HAM RADIO HORIZONS

Seasons Greetings From Ham Radio HORIZONS

December 1980/ $1.50

1981 Shopper's Guide

Yagi vs. Quad: W6SAI compares

Your Tower and the bureaucrats

How it's done in Poverty Flat, Arizona

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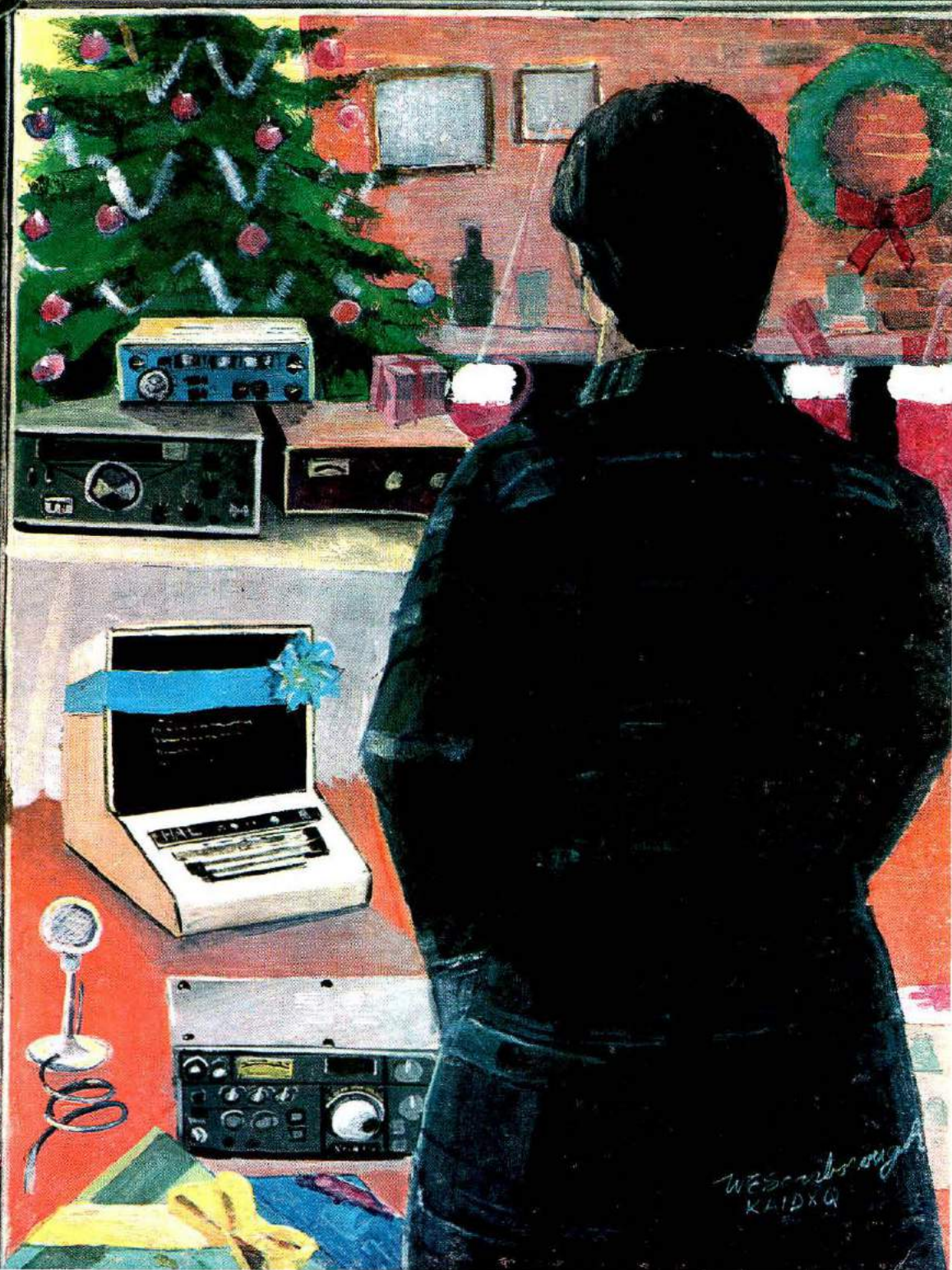

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Components are the latest in communication systems adapting to your stations' needs. The DTR-3KA and DTR-1200L are equipped with heavy-duty handles for easy rack mounting and rack brackets that can be easily removed. The DTR-1200L linear amplifier provides 1200 watts SSB and 1000 watts CW input continuous duty. It features large 3½" shadow box, back lit meters for easy reading, and tuned input for compatibility with solid state or tube transceivers. The DTR-3KA antenna tuner handles a full 3KW PEP. It features a built in 2KW dry dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 OHM impedance. Component racks available at your DenTron Dealer.

DTR-1200L Linear Amplifier

Frequency Ranges:

80 Meter Band	3.45 - 4.6 MHz
40 Meter Band	6.00 - 9.0 MHz
20 Meter Band	10.00 - 16.00 MHz
15 Meter Band	20.95 - 23.50 MHz
10 Meter Band	Export Model

Modes: USB, LSB, CW, RTTY, SSTV
Power Input: 1200W - SSB, 1000W - CW
Power Requirements: 234/117 VAC 50/60 Hz
RF Drive Power: 150 Watts maximum and 65 watts minimum for 1 KW DC input.
DC Plate voltage: Idle + 2300V approximate
Duty Cycle: 100% SSB, CW, RTTY, SSTV
Input Impedance: 50 Ohms nominal
Input VSWR: 1.5 to 1 average
Output Impedance: 50 Ohms nominal
Antenna load VSWR: 2 to 1 maximum
ALC: negative going, adjustable from front panel
Spurious Emissions: IMD - greater than 30 db down
Harmonics - greater than 40 db down
Switchable 12VDC accessory output voltage
Multimeter:

Plate Voltage	0 - 3000VDC
Plate Current	0 - 500ma
Relative Output	Adjustable

Front Panel Plate Voltage Switching
FCC Type Accepted
Size: 5¼" H x 17" W x 13" D (19" W with rack brackets)
Weight: 46 pounds

DTR-3KA Antenna Tuner

Frequency Coverage: 1.8 - 30 MHz continuous
Built in 2 KW PEP Dummy Load - Forced Air Cooled
Input Impedance: 50 ohms (Resistive) to transmitter
Antenna Inputs
- Coax 1, 2 & 3 - unbalanced—may range from a few ohms to a high impedance
- Long wire - low to high impedance
- Balanced line - 75-660 ohms

Power Capability: 3000 watts P.E.P.
Wattmeter: 200 watts forward
2000 watts forward
200 watts reflected
Accuracy: ± 5%
Remote sensor box
3½" backlit meters
Dummy Load: with manual or automatic forced air cooling.
Integral 3KW Balun

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THIS MONTH'S HORIZONS

1981 Shopper's Guide

We've sifted through the past year's offerings in our Product Showcase column, and gathered the latest input from our advertisers and friends in the Amateur Equipment business, and put it all together in a miniature catalog that you'll find most useful. Since this magazine actually leaves the presses and hits the mailbags several weeks ahead of the cover date, you'll find plenty of ideas in time to help with your Christmas shopping, so leave it on a table, opened to your choice, and hope that someone gets the hint. If that doesn't work, you can try again when you get some gift certificates as stocking-stuffers. Thumb through the pages, starting on page 12, and enjoy your holiday season.

The Novice Experience

The Holiday season . . . time to pause and reflect on the past year, the people we've met, the helping hands, the downright friendly, and the memorable experiences since that new ticket arrived. Jeff tried out his new call, and has a Christmas list all prepared for Santa. Some of his ham-band acquaintances are going to be surprised.

Trap Vertical Antennas

A vertical antenna is one of the simplest of radiators, and hams have used this type for years. Put some hardware in the middle of one, however, and things appear to be more complicated than they really are. W3JIP explains what those pieces of hardware called traps are doing there, how they work, and how to build an antenna using them. Good reading, starting on page 46.

Construction Worker's Special

You've all seen construction articles that tell you how to make neat things for your shack, and they all have one problem: the author always seems to have a complete machine shop, sheet-metal shop, and electronics engineering lab at his disposal. No wonder the gadgets are all "cover material" and always work just great. WB7CMZ, however, tells it the way it really is, using the equipment found in most of our workshops. How else could it be done if your address is (I kid you not) Poverty Flat, Arizona? The vandalism starts on page 61.

Ham Radio Techniques

The Yagi beam explained, and compared to the quad, as only W6SAI can explain and compare. The basics start on page 66.

DXer's Diary

An ideal weekend for DX, a Saturday morning with no overwhelming chores to keep you away from the rig, and the band is full of choice signals on long path from far, far away. How could you miss? Join the fray with Bob on page 72.

Lessons in Tower-ing

Finding the tower specifications and deciding which one would support the antenna is only the beginning. Far too often, today's Amateur finds that he has to enter the realm of politicians and bureaucrats in order to enjoy his hobby and station. Author Malley learned some valuable lessons that are worth passing along. The hearings come to order on page 81.

The Cover

Put yourself into the picture, and imagine the thrill of finding your dream station under the tree on Christmas morning. You can start your own "Good Fellowship" campaign by talking to the world during the holiday season. Original art in acrylic by Bill Scarborough, KA1DXQ.

Sorry About That, Folks

In our August issue of Horizons, the dry dummy load shown on page 17 should have been labeled as the Drake DC-1000, as their advertisement on page 41 clearly shows.

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MFJ-941C
$89.95 (+$4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.
SWR + dual range wattmeter (300 & 30 watts full scale, forward and reflected power). *Sensitive meter* measures SWR down to 5 watts output.
More flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.
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Matches everything from 160-10 meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.
Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.
MFJ-945, $79.95, like model 941C but less ant. switch. Optional mobile bracket for either model is $3.

MFJ 484 "Grandmaster" Memory Keyer

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Up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits).
Repeat any message continuously or with pauses of up to 2 min. LEDs show use.
Record, playback, or change messages instantly at touch of a button. Memories are resettable with button or touch of the paddle.
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Dot-Dash memories, self-completing, jam-proof spacing, instant start.
Panel controls: Speed (8-50wpm)/Record; Weight/Memories Combined; Tone/Tune; Delay (0-2 min.)/Repeat; rotary Vol/On-Off; Memory Select; Message Buttons select desired 25 ch. messages; Memory Reset button.
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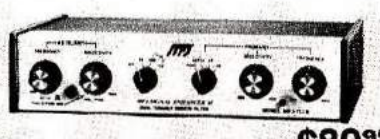
MFJ Dual Tunable SSB/CW Filter "Signal Enhancer"



MFJ-752B **$89.95** (+$4)

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The primary filter lets you *peak, notch, low pass or high pass* with extra steep skirts.
Auxiliary filter; *70 dB notch, 40 Hz peak.*
Both filters tune from 300 to 3000 Hz with variable *bandwidth from 40 Hz to nearly flat.*
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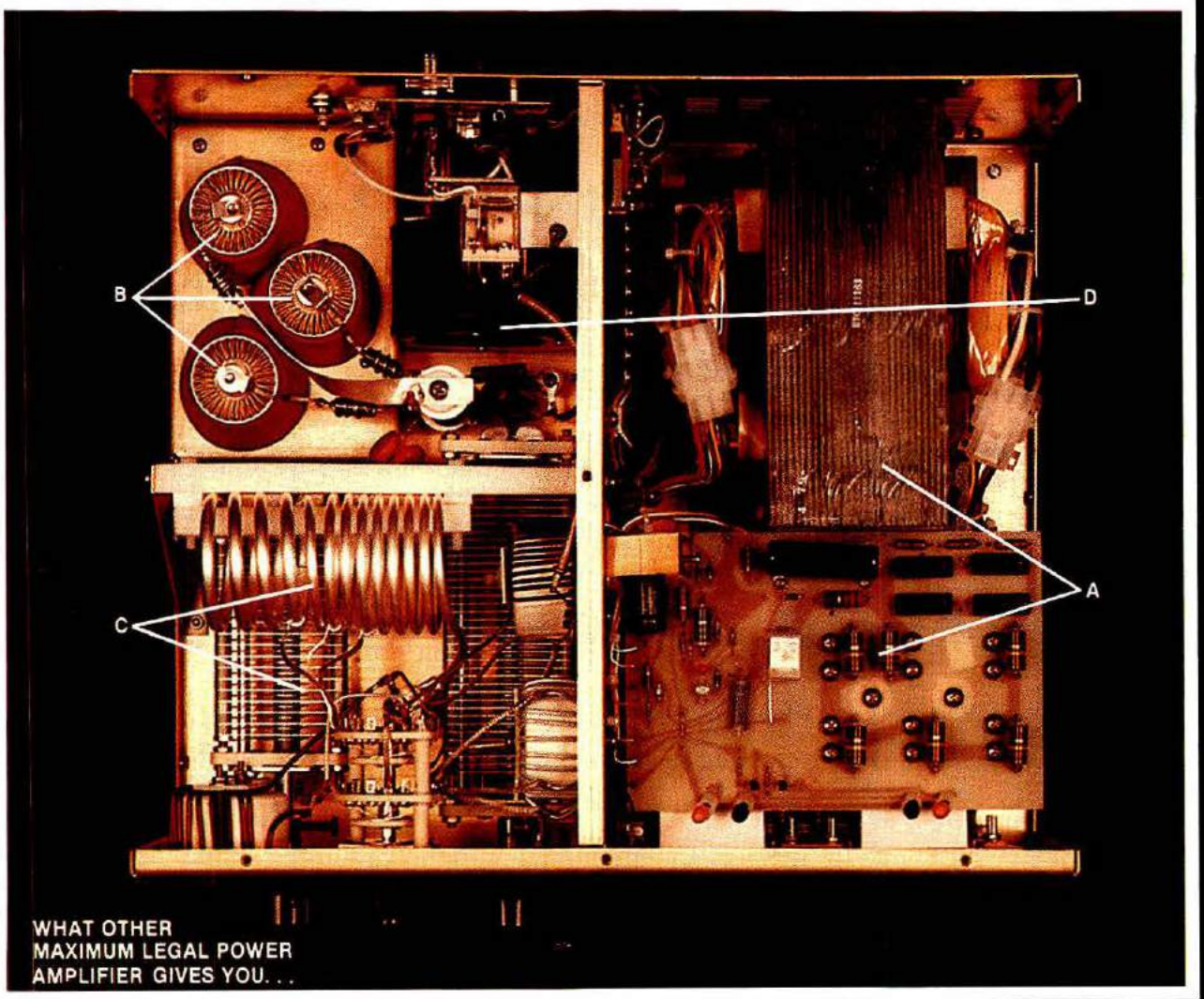

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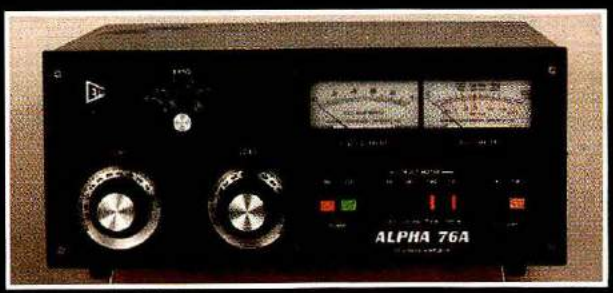

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ETO

HAM RADIO HORIZONS

December, 1980
Volume 4, Number 12

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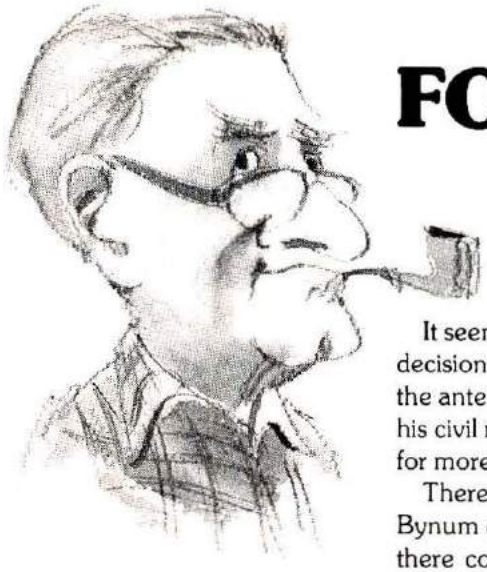


FOCUS & COMMENT

I'm going to bring up the "Amateur *vs* The Community" thing again, but this time in a more positive light.

It seems that there has been a recent decision in a California case — a decision that has been called a "landmark." The issue was directed at the antenna installation of W6QOL, and resolved under the finding that his civil rights had been violated. See *Newsline* on page 11 of this issue for more details.

There may be some important differences between this and the Randy Bynum case which I talked about in the October issue of *Horizons*, but there could be some similarities as well. It is heartening to hear that someone, at last, has recognized that an Amateur has *some* rights after all. Every one of us owes a large vote of thanks (at the very least) to the Personal Communications Foundation and K6JAN for their considerable work in helping W6QOL through what must have been a very trying experience.

This doesn't mean that Amateurs will automatically win every case against their community governments or neighbors — not by a long shot. However, it does provide some valuable guidelines for lawyers to follow, and it offers some hope to hams who are caught in this predicament. The town in this case spent a considerable amount of money in trying to remove one Amateur's right to freedom of speech. The thought occurs to me that a lot of improvements could have been made to Little-League ballfields, several coats of paint applied to town office or historical buildings, a lot of clothing or food bought for the ill or aged, or dozens of other worthwhile things dones with that money — all of which came out of the taxpayers' pockets.

Aha, you say, what of the rights of the non-ham who wants to watch TV or listen to hi-fi without interference from hams (or other nearby transmitters)?

I have no quarrel with the idea that a person should be able to enjoy whatever he or she chooses in the manner of relaxation and pleasure at home, but I say again — the quarrel should be directed at the business that sold him a bum set (or the manufacturer who refuses to put a few pennies worth of prevention into the product). Texas Instruments showed that it could be done; they developed a TV set that *could* tell the difference between a TV signal and whatever other garbage was floating around the neighborhood. This was done at the Government's request, by the way — our tax dollars at work on basic research. But, I don't see any manufacturers rushing to incorporate the improvements into their product, and how many TI TV sets have you seen for sale at your nearby retail store lately? Is this another case of a good idea swept into the trash bin by a government that is afraid to offend Big Business and Profits?

Just in case you or one of your friends need help or advice on a problem of the type W6QOL was faced with, have your lawyer contact the Personal Communications Foundation, Suite 203, 9036 Reseda Blvd., P.O. Box 812, Northridge, California 91328.

Incidently, I met both W3CL and WB2SBK at a VHF Conference and Hamarama held at Warrington, Pennsylvania, in early October. They're both really great people, and told me that the response to my October "Focus and Comment" column was terrific. I'm sure I express their feelings as well as my own when I say, "Thanks to each of you."

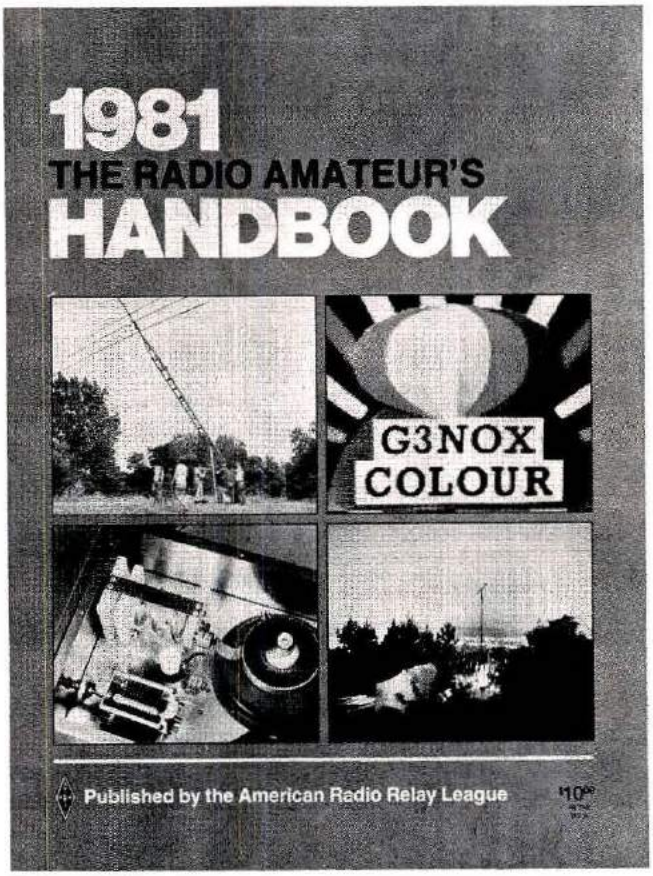
On another note, let me take this opportunity, on behalf of all of us here at Ham Radio *Horizons*, to wish all of you a most enjoyable Holiday Season, and a new year full of the best of good things.

Tom

Thomas McMullen, W1SL
Editor

64 MORE PAGES

NO CHANGE IN PRICE



In these inflationary times, it is difficult to find something which has been improved, but costs the same as a year ago. We've added 64 more pages to the *Radio Amateur's Handbook* with no increase in price! The 1981 Edition contains 640 pages, with 22 chapters of text, plus the popular chapter on vacuum tube and transistor characteristics and base diagrams.

What's new? Here is a partial listing:

- 600 MHz Frequency Counter
- Link-Coupled Transmatch
- Modulated RX Noise Bridge
- 50-75 ohm broadband transformer
- Foldover tower
- 12-volt, 30 amp regulated supply
- Economy 1.2-15 volt 5 amp Bench Supply
- NBS design charts for 50-432 MHz Yagi Antennas
- Table of optimum guy-wire lengths
- Amateur ASCII and Baudot technical standards and definitions
- Noise figure/temperature definitions and conversions
- New inductance formulas (for strip lines, etc.)
- Transmitting tube cooling specifications and blower information
- Table of phasing line lengths for vhf/uhf arrays
- Updated propagation information
- IC op amp and TV sweep tube charts
- Ferrite toroid electrical and mechanical cross reference
- Digital logic family compatibility chart and interface circuits
- PIN diode QSK system
- Modern Band-Edge Marker
- Buffered Morse Keyboard
- Antenna/Preamp system for EME
- 50 and 432 MHz Yagis
- 50 MHz kw linear amplifier
- Lightweight portable HF Antennas

There are also more template drawings for a variety of circuit boards, plus revised chapters on Solid State Fundamentals; Power Supplies; VHF and UHF Transmitting; Mobile, Portable and Emergency Equipment; Code Transmission; Specialized Communications Techniques; Test Equipment and Measurements; HF Antennas; and Vacuum Tubes and Semiconductors.

The price of the paper edition is $10 in the U.S. and possessions, $11 in Canada, and $12.50 elsewhere. The clothbound edition is $15.75 in the U.S. and Possessions and $18 elsewhere.

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ANTENNAS	ARX-2B	144-174 MHz
	ARX-220B	220-225 MHz
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Ringo Ranger II Conversion kit includes decoupling section with mounting ring, hardware, RG-8/U cable, vinyl connector boots, plus a built-in lightning arrester. An easy upgrade for your Ringo Ranger.

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	ARB-220K
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NEWSLINE

AN IMPORTANT ANTENNA VICTORY has not only restored the right of a Placentia, California, Amateur to use the antenna system of his choice, but has also reimbursed him his attorney's fees for defending that right. W6QOL, represented by attorney K6JAN, won his decision by taking the offensive and suing the city of Placentia in federal court for violating his civil rights by passing restrictive legislation aimed specifically at his installation.

W6QOL's Tower, A 71-foot Crankup with several beams on it, had been constructed in 1977 with the approval of the city's planning commission, but prodding by an unhappy councilman who lived nearby led the city council to pass an emergency ordinance making such installations illegal and ordering W6QOL to take it down. His response was to file a suit charging civil rights violation in the Federal District Court for the Central District of California.

On May 2, 1978, Judge Robert M. Pakasugi granted a preliminary injunction that prohibited Placentia from enforcing its ordinance but limiting the antenna to 50 feet. On December 11, 1978, the preliminary injunction was made permanent. On June 3, 1980, the court awarded W6QOL his attorney's fees as "prevailing plaintiff in the Paragraph 1983 action pursuant to the Civil Rights Attorney's Fees Act."

W6QOL's Antenna Was Still Limited to 50 feet, however, until a September 26 ruling by Judge Pakasugi that modified his permanent injunction by removing the height restrictions. Placentia has 30 days in which to appeal, but that's considered unlikely.

Details On This Unusual antenna case will be available from both the Personal Communications Foundation, which assisted K6JAN during the proceedings, and the ARRL.

10, 18, AND 24 MHZ AREN'T YET available for Amateur use, the FCC has warned the Amateur community in a Public Notice released in mid October. Responding to a growing number of inquiries and comments from individual Amateurs that indicated some confusion about new band availability, particularly in light of the new equipment currently being promoted as covering these new bands, the Commission pointed out that there are a number of steps that are necessary before the phase-in dates can even be set. First will come Senate ratification of the WARC treaty, then the normal rule making procedures to set the limits on band usage and the moving of present band users to their new frequencies.

Though The 18 And 24 MHz Bands don't have to become Amateur bands until 1989, the Commission did give some hope that we can actually be on them considerably sooner. With luck we may also make it on 10.1 MHz on January 1, 1982, as established by the WARC agreements.

A Special Meeting On WARC implementation has been scheduled by the Commission for November 25, in Washington.

FCC's CW Exams Are Changing from the multiple-choice format to "fill in the blank" effective as of September 28. At the same time, the passing grade on the new 10-question exam is being reduced from 80% to 70%. Basis for the change was a detailed study of Amateur exam takers made earlier this year, which indicated applicants who were competent at the required code speed would pass the new exam with ease, while those who weren't could rarely guess their way to a passing grade.

Questions On FCC Rules should no longer be directed to Washington, but instead to the Consumer Assistance Branch in Gettysburg. Their telephone number is (717) 334-7631, and the mailing address is FCC Consumer Assistance Branch, 334 York Street, Gettysburg, Pennsylvania 17325.

With This Change, all rules inquiries received by the FCC's Washington Office will be forwarded to Gettysburg for action, so sending them to Washington will only delay the return of answers.

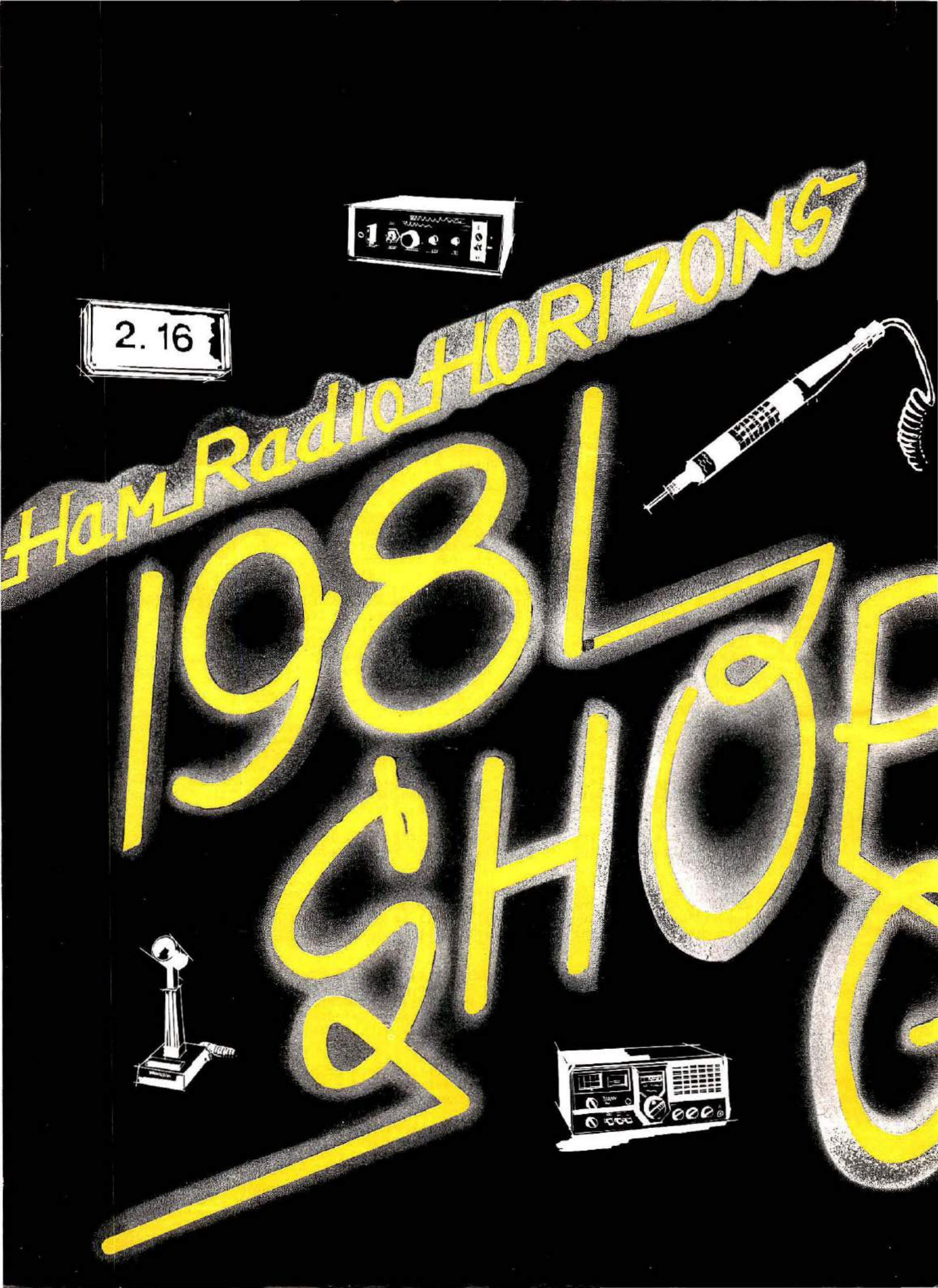
AN AROUND THE WORLD SAIL was begun on September 28th by WA7WMI, who left Newport Beach, California, with his 41 foot Westsail We Made It. On the westbound cruise he'll attempt to break five world's records for small craft. He'll be operating the Amateur bands on a regular basis, checking into various nets and maintaining regular scheules with W6ELU and alternate WA6WZO.

SOUTHERN CALIFORNIA REPEATER LISTS, for both 2-meter and 220-MHz machines, are available for an SASE from Rio Hondo College, 3600 Workman Mill Road, Whittier, California 90608.

A Similar List For Wisconsin, covering all repeaters in the state from 6 meters through 440 MHz, has been prepared by the Wisconsin Association of Repeaters. For copies, send an SASE to Dave Knaus, WA9POV, WAR Newsletter Editor, 6237 W. Lincoln Creek Drive, Milwaukee, Wisconsin 53218.

A GOVERNMENT OF IRAN request that Wilson Electronics quote price and delivery on VHF FM transceivers was answered promptly by Wilson. They quoted a competitive price, and delivery terms "30-45 days after release of the American hostages."

A PIRATE BROADCAST STATION operating in Los Angeles was shut down by the FCC last winter. Running only 500 watts in a garage, "KDOR" achieved an Arbitron rating of 32 among the Los Angeles areas 70 commercial broadcast outlets before it was closed down.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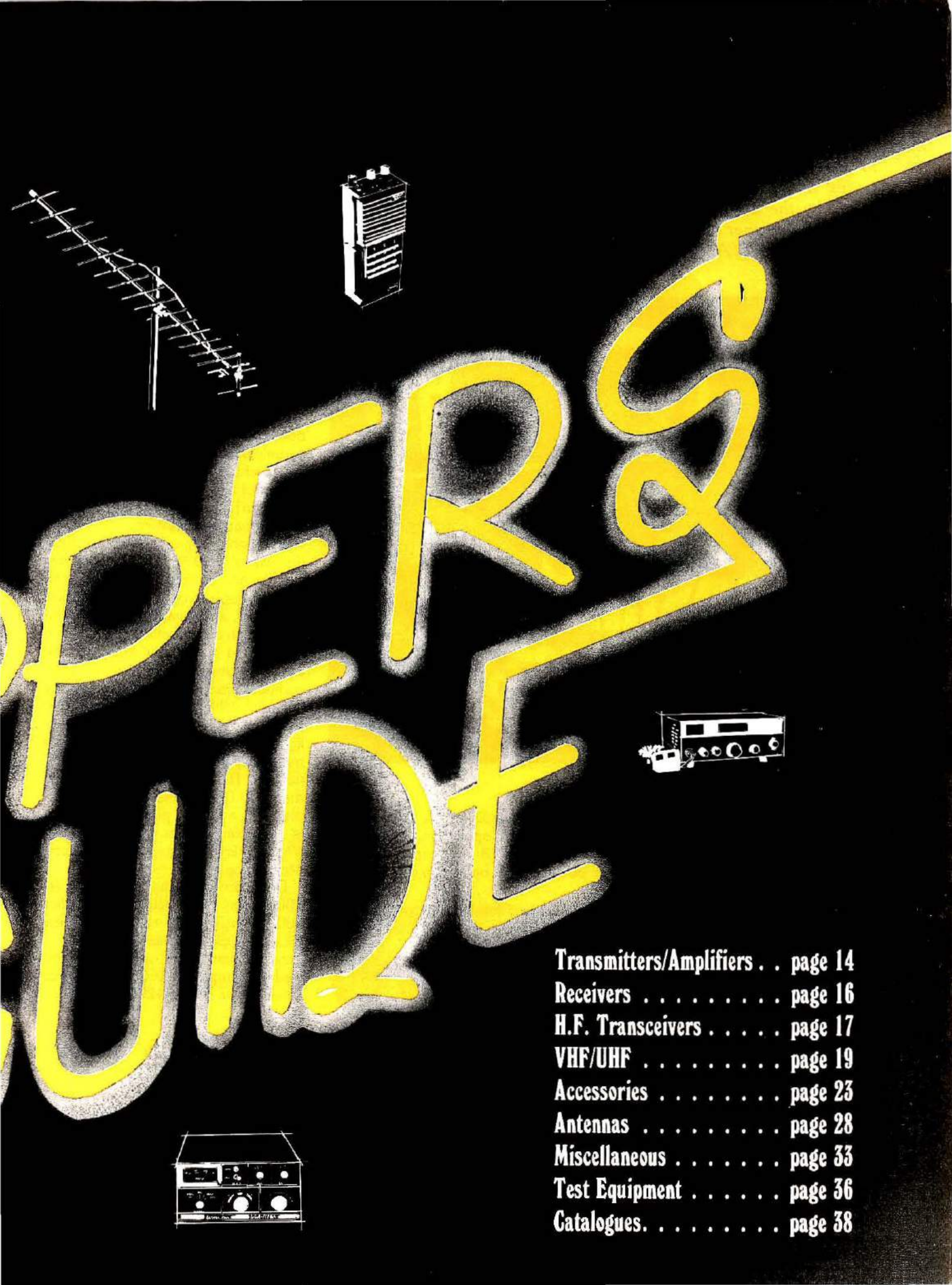

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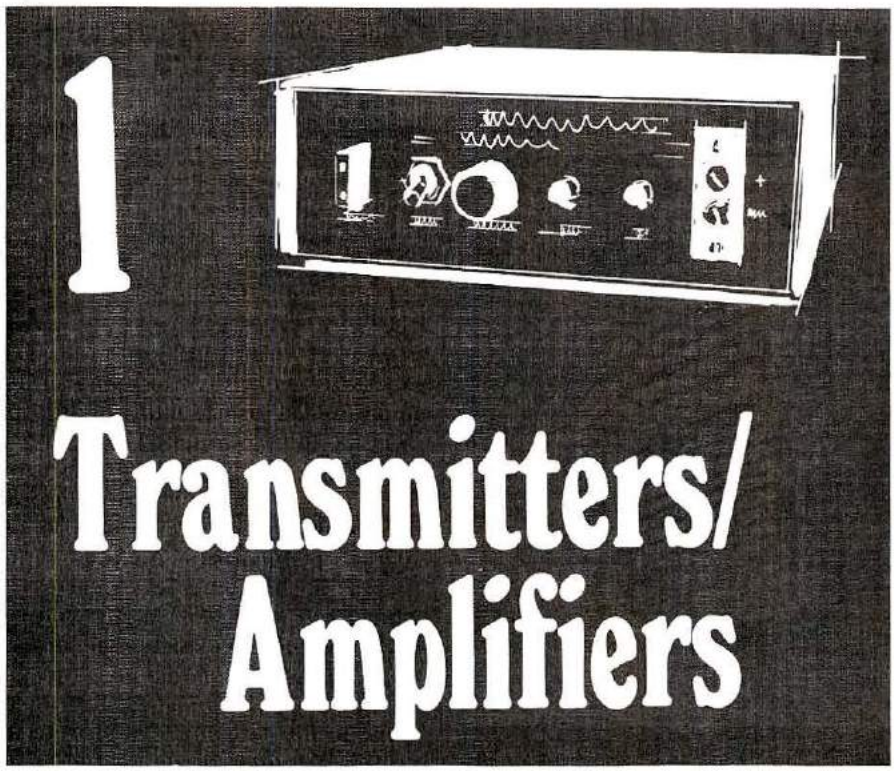
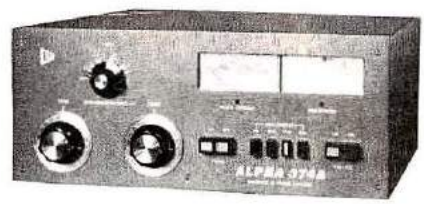
About the Shoppers' Guide . . . *Each year we select representative Amateur equipment from the broad range of available gear on the U.S. market for inclusion in this guide. This is not intended to be a complete listing of all that is available today. Information, prices, and technical characteristics printed herein have been provided by the manufacturers and are subject to change without notice. For further information, please contact either your favorite local distributor of Amateur Radio equipment, or the manufacturer.*



Alpha amplifiers

Alpha amplifiers have been designed to deliver full output power without the normal time limits designed into most RF amplifiers. They have also been carefully designed to tolerate moderate abuse that is incidental to most radio applications. To ensure that Alpha models can meet these specifications, only the highest quality components are used in their construction. For example, the Alpha type power transformer is rated for continuous commercial service. Alphas use Eimac ceramic metal tubes that have been designed and tested for the most demanding of all radio applications, commercial broadcasting. The Alpha 77DX is capable of running full legal power and is an amplifier for the serious radio operator. Two amplifiers are designed for "hands off" operation. The Alpha 374A and 78 are capable of full power output operation without tune-



up. The Alpha 76A has two 8874 tubes and a 1.5 KVA heavy duty power supply. The 76 PA model uses three 8874s and the same power supply as the model 76A. The 76CA uses three 8874s and has an extra heavy duty Hipersil transformer. The Alpha amplifier product line is rated as having at least 60% efficiency with full designed power input. For more information contact: ETO, Box 708, Canon City, Colorado 81212.

DenTron GLA-1000B Linear Amplifier

DenTron Radio Company has introduced an improved model of its popular GLA-1000 linear amplifier, the GLA-1000B. Featuring a tuned input circuit for consistent 50-ohm input impedance, the unit is among the smallest and most economical 1200-watt SSB (800-watt CW) linear amplifier ever offered to Amateurs.

Dentron has also added an innovation in Amateur linear amplifiers, namely a front-panel mounted antenna switch, designed to allow user selection of either a dummy load (such as a DenTron Big Dummy) or an alternative antenna system.

Additional improvements include the use of LED status indicators for standby and transmit, thus ending the need for replacement of incandescent light bulbs, and greatly enhanced tube life through design refinements.

Retained in the new GLA are the basic features of the original unit; compact size, complete metering of essential voltages, currents, and relative power output with a large backlighted meter, easy conversion to 10 meters by a licensed Amateur, economical D-50A finals that cost less than $40.00 to replace the full complement, a built-in power supply that is user selectable for 117 Vac or 234 Vac primary voltages, and FCC type acceptance.

DenTron is offering the new GLA-1000B less power supply for under $300 at suggested retail. The new GLA-1000B is available from DenTron dealers world-wide. DenTron Radio Company, 1605 Commerce Drive, Stow, Ohio 44224.

DenTron Radio Component Series

DenTron Radio recently announced a new series of Amateur Radio equipment called the DTR Component Series, with the first two products consisting of a 1200-watt linear amplifier and a 3000-watt antenna tuner,

both offering several features never before available to the Amateur market place.

DTR-1200L Linear Amplifier

Frequency ranges:

80 Meter Band	3.45- 4.60 MHz
40 Meter Band	6.00- 9.00 MHz
20 Meter Band	10.00-16.00 MHz
15 Meter Band	18.00-23.50 MHz

The DTR-1200L will cover most MARS frequencies just outside the Amateur bands.

Modes: USB, LSB, CW, RTTY, SSTV

Power input: 1200 W SSB, 1000 W CW

2 - 572B triodes

Power requirements: 234/117 Vac 50/60 Hz

RF drive power: 150 watts maximum and 65 watts RMS minimum for 1 kW dc input

DC plate voltage: Idle + 2200 V approximate

Duty cycle: 100% SSB, CW, RTTY, SSTV

Input impedance: 50 ohms nominal

Input VSWR: 1.5 to 1 average

Output impedance: 50 ohms nominal

Antenna load VSWR: 2 to 1 maximum

ALC: negative going, adjustable from front panel

Spurious emissions: IMD-greater than 30 dB down

Harmonics greater than 40 dB down

FCC type accepted

Size: H 5¼" W 17" D 13" (W 19" with rack brackets)

Weight: 46 pounds

Racks available in desk top or floor model versions

The DTR stackable components are designed to give you a complete communications system with mobility and versatility. The DTR components are equipped with heavy-duty handles for easy rack mounting on either a stationary rack or one on wheels. If you choose a desk-top station, the DTR components may be stacked, or used separately.

For more information contact Den-Tron Radio Co., Inc., 1605 Commerce Drive, Stow, Ohio 44224.

The DTR-3KA Antenna Tuner portion of the "Stackable Component" line is described in the Accessories section of this magazine, page 23.

1750-Meter Transmitter

Palomar Engineers has announced a new transmitter kit for the 160-190 kHz experimenter's band. Operation at one watt input power and with a 50-foot maximum antenna length is permitted by the FCC, with no license required.

The transmitter is in two parts: the main transmitter assembly contains the frequency generator, power supply, and the control panel. It is located at the operating position. The

antenna-tuning assembly mounts at the base of the antenna.

All the difficult assembly and wiring (including winding the Litz wire coils) is factory completed. Wiring of the kit takes about an hour with simple tools. Complete assembly and operating instructions are supplied.

The transmitter is for CW operation but easily can be a-m modulated if desired. Price is $145. For more information write Palomar Engineers, Box 455, Escondido, California 92025.

Ten-Tec Solid-State Linear Amplifier

Ten-Tec offers the Amateur Radio world another "first" in their new Model 44 Hercules kW linear amplifier — it's the first solid-state unit with instant break-in. And that's just one of its many advantages, both in operation and reliability.

The front panel of the amplifier has just four switches (power, mode, meter, and band). If you have a Ten-Tec Omni transceiver, the Omni will change bands of the amplifier automatically, selected by the Omni band switch which operates a motor-driven stepping switch.

Styling matches the Omni also, both in size and finish. And behind the 444 black-out upper panel are two large meters which light up when ac power is turned on. One meter measures collector current, the other measures collector voltage or power (forward or reverse). Also on the black upper panel are six status indi-

cators with LEDs that light up to show a condition (overdrive, improper control switch setting, heatsink temperature, SWR, overvoltage/overcurrent, and rf output balance). Any condition will shut down the amplifier when set limits are exceeded.

The design of the 444 Hercules uses two 500-watt push-pull transistor amplifier modules, operating at 45 Vdc at 22.2 A, providing typically 600 watts rf output from the hybrid output combiner. Driving power required is 50 watts, typical. Frequency coverage is 1.8 MHz through 21.5 MHz with provision for four auxiliary bands.

The new linear and power supply are priced at $1575. For further information, write or call Ten-Tec, Inc., Highway 411 East, Sevierville, Tennessee 37862.

Drake L7 Amplifier

The L7 Linear amplifier from R.L. Drake Co. is rated for 2-kW PEP (SSB), 1-kW CW, RTTY, and SSTV models of operation, continuous duty cycle. The tubes are 3-500Z triodes for ruggedness and stability, as well as low replacement cost.

Other features include a built-in dual-range, wattmeter, temperature-controlled two-speed fan of a high-volume, low-noise type, adjustable AGC feedback circuitry to allow accurate control of driving power from the exciter, and band-pass switching for straight-through operation.

Band coverage is 160 through 15 meters, and there are provisions for expansion to include the new WARC bands when they become available to Amateur operators.

For more information, see your favorite Amateur equipment supplier, or write R. L. Drake Co., 540 Richard St., Miamisburg, Ohio 45342.

Drake R-7 Receiver

The R-7 is a synthesized general-coverage receiver that has continuous tuning from the very-low frequencies up through the high-frequency part of the spectrum — 0.01 to 30 MHz — there are no gaps, and no range crystals are required. It provides state-of-the-art performance on a-m, SSB, RTTY, and CW reception. Further, it can be connected to transceive with the TR-7 for greater versatility.

The front-end circuitry uses high-level, double-balanced-mixer design to up-convert to a 48-MHz first i-f for superior image rejection and strong-signal-handling ability.

A broad-band preamplifier can be selected by pushbutton control for all ranges above 1.5 MHz. The receiver also features a tunable notch filter and full electronic passband tuning, both of which aid in reducing interference from nearby stations.

The R-7's digital readout section may be used as a 150-MHz frequency counter, switched from the front panel. Either the built-in speaker or the external MX-7 accessory speaker may be used. An audio output for a tape-recorder connection is included. Available accessories include CW, SSB/RTTY, and a-m filters with bandwidths from 300 Hz to 6 kHz, noise blanker, auxiliary range/fixed frequency board, cable kit to interface with the TR-7, and more.

For more information see your nearest Drake equipment dealer, or write R.L. Drake Co., 540 Richard St., Miamisburg, Ohio 45342.

Kenwood R-1000

The R-1000 is a general-coverage receiver tuning 200 kHz to 30 MHz in 30 bands. Operation and stability is based on a PLL synthesizer that incorporates modern, sophisticated technology by Kenwood.

Both a digital-display readout, in 1-kHz steps, and an analog dial are provided for ease of operation and convenience.

The R-1000 also boasts a quartz digital clock with timer, three-stage i-f filters, noise blanker, rf attenuator, tone control, and other features that help the user obtain optimum reception of either CW, SSB, or a-m.

The receiver is compact, and has been designed for excellent performance as either the main receiver for broadcast and short-wave listeners, or to serve in the hamshack of an Amateur Radio operator.

Available accessories include the SP-100 external speaker to augment the R-1000's internal speaker, the HS-5 deluxe headphone, and the DCK-1 power-cable kit to allow the receiver to be operated on external dc power.

For more information, write Trio-Kenwood Communications, 1111 West Walnut St., Compton, California 90220.

Radio Shack DX-302 Receiver

Radio Shack introduces the DX-302 all-band communications receiver to their line of electronic products. The DX-302 features quartz-controlled, frequency-synthesized tuning for accurate coverage of 10 kHz to 30 MHz in thirty tunable ranges.

This general coverage receiver uses five 7-segment LEDs in a large digital frequency display to indicate the exact frequency tuned.

According to Radio Shack the DX-302 offers excellent selectivity and image frequency suppression due

to its high performance triple-conversion design and its i-f bandwidth filters. A two position bandwidth control selects either a six or nine element ceramic filter for wide or narrow selectivity. All-silicon, solid-state circuitry is used throughout for maximum efficiency with minimum noise. Dual MOSFETS employed in the critical rf-

mixer stage are said to reduce cross-modulation undesirable rf distortion. Emergency operation is automatic, switching over to battery back-up if ac-power fails.

Other user features are: key jack that allows Morse-code practice by plugging in an (optional) code key, a tape-output jack for off-air taping, built-in speaker, external-speaker jack, rf-gain control, combination signal strength/battery meter, six-band rf preselector with calibrated tuning dial, BFO pitch adjustment, and signal attenuator switch.

The DX-302 can receive a-m, upper and lower sidebands and CW (code) signals and will operate from 120 Vac, 12 Vdc, or from eight self-contained "C" cells.

Specifications are given as: Sensitivity for 10 dB S/N: a-m 1 μV 900 kHz, 0.5 μV at 3.1 MHz and above; SSB 0.5 μV at 900 kHz, 0.3 at 3.1 MHz and above. Selectivity: wide i-f $\pm$1.75 kHz $-$6 dB, narrow i-f $\pm$1.25 kHz $-$6 dB, wide i-f $\pm$3.0 kHz $\pm$60 dB, narrow i-f $\pm$2 kHz $\pm$60 dB. Frequency stability within 1.0 kHz after 60 minutes warm up. Comes in heavy-duty metal cabinet. The Realistic DX-302 general coverage communications receiver is priced at $399.95. Available from participating Radio Shack stores and dealers, nationwide.

Microprocessor Controlled Transceiver

The ASTRO-150A is a high-quality transceiver in both circuitry design and construction. Emphasis has been placed on performance and human engineering.

The VRS™ tuning system employs a knob with a center detent. In the center position, the receive or transmit frequency is locked and indicated by the LED frequency readout. If the knob is rotated clockwise or counter-clockwise, scanning up or down is initiated. The rate of scanning is proportioned to the degree of knob rotation. Returning to the detent position stops the scan.

For mobile operation, tuning is accomplished by the microphone up-down push buttons. A single push on a button will move the frequency by one precise 100-Hz increment. Holding a button down will initiate a smooth up/down scan, stopping instantly upon release of the button!

For more details write Cubic Communications, Inc., 305 Airport Road, Oceanside, California 92054.

Drake TR-7 Transceiver

This transceiver was among the first commercially available Amateur transceivers to use an i-f above 30 MHz, a concept which allows a greater flexibility in frequency coverage as well as offering greatly improved image rejection. Reception through the entire range from 1.5 through 30 MHz is provided by the TR-7, and, with the use of an optional range-program board, frequency coverage can be expanded from zero to 30 MHz. Receiver sensitivity is less than 0.5 μV for 10 dB signal-to-noise ratio; image and i-f rejection are greater than 80 dB.

The all solid-state design and broadband tuned circuits mean that there are no preselector or peaking circuits to contend with. The transmitter is rated at 250 watts input on all modes, continuous duty for SSB and CW operation. Carrier suppression on SSB is greater than 50 dB,

and undesired sideband suppression is greater than 60 dB at 1 kHz. Intermodulation distortion is 30 dB below PEP. Harmonics are suppressed more than 45 dB. Transmitter coverage includes all present Amateur bands from 160 through 10 meters, as well as capability for the new WARC bands when available.

Other features of the TR-7 include a built-in wattmeter/SWR bridge and optional digital frequency readout with accuracy of $\pm$ 100 Hz, or analog readout with $\pm$ 1 kHz accuracy when properly calibrated. The digital frequency display can be used as a test instrument up to 150 MHz. Full passband tuning is another feature — it is possible to tune the receiver from the top edge of one sideband, through zero, to the bottom edge of the other

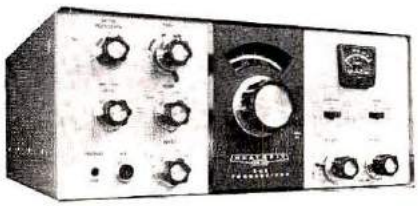
sideband. Further improved reception can be obtained by installing optional receiving selectivity filters in the rig; the desired filter is selected by push-button switches on the front panel. The receiving filter can be selected independently of the transmitter mode or function. Option filter widths include 300 Hz, 500 Hz, 1.8 kHz, and 6 kHz.

Optional accessories include a noise blanker, mobile mounting kit, crystal filters, speaker, and matching remote VFO. The TR-7 measures 4.6″ high, 13.6″ wide, 12.5″ deep; weighs 17 pounds.

For further information contact R. L. Drake Company, 540 Richard Street, Miamisburg, Ohio 45342.

Heathkit HW-101

Heath's HW-101 transceiver kit, when assembled, covers 80-10 meters. The receiver section is designed for a 0.35 μV sensitivity and has an effective i-f crystal filter. An optional 400-Hz filter for CW reception is also available. The transmitter is designed to prevent overdrive distortion. The final amplifier uses a pair of the popular 6146 tubes. Power input is 180 watts (PEP) SSB and 170 watts CW. The solid-state VFO provides good thermal stability with less than 100 Hz



drift per hour after 45 minutes warm-up. Construction plans are well prepared, showing a complete step-by-step approach to assembling the radio. The circuit boards are clearly marked with component layout and attach to the chassis with color coded wiring harnesses. For more information, write to Heathkit, Benton Harbor, Michigan 49022.

Icom IC-720

Icom's IC-720 is the successor to the IC-701 HF transceiver, and is representative of the very latest amateur radio design technology available. The IC-720 is designed to transmit on all amateur bands, including the new frequencies authorized by WARC-79. The receiver covers .1 to 30 MHz. The entire receiver and transmitter assembly is of solid-state design. The IC-720 has a dual VFO capability so that it can be operated on one segment of the band with the ability to immediately return to another frequency without significant control adjustments. For further information contact: Icom America, 2112 116th Avenue N.E., Bellevue, Washington 98004.

Kenwood TS-130

The TS-130 is Kenwood's latest addition to their HF transceiver line. All solid state, this compact 80 through 10 meter radio is full of new and interesting features. Kenwood has included their easy-to-read digital readout, i-f shift, RIT, narrow/wide filter selection (for both SSB and CW), a speech processor and the three new WARC bands.

The TS-130 comes in two different models. The TS-130S runs a full 200 watts PEP/160 watts dc input on 80-10 meters and 160 watts PEP/140 watts dc input on 12 and 10 meters. The low power model, the TS-130V runs a very comfortable 25 watts PEP/20 watts dc input on all bands. The solid-state, wideband rf amplifier eliminates transmitter tuning and is of the very latest design. A built-in speech processor increases the modulation effectiveness and average SSB output power while suppressing unwanted sideband power.

The TS-130 measures 3-3/4 inches high, 9-1/2 inches wide, and 11-9/16 inches deep and weighs 12.3 pounds. The DFC-230, Digital Frequency Controller is an available option which allows the operator to change frequency from a remote location in 20-Hz steps. The DFC-230 also includes four memory positions. Other options include PS-30 power supply, SP-120 speaker, VFO-120 remote VFO and the AT-130 compact antenna tuner.

For further information contact: Trio-Kenwood Communications, 1111 West Walnut, Compton, California 90220.

Ten-Tec's "Delta"

Ten-Tec's Delta has become a popular leader in the HF transceiver market in response to the new amateur bands at 10, 18 and 24 MHz resulting from WARC-79. A totally solid-state unit, the "Delta" leaves the factory fully operational except for plug-in crystals to cover the 18 and 24.5 MHz bands.

Performance of the Delta includes designed sensitivity of .3μV @ 10 dB S+N/N with a dynamic range of 85 dB, plus a selectable 20 dB attenuator. Other features include an 8-pole monolithic filter @ 2.4 kHz bandwidth as well as optional 200 and 500 Hz crystal ladder filters for CW use. A variable notch filter from 200 Hz to 3.5 kHz aids CW selectivity in heavy QRM conditions. Other features of the receiver circuitry include incremental tuning, full break-in, and 10 MHz WWV reception.

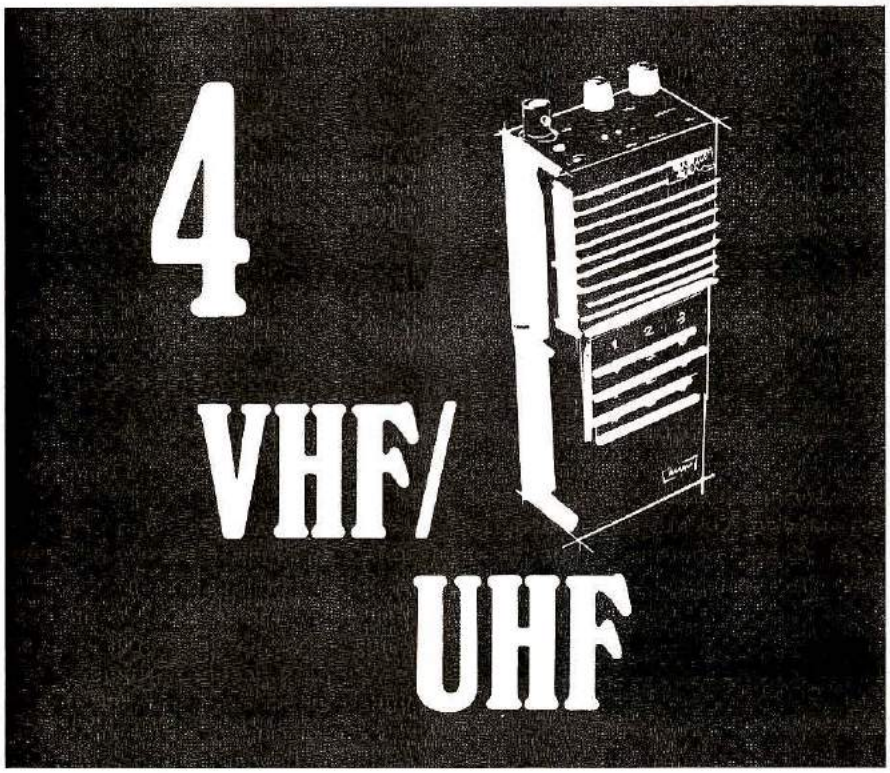
Transmitter RF input is rated at 200 watts on all bands (50 ohms load). It's solid-state RF output devices are rated at 100% duty cycle (all modes) with 20 minutes maximum key-down time. The "Delta's" permeability-tuned VFO is designed with stability of less than 15 Hz per degree (F) over a 40° range following a specified warm-up period. Individual circuit boards with plug-in harnesses allow easy removal for maintenance. A full accessory line includes a wide range of options.

For additional information contact: Ten-Tec, Inc., Sevierville, Tennessee 37862.

Yaesu FT-707

The FT-707 offers 100 watts rf output on 80-10 meters and operates in the CW, SSB and a-m modes. The receiver has sensitivity of .25 μV/10 dB signal-to-noise ratio. In addition to the FT-707, the FV-707DM scanning module is also available as an option. The FV-707DM has a flexible scan feature which allows the operator to program two different rates of scan. Thirteen discrete frequencies can be stored for later recall. Scanning can be controlled from the microphone as well as the front panel. The FT-707 can be configured with either 600 or 350 HZ crystal filters depending on your personal operating preferences.

Further information can be obtained from: Yaesu Electronics, 6851 Walthall Way, Paramount, CA 90723.



Pocket-Size Digital Receiver

New, from Ace Communications, Inc., the world's first 1,800 channel "Slimsizer" pocket-size vhf fm receiver. With this receiver, designated the AR-22, the entire 141.000-149.995 MHz Amateur band, or 151.000-159.995 MHz commercial band can be automatically tuned in precise 5-kHz steps.

The revolutionary AR-22 tuning system gives a direct frequency reading by employing digital-pushbutton switches and a slide switch.

The clean signal reception of this compact unit is the equal of many full-sized base stations. An electric tuning system in the rf-amplifier stage provides an incredible sensitivity over the full range. The AR-22 achieves a typical sensitivity of 12 dB SINAD for less than 0.2 μV on all frequencies.

The unit is built to be rugged and reliable, with circuitry contained on a double-sided, glass-epoxy printed-circuit board.

The AR-22 is completely portable. With its NiCd battery pack, the receiver weighs only 7.1 ounces (200 grams) and measures only 5½ × 2½ × 1 inch (130 × 63 × 25 mm). It comes equipped with a high-performance, "Mini-Helical" flexible rubber antenna for ease of use.

For a dependable, clear sounding, pocket-sized, digital 2-meter Amateur receiver, the AR-22 is one of the best buys on the market at $125. For more information on the "Slimsizer" AR-22, contact Ace Communications, Inc., 2832-D Walnut Ave., Tustin, California 92680.

AED Scanners

As most two meter fans know, there are many new and wonderful FM rigs currently on the market, with more in the design stage. AED Electronics, of Montreal, designs and markets a line of scanners, both in kit-form and pre-assembled, that virtually opens a whole new dimension of 2-meter FM operation.

Their first project was a scanner for the popular ICOM IC-22S. This remarkable unit fits entirely inside the radio, and the only outside indication that the unit is modified to scan is a small toggle switch mounted on the microphone to 'lock' the scanner whenever anything interesting is heard. It scans from 145.350 MHz to 147.990 MHz at a rate of 100 kHz/second.

The scanners themselves are extremely easy to assemble, install and operate. The manual supplied with each scanner kit is extremely comprehensive with large pictorial drawings and easily-followed step-by-step instructions. Also included in the manual is a simple description of how the circuit operates, and some tips on how you will get full enjoyment from operating your AED scanner. All you need to assemble and install the unit is some solder, a fine-tipped soldering iron, and some basic tools.

The scanner for the Yaesu FT227R samples the spectrum at a rate of 200 kHz/second, and the sweep width is easily adjustable for any portion of the band. The AED scanner is operated by one mini-toggle switch mounted on the mic and scans up and down repeatedly. While scanning, the received signal will cause the scanner to pause for five seconds before moving on, unless 'locked' by the switch on the microphone. This allows you to sample the band, find something interesting, and listen to different repeaters. The frequency appears on the display, so you know where you are on the band.

Other AED scanners include a kit for the Clegg FM-28, Midland 13-510 and the 220 MHz version, the Midland 13-513. This, incidentally, is the first scanner kit for a 220 rig. The kit is basically the same for all three rigs; the scan-rate is 100 kHz/second, and the sweep width scans MHz as selected by the MHz switch on the radio. Two mini-toggle switches mounted on the radio and microphone control the scanner itself — one switch turns the scanner on and the other switch 'locks' the scanner after the initial three to five second pause.

For Kenwood devotees, AED Electronics has two scanner kits that will convert the TR7400A, TR7600, and TR7625 into scanning radios. The scan-rate for the TR7400A is 50 kHz/second, but this can be adjusted by changing a resistor on the scanner PC board. The scan-rate for the TR7600/7625 kit is adjustable from 100 kHz/second to 1 MHz/second. As in the Midland kit, the scanner is controlled by two toggle switches. KDK owners shouldn't feel neglected, as there is a kit that will convert the KDK2015R and KDK2016A as well. The scan-rate is the same as for the Kenwood TR7600, and the sweep width is either the complete band or any MHz segment you want as selected by the switch on the radio.

One of AED's more recent projects is a scanner for the Comtronix FM-80 10-meter FM radio and its 6-meter counterpart, the FM-200. These popular rigs are channelized; each channel is 10 kHz apart. It, like all other AED scanners, fits entirely inside the radio and is controlled by a single mini-toggle switch on the microphone.

Finally, the latest project: a scanner for the Tempo S1 handheld which, in keeping with AED Electronics' unique design policy, will fit inside the Tempo S1. You select the MHz via the thumbwheel switch on the S1, and the scanner scans at a rate of one MHz in fifteen seconds. The transmit LED on the unit flashes to indicate the scanner is operating. The unit is designed for a battery-powered radio and draws only 2.5 mA. This scanner has a three second pause, and is "locked" by a micro-switch conveniently mounted on the S1's case.

The price for most AED Electronics scanner kits is only $39.95. Should you desire your scanner board pre-assembled, the price is $59.95. All AED pre-assembled scanner boards have a 90-day guarantee. Kits are also guaranteed for 90 days, but this warranty covers the components and the printed circuit board only. The scanner for the Tempo S1 is available pre-assembled only, and sells for $49.95. The Comtronix FM-80/FM-200 kit costs $49.95 ($64.95 assembled). You may order direct from the factory; AED Electronics, 750 Lucerne Road, Montreal, Quebec, Canada H3R 2H6. Please add $1.50 for postage and handling.

Repeater "Tail-Chopper"

Circuit Electronics, Inc., of Salina, Kansas, is introducing a repeater squelch-tail eliminator called "Tail Chopper." Two models are featured: TC-2000 and the TC-2100. Both use temperature-compensated operational amplifiers and digital logic, and have a five-turn control and LED indicator for maximum sensitivity.

TC-2100 is a universal module (as shown) that can be connected to most repeaters to eliminate squelch tails. It has a squelch enable-disable function if needed for tone operation.

TC-2000 is a plug-in module to fit Regency's U10R uhf repeater, with

simple, one-wire hookup. Existing squelch can remain functional.

A pc-board with parts and instructions is available for kit builders. For more information, write Circuit Electronics, Inc., 621 Bishop, Salina, Kansas 67401.

Clegg FM-88 and FM-88S

The FM-88 and FM-88S two meter transceivers are modern equivalents of the older Clegg FM-28 units. The FM-88 design has been changed to incorporate several important improvements.

Some of the features which have been added to the FM-88 include continuously adjustable power output, coverage of MARS and CAP frequencies, improved Touch-Tone® performance, and better frequency stability.

Also instituted has been a long-time, "burn-in procedure." Each radio is completely tested three times to assure that customers get a radio that meets Clegg's specifications.

The standard FM-88 provides complete coverage from 143.0 to 148.995 MHz in 5-kHz steps, and is internally equipped to accommodate ±600 kHz standard repeater splits as well as simplex. It is capable of accommodating two additional "odd ball" repeater splits for those areas having one or more non-standard repeater pairs, and for CAP or MARS applications.

The FM-88S retains all the features of the FM-88 but provides the owner with scanning flexibility. A virtually unlimited number of memorized channels can be stored and scanned. Either the entire 2-meter band or a selected segment can be scanned. It can be programmed to hold on a received signal, or to just pause a few seconds on each active channel. The scanner option can be added to a standard FM-88 at any future date.

For further information contact Clegg Communications Corp., 1911 Old Homestead Lane, Greenfield Industrial Park East, Lancaster, Pennsylvania 17601.

Microprocessor Controlled Repeater

A line of repeaters covering the 144, 220, and 450 MHz bands is available from Micro Control Specialties. The new Mark 3CR repeaters combine all the features of the popular Mark 3C repeater controller plus transmitter, receiver, and power supply in a rack-mount cabinet, ready for immediate service. The microprocessor-based repeater provides 39 tone-accessible functions, including autopatch, autodial, redial, reverse patch, external outputs, and secure control-operator commands. Crystal-controlled digital tone-decoding assures stable and reliable function access. To keep users informed of its status, the repeater generates thirteen different

Morse messages, several of which are custom programmed to user specifications. Basic repeater operations such as timeout, tail, and ID timing are also directed by the microprocessor so the repeater can discriminate intelligently against noise and kerchunkers. Several of these operations can be modified remotely by command functions.

The repeater receiver uses dual-gate MOSFETS in both rf amplifier and mixer stages for high sensitivity (20 dB quieting with only 0.25 μV of input signal) and freedom from overload in the presence of 0.5-volt signals. Crystal filtering and double conversion are both used to obtain 65 dB rejection of off-frequency signals, so the repeater is well suited for use in hostile rf environments.

Transmitter output is two watts, but optional amplifiers are available to increase the power output to any desired level. Transmitter and receiver oscillations are temperature compensated to meet commercial frequency-stability requirements. The audio circuits combine generous amounts of feedback with symmetrical clipping for virtually transparent audio quality.

For further information, write Micro Control Specialties, 23 Elm Park, Groveland, Massachusetts 08134.

Hamtronics Converters

Hamtronics, Inc., manufactures a series of low-cost vhf and uhf converters for use in receiving OSCAR and other signals on your high-frequency receiver. Retail prices are $34.95 for the kit (or $54.95 wired and tested).

Any 2-MHz segment in the vhf and uhf range can be covered, using the 10-meter band on your existing receiver. Standard models are listed below, and other rf and i-f ranges are available on special order at the same price. An attractive extruded-aluminum-case kit is available as an option for $12.95 additional.

Standard converters for 28-30 MHz i-f

Model	Input Range
C50	50-52 MHz
C144	144-146 MHz
C145	145-147 MHz
C146	146-148 MHz
C110	Any 2 MHz of aircraft band
C220	Any 2 MHz of 220-MHz band
C432-2	432-434 MHz
C432-5	435-437 MHz
C432-7	427.25 (61.25 MHz i-f)
C432-9	439.25 (61.25 MHz i-f)

To order, or to request a free 40-page catalog on vhf and uhf transmitters, receivers, pre-amps, and accessories, call 716-663-9254; or write Hamtronics, Inc., 182F Belmont Rd., Rochester, New York 14612.

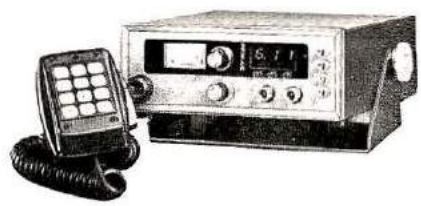
Heath 2-Meter Digital Scanning Transceiver

Heath Company recently announced the new VF-7401 2-meter fm Digital Scanning Transceiver kit. This scans the 2-meter band in 1 MHz segments, stopping on any active channel.

The VF-7401 is a completely solid-state, narrow-band fm transceiver featuring a continuously adjustable 15-watt (maximum) output. The fully synthesized digital circuitry provides full-band coverage without the need for additional crystals — even for MARS and CAP frequencies. The transceiver offers simplex, +600 kHz, −600 kHz and 1 MHz offsets, and can also accommodate any other 2-meter Amateur band offset combination.

A "power-up" feature allows the Amateur Radio enthusiast to monitor a particular channel first, before beginning to scan. The kit-builder preprograms the favorite frequency into the transceiver during assembly.

Mail order priced at $339.95 with standard PPT microphone, the VF-7401 is also available with the optional Micoder II™ Microphone/Auto Patch Encoder for placing telephone calls through repeaters equipped with auto patch. The transceiver is designed to operate from an automobile electri-



cal system, or using the optional VFA-7401-1 power supply. The power supply is mail order priced at $42.95, FOB Benton Harbor, Michigan.

For further information, or to obtain a free catalog, write Heath Company, Dept. 350-430, Benton Harbor, Michigan 49022. (In Canada, write Heath Company, 1480 Dundas St. E., Mississauga, Ontario L4X 2R7.)

Icom IC-251A

Icom's latest addition to their VHF transceiver line is the IC-251A, an all mode, 10-W, 2-meter transceiver, covering 143.8 to 148.19 MHz, Icom's traditional state-of-the-art engineering has included a multi-memory system, two internal VFOs and variable repeater offsets. Some of the other features in this advanced, flexible 2 meter system include a memory scan which automatically stops when it reaches one of 3 pre-programmed frequencies. Using the programmable band scan, an entire band can be scanned. (Or any portion thereof). The scanning speed is variable. The unit also provides SSB squelch which allows the operator to scan 2 meter SSB frequencies with the receiver quieted. For additional information contact: Icom America, 2112 116th Avenue, N.E., Bellevue, Washington 98004.

IC-2A Hand-Held 2-Meter Rig

The IC-2A 800 Channel hand-held VHF transceiver is sold with a three-way capability combination:

IC-2A with alkaline battery pack;

IC-2A with NiCd pack and wall charger;

IC-2AT with NiCd pack, wall charger, and built-in tone pad.

The NiCd pack (IC-BP3) and Charger (BC-25UO) is available separately. The Alkaline Pack (IC-BP4) without batteries is also available. The tone pad is a user-installable, plug-in option. Price and availability of additional options, including speaker-mic, drop-in desk charger, and leather case will be announced shortly. All IC-2As are supplied with a flexible rubber antenna and a belt clip.

In addition to the Icom 2A and 2AT, other VHF and UHF trans-

ceivers by Icom include the: IC-251A all-mode 2 meter transceivers; and IC-255A FM 2 meter mobile transceiver. For further details, contact Icom America, Inc., 2112 116th Ave. N.E., Bellevue, Washington 98004.

ATV Downconverter

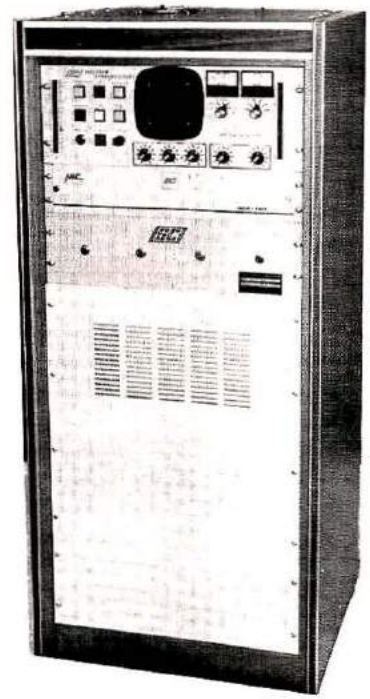
P.C. Electronics has introduced a new fast-scan ATV downconverter which converts the entire 420-450 MHz band down to TV channel 2 or 3, or to a 45-MHz i-f, with full bandwidth for color and computer video.

The standard model TVC-4 contains a new microstrip converter with a low-noise MRF901 preamp stage, 12 Vdc power supply, BNC antenna input connector, and type F output connector. The low-noise-figure preamp stage enables seeing sync bars down to as low as 0.3 microvolts. An ultra-low-noise NE64535 preamp stage is also available as an option to get sensitivity down to 0.2 microvolts in the TVC-4L.

The TVC-4 downconverter comes in an attractive Ten-Tec JW-5 enclosure, ready to plug in and enjoy the pictures. Ten-Tec has also specially coated the Cycolac woodgrain side panels with a conductive coating for excellent shielding.

Pricing for the downconverters is $85 for the standard low-noise TVC-4. $115 for the ultra-low-noise TVC-4L, with both prices shipping included in the U.S. For those who wish to build their own cabinet and power supply, the downconverter modules by themselves, wired and tested are available (TVC-2 and TVC-2L) for $49.50 and $79.50 respectively, postage paid. Write for a complete ATV catalog. Send a self-addressed, stamped envelope to P.C. Electronics, 2522 S. Paxson Lane, Arcadia, California 91006.

New UHF FM Repeater



Spectrum Communications Corporation has released the new SCR4000 uhf repeater for production.

The new uhf repeater offers unsurpassed performance, reliability, and the inherent flexibility necessary to handle all professional applications from the most basic to the most sophisticated. The repeater combines cost-effectiveness with state-of-the-art conservative design for many years of operation with minimal maintenance.

The recently FCC Type Accepted SCR4000 Repeater is a 20-watt unit, with a 406-512 MHz frequency range. Features include: excellent receiver sensitivity (0.3 μV/12 dB SINAD), 8-pole front-end filter very wide receiver dynamic range with double balanced mixer for superior intermod rejection, 8-pole i-f crystal filter, plus 4-pole ceramic filter, built-in CW IDer and time-out timer. All important operating parameters are conveniently adjustable and measurable from the front panel. The highest quality designs, components, and workmanship are used throughout. The unit is available complete with Tone Panel, matching cabinet, duplexer, etc.

For additional information, write Spectrum Communications Corp., 1055 W. Germantown Pk., Norristown, Pennsylvania 19401.

PA 1-10 Two-Meter Amplifier

The PA 1-10 is a solid-state, vhf power amplifier designed for fixed or mobile operation. The amplifier operates Class C, for fm only. The PA 1-10 provides a nominal 10 watts output for 1 watt of input. T/R switching is accomplished by diodes and quarter-wave stubs which are ac-coupled to ground. The amplifier is factory tuned to operate in the 144-148 MHz Amateur band, plus or minus 1 MHz for MARS or CAP operation. Some retuning may be required for out-of-band operation.

This design uses rugged, balanced-emitter rf power transistors to ensure long life and high SWR protection. Price is $79.95. For more information, write THS Electronics, Rt. 1, Box 195, Greene, New York 13778.

2-Meter Power Amplifiers

A unique line of 2-meter power amplifiers that includes a diminutive 25 watter not much larger than a king-size cigarette package and a programmable-input 100-watt model is offered by VoCom Products. Their smallest amplifier, designed to boost the low-level output of a typical hand-held transceiver to 25 plus watts, is available in either a 0.2 or 2-watt nominal drive model. The lower level model is designed for those hand-helds that feature a battery-saving, low-power mode, and will operate satisfactorily at drive levels as low as 100 milliwatts.

The other VoCom amplifiers are

rated at 50 and 100 watts nominal output. The 50 watt model delivers full output with only 2 watts drive, while the 100-watt amplifier can be user programmed to provide full rated output at 2, 10 or 25 watts of drive.

An illustrated catalog with full details on all of VoCom's 2-meter amplifiers is available from any VoCom dealer or the factory. VoCom also manufactures a 5/8-wave gain antenna. Contact VoCom at Box 219, Prospect Heights, Illinois 60070.

FT-127 220 MHz FM Mobile Transceiver

The FT-127 is a rugged, economical fm transceiver for the 220-MHz band. Crystal equipped for operation on the national simplex frequency of 223.5 MHz, the FT-127 is capable of operation over the entire 220-225 MHz band. Power output is 10 watts, and as many as twelve channels may be installed (crystals optional). The FT-127 is packaged in a heavy-duty metal case, using a diecast front panel, making it suitable for demanding mobile applications.

For further information contact Yaesu Electronics Corporation, P.O. Box 498, Paramount, California 90723.

FT-480R 2-Meter SSB/ CW/FM Transceiver

The FT-480R is a total performance, compact, SSB/CW/fm transceiver for the demanding 2-meter operator. Rated at 30 watts PEP input on SSB, 30 watts dc input on CW and fm, the FT-480R covers 143.5-148.5 MHz. The microcomputer circuitry built into the FT-480R allows unprecedented ease of operation. For example, when tuning on SSB/CW, the frequency synthesizer automatically tunes at 10 Hz, 100 Hz, or 1 kHz per step; or 1 kHz, 20 kHz, and 100 kHz per step on fm. At the flick of a switch, you can zero the display to an even-channel step (when switching from SSB to fm), thus avoiding the nuisance of being a few hundred hertz away from a "standard" channel when changing modes.

Four memories with priority channel operation, scanning from the microphone, a highly effective noise blanker, high/low power selection on CW/fm, and provision for changing frequency during transmission (essential for OSCAR operation, yet not possible on many rigs) all make the FT-480R a welcome addition to the Yaesu line. A matching external power supply, the FP-80, is available for ac operation.

For further information contact Yaesu Electronics Corporation, P.O. Box 498, Paramount, California 90723.

AEA MorseMatic Keyer

A computerized electronic keyer is now available that combines virtually all the features of all the other keyers in the marketplace, at a price that is affordable for any true CW enthusiast.

The AEA MorseMatic uses two custom, state-of-the-art micro-computer chips to perform functions that were previously only a CW operator's fantasy.

The MorseMatic can be tailored to the user's needs. Features considered to be great by some users (such as dot and dash memory) are disliked by others. For the first time, the MorseMatic makes a keyer available that will appeal to all users because it can be tailored exactly to each operator's desires with a 16-button keypad.

For serious contest enthusiasts, the MorseMatic offers the most flexible automatic serial-number generator on the market.

For serious vhf DXers, the MorseMatic offers the exclusive automatic-beacon mode for precise moonbounce, scatter, or tropospheric DX scheduling. To use the beacon mode, instruct the MorseMatic how long to transmit any selected message and how long to pause before the message is automatically transmitted again. The computers will automatically set the message code speed to fit the desired transmit window. The beacon mode can also be used for contest operating and for vhf beacon transmissions.

The MorseMatic is the first to offer "soft-partitioning" of the memory, unlike the "hard partitioning" in all other keyers. Soft-partitioning means no wasted memory space. All of the memory can be allotted to one message location, or it can be divided up into as many as ten locations. The memory can be loaded in automatic mode for perfect message formatting, or it can be loaded in the real-time

mode for individualizing a message. Memory can also be loaded in automatic-keyer mode (any dot and dash ratio) or in semi-auto (bug) mode. Any message can be played back with any selected dot and dash ratio. Hence, the user can send a sloppily loaded bug-mode message back with perfect 3 to 1 dash to dot ratio. Conversely, a perfectly loaded 3 to 1 dash to dot ratio message can be replayed later with as much as an 8 to 1 dash to dot ratio (sounding like a bug).

Automatic transmit-tune mode: The MorseMatic can be used to key the transmitter for tuning purposes. The operator need only hit any keypad button or the key paddle to defeat the tune mode.

Editing a memory loading mistake is a snap with the MorseMatic. If you are near the end of loading a message into memory and a mistake is made, it only takes seconds to erase the mistake and then continue with an error-free message.

All this, plus an excellent Morse trainer, is included in the basic price of the MorseMatic. It is the only trainer that will automatically increase the speed of the practice characters so that your brain is "fooled" into thinking it is still copying the starting speed. No more need to keep buying practice tapes as you start memorizing old ones, or as you progress in speed. The MorseMatic will take you from 2 to 99 WPM. MorseMatic and Soft-Partitioning are trademarks of AEA.

Introductory Amateur net price is $199.95. Write Advanced Electronics Applications, P.O. Box 2160, Lynnwood, Washington 98036.

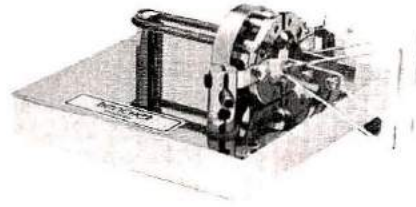
Magnet Mount Accessory

A new magnet accessory mount, model K-350, is available from the Antenna Specialists Co. The mount is a heavy duty, professional-grade magnet base with pre-assembled RG-58U cable and fittings to accommodate virtually all standard base-loaded or low-profile communications whips.

The assembly will accommodate either 5/8-24 thread base loads or, with an adapter furnished, the 1-1/8-18 thread low profile configuration. Cable length is 12 feet, ample for roof top vehicle installations, and is furnished with a pre-assembled PL-259 connector. Price is $28.75. For additional information write to, The Antenna Specialists Co., Professional Division, 12435 Euclid Avenue, Cleveland, Ohio 44106.

Bencher Keyer Paddles

The Bencher series of keyer paddles provides many unusual and interesting features that will improve your CW and help make operating a real pleasure. In addition to the dual levers that permit iambic keying, there are adjustable contact point spacing, a wide range of tension adjustments that can be tailored to match your "fist," self-adjusting needle bearings, solid silver contact points, precision-machined components, and a heavy steel base with nonskid feet. The standard BY-1 base is finished in attractive black wrinkle. The BY-2 has a polished chrome base, and the BY-3 is available with a gold-plated base on special order. A unique feature is the paddles themselves, made from crystal-clear, polished plastic that blends nicely with the chrome main-frame and black-wrinkle base. Model BY-1 is priced at $39.95, and Model BY-2 is $49.95. Write for quotation on Model BY-3. For more information, see your local dealer or write to Bencher Inc., 333 West Lake Street, Chicago, Illinois 60606.



DenTron Radio Antenna Tuner

The matching amplifier for the DenTron Component Series is described in the Transmitters section.

DTR-3KA Antenna Tuner

Frequency coverage: 1.8-30 MHz continuous built-in 2 kW PEP dummy load — forced air cooled
Input impedance: 50 ohms (resistive)
Output impedance:
- Coax 1 50 ohms nominal
- Coax 2 50 ohms nominal (may range from a few ohms to a high impedance)
- Coax 3 50 ohms nominal
- Long wire either high or low impedance
- Balanced line 75 to 600 ohms

Power capability: 3000 watts PEP
Wattmeter accuracy: ±5% full scale
Dimension: H 5¼" W 17" D 13" (W 19" with rack brackets)
Weight: 15 pounds

Flesher Terminal Unit

Designed for hf and vhf autostart operation, the TU-170 from Flesher Corp. connects your radio to your teletype or computer. Features include computer TTL interface, a built-in 60 mA loop supply, loop switching circuit and 170 Hz shift active filter demodulator. The demodulator requires 100 mV signal and has a 3-stage 2125 Hz active filter for mark signals and a 3-stage, 2295 Hz space filter. There is an adjustable threshold autostart with solid-state relay output.

For free brochure write Flesher Corp., P. O. Box 976, Topeka, Kansas 66601.

COMM Audio Processor

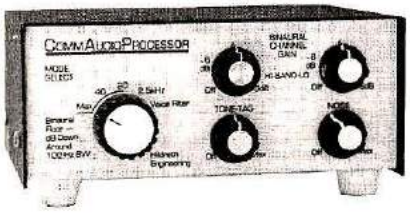
The Model 210 is an expansion of the earlier Binaural Synthesizer-Filter, the 1500 series — with the following additions and changes:

Additions: Voice-Filter — a new system using 13 poles of filtering resulting in a nominal 3 to 5 dB of S/N improvement over a single-pole, 2.5-kHz flat voice bandwidth . . . plus a significant benefit in rejecting overlap-

ping QRM. Also, using Voice-Filter in concert with the binaural synthesizer provides "directional tuning" which makes the precision tuning required for SSB quick and easy.

Antiphasic White Noise — a new method used to mask noise and interference of a more objectionable character without reducing — in fact often improving — the clarity of signals. Threshold CW signals, when being listened to through a very narrow filter, can often be copied solid when this noise feature is added.

Separate binaural output level controls — this enables fine balance to correct for any speaker, hearing, or



amplifier dissimilarities. Also, in special cases, either the high or low band gain can be reduced to zero, effectively increasing the CW filter selectivity function to 13 poles on the side reduced, plus a reduction to 50 Hz.

Modifications: Narrow-band filter — this filter has been increased to a 9-pole Chebychev design with the first stage configured as a passive pre-filter to reduce transient intermodulation distortion.

Power amplifiers — an LM377 dual, 2-watt integrated circuit has replaced the 1/2 watt system in models 1100 and 1500.

Input circuitry — the nominal input impedance is now 8 ohms.

For more information, write Hildreth Engineering, P. O. Box 60003, Sunnyvale, California 94088.

Kantronics Morse Code/ Teletype Reader

Kantronics' Field Day* is a tri-mode microcomputer system that reads and displays Morse code and radioteletype signals and computes Morse code speeds. It is a complete unit that doesn't require peripheral equipment or television monitors for use.

Field Day is lightweight and portable. A movable support arm tilts the unit to four different viewing angles and doubles as a handle for field use. The enclosure is sturdy and durable, but light and compact as well. Front-panel controls include ON/OFF, SPEED (display), EDIT, (word) SPACE, and RESET.

Field Day copies incoming or outgoing signals through the audio output of a receiver. (Outgoing signals are monitored through receiver sidetone provisions.) An internal speaker is enclosed, and volume is adjusted through the receiver audio gain potentiometer. If Morse code is being copied, Field Day screens out unwanted signals with an active 200-Hz bandwidth filter. The 750-Hz center frequency signals are then entered into the microcomputer system, which uses an 8035 chip.

Once signals are converted to alphanumeric text, they are advanced from right to left across ten 14-segment displays. When in the code-speed mode, the two leftmost LEDs display the speed while text advances across the others.

Two Morse copying modes are accessed on the front panel. In the standard copying mode, fairly strict Morse specifications are applied to the incoming code. If spacing or weighting is incorrect, the unit will display a variety of mumbo-jumbo. This mode is good for copying good code, and acts as the perfect "judge" for practicing Morse sending.

When the code editor is engaged, Field Day processes the signals with a relaxed program that effectively analyzes and edits poorly sent code. The corrected version is then displayed.

In addition to code editing, a word spacing control is included on the Field Day front panel. This control determines the most likely word breaks and inserts spaces into bunched copy.

Morse code speeds are displayed at the touch of a front panel button. When not in use, all ten LEDs are devoted once more to code-text display.

In RTTY mode, which is controlled from the back panel, the standard 60, 67, 75, and 100 words-per-minute Baudot teletype speeds are copied. With no other teletype equipment, the two-tone signals can be read as standard text. Also found on the back panel are terminals for audio input, TTL compatible inputs, TTL compatible demodulator output from the unit, and a phone jack for attaching headphones.

For more information, contact Rick Link, WBØKDE, Advertising Manager, Kantronics, Inc., 1202 East 23rd Street, Lawrence, Kansas 66044.

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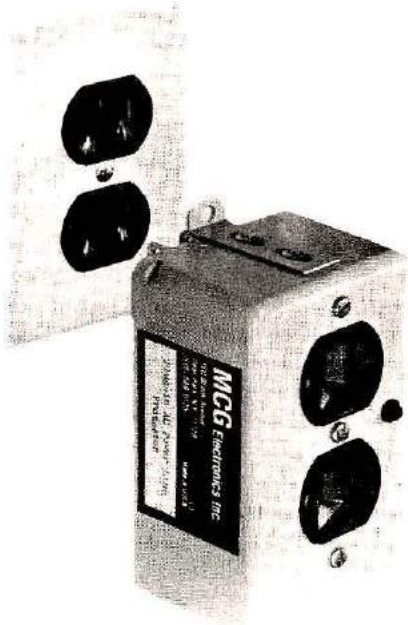
*"Field Day" is a trademark of Kantronics, Incorporated. All rights reserved.

Plug-In AC Power Conditioner

The Model 300 ac Power Conditioner protects sensitive electronic devices — for example, computers, terminals, printers, modems, as well as office, laboratory, and communications equipment — that use microprocessor and semiconductor circuitry. Since the Model 300 incorporates a wall-socket type of fixture, all equipment can simply be plugged-in, and any 117-Vac wall outlet can thus be converted into a "dedicated" line.

The 300 clamps high-energy transients and filters RFI from the ac line.



If a severe transient does occur, the device will "fail safe" and thus protect the equipment without interruption of service or loss of data. The protection status is monitored continuously by an LED.

The low-cost, portable (weighs 1

pound), Model 300 protects low- and high-impedance loads from common and transverse mode transients as well as from continuous or intermittent power-line noise. It holds down voltage spikes to safe levels, absorbing up to 80 joules of transient energy — a level that is unlikely to be encountered in actual operational conditions.

The price is $135 each with delivery from stock. For more information write MCG, 160 Brook Avenue, Deer Park, New York 11729.

Dummy Load from MFJ

The MFJ-250 Versaload is a kilowatt dummy load from MFJ Enterprises, Inc., of Mississippi State, Mississippi.

This oil-filled load permits high-power tuneups, and extends the life of transmitter finals by presenting a matched load. You can run 1 kW CW or 2 kW PEP for 10 minutes, 500 watts CW or 1 kW PEP for 20 minutes, or continuous duty using 200 watts CW or 400 watts PEP. A derating curve is printed on the can.

The resistor is a high-quality, 50-ohm unit, producing low VSWR to 400 MHz. The Versaload is ideal for testing high-frequency and vhf transmitters. Important in today's ecology, the Versaload contains no PCB! The unit comes with SO-239 coax connector, and is vented for safety.

Price is $29.95; you can order one today by calling 800-647-1800, or write MFJ Enterprises, Inc., Box 494, Mississippi State, Mississippi 39762.

New MFJ Transceiver/ Receiver Preselector

The new MFJ-1040 transceiver/ receiver preselector covers 1.8 to 54 MHz in 4 bands. It improves weak signal reception, helps reject out-of-band signals, and reduce image response. A push-button switch gives you 20 dB attenuation to cut down those strong signals that might otherwise overload your receiver. Two more push-button switches let you switch between two antennas and two receivers. Other controls include: gain, relay delay, band selector, on-off/bypass, and an LED to indicate when on.

Phono jacks are paralleled with coax connectors on the back panel to let you use the type of connector you prefer.

The MFJ-1040 has an rf-sensing relay which handles up to 350 watts. This relay automatically bypasses the preselector when transmitting. It also has a push-to-talk connection on back if this is preferred.

The 1040 operates on 9-18 Vdc or on 110 Vac with optional ac adapter ($7.95).

The MFJ-1040 is available from MFJ Enterprises, Inc. for $99.95 plus $3.00 shipping and handling.

The MFJ-1045 is a less expensive version of the MFJ-1040. This version is made for the serious SWL who will be using it with a receiver only.

The MFJ-1045 is the same as the MFJ-1040 except it doesn't have the 20-dB attenuator, relay for transceiver bypass, delay control, push-to-talk connections, and has only connections for one antenna and one receiver.

The MFJ-1045 is available from MFJ Enterprises, Inc. for $69.95 plus $3.00 for shipping and handling.

To order, call toll-free 800-647-1800, or mail order with check or money order to MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, Mississippi 39762.

New MFJ Receiver Antenna Tuner

The MFJ-959 lets you match your antenna to your receiver for maximum signal strength. It has a 20-dB, low-noise preamplifier to further enhance the received signal.

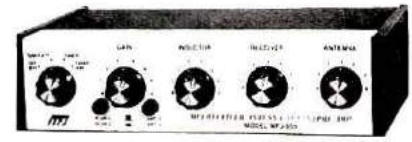
With the MFJ-959 you can switch between two antennas and two receivers. The 959 tunes from 1.6 to 30 MHz and there is a 20 dB attenuator to keep those stronger signals from overloading your receiver. Coax and phono jacks are connected in parallel to let you use the type of connector you prefer.

With the MFJ-959, you can enjoy the best possible reception from your antenna. It uses 110 Vac or 9-18 Vdc as a power source.

The MFJ-959 sells for $89.95 plus $3.00 for shipping and handling.

The MFJ-950 is the same as the MFJ-959 but without the preamp, attenuator, and bypass. The MFJ-950 sells for $59.95 plus $3.00 for shipping and handling.

To order, call toll free 800-647-1800 or mail order with check or money order to MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, Mississippi 39762.



MFJ-408 Deluxe Electronic Keyer II

The new MFJ-408 Deluxe Electronic Keyer II has a readout and a socket for the Curtis external memory, random code generator, and keyboard.

The MFJ-408 lets you read your sending speed to 50 WPM, and the accessory socket allows you to use

Curtis accessories such as external memory, random-code generator, or keyboard.

The MFJ-408 is based on the proven Curtis 8044IC keyer chip. It operates in lambic, automatic, semi-auto-

matic, or manual modes. Dot-dash memory provides self-completing dots and dashes with jam-proof spacing. The keyer provides keying for grid block, cathode, or solid-state transmitters (−300V, 10 mA max; +300V, 100 mA max.).

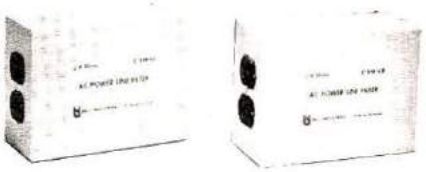
All controls are on the front panel, and include weight control, tone control, and function switch (on, off, semi-automatic/manual, and tune). A stereo phone jack for the key, and phono jacks for outputs are on the back of the MFJ-408 keyer.

The MFJ-408 is completely portable; it operates up to one year on four C-cells. It has a 2.5-mm phone jack for external power (6 to 9 Vdc), or order the optional ac adapter for $7.95.

The MFJ-408 Deluxe Keyer II is available from MFJ Enterprises, Inc., for $79.95 plus $3.00 shipping and handling; accessory cable with plug is $3.00. To order, call toll-free 1-800-647-1800, or mail order to MFJ Enterprises, P.O. Box 494, Mississippi State, Mississippi 39762.

Heavy-Duty Line Filters

New heavy-duty, ac power-line filters that handle up to 15 amperes have been introduced by the J.W.



Miller Division of Bell Industries in Compton, California.

Sensitive equipment is protected from interference by these filters. They are ideal for preventing power-line interference from virtually all sources such as copying machines, small computers, and appliances.

Model C-515-L1 (110-120 Vac) and Model C-516-L2 (220-240 Vac) five-section LC-network filters provide 50 dB attenuation or better for 500 kHz to 300 MHz.

In use, the equipment causing the interference is plugged into the filter, and the filter is plugged into an ac outlet. Also, the filter can be plugged in between equipment to be protected and the ac power.

Additional information may be obtained from Jerry Hall, J.W. Miller Division, Bell Industries, 19070 Reyes Avenue, Compton, California 90221.

New Automatic Antenna Tuner

An automatic antenna tuner for use with Amateur, commercial and government communications systems has been introduced by the J. W. Miller Division of Bell Industries from Compton, California.

The Auto Track Model AT2500 antenna tuner can handle power in excess of 2500 watts PEP over a frequency range from 3 to 30 MHz.

Average automatic tune-up time for the AT2500 is 15 seconds.

Front panel switch positions permit the use of three coaxial antenna outputs, one long wire antenna and one coaxial tuner bypass. Output impedance range is 10-300 ohms.

A direct reading SWR meter on the front panel is calibrated from 1:1 to infinity.

The POWER panel meter displays RMS with continuous (CW) carrier and automatically displays PEAK when in SSB mode in ranges of 0-250 W and 0-2500 W.

Additional information may be obtained from Curt Henius, J.W. Miller Division of Bell Industries, 19070 Reyes Avenue, Compton, California 90224.

P-3 Series Tone Encoder from Pipo Communications

Pipo announces the P-3 series, a small, miniature Touch-Tone encoder consisting of a separate keyboard and three different electronic packages to choose from. This is just what many hams have been waiting for to satisfy the need for a custom installation. The advantage of quality and reliability that Pipo has offered in the past is here again.

The system of the P-3 Series offers the choice of mounting the electronics directly behind the keyboard or in a remote location apart from the keyboard, without being subject to RFI.

Features include wide voltage range (4.5-16 Vdc), immune to RFI, will drive any transmitter or system, totally self-contained, twelve and sixteen key available, temperature range 15° to +160°F.

For more details, write Pipo Communications, P.O. Box 3435, Hollywood, California 90028.

New Model 444D Microphone from Shure

Serious Amateur Radio operators, who have long regarded the Shure Model 444 as the "standard" among fixed-station microphones, now have a new candidate upon which they may bestow the title.

It is the new Shure Model 444D, which retains all the performance characteristics that made the Model 444 popular, but also offers added features Amateurs will find especially appealing.

The Model 444D has a new impedance-selector switch located on the bottom of the base, which allows selecting either high- or low-impedance operation. This feature significantly increases the 444D's compatibility with existing fixed-station equipment.

A second easy-to-use slide switch is provided for switching between normal or VOX operation. These new convenience features join the unit's easy-to-use, momentary or locking, push-to-talk switch bar, which actuates the microphone and an external relay or control circuit with figertip action.

Other added features of the Model 444D are a coiled cable, the availability of a free, personalized nameplate imprinted with an Amateur's station call letters, and a new wiring guide with instructions for wiring the microphone to major brands of ham equipment.

Field-proven features retained in the design of the new Model 444D include a rugged, Controlled Magnetic® microphone element, speech response tailored for maximum intelligibility, height adjustment for operator comfort, and a tough, Armo-Dur® case that is impervious to rust and deterioration.

User net price of the Model 444D is $55.50. For more information, write: Shure Brothers Inc., 222 Hartrey Avenue, Evanston, Illinois 60204.

CW Station Identifier

Spectrum Communications' model ID1000 automatic morse CW station identifier is a 1-2 channel, stored-program unit designed to connect with any solid-state or tube-type base station or repeater transmitter. This new IDer features automatic identification of the station, either at completion of activity or at 15-30 minute intervals, AC supply, optional provision for 12-Vdc battery input with automatic switchover to special "Emergency Power ID." CW tone pitch, speed, level, and time are adjustable.

The transmitted code signal is a pleasant sinusoidal note, and the unit has an output capacity of up to 6 V p-p into a 600-ohm or greater load. A plug-in PMOM chip is used to store the memory. The unit is housed in a standard 19″ rack mount.

The unit ensures full and automatic compliance to the FCC requirements of parts 89, 91, 93, and 95, as well as other applications. For further information, contact Spectrum Communications Corp., 1055 W. Germantown Pike, Norristown, Pennsylvania 19401, (215) 631-1710.

ASCII/Baudot Morse Translators

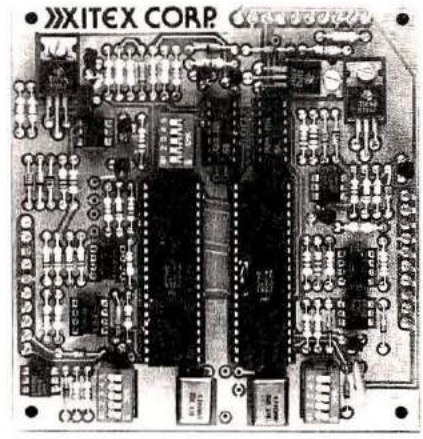
A new single-board code converter, designated the ABM-100, is now available from Xitex Corporation for translating between ASCII and Baudot or Baudot and ASCII. Using a pair of MK-3870 single-chip microcomputers, the board provides two independently programmable serial-data ports which are internally connected. Programming is accomplished using on-board DIP switches for selecting the baud rate, line length and data format for each of the two ports.

Eight different baud rates are provided from 110 to 1200 Baud ASCII, and 45.45 to 74.2 Baud Baudot. Output-line lengths of either 40, 64, 72, or 80 characters are also selectable.

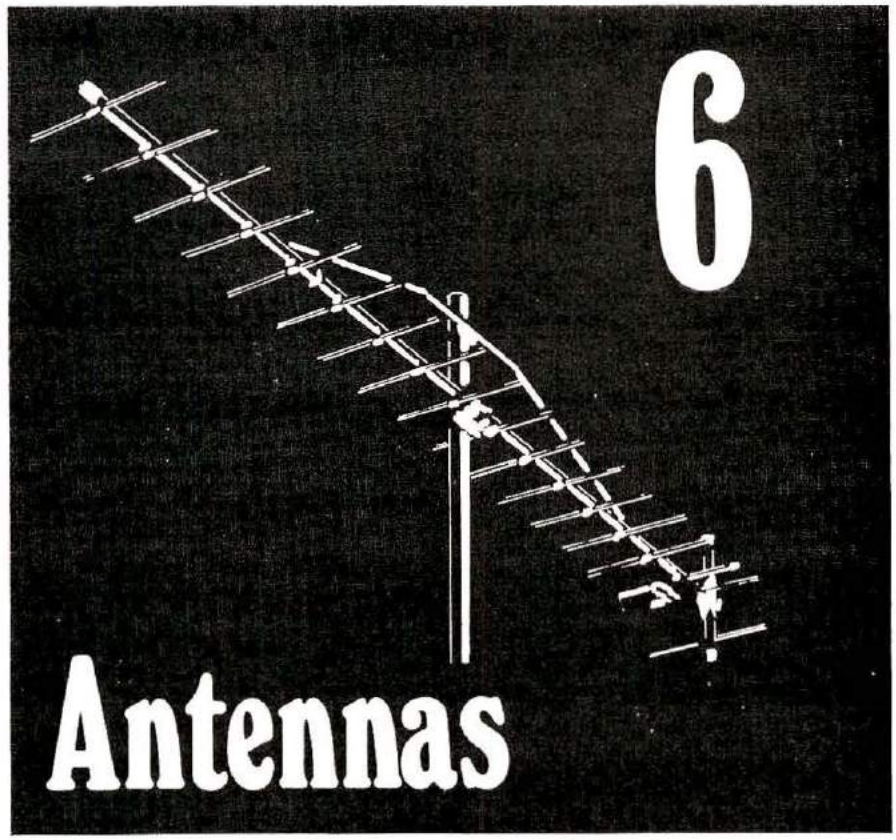
Other features include a built-in FIFO buffer and interfaces for both RS-232 and 20/60 mA current-loop operations, plus speed-conversion capability.

A third port is provided for translation between Morse code and either ASCII or Baudot. This permits the generation and decoding of Morse signals (dc levels) using conventional ASCII or Baudot equipment.

Applications for the ABM-100 are found in the Amateur, home-computer, hearing-impaired, Military, and other market areas where Baudot or Morse signals are being interfaced with equipment having only ASCII I/O capability.



The ABM-100 retails for $129 with quantity and dealer discounts available. For detailed information, write Steve Kriss at Xitex Corporation, 9861 Chartwell Drive, Dallas, Texas 75242.



Hydraulically Positioned Mobile Antenna

Anteck, Inc. introduces the MT-1RT 3.2 to 30 MHz inclusive, remote tuned, mobile or fixed portable anten-

na. Tuned from the operator's position or up to 500 feet away, the RT package incorporates a hydraulic cylinder in the mast section of the antenna, two miniature pumps with reservoir and mounting bracket, and an operator's control box with fast and slow rates. It covers 3.2 to 30 MHz in 22 seconds (in fast) or 44 seconds (in slow).

Ratings are: −40° F operation (still air, with recommended fluid), 50-ohms input, and 750-watts CW, 1500 PEP.

The main body of the loading coil and cylinder is approximately 1 inch in diameter and 60 inches long, with whip extending 32.5 inches at 30 MHz and 56 inches at 3.2 MHz, allowing exact resonance and true operator convenience. The MT-1RT installs in approximately thirty minutes. It is priced at $225. An MT-1RTR retro-fit kit for all existing MT-1s is available for $102. Contact your Anteck dealer or Anteck, Inc., Route One, Box 415, Hansen, Idaho 83334, for more information.

Antenna Specialists' New "Low-Profile Mount" Mobile Antennas

The Antenna Specialists Company has introduced new unity-gain mobile antennas, the ASPR690 series, employing sleek, low-profile mounts. Rated at 100 watts in either 108-174 MHz or 406-572 MHz bands, the new antennas are tunable from the top, and feature a special rubber vibration damper in the base. Roof-top, trunk-lid, magnet-mount, GE and RCA conversion, and 3/8 inch snap-in-mount models are available. The ASPR690 series can be converted to a gain antenna without changing mounts or installing adaptors.

For complete product information, write to Professional Products Division, The Antenna Specialists Co., 12435 Euclid Avenue, Cleveland, Ohio 44106.

Avanti High-Performance Glass-Mounted Antenna

Avanti Research and Development, Inc., of Addison, Illinois — has just introduced a new 3-dB gain, high-performance mobile antenna that's specially designed for Amateur Radio operators.

It's called the AH 151.3G, a 2-meter antenna (tunable to 174 MHz), that features a sleek, low-contour design and provides improved vhf signals. Also has a half-wavelength design that's guaranteed to deliver superior performance over a deck-mounted 5/8-wavelength antenna. It transmits a more uniform pattern than a typical "ground plane" antenna.

A unique on-glass mounting design eliminates the need for external electrical connections — thus preventing coax cable deterioration caused by corrosion and water seepage.

The patented "High-Q" impedance coupling unit, with built-in Ritter noise reduction system, mounts inside the vehicle to ensure maximum performance throughout the 2-meter band. There are no holes to drill, no car-body patching at resale time.

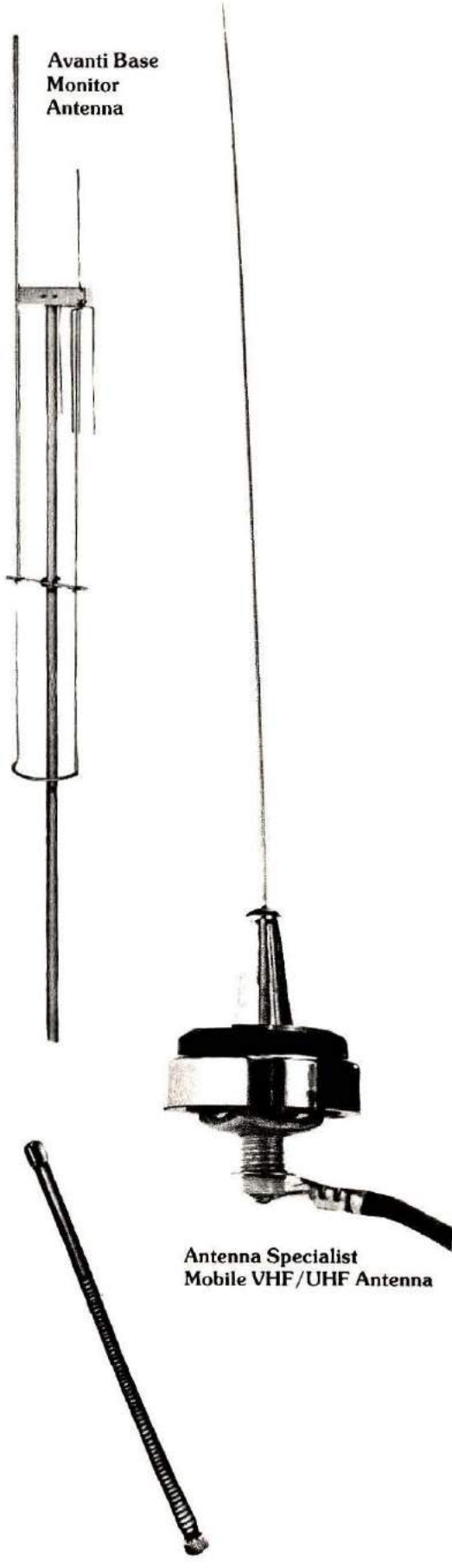
A new aerospace adhesive discovery securely locks antenna mount to glass with the strength of a 1/4-inch bolt, yet it can be removed instantly for storage, car wash, or theft protection. The mount is guaranteed to hold securely under even abnormal weather conditions and excessive vibrations. Durability is also ensured by triple-chrome-plated contour mount and 180 degree tilt-angle-adjustable whip holder. The whip itself is made of 17-7 pH stainless steel.

In addition to the AH 151.3G, Avanti makes on-glass antennas for Amateur Radio operators in the 220-225 MHz and 440-450 MHz bands, and trunk-mounted mobile antennas for comparative frequencies at 144-148 MHz and 440-450 MHz. Avanti also offers, especially for Amateurs, a 10-meter dual-polarity beam (AH028.98), which is the original polarity-diversity loop antenna.

For more information, contact Avanti Research and Development, Inc., 340 Stewart Avenue, Addison, Illinois 60101.

New Base Monitor Antenna from Avanti

A new tri-band monitor antenna, with a U.S. patented design for pulling in more signal, has been recently introduced by Avanti Research & De-



Avanti Base Monitor Antenna

Antenna Specialist Mobile VHF/UHF Antenna

Centurion Flexible

velopment, Inc. — a recognized leader in Antenna Systems.

Called the Astro Scan (AV-801), it combines three antennas in one, with each antenna operating at peak potential. It monitors the entire range of HF, VHF and UHF signals, including the new "T" Band.

State-of-the-art design on this new base antenna improves both gain and bandwidth over previous monitor antenna designs, and gives you fewer dead spots for longer range, clearer reception.

The Astro Scan uses a dc-ground construction to cut static and noise. Unique co-inductive design eliminates troublesome coils, making it durable in extreme weather conditions and when lightning strikes nearby.

In addition to easy assembly and installation, the Astro Scan also features a compact aerospace construction — well-balanced to reduce strain on the mast and rigging. Cryogenic aluminum used in the Astro Scan actually gains strength in colder weather, helping it to resist ice storms.

For more information, contact Avanti Research & Development, Inc., 340 Stewart Avenue, Addison, Illinois 60101.

Flexible Antenna

Centurion International has introduced a new field-tunable flexible replacement antenna for hand-held radios in the range of 30 to 50 MHz.

Designated Series L, the new antennas are available with any of the fourteen different connector configurations in the standard Centurion factory-tuned line. This selection assures high-performance replacement of virtually any handheld-radio antenna in this band.

The Series L antennas are protected by a mil-spec neoprene jacket with flexibility from −55° to +100° C. The jacket is self-extinguishing when exposed to flame. Approximate length is 10 inches.

For more information, write Centurion International, P. O. Box 82846, Lincoln, Nebraska 68501.

Cushcraft Vertical Antennas

Many hams are convinced that to work a lot of DX they need a couple of thousand watts and a monster antenna array. While that undoubtedly helps, where is it written that the ham suffering from a money or space cramp can't compete for his day in the DXCC sun?

The three new Cushcraft verticals, the ATV-3, ATV-4, and ATV-5, provide a common-sense solution to a commonplace problem. Specifically designed for the DXer, these antennas provide the low angle of radiation necessary for long-haul DX communications, along with the performance and quality long associated with the Cushcraft name. The ATV-3, ATV-4, and ATV-5 operate over the 10, 15, and 20 meter Amateur bands. The ATV-4 has built-in 40-meter coverage, and the ATV-5 is all set for complete five-band operation.

All antennas feature a built-in PL-259 coax connector and stainless-steel hardware for all electrical connections; all are matched to 50 ohms and rated for a full 2000 watts PEP. Factory-marked tubing and plain English instructions make assembly a snap.

Built to withstand the severest weather, the ATVs feature specially designed, high-Q traps employing large diameter enameled copper wire and solid aluminum, air-dielectric capacitors. The trap forms are manufactured from fiberglass for minimum dielectric loss and high strength.

Available from dealers worldwide, the ATV-3, ATV-4, and ATV-5 retail for $49.95, $89.95, and $109.95 respectively. For more information and a full-color catalog highlighting the entire Cushcraft antenna line, write to Cushcraft, P.O. Box 4680, Manchester, New Hampshire 03108.

2-Meter Cushcraft Yagi

Cushcraft calls your attention to the Boomer 3.2-wavelength Yagi for two-meter DX Amateur-band communications. The antenna exhibits 16.2 dBd forward gain and 24 dBd front-to-back ratio. It has a high-efficiency, balanced feed system with integral balun. A trigon reflector contributes to Boomer's precise pattern. Mechanical features include a large-diameter round boom, reversible truss supports, high strength aluminum mounting plates, and all-stainless-steel hardware.

Boomers have already established new EME and two meter contest records. Two or four Boomers can be easily stacked using Cushcraft power dividers, coaxial cables, and stacking frames, for up to 22.2 dBd gain. More information is available directly from Cushcraft Corporation, PO Box 4680, Manchester, New Hampshire 03108, or through most local ham dealers.

New VHF Antennas From "Firestik'

'Firestik' Antenna Company moves into the vhf bands with three new helically wound fiberglass antennas. The new additions are: a 144-148 MHz 2-meter whip (model 2MP-4); a 156.250-157.035 MHz marine teleband whip (model MTB-4); a 157.755-158.715 MHz land mobile tele-whip (model LMT-4).

All of the new vhf antennas will be available in 48 inch mobile models, in white with a white tip. The 2-meter and marine tele styles will also be available in base station models.

All three of the new antennas are 5/8-wave, both electrically and physically, and are capable of handling power up to 400 watts. The antennas, due to their design features, promise a low angle of radiation, an exceptionally wide bandwidth, and a low standing wave ratio.

For more information, write 'Firestik' Antenna Company, 2614 East Adams, Phoenix, Arizona 85034.

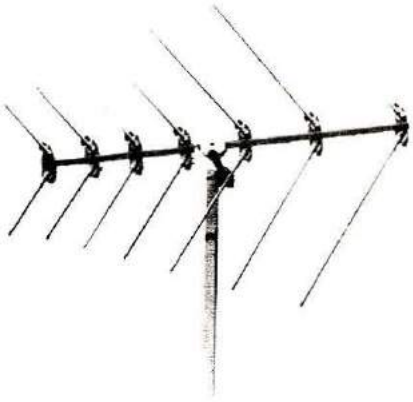
Broadband VHF/UHF Beam Antenna

Intended primarily for the hobby scanner-radio market, the new Scanner Beam from Grove Enterprises is designed to work over the continuous frequency range 108 through 512 MHz. A seven-element, log-periodic dipole array, the Scanner Beam is said to offer gain approaching 8 dB above a dipole on high-band and uhf.

An additional 15 dB front-to-back ratio makes the Scanner Beam particularly suitable for long-distance, weak-signal directional reception. Average VSWR is 1.9:1.

On low band (30-50 MHz), the antenna resembles an omnidirectional vertical dipole.

Constructed of heavy-duty aluminum tubing, the Scanner Beam features unbreakable ABS Cycolac insulators, 4-foot, baked-enamel painted boom, and includes a 4:1 matching balun transformer for either 50- or 75-ohm coaxial feedline.



A universal offset mount permits the Scanner Beam to be attached to a metal mast with a minimum of interaction, and additionally allows the antenna to be tilted in a vertical plane for satellite reception.

Hams will find the Scanner Beam also useful for transmitting in the 144, 220, and 420 MHz bands. $39.95 plus $4.00 shipping.

A matching coaxial cable assembly is also available. Constructed of 65 feet of low-loss, foam-dielectric, copper-braided shield, the cable assembly comes with factory installed F connector, Motorola connector, and weather boot. $14.95 plus $4.00 shipping.

For more information, write Grove Enterprises, Inc., Route 1, Box 156A, Brasstown, North Carolina 28902.

Hy-Gain Model TH5DX Antenna

Hy-Gain Electronics, division of Telex Communications, Inc., introduces the newest member of the famous Thunderbird line of tri-band antennas. The TH5DX offers outstanding performance on 20, 15, and 10 meters. It features 5 elements on an 18-foot boom, with 3 active elements on 15 and 20 meters and 4 active elements on 10 meters. The TH5DX also uses separate air-dielectric Hy-Q traps for each band. This allows the TH5DX to be set for the maximum front-to-back ratio, and the minimum beam width possible for a tri-band antenna of this size.

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

Contact your nearby Hy-Gain dealer, or write to Hy-Gain Div. of Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis, Minnesota 55420.

Hustler 2-Meter Antenna-Mounting Kit

A new mounting kit, Model MKR-2, is now available for converting Hustler's famous line of series-fed mobile vhf antennas to fixed-station operation.

With the appropriate vhf antenna installed and tuned, the MKR-2 is ideally suited for temporary field-day use or permanent installation for local QSOs.

The MKR-2 radial kit consists of a heavy duty zinc-plated mast bracket and hardware with three 19 inch decoupling radials for correct feedpoint impedance. It accepts any vhf antenna with a standard 3/8 X 24 thread.

The radial kit can also be used with the Hustler SF-220 1-1/4-meter antenna for 220-MHz operation.

Suggested price on the MKR-2 radial kit is $19.95, and available from Hustler dealers worldwide.

Information on this and other Amateur fixed and mobile antennas may be obtained by writing to Hustler Inc., 3275 North B Avenue, Kissimmee, Florida 32741.

KLM Circularly Polarized Antenna

KLM's new 420-450-18C antenna will bring all the advantages of circular polarity to the UHF bands. Flutter and multipath fading can now be reduced for optimized satellite and terrestrial communications. For efficient use of all operational OSCAR satellites, the 18C is a virtual necessity. Its broadband character, in the KLM tradition, also permits the 18C to meet the critical needs of DXers, ATVers, and the 440-450 FM group. According to KLM, gain is conservatively rated at 12 dB.

New design and construction techniques were used to meet the strict electrical requirements for good circularity at UHF. The reflector and director elements of the 420-450-18C pass through the center of the boom and are secured with integral polyethylene insulators and locking snap-rings. Folded dipoles are used for the driven elements. They provide excellent bandwidth and maintain perfect element symmetry. Circularity is held within 1 dB, 430-440 MHz, and 3 dB, 420-450 MHz.

Electrically, the 18C has nine elements in the vertical plane and nine, offset by 1/4 wave, in the horizontal plane. Feed impedance of each section is 50 ohms balanced. Two coaxial baluns are supplied.

The optional CS-2 Circularity Switcher, mounted on the antenna, features fingertip control of circularity (RHC-LHC) in the shack and a built-in power divider, for single-feedline convenience.

Price of the 420-450-18C is $59.95; the CS-2 is $49.95. For more information on the 18C and other OSCAR related products, contact KLM Electronics, P.O. Box 816, Morgan Hill, California 95037.

KLM Multi-Band Vertical

KLM's 40-10V brings a new standard of performance and efficiency to the multi-band vertical. The unique design uses a series of lossless linear loading and efficient Hi-Q air capacitor sections on 20, 15, and 10 meters, similar to those on the highly successful KT-34A and KT-34XA Tribanders. Old style, power-robbing coils and capacitors have been completely eliminated.

In the KLM tradition, the 40-10V provides broadband coverage. All of 40 meters is accessible with no tuning adjustment at 1.5:1 VSWR or better. Optimized tuning is also possible using the adjustable element tip. And, just two settings on each band provide complete coverage of 20, 15, and 10 meters at 1.5:1 VSWR or better.

The 40-10V is self-supporting; no guying is necessary. It is designed for mast, stake, or sidewall mounting. All aluminum tubing is strong, weather-resistant 6063-T832 alloy. All electrical hardware is stainless steel. Nominal feed impedance is 50 ohms. Windload is 2 square feet. Price is $109.95. For more information contact KLM Electronics, P.O. Box 816, Morgan Hill, California 95037.

New MFJ Indoor Active Antenna

The new MFJ-1020 indoor active antenna can rival, or even exceed, the reception of outside long-wire type antennas.

The tuned circuit of this unique active antenna helps reduce intermod, provide rf selectivity, and reduce noise outside the tuned band.

The MFJ-1020 can also be used as a preselector for an external antenna. It covers 300 kHz to 30 MHz in four bands: 0.3-1 MHz, 1-3 MHz, 3-10 MHz, and 10-30 MHz.

The 1020 comes with an adjustable telescoping antenna, ready to sit on your desk and listen to the world. The controls include: tune, band selector, gain, and on-off/bypass. A 9-volt battery will provide power for portable use, or it may be used on 110 Vac with the optional ac adapter.

If ordered from MFJ, there is a 30-day, money-back trial period. If you are not satisfied, you may return it within 30 days for a full refund (less shipping). MFJ also provides a one year unconditional warranty.

The MFJ-1020 Indoor Active Antenna is available from MFJ Enterprises, Inc. for $79.95 plus $3.00 shipping and handling.

To order, call toll-free 800-647-1800, or mail order with check or money order to MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, Mississippi 39762.

HF Bantam Dipole

Camping? Traveling? Stuck with apartment living or building code restrictions? Smithe's HF Bantam dipole may be for you!

This 13-foot, center-fed antenna can be used on any frequency from 3.5 to 54 MHz. And it can easily be shortened to 7 feet. Most living rooms can accommodate it.

The dipole is made of high quality 6061-T6 aluminum tubing and stainless steel hardware. Through bolts are used in assembly, nothing can slip off, fall from an apartment balcony, and hurt neighbors below.

Performance? High-Q air wound coils and heavy conductors permit very high currents to generate a strong radiated field. You'll be amazed at what the Bantam will do.

Mounting is simple. It can easily be attached to a camera tripod and the whole assembly set on the front lawn. Change of frequency or polarization needs only a moment's effort. And when not in use, the Bantam stores in its handy carrying case, ready for your next trip or DXpedition.

Specifications:

Frequency range, 3.5 to 54 MHz. (Designed for the 80 to 10 meter bands); polarization, horizontal or vertical, quickly interchangeable; feed point impedance is 50 ohms nominal, coils easily set for other values; power handling ability, 80 meters — 200 watts; 40 meters — 400 watts; 20, 15, and 10 meters — legal limit. Mounting, 3 foot mast has 1/4-20 threaded hole for camera tripod (tripod not supplied), 3/8-24 mounting available.

For additional information write to The Comm Center, Laurel Plaza — Route 198, Laurel, Maryland 20810.

Broomstick Antennas

Broomstick single-band antennas from Smithe are designed for the ham who must "make do" without outside antennas. They are only five feet long and an inch in diameter, but are fully self-contained, center-fed dipoles with built-in matching networks for 50-ohm transmitters.

They require no ground plane or ground connection.

Each antenna comes fully assembled. Simply connect it to your high-frequency transceiver with coax (not included) and you're on the air.

Broomsticks can be used outdoors, too — they are waterproof. Or they can be hung inside a window, right next to the rig. They will work DX, too — the antenna's designer worked 13 countries in as many days, with a 200 watt transceiver and a Broomstick hung in the window of his shack on the first floor of a typical suburban ranch-style home.

The price is right: a Broomstick, at only $29.95, costs less than a mobile whip.

Bandwidth is 100 kHz (antenna can be readily tuned to any frequency in band), and the power rating is 120 W CW, 400W PEP SSB, 70W RTTY/SSTV.

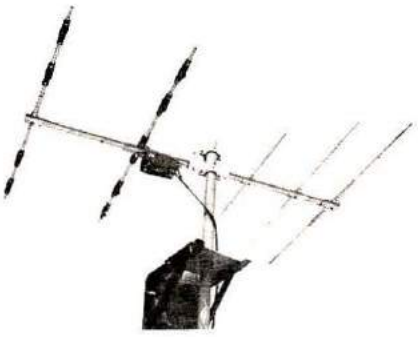
Polarization can be vertical or horizontal, depending on mounting. Length is 5 feet, diameter is 1 inch, and weight is 5 pounds. Broomsticks carry a 30-day money-back guarantee and a 90-day warranty.

For further information write to The Comm Center, Laurel Plaza — Route 198, Laurel, Maryland 20810.

Telrex 5-Element Beam

Telrex introduces the latest in its series of professionally engineered antennas, a five-element, balun-fed 10, 15, and 20-meter tri-band beam, Model TB5ES. The TB5ES provides optimum forward gain, front-to-back ratio, and signal-to-noise ratio, in an antenna which exhibits a clean and precise pattern.

The quality of the TB5ES is also in



keeping with its famous Telrex predecessors, the TB5EM and the TB6EM. A precision-machined boom, hermetically sealed, epoxied traps, stainless-steel electrical hardware, preformed gusset mounting straps, reinforced, extremely heavy-walled boom and elements, elements driven through the boom, high-strength, seamless, drawn-dural aluminum tubing, and a non-ferrite, coaxial high-performance Balun (provided with the antenna) are only a few of its many attributes.

Consistent with the workmanship normally associated with Telrex, the TB5ES is a hand-crafted, precision-machined antenna.

The TB5ES has an 18-foot boom, 36-foot longest element, 22-foot turning radius, 7 square foot wind surface area, weighs 49 pounds, and is shipped via motor freight in a 13-foot long carton.

The half-power beamwidth is 60°, with 35 dB side nulls and a 1 kW peak power rating.

The price is $315.00, f.o.b. Asbury Park, New Jersey.

For further information write Telrex Labs, P.O. Box 879, Asbury Park, New Jersey 07712, or phone (answer phone available day or night, Saturdays, Sundays, and holidays) 201-775-7252 and leave your mailing address.

2-Meter Gain Antenna For Hand-Helds And Portables

VoCom's telescoping 5/8-wave antenna for 2-meter hand-held and portable transceivers offers users a significant improvement in performance over standard whip or "rubber duckie" antennas. The lightweight antenna mounts on the radio with a BNC connector, and features a combination matching coil/base spring that protects both radio and antenna from accidental damage.

Though the extended length of the antenna is 45 inches, it collapses to only 8-1/2 inches for convenience in carrying the radio in a belt pouch or pocket. VoCom's tests indicate a greater than 6 dB improvement in signal with their antenna as compared to the standard "rubber duckie." In use, the improvement in both received and transmitted signal is quite remarkable.

Price of the VoCom 2-meter portable antenna is $19.95 from any VoCom dealer or direct from VoCom, Box 219, Prospect Heights, Illinois 60070.

Roof-Mounted Towers For Vans

Aluma Tower Company is now manufacturing five styles of mobile-van, roof-mounted telescopic towers.

The heavier duty model of these towers will crank up to 60 ft., if required. They are manufactured for easy mounting on your van ladder rack, so they can be easily cranked up when needed for use, and easily cranked down for storage.

These quality-made aluminum towers are tungsten inert gas welded (heli-arc) for strength. These towers are also manufactured with a safety stop for safe, trouble-free use.

Aluma Tower Company is located at 1639 Old Dixie Highway, Vero Beach, Florida 32960.

DS3100 RTTY Terminal

HAL Communications Corp. is proud to announce a new standard of comparison in electronic RTTY terminals — the DS3100 ASR. The new terminal features full buffering of both received and transmitted data, thus permitting preparation of transmit text while receiving, as well as storage of up to 150 lines of received text and 50 lines of text to be transmitted. The terminal also features a new screen format with twenty-four 72-character

lines split to show both receive and transmit buffers, line numbering for each buffer area, on-screen status indicators to show terminal code, rate, mode, *etc.*, and a new high-contrast green P31 phosphor screen for easier viewing. The screen also uses bright/dim intensity changes to differentiate between keyboard and received data.

A total of ten "HERE IS" programmable identifier messages are available, two of which can be saved even while power is removed from the terminal. An IDENT feature allows Morse identification, regardless of the terminal's selected data code. Other features include a real-time clock, programmable answer-back (WRU), upper and lower ASCII, ASCII speeds from 110 to 9600 baud, four keyboard operated output switches to control accessories, and a full 25 pin modem connector, for ASCII computer connections.

As in the previous DS3000 KSR V3 terminal, the new DS3100 ASR will send and receive all three data modes (ASCII, Baudot, and Morse), allows use of continuous, line, or word transmitting modes, and has synchronous idle, unshift on space, and word wrap-around. Both the electrical and mechanical features of the terminal have been completely redesigned to use a Z80 microprocessor, plug-in circuit boards, and allow easy service. A front-face legend has been added to the keytops to fully label all control functions of the terminal and simplify operation.

The cost is $1995.00 including shipping within the United States. Contact HAL Communications Corp., Box 563, Urbana, Illinois 61801 (phone 217-367-7373) for further information.

Heath Frequency Counters

Heath Company has introduced two new digital frequency counter kits. The IM-2400, Heath's first hand-held counter, features a 50 Hz-512 MHz frequency range — while the portable IM-2410 offers a single input for its entire 10 Hz-225 MHz frequency range.

The IM-2400's crystal-controlled, 10-MHz time base provides improved accuracy and 10 ppm temperature stability.

True hand-held portability is achieved by placing the five rechargeable nickel-cadmium batteries inside the housing of the IM-2400. To recharge the batteries, as well as use ac line current, a Heathkit Eliminator/Charger for either 120 Vac (PS-2404, which sells for $4.95) or 240 Vac (PS-2405, priced at $12.95) is required.

The IM-2410 portable frequency counter measures input signals between 10 Hz and 225 MHz with 10 ppm temperature stability. A durable metal cabinet, improved RFI shielding and complete voltage protection help assure proper operation.

Both the IM-2400 and IM-2410 counters may be connected directly to the component under measurement.

The IM-2410 is priced at $119.95, and the IM-2400 hand-held counter retails for $139.95, both in kit form. Both these two new Heathkit digital frequency counters are available in assembled form also. The SM-2400 hand-held counter sells for $179.95, while the SM-2410 portable 10-225 MHz counter is priced at $159.95.

For further information, or to obtain a free catalog, write Heath Company, Dept. 350-500, Benton Harbor, Michigan 49022. (In Canada, write Heath Company, 1480 Dundas St. E., Mississauga, Ontario L4X 2R7.)

Digital Dial for Rotators

The digital age has entered the antenna rotator field. The DX-360 Digital Degree Dial custom module converts your CDE Ham M, II, III, IV, T2X, Alliance HD-73, KLM, Wilson, Kenpro (TET) 400, 500, 600, and other rotor control boxes into easier-to-read digital-bearing readouts which have superior accuracy compared to present analog meters. Guesswork is eliminated.

The tested and assembled DX-360 customized module is only $39.95 (U.S.) with VISA, Master Charge, money order, or check. Shipped first class air mail. Guaranteed. Write for free details, and specify rotor type: Monitor, Box 55AB, Agincourt, Canada M1S 3B4.

Vehicle Security System

Page Alert Systems, Inc. has recently introduced a new deluxe model, the *Page Alert 4444*. The innovative Model 4444 has been designed to be more than just a superior vehicle-security system. A special "PAGE and SECURITY Switch" has been added to the transmitter along with two small lights (LEDs) on the receiver, making the *Page Alert 4444* into a low-cost immediate area communications and emergency alert system for the home, office, and factory, as well as a theft-warning device.

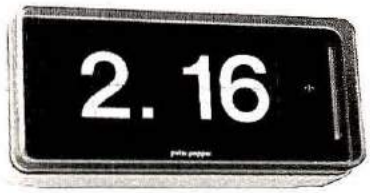
The *Page Alert 4444* has literally hundreds of uses in the home, office, industry, or wherever communication is critical. The unique and low-cost *Page Alert 4444*'s communication and security applications are limited

only by one's imagination.

For additional information contact Page Alert Systems, Inc., 23842 Hawthorne Blvd., Torrance, California 90505.

Digital Wall Clock

A new digital wall clock distributed by Peter Pepper Products for Copal of Japan has just been introduced. This digital clock is accurate to a minute a



year, using a battery-operated quartz movement. It is easily readable up to 65 feet. The contemporary design features black number flaps with 2 inch white numerals, a case made of ABS plastic in a light color and has a clear acrylic cover. A luminous diode indicates that the clock is operating and when a battery needs to be replaced.

The clock measures 12 X 5-1/2 X 3-3/4 inches and weighs 3 pounds. Price is under $120.00. For more information contact Peter Pepper Products, 17929 S. Susana Road, Compton, California 90221.

RE-ZOLV For PC Boards

The Re-Zolv® process is photosensitive. The emulsion of the imaging process is unique. Being non-toxic, non-corrosive, and non-inflammable, the process is environmentally safe. The sensitizer is specially modified ammonium bichromate. The developed image, dark colored against the copper background, allows easy detection of minor imperfections prior to the etchant bath. Re-Zolv® is designed to be used in ambient temperature conditions. As a result, there is no need for temperature-control devices.

The emulsion itself is water soluble. When the ammonium bichromate is added, the resultant mixture reacts to the visible light spectrum in such a way as to cause the emulsion to be non-dissolable in water. Only the areas sensitized by light become resistant to water. The action of light on the emulsion changes its molecular structure. All areas not exposed to light remain soluble.

Once the proper steps are taken, that is, application of emulsion, drying, and exposure, ordinary water sprayed on the board "develops" the circuit by removal of all un-exposed areas. The result is a high resolution image of the printed circuit.

Re-Zolv® is available from Conval Industries, Inc., or its representatives. As a prospective user, you are urged to try the process now, demonstrating its superiority. Write Hal-Tronix, P. O. Box 1101, Southgate, Michigan 48195.

Free-Standing, Telescoping Towers

The telescoping towers from Tele-Tow'r can be raised from their lowered position up to as high as 55 feet, and can be stopped at any point in between for experiments in determining the optium height for reception or transmission. Maintenance or installation of new antennas can be performed with ease.

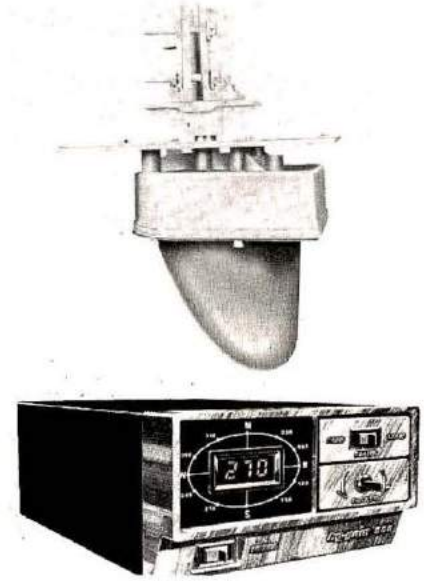
Also available from Tele-Tow'r is a breakover model that will tilt to ground level after telescoping, providing even greater safety and ease of installation and antenna maintenance.

The towers are designed to withstand 60-mile-per-hour winds, while supporting 50 pounds of rotor and antenna with an area of 6 square feet.

Weight of a 40-foot Tele-Tow'r is approximately 165 pounds, and for the 55-foot model, 350 pounds. Each tower comes complete ready to install. For more information, write Tele-Tow'r, P.O. Box 3412, Enid, Oklahoma 73701.

Hy-Gain HDR-300 Antenna Rotator

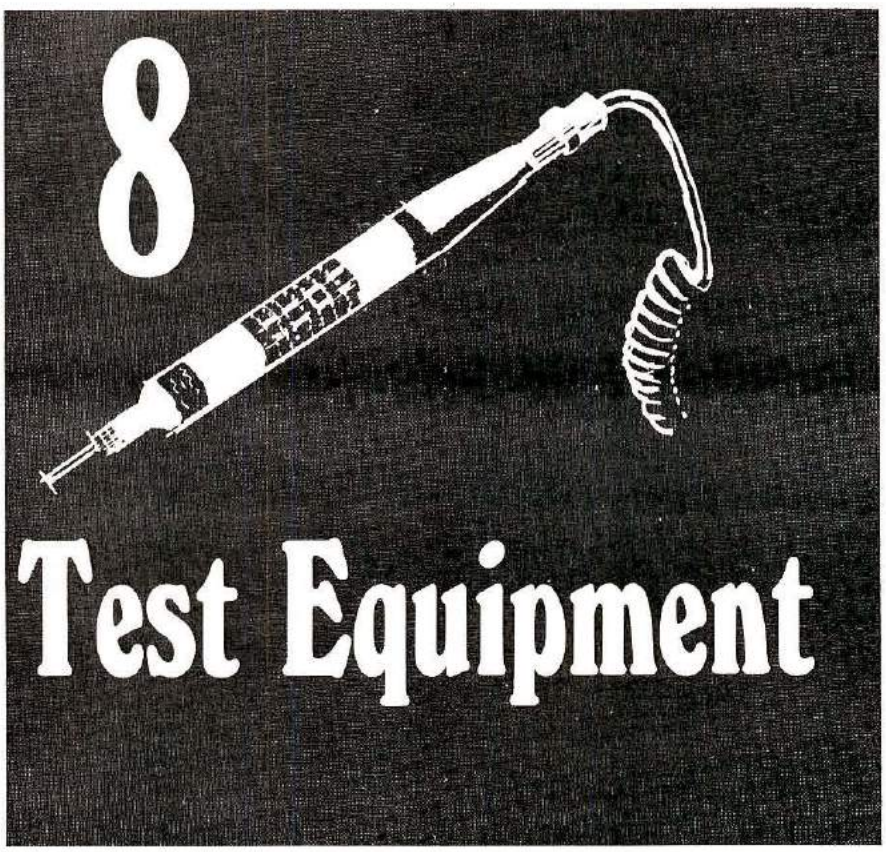
The HDR-300 antenna rotator has been designed for heavy-duty Amateur Radio use. Design specifications were derived from many years of experience in the military and commercial-communications field. The HDR-300 will handle 25 square feet of antenna, up to a maximum weight of 500 pounds. Stall torque is rated at 5,000 inch-pounds, and braking torque is rated at 7,500 inch-pounds. Mechanical travel is 390°. Instead of an analog meter readout, the HDR-300 control box features a new, easy-to-read digital azimuth readout that is accurate to ± 1°. The HDR-300 rotator is designed to mount in or on many of the popular towers in use today. For more information write Hy-Gain Div. of Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis, Minnesota 55420.



Tri-ex Tower

The Winner 51 from Tri-ex is a self-supporting, extendable, crankup tower designed for general communications and Amateur use. The W51 extends to 51 feet and nests to 21 feet for ease of repair and installation. The W51 is fabricated from high strength steel tubing and solid-rod "W" bracing that is hot dipped galvanized for superior protection from the elements. The base mount and tower base are designed so that two bolts may be inserted into the base and tower base while the tower is laying on the ground. This allows the tower to be raised safely to the vertical position.

For more information write Tri-ex Tower Corporation, 7182 Rasmussen Ave., Visalia, California 93277.



Bird Milliwattmeter

This new broad-band Termaline® RF Milliwattmeter terminates and measures the output of low-power signal sources directly, without the use of charts. A front-panel range-switch selects one of three ranges, 0-200 mW, 800 mW and 3 watts, without the need to transfer detector crystals. The wide frequency range of the model 6257 accommodates communications measurements, all the way from 100 kHz Maritime Mobile/ Maritime Radio Navigation to one gigahertz Aeronautical Radio Navigation, and all services in between.

The unit is designed to measure output of broad-band oscillators, signal generators, hand-held transceivers, or any low-powered device. Used in conjunction with compact Bird Tenuline® Attenuators, the Milliwattmeter's maximum full-scale range can be expanded to 25 or 100 watts. Each of the three ranges can be calibrated in the field — for tighter accuracy at a specific frequency.

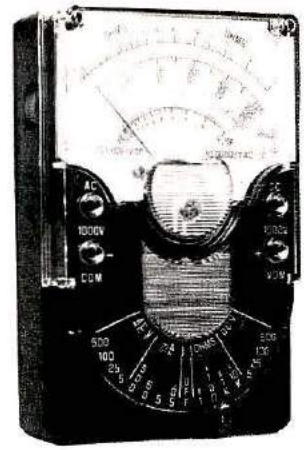
The wattmeter's diode detector also serves as a demodulator of a-m transmission envelopes. The demodulated (audio) signal is available at a front-panel miniature phone jack to feed into high impedance display or analysis instrumentation. VSWR of model 6257 is below 1.1 to 512 MHz, and less than 1.15 to 1000 MHz, in 50-ohm coaxial systems.

Model 6257 price is $265, from Bird Electronic Corporation, 30303 Aurora Road, Cleveland, (Solon) Ohio 44139.

New Low-Cost Multitester

BP Electronics has introduced a new, low-cost multimeter with 20,000 ohms/volt dc and 10,000 ohms/volt ac sensitivities, and a total of 17 ranges. Measuring only 4-7/8 X 3 X 1-1/2 inches, and weighing 10 ounces (including batteries), the VM528 is compact, lightweight, and impact resistant.

The BP VM528 Multimeter is accurate to 3 per cent dc, and 4 per cent ac, of full-scale for five voltage ranges. Four dc current ranges and four resistance ranges provide precise current and resistance indications.



Decibels can be measured from −20 to +62 dB on five ranges. Resistance can be measured from 0-60 megohms in four ranges at 3 per cent of full scale.

In conjunction with a power supply, capacitance and inductance can also be measured. The unit incorporates overload protection, and a mirror arc to eliminate parallax errors. Carrying case is optional. Suggested retail price is $9.95.

For additional information contact BP Electronics, 855 Conklin Street, Farmingdale, New York 11735.

MFJ Peak-Reading Wattmeter

The new MFJ-825 lets you operate 3 rigs simultaneously and monitor each rig's output with just the flip of a switch. There are three sensors available: hf-high power (MFJ-830), vhf (MFJ-831), and hf-QRP (MFJ-832). The sensors may be mixed or matched in any combination. The MFJ-825 is constructed to house all three sensors, or sensors may be mounted externally.

You may read forward or reflected power in two ranges or read SWR directly from any rig.

The MFJ-825 is available from MFJ Enterprises, Inc. for $119.95 plus $4.00 shipping and handling. This price includes one sensor of your choice. Additional sensors are available for $29.95 each.

The MFJ-830 hf sensor covers 1.8 to 30 MHz and the scales are 200 and 2000 watts forward and 20 and 200 watts reflected, with 5 watt SWR sensitivity.

The MFJ-831 vhf sensor covers 50 to 175 MHz and the scales are 20 and 200 watts forward and reflected, and 1 watt SWR sensitivity.

The MFJ-832 QRP sensor covers 1.8 to 30 MHz and the scales are 2 and 20 watts forward and reflected with 500 milliwatt SWR sensitivity.

To order call toll free 800-647-1800 or mail order with check or money order to MFJ Enterprises, Inc., P. O. Box 494, Mississippi State, Mississippi 39762.

Millen Grid-Dip Oscillator

A tube-type grid-dip meter for testing radio frequency circuits, rf chokes, oscillators, antennas, and similar devices, formerly manufactured by Millen, is now available from Caywood Electronics, Inc., of Malden, Massachusetts.

The Millen model 90651-A Grid Dip Meter is an oscillating frequency meter that determines the resonant frequency of de-energized circuits. Accurate to ±2 per cent, it covers a range of 1.7 to 300 MHz with 7 plug-in coils, and provides signal power output for use as an antenna bridge source. A semiconductor electronic voltmeter indicates output amplitude.

The rugged, copper-plated unit and coils store in a sturdy carrying case. Additional coils for frequencies to 165 kHz, and a 3 foot extension probe are optional.

The Millen model 90651-A Grid Dip Meter is priced at $180, complete with seven coils and case; each additional coil is $17.75. Literature is available on request.

For more information contact Caywood Electronics, Inc., Wade Caywood, 67 Maplewood Street, P.O. Drawer U, Malden, Massachusetts 02148.

Mirage MP1 Wattmeter

Mirage Communications has entered the Amateur Radio market with the introduction of the MP1 hf Wattmeter. The MP1 is designed to provide the Amateur hf operator with a versatile instrument to help obtain optimum performance from his station.

The unit will work from 1.8 to 30 MHz, and measures power in three ranges; 50, 500, and 1500 watts. The MP1 displays average-reading power for fm or CW, or peak-reading for SSB. Standing-wave ratio may also be measured with as little as 2 watts of power, and is displayed directly without having to use charts or graphs. The SWR and peak-reading features have not been available on a single instrument before. The coupler unit may be remotely mounted for added installation convenience.

Suggested list price is $119.95. For further information, contact your local dealer or Mirage Communications, P. O. Box 1393, Gilroy, California 95020.

New DMM Series Includes Logic-Probe Capability

New from Hickok Electrical Instrument Company is the MX Series of Digital Multimeters. Designated the MX 331 and MX 333, both provide 0.1 per cent basic accuracy, 10 megohm input impedance, and excellent overload protection.

The premium version, the MX 333, contains two unique features that substantiate Hickok's claim for the unit as "the world's fastest troubleshooter." These features have been designated as VARI-PITCH™, a built-in, audible signal that changes frequency proportionally to digital readings, and LOGI-TRAK™, a self-contained logic-testing capability that combines the features of a high-performance logic probe and voltmeter in one convenient function.

VARI-PITCH functions on all voltage, current, resistance, and diode test ranges. Audio response is instantaneous, proportionate, and accurate for rapid indication on repetitive measurements. Wide-range audio output on each selected range provides excellent audible resolution. Thus, with a little practice, the operator can, literally, "troubleshoot by ear" without taking his or her eyes off the probe or waiting for digital readings to settle.

LOGI-TRAK is a built-in logic-testing capability that combines the features of a high-performance logic probe and voltmeter in one convenient function. It is activated by pressing a logic button on the MX 333. This automatically sets the VARI-PITCH tone range for maximum audible resolution of logic-level voltages and sets the multimeter to provide direct display of the actual voltage (0-19.99V).

Hickok MX Series multimeters are currently available from all Hickok distributors. The price of the MX 331 is $179. The MX 333 with VARI-PITCH and LOGI-TRAK is attractively priced at only $235. Write Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio 44108, for more information, or see the MX series at your nearby dealer.

Communications Essentials From J.W. Miller

Bell/Miller Catalog

A new 100-page catalog with specifications for more than 5,000 coils, filters and communications essentials is now available from the J. W. Miller Division of Bell Industries, Compton, California.

Catalog 81 includes the new automatic antenna tuner, direct reading SWR/Power meters, speech processor and coaxial swtiches.

Included also is the broad line of high-pass, low-pass, audio, and ac power-line filters.

Detailed specifications are given for all coils, chokes, filters, and related communications components.

To assist in selection, coils are categorized by frequency from 0 through 500 MHz in the table of contents.

Schematic diagrams for all shielded and unshielded coils, showing adjustment accessibility are given.

Additional information may be obtained from Joe Johnson, J. W. Miller Division, Bell Industries, 19070 Reyes Avenue, Compton, California 90221.

RADIOKIT
RADIO COMPONENTS/ACCESSORIES

FALL–WINTER
1980

Radiokit

You'll find all sorts of goodies in this new catalog from Radiokit: kits for speech-processors, baluns, keyers, QRP transceivers, noise-bridges, etc. More items are being added each month, so get on their mailing list. There are plenty of components available, as well: variable capacitors, trimmers, dials and drives, chassis, toroids, ferrite beads, and the complete line of rf coils and chokes from the J.W. Miller selection. Also included are B & W Air-dux antenna traps, tank circuits, filament chokes, and coaxial switches. Then, too, there's a good selection of James Millen parts.

All this, plus special items that will make this catalog a pleasure to use as well as a convenient source of parts. Radiokit, Box 411, Greenville, New Hampshire 03048.

New Fall 1980 Kit Avionics Catalog from RST

Radio Systems Technology, pioneer designer and marketer of low-cost, high-technology, light-aircraft avionics and test-equipment kits, announces the availability of its new Fall 1980 catalog.

The 16-page, illustrated catalog contains a wide variety of new kits including battery chargers, a voltmeter-ammeter, a 24 to 12 volt converter, and a high performance intercom. RST has also expanded its line of antennas, headsets, and microphones. The full product line includes transceivers, audio panels, marker receivers, test equipment, and miscellaneous equipment and supplies of interest to general aviation aircraft owners and pilots.

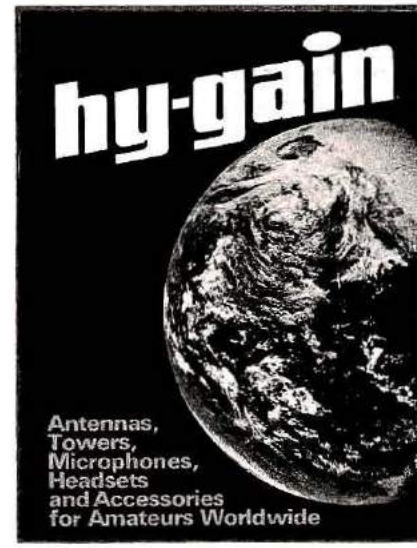
Copies of the catalog may be obtained free by writing Radio Systems Technology, 10985-R Grass Valley Ave., Grass Valley, California 95945.

New Hy-Gain Amateur Catalog

Hy-Gain, a division of Telex Communications, Inc., has published a 24-page catalog featuring over 200 base and mobile antennas, towers, rotators, microphones, headphones, boom-mic headsets and accessories for the Amateur Radio operator.

A full line of desk and hand mics, the new HDR 300 antenna rotator, and a series of seven crank-up antenna towers are the newest additions to the popular Hy-Gain Amateur offering. The catalog contains detailed specifications on all products, including SWR curves on all base antennas.

For a copy of this informative catalog, write to Kit Kitterer at Hy-Gain, Division of Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis, Minnesota 55420, and ask for catalog No. AM2504.



Radio Protection and Interference-Control Products

A new catalog from Electronic Specialists presents their line of Radio Interference Control products. Many protective devices are also included.

Descriptive sections in the booklet outline many particular problems, and suggested solutions are given. Typical applications and uses are also outlined. Request Catalog 801 from Electronic Specialists, Inc., 171 South Main Street, Natick, Massachusetts 01760.

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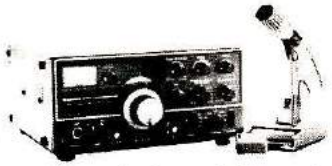
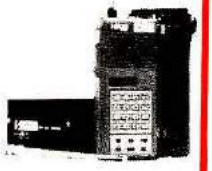


You simply can't buy better reliability, performance and reputation than the 520 series from Kenwood, and the TS520 SE is no exception. This is a just plain good radio at a tremendous savings, when you consider the free CW filter (YK-88) and microphone (MC-50) too.

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

NEW 4 WATTS



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Cushcraft A3 Tribander	169.00
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CDE Ham-4 Rotor	169.00
Ham-X	239.00
FDK Palm 2 Handie with BP/AC	149.00
Cetron, GE 572 B	34.00
GE 6146B	9.95
Fits Kenwood Yaesu Kenwood Service Manuals Stock	10.00 ea.
Telrex TB5EM	425.00
Telrex TB6EM	540.00
Telrex Monobanders	Stock
Adel Nibbling Tool	8.95
Janel QSA5	41.95
Sprague 100MFD/450V Cap	2.00
Rohn Tower 25G, 45G Sections	20% off dealer
Alliance HD73 Rotor	109.95
Amphenol Silverplate PL259	1.00
ICOM 255A 2M Synthesized	319.00
ICOM 260A 2M SSB/FM/CW	429.00
Kenwood TS180S/DFC/SSB	Call
ICOM IC2AT/TTP/NICAD	229.00
New-Icom IC720 w/AC/mike	Call
Bearcat 220 - $299.00	300-399.00

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160 THROUGH 10, INCLUDING WARC
9 BANDS FULLY OPERATING

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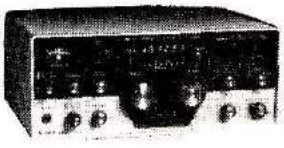

100 WATTS ALL BANDS ALL MODES

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

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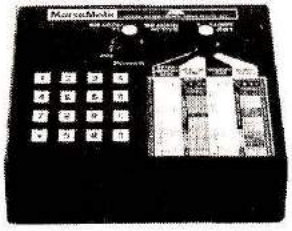
MEMORY KEYER BREAK-THROUGH!



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

199.00

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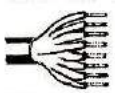
BELDEN

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

8448 24¢/ft.

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



9405 38¢/ft.

No. of Cond. — 8
AWG (in mm) —
2-15, (26×30)
6-18 (16×30), (1.17)

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More details? Ad Check page 102.


ALIF BILLINGS

The Novice Experience

JEFFREY DICK
KA4OXQ

Dear Santa,

It's been six months now since the arrival of the Novice call I waited eight ponderous weeks for after taking my exam. Time enough, I think, to share some likes, dislikes and reflections about Amateur Radio from the newcomer's point of view.

Christmas, with thoughts of cheer, the New Year arriving and a kiss good-night to the one departing, seems an appropriate time for putting thoughts in order.

Well, this Christmas, Santa, I'd like to meet a few more operators on the air like Lin Mergist, N5CAS. Lin was one of the first contacts I made on ham radio. My ticket was two days old, as I recall — the computer smudges hardly dry — and I can still remember the surge of adrenalin when someone responded with my call.

Our introduction went something like this: I was tuning around 10 meters just to see what was there when I heard N5CAS sign "73" with another station I couldn't hear. I gave a very brief call in CW, heard nothing, and repeated it. He came back with "AS," which a handy operating aid nearby told me meant "standby." Sure enough, the call soon came back. Lin told me he'd been on the phone, gave his QTH, name and signal report.

We spent the next 35 minutes or so talking about almost everything under the sun. I confessed (as if he couldn't tell) that I was two days into ham radio; he confessed he'd been into it for some time now but liked to get down on the Novice bands occasionally. He then gave me a nice compliment on my CW. It was evident Lin was quite proficient (I was later to learn he can handle 35 wpm with ease), but he popped right along, matching the speed of my sending. It was very encouraging, and I recall walking into the kitchen after we'd signed off and telling my wife how much I'd enjoyed that one particular contact — that I hoped we'd find a way to work each other again.

In less than a week Lin's QSL arrived. Along with it was a two-page letter and a photo of his station, showing Lin pounding away on CW in front of a beautiful operating desk. The desk was obviously hand-made with a lot of thought and care.

The letter was really great, encouraging me again on my CW, sharing some thoughts on Amateur Radio, and welcoming me to this fraternity of hams to which I'd been so near, but not really a part of, for so very many years. There was a bit of humor about the man, too — references to the enclosed picture as being one of Lin "teaching his key how to spell," etc.

The point of it all was that I felt I knew the guy and liked what I saw. I wrote a letter back to accompany my QSL, mentioned a sked possibility, and then asked if there might be some plans for the desk available, as I had wanted to build something similar. He returned a letter a week later with a hand-drawn plan for the desk, and some options for a schedule.

In short, we're friends, good friends; we've never met in person, but I hope to meet a lot more like him.

Also, Santa, for Christmas, maybe you could find a way to give a keyer to any new hams you know of. All of us, I suspect, recall reading about the good old days of ham radio "when we could recognize each operator by his fist," and know, for example, without hearing the station ID, that it truly must be old Joe in Pasquotank City.

Fine and dandy, particularly if old Joe had a sense of rhythm and proportion, and was as concerned with trying to be understood as he was with having his own unique fist.

Let me put it this way, Santa: today I, too, can recognize some operators by their fist without having to hear the station ID. Unfortunately, I don't know if I'd be able to decipher the ID if I heard it; their fist is unique all right, but their code just ain't what old Sam Morse had in mind when the system clicked in his thoughts. Those who "Dit-Da-a-a-a-a-a-a-a-a-a-a-h-h-h-Dit" and "D-a-a-a-a-a-a-a-a-ah-h-h-h-h-hdit" and then, to make it more distinctive, run all the letters together without separation, will remain unique. I've got better things to do with my time than try to figure out what they mean by it all.

The keyer, on the other hand, is designed to generate computer-perfect code.

It is extremely unfortunate that the prospect of using a keyer has apparently intimidated many Novices. There seems to be a misconception perpetuated by many old-timers that you need a whale of a lot of experience on a straight key before being able to use a keyer. Keyers also cost money (not as much as you might think, though, with models available of the non-programmable variety for $35 to $45).

The idea you need years of experience on a straight key in order to use a keyer is bunk.

In fact, I'd submit that the learning curve on a keyer is probably more efficient because all the operator has to do is make his strokes in proper sequence and leave space between letters and words. With the straight key, he also has to supply the proportion and rhythm. Keyers also have a control to allow you to speed up or slow down without losing the proportion of dits to dahs.

A word of caution here: using a keyer, it is very easy to fall into a trap of sending at a rate much faster than you are capable of receiving. You have to discipline yourself to send at the rate you want to get it back.

Which brings us to the next item, Santa: an extra cup of cheer and a nice little goody for the guys who are not afraid to send "QRS" over the air, please.

Be honest with yourself, guys, YLs and XYLs: haven't you, at least once since you've been licensed, sent "Pse rpt, vry bad QRM," when, in fact, it was simply a case of working a guy who was sending faster than you could translate? Asking your contact to repeat because of QRM, hoping you can pick it up the second time and fill in the blanks, saves a lot of

face compared to the admission our egos must make by sending "QRS." But, it also helps crowd the airways and keep others waiting a bit longer to work the same contact. A simple QRS tells the other ham not to keep cranking it out at 20 per, but to slow it down to 10 or 15. It will make the QSO a more enjoyable one, guaranteed. And, if the other Amateur is half a gentleman or lady, they won't mind a bit — might even respect your honesty.

On a related subject, Santa, throw a little something in the stocking for guys like Jim Martin, KS4G. I met Jim on the air the first night my ticket arrived. It was real DX; he lives just 7 miles away. He's also a guy who can go at 25 wpm or better. By his call, you also know he's not a Novice. But I met him in the Novice band that Friday night, and I still remember the textbook quality of his code, which was returned at my 8 wpm rate. He was extremely patient, and I found out later he's no stranger to the Novice bands, making it a point to work with newcomers. He also volunteered to help a friend of mine, newly licensed, who is having difficulty picking out the code he hears on the airways — a far cry from the precision and quality found on the ARRL tapes he learned from. Jim, all I can say is that QSO was one of the best confidence builders I ever experienced in my life. I really appreciate it. Since then, I've run into several Advanced and General class hams who regularly go down into the Novice bands to work CW. I think it's great. These fellows are darned good operators, usually have great CW technique, and are very encouraging to new hams. I recall working W4NWP from Riviera, Florida, and asking him why he was working in the Novice portion of 15 one night. His response: "Because that's where the action is!" 'Nuf said.

Still got the list out, Santa? See if you can find something really nice for the guys who take the trouble to design unique, entertaining, technically proficient QSL cards. We hear a lot about ham radio and its role in building international harmony, bringing the world a little closer, and finding friends you never knew existed.

We commonly refer to QSLs and awards as wallpaper, of course. Apparently, though, many of us really enjoy receiving them because it's a heck of a business. When my ticket arrived, it was followed closely by a veritable barrage of samples from many QSL-printing houses. And I've heard, firsthand, the extremes operators will go to to provide QSL information on the air.

Perhaps because I am in the public relations business and do a lot of work with graphics, I was determined to design my own QSL and make it unique. Hopefully I succeeded. If so, the ops who've received one have a new look to hang on their walls (if that's their bag). It wasn't all that expensive either.

Even nicer are the ops who have their cards printed with a picture of themselves and/or their station. You get to put a face with the QSO. I genuinely appreciate the hams who have cards reflecting items of interest about their region, state, city, county, or themselves.

When you really think about it, there really aren't many hams who wouldn't go to almost any degree of trouble to make certain their signal goes out as pure and as clean as possible. It's a reflection on their operating ability.

My point, I guess, is why not take the same trouble to do something about the signal you send out via QSL after the QSO is over? It, too, is a reflection on you.

Designing your own QSL need not be expensive or difficult. This magazine has run articles on it. All you really need is some patience, a bit of thought, possibly a few inexpensive materials, and the services of a printer. You'll be surprised to find that many small printers can print cards for you to your specifications at a cost comparable to the houses you see advertising in the radio magazines.

You can even do your own layout if you have the patience and neatness. Many artist supply stores, architectural supply houses, and book stores sell dry-transfer lettering you can rub onto your layout. It's sold under the name of Presstype, Letraset, and a couple other names. Better yet, a typesetting service or the printer you use can compose the design according to your specifications. You'll need to take a reproducible copy of whatever art, drawings, or pictures you use. You might also want to take along a QSL card you like so the printer can see how it will be used.

Santa? Still with us? Can we find something especially nice for the hams who fill their own QSL cards out properly, please? You know, the operators who remember to record that our contact was "two way, or 2 x," have learned how to calculate and show the date and time in Zulu, manage to log the frequency correctly, and, most of all, actually send that little slip of paper out as they promised.

Just a couple more items on my list, Santa. Stay with me, please. If it's okay, see if you can find a way to spread the Elmer system. Remember to do a little something extra for guys like Herb Lacey, N4UE, and Jim Bradley,

WA4AOO. Between them, Santa, they have made my entry into Amateur Radio a great experience rather than a disappointment and frustration.

Every Novice should be blessed with an old pro or two to be available when needed. Between them, these two gentlemen have done yeoman's work keeping me from reinventing the wheel.

It was Jim who helped me build my 40-meter dipole, showed me a nifty way to mount it so that the whole thing rides on a series of pulleys, instantly serviceable, and so it stays immune to the effects of the gusty winds we experience here on frequent occasions.

Jim even let me borrow an SB-102 to take on vacation to the beach when my own rig blew a pass transistor in the power supply, frying my transceiver and necessitating a trip to the factory for repairs. That's a true friend, and I'll never forget his generosity.

Herb, my other Elmer, is the kind of guy who doesn't mind (or says he doesn't) my calling him at work a couple times a week to ask about some mystery which has temporarily befuddled me. He's counsel, for example, on how to QSL DX contacts and improve chances on getting return cards; he's run frequency checks for me. He designed a nifty pair of antennas for me to play with, one of which is extremely portable. I took it to the beach along with the borrowed Heath, and it was great — worked 30 or so countries in about 10 hours of operation spread over a week. He's helped me in my effort toward WAS, is great at helping to pick through the complexities of SWRs so I can understand them, and has encouraged my writing this series through animated discussion of a wide range of wordly topics relating to ham radio and the Novice.

Herb also teaches two Novice classes a year, is a gentleman in the truest sense of the word, and takes great effort to instill into his students the value and need for courtesy in ham-radio operations. In short, he's an inspiring sort of fellow. Because of his kindness, I have become interested in helping new hams to match up with Elmers of their own. We are making an effort, in my own local radio club, to revive the system, identify local Novices or would be Novices, affiliated with the local club or not, and introduce them to experienced hams who would really like to work with them.

Santa, you might want to do a little something extra for the QRP_p ops on the Novice bands, too. They remind me of David and Goliath — perhaps Don Quixote might be more appropriate. I go out to my way to work these ops, and others should be encouraged to do the same. Why?

First, because generally, they're darned good operators with superior technique that makes up for their lack of power. I wonder if anyone has ever done a reverse WAS for QRP_p. By that, I mean where the guy on the other end in each state is operating QRP_p. Secondly, because these operators are on such low power, their signal doesn't splatter over half the band, drowning out everything else over several kHz. Finally, there's always been a soft spot in my heart for the underdog, the little guy. They've got the guts to tough it out with QRP_p, something I haven't found in myself. It's really inspiring to talk with guys like G4EFJ, working him across the Atlanic just before supper on 15, and listen in amazement at the countries he's worked QRP_p — just like our contact.

Finally, Santa, I wonder if you could find a way to help me, and a bunch of other Novices, in establishing some national calling frequencies on the Novice bands. The idea would be to look at a single frequency on each Novice band where beginners could go, for example, to "CQ South Dakota," or Maine, or Rhode Island, establish a contact and move off the frequency to continue the QSO.

The county hunters have a net serving a similar purpose on the phone bands. It would be great if Novices chasing WAS knew there might be a good chance of tracking down some rare ones by going to a known frequency to do some looking. My thought was to use a frequency near the mid-point of the appropriate bands: 28.150 on 10 meters; 21.150 on 15; 7.130 on 40 (up a bit from the midpoint to escape foreign broadcast activity); and 3.725 on 80.

What would it take to make it work? Some support from fellow Novices in using the frequencies for that purpose (maybe a letter or two to the editors of some of the radio magazines in support of the idea), a commitment to use the frequencies as a "meet" and not a "work" frequency, and the cooperation of a gentlemen's agreement from other Novices and hams not to tie the frequency up for other purposes.

Merry Christmas, Santa. It's been a great half-year. **DE KA4OXQ!**

HRH

Three Band Trap Vertical

BY
ROBERT H. JOHNS,
W3JIP

Build this DX antenna from easily available tubing and an inexpensive trap kit.

A vertical is a simple antenna that takes little space and radiates at a low angle to the horizon for good DX. Verticals have long been used by hams, especially when they could be operated on several bands. Amateur magazines have shown many home-built vertical antennas that use tuned feeders, matching networks, or loading coils to achieve multiband operation. The commercial verticals, on the other hand, use traps to resonate the antenna in several bands, and offer the simplicity of direct coax feed with no complicated matching circuits. This antenna uses one trap, tunes to three bands, and is directly fed with 50-ohm coax.

What is a trap?

A trap is a tuned circuit, a coil in parallel with a capacitor, that is placed in an antenna to separate sections of the antenna for use on different bands. In **Fig. 1**, a common trap arrangement is shown for 40 and 80 meter operation with one antenna. The coil-capacitor combination resonates at 7 MHz. This means that currents with a frequency of 7 MHz can flow back and forth like a flywheel between the coil and capacitor, but currents at that frequency flowing along the antenna cannot get through; the trap is a very high resistance to them. The 40-meter traps are therefore placed at the ends of sections **A-A**, which are long enough to make a 40-meter dipole. When 7-MHz power is fed to the antenna, the traps disconnect the middle section from the rest of the antenna, letting it radiate efficiently as a half-wave dipole. On 80 meters, however, the trap is not resonant. At 3.5 MHz, the coil's inductive reactance is less than it was at 7 MHz, and capacitor's reactance is more. They are in parallel, so that when 3.5 MHz currents flow along the antenna, most of the current takes the easier path through the coil. Thus the trap acts like a loading coil for frequencies lower than the one it is tuned for. This is an advantage at 80 meters; since the inductance of a coil makes the antenna shorter, less wire is needed end-to-end to make up a half-wave dipole.

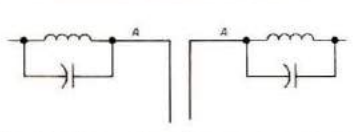

Fig. 1. The coil and capacitor circuits are traps that isolate the **A** sections of the antenna at their resonant frequency. The traps become loading coils on a lower frequency.

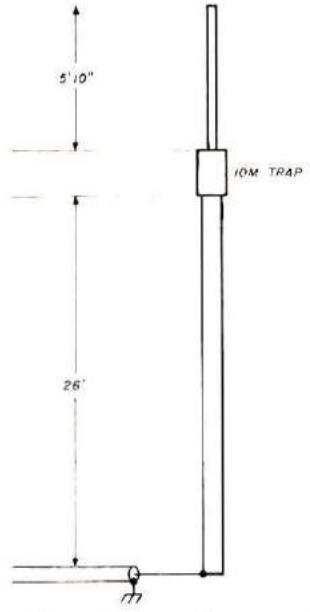

Fig. 2. The entire vertical is a quarter-wave radiator on 40 meters. The 10-meter trap separates the bottom section which is three quarter wavelength at 28 MHz. The entire vertical also works on 15, where it is three quarter waves high.

The 40, 15, and 10-meter vertical

In the vertical antenna shown in **Fig. 2**, the 10-meter trap is tuned to 28 MHz and separates the bottom section from the top on 10 meters. The 24-foot, 3-inch length of the bottom section is three quarter-waves on 10 meters, which is a useful resonant length for antennas. It has an even lower angle of radiation than

a quarter-wave vertical, plus some minor lobes of high angle radiation that are useful for short skip conditions. On the lower bands,

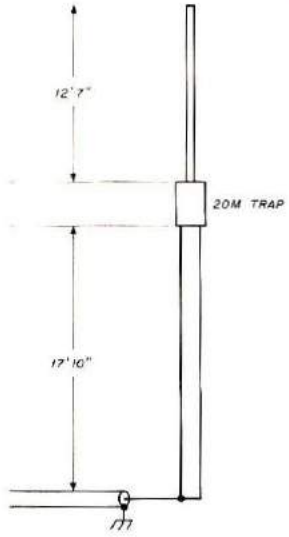

Fig. 3. The 40, 20, 10 version of the three-bands-with-one-trap antenna uses a 20-meter trap to establish a quarter-wave radiator on 20 meters. The trap loads the entire vertical which acts like a quarter wave on 40. On 10, the antenna is three quarter-waves long, with the capacitance of the trap tuning out the extra length in the upper section. This is a common multiband trap antenna, the W3DZZ, adapted to a vertical style.

the trap acts like a loading coil for the entire antenna, making it a quarter wave on 40 meters and three quarter-waves on 15 meters. The loading coil is important here, since antenna lengths do not work out to be exact multiples of one another, even though the frequencies are (like 7 and 21 MHz). A 40-meter half-wave dipole is a little short of being three half-waves on 15. The lack of end capacitance for the inner 15-meter sections requires a longer antenna. The loading-coil inductance makes the vertical electrically longer than the physical length, and this effect is greater at 21 MHz

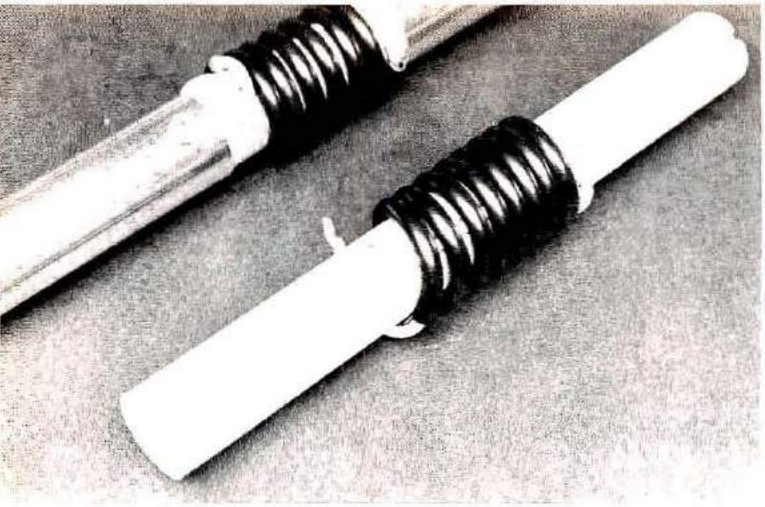

Fig. 4. The trap is wound on a wood form which fits into the one-inch-diameter aluminum tubes of the antenna, and insulates them from one another. The inner conductor of the coax is separated from the braid and laid in a slot under the coiled coax. It should be connected to the braid at the opposite end of the coil.

than it is at 7 MHz. The trap coil has been chosen so that it makes a loading coil of the right size to bring both 40 meters and 15 meters into resonance on the same length of vertical antenna.

The 40, 20, and 10-meter vertical

Another three-band vertical using only one trap is shown in **Fig. 3**. Here the 20-meter trap cuts off a quarter-wave antenna on 20, and acts as a loading coil on 40 meters. On 10 meters, the trap looks capacitive, rather than inductive as it does on lower frequencies. This stretches the antenna, making it physically longer on 10 meters than it is electrically. The entire vertical is approximately three quarter-waves at 28 MHz.

The traps

The traps are made from coaxial cable. The outer braid of the coax is the coil, and the capacitance between the braid and the inner conductor is the trap capacitor. In brief, the coax makes a low-resistance, high-*Q* coil, and the capacitance to the inner conductor is a good, high-voltage, weather-proof capacitor. The best feature is that they are very simple to make. In **Fig. 4**, a trap is shown wrapped on a hardwood dowel, as well as another completed one with the dowel joining together two lengths of one-inch aluminum tubing. The trap connections are made to the tubing by small bolts.

The way to electrically connect the inner and outer conductors of the coax is shown in **Fig. 5**. The cross-connection is important; there will be no capacitor formed if the inner conductor is simply joined to its braid at the same end, or shorted. To make a 10-meter trap, drill two holes straight

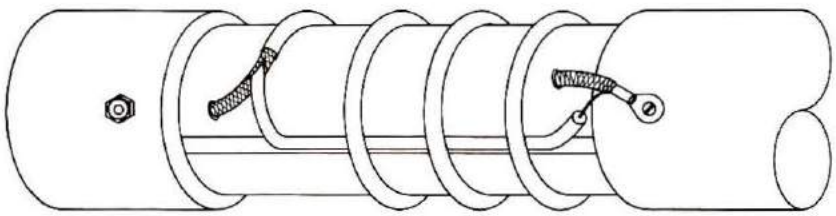

Fig. 5. The coaxial-cable trap requires a cross connection of the inner conductor to the coil made from the outer braid. This connects the distributed capacitance of the cable in parallel with the coil. The coax becomes both coil and capacitor; no other component is needed.

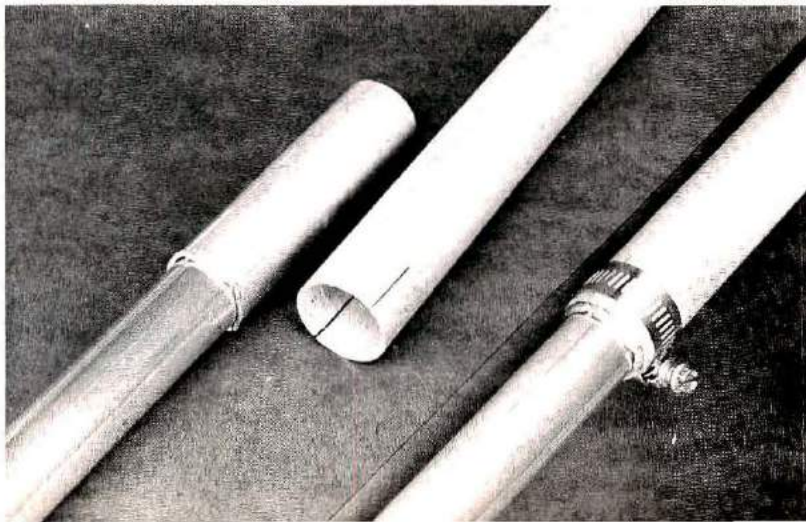

Fig. 6. To make an adjustable joint between common sizes of aluminum tubing, a shim is used. This is a piece of tubing that fills up the space between the two tubes. The shim is shown in place on a 1-inch tube, ready to slide into a 1½-inch tube. Notice that both the outside tube and the shim are slotted to make a tight fit, and that the end of the shim has been bent out to prevent it from sliding too far into the large tube.

through the 7/8 inch dowel, two inches apart, about in the center of the dowel. Carefully remove the plastic jacket from about three inches of the end of the RG-58 coaxial cable, exposing the braid. Loosen and push the braid back away from the end, open a hole in the loose braid with a round pointed tool like a Phillips-head screwdriver or a ball-point pen, and fold the cable and pull the inner conductor through the hole in the braid. After the braid is pulled tight again, you will have separated the inner and outer conductors as shown in **Figs. 4** and **5**. Make a slot in the dowel about one-eighth inch deep and wide, big enough for the inner conductor and its surrounding insulation to lie in. Pass the coax braid through one hole in the dowel and wrap 6-1/2 turns around the dowel. Keep the inner conductor in the groove in the dowel, under the coil. Remove about two inches of outer jacket and separate the braid and inner conductor as before. The braid is passed through its hole, and the inner conductor cut off about an inch from where it emerges from the braid. The holes are spaced so that the turns of the coil are not close together. This is so that the frequency of the trap can be adjusted to the middle of the band by spacing the turns together or farther apart. A dip meter, checked by listening to it with a calibrated receiver, is needed to find the trap frequency. This adjustment needs to be made before the trap is connected to the antenna tubing, but with the inner conductor connected to the braid. Short lengths of tubing will add capacitance and appear to lower the trap resonant frequency, and longer pieces will have antenna resonances that show up on a dipper. A 20-meter trap takes twelve turns of RG-58, with the holes 3 inches apart.

After the trap is tuned and the aluminum tubes are forced onto

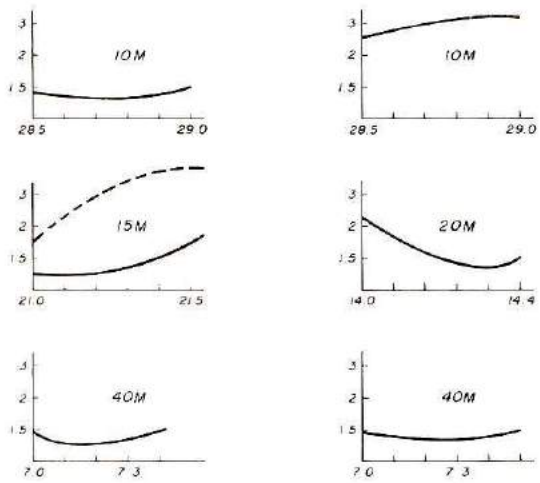

Fig. 7. SWR plots for the two verticals. The 40-15-10 meter vertical is a good match on all bands. It could be adjusted for minimum SWR in the CW portion of 10 meters by making the base section longer. The 40-20-10 meter version is a compromise on 10 meters; it is just too long. Taking several feet off the top section will bring 10 meters into resonance, but at the expense of 40-meter performance.

the dowel, drill holes for 8-32 bolts through the tube and dowel to secure them mechanically, and also provide an electrical connection between the antenna and the trap. Use a large solder lug under the bolt. The completed trap should be protected so that the bolted contact does not corrode and moisture get into the coax. Silicone rubber is good for this, or you can use a thick, sticky, roof-repairing material widely available in tubes. A thinner, brush-on coating is sold by Dow-Corning and is available only in quarts. The trap could also be covered with electrical tape. When wrapping or covering the trap, give attention to the free end of the inner conductor. There will be high voltage between this end and the rest of the conductors, and it should be insulated. One way is to drill a hole part way into the dowel and stick the inner conductor with its surrounding insulator down the hole, preferably with some silicone rubber. This is the white half-loop visible at the left end of the coil in **Fig. 4**.

Aluminum tubing

The trap was designed to fit into one-inch-diameter aluminum tubing, which is a common hardware store item, sold in 8-foot lengths. Other sizes that are readily available are 3/4 inch (hardware) and 1-1/4 inch (TV masts). The masting comes in 5-foot and 10-foot lengths, made of steel. They have a tapered end so that they fit together nicely, but care must be taken to make sure that a good electrical connection is made between sections.

One advantage that commercial verticals have that is difficult for the home builder to achieve is the easily adjustable lengths for tuning, offered by sections of tubing that telescope into one another. It is very convenient to set up an antenna and tune it for different parts of a band just by loosening a clamp and sliding an inner section in or out. However, if shims are used, adjustable joints between the common sizes, like 1-1/4 inch to 1 inch, can be made. A 1-1/8 inch diameter, 0.058 inch wall shim is shown in **Fig. 6**, and a similar adjustable joint between 1 inch and 3/4 inch tubing sections can be made with a 7/8 inch, 0.058 inch wall shim. A kit to aid the builder in making a trap and adjustable antenna sections is described at the end of the article.

Grounds

When Amateurs get together and talk antennas, a lot of strange things are said about verticals. Many hams hate them! Lack of a good ground is usually the reason. Don't put up a vertical and "hope" that it will work out with just a water faucet as ground, or a single rod driven into the ground. The ground is half the antenna! I recommend a system of tuned radials, four for each band. They can be made from practically any type of wire available. Suggested lengths of the radials are: 10 meters — 8 feet 10 inches; 15 meters — 12 feet; 20 meters — 17 feet 11 inches; 40 meters — 35 feet 6 inches. They may be buried or laid on the ground with little difference in performance. If you are serious about a vertical antenna, it is worthwhile to build up a good ground system; not just four radials, but as many as is practical. Connect the coax braid to the radials and the center conductor to the vertical that has been insulated from ground with a soda bottle or block of plastic or wood.

If the vertical is to be roof mounted, the radials can be draped across the roof and bent to follow gutters and downspouts. Heavy nylon string is strong and can be used to guy the vertical without insulators; the nylon itself is a good insulator.

Tuning

Even if the dimensions given here are used, you may find that the antenna needs tuning to make it resonate where you want it. This is because nearby objects and the ground system you have will both affect the resonant frequency. For

example, if you measure the SWR across the 15 meter band and get a result like the dotted line in **Fig. 7**, the antenna is too long. The SWR is falling toward a minimum that is lower in frequency than 21.0 MHz. The upper section of the antenna needs to be shortened, assuming that the 10-meter base section is OK. Notice that the 10-meter portion should be adjusted first, since changes here will affect all the bands. After it is tuned, go to the 15 and 40 meter bands, plot SWR, and adjust the upper section.

The bandwidth of the single-trap vertical is wider than that of many trap antennas. This is because the one trap does not load the antenna very much; notice that the overall height is only slightly less than the 33 feet of a full-sized, 40-meter quarter-wave vertical. The 40-15-10 meter antenna is the best bet, offering a good match to 50-ohm coax and very broad tuning. It has also been an excellent performer!

Amateurs are encouraged to build these new coaxial traps for their own use, but a patent applications has been filed on them and manufacturers are cautioned that all rights under the patent code will be enforced.

Kits

As an aid in building these verticals, a kit is offered by R. H. Johns Scientific Instruments, 3379 Papermill Road, Huntingdon Valley, Pennsylvania 19006. It contains a slotted rock-maple insulator and coil form, two 0.058-inch shims for making an adjustable joint between tubing sections, and RG-58A/U cable having a flexible, stranded inner conductor which is superior to solid-wire-inner-conductor cable for making traps. The kit sells for $3.75 plus $1.00 postage and handling. Pennsylvania residents add 6 per cent sales tax.

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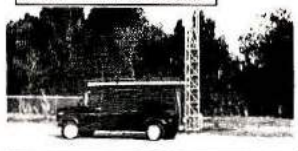

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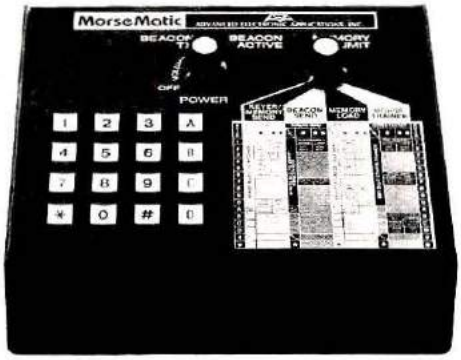

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DX Horizons

By Bill Kennamer, K5FUV

Rising above the pack

Over the years, we've heard many hams on the air talking about how they've been working on their DXCC for several years and how close they are. Many of them talk about how hard the chase is, even though they're running a kilowatt and beam. Yet, it's not equipment that will bring you DX, but time, perserverance, and operating skill.

We didn't have to go far to find a good example of all of the above. Bill Carter, N5BET, of Richardson, Texas, who celebrated his 15th birthday in August, 1980, has used a modest station to achieve a DX record which anyone could show off with pride. Bill received his General class license in May of 1979. Between that time and August of 1980, he had worked 207 countries, with 174 confirmed. Although this is the peak of the sunspot cycle, 207 countries don't just fall into one's lap, so I talked with Bill to get a description of his rig and to find out how he did it.

First, how about the antenna? Until January it was a homemade multiband dipole, 40 through 10 meters, four individual ones fed with one feedline, with the top at 30 feet. With this antenna, Bill worked about 180 countries. In January, he added an 18AVT vertical with many radials, and in July, 1980, he finally installed a beam, a TH6DXX at 48 feet. The beam caused something of a problem in that Bill says that he can now hear more than he can work, which wasn't the case with either the vertical or dipole. In the shack, Bill used a Yaesu FT101F. No amplifier, not even a VFO until July.

So, if not by equipment, then how did he work so much DX? By developing good operating skills, and by determination. He stayed up late, got up early and even stayed up all night on occasion. He found best luck from sunset to sunrise, and usually tried to be on the air when everyone else had gone to bed. We asked about lists and nets. Bill said he had worked about ten countries on various lists and nets, but largely found them a waste of time, as it was usually more difficult to get on the list than it was to work the DX, and too much time was spent waiting around to be called to work the station. Instead, Bill worked every contest he could find.

Bill's story shows that a DXer does not have to have the newest Super Pulverizer amplifier, or the Band-Opener antenna. What is needed is time, perserverance, and desire.

Qatar

Mike Smedal, A7XD, was the first foreigner licensed for Amateur Radio in Qatar. He is very active on 10, 15, and 20 meters, both SSB and RTTY, where he uses a Radio Shack TRS-80 computer with Macrotronics M-80 ham interface.

Mike says that the following stations were the only ones licensed as of July, 1980:

Station	QSL Routes
A7XA	DJ9ZB
A7XAH	DJ9ZB
A7XB	DJ9ZB
A7XD	Mike Smedal, Box 4747, Doha, Qatar
A7XE	DF4NW
A7XM	DJ9ZB

Both A7XGI and A7XZ were no-license bootleggers. Roland, A7XGI, was caught by the authorities and all of his equipment was confiscated.

Sudan

Steve Bauer, DJ1US (also N5SB, ZK2AV, A35MB, 3D2BB and 5W1BM) will be in Wad Medani until the end of the year as DJ1US/ST3. He prefers CW, but may be found sometimes on SSB. Steve works all bands and hopes to complete 5-Band DXCC during his stay. QSL via DF2RG.

Gunther, DF3NZ/ST2 is also planning to be very active during his two-year stay in Sudan. He favors SSB, usually around 2000 to 0100Z, and asks for QSLs via his home call, or through the Bureau.

Gambia

Another chief of state, the President of the Gambia, has an interest in Amateur Radio. His call is C5AA, and he began operations from the shack of Keith, C5ABK.

K5YY Pacific expedition

Dr. San Hutson, K5YY, whose DXpedition career started in the late 60s and has now spanned three decades, has decided that he won't go out again until his children are out of college. Although San has such firsts as STØ, D68, and others in Africa, this trip was intended to provide low-band contacts while being a little more relaxing than some of the African trips have been.

San operated from 5W1, Western Samoa; KH8, American Samoa; A35, Tonga; and ZK2 Niue. During the trip, he worked 11,810 total QSOs. Of that total, 3,630, or 31 per cent, were CW, with highest CW percentage being 54 per cent from A35YY. From KH8, 104 different countries were worked. 5W1 accounted for 78 countries in two nights, while A35 was good for 66 countries, and ZK2 for 102. A total of 160 countries were worked on the trip.

By band: 28 QSOs were made on 160 meters, 202 QSOs on 80 meters, and 885 on 40 meters. San's perserverance on 80 and 160 meters was outstanding, as conditions in the U.S. during the trip were very poor and he reported hearing many more stations than were able to hear him.

All in all, the trip was very successful. After eight trips and 60,000 QSOs, San will be taking a hiatus from expeditions, but he says he will return.

DX tips from the other end

After eight trips, San, K5YY, said that he has noticed several things over the years that have been recurring peeves of his on each expedition. They are:

1. CW stations breaking over the one he is working. Many times it happens before he gets the first station's call, necessitating two or three exchanges and slowing down the whole operation. He says that most U.S. stations don't know how to tail-end properly and shouldn't try.

2. Stations asking QSL information, or time and frequency on other bands. This information is given frequently, and also was published in the bulletins before the trip. Read the bulletins or ask other DXers in the area. Multiply your request by hundreds and see how it may affect others by wasting QSO time.

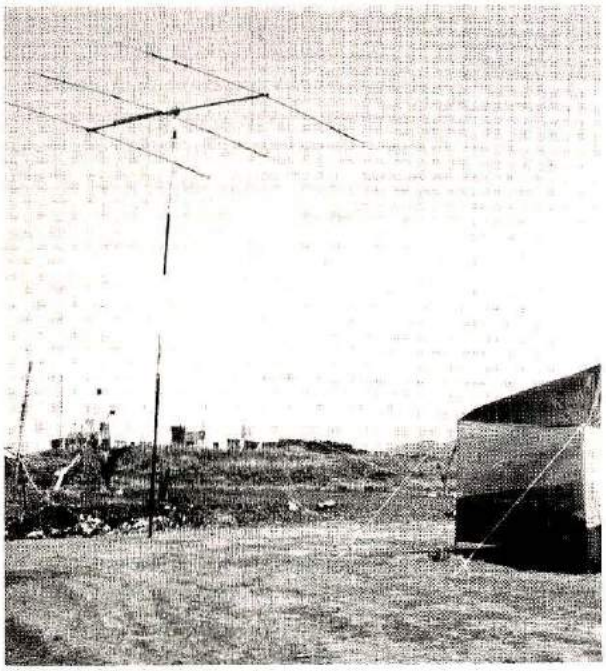
3. Asking an expedition to listen for CW during an SSB pile-up. This is ridiculous. It might be different if no one's calling, but there's a time and place for CW. Some expeditions will black list you for this.

4. Duplicate QSOs on same band, same mode is frowned upon. Many will make a quiet "No QSL" notation in the log. Beware, especially if first QSO was good.

5. Those who give a 33 report and never heard a thing. An R3 is readable, but *with difficulty*, and R2 is readable now and then. This is more nearly the truth on 160 and 80 meters, and often on 40 meters. Why give a 33 report, and then not hear after your report is given six times and even counted out? Is this not R2 or even less? Should this be a QSO? In San's mind, if one can't at least cycle with him after a couple of good attempts, it is not a QSO. He could

Rick, HC8EE, and Marcia, HC8MM, with the rest of the Dorsch family during their stay in the Galapagos Islands, November through December, 1979. Look for them to appear again (*photo courtesy of HC5EE*).

Luis Salinas, XE1OW, operating from Revilla Gigedo, 4B4MDX, during Mexico DX Club expedition of July, 1980 (*photo courtesy of XE1OW*).



The operating site at Revilla Gigedo, 4A4MDX on CW and 4B4MDX. Not shown are the places where off-duty operators can do some fishing or swimming (*photo courtesy of XE1OW*).

Bill Carter, N5BET, who amassed 207 countries in a year with his modest station. He proved once again that big guns aren't the only ones who can work DX.

hear many stations this time at 55 to 59, but that does not mean a QSO was made. Don't ask a buddy on frequency "was that a 53 or 57?" Talk to the DX station! Ask him. *Why even call if you can't copy well enough to get a report*, unless you're going to rely on others on frequency to give you the report, or keep guessing yourself until someone finally says, "Yes, that's correct now." Is that pride in a good contact?

Guys who want QSLs just because they are on frequency early in the morning, but aren't able to copy the DX station, will be sorely disappointed when more DX stations reject their QSL with 44 or 33 when the log has noted that the guy didn't come back after calling him four times. There is too much guessing and buddy-helping compared with just a few years ago. What is the solution? Strict enforcement of the NO QSL policy if there is no QSO. This should be kept in mind when working DXpeditions in the future. Remember, the QSL you don't receive could be the result of your own operating practices.

Vanuatu

New Hebrides became independent back in July, 1980, and the country name was changed to Vanuatu. During this time the special event station YJ8IND was operated by VK3OT, YJ8PS and others. QSLs for this operation go to Paul Savage, Box 39, Port Villa, Vanuatu (New Hebrides).

Club news

Officers for the North Florida DX Association for 1980 are: President, AJ2E/4, Dick Knox; Vice President, W4ZTW, Bob Gorman; Secretary/Treasurer, W4FDA, Pres Graham.

South Georgia

Many have received the following letter from the post office in the Falklands Islands. It speaks for itself:

Amateur Radio Station VP8JO

This office is receiving considerable numbers of QSL cards addressed to VP8JO variously under the names of Pat Langley, Pat Turner or simply Pat and directed to South Georgia or Stanley. Please be advised that the callsign VP8JO is not registered in any of these names nor are any individuals of these names known either in South Georgia or the Falkland Islands. This is thought to be a pirate operation and QSL cards are not being forwarded.

This office would be interested if anyone has received recent QSL cards purporting to have come from anyone operating under the callsign VP8JO.

The Post Office,
Stanley,
Falkland Islands

Just goes to show, it ain't enough to work 'em, you also have to find a real one.

QRP Can do it too

One of our readers, Joseph Unfried, W9ITV, tells us about his experiences operating DX with QRP:

"I have just worked my 103rd DX country with my Ten-Tec Argonaut 509 (5 watts PEP, 2 watts out CW). I am using a vertical or dipole arrangement (25 feet high). I started this venture on March 8, 1979. I picked up the rig and figured that for portable/camping it would be OK — you know, local U.S. contacts. Well, by June 5, 1980, I had worked 100 countries — basically on the merits of the "Argo" alone — no piggyback or Big Rig — listen for my QRP. (I packed the Big Rig away.)

"My deluxe antenna system is an 11 foot military surplus whip — mounted on a piece of conduit — wired to the chimney, with No. 14 (purple) house wire for radials held out about 45 degrees with waxed lacing cord . . . a temporary antenna three years ago . . . oh well.

"I have 51 of these countries confirmed, with my cards going out in January, 1980, (ran out in early autumn) — so I've got my fingers crossed that they all come in.

"These contacts were about 50/50 SSB/CW on 10, 15, and 20 meters. I found that at times it seemed the same as running my normal 100 watts — they say in the manual to pick on the strong stations — well I was desperate a few times — I could just barely hear the DX station — I called anyway. You know, he didn't realize that he couldn't hear me and answered anyway.

"So, since you are writing a column to help the new people learn the ropes, you can tell them that the full gallon with a 60-element beam 150 feet up is not really necessary.

"Patience *is*; I figure about 90 per cent listening and 10 per cent calling. I never call CQ, but I listen for a station to sign off with a contact and then I call him. I try pileups a little but don't waste a lot of time, since 99 per cent of the stations are running 100 times more power than I am. All it takes is one to cover you up.

"Another thing, I would like to see the DX gang stand by for QRP (20 W or less) once in a while. We are out there!

"I worked one phone contest (22 contacts) using HT-220 batteries (2). I left the pilot lamps off

to conserve the battery. The three pilot lamps require more power than the radio.

"I have found that however bad you hate CW, that is where most of the DX is. So you will usually find me around 28.0-28.2, 21.025-21.2, 14.025-14.1. Now I think I'll try 40-meter DXing. Either that or I guess I could go one-half power.

"I have found that people are amazed to hear that I'm running 2 watts or 5 watts PEP, especially the DX. They figure that Americans all use gallons. No sport to it. I usually get such reports as 559 or a good one is 579 — or 3x2, 3x1, 5x1 on phone — I got a 5x9 once from 8P6 land.

"So, I've run out of suggestions, or whatever. Just let the would-be DX hunters know that with desire and patience you can talk all over this world. It gets in your blood. Do you know anyone who wants a nice 150 watt rig? It's dusty, but it works — used only on weekends."

This shows, once again, that anyone can work DX who wants to work DX.

Next month, look for some tips on DXing on 80 and 40 meters. In the meantime, if you have any news for us, please write to DX Editor, *Ham Radio Horizons*, Greenville, New Hampshire 03048.

QSL route

Station	QSL Via
AH2G	KG6JAR
AHØA	K4AVU
A4XIU	G4GIR
A9XBS	G4GOH
CE1BLL	WB4LFM
CR9B	WA3HUP
CT2DE	WB3IFD
C31IR	F6AUS
C31LY	DJ9ZB
C31MK	EA3WZ
C31MS	EA3MS
C31UN	EA3AOC
C5ACO	W2TK
C5ACC	KB4GQ
C6AFR	Box F996, Freeport, Bahamas
EA9GT	WA2JOC
EL6A	K4SE
ET3PG	Op. Tensay only, DJ9ZB
FØCH/FC	HB9TL
FB8XY	F6CIU
FGØFOO/FS	N6RA
FGØFVB	WA7IRD
FM7BW	WB4IWW
FMØFJE	F5VU
FPØFON	W1IHN
FY7BC	F9LM
G5DKH	KB6AA
GD4JUU	VE3BXY
GU5AEG	DJ9NX
HC7EE	K8LJG
HM1JJ	JA3JJ
HP1XAT	WB3KGY
HS1AMM	JE3GCO
HT5JAR	WAØTKJ
H44SH	AD1S
JD1YAA	JF1ZTF
JT1AN	Innok W. Arsen, Box 540, Ulan Bator
JW1UW	LA1UW
J28AZ	I8JN
J3AH	W4GYP
J73CB	J7DAO
KA4EIN/TI4	N5ANA
KG4WC	K4EXA
OA8AV	Tim Chase, Casilla 206, Pucalla, Peru
OD5FB	WA2QAU
OD5HQ	DJ9ZB
OHØAM	OH2BH
P29JA	WA7OPZ
RK5O	UK5UDX
SVØAO	KA2FRP
TA2TAT	Talat Turgay, Box 133, Ankara, Turkey
TG9XHB	John, American Embassy, Guatemala City, APO Miami, Fl. 34024
TU4AT	HB9BTQ
TU4AW	K5TC
T2AAA	Weather Station, Funafati, Tuvalu
U1N	UK1NAA
UAØFDA	WAØTKJ
VP1TC	K5TC
VP2MFU	KB7KQ, Karl Jensen, Box 275, Redmond, Wa. 98052
VP8KF	G3VPW
W1DDV/C6A	N7YL
WB4LRB/8R1	N4BPP
WAØTPD/OA8	N4CQ
YB1ADU	DK4XJ
YB9ADA	W5SVN
YBØADT	From 1 July, 1980, VE7CBK
YBØWR	WAØTKJ
YJ8IND	Paul Savage, Box 39, Port Villa, Vanuatu (New Hebrides)
YJ8KM	VK3OT
YJ8OT	VK3OT
YJ8PD	VK3OT
YJ8PS	Paul Savage, Box 39, Port Villa, Vanuatu (New Hebrides)
ZD8MH	G4DDH
ZK1BD	ZL1SZ
ZK1CF	ZL2AQF with Green Stamp
ZL3MA/C	WB8WMS
ZS3HL	WA1ZXF
3D2SG	9V1UH
5NØRMJ	W4FRU
5T5DX	W2TK
5U7AF	Box 877, Niamey
6OØDX	I2YAE
8Q7AV	Noel Lokuge, H. Four Winds, Majeedi Road, Male Republic of Maldives
8R1RBF	Box 684, Georgetown, Guyana
9G1RF	WA2MRZ
9M2PV	Elizabeth Saoud, Box 1835, Kumasi, Ghana
9G1RF	WA1ZFS
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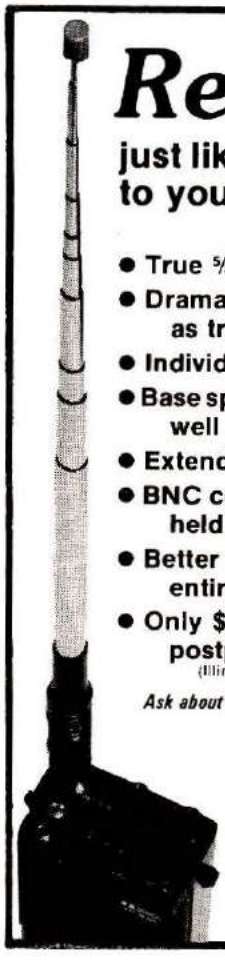

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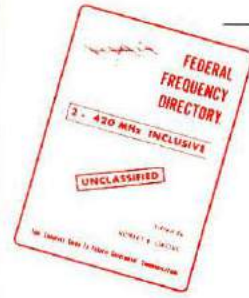

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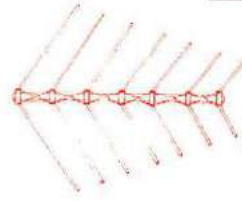

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With Hammer, Hacksaw, and Hand Drill

GLENN JACOBS, WB7CMZ

You've seen the advertisement: **Parts Bonanza**! Surplus tuning unit. Many valuable parts. Originally cost the gov't. $XXX.xx. Limited quantity. $X.xx.[1] So I sent for *two*. I *like* taking things apart. There is always the hope that I can use the pieces. Some people go fishing to get away from the frustrations and tensions of modern life. Not me: I take a pair of needle-nose pliers and a hot soldering iron and carefully peel out the working parts from some non-working device. It sure beats peeling my soul in a psychiatrist's office. Cheaper, too.

When the little brown truck[2] finally delivered my tuning units,[3] I was not disappointed. They were in "depot pack," in perfect condition, and painted a beautiful crackle-black. Each had an outer, removable steel cabinet and an unpainted aluminum inner cabinet with the parts bolted on. The panel was bolted to the inner cabinet. When I removed the pierced aluminum covers (top and bottom) from the inside box, I saw that it was indeed a parts bonanza. It was just full of heavy-duty, high-voltage, transmitting-type, plated brass, variable capacitors.

As it turned out, I never found an opportunity to use even one of those fine, high-quality "bread-slicers," but I used almost everything else. First, the nice black dustcovers are at the back of my operating desk with little hammy things in them and bigger necessaries on top. The big thumbwheel has become the main tuning knob on my station receiver. The heavy-duty, porcelain-core, radio-frequency chokes went into another receiver to choke radio-frequency gremlins who tried to sneak up the power cord. Somebody offered to buy half of one front panel for the fine, five-to-one vernier irremovably installed thereon. I used the other half as a front panel for a home-brew 40-meter CW receiver. It has a fifty-to-one worm-gear re-

duction drive to tune my local oscillator! It has considerable sheet aluminum from the surplus black box. Then I used the same part of the other panel on a matching transmitter (one of these days I'll even make that peanut whistle work!).

For a grand finale, I used all the left over sheet aluminum to build the cabinet for a Transmatch (see photo). Yes, I realize that the unit would have made a fine transmatch almost "as-is," but I didn't do it that way.

Oh? You don't want to build a Transmatch? Nor a transmitter? You really wanted to build a combination grid-dip meter and scissor sharpener? Or just a back cover for your VTVM? Read on.

Here's how: first, get a nice looking piece of government surplus junk. Next, make a picture in your head of all that beautiful painted boiler-plate made over into a rugged exterior for your intended project. Then, just *do it*.

The purpose of this writing is to give you detailed instructions for *doing it*, (after you have decided just what "it" is).

Taking it apart

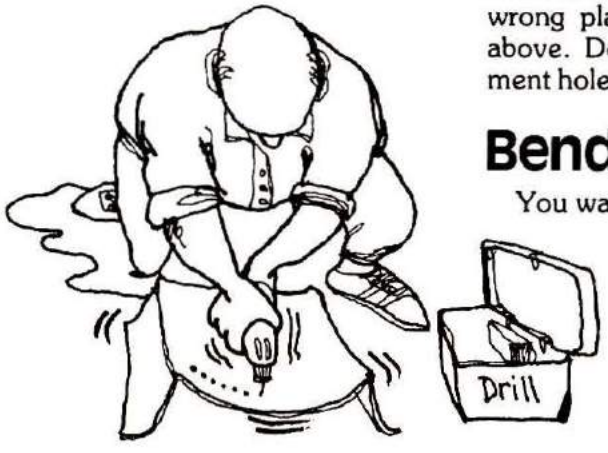
You already know all about leaving long leads on the components you want to re-use. Salvaging the sheet-metal takes some care too. If you will deliberately use a screwdriver that exactly fits in the screw slot, the finish on the screw head will look good and you will avoid those long, ugly scratches on the panel. The same goes for using nut-drivers on the nuts and bolts instead of that old ninety-five-cent pair of pliers. Preserve the paint: that government paint job is probably what enticed you to buy that boat-anchor in the first place.

Cutting it apart

Rule one: you can always cut it shorter, but you cannot cut it longer. So be sure before you cut. There are two ways to preserve the paint while you butcher a panel or cabinet or chassis with a hacksaw. (Actually there are probably more than two. I only know of two.) You can lay on masking tape where you intend to cut. Measure and mark right on the tape, and saw right through it just a hair outside the mark. Finish by filing off the burrs and toolmarks. Peel off the tape and file a slight bevel, a very slight one, along the edge where the paint meets the cut. Now, go have a cracker dipped in chili sauce and meditate on the beauty of your panel. You say it ain't square? You should have checked that before you cut it.

Drilling it

If you want a hole, just drill one. But let me bring up old times. Once I saw an ad, "Build your own radio." The picture showed a young man with a mustache and a hand-drill going after a steel chassis about four feet square. He was doing it right: his tape and square and awl and center punch were in sight, and the fine lines he had scratched to measure from were plainly visible. You could assume he had even punched a little dent where his lines crossed. And he was drilling straight down. You can bet *his* holes turned up the right distance apart! Now, there are three things (that I know of) that can be wrong with a hole: 1. It can be too little (enlarge it with a rat-tail file). 2. It can be just a little too far from the other one,



and the holes in the framistan don't quite match (make it watermelon-shaped with a rat-tail file). 3. It can be altogether in the wrong place (drill a hole in the right place. Fill up your mistake with a nice bolt. Maybe you can even find one painted to match the panel. Or, you could install a ground-lug there). Now that I think about it, you have four ways to blow it. You could drill it too big. Way too big. So big that your biggest bolt-head wouldn't cover it. (That never came up before and I don't know what to do about it.) By the way, after you drill, trim off the burrs around the hole with a dull knife. Of course they don't show after you put the bolts in, yet *you* will always know, and be proud you did it right.

You can drill out rivets, too. Of course, this leaves a hole in the wrong place. Proceed as in "3" above. Do the same for government holes in the wrong place.

Bending it

You want this thing to look pro-

fessional. Measure and mark where you want to bend it. Remember that the metal has a certain thickness, so neither the inside of the bend nor the outside of the bend will be just where your mark is. The molecules of metal inside of the bend will be squashed towards one another. Since they cannot actually get any closer, they slide past their brothers in a curious manner. Outside the bend, there is a stretching effect. Most paint won't stretch, so don't expect much. But you decided to bend it. For best results, take it to a sheet-metal shop. Oh? You want to bend it yourself? Okay, but don't say I didn't warn you. This is the voice of experience: I bent my own. It looks awful. The first time, I pinched it between a door and the frame and pushed hard. The next time, I bent it over a sharp-edged board with a block of wood. I didn't have a vice then, but I might have done at least a mediocre job of it if I had padded the vice jaws with masonite strips, put a block of wood against the tin, and pursuaded it with a heavy hammer. Naw! Never happen! If the vice were not as long as the bend, the ends of the bend would be round and the middle square.

The only half-way decent bend I ever made looked good only on the outside. I cut half-way through the aluminum (the hard way: half-way through the *thickness*) and bent on the sawed "line." The inside, of course, was all scratched up from missing the line with the hacksaw. Like I said, measure and mark it and take it to the man who bends the stuff for a living; he has a machine.

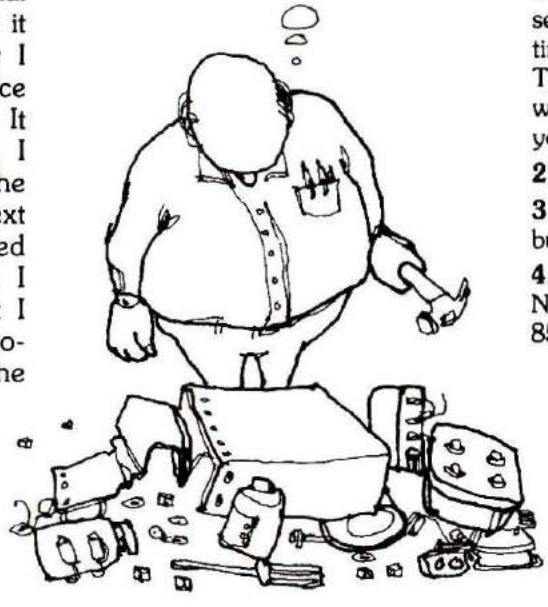
Painting it

I've heard it can be done but cannot swear to it. If anyone tells you how, try it on a scrap first and let me know how it comes out.

Labeling it

A certain organization which shall not be named usually says to use "Dymo Labels." They're all right. Roughen the spot where they are supposed to stick, and round the corners of the labels: they'll stay on better.

Oh, you want your gadget to look professional? Buy rub-on lettering.[4] Instructions come with them, and they really make a factory-like job.



Putting it together

Bolt it, of course. That's why you drilled most of those carefully measured holes. That's why you were so careful not to mess up the slots (and paint) on all those machine-screw heads. Think. Nobody is going to notice a bolt-head that doesn't match. Nobody but you, that is.

Making it work

If you went to all this trouble just to build a case for it, surely you have the drive and grit to clean up a mere circuit. (I could write more here if I had already made my beautiful little transmitter work.)

And another thing

Way back at the start of this article, I said to make a picture in your head. It helps a lot more if you make the picture on paper, in detail, to scale. As they taught me in the Army, "Prior Planning Prevents Poor Performance."

Footnotes:

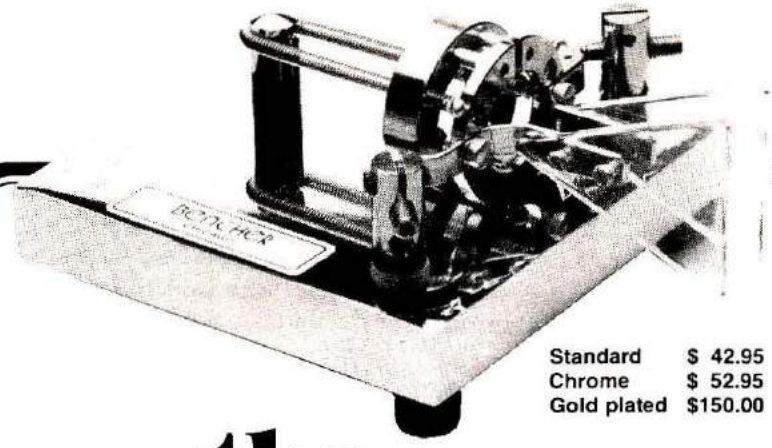
1. Fair Radio Sales has 'em. You can see them at hamfests, too — sometimes, but that's beside the point. The point is, you can make what you want out of whatever boat-anchor you can get.

2. U.P.S., of course.

3. These were "T.U.-8" Tuning Units, but see footnote one.

4. Circuit Specialist has these. 1344 N. Scottsdale, Tempe, Arizona 85281.

HRH



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Ham Radio Techniques

BY BILL ORR, W6SAI

Last month, I presented an overview of the cubical-quad antenna. This month, it is time to look at the popular Yagi antenna and draw a comparison between these two configurations.

The Yagi beam antenna is much the older of the two designs, first surfacing about 1926. It is named after Dr. H. Yagi of Tokyo University who publicized the design after original investigations conducted by him and Dr. Uda. Early adaptions of the Yagi data to ham radio occurred about 1933-34, but it was not until Walter Roberts, W3CHO, presented actual construction information for a two-element close-spaced Yagi that the antenna achieved any degree of popularity.[1]

Finally, in 1938, the first three-element, high-frequency Amateur Yagi beams were built and the information published.[2] Most of the development occurred in California as that was the only place in the country where inexpensive aluminum tubing could be purchased — as discarded material from the expanding aircraft industry.

The spectacular results obtained with the three-element Yagi antenna established it as a favorite before the Radio Amateurs were closed down by the outbreak of World War II.

As far as is known, the first three-element beam for high-frequency operation was installed in the summer of 1938 by Peter Gioga, W6APU. A photo of this antenna (later installed at W6PKK) is shown in **Fig. 1**. From this humble beginning grew the Yagi of today!

Operation of the Yagi beam

Unlike the famous cubical-quad antenna, the operation of the Yagi has been throughly researched and its attributes are well known. Basic theory of the antenna was outlined in a paper by George H. Brown in the Institute of Radio Engineer's *Proceedings*, for January, 1937. All Yagi antenna designs have evolved from this classic article.

A simplified representation of the operation of the Yagi antenna is shown in **Figs. 2** and **3**. When a radio wave meets a conductor, the free electrons will move in a direction that bears a distinct relationship to the wave. When the polarization of wave and conductor are the same, electrons will move along the wire. In other words, a current flows in the conductor.

This action takes place regardless of the length of the conductor. If we imagine the radio wave to be a short pulse, and we look at the conductor just after the pulse has passed by we will find that the induced current is still flowing and a portion of the radio energy is *reradiated back into space*. The rest of the energy is lost in the ohmic resistance of the conductor.

If a load is connected to the antenna which is energized by the passing radio wave, a certain amount of energy is extracted from the antenna and dissipated as heat in the load. Maximum power is extracted when the antenna is resonant.

The parasitic element

A resonant conductor will reradiate most of the radio energy it intercepts if it is not connected to a load. Such a conductor is called a *parasitic element*. **Figure 3** shows a parasitic element placed near a dipole, the latter being terminated by a load. In this case, the parasitic is placed between the dipole and the signal source and is termed a *director*. The signal is first intercepted by the parasitic element, which extracts energy from the radio wave and reradiates it. The dipole is now exposed to the original signal plus the reradiated wave from the director, which reaches the dipole a fraction of a radio cy-

cle later. If the reradiated wave from the parasitic reaches the dipole at the proper instant, it will reinforce the wave received directly by the dipole.

The phase-timing of the reradiated wave from the parasitic is determined by the physical spacing between the elements and by the tuning (length) of the parasitic. The proper combination of spacing and parasitic length can provide appreciable power gain, and, at the same time, attenuate signals received from the rear of the antenna array.

A parasitic element placed "behind" the dipole, when properly adjusted, provides much the same results as the director element, but is now termed a *reflector*.

The popular three-element Yagi beam is composed of a single director, a dipole element, and a single reflector (**Fig. 4**). The elements, plus the supporting structure, are made of metal and no insulators are required between the boom and the elements in most cases. This leads to a rugged and relatively inexpensive beam-antenna assembly.

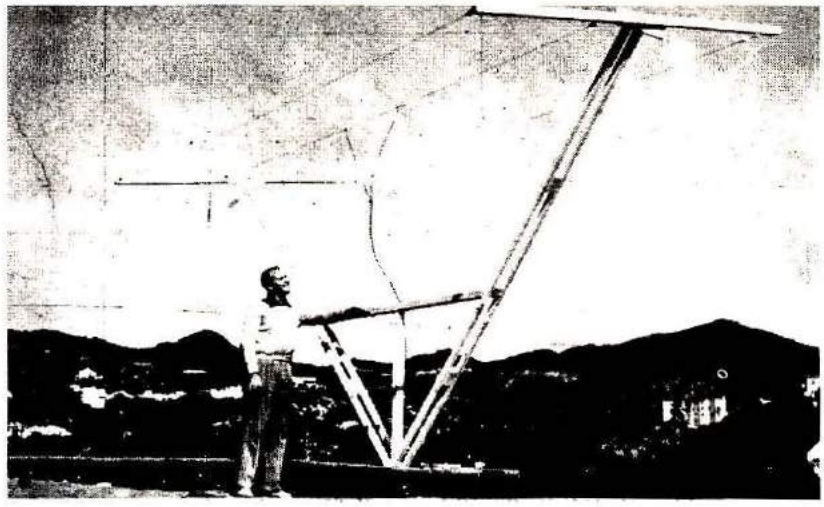


Fig. 1. The original wire-and-insulator three-element beam installation at W6PKK. The OM himself bracing the supporting structure.

Yagi beam characteristics

There are many variables to consider when designing a three-element Yagi beam: element spacing, length of all elements, and element diameter. Each of these factors exerts influence upon the final design and all factors are interlocking.

Early designs were maximized by adjusting the antenna for maximum gain or best front-to-back ratio on a laboratory antenna range. Sometimes, however, the results achieved were not reproducible. Over the years, by common consent, the dimensions of the Yagi have been more or less standardized and have not proven to be critical provided care was taken with the mechanical assembly.

It is only within the last year that the optimization of the Yagi beam was undertaken by a computer analysis program done by Jim Lawson, W2PV.[3] The program showed that many of the most popular designed were "in the ball-park" and that the program user could optimize his design for the best possible characteristics.

The parameters examined by W2PV were gain and front-to-back ratio. An application of this data to a very popular beam design (0.25 wavelength boom) is summarized in **Figs. 5** and **6**. A representative case for 20 meters is shown. A design frequency of 14.150 MHz is chosen. **Figure 6** shows that the power gain of the Yagi varies from 7.3 dB to slightly over 8.0 dB across the band. The passband of the beam resembles a double-tuned circuit, with beam gain dropping to zero near the self-resonant frequencies of the parasitic elements. In this case,

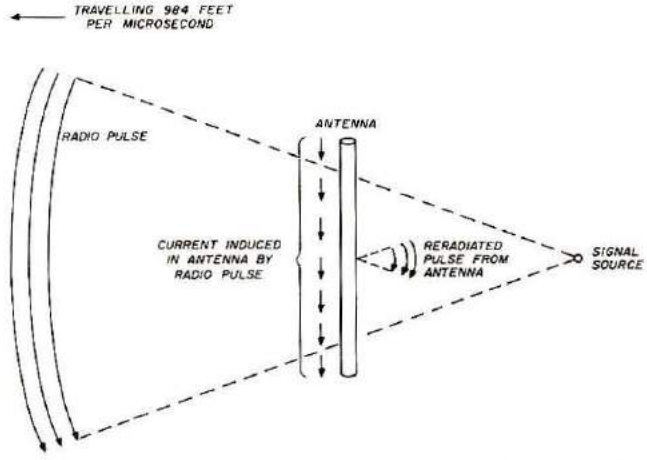


Fig. 2. This shows a dipole antenna intercepting a burst (pulse) of radio energy that originates at the source at right. The wave travels toward the dipole and, as it passes, induces a current which flows in the dipole. If the dipole is broken at the center, the energy may be extracted from the dipole. Maximum antenna current flows when the antenna bears a certain relationship to the size of the radio wave. A portion of the radio energy is reradiated back into space by the dipole.

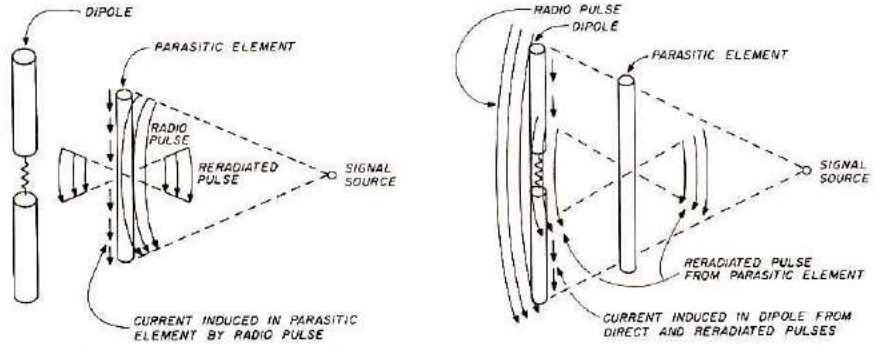


Fig. 3. A parasitic element reradiates most of intercepted radio pulse (left). A dipole placed near the parasite receives energy directly from the radio pulse and also from reradiated energy from the parasitic element (B). Proper adjustment of the parasite insures that reradiated energy reaches the dipole in phase with the direct radio pulse. Energy is extracted from the dipole by the terminating load at center. These examples assume both the antenna and parasite are intercepting the radio wave. A similar case may be built by assuming the radio energy is radiated from the dipole.

the parasitic elements are detuned about three per cent from the design frequency of the dipole element. The gain passband is somewhat lopsided, providing slightly more gain on the high-frequency side of the design frequency as compared to that achieved on the low side.

Gain response similar to this computed curve has been noted on model antennas tested on antenna ranges, so the data shown can be considered representative for the average, properly adjusted three-element Yagi.

The computer-produced front-to-back plot is shown in **Fig. 6**. The maximum ratio is about 23 dB, dropping sharply at both ends of the band. This is repesentative of all designs for the three-element Yagi antenna; the front-to-back ratio curves being very sharp and the ratio deteriorating when boom length is changed in either direction from an overall length of about 0.25 wavelength.

In summary, then, a representative three-element Yagi beam provides about 7.5 dB gain and a front-to-back ratio ranging from 15 to 23 dB, depending upon the exact frequency of operation. Operational bandwidth for a power gain in excess of 7 dB is about ± 2 per cent of the design frequency. A little work with a calculator shows that an acceptable design frequency for the Yagi is 14.15 MHz for the 20-meter band, 21.20 MHz for the 15-meter band, and 28.6 MHz for the lower portion of the 10-meter band (28.0 to 29.2 MHz). A suitable design frequency for the top portion of the 10-meter band would be 29.1 MHz.

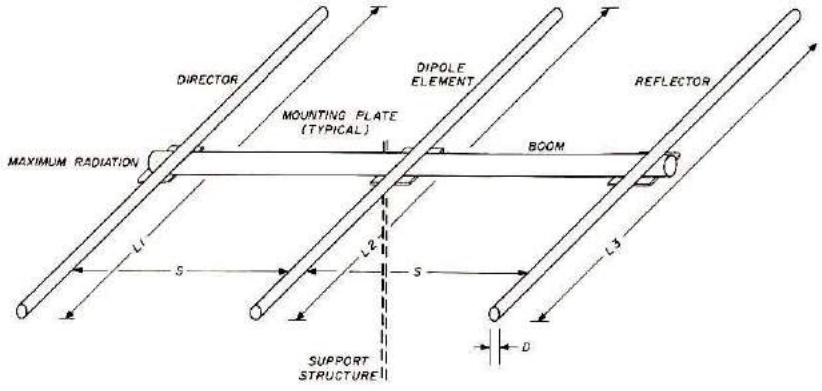


Fig. 4. Oblique view of typical three-element Yagi beam. The elements are in the horizontal plane. Director is slightly shorter than the dipole element and the reflector is slightly longer. Metal elements are held to boom by means of mounting hardware. The Yagi is supported near its center of gravity. The dipole element may be broken at the center and insulated from the boom for certain types of feed systems. The Gamma matching system described in this article does not require that dipole be broken, and thus it may be mounted directly to the boom, as is the case with the parasitic elements. See **Table 1** for dimensions.

Yagi beam dimensions

Once the general parameters have been worked out it is possible to provide antenna dimensions that are quite accurate. Some assumptions must be made, the most important of which is that the elements have a minimum taper (**Fig. 7**). Elements that have a taper ratio greater than 1.5 from center to tip must be lengthened over the computed dimensions. Typical element lengths for 10, 15, and 20 meter Yagis with and without element taper are given in **Table 1**.

Beam dimensions are not critical. Antenna resonance is established by the length of the driven element, and slight adjustments may be made (equally to both tips) to bring the resonant frequency to the desired point within a particular band. Variations in

Table 1. Yagi dimensions for taper ratios of 1.5 to 1.0 or less.

Band	Director L1	Dipole L2	Reflector L3	Spacing S
20	31'1"	33'2"	35'8"	8'7"
15	21'5"	22'2"	23'10"	5'9"
10 (LO)	15'10"	16'5"	17'7"	4'3"
10 (HI)	15'5"	16'0"	17'3"	4'1"

element length for the parasitics of up to two or three inches on 10 meters are unimportant. (This works out to a variation of four to six inches on 20 meters.)

Once you have designed your beam, the last step is to devise a feed system for it that will provide a good match to your transmission line. In the United States, the popular 50-ohm coaxial lines are almost universally used. Overseas, 75-ohm transmission is more readily available.

Feeding the Yagi beam

A perusal of handbooks and technical magazines shows there are many ways of coupling the beam to the transmission line. Because of cost and mechanical problems, most of them are unsuitable for the home constructor. One of the best, in terms of ease of adjustment, is the so-called *gamma match* (**Fig. 8**). One nice thing about this matching system is that the driven element doesn't have to be split at the middle to make connection with the transmission line. Furthermore, the gamma match is easy to build and adjust.

In this matching system, the coaxial transmission line is tapped on the driven element at a point which provides a good match. A series-connected capacitor is used to tune the matching device to the operating frequency. The match is achieved by changing the length of the gamma rod and the capacitance while monitoring the adjustments with an SWR meter in the transmission line.

A few watts of power are fed to the antenna via the match, and the capacitance and rod length are varied a bit at a time until the SWR drops to near 1-to-1 at the design frequency. Information for design

of the matching system is given in the illustration.

The Yagi versus the quad

One of the first questions that comes to the mind of a ham contemplating a beam antenna is the relative difference in performance between a Yagi and a quad. Is there a worthwhile difference?

A direct comparison between the two antenna types is difficult to make and the results of on-the-air tests are often confusing and inaccurate. Accurate antenna tests are difficult to conduct, and some enthusiasts seem to get results that substantiate their beliefs.

It's my opinion that the quad does exhibit a power advantage over an equivalent Yagi, element for element, of between 1 and 2 dB. Some other experimenters doubt this. I've seen reliable information leading to this conclusion . . . but I've also been presented with information showing that this deduction is optimistic.

If the advantage exists, is the additional signal gain of the quad over the Yagi worth the effort of building the quad, which some frustrated builders classify as a mechanical monster? After all, a quad is a three dimensional object. The Yagi, on the other hand, is a two dimensional object. Addition of the third dimension (height) to an antenna-building project immensely increases assembly and erection problems, and also inceases the wind resistance of the array. A quad tends to be bulky, unruly, and fragile, whereas the Yagi is simple to assemble and can be made very rugged. It is easy to move about on the ground and atop the tower.

However, if the builder has no access to aluminum tubing, and is limited to local materials, the quad can be the only game in town. A lot of ham operators in out-of-the-way spots use quads because they can be built up of wire and bamboo poles.

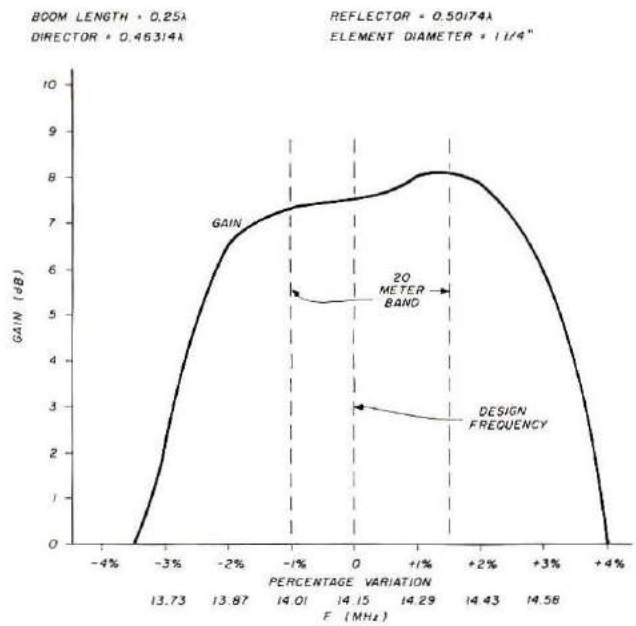


Fig. 5. Gain-versus-frequency plot for a three-element, 20-meter Yagi array. The design frequency is 14.15 MHz. The gain curve peaks on the high frequency side of the passband, and is between 7.3 dB and 8.0 dB across the band. Gain drops off abruptly as resonant frequencies of parasitic elements are approached (curve based upon W2PV data).

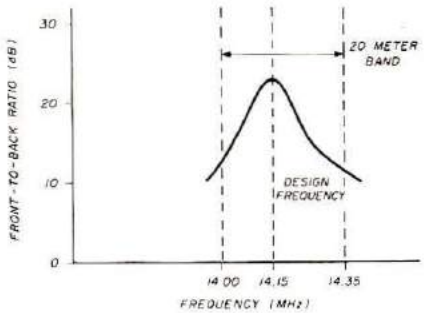


Fig. 6. Representative front-to-back ratio for three element, 20-meter Yagi beam antenna. Ratio peaks at design frequency and drops sharply at both ends of the band. In real life, the front-to-back ratio may be obscured by signal reflection from nearby objects (curve based upon W2PV data).

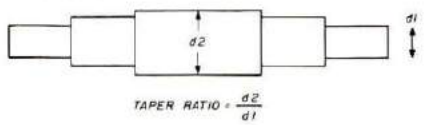
A two-element quad is relatively simple to build, and can provide a signal gain roughly equivalent to a three-element Yagi. That's hard to beat in a simple array that can be made up out of odds and ends.

Nevertheless, the Yagi is the accepted beam antenna for many services, and the quad has "caught on" only among radio hams and CBers.

If I were starting from scratch and could get a Yagi antenna kit, or sufficient aluminum tubing, I'd put up a Yagi as opposed to a quad.

On the other hand, if I were in Outer Baldovia and couldn't get aluminum, I'd quickly put up a quad. In the long run, the quad and the Yagi are roughly equiva-

Fig. 7. Element taper. Most data for Yagi antennas assumes that elements have no taper ($d_1 = d_2$). Real-life antennas made of telescoping aluminum tubing have taper ratios as high as 4 to 1. **Table 1** provides Yagi dimensions for a taper ratio as high as 1.5 to 1. For a 2-to-1 taper, add 3 per cent to all element lengths. For a 3-to-1 taper, add 5 per cent to element lengths.



lent, providing you allow the Yagi one more element than the quad.

That is to say that a 2-element quad is equivalent in performance to a 3-element Yagi, a 3-element quad is equivalent to a 4-element Yagi, and so on. In any case, either antenna type will pay big dividends and is an immense improvement over a simple dipole or ground-plane antenna.

For 50 Ohm Line

Band	$C_{(pF)}$	L (in.)	S (in.)	d (in.)
20	120	40-48	6	1/2
15	70	30-36	5	3/8
10	45	20-24	4	1/4

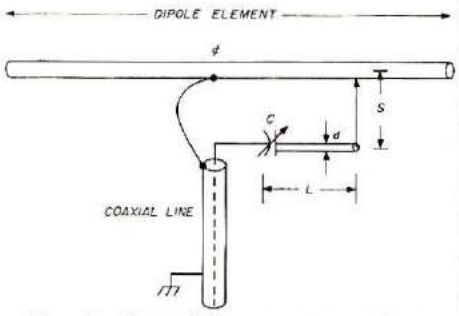


Fig. 8. Coaxial line is connected to Yagi beam by means of Gamma matching system attached to dipole element. Important dimensions are shown in the chart. Capacitor C should be transmitting type and well protected against the weather. Diameter of Gamma rod is small compared to diameter of dipole. The far end of the rod is shorted to the dipole by means of a moveable clamp.

More information

More information on these popular antennas exists than can be compressed into one or two columns. If you want to carry the subject further, I recommend the *Beam Antenna Handbook* and *All About Cubical Quad Antennas*, both of which can be purchased from the Ham Radio Bookstore. They are excellent; I should know — I wrote them.

References

1. Walter Roberts, "The Compact Uni-directional Array," *Radio*, January, 1938.
2. Gioga and Dawley, "The Three-Element Rotary," *Radio*, November, 1938.
3. James Lawson, W2PV, "Yagi Antenna Design," *ham radio*, May, 1980.

HRH

DXer's Diary

BY BOB LOCHER, W9KNI

Getting up at 7:15 in the morning shouldn't seem difficult for someone who normally gets up at 6 AM. But somehow, Saturdays are different. Having turned the alarm off, I lie in the bed for a moment, considering my alternatives.

The cold bedroom, the warm bed, Saturday morning — the temptation to stay is strong. But the alternatives are real too —hot, fresh coffee, bright sunshine and the long path on twenty meters. It's enough. A part of me groans and cries for my lost sleep, while the rest starts looking forward to a new day.

In a matter of minutes I am sitting at the rig, wrapped in my heavy bathrobe, shod in knitted slipper-socks, and capped by my headphones, with a steaming mug of coffee parked adjacent to the gleaming Bencher paddle. As the receiver comes to life I spin the dial a moment and hear lots of signals. Good, the band is open, I can start drinking my coffee now. Last Saturday I got up early, but a disturbance had suddenly popped up and wiped the band dead. I went back to bed, but too late — I was already too much awake to go back to sleep.

Today, I am more careful to avoid being irretrievably wakened till I'm sure that the band is open. But it is, so I begin serious work on my coffee as I start tuning.

I ease the antenna into the Southwest — short path bearing for New Zealand, and close enough, too, for Australia or any South Pacific stations burning the midnight oil. It's a long-path bearing for the Middle East and Eastern Europe, and close enough for Africans and even for India, Ceylon, and Pakistan. I have no special target today, but you never know. That's part of the fun — you never know what's on the next kilohertz.

I put the receiver on the bottom edge of the band, and begin working my way up. The first signal I hear is loud — obviously stateside in origin, but he's signing clear. Who is he in QSO with? Okay, it's YO3AC. Let's see how loud he is — a W2 is working him. Now he turns it over. Wow, what a signal! S9 plus, and every bit as strong as the W2. I listen carefully to see if there's any sign of short-path echo on his signal, but I cannot detect any. The YO3's signal is remarkably clean and almost free of the usual long path characteristics — the trace of flutter, the auroral buzz, the tiny traces of Doppler shift. It's just a clean, loud signal. The band must really be hot this morning. Oh boy!

I do not stay. While a YO that strong on long path is certainly unusual, the fact remains that a YO3 is relatively common (in my log). Another factor not to be forgotten is that long path openings are definitely finite in nature — a really good one at the right time of year might go for three or even three and a half hours, but that tends to be rare. Also, even though the long path is open, signal peaks to any one area change rather rapidly. All of which makes tuning a good long path opening some of the most exciting moments of DX. I keep tuning.

I come across a mini-pileup, six or seven stations calling someone. Let's see what this is all about. Yeah, there's someone coming back. Oh, okay, it's OE5REB/YK. Syria! That's a pretty rare one — I'm all set with a YK1AA QSL in hand, but at least a few club members must need it.

I pick up the 2-meter transceiver mike, "Good morning! OE5REB portable YK, Syria, fourteen oh one two, long path, that's OE5REB portable YK; this is W9KNI."

"Hey, W9KNI here's W9BW. Hey, Bob, where were you, still in bed? That one was called in half an hour ago. I thought you big DXers never slept." (Note — W9BW is very near the top of the Honor Roll.)

"Hah. Good morning, George. Yeh, I overslept, thanks for bringing it to my attention. Did anybody get him?"

"Oh yeh. K9BG, K9QVB and WD9JTL made it. That's all who wanted him, I guess. Band's hot this morning — I'm going back tuning. W9KNI here's W9BW."

"Roger, George. Thanks, and call in any good ones you find that you don't need."

The DX repeater is really nice. Over seventy DXers use it to call in. It's a real pity that it's usefulness has been impaired by a non-coordinated group nearby with their own repeater. Their selfishness is only harmful, and in fact hurts DXers a~ong them who could use our repeater. I shake my head in disgust, and continue turning up the band.

There's a CQ, good speed, nice fist. Yes, it's OD5LX, Ted, in Beirut. Not real strong, but plenty loud enough for good copy. I

don't need him, but I know Ted slightly. Let's see if he draws any callers — maybe I can get in a quick hello.

I'll never forget one QSO with him several years ago, during the tragic civil war that raged through that unfortunate land. Because of the war, hearing Ted had been a real surprise, but there he was, and I got him. We had a nice chat, avoiding any mention of the war, till suddenly, in mid transmission, he said,

"THEY ARE SHOOTING AGN MORTAR FIRE 73 QRT W9KNI DE OD5LX QRT." Ted is a brave man. I wouldn't have waited to send the closing.

After that QSO it was six months before I heard any report of him again, so I certainly was delighted to hear him back on the air. He finishes his CQ, and I wait. But there — he has a response — apparently only a single caller. Slow fist, hesitant — sounds nervous. I'll let him have it — yes, it's an N8 call, must be a brand new General. He signs — we both wait — and . . .

"R N8PTJ DE OD5LX R . . ." You never know for sure, but I can imagine the thrill that the N8 is experiencing right now — a fine DX catch. I get a vicarious thrill too, remembering my first OD5.

I tune on, higher, looking for I know not what, but the band is calling, the world is calling. There's a signal in QSO — "QTH HR MBANE, MBANE . . ." a 3D6 in Swaziland.

"NOM PIERRE PIERRE HW CPY WDØURT DE FR7CL KN." Hmm. Reunion Island in the Indian Ocean. Gosh, the band is good.

There's a loud one with the long-path quirks impressed into his signal — going fast, too. "5NN 5NN WB4PLK DE HZ1HZ K" Saudi Arabia — it's Ahmed in Jeddah — a fine operator and a sure QSL, too. I tune on.

I am in awe. A band opening like this is the stuff of dreams. I've heard it this good only two or three times in my life, where signals from almost everywhere are coming through loud, strong and clear. And the frosting is on the cake, too — no strong short skip. I can hear the stateside signals okay, but they are not overpowering.

I keep tuning higher in the band, looking, listening. I hear a lot of East Europeans — YOs especially, some LZs, some YUs. I hear several French stations. I've noticed before that the French operators seem particularly adept at milking the long path for all its worth.

Let's see here, we're at fourteen-oh-sixty. Okay, let's keep going up. There's a weak station. "QTH HR DELHI . . ." Hmm. A VU2, an Indian. I turn the antenna a bit farther South from Southwest, and sure enough, his signals pick up a little. I decide to leave the antenna there as I continue tuning.

There's a weak signal — what's that?

"CQ DX CQ DX DE A51RT A51RT . . ." Wow! Bhutan! Always one of the very rarest of countries — a tiny Kingdom nestled between India and China, high in the Himalayan mountains, the stuff of dreams and National Geographic articles — and a country I need.

Hit the linear switch, quick. Bzzzt, snap; the surge circuit drops, and the blower begins its quiet hum. I pull the VFO up on frequency. I hit the rotor control, and turn the antenna further into the South to peak his signal.

". . .CQ DX CQ DX CQ DX CQ DX DE A51RT . . ." Gosh, he's sending a long call. Hope he doesn't attract too many callers. I'd just as soon not get involved in a pileup on this one. I put the rf wattmeter into the high range, and move off frequency a hair. "CQ DX CQ DX . . ." A long call indeed. I key down. Hmm. A little over 500 watts. A quick touch up on the tuning, the loading, the drive. OK, a hair over 600 watts.

I'm ready. I zero the A51, and wait. Yes, there. He signs.

I pause a moment — oops — someone else is calling him. My hopes that he would go unnoticed this high in the band are for naught. I start calling him. I'm a little higher than the other station calling him, so I keep my frequency.

I give a one by three call — I don't want to send the A51 more than I have to so that I can avoid advertising his presence to the whole world. I'd just as soon keep this a private matter, at least until he's in the log.

There — he's back — to a WØ . . . WØSR. Fooey. That was my best chance — to catch him sending CQ. But WØSR is firstest with the mostest. Hope he doesn't go too heavy on the A51's call, maybe I can still get a clean shot when he's done with the A51. I listen:

"WØSR WØSR DE A51RT A51RT R GE OM TNX CL UR RST 569 569 QTH THIMPU THIMPU NAME IS RANDHU RANDHU HW? WØSR DE A51RT KN."

Okay, let's see here.

"A51RT DE WØSR R . . ." Ahh. Okay, WØSR is going light on the call too. There's hope.

After another exchange, they sign clear. I have my VFO set, a hair above WØSR. I listen as he signs clear. No one else is calling the A51, so I bide my time. If, as WØSR had started to sign clear another station had begun to call the A51, I would have also. But no one else calls; either no one is waiting or whoever is waiting is a gentleman. No need to tell you which of the two I hope that it is.

WØSR completes his final transmission with the traditional dit dit. I pause; I hear no one; I call, again a one by three.

I listen. He's already back to someone, and it ain't yours truly. He has already sent the other station's call so I have to wait through his transmission to see who got him. Okay, It's UK9PRN; a chip shot for him, and a long drive for me. The A51 seems to be a shade weaker. Sure hope that the path holds up.

The 2-meter radio opens up. "W9DWQ here. Does anybody know what the big pileup on fourteen-oh-twenty seven is?" I have no idea what the pileup is — wait — maybe it's OD5LX. That would be good — I don't need him, and a nice big pileup down there will tend to keep people from finding their way up here.

Let me see if I can find that UK9 who is in QSO with the A51. I listen intently; if he's in there he isn't very strong. I detect an extremely weak signal — too weak to copy — about on the A51's frequency. I keep my ears peeled — the signal stops. Yes, here comes the A51 back.

The 2-meter radio comes alive again . . .

"Hey, it's A6XJD, fourteen oh twenty four listening up three — with a huge pileup. He's got a good signal. This is W9DWQ."

Uh. That's another one I need. What a dilemma. But I decide to stick with the A51 — if the A6X is taking them up three, he's showing that he knows what he's doing, and people like that will be on again. Besides, maybe I can get this fellow pretty quickly and get on down there and into that fray. The A51, on the other hand, is very much a sometime thing, and besides, he doesn't seem to have much of a pileup on him. Yes, I'll stick with the A51.

There, good. The A51 is signing clear with the UK9. I move a hair lower with my VFO — where WØSR got him. The UK9 is about where I was, but the A51 picked a lower frequency the first time. The UK9 must be pretty strong for the A51.

I give a call; again a one by three. I listen, to hear . . . "VX AR" and then the A51 is back.

"WØVX DE A51RT . . ." Phooey. Beaten again. WØVX — yes — I met him at Dayton last year. He and WØSR are good

buddies, and run together. I'll bet WØ burned up the telephone or maybe 2-meters on that one, once he had his QSO. I hope that he didn't call too many friends — at least until after I get through to the A51. Of course, once I do, I'll be on the phone and two meters spreading the word.

While I wait, I run the receiver down to 14024 for a quick check on the A6X — with luck — maybe a lot of luck — I can snag both the A51 and the A6X. Would that ever make a nice one-two punch in the log book! And it's been a long time since I snagged a new country — let alone two in one day.

I listen on 024. Yes, there he is, passing out "W9BW 5NN DE A6XJD KN." Huh, George got him. Good. I listen up three — there's George, "R A6XJD DE W9BW 5NN 5NN TU 73 SK" I wait a moment . . . silence. Then George's frequency explodes with callers. Wow, what a pileup! No wonder the A51 is lightly contested — the whole band is on George's frequency. But I better get back up to the A51.

I spin the receiver dial back to 064, and a tap on the spotting switch of my VFO helps me instantly home in. Yes, the A51 is still transmitting. But, now for sure his signals are going down. If I don't get this fellow in the log pretty quickly I'm in deep trouble here.

Ahh — the A51 and WØVX are signing. I decide to go just a shade higher than VX.

I make my call; once again a one by three. I listen — I hear one or two letters of another station calling, then silence. Then, the A51 comes back . . . to a K5? Yes, to K5OA. Darn! Mother told me that there would be days like this. Phooey.

This is starting to look bad. I can still copy the A51, but if he gets any weaker, it's going to be really tough. I turn my antenna to the North on the odd chance that the short path has opened up, but the frequency is completely dead in that direction. I turn the antenna South again as fast as I can get it back around. His signal slowly lifts out of the mud as I approach the South end position, but still not at all strong anymore. I'm just in time.

"OK RUSS TNX QSO QSL SURE 73 K5OA DE A51RT QRT CL SK"

Darn! K5OA goes back, "73 ES CUL EE" And all is quiet. I give a call — a short one this time, a one by two. I listen. Nothing. No one else is calling. I call again, in faint hope that he needs to work a W9 worse than he needs to QRT. Hah. Is my luck ever bad today. I finally get him one on one and he QRTs. Oh well, maybe I can go snap the A6X.

I spin the receiver down to 14024 and swing the antenna back to the Southwest for his long path bearing.

The frequency is quiet — too quiet. The 2-meter radio squawks, "K9RN here; what happened to the A6X? My rotor's bust, and I had to go turn the antenna by hand."

"Yeh. K9RN from W9BW. Sorry, Bob, he just pulled the switch five minutes ago. Too bad about the rotor. You better get that fixed."

I turn off the 2-meter radio, completely disgusted. A terrific band opening — two very rare countries — and all I have to show for it is more filament time on the linear. Well, what the heck. If I worked 'em all for the first time I heard them, it wouldn't be much fun. I *must* keep telling myself that. Anyhow it was fun tuning the band. And maybe I'll get another shot at those guys tomorrow.

And, you know what? If 20 is that hot on long path, 15 ought to be pure dynamite on short path into Europe. I smile in anticipation, flip the bandswitches to fifteen, and start swinging the antenna to Northeast.

HRH

Questions & Answers

Entries for this column must be by letter or post card, only. No telephone requests will be accepted. All entries will be acknowledged when received and those judged to be most informative to the most Amateurs will be answered by return mail. Questions must relate to Amateur Radio.

Readers are invited to send a card naming the question they feel is most useful in each issue. Each month's winner will receive a prize, and there will be a prize for the most popular question of the year. In case of two or more questions on the same subject, the one arriving the earliest will be used.

Thanks again to all of you who have been telling us whose question you liked most. It is a real help, and prevents much fingernail biting and agonizing over who gets the prize.

KA8COI received the most mention for July, with his question about voltages.

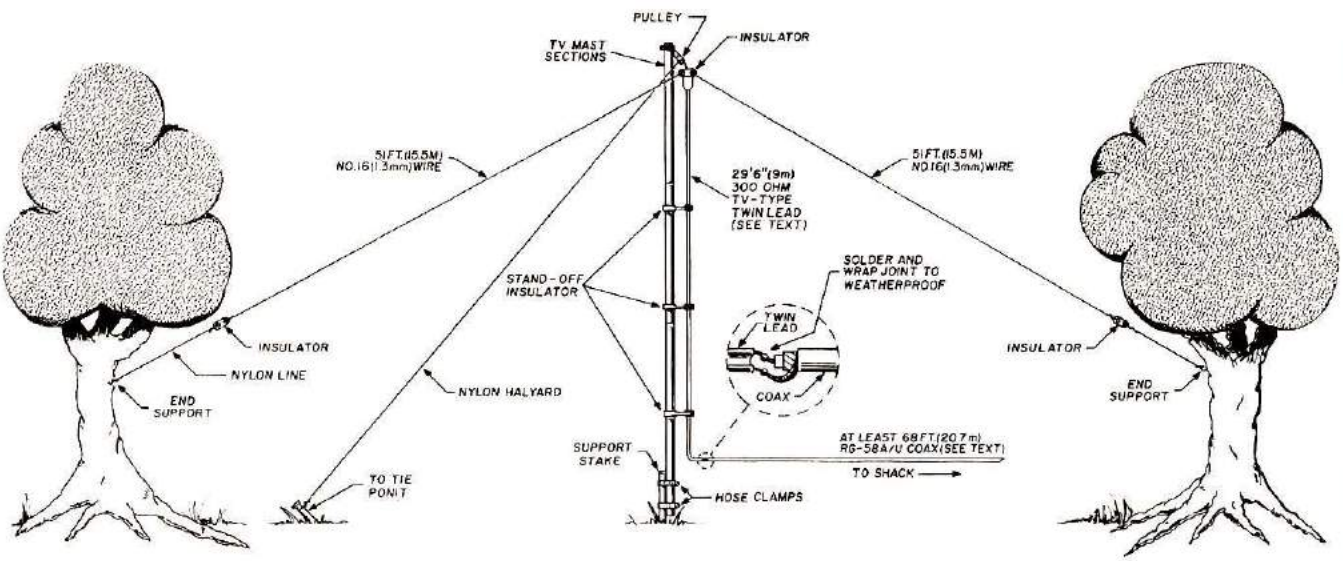


Fig. 1. The G5RV antenna is shown here in an inverted vee configuration. A nylon halyard raises the center of the antenna to the top of a mast made from TV mast sections. Stand-off insulators keep the feedline from flapping in the wind. The antenna "legs" serve as guy wires, while the halyard acts as additional support.

WA1UZH gets the prize for August, for asking about neutralization. The autographed handbooks are on the way, and they should provide many more answers to some of the puzzling aspects of Amateur Radio.

Here are some of the very interesting questions that were found in the latest pile on the desk.

G5RV

I have some questions about the G5RV antenna. I have been told to use a 4:1 balun and then 75-ohm coax, or to use no balun and 52-ohm coax. Why? Also, one guy said to roll the coax up and put it in my shack, but another said not to do that, because it would create inductance. Why? — Tom Peischl, KA2JMP.

Here, in **Fig. 1**, is the G5RV as it has been used by thousands of hams around the world, with excellent results. I suggest that you put it up exactly as designed first, and try it out that way. Then, if you want to experiment with baluns and different feedlines, you'll have something to compare it with.

The dimensions of the antenna portion are critical, as is the length of the twin-lead feeder from the center of the antenna to the coax. This is what makes it perform as a multi-band antenna. The element lengths and the twin lead form a matching system that provides a reasonable load for the 50-ohm coax. The impedance at the end of the twin lead might be 300 ohms for one band, but not for others, so using a balun could make things either better or worse, and certainly will lose a little power (no balun is lossless, and the compact types with ferrite cores soak up a measurable amount of power).

The coiled coax might or might not work — if it makes a difference in the way your rig loads, that means that there is rf on the outside of the coax, and the coil is simply acting as a big rf choke. Some hams make a coil of coax to feed a beam antenna for just that reason — it keeps rf off the outside of the coax, and acts as a balun at the same time. Also, it might make a difference on one band, but not another, depending upon where the SWR "hot spots" were for each band.

Fig. 1 is reprinted here from our original article about the G5RV, which appeared in the June, 1977, issue of *Ham Radio Horizons*, page 36.

Rules

I would like to know what steps we should take to attempt to change some of the current FCC rules and regulations, such as allowing phone activity between 14100 and 14200, and adding to the lower end of the Novice bands on 40 and 80 meters. — J. A. James, WB7OIJ.

If you're the type who likes to tackle bureaucracy head-on, you can send in a petition for change. They'll give it a number and consider it when it comes up on the agenda. Your chances of success are very low.

It's not that you might do something wrong, or that they (the Commissioners) are unresponsive, but that they will look at the overall impact of the proposal on ham radio, and at the amount of support that it might receive from the rest of the Amateur world.

An approach that has a better chance of success is to work with and through the ARRL. No, not through their Newington headquarters — they're the administrators, the paper-shufflers, and the membership-services people. The place to start is at your local level. Your ARRL Director is Robert B. Thurston, W7PGY. Get him to at-

tend a club meeting, or a meeting of a group of hams who are interested in the same thing you are. Talk it over, give him your ideas (and listen to his), and drum up enough support that he can propose a petition at the next meeting of directors.

It may take some time to get results by this path, but isn't that preferable to any system that can produce quick results upon the whim of one or two individuals?

If an organization with the support of thousands of hams proposes a change, the FCC is bound to take more notice of it than they would of one Amateur, or even a dozen or so who might support any given proposal. After all, *any* change to the rules is going to affect upwards of 300,000 people, and they are very aware of this.

Cantenna

I recently put together a Cantenna dummy load, and would like to know how to use it. Also, in your August issue, WB2IBE noted that the Cantenna can be used to check power output. How? — Jim Disetti, KA3EXG.

The Cantenna (or any dummy load) should be used every time you change bands on your transmitter. This is most easily done by connecting the dummy load to one position of an antenna switch.

For instance, suppose you are going to spend some time on 40 meters, but your rig is still set on 80 meters where you did some operating last night. Depending upon what kind of rig you have, the first thing you would do is to set the bandswitch (or other controls) on your transmitter or transceiver to 40 meters. Next, switch from your antenna to the dummy load. If your transmitter has tuning controls, adjust them for proper output. The output can be indicated by a wattmeter in the output line from the transmitter, or by an output-indicating meter in the transmitter itself (if it has one). Note that *proper* output is not necessarily *the most* output! Follow the manufacturer's recommendations, and don't overload the final stages.

Once you have your rig tuned up into the dummy load, you can then switch back to the antenna. If you are using a Transmatch or antenna tuner, however, you have one more step: try to find a clear frequency, and adjust your Transmatch (or whatever) for lowest SWR on 40 meters. Do this as quickly as possible, and reduce the *drive* to your transmitter to cut down the amount of signal you radiate — use no more power than you need to get a meter reading. While doing this, *don't adjust the transmitter's tuning controls*! It wants to see 50 ohms, just like the dummy load you tuned it to in the first place. Your matching network or antenna tuner must provide this 50-ohm load for the transmitter. If you retune the transmitter during all this, you'll have to go back to square one and start all over again.

The object of having the dummy load is to cut down the amount of time you spend radiating a signal on the air, thus decreasing interference. Until you have gotten the feel of your rig, it may take you several minutes of tuning and tweaking to get things perking right. (Old hands at it can pre-set the dials on their rigs and be within a few per cent of "right on," just because they've done it so many times they know how their rig is going to behave.)

The Cantenna (and most dummy loads of that type) has a diode built into the connections box on top (see the instruction manual). This diode will provide a dc reading that is representative of the amount of power fed to the dummy load. You can connect a VOM

to the jack and obtain a reading that will vary as you tune your transmitter. This is strictly relative, and not an exact indicator of any given number of watts. However, it is most useful to be sure that the transmitter is as good today as it was yesterday, or that the new tube you just installed is doing its job.

Reflections

What happens to the reflected power in a mismatched antenna system? Is it radiated as heat? Does it cause TVI? — John W. Baker, N5BSZ.

This is one of the most difficult things to visualize about the whole antenna-matching and VSWR business. It helps if you think of the reflected power in terms of a slow-moving wave (slow enough to follow what happens to it). Let's see if we can stay with a wave and not get tangled up in exact percentages and ratios and all that mind-boggling calculation.

Let's start at the beginning — this burst of rf energy, this wave, is generated by the output stage of your transmitter. Let's say it is a tube rig, just to keep things simple. The plate circuit of the tube is a matching network, and in this particular rig it matches the plate impedance of 3000 ohms to your coax impedance of 50 ohms: it is a simple step-down process.

The wave now travels down the coaxial cable, and arrives at the antenna end. Upon arrival, it finds that the antenna is *not* 50 ohms at all but something else. Because of this mismatch, some portion of that energy wave is going to bounce back up the line. For the sake of illustration, let's say 50 per cent is reflected. This "backward" wave comes back into the shack, and meets the plate-to-coax matching circuit head-on. After being stepped up by this 50-to-3000-ohm network, it sees the plate of the tube as a barrier — it cannot go anywhere because the tube is a "putter-outer," not a two-way device. Reflected again, the "50-per cent wave" now heads down the line toward the antenna. When it gets to the antenna end of the line, part of it is radiated and 50 per cent of 50 per cent is reflected again. This keeps happening over and over, until the remaining reflected portion is so small that is is absorbed in the ohmic losses of the coaxial cable and the tuned circuit in the final amplifier.

Ah-ha! Ohmic losses absorbing power equals heat produced, right? Right, but not very much. At frequencies up to 30 or 40 MHz, the loss in a 100-foot piece of coax is very, very low (see the loss tables in any handbook). Likewise, the loss in a tuned output circuit of a transmitter is very small (otherwise it would burn up from just the normal output power of your rig). These combined losses only absorb a fraction of a per cent of the reflected power each time it makes the trip from antenna to rig and back again.

So, very little is lost in a mismatched antenna system; the energy has to go somewhere, so if it is not used by the final amplifier tube, and doesn't heat up the coax, then it must radiate.

What it does do is to confuse the final amplifier tube. The tube (or other device) is producing rf at a rate and amount that is consistent with the 3000-ohm impedance it sees at its output. Suddenly, here's a bunch of rf that is superimposed on the normal production, and the tube interprets this as meaning that the impedance is *not* 3000 ohms, and it doesn't like that. The tube will sometimes turn red, sometimes oscillate, and usually will "tune funny." Transistors usually burn out under these conditions, unless they have a protective "shut-down" circuit to prevent it.

TVI? Yes and No. If the mismatch allows rf to crawl down the outside of the coax, and into house wiring, yes, it will cause TVI by also creeping into your TV set. This is a common occurrence with severe mismatch cases. However, if all the rf stays inside the coax, it will not cause TVI any more than will the normal output of your rig.

Grounding

On my SB400 and SB301, I have ground posts with wing-nut fasteners. They tend to work loose at times. How should these be used for grounding? Should I bring three-wire ac cord into the set? Are there three-prong ac sockets available? — Frank Erker, WA4YMQ.

Many of those ground-post assemblies on Heath, Collins, and other rigs are not put together correctly. There should be a good internal-star lockwasher under the head of the bolt, inside the chassis, to keep the bolt from turning. There should be another lockwasher under the first nut outside the chassis, to keep that nut from turning. Then, there should be two flat washers on top of this outside nut, with the wing nut (or even another hex nut) on top of these two washers. The nut against the chassis (and lockwasher) should be very tight — make the teeth of both lockwashers bite into the chassis and the bolt and nut. That will keep the assembly from working loose. If the assembly is No. 6 or No. 8 hardware, replace it with No. 10 for greater strength so it can be tightened without breaking the bolt.

The ground strap or heavy wire should be placed between the two flat washers and the wing nut tightened just firm — you don't have to torque it down like an engine-head bolt. That's half the reason that these assemblies work loose — people assume that the tighter they make the wing nut the better the ground will be, but all they are doing is loosening the bolt inside the chassis, which is no help at all.

The ground from this ground-lug assembly should be completely separate from the power-line ground. Many hams use a piece of braid from scrap coaxial cable to make a 2- or 3-foot pigtail to connect between the chassis and a heavy ground buss that goes outside to a ground rod, or even to a good water-pipe ground if you have one.

There are three-prong ac sockets (both male and female) available which will mount on the chassis of radio equipment, but they are generally larger than any space you can find to mount them in. Best bet is to use the split-grommet fasteners — they're made of plastic and clamp down on the ac wire where it goes through the chassis. The hole must be a snug fit, and the pressure of the grommet in the hole causes the tang on the grommet to grip the ac cord so that it cannot be pulled loose. (Besides, a cord that is fastened to the chassis won't get lost.)

The green wire on the ac cord should be connected to the chassis, following standard American practice; the white is common, black is hot.

Again, the three-wire system is nice to have, and has saved many people from nasty (or fatal) shocks. But, don't use *any* power-line ground as an rf ground. Also, don't assume that the ground in a three-wire outlet is all the protection you need — a bad connection between that outlet and the ground at the meter box could leave the rig "floating," ready to bite you. Keep your rf grounds and your power-line grounds separate, and everyone will be happy.

HRH

The CONTINUING SAGA of THE TOWER DILEMMA

DAVE MALLEY, K1NYK

NOTE: REDUCTION 79%

Pity the poor ham with only 100 watts and a 20-meter dipole! One can easily imagine his hours of sleep lost to DX-pileup frustrations, and his wild thoughts of multi-element stacked arrays that rotate high above a mountaintop home. Unfortunately, for many years, I was among those hams who ran medium power into a (very) modest dipole. Finally, a day came when I had an opportunity to buy a used tribander beam and rotor for a price that couldn't be refused. Suddenly, I was in the position of having an antenna with no visible means of support, so to speak. What followed was a course in Fundamentals of Tower Selection/Installation.

After looking over many tower advertisements, and reading through manuals and brochures from several manufacturers, I decided that the time had come to make a selection. This point probably would have been reached much sooner if it weren't for my being an engineer. Anyway, a freestanding, tiltover aluminum tower was chosen for a variety of reasons. I then decided to check out the local zoning ordinance, since our house was on a small suburban lot (no mountaintop here). This was primarily to keep from getting complaints from some unsympathetic neighbor, which might cause removal of the tower and more hours of lost sleep. The ordinance seemed reasonable until I got to the part about the eighteen-foot maximum height. It was immediately clear that no ham had been involved in writing this law. Conversations with the Zoning Department determined that I could: 1) see the Appeals Board ($25), 2) change the law (same fee), or 3) take my chances. The second choice was selected since it would favor all the hams in town.

I knew from the start that revising what might be a sensitive law required a well-planned attack. The strategy planning took several weeks to complete, with the help of a few local Amateurs. Most of the reasons justifying increased tower heights have been discussed before, so they won't be covered in depth here. The usual reasons, however, include Civil Preparedness, possible TVI reduction, freedom of pursuit of a hobby, and the like. Club newsletters and area repeaters helped alert other local hams to what was underway. When the hearing date finally came, forty Amateurs filled a room that contained only about fifty seats. The Zoning board heard the formal testimony, as well as support from Civil Preparedness groups and many of the hams in the room. In spite of the overwhelming support from those in attendance (and no negative comments), one Board member managed to defeat the proposed revision. The lesson from this was that it's probably best to lobby the influential Board members prior to submitting a zoning revision. The effort was not a total waste in that the interpretation of the ordinance was altered to allow towers of any height as long as they were attached to the house, with the unsupported height too short to fall across the property boundary. This helped considerably but was rather poor from an engineering standpoint. In any event, the tower could legally be put up by connecting it to the house with a bracket or guy. By now, an idea was coming across that my project might be hexed.

An order was placed with the tower manufacturer, and I began to wait anxiously for its arrival. The weight of the tower was enough to require that it be shipped by a freight line. The manufacturer gave me the name of the trucking company and their depot location. A phone call to the depot manager was rather disappointing as they had no intent of delivering the tower to our house. Furthermore, they denied knowledge of any other trucking line that could deliver it. A week went by while I found out that trailer rentals were out of the question because the hitches wouldn't fit on either of my cars. Consequently, another phone call was made to the depot to get some help. My suspicions about the hex were confirmed when the manager said that they were going out of business at 5 PM. That left less than four hours to get the "pole" out of their building! If this is beginning to sound like fiction, I only wish it were.

Fingers probably never did such fast walking through the Yellow Pages as on that day. Finally, a trucking firm was located that agreed to pick up the tower that afternoon and deliver it the following day. There was, however, a thirty dollar COD fee that had to be paid in advance because the driver was unlikely to have enough money himself. About an hour later, I arrived at the depot, with the money in hand, to find the manager (and others) with beer in hand (and several earlier ones on the floor). Only the inbred desire for breaking pileups, achieving DXCC and other treasures kept me from joining the party. Eventually, though, the trucker arrived and the tower headed for the K1NYK QTH.

The top section of this tower contained an aluminum pipe to guide the antenna mast. An oversight on my part was not reading the manufacturer's information about the various pipe sizes available. Consequently, I was surprised to find that the nearest size steel pipe had an outside diameter that was about a quarter-inch smaller than the inside diameter of the aluminum pipe. That was definitely too great a gap, and would

probably destroy the rotor in no time. Fortunately, the solution turned out to be quite simple. A small section of quarter-inch thick Teflon® was purchased. Two pieces about an inch wide were cut so that they were slightly shorter than the internal circumference of the aluminum pipe. These were rolled and slipped inside the pipe, and the natural tendency to spring back held them tightly in place at the top and bottom of the pipe (see **Fig. 1**). This not only provided an excellent shim between the mast and the plywood was removed and the four foot tower base section was leveled and fastened upright in the hole. Things would have worked out well if it hadn't started raining late that night and continued into the next day. The sight of two collapsed sides, and a foot or more of mud in the bottom of the hole seemed to justify the expletives that followed. Eventually, the mud was removed and plywood forms were fitted to the two eroded sides. This time, the cover was left in place until just before the concrete truck arrived.

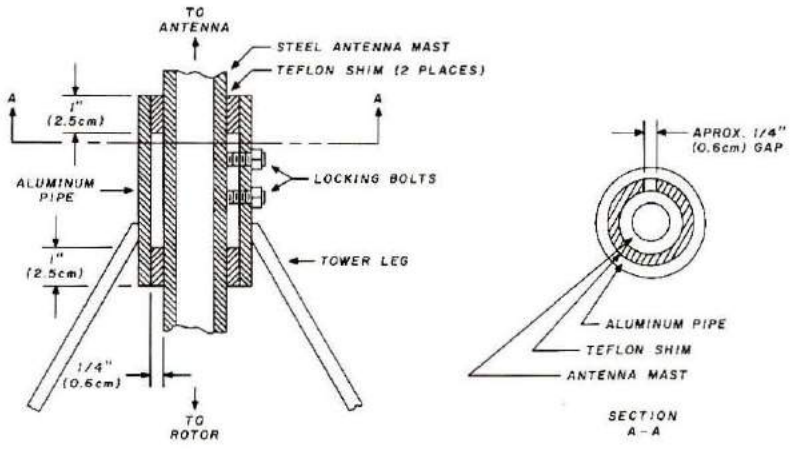


Fig. 1. Schematic drawing showing placement and size of Teflon® tower to mast shims. Springback of the two formed shims holds them in place.

pipe, but the low frictional coefficient of the Teflon® made it an excellent bearing material that is unaffected by the elements. These shims have performed very well for two years, and have prevented any wear or electrolysis (corrosion) problems between the two pipes.

The hardest work in this project was digging the foundation hole that measured four feet on a side. Plywood sheets were laid across the completed hole to keep out any rain that might fall before the concrete truck arrived on the following Saturday. Friday night, the

Somehow, the final pouring of the concrete base and subsequent tower erection seemed anticlimactic to what had preceded it. I suppose that the good grounding system and some luck (some what?) are responsible for the tower avoiding the visions I used to have of direct lightning strikes. Anyway, it's over now, and I occasionally stop to wonder whether or not the tower was worth all the trouble. The answer? My QSL cards from 9N1-land, and other exotic places, say "You bet it was!"

HRH

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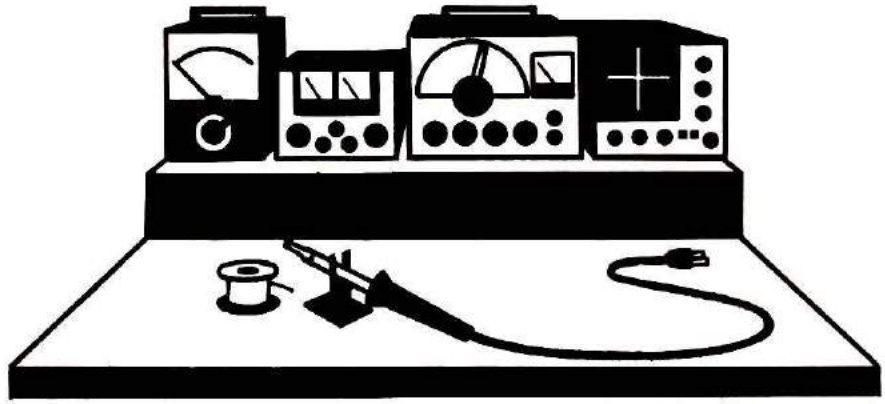


BENCHMARKS

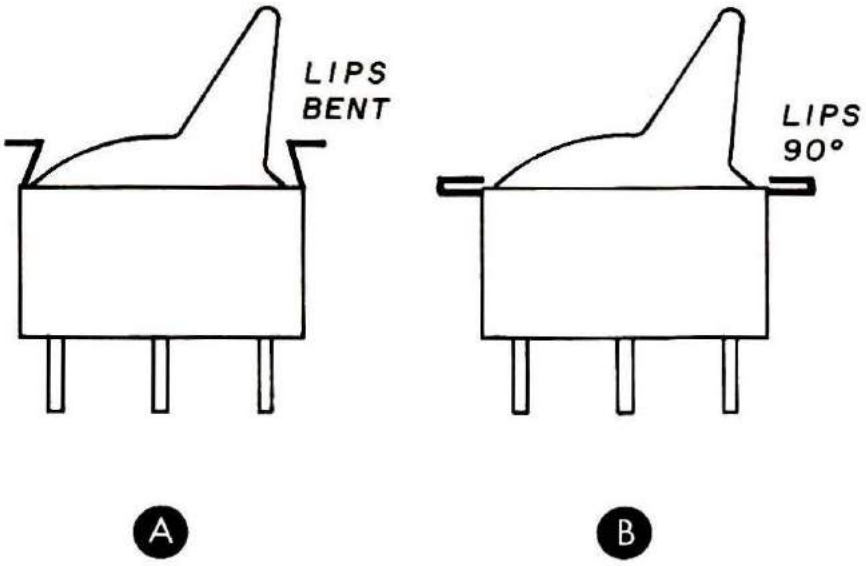
More TS-520 Filter Mods

I just completed the modification for the filter selection on the Kenwood TS-520 as listed in the June, 1980, Benchmarks. I think it is great (the modification), but some additional information is needed for us first-time hams. Here are my notes on how I accomplished the task. You may do with them as you will; they will make great trash-can liners, or could soak up quite a bit of cold coffee, but I hope you see fit to put it in your fine magazine.

The article appearing in Benchmarks for June, 1980, inspired me to take a peek inside my TS-520. Having previously had a hot soldering gun and the nerve to build a HW-101, I felt capable of performing this simple task. I proceeded to remove the top cover of the radio, and, Lo, there are the two crystals. With a little gentle poking, the brown wire soldered to the CW pin emerged. I now turned my attention to the bank of switches located just below the meter. (I had already made up my mind that the noise blanker would be permanently wired in the ON position. I like being able to listen without the heaters being energized. No way was I going to wire the heaters permanently on, I don't like to make contributions to S.C.E. (Southern California Edison). The bank of switches gave me a few butterflies in the old stomach; there was simply no way to get at the selected switch in a quick and easy manner.

The following must be done to accomplish the modifications:

- Remove the bottom cover (the top one should already be off).
- Set all front panel controls to a reference point and remove all knobs. (I drew up a quick panel sketch and noted the position of all knobs.)
- Carefully remove the nut from the channel-select switch, after removing the knob (carefully, it's easy to scratch the plastic).
- Remove four screws from the front panel — two on top, two on bottom.
- Carefully remove the front panel. (Now is a good time to give it a cleaning, use only *mild* soap and water; be careful of the plastic cover in the front panel, it will fall out.)
- Locate the selected switch; double check to make sure it's the one on which you want to perform the operation. I found myself playing with the VOX switch. It's easy to get confused.
- You should notice the manner in which the switches are clipped to the subassembly. Using a long, flat-blade screwdriver, from the back of the front subassembly, gently push up on the locking tabs on the noise blanker switch while prying gently under the lip of the switch from the front. It will move up about 1/8 inch. Alternately pry on the top and bottom lip of the switch from the front of the subassembly until the switch can be lifted out. As you pry, push in gently with screwdriver toward the center of the switch.
- Clip the yellow and black wire as close as possible to the switch, *but don't cut the lugs*! Reach under the radio and pull the black and yellow wires down where you can work on them.
- Slip a piece of heat-shrink tubing as far from the intended connection as possible. Connect the black and yellow wires, and solder them.



Allow the splice to cool. Slide the heat-shrink tubing up, and shrink it over the joint.

- Use *Solder Wick* or a solder sucker to remove the solder from the lugs of the switch.
- Examine the black wires from the back of the switches; you will find that they all are soldered to a common ground near the bottom front of the sub-assembly.
- Attach a 6-inch length of black wire (No. 22 hookup will do nicely) to the ground point, and solder it. Check with an ohmmeter to ensure that the wire is at ground potential. Route the other end up through the hole for the noise-blanker switch. Slide a piece of heat-shrink tubing 3/4-inch long over this wire. Cut one lead of a 0.001-μF capacitor to 1/4-inch long. Connect this lead to the black wire and solder it. Slide the heat-shrink tubing up and shrink it over the joint.
- Locate the brown wire attached to the CW pin; carefully unsolder and remove it. Reroute this wire through the hole for the noise blanker switch — make it neat! Insert this wire through the center lug of the switch, insert the remaining lead of the 0.001-μF capacitor into the center lug with the brown wire. Pull this lead up as short as possible, but don't break it! Solder both the lead and the brown wire to the center lug. Make sure that the brown wire or the lead does not touch either of the remaining lugs (cut off the excess lead of the capacitor).
- Locate the SSB pin (it's between the two crystals). There are some other wires already attached to this pin; leave them alone. Attach a wire, No. 22 hookup, of a color *other* than brown to this pin (really, it is important not to use brown — imperative if you don't have an ohmmeter!). Solder this wire to the SSB pin; be careful not to burn the other wires. Also, make sure that no bare part of the wire touches anything other than the pin. Route this wire out through the hole for the noise blanker and solder it to the remaining lug.
- Carefully recheck your work.

If you have an ohmmeter, set it for R × 1, and connect one lead to the center lug of the switch, the other to the CW pin. Throw the switch and observe the action of the meter. You should install the switch so that in the NB position the CW filter is activated.

- Look carefuly at the switch in profile. See **Fig. 1**. It should look like **B**, not **A**. If it looks like **A** — lips bent back — carefully straighten with needle-nose pliers.
- For those of you without an ohmmeter (for shame, for shame), insert the switch with the brown wire from the CW pin at the bottom. Push the switch in gently until it locks into position. Some help may be needed to get the spring clips to lock. This can be done by holding the switch in with your fingers and using a screw driver through the opening just below the meter. Do not pry against the meter case; you'll be buying a new one. Once the switch has been installed to your satisfaction, the job is almost complete.
- Reverse the first five steps to reassemble the front panel. While you are reassembling the front panel and covers, scrape the paint away from the inside of the screw holes at all attaching points; this will go a long way toward curing any TVI problems you may have (aided by a low-pass filter and a good ground system).

I performed the above modifications on my TS-520, and I must say that it is very pleasant to throw that switch and watch the QRM disappear. I hope this helps some of you out there to enjoy a fine radio a little more. See you on 7125 — my favorite spot on my favorite band.

Jim Haney, KA6DNF

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Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Calibrated Beacon Mode	Yes			No		No	No	No	
Repeat Message Mode	Yes			No		Yes	Yes	Yes	
Front Panel Variable Monitor Frequency	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Message Resume After Paddle Interrupt	Yes			Yes		No	No	Yes	
Semi-Automatic (Bug) Mode	Yes	Yes		Yes	Yes	No	No	No	No
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Automatic Stepped Variable Speed	No	No	No	Yes	No	No	No	No	No
2 Presettable Speeds, Instant Recall	No	No	No	Yes	No	No	No	No	No
Automatic Trainer Speed Increase	Yes	Yes	Yes						No
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airTime

Rob Schneider, N6MR

Connecticut QSO Party

The 1980 Connecticut QSO Party, sponsored by the Candlewood Amateur Radio Associaton, will be on the air from 2000Z December 6 to 0200Z December 8, with a rest period scheduled from 0500Z to 1200Z on the 7th. Phone and CW are considered part of the same contest; stations may be worked once on each band and each mode.

Besides the awards for high scores, a Worked All Connecticut Counties certificate will be awarded to each station working the eight counties in the state.

The contest exchange consists of a sequential QSO number, RS(T), and ARRL section (for out-of-state stations) or Connecticut county.

Suggested operating frequencies are: CW — 40 kHz up from the bottom of each band; SSB — 3927, 7250, 14295, 21370, 28540; Novice — 3725, 7125, 21125, and 28125.

Out-of-state portable and mobile stations operating in Connecticut are requested to identify themselves as such, as are Connecticut mobiles operating in other counties.

To calculate a final score, multiply total QSOs by the number of Connecticut counties worked (eight maximum). Connecticut stations multiply total QSOs by the sum of ARRL sections and provinces worked. Additional DX contacts count for QSO points, but only one DX multiplier overall is allowed. Club station W1QI will be operating CW on the odd hours and SSB on the even hours; contacts with W1QI count five points (each band/mode). Novice contacts score two points each, and OSCAR contacts count three points each.

Logs must show category, date/time (Z), callsigns, QSO numbers, bands, QSO points, and claimed scores. Logs must be postmarked no later than January 2, 1981, and sent to CARA, c/o Steve Grouse, KA1ECL, 3 Queens Court, Danbury, Connecticut 06810. Include a large SASE for contest results.

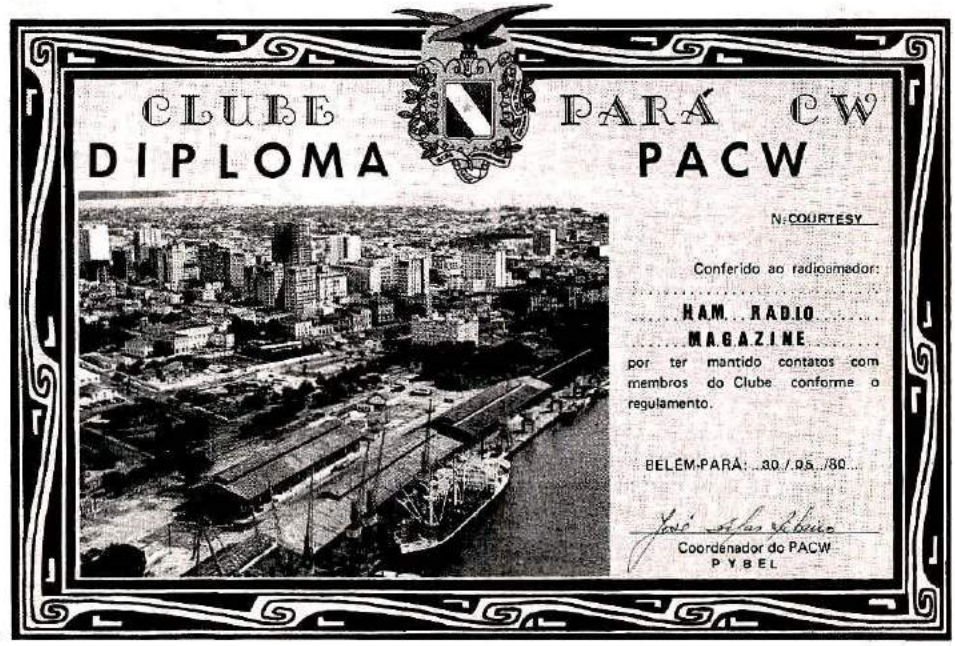
PACW Award

The PACW Award is offered by the Brazilian Para Group of CW to all Amateurs/SWLs who have worked/monitored *two* different group members since January 1, 1980. Only CW contacts qualify for the award.

PACW members are: PY8AA, PY8ACR, PY8ACS, PY8AFH, PY8BI, PY8DP, PY8EL, PY8FI, PY8HP, PY8JS, and PY8ZLC.

To apply, send logs (no QSLs) showing call, date, time, band, and report, along with ten IRCs and a personal QSL to PACW, P. O. Box 203, 66.000, Belem-Para, Brazil.

HRH



watts reflected power, the ICOM 701 sees SWR approaching 1 to 1 and is quite happy.

But I really rely on the Bird 43 as the final indicator.

Bill Rohrbach, WA2DXJ
Chatham, New Jersey

Thanks, Bill, for the kind words and the information on the ever-useful Bird 43 wattmeter. I'll have to nit-pick a bit, however, and say that the Bird 43 does not read SWR, but rather it indicates reflected power which you must convert to SWR by either calculation or a table.

Also, a word of caution to the newcomer: the insertion of a low-power slug to obtain a more precise reading of reflected power is very useful, but you can wipe out an expensive slug that way if you ***A)*** *forget to make the arrow point toward the rig,* ***B)*** *have too-high an SWR, or,* ***C)*** *have a transient voltage spike on the transmission line with enough power to burn out the diode in the slug.*

A ratio of 10-to-1 (2500 watts to 250 watts) is not bad, and the low-power slug will probably be safe from item ***(C)*** *above, but trying for a finer reading by using a 25-watt (or lower) slug would probably cost more in repair bills than the extra precision is worth.* ***Editor.***

Dear Horizons:

Read with interest the article by John Edwards, WB2IBE, concerning wattmeters in the August issue of *HRH*.

However, one comment may be misleading to prospective purchasers of the Bird 43.

It definitely will show SWR by measuring reflected power when turning the slug 180°. Use a 2500-watt slug and a 250-watt slug. If I tune the exciter and linear for 900 watts indicated output, turn off the excitation and put the 250 watt slug in reverse condition (with arrow pointing towards linear), and turn the excitation back on with linear also on, I will read reflected power. Bird's manual provides a table for interpolating the simple calculation.

For instance, with 900 watts forward the reflected readings would indicate approximate SWR as follows:

Forward Watts	Reflected Watts	SWR
900	5	1.16
900	50	1.60
900	200	2.80

Since I use an ICOM 701 with solid-state finals, I must keep the SWR as low as possible, and therefore also use a Nye Viking tuner.

Therefore, if I can get maximum legal power out and show less than 5

Dear Horizons:

When you added Bill Orr's articles to your magazine you added class plus.

I think Bill's articles are superbly interesting and he has a knack for making complex subjects readable and interesting.

The only improvement I would like to see is your magazine published twice a month. One month is too long to wait for his next article.

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Sugar Land, Texas

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COPY No special layout or arrangements available. Material should be typewritten or clearly printed (not all capitals) and must include full name and address. We reserve the right to reject unsuitable copy. *HORIZONS* cannot check each advertiser and thus cannot be held responsible for claims made. Liability for correctness of material limited to corrected ad in next available issue.

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500 QSL'S, $10. Catalogue, 743 Harvard, St. Louis, MO 63130.

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CB TO 10 METER CONVERSIONS. SSB/AM/CW. Let a specialist convert your rig, or buy one complete. Write Conversion Engineering, Box 183, Sandwich, Massachusetts 02563.

WANTED: U.S. manual for model 15 teletype. Will pay all costs involved. Terry Robinson, L31105, 21 Russell Avenue, Woodend, Victoria, Australia 3442.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu Goodman, K2PRZ Print, P.O. Box 412, Rocky Point, N.Y. 11778, (516) 744-6260.

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THE MOR-GAIN HD DIPOLES are the most advanced, highest performance multi-band HF dipole antennas available. Patented design provides length one-half of conventional dipoles. 50 ohm feed on all bands, no tuner or balun required. Can be installed as inverted VEE. Thousands in use worldwide. 22 models available including two models engineered for optimum performance for the novice bands. The Mor-Gain HD dipoles N/T series are the only commercial antennas specifically designed to meet the operational requirements of the novice license. Our 1-year warranty is backed by nearly 20 years of HD dipole production experience. Write or call today for our 5-page brochure. (913) 682-3142. Mor-Gain, P.O. Box 329N, Leavenworth, KS 66048.

MOBILE IGNITION SHIELDING provides more range, no noise. Literature. Estes Engineering, 930 Marine Drive, Port Angeles, Wash. 98362.

QSLs & RUBBER STAMPS — All Top Quality Merchandise! QSLs: Glossy Inks and Cardstock. Rubber Stamps: Report Forms, Call Letter, Address. Card Samples and Stamp Information 50¢. Ebbert Graphics 5H, Box 70, Westerville, Ohio 43081.

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QSLs with class! Unbeatable quality, reasonable price. Samples: 50¢ refundable. QSLs Unlimited, 1472 SW 13th Street, Boca Raton, FL 33432.

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THE SUPERMARKET OF ELECTRONICS — Thousands of items for sale or trade each month. Free classified ad with subscription. Only $5.00 to Nuts & Volts, POB 1111-H, Placentia CA 92670.

QRP A.R.C. INTERNATIONAL INC. invites you to join its membership providing you operate 100 watts or less. For complete details send SASE to Robert Reynolds, K5VOL, Secretary/Treasurer, 835 Surryse Road, Lake Zurich, Illinois 60047.

"CADILLAC" of QSL's — FAST 100-$9.95 — Our Design. Send $1.00 for samples — Refundable. MAC's SHACK, P.O. Box 43175, Seven Points, Texas 75143.

QSL ECONOMY: 1000 $12.00. SASE for samples. W4TG, Drawer F, Gray, Georgia 31032.

TOP SECRET Registry of U.S. Government Frequencies 25 to 470 MHz by K2AES. Unique book lists 15,000+ freqs. of FCC, FBI, Border Patrol, Immigration, Treasury, ATF, NASA, FAA, military, etc. Only book of its kind! $5.95 ppd. CRB Research, Box 56-HR, Commack, NY 11725.

MAKE HAM RADIO FUN! Supplement your learning programs with a motivational hypnosis cassette. Tape #3, Learning the Code; Tape #4, Breaking the Speed Barrier; Tape #7, Electronics Theory. Free catalog. For tapes send $10.95 to John Wolf Hypnosis Center, P.O. Box 497, Hayden, Idaho 83835.

TR7/DR7 modification information for transmitter coverage of WARC-MARS (transmit complete from 1.5 - 30 MHz). Color photo and description of modification. Takes minutes, no circuit board removal. $20.00 — Gene DeFoe, WA7SRI, Box 211, Shoshoni, Wyoming 82649.

COMING EVENTS

OVER THE HILLS and thru the woods to Wheaton Community Radio Amateurs Hamfest we go. For the bargains and buys and to meet all the guys, come to the best Winter Hamfest in the U.S.A. — January 25, 1981 — Plan on it. — N9YL.

More details? Ad Check page 102.

AGL Electronics

DALLAS, TEXAS
15 miles from South Fork Ranch

YOUR FULL SERVICE DEALER

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AGL Electronics deals only in Ham equipment of the highest quality at the best prices available, and the service and attention are Extra Class. Our entire staff holds Extra Class Amateur licenses, and they've all been dealing in Ham equipment for years.

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TONNA F9FT ANTENNAS

4 element 2M	$ 21.95
16 element 2M	$ 55.00

HY-GAIN ANTENNAS

TH6DXX	$ 219.00
TH5DX	$ 195.00
TH3MK3	$ 174.00
TH2MK3	$ 99.00
TH3JR	$ 125.00
105BA	$ 86.00
155BA	$ 133.00
205BA	$ 219.00
204BA	$ 166.00
402B	$ 159.00
DB1015A	$ 121.00
18AVT	$ 78.00
14AVQ	$ 46.00
18HT	$ 260.00
BN86	$ 12.00

HY-GAIN CRANK-UP TOWERS

HG-52SS	$ 777.50
52 ft. self supporting. 9 sq. ft. at 50 mph. Nested height: 20½ ft.	
HG-50MT2	$ 627.50
50 ft. side supported. 6 sq. ft. at 50 mph. Nested height: 20½ ft.	
HG-54HD	$1513.00
54 ft. self supporting. 16 sq. ft. at 60 mph. Nested height: 21 ft.	
HG-70HD	$2187.00
70 ft. self supporting. 16 sq. ft. at 60 mph. Nested height: 23 ft.	

CUSHCRAFT ANTENNAS

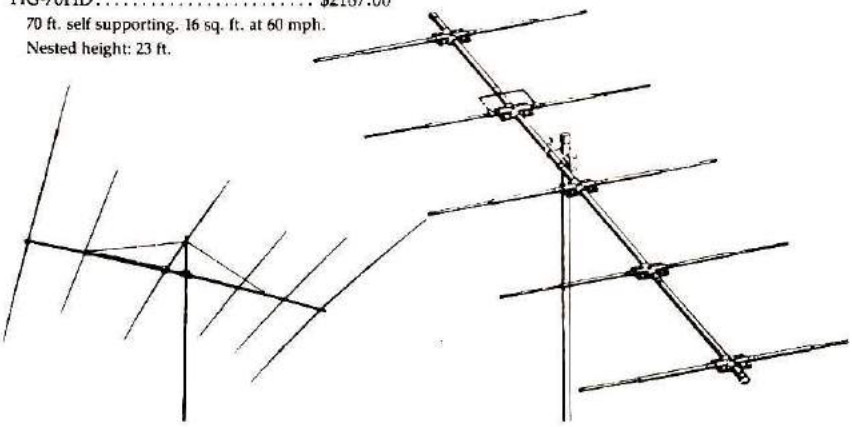
ATB34 Tribander	$ 219.00
20-3CD	$ 165.00
20-4CD	$ 240.00
15-3CD	$ 83.00
10-3CD	$ 98.00
10-4CD	$ 75.00
ATV-4	$ 85.00
ATV-5	$ 90.00
ARX-2	$ 34.00
ARX-450	$ 30.00
A-147-11	$ 34.00
32-19 Boomer	$ 75.00

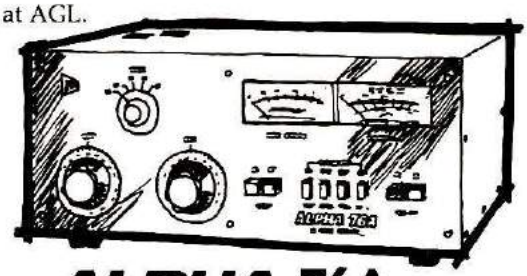
ROHN TOWERS & ACCESSORIES

25G Section	$ 37.50
45G Section	83.75
HDBX48 Self supporting tower	$ 305.00
HBX56 Self supporting tower	$ 335.00
3/16 EHS guy wire, 500 ft.	$ 63.00
3/16 CCM cable clamp	$ .29
3/8 Turnbuckle, eye & eye	$ 5.39
M200H 10 ft. H.D. galv. mast	$ 36.99

ROTATORS

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





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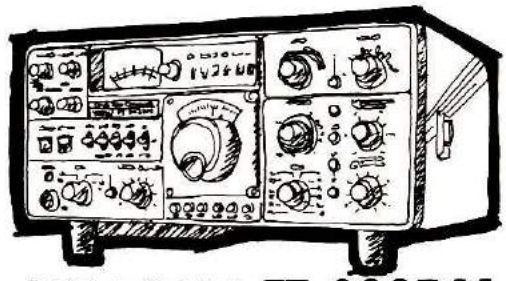

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All Hy-Gain towers are drop shipped direct from the factory to save you money. You get free freight on Rohn Tower orders over $1900.00 and freight paid on all Rohn Tower foldover towers. All others F.O.B. Dallas. 10% higher west of the Rockies, unless shipped from Dallas: slightly higher if drop shipped.

Please call for more prices and information. Whether you talk to Gordon, N5AU, Bill, K5FUV, or Mike, KG5F, you'll get a bigger signal for less. We're here to serve you six days a week.

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For quick shipment, call today: 800-527-3418

AGL Electronics, 13929 N. Central Expressway, Suite 419, Dallas, Texas 75243, (214) 699-1081, **We'll do it right.**

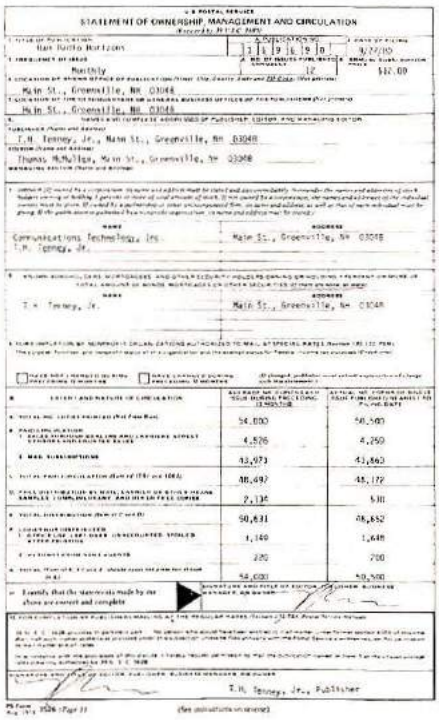
AGL Electronics is located only in Dallas and has never been associated with any other dealer.

Coming Events (cont.)

THE CLARK COUNTY AMATEUR RADIO CLUB (Jeffersonville, Indiana) will go on a DXpedition to Bethlehem, Indiana, from 1700 UTC December 13 until 1700 UTC December 14, 1980. Using the call sign W9WWI/9 they will operate phone on 3.900, 7.235, 14.285, 21.360, 28.510 also 147.300 simplex. Special Christmas season cards will be sent to all stations and the envelopes will be stamped with the unique Bethlehem, Indiana, postal stamps consisting of the Three Wise Men and the Star of David. QSL (with SASE) to Clark County Amateur Radio Club, P.O. Box 352, Jeffersonville, Indiana 47130.

LOUISIANA: The Twin City Ham Club of Monroe/West Monroe, will hold its annual Hamfest, Sunday, November 9 at West Monroe Civic Center, 910 Ridge Avenue, West Monroe. Doors open at 8:00 AM. Free swap tables. Activities include VHF Forum and left-footed CW contest. Refreshments available. Many door prizes. $1.00 admission includes chance on grand prize. Talk in on .25/.85 and .52/.52. Dealers invited. For more information contact WB5MHU, 94 Birchwood Drive, Monroe, LA 71203.

SPECIAL EVENTS STATION: The Delaware-Lehigh Amateur Radio Club (W3OK) will have a special events station on the air as part of Bethlehem's Christmas City Celebration. The station will be on the air from 2300Z to 0300Z, starting December 15 through January 1, 1981. Operating hours will increase when possible. Operation will be on Novice CW and General phone bands. Suggested frequencies are: Novice — 15 KHz down from top of band and General — 15 KHz up from the bottom of band. Special QSL certificates will be sent from Christmas City station. Send SASE to W3OK, D.L.A.R.C., Inc., 1719 Callone Avenue, Bethlehem, Pennsylvania 18017.



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	54,000	50,500
	4,526	4,250
	43,973	43,860
	48,499	48,110
	2,135	530
	50,631	48,640
	1,149	1,648
	220	220
	52,000	50,500

T.H. Tenney, Jr., Publisher

DX FORECASTER

Winter DX

December is the ultimate month for winter DX. Although the hours of daylight are quite short now in the northern hemisphere, the ionosphere-propagated frequencies rise rapidly, with the rising sun, to the higher frequency bands of good DX. The sunspot number and solar flux remain high enough to assure a good winter DX season. The earth is closest to the sun, which results in a 5 per cent rise in solar flux and ionospheric density. December, next to November, is also one of the quietest months of the year as geomagnetic disturbances go. Radio noise propagated from the thunderstorm centers over the few land masses of the southern hemisphere are far from us, so the 80- and 160-meter bands are good for daytime use and become good possibilities for DX during the long winter nights when you're in by the fireside. The longest night, winter solstice, is on the 21st this year.

This time of year, especially during sunspot maximum years, the ionosphere piles up extra dense F-region ionization at approximately 20 degrees north and south of the geomagnetic equator. A mound of ionosphere above Central America and Northern Argentina then allows transequatorial one-hop signals into the southern populated areas of South America. The late evening hours, 2000-2300 local time, are the optimum time for DX to our friends down south.

The Geminid meteor shower, which reaches its peak on December 13-14, provides the richest and most reliable display of the year with rates of 60-70 per hour (measured mainly by radio because of the poor weather in December). Also, a smaller shower (15-20 per hour) is observed on December 22. Lunar perigee occurs on December 19 this month.

Band-by-band Summary

Six meters will open occasionally during time of 27-day solar-flux maximums. The openings will follow the sun — east before noon, south at noontime, and west and transequatorial during the evening.

Ten and *fifteen meters* will be like the openings on six, except more frequent and longer in duration. Worldwide DX will abound from after sunrise until well after sunset during periods of high solar flux (listen to WWV at 18 minutes after the hour for the daily flux value). Short skip will also follow the same pattern in the daytime hours.

Twenty meters, the universal DX band, will be open most days during December this year, to most parts of the world during the day and into the night. Best conditions can be expected just after sunrise and just before sunset. Long skip will be available as the bands open upon sunrise, and will last until well after sunset. Short skip will also follow the sun across the globe.

Forty meters is a transition band between the daytime bands at higher frequencies and the nighttime bands at this and lower frequencies. Our new 1979 WARC 30-meter band will provide the in-between band that may allow round-the-clock communication on 350- to 2500-mile paths. As is, this band is very active to most areas of the world during hours of darkness to just before sunrise. In late afternoon, the band will open to the east, covering Europe, then swing around to the south at about midnight, and west to the Pacific by dawn. Short skip will be available on most days.

Eighty and *one-sixty meters* are expected to be excellent on this best month of the year for the top bands. Low noise during the long nights will give hours of pleasure if you are looking for the rare ones on these bands. DX from the coastal areas over water to South Africa, South America, and Australia-Asia will be easiest, but rare ones from anywhere will be worth the effort. Try it, you'll like it, as everyone used to say.

HRH

More details? Ad Check page 102.

GMT	PST	WESTERN USA N	NE	E	SE	S	SW	W	NW	MST	MID USA N	NE	E	SE	S	SW	W	NW	CST	EST	EASTERN USA N	NE	E	SE	S	SW	W	NW
0000	4:00	10	20	10	10	15	10	15	10	5:00	10	20	10	10	15	10	10	10	6:00	7:00	15*	20	10	15	15	10	10	15
0100	5:00	10	20	10	10	15	10	10	10	6:00	10	20	10	15	15	10	10	10	7:00	8:00	15*	20	15*	15	15	10	10	15
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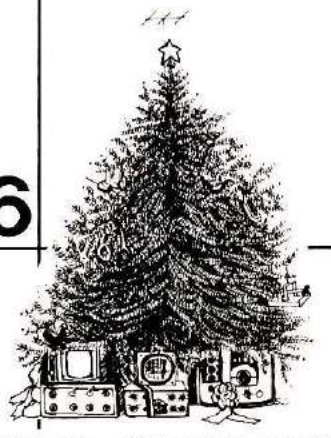
0600	10:00	20	40	20	20	20*	15	15	20	11:00	—	40	—	20	15	20	—	20	12:00	1:00	20	40	15	20	20	40*	—	20
0700	11:00	—	40	20	20	20*	15	—	20	12:00	—	40	—	20	20*	20	—	20	1:00	2:00	—	20	—	20	20	20	20	20
0800	12:00	—	20	20	20	20*	20	—	20	1:00	—	40*	—	40	20*	20	—	20	2:00	3:00	—	20	—	40	20	20	20	20
0900	1:00	—	20	—	20	20	20	—	40	2:00	—	—	—	40	20	20	—	20	3:00	4:00	—	20	—	40	20	20	20	20
1000	2:00	—	20	—	20	20*	40*	—	40	3:00	—	—	—	40	20	20	—	20	4:00	5:00	—	20	20	40	20	20	—	—
1100	3:00	—	—	—	40	40	40	40*	40	4:00	—	—	—	40	20	20	—	—	5:00	6:00	—	15	15	20	—	40	40	—
1200	4:00	—	—	—	—	20	40	40*	40	5:00	—	20	15	40*	—	20	—	—	6:00	7:00	20	10	10	15*	20	80*	40	—
1300	5:00	—	—	20	20	20	40	40	40	6:00	—	20*	15*	20*	—	40*	20	—	7:00	8:00	20*	10	10	10	—	80*	20	—
1400	6:00	—	20	15	15	20	40	40	40	7:00	—	10	10	10	—	20	20	—	8:00	9:00	20*	10	10	10	—	—	20	20
1500	7:00	—	20	15*	10	20	40*	20	40	8:00	20	10	10	10	—	20*	20*	40*	9:00	10:00	15*	10	10	10	—	—	15	20
1600	8:00	20	15*	10	10	—	20*	20	40	9:00	20	15	10	10	—	15	20*	—	10:00	11:00	15*	10	10	10	—	15	15	—
1700	9:00	20	10	10	10	—	15	15	40	10:00	20	15	10	10	—	15	15	—	11:00	12:00	15	15	10	10	—	15	—	—
1800	10:00	20	15*	10	10	—	15	15*	40	11:00	20	15	10	10	—	15	15	—	12:00	1:00	—	15	10	10	—	10	10	—
1900	11:00	20*	15	10	10	—	10	10	20	12:00	20	15	10	10	—	10	20*	—	1:00	2:00	—	15	10	10	—	10	10	—
2000	12:00	15*	20	10	10	—	10	10	20*	1:00	20	20	10	10	—	10	10	20*	2:00	3:00	—	20	10	10	—	10	10	40*
2100	1:00	15*	20	10	10	—	10	10	15	2:00	20	20	10	10	—	10	10	15	3:00	4:00	—	20	10	10	—	10	10	20
2200	2:00	15*	20	10	10	—	10	10	10	3:00	—	20	10	10	—	10	10	10	4:00	5:00	15	20	10	10	15	10	10	15*
2300	3:00	10	20	10	10	—	10	10	10	4:00	—	20	10	10	—	10	10	10	5:00	6:00	15	20	10	10	15	10	10	15*
DECEMBER		ASIA FAR EAST	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN		ASIA FAR EAST	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN			ASIA FAR EAST	EUROPE	S. AFRICA	CARIBBEAN S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN

NOTE: * Means look at next higher band for possible opening.

HAM CALENDAR

DECEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Florida Ham News — Swap Net By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society** Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **West Coast Bulletin** Edited & Transmitted by W6ZF 8:00 PM PST 3540 kHz, A-1, 22 WPM **1**	**AMSAT** Eastcoast Net 3850 kHz 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT** Mid-Continent Net 3850 kHz 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT** Westcoast Net 3850 kHz 8:00 PM PDST (0300Z Wednesday Morning) **2**	**3**	**4**	**5**	**6**
7	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society** Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **8**	**AMSAT** Eastcoast Net 3850 kHz 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT** Mid-Continent Net 3850 kHz 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT** Westcoast Net 3850 kHz 8:00 PM PDST (0300Z Wednesday Morning) **9**	**10**	**11**	**12**	**W9WWJ/9 Dxpedition to Bethlehem, In.** — 1700 UTC December 13 until 1700 UTC December 14, 1980 — **13-14** **13**
Bethlehem's Christmas City Celebration — 2300Z to 0300Z, starting December 15, 1980 and will continue to operate thru January 1, 1981 — W3OK — **Dec 15-Jan 1** **14**	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society** Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **West Coast Bulletin** Edited & Transmitted by W6ZF 8:00 PM PST 3540 kHz, A-1, 22 WPM **15**	**AMSAT** Eastcoast Net 3850 kHz 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT** Mid-Continent Net 3850 kHz 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT** Westcoast Net 3850 kHz 8:00 PM PDST (0300Z Wednesday Morning) **16**	**17**	**18**	**19**	**W4NLX/4 Expedition** — operating from Christmas, Fla. — 1400Z to 2000Z daily — **20-27** **20**
21	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society** Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **22**	**AMSAT** Eastcoast Net 3850 kHz 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT** Mid-Continent Net 3850 kHz 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT** Westcoast Net 3850 kHz 8:00 PM PDST (0300Z Wednesday Morning) **23**	**24**	 **25**	**26**	 **27**
28	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society** Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **West Coast Bulletin** Edited & Transmitted by W6ZF 8:00 PM PST 3540 kHz, A-1, 22 WPM **29**	**AMSAT** Eastcoast Net 3850 kHz 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT** Mid-Continent Net 3850 kHz 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT** Westcoast Net 3850 kHz 8:00 PM PDST (0300Z Wednesday Morning) **30**	 **31**			SEASONS GREETINGS

HI-Q BALUN

- For dipoles, yagis, inverted vees & doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz
- Small, lightweight and weatherproof
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- For full legal power and more
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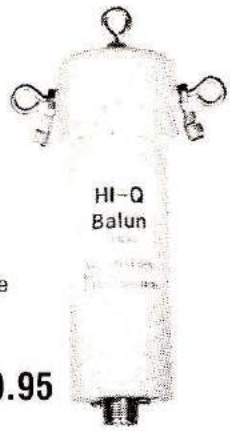
- With SO-239 connector



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May be used for
- Guy wire strain insulators
- End or center insulators for antennas
- Construction of antenna loading coils or multiband traps

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Patent No. 4,091,350

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MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
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D-80	80/75	130'	$28.95	$24.95
D-40	40/15	66'	25.95	21.95
D-20	20	33'	24.95	20.95
D-15	15	22'	23.95	19.95
D-10	10	16'	22.95	18.95
Shortened dipoles				
SD-80	80/75	90'	31.95	27.95
SD-40	40	45'	28.95	24.95
Parallel dipoles				
PD-8010	80,40,20,10/15	130'	39.95	35.95
PD-4010	40,20,10/15	66'	33.95	29.95
PD-8040	80,40/15	130'	35.95	31.95
PD-4020	40,20/15	66'	29.95	25.95
Dipole shorteners - only, same as indicated in SD models				
S-80	80/75		$11.95/pr.	
S-40	40		$10.95/pr.	

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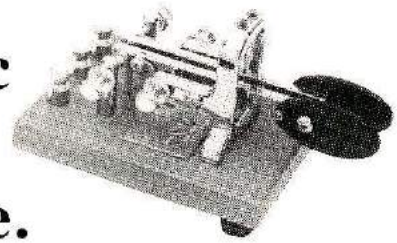

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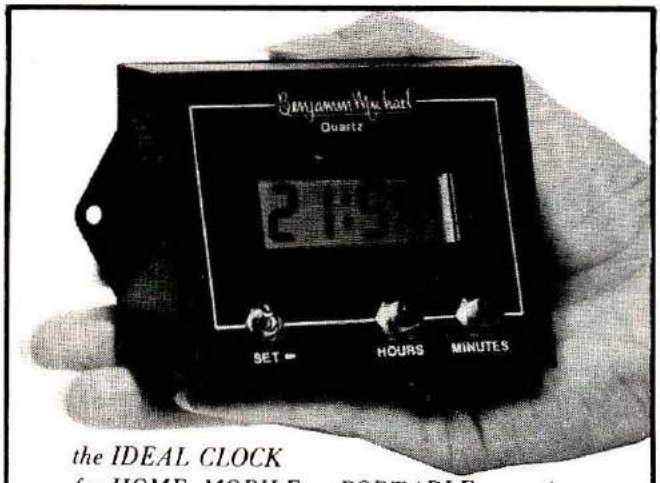

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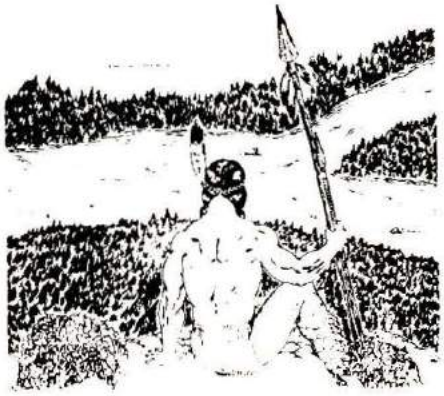

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But thou Bethlehem, though thou be little among the thousands of Judah, from you shall come forth one who is to be ruler in Israel, whose origin is from old, from ancient days.

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Luke 1:27-31 70-90 AD

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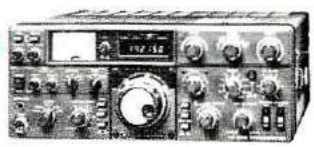

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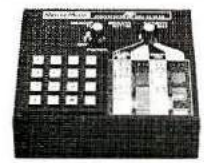

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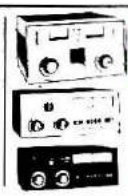

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