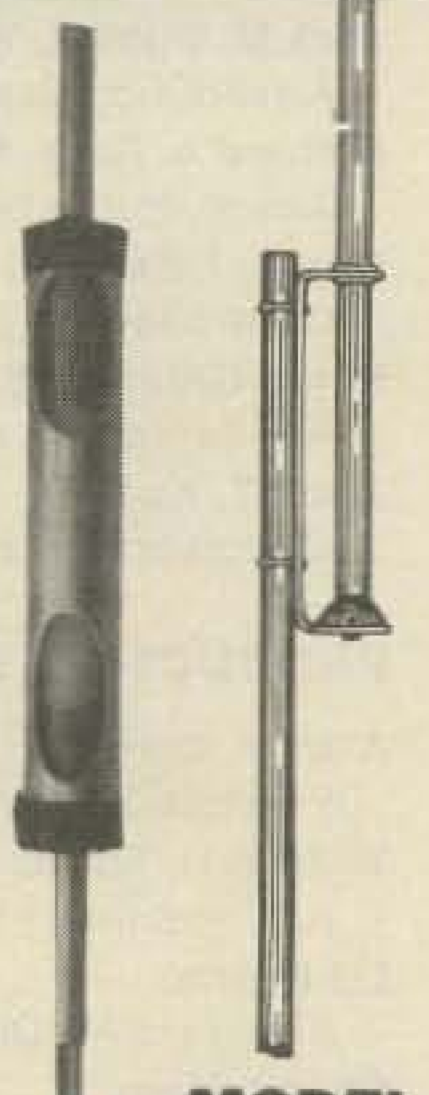
10 METERS - MODEL WV-1

WV-1 WILSON VERTICAL TRAP ANTENNA

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across full width of each band. Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity. Easily assembled, the WV-1 is supplied with base mount bracket to attach to vent pipe or to mast driven in the ground. The new WV-1 Antenna is priced at $65.00 . . . and ships via UPS!

SPECIFICATIONS

Input Impedance: 50 Ohms • Powerhandling capability: Legal Limit • Two High-Q Traps with large diameter coils • Low Angle Radiation Omnidirectional performance • Taper Swaged Aluminum Tubing • Automatic Bandswitching • Mast Bracket furnished • SWR: 1.5:1 on all Bands • 1½" O.D. Heavy wall aluminum tubing • Does not require guying • Overall length: 25' 1½".



MODEL WV-1

Wilson Electronics Corp.

4288 SO. POLARIS AVENUE • P. O. Box 19000 • LAS VEGAS, NEVADA 89119
TELEPHONE (702) 739-1931 • TELEX 684-522

Zero Bias

an editorial

By necessity, magazine editorials are written far in advance of the published date. Events and situations have a way of changing rapidly during the writing and printing stages, to make the writing of editorials take the form of second-guessing or gazing into a crystal ball. It is hard, for example, to write this in November, trying to predict what will be important in February, which is the time most of you will read it.

There are a number of issues that have recently developed that I would like to comment on. First, it was learned this week that the ARRL has shelved (for a month) their plan for a compulsory Code of Ethics. This fact was learned in November, after the January issue of CQ went to press, and so my editorial on the Code of Ethics may or may not be apropos. I still feel strongly about it, although it may not be the burning issue it once was . . . if it is not reinstated. We will have to wait one more month to see what they have in mind.

The Communications Attorney Service (CAS), as mentioned in "A Message From The Publisher" last month, has now taken a new direction to gather attention and notoriety for their founder Richard B. Cooper. Mr. Cooper, in a recent telephone conversation, told me that he plans to seek full General Class privileges and a sizable hunk of the amateur spectrum for CB operators. He feels that amateur radio has outlived its usefulness, and that a small minority should not control the frequency spectrum that they (we) do. He is explicitly seeking, through a chain letter, support from CB operators over the age of 18 to form a petition of 5,000,000 signatures to place before Congress in the hopes of eliminating amateur radio in favor of a large Citizens Band Radio Service. This petition would also have the United States withdraw from international agreements which preclude such use. Well we can laugh at Mr. Cooper's audacity and say that he hasn't a chance of pulling this off, or think about the weight of 5,000,000 voters on Congress. Congress, you say, wouldn't do that to us. Think about it.

This leads into another item that I've heard recently. I've been accused of being naive in my previous editorials about the FCC, OMB and the OTP organizations. I've been told that it was "common knowledge" that all of the fee money for the FCC was turned over to the General Fund and relegated by Congress; any schoolboy knew that. Obviously, from my considerable mail, it is clear that a great number of you out there didn't have the whole picture on where this money went relative to the FCC. I am trying to make you aware of the process, not insult your intellegence. What is obvious is often taken for granted without understanding or not seen at all. It blends in with everything else. What is obvious and often not seen is the power of Congress over amateur radio. They exercise far more power over us than the FCC.

It doesn't follow then, that if the FCC has quite a number of amateurs on the staff, amateur radio is the focal point of the FCC's thinking. At best, amateur radio is becoming a thorn in their side. What you or I want for amateur radio for the most part is realistically impossible for the FCC to deliver, regardless of what they (FCC) want. Congress controls the purse strings.

Now if we think back to Mr. Cooper's desires for amateur radio we can see the merit of 5,000,000 votes as a determining force in what Congress ultimately wants . . . to be re-elected. As I have been saying for a long time . . . numbers do count.

Those of you who have the chance to read the International Amateur Radio Society News Letter by Clif Evans, K6BX shouldn't miss the October 1977 issue. The first dozen or so pages read better than "The Godfather" and have more suspense, intrigue, murderous plots and secret meetings than any James Bond movie. This includes a purported plot by denizens of the CQ Gang to snare K6BX in the Dayton Hamfest parking lot, douse him with gasoline and light him up like a Roman Candle. Clif goes into tremendous detail on how he fought the League and their evil anti-semitic (he claims) henchmen to foil their nefarious plots to control the amateur radio market. Exerpts from the famous "Doyles Diary" are printed and make interesting reading in historical context. I've been working at Cowan Publishing now for about 15 years and have apparently missed all of the conspiracy meetings and assassination plots so far. I don't think anybody at ARRL Headquarters has been down here for those meetings either nor have we been up there. Anyway, a lot of this story by Clif is some of the best fiction (ramblings would be a better word) I've read so far. I'm looking forward to the movie when it's produced. I hope James Caan or Al Pacino get to play me. Dick Cowan is sure that Clif has Marlon Brando penciled in for him.

73, Alan, K2EEK

KENWOOD'S
TS-520S
AND DG-5 DIGITAL FREQUENCY DISPLAY
A NEW STANDARD IN ECONOMY TRANSCEIVERS

The NEW TS-520S combines all of the fine, field-proven characteristics of the original TS-520 together with many of the ideas, comments, and suggestions for improvement from amateurs worldwide. Kenwood's ultimate objectives . . . to make quality equipment available at reasonable prices.

FULL COVERAGE TRANSCEIVER

The new TS-520S provides full coverage on all amateur bands from 1.8 to 29.7 MHz. Kenwood gives you 160 meter capability, WWV on 15.000 MHz., and an auxiliary band position for maximum flexibility. And with the addition of the TV-502 and TV-506 transverters, your TS-520S can cover 160 meters to 2 meters on SSB and CW.

DIGITAL DISPLAY DG-5 (option)

The new Kenwood DG-5 provides easy, accurate readout of your operating frequency while transmitting *and* receiving.

OUTSTANDING RECEIVER SENSITIVITY AND MINIMUM CROSS MODULATION

The new TS-520S incorporates a 3SK-35 dual gate MOSFET for outstanding cross modulation and spurious response characteristics. The 3SK35 has a low noise figure (3.5 dB typ.) and high gain (18 dB typ.) for excellent sensitivity.

NEW IMPROVED SPEECH PROCESSOR

A new audio compression amplifier gives you extra punch in the pile ups and when the going gets rough.

VERNIER TUNING FOR FINAL PLATE CONTROL

A new vernier tuning mechanism allows easy and accurate adjustment of the plate control during tune-up.

FINAL AMPLIFIER

The new TS-520S is completely solid state except for the driver (12BY7A) and the final tubes. Rather than substitute TV sweep tubes as final amplifier tubes in a state of the art amateur transceiver, Kenwood has employed two husky S-2001A (equivalent to 6146B) tubes. These rugged, time-proven tubes are known for their long life and superb linearity.

HIGHLY EFFECTIVE NOISE BLANKER

An effective noise blanking circuit developed by Kenwood that virtually eliminates ignition noise is built-in to the TS-520S.

RF ATTENUATOR

The new TS-520S has a built-in 20 dB attentuator that can be activated by a push button switch conveniently located on the front panel.

VFO-520S — NEW REMOTE VFO

The VFO-520S remote VFO has been designed to match the styling of the TS-520S and provide maximum operating flexibility on the band selected on your TS-520S.

AC POWER SUPPLY

The TS-520S is completely self-contained with a rugged AC power supply built-in. The addition of the DS-1A DC-DC converter (option) allows for mobile operation of the TS-520S.

EASY CONNECTION PHONE PATCH

The TS-520S has 2 convenient RCA phono jacks on the rear panel for PHONE PATCH IN and PHONE PATCH OUT.

CW-520 — CW FILTER (OPTION)

The CW-520 500 Hz filter can be easily installed and will provide improved operation on CW.

AMPLIFIED TYPE AGC CIRCUIT

The AGC circuit has 3 positions (OFF, FAST, SLOW) to enable the TS-520S to be operated in the optimum condition at all times whether operating CW or SSB.

The TS-520S retains all of the features of the original TS-520 that made it tops in its class: RIT control • 8-pole crystal filter • Built-in 25 KHz calibrator • Front panel carrier level control • Semi-break-in CW with sidetone • VOX/PTT/MOX • TUNE position for low power tune up • Built-in speaker • Built-in Cooling Fan • Provisions for 4 fixed frequency channels • Heater switch.

Specifications

Amateur Bands: 160-10 meters plus WWV (receive only)

Modes: USB, LSB, CW

Antenna Impedance: 50-75 Ohms

Frequency Stability: Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during any 30 minute period thereafter

Tubes & Semiconductors:

Tubes (S2001A x 2, 12BY7A)	3
Transistors	52
FETs	19
Diodes	101

Power Requirements: 120/220 V AC, 50/60 Hz, 13.8 V DC (with optional DS-1A)

Power Consumption: Transmit: 280 Watts Receive: 26 Watts (with heater off)

Dimension: 333(13⅛) W x 153 (6-0) H x 335(13-(13-3/16) D mm(inch)

Weight: 16.0 kg(35.2 lbs)

TRANSMITTER

RF Input Power: SSB: 200 Watts 'PEP CW: 160 Watts DC

Carrier Suppression: Better than -40 dB

Sideband Suppression: Better than -50 dB

Spurious Radiation: Better than -40 dB

Microphone Impedance: 50k Ohms

AF Response: 400 to 2,600 Hz

RECEIVER

Sensitivity: 0.25 uV for 10 dB (S+N)/N

Selectivity: SSB:2.4 kHz/-6 dB, 4.4 kHz/-60 dB

Selectivity: CW: 0.5 kHz/-6 dB, 1.5 kHz/-60 dB (with optional CW-520 filter)

Image Ratio: Better than 50 dB

IF Rejection: Better than 50 dB

AF Output Power: 1.0 Watt (8 Ohm load, with less than 10% distortion)

AF Output Impedance: 4 to 16 Ohms

DG-5

SPECIFICATIONS

Measuring Range: 100 Hz to 40 MHz

Input Impedance: 5 k Ohms

Gate Time: 0.1 Sec.

Input Sensitivity: 100 Hz to 40 MHz . . . 200 mV rms or over, 10 kHz to 10 MHz . . 50 mV or over

Measuring Accuracy: Internal time base accuracy ±0.1 count

Time Base: 10 MHz

Operating Temperature: -10° to 50° C/14° 122° F

Power Requirement: Supplied from TS-520S or 12 to 16 VDC (nominal 13.8 VDC)

Dimensions: 167(6-9/16) W x 43(1-11/16) H x 268(10-9/16) D mm(inch)

Weight: 1.3 kg(2.9 lbs)

VFO-520S

Here's the perfect companion for your TS-520S . . . the new solid state remote VFO designed for the TS-520S. This handsome accessory features its own RIT circuit and control switch and, of course, adds greatly to the versatility and pleasure of your own station. (Also compatible with the TS-520.)

AT-200

A versatile addition to any station. Serves as an antenna tuner, an antenna switch, an SWR bridge and an in-line wattmeter. May be used on all HF amateur bands from 160 to 10 meters. Perfectly matched to the TS-520S and TS-820S, but can be used with any HF transceiver or transmitter with less than 200 watts output.

KENWOOD

. . . pacesetter in amateur radio

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

Announcing

• On Sunday, August 17th, 1977, the U.S. CCIR National Committee approved the addition by U.S. CCIR Study Group 8 of cognizance over Amateur terrestrial services. If International CCIR Study Group 8 approves the addition of the Amateur (terrestrial) service to its responsibilities at the Block B CCIR meeting Jan. 1978, a recommendation would be expected to be made to the XIV Plenary Assembly to modify the Study Group 8 Terms of Reference to include the non-space Amateur service. Since this action will occur after May 31, 1978 deadline for submission of papers to be considered at the Special Preparatory Meeting (SPM) of the CCIR, it is hoped that agreement in Study Group 8 can be reached to allow submission of papers concerning the Amateur service in time for the SPM, presuming favorable action at the XIV Plenary Assembly.

• **Coral Gables, FL** — The University of Miami Amateur Radio Society is pleased to announce the "Worked All Universities Award on Ten". This award is available to all amateurs. To qualify you must work five university club stations on ten meters. Each contact is worth 2 points, a total of ten is required. However, any charter university, i.e., U. of Miami Ch. no. 01, is worth 4 points. This award is available by sending $1.00 to: Michael J. Kravit, WA4ZIE, c/o University of Miami, ARS, McArthur Engineering Bldg., Coral Gables, FL 33146. Any University Club Station interested in becoming a charter member should contact K4HYE any week day on 28.6 MHz. Between 1630z and 2100z, or by writing the above address.

• **Akron, OH** — The Cuyahoga Falls Amateur Radio Club's 24th Annual Electronic Equipment Auction and Flea Market is Sunday, Feb. 26th at North High School, from 9 a.m. to 4 p.m. Tickets are $1.50 in advance, $2.00 at the door. Bring your own tables, some available at $1.00 each. Refreshments available. 5 main prizes including the grand prize, a Triton IV. Plenty of room for buyers and sellers, over 32,000 sq. ft. Easy access located on Tallmadge Ave. at off ramp North Expressway (rt. 8). Check in 146.52, 146.04/.64, 147.84/.24, 223.5. For more info: CFARC, P.O. Box 6, Cuyhoga Falls, OH 44222.

• **Wheaton, IL** — The Wheaton Community Radio Amateurs will hold their 16th Annual Midwinter Swap & Shop on Sunday, Feb. 5, 1978, from 8 a.m. to 5 p.m., at the DuPage County Fairgrounds on Manchester Road (near County Farm Rd.) on the west side of Wheaton, IL. Some tables will be provided, but bring your own if possible. WCRA invites anyone with an interest in buying or selling new or used electronic equipment to attend this hamfest, which will be inside four large, heated buildings at the fairgrounds. Advance tickets (available until Jan. 23rd) are $1.50 and tickets at the door are $2.00. Checks must be payable to the club. Write Don Snyder, WB9VFC, 623 Meadows Blvd., Apt. 3C, Addison, IL 60101.

• **Mansfield, OH** - The Midwinter Hamfest-Auction will be held Feb. 5, 1978 at the Richland County Fairgrounds. Prizes, flea market, auction. Large heated buildings. Doors open at 8 a.m. Talk in 146.34/146.94. Tickets are $1.50 in advance, $2.00 at the door. Contact Harry Frietzhen, K8HF, (K8JPF), 120 Homewood, Mansfield, OH 44906 or phone (419) 529-2801 or 524-1441.

• **LaPorte, IN** - The LaPorte ARC's Winter Hamfest is Sunday, February 26, 1978 at the LaPorte Civic Auditorium (main Floor). There is plenty of room, free tables, and good food. LaPorte is 50 miles southeast of Chicago. Talk in on .01/.61 and .52 simplex. Donation is $2.00 at the gate. For more info: LPARC, Box 30, LaPorte, IN 46350.

• Anyone desiring to list stolen amateur radio equipment please send information to Colorado Council of Amateur Radio Clubs, c/o Charles E. Myers, W0RNT, 1120 Yosemite Drive, Colorado Springs, CO 80910. Please include as much indentification information as possible. Free distribution will be made to all amateur radio magazines and Colorado Amateur Radio Clubs. Funds for postage and printing will be greatly appreciated.

TEN-TEC 540/544—the transceivers that almost seem like an extension of yourself. Following your every command, easily, simply — because we did our homework. They are designed with the same out-front thinking that characterizes all Ten-Tec equipment — super-sophisticated to make things simple for you.

TAKE BAND CHANGING. IT'S SIMPLE! No more peak and dip, peak and dip. Just snap a switch and there you are. Anywhere you want to be, in any part of a band segment—and always at full efficiency without danger of out-of resonance damage to the final amplifier. Thanks to the Ten-Tec broadband design, and thanks to the leadership of Ten-Tec engineers in solid-state high power HF design.

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THE SMART "S"-METER. IT MAKES THINGS SIMPLE FOR YOU. It's electronically switched to read SWR when you are transmitting so that without throwing switches you know at a glance that the correct antenna is in use. Simple for you, extra effort for us.

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SUPERIOR SPEECH QUALITY. IT'S SIMPLE! Ten-Tec rigs are known for their crisp articulation — the kind that brings compliments and satisfaction. Articulated, shaped speech for maximum penetration, yet smooth and clean, with less than 2% distortion to reduce fatigue and enhance the quality of both transmitted and received signals. The signal that's easy to listen to is the one everyone wants to work. And it's yours in the sophisticated simplicity of the 540/544.

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To make your operating simple, simply see your Ten-Tec dealer, or write for full details.

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The TEMPO 2020	**$759.00**
Model 8120 external speaker	**$29.95**
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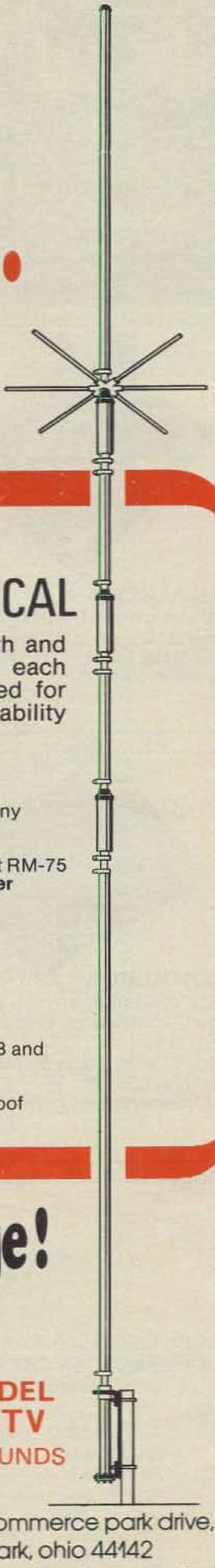

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- All sections 1¼" **heavy wall,** high strength aluminum. Length 21'5".
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- Feed with **any length** 50 ohm coax.
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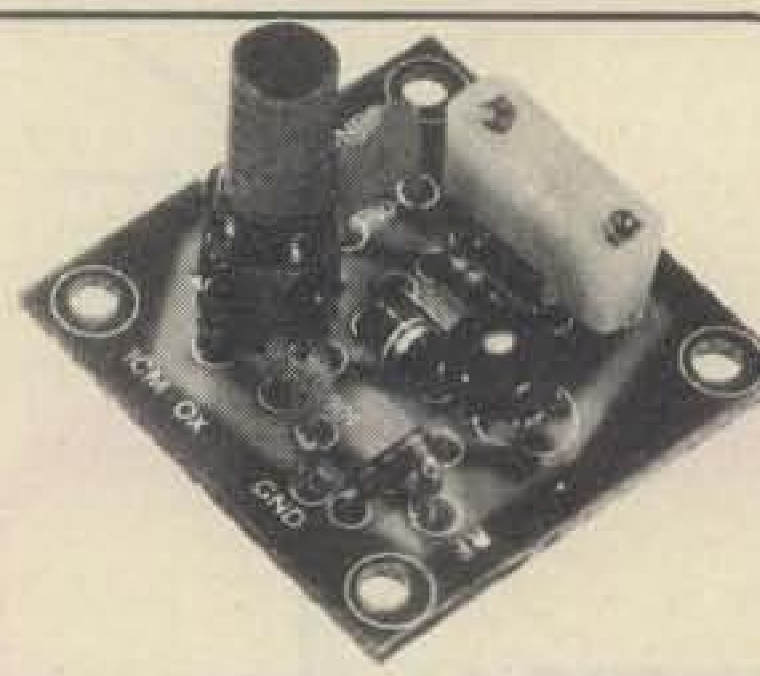

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A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106
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A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated. 3 to 30 MHz, Cat. No. 035104
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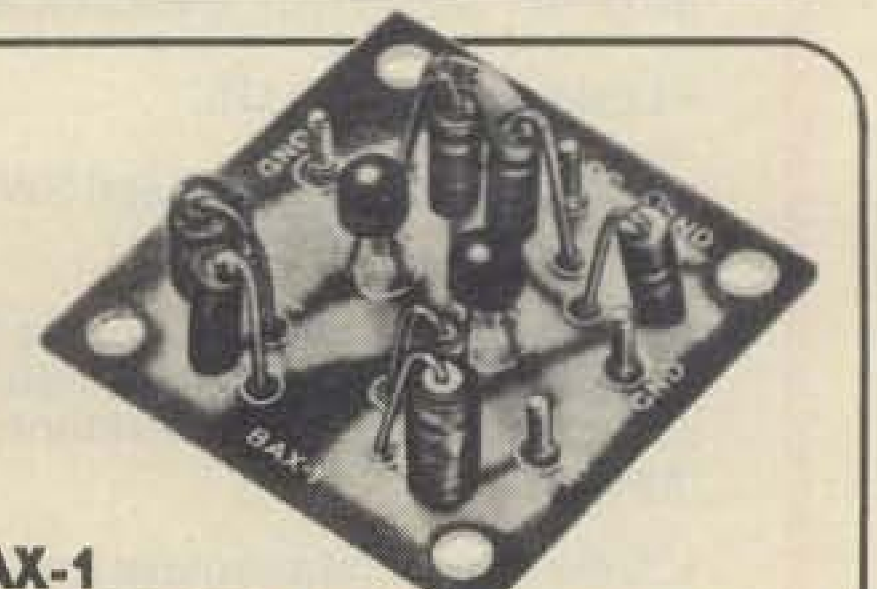

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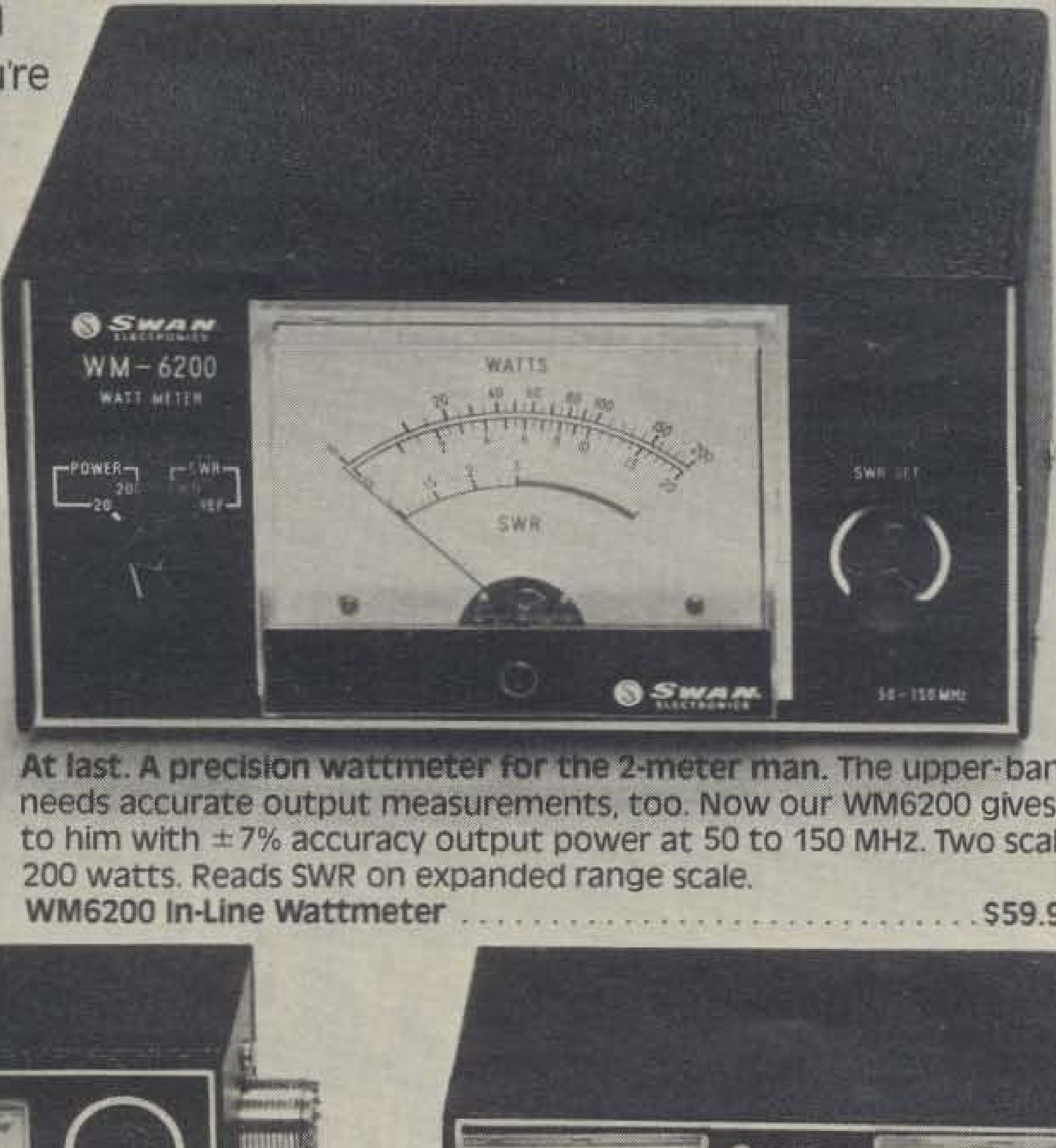

At last. A precision wattmeter for the 2-meter man. The upper-band man needs accurate output measurements, too. Now our WM6200 gives them to him with ±7% accuracy output power at 50 to 150 MHz. Two scales to 200 watts. Reads SWR on expanded range scale.
WM6200 In-Line Wattmeter $59.95

Measure power coming and going. Measure SWR and get maximum power to your antenna. Then get your antenna pattern right by measuring relative radiated power. A one-two power punch at a knockout price. **FS-2 SWR and Field Strength Meter $15.95**

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WM2000 In-Line Wattmeter. . $59.95

This wattmeter tells the truth about SSB. True peak envelope power of your voice modulated signal is what you want to know most about your SSB transmission, and that's where our WM3000 shines. Flat response forward or reflected power from 3.5 to 30 MHz on scales to 2000 watts in RMS or PEAK at the flip of a switch. **WM3000 Peak/RMS Wattmeter $79.95**

Sniffs out radiated power wherever it is. This little unit is so compact it could measure relative radiated power in your pocket. Telescoping antenna and a frequency range of 1.5 MHz all the way to 200 MHz.
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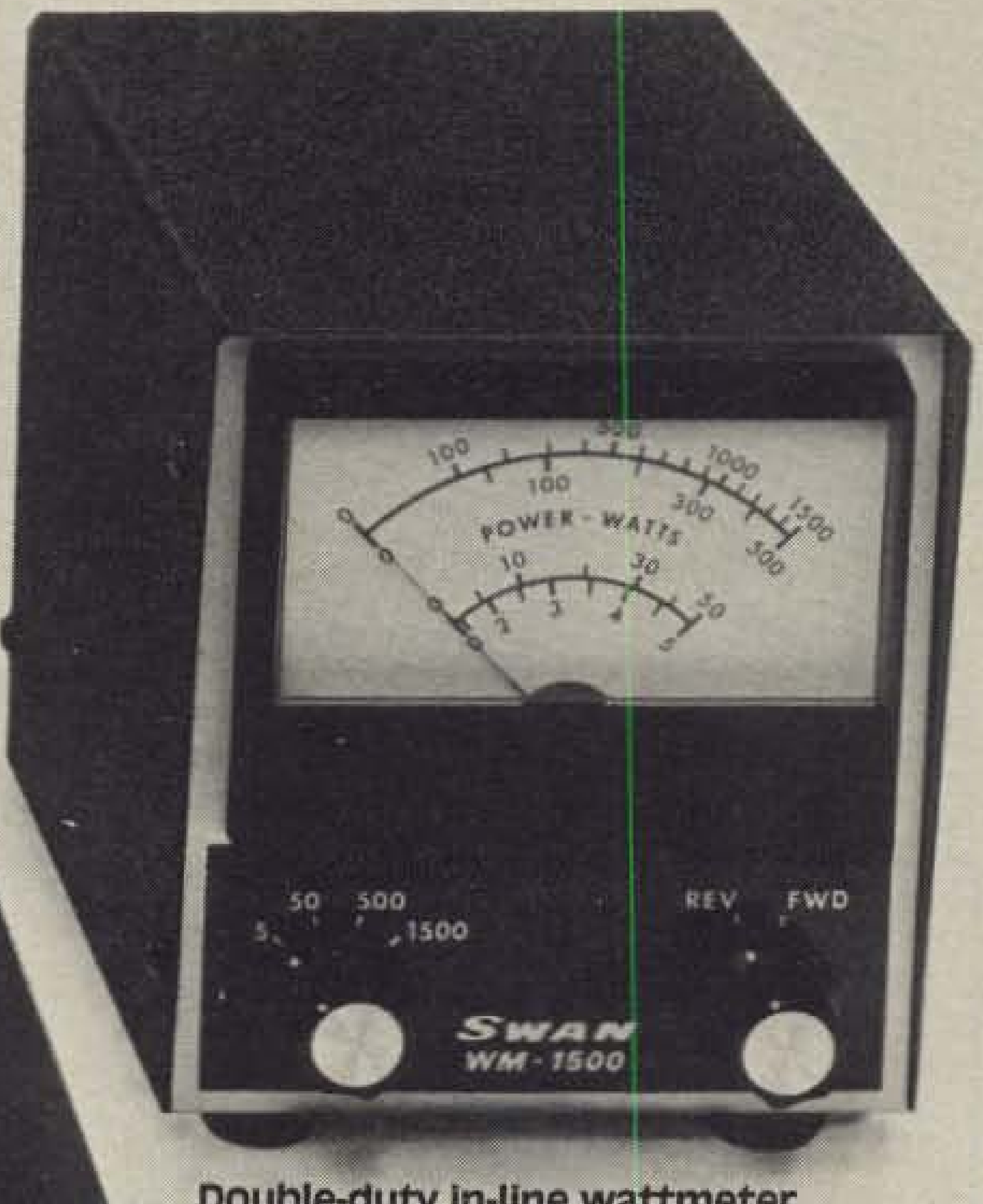

Double-duty in-line wattmeter. Use this meter for output power measurement and troubleshooting, too. Better than 10% full scale accuracy from 2 to 30 MHz, and you can go to 50 MHz with only slightly reduced accuracy. Four scales to 1500 watts and selector for forward or reflected power.
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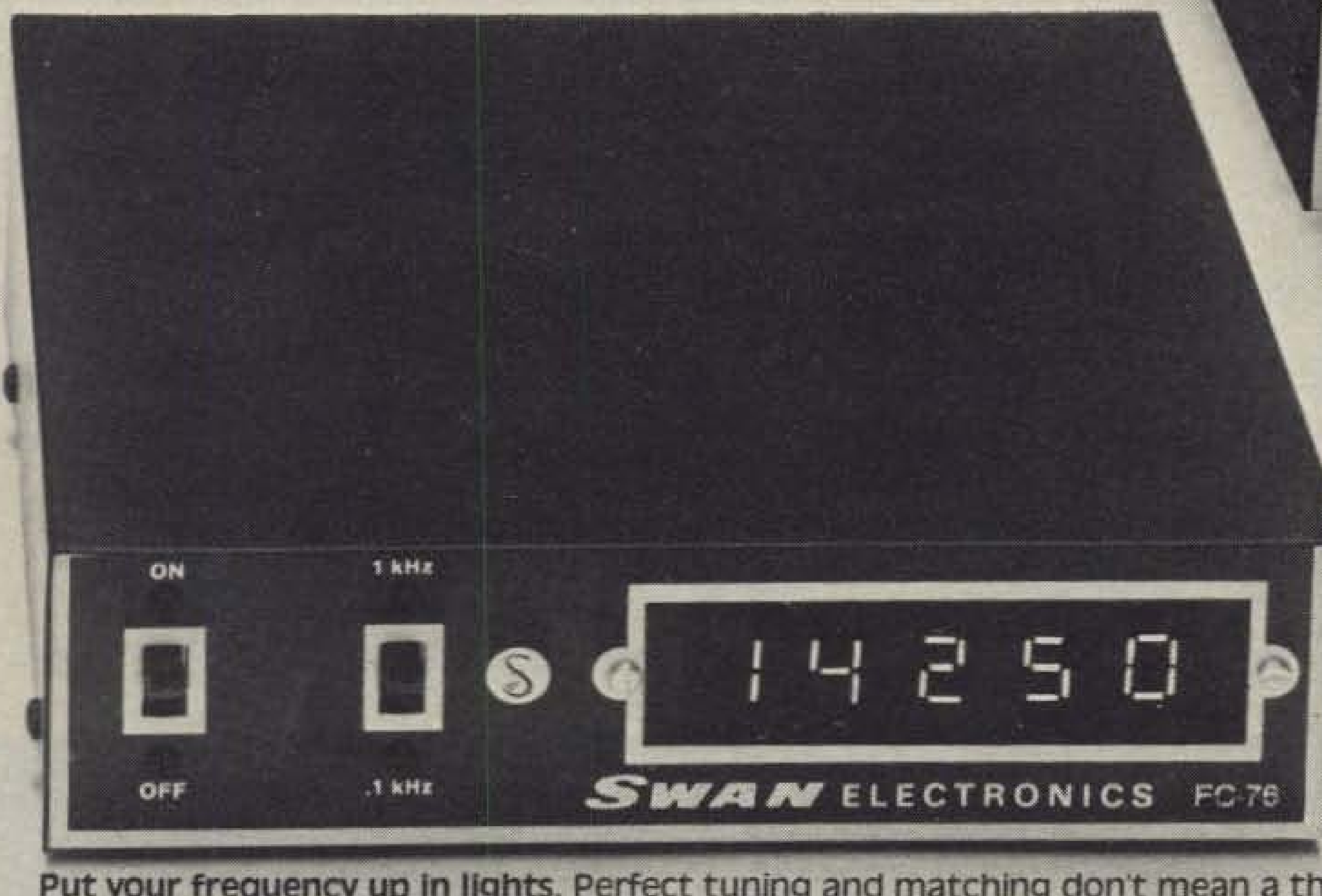

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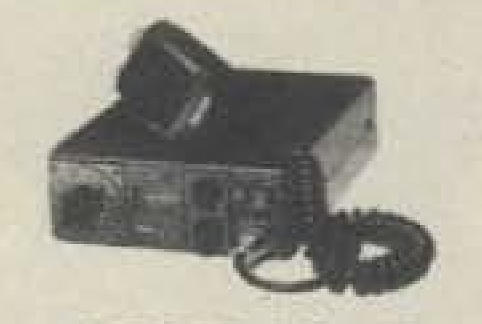

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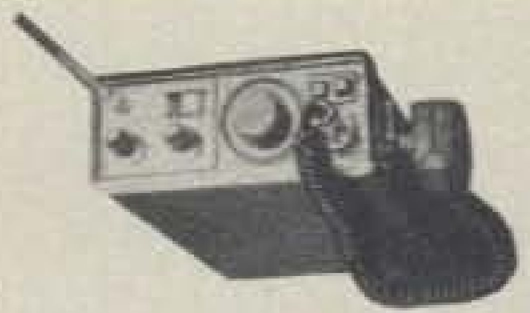

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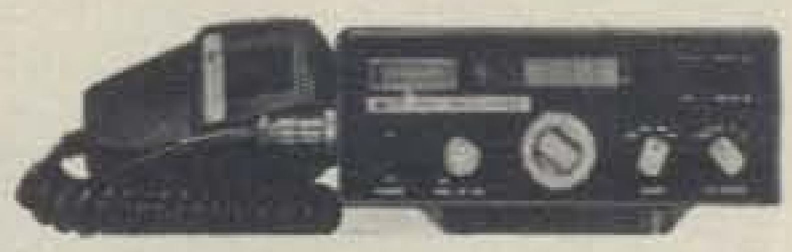

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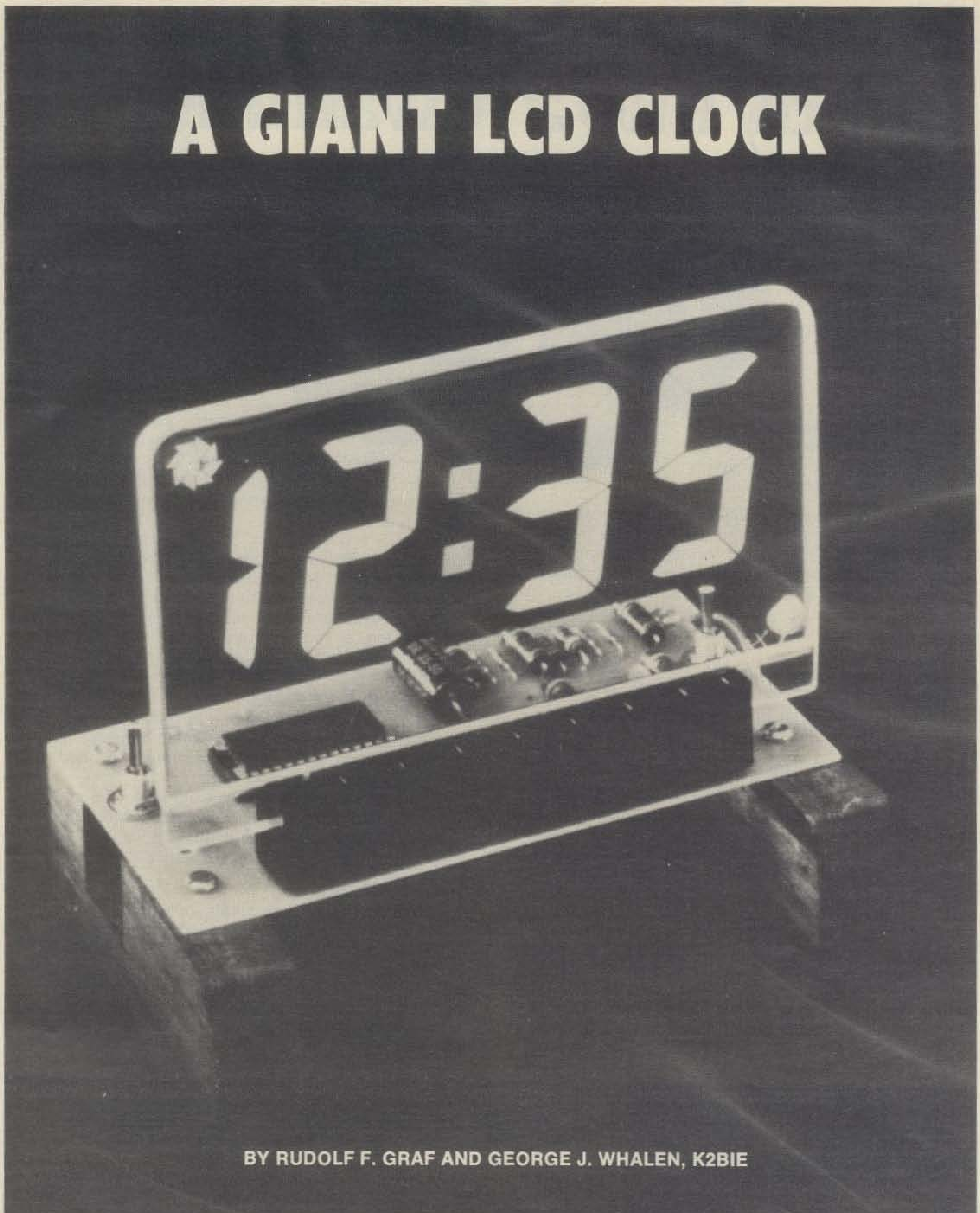
A GIANT LCD CLOCK



BY RUDOLF F. GRAF AND GEORGE J. WHALEN, K2BIE

Blackstone and Houdini, the master illusionists, would have been baffled by the high-technology legerdemain that makes this digital clock work! On a clear panel, transparent as a sheet of glass, the time of day mysteriously appears in two-inch high whitish numerals. Two digits accurately report the hours and two digits mark the passage of the minutes. Yet, there is no sign of wires or connections to the "floating" numerals! While the clock *tells* the time, it keeps the way it works a *secret*.

In just one enjoyable evening, you can assemble this extraordinary time-keeping conversation piece. Construction is made easy by the use of a single LSI integrated circuit, requiring but a handful of external components, and a large liquid crystal display that plugs into a mating connector on the printed circuit board. Powered directly from the a.c. line without bulky, heavy transformers, the giant clock is compact and light enough to build into any enclosure you can conceive of. And, its accuracy is as good as the closely-controlled 60-Hz power line frequency. The line frequency is held to +.02 Hz, −.05 Hz. Thus, the giant clock can deliver better than 0.1% accuracy over time periods up to an hour. Long time accuracy is maintained because accumulated cycles-per-second errors are periodically corrected by the power company.

The time-keeping heart of the clock is a type C1200 monolithic MOS integrated circuit manufactured by LSI Computer Systems, Inc. (see fig. 1). Time set, logic, dividing for seconds, minutes, and hours, seven-segment decoding, and display drivers and switches, are all built into this unique chip. Circuit functions use MOS p-channel enhancement and ion-implanted depletion mode devices.

The liquid-crystal display panel (LCD) is an optically-transparent "sandwich" that has many components that don't meet the eye at first glance. Figure 2(A) reveals its inner secrets. Two glass panels (called front-plane and back-plane) make up the front and back of this device. The inner faces of the two panels are thin-film metallized with tin oxide or indium oxide. On one, the film has been deposited to produce the seven-segment patterns of the numerals, as well as a colon and starburst, together with thin-film metal conductors that lead down to a "connector" edge. Thus, each film-metallized segment is individually addressable (Fig. 2B). The other glass panel is metallized over its entire inner surface.

The two metallized glass panels don't touch. They are separated by a normally transparent fluid called a *nematic liquid.*[1] A seal about the outer edge keeps the panels separated and prevents the liquid from leaking out. The assembled LCD appears to be transparent when not excited, since the metallizing film on the glass plates and the nematic liquid have about the same refraction index.

The LCD "sandwich" is a *field-effect device.* (fig. 3.) Applying an electric field between the back metallized panel and any front metallized segment causes a molecular reorganization of the "crystalline" structure of the nematic liquid. Normally, these long, cigar-shaped mole-

---

[1] *An LCD's performance is based on the behavior of certain organic chemicals which simultaneously exhibit both liquid and crystal properties. These nematic liquids are transparent in the liquid state until their thread-like molecules are disturbed by the presence of an electrical field —a phenomenon discovered in 1888, but regarded as a laboratory curiosity until late in the 1950's when investigations of practical uses began.*

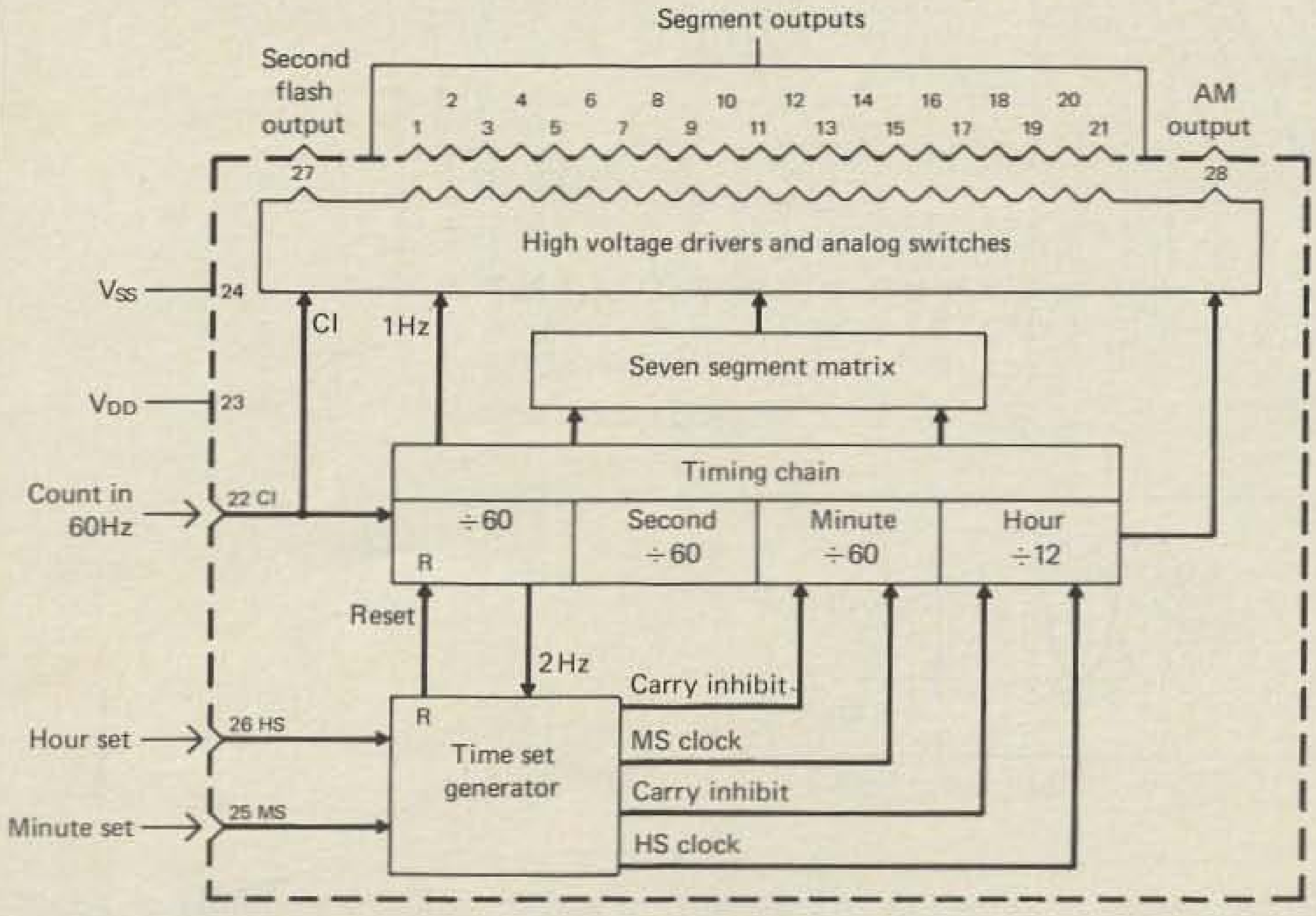
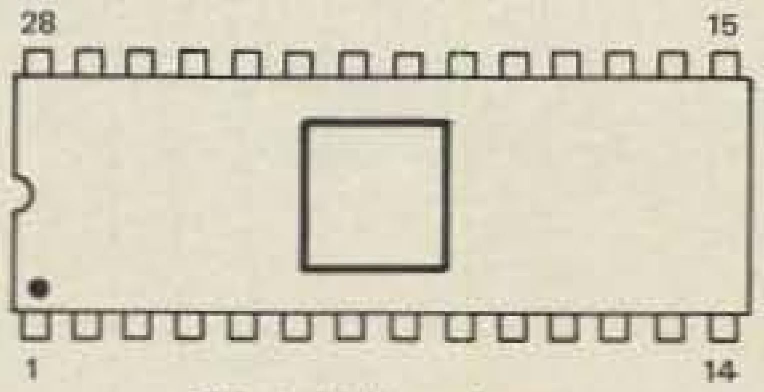


Fig. 1—Block diagram of LSI Computer Systems Inc. C1200 clock IC.



28 pin DIP package

C1200
Pin connections

PIN NO.	FUNCTION	
1	C4	LCD segment output
2	F3	
3	G3	
4	E3	
5	D3	
6	C3	
7	B3	
8	A3	
9	F2	
10	G2	
11	E2	
12	D2 & A2	
13	C2	
14	B2	
15	F1	
16	G1	
17	E1	
18	D1	
19	C1	
20	B1	
21	A1	
22	C1	60Hz count input
23	V_{DD}	Supply
24	V_{SS}	Supply
25	MS	Minute set input
26	HS	Hour set input
27	SEC	One second flash output
28	AM	AM output (not used)

Pin function and pin identification for the LSI Computer Systems C1200 chip.

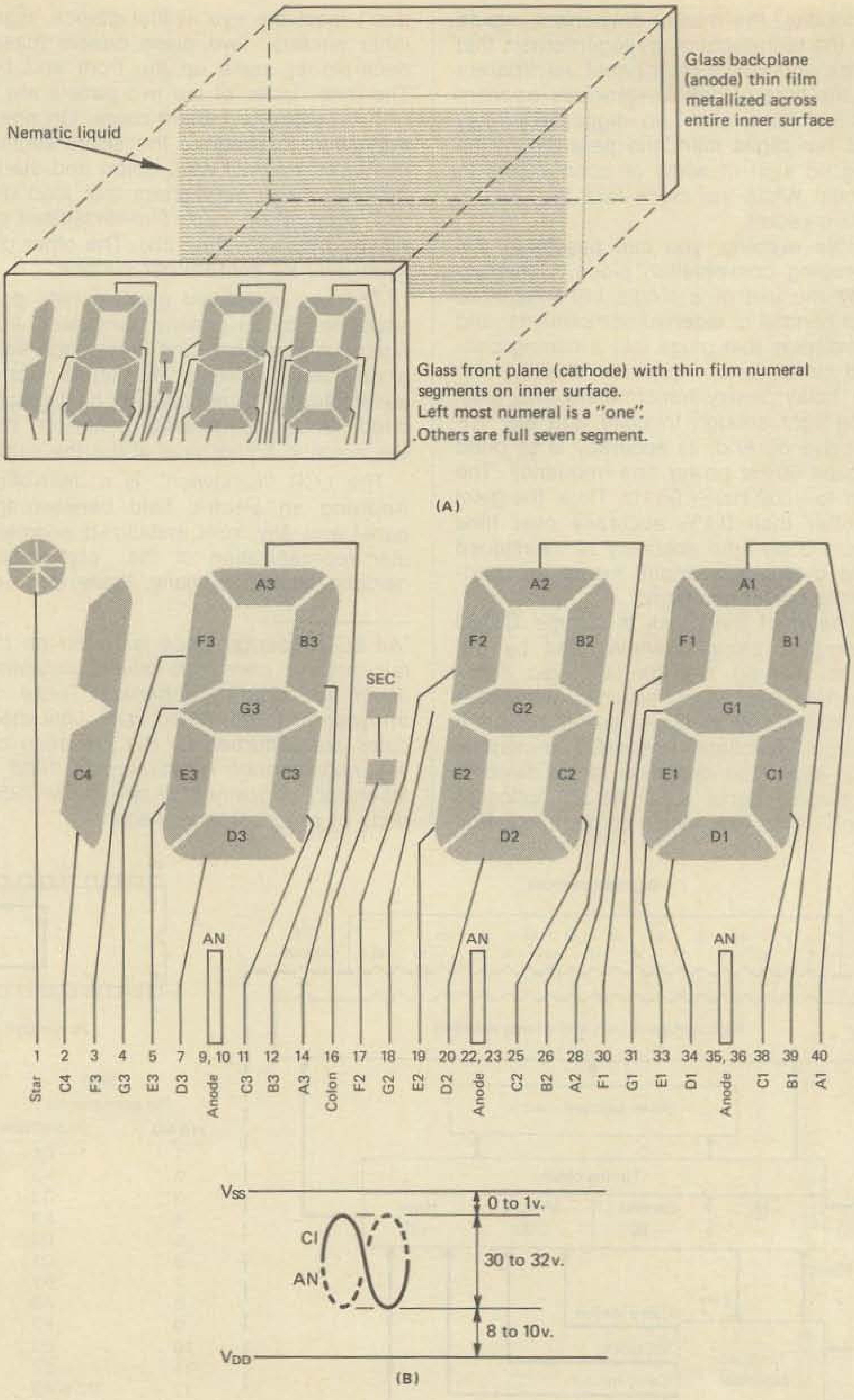


Fig. 2—Construction of liquid crystal display device is shown in (A). Metalizing pattern and connections of liquid crystal display with diagram of voltages applied to the cathode (front-plane) and the anode (back-plane) is shown in (B).

cules are in a parallel alignment and are free to slide past each other. In this unperturbed state, the crystal molecules don't scatter light, and so, the liquid appears transparent. However, when disturbed by an electric field, the well-ordered structure is upset; molecules organize randomly, thus scattering light passing through the LCD sandwich. This causes the affected area of the LCD to turn milky white. Thus, the LCD, when properly "addressed" by the output of the clock IC, provides an easily seen display of time by *scattering light*, rather than emitting light, as in other forms of digital readout devices.

The process of cycling the transmissivity of the crystals produces *dynamic scattering*, so that the LCD's light transmission properties at any instant depend upon the voltage applied between the front-plane and back-plane electrodes.

How it works

Components external to the clock IC are shown in fig. 4.

A.c. power is applied to a voltage divider (R1-R4), that supplies an 11-volt RMS 60-Hz count input to pin 22 of the IC, provides the input to a full-wave rectifier (D1-D4) and filter (C1) to supply d.c. operating potential to the IC, and supplies a nominal 40-volt RMS potential for excitation of the LCD segments, with transient over-voltage protection afforded by Zener diodes D5 and D6.

Referring now to fig. 1 for events going on inside the IC; the 60-Hz line frequency signal goes from pin 22 to the **timing chain,** where it is divided several times to generate binary coded decimal (BCD) equivalents of seconds, minutes and hours pulses that are fed to the **seven-segment matrix** to be decoded. Outputs from the matrix go to the **high-voltage drivers** that control the **analog switches.** The seven-segment matrix is a complex decoder/driver. Here, the inputs from the timing chain, which are in the form of four BCD inputs for the first significant digit of the minute display, are decoded to excite the right number segments. For the second significant digit of the minute display, only three BCD inputs are needed, for here we are only counting from zero thru five, rather than from 0 to 9 as in the first significant digit. BCD outputs from the hours section of the timing chain are similarly decoded by the matrix.

The **time set generator** receives a 2-Hz input from the timing chain, and, depending on whether you close *minute set* switch S2 or *hour set* switch S1, it generates a signal that advances the minutes or hours portion of the display at a 2-Hz rate.

The *carry inhibit* signal from the time set generator serves a very important function. It makes sure that setting the minutes does not affect the hours display and vice versa. In other words, the minutes display goes to 00 after it reaches 59, but does not advance the hours setting. Similarly, the seconds input to the minutes portion of the timing chain has no effect when *minute set* switch S2 applies a signal to pin 25.

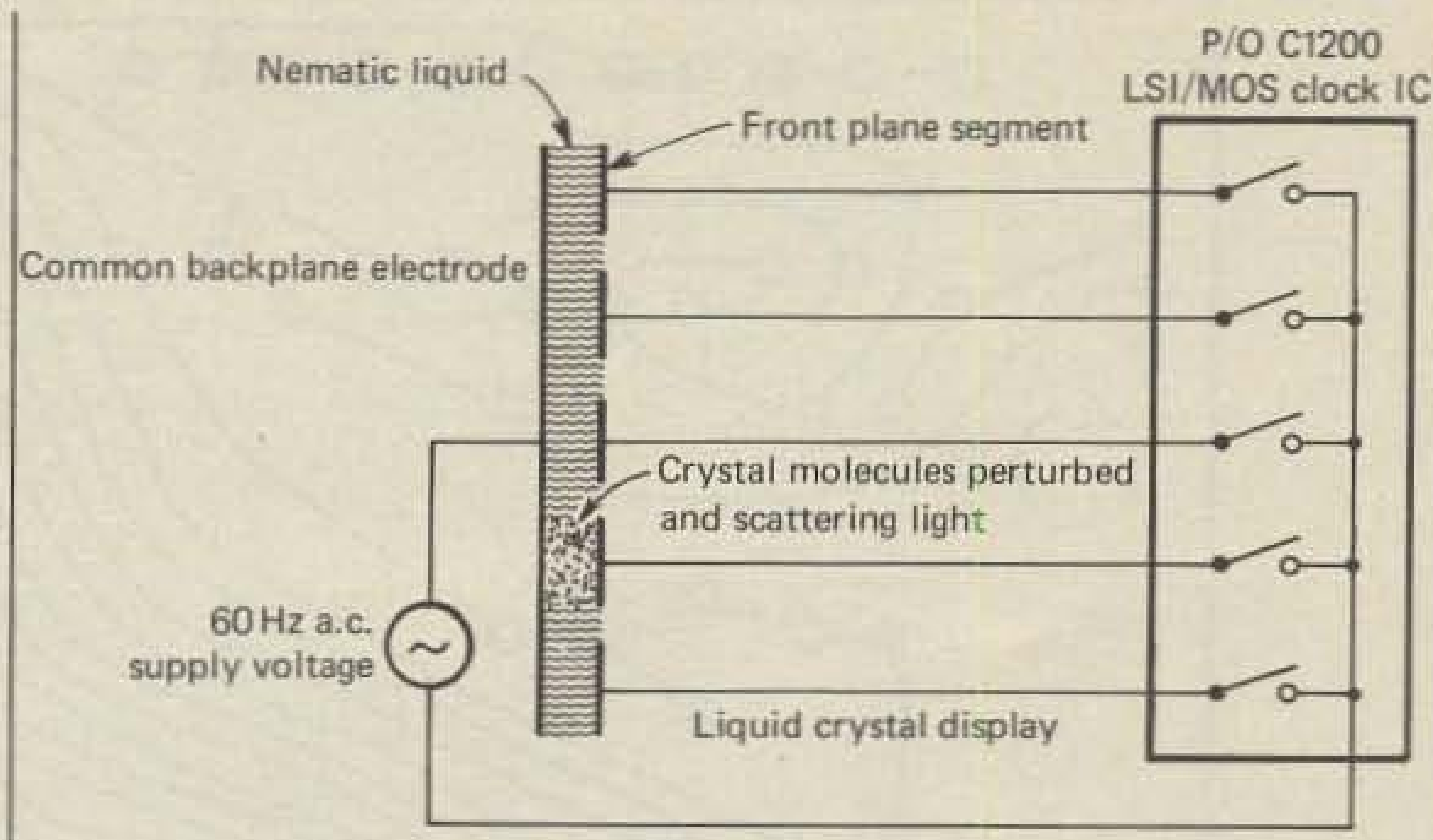


Fig. 3—The Crystal Molecules in the nematic liquid are disorganized by an electric field.

The *reset* output of the time set generator is used when the IC is used as an elapsed time indicator. To do this, *hour set* S1 and *minute set* S2 must be closed at the same time. This automatically generates a *reset* pulse which sets the timing chain—subseconds, seconds, minutes and hours—to zero. When both switches are released, simultaneously, the chip starts from an all-zero reference and counts "up", to add one minute to the time displayed every sixty seconds.

The cathode (front-plane) voltage input to the LCD goes through the analog switch that is *on* at any given time so a.c. is applied to the appropriate segment of the LCD. The anode (back-plane) voltage is applied via three contacts on the display (see fig. 2(B). Cathode and anode voltages are always 180° out of phase and identical in amplitude. There is *no* d.c. component present, for the life of an LCD is appreciably reduced if it is operated from a d.c. source, or from a.c. with a d.c. component. However, d.c. is required to perform the logic operations in the chip and is

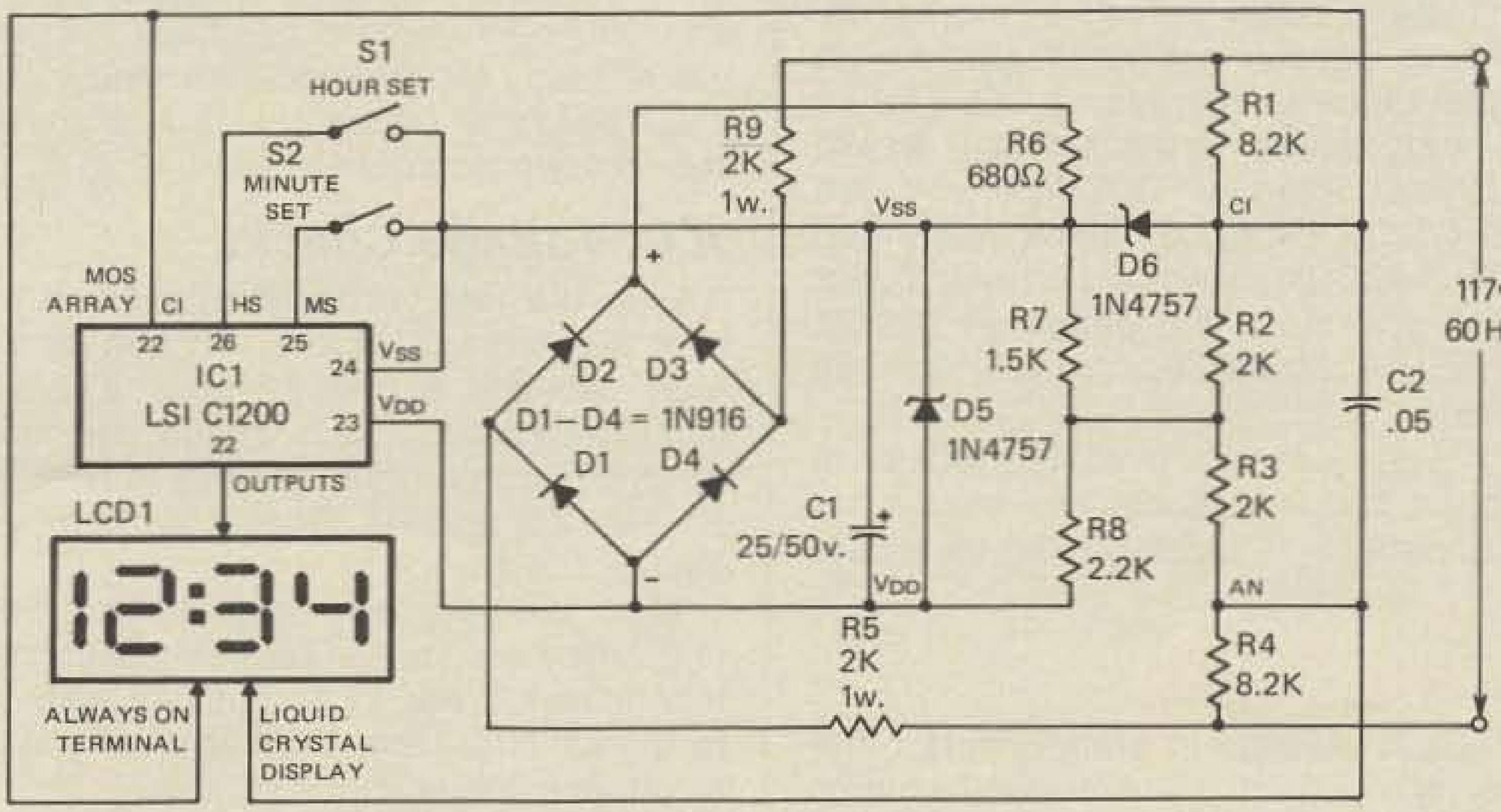
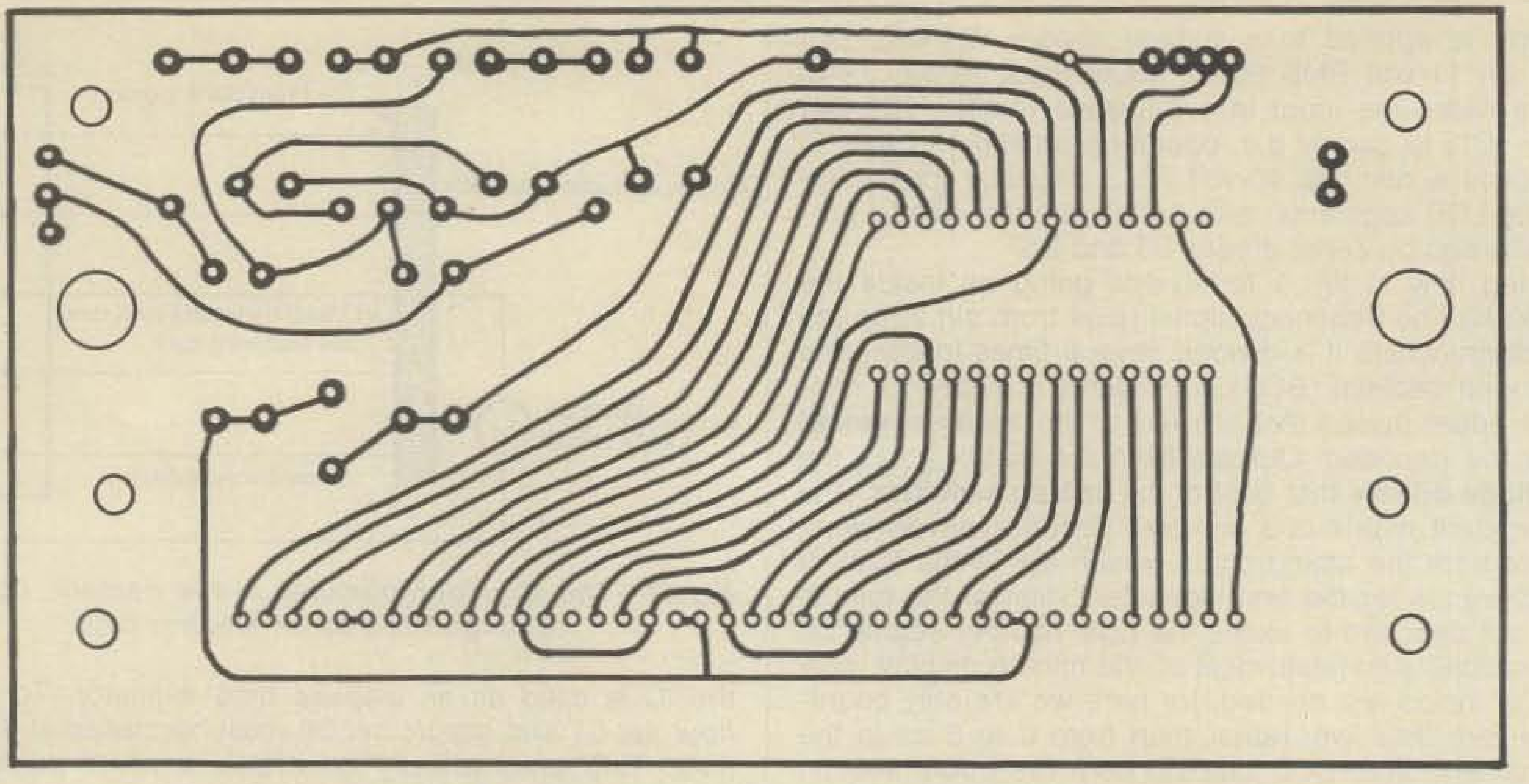


Fig. 4—Schematic diagram shows the C1200 IC and the external components necessary for the clock.

R1, R4—8200 ohms, ¼ W, 5%
R2, R3—2000 ohms, ¼ W, 5%
R5, R9—2000 ohms, 1 W, 5%
R6—680 ohms, ½ W, 5%
R7—1500 ohms, ½ W, 5%
R8—2200 ohms, ½ W, 5%
C1—25μF, 50 V, electrolytic
C2—.05 μF, 50 V, ceramic
D1, D2, D3, D4—1N916 or equal
**D5, *D6—Zener diode, 51V, 10%, 1W (1N4757 or equal) (Part MGC-51)*

**IC1—C1200 (LSI MOS clock IC) (Part MGC-C1200)*
S1, S2—spst, momentary contact (see text for details)
**LCD1—Liquid crystal display (Part MGC-50)*
**Socket for display (Part MGC-116)*
**28-pin IC socket (Part MGC-28)*
**Circuit board (Part MGC-48-7)*
AC line cord with plug

***These parts are available from Inventive Electronics, Box 53C, Wykagyl Station, New Rochelle, NY 10804. Price of the partial kit containing all parts marked with an asterisk is $65 postpaid.**



Full-size foil pattern for the digital clock printed circuit board.

supplied from the full-wave supply consisting of low voltage diodes, D1, D2, D3, D4 and filter capacitor C1.

The two Zener diodes (D5, D6) are required for overvoltage protection of the IC. D5 limits the supply to 51 volts and D6 limits the voltage applied to the *hour set* and *minute set* inputs (pins 26 and 25) to 51 volts, peak-to-peak. C2 acts as a high-frequency filter. It eliminates the high-frequency component of transients on the a.c. line.

Obtaining parts

The liquid-crystal display and the C1200 LSI Computer Systems clock IC are specially designed components, not easily obtained through usual distribution channels. Accordingly, arrangements have been made to supply, by mail, a kit containing these special and other hard-to-get components of the digital clock to readers of *CQ*. The kit includes the etched and drilled printed-circuit board (MGC 48-7), Liquid-Crystal Display (MGC-50), 40-pin connector (MGC-116), C1200 MOS/LSI clock integrated circuit, 28-pin IC socket (MGC-28), and two 51-volt Zener diodes (MGC-51). The digital clock kit, priced at $65.00, postpaid, is available from: Inventive Electronics, Box 53 Wykagyl Station, NY 10804.

Other components of the clock are available locally at any electronics distributor. Do not substitute values for those given, as voltage division is quite critical to proper operation.

Construction

Begin by laying out and soldering-in components other than the IC. Leave this component in its protective foam until everything else has been wired. (Be sure to read the precautions in handling before you attempt to install the IC.)

The use of a PC board makes construction easy. The sockets for the LSI integrated circuit and for the display, as well as all other components mount flat on top of the PC board, as shown in fig. 5. Carefully observe the polarities of the six diodes.

The display socket must be inserted with its part number facing the edge of the PC board so the display can plug in correctly. For S1 and S2, you can use either toggle switches or momentary-contact, normally open, pushbutton switches. For our clock, we used toggle switches that nest neatly into cavities cut in the two wooden cleats, that support the PC board. Switch location is optional and not at all critical to proper operation of the clock.

Checkout

Perform these checks before installing IC1 or the LCD. *Do not install either of these components until everything is checked.*

After connecting the socket, the line cord, the wires to the switches, and all other components, give the PC board a careful visual once-over. Look for cold solder joints and potentially destructive solder or rosin bridges between pads. Protect your investment by making sure that the right resistor is in the right place. (Remember: you can blow the IC in a few microseconds if something's wrong and you don't bother to check.) If everything looks OK, you're ready for the recommended voltage checkout, which *must be done before you install the IC and the LCD in their respective sockets.*

A.C. Voltage Checks

Plug the line cord into a 117-volt a.c. outlet and measure the voltage across R2 and across R3. You should read between 9 and 12 volts a.c. across each resistor, and the two readings should be about equal. If these voltages aren't right, remove power and check resistors R1, R2, R3, and R4. One or more may be the wrong value or out of tolerance.

Now, plug the line cord in again and measure the voltage across R1 and across R4. Each reading should be not less than 42, nor more than 48 volts a.c. If either voltage is out of tolerance, remove power and thoroughly check resistance values in the divider.

D.C. Voltage Checks

Measure the voltage from the junction of R2 and R3 noted as point X on the schematic, to the VDD point on the PC board (see fig. 4). You should read about −28 volts d.c. (VDD is negative with respect to X.) Next, measure from the VSS point to X. You should read about +19 volts d.c. (VSS is positive with respect to point X.) Now, measure from VDD to VSS. The meter should indicate the sum of the two previous readings (approximately 47 volts d.c.) with VSS positive with respect to VDD.

Finally, measure the voltage drop across R6. The reading should be at least 8 volts, d.c., but not more than 9 volts, d.c.

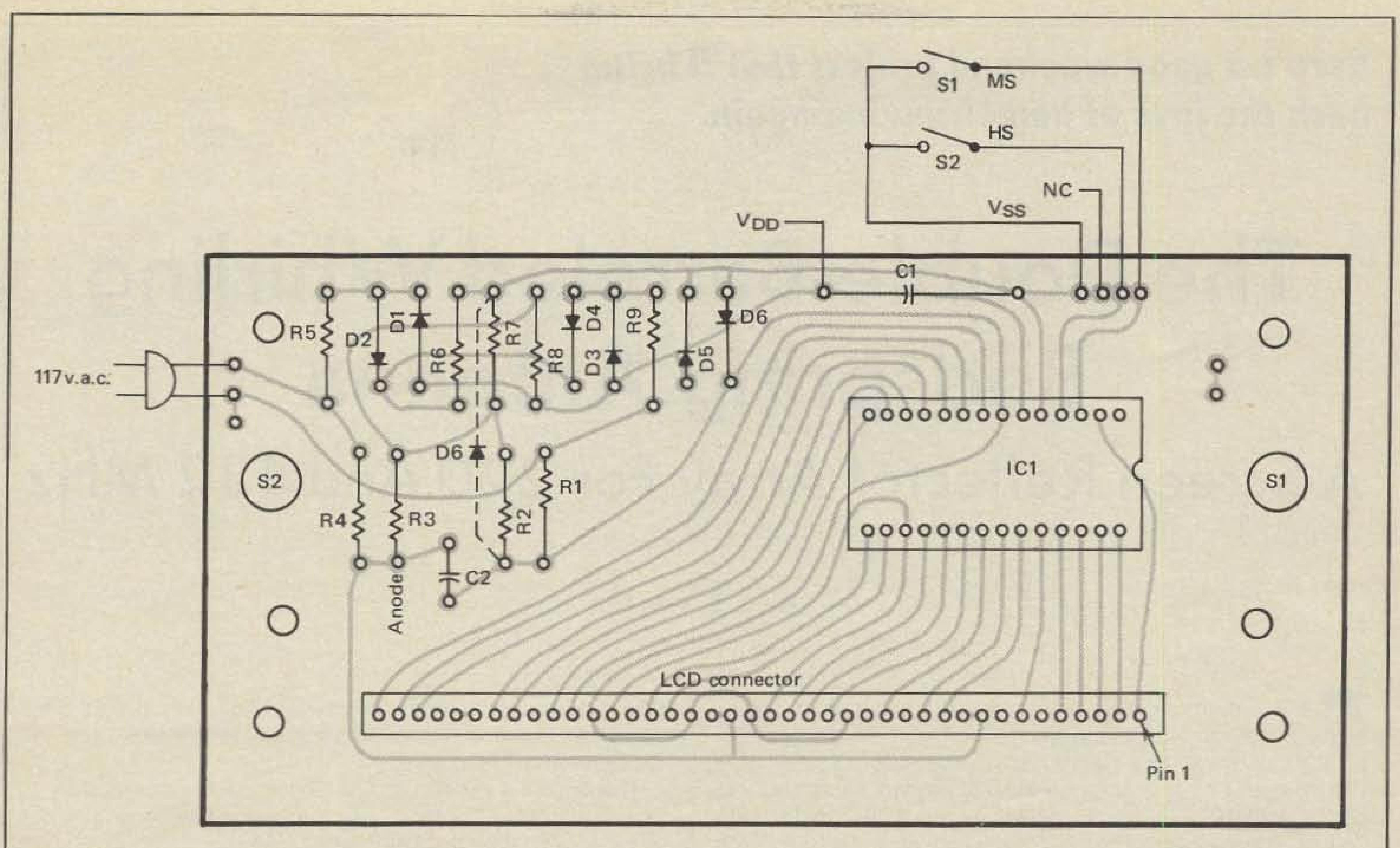


Fig. 5—Component layout of printed circuit board. An IC socket is used for easy assembly.

If any reading is not in tolerance, carefully check each resistor value and replace any that are out of spec.

Installing The Liquid Crystal Display

Disconnect the a.c. plug and carefully insert the LCD panel into its socket. Line it up so that contact areas on the lower edge of the glass are exactly opposite the spring contacts of the socket. In this way, you make sure that when the display is firmly seated, all socket contacts will properly mate with the LCD's connector edge. *Don't insert the IC yet.*

Plug in the a.c. line cord. If the LCD is properly inserted, the colon will appear on the display. If it doesn't, the LCD is not making proper contact. Reinsert the LCD or move it slightly to one side or the other, until the colon lights. Now pull out the a.c. plug again.

Installing The LSI Clock Chip

Having come this far, you are within minutes of seeing your clock in operation. Don't rush things now! Read and heed the next paragraph's precautions as you prepare to install IC1.

Any MOS IC device must be handled carefully, for it can be damaged by high-voltage static charges produced by casual, ordinary handling. For this reason, it is shipped with all of its pins pressed into a piece of conducting foam rubber, where it should remain until you're ready to plug it into the socket on the PC board. Don't handle the device immediately after you walk across a dry rug with rubber-soled shoes, comb your hair or put on a nylon sweater, for you can easily build up static charges of several thousand volts and unwittingly ZAP the IC. Before removing the IC from its protective foam, touch a grounded object to discharge any body capacitance charge. *Never, never, never attempt to insert or remove the MOS IC while power is on.* If you need to resolder a connection after the IC is plugged-in, run a ground wire to the iron's top to drain away destructive charges. Follow these precautionary steps and your IC is sure to survive.

After pulling out the power line plug, wait a few seconds for filter capacitor C1 to dissipate its charge through R6, R7 and R8. Now insert the integrated circuit into its socket. *Be sure to plug it in correctly as shown in fig. 5.* If you insert the socket incorrectly, you'll damage it the instant power is applied—so, do it right the first time.

Connect the a.c. line cord. A random number display will appear on the LCD. It may even flash at a 1-Hz rate. Now, you're ready to set the time and that is *very* simple.

Setting Time And Using Your Clock

Close the *minute set* switch and you will see the minutes change rapidly—two minutes each second. As the correct minute digit appears, open the switch. The hour digits are set the same way with the *hour set* switch and that is all there is to it!

The clock can be set precisely from the time signal sent over the radio or telephone. Close the *hour set* and *minute set* switches at the same time. Release them both at the instant the time signal is heard. Then set the minutes and hours independently to the correct time as before. The clock is now accurately synchronized to the time tone.

For elapsed time indication close both switches and release them simultaneously. The display will start from 0:00 and count elapsed time in one minute steps.

If there has been a power interruption (as is theoretically the case when the clock is first plugged in) the entire display may flash at a 1-Hz rate signalling that the time displayed is not correct. When either time set switch is activated, the display will stop flashing.

If you plug in the clock immediately after bringing it

(Continued on page 76)

Here's a good weekend project that'll bring back the joys of homebrewing again.

The Double-Barreled Whirling Bedspring Antenna

A Screen Reflector Array For 220 And 432 MHz

BY T. E. WHITE*

Plane reflector arrays have not been used very extensively by US amateurs, tho' for years they've been popular on the Continent. The author has always felt a bedspring or billboard to be an excellent piece of skywire, and built his first one in 1949. It was a 4 over 4 over 4 two meter yagi with a screen replacing the individual reflectors of each bay. It was in those days quite a large array, moonbounce giants not having yet arrived on the amateur scene.

Here is a double-sided dual-bander for 1¼ and ¾ meters. It is suggested that the 220 side be considered the compass direction side, and the 432 "mentally" aligned on a 180 degree reciprocal when operating that band.

The 4-bay extended/expanded yagi for 220 has "normal" directors but ⅝λ driven elements. Vertical stacking is ¾λ. Direct 300 ohm feed is available with quite broad band coverage. 14 db gain over a dipole is possible and the radiation angle is quite low.

The collinear for 432 on the "back" of the screen has 12 driven elements ⅝λ long with each pair having a common director. Vertical spacing is again ¾λ. Gain can be shown to be a very worthwhile 15.5 db. Vertical radiation/reception angle is quite low and beamwidth is sharp enough to dodge radar blasts but not too narrow for general band-searching use. Close horizontal end-to-end element spacing keeps side lobes down.

Dimensions are chosen for efficient use of 6- 8 ft. lengths of 1" x 1" cedar or spruce (actually ¾ x ¾ as sold), of which all supporting members are made. All elements are of ⅛ alum. rod. They can be cut from 3 ft. welding rod. Members **A** and **B** frame the chicken wire reflector, which

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

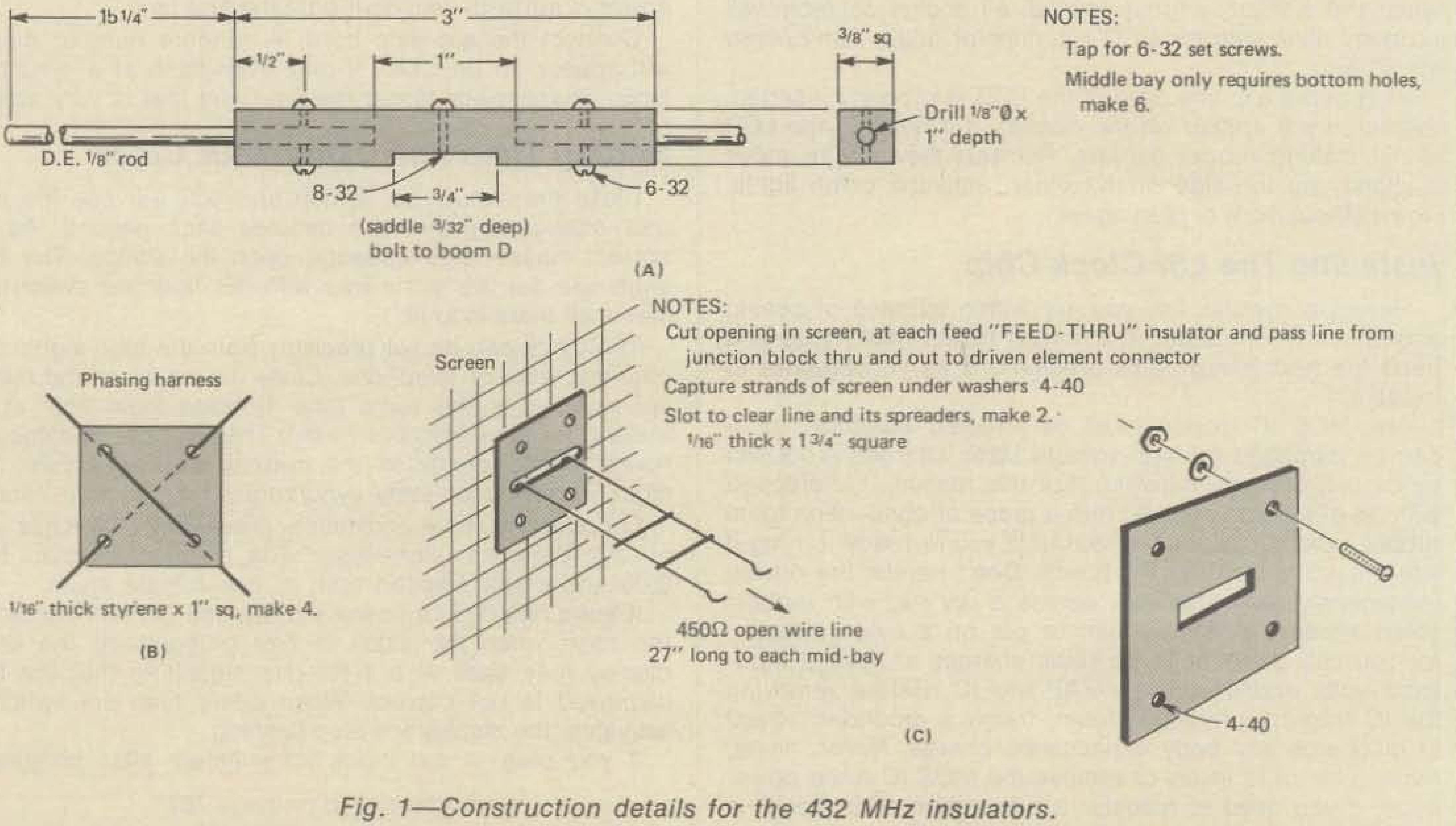
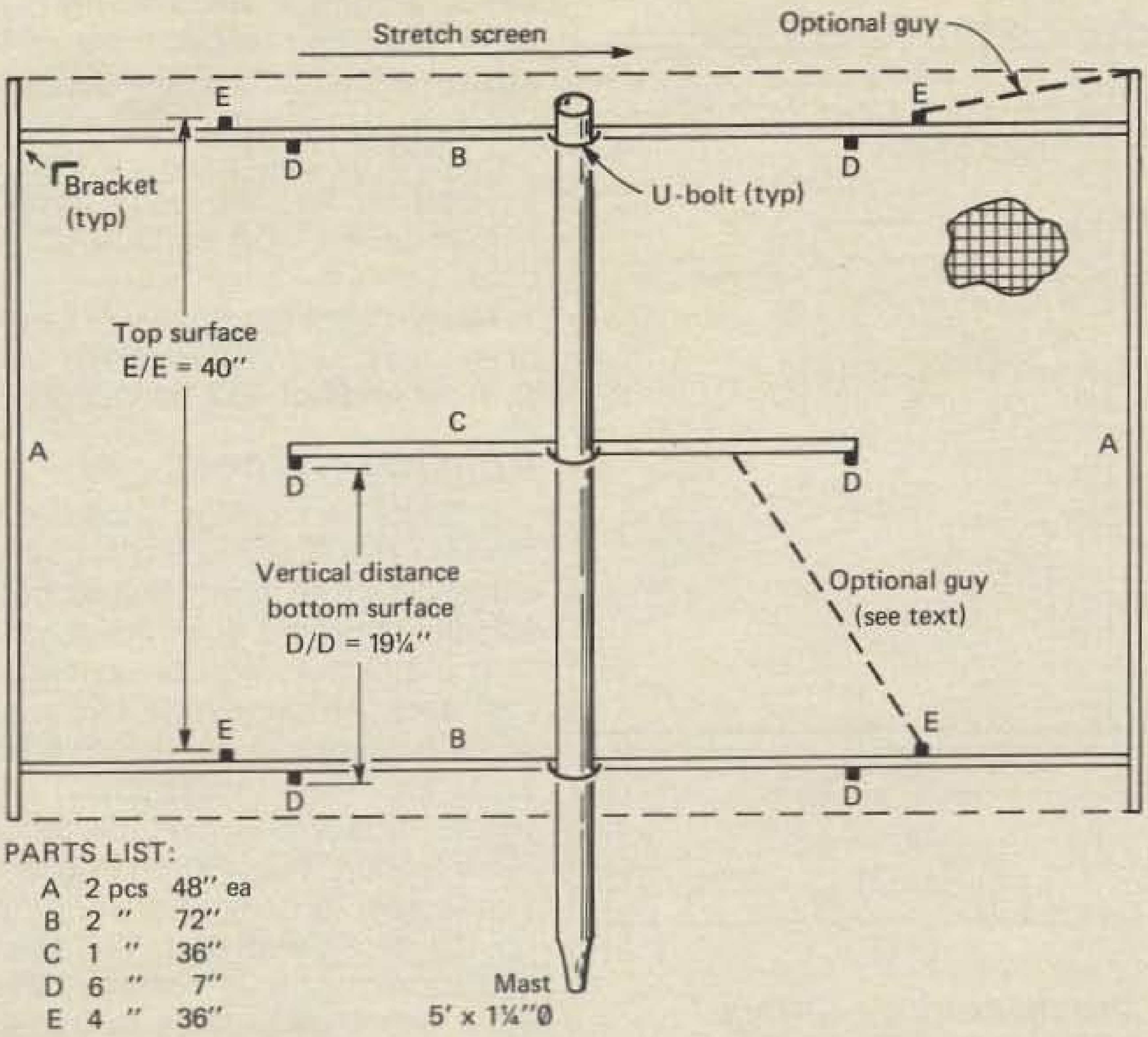


Fig. 1—Construction details for the 432 MHz insulators.



PARTS LIST:

A	2 pcs	48" ea
B	2 "	72"
C	1 "	36"
D	6 "	7"
E	4 "	36"

Fig. 2—Front view of the 220 MHz framework.

is 6 ft. 2 in. cut from a 4 ft. wide roll. Members **B** also support the 220 booms and 4 of the 6 432 bays. Member **C** supports the middle bays on 432.

220 elements are mounted on members **E** by simple clamps, 432 elements are mounted by members **D**, with driven elements joined by plastic insulators detailed in fig. 1. Insulators for the middle bays have set screw holes both top and bottom to accommodate (on top) harness feeders descending from top bays plus branch feeders back to the main downlead connection. The harness from the middle bays down to the bottom sections is connected under the *bottom* screw heads.

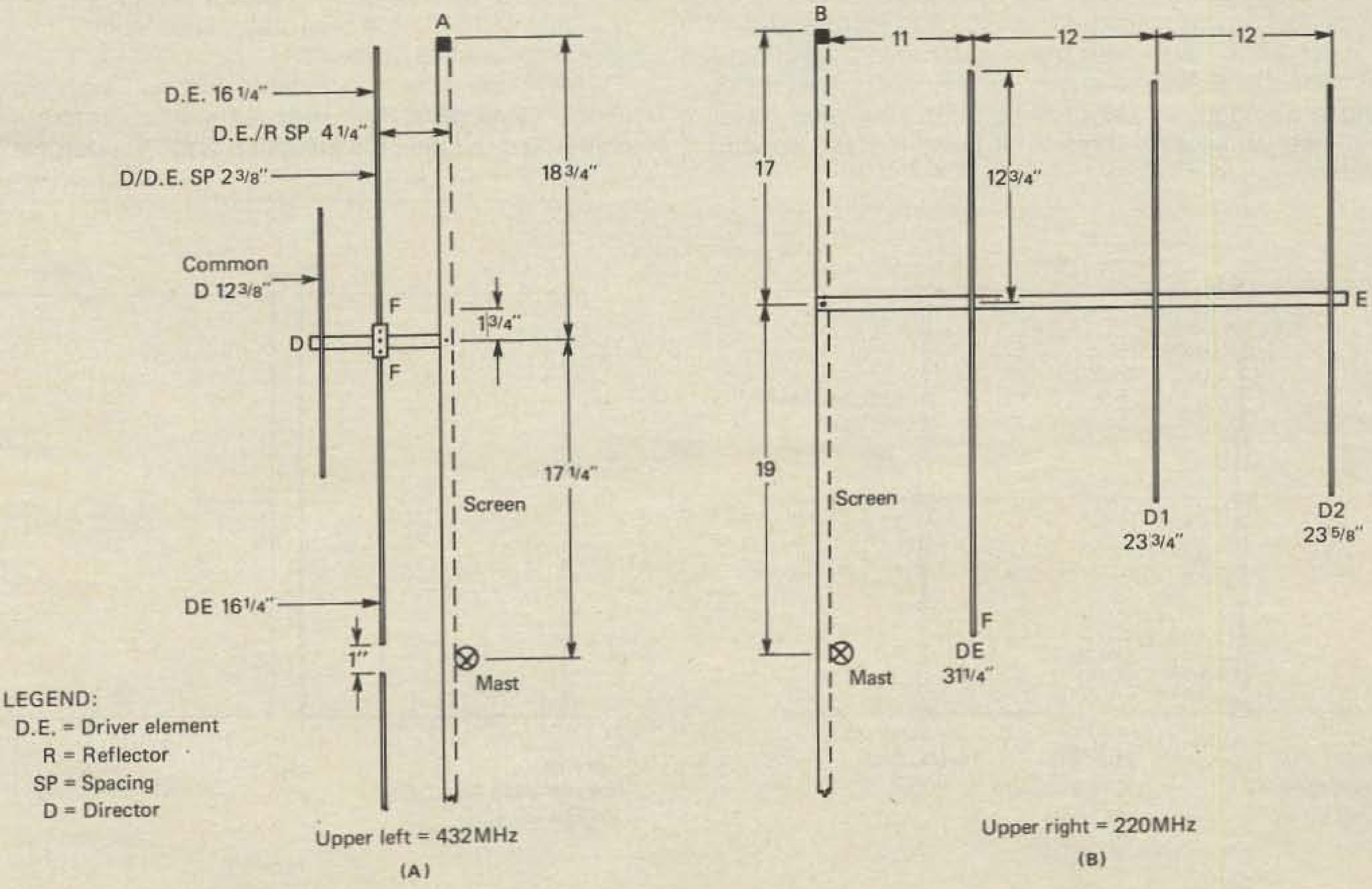


Fig. 3—Top view showing half of each array.

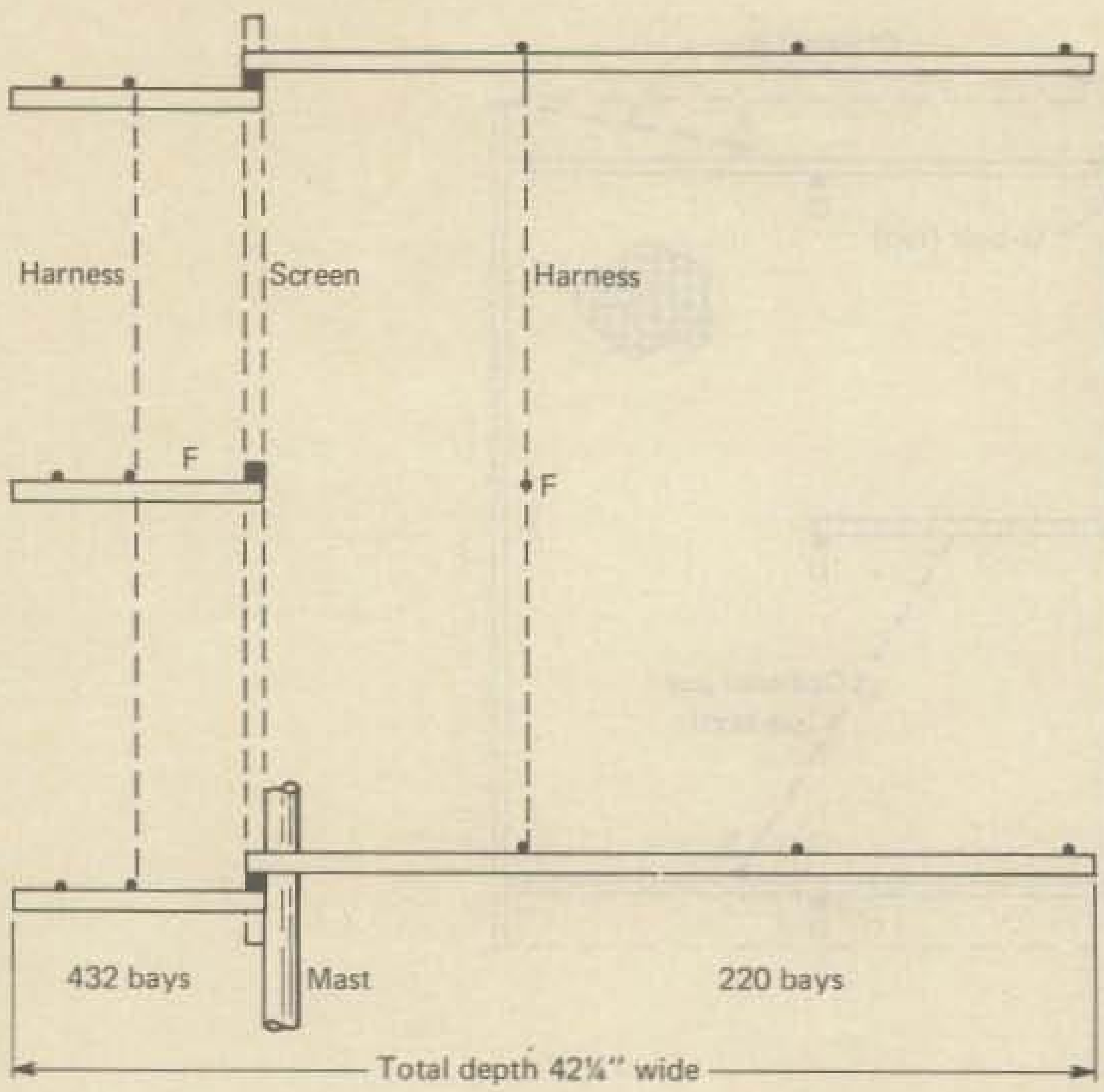


Fig. 4—Side view of the "bedspring" antenna.

Construction

First cut two 72" members **B**, one each out of an 8' length. Then cut a third 8' length in half for the **A**'s. Assemble **A-B** (fig. 2) with angle brackets, glueing butt joints with marine glue. Cut a 36" **C** piece from the fourth length of stock. Drill **B** and **C** for U bolts. Staple wire to **A-B** frame. Set aside.

Next, make up the 432 MHz bays by cutting 6- 7" booms **D**. Pre-assemble units of 432 MHz driven elements (DE's), insulators, and directors, cutting rod stock to lengths shown in fig. 3; set aside. Then also pre-assemble 220 MHz bays by cutting booms **E**, rod elements, and mounting per fig. 3.

Clamp a 5' length of 1¼ masting with a swaged lower end in a vise. Make sure there is at least 4' clear working radius around it. Retrieve the screen/frame assembly and **C** member and mount them to the mast with U bolts and anti-twist clamps with the screen side against the mast (the "screen side" is the 220 side). The screen is effectively grounded by being against the mast. Now attach four subassemblies for 220, each through a trimmed hole in the screen to the *TOP* surface of each X-arm **B**, glueing and bolting with 8-32 hardware.

Next, mount the 6 bays of the 432 array on the other side of the screen, *UNDERNEATH* each **B** and mid-bay support **C**. Rear ends of 432 booms abut the screen.

Phasing Harness

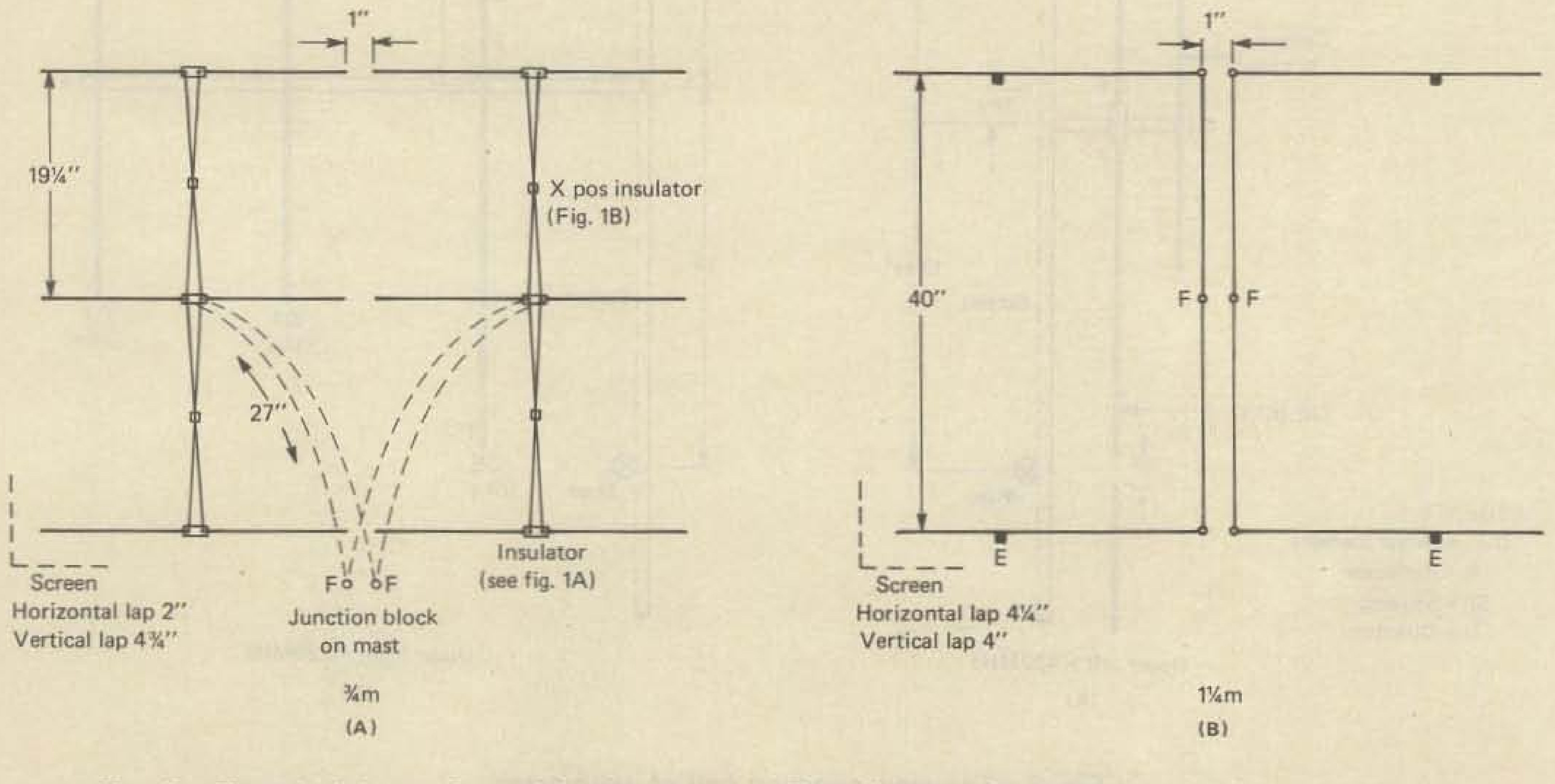
It only now remains to construct and attach phasing harnesses. The 220 one is a simple parallel connection of #14 wires (fig. 5) to which is attached 300 ohm twinlead at **F-F**, and the latter fed down the mast with standoffs.

The 432 feed (fig. 5) consists of two criss-crossed #18 wire sets. At the middle bays, branch feeders 27" long, of 450 ohm open wire (o/w) line, are taken back through lucite pass-thru blocks (fig. 1 C) bolted to the screen and vee-ed down to a junction block on the mast, where the main feeder, also 450 ohm, goes to the shack.

It is best to complete all harnesses on the ground, carry up the array and drop the mast's swaged end into your main mast. Affix a collar or thru-bolt to prevent twisting. Then attach drop lines to the shack. Those living in high wind areas may affix rope guys from a point 29" out on 220 booms **E** up to the upper corners of the screen frame (for the top bays), and up to a midpoint either side of mast on **C** (for the lower bays. See fig. 2.) Do not over-tighten or booms will "bow."

Contrary to what you may have heard for years, it is not necessary for the screen to overlap the area encompassed by the driven elements by at least a ¼λ. The 24 sq. ft. of reflecting plane here provides excellent F/B ratio and "capture area," equivalent to nearly 3 sq. λ on 1¼ and 6 on ¾ meters. Since it can be shown that an array of 1 sq. λ has a gain of 10 db, the realizable gains from "The Whirling Bedspring" are self-evident.

Furthermore, there is nothing "wrong" with supporting collinear elements at their ends rather than centers. It is done commercially all the time (ain't that right, Pendergast?). ■



¾m
(A)

1¼m
(B)

Fig. 5—Electrical front view of both antennas. The director elements are not shown in this view.

Ted Cohen capsules the FCC CB RFI and TVI report. The results are very interesting and have far reaching implications.

Television Interference And The Citizens Band Radio Service

BY THEODORE J. COHEN*, N4XX

It should come as no surprise that RFI is one of the greatest problems facing the CB and Amateur Services today. In fact, with RFI complaints to the FCC expected to reach 200,000 by 1979, the Commission has recently completed a study of the problem, which, hopefully, will aid in establishing and implementing procedures leading to the elimination of RFI.

In this article, Dr. Cohen reviews the FCC study on CB-related RFI, and discusses the impact such interference problems may have on the Amateur Service. Based on his experience in, and his contributions to, the field of radiofrequency interference (for which he received the ARRL Technical Merit Award for 1975), Dr. Cohen concludes that only if all parties concerned work together will it be possible to resolve the burgeoning RFI problem.
K2EEK

Introduction

In July 1977, the Federal Communications Commission (FCC) released the results for one of the most comprehensive studies ever performed on the incidence of so-called television interference (TVI). Entitled *The Extent with CB Radio Transmissions*, the report analyses more than 70 "in field" cases of alleged TVI, and summarizes over 560 interviews which the Commission obtained in a Radio Frequency Interference (RFI) Neighborhood Survey. Among the results obtained in the study is one which shows that almost 55% of all CB-related TVI complaints are at least partially attributable to inadequate suppression of transmitter harmonics. On the other hand, the study also shows that approximately 45% of all TVI cases investigated are the result of fundamental overload in the television receiver affected.

Background

In the years following World War II, the growth of television as a major form of home entertainment brought with it the potential for severe RFI problems. Where as complaints of interference during the 1940's largely involved a.m. broadcast radios and numbered roughly 7,000 per year, the rapid growth of television in the early 1950's was accompanied by an equally-rapid increase in the number of RFI complaints involving this new entertainment form. By 1953, RFI complaints had reached 21,000 per year and were climbing at a relatively moderate pace.

While TVI complaints continued to rise during the 1960's, three events occurred late in that decade which had a profound effect on the number of interference cases reported to the Commission. These were:

- The phenomenal growth of 27 MHz Citizens Band (CB) radio;
- The increased use of semiconductor devices in home-entertainment;
- The increased use of electronic entertainment equipment in the home.

By 1976, the number of RFI complaints reported to the FCC climbed to 80,000 per year (fig. 1), with a conservatively-estimated 87% of all interference cases reported that year involving impaired television reception. Not surprisingly, 85% of all TVI cases reported in 1976 were associated with Citizens Band radio transmissions, for over six million licensed CB stations (and millions of unlicensed stations) were presumably on the air by that time (fig. 2).

The data in figures 1 and 2 establish a link between the growth in CB licensees and the number of interference cases reported. Further, based on this link and on the anticipated growth in the CB Service (and in the Amateur Service as well), the Commission, in 1976, projected that it would receive almost 200,000 RFI complaints per year by the end of this decade.

Clearly, the time had come to examine those factors which have an impact on the television interference problem so that information would be available to aid in establishing and implementing procedures leading to the elimination of this problem.

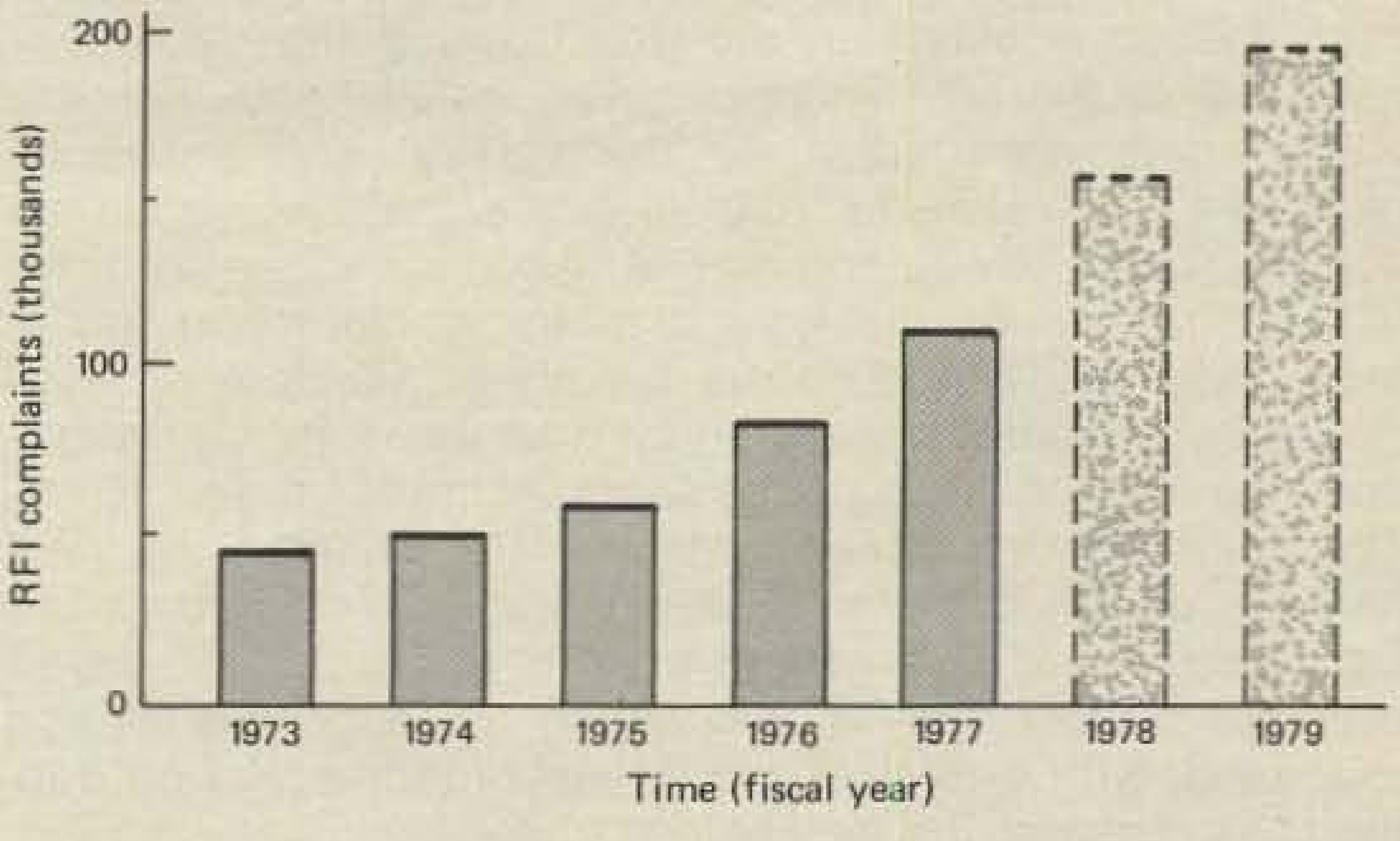


Fig. 1—The number of RFI complaints forwarded to the Commission is expected to reach 200,000 per year by 1979 (1978 and 1979 data are estimated).

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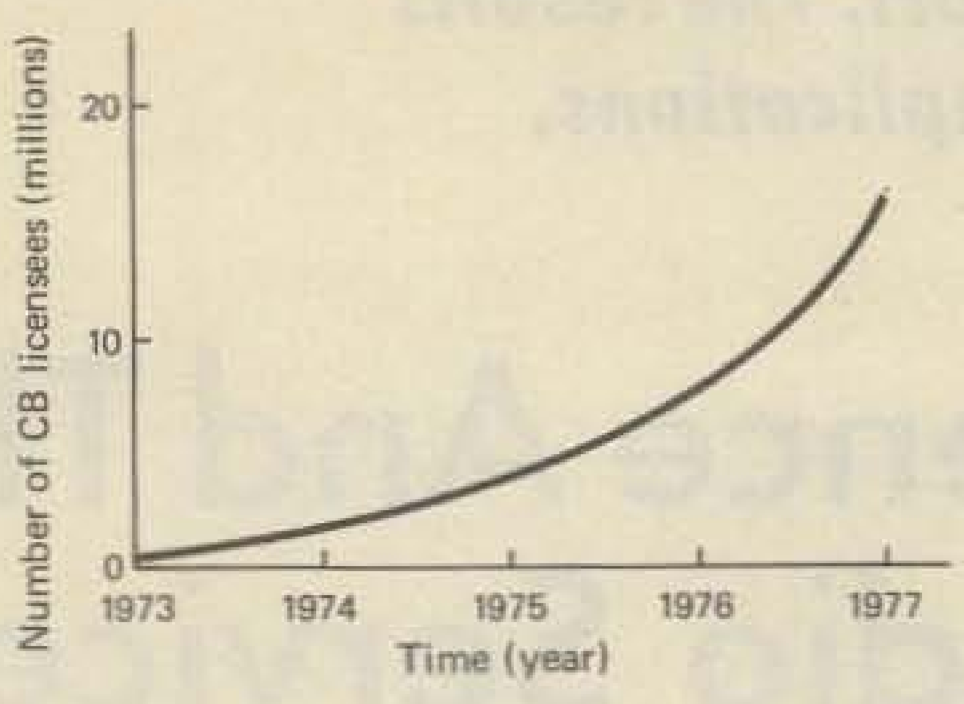

Fig. 2—By the end of 1977, almost 16 million CB licenses had been issued in the United States. This is twice the number of individuals licensed at the end of 1976.

The Study

The study, in essence, involved on-scene analyses of CB and television installations which were involved in TVI complaints filed with the Commission by the Public. To this end, 72 randomly-selected complaint locations in six cities served by Commission district offices (Baltimore, Maryland; Buffalo, New York; Kansas City, Missouri; Norfolk, Virginia; San Francisco, California; and Seattle, Washington) were made the subject of a carefully controlled analysis and test measurement program.

More specifically, FCC engineers were assigned the task of quantifying all factors which may have been associated with, or which may have contributed to, the interference reported. Included were analyses of the complaintant's television receiver and its attendant antenna system, with attention given to antenna type, type of lead, the antenna mounting location, and whether a booster amplifier was used. Data were also collected on the signal levels expected at the complaintant's location for television signals delivered to the community, and on the TV and CB signals delivered by the antenna system to the television receiver's antenna terminals.

As regards the CB installation, descriptive data on the transmitting system and its associated antenna installation were collected for analysis purposes. In particular, a major effort was made to obtain accurate information on the use of (illegal) linear amplifiers by CB operators. To encourage cooperation by CBers in this matter, the FCC assured those operators whose stations were examined that no action would be taken against them as a result of the study findings. All transmitters and linear amplifiers used at a given station were then tested to determine emission characteristics.

Data were also compiled on the physical and electromagnetic environment in the area around the CB transmitters and the television receiver installations. For example, data were taken on the vertical and horizontal distances between the CB station's antenna and the complaintant's television antenna. Attention was also given to such factors as the type of home construction in the area under study, and on the density of housing.

Finally, a nontechnical survey was taken in the neighborhood around each CB station included in the study. The information obtained was used to estimate the percentage of RFI complaints which are not reported to the Commission. In all, interviews were conducted at seven or eight households in the vicinity of each CB station examined, with a total of 563 households interviewed during the course of the survey.

Results

In analyzing the data collected, it was assumed that the CB stations and households involved in the FCC study on television interference are representative of stations and households throughout the United States. Given this assumption, the survey results suggest that in Fiscal Year (FY) 1976, 4,000,000 individuals (or about 1.3 million households) probably experienced television interference which was related to the operation of an estimated 22,000 CB stations. Further, the number of individuals who experienced CB-related TVI in FY 1977 is estimated at 5,000,000 (1.5 million households), while as many as 9,000,000 individuals (2.7 million households) will probably be affected during FY 1979.

For the stations examined, the FCC found that the primary cause of TVI was inadequate suppression of harmonic and spurious radiation at the CB transmitter. Then too, it was found that even when antenna line harmonic radiation was suppressed by 60 dB or more (the specified value for new transmitters), harmonic radiation was still a basic cause of TVI. Thus, the Commission concluded that the present requirements for the suppression of antenna line harmonic radiation are inadequate.

In sum, antenna line or chassis harmonic radiation from CB transmitters was a contributory factor in 55% of the TVI cases investigated.

With respect to television receivers, the FCC observed that front-end overload was the primary cause of 45% of the TVI complaints investigated. However, in 80% of these cases, a high-pass filter (Drake Model TV-300), installed at the antenna terminals of the television receiver, was found to eliminate or reduce significantly the interference produced by receiver overload. Based on these results, the Commission concluded that if a greater, "unwanted" signal rejection capability was incorporated in television receivers at the time of manufacture, such actions would eliminate more than one-third of all CB-related TVI cases.

In the case of linear amplifiers, these devices were associated with about 45% of all CB-TVI. On the average, the Commission found that these amplifiers had an average power output level of 120 watts; however, most CB stations employing linear amplifiers also were found to use high-gain antennas, thereby compounding the interference problem. If the use of linear amplifiers by CBers was eliminated, the FCC estimates that 25% of all CB-TVI problems would be resolved, with an additional 20% of such TVI problems being improved to the point where the interference observed would probably not be objectionable.

Implications of CB-TVI with Respect to the Amateur Service

With the majority of all TVI cases—and, indeed, all RFI cases—related to the operation of stations which use frequencies assigned to the Citizens Band Radio Service, Amateurs may ask why they should be concerned with these problems. The answer, simply put, is that increased regulation which is directed towards CBers, and which is intended to reduce the incidence of CB-RFI problems, affects Amateurs as well.

Because of CB-RFI, many communities now enforce strict zoning laws which limit severely the height of antenna towers. Further, CB-RFI has led state and local governments to enact statutes which are being used to fine CB and Amateur operators who disrupt a neighbor's enjoyment of his or her home entertainment equipment. True, these statutes apparently pre-empt federal laws which govern the operation of radio stations, but the Amateur—just as in the case of the CBer—has little choice but to challenge the state and local statutes in court.

Even the design of future Amateur equipment could be impacted because of CB-RFI. The FCC, for example, has

(Continued on page 76)

Just what is it you want to do? Do you need a computer or will a calculator do? What kind of equipment will you need? What do you have to know? Read on, and find out.

COMPUTERS...

DO YOU REALLY WANT ONE?

BY ROBERT L. STITES*

When viewing a beautiful panorama across farm pastureland, it is often easy to forget to watch our footsteps. Too much time observing the path, however, may allow us to miss the potential beauty that surrounds us.

Has the time of the future arrived? During the past two decades, books, movies and articles have raised visions of computer controlled everything—especially in the home. We have begun to relish the day when each individual might have a computer at his command to perform those tasks as may strike his fancy—from washing the dishes to walking the dog.

Perhaps we must continue to dream for a while longer, but the thought of having one's own computer is now within the grasp of the average individual. Costs vary but are comparable with those for quality hi-fi and amateur radio configurations.

How Did It Happen?

Computers as a hobby was a reality for only the most serious individuals until early 1975 with the introduction of the MITS computer kits. The introduction of these kits has resulted in a hobby market of considerable proportions. A large number of companies now market products aimed specifically at the hobbiest. An estimated three hundred computer stores have opened across the nation. These have been predominately independent operations providing a focal point for the hobbiest in their geographical area.

Several recent entries into the hobby computer market, notably Heath, Radio Shack and Commodore have caused considerable interest. These companies have a large, established merchandising base and have established a reputation with consumers for producing quality products. Even large international corporations like Sears Roebuck & Co. have considered entry into the small computer market. Imagine the impact on the price and performance when firms like Texas Instruments unveil their entries!

The availability of this type of equipment is increasing so rapidly that the potential buyer often finds himself bewildered by the options he is presented with. Ads abound in the literature for the $19.95 "computer on a chip." So why should the buyer consider the $600.00 kit or even worse, the "complete system for $1495.00?"

The answers can only be had by first defining the objectives of the individual. What does he or she want to achieve with their computer? What is best for one person may not be best for the next.

What Do I Do With It?

What is the purpose of your computer? Is it to be used for a specific application or is its existence for fun and experimentation. Most hobbiests are interested in the computer itself, how it works and experimenting with a variety of applications—"just for the fun of it." On the other hand some persons will have specific intentions for their tool—the computer. These *Personal* users (as opposed to hobbiests) will generally be interested in units which are ready to utilize and easily adapted to their intended use.

While small 'Ready to Use' computers are available as low as $600.00, it might be wise for personal users to consider several alternatives. If the application is of the numerical or "number crunching" variety, it might be well to consider one of the programable calculators.

The evolution of the electronic calculators has begun to overlap some previously isolated definitions of "computers." Consider for a moment a unit which has a numeric keyboard, display, optional 64 character printer/plotter, plug in program modules, memory which may be allocated to data and/or programs, indirect addressing, subroutining, program editing, and the ability to record programs on a magnetic medium. Sound like a computer? The manufacturer's literature says it is a calculator!

If the primary intent is for games perhaps considering one of the new variety of TV games would be in order. Actually built with a micro-computer, some of these units have optional cassettes with new semi-intelligent games.

The personal user may find that pre-packaged application units may not truly serve his needs. If this is the case then one of the "ready to use" or assembled general purpose computers may provide the best solution. Some personal users may even want to try building one of the numerous kits on the market.

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Kits are available from a number of sources for both computers and peripherals. Many will offer the hobbiest substantial savings over assembled units. This is true primarily because most kit builders place no dollar value on their time—it is truly "free time." If a person has no experience with digital electronics they should consider the availability of assistance should they encounter problems. This may be from a friend, computer club, or possibly a local computer store. Due to the complex nature of a computer, locating and correcting problems can become very time consuming and frustrating even for those with substantial experience in the field.

Learning About Computers

Many people have purchased computer kits with the idea that they can "learn about computers." Unfortunately for most, building a kit does little more than reinforce soldering skills and test their ability and stamina in following instructions. The amount learned is generally a function of the number of mistakes that the builder must correct and the clarity of the vendors troubleshooting guide. This is not to say than an individual can *not* "learn" by building a kit. It depends on the individual, his attitude, background, *AND the kit involved.*

Most people want to "hurry up" and complete the kit. They are not willing to dedicate the additional time necessary to learn as they go. For those individuals who do want to learn while building but find it difficult to pace themselves it would be wise to consider one of the kits marketed as "educational," "learning development," or "tutorial." These kits tend to be priced a little higher as a result of the cost of developing complete educational documentation. These educational packages sometimes cannot be expanded to full systems but will still be a wise investment for many people.

Ready To Use Systems

Several ready to use systems are available starting from $600.00. This price includes a microcomputer with keyboard, video display and cassette recorder. Decisions to market assembled units have been based in part on the experiences of companies who have entered and since withdrawn from the kit market. Many of these manufacturers have found that the average kit builder is not very adept at trouble shooting digital logic. Documentation which will enable the individual with little or no knowledge of digital electronics to detect and correct problems is difficult to write. The cost of producing this type of documentation for a product with a questionable life cycle is often prohibitive. The units are not generally lower in capability. With mass production and merchandising responsible for the lower cost, this type of system can even offer the hobbiest substantial advantages. It is reasonable to assume that these types of units will become more prevalent in the future.

You Pay For What You Get

A wide variety of computers, memory, and peripherals are available to the hobbiest. A few years ago it was relatively easy to distinguish between minicomputers and microcomputers based upon speed, size, instructions, flexibility, and cost. Today however the two as classes have actually begun to overlap in many areas. Some "minicomputers" actually use micros in one form or another.

Many people will find that the initial investment is only the tip of the iceberg. It is important to carefully judge the potential requirements for additional memory, peripherals and interfacing. The costs associated with these items can easily double or triple (and often times more) initial investments.

Most potential hobbiests are ultimately interested in establishing a complete system (i.e. one with some processing capability, memory and some means of communicating with the system). The process of building such a system might be compared to configuring a good stereo system. While an advertisement might suggest that you can purchase a "complete computer for under $400.00," what you actually receive may only be the heart of a complete system. These units may contain "microprocessor, i/o, and memory," and yet do not constitute a complete *system*. Buying such a unit might be analagous to purchasing a stereo amplifier without speakers or tuner. The unit may have plugs for a variety of inputs such as tuner, tape deck, or turntable but without such devices the amp may not be of much use.

Software

Software available to the hobbiest runs the full spectrum from operating systems and language processors to applications packages. The amount available varies widely from manufacturer to manufacturer. Some units have absolutely no software available requiring that programs be entered by hand, one machine instruction at a time. This may not sound too serious until you consider that many programs will require thousands of instructions. Most systems, however, have a limited amount of software available in each of the three areas.

Many of the units will include a resident form of an operating system. These will typically include a small number of commands for editing, debugging and executing programs. File structured types of operating systems are few and generally available only on the more expensive systems. Assemblers with various capabilities are available for most hobby computers. The most popular and certainly most universal programming language available to hobbiests is **BASIC.** An easily learned language, BASIC is used by most hobbiests for writing and exchanging software. BASIC is usually offered in a form which is standard only to the unit with which it was purchased. Slight variations occur from system to system.

Application packages are available for some systems, however most are still relegated to the demo and game variety.

Software development has been found to be extremely expensive for most manufacturers. It has been difficult for most vendors to recover their investments. Some are now hoping to recapture their costs thru larger volume, lower cost sales. The success of this approach is questionable since many hobbiests will still bootleg software regardless of the restrictions originally placed upon the package. If hobbiests continue this practice then the responsibility for software development will remain in the hands of the hobbiest himself. If a vendor finds he is unable to recover his costs or make a profit he will discontinue his efforts on behalf of this market.

What Do I Do With It?

While uses for the personal or hobby computer have been categorized, relatively few specific applications have been identified and implemented. Suggestions such as education, personal finances, games and small business payroll abound. The possibilities are certainly limited only by one's imagination, BUT . . . most individuals have some finite limits of time and funds available for their hobby.

Most of the original and many of the current applications are games. These have increased in complexity as users became more sophisticated and equipment more readily available. Some systems have been used for message and logging centers for home and amateur radio stations.

(Continued on page 76)

Part III of this engrossing series deals with the demodulator and its function and concludes with construction details for building your own.

AN RTTY PRIMER

Part III

BY IRWIN SCHWARTZ*, K2VGU

An RTTY signal is distinguished in that it is two very rapidly changing frequencies separated by a small number of Hertz (usually 170). The function of a *demodulator* is to process these two discrete frequencies into d.c. pulses which will subsequently activate the selector magnets in the teleprinter.

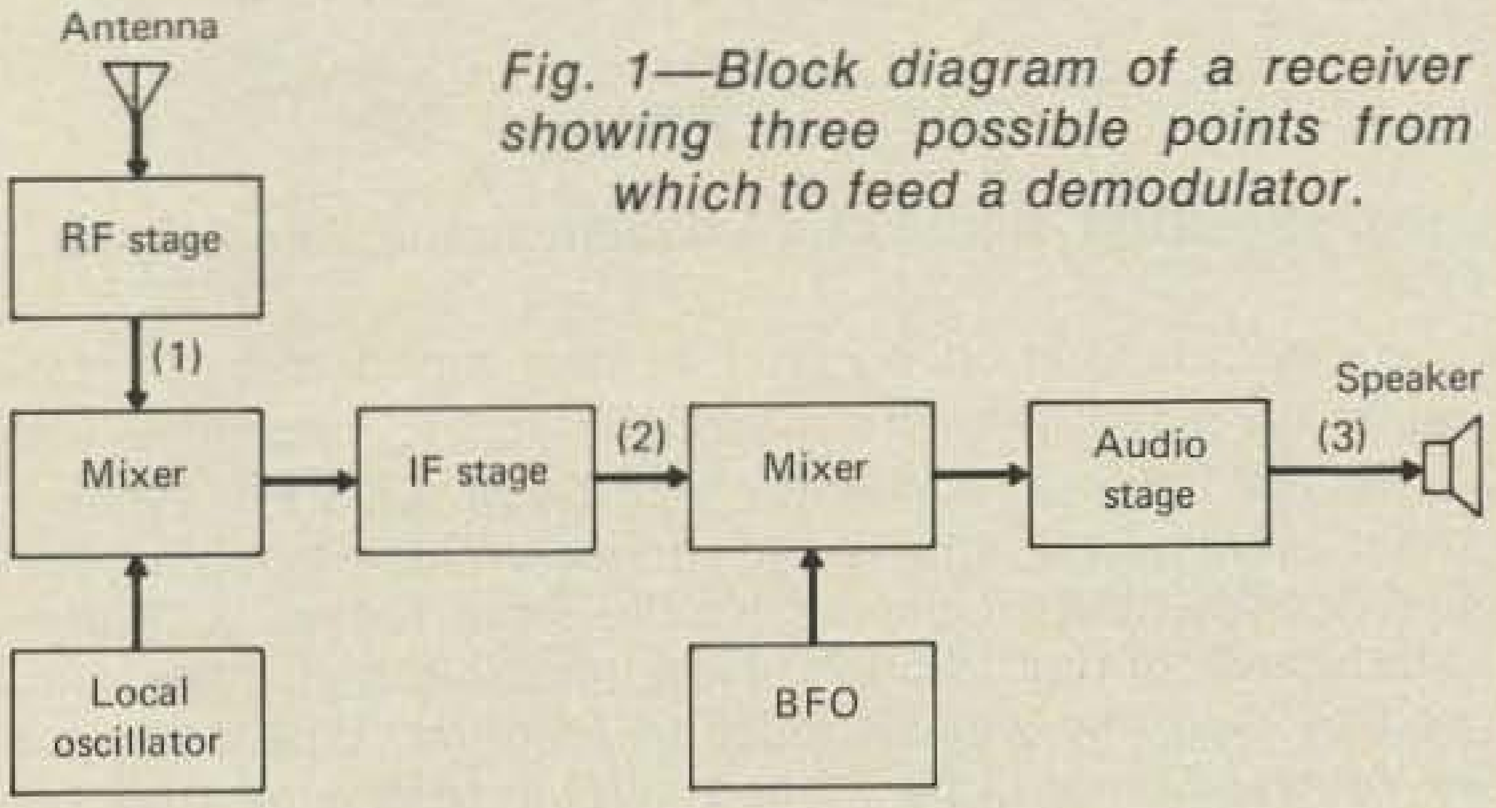

Fig. 1—Block diagram of a receiver showing three possible points from which to feed a demodulator.

If the signal path through a receiver is traced, it can be seen that there are several sources from which an RTTY signal can be fed into a TU.

Referring to fig. 1 consider the RTTY signal characteristics at each of the following three points: (1) after the r.f. stage, (2) after the i.f. stage, and (3) after the audio stage.

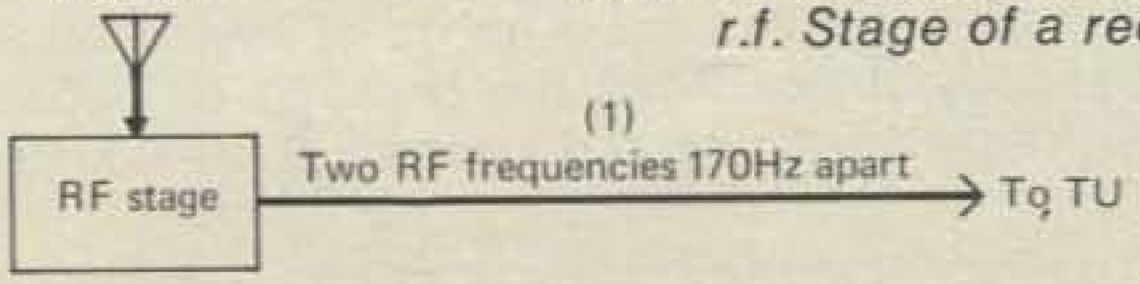

Fig. 2—Feeding a TU from the r.f. Stage of a receiver.

If the RTTY signal is fed into the converter from point (1), the signal source is effectively a truncated receiver as illustrated in fig. 2. This receiver has only an r.f. stage. If fed from here the TU must respond to two r.f. frequencies 170 Hertz apart. This is not easy to accomplish: for if such were the requirement, the TU's overall domain of response (its bandwidth) would have to be made *very* broad (on 20 meters in the order of 200 kHz) and, as a collateral undesirability, the TU would react to *every* signal in that spectrum. It would therefore be quite ineffective for a TU to respond to RTTY signals at their original transmitted frequencies.

At point (2) the r.f. signal has been mixed down to some intermediate frequency (in many receivers, 455 kHz). If this were the feedpoint the receiver would look as in fig. 3. This system is in use — some surplus gear use it — but it presents inherent design problems which are not so easily overcome.

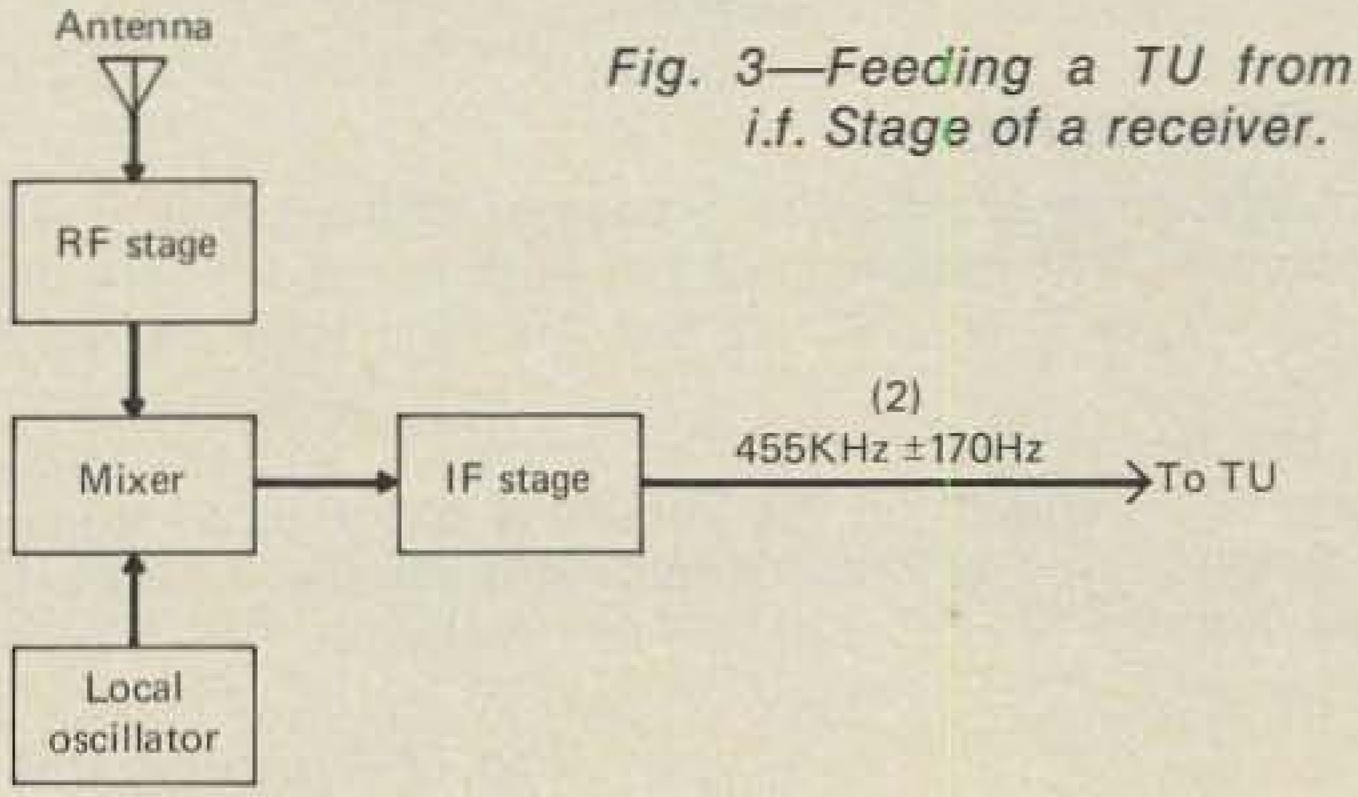

Fig. 3—Feeding a TU from the i.f. Stage of a receiver.

Thus, point (3) remains from which to feed the TU. At this point the i.f. signal has been mixed down again, this time to audio frequency, at which the receiver issues tones of 2125 Hz and 2295 Hz. The broad bandwidth problem of r.f. injection is avoided as are the design difficulties of i.f. injection.

In order to optimize the performance of a converter,

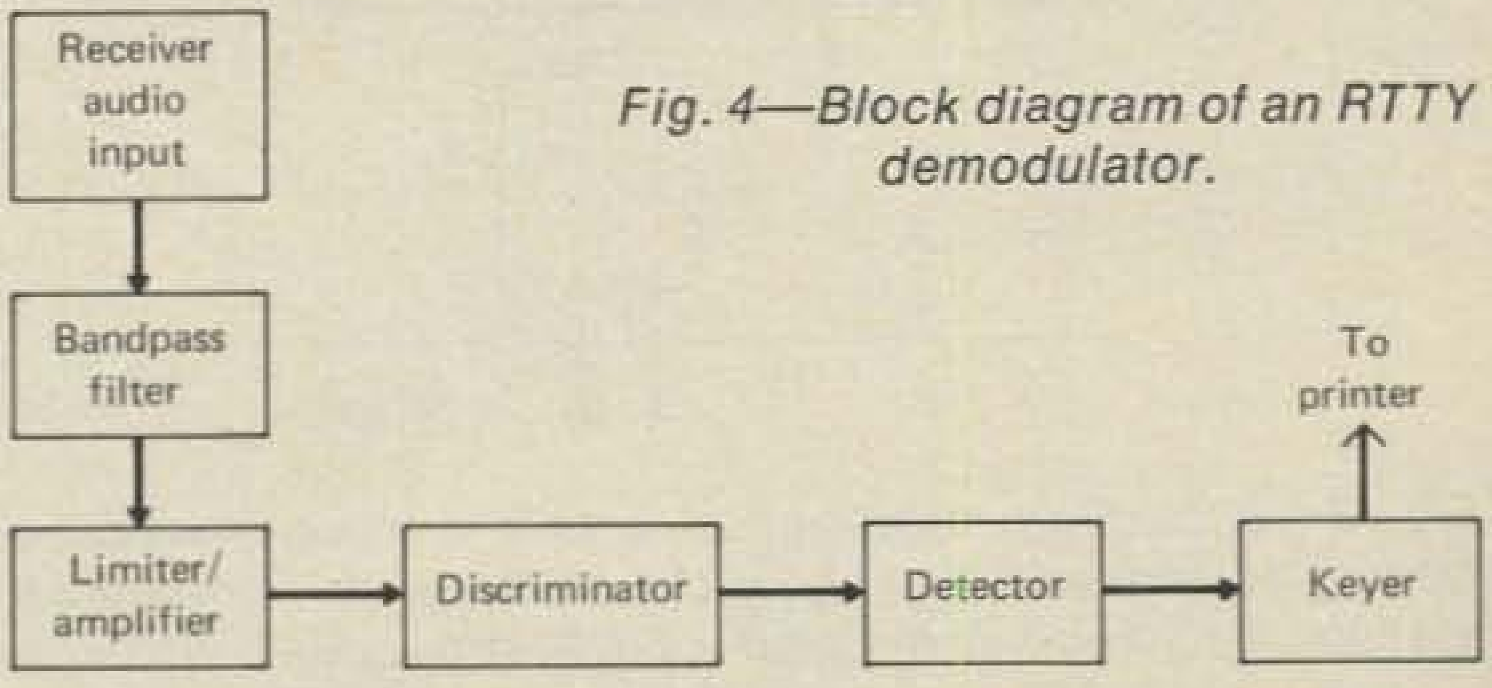

Fig. 4—Block diagram of an RTTY demodulator.

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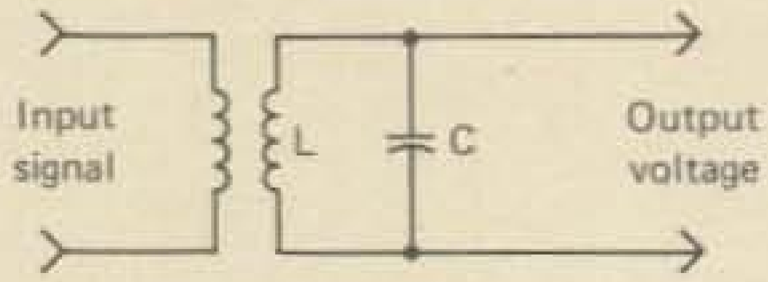


Fig. 5—Parallel-tuned L-C circuit used as a frequency discriminator.

it must be guaranteed that the two prescribed audio tones and *nothing else* pass through the demodulator. Each stage of the TU contributes to that end.

Figure 4 is a block diagram of a demodulator which maximizes the possibility of processing the desired audio tones only. It should be pointed out that this demodulator contains complexities not always necessary for satisfactory reception.

The stages will not be discussed in the order they appear in the diagram since their interrelationships and functions can be seen more clearly if they are studied in a somewhat inside-out order.

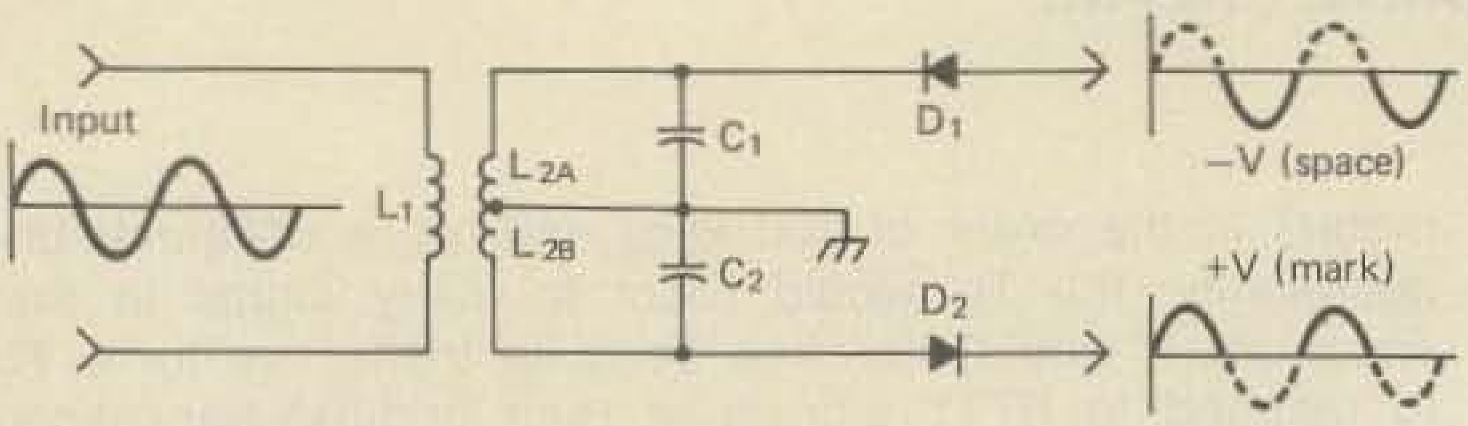


Fig. 6—A simple diode discriminator maximizing positive voltage for Mark *and maximizing negative voltage for* Space.

The Discriminator

For this stage and for the remainder of the article it will be assumed that narrow (170 Hz) shift is used where the low tone *(space)* is 2125 Hz and the high tone *(mark)* is 2295 Hz.

A frequency discriminator is a circuit whose output voltage is dependent on the frequency of the input signal. The simplest type of discriminator is a parallel tuned L-C circuit. See fig. 5.

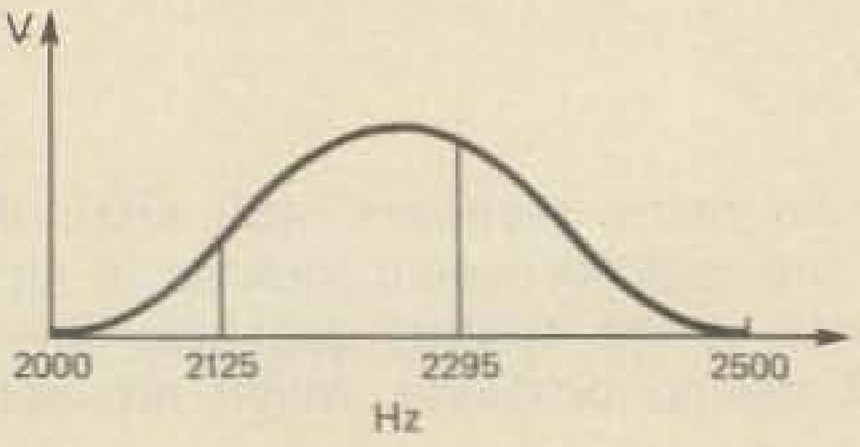


Fig. 7—Input bandpass filter characteristics.

The output voltage of this circuit is a function of the input signal frequency. Maximum output voltage is realized when the input signal frequency is equal to the resonant frequency of the L-C circuit. The resonant frequency f_r of an L-C circuit is related to the values of L and C by $f_r = \frac{1}{2\pi\sqrt{LC}}$, where L is the inductance in Henries and C is the capacitance in Farads. Two such tuned circuits are required for an RTTY discriminator — one which resonates at 2125 Hz and one which resonates at 2295 Hz.

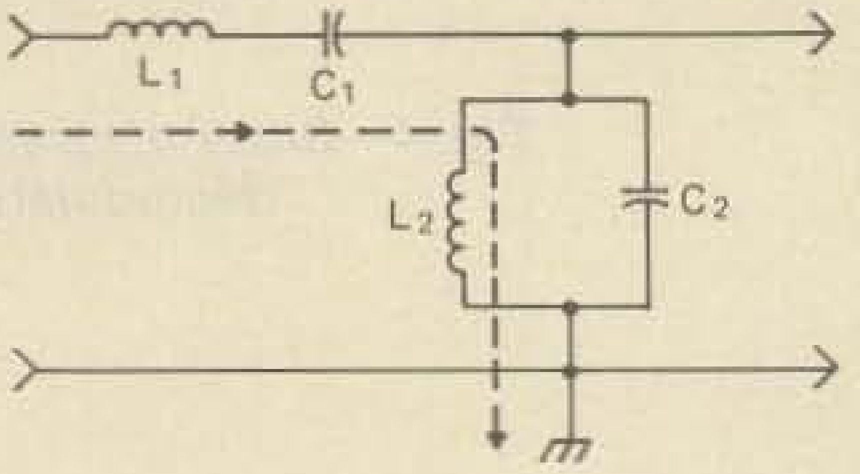


Fig. 8—Schematic diagram of a RTTY input bandpass filter. The broken lines show the paths of the undesired signals, i.e., High-Z through L1-C1 and Low-Z through L2-C2.

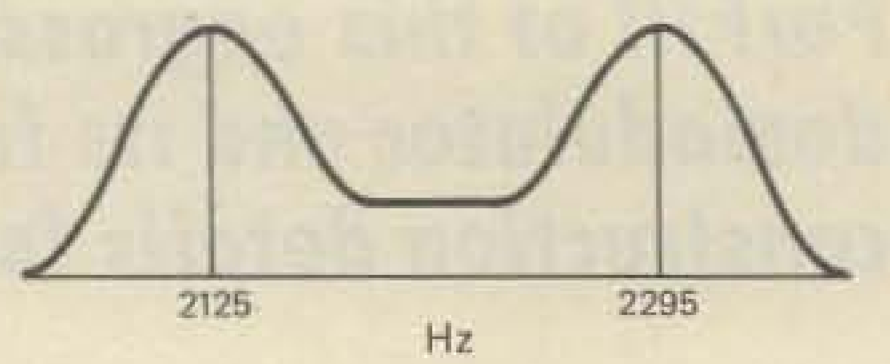


Fig. 9—Notch filter response curve.

However, it is undesirable for the resonance output voltages of the two circuits to be the same. For if such were the case the teleprinter could not disinguish between a mark and a space. Some method of maximizing both voltages while maintaining a differentiation between them is necessary. The simplest (and a very common) solution is to maximize one (say mark) as a positive voltage and maximize the other (space) as a negative voltage.

This is accomplished by use of the unidirectional conducting property of diodes. See fig. 6.

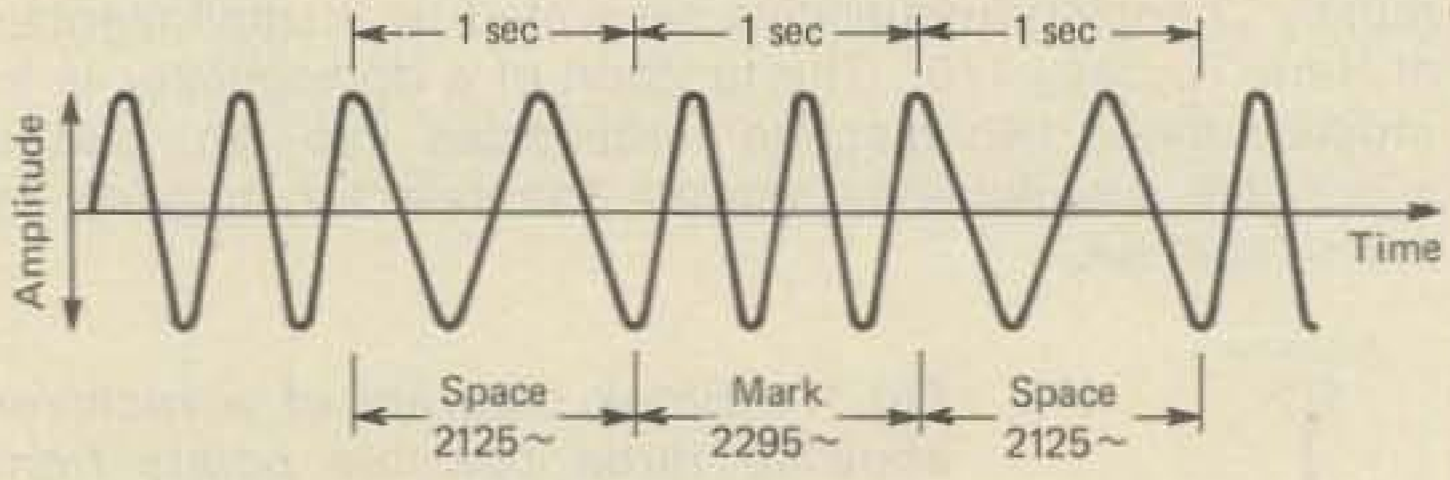


Fig. 10—RTTY signal as a frequency modulated signal.

Here, L_1 is a coupling link. Its only function is to introduce the signal into the discriminator. L_{2A} resonates with C_1 at 2125 Hz; L_{2B} resonates with C_2 at 2295 Hz. When a mark is received, the lower tuned circuit resonates and the positive half of the sinusoidal input signal voltage is conducted through diode D_2, the negative half being clipped by D_2's one-way conduction property. When a space is received, the upper tuned circuit resonates and the negative half of the sinusoidal input signal voltage is conducted through diode D_1, the positive half being clipped by D_1's one way conduction property.

Thus the end result of RTTY frequency discrimination in the example is that mark tones produce a peak positive output voltage and space tones produce a peak negative output voltage.

The Input Bandpass Filter

To further contribute to the guarantee that only the desired mark and space tones are processed by the TU, an *input bandpass filter* is often used ahead of the discriminator. The bandpass filter allows the passage of signals within desired frequency limits and rejects (or attenuates)

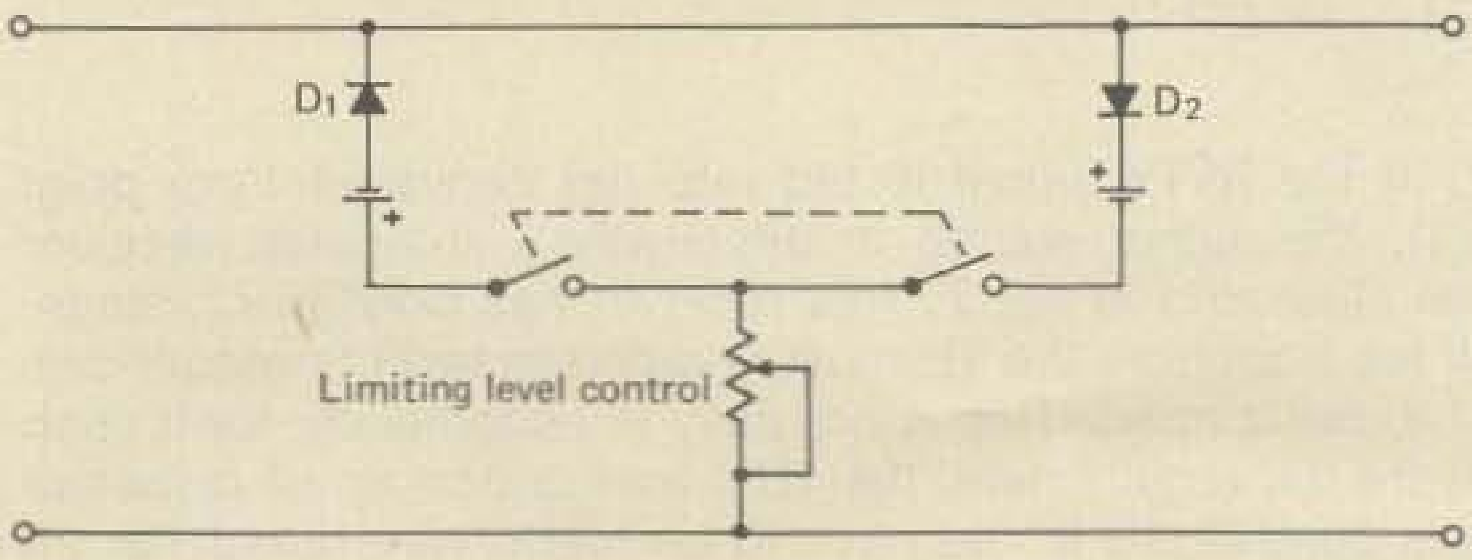


Fig. 11—Simple diode limiter.

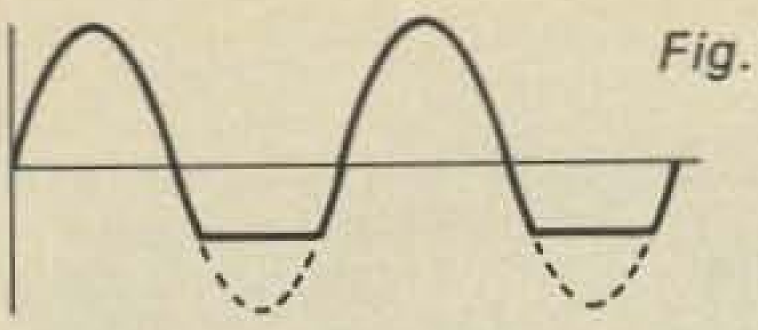


Fig. 12—Clipping effect of D1.

signals outside these limits. If the range of frequencies entering the discriminator is limited to, say, between 2000 Hz and 2500 Hz, the 2125 Hz and the 2295 Hz tones will pass and mostly all other signals will be rejected or, at least to a large extent, eliminated.

Figure 7 shows a picture of what is required. The filter whose response is shown will pass 2125 Hz and 2295 Hz and reject or sharply attenuate all frequencies beyond the limits of 2000 Hz and 2500 Hz. This filter response looks very similar to the receiver bandpass filter response in the previous article. In fact, they are quite alike.

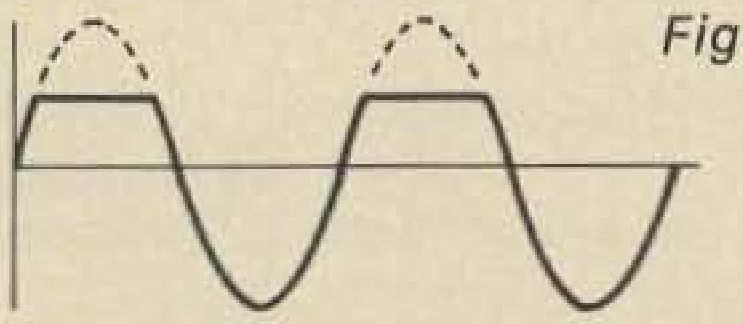


Fig. 13—Clipping effect of D2.

There are several types of bandpass filter circuits; however, they work on essentially the same principle. Consider fig. 8. Both L_1 — C_1 and L_2 — C_2 are designed to resonate on 2210 Hz (the center frequency of 2125 Hz and 2295 Hz). The idea is that desired frequencies within the bandpass (2000 Hz to 2500 Hz) will travel through the filter without being affected; but the unwanted signals, that is, signals whose frequencies lie outside the bandpass, will meet high series impedance through L_1-C_1 and a low parallel shunt impedance through L_2-C_2 (to ground) and thus be attenuated. In this way the door is closed somewhat to signals which might interfere with the desired ones.

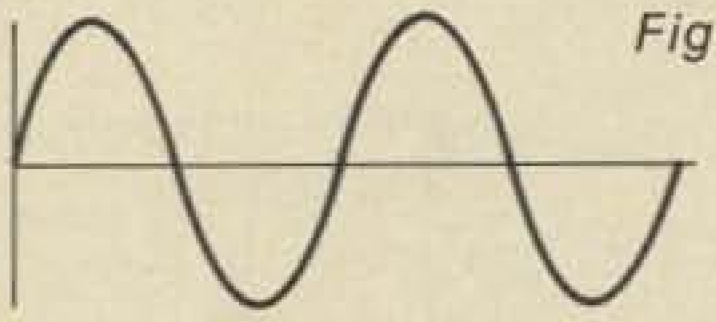


Fig. 14—Input signal waveform.

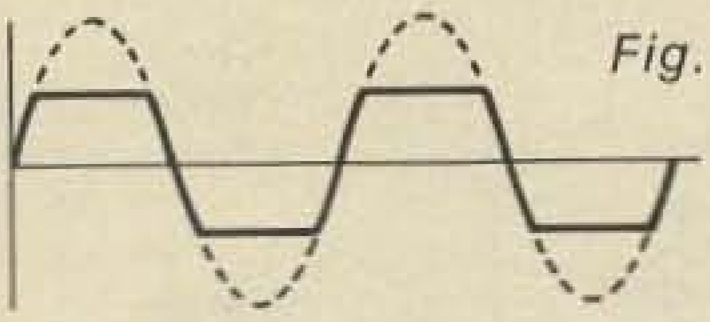


Fig. 15—Output signal waveform.

Just one more word about signal filtering. If your mental machine is working overtime you may have asked: What about attenuating signal frequencies *between* 2125 Hz and 2295 Hz? It can be done — with a device called a *notch filter*. The notch filter's response is such that all frequencies below 2295 Hz and above 2125 Hz are attenuated. See fig. 9.

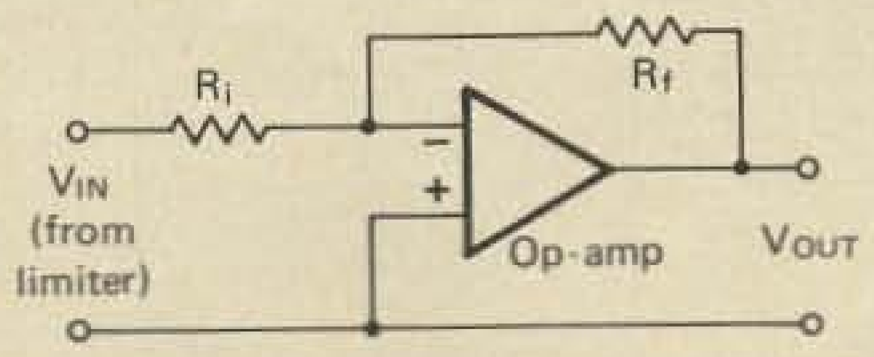


Fig. 16—Basic operational amplifier circuit.

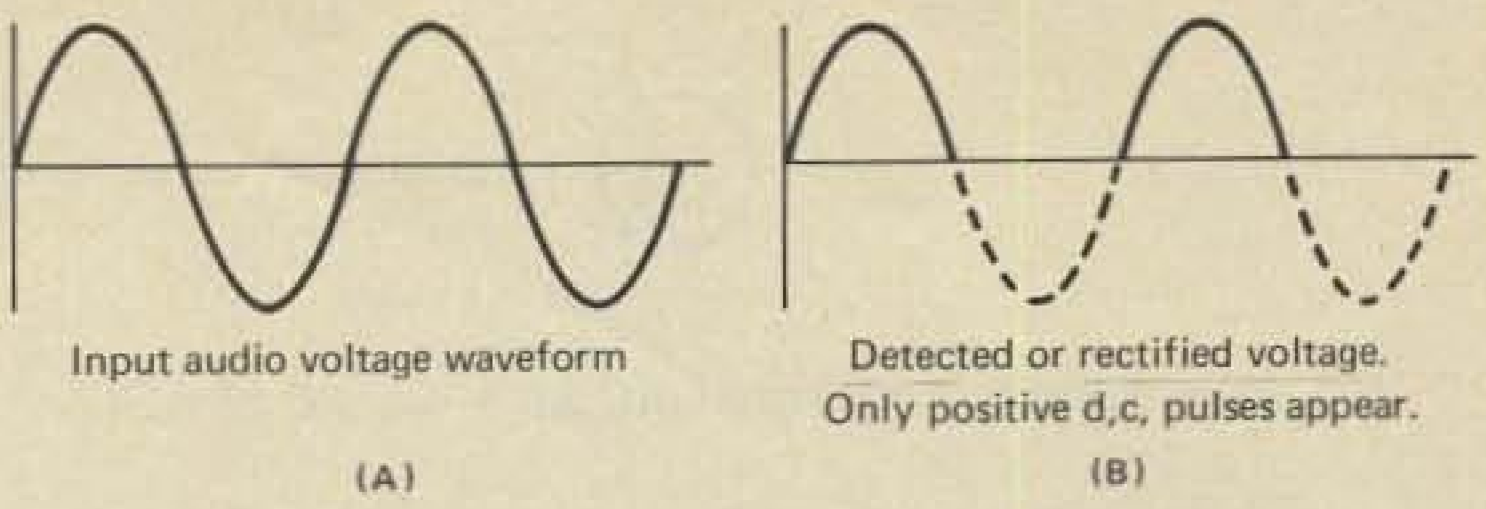


Fig. 17—Changing an a.c. waveform (voltage) to a d.c. waveform (voltage) through the process of detection.

The Limiter/Amplifier

If the incoming audio signal level from the receiver output is above a predetermined level the signal is *limited* (or *attenuated* or *clipped*); if the output signal of the receiver is too weak it is amplified. In this way constant and equal voltage levels for mark and space are maintained.

. To make the function and operation of the limiter/amplifier more lucid, it would be wise to digress a bit and discuss the nature of f.m. signals.

RTTY transmission is a form of frequency modulation. This can be illustrated with the aid of fig. 10. Notice that the amplitude (height) of the signal wave remains constant. If, in fact, the amplitude varied the signal would be amplitude modulated, or a.m.

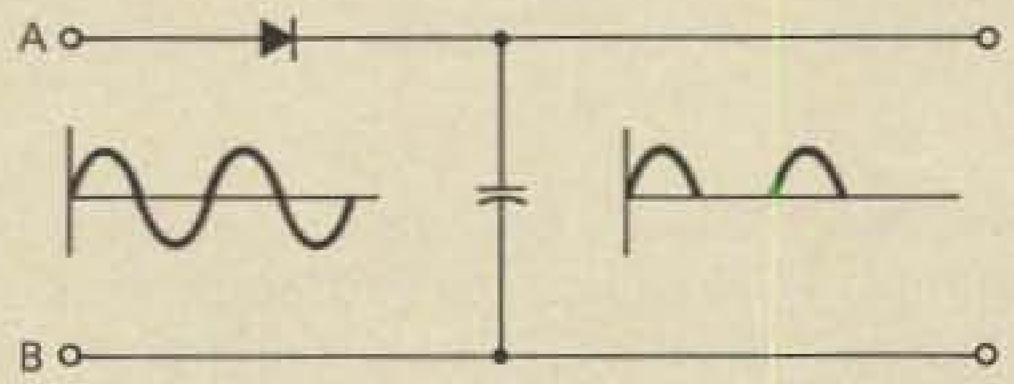


Fig. 18—Simple detector circuit.

The mark pulse contains more cycles of wave than the space pulse per unit time — 170 more. This means that in one second the mark tone will move up and down 2295 times and the space tone will move up and down 2125 times.

This f.m. signal behaves as any other f.m. signal, for example, as f.m. broadcast radio or 2 meter f.m. One of the advantages of FSK is that it *is* f.m. The (f.m.) receiver, i.e., the demodulator, will "capture" the strongest signal on the frequency and reject all others. Good f.m. is QRM-free. However, it can also be signal-free if the receiver captures noise which happens to be stronger than the desired signal. In that case, the signal is lost. F.m. (fsk RTTY) reception works *only* if the signal is stronger than the noise. The bandpass filter takes care of a greater part of the noise; if the input bandwidth is decreased, the signal-to-noise ratio is correspondingly improved. The limiter/amplifier takes care of the signal.

Figure 11 shows a simple diode limiter circuit. As the amplitude of the input signal increases, the negative peak of the output signal cannot rise beyond the d.c. bias voltage on D_1 and the signal is clipped below. See fig. 12. Similarly, as the amplitude of the input signal increases,

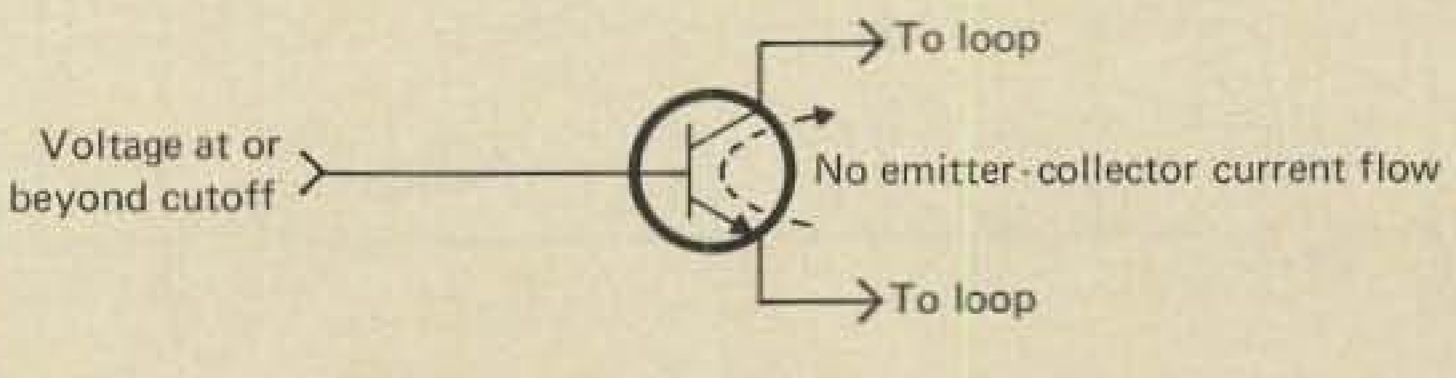


Fig. 19—A switching transistor as an open circuit.

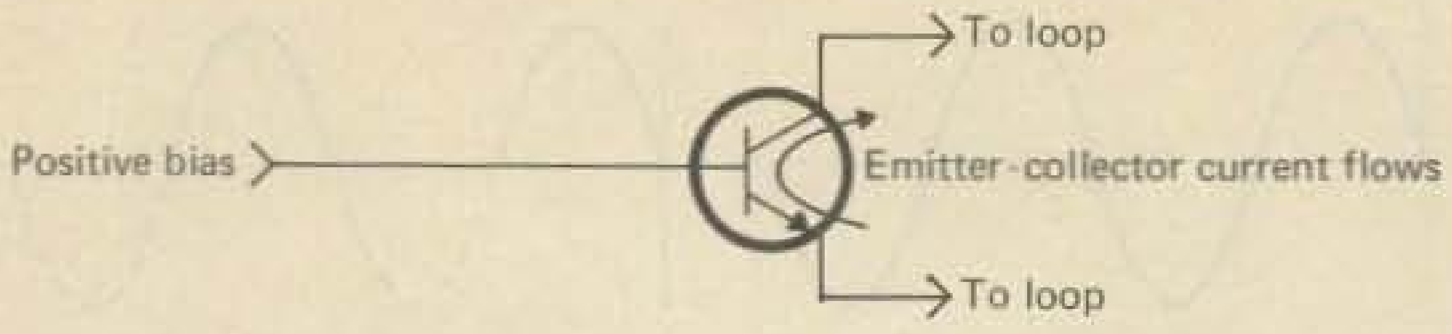


Fig. 20—A switching transistor as a closed circuit.

the positive peak of the output signal cannot exceed the d.c. bias voltage on D_2 and the signal is clipped above. See fig. 13.

The combined effect of D_1 and D_2 is to clip both the top and bottom peaks of the input signal. If fig. 14 is the input signal wave form, then fig. 15 is the clipped output signal waveform.

The result is that an incoming RTTY signal is clipped to a constant amplitude if it is at too high an amplitude level when it enters the limiter.

On the other hand, if the input signal is too weak, the signal is amplified to the predetermined level. This result can be achieved by any of several amplification techniques, the most popular now being use of the ubiquitous operational amplifier *(op-amp)*.

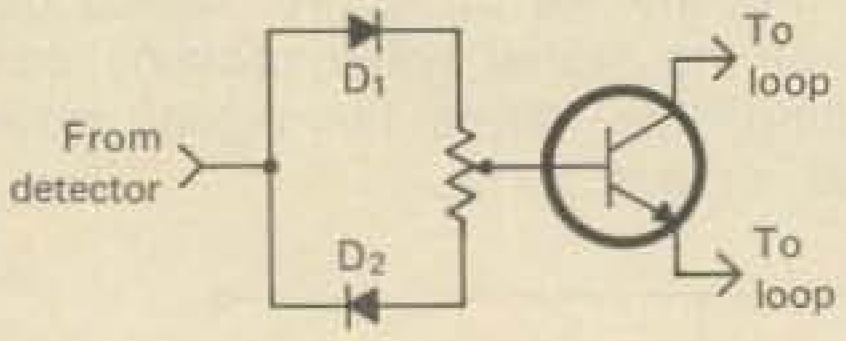


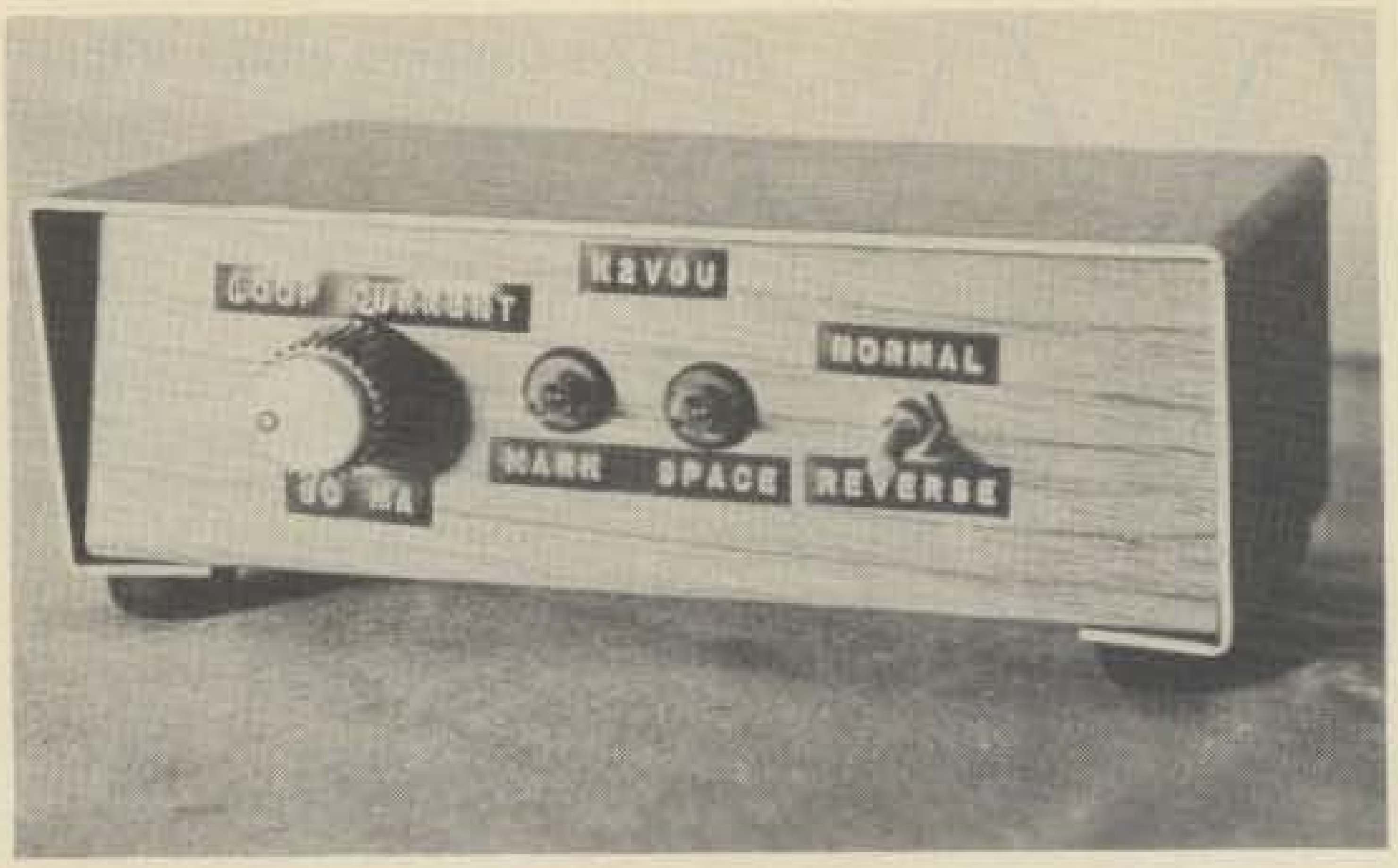
Fig. 21—Simplified keyer circuit.

Figure 16 shows a basic op-amp circuit. R_i is called the input resistance; R_f is called the feedback resistance. The output voltage can be kept at a constant level by assigning the values of R_i and R_f according to the prescription $V_{out} = V_{in} \bullet \frac{R_f}{R_i}$.

The Detector

The *detector* is the stage of the converter which changes the audio tones into d.c. pulses. The two RTTY audio tones are fed into the detector at frequencies of 2125 Hz and 2295 Hz. The input signal type is a.c.; the output signal type is d.c. See fig. 17.

The detector works on the same principle as any diode rectifier. In most detectors, use is made of the one-way conductivity property of solid-state diodes. A closer look at the process of rectification can be made with reference to fig. 18.



Front view of the K2VGU constructed demodulator.

The input signal is a varying voltage, first going positive, then going negative; repeating the process again and again in a short time interval (for a mark tone, 2295 times in one second).

When the injected signal is positive-going at point A (relative to point B) conduction occurs through the diode and the upper half of the input waveform is reproduced at the output. When point A is negative with respect to point B, no conduction occurs, thereby clipping the lower half of the input waveform. The resultant voltage thus produced at the output is positive d.c.

It might be noted that the function of the capacitor is to hold the peak positive voltage value (by charging) until the next positive pulse arrives.

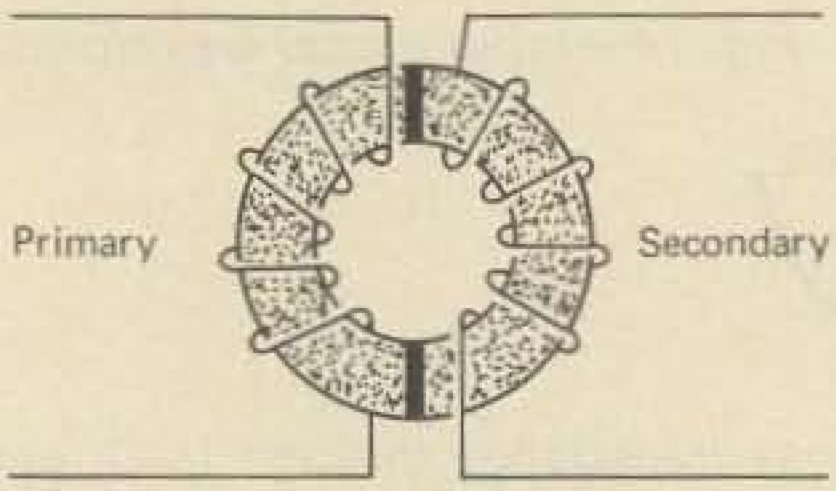


Fig. 23—Illustration of a toroid.

Thus the detector stage completes the basic demodulator function of changing the incoming RTTY tones into d.c. pulses.

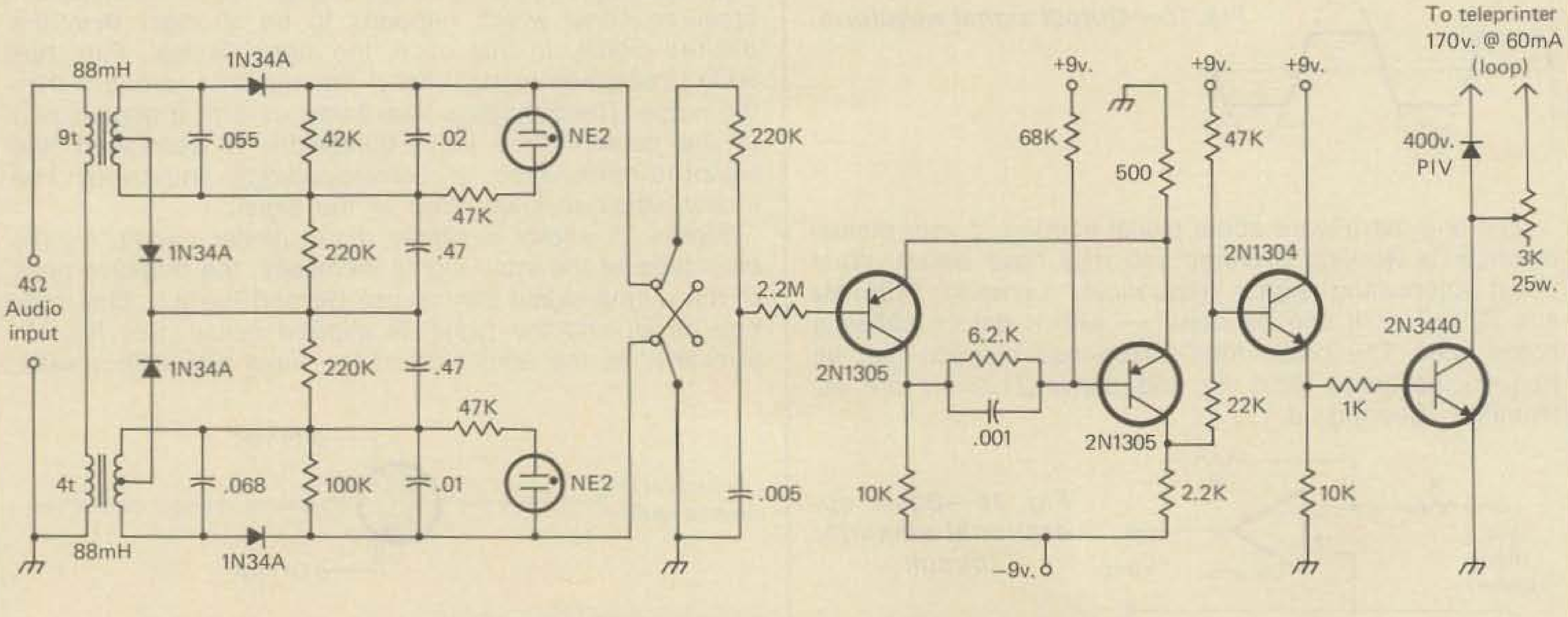


Fig. 22—Schematic diagram of the demodulator.

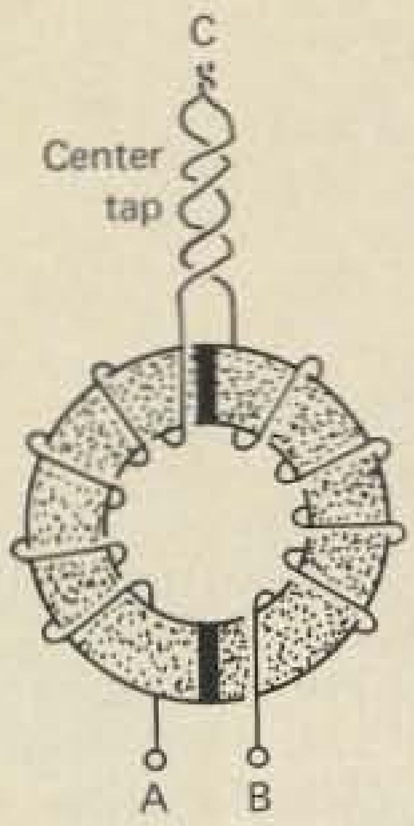


Fig. 24—Wiring a toroid. The inductance between points A and B is 88 mH.

The Keyer

The *keyer* stage of a TU is a switching device, alternately turning the loop supply current to the selector magnets on and off. As was pointed out in the previous article, the keyer acts as a single pole-single throw switch. The required switching conditions are (1) loop current flow for a mark (switch *on*) and (2) no loop current flow for a space (switch *off*). There are several ways of turning the loop current on and off, among them being use of a tube, use of a relay, and use of a transistor. This discussion will consider transistor switching.

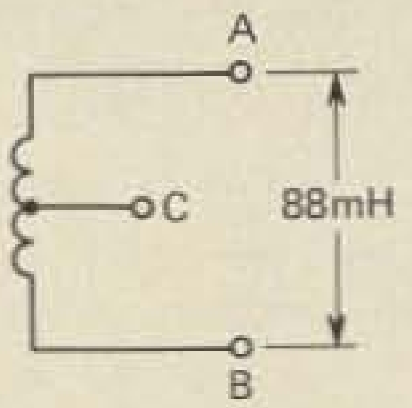


Fig. 25—Schematic diagram of an 88 mH toroid.

The base of a transistor acts as a valve of sorts to current flow from the emitter to the collector of a transistor (very much like the grid's relationship to the cathode and the plate of a vacuum tube). If the base is biased at or beyond cutoff, no current will flow from the emitter to the collector and the transistor acts effecively as an open circuit. See fig. 19.

A transistor is chosen whose cutoff bias corresponds to the voltage of a space pulse. When a space pulse feeds the base, the emitter-collector circuit is open, no current flows and the loop circuit remains open. On the other hand, if the base is fed with a mark pulse (a positive bias), emitter-collector conduction occurs, current flows through the transistor and the loop circuit is closed. See fig. 20.

Mark and space pulses reach the keyer transistor through diodes. See fig. 21. On positive pulses current flows through D_1 only and keys the transistor so that the loop circuit is closed. On negative pulses current flows through D_2 imposing cutoff (or beyond-cutoff) bias of the base, thereby preventing a closed circuit between the emitter and collector; thus opening the loop. Therefore, the selector magnets are activated or not by positive pulses or negative pulses, respectively.

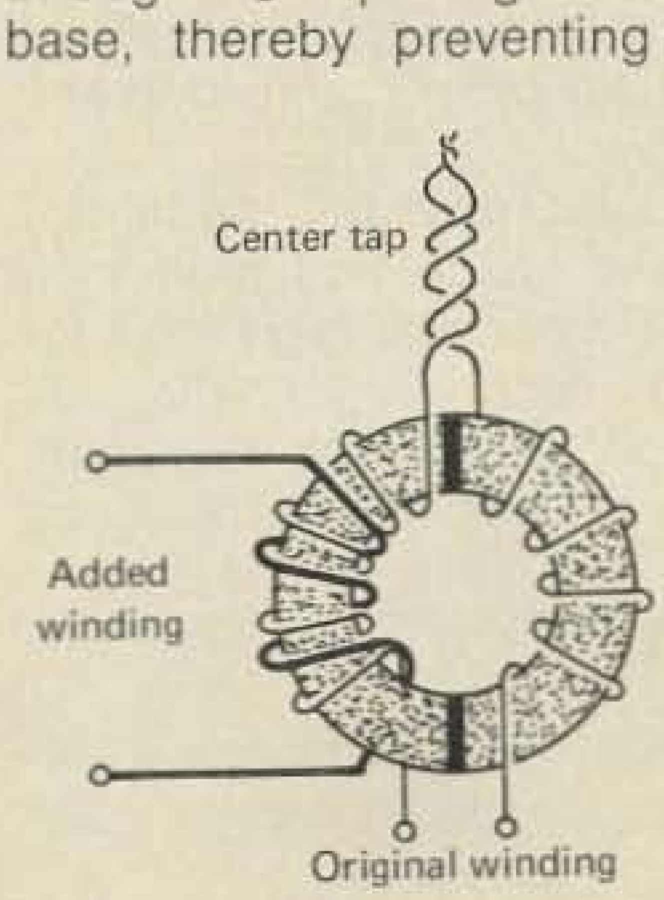
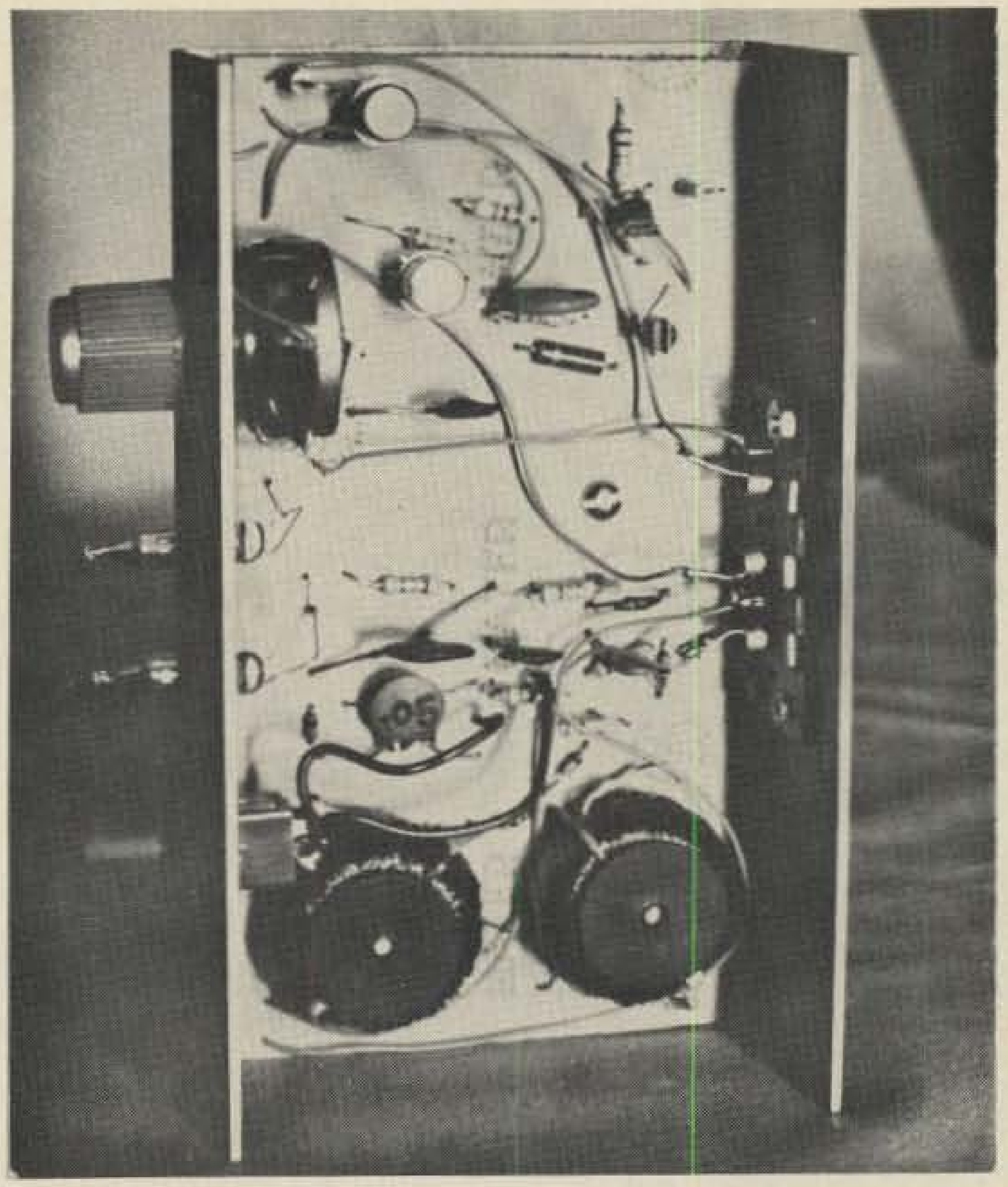


Fig. 26—Adding the coupling link to the toroid.



Interior view showing the two toroids and the point to point wiring that is done on perf board.

The potentiometer is used to balance the positive and negative pulses.

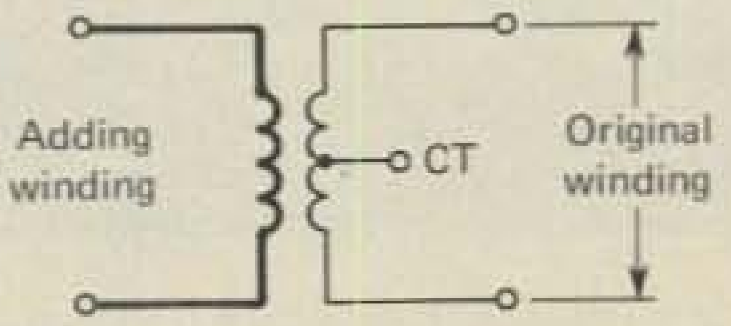
It should be pointed out that the keyer transistor must be a "heavy duty" type, having to key voltages upwards of 170 volts at 60 mA (more than 10 watts).

This completes the detailed functional description of the stages of a basic demodulator. The discussion is by no means comprehensive. In fact, in order to aid in the understanding of the various stages' operation, the circuitry was deliberately pared to the barest essentials. A few of the circuits as presented would not perform well in practical use. Their simplification was an instructional device, not a plan for construction.

Demodulator Construction

The demodulator described in this article (fig. 22) is an adaptation of one previously published.[1] Construction is quite simple and the components are easily obtained. The only parts of the demodulator which may require special attention are the toroids. The ones used in this project are surplus 88 mH toroids. They can be bought very cheaply (about 70 cents each) from various suppliers who advertise in the amateur radio magazines.

Fig. 27—Schematic diagram of the modified toroid.



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[1] *The Teleprinter Handbook* (An RSGB Publication), The Garden City Press, Ltd., Letchworth, Hertfordshire SG6 1JS, Great Britain, 1973, p. 5.11.

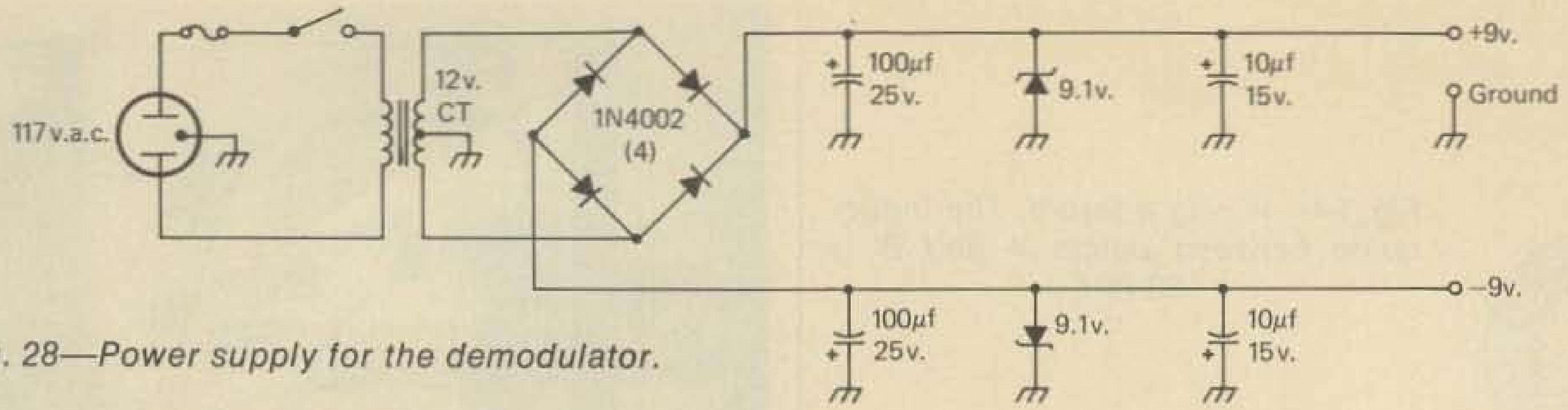
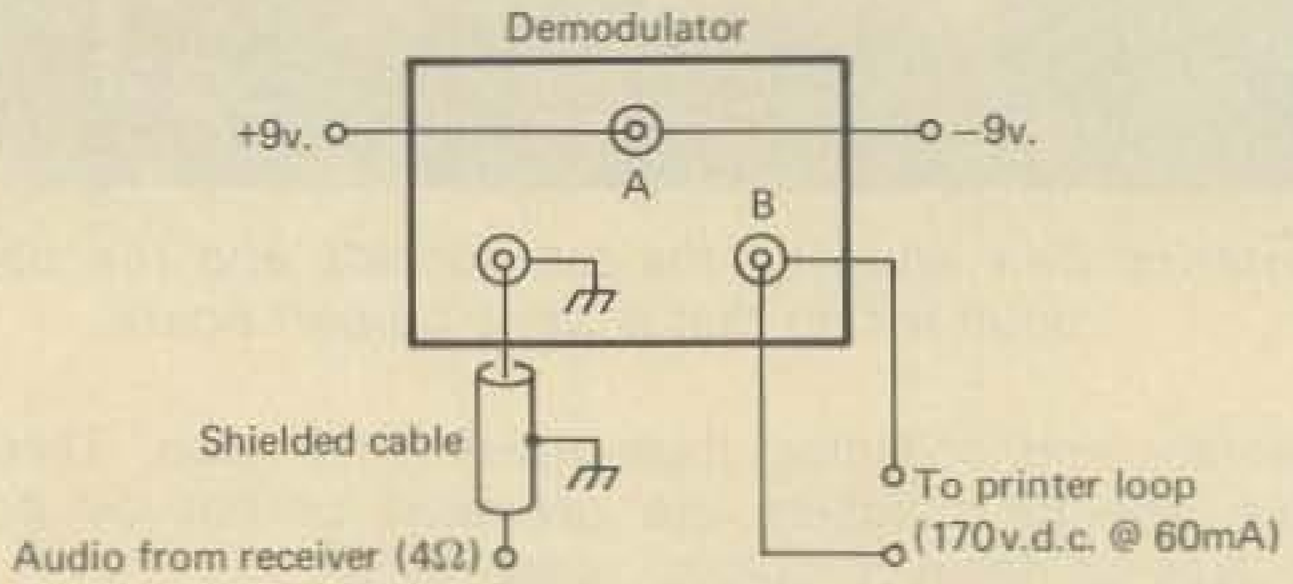


Fig. 28—Power supply for the demodulator.

A toroid is simply a transformer wound on a doughnut-shaped (toroidal) iron core. There are two windings, one on each half of the core. See fig. 23.

One half (either one) is the *primary* and the remaining half is the *secondary*. If one side of the primary winding is connected to one side of the secondary winding the inductance between the two remaining leads approximates 88 mH.

Refer to fig. 24. Here one side of the primary has been joined to one side of the secondary, forming a pigtail at point C. This pigtail is called the **center-tap of the toroid.** The *inductance*, then, between points A and B is 88 mH.



NOTE:
Plug A and plug B *must* be insulated from the chassis.

Fig. 29—Installation of the demodulator.

Figure 25 shows a schematic diagram of fig. 24.

The wire used to wind a toroid is laminated and thus insulated. Before making any solder connections to the toroid it will be necessary to scrape them clean of the laminate. This can be done with the edge of a small knife.

Each of the toroids in the demodulator will require an additional winding. You must supply them. One toroid needs four turns; the other, nine turns. The function of these windings is to couple the receiver audio output to the converter.

The demodulator is shown for a size comparison with a pack of cigarettes.

The additional wire (transformer wire or wire taken from another toroid can be used—but make sure the wire is laminated) must be wound in the same direction as the windings on the toroid. The finished modified toroids should look like fig. 26.

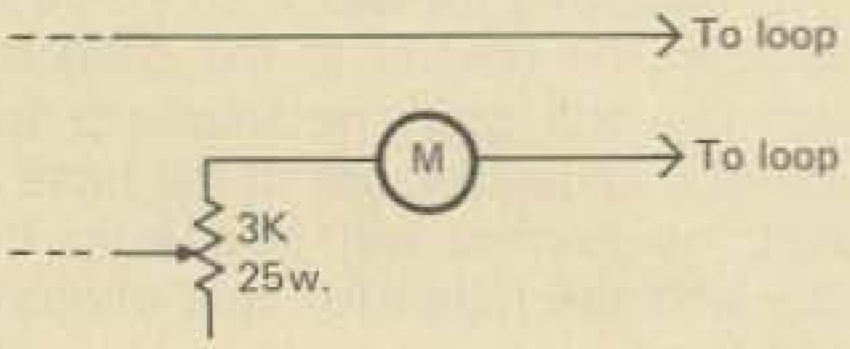
Schematically, the toroids are now represented by fig. 27.

The final result is a transformer whose primary is the added winding and whose center-tapped secondary is the original toroid.

The demodulator can be constructed on a piece of perfboard using point-to-point wiring. The photographs illustrate a possible arrangement of components. However, parts layout is not critical. My demodulator was built into a 2¾ × 6 × 4 inch box.

The TU needs a plus 9 volt d.c. and a minus 9 volt d.c. power supply. Fig. 28 shows one that can be used; or, if available, power can be drawn from an existing piece of equipment.

Fig. 30—Adjusting the loop current. The meter is 0-100 mA.



Installation of the unit is quite simple. The audio output (4 ohms) of the receiver is fed into the TU via shielded cable. The "to printer" leads tie into the loop supply of of the teleprinter. See fig. 29.

The potentiometer is used to adjust current from the loop supply. To get an accurate current draw put a 0 to 100 ma ammeter in series with the loop supply. Refer to fig. 30.

Start the current adjustment at the center of excursion of the pot to avoid transistor burnout.

The converter is sensitive to 170 Hz shift only. Tune across a signal until both the mark and space neon lamps flicker with equal brilliance. The teleprinter should react. Tuning must be done *very slowly*.

The d.p.d.t. switch is a "normal-reverse" switch. It allows copy of either low tone for space and high tone for mark (normal) or low tone for mark and high tone for space (reverse). Most stations send "right-side up" (normal). Some stations, through design or oversight, send "upside-down" (reverse). If copy is garbled, try flipping the switch.

My thanks to Harlan Kramer, WA2HPS, for the fine photography.

The next article will describe various teleprinters available to amateurs and will discuss the mechanics of teleprinter operation.

(To Be Continued)

Here's a closer look at one of the most sought after receivers today. Bill Orr takes us down Memory Lane and back again as we refurbish and use the famous SW-3 receiver.

The National SW-3 Receiver: Revisited

BY WILLIAM I. ORR*, W6SAI

In the July, 1971 issue of *CQ* magazine I wrote a short article about the National SW-3 regenerative receiver[1]. Undoubtedly the story struck a responsive chord as I was inundated with mail from SW-3 owners and amateurs hunting for an SW-3 for their collection (fig. 1). The interest was heart-warming and it is encouraging to see so many amateurs taking an active interest in their heritage and showing a curiosity about some of the marvelous equipment that was manufactured for amateurs during the "Golden Years" of amateur radio.

A side effect of the story of the SW-3 was that the market value of a good SW-3 receiver with coils and power supply shot from a range of approximately thirty-five dollars to well over one hundred dollars in a period

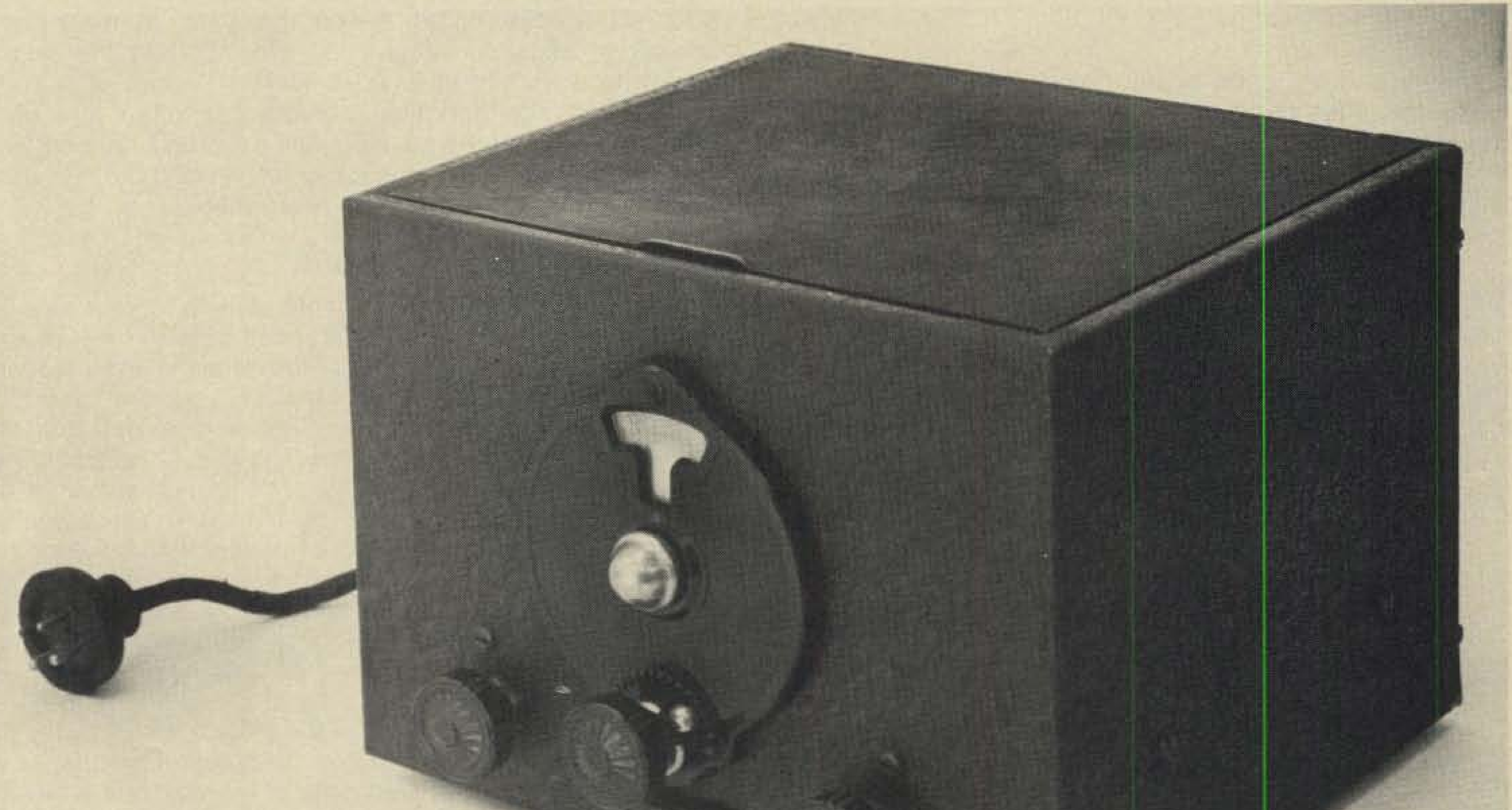


Fig. 1—The popular SW-3 receiver by National Co. This three tube, pre-war beauty is today's hot collector's item. Using plug-in coils, the SW-3 covered all frequencies between 30 MHz and 90 kHz. Panel controls (left to right) are: R-f trim, tuning and regeneration. Below the main tuning dial is the horizontally mounted r-f gain control, calibrated in signal strength units. Receiver required external power supply.

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*48 Campbell Lane, Menlo Park, CA 94025

[1] Orr, "The Year is 1931. National Radio Introduces the SW-3 All-Wave Receiver", *CQ*, July, 1971, pp. 34-38.

SW-3 Coil Chart
General Coverage

Range (kHz)	Universal Model 3	Model 2	Model 1
90-160	42	72	22
150-220	41	71	21
190-280	40	70	20
250-390	39	69	19
320-650	38	68	18 (purple)
500-900	37	67	17 (yellow)
690-1500	36	66	16 (orange)
1500-2700	35	65	15 (blue)
2500-4500	34	64	14 (green)
4200-8000	33	63	13 (white)
7000-12000	32	62	12 (red)
12000-21000	31	61	11 (black)
19000-35000	30	60	10 (brown)

Fig. 2—Coil data for the SW-3 receivers.

of weeks, and the price is still going up!

Ah, well, they don't make 'em anymore and that's the way the Free Enterprise system works, I guess. In any event, in response to many inquiries, here's some additional information about the SW-3 and its many variations.

SW-3 Variations

As explained in my first article, there are three basic models of the SW-3, with three different versions of Model I. In a few words, this is the story:

SW-3 Model I:

Version 1. Uses 35, 35, 27 tubes and color coded coils. Later coils for this receiver were identified as the "10-20" series.

Version 2. As above, but with 36, 36, 37 tubes and B-plus switch for mobile operation. Used "10-20" series coils.

Version 3. Used 30, 30, 32 tubes (1.4 volts d.c.). Used "10-20" series coils.

SW-3 Model II:

Used 58, 58, 56 (2.5 volt) or 6C6, 6C6, 76 (6.3 volt) tubes interchangeably. Used "60-70" series coils.

SW-3 Model III: ("Universal Model")

Used 6J7, 6J7, 6C5 (6.3 volt) or 1N5, 1N5, 1A5 (1.4 volt) tubes interchangeably. Used "30-40" series coils.

Within these broad classifications there seem to exist many receivers which exhibit small differences. There's a "Marine" model that has toggle switches on the panel for filament control and standby. And I've seen SW-3s that have side handles, apparently put on at the factory. And, of course, many owners of SW-3s in the past have modified or otherwise "butchered" their receivers. Many SW-3s were made into preselectors and some even served as the front-end for home-made superhet receivers. So it is wise to examine the SW-3 before you purchase it or you may be in for an unpleasant surprise.

SW-3 Coil Chart
Bandspread

Band	Universal Model 3	Model 2	Model 1
160	30A	60A	10A (brown)
80	34A	64A	14A (green)
40	33A	63A	13A (white)
20	31A	61A	11A (black)
10	30A	60A	10A (brown)

Fig. 3—Bandspread coil data for the SW-3 receivers.

Receiver Coils

A major problem facing today's owner of an SW-3 is a dearth of plug-in coils. An SW-3 without coils is like a ship without sails. And it is difficult to wind your own coils as the SW-3 coil forms and sockets have an odd-ball pin spacing that matches nothing else!

As the years have passed, coils have been lost or rewound for other purposes and it is a rare receiver that has a full set of coils (fig. 2). In fact, many SW-3s never had a full set of coils, for what 1930 amateur had the pocket money to buy coils at $3.00 a set?

Classified ads and flea markets can often turn up a few coils, but Murphy's Law is still valid and the coils you find may not be the proper ones for your type of receiver, as outlined in the chart. What to do then?

Modifying the SW-3 Coils

It is possible to modify available coils to fit your receiver in many cases. The main differences between the various coil sets are the inductance of the primary and feedback (tickler) windings. The older, Model I receivers used low-transconductance tubes which required a detector coil having a high degree of feedback and a large number of turns in the tickler coil to make oscillation possible for code reception. Hence, the color coded (or so-called 10-20) series coils have more feedback turns than the other coil sets. The feedback winding, by the way, is the winding wound in a slot at the bottom end of the coil. The "60-70" series coils have less turns on the feedback winding, and the "30-40" series of coils have slightly less turns than the "60-70" series coils.

There's a small difference in the plate (primary) winding, too, but that is too much bother to adjust. Besides, I can notice no difference between *any* of the coil sets when the feedback winding is properly adjusted.

It is easy to check a set of coils in your receiver. If the feedback winding is correct, the regenerative detector will go into oscillation when the regenerative potentiometer is set at, or near, mid-position when the r.f. resonator control has been peaked for maximum background noise.

Of course, the point of regeneration also depends upon the plate voltage applied to the receiver, and there's a lot of leeway in regeneration adjustment by merely changing the plate voltage from 90 to 150, or perhaps down to 120 volts.

In any event, the tickler coils can be easily rewound,

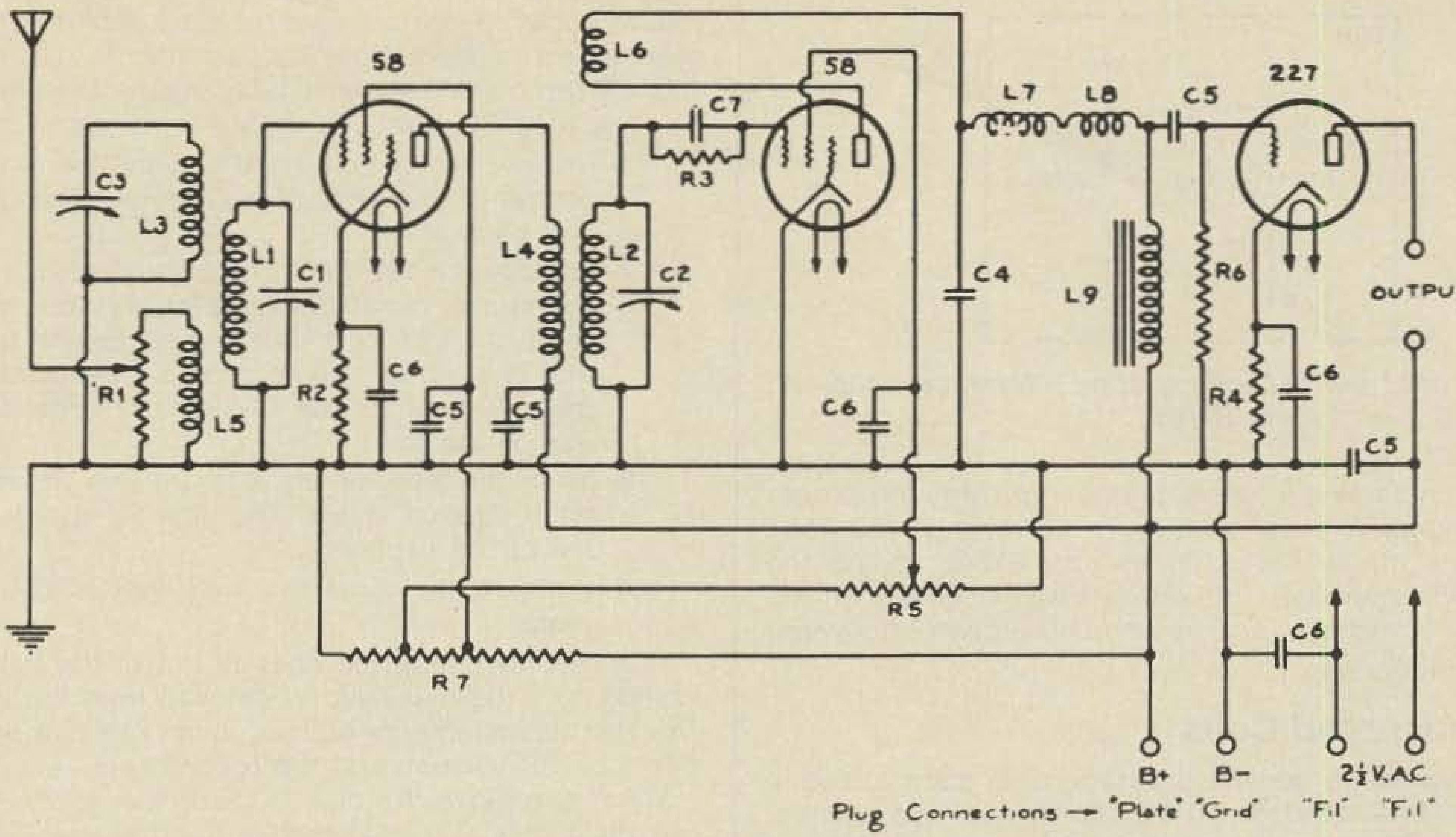


Fig. 4—The a-c model of the SW-3 using 6.3 volt or 2.5 volt glass tubes. This early version of the Model II receiver has the r-f gain control wired as a potentiometer in the antenna circuit. Later models shifted the control to the cathode circuit of the r-f tube so that the operating bias could be increased, dropping the stage gain.

CIRCUIT DIAGRAM OF THE ACSW-3

This receiver employs only a-c tubes, as indicated, and should be selected for complete a-c operation, or for partial a-c operation (using plate batteries) where a 2.5 a-c heater potential will always be available. The circuit constants are as follows —

L_1, L_2, L_3, L_4, L_5 and L_6 — R.F. Transformers.
L_7 — No. 100 Ultra High Frequency R.F. Choke.
L_8 — No. 92 Low Radio Frequency Choke.
L_9 — 700 Henry Choke — Part of S-101 Audio Coupler.
C_1 and C_2 — Ganged S.F.L. 270° Tuning Condensers with isolated rotors. 90-μμf per section.
C_3 — Midget Type Trimmer Condenser — 50-μμf.
C_4 — 250-μμf mica by-pass condenser.
C_5 — .01-μf non-inductive mica fixed condensers.
C_6 — .5-μf non-inductive paper by-pass condenser.
C_7 — 100-μμf small mica grid condenser. Incorporated in Detector R.F. transformer.
R_1 — 3000 ohm potentiometer — special taper — used as gain control.
R_2 — 300 ohm cathode resistor, 2 watt type.
R_3 — 5 megohm detector grid leak.
R_4 — 2000 ohm cathode resistor, 2 watt type.
R_5 — 50,000 ohm potentiometer for regeneration control.
R_6 — 250,000 ohm audio grid resistor — part of S-101 Coupler.
R_7 — Voltage Divider-total resistance 12,000 ohms.

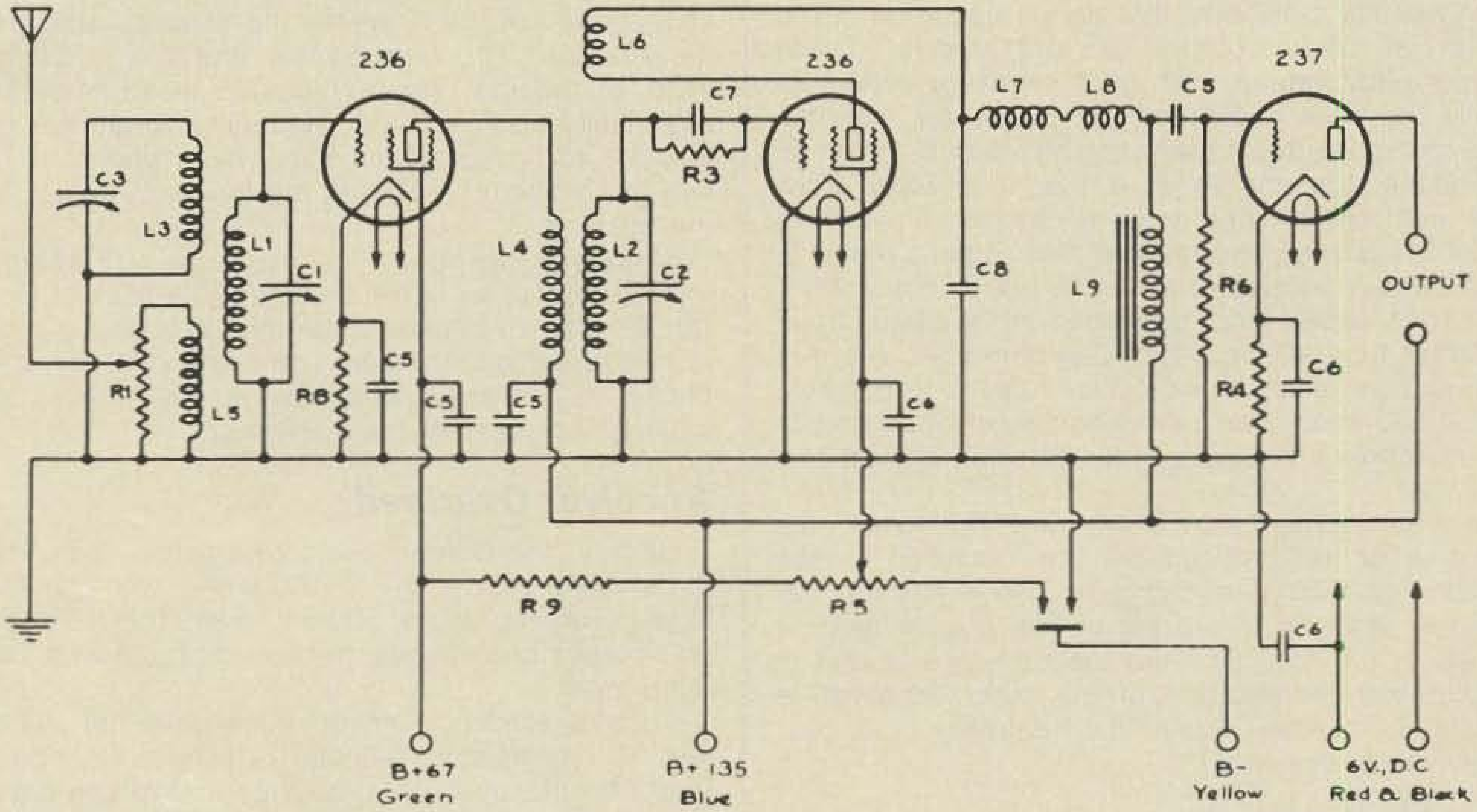


Fig. 5—Circuit of the Model I, version 2 receiver designed for mobile operation or battery operation. Same general circuit as shown in Figure 4 except for addition of a B-plus power switch and the omission of the bleeder resistor for the r-f stage screen supply. A 5-prong power plug is used with this receiver.

CIRCUIT DIAGRAM OF THE DCSW-3

This is the combination circuit which should always be selected when battery operation may be required. It can, however, readily be converted to a-c operation using the standard 235 and 227 tubes. The circuit constants are identical with those indicated in Figure 4, with the following exceptions —

R_8 — 350 ohm resistor.
R_9 — 20,000 ohm 2-watt type resistor.
SW — Regeneration control and cathode circuit switch.

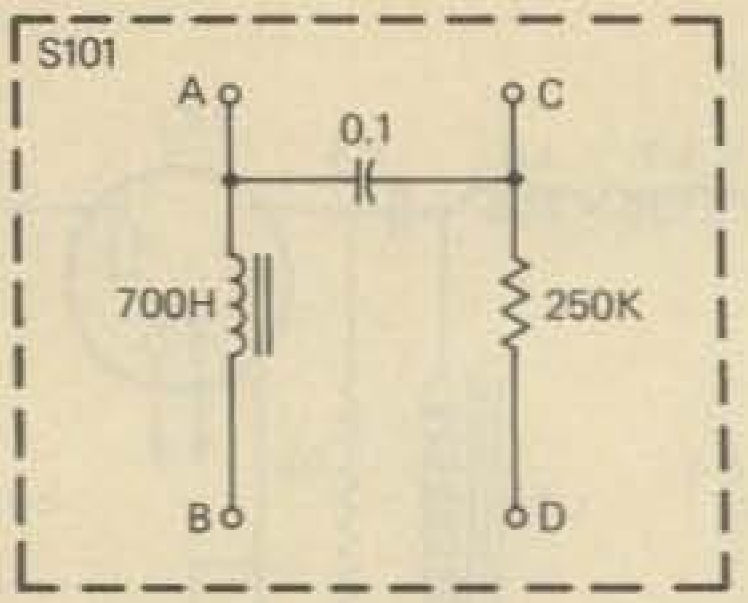


Fig. 6—Interior connections of the "interstage coupler", S-101.

adding or subtracting a turn at a time to provide the proper control settings. A word of warning, however: if you don't want to ruin the resale value of your SW-3, rewind the coils with the same type of wire that was originally on the coil. *(Editor's note: Ho, ho. Try and find green silk covered wire these days!)*

The Bandspread Coils

In addition to the general coverage coils summarized in fig. 2, there exist bandspread coils for the various amateur bands fig. 3. The same remarks concerning the tickler coil may be applied to the bandspread coils Remember, no matter which coils you modify, *make the modification to both coils,* as they are intended to be interchangeable in the detector and r.f. stages of the receiver.

A schematic of the bandspread arrangement is shown in the drawing. You can adjust the exact tuning range of the receiver by means of the variable mica capacitor on the detector coil. And please note that the bandspread coils are unique in that you cannot switch detector and r-f coils back and forth. The detector coil is the one with the mica padding capacitor atop it.

The Long Wave Coils

Fig. 1 shows that coils exist that permit operation of the SW-3 as low as 90 kc (pardon, 90 kHz, that is). These coils are rare birds indeed, and much prized by collectors —especially the coils that cover the 600 meter maritime range. Old timers like to sit and copy ship traffic, for some unknown reason, it seems. Anyhow, the "long wave" coils are a little more cranky, and some of them won't work at all in Model I receivers. The reason? See Figures 4 and 5. In order to sustain oscillation at the very low frequencies, an additional r.f. choke must be placed in the plate circuit of the detector tube. If this choke (L_8) is missing (as it is in early production sets), the detector refuses to oscillate much below 500 kHz. Later production receivers incorporated two r.f. chokes in series and effectively solved this problem.

Even so, after adding the r.f. choke and fiddling with the tickler winding of the detector coil, on occasion I have been completely frustrated trying to make a particular SW-3 perform properly with a set of low frequency coils not matched to the receiver. And the coils are wound in such fashion that modification of the other windings is very difficult. So beware! *Some* low frequency coils may not work in *some* receivers!

Take the SW-3 Apart?

Why not? Some of them are incredibly dirty and should be thoroughly cleaned before operation is accomplished. Outside, the black crackle finish can be cleaned by scrubbing is vigorously with a rough towel dunked in a warm solution of tri-sodium phosphate (TSP at your friendly hardware store). And you can tell if a previous owner was a cigarette or cigar smoker. You'll get a sticky, yellow *guck* off the receiver chassis that smells like a dead ashtray after a New Year's party.

Once the outside is reasonably clean, you are ready to take the receiver apart. These are the steps:

1- Remove the bottom plate and the four sheet metal screws on the sides of the receiver. Remove the lid and back plate.

2- Remove the two front sheet metal screws. Remove the two knobs at the sides of the front panel. Remove the lock nuts on the regeneration potentiometer and the antenna resonating capacitor. Loosen the set screw for the tuning shaft under the center cap on the dial.

3- Inside the receiver, unsolder the two ground lugs on each internal shield. The lugs lie on each side of the tuning capacitor.

4- Unscrew the three tiny nuts that hold the dial in place.

You can now slide the chassis out of the cabinet, first making sure the dial light is removed from the panel clip. The chassis and interior of the cabinet can now be cleaned with the TSP solution and the rough towel.

Want to remove the dail to clean the rotary disc? You can do it now. The dial comes apart if you take off the knob. You'll see that the dial assembly is held together by means of a locking pin on the dial drive shaft. If you remove that..........easy! Watch out! There is a pin-spring-bushing assembly at this point. Study it before you pull the pin. Everything is under tension.

When I took my dial apart the first time I pulled the pin out of the shaft with a long-nose pliers. There was a loud *twang*. The spring and bushing flew out. A nearby window was conveniently open. I watched with open-eyed horror as spring and bushing flew out the window into the yard. It took a good 15 minutes of painstaking search to find the spring and bushing. In fact an ant was already hauling the bushing off to feed it to its offspring!

Keep track of all loose hardware! Once everything is in ship-shape you can reverse the process and reassemble the receiver. Oh, yes! Notice that the condenser drive shaft of the dial has a phenolic insert and the dial is electrically insulated from the tuning condenser shaft. This is done to reduce dial noise, which can show up when two ground returns exist in the tuning system. *Don't* loose this bushing.

While you are at it, you might as well check out the interstage coupler in the tin can at the back of the receiver (fig. 6.) Use an ohmmeter for this. In fact, it is a good idea to measure this unit *before* you buy an SW-3. If the primary choke (L_9) is open, you have a problem, as they ain't making replacement parts anymore!

Receiver Overload

Back in the Golden Years of amateur radio most amateurs ran inputs of 10 to 100 watts, with the majority of signals running at the 50 watt level. The "California Kilowatt" was not unknown, to be sure, but it was a very subdued beast.

Today's electronic environment does not suit the SW-3 well. A regenerative detector is very susceptible to overload and the overload capability and strong signal rejection of the SW-3 are poor compared to today's modern receiver. The worst thing you can do to your SW-3 is to hook it on to your beam antenna. The receiver will choke on the strong signals of 1978.

A good antenna for the SW-3 consists simply of about 20 to 30 feet of wire, high and in the clear. Use a good

(Continued on page 75)

CQ World-Wide WPX/SSB Contest All-Time Records

By BERNIE WELCH, W8IMZ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be up-dated and published annually. The method of computing final scores changed several times since 1957.
Data following the calls listed below is: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	XJ3FFA ('76)	31,416	77
3.5	YY4YC ('76)	739,468	223
7.0	CT4AT ('77)	1,212,070	305
14	PJ9JR ('71)	2,385,192	348
21	W3AU ('71)	1,435,230	333
28	KG6AQY ('70)	1,096,275	235
AB	PJ9JR ('70)	2,972,826	317

Multi-Operator Single Xmtr

4J9B ('77)	5,201,056	434

Multi-Operator Multi-Xmtr

CJ3DCB ('77)	6,688,860	460

AFRICA

1.8	No Entrant		
3.5	No Entrant		
7.0	ZD8CS ('72)	40,230	45
14	CQ6LF ('73)	1,138,047	309
21	XX6OZ ('75)	1,247.145	305
28	5Z4LS ('70)	1,059,723	267
AB	EA8CR ('75)	2,173,824	384

ASIA

1.8	No Entrant		
3.5	4X4DK ('71)	478,950	155
7.0	JA2BAY ('77)	195,160	140
14	UK9ABA ('71)	1,740,020	361
21	4Z4QC ('71)	889,592	242
28	5B4IS ('72)	511,100	220
AB	UW9AF ('75)	2,580,626	389

EUROPE

1.8	DL8PC ('75)	6,468	33
3.5	DM2DUK ('76)	526,750	245
7.0	CT4AT ('77)	1,212,070	305
14	OI2BA ('77)	1,571,140	340
21	OH2BR ('71)	695,520	207
28	IR0ZV ('70)	338,829	159
AB	GC3UML ('70)	1,628,556	339

Multi-Op Single Xmtr

AF	CR4BC ('70)	2,100,526	331
AS	4J9B ('77)	5,201,056	434
EU	CT4AT ('76)	3,250,544	484
NA	KP4AST ('77)	3,547,776	384
O	5W1AZ ('76)	3,114,315	295
SA	PJ9JR ('74)	4,543,618	347

NORTH AMERICA

1.8	XJ3FFA ('76)	31,416	77
3.5	W1CF ('77)	460,908	186
7.0	W4BRB/C6A ('76)	911,302	213
14	KV4FZ ('70)	2,031,246	343
21	W3AU ('71)	1,435,230	333
28	K5MDX ('70)	493,929	280
AB	VJ2G ('76)	2,054,308	388

OCEANIA

1.8	No Entrant		
3.5	VK3XB ('75)	540	10
7.0	ZL4BO ('73)	187,884	102
14	DU1FH ('71)	1,264,640	260
21	KG6AQY ('71)	930,936	158
28	KG6AQY ('70)	1,096,275	235
AB	VK9GN ('70)	2,057,160	316

SOUTH AMERICA

1.8	No Entrant		
3.5	YY4YC ('76)	739,468	223
7.0	YV5CVE ('76)	671,160	255
14	PJ9JR ('71)	2,385,192	348
21	PT2ZBS ('75)	1,283,840	256
28	ZV2DFR ('70)	1,010,814	246
AB	PJ9JR ('70)	2,972,826	317

Multi-Op Multi-Xmtr

AF	9E3USA ('69)	2,398,192	296
AS	4X4GV ('72)	6,036,175	415
EU	OF1AA ('77)	4,458,636	468
NA	CJ3DCB ('77)	6,688,860	460
O	KH6GLU ('68)	394,869	129
SA	CE6CA ('69)	3,341,180	340

WPX (Prefix) RECORD
DK2BI ('76) 517

CLUB RECORD — **QRPp RECORD**

(Beginning with the 1978 WPX Contest)

CQ WORLD-WIDE WPX/SSB CONTEST ALL-TIME U.S.A. RECORD HOLDERS

Single Operator

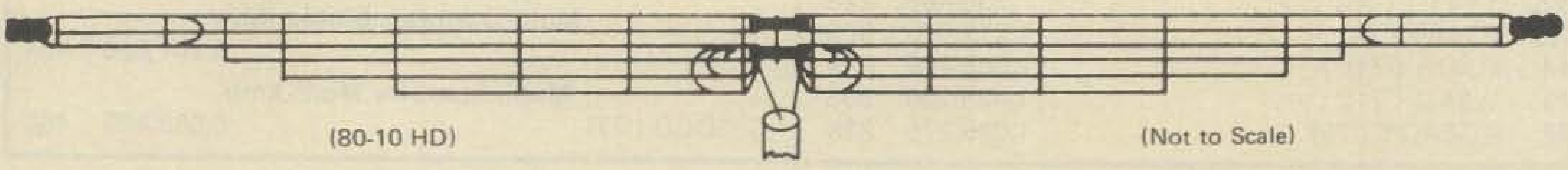
1.8	W8LRL ('77)	2,800	40
3.5	W1CF ('77)	460,908	186
7.0	K6JAN ('75)	270,972	117
14	K4VX ('75)	943,824	336
21	W3AU ('71)	1,435,230	333
28	K5MDX ('70)	493,929	280
AB	W5QQQ/7 ('72)	1,741,285	301

Multi-Op Single Xmtr

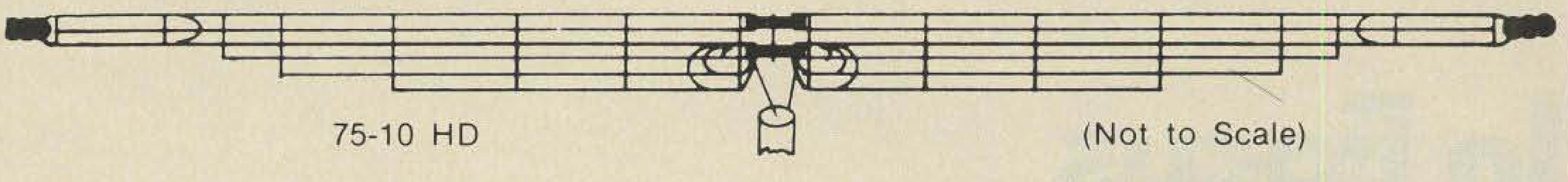
WA3HRV ('72)	2,359,816	388

Multi-Op Multi-Xmtr

WB6GFJ/6 ('72)	1,745,272	269


(80-10 HD)
(Not to Scale)

half size · full performance multi-band HF communications antennas



75-10 HD (Not to Scale)

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■ All models above are furnished with crimp/solder lugs.

■ All models can be furnished with a SO-239 female coaxial connector at additional cost. The SO-239 mates with the standard PL-259 male coaxial cable connector. To order this factory installed option, add the letter 'A' after the model number. Example: 40-20 HD/A.

■ 75 meter models are factory tuned to resonate at 3950 kHz. (SP) models are factory tuned to resonate at 3800 kHz. 80 meter models are factory tuned to resonate at 3650 kHz. See VSWR curves for other resonance data.

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80-40 HD	80/40 + 15	57.50	41/1.15	69/21.0
75-40 HD	75/40	55.00	40/1.12	66/20.1
75-40 HD (SP)	75/40	57.50	40/1.12	66/20.1
75-20 HD	75/40/20	66.50	44/1.23	66/20.1
75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
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a monthly feature by

BILL DEWITT, W2DD

In Focus

Television on the Amateur bands

Newsflash—Cop's Writing A Book!

CQ readers of long-standing will remember "Cop's Column" written by Copthorne Macdonald, now VE1BFL, inventor of our amateur system of slow scan television. For the benefit of the many amateurs who have inquired about Cop's current activities, I'm pleased to report that he is at work on a book. A book on SSTV? No, he says that the book is totally non-technical and will be concerned with those perennial biggies: "What is going on?"—"What's it all about?"—and, What am I to do?" My (unrequested) suggestion for a title would be, *Cop On Cope!* In any event, I'm sure that the book will be a darned good one and you can bet that W2DD will have the first copy available in this neck of the woods.

Cop's on the air as frequently as possible with his SB-104 and Venus SSTV gear. As you can see in fig. 1, his station is very compact. Cop says that it HAS to be compact because it is in a closet!

Some SSTV History—Or, Slow Scan Comes Of Age

Starting this month, and for the next few months, "In Focus" will include a review of how Cop Macdonald got SSTV under way. I believe that many newcomers to slow scan will welcome these vignettes of how the system started and how its standards were set.

With amateur slow scan television in its twenty-first year of existence, now seems an appropriate time to review the beginnings of this fast growing phase of amateur radio.

Fig. 1—Versatile Cop Macdonald, VE1BFL, has temporarily deserted the electronics field and is hard at work on a non-technical book. See text for details. Cop's shown here in his "compact closet" shack.

Fig. 2—Dex Phibbs, W4IPA, looks pretty relaxed and ready for a QSO on v.h.f., h.f., or maybe smoke signals. Here's hoping that the photographer's flash bulb didn't burn the camera vidicon when this picture was taken!

Perspective—"Cop" Macdonald, A Young Inventor

To add perspective, let's take a look at a much younger Copthorne Macdonald. When Cop was five years old, his father gave him a crystal set. The interest in radio sparked by that gift led to Cop securing his first amateur license (W9OLS) at the age of fifteen. At this point, Cop's interest in amateur radio was rather broad. However, during his early years in college he developed a particular interest in picture transmission modes of communication. He felt that there was a need for a system that could be used by amateurs to exchange pictures on a worldwide basis. *(Note from W2DD—what a wonderful gift that crystal set was!)*

An Electrical Engineering Junior Does A Feasibility Study

It was in 1957 that Macdonald started his work that resulted in today's SSTV standards and practices. Macdonald, then a University of Kentucky Junior in Electrical Engineering, had a well-organized approach to his goal of an amateur picture transmission system. He described his efforts in a recent letter as follows:

"In 1957, I did a feasibility study starting with a literature search and including such fun things as masking off a 120 line square window on a regular TV set to see if the resolution was good enough for anything. (Conclusion, it was!) Anyway, I wrote all this up in the enclosed report and sent a copy to George Grammer who was then Technical Director of the league. You'll see on Page 1 of the report that ACTUALLY COMMUNICATING with the mode was the dream behind the whole project!"

In 1957 It Was "Narrow Band Television"!

Here's the very potent first paragraph of Macdonald's feasibility study report and it does indeed spell out the potential benefits, values, and usefulness of what he then called "Narrow Band Television":

"World wide amateur television, the dream of two generations of hams, is today not only a technical possibility, but also an economic one. From its earliest days, the great potential of amateur TV has been seen. Seeing the person you are talking to, his family, home, and community, as well as slides of the interesting places he has been and the things he has done, would add immeasurably to the enjoyment of a contact, and would inevit-

Fig. 3—Photographic cards are most appropriate for the video-minded amateur. This card showing John Groezinger's station, WB9OGS is simple but effective.

---

*2112 Turk Hill Road, Fairport, N.Y. 14450

ably promote better inter-regional and international understanding. In addition to the personal benefits gained by the individual amateur, the community stands to benefit. Amateur TV provides means for greatly enhancing the personal talks between servicemen and the folks at home, and between friends and relatives in different parts of the country which are carried on by amateur radio. The ability of a long distance amateur system to transmit charts, maps, and similar material could prove valuable in an emergency situation. In short, a long distance TV system would be a valuable addition to the amateur program."


Fig. 4—A recent picture of Stefan Redei's station, YO2BGP. Stefan is still anxious to transmit SSTV but the regulations say "No". Slow scanners everywhere are hoping for a change!

Thus, in one long but coherent paragraph, Cop Macdonald stated the possibilities for amateur slow scan television.

Simplicity A Goal, Cost A Consideration

Macdonald did not ignore costs. We accept our present methods and procedures as "Standard Operating Procedures"—but remember, at some point, somebody had to decide, *"That's* the way it's going to be!" Here's another excerpt from Cop's report that shows his perception of how to insure simplicity and low cost. Remember, this is the inventor's concept, the year, 1957.

"—The ever guiding principle must be to use, as much as possible, the equipment already in the amateur station. This, of course, will mean that the station's transmitter and receiver will be used for video as well as for audio. The video equipment should be adaptable to the receiver and transmitter without complicated engineering of each installation or extensive changes in the transmitter or receiver. Ideally, the image pick-up and reproduction units would simply plug into the microphone jack of the transmitter and the phones jack of the receiver, and as will be shown, this is entirely possible with certain system standards." Right on! It's fortunate to say the least, that Macdonald's concept of adaptability to equipment designed for voice (s.s.b.) operation has survived the years. If special and separate receiving and transmitting gear had been required, it's a foregone conclusion that SSTV would have died long ago!

Next Month, More On Early SSTV

How Macdonald handled the technical considerations of SSTV, his first approach to a practical system, and A.R.R.L. reaction to his ideas will be covered in next month's issue.

Computers? Computers!

Clayt Abrams, K6AEP, and Mike

Fig. 5—Test pattern from DZ1AT as seen on YO2BGP's monitor.

Fig. 6—W5DFU's workshop BEFORE its recent renovation.

Tallent, W6MXV, have teamed up on a pair of projects of great interest to all slow scanners. Mike is designing the hardware of a new scan converter which will include some computer interface ports. Clayt will take the digital video from these ports, "process it", and then ship it back to the scan converter. Clayt has written programs for 6800 and 8080/Z8070 to "enhance" video in the microprecessor. The programs are aimed at the SWTPC computer system. When all is complete and checked out, Clayt will be selling the SSTV picture enhancement program for a nominal price.

According to a recent letter, here are the types of things you can expect to accomplish with the enhancement program: Place a received picture in the memory of the computer; Make an improvement in contrast of received pictures; Convert a received picture to the binary state (just blacks and whites); Convert a received picture to a negative; Zoom in on 5 locations on the picture in computer memory, magnification will be 2 times; Re-transmit received pictures without enhancement; Remove random noise. Receiving successive pictures reduces noise by the square root of the number of pictures received; Produce hard copy of an SSTV picture in memory using ASCII characters for the 16 gray levels of SSTV picture.

Clayt and Mike really have "something going" here that represents an excellent combination of microprocessor capabilities and a real need of the SSTV system. If you wish further details on either the hardware or programs described, please direct your enquiries to either W6MXV or K6AEP.

Fig. 7—Combined hamshack and workshop of W5DFU AFTER its re-design and renovation.

Kit And PC Board Availability

In answer to many letters asking about kits related to SSTV, here's my latest information: W6MXV still has PC boards and kits for BOTH the W6MXV P-7 type monitor and the fast-to-slow scan converter accepting inputs from any conventional fast scan camera and outputting SSTV.

Select Circuits, operated by Russ Sievert, W8OZA, and Len Butsch, K4CNP, have a wide variety of kits. They too have the fast-to-slow scan conversion kit for use with a fast scan camera but may discontinue it after present supplies are gone. They stock PC boards for the W0LMD keyboard and W0LMD scan converter and complete kits for the Morse-A-Letter device designed by famous slow scanner WB9LVI.

Fig. 8—Warren Weldon, W5DFU, enjoying the fruits of his efforts in re-modeling his shack! Trophy at the left is A5 Magazine's Award for outstanding achievements.

For prices and other details on PC boards and kits, *please* contact W6-MXV, W8OZA, or K4CNP directly.

Two Well-Equipped SSTV Stations, W4IPA And WB9OGS

The stations of Dexter Phibbs, W4IPA, of Chesapeake, Va., and John Groezinger, WB9OGS, of Peoria, Ill. are pictured in figs. 2 and 3 respectively.

Although Dex built his first monitor from scratch (and it still works perfectly!) he is now using Robot gear. Judging by the picture, Dex is well-equipped for v.h.f. as well as h.f. operation.

As you can see from the other photo, WB9OGS uses a photographic QSL card, and it's a good one! Seems appropriate for a video-oriented amateur to have a pictorial card, doesn't it?

Thanks to Dex and John for sharing these fine pictures with "IN FOCUS" readers.

More Pix Of YO2BGP

Courtesy of George Pataki, WB2-AQC, we are able to bring you a more recent picture of Stefan Redei, YO2-BGP than that shown in our December issue. Stefan still does not have permission to transmit SSTV but is enjoying the reception of slow scan pictures very much. You can see in fig. 4 that for someone who started in amateur radio rather late in life, Stefan has garnered his share of equipment! In fig. 5, a test pattern from DZ1AT demonstrates the fine quality pictures that Stefan is getting on his Robot 70 monitor.

Pictures We Couldn't Resist Department

Down in Tulsa, Okla., Warren Weldon, W5DFU, keeps making the news with prize winning gear, a letter of commendation from the White House, and just lately, acquiring *A5 Magazine's* award for "Outstanding achievements in serving the public interest of the community."

In my opinion, Warren is eligible for yet another award. Fig. 6 shows how his workshop used to look. Figs. 7 and 8 show how his combined "shack" and workshop look NOW. Anyone who can accomplish that kind of a transformation deserves at least a gold medal. Congratulations on your achievements and your new quarters, Warren!

10 Meter Slow Scan Anyone?

Bobby Hargis, W6WDL, of Glendora, CA. writes that she is Net Control of the 10 meter net on Mondays. The net meets at 22:00 Z. and 02:00 Z on approximately 28.680 MHz. With propagation on 10 starting to pick up here's your chance to avoid the 20 meter QRM. Why not join Bobby and the net for some good SSTV picture exchanges on this little used band?

From Down Under, A Letter From VK2NM

Len Pollack, VK2NM, of Mount Druitt, N.S.W. is active on SSTV with home-brewed gear. Len built his own fast scan camera, a sampling converter, an SSTV keyboard, and solid state monitor. His next project will be a slow-to-fast scan converter. According to Len's letter, his contacts with Ws have been minimal recently. If you're looking for a VK contact, you'll find VK2NM on 20 when it's open.

Final-Final

Thanks again for the many letters and photographs. Please keep them coming, and, if you have a "pet" SSTV project, why not write it up and submit it for possible publication in *CQ's* pages? Please address your letters to that same old hilltop address, 2112 Turk Hill Road, Fairport, N.Y. 14450.

73, Bill, W2DD

Add SSTV for $695

$695! That's all it costs to add a total new dimension of activity to your station.* That's the price of the Robot Model 400 Converter, that converts the SSTV signal picked up by your transceiver to a video image on your home TV set.

SSTV contacts are easy to make, since there are over 3000 SSTV stations already operating in over 100 radio countries, and the list is growing daily.

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DX'ing is a whole new ballgame on SSTV. You can actually see the fellow you're working, as well as his station, his equipment, even his family. SSTV is a very personal communication, and with over 100 countries to work, the challenge is definitely there.

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We've assembled a whole package of literature on SSTV, including reprints of magazine articles, data sheets on our equipment, and our new 8 page brochure on SSTV. Just drop us a note and we'll send your SSTV Fact Pack by return mail.

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a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Part 4 of 5

Amateur Radio Station Tips

Equipment Installation

Stacking

New amateurs often stack their station equipment into one pile. This approach may look impressive but it is a poor way to arrange a station. For one thing, equipment cooling is reduced when hot units are stacked on top of each other. A more important argument against stacking is that it is more difficult to use equipment that is not set down on the surface of the operating position. It is particularly important to have the receiver down where its controls can be used without lifting your arm off the table. Receiver controls are used much more often than the controls on the rest of the station equipment. In addition to locating all gear at the level of the operating surface and positioning everything within easy reach, it is also helpful to tilt each unit up in front to provide improved viewing of controls, meters, and dials. Some equipment has lifters installed to tilt up the front panel but you usually have to customize your installation to obtain good front panel visibility.

Custom Consoles

Some new amateurs customize their stations by building operating consoles to house their equipment. I have seen some very well made station consoles but I have never seen one that is as pleasant to use as when the gear is set on the operating surface of a table or desk. One problem related to customized station consoles is that amateurs do change equipment and it can be a major job to revise a custom console to house different equipment. I have noticed that very few custom consoles provide adequate cooling and installed gear runs hotter than is necessary. It is also easier to make and change rear apron connections on equipment that is not mounted in a console. The major point against installing equipment in a customized console is that it is harder to use. Operating comfort and ease are important factors that can contribute to successful operating results.

Safety

Be sure you install a completely safe station. If you use a receiver and transmitter combination, do not leave the antenna changeover voltage (usually 115 vac) exposed at relay coil terminals. Tape (or otherwise cover) over all exposed points that may present an electrical hazard to your family, pets, or yourself. Children and pets are naturally curious and it is up to you to make it impossible for them to receive an electric shock from anything external to your equipment. One side of the keying lead is usually connected to the chassis (ground) of the transmitter and this wire should be attached to the terminal that connects to the base of the key. This ground lead connects to the barrel of the key plug and it is easy to trace keying leads to make sure the transmitter chassis is connected to the base of the key. Erect your antennas so that they cannot come in contact with electric power lines if they do come down. It is a good idea to take a first aid course to learn how to help anyone who suffers an electric shock.

Here is Johnny Sherrod (WH4LEH) of Belleview, Florida at his operating position. Johnny says he enjoys listening to the various ways code characters are sent by different operators.

Electric Power

The electric power requirements of most initial amateur radio stations are not high. One can normally plug gear into nearby house power sockets and have no problem sharing a circuit with household electrical and electronic devices.

If you want to customize your station's electric power input, there are several good power line strips available which allow you to power all your station equipment through a separate fuse and includes a switch used to turn all station power on or off at once. These power strips use a single plug connection to the house electric power wall socket. Several ac power receptacles are mounted on the strip and station equipment ac power cords are plugged into these strip receptacles. An indicator lamp is usually included in these strips to indicate whether power is, or is not, available at its outlets. It is not necessary to install this type of electric power input control in a station, but many amateurs like to add this feature. When using one of these strips, it is common practice to leave all required equipment power switches in the on position at all times, and to simply turn the whole station on and off with the switch on the power line strip. Use of a strip also minimizes the messy appearance related to many power cords extended to remote wall sockets. It is certainly better to install a power strip than to use extension cords and cube taps (multiple outlets) neither of which is safe to use.

---

*2814 Empire Ave., Burbank, California 91504.

RF Ground

It is important to establish an excellent rf ground for your station and this is the one thing I usually find lacking in new stations. Grounding has been covered very well in magazine articles published during the past few years and this article will just mention a few major facts that you should know.

Do not assume that you have an adequate station ground simply because you have connected a large diameter wire between your equipment and some assumed ground point such as the electric power ground or a cold water pipe. Suitable rf grounds seldom exist where they are needed and one usually has to be carefully established for each station. Your home's electric power ground can be more than adequate at the 60 Hertz house power frequency and still be very poor at the much higher frequencies you will be operating. House power electrical grounds are occasionally found to provide an adequate rf ground but this seldom occurs.

Some amateurs greatly overrate the rf grounding capability of cold water pipes. Even if your house has good metal piping, it very seldom provides an adequate rf ground. When a station ground is attached to a cold water pipe, (usually with a C-clamp) just that one section of pipe is normally trying to function as the rf ground, because each pipe is quite well insulated from the rest of the pipes and fittings by sealant and dirt, at each joint. Good rf grounds are often obtained by soldering or clamping a suitable ground line to copper tubing used to supply water to lawn sprinklers. There should be no water in it when a ground lead is soldered to such a copper tubing.

It can be effective to bury pairs of quarter-wave dipoles in the ground to function as an rf ground. This amounts to burying a dipole antenna for each band to be operated. This system requires more space than most amateurs have available.

The majority of amateurs find that the simplest way to establish a good rf ground is to install about a six foot long ground rod as close as possible to where the equipment is to be operated. Use a heavy duty (3/8 inch diameter, minimum) ground rod with a steel center (for mechanical strength) and an outer copper coating (for electrical conductivity). Make the area where the ground rod is to be installed electrically conductive with copper or some similar material.

Once the rf has been established, use a piece of heavy duty ground braid to interconnect the ground post (chassis) of the transmitter (or transceiver) to the rf ground. A piece of wire that is electrically a quarter-wavelength long can act like an insulator; consequently, no size of wire can be depended upon to function properly as an rf ground line at all frequencies related to the operation of an amateur radio station. It is best to use ground braid for all ground connections and all other station equipment should be connected to the transmitter (or transceiver) ground post, where the external station ground is attached. Good ground braid is not cheap and one way to get it at a lower cost is to strip the shield off old (scrap) coaxial cable. It is easy to strip shielding off scrap coax. Just use a razor blade or a sharp knife to slice the outer protective jacket of unarmored coax and the jacket can then be pulled off very easily. Then, just loosen the shield off the inner conductor by bunching (pushing) it from one end towards the other end. It is easy to strip up to 100 feet of coax at a time and the removed shield serves as an excellent ground line. Ground braid can be purchased from electronic distributors but the cost is high. The best way to make ground braid connections is to flatten out one end of the ground braid and to open up an attachment hole (with a pencil or similar object) to fit the associated ground lug or screw. Once the correct size hole has been made in the end of the ground braid solder the area around this hole, using a heavy duty soldering iron or gun. The soldered braid end, with the attachment hole, provides a very good electrical and mechanical connection. Station equipment must be connected to a single good ground point to eliminate any possibility of electric shock hazards existing between different pieces of gear. A good rf ground also provides improved station performance. As an example, your transmitter and receiver circuits bypass many kinds of energy to the chassis and an rf ground is required to hold the chassis at (or close to) a zero voltage potential.

Antennas

Directional Antennas

The long range (DX) performance of a good directional antenna such as a beam or a quad is much better than the performance provided by an omnidirectional (nondirectional) antenna such as a vertical. Simply stated, a good directional antenna enables one to work stations that may not even be heard when using an omnidirectional antenna. This article will not cover radio wave propagation factors such as MUF (maximum usable frequency), FOT (frequency of optimum transmission), or fire (transmit and receive) angles since they are parts of a different subject. Just understand that the difference between using a directional antenna with a low angle of radiation, and using an omnidirectional antenna with a high angle (35 degrees, or more) of radiation, is roughly the same as the difference between flying or walking across our country. You'll probably reach your objective either way but you'll be able to do it a lot easier and more often with the directional antenna.

Dipoles

It can take a long time to complete the installation of a really good antenna system that provides optimum reception and transmission on the desired bands. Many Novices erect a simple and inexpensive antenna to get on the air while they are completing a much better antenna installation. It has been my experience that the first antenna erected by most Novices is a 40 meter dipole. The 40 meter dipole is a reasonable choice in this situation since it provides both 40 and 15 meter operation with a reasonably short (66 feet) length. The directivity of a dipole is not as pronounced as it appears to be in the text books. A dipole does have maximum reception and transmission capabilities broadside, (fore and aft) but it is common to work stations off the ends of a dipole. The dipole antenna has a high fire angle which can cause a higher band to be unusable with a dipole when it is good with a low angle antenna. It is normal for an amateur using a dipole on 10 or 15 meters to think there is something wrong with the receiver when other amateurs are heard working stations not even heard with the dipole.

Despite its shortcomings, the dipole is still a useful antenna. It is inexpensive and easy to install and it does let one get on the air with minimum delay.

The most suitable antenna wire is copperweld, which has a steel center for structural strength and a copper outer coating to provide excellent electrical conductivity. This wire holds its length very well, which is more than can be said for the stranded copper wire often used by beginners. A major problem related to using copperweld is that it is usually just available from the best suppliers. Due to its stiffness, it is not advisable to use larger gauges (10, 12, or 14) of copperweld. I have found that 16 and 18 gauge copperweld are satisfactory for use in amateur antennas. It is not good to use multi-stranded copper wire to construct Novice antennas. A major problem related to using this copper wire is that it will stretch as the antenna is subjected to strain, and this lowers the resonant frequency at which the antenna resonates. Soft-drawn copper wire is more prone to stretching than hard-drawn copper wire, but both will stretch in our applications. Another reason not to use multi-stranded wire is that it has a higher inductive characteristic due to the individual strands being wound around the conductor's center. Adding inductance to an antenna increases its electrical length, which means that the antenna actually resonates below the intended frequency.

Use heavy duty rf insulators when building antennas, not the lossier power line insulators. Take care not to kink the antenna wire or to nick it with tools.

One dipole can be used on several bands when it is used in conjunction with the antenna tuning device which is popularly known as the transmatch, which changes the electrical length of the existing dipole to make it be resonant at any desired operating frequency.

Longwire Antennas and Tuners

The simplest, first antenna to install is the end-fed longwire, used in conjunction with a standing wave ratio (SWR) meter and a random wire tuner. This combination provides reasonable performance on all Novice bands. The length of a longwire antenna is not critical, but it should total at least 70 feet (end to end) if it is to be used on 80 meters. The longwire does not have a transmission line and its useful radiating length starts at the antenna tuner's antenna post connection in the radio shack. Since no transmission line is attached to a longwire antenna, transmission line cost and rf loss is eliminated. A short piece of coaxial cable (or any other suitable transmission line) and an SWR meter are connected between the station's antenna connection and the antenna tuner's input. The longwire is attached directly to the antenna tuner's output terminal and is strung outside wherever it is easy to erect. As is true with any antenna, do not allow any part of the longwire to double back on itself, which means it cannot be erected in two opposite directions. If one part of the longwire is erected East-to-West, no other part of it can be erected West-to-East. Also, the longwire normally is erected to a greater height where it leaves the station but it cannot later be run from a high to a low point. The longwire can provide satisfactory results on several (or all) Novice bands, even when it is a relatively short and scarcely visible (very thin) piece of wire. It is easy to use a longwire tuner and an SWR meter to change the electrical (not physical) length of a longwire antenna, to have it match the desired operating frequency. Tune the transmitter to provide a low power output at the desired frequency. Set SWR switch to forward position and adjust SWR gain control to get a full scale SWR meter indication. Then, set SWR switch to reflected position and simply adjust the antenna tuner controls to obtain the minimum possible SWR meter indication. It is usually possible to attain an apparent one to one (perfect) ratio. After the antenna tuner has been properly adjusted, transmitter rf output can be increased to the desired level. Neither the SWR reading nor the antenna tuner control settings are altered by increasing rf output power. As optimum antenna tuner control settings are determined for each band, they should be recorded because they can be used each time one shifts bands in the future. Antenna control settings will vary from season to season or between wet and dry days, but they will not change very much. The antenna tuner must be connected to a very good rf ground or it is possible to lose more power in the poor ground path than is being radiated from the antenna. As is true with all antennas, the longwire should be erected as high as possible and clear of nearby metallic objects such as rain gutters, rain drain pipes, telephone lines, and electric power lines. If you must erect an antenna close to a metallic (conductive) surface, try to do so at a right angle to minimize undesirable results. Use good rf insulators to support and position the longwire, taking care not to make a loop in the antenna as it passes through the eye of each insulator. Solder all antenna connections, including those at end insulators. Failure to solder an antenna connection will result in noise being heard whenever wind or vibration causes the antenna to move. If you want to convince yourself of this noise source, just listen to your receiver while someone else strikes any metal object against your antenna. Do not leave any loose metal-to-metal points in any type of antenna, or you will certainly subject yourself to unnecessary noise whenever the wind blows.

Ten Meter Band Advantages

At this point in the eleven year sunspot cycle, the ten meter band has improved dramatically and it will continue to get better at a rapid pace. This band now provides worldwide communications with an antenna that is physically small (about 16 feet long), light, and low cost. The small size and light weight of an excellent directive 10 meter antenna (such as a beam or quad) make it possible to install one on an inexpensive push-up (telescoping) TV mast and to rotate it with a low cost TV antenna rotator. A highly effective directional 10 meter antenna can be installed at a small fraction of what it would cost to install a triband (10, 15, 20 meter) equivalent antenna. It is interesting to know that one of these relatively inexpensive 10 meter (only) antennas will function at least as well as the much more expensive triband counterpart. The performance of marginal equipment is usually much worse on 10 and 15 meters than on the 40 and 80 meter bands. Consequently, good equipment is needed to obtain optimum results on the 10 meter Novice band.

Tuners for Balanced Antennas

There is a wide variety of antenna tuners available for use with balanced (two conductor transmission line) antennas such as beams, quads, and dipoles. Some of these devices can also function as a longwire antenna tuner and many of them can be used to read output power. These devices are nice to have but they are very seldom essential to the proper operation of the antennas.

Part 5 Summary

I hope the preceding information has given you a better understanding of station installation factors. If you have read something that is particularly interesting, learn more about it by reading related magazine articles and text books.

Bob Cregar (WD8NKT) of Essexville, Minnesota advises that Don Newcomb (W0DN) helped him solve his antenna problems at the trailer park where Bob lives. Don is one of several amateurs working at Butternut Electronics in nearby Lake Crystal. It is people like Don who make amateur radio a lot more enjoyable to new operators like Bob. If you are an experienced amateur, I hope you will volunteer your help to a few new amateurs each year.

The following stations were worked recently on the Novice bands:
WB1CVN Bernie @ Marlboro, Mass.,
WB2RRR Joe @ Staten Island, N. Y.,
WB3FNV Larry @ Cheswick, Penn.,
WD4DJP Dean @ Wilmington, N. C.,
WD5ESL Don @ Brownsville, Texas,
WA6MUN Mike @ Woodland Hills, Ca.,
WB7PUP Wade @ Bremerton, Wash.,
WD8JXY Dan @ Columbus, Ohio,
WD9DTF Dave @ Racine, Wisc.,
WD0BBR Jr. @ St. Joseph, Missouri.

I am always glad to receive good black-and-white pictures of Novices at their operating positions. If you send one, it may appear in a future Novice column. Please enclose an SASE if your picture must be returned.

73, Bill, W6DDB

How does it work? Will it help? Do I need it? What kinds are there? K2OT gives us the low down on speech processing.

Some Comments On Speech Processing

BY HANK STECKLER*, K2OT

There is a great interest among amateurs on various forms of speech processing. Debates as to compression vs. clipping, and whether to do it at a.f. or r.f. seem to be in vogue. In all this, I feel some important points are being overlooked. Before getting into this, a brief review of basic speech is helpful.

It has been found that speech power tends to occur in certain bands called "formants". The first (lowest frequency) formant lies below about 1 kHz. It comprises mostly the vowel sounds and is the strongest. It has been found that it contributes little to intelligibility (the characteristic of being able to understand what someone is saying), but a lot to fidelity (the characteristic of being able to recognize who is doing the talking). Incidently, this brings up one of my pet peeves. Frequently I hear on the air one amateur ask another "How does my processor (clipper, compressor, or what have you) sound?". He is hoping for the reply "It sounds good", but as pointed out above, fidelity has nothing to do with intelligibility. In my opinion, if a processor sounds good, it isn't doing its job, which is to punch through QRM and QRN. That does not mean it should sound garbled and distorted, since this also reduces intelligibility. More on this later.

Between roughly one to two kHz lies the second formant, which comprises largely the consonant sounds and some harmonics of the vowel sounds. The consonant sounds contribute mostly to intelligibility, but unfortunately are 30 to 40 db down from the first formant vowel sounds. This brings up yet another point. In most amateur literature it is emphasized that speech has a peak to average ratio of somewhere between 12 to 14.5 db, depending on exactly how you define "peak" and "average" and who is doing the talking. It is then pointed out that a processor should lower this ratio so that for a given peak power, which is set by the distortion limits of your rig, you can have a higher average power. This is really only part of the story. A processor should also increase the ratio of consonant power to vowel power so as to increase intelligibility. Processors do this, but there is a way of improving upon this function as we shall see.

Above about 2 kHz lie weak third and fourth formants which contribute some more to intelligibility.

Now let's consider clipping. As most of you know, a clipper "mows off" the top of the speech signal. Thus the weaker consonant sounds are increased relative to the stronger vowel sounds, if they do not occur at the same time. However, if they do occur at the same time the waveform looks like a strong low frequency signal with a high frequency signal riding on top of the low frequency signal. The "mowing" action of the clipper chops off most of the high frequency signal, since it is up high on top of the low frequency signal, but a lesser amount of the low frequency signal is mowed since it is centered around zero volts. This is why most clippers sound "bassy" or "mushy" and have reduced intelligibility at high clipping levels. Most clippers have an input signal low frequency roll off of about 300 Hz, so they will "sound good" at low clipping levels, but this is not high enough to prevent this effect at high clipping levels. A.f. clipping produces harmonics of the low frequencies that lie in the frequency range of the second formant, thus reducing intelligibility. R.f. clipping does not have this problem since its harmonics can easily be filtered out. Both types produce intermodulation distortion that cannot be filtered.

Compression can also sound mushy at high compression levels, but there is less harmonic and intermodulation distortion because of a "softer" gain control characteristic. Instead of mowing off the tops of speech peaks as does clipping, compression "rounds" them off. This leads to reduced distortion. It is important to note that there are

(Continued on page 72)

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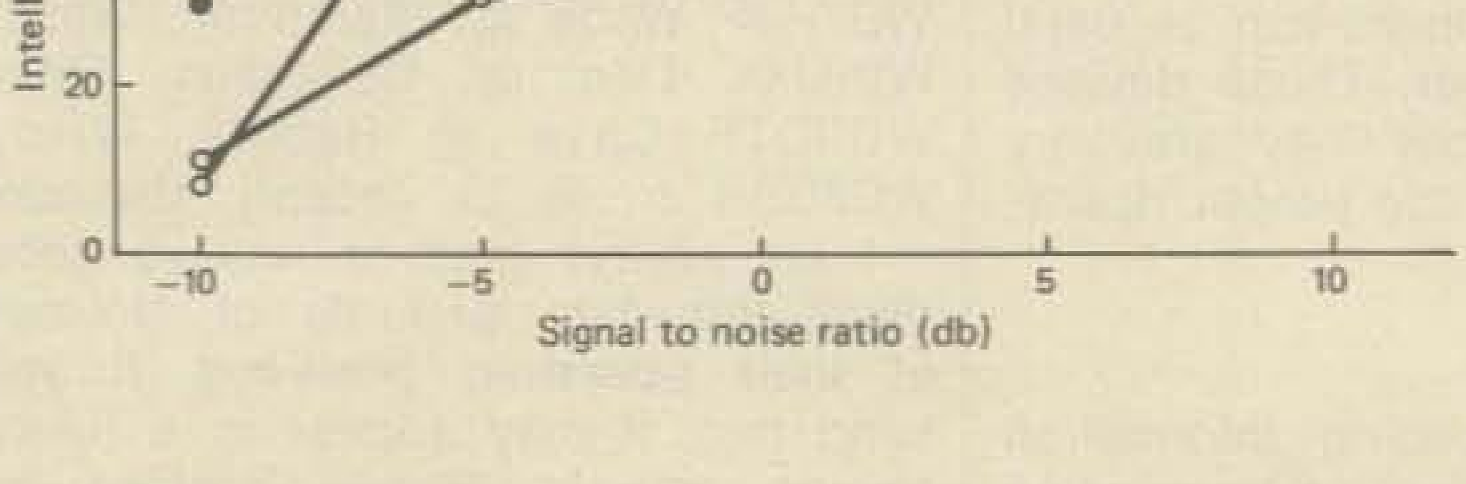

Fig. 1—Intelligibility vs. signal to noise ratio for various types of processed and straight speech.

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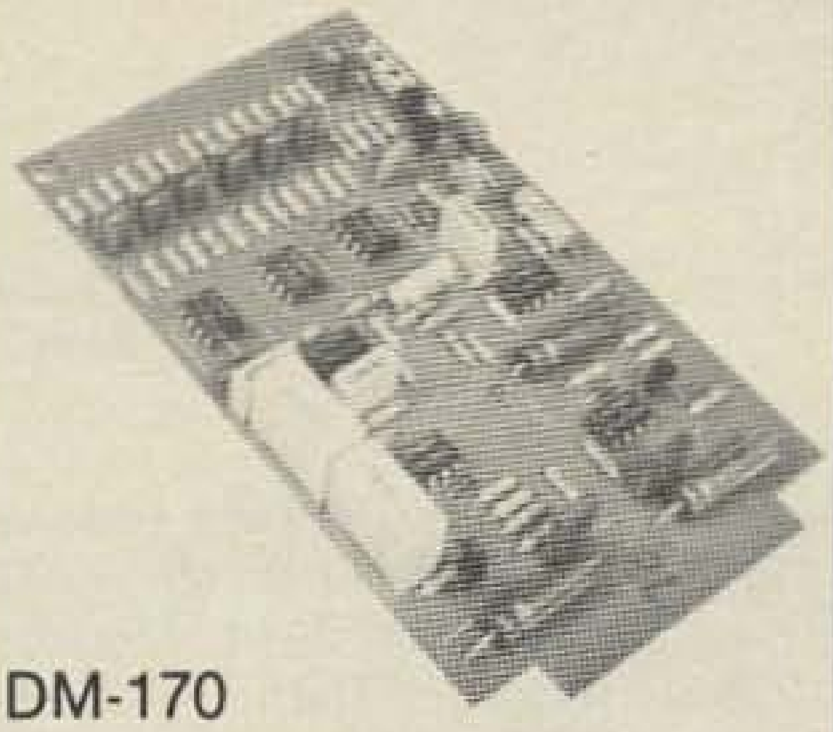

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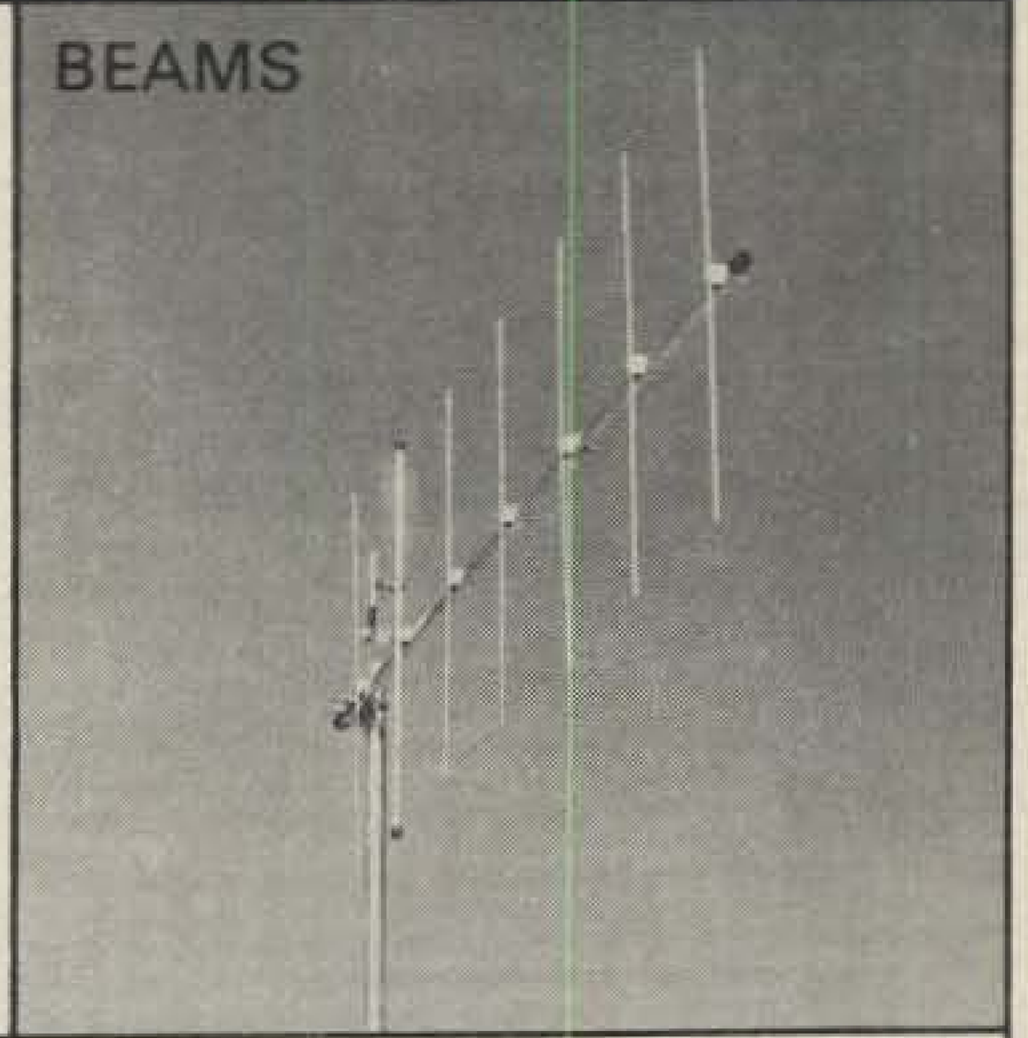

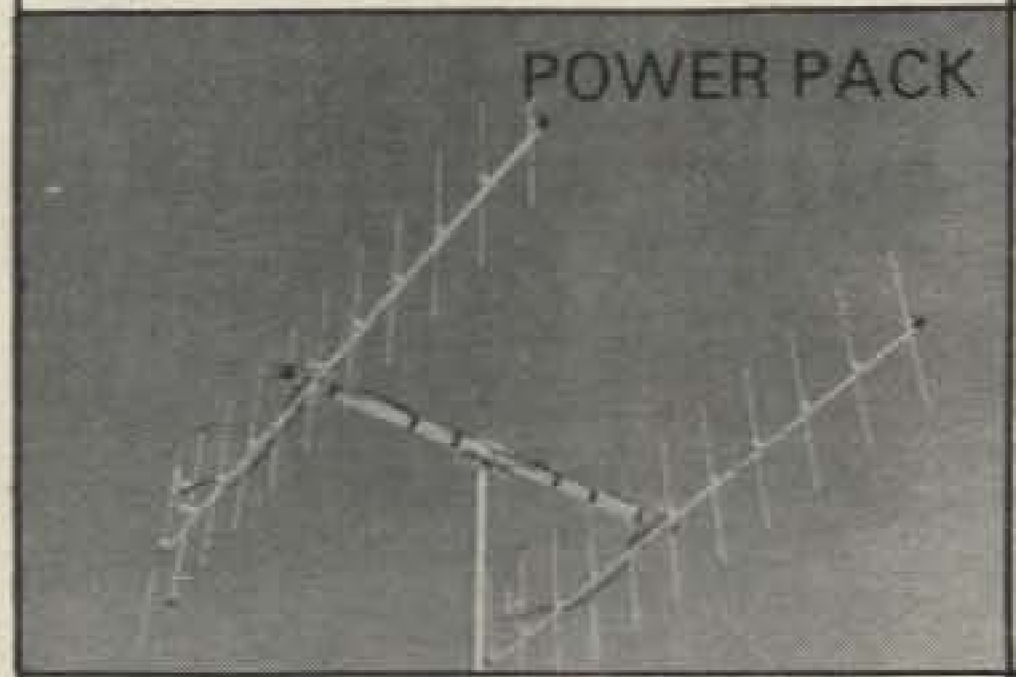

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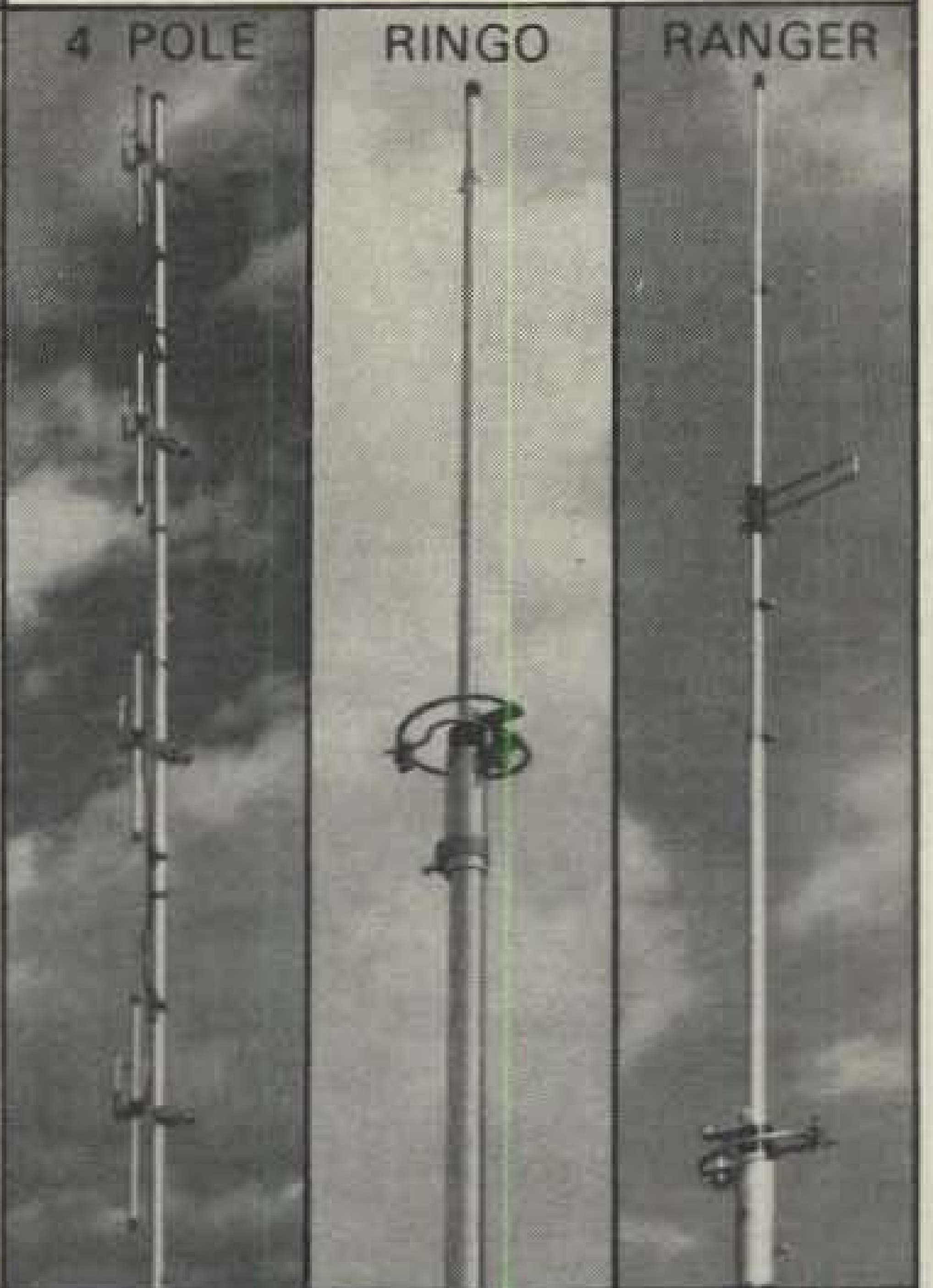

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QRP

The art of very low power operating

1977 Milliwatt Field Day/ Antenna Height

Except for a "Strays" note in *QST*, we didn't mention the 1977 Milliwatt Field Day Trophy competition in print. We let 1976 slip by also, wondering if there is sufficient interest to warrant continuation of the award. Well, only two entries were received this year, and one in 1976! This could be interpreted as an indication that interest has waned—or is it a lack of publicity? We'll make 1978 the deciding year. Fifteen entries this year, or no more trophy.

K6TG/6 near Don Pedro Dam, Tuolumne County, Calif. 1976 Field Day. Center 40 ft. pole holding up the apex of the 450 ft. V beam—other two poles for the 67 ft. inverted Ell.

Let's run down the entries received for 1976 and 1977. First off, K6TG, Ben Saylor, P.O. Box 2314, Modesto, CA 95351 reports: The day before Field Day 1976, K6TG and the XYL worked eleven hours in the broiling sun at a baked dry Field Day site putting up a Vee beam with 450 ft. legs and a height of 40 ft. The Vee beam was a bomb that night, pulling in powerful signals from Asia, Oceania, Europe, and all North America, loud and clear on 20 meters. Saturday morning a 67 ft. inverted Ell was put at 25 ft., and the rest of the time, before the start of Field Day, was used in tuning and logging the "Ultimate Transmatch" 10 thru 80 meters for the Vee beam, each 450 ft. wire separately, both 450's together, and the Inverted Ell. All ready for Field Day. Then came the surprise! When Field Day started, it was found that propagation conditions were considerably different from the previous night, in fact, fewer signals were on the bands than the night before, and the new conditions were causing the big beam to be of little use, and the Inverted Ell was now consistently one "S" unit louder on reception! Hopes of a big QRPp score from a big beam faded, and the old system of working hard for the most QSO's was used again. 128 contacts were sweated out. Then came the take-down and pack-up time —5½ hours, again in the blazing sun of Sunday afternoon. What a Field Day!" K6TG's log shows the following QSO/band breakdown: 80m - 51 QSOs, 40m - 38 QSOs, 20m - 29 QSOs, 15m - 10 QSOs. Total score: 128 QSO × 4 (5w pwr. mult.) + 1.5 (full battery mult.) + 150 (completely portable bonus) + *918 points*. K6TG's call will be added to the list of winners of *The Milliwatt Field Day Trophy*.

Then, for 1977, we received two entries—N2AA and WA7NWL. WA7NWL did not provide any comments, and his log shows the following breakdown: 80m - 15 QSOs, 40m - 5 QSOs, 20m - 28 QSOs, 15m - 1 QSO, for a total of 49 QSOs at the one watt level from a home station, battery power. Total score = 367.5. A nice showing for 1 watt.

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100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
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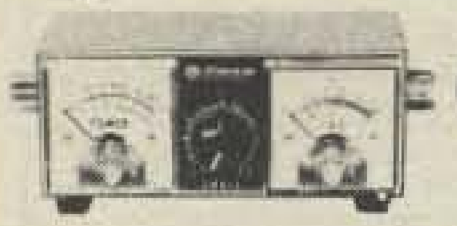

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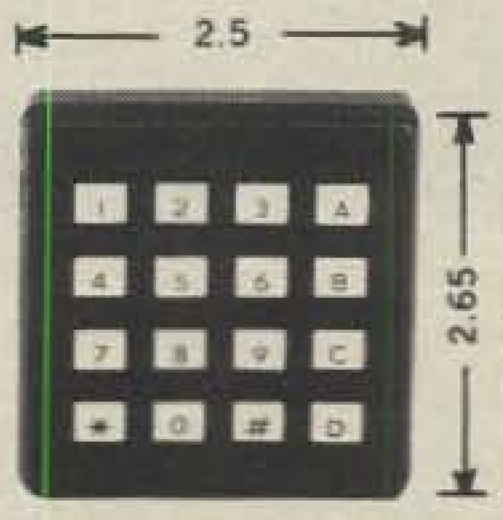

PP-2

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1. **Drop-resistant, hand-size V-O-M with high-impact thermoplastic case.**
2. **20,000 Ohms per volt DC and 5,000 Ohms per volt AC; diode overload protection with fused Rx1 Ohms range.**
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sample page!*

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** Sample page from our very large mail order catalog, free for the asking! (We also have a dealer program now available.)*

N2AA (K2KUR), winner of *QRPp DXCC Trophy* #5 (see story in an upcoming issue of *CQ)* teamed up with W2JDH for an all-out effort challenge to WØIYP's 1974 total of 439 QSOs (4 watt level) for a total of *2,784 points.* N2AA chose the 1 watt level for the 5× power multiplier, and despite some equipment failures which consumed valuable operating time, managed to grind out 389 QSOs for a grand total score of *2,790 points.* INCREDIBLE! N2AA/W2JDH are the NEW MILLIWATT FIELD DAY CHAMPS BY A MARGIN OF 006 POINTS! How close can you get! WØIYL, wherever you are, this is too close a margin to sniff at—how about topping it this year? It would be a battle between two absolutely top-notch contest operators—W0IYL and N2AA for top honors. Who knows— maybe there is a sleeper out there who will come out of the woodwork once he realizes that some real competition will be in there? At least, you two won't have to worry about K8EEG getting into the fray, since I'll be in Europe. How about it? A challenge match or no? At any rate, N2AA submits the following note: "Field Day!!! Lots of problems. Arrived at N2AA/3 at 1745Z. At 1800 we started working on the tent and vertical antenna, and it started to rain like crazy. Soaked to the skin. Hooked up the rig and the darned keyer wouldn't work. The keyer had a transistor output that would not key the Argonaut. So I rigged up a reed relay and the damned relay broke! The vertical didn't work: VSWR on 40 = infinity, 20m = 10:1, 15m = 6:1, 10m = 5:1. Raised two guys on 15 meters, but couldn't get a solid QSO. At this I was using the paddle as a hand key! The power supply was a car battery. Worked on the keyer some more—put a small battery in line to shut off the keying transistor in the Argo and it worked. Put up an 80/40 meter dipole with a bow and arrow. About 50 ft. up. A straight di-

Five watts to an Argonaut from a spare VW battery. XYL in the operating position.

(Continued on page 72)

a monthly feature by

JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

"Not for thee the joys of family,
Or the siren call of sex.
Your vocation, you've decided
Is to chase the rare DX..."
Red-Eyed Louie,
West Coast DX Bulletin

Frequently, the key man in the DX Award's game is neither the chaser nor the chased, he's the man who makes is possible to confirm the contact. He's the QSL Manager, and his importance is emphasized by the presence of a QSL Manager listing in every major DX bulletin or DX column the world over. Without the hard work and dedication of the QSL Manager, tens of thousands of contacts would go unrecognized each year for lack of that elusive little card. Likewise, hundreds of certificates for Worked All Zones, WPX, the CQ DX Awards and DXCC would remain unissued.

For the QSL Manager system to work, an important element must be recognized and respected, *the self-addressed, stamped envelope.* A very active DX station will frequently make 10,000 contacts over the space of 1-2 years. Simple arithmetic shows that at 13¢ each it will cost $1,300.00 for postage alone in answering these cards. Add the enormous amount of time to address the cards, the cost of cards and envelopes, plus the high cost of overseas mail, (31¢ per half-ounce for air mail to most parts of the world) and you get an impossible situation. The simple answer is for the station asking for the card to enclose a self-addressed, stamped envelope so that the QSL Manager has only to fill out the card, place it in the envelope and into the outgoing box.

Scotty Meadows is 9H1FC in Malta and K5CO in Texas. He works in North Africa and with luck may be able to confirm a rare zone for you.

JH3JEX, Akira Shimizu, age 43, of Kyoto, Japan earned Single Band WAZ #22 on 14 MHz c.w. Akira also has WPX and WAZ certificates and has 300 U.S. counties confirmed. His rig is a TS-510D to an inverted VEE up 13 meters.

Many DX stations would be delighted to have a stateside QSL Manager. However, if he or she is in Africa, Asia, the Middle East, the Pacific or one of many other overseas locations it's not that easy to find someone who will do the job. Consequently, our October DX column asked amateurs interested in being a QSL Manager to so advise us and we would publish their names, addresses and calls with the hope that it might facilitate contact with a station at the "other end." The response has been gratifying, as we have a good list for you ladies and gentlemen in DX land to peruse. We hope that some fruitful associations and fast friendships may result. Here are those who have answered to date, listed in random order as we received them:

Dave Wolkow, WA6PNG, 837 North Magnolia Ave., Anaheim, California 92801; Ted and Julie Ermi, WA8FOV, 25895 John Road, Olmsted Turnpike, Ohio 44138; Glenn Lethlean, WA9-WTF, Route 1, Box 17, Apple River, Illinois 61001.

Arthur Marshall, W1FJI, 60 Meadow Road, Westport, Massachusetts 02790; James E. Mackey, K3FN, 30 Lockwood Lane, Westchester, Pennsylvania 19380; Joe Schilling, 1409 S.W. 66th, Oklahoma City, Oklahoma 73159.

Dana L. Gregory, WD4AAE, 1208 N.E. 10th Avenue, Ocala, Florida 32670; Randal D. Terborg, WB9SAD, 10137 Kostner, Oak Lawn, Illinois 60453; Ronald E. Brodowski, WB2OJX, P.O. Box 196, Elma, N.Y. 14059; Thomas W. Gates, WB5MAH, Route 1, Box 288, DeVille, Louisiana 71328.

Robert Fuss, W4OWY, 2936 Gant Quarters Circle, Marietta, Georgia 30067; SWL WDX3IKN "Al" RD #2 Box 542, Wescosville, Pennsylvania 18106; John E. Mullen, K6CBL, Box 5883, San Francisco, CA 94101; Mike McNeely, K9HCK, 618 Sheridan Rd., Evansville, IN 47710; Ron Stange, WA4PYF, 2760 Davidson Drive, Lithonia, GA 30058; Heriberto (Herb) Hernandez, WB4IQI, 27 Amy Lane, Taylors, South Carolina 29687; and Tom Jenkins, WA8VDC, 4828 Elm Street, Newport, Michigan 48166.

Many European SWLs are avidly seeking endorsement stickers for their VPX certificates. Hans Burger, HE9CEA, of Chur, Switzerland is one of the most active.

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*P.O. Box 205, Winter Haven, FL 33880.

Ranga, VU2GW (left), and Bala, VU2LE (right), are quite active on 20 and 40 meter c.w. and were worked by many this winter via the long path. VU2LE is a CQ subscriber. Route QSLs to him via Pete, K6JG, 4040 Via Opata, Palos Verdes Estates, CA 90274. (Photo via K6JG)

De Extra

The October, 1977 issue of "The DXer," (published for members of the Northern California DX Club only) had a timely and timeless article by N6GG and WB6RIU entitled "Climbing the DX Ladder." The following are excerpts from this article:

Which Way Do You Point Your Beam?—Sometimes the beam heading doesn't add up. On occasion India comes in due west. Swing the beam to 330 degrees and he fades out. Bootlegger? Not at all. That west heading happened to be the best propagation path at that moment for that part of the world. Some theories say that the F2 layer tilts as it changes height, and 2 or 3 of these tilts add up to produce the best multi-hop path. It's best to trust your ears more than your beam indicator when you are trying for very long distances. Don't be too rigid about what the beam settings should be, because, in the final analysis the propagation path ends up being a reciprocal path. Where you hear 'em best is where you will transmit to them the strongest.

Tuning Habits—An efficient method of tuning a band is to first scan it rather quickly to catch any pileups. Next, start at the low end and tune carefully up the band. On c.w. use the sideband filter rather than the c.w. filter as it is much easier to listen to while scanning. When you get to the high end, tune rapidly back down to catch any pile-up you might have missed. If you repeat again within 2 or 3 minutes, most of the signals you had heard will have reversed, that is, those transmitting will be listening and you will have a different set of signals to monitor.

Whenever you happen to tune on to 2 or 3 stations bunched closely and signaling their calls together, STOP! Do *not* avoid the QRM by tuning past as this may be the beginnings of a pileup. Switch in that sharp c.w. filter, write down the last 2 digits of where your dial is set, and tune carefully for a weak reply to one of the 2 or 3 stations heard.

International Buddy System—There is no reason why you can't have "ears" all over the world looking for a new one for you. That UQ2 you need is pretty common stuff to a European, while the KC6 you run into once a week in W6-land is prettty rare DX in Europe. Why not make friends with someone over in Europe or Africa or somewhere and get some Pacific DX up on frequency for them and have them look for some of those elusive countries you need over in their neck of the woods. Any true DXer will be delighted to help you get a new one, especially if you sweeten the pot and get him a few new ones as well. You might even start a lifelong friendship. A good deal, huh!

Some Thoughts on Operating From the Bahamas During the 1977 CQ Worldwide Phone Contest

Ye DX Editor was in Freeport with the XYL during the October, 1977 bash and was fortunate in being able to operate C6ABC for 20 hours during the contest. The following notes may be of interest to you:

1. When you are operating from the U.S. during the contest most of the fun is on 10, 15 and 20 meters. The low frequency bands yield only a few stations and the competition is fierce. From the Bahamas the opposite is true. All the stateside stations need you for a multiplier and the pileups during the night and early morning hours are awesome. However, when the higher frequencies open up and you start trying to compete with the W/K kilowatts for the European and Asian stations, your contact rate falls rapidly. In C6A the power limit is 100 watts and you can't hack it from the "wrong side" of the pileups. Soon you find yourself looking forward to 2 AM when you'll be king of 80 meters again.

2. There is no doubt that having a 2-letter call is a big help in the contest pileups. Its much easier for a DX station to pull a 2-letter call out of the mud than a WB or WD call, particularly one signing portable. We worked WA0OOL/8 who was very strong, but Whiskey 4 Ham Radio or Kilowatt 2 Good Morning were much quicker and easier. Further, we were surprised by the number of 2-letter calls used in the contest. For example, out of 38 U.S. stations worked on 160 meters, 28 were 1 x 2 calls. In the order worked these were N4EA, K2GM, W4DR, K5OA, W3AU, W2PV, W2YV, N4PB, W5CH, K5JA, N1MM, K1PR, W3MM, N4YN, W9YF, W1BB, W0FG, N5XR, N5WA, K1OX, N4JJ, K3RA, W1ZA, N5OX, K5GO, K6SE, and W4WS. On every band it was common to work a string of a half-dozen 1 X 2 calls.

Dr. Alfonso Porretta, I0AMU, has earned most of the CQ DX Award certificates. He has all countries confirmed with the exception of Clipperton Island, and is on the WPX, CQ DX and DXCC Honor Rolls. He has least 200 countries worked on each of the 5 bands, 80—10 meters. Al's station includes the Drake R4C, T4XB and linear. If you hear I0OU. its Al's son who is going on 19.

3. The QRPp boys have their fun in the contest also, despite the fact that they can't compete for top score. W6PQZ was worked on more than one band, *including 40 meters*, though he was running *only 5 watts*. Those west coasters who complain that my 100 watts is too weak on the low bands please take note.

4. People don't take advantage of the potential multipliers on 160 meters. With C6A power we worked as far east as EA8CR, got him on the first call, and as far west as K6SE. Granted there were only a handful of stations on 160 which could be easily worked, but if you log C6A, FM, HH, HI, KP4, KV4, TI, VP2's, VP9, ZF and others, you've got some darn valuable multipliers.

160 Meter News (de W1BB)

For complete details on this winter's 160 activities, send a self-addressed, stamped (13¢) envelope to Stew Perry, W1BB, 36 Pleasant Street, Winthrop, MA 02152. Stew's 160 Bulletin is issued 3 times each year gratis to active top band DXers. The fall issue reports that KH6 stations may now operate from 1800-1810 as well as the high end of the band, 1995-2000, and the very sad news that Roy, W1TX a leading 160 DXer for many years, passed away last July.

Listen for the Marconi 75th Anniversary Station, KM1CC, which should still be active using A-2 emission and some 160 meter operation.

Everyone is encouraged to keep 1825-30 KHz clear for weak DX stations. This is the 160 meter DX window.

New DX Committeemen

The DX Department is pleased to announce the addition of David Novoa, KP4AM (ex-KP4BDL), and Dewey L. Treanor, K0SVX, to the CQ DX Award's Advisory Committee. David is President of the DX Club of Puerto Rico and will be representing that club on the Committee. Dewey will be representing the Eastern Iowa DX Association of which he is President.

The complete list of officers for the Eastern Iowa DX Association includes K0SVX, President; Douglas C. Byal, W0SML, Vice President and John V. Lundberg, W0VU, Secretary-Treasurer. Officers of the DX Club of Puerto Rico include KP4AM, President; Alicia Rodriguez, KP4CL, Vice President; Luis de la Vega, KP4DMZ, Secretary-Treasurer; Pedro Piza, Jr., KP4RF (ex-KP4AST, the world's strongest signal), Director; Jose Toro-Romanache, KP4RK, Director and Robert Jimenez, KP4CLB, Director. KP4RK is the original founder of the DX Club of Puerto Rico and edited its club newsletter during the 1960's.

More About The Committee

Since the CQ DX Award's Advisory Committee was first established in 1967 by K4IIF, John has been sole liaison with the Committee. This was fairly easy with the original 5-man Committee, but now that 22 clubs have Committee representatives it is no longer possible for one man to provide adequate liaison. Therefore, the following 3 sub-committees have been created: WAZ and DX Hall of Fame chaired by K4IIF; WPX and other prefix awards chaired by WPX Manager Bob Huntington, K6XP and the CQ C.W. and S.S.B. DX Award sub-committee chaired by Assistant DX Editor Rod Linkous, W7OM. Callsigns of the members of each sub-committee are as follows:

WAZ and DX
Hall of Fame
K4IIF—
Chairman
W1AM
W1WY
W2GT
K2FL
N4MM
N5JJ
W8IMZ
K8LJG

WPX and Other
Prefix Awards
K6XP—
Chairman
N4MM
N4NO
W4UG
K5UR
K6AHV
KH6GQW
KP4AM

CQ C.W. and S.S.B.
DX Awards
W7OM—Chairman
W4KNW
K5YMY
W7OK
W9DWQ
W0SFU
K0SVX
WB0NHG
VE3GMT


Aldo Tallone, I1TLA, earned Single Band WAZ #21 on 14 MHz c.w. using the Drake Line barefoot. He has worked almost 250 countries. Aldo is age 26.

The Committee was recently petitioned to change the effective date for contacts counting toward Single Band WAZ. The original rule states that contacts must have occurred on or after Jan. 1, 1973. It was suggested that after the first award had been made for a particular band/mode, that cards dating back to Nov. 15, 1945 be accepted for later certificate numbers, or alternatively that after 10 awards have been made for a band/mode the date would revert to 1945. Examples of band/mode are 20 meter c.w., 40 meter phone, etc. The Committee vote on these 3 options was over 90% in favor of keeping the present Jan. 1, 1973 date. Comments from some of the Committee members with their ballots went as follows: "Changing the ground rules always causes bad feel-


Don, W2MPK, holds c.w.-phone WAZ # 4131, s.s.b. WAZ # 1392 and recently qualified for Single Band WAZ on 20 meter phone. Don is also at the 300 country level.

Cal, W2PPG, happy to help so many with another new country on the Africaner Net, which meets daily on 21355 kHz, 1800Z/2000Z.

ings."—W1AM. "The newcomers are the enthusiastic ones. They're in the pileups looking for the new ones."—W7OK. "It would be a disappointment to a station striving for the award to suddenly find himself many serial numbers down the list."—N5JJ. "I believe that once started it is too late to change the rules. There would be great confusion over certificate numbers."—W4UG. "I think that Single Band WAZ is such a prestigious award that the difficulty factor should remain high."—K6AHV/W6RJ. "If we reverted to the 1945 date, a DXer. could be dormant and rest on past laurels."—K8LJG. "If a rule is made for one person, all should be under the same."—K5OA/K5YMY.

News of Rare and Unusual Prefixes

A4—A4XFE in Oman has been active on 15 meter s.s.b. around 1100 GMT and from 14245-14310 at 1200 GMT and 2300 - 0100 GMT. A4XGG also likes 20 meter s.s.b. and asks for QSLs via Box 2071, SEEB Airport, Muscat, Oman.

Ron—OE5CA/YK—serving with the U.N. Peace Keeping Forces, shown at the operating position, located on the Golan Heights, Syria—giving a new country to all who call. (Photo courtesy, Cal-W2PPG)

BF - BU—China will use this prefix block if it licenses amateurs at some future date. BY is said to no longer be a legitimate allocation to China so look upon any BY stations with great skepticism.

CO7—This is a rare Cuban prefix recently activated by John, CO7UPC. QSL to box 52, Camaguey, Cuba.

CR9—If you worked CR9AJ during the CQ Worldwide Phone Contest in October it was Dave Bell, W6AQ, who made a special trip to Macao for the big Test.

CW0—CW0A was a special call for the CQ Worldwide Phone contest by CX3BR and company. QSL to the CX Bureau.

FR0—FR0DCK was heard near 14025 at 1200 GMT. QSL to F3OM.

H4—This is the new prefix for the Solomon Islands replacing VR4.

HH5—HH5HR, HH5RB and HH5TW were the calls used by the North Florida DX Association during their mammoth DXpedition to Haiti during the CQ Worldwide DX Contest in October. K4UTE is QSL Manager for phone contacts, while c.w. contacts before and after the Contest are handled by W4ORT.

That's Ron—OE5CA/YK standing in front of an Austrian U.N. Tank—2600 meters above sea level on the Golan Heights—Mt. Hermon, Syria. (Photo courtesy, Cal-W2PPG)

HU0—HU0YS celebrated the 156th Anniversary of the Independence of El Salvador. QSL to P.O. Box 32, San Salvador, El Salvador.

HZ1—HZ1PA is a newly active station in Saudi Arabia. He has been reported on 14243 KHz at 2025 GMT. QSL to W4UL.

J3A - J3Z—This is the new prefix block for Grenada replacing VP2G—.

S2—Erik Sjolund operated from Bangladesh as SM0AGD/S2 in September, 1977. QSL to SM3CXS.

S9—S9RLB in Sao Thome is often heard near 14200 KHz s.s.b. at 2000 GMT.

TF30—This was a special prefix used by the Icelandic Radio Amateur Society Club Station, TF3IRA, in celebration of the Society's 30th Anniversary.

The CQ WPX Program

Mixed

606...HA0KLU
607...YU2CAL
608...OK31F
609...WB2FKF
610...OK1MP
611...KP4AM
612...DK8KC

S.S.B.

1005...OK3CAW
1006...JA1PUK
1007...YU3TKT
1008...I4QCD
1009...I8IGS
1010...K8SQE

C.W.

1653...W4RT
1654...I5SMX
1655...W3OG
1656...WA7JMV
1657...WB8ZRV

WPNX

105...WB2MSO
106...WA1VLE

VPX

131...HE9CEA

Endorsements

Mixed: 1480 ON4QX, 1004 OK1MP, 900 WA6TAX, 799 K0JN, 758 JH1VRQ, 600 VE7IG, 553 W9MYG, 550 DJ8WD, 471 DJ1ND, 468 HA0KLU, 435 WB2-FKF, 422 YU2CAL, 410 HE9CEA, 400 OK3IF, KP4AM.
SSB: 967 F2YT, 872 I6SF, 850 WA6TAX, 783 K8SQE, 650 W7KOI, 615 OK3CAW, 600 JH1VRQ, 579 4Z4-GH, 550 VE7IG, 500 I8IGS, 498 G3XPO, 400 WA4-QMQ, 376 I0RKR, 307 YU3TKT, 304 I4QCD, 300 JA1PUK.
CW: 1313 ON4QX, 1230 DL1QT, 1002 N6JV, 981 N4MM, 910 OK1TA, 850 OK2BLG, 750 K9UIY, 528 OK1MP, 506 DJ1YH, 400 G3JTO, OE1KJW, 381 W3OG, 309 W4RT, 302 WB8ZRV, 301 I5SMX, WA1-VLE, 300 WA7JMV.
10 Meters: OK1MP.
15 Meters: OK1MP.
20 Meters: VE7IG, OK1MP, W6CNA, OE1KJW, K8SQE.
40 Meters: K0JN, OK1MP.
80 Meters: HE9CEA, OK2BLI, OK1MP, K8SQE.
Africa: OK1TA, W7KOI, OK1MP.
Asia: OK1TA, OK3IF, DJ8WD, OK1MP, JA6-9330, WA6TAX.
Europe: OK1TA, HE9CEA, YU3TKT, WB2FKF, OK2-BLI, OK1MP, W6CNA, K8SQE.
No. America: OK1TA, VE7IG, WB2FKF, OK1MP, W3OG, K8SQE.
Oceania: OK1TA, VE7IG, W7KOI, OK1MP, K8SQE.
So. America: OK1TA, OK1MP, K8SQE.

Complete rules for WPX can be found in the May, 1976 issue of CQ Magazine. Application forms may be obtained by sending a business-size, self-addressed envelope to "CQ WPX Awards", 5014 Mindora Dr., Torrance, CA 90505, U.S.A.

VR4(H4)—The Solomon Islands are only semi-rare on 20 meters, but very rare on 160. VR4DX comes in nights on 1800-1805 KHz c.w. from 1400 GMT onward. He may be H4DX by the time you read this, (see H4 above.)

The WAZ Program

Single Band WAZ

40 Meter C.W.

3...SM6DHU

20 Meter C.W.

28...JA2RGH

20 Meter Phone

63...LA7AH
64...W2VO
65...K8SQE

S.S.B. WAZ

1399...JA2RJV
1400...DJ0YD

C.W.—Phone WAZ

4151...JA1CMD
4152...K2PP
4153...JA3BNT
4154...OH1MQ
4155...F6DHB
4156...W9VA
4157...W2TA
4158...K4YOE
4159...DJ3OE
4160...DK3DZ
4161...DJ9KM
4162...DJ4YS
4163...DK7FZ
4164...DK3KD
4165...DM2AJH
4166...W6TC
4167...JR1FCT

The complete rules for all WAZ awards are found in the May, 1976 issue of CQ. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total, regardless of an operator's all time count.

Mixed

W4WV	1675	N4MM	1290	W8CNL	1030	YU2OB	882	YU2EBL	782
K6JG	1552	W4BQY	1271	W6ISQ	1028	DL1CF	872	WA2AUB	757
F9RM	1537	K2VV	1250	K6ZDL	1027	W4BYU	859	K8UDJ	750
VE3GCO	1436	WB4KZG	1230	I6SF	1024	G3DO	849	K8LJG	750
ON4QX	1429	PA0SNG	1229	WA0KDI	1019	I3ANE	848	CT1LN	749
YU2DX	1407	W9FD	1184	WA1JMP	1008	W0SD	844	WA5LOB	749
W2NUT	1400	W8ROC	1181	SM6DHU	1000	YU1ODS	836	W6ANB	741
W9DWQ	1365	K5UR	1171	DL1MD	993	JA1AG	831	PY4AP	735
W3PVZ	1364	WB4SIJ	1152	K4KQB	960	W9WHM	811	K0BLT	733
W7LLC	1358	N6AV	1150	W4IC	950	YU3EY	811	K7NHG	719
W8LY	1349	W0AUB	1107	WA6TAX	949	W6NJU	811	WA6EPQ	713
W2NC	1330	N6CW	1092	K5DB	923	W9ZTD	807	PA0VB	706
YU1BCD	1327	YU1AG	1075	W0SFU	908	I0JX	803	UA3FT	705
W4CRW	1308	N2AC	1043	W3YHR	906	IT9AGA	791	OE6RP	622
DJ7CX	1297	N6JV	1035	SM7TV	905	K2ZRO	782		

S.S.B.

F9RM	1443	HP1JC	1086	CT1PK	923	N2SS	850	WA5LOB	747
W4UG	1433	YU1BCD	1063	IT9JT	916	W4CRW	840	W2NC	730
I0AMU	1329	PA0SNG	1034	F2MO	904	OE2EGL	839	W6YMV	720
K6JG	1320	DL9OH	1033	DL1MD	903	W6RKP	822	WB6DXU	708
I0ZV	1289	DK2BI	1003	WB4KZG	900	W3DJZ	818	I0MBX	702
I8KDB	1188	WB4SIJ	1000	W0YDB	884	OK1MP	817	CX2CN	702
N4MM	1149	K2VV	1000	K2POA	883	PY3BXW	808	YU1ODS	648
I8YRK	1108	WA6TAX	975	W3YHR	881	W4IC	800	N2AC	630
I4ZSQ	1102	WB2NYM	941	ZL3NS	874	YU1AG	785	CR7IK	613
W9DWQ	1089	K5UR	932	DJ7CX	852	G3DO	765		

C.W.

W8LY	1331	YU1BCD	1086	K6ZDL	915	VK3AHQ	809	K2ZRO	649
W8KPL	1330	W4CRW	1041	N4MM	905	I6SF	801	YU1ODS	639
ON4QX	1245	WA2HZR	1006	N2AC	896	VO1KE	800	K1LWI	629
DL1QT	1208	G2GM	1004	K5UR	892	W4BYU	768	OK2QX	600
K6JG	1205	N6JV	992	YU1AG	870	W4IC	754	VE4OX	600
W2NC	1170	DJ7CX	988	K2VV	850	SM5BNX	706		
W2HO	1126	W2AIW	972	IT9AGA	825	OK2DB	693		
K6XP	1124	W3ARK	960	W6ISQ	824	WB4KZG	680		
W9FD	1091	VO1AW	932	K7ABV	812	KH6HC	649		

WS1—WS1ACR QSLs go to W1SYE, 18 Market Square, Newport, R.I. 02840.

YT0—YT0M was heard in the U.K. His QSL route is to SRS Bureau, P.O. Box 64, 11001 Belgrade, Yugoslavia.

4S7—If you need Sri Lanka look for 4S7WP after 1800 GMT on 20 meter s.s.b. QSLs go to DJ8HR.

5B4—Activity is scarce from Cyprus these days, but you may be able to catch 5B4EU around 14240 at 2000 GMT. QSL to SM3GII.

5W1—General class operators needing 5W1 can frequently find 5W1BD near 21300 KHz after 2330 GMT. QSL to K1AGB.

8J1—8J1HAM was a special Japanese call from a Radio Festival in September, 1977.

8Q7—8Q7AB in the Maldives was operated by JG1CIF through December, 1977. QSL to JG1CIF's home QTH. 8Q7AD has also been reported and asks for QSLs to be sent via JA1MUN.

9U5—Terry, 9U5CA, is reported to be back on the air from Burundi. Listen around 14280 at 1900 GMT.

9V5—Singapore is activated with some regularity by 9V1TF, 14225 at 1530 GMT and 9V1SW, 14225 at 1430 GMT.

The Rare Zones

Most U.S. DXers find zones 18, 19, 23 and 34 to be the most difficult to work and confirm for WAZ., so we periodically list some of the active stations in those zones. If there is another zone giving you particular difficulty drop us a line and we'll include it in future listings.

Zone 34: Sid, ST2SA, appears on 20 meter s.s.b. between 14200 and 14210 at irregular intervals after 2100 GMT. He usually has a pileup of stations needing Sudan and zone 34. Sometimes he can be heard at 1430 GMT. QSL to P.O. Box 1533, Khartoum, Sudan or via DJ9ZB.

Several /SU stations continue to be active from Egypt. VE3HYU/SU has given many a happy DXer a new one on 20 meter s.s.b., 14260-270, after 1100 GMT. QSLs go to VE1RU.

Zone 23: The most active Mongolian stations in recent weeks have been JT1AN on s.s.b., daily around 0100 GMT near 14220-225 KHz and JT1AO, on c.w. 14020-25 KHz also around 0100 GMT. QSL JT1AN to P.O. Box 540, Ulan Bator, and JT1AO to P.O. Box 639, Ulan Bator.

UA0YAD has been active from Tanna Tuva, the small part of Asiatic Russia in Zone 23, on c.w., 14032 KHz at around 0200 GMT.

Zone 19: Several stations have been active on both c.w. and s.s.b. from zone 19. If you are a continuous wave enthusiast on 15 meters, UA0LAJ from Vladivostok has frequented 21033 around 0000 GMT and UA0LAK, also from Vladivostok has been reported on 21013 at that same time. UA0, UV0, UW0 and UK0 stations with the letter L immediately following the 0 are from the Vladivostok area. If the letter after the 0 is C, E or G the station is either in the Khabarovsk region or on Sakhalin Island, both being in zone 19.

S.s.b. DXers looking for zone 19 should listen for UA0IAW, UK0CBE or UV0EX in the 14220-240 band segment from 0000 - 0200 GMT. UK0QAQ has been heard later in the evening.

Zone 18: S.s.b. stations heard recently from zone 18 on 20 meters include UA9UV, UA0OAN, UA0AAK, UA0AN, UK0SAB, and UK0AAO. Again, 0000 - 0200 GMT seems to be the best time period from the east and central U.S. and Canada, with 0300 - 0400 more productive from the west. C.w. stations on 20 meters during these same time periods include UA9OBK, UA0ABK, and UA0ABB. All 3 of these stations were heard between 14030 and 14040.

QSL Information

A35DG—Via D. Goddard, P.O. Box 147, Nukualofa, Tonga

A4XGX—To D. MacGregor, PYE TVT BFPO 66, London, England

AP5HQ—c/o Commandant, Signal Training Center, Kohat, West Pakistan

AP2TN—Via B. M. Moroz, W8QFR, 9106 Fulton, Detroit, MI 48209

C31OH—To D. Schneider, DK8EV, Bergstrasse 66, D—4060 Viersen 12, Germany

EA9FK—c/o Jose, P.O. Box 101, Melilla, Via Spain

EL3A—Via Dr. Oscar Ocampo, P.O. Box 148, Greenville, Liberia

F8CUW/FC—To M. Alberti, I1ANP, Via Priv Maralunga 12, I-19100 La Spezia, Italy

FK8KAA—c/o Box 20, Nei, New Caledonia

FR7AD—Via J. Delavarde, F6ASK, 30 Rue de Belle Ile, F-77500 Chelles, France

HB0BLT—To R. Holenstein, HB0MRR, Schoenbuehl 92, FL-9492 Eschen, Liechtenstein

HD8CD—c/o John Kroll, K8LJG, 3528 Craig Drive, Flint, MI 48506, except European and African QSOs to I0WDX, Piazza Conti 2, I-00010 Poli, Italy.

HD8EE—Via John Kroll, see HD8CD above.

HM2KL—To Cho-il Namill, 508-1 Kalhyun-dong, Seodaimoon-ku, Seoul 120-02, Korea

HP5FI—c/o P.O. Box 1568, Chitre, Herrera, Republic of Panama

HS0SEA—Via QSL Bureau, Radio Amateur Society of Thailand, P.O. Box 2008, Bangkok, Thailand

J28AQ—To Gabriel Rouault, SP 85014, Diibouti, Republic of Diibouti

J28AR—c/o Regis Olivier, SP 85302, Obock, Republic of Djibouti

JT1AN—Try either P.O. box 377 or P.O. Box 540, Ulan Bator, Mongolia

JY5US—Via P.O. Box 2285, Amman, Jordan

K4IIF/C6A—To Leo Haijsman, W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904

K8ADY/DU2—c/o R. H. Williams, MSD, Box 33, FPO San Francisco, CA 96555

KH6JJD/VQ9—Via T. F. Rogers, Jr., 5193 Iroquois Ave., Ewa Beach, HI 96706

KS6DV—To P.O. Box 1333, Pago Pago, American Samoa

KX6LA—c/o D. R. Snowden, Box 494, APO San Francisco, CA 96555

OF1AJ/OJO—Via OH1AJ, P.O. Box 266, Turku, Finland

PZ5AA—To ICAO Office, P.O. Box 1881, Paramaribo, Surinam

(Continued on page 71)

The CQ DX Awards Program

S.S.B.

526...WB5UKI
527...I6ONE
528...I0RKR
529...I0UCM
530...GM3GRX
531...G4BSY

C.W.

289...HA0KLU
290...IT9XNM
291...W6CNA
292...VE2BDT

S.S.B. Endorsements

310...W9QLD
310...XE1AE
300...OE2EGL
275...N4MM
275...OE3WWB

C.W. Endorsements

300...N6AV
150...HA0KLU
150...W6CNA

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

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The "Story of The Month" for February, as told by Mel, is:

Mel Boatman, W5AWT
All Counties #169, 6-29-77

Mel's interest in radio started back in the '20's when KDKA (Pittsburgh) came on the air. Coils were wound on Mother's Oats boxes, and a Ford spark coil along with the car battery made up the transmitter. Next came a UX-171A with the base removed and suspended upside down in a jar of water. That TNT circuit put at least 1.5 watts out, but Mel made WAS with it on 40 c.w. C.w. was used for some 20 years before he tried fone. All in all, he made WAS on six bands over the years, once on 11 meters, which seemed a tough way.

Back in 1956 Mel was Electrical Supervisor for the Texas and Pacific Railway, but his doctor told him to get out of the Dallas Headquarters before he turned into one solid ulcer. He bid on a Communications Maintenance job in Monahans and, you guessed it, took up County Hunting. Not too fast at first—he wanted to run his DXCC score to well over 300 first, and add a few more Certificates and Awards to the pile on the desk. See page 75 of *CQ* October 1962 where fotos show Mel being issued the Arne Trossman Top Honors Plaque and also being interviewed by KRIS-TV News Editor. Oh yes, August 5, 1962 was proclaimed by Price Daniel, Governor of the State of Texas as, "Mel Boatman (W5AWT) Amateur Radio Day"!

Mel and Geneva Boatman, W5AWT on their 50th Wedding Anniversary August 1977.

Trunk of Mel's 1966 Buick with the power plant.

In 1969 he moved to El Paso, still trying to get away from Dallas, and he was off the air until 1973, when his retirement became legal as well as official. Then back to Monahans where he went to work for HoneyDew.

Then the Mobile bug bit him. He reasoned it was silly to sit in the shack all day listening, when he could be riding around seeing the country and still listen.

Mel bought a 1-KW plant from Sears, mounted it on a platform, and installed it in the back of the old 1966 Buick. He never solved venting the exhaust, so he took to running County Lines. That way he could park the Buick so that any breeze would take care of the fumes from the generator, cut the ignition and be in business.

He did not get down to the nail-biting stage until about a year ago when he realized he had only 18 to go. Finally, this had shrunk to *four,* and there it stayed for weeks on end. Then all at once it came to a head. WA0BPE gave the last one in Virginia, W9ZD went out of his way for the last one in Tennessee, and WB5DPR gave him the last two in, of all places, Texas. Phil could almost spit into both of them from his home, but Mel had never heard either of them being run.

Mel uses the same rig for his base station and for mobile work, a little Swan SW-240 with a homebrew power supply. Then he got a Heath MP-10 converter and it would supply the receiver section of the Swan, so he could receive while in motion and by running the transmitter at low power, perhaps 10 or 15 watts out, he could also transmit while in motion.

At last check, the Buick needed under 4,000 miles to turn 200,000, and when that happens, Mel will probably retire it.

Mel said, "At present I don't plan on a second go-round. I would like to finish them All Mobile, All SSB, and All 14. Meantime, the Good Lord and the old Buick willing, I will still be out mobiling, depending on the availability of gasoline and hamburgers".

In case some of you do not remember, Mel was among the First to acquire USA-CA-500, back on September 27, 1961 he was issued #1-U.

L to R. Phil, WB5DPR receiving MARAC Plaque from Mel, W5AWT for getting him last 2 counties.

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

CALIFORNIA CHAPTER
NATIONAL AWARDS HUNTERS CLUB
LOCAL MEMBER AWARD
Sample

California Chapter NAHC Local Member Award

We all hope the Good Lord is willing and that we will be hearing W5AWT/Mobile for a long long time.

Awards Issued

Mike Gilmore, K7CLO was issued USA-CA-2500.

Cesar Santos, CT1UE acquired USA-CA-2000 endorsed All SSB, this is the 2nd such Award to CT1.

California Chapter
National
Awards Hunters Club
Sample

California Chapter NAHC NET Award

Lyn Welliver, WB4RVW obtained USA-CA-1500 and 2000.

Dorothy Johnson, WB9RCY claimed USA-CA-1500 and added All SSB endorsement to her USA-CA-500 and 1000.

Dr. Hugh Unger, WB4UHN added USA-CA-1000 and 1500 to his collection. These were endorsed All SSB, All 14.

Don Skaife, W7ULA qualified for USA-CA-1000.

IDX
ISLAND DX AWARD

Islands of the World DX Award (rules in the December 1977 column).

Alex Henry, WA9YXA collected USA-CA-500 endorsed All SSB, All 14, All Mobiles and USA-CA-1000 Mixed.

Al Churchman, WA6AQR received USA-CA-500 and 1000 endorsed All SSB, All Mobiles, All 14.

Richard Schier, WA4LOF gained USA-CA-500.

Justino Mateiro Santos, CT1TZ won USA-CA-500 endorsed All SSB, #9 Award to CT1.

SHEFFIELD AWARD
Specimen

Sheffield Award

Bob Beaudoin, WA1FCN got USA-CA-500 endorsed All CW.

George Woodruff, WA7FGU had me send him USA-CA-500 endorsed All SSB.

Awards

W.A.B. British Counties Award: Data and rules in last month's column but the WAB Award Books (Record Books), with 200 pages of info on WAB/HAB Awards, which costs 2 pounds .60 or $5.00 U.S. as of June 7, 1977, are to be obtained from: Mrs. J. E. Lacey, Oak Tree Bungalow, Lambourn Woodlands, Newbury, Berks, RG15 7TR, England.

USA-CA Honor Roll

2500	
K7CLO	249
2000	
CT1UE	289
WB4RVW	290
1500	
WB9RCY	337
WB4UHN	338
WB4RVW	339
1000	
WB4UHN	455
W7ULA	456
WA9YXA	457
WA6AQR	458
500	
WA4LOF	1199
CT1TZ	1200
WA9YXA	1201
WA1FCN	1202
WA7FGU	1203
WA6AQR	1204

California Chapter National Award Hunters Club-Awards Program:

Awards Chairman: Nancy E. Barron,
WA6ZAO, 14603 Fairvilla Drive,
La Mirada, California 90638.

California Charter Member Award: Work five (5) Charter Members, send GCR List B/M - $1.00.

National Full Member Award: Work any five (5) full NAHC members (numbers required). Seals for 10, 15, 20, 30 and 35. GCR List, B/M, $1.00.

Local Member Award: Work 10 California Chapter Members. Seals for 20, 30, 40, 50, 60, and 70. DX need work only five (5) California Chapter Members, Seals for 10, 15, 20, 30, and 35. GCR List, B/M, $1.00.

CALIFORNIA CHAPTER
NATIONAL AWARDS HUNTERS CLUB
PRESENTS
CHAPTER MYL AWARD

California Chapter NAHC MYL Award

MYL Award: Work five (5) California Chapter NAHC MYL Members. Seals for 10, 15, 20, 25, 30, and 35. GCR List, B/M, $1.00.

Los Angeles County Award: Basic Award for 50 towns/cities of Los Angeles County as listed on any map of Los Angeles County. Stations to count would have to be fixed or portable (no mobile). The criterion would be stations located as shown in the callbook, or if moved, as used in his normal statement of QTH. Seals for 75, 100, 125, 150, 175, and 200. GCR List, B/M, $1.00.

3.905 Century Club
This Award is issued to
Amateur Radio Station

3905 Century Club Award

Local Net Award: Basic award for 25 check-ins to the California Chapter NAHC Net. Seals for 25, 50, 75, 100, 125, and 150. Send list of dates. Free.

(Continued on page 69)

SOUTH YORKSHIRE AWARD
Awarded to Amateur Radio Station
for achievement
SPECIMEN

South Yorkshire Award.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The Swiss Federal Solar Observatory at Zurich, the world's official keeper of sunspot numbers for over two hundred years, reports a monthly mean sunspot number of 44 for September and a number of 41 for October, 1977. This results in running smoothed sunspot numbers of 20 and 22, centered on March and April, 1977, respectively. The new sunspot cycle, which began during March, 1976, continued to rise slowly, but steadily. A smoothed sunspot number of 45 is forecast for February, 1978.

DX Conditions

A seasonal decline is expected in *10* meter DX openings during February, but some good ones should still be possible, especially during periods when conditions are HIGH or ABOVE NORMAL. The band should occasionally open towards Europe and the east, particularly from the eastern half of the country, between 9 a.m. and Noon. Better conditions should exist towards South America and various regions of Africa, with fairly regular openings possible between 1 and 5 p.m., and occasionally as early as 9 a.m. Some good openings are expected towards Oceania and Asia between 2 and 6 p.m., but these should favor the western half of the country.

Fifteen meters looks good for worldwide DX during most of the daylight hours. The band is expected to open first towards Europe, Africa and the east about 9 a.m., and often remain open to as late as 2 p.m. Openings towards South America should be possible throughout the day, with conditions peaking between Noon and 4 p.m. Openings towards Oceania, the Far East and Asia look best between 4 and 8 p.m., favoring the western states. The path to Antarctica should peak on *15* meters between 4 and 7 p.m.

On *20* meters, look for a window of fairly good openings in almost all directions for an hour or two after sunrise. The band should peak again towards Europe and the east between 11 a.m. and 3 p.m. in the eastern half of the country and between Noon and 2 p.m. in the west. Towards Africa, propagation should be best on this band between 2 and 6 p.m. Best bet for *long path* openings from the western states to Europe and Africa is for a period of about two hours immediately after sunrise. Openings towards the south should peak again during the late afternoon, with the band remaining open towards South America until as late as Midnight when conditions are HIGH or ABOVE NORMAL. Check until Midnight for openings to Antarctica as well. Evening openings on *20* meters should also be possible to Oceania, the Far East and Asia, with signals expected to peak between 7 and 9 p.m. in the eastern states, and 7 to 11 p.m. in the west.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Feb. 1978

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

Where *expected signal quality is:*

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

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of (3) will be good (B) on Feb. 1, fair (C) on the 2nd, fair to poor (C-D) on the 3rd, and poor to no opening (D-E) on the 4th, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

Fairly good *40* meter openings are forecast to most areas of the world during the hours of darkness in February. Check between 7 p.m. and 2 a.m. for openings to Europe; between 7 p.m. and Midnight towards Africa; and between 8 p.m. and 5 a.m. for openings towards the south. From the West Coast, the band should open to Oceania, the Far East and Asia between Midnight and 7 a.m., with openings extending towards the East Coast between 4 and 7 a.m., local time.

Eighty meter openings are also forecast to most areas of the world during the hours of darkness. Conditions are not expected to be as good as *40* meters, with weaker signals and higher levels of static. Best bet for openings to Europe and the east is between 8 and 10 p.m. in the western half of the country and from 8 p.m. to about Midnight in the east. Conditions are not expected to be very good towards Africa, but check between 8 p.m. and 11 p.m. for an occasional opening. Best bet for openings towards South America is between 8 p.m. and 5 a.m. From western states there is a chance for some openings to Oceania between Midnight and 6 a.m., with possibilities in the eastern states between 3 and 7 a.m., local time. Conditions to the Far East are expected to be poorer, but with an occasional opening possible, particularly from western states, between 4 and 7 a.m.

Static levels are expected to increase on *160* meters during February, but some DX openings should be possible during the hours of darkness. Expect signals to peak when it is sunrise on the *easternmost* part of a path. For example, openings towards Europe and the east should peak between Midnight and 1 a.m. in the eastern time zone, while openings towards Oceania should peak between 5 and 6 a.m. in the pacific time zone, etc.

Short-Skip Openings

No significant skip openings are expected on *160* meters during the daylight hours, but openings up to 1300 miles should be possible at night, often extending to the one-hop limit of 2300 miles. On *80* meters, expect openings up to 250 miles during the day, and between 500 and 2300 miles at night. On *40* meters, daytime skip should be possible between 250 and 750 miles, extending to between 750 and 2300 miles during the evening to about 9 p.m., and between 1500 and 2300 miles until sunrise. On *20* meters,

*11307 Clara St., Silver Spring, MD 20902

daytime skip should range between 750 and 2300 miles to about 4 p.m. Between 4 and 7 p.m. the skip is expected to lengthen to between 1500 and 2300 miles, with the band out for short-skip by 8 p.m. on most days. On *15* meters, skip should range between 1300 and 2300 miles during most of the day to about 6 p.m., with the band usually dead for short-skip after that time. An occasional F-layer short-skip opening may be possible on *10* meters during the afternoon, for distances between approximately 1500 and 2300 miles. Some sporadic-E openings over shorter distances may also be possible.

V.h.f. Ionospheric Openings

No significant meteor showers are expected during February, and very little sporadic-E propagation is likely to occur. Best chances for ionospheric openings on the v.h.f. bands during February should result from auroral activity expected during periods when h.f. conditions are BELOW NORMAL or DISTURBED. Such openings on *2* and *6* meters, usually characterized by flutter fading and signal distortion, result from the intense regions of ionization that accompany auroral displays. Auroral-type openings usually range in distance from a few hundreds up to approximately 1300 miles. Check the "Last Minute Forecast" at the beginning of this column for those days during February that are expected to be DISTURBED or BELOW NORMAL.

Trans-equatorial propagation (TE) usually improves during the spring months and particularly when a solar cycle rises.

Some TE openings may be possible on *6* meters, in February, between South America and the southern states. The best time to check for TE openings is between 7 and 10 p.m., local time.

This month's Propagation Charts contain band opening predictions for major DX paths for the period of February 15 through April 15, 1978. A short-skip propagation forecast for February appeared in last month's column. Instructions for the proper use of these charts appear at the beginning of this column.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

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

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

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

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

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

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

February 15-April 15, 1978
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

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

*Predicted times of 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.

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

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

(Continued on page 68)

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

Recently, I received a letter in which the writer asked for an opinion as to the status of the operators at a multi-operator contest station. For example, can a Novice or Technician be part of the operating crew?

Sure, why not? As long as their operating is confined to those portions of the bands as specified in their license, I see no reason why they cannot be part of the crew. For that matter I see no reason why a s.w.l. could not also be included as a "spotter" at a receiving position, keeping the log, etc., as long as he does not do any actual operating at the transmitting position.

And by the same token it is quite obvious that the usable frequencies at the station are dictated by the station license and not by the grade of the license held by the operator.

Anyone not observing the regulations specified in their license are not only operating illegally in the eyes of the FCC but also risk disqualification, of the station, in the contest.

On the subject of operation of a Contest Expedition station; in most cases these expeditions are organized by members of a club, and as a result the score is credited to their Club.

One thing must be kept in mind however, in order for the club to receive this credit, the major portion of the operating crew must be members of that Club.

I am sure that this has been generally understood but I want to emphasize this point because of the increasing number of expeditions during our contests.

73 for now, Frank, W1WY

O.O.T.C. QSO Party

Phone: Fri./Sat., January 20/21
C.W.: Sun./Mon., January 22/23
1600 to 1600 GMT (11 AM EST)

Here again we have a late entry that did not make last month's issue. (Being Old, Old, Timers guess they will have to be forgiven.)

Logs should be columned as follows: Date/time in GMT, station worked, QSO no. sent and rec'd, state or country, name, OOTC no., band, OSO points and multiplier.

Calendar of Events

Jan. 20 & 22	O.O.T.C. QSO Party
Jan. 21 & 22	Americas QSO Party
Feb. 4-5	ARRL DX Phone Contest
Feb. 4-12	ARRL Novice Round-up
Feb. 10-12	New Hampshire QSO Party
Feb. 11-12	QCWA QSO Party
Feb. 11-12	Ten-Ten Net QSO Party
Feb. 18-19	ARRL DX C.W. Contest
Feb. 18-19	YL—OM Phone Contest
*Feb. 25-26	French Phone Contest
Mar. 4-5	ARRL DX Phone Contest
Mar. 4-5	YL—OM C.W. Contest
Mar. 18-19	ARRL DX C.W. Contest
Mar. 25-26	CQ WW WPX SSB Contest
Mar. 25-27	B.A.R.T.G. RTTY Contest
Apr. 1-2	Tennessee QSO Party
Apr. 1-3	ARCI QRP QSO Party
Apr. 11-12	DX to W/VE YL C.W. Party
Apr. 25-26	DX to W/VE YL Phone
Apr. 29-30	PACC DX Contest

*Covered last month.

Score 2 points for each QSO. A multiplier of 2 for each state worked on each band. And 5 for each country on each band.

Suggested frequencies are 15 kHz from the top and bottom of each band, plus all v.h.f. phone bands.

Logs must be submitted within 5 days after the end of each contest.

Phone logs go to: Herb Gleed, W6FQ, 2206 West Blvd., Los Angeles, CA 90016.

C.W. logs to: Glenn H. Means, W7AO, 226 S. Penn. Ave., Prescott, AZ 86301.

Americas QSO Party

Phone: 0001-2359 GMT Sat. Jan. 21
C.W.: 0001-2359 GMT Sun. Jan. 22

Announcement of this event organized by the Guantanamo A.R.C. was not received in time to make last month's issue. However now that *CQ* is being received at an earlier date the following may still be of some value.

Phone and c.w. are separate contests, but mixed modes entries will also be considered.

Stations in CQ Zones 6/7/8/9 and adjacent areas (HC8, VP9, HK0, PY0, XF4, TI9) may work stations in all areas including the above. The rest of the world will be looking for contacts in the above CQ Zones and adjacent areas.

Use all bands in the U.S. general portions. No cross band or cross mode except via Oscar.

Exchange: RS(T) plus QSO no., and country. (i.e. 599001 Gitmo)

Points: Contacts between stations within own country, 2 points. Outside own country but within contest zones, 3 points. With areas outside contest zones, 5 points.

Rest of world, 5 points for all contacts with stations in above contest zones and areas.

Multiplier: One for each DXCC country worked per band.

Final Score: Total QSO points from each band multiplied by sum of countries worked on each band.

Awards: Certificates and special recognition will be given in many categories. Including working six or more KG4s, six or more countries in the contest zones, and for Oscar contacts.

Include a summary sheet, signed declaration and check list for logs with 100 or more contacts.

Mailing deadline is March 1st to: Guantanamo A.R.C., P.O. Box 73, F.P.O. New York, N.Y. 09593. Include a s.a.s.e. if copy of results desired.

ARRL DX Contest

Phone: Feb. 4-5 & March 4-5
C.W.: Feb. 18-19 & March 18-19
Starts: 0001 GMT Saturday
Ends: 2359 GMT Sunday

This will be the 44th year for this marathon making it the granddaddy of all DX contests.

DX stations will be working the W/Ks and VE/VOs on all bands, who in turn will be digging for the DX.

Rules will follow the same format as in the previous three years.

Briefly, they are as follows:

Single operator stations will compete in any one of three categories. All Band, High-Band (10, 15 & 20) and Low Band. (40, 80 & 160) Multi-operator stations, single and multi transmitter, All Band only.

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*14 Sherwood Rd., Stamford, Conn. 06905

Exchange: RS(T) plus state or province for W/K and VE/VO. RS(T) plus 3 figures indicating power input for DX stations. (KH6 & KL7 are classified as DX).

Scoring: Three points for each completed QSO on each band. Ws and VEs multiply total by the number of DX countries worked on each band for their score. DX stations will use the 48 continental states and VO, VE1-VE8 for their multiplier. A possible 57 per band.

Awards: Certificates to the top scoring single operator station in each category, in each country and each U.S. and each VE ARRL section. Awards to multi-operator stations, both single and multi transmitter, will be made in each W/VE call area and DX country. In addition DX stations making 1000 or more QSOs will also receive a certificate. Plaques to continental leaders. There is also a Club award.

It is recommended that you write to ARRL for more detailed information, and for log forms and check sheets. A large s.a.s.e. will get fast delivery.

Mailing for your contest entries is April 17th to: ARRL Communications Dept. 225 Main Street, Newington, CT 06111

ARRL Novice Round-up

Starts: 0001 GMT Sat. February 4
Ends: 2359 GMT Sun. February 12

This is a good opportunity for Novice and Techs. to get initiated into contest activity. It is suggested that you check January QST or write to ARRL for more information. If you expect to participate ask for log forms and summary sheet and for Op. Aid #6. (Include a large s.a.s.e. for fast delivery).

Briefly rules are as follows:

Only 30 hours of total operating time can be used. Time may be divided as desired, but off periods may not be less than 15 minutes, and must be indicated on the log.

All classes may participate but only contacts with Novices and Technicians, made in that portion of the band assigned to them, have any point value. Novices will be competing with other Novice, and Techs. against Techs.

For purposes of identification Novice and Techs. should include /N and /T in their call.

Exchange: RST and ARRL section, country for DX stations. (Novices with ARRL Proficiency credit should include that info in their exchange for extra scoring points.)

Scoring: Number of (QSOs + CP credit) multiplied by (ARRL sections + DX countries) worked for final score.

Awards: Certificates to highest scoring Novice and Technician in each ARRL section.

Entries must be mailed no later than March 15th to: ARRL Novice Roundup, 225 Main Street, Newington, CT 06111

New Hampshire QSO Party

Two Periods GMT
2000 Fri. Feb. 10 to 0500 Sat. Feb. 11
1400 Sat. Feb. 11 to 0200 Sun. Feb. 12

Again sponsored by the Concord Brasspounders W1OC, this one was organized to promote the Worked New Hampshire Award.

The same station may be worked once on each band and mode, and New Hampshire stations may work each other for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for N.H. stations, ARRL sections or country for others.

Scoring: N.H. stations score 1 point per QSO, times the number of (ARRL sections + DX countries + N.H. counties) worked.

Others score 5 points for each N.H. station worked times the number of N.H. counties worked. (max. of 10)

Frequencies: C.W. — 1810, 3555, 7055, 14055, 21055, 28130. Phone—1820, 3935, 3975, 7235, 14280, 21380, 28575. Novice—3730, 7130, 21130, 28130. v.h.f. — 50.115 and 145.015 Simplex. (no repeaters)

Awards: Certificates to the top scorers in each N.H. county, and each state, VE province and DX country. (min. of 50 points) And the WNHA award if all 10 counties are worked.

Mailing deadline is March 15th to: Concord Brasspounders, Inc., Att: C. Halloway, 9 Via Tranquilla, Concord, N.H. 03301. Include a large s.a.s.e. for results and/or an award.

QCWA QSO Party

Starts: 0000 Sat. February 11
Ends: 2400 Sun. February 12

The 21st Annual QSO Party will be sponsored by the Northern New Jersey Chapter this year, under the direction of George Apfel, W2GHV and a committee of four other members.

The rules have been further streamlined and the scoring system simplified by headquarters. It is expected that this format will be retained for future parties, with possibly only minor refinements. The change of sponsorship each year will have no bearing on any rule changes.

Only contacts between members have any point value. The same station may be worked once only, c.w. or s.s.b., regardless of the band.

Exchange: QSO no., time in GMT, name of Chapter and state. Members with no Chapter affiliation indicate "member at large." (AL) But have no multiplier value.

Scoring: Very simple, Multiply number of QCWA members contacted by the number of Chapters worked.

Frequencies: C.W. — 3550, 7050, 14050, 21050, 28050. S.S.B.—3900,

More Trophy presentations. This one at the Yankee Clipper Contest Club meeting at Hartford last Fall. All were for the 1976 CQ W.W. Contest. From L. to R.—WA1JLD with the Bill Leonard, W2SKE World All Band Phone Trophy for his winning score at PJ9CG. Next is W1GNC with the Anthony Susen, W3AOH World Multi-opr. Single Xmtr. C.W. Plaque for the PJ9MM operation. (W3ZZ, WB3BSV & W8FAW were also part of the crew.) And K1ZM with the PVRC U.S.A. All Band Phone Trophy for his operation at W1ZM. That's me, W1WY with nothing to hold but my hands.

7240, 14270, 14340, 21390, 21435, 28600. RTTY—3595, 7095, 14095, 21070. FM—146.55 simplex. (plus or minus 10 kHz)

Logs: Log sheets should be columned as follows: QSO no. sent and rec'd., time in GMT, station worked, Chapter and state. And a column recording the Chapter multiplier. The QCWA Dec. Newsletter had a sample copy. Also a list of Chapters by numbers.

QCWA will award a plaque to the high scorer in the party.

Mail in your entry as soon as possible and mail it to: Northern New Jersey Chapter of QCWA, P.O. Box 312, Park Ridge, N.J. 07656

Ten-Ten Net QSO Party

Starts: 0000 GMT Sat., February 11
Ends: 2400 GMT Sun., February 12

This is the Winter QSO Party of the Ten-Ten International Net. It's open to all amateurs but only members are eligible for awards.

Activity is on 10 meters only, use any mode but one contact only with the same station.

Exchange: Name, QTH, and 10-10 membership number if a member. Include Chapter name to credit score to your chapter.

Scoring: One point for each QSO, add another point if its with a 10-10 member. (max. of 2 points)

Awards: 1st and 2nd place certificates in each U.S. call area, KH6, KL7, and each VE District. Also Central America and Caribbean; South America; Europe; Africa and South Atlantic; Asia and North Pacific; Australia, New Zealand and South Pacific.

Results will be published in the Net's Summer Bulletin.

Logs and applications for membership go to: Grace Dunlap, K5MRU, Box 445, La Feria, TX 78559. Mailing deadline is March 31st.

YL-OM Contest

Phone: Feb. 18 - 19 C.W.: Mar. 4 - 5
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

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

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

Scoring: Each QSO counts 1 point. Multiply total by number of ARRL sections and countries worked for your final score. The same station may be worked once only, regardless of band.

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

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

Awards: Certificates to the highest scoring YL and OM in each U.S. and VE call area and in each country. There are 2nd and 3rd place certificates for the runner-ups. And 4 Trophies for the top YL and OM in each contest.

Logs must be mailed by March 23rd and received no later than April 17th. The V.P. for 1978 had not been elected at the time of this writing, therefore we do not have a mailing address for your logs. However we should have it before the mailing deadline and will include it in the next issue.

Winners in the 1977 YLRL "Howdy Days" are Christa Elksnat, DJ1TE (member) and Darleen Magen, WD5FQX (non-member).

Propagation *(from page 65)*

Austral-asia	14-15 (1) 15-17 (2) 16-18 (1)	08-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-01 (1)	02-04 (1) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*

Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-14 (3) 14-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-09 (4) 09-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-21 (3) 21-00 (2) 00-06 (1) 06-07 (2)	18-19 (1) 19-20 (2) 20-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	14-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-00 (2) 00-02 (1) 04-06 (1) 06-08 (2) 08-14 (1)	19-20 (1) 20-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	*Nil*	13-16 (1) 16-18 (2) 18-20 (1)	16-19 (1) 19-23 (2) 23-02 (1) 07-09 (1)	22-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

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

Awards *(from page 63)*

Presidents Award: Basic Award for 50 consecutive check-ins to the California Chapter NAHC Net. All check-ins must be consecutive, No. 1 through seal applied for. Seals for 50, 100, 150, 200, and 250. GCR to be mailed to the President of this Chapter. B/M, Free.

DX Net Check-In Award: For DX 6 meter radiophone Check-ins to the net. Station checking-in and applying for certificate must be located more than 150 miles from Los Angeles City Hall. Free.

Booster Award: For sponsoring 5 new members of this Chapter. Award sent upon acceptance of 5th member sponsored. Seals for every 5 thereafter upon receipt of GCR List and SASE. B/M. Free.

Worked All Club Calls Award: During contests many amateur radio clubs across the USA work for points. In order to make this profitable for both the contest station and the poor amateur trying to carry on a normal QSO, there is now an Award for working 15 Club Calls, as designated in the callbook. Seals for 30, 45, 60, and 75. GCR List, B/M, $1.00.

California Counties Award: There are 58 Counties in California. Stations to count would have to be base stations or fixed portable. A mobile would be portable if unable to move while transmitting and receiving, attached to a ground rod, operating from 110 volt land line power, operating with power from a gasoline generator set on the ground, etc. Basic Award for 10 Counties. Seals for 18, 26, 34, 42, 50, and 58. GCR List, B/M, $1.00.

Seals of the United States: This is an attractive 11" by 14" certificate, which when completed will display all of the United States Seals. The cost is $2.00. QSL cards are not to be sent in at the time of application, but must be in your possession for spot checking. Basic Award and Seal is for one State worked, seals are issued for each state worked thereafter with a GCR

List and an SASE. *The 12 aforementioned awards are from the California Chapter of the National Awards Hunters Club, Awards Chairman, Nancy, WA6ZAO., President, Mike, WB6VUB.*

3905 Century Club 1000 Point Award: This NET meets daily at 0100Z and closes at 0500Z and issues two Awards. Rules for this Award are: 1. You must fill in every blank on the check sheet, in each category. List each call you claim. Check sheet and rules to be obtained by sending SASE with your blank QSL to: Charles Cook, WD8DIV, 2792 Friar Drive, Parma, Ohio 44134. Be sure the SASE is at least 4" x 9".

3905 500 Point Award: Send 4" x 9" SASE for rules and check sheet to: Charles Cook, WD8DIV, 2792 Friar Drive, Parma, Ohio 44134.

The Sheffield Award: Sponsored by the Association of Sheffield Amateur Radio Clubs of England. Available to transmitting amateurs and SWLs in the following categories:

1. To stations outside Europe: Proof of contact with 5 Sheffield stations.
2. To stations in Europe, outside UK: Proof of contact with 10 Sheffield stations.
3. To stations in UK: Proof of contact with 20 Sheffield stations. "Sheffield stations" are those within the city boundary. "Proof of contact" must be in the form of a copy of logbook entries examined and signed by another licensed amateur of the same country. The Award is for contacts *after* January 1st 1975, any band, any mode. Application (with 15p stamps or 3 IRCs) to the A.S.A.R.C. Awards Manager, Brian Flounders, 24 Birley Spa Lane, Sheffield, S12 4ED England.

The South Yorkshire Award: Also sponsored by the Association of Sheffield Amateur Radio Clubs. Available to transmitting amateurs and SWLs in the following categories:

1. To stations outside Europe: Proof of contact with 10 stations in South Yorkshire.
2. To stations in Europe, outside UK: Proof of contact with 20 stations in South Yorkshire.
3. To stations in UK: Proof of contact with 30 stations in South Yorkshire. Proof of contact, applications same as for the Sheffield Award and also contacts after 1st January 1975.

Notes

There's just enough room to tell you to keep in there plugging and have patience, the QSLs will arrive. Also remember to write and tell me, How was your month? 73, Ed., W2GT.

QRP *(from page 56)*

pole on 80, and inverted Vee on 40, using the same feedline. At 2025Z we finally had our first QSO! 80 meters was fine, 40 was very tough—had to call five or ten guys for everyone worked. Then we put up the beam at 0200, but it was only 20 ft. up, and we were not able to rotate it. Pointed it at about 260 degrees. It seemed to work OK but couldn't seem to get out well on 20 meters. Then had Argonaut trouble—measured output was 80m - 4 watts, 40m - 0.8w, 20m - 0.75w, 15m - 1w, 10m - 0.6w. Don't know why, but the Argo is busted. We lost about five hours fooling around with stuff that went wrong. Except for 80 meters, every QSO was a battle. We had to push tooth and nail all the time and we were both beat at the end. 80 was sweet!! Worked nearly everything we heard on that band. I haven't been on Field Day since I was a teenager —had a great time!"

Gene sure must be an ultimate optimist, still able to view the excursion as a great time despite everything that went wrong. At any rate, congratulations on racking up a fine score to N2AA/W2JDH!! Let's see if we can drum up more entries next year fellas.

QRPp Section—CQ WW WPX/SSB Contest!!!

It is official gang, a QRPp section where QRPp operators can compete against each other in a big DX contest. Runs from 0000 GMT March 25 to 2400 GMT March 26, 1978. See complete rules in another issue of *CQ.* Certificates will be awarded to high scoring stations in each country and call area of the U.S. This looks like a good opportunity for the QRPp gang. I only wish the section could have been opened up for the CW portion. That would have allowed HW-8 types to get into the fun. So, let's get to it gang!!!

For now, 73 and good QRPp'ing,
Ade

DX *(from page 61)*

SM0AGD/S2—c/o J. Svensson, SM3CXS, Berghemsv. 11, S-86021 Sundsbruk, Sweden
TI2DBJ—Via P.O. Box 2357, San Jose, Costa Rica
VE8AS—To A. S. Cobham, P.O. Box 4597, White Horse, Yukon, Canada
VG3BA—c/o Brantford A.R.C., 290 West Street, Brantford, Ont. N3R 3V5 Canada
VP1APC—Via Airport Camp A.R.C., P.O. Box 826, Belize City, Belize
VP2LDD—To Peter Searle, P.O. Box 181, Castries, St. Lucia, West Indies
VP2MJE—c/o S. C. Shallon, W6EL, 11058 Queensland St., Los Angeles, CA 90034
VP8OT—Via T. Stewart, British Antarctic Survey, Port Stanley, Falkland Islands
VP9II—To P.O. Box 463, Hamilton, Bermuda
VR4BC—c/o P.O. Box 225, Honiara, Guadalcanal, Solomon Islands
VU2KMK—Via D. K. Hendricks, W7ISY, 4906 Pinewood Drive, Salt Lake City, Utah 84107
VU2LE—To J. W. Billon, WA6OET, 4040 Via Opata, Palos Verdes Estates, CA 90274
WB5SGZ/DU2—c/o H. R, Jones, K3GBZ, 200 W. Moreland Ave., Hatboro, PA 19040
YB6ACV—Via H. Arasz, c/o Mobil Oil Co., LHO, Seumawe, North Sumatra, Indonesia
ZD8EW—c/o E. Wilby, B.B.C., Ascension Island, South Atlantic
ZF1MT—To A. A. Pahr, WA9UEK, Box 1, Plymouth, Wisconsin 53073
ZP5LX—c/o Joe Arcure, Jr., W3HNK, P.O. Box 73, Edgewood, PA 19028
ZS4PB—Via D. J. Moen, W7VRO, Box 981, Bellingham, WA 98225
5N2PPP—To P.O. Box 17, Ekeja, Nigeria
9K2EX—c/o H. Loow, SM0BYD, Radarv. 13-13, S-18361, Teby, Sweden
9M2DW—Via R. Knobloch, DJ3HJ, P.O. Box 1224, D-7814 Breisach, Germany
9M6MU—To Alpons Undan, P.O. Box 210, Keningau, Sabah, Malaysia
9Y4SF—c/o G. L. Black, WA5GFS, Box 141, Hattieville, AR 72063

73, John K4IIF

Speech Processing *(from page 52)*

two types of compression depending upon the time constant. Both types have a fast, about 1 ms, attack time. This is necessary because speech is characterized by very fast rise time large amplitude signals. If the compressor is to work, it must quickly reduce its gain to compress such a signal. On the other hand, the speech bursts decrease at a slower rate, and therefore the release time constant can be longer. Until a few years ago, most release time constants were on the order of about 1/2 sec. this was true for audio compressors and for r.f. ones called a.l.c. (automatic level control). This time constant is much longer than the decay times of the speech sounds. Thus, if a strong signal is followed by a weak one, the gain reduction that was done to reduce the amplitude of the strong signal, is still in effect for the weak one, and the ratio of their amplitudes did not change much. Such a long release time constant compressor is effective for compensating for slow variations, such as moving away and towards the microphone, but does not do much to enhance intelligibility.

More recently another type of compressor has become popular. It has a shorter release time constant, and hence is called a **syllabic** rate compressor, since the time constant is roughly the length of speech syllables. The exact value varies, but 100 ms is about the maximum. The minimum is limited by the fact that, if it is too short, distortion will be created during slowly varying speech sounds. About 10 ms is the minimum, which is about the length of the shortest speech sounds. This type of compressor does give an increase in intelligibility and it can be implemented at either the r.f. level, such as on the TS-520, or at the a.f. level. However, at high compression levels the mushiness problem remains.

Before going to some remedies for this, a note on intelligibility. There are many ways to measure it, but the most common is using a single syllable or one syllable words. A speaker speaks syllables from a prepared list, varying amounts of noise are added, and a listener writes down what he hears. Thus the effect of modifying the transmission channel between them, such as compression, clipping, filtering, etc., can be determined for various signal to noise ratios. Fig. 1 summarizes much of the recent research into this area[1]. The starting point is curve **B**, which represents just straight speech, i.e., without any clipping, filtering, or compression. It will be seen that the curve is roughly linear, with intelligibility increasing with the S/N ratio.

One attempt at improving this situation is interesting. If the intelligibility is in the higher speech frequencies, why not just roll off the low frequencies without using any compression and clipping? This was done and the optimum roll off filter determined. It turned out to be one with a 1.5 kHz cut off and a roll off rate of 18 db/octave below this frequency. It should be noted that this, as well as the subsequently discussed filters, are for male voices, YL's no doubt have a higher optimum cut off frequency, although my guess is that the optimum roll off rate would be the same. Curve **C** shows the results, and it is noted that at the very low S/N ratio of −10 db it is the best. I doubt that much amateur communication takes place at such low levels of S/N ratios. It is considerably better than the straight speech curve **B**.

Another attempt to improve the situation was the use

(Continued on page 75)

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[1] I.E.E.E. Trans. Acoustics, Speech, and Signal Processing Vol. ASSP-24, No. 4, August 1976 page 277.


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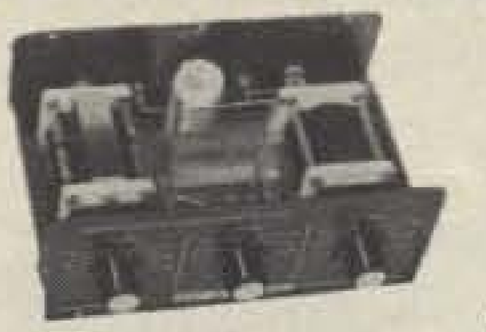

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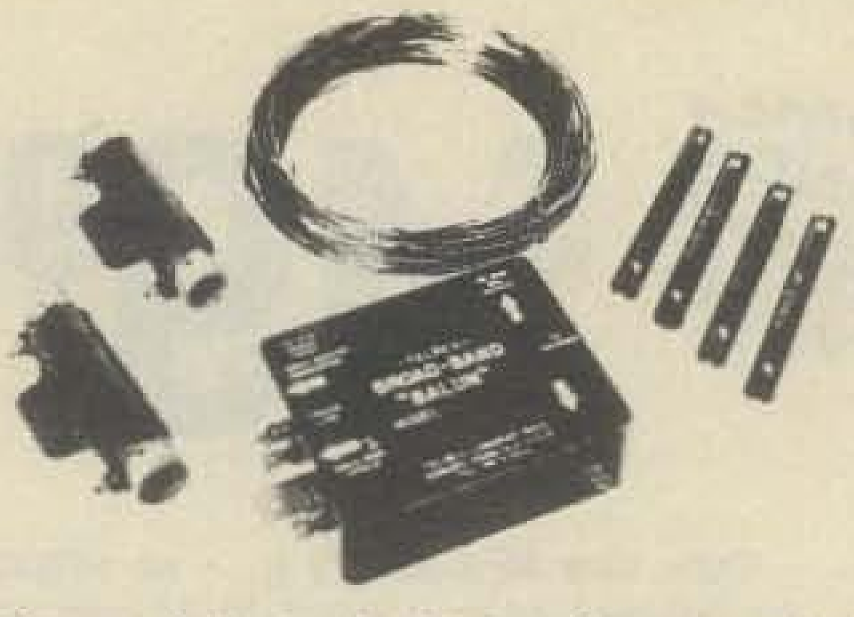

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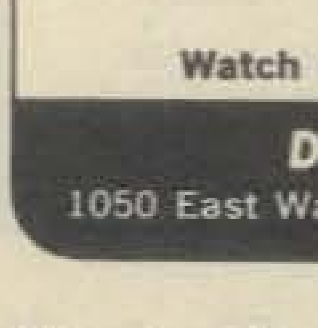

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Speech Processing *(from page 72)*

of infinite clipping. In such a situation the output of the clipper is just a square wave signal. Again low frequency roll off was used before the clipper. This time to reduce the power of harmonics from the low frequency first formant signal due to clipping from interfering with the second formant signals. The optimum high pass filter was found to have a 1.1 kHz cut off frequency with a 12 db/octave roll off. The result is shown in curve **A**. At positive S/N ratios it beats curve **C** somewhat, but at negative ones it rapidly falls off. This is probably due to the fact that even with the filter, harmonics of the lower frequencies are still present, and therefore still interfere with the second formant.

Finally, a fast time constant compressor was tried again with a high pass filter before the compressor. The optimum high pass filter was found to be a two kHz cut off frequency with 6 db/octave roll off. The results are shown in curve **D**. It was the best of them all except for very low S/N ratios. This is due to the fact that compression creates much less harmonic distortion than does clipping.

Finally, that customary question "How does it sound?" I tried a syllabic compressor with the 2 kHz filter and recorded it. You could tell that the speech was not normal since it lacked lows, but it was by no means garbled. It had a very crisp sound to it, but it did not make me sound like the medieval Italian *Castrati*. During an on the air test, one station asked me to turn it off because he didn't like its sound. On the next go-round he asked me to turn it back on again since he was missing an occasional word. Then I knew it must be working! Other comments were that it was "easy copy" through the QRN on 75 and QRM on 20.

In summary, doing processing at the r.f. level is better since harmonic distortion is easy to filter out, compression is better than clipping since less harmonics are generated to begin with, and low frequency roll off reduces these harmonics even further and gives a crisp easy to *copy* sound. Most important, intelligibility is the criterion not fidelity; how does it work is more important than how does it sound. ■

SW-3 Revisited *(from page 40)*

ground connection on the receiver. Finally, place a mica compression trimmer in series with the antenna right at the receiver terminal. Use as little capacitance as you can and still get good, strong signals. You will be surprised at how little capacitance is needed. The SW-3, in fact, will perform wonders with as little as 10 feet of antenna wire on the higher bands. For 80 and 160 meter reception, a minimum of 20 feet of wire is suggested.

The sensitivity of the SW-3 is amazing. Properly peaked up and with optimum antenna coupling, you'll hear everything your station receiver can hear, right down to the background noise. You'll be limited by antenna pickup, since you are probably used to having a beam hooked to your station receiver. But the SW-3 has "ears" like an Iroquois Indian scouting party, so don't be surprised when you hear that exotic DX-pedition station rolling in on the little receiver.

Receiver Power Supply

The SW-3 works very well at a plate potential of 90 to 150 volts. At the lower plate voltage, you may find that the receiver won't break into regeneration on the lower frequency coils. You can use a National power supply (if you can find one). I use a small, surplus 140 volt regulated supply that does the job nicely.

Examine your SW-3 to see if one side of the filament leg is grounded in the receiver. Most of them are wired that way. A few receivers, however, have the filament circuit ungrounded. One leg of the filament should then be grounded in the power supply, or a hum may exist on strong signals. Other receivers have a built-in filament center-tap resistor and these receivers should use a filament supply that is not grounded in the power supply.

Good Luck With Your SW-3

This little set is a popular collector's item and its value will increase as the years go by. Best of all, you can hook it up and listen to it! You must use high impedance earphones (2,000 ohms to 5,000 ohms). Low impedance phones just won't work unless you place a matching transformer between the receiver and earphones. A pee-wee transformed to match a pentode output tube to a speaker voice coil will work OK.

Get your receiver working and start listening. You'll be surprised at the DX you can hear! ■

Computers *(from page 30)*

Interested in conversation with your computer? While not truly a reality, hobby grade equipment is available allowing the hobbiest to experiment with speech synthesis and recognition.

Word processing is available on some systems with the appropriate hardware and software. This might be used for putting the professional touch on letters and documentation.

Perhaps some software to help children with their math homework or a recipe file for the wife would be useful.

Amateur radio users can use their system to send and receive code and to process, transmit, and display slow scan television images, plus do their logging.

Where Are They Available?

Computer equipment is available through mail order houses or local computer stores. The potential buyer should be careful to deal with a reputable firm. Although the hobby computer industry is relatively young many businesses have found themselves forced to close their doors. Continued price declines and increased product offerings will almost certainly contribute to the demise of many more in the next year. Those who feel a deficiency in computer hardware or software should seek the assistance of other hobbiests or professionals in their area.

Is It Really Worth It?

Caution should certainly be exercised while considering entry into any avocation. It is important not to become overwhelmed by the potential problems. If the possible rewards or gains of hobby and personal computing are assessed realistically by an individual, the answer to the question "Is it really worth it?" can be a resounding YES! Even if a decision is made not to enter into hobby computing at the present time, keep it in the back of your mind—the situation might change tomorrow.

Coming Up In Future Issues

Future issues of *CQ* will contain articles on Computer Hardware and Software—"What are They" and "How Do They Work" along with reviews of products of particular interest.

Next: COMPUTER? What is it?

TVI and CB *(from page 28)*

issued Docket No. 21116, which proposes to amend the Commission's Rules to prohibit the marketing of external radio frequency amplifiers capable of operation on any frequency from 24 to 35 MHz.

Finally, as a result of CB-RFI problems which are related to the use of Amateur transmitters and transceivers by communicators on the 27 MHz Citizens Band, and because such Amateur equipment does not now fall under the Commission's regulations on type acceptance and marketing, the Commission has issued Docket No. 21117. This Docket proposes to amend the Commission's Rules to require type acceptance of equipment marketed for use by operators in the Amateur Service. And while the Commission would not require the spurious and harmonic attenuation levels of type-accepted Amateur transmitters to be as great as those imposed on CB transmitters, the fact that type acceptance might be required for Amateur equipment represents a departure from the traditionally-held view that such regulations impede the innovative process within the Amateur Service.

To say the least, Amateurs have much at stake in the deliberations which address CB-RFI. As such, we can ill afford to ignore the effect such proceedings might have on the Amateur Service.

The Bottom Line

The FCC study on television reception difficulties associated with CB radio transmitters indicates that TVI (and, indeed, RFI, in general) is a very serious problem. Further, given the fact that millions of households are now affected by RFI, and that increased regulation of the CB and Amateur Services may evolve as a result of such interference, it behooves all parties concerned—the radio operator, the manufacturers of CB and Amateur equipment, the manufacturers of electronic home-entertainment equipment, and the Commission—to work together in resolving RFI problems. Such a coordinated approach appears to be the only way in which to resolve for all time one of the most complex problems facing the CB and Amateur Services.

Copies of the report, entitled "The Extent and Nature of Television Reception Difficulties Associated with CB Radio Transmissions," are available for inspection at the FCC's Public Information Office, Room 202, 1919 M Street, N.W., Washington, D.C. The report may be purchased from the Downtown Copy Center, 1730 K Street, N.W., Washington, D.C. 20006. Telephone (202) 452-1422. ■

The Giant LCD Clock *(from page 23)*

indoors on a very cold day, the display may not read correctly—one or more "extra" segments may light up. This happens because of condensation between the IC or LCD sockets' closely spaced "lands" on the PC board, or moisture between the contact areas on the LCD itself. Normal drying in warm room air should alleviate the problem. Plug in the clock and let it operate for 15 to 30 minutes to restore normal operation.

Back-Lighting The Display

If you add a small fluorescent or incandescent light source *behind* the LCD the visibility of the large time numerals will improve. The light should be mounted out of direct line of sight, so as to cast light on the display, without the light-source itself being visible through the LCD panel. An angle-mounted plane mirror is a good choice for reflecting light onto the display. Choose one about the same width as the LCD panel and about half its height. Alternatively, aluminum foil can be used as a flexible, easily worked reflector. ■

Warning

The digital clock is powered *directly* from the a.c. line. Accordingly, it should be housed in an insulated case or enclosure, to protect children and non-technical admirers from accidently touching "live" connections and receiving from accidentally touching "live" connections and receiving a shock.

HAM SHOP

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CASH for your clean ham gear. Beacon Communications — used equipment specialists, 879 Beacon St., Boston, Mass. 02215. 617/267-1975.

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

SELL: Swan 250 $175.00 less power supply. 1 kilowatt plate transformer $15.00. Waterman scope $25.00, Hyler Ignition scope $10.00, 16 mm gun camera $10.00. Donneau, W1YIX, 11 Blanche Ave., Cumberland, RI 02864.

HELP! Need to contact anyone that was part of the group that set up a ham station on Isla del Coco off of the coast of Costa Rica. Need maps and photos of the island, info on comm problems and sea transport to the island. J.F. Welch, TUSLOG, Det-8, Box G, A.P.O., New York 09294.

SELL TO AMATEURS: Stainless steel fasteners, all types and sizes, syntane insulating material, small parts machined, send sketch for quote. Anthony C. Hoynacke, 512 Woodward, Iron Mountain, MI 49801.

FREE Shipping, Bearcat BC-210, Discounted $259.95. Regency Touch, $249.95. Others, write or call 707/544-4388. Visa & Master. McDonald Electronics, Box 7492, Santa Rosa, CA 95401.

WANTED: Yaesu FL 2000B — Charlie, WA2-CMR, 410 George St., Spt. 3, New Brunswick, NJ 08901.

WANTED: Manual and schematic for Hallicrafters receiver S20 R "Sky Champion". Charles Cook, 14 Sandcreek Place, Decatur, Illinois 62521.

D & V RADIO PARTS — Variable & Trimmer Capacitors-RF Chokes-Air Wound Coils-Transmatch Components-Send stamp for complete listing of in stock components. 12805 W. Sarle, Freeland, Michigan 48623.

YAESU FT 101E, 2 mos. old, CW filter, fan, warranty cards, manuals and packing materials. Best offer over $615. Will pay shipping. Call Steve, WD4LUT, (919) 968-2906.

ELIMINATE QRM AND QRN problems with our superior CW and SSB filters. Also CW Keyers, speech compressors, power supplies, teletype converters, and multiband antennas assembled or in kits. Dealer discounts. Dynamic Electronics, Box 896, Hartselle, AL 35640. 205/773-2758.

WANTED: Heath HG-10 VFO w/manual. State price and condx. Steve Hart, WB9UTX, Box 620 SR 67, Vincennes, IN 47591.

COLLINS 75S1 $325; Heath DX60 and HG10 with mods $100; PCS four channel radio control system $90. All excellent, all with manuals. Harry M. Capper, Harrisburg, PA. 717/652-0868 after 6 p.m.

WANTED: Johnson Navigator. State condition, price. Shipping paid. WA2QKF, Drawer M, Tully, NY 13159.

HF SEPARATES or Tranceive: SB400/SB301 with SSB, CW & AM Xtal filters, 25 kHz Cal, 2 & 6M converters, manuals, cables. FB Rig. $225 each or $375 pair incl. UPS. Chuck/WA2IXE, (914) 277-4168. Union Valley Rd., R.D. I, Carmel, NY 10512.

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SELL: Heath SB-104 txcvr, completely checked and aligned by Heath, w/noise blanker, plus HP-1144 pwr supply and SB-604 spkr, all mint. $700. B. Pearce, 204 Ave. B W., Bismarck, ND 58501.

HALLICRAFTERS HA-60 blower kit for FPM-300, SR-400, SR-400A. $29.95 plus shipping. ARDCO ELECTRONICS, P.O. Box 3614, Arlington, Texas 76010.

BEAUTIFUL multi-colored decal with your call and state, $3.95. Forwardco, Box 76, Massillon, Ohio 44646.

I'M LOOKING FOR CW/Phone skeds. Need QSL's for 5BWAS/DXCC. All letters answered. W3HU, Box 522, Levittown, PA 19058.

TECH MANUALS for Govt. surplus gear—$6.50 each: SP-600JX, URM-25D, OS-8A/U, TS-173/UR. Thousands more available. Send 50 cents (coin) for 22-page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

PARALINE Manufactures and stocks transformers, Write for free data sheets. Paraline, Dept.-t, 515 So. Palm, Alhambra, CA 91803.

REPLACE RUSTED ANTENNA BOLTS with stainless steel bolts, small quantities, free brochure, Elwick, Dept. 255, 230 Woods Lane, Somerdale, NJ 08083.

WANTED: For tube museum. Mercury Arc Recitifier from early heavy battery charger or theatre projector. Also other unusual tubes any size. Write the Tube Bank, WA7-YFM, 123 Westview, Spokane, WA 99218.

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

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

SSTV AND PHOTOGRAPHERS: Make offer, 1 each, like new, Fujitar lenses, 135 mm, f 4.5—telephot, 35 mm, f 3.5—wide angle. Cary Cowan, c/o CQ Magazine, or call (516) 883-6200.

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

SALE: Heath IM-28 VTVM kit. New. Perfect. Ordered by mistake. $40. Schultz, Box "L", FPO New York.

TRI-EX 40' tower, 15, 20m monobanders, Ham M rotator, cables, guys, $275. 2m FM Sonar, AC P/S, $175. HW-32A spare tubes, $65. WB2AQC, George Pataki, 34-24 76th St., Jackson Hgts., NY 11372.

SELL: Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch, $16. UTC S-50 kv c.t. 300 ma, new, pick-up only, $75. Small (2 kw) $20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in JUne 1976. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted dorectly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., Albuquerque, NM 87114. Please enclose $1.00 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapter, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

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

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

FOR SALE: Spectra Physics 137P 2mw laser tube, brand new, never used $80. G.R. 572B 1 kHz Hummer $15. Irwin Math, 320 Northern Blvd., Great Neck, NY 11021.

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

CAN ANYONE HELP? Need a 3RP1A CRT to repair my scope. Schultz, US Consulate, Box "L", FPO New York 09544.

SACRIFICE: Drake T-4X, R-4B, spk-MS-4 with pwr supply. $595.00. Atlas 210X with console $685.00. All in mint condition. CB Mart, Box 5024, Conalville, IA 52241.

HW-202 w/built-in Sandlin scanner, crystals; ITC Multi-2000; Bearcat 101 Scanner. All good condition. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

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

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

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HIGH SPEED CODE TAPES: 40 to 80 WPM. Inquire K4KHT, 4330 N.E. 13th St., Ocala, FL 32670.

ENGRAVED PLASTIC SIGNS—Badge with name and call—$1.25, Desk-with name and call with walnut base 2 x 6"—$6.00, custom also. Anthony C. Hoynacke, 512 Woodward Ave., Iron Moutain, MI 49801.

TUBES: 829B with socket 6.50, 5894 at 15.00, 4-124A at 19.00, 807w/5933 at 2.00, 931A at 5.00, 811 at 2.25 812 at 2.75, SASE for list. K0JHW, 7061 Idlewild Ave., Jennings, MO 63136.

CLEANING HOUSE: Sell Heath HW32A, 20m xcvr with mike/spkr $85; Heath HP13B DC pwr supply $35; Heath HD10 keyer $15; Heath 10ER (AM) $5; Apelco Marine Band xcvr $10; Mil Surplus Aircraft Trans. $5; Home brew 6m AM 60w tras. $5; Add $2 per item for shipping. D. Haworth, K2QQ, 14 Phyllis Dr., Succasunna, NJ 07876.

WANTED: Schematics and manual for Harvey-Wells T-90 bandmaster. (913) 628-8848 nites only. Tony Lowman, WD0FAQ, 405 West 14th, Hays, KS 67601.

SELL: Yaesu 200R syn 2m FM xcvr, NPC 104R, PS, 1/4 whip, 11 el beam, mint $360. Joystick Indoor ant. $50. R. Hajdak, 1644 Morris St., SE Mineral Ridge, OH 44440.

SELL: Wilson 1405, Genave GTX-10 Both full of xtals and touchtone working fine, make offer! Wayne Davis, WB4FNC, 2258 Royal Palm Ave., Ft. Myers, FL 33901.

E.F. JOHNSON telegraph sounders and key brass and wood, diagram underneath. K2FS, 33-55 161 St., Flushing, NY 11358.

VFO Eico model 722 in VGC, 80 thru 10 meters, very stable, w/manual, $45.00. WA4-TGJ, 2957 Gaffney Rd., Richmond, VA 23234, (804) 275-1252.

SB-34, Swan 500C, Regency [illegible] A, Touchpad, VOX, postcard brings details. [illegible], 17 Whitney, East Hartford, CT 06118.

WILL PAY $100 for factory wired atwater Kent "Breadboard". WB1BVO, 22 Forest St., Branford, CT 06405.

TEKTRONIX 512 scope, DC to 500 kHz, triggered sweep, calibrator, magnifier, manual. $225 pick up; $250 commerically crated. PhD, 5220 Carlingford, Riverside, CA 92504.

RUBBER STAMPS: Personalized for hams, your call, name, QTH, etc. $2.50 sent prepaid worldwide. Les Belyea, Box 327, Belgrade, MT 59714.

SELL: Antenna noise bridge, Omega TE7-02, 1-300 MHz. New condx, $37.95. W4JGO, 643 Diamond, Salem, VA 24153.

NEED: Operators manual for Kenwood R-599 and T599, have service manual, trade, copy yours, or buy. Jung Y. Lem, WA6ROJ, 5222 Coringa Dr., Los Angeles, CA 90042.

QSL CARDS: Printed on white coated stock. Send 24 cents no. 10 s.a.s.e. for samples and price list. Marv Mahre, W0MGI, 2095 Prosperity Ave., St. Paul, MN 55109.

WANTED: Eico 730 modulator and VFO for Eico 720 xmtr. Dan Nichols, WB0GXO, 2026 A Tavel Ct., St. Louis, MO 63141.

SELL: TS 520. 8 mos. old new finals. $500. Having gum surgery, must sell. Bill Murphy, 4058 Cheoah Dr., Douglasville, GA 30135.

SBE-34 transceiver with 25 kHz calibrator, like new. Ralph Senechal, 938 A Avenida Majorca, Laguna Hills, CA 92653.

SELL: Electro-Voice 619 dynamic Hi-z desk mike, PTT and VOX, mint $13.00. David Schwartz, 1183 Southeast St., Amherst, MA 01002.

QST's 1970 thru 1975 (6 years), $35.00 prepaid. Code pratice oscillator, $6.00, earphones $7.00, all band remote antenna tuning unit $20.00 all prepaid. James Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

SB-12 PANADAPTER $175, G.E. 150 mc Pager and charger $45, Motorola 150mc desk top monitor $30, G.E. mibile monitor 30-50 mc $10. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

SBE-33 $185; HR6-$155; DX-150A-$85; Motorola L41GGB 6 meter base-$125. I pay all postage. K8BRX, 4658 Luanne, Traverse, MI 49684.

FOR SALE: Turner super sidekick base microphone. Good condition. $37.00. Matt Stuart, WD0AAY, 703 Second Ave., SE, Altoona, IA 50009.

SELL: Heath HR-10B w/cal. exc. recently agligned. $60. Robert, WD5AAT, 6 Cameron Dr., Lampasas, TX 76550.

HANDBOOKS: ARRL, Radio, Frank Jones, Collection. 30's to 60's. SASE for list. Ed Gleason, W8DVY, 7096 Pickway Dr., Cincinnati, OH 45238.

WANTED: Hammarlund 170-C plastic clock cover. Have an extra clock to trade or sell. John, WB9OEQ, 6050 North Oakley Ave., Chicago, IL 60659.

HEATHKIT IM-4100 frequency counter with manual; professionally wired; $95. WB5LMN, 1432 Pamela, Hurst, TX 76053.

VP2M LAND. Share house ham equipment $75 weekly. Dave, 60 Amsterdam, Toronto, M4B 2C2 Canada Tel- 755-2117.

ARGONAUT for sale: $200. W7CSD, 3740 Summers Lane, Klamath Falls, OR 97601.

NOVICE ALL—AMERICAN certificate: Work a novice in all 10 areas. Send list and $1. WB6QBJ, 25 Rudnick Ave., Novato, CA 94947.

SELL: KWS-1 & Console-Howard Converter and Teletype 19-complete plus spare; Collins 30S-1, 75S3-A, 32S-1, 312 Console; 1 kw Mat. Box. Nite (914) 337-8773, Kenneth C. Schwartz. Also SS Adapter for Johnson.

SELL: FT101B with fan, cw filter, 160m, manual, ac and dc cord. $500 UPS, ppd. Bob Eley, Rt. 3, Shelbyville, TN 37160.

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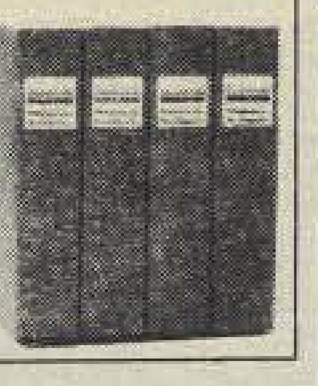

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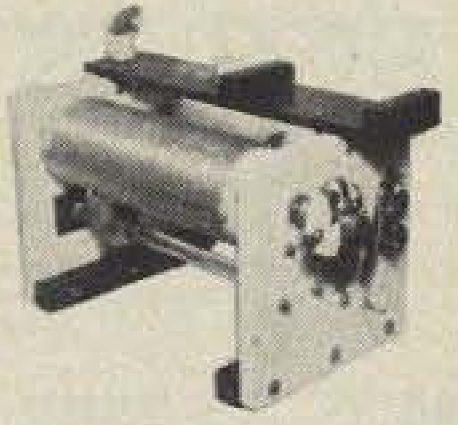
#939-L5-SM:
5¼ turns of #12 T-C wire in 1-⅜"L x 2" dia. coil (1.3 uHY). Roller contacts; less coupler. ⅜" x ¼" shft. Overall: 3x5x4; Shpg. wt: 8 lbs. Used, **$6.95**



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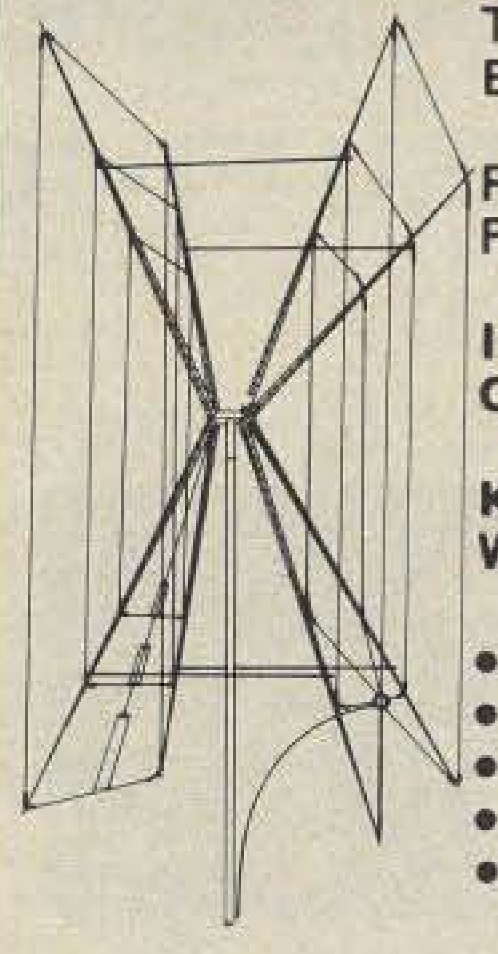

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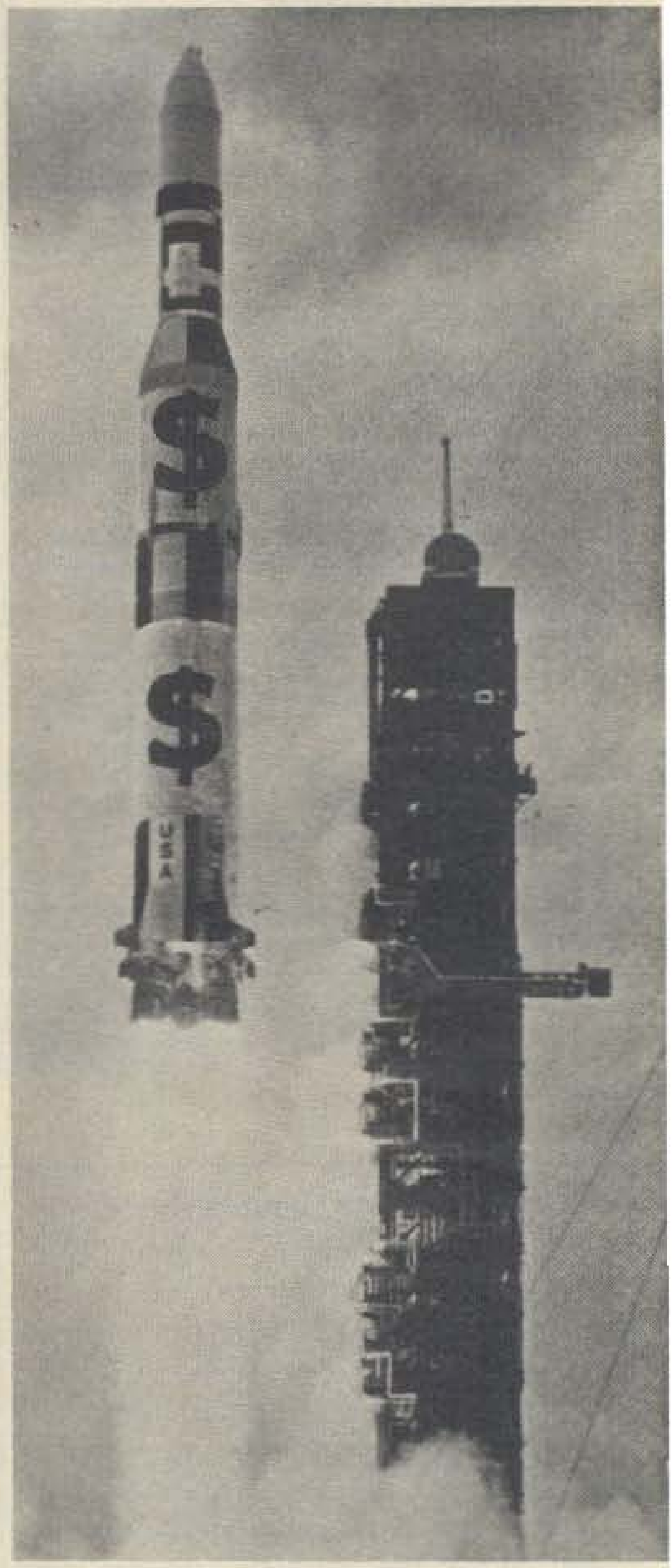

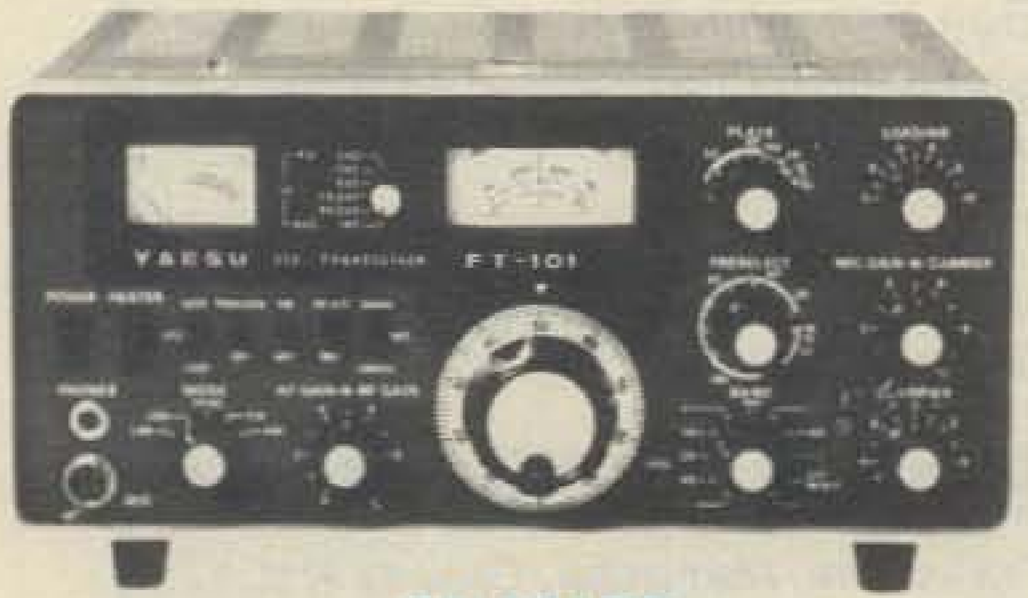

FT-101EE

Just one step down is the FT-101EE identical in every respect—but less the RF speech processor—an item many hams can live without, thus saving a few dollars.

FT-101EX

The FT-101EX is the same basic unit, less DC/DC converter, 160M, WWV, and three of four 10 meter crystals and the RF speech processor. Many hams do not need these features and would just as soon save the money. All accessories may be added later and the "EX" can then become an "E".

Amateur radio's first all plug-in PC board transceiver, the FT-101 series has a long pedigree of success dating back to the FT-101 and FT-101B. More than a quarter million are in use all over the world! Refinements have been added over the years to update the equipment and we believe it is the most thoroughly satisfactory and trouble-free transceiver money can buy. Compare price and features with any "Brand X" and you'll choose Yaesu!

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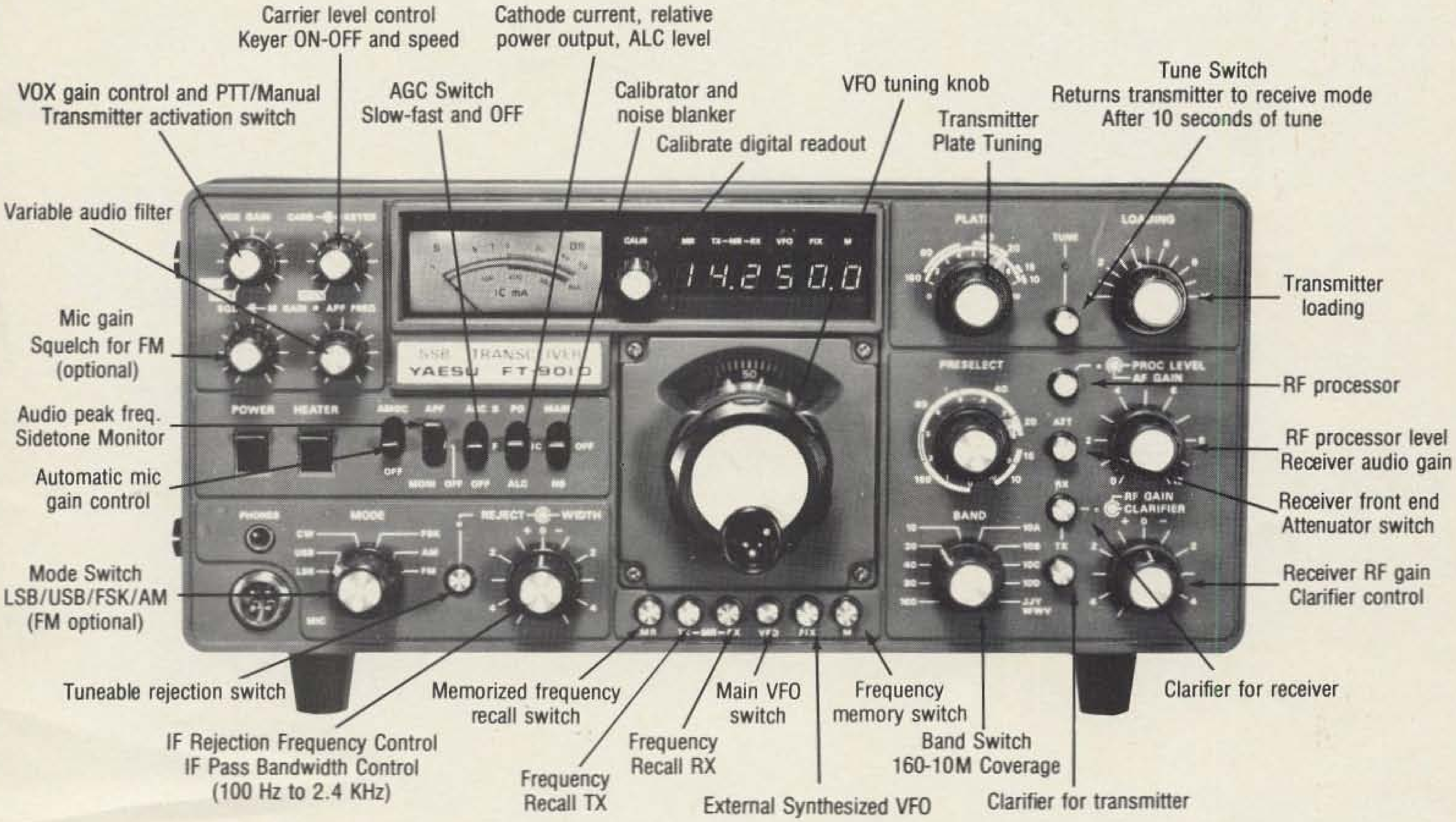

■ Two rugged 6146B's in the final, with negative feedback ■ A variable IF bandwidth that allows 100 Hz to 2.4 KHz selectivity at the turn of a knob ■ IF rejection tuning to notch out interfering signals ■ Optional synthesized VFO, or enlarged frequency memory bank ■ Selectable AGC ■ Built in speech processor ■ Built in Curtis Keyer ■ Full range 160-10M coverage ■ Provision for new WARC frequencies ■ Meets Part 97.73 of FCC requirements. . . . at your dealers soon!

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EIMAC	Typical CW Performance Data			Maximum Ratings	
Type	Gain	Power Output	Frequency	Plate Dissipation	Maximum Frequency
3CX400U7	13.5dB	225W	900MHz	400W	1000MHz
3CX600U7	14.0dB	445W	775MHz	600W	1000MHz
8938	12.8dB	1570W	400MHz	1500W	500MHz

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