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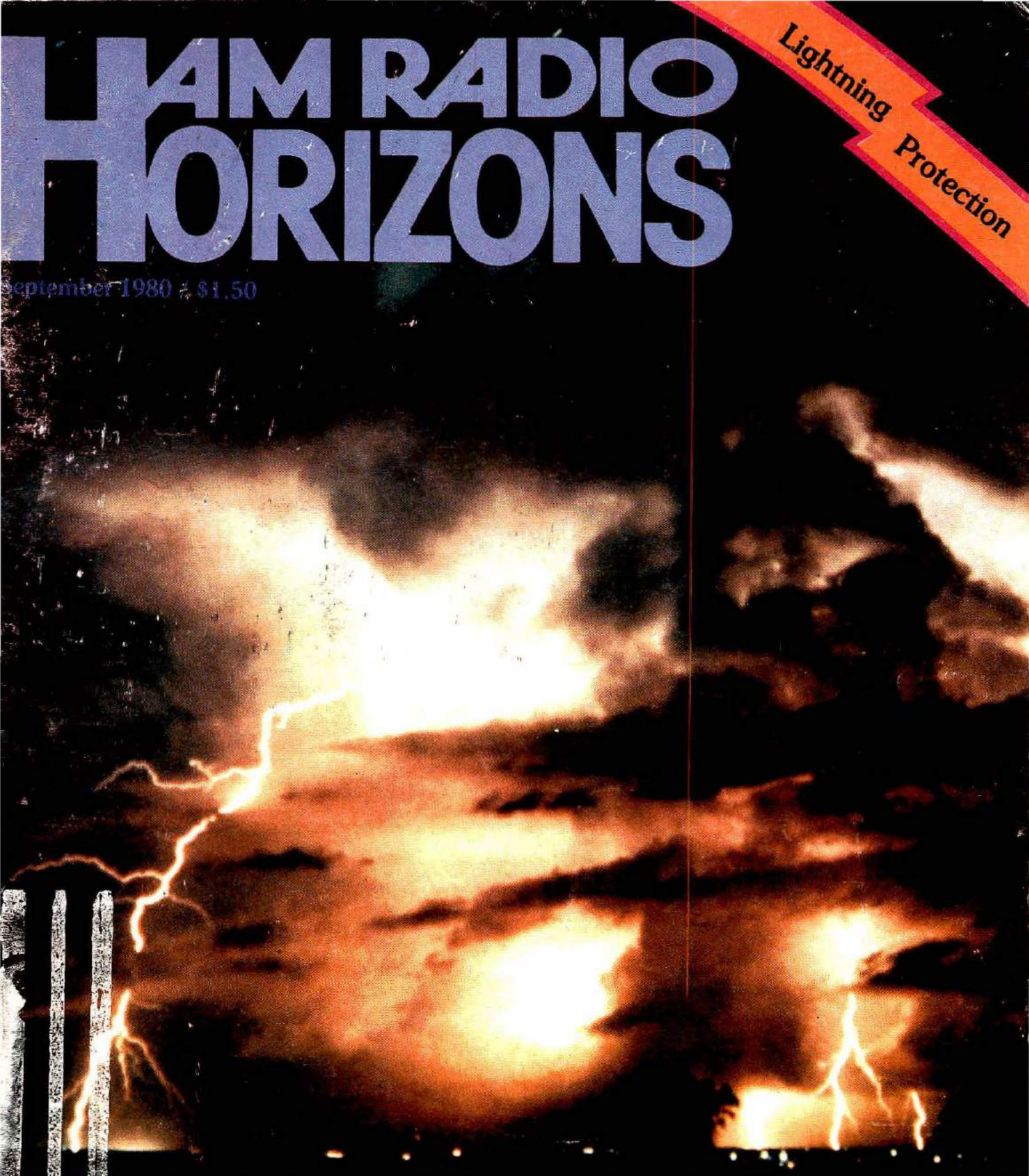

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DELTA — the symbol of change—the name of a great new TEN-TEC transceiver. A transceiver for changing times, with new features, performance, styling, size and value.

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ALL 9 HF BANDS. First new transceiver since WARC. 160-10 Meters including the three new hf bands (10, 18 & 24.5 MHz). Ready to go except for plug-in crystals for 18 and 24.5 MHz segments (available when bands open for use).

SUPER RECEIVER. New, low noise double-conversion design, with 0.3 μV sensitivity for 10 dB S+N/N.

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SUPER STYLING. The '80s look with neat, functional layout. "Panelized" grouping of controls nicely human engineered for logical use. New, smaller size that goes anywhere, fixed or mobile (4¾"h x 11⅜"w x 15"d). Warm, dark front panel. Easy-to-read contrasting nomenclature. Black "clam-shell" aluminum case. Tilt bail.

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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

Lightning Protection

Those atmospheric rumblings heard in the summer and early fall usually send chills up and down the back of almost every Amateur, and well they should — lightning is a part of nature to be taken seriously. What can you do about it? Other than being somewhere else when it hits, there are some measures that will help prevent strikes, and other things to do that will reduce the damage. Most are common-sense precautions, and the price is low, compared to the cost of being unprepared. W1HEO has some pointers for you, starting on page 12.

Inside A Transceiver

Some of us can remember when it required three or four switches to control a rig — one for low voltage, one for high voltage, one for the antenna circuit, and possibly another for the audio circuitry if you were using phone. Today's hams need only say the word (usually "aaaahhhhh") and their rig comes alive. Many other features abound inside the modern boxes that sit quietly on the desktop, and author Grove gives you a peek at what's in there, starting on page 20.

Telephone "Phone"

If you think expeditions are your bag, but can't afford the time or expense, be not dismayed; change the prefix from "DX" to "Mini," and forge blindly ahead.

Getting Started

To the newly licensed Amateur Radio operator, the task of deciding "which way to go" in setting up his station can be a formidable one. Author W8FX provides some valuable guidance to help chart a course through some difficult decisions. The advice starts on page 33.

The Novice Experience

You say you haven't quite made up your mind about becoming a ham? That exam got you scared? Or you're not sure about those Amateur Radio courses offered by a school or club in your area? Well, relax, and read a "life experience" (as the current buzz words go) from a guy who "never got around to it" for a long, long time. He finally took that first step, and found out what he had been missing. You'll read all about it in several installments, and the first one starts on page 42.

Ham Radio Techniques

This month, Bill talks about some novel antennas, including a microwave radiator that can be implanted through a hypodermic needle (!), and takes a look backward and forward at TVI and Hi-Fi interference. Look on page 46.

DXer's Diary

What happens when a rare one shows up on a Sunday afternoon, when all the big guns of the DX world have plenty of time to work him? W9KNI tells you, and the excitement and pace is so tangible that it'll make you perspire just to read about it. Try page 52, if you think you can stand it!

Airtime

September's Airtime selections cover the Delta QSO Party and the North Hills ARC "City of Champions" Award. See page 64.

The Cover

Lightning has instilled fear and awe in mankind for eons, and, although recent studies have taken some of the mystery out of the flash and rumble, it still commands great respect. Our feature article this month treats both the history of lightning studies and some protective measures you can take. Photo courtesy of the National Center for Atmospheric Research.

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The NEW MFJ-406 Deluxe Electronic Keyer sends iambic, automatic, semi-automatic, manual. Use squeeze, single lever or straight key.

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Iambic operation with squeeze key. Dot-dash insertion. **Semi-automatic "bug" operation** provides automatic dots and manual dashes.

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Front panel controls: linear speed, weight, tone, volume, function switch. 8 to 50 WPM.

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Tone control. Speaker. Ideal for classroom.

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Reliable solid state keying: grid block, cathode solid state transmitters.

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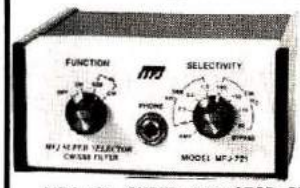

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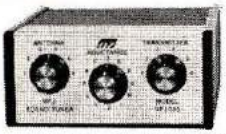

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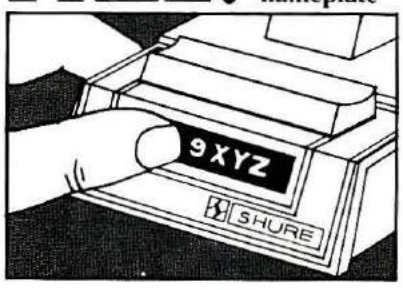
FREE! Personalized call letter nameplate



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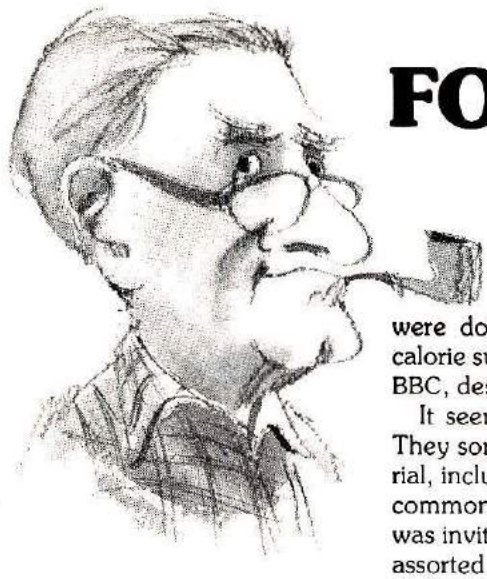

FOCUS & COMMENT

A friend of mine here in the office (W1XU) regularly corresponds with an acquaintance in England, and recently, as we were doing our daily two-mile-around-the-block grind (a good low-calorie substitute for lunch, by the way), he told me about a program on BBC, described by his pen-pal.

It seems that one particular TV channel had an unusual offering. They somehow accumulated a pile of assorted bits and pieces of material, including hardware and bric-a-brac of all sorts. (Sounds like what is commonly found in my basement.) Each week, a group of engineers was invited into the studio, and given the challenge of using this pile of assorted oddments to construct a gadget to perform a specific task — with a time limit of three hours.

One task Jim's friend described was to design a means of transporting an egg a certain distance during the shortest time period (it had to arrive unbroken — no catapults!). Another was to devise a mechanical method of flipping a pancake as you would do if you were cooking, — and the pancake had to land "other side up" inside the frying pan; stuck on the ceiling doesn't count.

This sounds like great fun, and it must be fascinating to watch different engineering approaches to the problem at hand, and to see which group came up with the best (most efficient, least complicated, etc.,) method. I cannot help but wonder why our own Educational TV channels have not offered similar fare, rather than reruns of the nesting habits of the Arctic Tern, etc.

But, then, let's not get off on a tangent — little that I say here will matter at all to the boob-tube industry.

I guess the real thought behind this is that it could be a wonderful way to introduce youngsters (of any age) to the technical side of Amateur Radio. I seem to remember that, a few years ago, some hamfests advertised a "junk-box rig" contest as part of the day's entertainment. The idea was similar to the BBC effort — a well-stocked junk box was provided, and participants were encouraged to dive in and construct a functional piece of gear (of any sort) before the day was out. Entries were judged on originality of thought, uniqueness of application, or usefulness of the end product. It was a lot of fun, with some interesting gadgets produced from the most unlikely pile of stuff.

Now, how about some clubs getting into the act. Set up the ground rules any way you like, but make them realistic. Perhaps a 1-month time period would work, giving the newcomer time to bone up on some theory and come back to the junk box for a second look. Maybe you could use a point system for scoring, with points added for originality, and subtracted for the dollar value of any part which was purchased instead of coming from the junk box.

Being chosen as the winner of the contest would be reward enough for many youngsters, but how about boosting his ego a bit more than that — have the best of the year as an honored guest at your annual dinner or hamfest, or give him an award and send a write-up to your newspaper.

The program will not only show youngsters that there is a lot of fun in Amateur Radio besides operating an appliance, but it will also be a popular subject at your monthly meetings and over the air.

One small problem, though. Someone is going to have to be pretty sharp to judge the entries. But then, your theory needs a bit of brushing up lately, doesn't it?

Tom

Thomas McMullen, W1SL
Managing Editor

Amateur Radio

Just getting started? This book is ideal for you. It will help you get your first license. Or if you already have your ticket, the book will serve as your handy station manual. Written by Bill Lowry, W1VV, it includes a brief description of major activities, equipment and procedures to help the new ham decide where to begin, what equipment to buy initially, and how to make contacts with other hams after the station is assembled. Most importantly, this book tells the beginner how to study for the test, and presents the facts that must be learned in order to pass the written part of the exam. It includes complete FCC rules and official study guide for all license classes. Also included is a colorful call-area wall map.

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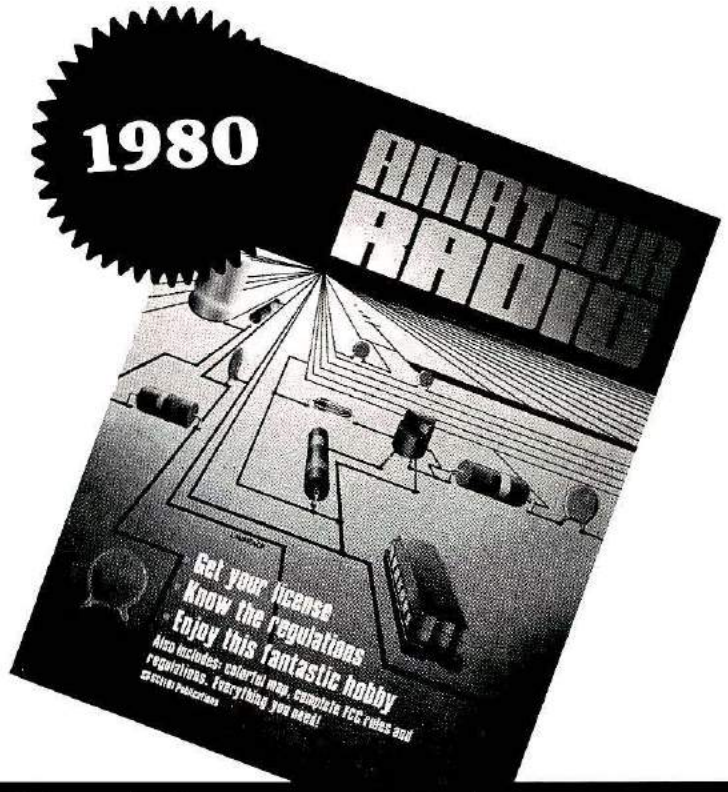

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EXTRA **Hamfest News** EXTRA

Special Edition For Those Seeking a Good Time

October 4 & 5, 1980

THOU$ANDS in PRIZES

Biggest Show in the East

The Great Boxboro Convention Returns!!

Remember the fantastic Boxboro hamfest back in 1978? Well here we go again with improvements galore to make the show even better! Located in the "country" on Route 495 at Route 111 the New England ARRL Convention for 1980 features free shuttle bus service to and from a giant new free parking area — no more parking worries!!

Prizes Awarded Both Days of Show

Through the generous cooperation of the manufacturers and exhibitors lucky conventioneers will be taking home transceivers, antennas, microphones, amplifiers . . . the list goes on endlessly. The event is a non-profit affair and surplus funds go directly into the prize fund.

See Every Possible Make of Ham Gear

Virtually everybody who is anybody will be at the show. Equipment on display should include Kenwood, Icom, HyGain, Hustler, Dentron, Microwave Modules, Kantronics, Yaesu, Cushcraft, Robot, HAL, Ten-Tec, Tri-Ex, ETO, Vomax, Heath, TPL, DSI, Ramsey, Optoelectronics, Larsen, Telex, Wilson, Azden, Collins/Rockwell, etc. etc. Manufacturers and distributors will be there in force.

Big Events All Weekend

Two meter fox hunts, YL programs, seminars on all aspects of ham radio including microprocessors, RTTY, SSTV and DX, a Wouff Hong ceremony, Saturday night banquet show and dance, plus prizes awarded all weekend.

There will be a home brew equipment exhibit and contest, FCC exams, QSL and CW contests, an antique wireless exhibit and special YL programs.

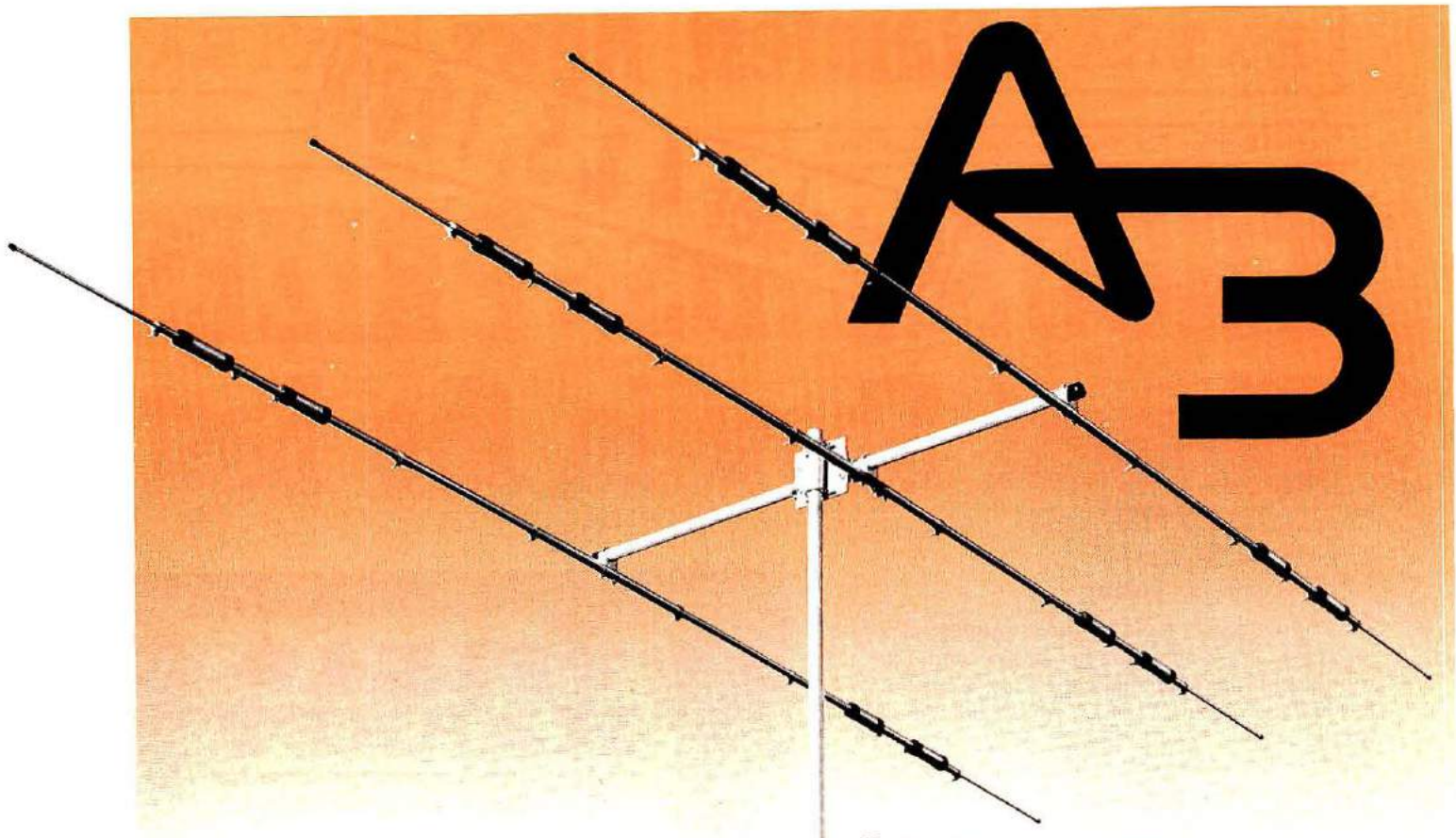
Early Bird Tickets Available by Mail Only!

Registration is $4 early bird, $5 at the door. Banquet and show tickets, $12 each. Order tickets from George Stewart, W1ZQQ, 17 Barnes Avenue, East Boston, Mass. 02128. Include SASE! Hotel reservations must be made directly with the Sheraton Boxboro Hotel, Boxboro, Mass. 01719; $42 single, $46 double. Hotel will NOT ACCEPT phone reservations!

SAVE OSCAR 9-B Matching Fund!

Add 50¢ to your ticket order and we will match it with another 50¢.

More details? Ad Check page 78.



$199.95

The full power, full performance 20-15-10 meter beam.

Forward Gain	8 dBd
Front to back ratio avg.	25 dB
V.S.W.R.	1.2-1 Typical
Average Bandwidth	500 KHz
Power Rating	2000 w PEP
Feed Point Impedance	50 Ω
Connector	Twin terminal stainless steel takes all coax.
Boom	1⅜"-1½" x 14'
Elements/Longest	1⅛"-½" x 27'9"
Wind Sfc. area	5.6 Feet²
Weight	35 Pounds
Turn Radius	15'6"
Mast Diameter	1¼" min. 2" max.
Material	6063-T832 Seamless aluminum
Fasteners	Zinc Plated Steel
Telescope Method	Taper tubing with full circle clamps

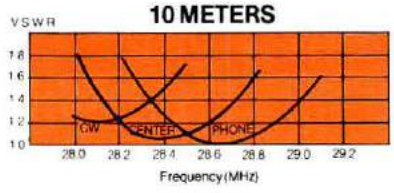
UPS Shippable

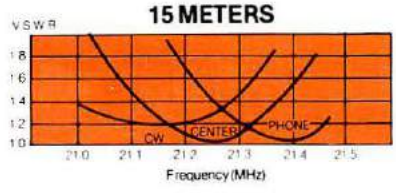
No balun required

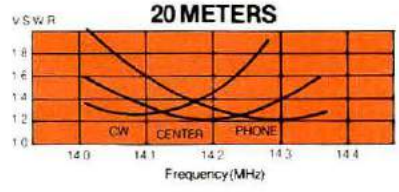
Enjoy the thrill of working rare DX with excellent A3 forward gain. Increase the pleasure of your daily contacts with A3 interference reducing front to back ratio. Use your linear amplifier with confidence in our new A3 high power traps.

Make friends of your neighbors with A3 compact dimensions, low profile, and small turn radius. Satisfy your budget with A3 economy pricing.

The Cushcraft engineering team has again created that unique combination of quality materials, easy assembly and high performance with A3, the three band beam for the eighties.







A LEADER FOR OVER 30 YEARS

cushcraft CORPORATION

The Antenna Company
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108

NEWSLINE

STATE-OF-THE-ART NEW FRONTIERS for Amateur Radio are going to be pushed by the FCC's Office of Science and Technology, the monthly meeting of AMRAD was told by Assistant to the Chief Scientist Mike Marcus on July 7. The Radio Amateur and computer buff group heard that the OST would be preparing a Notice of Proposed Rule Making that would permit Amateurs to use spread spectrum, a sophisticated broadband communications technique that can be used on frequency bands already occupied by conventional discrete frequency stations. He also challenged experimentally minded AMRAD members to apply for Special Temporary Authority to use spread spectrum and advanced digital communications techniques such as packet radio, now in use in Canada. Amateur use of spread spectrum, as he described it, would not be restricted to Amateur bands but could encompass all VHF/UHF frequencies!

He Also Discussed the possibility of a code-free digital license like the new Canadian ticket, noting that thus far only 300 Canadians had passed the digital exam since it's been offered.

27-MHZ SSB EXPANSION was dealt a major setback at a special Commission meeting on July 1, while, in the process, Amateur Radio received probably the most compliments it's had at an FCC meeting in a long time. Back in December, the Commissioners had directed the staff to prepare a Notice of Proposed Rule Making on expansion of SSB-only CB channels, and this meeting was to have approved that NPRM. It didn't work out that way.

The Proposal Was In Trouble almost from the moment the meeting opened. Though strongly supported by the originating Private Radio Bureau and endorsed by the Office of the Chief Scientist, expansion ran into heavy opposition from Field Office Bureau Chief Jim McKinney for rewarding present illegal operators and not solving any real problems. He noted his monitors had already recorded comments from out-of-band operators that they planned to move away from any expansion to maintain "clear channels" and cited CB's lack of self-enforcement and consequent ignoring of the rules (as contrasted with Amateur Radio and its tradition of self-enforcement and respect for the rules). Commissioner Lee then agreed with McKinney's points, saying he couldn't support the item while also complimenting traditional Amateur values.

Chairman Ferris Again Noted the difficulty in distinguishing Amateurs from CBers, and that a few hundred thousand Amateurs had so many frequencies while millions of CBers had so few. Commissioner Washburn objected to the proposed "okay" for skip contacts, while Commissioner Brown questioned Chief Scientist Lukasik on expansion's effect on TV channel 6. License exams were discussed at length, with the conclusion that apparently they're not possible.

FREEDOM TO LISTEN TO RADIO communications would be drastically curtailed by a new bill just introduced in the House Of Representatives. HR-7747, by Rep. Richard Preyer (D - North Carolina) and several co-sponsors, would "prohibit the unathorized reception of private radio communications." By prohibiting reception this new bill goes much further than Section 605 of the Communications Act, which is generally interpreted to ban the divulging of the content of private radio communications.

ARRL'S SOUTHWESTERN DIVISION Convention in Los Angeles September 7-8 also coincides with the 200th Anniversary of the City of Los Angeles, and the mayor's office has asked for Amateur Radio assistance for the bicentennial celebration. WB6VHS of the group coordinating celebration communications is working out assignments so operators who wish to do so will be able to attend the convention as well, and suggests that some out-of-towners may want to take part. Assignments in first aid, security and crowd control are available—contact WB6VHS if interested.

PLANS FOR ANOTHER AMATEUR SATELLITE are accelerating, particularly in the U.S. and Germany. Almost all the contributors to the Phase III satellite have now volunteered to participate in the Phase III-B effort. Discussion is underway over whether this new satellite should be an exact "clone" of Phase III or revised in view of new capabilities and possibilities. However, the issue may not really be resolved until a specific launch opportunity is ensured, since satellite design depends on the vehicle.

Greater Testing and burn-in seem almost certain for the new satellite, enhancing both performance and lifetime. AMSAT's pleas for assistance have thus far been answered by qualified draftsmen and machinists, but still more professional help is needed.

"THE WORLD OF AMATEUR RADIO," the W6AQ/ARRL film, is now available to clubs on a free-loan basis through Modern Talking Picture Service, 5000 Park Street North, St. Petersburg, Florida 33709. Playdate requests should include a first choice and alternates.

THE MOUNT ST. HELENS volcanic eruption death toll now includes two Amateurs among the confirmed dead, Gerald Morton, W6TQF, and Reid Blackburn, KA7AMF.

A SPANISH-LANGUAGE AMATEUR EXAM is now available, though only for Technician/General applicants who don't already have a Novice ticket. The applicant must first pass the CW exam (in English), then ask for the Spanish-language Element 2/3 exam. Other class exams are not available in Spanish at this time.

The ABCs of

BY "DEE" LOGAN, W1HEO

That ominous rumbling in the summer sky and a rising static level in your receiver are warnings that lightning is on its way. For safety-minded Radio Amateurs who have taken pains to install a good ground system, the signs cause no panic. For others, unfortunately, the approach of an electrical storm results in a frenzied scramble to yank ac plugs, disconnect antennas, and pray for escape.

Lightning is a frequently found natural phenomenon. Each day, 44,000 lightning storms bombard the earth with about 9,000,000 strokes. The distribution of these savage electrical storms varies with climate and location, with the highest frequency in equatorial regions. The U.S. average is about 40 storms a year.

The lightning season for most of the northern states extends from early May through October. As you move south, however, the season increases in length. In the Gulf states, lightning storms can appear from early March through December.

The "hit" parade

Between 100 and 150 people in the U.S. are killed by lightning each year. Death is frequently caused by fibrillation of the heart, as is the case with ordinary electric shocks, and the same first-aid techniques can be used in efforts to revive victims.

There are certain locations in the country where lighting damage is more likely than in others. A study in February, 1977, by the Rural Electrification Administration of the U.S. Department of Agriculture produced a lightning probability map. It's based on a mathematical formula taking into account earth resistivity and other factors, plus the annual number of thunderstorm days, see **Fig. 1**.

The calculations show that northwest Florida, southwest Florida, northeast Georgia, and central Colorado are the worst lightning-damage areas in the country. The west coast is the least vulnerable, see **Table 1**.

Lightning Protection

The annual toll of damage and loss from lightning is over $40 million. Over 20,000 fires are caused each year by lightning bolts. Much of this damage is the result of direct hits, either to a building or to the electrical lines near the service entrance. Other damage is the result of lightning-induced surges on power lines, antennas, and conductors in the vicinity.

Spare the rod?

A common sight on the rooftops of American homes just a few years ago was the lightning rod. It symbolized the respect that mere mortal homeowners had for the awesome power of lightning. Today, a drive through suburbia reveals that the lightning rod has faded from the scene. Unfortunately, lightning has *not*.

The popularity of the ground-plane antenna has produced a new substitute for the lightning rod. Few consider it as more than a radiator of rf energy, but when installed on a roof, the vertical ground-plane antenna serves as a likely target for a bolt from the not-so-blue sky. When well-grounded, the ground-plane antenna can serve to divert a surge from seeking a lower point on the roof.

There is ample information today on how we can protect against the real zapping of America. Prudent people — ham radio operators in particular — can take steps to protect

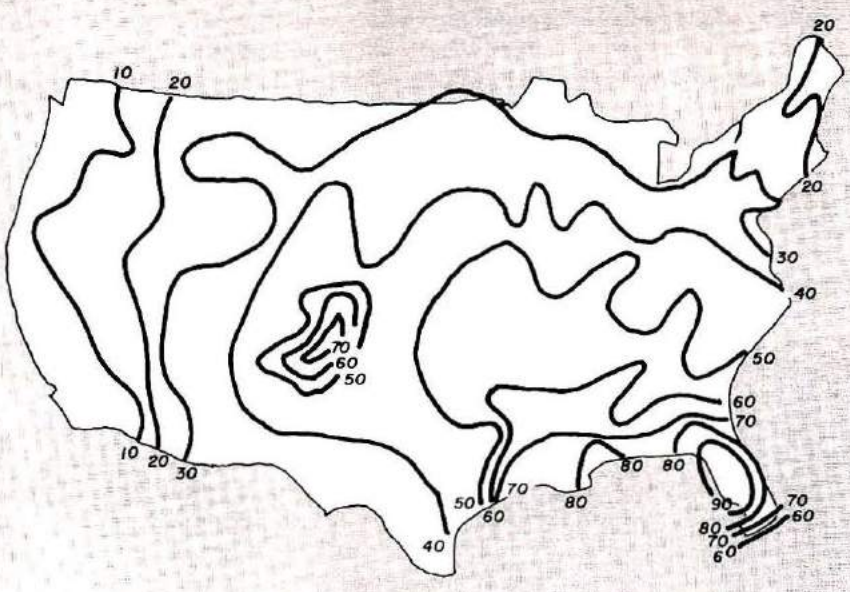


Fig. 1. Average thunderstorm days in the United States.

Table 1. Lightning-damage probability. Source: Rural Electrification Administration study of February, 1977.

Geog. area	Earth Res. zm	Storm days per year	"Fig. of Merit"	Lightning Damage Probability
NW FL	1,000	80	11,520	Very high
NE GA	1,000	55	6,655	
SW FL	250	110	4,840	
C CO	500	60	4,140	
NE WS	500	52	2,974	
E TN	500	50	2,875	– 2900 High
C WV	500	45	2,531	
C ME	1,000	25	1,938	
W TN	250	53	1,615	
SE AZ	250	50	1,375	
NW MS	125	52	743	– 1000 Average
NW NY	250	30	675	
E NV	250	30	630	
C UT	125	40	520	
NW MN	125	35	475	
C OK	67	53	433	
C IL	67	50	419	
C NM	67	50	385	
S ME	500	15	382	
C LA	67	45	353	
SW KA	67	45	339	
NE TX	67	47	325	
W NV	250	18	243	
SE TX	33	55	200	– 200 Low
C KA	33	50	198	
C MT	67	30	187	
W KA	33	45	167	
C ND	33	33	111	
W VA	500	7	93	
W CA	125	5	11	– 80 Very low

themselves and their property. The latter most emphatically includes our expensive radio gear!

A good lightning protection system for the Radio Amateur would cover three major areas: grounding of radio equipment and antennas, avoiding easy entry of lightning charges via the electrical service entrance, and proper installation of a good ground system.

The accepted standard for lightning and fire protection is the National Electrical Code adopted by the National Fire Protection Association (NFPA). Installations made in conformance with this code will assure the Radio Amateur little grief with the law or insurance adjusters, should a claim arise.

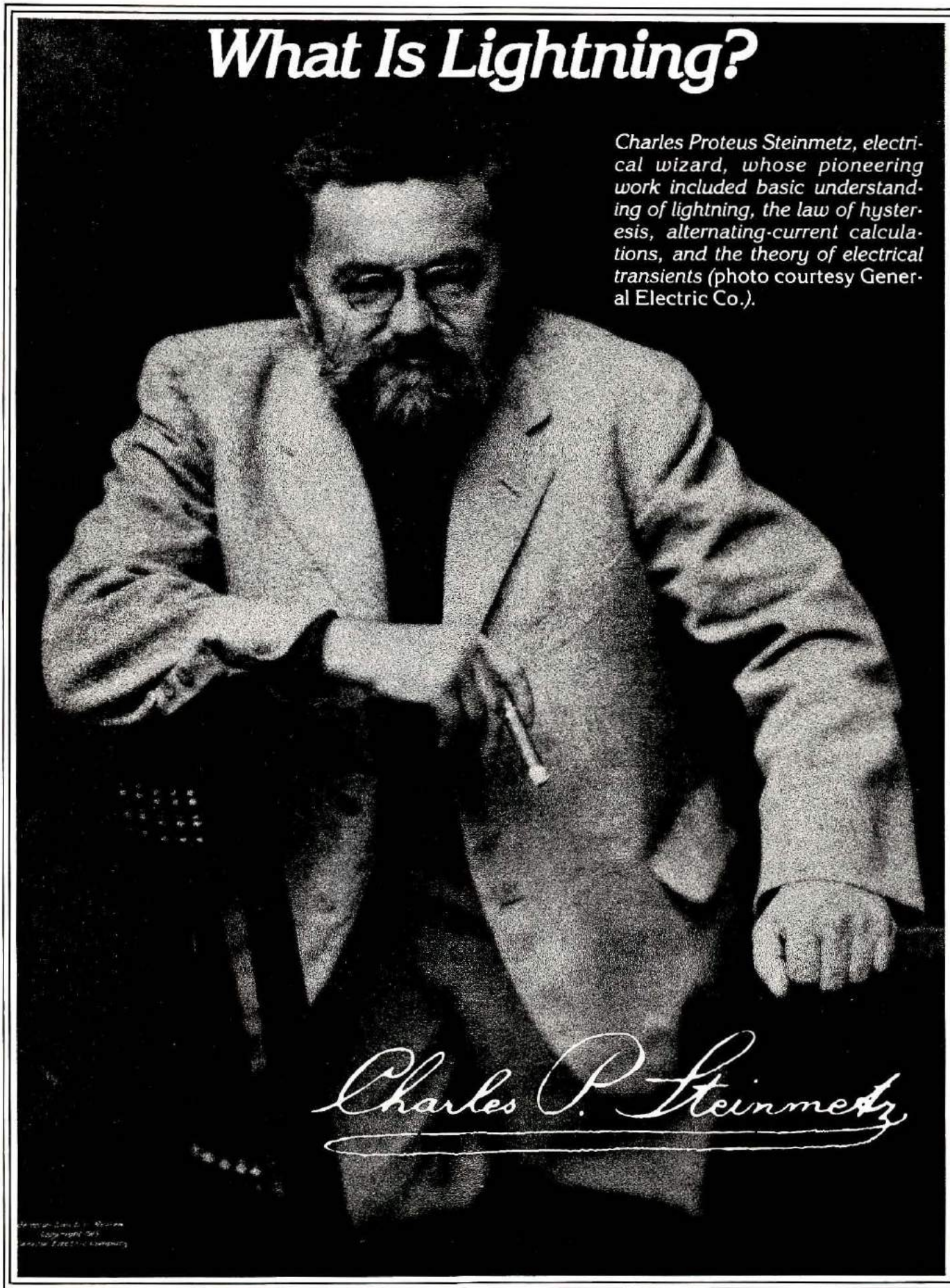
Part of the NFPA code deals with radio and television equipment. For example, outdoor antennas and feedlines running to a building shall not cross over electric light or power circuits, and should be kept well away from all such circuits so as to avoid possible contact. Masts and metal structures supporting antennas shall be permanently and effectively grounded, without intervening splice or connection. Each conductor or lead-in to radio transmitters shall be provided with a lightning arrestor, or other suitable means, that will drain static charges from the antenna system.

AC lines

One of the easiest ways for a lightning surge to enter your home and radio shack is the main ac power line. Some induced surges can be several volts in amplitude and be sufficiently high to burn out or harm any electrical device plugged into the household lines. The accepted practice is to allow surges on the incoming service line to be bypassed to ground by means of a lightning protector installed at the service entrance. A typical unit is the GE TLP175, a Thyrite® disc type that will perform its protective function repeatedly without maintenance, see photographs.

Since other spikes on the ac line can be induced by surges *inside* the home due to inductive "kicks" from solenoids, motors, or the switching on or off of an appliance, protective devices may be installed at the ac input of radio equipment, TV receivers, and other solid-state devices. The va-

What Is Lightning?



Charles Proteus Steinmetz, electrical wizard, whose pioneering work included basic understanding of lightning, the law of hysteresis, alternating-current calculations, and the theory of electrical transients (photo courtesy General Electric Co.).

Different Strokes

Until Ben Franklin's famous kite-flying experiments in 1752, thunder and lightning carried mysterious significance. Ancients gazed skyward at the thundering clouds, imploring Zeus and his bolt-hammering associate, Vulcan, to spare them another hair-raising experience.

While Ben's observations first identified lightning as electricity, it escaped serious study until early in this century. Then, a very large intellect, carried in a small body belonging to Charles Proteus Steinmetz, began laboratory experiments that quantified lightning and helped man understand the means needed to tame it.

Steinmetz was a tireless experimenter who frequently worked long into the evening, at his Schenectady, New York, home, on arc-light electrodes. The flashing blue lights undoubtedly attracted the attention of neighbors, who observed the electrical wizard's bearded chin, ever-present cigar — and fondness for unusual pets such as Gila monsters and alligators — and undoubtedly branded him eccentric. Yet, Steinmetz was the first to make key observations on the protection of electric-power transmission systems. He was called, "the man who tamed lightning."

From such experimental work unfolded an understanding of the anatomy of lightning. Sensitive instruments measured it, and the high-speed, rotating-lens camera showed it to be a complex phenomenon of many components rather than a single bolt.

By definition, lightning is a gigantic electrical spark, resulting from millions of volts and thousands of amperes hurtling between clouds and earth, and produced by the attraction between positive and negative electric charges.

Lightning is accompanied by thunderstorms which develop with the formation of massive clouds and rapid updrafts of moist air rising by convection from a hot, humid area. Within this major upheaval are produced charges of hundreds of millions of volts, adequate to produce lightning strokes from cloud to earth, or among clouds. Separation of charges and resulting voltage buildup can be rapid as evidenced by the number of strokes occurring while a storm passes over an area.

Lightning bolts descend from the sky in a series of successive, hesitating steps. Total time for this zig-zag route may be as much as 1/150th of a second.

Stroke voltages may start at hundreds of millions of volts between cloud and earth, but when the bolt hits earth, mutualization of charges somewhat reduces the voltage. However, millions of volts can still be delivered to the building, tree, power line, or antenna which is struck. Actual voltage depends upon the amount of current, conductivity of the struck object and impedance of the path to true ground.

Depending upon the violence of the storm, the stroke current may range between 1,000 and 200,000 amperes. Stroke current flows through the leading node of a bolt, and usually builds to a peak within one to ten microseconds after the bolt completes contact with the earth.

About half of the lightning strokes are multiple, with from 2 to as many as 42 individual strokes. They're caused by quick recharging of the cloud area and may last for as long as 1.5 seconds, with cumulative energy and destructive force also multiplied.

When a stroke is about to take place, the surrounding surface of the ground for a radius of several miles carries an electrical charge. As the lightning stroke takes place, this surface charge moves radially toward the ground end of the air path, forming an electric current in the ground. At the point where the discharge enters the ground, the current density becomes high. If the flow takes place through a foundation wall, such as your shack, damage is likely.

In view of this, ground systems should be distributed rather symmetrically outside and around the circumference of your house and shack rather than grouped on one side. With ground connections properly distributed, the current will be collected at the outer extremities, with the flow underneath your home minimized. At least two ground connections should be made at opposite sides of your house.

Lightning Protection

Charles Proteus Steinmetz, left, "the man who tamed lightning," in 1922 demonstrated his artificial lightning generator to Thomas A. Edison in Schenectady, New York (photo courtesy General Electric Co.).

ristor is one electronic device that chops off surges at 600 volts, protecting the circuits beyond.

Like the ac line, any conductor entering a home or ham shack supplies easy entry for lightning surges. Therefore, the best protection is to completely disconnect all equipment from antennas and eliminate all paths for strokes. Rotator cables are frequently overlooked, but should be disconnected during electrical storms.

Transmission lines

Any lightning surge that hits your antenna feedline will follow it into your shack unless it is bypassed to ground *outside* your dwelling. Some commercial devices are available that can be inserted in the coaxial line — the "Blitz bug" and Hy-Gain's LA-1 and LA-2 are examples — and when connected to ground will provide some protection.

Installing your feedlines so that they enter your shack via SO-239 chassis fittings mounted on the outside wall allows rapid disconnections when your station isn't in use.

For open-wire feedlines, a simple lightning arrestor can be made with copper or brass strap mounted on three stand-off insulators. A spark gap between the two conductors is connected to ground, adjusted so that it doesn't arc at the highest power level operated, see **Fig. 2**.

Long wires, with the antenna running directly to the transmitter, are a particularly dangerous lightning path. Either the conductor should be disconnected completely or an outside spark gap should be mounted at the point of entry into the shack wall.

Any feedlines that are grounded *inside* your shack will allow voltage spikes and surges to gain entry, and should be considered risks of fire or damage to your radio equipment.

There are many coaxial switches sold that offer automatic grounding of antennas when not in use, and antenna tuners that are equipped with a "lightning protect" position, but both allow lightning to come inside your shack. They will protect against static buildup on the antenna system, but any solid hit will carry high currents ample to cook wafer switches, and most coaxial switches as well.

The best protection is to keep lightning *outside* your shack!

Equally important is disconnecting the ac lines from your radio gear when not in use and when thunderstorms are most likely.

Ground wires

The conductor used for grounding connections should be equivalent in strength and cross-sectional area to a No. 6 AWG (4 mm) copper wire. Solid wire is ideal.

If aluminum wire is used for a ground conductor, it should not be used in conjunction with copper, copper-covered, or copper-alloy fixtures.

Materials used for the ground system should be resistant to corrosion, according to the NFPA code. No combination of materials should be used that forms an electrolytic couple so that corrosion is accelerated in the presence of moisture.

Ideal ground rods are from six to ten feet long, and are usually made of solid copper, copper-clad pipe, galvanized pipe or galvanized iron rod.

The ground system

A good ground system is easily made in areas where the soil has low resistance — moist soils near salt water are ideal — but will require more effort if rocky, dry conditions prevail.

Properly made ground connections are essential to a well-functioning system, and every effort should be made to provide ample contact with the earth. Where good, moist soil exists, a ground rod ten feet into the ground will provide a resistance of from 20 to 50 ohms, and two such rods connected together, one at each end of a house, will be adequate for collecting and dissipating the energy of a flash.

If your soil is rocky, as it is here in Connecticut, conventional grounding methods will be difficult. Most kinds of rocks are insulators, or at least of high resistivity, so to obtain an effective ground, an extensive network of wires can be laid on the surface of the rock — much like an antenna counterpoise — or pushed into slits cut in the soil to cover the wires and avoid the hazard of tripping passers-by.

Such a wire web will include areas where the resistance to earth is high, but at the same time the potential dis-

tribution around the house is substantially the same as though it were resting on conducting ground, and the protection resulting is also about the same.

One technique used by hams with dry, rocky soil is to add salt to the soil surrounding a ground rod. If a post-hole digger is available, the rod can be inserted after a hole is cleared of rocks and gravel and filled with a mixture of commercial salt and topsoil. Try to avoid getting the salt near the surface, or grass will have a hard time sprouting. Putting a ground rod near drains or downspouts will work, as they help keep the soil moist.

It's recommended that all ground systems in the house be bonded together. The copper or lead water pipes, and telephone ground wire, should be included, together with the ground of the electric service. Common bonding is recognized as the most effective method of preventing side flashes resulting from a lightning discharge.

Conductors should be installed with consideration for offering the least impedance to the passage of stroke current between the air terminals and ground. The most direct path is best, and there should be no sharp bends or narrow loops for the lightning to jump across on the ground. The impedance to ground is almost inversely proportional to the number of widely separated paths, so from each roof- or tower-mounted air terminal there should be at least two paths to ground.

Towers and masts

By their nature, towers and vertical structures are ideal "targets" for lightning and should be well grounded. The tower and its guys should be connected to the main ground system, and a separate ground rod should be installed near the base of the tower. A radial system of ground wires extending away from the tower base is effective, and each wire should have an individual ground rod connected at its end. If these radials are cut for one-quarter wavelength, they will naturally serve as rf grounds should the tower be shunt fed and used as a vertical antenna. The radials should be spaced about ten feet apart at their ends, and the main tower ground rod should *not* run through the concrete base if one is used to support the tower. The reason is that with a direct strike, the high current would likely heat the base material and cause it to explode.

An rf ground and a lightning ground may not be the same, as many apartment-dwelling hams have discovered. If the radio shack is located several floors up, the ground wire may become resonant on several bands and lose its effectiveness for rf purposes. One solution is to add quarter-wave resonant lengths.

Boats

For Radio Amateurs operating maritime mobile, the installation of antennas on the mast is a common procedure. In such cases, the radio antenna may serve as a lightning-protective mast provided it has adequate conductivity and is equipped with lightning arresters, lightning-protective gaps, or a means of grounding during electrical storms.

Obviously, materials used for grounding systems on boats should be resistant to corrosion. Avoid using combinations of metals that form galvanic or electrolytic couples. Number 8 AWG (3.3 mm) copper is recommended.

If a vertical antenna is used that has a loading coil at the base, consider the antenna as ending immediately below the coil. A suitable gap should be provided for by-passing lightning current.

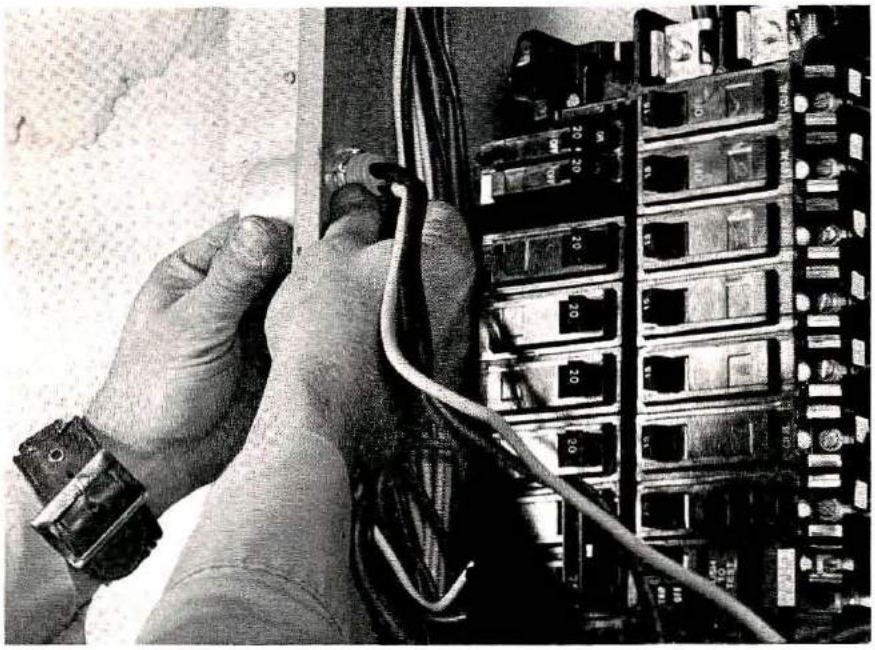
A current connection for a boat consists of any metal surface normally submerged in the water and that has an area of at least one square foot; propellers and metallic rudders may be used. A steel hull also provides an adequate ground.

Protecting lives

Most of our discussion has involved the protection of property — including our radio equipment. But please remember that simple safety precautions can also help protect lives against severe injury or death due to lethal strikes or high-voltage shock.

The lightning hazard is greatest among those who are outdoors a great deal. For those who are inside buildings during electrical storms, the risk is far less and serious injuries are

To operate General Electric's new Voltage Spike Protector (VSP), simply plug the VSP into any 120-volt grounded alternating current (ac) receptacle, and then plug the cord from your TV set, radio, or stereo into the VSP (photo courtesy General Electric Co.).



A home lightning protector installed on the main ac service entrance will bypass lightning surges to ground and guard appliances and radio equipment plugged into the ac system (photos courtesy General Electric Co.).

rare. It has been said many times that to seek shelter from an electrical storm by standing under a tree is a mistake, and an invitation to a lightning strike. Working around towers, masts, and various antennas with a thunderstorm approaching is also a bad bet. Avoid the high ground and any conductor that could suddenly get "hot" in the event of a strong buildup of electrical potential.

Seek shelter in one of these places if possible: large metal-frame buildings, homes that have lightning protection, automobiles or buses with metal tops and bodies, trains, trailers with metal bodies, enclosed metal boats or ships, or on city streets that are shielded by nearby buildings.

In heavily urbanized, built-up towns and cities, the hazard isn't as great as in the open country. Barns and other large, isolated buildings are the most prominent targets for lightning in a large open area. In hilly or mountainous districts, a building on high ground is usually subject to a greater hazard than one in a valley or otherwise sheltered area.

During an electrical storm, be sure to remind other members of the family to stay away from electrical appliances or plumbing fixtures such as faucets, etc. Taking a shower or bath during an electrical storm is ill-advised, since a lightning strike in the neighborhood could send severe high-voltage surges through the ground, and the surges can travel along conducting pipes. Pulling the plug on the family TV set is also a good idea, although the kiddies in the household might stage an instant protest.

Every ham shack should have a fire extinguisher handy, and additional units should be mounted conveniently on each floor. The rating should be such that the contents are effective against *electrical* fires in particular.

First aid

What do you do in the event someone is shocked by a lightning-induced surge or an electrical short circuit? Follow the basic rules of first aid for an electrical emergency.

If the victim is in contact with *live* electricity, first shut off power. If this isn't possible, call the power company. An alternative is to free the victim from the "hot" wire or appliance using either a dry rope, dry board, or dry stick, making sure that your hands are dry and that you're standing on a dry surface.

Then, treat for asphyxiation. Use the standard methods of mouth-to-mouth, or the modern cardiopulmonary resuscitation (CPR) technique of artificial respiration.

For shock, get medical aid as soon as possible, and in the meantime keep the victim warm, placing the head lower than the feet. If the person is conscious, give fluids unless the victim is nauseated or has a penetrating abdominal wound.

If the victim has burns, cut away loose clothing, cover the burned area, and around it, with sterile dressings to keep out air.

Conclusion

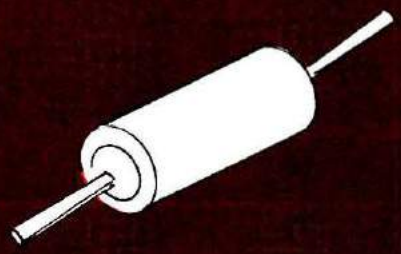
Lightning is a serious business, but it need not cause you to give up a wonderful hobby, or to lose a lot of gear for lack of protection. Provide low-resistance paths, in several directions, outside your shack to encourage lightning to take the shortest route. Hook some protective devices across the ac line to suppress spikes and surges, and then disconnect your lead-in wires when things really start grumbling. You'll sleep a lot easier and still have a rig for tomorrow morning's DX search.

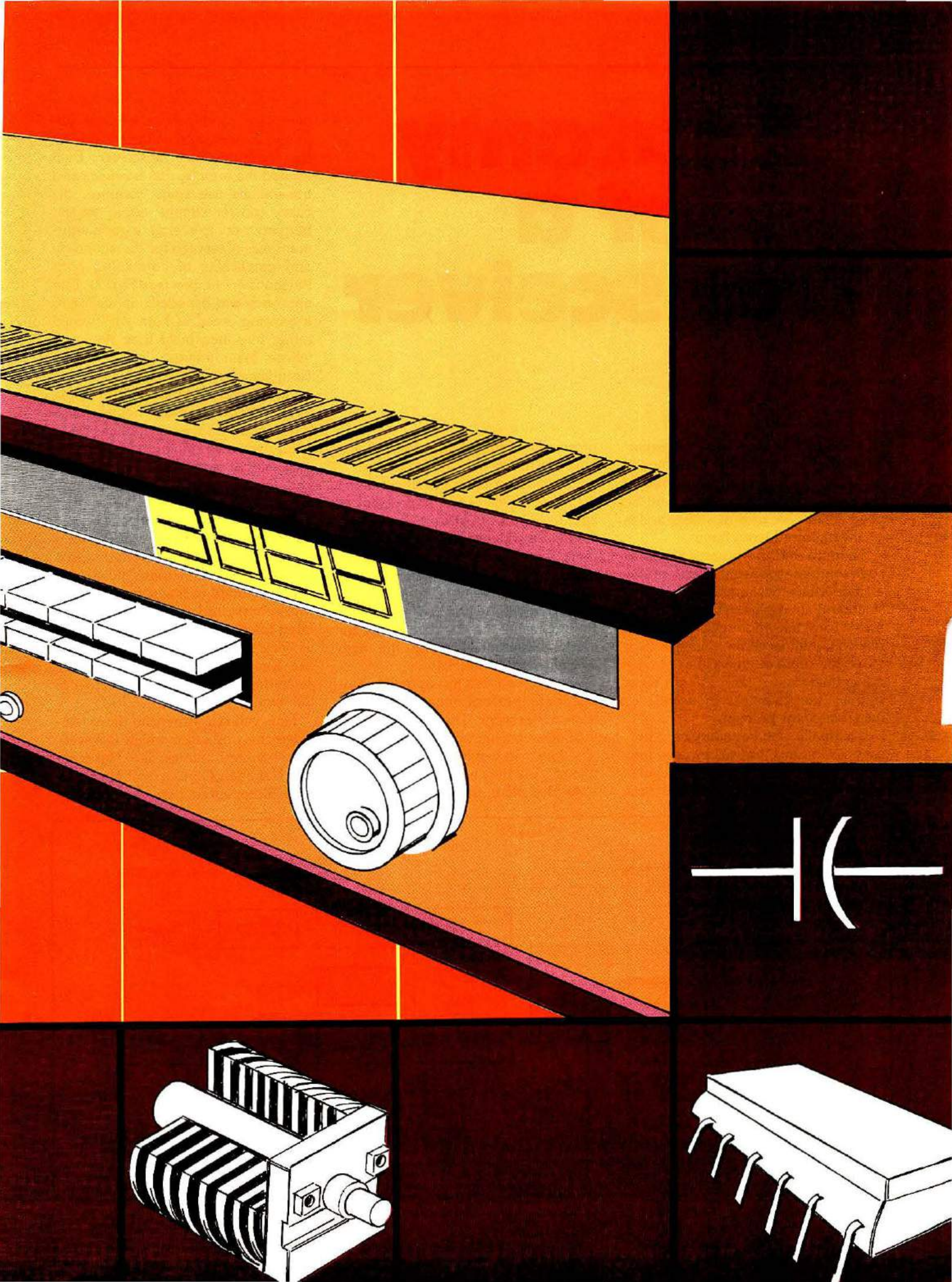
HRH

The Anatomy of a Transceiver

A look at the miracles of modern design

ROBERT GROVE,
WA4PYQ





Anatomy of a Transceiver

Not too many years ago, the beginning Amateur had few decisions to make in selecting a rig. Transmitters were separate from receivers, and he used either CW or a-m voice modes on the high-frequency bands.

As more and more users began to soak up radio-spectrum space, mutual interference became a serious consideration in design. Adding to the melee were television receivers by the millions. Hams came under attack more and more often because of television interference, and TVI kits were sold by the countless thousands to help reduce the problem.

Eventually, the Federal Communications Commission was pressed into the struggle, and a series of regulations were enacted to ensure that proper interference suppression was built into the rig right at the factory.

Cleaning up the transmitters didn't do much to alleviate the problem of spectrum congestion, however. Those old wideband a-m signals used more than twice the frequency space necessary to convey their information. Narrow-band techniques became mandatory, and single sideband (SSB) became the standard mode for voice communications on the high frequencies (3-30 MHz).

The receiver was just as guilty of inadequate performance as the old transmitters were. They were insensitive, noise-prone, unstable, wideband . . . they, too would have to be redesigned. And they were.

As the older transmitter/receiver, two-piece combinations became obsolete, a new style of radio came to the forefront: the transceiver. Built around the premise that receivers and transmitters use some common circuitry (power supply, audio stages, frequency control, etc.), a good argument was presented for the economy and practicality of combining both functions in one box (see **Fig. 2**). The approach was especially appealing to a growing breed of ham who would rather buy than build their rigs, and whose main interest was operating (sometimes referred to in depreciating terms by the old-timer as the "appliance operator"). True, not all hams have either the time or the interest to build their own equipment, and sagging sales at parts supply houses testified to the growth of the "factory-wired" market.

Radio surplus inventories of choice components dwindled, and Japanese-manufactured imported transceivers became increasingly attractive. Regarded at first with suspicion, these imported transceivers were often referred to by cynical old-timers as "rice boxes." Nevertheless, names like Yaesu and Kenwood began to catch the eye — and the wallet — of the ham.

Few veteran American firms survived the onslaught which followed; time-honored names like Hallicrafters, National, Gonset, and Hammarlund disappeared from the Amateur

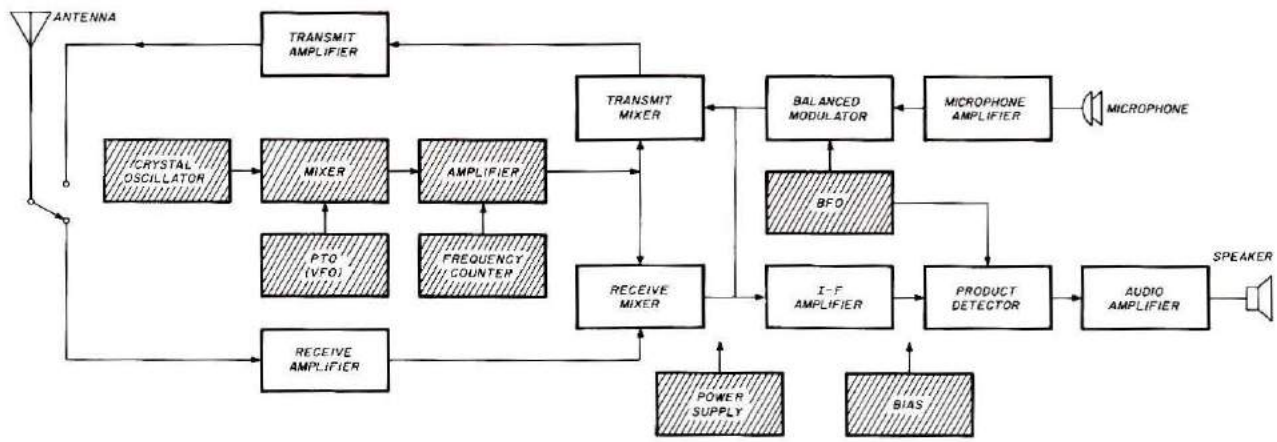


Fig. 1. A block diagram of a modern transceiver. The shaded portions indicate circuitry that is shared by both the transmitter and the receiver. For clarity, switching is not shown.

Fig. 2. The "OFFSET" control, top center, is sometimes called Receiver Incremental Tuning (RIT). This allows you to change the receiver's frequency slightly without disturbing the transmitter's setting. It's useful for following a "drifter," or for working DX stations who are not listening on frequency.

marketplace. And yet, other American firms were born: Swan, Drake, and Ten-Tec to name a few.

Their products were good, the prices were affordable, and their products are found in many hamshacks today.

This month we are going to take a close look at a typical American-made Amateur transceiver marketed for the high-low frequency bands: the Ten-Tec OMNI-B will serve as an example.

A good look at a rig

Even a casual glance at one of these new rigs reveals a host of features hardly dreamed of in the early days of a-m transmitters and receivers: receiver offset tuning (RIT), tunable notch filter, voice-actuated operation, digital frequency display, all-solid-state construction, and automatic level control.

The OMNI is a six-band rig in the sense of Amateur operations, (160, 80/75, 40, 20, 15, and 10 meters), but includes 10-MHz WWV for receiving time signals. This convenience is included in Kenwood, Yaesu, and Drake. Since each band tunes slightly more than 500 kHz, (except 28-30 MHz) licensed out-of-band operation, such as on the MARS frequencies, is possible, as is reception of non-Amateur signals. This feature is also shared on products from Icom and Swan. The Drake TR-7 and Collins KWM 380 include a general-coverage receiver, and Palomar's PTR-130K *transmits and receives* from 1.8-30 MHz inclusive!

All high-frequency transceivers use a common oscillator to control both transmitter and receiver, thus you are ensured of being on-frequency when you call another station. In some cases, it is desirable to transmit slightly off frequency; a receiver offset control (RIT) allows this flexibility (see **Fig. 2**). It is analogous to the "delta-tune" feature found on many CB sets, and permits fine tuning your receiver on the other fellow's signal without moving your transmitter off frequency. In the days before offset tuning, it was common to hear two hams working one another and moving up and down across the band trying to tune in one another!

The Receiver

Offset tuning for the receiver sections of transceivers which have this feature is accomplished by switching in a set of varactor diodes (see **Fig. 3**). These are devices which change capacitance with applied voltage. A front-panel potentiometer changes that voltage, thus altering the frequency of the normal receiver tuning circuit.

Preselector

A preselector peaks incoming signals by resonating (tuning) the rf amplifier circuit of the receiver (see **Fig. 4**). Some transceivers, such as Kenwood's TS-120S, are automatically tuned on both transmit and receive modes.

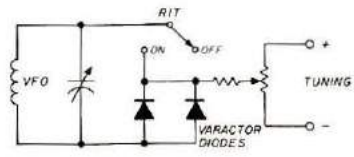
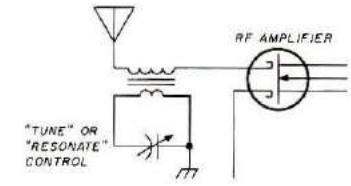


Fig. 3. Varactor diodes are switched into the VFO circuit for offset tuning.

Fig. 4. The receiver rf amplifier, or input stage, is tuned by a front-panel control for better rejection of out-of-band signals and noise.



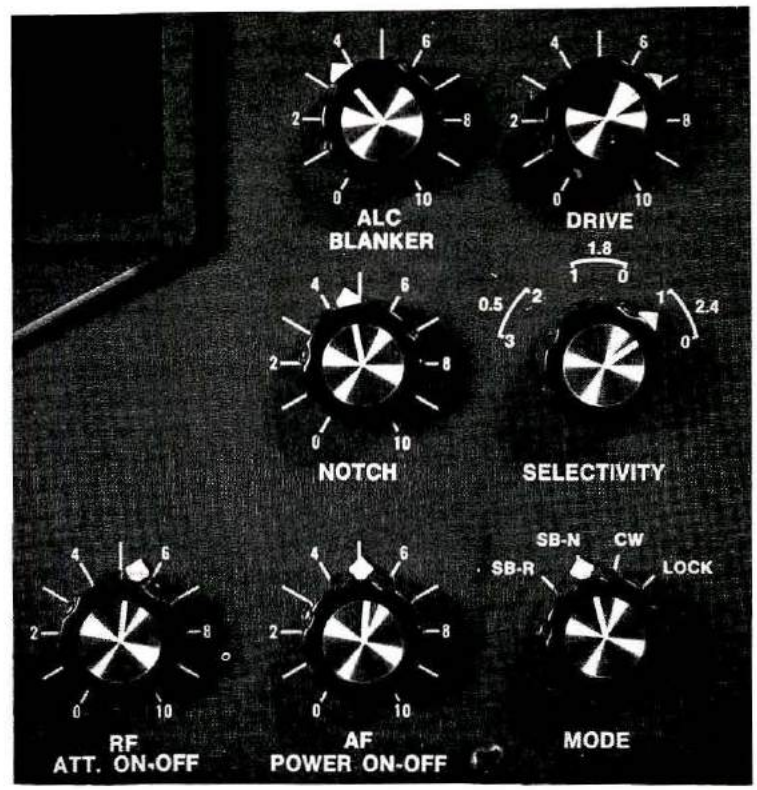


Fig. 5. The NOTCH and SELECTIVITY controls are very important for the receiver, and the DRIVE control helps keep the transmitter from overworking. See text for details on these functions.

Bandswitch

The choice of band for both transmitting and receiving is accomplished by rotating a multi-section bandswitch. The switch provides the correct sets of inductances and capacitances for proper resonance on the bands selected. When set for 10-MHz WWV, the transmitter circuitry is defeated to prevent accidental or unlawful transmission on that frequency.

NOTCH and SELECTIVITY are among the handiest of receiver controls, **Fig. 5**. In many cases, they will spell the difference between failure and success from a reception standpoint. They work totally opposite from one another in terms of technique.

Selectivity

The selectivity control is a step-selectable bandwidth control; it permits the operator to choose how wide a portion of spectrum around the wanted signal will be detected. Obviously, it is advantageous to make this bandwidth as narrow as possible to avoid interference from adjacent-frequency signals. With too narrow a bandwidth, however, intelligibility of the desired signal suffers. A compromise is therefore often necessary, allowing a slight amount of nearby interference to come in, in exchange for high intelligibility of the desired signal (as in **Figs. 6** and **7**). If the interference has a well-defined pitch, as in **Fig. 6**, it may be tuned out by a good notch filter.

Notch filter

A notch filter is a sharply tuned (high-*Q*) filter which may be adjusted over an audio-frequency range, typically from 250 to 7000 Hz. It will trap out any audio frequency to which it is tuned. This will substantially reduce many types of interference, and when used with a narrow i-f filter, single-signal reception is often a reality.

Attenuator

The volume control is nothing new, nor is the way in which it operates, an rf-gain control with its built-in attenuator is unusual.

To prevent the delicate front-end circuitry from being overloaded by a strong nearby signal — and to reduce distortion on unusually strong signals — a set of PIN diodes may be switched into the circuit, forming an attenuator. They, in effect, short out part of the incoming energy.

Noise blanker

A noise blanker is another popular feature of modern transceivers. Automatic noise limiters (ANL) are found on many less expensive receivers. They work by smoothing out noise peaks, such as ignition noise, by clipping any excessive voltage peaks as they appear in the audio circuitry.

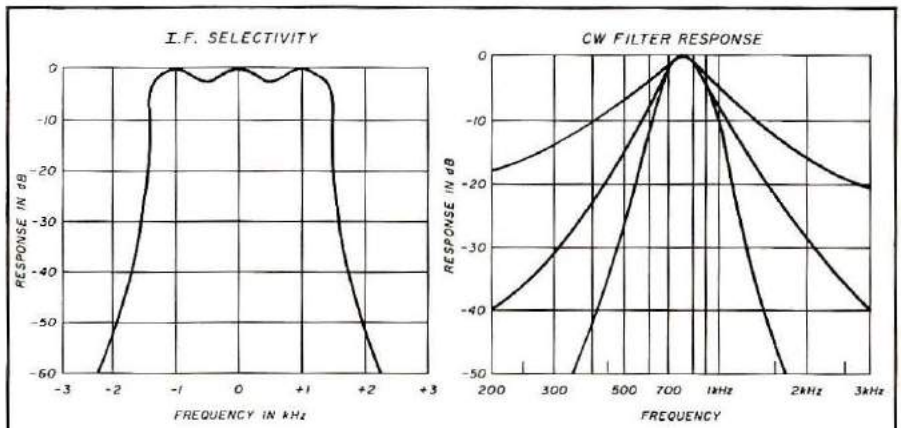


Fig. 6. Selectivity in the i-f system can help keep interference out of your receiver by limiting the response to a narrow segment of spectrum, left. Audio filters can further eliminate interference by reducing the range of tones that you hear in your headset or speaker, shown at right.

However, a noise blanker senses each spike of noise, shutting off the receiver for a fraction of a second while that spike occurs. Our ears usually do not notice this brief period of inoperation, and thus a signal is easier to copy. Noise blankers are superior to noise limiters in this respect, and a distinct advantage when considering a rig. They are available on transceivers from virtually all manufacturers.

The Transmitter

While modern receivers boast features which are certainly a far cry from the old Hallicrafters days, new transmitters also show true state-of-the-art innovation.

On most high-frequency (i.e., 1.8-30 MHz) transceivers, two modes of operation are available: CW and single sideband, with a choice of either upper or lower sidebands.

Because of the good frequency stability required by single-sideband communications, the tunable oscillator must be extremely well designed. The modern approach is to use a permeability-tuned oscillator (PTO), pioneered by Collins Radio Company and widely used in their classic "S-Line" receivers and transceivers. The military R-388 and 390 series exemplify this superior stability of frequency and ease of tuning.

Essentially, selection of temperature-cancelling components, coupled with a slug-tuned oscillator coil, provide the basic oscillator circuit. It is mechanically and thermally stable and, also important, linear in re-

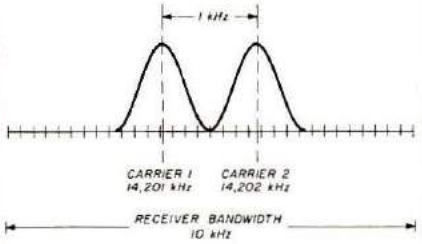


Fig. 7. Two carriers close to one another will produce a beat note that is directly related to their frequency separation. In this case, they are 1 kHz apart, thus you'll hear a 1000-hertz tone when they are both on.

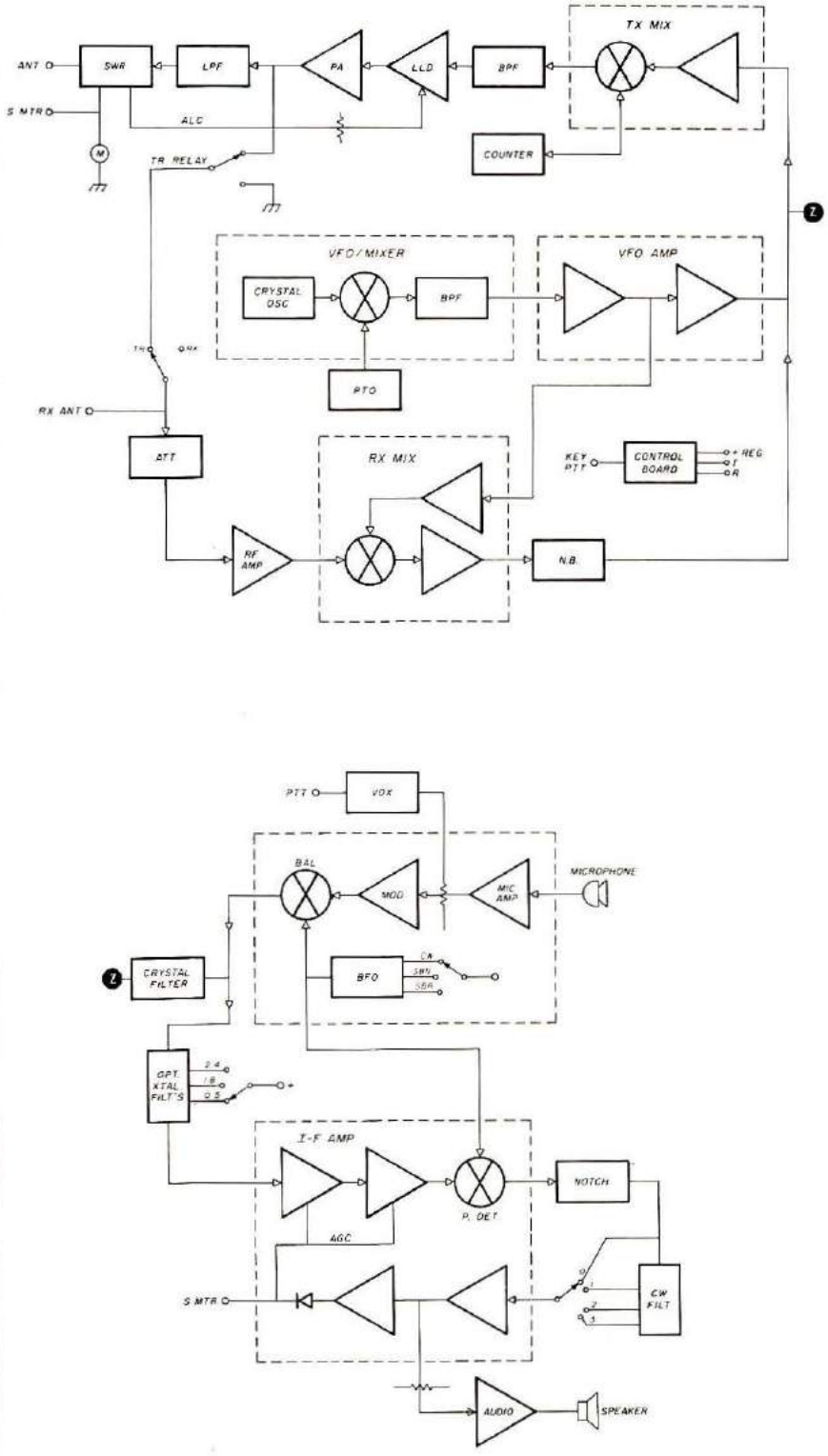


Fig. 8. A modern transceiver is a joy to use, but that convenience does not come easily. This block diagram of the Ten-Tec OMNI-D shows what it takes to pack all those marvelous functions into one neat box.

sponse through its tuning range. This makes calibration easier (when using a printed dial).

Frequency readout on most new transceivers is provided by a digital display. The readout circuit is actually a special frequency counter, calibrated to measure the output of the tunable oscillator, compare it with the heterodyne-oscillator frequency, and display the actual operating frequency.

This procedure is similar to the super-heterodyne principle in which a received signal is mixed with an oscillator signal to produce an intermediate frequency. In most transceivers, 9 MHz is the output of the sideband generator, and that frequency must be taken into consideration when compared with the VFO output in order for the readout to display the correct operating frequency.

The signal generated by the VFO is fed to both the receiver and the transmitter. In the receiver, the VFO signal is heterodyned (mixed) with the incoming radio signal to which you are listening, producing an intermediate frequency (i-f). This i-f signal is then reduced to an audio output by mixing it with the output from the BFO (beat frequency oscillator) in the product detector. The resultant audio is amplified and fed to a speaker or earphones.

In the transmitter, the signal generated by the VFO is mixed with a 9-MHz signal which comes from a balanced modulator. The balanced modulator has two inputs, one from the microphone and one from the 9-MHz oscillator (carrier generator). Linear amplifiers are used to produce a signal of usable strength.

Naturally, the complex processes mentioned here have been reduced for simplicity, but the essentials are there, and shown in block diagram form in **Fig. 8**. By using a common BFO and VFO, transmit and receive functions will occur on identical frequencies.

Bandpass filters

In order to remove spurious (unwanted) signals from the receiver and transmitter circuits, special filters are used throughout the transceiver as shown in **Fig. 9**. These filters are designed to allow only the desired frequency to pass through. This prevents potential interference from being radiated along with your signal, or from being received along with the desired signal while you are listening.

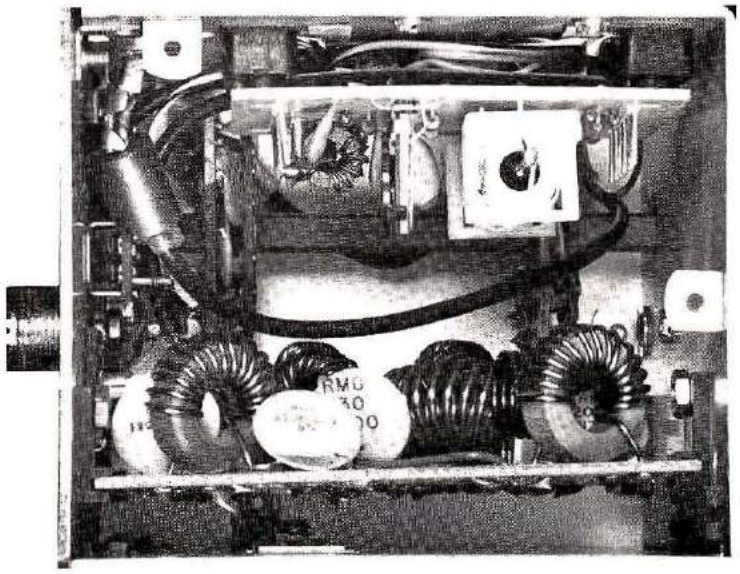


Fig. 9. Because of the broad-band nature of modern, solid-state circuitry, band-pass filters must be used in the output to keep harmonics and spurious signals from being transmitted. These filters are visible in the Ten-Tec OMNI.

Of particular interest in the design of a modern transceiver is the broad-band output circuit, or "final". In vacuum tube days, two front-panel controls were alternately peaked and dipped while watching the final-amplifier plate-current reading on the meter. This procedure insured that the final amplifier tubes were operating within their limits, and that the antenna and feedline were properly coupled to the transmitter.

With solid-state amplifiers, the procedure is quite different. Instead of the high voltage we had with tubes (often 1000 volts or more), we have high current (as much as 20 amperes) and low voltage (12 to 14 volts).

Additionally, no tuning is required for these final amplifier stages. Broad-band output circuitry maintains a relatively constant impedance over the full operating range, see **Fig. 10**. As handy as this may seem, it has certain disadvantages. If an improper load is connected to the final amplifier, the rf (radio frequency) power which is produced will heat the transistors rather than radiate from the antenna. This mismatch is called SWR (standing wave ratio), and results from improper antenna or feedline design. If precautions are not taken, the result may be a blown set of expensive output transistors!

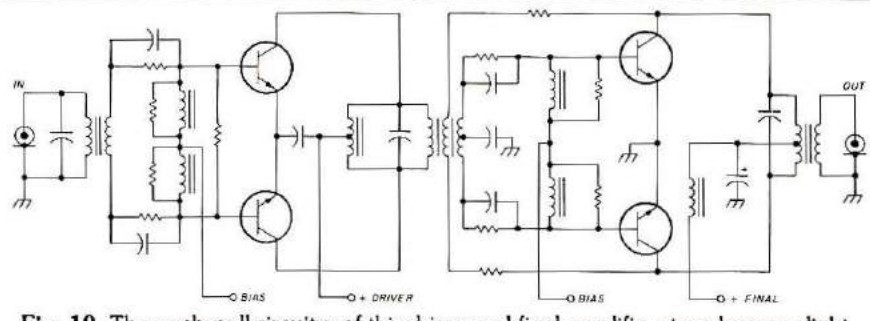


Fig. 10. The push-pull circuitry of this driver and final amplifier stage bears a slight resemblance to that found in older rigs, but note the lack of tuning capacitors; it's all done by impedance matching.

Fig. 11. Voice-operated transmit (VOX) controls make the operator's life easier. All you need do is speak, and electronic wizardry does the rest. The controls shown here, below the main tuning knob, are for adjusting the sensitivity and time-delay of the VOX; the one labeled "ANTI" is to prevent your own speaker from turning the rig on.

SWR protection

Fortunately, most manufacturers have thoughtfully provided a failsafe system to check the impedance mismatch before it can do harm. A circuit breaker or drive-reducing system disables the power supply when a sensor detects reflected power (SWR) at an unsafe level. Everything shuts down, and (with some rigs) the operator must wait a few seconds before he can restore power. In the meantime, the cause of the mismatch should be determined.

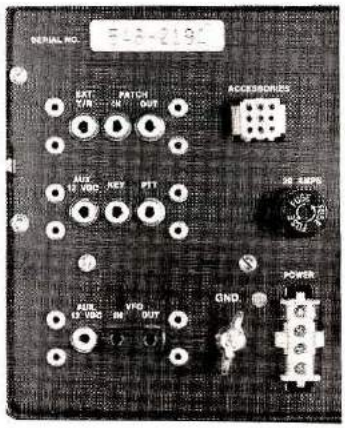
When feeding a properly designed antenna system, many of the new rigs are capable of 200 watts input power or nearly 100 watts output into a 50-ohm unbalanced (coax-fed) load. Just to let you know what's going on, some rigs like the Ten-Tec OMNI have a built-in SWR meter.

To prevent tune-up interference, some manufacturers provide a couple of extra features: a drive control permits low-power tuneup by reducing the amount of signal going into the power amplifier. The Ten-Tec OMNI includes an automatic-level-control circuit which permits the user to set a maximum power level beyond which the transmitter will not operate regardless of the drive level setting. This is useful for driving external linear amplifiers which do not need the full output of the transceiver. This, too, helps protect the output transistors from high-SWR antenna systems.

On single sideband, your voice provides audio which is mixed with the BFO to drive an amplifier. This is why there is no signal between words when you are listening to an SSB station — your S-meter keeps hopping up and down with voice peaks!

Many hams enjoy the automatic convenience of VOX (voice-operated transmit-receive control). VOX is not only handy for "rag chewing" with other hams, but for phone-patch applications it is quite practical too. Instead of having to manually switch the rig back and forth between transmit and receive while you anticipate comments from parties on the telephone, they automatically switch the rig to transmit each time they talk! The location of these controls varies from rig to rig, but you can see them just below the main tuning dial of the OMNI, as shown in **Fig. 11**. The first controls the amount of gain required to actuate the VOX circuit. The second adjusts the amount of delay time between the last voice sound and when the rig switches to receive. The third control is "ANTI-TRIP." Its purpose is to prevent the rig's own speaker audio from activating the VOX circuit through the mic. For those hams who still would rather push the mike but-

Compact, lightweight, versatile — today's transceiver provides all the features hams usually need to partake of Amateur Radio to the fullest. Accessories that were never dreamed of in the early days of Amateur Radio are provided in the modern transceiver — such as phone patches, electronic keyers, a remote VFO, and more.



ton to talk, PTT (push-to-talk) operation is also provided. Since VOX controls rarely need constant readjustment, they are often located elsewhere on other rigs.

For totally arbitrary reasons, the lower three Amateur bands (160, 75 and 40 meters) were committed by early SSB operators to lower-sideband mode. The higher frequencies, (20, 15, and 10 meters) use almost exclusively *upper* sideband. Nearly all Amateur sideband communications will follow this plan. Some transceivers like the OMNI have already been programmed to follow this plan as the operator switches bands. Just in case the operator wishes to swap sidebands, however, he may switch from normal sideband to reversed sideband by rotating the appropriate control.

For CW operators, sharp receiver filters really help separate the wheat from the chaff. Full break-in (QSK) is provided in some rigs like the OMNI. When you stop keying, the receiver automatically comes on so that you don't have to reach up from the key to switch manually.

In conclusion

Years ago, it was considered a routine responsibility for hams to build their own rigs. Virtually all Amateurs "home-brewed" their transmitters, and a large number even made their own receivers. They wound coils, and fabricated their own cabinets and chassis. But times have changed; these older rigs could not begin to compare with the simplest of today's technology. While good rigs can still be made at home — kits and components are available — the majority of ham rigs in use today are factory wired.

A manufacturer buys his components in large quantities, keeping costs down. We couldn't begin to put together from scratch a transceiver in the class of the Ten-Tec OMNI, Heath SB-104, Kenwood's TS series, the Yaesu, Icom, or any of several other modern rigs, at anywhere near the price.

Amateur Radio has grown into an intricate and fascinating hobby. Understanding the functions of your transceiver will help you appreciate the thoughtful engineering which makes our hobby even more enjoyable than in yesteryear.

HRH

Working Phone From Telephone

BY ROY MOSES, WD5ICY

A Telephone Exchange with a Difference

The Telephone, Texas, barbershop (left), and the general store (right). Next door is the Masonic Lodge, with the Baptist Church behind.

Expedition — *A journey undertaken by an organized group of people with a definite objective.*

The American Heritage Dictionary of the English Language

You can't be an active ham very long without hearing or reading about DXpeditions to far-off places, pileups, operating marathons, rare QSLs, and the attendant problems in logistics, planning, and red tape that must accompany such efforts.

And, if that sort of activity appeals, it brings wistful wonderings about how such massive efforts are accomplished. How does the average eight-to-five working ham afford such a "vacation?" How can he arrange that much time away from job and family? Where does he find companions of like desire and circumstance for a successful working party?

Some members of the North Texas High Frequency Association in Denton, Texas, pondered these questions over coffee and doughnuts one night after a club meeting, and came up with an alternative. We planned an expedition, but changed the prefix from "DX" to "mini," then charged blindly ahead. The result was one of the most enjoyable operating events in the history of the two-year-old High Frequency Association.

The logic was simple: knowing full well that trips to distant atolls, reefs or islands were beyond the time and means of the club or its members, the next step was to select an operating site that, while not "exotic" in the strictest sense of the word, still had some uniqueness to it.

Texas, like most states, has any number of small towns with quaint names, so NTHFA members began looking at tiny dots on state maps. We came up with several possibilities, the most appealing being Telephone, Texas, providing the concept of "working phone from Telephone." Others were Telegraph, Texas, for

CW, naturally, and Novice, Texas, for working the Novice-class frequencies.*

We selected Telephone primarily because of its size (population 210 in the last census) and proximity (about 85 miles northeast of Denton). Also, since this would be a first-time effort, we thought the mini-expedition concept could be more easily explained on the air by voice than by CW.

These initial steps were taken in early 1979, and by the end of March, planning had proceeded with all the organization and detail of a Keystone Cops vice raid. The major decision was made: "Go." Minor decisions, such as date, time, operating site, frequencies, equipment and logistical arrangements, were left almost to chance.

In late spring, Duncan Engler, WD5IKY, had occasion to be near Telephone, and stopped in for a visit with the postmaster. His town, the postmaster said, is the only one in the world named Telephone, and he would be delighted to hand cancel our QSLs with a Telephone postmark — particularly if we would buy the stamps for him.

Telephone consists basically of the Post Office, a general store, barbershop, Masonic Lodge, and Baptist Church. Duncan selected a vacant lot across from the general store as a possible operating site, and so reported at the next club meeting.

The next step was to select a time, and publicize it. A tentative early summer date was set and notices were mailed to ham publications. But then came a severe gasoline shortage in the area; original plans were scrubbed and the entire operation was temporarily put on the back burner.

By summer's end, the gasoline problem had eased somewhat, so club members revived the mini-expedition project. We looked for a new date while keeping one eye on the calendar, for fall weather in North Texas can be most unpredictable and "iffy." Finally, it was agreed: the weekend of October 27, operating from noon Saturday, local time, to noon Sunday.

Equipment, in keeping with the informality of the entire operation, was simplicity itself: a trailer-mounted generator and forty-foot layover, telescoping mast; ground-mounted vertical; 40- and 15-meter inverted vees; Ringo Ranger on top of the telescoping mast for 2-meter contacts; Swan 500CX transceiver operating barefoot; and an Autek QF-1 audio filter.

When the new date was set it was too late to publicize the operation, but we did notify hams who had made specific inquiries after our earlier announcement. We also notified area news media, but other than that, we just figured to take our chances on random contacts.

The main party of the mini-expedition consisted of George Watkins, WD5FNI; George Lindley, WA5HKW; Smitty Kiker, KB5UM; and me. We were joined later by Fred Opaskey, WB5TSB; Greg Jones, WD5IVD, Gary Fellers, K5LQP; and David Goins, KB5TO.

We departed from Denton at 0800 local time Saturday, October 27, and arrived in Telephone about 1030, with a stop in Bonham for coffee and road directions. In Bonham, we discovered that advance publicity mailed to weekly and daily newspapers in the area had paid off — we mentioned Telephone or Denton or ham radio, and people knew who we were, where we were going, and why.

In Telephone, we found a four-man welcoming committee waiting in front of the general store. We discussed operating sites and they suggested we set up in front of the Community Building, about a block and a half off the main (and only) road through Telephone proper. They took us across the street to the local barber, Calvin Felts, who is in charge of the Community Building.

Mr. Felts interrupted a haircut in progress to tell us he didn't think we would have enough public visibility at the Community Building. "Why don't

Telephone mini-expeditioners, from left, are: Fred Opaskey, WB5TSB; Smitty Kiker, KB5UM; Greg Jones, WD5IVD; Roy Moses, WD5ICY; George Lindley, WA5HKW; Darren Brown (kneeling), at the time a Novice-class trainee, now KA5HHJ; George Watkins, WD5FNI; and Gary Fellers, K5LQP. Not pictured: David Goins, KB5TO, who had taken David Jr. fishing (*photos by Smitty Kiker, KB5UM*).

*Keep an ear tuned to the bands for more activity from this group. They plan to repeat the "Telephone" experience late in September or early in October, and are perhaps operating an "Alternate Olympics Mini-Expedition" from Moscow, Texas, even as this magazine is in the mail. Plans call for a Box 88 QSL address if everything works out. Who says summertime hamming is dull? — Editor.

Taking a "Telephone break" are, from left to right: Gary Fellers, K5LQP; David Goins, KB5TO; David Jr.; George Lindley, WA5HKW; and Greg Jones, WD5IVD. At right is trailer-mounted generator and telescoping mast.

you just set up in front of the shop here?" he asked. He further suggested we plug into his ac power and not have to cope with the noise of the gasoline-powered generator, and added that he would leave his shop unlocked that night in case the weather turned a little cool and we wanted to sleep or operate inside.

It didn't take us long to accept that hospitality. We offered Mr. Felts $10 as a token of appreciation for his electricity and facilities, and he unplugged his clippers and went home, since he was scheduled to close at noon. (He returned in mid-afternoon, however, because George, WD5FNI, had mentioned wanting a haircut, and Mr. Felts obliged. The price was $2.50.)

It required about an hour to get the station assembled and all the wires sorted out, and from then on it was pure enjoyment. There was a large open area beside and behind the barbershop where we parked vehicles, set up the vertical antenna and trailer, did our cooking, and where two participants even pitched a small tent. Some slept in the open on cots, some in the back of a station wagon, and two moved their cots inside the barbershop.

We descended on the general store next door for barbecue sandwiches for lunch. We put a brisket on a smoker for supper, and bought bacon and eggs for breakfast, to be cooked on a Coleman stove. We forgot only two major items — a cube tap for the power line, and a "guest register" for visitors, of which we had many. Some stayed as late as 2 AM Sunday, and we answered many questions about ham radio.

With a phone contest in progress, high winds and blowing dust most of the day and lots of QRN, operating conditions were less than ideal, but the hospitality of the Telephone citizens more than compensated.

When we inquired about restrooms, we were told the back door of the nearby Baptist Church would be left open so we could use those facilities. Mr. Felts made several trips back to our operating site to check on our needs, and provided some backup extension cords. The lady at the general store said she normally slept late on Sunday mornings, but volunteered to come down and cook a hot breakfast for us Sunday morning if we lacked the necessary facilities. A Fannin County deputy sheriff came by Saturday night to see if we needed anything, stayed for a long visit, and left a phone number where he could be reached if necessary.

Operationally speaking, things began slowly, but gradually picked up as word seemed to spread about working phone from Telephone. Early Sunday morning, we stumbled into the Kadiddlehopper Net on 40 meters, and had Kadiddlehoppers lined up for the next four hours. From the beginning, however, the philosophy was for quality of contact, not quantity; so instead of just quick exchanges of QTH and signal reports we did a lot of ragchewing along the way. As one member said, the fun of this operation compared to Field Day is that, "We make up our own rules as we go along."

We operated 23 hours, and the box score stacked up like this: 183 total confirmable contacts. We worked 43 states and Washington, D.C., including a pickup truck mobile in downtown Las Vegas and a mobile on the

Shortly before sunup, WD5ICY took a break from logging to start fixing breakfast, while George Watkins, WD5FNI, kept radio operations going strong.

Colorado River in Arizona. We worked VE3s and VE7s, St. Kitts in the Leeward Islands, the Canal Zone, and a California ham on board his sailboat near Costa Rica.

We had with us a foreign and U.S. *Callbook*, with supplements, and as each station was logged, the logger would look up the address and prepare an adhesive-backed mailing label. The labels were later used to mail QSLs.

To commemorate the event, special QSLs were prepared. These consisted of four panels of pictures and text, each panel measuring 4 × 8½ inches. After labels were put on, the QSLs were sent to Telephone, where the postmaster affixed stamps and the Telephone postmark.

A byproduct of the mini-expedition was that it provided one of the most entertaining club-meeting programs of the year. Gary, K5LQP, took "home movies" of the entire operation, from departure to return, and these were shown at the next meeting, complete with appropriate comments and narration by the participants.

As far as cost goes, the concensus seemed to be, "I've spent a lot more money and had a lot less fun." The largest single expense — about $80 — was for printing and mailing the QSLs. The club treasury took care of that expense, and individual members who participated shared the costs for travel, food, and incidentals.

The experiences at Telephone were so enjoyable and rewarding that NTHFA members are giving a second thought to similar mini-expeditions to Telegraph, Texas, Novice, Texas, and possibly other unique or unusual operating sites. But Telephone, the first, will always be the favorite of those who took part.

We have already had inquiries about the possibility of a second mini-expedition to Telephone, and requests for personal notification if we go again, so it may become an annual event.

The Telephone trip is still a prime conversational topic when members of the "Telephone Crew" get together, and one may have summed up the general feeling recently when he said, "You may have a hard time getting me to work Field Day after the fun we had at Telephone."

HRH

Getting Started:

KARL T. THURBER, JR., W8FX

Build, Buy; Used or Surplus

Setting up the hamshack can be a difficult and challenging task. A number of important decisions have to be made that will have far-reaching impact on the ultimate composition of your station and the satisfaction you derive from its operation. These include decisions on building your own gear (or working from kits), buying your station fully assembled and factory-fresh, scouring the ham markets for suitable used gear and accessories, and looking into the surplus scene for gear that you might put to use.

In this article, I will survey these considerations, covering the merits and drawbacks of homebrewing, building and constructing kits, purchasing ready-made equipment, shopping the secondhand market, and salvaging surplus gear.

Whether you decide to buy commercial gear, assemble kits, or homebrew, you will want to know what's available. You'll want to acquire some general electronics catalogs and those of the ham-equipment specialty dealers. You will surely want to obtain flyers from Radio Shack, Burstein Applebee, Olson Electronics, and McGee Radio. The ham catalogs of distributors such as Tufts Radio, AGL Electronics, and Amateur Radio Sup-

Getting Started:

ply should also be high on your list. And you'll need the catalogs and specification sheets of equipment manufacturers such as Drake, Yaesu, Icom, Kenwood, Heath, and Ten-Tec, as well as the myriad accessory suppliers, too.

The Amateur Radio publications such as *Ham Radio Horizons*, *ham radio*, *73*, *CQ*, and *QST* constitute a treasure-trove of information about current equipment. Additionally, classified ads in these magazines can give you a good picture of the used market. Furthermore, you can read the product reviews to find out about performance of newly introduced equipment, though the reviews will rarely be critical or objective enough to be really useful in making final equipment-selection decisions.

This all brings up the question of what it costs to be a ham. While, at this time, the ham license costs nothing, getting on the air does cost money. A basic station can be bought or built for as little as $100, or many thousands of dollars can be spent on a commercial-quality installation. As in any other undertaking, you get what you pay for. However, Amateur Radio is not necessarily a super-expensive hobby. Wise and judicious equipment selection can optimize your results based on a minimum monetary investment.

The beginner has some decisions to make. First, whether to build his own gear, buy new or used commercial equipment, try a kit, or homebrew — or even seek to convert a suitable piece of surplus gear. Next, he has to decide just what receiver, transmitter, or transceiver to buy. And then he has to make a selection of those accessories which will be most useful to him.

As a beginner, you should not be reticent about asking for help from those who are already established. A little advice from one who has successfully "weathered" the equipment-selection process can save a great deal of heartache and expense in trying to correct poorly made choices. If there is a ham club in your area, attend its meetings and pick the brains of its members. You'll have to evaluate what you are told in the light of your own needs and finances, but you'll be all the wiser for doing so.

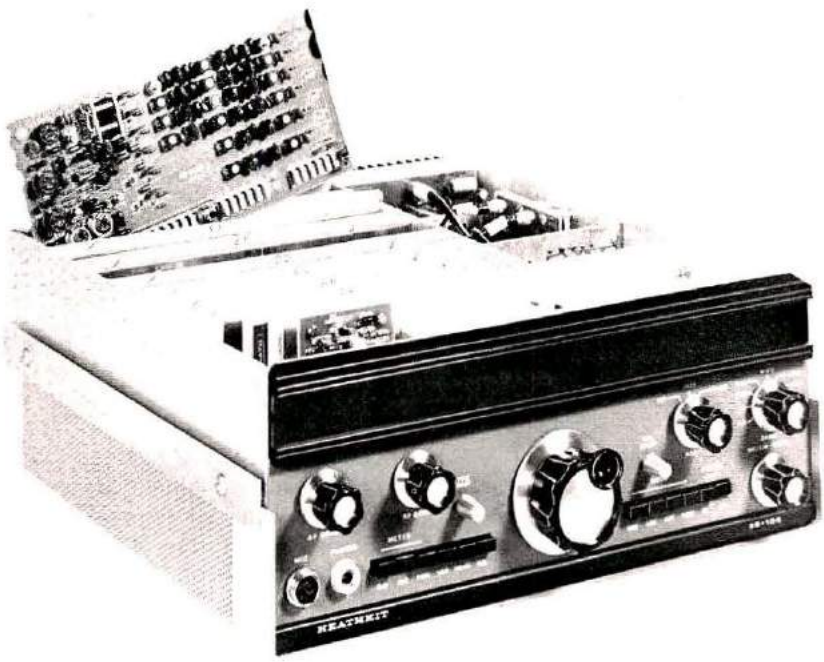
Let's present a few guidelines that should be helpful in wrestling with the decisions you'll have to make.

Less fashionable than it once was, building your own gear *is* a good way to "get your feet wet" and to learn about the hobby's technical aspects. No matter how intently you study the license manuals and read the handbooks, all this means nothing until you do something with the knowledge you've gained. It's not necessary to build sophisticated equipment, but building *something* helps to develop real understanding. If a transceiver's circuitry is over your head, you can tackle a simple project that can be used in getting your "ticket," such as a code practice oscillator. Or, you can tackle an item for use with your new station, such as a field-strength meter, SWR bridge, or dummy load. There's little penalty involved if what you build doesn't work right the first time — if you start small. But, the experience gained can be invaluable.

If you go the homebrew route, there are some important considerations. First, the cost of building can actually be much more than the price of an equivalent kit, and, unless you're sure of the credentials of the designer, you have no assurance that the circuit is a good one. Homebrew equipment has a very low resale value, and it may very well be impossible to sell except to another ham on a personal basis. Very rarely is homebrew gear accepted on trade-in for new or used items. If you have trouble with your construction project, there may be no one to turn to for help. For these reasons, it's best to start simple, holding off on the more complex projects.

If you build a kit

Kits represent a good way of setting up at least a portion of your station. You gain building and troubleshooting experience and become familiar with the inner workings of your gear. You also learn about the use of tools,



Most current high-technology, solid-state Amateur equipment pushes the limits of what can be accomplished by the home craftsman. However, this Heath SB-104 transceiver, constructed from a kit, is easily within the reach of the Amateur with average electronic skills. Unit features plug-in circuit boards and modular construction for most subassemblies (*photo courtesy Heath Co.*).

component color codes, schematics, and test equipment. Working from a kit overcomes many of the obstacles of building from scratch. Usually, holes are pre-drilled, step-by-step as-

Precise antenna matching requires the use of a standing-wave-ratio indicator installed in the coax line between the tuner and the transmitter (or transceiver). This Heath inline wattmeter is a typical high-quality unit and features dual power/SWR scales. This particular model is designed to handle gear running from 10 to 2000 watts over the range 50-160 MHz, making it ideal for 6 or 2 meter use. A similar model is designed for 160 through 10 meters (*photo courtesy Heath Co.*).

sembly and alignment instructions are provided, and only simple tools are required for construction.

The kit will usually cost about 20-30 per cent less than that of a comparable wired-and-tested unit because of the factory labor that did *not* have to be put into it. Well-established kit manufacturers, such as Heath and EICO, provide easy, "by-the-numbers," instructions that the inexperienced beginner can follow. These same firms also label in their advertising those few kits that should not be attempted by the first-time kit builder.

In most cases — unless a defective part is inadvertently furnished — the kit will work as advertised. Even if it doesn't work the first time it's turned on, the experience gained in tracing and analyzing circuit diagrams and performing trouble-shooting routines can be worth the technical insight that results.

Getting Started:

Are you ready to tackle the conversion, adjustment and troubleshooting required to get that "good-deal boat anchor" into proper shape? Be sure you have all the facts before ordering or lugging home an "unknown."

There are disadvantages. Kit-built equipment has a lower resale value than commercially constructed gear. Many firms will not take kits in trade, or may offer very low trade-in quotes because of the bad experiences they have had in accepting poorly wired or modified kits for resale. Unfortunately, there are only a few firms whose prime business lies in selling electronic kits — foremost among them being the two giants we mentioned, Heath and EICO. Kits sold by others typically do not have the detailed instructions so necessary for success; details are often limited to a schematic and the basic entreaty, "install the parts." And, kit savings may be washed out by factory returns and repair charges.

Try your hand at a few simple, accessory-type kits. If you enjoy building and are successful at it, go on to more complex gear, such as a transmitter, receiver, or transceiver. There's plenty of time to build up your construction skill as you develop your operating skill.

Buying commercial gear

Everyone knows that buying top-quality, strictly brand-new gear at the start is fine if you can afford to do so. You have the warranty backing of the dealer and/or manufacturer, and you have a list of the specifications that the equipment should meet. If it doesn't, you can return it for repair or replacement. It's a good deal.

Still, ordinary cautions should be observed, just as in buying any major household or personal item. Know what you want before you shop, know the facts and specifications, carefully assess the differences between competing equipment, and consider price. Be aware, however, that price should definitely not be the only consideration. The price often determines the degree of post-sale service you can expect, warranty or not. If you buy locally, you may pay more. Buying from the "800 number" market is fine, but check on post-sale service — ascertain who will back the equipment in case something goes wrong. Inquire as to refund and exchange policies. There may be a 10-15 per cent restocking charge should you return the unit. And don't rely completely on the advice of the salesman for critical information on the unit you're interested in. Check out the facts on your own.

Used equipment may actually provide better value than new gear. A current model used Amateur transceiver usually costs 20-30 per cent less than an equivalent brand-new unit; depreciation takes its toll on ham gear as it does on anything else. On older gear, cost decreases consider-

If your budget is strained for the purchase of needed gear to get your station on its way, check out the used equipment tables at a local hamfest. The used market in ham gear is an active one, and genuine bargains can be had. If you're a beginner, however, take a friend who can help evaluate any prospective purchases. (*Photo taken at 1979 ARRL National Convention, Baton Rouge, Louisiana.*)

ably. Actual prices depend on the condition of the equipment, terms of sale, and current demand.

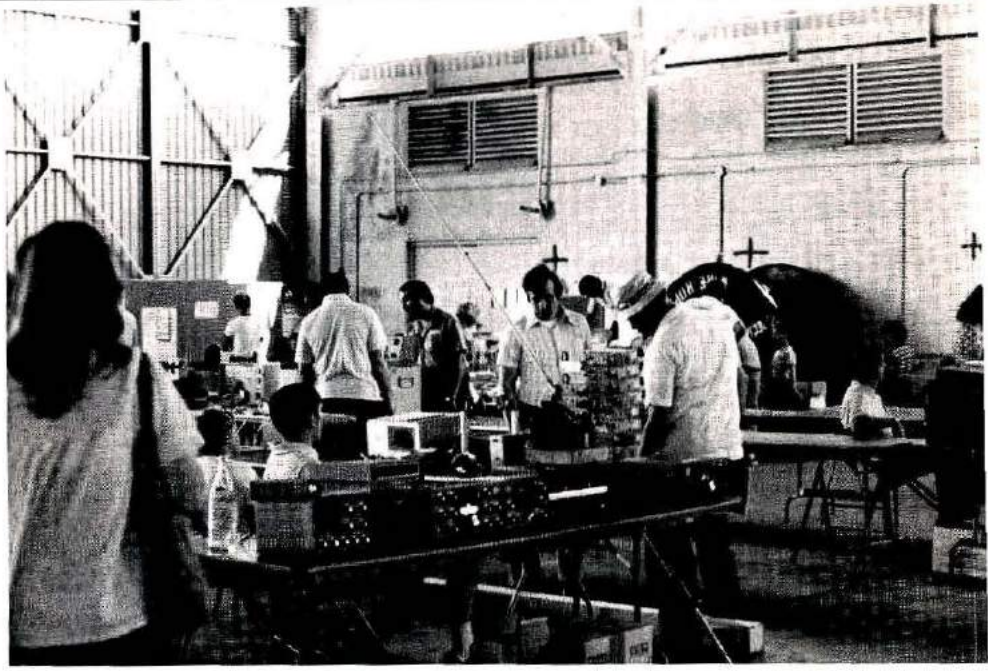
Where to buy used gear? Typical sources are local hams, through the magazine classified ads, from others at hamfests and swap meets, and from regular used-equipment dealers. Buying from local hams is preferred, since it's unlikely that a "local," particularly a member of your own radio club, would shortchange you with a lemon. Buying through the classifieds is usually successful, but satisfaction depends on the personal integrity of the seller. Several trading firms have sprung up in recent years to act as intermediaries in the buying and selling of ham gear between private parties. These services set up various procedures to help prevent the buyer from getting "stuck" with a lemon and to make sure the seller gets prompt payment. Most of these outfits run classified ads, and it's worthwhile to check out the services offered. They can function as effective "matchmakers."

Buying at swap meets can yield great savings, but there is little protection from bad deals. Again, you have to rely on the integrity of the seller; there is no warranty and lots of risk. It's best to shop with specific equipment in mind, and to have an idea of the range of acceptable prices. If necessary, take along an experienced ham to help you check out the gear you're interested in. There is little recourse for a poor choice.

Scouting out your equipment in person or by mail from a store specializing in used Amateur gear is usually satisfactory. Most ham supply houses accept "clean" trade-ins on new equipment as a convenience to their customers, and they dispose of it through their used-gear departments. Normally, the equipment is at least checked over. In some cases it is "reconditioned" to near-new condition, or certainly put in working order. Most dealers will not accept beat-up, modified, kit-built, or homebrew gear in trade. If they do, the gear/equipment is usually sold "as-is" at a low price, and return policies vary. Before clinching a deal, you should check to

Getting Started:

Older, tube-type gear abounds on the swap tables and under the auction block at most hamfests. But be sure you know what you're buying before you buy.



see if the firm allows you to return unsatisfactory gear for a refund or credit toward other equipment. There is usually a time limit — normally 10-30 days — on a free-trial or return privilege, and up to 90 days for a trade-back on new gear. Check also to see who pays for repairs after the return period has expired, and for how long the warranty — if any — is valid.

A disadvantage of buying used equipment in this manner is that you may not be able to get just what you want when you want it. Dealers' stocks are constantly changing; a recent ad showing the equipment you want may have been prepared three or four months ago, and the gear long since has been sold. Many dealers will hold the next unit they receive in trade for you upon placing a small deposit.

What about surplus?

If you aren't much on homebrewing or constructing kits, you may want to consider modifying surplus gear for hamshack use. Some equipment requires a minimum of reworking — just add an ac power supply to make it ready to go.

There are a number of reputable outlets for surplus gear, military and commercial, such as Fair Radio Sales, Delta Electronics, and Surplus Center. Getting on their mailing lists and obtaining their catalogs are good ways to become familiar with the range of surplus equipment and parts that are available. Surplus gear is usually sold for a very small fraction of its original cost, and much of it is built to higher standards than ordinary equipment.

Despite the obvious cost-saving aspects of surplus gear, there are many drawbacks of which you should be aware. Although much military gear is *adaptable* for ham use, it really isn't *intended* for such use. Surplus gear is rarely eye-appealing, power requirements are cumbersome, control panels are designed with other purposes in mind, and what is available is rarely state-of-the-art. Most popular equipment of World War II and Korean-War vintage just doesn't "hack it" on today's crowded bands. Tube-type surplus requires high-voltage dc; filament supplies typically run off of 12 or 26 volts; and conversion data and manuals are often not available. Be especially careful of purchasing surplus gear with which you're not familiar, or for which modification data isn't available. Consider the cost of conversion (including new parts required), the outlay for the basic gear, and the resultant value of the equipment after conversion. Simply stated, is the conversion worth the cost and

Table 1. Selected surplus equipment dealers. The companies listed below sell military and/or commercial surplus equipment and parts to the Amateur community. Those marked by an asterisk (*) issue a catalog which is usually available on request, either free or for a small fee.

Atlantic Surplus Sales, 3730 Nautilus Ave., Brooklyn, NY 11224
B&F Enterprises, 119 Foster St., Peabody, MA 01960*
Barry Electronics, 512 Broadway, New York, NY 10012
Delta Electronics, P.O. Box 2, 7 Oakland St., Amesbury, MA 01913*
Electronics Distributors, Inc., 4900 Elston Ave., Chicago, IL 60630*
Etco Electronics, North Country Shopping Center, Plattsburgh, NY 12901*
Fair Radio Sales, 1016 E. Eureka, Box 1105, Lima, OH 45802*
Gregory Electronics Corp., 249 Route 46, Saddle Brook, NJ 07662
John Meshna, Jr., Box 62, E. Lynn, MA 01904*
Poly Paks, P.O. Box 942, S. Lynnfield, MA 01940*
Space Electronic Co., 36 Ruta Court, S. Hackensack, NJ 07606
Spectronics, Inc., 1009 Garfield St., Oak Park, IL 60304*
Surplus Center, Box 82209, Lincoln, NE 68501*
Surplus Electronics Corp., 7294 N.W. 54th St., Miami, FL 33166
Ultima Electronics Ltd., 73 Sherwood Court, Huntington, NY 11743

trouble, and will you have a good piece of *ham gear* once the job is done?

Commercial (non-military) surplus is often perfectly good new equipment, sub-assemblies, and components that go "on the block" when a contract is completed or an overstock condition is reached. You can reap parts bonanzas by careful reading of the surplus houses' ads and flyers — see **Table 1**.

It's good to choose which acquisition route you will take while you're waiting for your license to arrive — you don't need a license to make these decisions. Be ready to operate when the awaited "ticket" arrives!

These, then, are the main considerations involved in making the important "way to go" decisions. Follow the hints and suggestions I have presented, and you should be well on your way to achieving a functional first ham station that "gets out."

A five-band antenna tuner with a difference — it can be built from a kit to offer valuable construction experience while producing a useful hamshack accessory (*photo courtesy Apollo Systems*).

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HRH

ham Radio's Bookstore

"Summer Book Sale"

WORLD TIME CALCULATOR *NEW!*

Here's a very handy operating aid for your ham shack. To use it, you locate your local time, move the dial to your local time zone and voila — you know the time anywhere around the world. Besides determining time, you get a full explanation of many confusing terms such as: mean solar time, ephemeris time, atomic time, and more. Indispensable aid for both the contester and DX'er. ©1980.

☐VG-TC **$2.95**

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☐AR-FI **Softbound $3.00**

OWNER REPAIR OF RADIO EQUIPMENT
by Frank Glass, K6RQ

"The successful repair of any device results in restoring its operation at least to the level it had just before it quit." With this basic concept in mind, author Frank Glass gives you step by step instructions on how to repair all kinds of electronic equipment. Fourteen chapters cover every aspect of repair procedure from component use and failure and how to read schematic diagrams to a most important subject, safety. This book is a must for the amateur new to servicing his own equipment. 85 pages. ©1979.

☐RQ-OR **Softbound $7.95**

1980 34th EDITION WORLD RADIO & TV HANDBOOK

The world's only complete reference guide to international radio and television. This 1980 edition has complete information on each station including address, frequency and scheduling. Much additional information such as solar activity and World Time Table is included. Unquestionably the leading book of this type. 554 pages. ©1980.

☐WR-TV **Softbound $14.95**

THE ARRL ANTENNA ANTHOLOGY
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This brand new book pulls together a wide selection of antenna articles from QST. Written for Amateurs of all levels and interests. Included are phased arrays, verticals, Yagi's . . . even the VHF Quagi! Detailed instructions and full illustrations make this a really useful book for any Amateur. 152 pages. ©1979.

☐AR-AA **Softbound $4.00**

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☐AR-FM **Softbound $5.00**

ARRL CODE KIT

A good practice kit for upgrading your Novice or Technician license. Two 60 minute cassettes with 30 minutes each at speeds of 5, 7-1/2, 10 and 13 wpm. Also you'll receive an instruction booklet containing hints and suggestions on methods for mastering code.

☐AR-CK **$8.00**

RADIOS THAT WORK FOR FREE
by K. F. Edwards

It's not often that you can get something for nothing in this world, but this book will tell you how to come as close to it as possible. "Radios that Work for Free" tells you how to build several circuits, each of which will provide you with music, news and entertainment while using only the intercepted power of the station itself. The parts used are inexpensive, or if you are a good scrounger and salvage expert, you'll find most of the parts for free, just as the signals are. Descriptions are amazingly complete. You are led through some of the mystery areas of radio such as antennas, grounds, coils, capacitors, earphones, schematic diagrams, and how to plan, layout, and wire your projects. More than just a trip into nostalgia, the book is a lesson in basic radio principles and techniques — and you can dance to the results. 137 pages. ©1977.

☐HO-RWF **Spiralbound $5.00**

PRACTICAL ANTENNAS

From the folks at SCELBI, **PRACTICAL ANTENNAS** is not quite like any of the other ham antenna books. Written by a knowledgeable DX'er, this new book is chock-full of helpful hints and suggestions on the how-to's of putting up a super antenna system. Chapters include information on design and construction of practical Yagis, quads and wire type antennas. Inside you'll also find a complete bibliography of antenna articles from the popular amateur publications. Charts and tables are designed to eliminate all those tricky calculations. And, SCELBI has included a list of computer generated beam headings from major population centers to all the countries of the world. A new format, large easy-to-read text and durable vinyl cover make **PRACTICAL ANTENNAS** a "must" for every amateur library. ©1979.

☐SC-PA **$9.95**

GUIDE TO RTTY FREQUENCIES
by Oliver P. Ferrell

Radioteletype to many hams and SWL's is an exotic, complicated form of electronic communication. The author is a well known expert in this interesting field and brings to you a wealth of knowledge and practical experience. First he covers the basics of RTTY identification codes and equipment. Once you've mastered the basics, he gives you a complete rundown on how to receive and understand what you'll be seeing. And — there are over 60 pages of worldwide station listings. For your convenience, listings are made by frequency with station location and service. ©1980, 96 pages.

☐GL-RF **Softbound $8.95**

Order $30.00 or more and take a 5% discount. Order will be shipped postpaid.

Ham Radio's Bookstore

ANTENNA BOOKS by Bill Orr, W6SAI

THE RADIO AMATEUR ANTENNA HANDBOOK

by William I. Orr, W6SAI and Stuart Cowan, W2LX

If you are pondering what new antennas to put up, we recommend you read this very popular book. It contains lots of well illustrated construction projects for vertical, long wire, and HF/VHF beam antennas. But, you'll also get information not usually found in antenna books. There is an honest judgment of antenna gain figures, information on the best and worst antenna locations and heights, a long look at the quad vs. the yagi antenna, information on baluns and how to use them, and some new information on the increasingly popular Sloper and Delta Loop antennas. The text is based on proven data plus practical, on-the-air experience. We don't expect you'll agree with everything Orr and Cowan have to say, but we are convinced that **The Radio Amateur Antenna Handbook** will make a valuable and often consulted addition to any Ham's library. 190 pages. ©1978.

☐ **RP-AH** **Softbound $6.95**

ALL ABOUT CUBICAL QUAD ANTENNAS

The cubical quad antenna is considered by many to be the best DX antenna because of its simple, lightweight design and high performance. In Bill Orr's latest edition of this well known book, you'll find quad designs for everything from the single element to the multi-element monster quad, plus a new, higher gain expanded quad (X-Q) design. There's a wealth of supplementary data on construction, feeding, tuning, and mounting quad antennas. It's the most comprehensive single edition on the cubical quad available. 112 pages. ©1977.

☐ **RP-CQ** **Softbound $4.75**

SIMPLE LOW-COST WIRE ANTENNAS

Learn how to build simple, economical wire antennas. Even if you don't know a feedline from a feed-through, W6SAI will get you on the air with an effective low-cost wire antenna. And, apartment dwellers take note! Fool your landlord and your neighbors with some of the "invisible" antennas found here. For the old-timer as well as the beginner, it's a clearly written, well diagramed, and even humorous antenna book. 192 pages. ©1972.

☐ **RP-WA** **Softbound $6.95**

BEAM ANTENNA HANDBOOK

Here's recommended reading for anyone thinking about putting up a yagi beam this year. It answers a lot of commonly asked questions like: What is the best element spacing? Can different yagi antennas be stacked without losing performance? Do monoband beams outperform tribanders? Lots of construction projects, diagrams, and photos make reading a pleasurable and informative experience. 198 pages. ©1977.

☐ **RP-BA** **Softbound $5.95**

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☐ **KT-GT**	General Class Theory Cassette	**Two tapes $8.95**
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GOING SAILING WITH AMATEUR RADIO

Are you into sailing? Then you need **Going Sailing** — an extremely helpful book, especially for the boating and yachting enthusiast who wants to incorporate Amateur Radio in his ship's gear. Whether it is just for fun or safety measures, bringing Amateur Radio aboard makes a lot of sense. Next time you're headed for sea, take Amateur Radio and a copy of this great new book for long-range radio communications. 64 pages. ©1978.

☐ **HR-GS** **Softbound $3.95**

SHORTWAVE PROPAGATION HANDBOOK

Edited by George Jacobs, W3ASK, and Theodore J. Cohen, N4XX

For many hams, both new and old, radio wave propagation is still a mystery. Realizing this, the authors went about the task of preparing a simplified text that could be understood by hams, swl's and engineers alike. Stress has been given to simplified explanations and charts. The authors also detail a simplified method of do-it-yourself propagation forecasting. To assist your forecasting efforts, the book contains a complete listing of the 12 month smoothed sunspot numbers since 1749. Join those who know how to predict when the bands will open to specific areas of the world. ©1979.

☐ **CQ-PH** **$7.50**

ARRL Q & A SERIES

Each book is full of sample questions that cover just about every aspect of the FCC Amateur exam series. These handy study guides are a must for the soon-to-be or ready-to-upgrade Amateur. Convenient pocket size lets you take your study guide with you everywhere. Softbound.

☐ **AR-QA**	Novice ©1979	**$2.00**
☐ **AR-TG**	Technician, General ©1979	**$2.50**
☐ **AR-AE**	Advanced, Extra ©1979	**$3.00**

RSGB AMATEUR RADIO OPERATING MANUAL

Edited by R. J. Eckersley

Compiled by the RSGB, this exciting new book covers just about every facet of Amateur Radio. Starting with a precise description of the Amateur Service worldwide, the **Amateur Radio Operating Manual** leads the Amateur through the steps to setting up a station correctly, how to operate properly, DX, contests, satellites, RTTY and Slow Scan Television. You also get 5 big appendixes jam-packed with more information; callsigns in use, maps, DXCC country list, time zones and international callsign assignments. 190 pages. ©1979.

☐ **RS-OM** **Softbound $9.95**

GENERAL CLASS AMATEUR LICENSE STUDY GUIDE

by Phil Anderson, W8XI

This book was written in simple laymen's language with uncomplicated explanations and examples used to present electronic radio concepts and ideas. Throughout each chapter, questions and answers are used to strengthen your understanding of the terms and concepts presented. This book also covers several methods that can be used to improve code reception skills. The final chapter is a sample FCC exam which the author feels he would ask if he were to give the FCC exam. 160 pages. ©1979.

☐ **21617** **Softbound $6.50**

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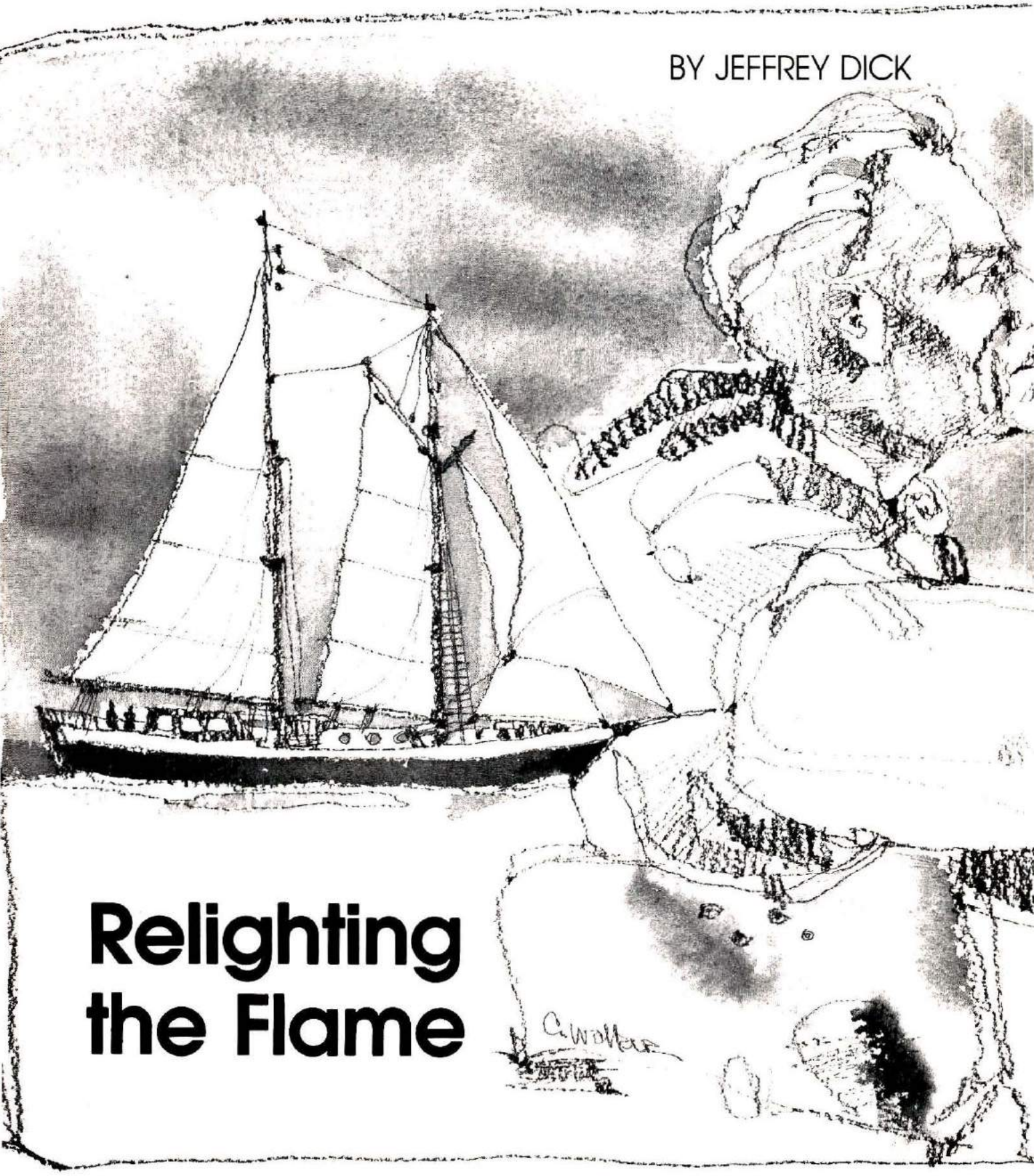
The Novice Experience:

BY JEFFREY DICK



Relighting the Flame

O'Daniel came topside amongst the commotion, calmly reached for the searchlight, and began signaling in Morse code: "Turn to Channel 16 on VHF."

Relighting the Flame

My fascination with Amateur Radio has bounced in and out of most of my 37 years of life. It began, as I recall, in my pre-teens, as I listened to the plaintive "Ble-e-a-p, ble-e-a-p, ble-e-a-p" of the first Sputnik as it passed over the horizons of Raleigh, North Carolina. I had been invited to listen by a next-door neighbor who was an electronics wizard and a ham.

Then it was crystal sets — the good Lord only knows how many coils I wrapped on cardboard tubes that once held aluminum foil, paper towels, or waxed paper. Happiness was sending an order off to Allied Radio in Chicago and then waiting for the postman.

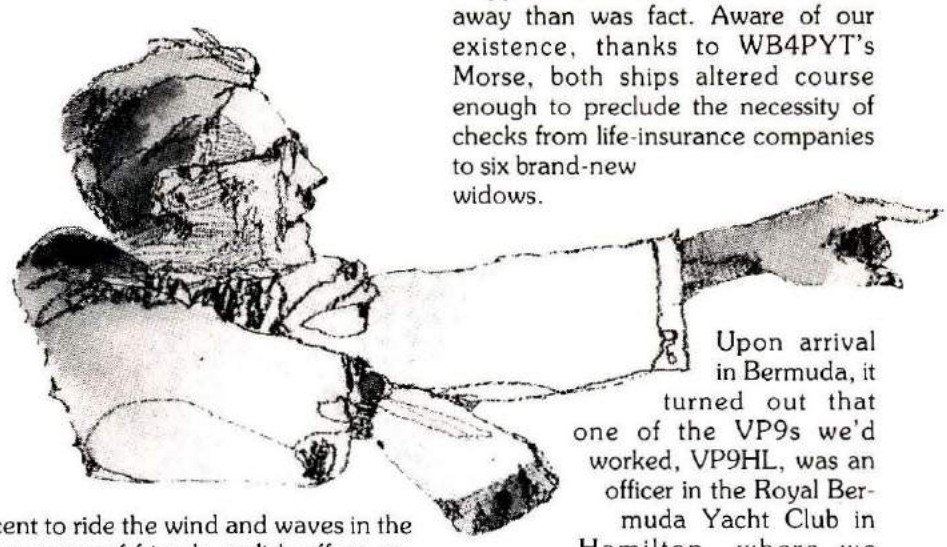
I'll even confess to having deliberately sent an extra one or two cents in with my orders, because Allied would actually send you back a check for a penny if you overpaid. I thought that was not only a riot, but the ultimate test in honesty.

Somehow, though, with all the tinkering, I never buckled down to the Morse code, nor did I sit for the exam. I do recall memorizing questions and answers from license manuals, not having the faintest knowledge of the why of the answers.

Then there was high school, cars, girls, college, more girls, wife, a job, family (all girls), starting a business (and the accompanying poverty), and a host of other excuses that kept the flame for ham radio diminished. It was always there, but burning very low.

It took a sailing trip from Morehead City to Bermuda in the company of five good friends, one of them WB4PYT, to really fuel the flame. WB4PYT, Jim O'Daniel (now AA4OD), put a rig on the *Kristen*, the Morgan 01-41 we sailed to Bermuda. Before we even left the dock, Jim cranked that gear up and worked a DL in Frankfort, using a vertical antenna which looked as though it had been purloined from some local junkyard.

The trip to Bermuda took four and a half days, and it was truly magnificent to ride the wind and waves in the company of friends, polish off an occasional frosty beer and, about twice a day, watch Jim tune up the ham gear.



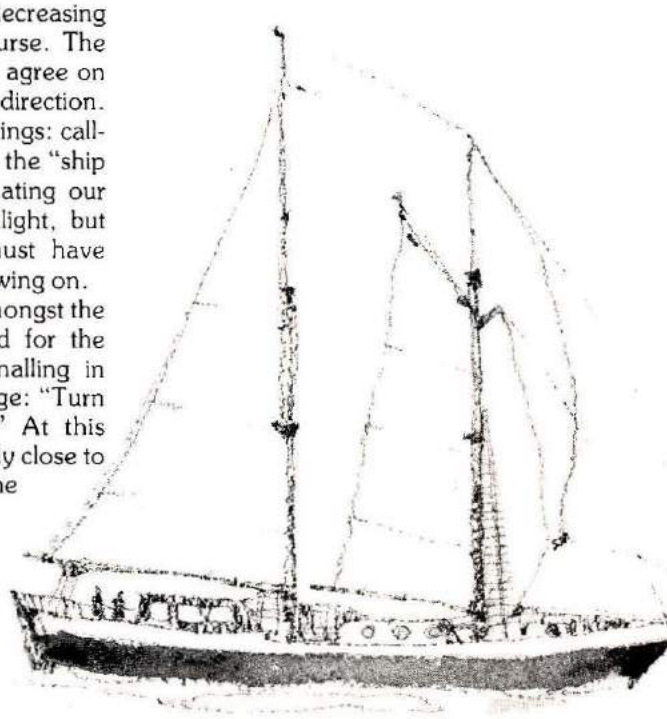
The special fraternity which makes Amateur Radio so appealing was quickly evident: operators in New Jersey were only too glad to run a phone patch back to North Carolina for us. VP9s in Bermuda followed our approach with interest and offers of assistance when we arrived.

I recall being at the helm one night while most of the others were sleeping below. A merchant ship we had first detected on radar was growing in size as our courses converged. The problem — it's a nightmare for sailors everywhere — was the ship, while growing closer, kept on a constant bearing. Constant bearing, decreasing range means a collision course. The idea is to get both parties to agree on who will turn and in what direction. We tried the conventional things: calling on VHF Channel 16 for the "ship off our port beam," illuminating our sails with the boat's searchlight, but the merchantman, who must have been on auto-pilot, kept plowing on.

O'Daniel came topside amongst the commotion, calmly reached for the searchlight, and began signalling in Morse code toward the bridge: "Turn to Channel 16 on VHF." At this point, the ship was sufficiently close to induce a lot of tension, but the tactic worked. A distinctly Spanish and sleepy voice came over the VHF and, once contact had been established, confessed that our masthead light — some 40 feet in the air in the dead of night — made it appear our boat was much farther-away than was fact. Aware of our existence, thanks to WB4PYT's Morse, both ships altered course enough to preclude the necessity of checks from life-insurance companies to six brand-new widows.

Upon arrival in Bermuda, it turned out that one of the VP9s we'd worked, VP9HL, was an officer in the Royal Bermuda Yacht Club in Hamilton, where we berthed during our stay. Like Jim O'Daniel, John Young is a pharmacist by profession. More than that, though, when the wives and part of the return crew flew over to join us, John hosted an elegant harborside cocktail party for us at his home. I recall saying to myself, "I can't believe how nice the people of Bermuda are. This guy didn't even know us five days ago."

WB4PYT had to fly home rather than sail back, and the return trip just didn't have the same luster or magic. Poor winds, either 2 knots or 50 knots but little in between, and the absence



of Amateur Radio that brought friends into the galley, left the return trip a part of the excursion just as soon forgotten.

The appeal of experiencing friendships via the airways has lingered long after the trip. Four of the crew have now gotten Amateur licenses, mine coming after I simply ran out of excuses, and found myself close to a University which offered a night course geared toward the Novice exam. Herb Lacey, N4UE, was our instructor, and his technique reflected all that has ever appealed to me about Amateur Radio. His chats gave the

subtleties and nuances appeal — finding things out for yourself, learning radio etiquette, the pride behind the idea of self-policing, the courtesy of it all. Herb taught as a friend, and left the idea there are still challenges out there in radio: SSTV, 6 meters, QRP, DXCC. It's a neat promise. In fact, it's my belief in the promise of the experience that gets these words onto paper and into print.

My thought has been that it might be interesting to offer a running commentary on "The Novice Experience" for a while, sharing what happens, the impressions, the learning curve, with other hams, Novices, and friends. Possibly, it could make the appeal pleasant enough to attract a few readers who, like I did, stood on the outside for too long. Next, I'll tell you about Samuel Morse's revenge on humanity. 73.

HRH

Ham Radio Techniques

BY BILL ORR, W6SAI

The summer months are slipping away and fall is nearly at hand. Static levels are dropping and 10 meters should start opening up very soon for the fall DX season.

As every Amateur knows, the sunspot activity is gradually dropping, and, in the next year or so, 10 meters will probably be gone, or nearly so, for DX contacts. A pity. Better take advantage of this marvelous band while you have the chance!

Many newly-licensed Amateurs think that the glory-days of 10 meter DX will go on forever. Not so. As the sunspot numbers continue to decrease, the 10-meter band will be the first important victim, and eventually it will be as dead as a Scotch village on Tag Day.

There's plenty of enthusiasm about 10 right now, if I read my mail correctly. A frequently asked question is, "What can I put up for 10 meter DX work that is inexpensive and sure-fire?" Luckily, there are several choices open to the ham with a thin purse.

CB antennas on 10 meters

The best and least expensive choice of 10 meter DX antennas comes right from our neighbors in the CB range. Yes, it is easy to modify most CB antennas to work on 10 meters. And, because these antennas are made in quantity, they are relatively inexpensive. Two of the "best buys" are the *Radio Shack* three-element CB Yagi beam and quarter-wave ground plane.

These are available in most metropolitan areas in the United States, and can be easily and quickly modified for 10-meter service. All that is required is that the element lengths be shortened by the ratio of the desired 10 meter design frequency to that of the CB design frequency.

As an example, suppose that the original antenna is designed with CB channel 20 as the center frequency. This corresponds to about 27.2 MHz. Suppose that it is desired to shift the design frequency up some spot in the 10-meter band, say, 29.0 MHz. The element(s) of the antenna must therefore be shortened by the ratio 27.2/29.0, or about six per cent. In other words, the CB elements must be shortened by a factor of 0.94. This amounts to trimming a total of 1 foot 2 inches off of half-wave elements and 7 inches off quarter-wave elements.

The ground plane? Trim seven inches off each radial and the whip and you'll be in the ball-park. Leave the matching system, if any, alone.

The Yagi beam? Trim a total of 1 foot 2 inches off each element. That is, cut 7 inches off each tip. Again, leave any matching system as is.

When you have completed this, place the modified antenna up in the air and run an SWR plot on it. This is how you do it.

The SWR plot

It is easy to measure the frequency

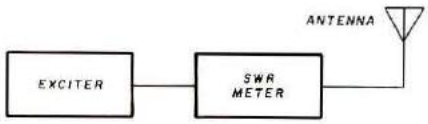


Fig. 1. Plot your SWR antenna response. This can be done by taking readings across an Amateur band and plotting the results-versus-frequency as shown in **Fig. 2**.

response of your antenna. The setup in **Fig. 1** is all that is required; your station SWR meter will do the job. The idea is to take SWR readings at various frequencies across the 10-meter band, and plot them as indicated in **Fig. 2**. You'll get a nice, smooth curve if all goes well, and the frequency of minimum SWR is the resonant frequency of your antenna system. If you want to move the resonant frequency about, you can do it by lengthening or shortening the antenna elements. Reasoning tells you that if you shorten the elements the resonant frequency will rise, and if you lengthen the elements the resonant frequency will be lowered. In the case of a beam, all elements should be lengthened or shortened *en masse*, or you are liable to lose the particular relationship established between the parasitic elements and the driven element.

And that's how to get an inexpensive and good 10-meter antenna quickly. The only tool you need is a hacksaw!

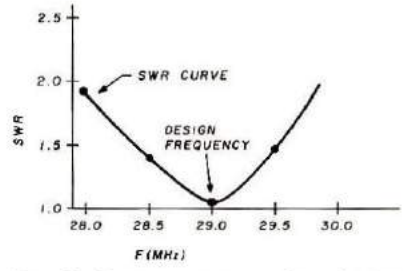


Fig. 2. Representative plot of SWR taken at 100-kHz intervals across the 10-meter band. Each SWR reading is plotted on a graph, and points are interconnected to produce an SWR curve. In most cases, you'll note the slope of the curve is greatest on the high frequency side of the design point. For this three-element Yagi, the design frequency is 29.0 MHz.

The coaxial antenna

Every once in a while the wheel is reinvented. This is the case of the so-called coaxial antenna which has just come to life in a new form.

One of the earliest forms of coaxial antenna is shown in **Fig. 3**. This is a vertical, 2-meter array made up of half-wave elements cut from sections of coaxial line. The phasing of the antenna sections is achieved by cross-connecting the coaxial lengths: shield to inner conductor and inner conductor to shield. I haven't the faintest idea where this design originated, although I do remember some information floating around in the late forties concerning various forms of coaxial antennas used for early fm broadcasting. I think they were called "needle antennas" because of their shape.

Every once in a while the wheel is reinvented. This is the case of the so-called coaxial antenna...

Well, a few weeks ago I received a letter from "Doc," WA6IFO, of Solana Beach, California. He sent me a sketch of his coaxial antenna for 40, 20, 15, and 10 meters (**Fig. 4**). In brief, it is a length of coaxial line, reversed in phase from the transmission line and terminated in a 50-ohm load. Doc used a Drake DL-300 dummy load for the termination. The antenna isn't very high in the air, but it works on four bands with no antenna tuner necessary. Maximum SWR on any *band* is no greater than 1.25 to 1.

Doc reports that he's worked plenty of DX, including Japan on 40 meters, with this modest and inexpensive antenna. Recently, he's made a compact version, only ten feet long, and found that it loaded well on 40 and 20 meters. He's going to try it as a radial-less vertical antenna next.

Doc's antenna resembles other antennas which are terminated (such as the rhombic) and doubtless the radiating portion of the coax could be removed and open wire line substituted for it. If this is done, it then starts to resemble the so-called T2-FD terminated dipole that was in vogue a few years back.

Shortly after Doc's letter to me, I ran across another coaxial antenna design in the January issue of *Proceedings of the IEEE* (Volume 68, number 1). It was in an article entitled "Implantable Radiators for Cancer Therapy by Microwave Hyperther-

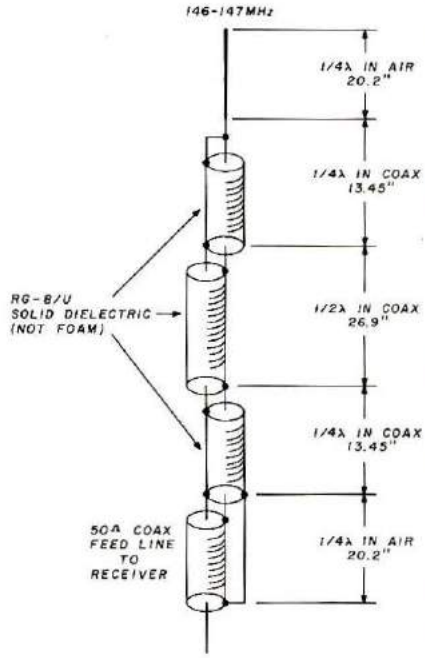


Fig. 3. A coaxial antenna made up of sections of transmission line. Each section of line serves both as a radiator and a coupler to the adjacent section. Antenna is patterned after an early design used in fm broadcasting. Coaxial antenna is "terminated" by quarter-wave whip section at top. Drawing is adapted from *FM and Repeaters for the Radio Amateur*, published by the American Radio Relay League.

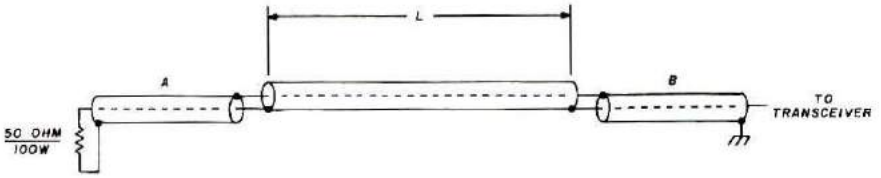


Fig. 4. The coaxial antenna at WA6IFO works on all Amateur bands from 80 to 10 meters. Length L is uncritical, and is about 40 feet at Doc's station. Sections **A** and **B** are random length. Doc reports maximum SWR on any band is less than 1.25 to 1. For best results, L should be as long as possible, although Doc has used lengths as short as 10 feet. Doc says, "It may not be the world's hottest antenna, but it seems to put out comfortably workable signals on all bands despite the random proportions." Latest DX is Japan on 7 MHz.

mia," by Leonard S. Taylor of the University of Maryland.

It seems that certain cancers can be treated by combined effects of heat and radiation. Since microwaves are rapidly attenuated in passing through the body, a microwave antenna has been developed that may be inserted *into* the body by means of a hypodermic needle! The "hypodermic monopole" is shown in **Fig. 5**. Note that one of the versions has a phase-reversal mode in it. The microwave radiation applied by the implantable radiator was in the 2.4-GHz region.

Doc (WA6IFO) has continued his antenna experiments and has come up with another interesting antenna (**Fig. 6**) that has no terminating resistor. The idea came from a loop antenna that was described in the "Ham News" bulletin issued by the General Electric Company over thirty years ago. Doc substituted a coaxial section for the loop as shown in the illustration. He's driving it with a Swan 150 on 40 meters. The coaxial line is quite low and runs in a north-south direction. He tunes the antenna for maximum current in the rf ammeter, which runs about 2 amperes. No DX yet with this antenna but plenty of S9 reports around California!

TVI revisited

The period 1947-48 was a vintage year for *QST* magazine. In the October, 1948, issue there was a short article about an "amplifying crystal" called a transistor. *QST* stated, "These clever little devices are well worth keeping an eye on." How true.

Of equal impact was an article in the August, 1947, issue of *QST* entitled "Curing Interference to Television Reception" by Mack Seybold, W2RYI, of RCA. While the transistor article under-emphasized the importance of the transistor, the TVI article oversimplified the problem of TVI, because 34 years later we still have it!

TVI is back with us once again. All that was learned the hard way has apparently been overlooked or forgotten.

W2RYI summed up the solution: improved transmitter shielding, use of harmonic suppression circuits in the transmitter, and a high-pass filter on the television receiver.

During the next decade, great advances in transmitter design came about, expressly engineered to reduce and suppress harmonic energy in the transmitter. The old Viking II and Ranger transmitters are examples of this forgotten art.

TV-receiver manufacturers, too, improved their sets, incorporated filters in the design and generally buttoned up their circuits. And finally, when SSB came along with its linear amplification that virtually eliminated the harmonic-producing class-C amplifier, the TVI problem gradually faded into the background and was forgotten by the great majority of Amateurs.

Alas, this scourge is again on the increase. Once the TVI uproar quieted down, transmitter manufacturers became more lax, shielding disappeared, suppression circuits were forgotten, and the TVI shielded cabinet degenerated into a metal or plastic dust cover. TV-receiver manufacturers did their part, too. High-pass filters were dropped out, shielding was cast aside, and the printed-circuit board took over, with its long ground loops and high-impedance return paths.

The sorry result of all of this is that TVI is back with us once again. All that was learned the hard way has apparently been overlooked or forgotten. And the majority of new Amateurs have never known the problems of the 1947-1955 period when TVI was rampant and Amateur Radio was shaken to the core by this serious interference problem.

So here we are in 1980 with TVI on the increase. A lot of the problem is due to the great interest in 10-meter activity. Since the second harmonic of a 10-meter transmitter falls directly into the TV band, the problem is real, and any 10-meter operator should take steps to make sure that he hasn't

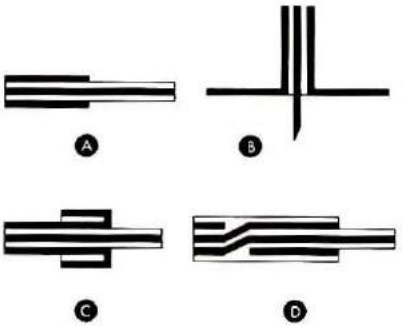


Fig. 5. The implantable hypodermic radiator used for cancer treatment. At **A** is a simple needle radiator. **B** shows a hypodermic monopole with ground-plane flange. **C** is a sleeve monopole with quarter-wave isolating element. **D** is a cross-connected (phase reversal) radiator with needle radiator at right. Drawing is adapted from *Proceedings of the IEEE*, January, 1980.

knowingly become the neighborhood nuisance.

The 10-meter operator can do a lot to alleviate the TVI problem, and here are some suggestions for him. (This information applies equally well to the lower frequency bands.)

1. Place a lowpass, transmitting-type filter in the coaxial line to your antenna, or antenna tuner. *R.L. Drake Co.* makes a suitable filter and so does *Barker & Williamson Co.* The latter filter, by the way, is listed in the *Heathkit* catalog (HDP-3700). Another source of a suitable filter is *J.W. Miller* (C-514-T).

2. Once your transmitter harmonics are prevented from running up the coax line to your antenna they will try to escape via the transmitter's ac power line. A line filter will stop this. Again, the *J.W. Miller Company* makes several line filters (model C-508-L for a line current of 3 amperes and model C-509-L for a line current of 5 amperes). Also, I note in the *Newark Electronics* catalog, several pages of line filters. The *Corcom* model 20K6, for example, has a current rating of 20 amperes — sufficient for that 2 kW PEP final amplifier. All filters, of course, should be installed properly according to the manufacturer's specifications.

3. The final step is to add a high-pass filter to the television receiver. You *should not fool around with your neighbor's set.* If anything goes wrong with it in the future, he'll blame it on your tinkering! Let *him* (or his serviceman) put the filter on his set. You can get a good filter from *R.L. Drake Co., J.W. Miller Co.*, and at the *Radio Shack* outlets. Install the filter according to instructions.

If you do these three simple things, you'll probably clean up your TVI. Common-sense operating habits (don't overdrive your amplifier, and making sure your equipment is tuned properly) will certainly help a lot, too.

Stereo Interference

The same general cure applies to stereo interference as it does to TVI: keep your signal out of the equipment. Stereo circuits are prone to rf pickup because of the long speaker wires and various interconnecting leads. Interconnecting cables used in most stereo setups are poorly shielded and do their bit to act as an antenna, picking up your signal and piping it into the sensitive stereo circuits.

J.W. Miller Co. makes a set of lead filters designed to suppress stereo interference. The C-505-R filters are placed at the audio input jacks of the equipment, and the C-506-R filter installs in the speaker leads. Other manufacturers make similar filters. Once your transmitter is properly filtered for TVI, the addition of these filters to a nearby stereo, tape recorder, electronic organ, or guitar amplifier should clean up the problem.

Stereo circuits are prone to rf pickup because of the long speaker wires and various interconnecting leads.

Just remember that cleaning up unwanted interference is a double problem: you must clean up your equipment and then prevent your signal from getting into the entertainment equipment. Okay?

Additional Reading

From time to time I recommend interesting reading that will enhance your knowledge of ham radio and electronics. This month's suggestion is a new magazine called *R-F Design*. A subscription to this magazine is *free of charge* to those who qualify. It is a monthly gold mine of information for the advanced Amateur. To obtain a subscription qualification card, write Cardiff Publishing Circulation Service Center, Box 1077, Skokie, Illinois 60077.

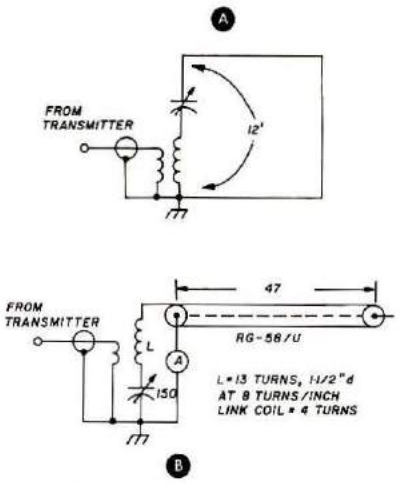


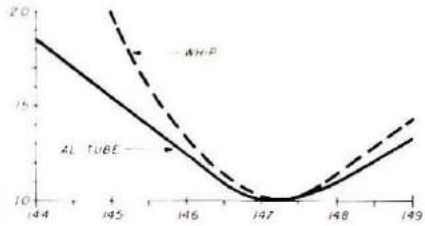
Fig. 6. The coaxial antenna of WA6IFO. A random length of small, 50 ohm coaxial cable is used for the radiating portion of the antenna. The Original loop antenna is shown at (A).

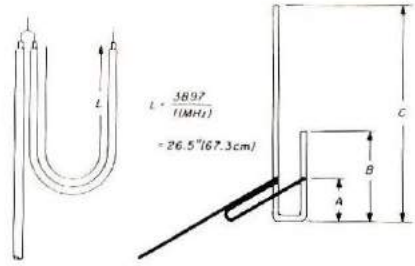
Interested in the latest electronic news from Asia? Information about imports and what is being manufactured in Japan, Hong Kong, Korea, and parts west? *Asian Sources Electronics* will tell you what is going on. This fat (375-page), colorful, monthly magazine is published by Trade Media, Ltd., Box K-1786, Kowloon Central, Hong Kong. A one-year subscription (by surface mail) is twenty-five dollars. There's not much in the way of ham equipment in the magazine, but you'll be dazzled by the fantastic displays of stereo gear, digital watches, TV games, cassette recorders, CB gear, walkie-talkies, and so on.

And, finally, a freebie. Send your QSL card, addressed to me, care of Ham Radio Horizons, Greenville, New Hampshire 03048, and I'll send you at no charge a data sheet on the popular EIMAC 3-500Z linear amplifier tube, plus circuitry information about its use.

HRH

Ham Radio Techniques





ANTENNA	A	B	C
5/8" (16mm) ALUMINUM TUBE	3" (7.62mm)	19 5/8" (50mm)	56" (142.2mm)
TELESCOPIC WHIP	4" (10.1mm)	19 3/4" (50.1mm)	56 7/8" (144.3mm)

Erratic Errors

Dimensions in the drawings for **Fig. 8** (page 45, July *Horizons*) were inadvertently switched, creating some confusion (to put it mildly). Here is the corrected version. For some of you who wrote in asking for a clarification, dimension **B** is ¼ wavelength, and is a "matching section." Dimension **A** is the tap point on that matching section, and can be varied slightly up or down to obtain a good match on the coaxial cable from the transmitter. The portion of the antenna above dimension **B** is a half-wave element, and does the radiating.

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D-15	15	22'	23.95	19.95
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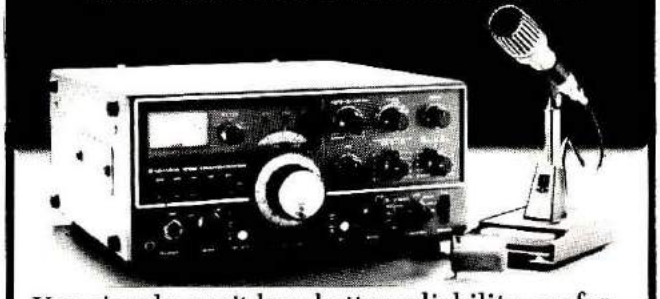
STARTER PACKAGE 2



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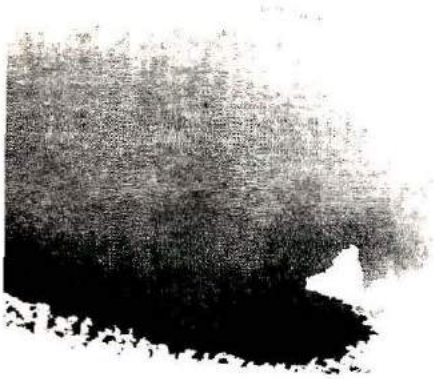
DXer's Diary—

Sunday Shootout

BY BOB LOCHER, W9KNI



"Daddy, what's a VQ9?" my eight-year-old daughter sweetly asked me.

"That's Chagos Islands. It's a country I need. Why?"

"Well, Mr. Becker just called on the phone. He said that if you wanted a VQ9 you better get on your radio right now."

Casually, I patted my daughter on the head, excused myself politely from my neighbor, and sauntered on home with that savoir-faire for which I am well known throughout the neighborhood, clearing completely all the hedges but one — and bending it only slightly — and stepping in only one of the mines that my next-door-neighbor's dog is always placing for me.

In mere moments, I am in the basement in front of the rig, in my stocking feet, throwing switches and grabbing for the microphone of my 2-meter rig.

"K9MM W9KNI. Where is he?"

"W9KNI K9MM. It's VQ9DC on Diego Garcia. He's on fourteen two-ten, going by districts, and just finishing the zeros. He said he'd be on CW at fourteen-oh-twenty-five after a short break."

"All right! Are you all tuned up for CW?"

"Roger. Go ahead and tune up — I'll watch for him. But let's switch to 525 simplex first. You sound out of breath."

"Roger." I flip the 2-meter rig to the simplex channel.

"K9MM, W9KNI. Okay?"

"Roger. W9KNI here's K9MM. Go ahead now."

I'd had all the gear tuned up on 15, so a complete retuning was necessary; dump in the dummy load, preset the dials, linear on — Bzzzt-clunk goes the automatic surge circuit, and the blower starts its hum. Okay, linear out, peak the driver, dip the final, linear in, reduce drive, dip the final, load tighter, dip the final, redip the driver. Advance the drive — 115 mils — okay. Switch the antenna in, advance the loading a hair more, find a clear frequency, key down, dip the final, check output. All okay — 600 watts — I even start to catch my breath.

"Okay. I'm ready."

"Good. He's not on yet, or at least I haven't found him. But listen to all those carriers! This isn't going to be just your ordinary Sunday afternoon pileup."

"Hoo boy! Yeah, I hear them. Everybody and his brother is tuning up. He must have had the whole world after him on sideband. What heading was he peaking?"

"I had him at 15°. He's pretty loud. He said he was running a kW to a log-periodic."

"Fantastic. That sure will be a nice change from that last DXpedition."

"Sure will. I never did really hear those guys very well. We better start watching. W9KNI from K9MM."

"Right. K9MM here's W9KNI."

I settle the headset over my ears, and begin tuning. Almost instantly I find him . . .

"CQ CQ DE VQ9DC VQ9DC AR"

I grab the spotting-switch and pull the VFO down on him as he signs from that quick call. Already three stations are calling, all almost dead on him, so I jerk my transmitter VFO up a few hundred hertz. I start my call — oops! Keyer speed too slow — I goose it up to match the VQ9's speed . . .

"VQ9DC DE W9KNI W9KNI AR"

Hah! "W9KNI 599 599 Chagos QSL W3HNK DE VQ9DC"

As he transmits, I thumb my 2-meter microphone without lifting it off its hook, and shout, "John, I got him. Oh twenty eight — drop a tail end on me." The VQ9 turns it back to me . . .

"VQ9DC DE W9KNI W9KNI R TU UR 5NN 5NN CHICAGO BOB BOB QSL OK 73 DE W9KNI"

The transmitter drops out, and my

receiver comes back to life — I hear the ending of two or three tail end calls. John's got competition.

"W9KNI R 73 BOB ES TU QRZ DE VQ9DC K" Bang! Instant pileup. Wow! Only one QSO and already he must have twenty stations after him. Looks like he doesn't pick up tail-enders either. Was I ever lucky!

I continue to listen as I scribble in the log entry. Chagos Islands. What a catch! Ahh. There he goes again.

"W3KT DE VQ9DC R . . ."

I get a call on 2 meters. "W9KNI from K9MM. Way to go, Bob. Boy, what a zoo. 3KT's got him now. Will you stick around and help me spot?"

"Yeah, okay, fine, John. K9MM here's W9KNI. Hey, I was really lucky, and I sure appreciate you calling me. Of course I'll help. Hey, there he goes again." We listen back on 20 meters.

"W3KT R TU 73 QRZ UP5 UP5 DE VQ9DC K"

"Hey John, up five, up five. He's going split." I set my receiver cursor on 30, so that I can instantly return to the VQ9's precise transmitting frequency, and then move up five kilohertz to see what's happening for a three or four second look. I hear perhaps a dozen stations calling the VQ9 — it seems not everyone has the message. Boy, am I glad I'm already through. I listen to John call, note his frequency, and jump back down to the VQ9's frequency.

Yes, there he is, coming back to someone . . .

"W1XU DE VQ9DX 5NN . . .

"Okay, John, he's back to W1XU, K9MM from W9KNI." I move back up to find the W1 — yes, there he is, not too strong, about one kilohertz higher than John was.

"Okay, John. The W1 is on oh-thirty-four."

"Yeah, I got him. I'll set up just above him. W9KNI FROM K9MM." We listen . . . "QRZ DE VQ9DC UP 5 K"

I move the receiver up five again. It seems that most of the pileup has caught on. There must be fifty or even a hundred stations in there — it's hard to tell in a pileup. I find John — his signal here is very loud. But someone else is dead on him.

"John, move up a couple — you're

being buried." I pull the receiver back to the VQ9's frequency. "Keep calling, keep calling. Okay, okay, stop calling. He's back to someone — a two. Yeah, it's W2BA. It looks like the East Coast has propagation on him."

W2BA signs. The pileup mounts. A WB4 snags him. He clears. Another three catches him, he clears. Hey, he's working a six. There's the six. Oh, "QTH CONN . . ." A transplant. Now an eight's got him. Maybe there's hope for us nines. But the pileup seems to be growing by the minute in what seems to be a geometric progression.

"K9MM here's W9KNI. John, he seems to be moving up and down a bit, right around thirty-three. Try getting on thirty or thirty and a half. It's quieter there. No way you're going to beat out that mob head on. But you might have a chance if you give a try down there."

"Roger, I'll try it. W9KNI from K9MM."

Ah, another four gets him. Then, "K9MM DE VQ9DC 5NN 5NN BK"

"All right! You got him!" John completes his QSO.

"W9KNI from K9MM. Whew! I didn't think I was going to get that one. Thanks a lot for the help, Bob."

"Hey, you got to know I'm as happy as you are, John. You're the guy that found him. I'd have felt bad if I had gotten him and you hadn't. Of course, I'd have still QSL'd."

"Yeah, I know. You wouldn't have felt *that* bad. But that's a good one."

"Well, glad I could help. It's always easier with another set of ears to help."

"Sure is. Well thanks, Bob. That was a big help."

John and I clear, and I move my 2-meter frequency back to the DX repeater channel; no sense missing a call for the next new one. Then, I clear up my log entry, and check VQ9 off my country-need-list records — with a big smile. VQ9 is an outstanding catch in anybody's log book; a fine long-haul DX QSO, not to mention a rare country for DXCC.

I fill out the QSL for the contact, to be sent with a self-addressed, stamped envelope for return, and address it to W3HNK.

My feet are getting cold. Time to go clean my shoes.

HRH

DX Horizons

September, the month that the DX returns. As in past years, steadily improving conditions on all bands should rekindle interest in pursuit of the Rare One. Look for 10 meters to show some signs of life near the end of the month. Seasonal static levels should also begin to die down, allowing 80-meter signals to be heard above the noise again. This is the time to prepare for a fall and winter season of filling the log with DX on all bands.

Saint Helena

Saint Helena Island is a British Crown Colony located in the South Atlantic Ocean, about 1200 miles from the West Coast of Africa. It probably is best known as Napoleon's place of exile from 1815 to 1821. At present, it would definitely qualify as an exotic DX location.

There are several hams now QRV from Saint Helena. One of these is Harold Henry, ZD7HH, a permanent resident of the island. Harold is 34 years old, married, and has three children. His occupation is Examiner of Accounts, Office of the Auditor, Government of St. Helena, and his hobbies, other than Amateur Radio, include golf and rifle marksmanship. He is Secretary of the Rifle Association of Saint Helena.

Harold uses a Yaesu FT-101B transceiver, and at this time does not have a VFO for operating split. He is trying to obtain one so that he may operate on 80 and 40 meters. He uses a TA-33 tribander that was donated by many of the U.S. Amateurs whom he had worked. ZD7HH may be heard on all bands, and was worked by many on 80 meters SSB last winter. When you find him, QSL via W4FRU.

Taiwan, Republic of China

It almost goes without saying that Tim Chen, BV2A/BV2B, is one of the most desired QSOs in Amateur Radio. Tim is the only station active from Taiwan, and does a good job in providing QSOs for the Deserving DXer.

At present, Tim is using a Hallicrafters FPM-300 transceiver — which lacks a bit in CW selectivity as it has no CW filter — a Collins 30L1 amplifier, and has a Heath HW32 as a backup rig. His antenna is a vertical, as the 203BA 20-meter monobander was damaged in a storm last year. Tim only operates 10 and 20 meters, CW and phone. He can be found most Wednesday mornings on 14.225 MHz with the W7PHO Family Hour group.

This year, Tim won the D.D. (Dot and Dash) Prize as the most excellent DXer in the world, presented annually by the DX Family Foundation in Japan. He will be honored with a reception in Tokyo sometime this year.

DX Family Foundation

The DX Family Foundation was recently formed by a group of Amateurs

in Japan, who have an interest in the progress and promotion of DXing in the world. The main purposes of the group are to provide QSL cards for DX Amateurs and DXpeditions, to provide QSL managers for DX Amateurs, to issue DXF awards, and to publish a weekly DX Bulletin for Japanese Amateurs. They also award annually the "D.D. Prize" to the Amateur they feel to be the most excellent DXer in the world. Information on the group and awards may be obtained from Yoshiano Kouzuma, JA2MTO, 223-7 Azumada-Cho, Toyohashi, Aichi 440, Japan.

Conversation

One of the shortcomings of the majority of American Amateurs is the inability to communicate with a DX station in a language other than English. This sometimes can be an obstacle, in that some rare countries cannot be worked in English. Having run into this problem early in their ham radio career, Jukka Heikinheimo, OH1BR, and Miika Heikinheimo, OH2BAD, put together *The Radio Amateur's Conversation Guide*. The book provides translations of common Amateur phrases in eight languages, and also provides a dictionary of ham radio terms in those languages.

The book is more comprehensive than most have been in the past. Phrases are included for making the QSO, common courtesies, reports, name and QTH, equipment, antenna, weather, regulations, operating, signal quality, conditions, contests, personal QSL, address, and ending the QSO.

To illustrate the diversity of the book, it contains such phrases as "Please repeat your callsign slowly several times," "Can you wait for a moment? I'll turn the antenna in your direction," and "Are you allowed to operate on the 160-meter band?" The phrases in this book are much more extensive than the usual hello, signal report, and goodbye type seen often in the past. The book is available in the U.S. on a non-profit basis from W6EUF, Wayne Gingerich, 2301 Canehill Ave., Long Beach, California 90815, for $12 postpaid.

Ethics

We talk to many DXers around the country each year during our travels. Several topics are discussed, but one that sticks out most often is the subject of ethics. Many feel that ethics are be-

U Confused?

There are 18 DXCC countries in the USSR. However, many DXers suffer some confusion in determining which prefix counts as which country. Here is a guide to the Russian prefixes. The basic countries are:

1. UA1 through 6, except UA2	European Russian S.F.S.R.
2. UA1	Franz Josef Land (The operator or pile-up will be the tip-off on this one)
3. UA2	Kaliningradsk
4. UA9-UAØ	Asiatic R.S.F.S.R.
5. UB5	Ukraine
6. UC2	White R.S.S.R.
7. UD6	Azerbaijan
8. UF6	Georgia
9. UG6	Armenia
10. UH8	Turkoman
11. UI8	Uzbek
12. UJ8	Tadzhik
13. UL7	Kazakh
14. UM8	Kirghiz
15. UO5	Moldavia
16. UP2	Lithuania
17. UQ2	Latvia
18. UR2	Estonia

The alternate prefixes for the 18 countries above are:

UK2A	=UC2	UK2S	=UC2	UK8L	=UI8	UZ1	=UA1
UK2B	=UP2	UK2T	=UR2	UK8M	=UM8	UZ3	=UA1
UK2C	=UC2	UK2V	=UR2	UK8N	=UM8	UZ4	=UA1
UK2E	=UC2	UK2W	=UC2	UK8O	=UI8	UZ6	=UA1
UK2F	=UA2	UK2Z	=UC2	UK8Q	=UI8	UZ9	=UA9
UK2G	=UQ2	UK3	=UA1		UZØ	=UAØ	
UK2H	=UQ2	UK4	=UA1				
UK2I	=UC2	UK5	=UB5 (except UK5O)				
UK2O	=UC2						
UK2P	=UP2	UK5O	=UO5				
UK2Q	=UQ2	UK6A	=UA1				
UK2R	=UR2	UK6B	=UA1				
UK6C	=UD6	UK8R	=UJ8				
UK6D	=UD6	UK8S	=UI8				
UK6E	=UA1	UK8Z	=UI8				
UK6F	=UF6	UK9	=UA9				
UK6G	=UG6	UKØ	=UAØ				
UK6H	=UA1	UT5	=UB5				
UK6J	=UA1	UV1	=UA1				
UK6K	=UD6	UV3	=UA1				
UK6L	=UA1	UV4	=UA1				
UK6N	=UA1	UV6	=UA1				
UK6O	=UF6	UV9	=UA9				
UK6P	=UA1	UVØ	=UAØ				
UK6Q	=UF6	UW1	=UA1				
UK6R	=UA1	UW3	=UA1				
UK6U	=UA1	UW4	=UA1				
UK6V	=UF6	UW6	=UA1				
UK6W	=UA1	UW9	=UA9				
UK6Z	=UA1	UWØ	=UAØ				
UK7	=UL7	UX1	=UA1				
UK8A	=UI8	UX3	=UA1				
UK8G	=UI8	UX4	=UA1				
UK8H	=UH8	UX6	=UA1				
UK8I	=UI8	UX9	=UA9				
UK8J	=UJ8	UXØ	=UAØ				
UK8K	=UI8	UY5	=UB5				

Of course, there are always some special prefix stations. The Olympic prefixes used earlier in the year merely had an R in place of the U in the regular callsign. There are regular R callsigns for VHF stations rarely heard in the U.S. except on 10 meters.

Special calls may be heard at various times during the year; most can be solved by logic. Example: UØY was a UAØY. U2Q was a UQ2. The R contest calls can usually be determined by adding a U after the last letter and reading backwards. Example: R6F, with U added, would be R6F(U), read backwards to be a UF6.

Special number prefixes are also used. 4K1 prefixes are used in Russian Antarctica, and 4J through 4L prefixes may sometimes be found during contests. EK, EM, EO, ER, EX, EZ, are also assigned, and are sometimes used for special occasions.

We hope this may help in recognition of the U calls. Thanks to K3WS for his help in preparation of this list.

Harold Henry, ZD7HH, at his station on Saint Helena.

The ZD7HH antenna farm, a TA33, which has been raised to about 60 feet. The radio shack is in the small building just to the right of the antenna.

The ever popular Tim Chen, BV2A/B, with his very neat station, in Taipei.

Right, Bill, KA1NC, from the position where he passed out over 10,000 QSOs from Minami Tori-Shima during 1978-79. Bill expects to visit other rare spots before his Coast Guard tour is up.

ing totally ignored in pursuit of a small pasteboard card.

Most of us operate for our own feeling of self-accomplishment. Self-accomplishment is important in all of one's daily life, but is doubly so in DXing, where self-satisfaction is the primary reason for DXing.

For this reason, many are not only surprised, but also appalled at some of the things heard on the bands these days. Call dropping in the pile-ups for weaker friends, help by relaying reports, lists made by telephone, and even log information passed by telephone and two meters to those who weren't fortunate enough to be at home when the DX was worked, but will strangely appear in the DX station's log book. No longer does there seem to be any need to miss a night on the town to work all the rare DX.

We wonder how anyone can maintain their own self-respect while being a party to such happenings. After all, most will find that their peers in their local area know what's going on, and so the only respect they have left to maintain is their own.

There are more than a few DXers around who have enough confirmations to go onto the DXCC Honor Roll, and yet have never submitted any cards. It's obvious that these people are DXing for self-accomplishment, and not just to see their card in a once a year listing.

The Deserving DXer knows what's going on. They know who worked the DX and who didn't. Such happenings don't bother the Deserving much, as their self-esteem is intact. The ones who will pay the price of the loss of their own self-respect in the long run will be those who can show you a list of their accomplishments, yet deep inside know they have accomplished nothing. Let them live with their own non-accomplishments.

Cocos Island

Cocos is a small island of about 18 square miles located southwest of Costa Rica. It is part of the Costa Rican National Park System, and is normally uninhabited.

In recent years, activity from Cocos seems to have been only from semi-annual, week-long expeditions. However, recently there has been a big upsurge in activity from Cocos. There were several expeditions this spring, and TI2CF, along with TI2XXX, spent ten days on the island installing a tower and beam antenna for use by future DXpeditions.

There is an eight-man guard force for the National Park, and, on a trip in early May, TI2CF left a transceiver for their use. TI9PN is now active from the island, operated by Jose. Jose speaks little English, and will be mostly below the American phone band; however, he will be up occasionally to work a list taken by TI2CF, who also handles his QSLs.

Next Month . . .

Next Month, we will have some information on how to build your country count with contest QSOs. Cards, letters, and photographs you may wish to share will certainly be appreciated. Correspondence may be sent to DX Editor, *Ham Radio Horizons*, Greenville, New Hampshire 03048.

QSL Route

Station	QSL Via
AN8AK	EA8AK
AP2AD	K1KNQ
A22GD	SM3CXS
A35JL	K9AUB
A35RB	Direct
A4XIH	G4BWP
A7XE	DK3GI
A7XM	DJ9ZB
CI3LSS	VE3LSS
CN8BL	F3HT
CR9AK	VS6AG
CT2CE	AG1K
CT2DE	WB3IFD
CX7AAR	AA1U
C31DA	ON5MG
D2AZB	PY5WD
EC3AT	EA3XZ
EL7A	DL2GA
ET3PG	Operator Tensay only: Box 6128, Addis Ababa
FH8CL	I1KFB
FK8AU	IØPQ
FK8DD	WB3JUK
FK8DJ	JH3XCU
FKØBW	DJ5CQ
FKØCQ	DJ5CQ
FKØWK	W6EDN
FM7AV	F6BFH
FM7ITU	F6BFH
FOØDX	K1MM
FR7BP	WØAX
FRØFLO	Box 200, LeTampon, Reunion
GI4GPC	WA4JIL
GJ5DGO	DJ4FO
HDØMM	K1MM
HI8IARU	HI8LC
HL9TN	WA8DHK
HL9UG	N4CPR
HP1XEK	DL1HH
HS1AMT	W2TK
HT1HFC	WØSA
HT9TM	K2TV
HV2VO	IØGPY
H44OH	Odeh Habash, Box 22, Honiara, Soloman Islands
ISØMVB	WB1DQC
JD1AKE	JF1ACZ
JY9LG	WA4DXL
JY9OD	KA4LXZ
J3ABT	W6RGG
J3ABU	W6RGG
KC6HC	KG6JHH
KG4WM	KG4AN
KP4KK/DU2	WA3HUP
N4ADJ/KH2	WB4CCT
N7KA/VP2A	N6NK
OD5NG	Box 2488, Beirut
OE6HZG	W2VMH
OY1R	W2KF
PT7WA	WD4DXK
P29DP	W7O7
P29LB	WB2FLB
SVØAA/9	N2OO
SVØBC/9	No callsign on envelope. Shirley Larsen, Box 711, APO NY 09291
S79GM	WA4JIL
TA2KS	G3SCP
TDØG	TG Bureau
TI9PN	TI2CF
TI9TE	TI7TE
TJ1AA	Direct
TU2HS	DJ9HD
T3AC	W5RBO
T3AY	WB6LED
UVØEX	W7PHO
U2Q	UK2GCF
VK9NM	DJ5CQ
VP1WG	WBØDEL
VP2EEU	WA4ZSX
VP2VGB	K7SE

Horizons DX

QSL Route

Station	QSL Via
VP8HA	W3HNK
VP8ZO	Bill Berntsen, Pt. San Carlos, Falkland Islands, South Atlantic. 2 IRC's, allow 6 month wait
VQ9JJ	K4NYK
VQ9TT	KB5MZ
VQ9WE	WA6IJZ
VS5MM	K1MM
VS6CT	WB9WPR
WA4BVB/KH2	WA4GLE
WB8CSH/C6A	K8CW
XE1RL	WD8KNT
XT2AT	OE8HNK
ZB2EO	K3MNW
ZD8MH	G4DDH
ZK1CA	ZL2UW
ZK1CE	AD1S
ZK2DX	JA1BK
ZL1BD	ZL1SZ
ZS6DN	WA4HHG
3D2DB	JA1BK
3D2WR	G5RP
3D6BP	W1OX
4K1A	UQ2OC
4M3AZC	YV3AZC
5K4LRM	HK4LRM
5W1CN	ZL1AA
5Z4GX	DF7GX
5Z4YT	DJ5IL
6H1MEX	XE1MEX
6W8AR	WB4LFM
6W8FZ	DJ7BG
6Y5AH	W1BPM
7X5AH	AD1S, George Adkins, P.O. Box 32735, Oklahoma City, OK 73123
8P6AH	WA4WTG
8P6NW	KA9EBM
8P6OH	W2FLO
8Q7AW	DJ3BL
9H3AM	G3VLX
9J2TJ	N8JW
9K2EW	WA3SWH
9L1FC	WAØCAE
9V1UH	G3VJG

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 in this column. No questions 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 here the earliest will be used.

I seem to be unable to understand the decibel. Can you help me? — J. R. Watson, WD5GMF.

No doubt you've heard about the origin of the term, i.e., dec = 1/10, thus dec + bel equals 1/10 bel (and a bel was an early measure of telephone-line losses). You've also seen, I'm sure, the formula for figuring dB, such as

$$dB = 20_{log} \quad P1/P2$$

This is great stuff for engineers and historians, but, for many Amateurs, a more down-to-earth explanation will suffice. Try this one: 1 dB = 26 per cent.

If you'll keep that in mind, you'll always know two very important things. First, you'll remember approximately how much of an increase or decrease 1 dB represents, and, second, you'll also see that it must be referenced to something (26 per cent of what?). When you think about it, you cannot just say, "I have a 26 per cent antenna." Right? Obviously, you have to say, "My antenna performs 26 per cent better than Joe's antenna," or, "Your signal is 26 per cent stronger than it was before you turned on your amplifier."

Common references used in Amateur circles are dB compared with a milliwatt or watt (for power), written as dBm or dBw, respectively; and compared with the isotropic radiator or a half-wave dipole (for antenna work), written dBi or dBd. (The isotropic radiator is a hypothetical beast used to scare engineering students, but not of much use to an Amateur who wants to build something in his back yard. You can see and feel a dipole, so let's stick with that.)

Here's something else: A dB can be either positive or negative. An increase in signal strength, gain, or power output — as compared with some previously measured amount — would be positive, and could be expressed as +12 dBm (12 decibels above a milliwatt) for example. A negative value, such as −40 dBc, would tell you that a signal (such as a harmonic) was 40 decibels below the main *carrier* of a transmitter.

Just to show you how this works, let's try an example. Suppose you have a transmitter that puts out 100 watts. You are using a dipole antenna, which will serve nicely as a reference, allowing us to express gain referenced to a dipole — dBd.

You find an idea for a simple improvement to your antenna, and hook it up; according to the formula in this make-believe article, you will get a 1-dB improvement in signal strength, so let's multiply your 100 watts by 1 dB (26 per cent):

$$100 \times 1.26 = 126, \text{ or } (+1 \text{ dBd})$$

Now, your buddy at the local radio

club hears of this, and tells you about a simple modification that he has made that gives you another 1 dB improvement:

$$126 \times 1.26 = 158.7, \text{ or } (+2\ dBd)$$

Your transmitter is still putting out 100 watts, but your antenna is concentrating it in a narrower pattern, and to some distant observer it appears that your signal is as strong as if your transmitter was putting out 158 watts.

You've been making sketches and thinking about that antenna, and suddenly, you see a way to improve it some more — maybe another dB:

$$158.7 \times 1.26 = 199.962,$$
$$\text{or } (+3\ dBd)$$

Wow! As far as that guy at the other end of the path is concerned, you have just doubled your power! You've gained 3 dBd, which is the same as doubling your signal strength compared with your original dipole antenna. (And the best part is, your electric bill stays the same.) Also, this gain is applied to any signal you receive, so that the guy at the other end of the path apparently has doubled his power too.

There you have it — 1 dB equals approximately 26 per cent, and, dB must *always* have a reference point for comparison. Remember these two things and dB will never again be a mystery.

Antenna performance

Does a vertical (antenna) perform better on the roof, on the ground, or on a pole? Also, I would like the answer to that age-old question, which does perform better, a Yagi or a quad? — Jody Dunn, WA2QSI.

The only question that's more difficult to answer than your last one is, "Which came first, the chicken or the egg?" No matter how thorough an investigator is, how well equipped, or how clearly he writes about *quads* or *Yagis*, he'll immediately be shot down by dozens of "experts" who can provide equally impressive volumes of proof of the other side of the argument. We may never know — and, anyway, who cares, as long as either one will do the job to your satisfaction.

A vertical antenna should do better mounted high, if it is properly matched and has a ground plane or some other arrangement to make it radiate as intended. Obviously, it is impractical to mount an 80 or 40 meter quarter-wave vertical very high above the ground, but for the other bands, getting the thing above trees, fences, house wiring, etc., is bound to help. You can't go wrong, however, if you follow the manufacturer's instructions. They know best what it takes to make their product play.

Antenna measurements

I recently purchased a noise bridge to use in adjusting some antennas I am building. I need to use a piece of feedline between the antenna and the bridge, but do not understand how this works. Is there a formula I can use to know when the antenna is resonant at the other end of a transmission line? — John Merlyn, WD5FZD.

You can convert the readings at the end of a length of line (if you know the length) by use of a Smith chart and a little math. The use of Smith charts was explained in the March, 1978, issue of *ham radio* (back issue or photocopy, $2).

However, there's a simpler way if you don't mind taking the antenna down and connecting a substitute transmission line for the measurements. Simply make the line an electrical half-wave long. This, too, can be done with the noise bridge, and the simple procedure is explained in "Use A Noise Bridge," by K6NY in November, 1978, *Ham Radio Horizons*.

Lightning protection

I live in a rural area, and my antenna is the highest structure on the property (it is a three-element beam on a tripod on the roof). I have attached a lightning arrestor to the antenna, and run a ground wire to a nearby lightning rod, which is grounded through a normal lightning-protection system ground. Is this safe? — Paula Franke, WB9TBU.

When it comes to lightning, safety can only be comparative. As they say about the Atomic Bomb, the only protection is "don't be there." However, your approach is probably as good as you can make it under the circumstances. I assume that the lightning arrestor is in the coaxial cable from the antenna to your rig — at least that's where it should be. The tripod should be connected to the lightning-rod system with cable just as heavy as the ground wire in the rest of the lightning-protection installation, and by as short and direct a route as possible. Another tip: the purpose of the sharp points on lightning rods is to bleed off a charge before it can build up to the "flash point" which induces a lightning bolt. Put a sharp point on the top of the mast supporting your antenna. Let it stick up a couple of feet. This will provide an additional discharge point in the protection system. You'll get plenty of "rain static" in your receiver (which should be a clue to disconnect everything and wait a while), but the chances of a lightning strike will be reduced.

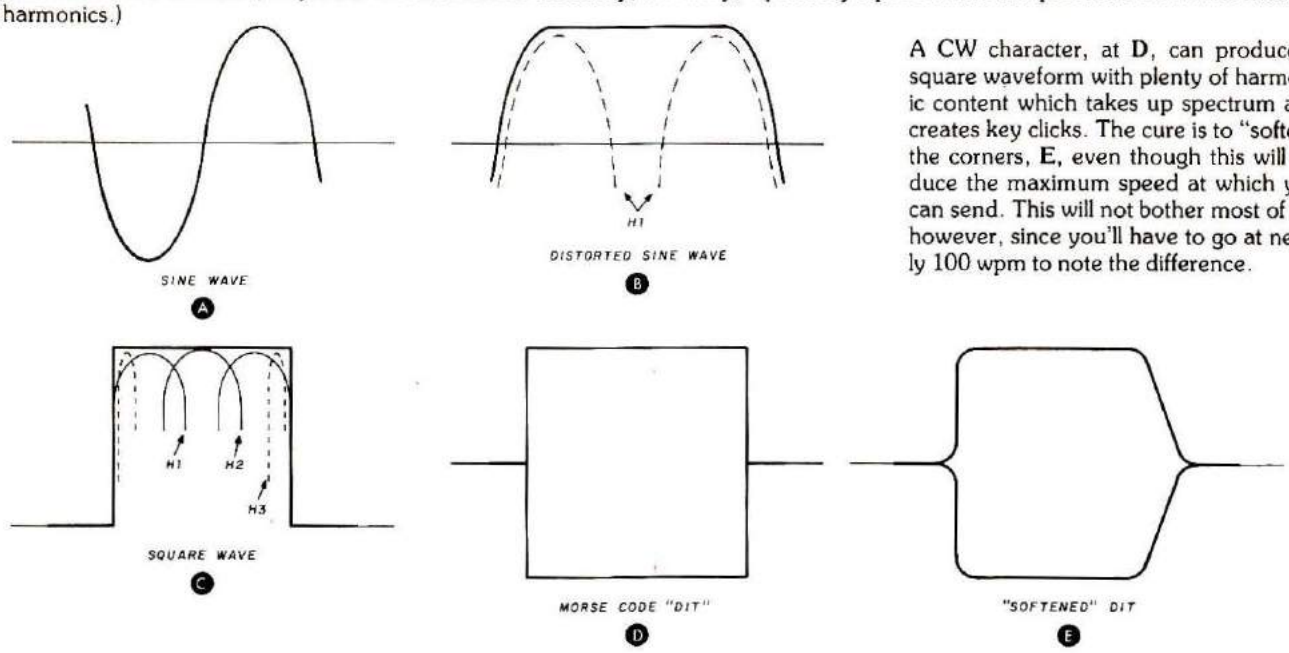
For more information on grounding and lightning protection, see the article in this issue by W1HEO.

Broadband CW

I have read that, in CW, the faster the code is sent, the greater the bandwidth is occupied. Why is this? — John Ciciarelli, WB3DDM.

It's not anything you'll have to worry about for the majority of Amateur Radio contacts using Morse code. If you progress to the point where you are conversing at 100 words per minute or so, then the other guy might have to back off on his receiver selectivity a bit. The reason for the increased bandwidth has to do with the rapid transition that occurs when you turn a signal on, and again when you turn it off. A nice,

Fig. 1. In a sine wave, **A**, only one frequency is represented. As the wave becomes distorted, **B**, "ghost" harmonics (H1) are simulated in the corners. An extreme case is represented by a square wave, **C**, where there are several harmonic waveforms (H1, H2, H3) represented in the corners. (Only three are shown here for clarity; in theory, a perfectly square waveform produces an infinite number of harmonics.)



A CW character, at **D**, can produce a square waveform with plenty of harmonic content which takes up spectrum and creates key clicks. The cure is to "soften" the corners, **E**, even though this will reduce the maximum speed at which you can send. This will not bother most of us, however, since you'll have to go at nearly 100 wpm to note the difference.

smooth sine wave is theoretically pure, and only one frequency is represented in its wave form. However, as the wave becomes distorted, certain portions of it begin to appear the same as a waveform of a different frequency superimposed on the original, see **Fig. 1**. The extreme case is when the waveform is squared off — as in a CW "dit" — with very sharp corners. The voltage rises very rapidly to its full value, then stops abruptly. This sudden transition from rising to steady-state appears the same as some "harmonic" waveform would, if it were superimposed on that "corner" of the pulse. The same thing happens in reverse when the key is opened — a steady-state condition ends and an almost instantaneous drop takes place.

The more often you perform this on/off function, the more of these "ghost" harmonics are generated, and it requires more bandwidth to pass them. If you don't pass them, the holes between the pulses, and the corners of the pulses, become blurred and hard to follow. Try it on some high-speed CW down at the low end of an Extra-class segment. Tune in a signal that is really zipping along — but do so with your receiver set to receive SSB. Next, switch to your sharpest CW position. Notice how much harder it is to hear the characters (you don't have to read the code, just listen for the individual dits and dahs). If your filter is sharp enough, say 100 to 200 Hz wide, it will probably "ring" and you'll not be able to distinguish a dot from a dash.

Incidentally, this sharp "corner" on CW signals is great for creating key clicks in nearby receivers. The cure is to put a resistance/capacitance filter in the keying circuit to round-off those corners, creating a smoother transition and no clicks, **Fig. 1E**.

Interference

On 15 and 40 meters, foreign-station audio and other interference completely dominates the bands at times. How come? — Dan Simmons, KA4MDI.

There could be many reasons for this interference, the chief one being that perhaps the stations are there legally (this is permitted in some parts of the world), and propagation conditions make their signals far stronger than any ham signals. After all, many foreign broadcast stations run hundreds of kW, and use antennas with plenty of gain. A 1-kW ham cannot compete with that.

Also, such strong signals can overload your receiver front-end to the point where it just cannot handle them. Many receivers suffer from that problem, especially some of the solid-state models. The interfering signal does not have to be in the band to cause this problem, either. A broadcast station that puts a large fraction of a volt into your receiver front-end can create "duplicates" of itself by mixing with other nearby signals.

If the problem is caused by out-of-band stations, a sharp (high-Q) tuned-circuit between the antenna and your receiver will help by reducing the strength of the broadcaster. Also, using an antenna that is much shorter than usual for the band (on your receiver only) will help by reducing the voltage produced by strong out-of-band stations.

However, if the stations are legally operating in the band (and several dozen do so on 40 meters), there is nothing you can do about it except try to work hams when the band is dead toward Europe, or make sure your antenna is not broadside to that part of the world.

HRH

airTime

Rob Schneider, N6MR

Delta QSO Party

The 11th Annual Delta QSO Party, sponsored by the ARRL Delta Division, will be on the air from 1800Z September 27 to 2400Z September 28. Amateurs within the Delta Division (Arkansas, Louisiana, Mississippi, and Tennessee) will attempt to contact as many stations as possible both inside and outside of the division. Stations outside of the Delta Division will try to work as many division stations as possible during the contest period.

Operation will be on all bands, both CW and phone. Stations may be worked on each band/mode. Portables and mobiles may be reworked on the same band/mode if they change counties.

Various awards are available to stations inside and outside the Delta Division:

Delta Achievement Award — A certificate to all Amateurs contacting five different stations in each of the four Delta Division states.

Section Award (Delta Division) — Certificates to the three highest-scoring stations in each state within the division.

Section Award (Outside division) — A certificate to the high-scoring stations in each ARRL section and country.

Plaques — A plaque will be awarded to the high-scoring station both inside and outside of the Delta Division. Plaques will also be awarded to the high-scoring portable and mobile stations within the division. A club plaque will be awarded to the high-scoring Delta Division multi-operator club station. All plaques are sponsored by the Lafayette, Louisiana, ARC.

The contest exchange will consist of QSO number, RST, and QTH (ARRL section for non-Delta Division, county and state for Delta Division).

The most active frequencies should be: Novice — 3725, 7125, 21125, 28125; CW — 3550, 7050, 14050, 21050, 28050; SSB — 3990, 8290, 14290, 21390, 28590.

To calculate a final score, multiply number of QSOs times the number of Delta Division counties worked (316 maximum). Delta Division stations multiply QSOs times ARRL sections worked (75 maximum). DX contacts are allowed, but do not count as multipliers.

To be eligible for awards, logs must show date/time, station worked, exchange, band, mode, and multiplier. Logs should be postmarked no later than October 21, and addressed to Malcolm P. Keown, W5XX, 213 Moonmist, Vicksburg, Mississippi 39180. Logs will be returned if requested.

City of Champions Certificates

A "city of Champions" sports certificate is offered by the North Hills Amateur Radio Club of Pittsburgh, Pennsylvania, in honor of the Pittsburgh Pirates' World Series victory and the Pittsburgh Steelers' Super Bowl victory in 1979. All amateurs are eligible to receive the award; the only requirement being contacts with members of the North Hills club.

Total number of contacts required is nine, broken down as follows: Western Pennsylvania ARRL section — five contacts; continental U.S.A. (other than West. PA) — three contacts; DX (including Alaska and Hawaii) — one contact. Log entries should show time, date, band, call, ARRL section, and signal report.

To apply for the City of Champions award, send log entries along with an 8½ × 12 SASE (22 cents postage) before December 31 to: NHARC — City of Champions, c/o WA3WOX, 4197 Timberlane Drive, Allison Park, Pennsylvania 15101.

HRH

Dear Horizons:

I have read with much interest your article on DX in the past few issues. I've been an Amateur for just over a year now, and am really caught up in the DX chase. I upgraded to General two months after receiving my Novice ticket, and it didn't take long to start trying for new countries. As a Novice, I worked several DX countries — YKs, ZLs, KH6, SM, and DLs. Since becoming a General, I have worked 112 countries, and have received QSLs from 65 of them. I plan to have DXCC within a few months. Please don't get me wrong, I'm not bragging; anyone can do this with determination. My equipment is not anything special. The rig, a Yaesu FT-101EE, was used when I bought it, and my first antennas were dipoles. I made a Yagi for 10 meters out of parts from a fallen CB antenna for practically nothing, and bought a used rotator for $25. The Yagi worked like magic, with approximately 90 watts to it; I consistently received 59+ signal reports from Europe and South America, and 55 to 59 from Japan and Africa. I've got WAS, WAC, WAUSA, and CCA (from *73*).

There are many ideas that I have that should help new DXers (since I am new and know they work), and here are a few of them:

1. Listen, listen, listen. I know it has been said before, but this point cannot be overemphasized. Find a country you need and wait for him to finish his QSO. Then either call him if he is making casual contacts, or just give your call if he is working stations fast. If you don't hear him reply within four or five seconds, give your call again — most of the time once just isn't enough. It may take a while, but you will get him.

2. Propagation charts are good guide lines, but not Gospel. I worked 5NØDOG at approximately 2300Z on ten meters, when the band should have been dead going in that direction, and we had a QSO that lasted a good while, with good signals both ways. So, listen around — the band may be open to places that seem impossible.

3. Try to make or buy a Yagi for 10 meters. This is not expensive, even if you have to buy one for 11 meters and trim it down. This is the single most important feature that has helped me with DX. They can't work if you can't be heard by them. With a beam, you can work almost everything you hear. I say almost because some of the DX stations have such pileups you just won't be able to make it. Don't give up though, try a few times. If you get no results, write down the frequency and check back every fifteen minutes or so; conditions may make your signal the strongest on the band.

4. If the fast DX type contacts scare you off, listen to a DX contest for a while. Pay attention to the exchange, and if you don't understand it, look in *QST*, *CQ*, or *73* for what exchange is to be given in the contest. Then, dive in! Be sure to give both your call and the DX station's call during the exchange. QSLs are nice; pink slips aren't.

5. If, after working several countries, you find yourself at a standstill, don't give up. Listen for DX, or someone talking about DX, for clues of when rare countries will be on. It is a lot easier to get them before the pileup gets too big.

6. Once you make the contact, it is good practice to thank the DX operator and say 73, but be quick about it. Don't waste his time with name or QTH unless he requests it or gives you his. Amateurs in the United States are common as an old shoe and he is not going to get excited about working you.

7. If the DX station is working U.S. stations by call areas, don't give your call if he is not asking for your area. This only adds to the QRM.

All-in-all, DX takes patience, confidence, and skill, so develop these three traits and DXCC will be yours.

I'm sure that everyone has his own ideas about working DX, many of which have done much better than I, but these basic ideas worked for me.

Ken Sturgill, KA4HEP

Dear Horizons:

Our condolences for Jim's passing. All of us in Amateur Radio will miss him deeply. He was one of the greatest contributors to the art. His ability to chronicle important advances in radio technology was unsurpassed. Jim was a good and respected friend of ours.

George Badger, W6TC
Bill Orr, W6SAI
Bob Sutherland, W6PO
EIMAC, San Carlos, CA

Dear Horizons:

It was with a deep sense of loss that I received the notice of Jim's death. Over the years I had met Jim many times at ARRL and other functions. He was an excellent engineer, a true friend to the Amateur, and, above all, always a gentleman. He will be missed by all of us.

My deepest sympathy to his family, and to all the staff. His spot can be filled but he can never be replaced.

George A. Diehl, W2IHA
Vice Director, ARRL Hudson Div.

Dear Horizons:

As a new subscriber to your magazine, and a new ham as well, I want to let you know that I enjoy the articles in your magazine — such as the following:

"The Anglo-American Connection" (January, 1980)
"Hamming in Hong Kong" (January, 1980)
"Lifelines to Antarctica" (February, 1980)
"The Fourth Time's the Charm" (May, 1980)

I also enjoy the editorials and the "Newsline" feature. I fall into the same philosophy as Ramon Amoros, KA4HBI, who wrote in your letters segment of the February, 1980, issue: "Keep your magazine educational as it is, don't let it become an electronics engineering magazine."

Glen Henderson, KA4BMT

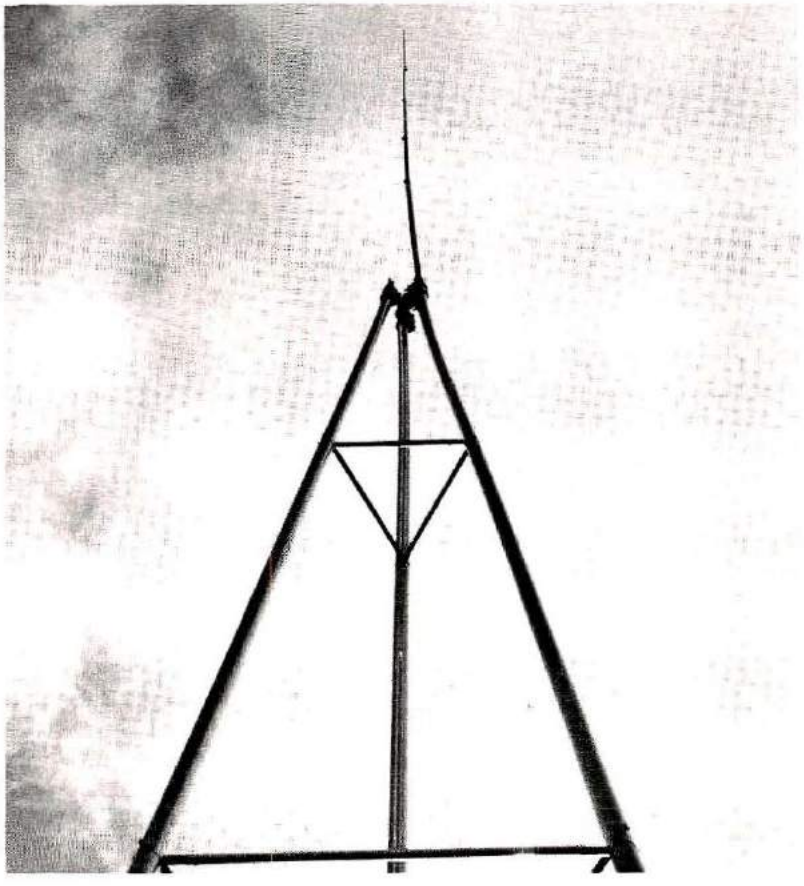
Product showcase

KLM SSV 80-40-15 Antenna

The SSV 80-40-15 is the latest addition to KLM's unique new series of vertical, multi-band antennas, and, in the KLM tradition, features broadband response on 80, 40, and 15 meters. The SSV is freestanding, with the lower half made up of three electrically active tripod legs. Excellent DX is possible because the configuration of the legs contributes to a low angle of radiation on each band. Two of the legs are hinged at the base, allowing the SSV to be easily raised by two men. Only modest base preparations are needed. The upper half of the SSV is a single telescoping-whip section. It is quite flexible, and survives high winds by laying over to reduce its own wind-load. Although the SSV stretches over 60 feet above ground, no guying is necessary. Overall weight is only 88 lbs. Feed impedance is 50 ohms.

A full 1/4-wave resonance is possible on 80 meters through the use of one tripod leg and the upper whip section. The adjustable tip allows the SSV to be tuned from below 3.5 MHz to 6.5 MHz, in 300-kHz steps at 1.5:1 VSWR or better.

The 40-meter resonance is quite broad, thanks to the effective diameter of the base section (two of the tripod legs). Wide-range tuning is possible from 6.5 MHz on up. Performance on 40 meters appears better than a standard, ground-mounted, 1/4-wave vertical because shock excitation of the 80 meter section improves the radiation pattern.



Performance of the 3/4-wave, 15-meter section is also improved by shock excitation of the 80-meter section. The VSWR curve is very broad, with little change from band edge to band edge.

Performance approaching that of a full 1/4-wave vertical is also possible on 160 meters simply by adding inductance at the base of the antenna.

Experimental uses for the SSV abound. A wide-spectrum VSWR plot shows three more naturally occurring resonances that fall very close to the three new high frequency bands authorized at WARC-79 (10, 18, and 24 MHz) and are usable with slight retuning.

High-quality materials are used throughout the SSV. All aluminum tubing is drawn, seamless, 6063-T832 alloy. Tough fiberglass insulators are used to insulate the SSV from ground and insulate the resonant sections. Base-mounting anchor-plates are supplied.

Price of the SSV 80-40-15 is $399.95. For more information, contact KLM Electronics, Inc., P.O. Box 816, Morgan Hill, California 95037.

More details? Ad Check page 78.

Bird Milliwattmeter

This new broad-band Termaline® RD 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 conjuction 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 on 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.

6-Meter Interfilter

Unadilla/Reyco introduces a new filter in their Amateur Radio product line. The 6-meter "Interfilter" is rated for full Amateur power over the passband of 50 to 52 MHz. Passband specifications are loss of 1 dB or less and 1.4:1 or less SWR. Filter rejection is 65 dB minimum on TV channel 3 through 13. The unit is weather sealed and lifetime guaranteed. Suggested retail price is $69.95. Unadilla/Reyco, 6743 Kinne St., E, Syracuse, New York 13057.

World Time Calculator

Ever since man has been keeping time, there has been confusion about whose tick-tock is truly ticking. World Standard Time is the accepted time keeping method today. But, is it really Standard? Theoretically, the world is divided into twenty-four equal time zones. Rarely do these zones ever follow a straight line. They are modified by geographic and political considerations. Two countries can lie in the same time zone and yet follow a different hour. As much as three hours difference exists between some neighboring countries. Available timepieces do not take this fact into consideration. UTC conversion tables assume countries in the same time zone observe the same hour, when sometimes they do not.

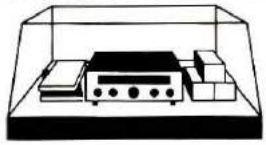
End of confusion — The World Time Calculator, with a turn of the dial, instantly and accurately shows the correct world time. Unlike other timepieces or tables, no mental arithmetic is necessary.

It's a simple matter to find world time by setting your local hour. Automatically, time throughout the world falls into place. When you know the time in another country and want to know your local time, set that hour then read yours. The World Time Calculator is universal and can be used anywhere. The face of the instrument is a detailed polar map, showing over 200 locations. Each zone is drawn to show exact time boundaries. Variations from Standard Time are clearly marked.

Priced at only $2.95 from Van Gorden Engineering, P.O. Box 21305, S. Euclid, Ohio 44121.

More details? Ad Check page 78.

PRODUCT SHOWCASE



Kantronics Signal Enforcer™

A frequency-agile, dual audio filter that will reduce or eliminate signal interference to any one of five common modes has just been introduced by Kantronics. To provide ultimate versatility in a single accessory, the Signal Enforcer uses two independently tunable filters to team up on signal interference to CW (continuous-wave), single sideband, a-m, radioteletype, and ASCII computer transmissions.

The Signal Enforcer's two state-of-the-art filters have both notch and peak capabilities. That means they can be used either to reduce signals on all but a selected frequency (peaking), or to eliminate signals on a selected frequency where interference is present (notching). Because they are independently tunable, one filter can notch out an interfering signal or noise source while the other filter peaks up the signal being copied.

The filters can be operated in series on separate frequencies to notch and peak, or they can be teamed to make a super-peak or super-notch filter. In series, the filters can even be used to notch two frequencies at once. Series operation of the Signal Enforcer is called cascading. The filters can also be used in parallel to peak two frequencies at once.

In cascade mode, for example, one filter can be used to peak a weak CW signal while the other is used to notch out a nearby foreign broadcast station. Also in cascade mode, the Signal Enforcer can act as a doubly potent single filter to peak or notch individual frequencies. Operated in the parallel mode, the two filters can be used to peak the mark and space signals used in RTTY and ASCII transmissions.

Because the Signal Enforcer is an audio filter, it can be hooked in-line with the audio output of a receiver, so that no connections inside the receiver are necessary. It can be used in-line with the receiver speaker, headphones output, or other audio outputs from the receiver. The Signal Enforcer will drive up to 2 watts through an 8-ohm speaker. The audio output is adjusted through a volume control.

Each Signal Enforcer filter has its own "tuning-eye" indicator, peak/notch switch, bandwidth control and frequency control. The tuning eyes are LED indicators that make tuning fast and simple. Each tuning eye has its own very narrow filter. When one of the Signal Enforcer filters is tuned to the heart of a signal, its tuning eye will blink simultaneously with the signal's audio output. Under crowded-band conditions, it is very difficult to tune signals without the aid of tuning eyes. The Signal Enforcer is the only filter that offers that essential feature on both filters.

The high quality of the filters allows the bandwidth to remain constant, once it has been set by the operator, regardless of the frequency tuned to. The filters are continuously variable in bandwidth from less than 30 Hz to over 1000 Hz. Their audio-frequency range runs from less than 150 Hz to over 3000 Hz.

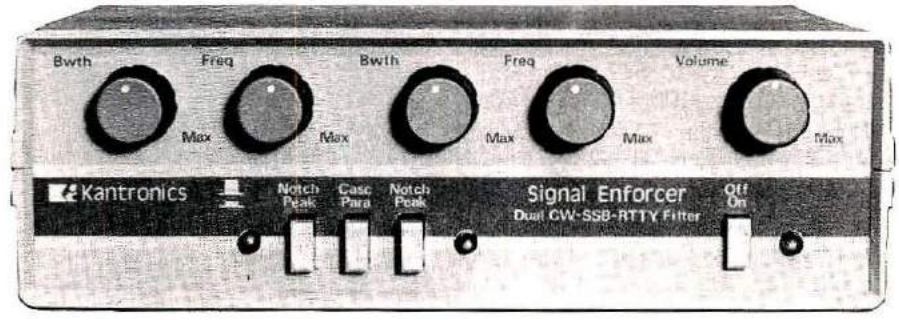
Ultimate serviceability has been designed into the Signal Enforcer. If service or repair is needed, the modular design will allow for nearly immediate replacement and turn-around. All internal boards, components and craftsmanship are of the highest quality.

The Signal Enforcer has its own internal power supply and can be run from 115 Vac at 60 Hz, 220 Vac at 50 Hz, or from an external 12 to 18 Vdc power source.

The Signal Enforcer is in a tan, cream and brown enclosure about 2½ by 8 by 6 inches. It comes with operator's manual and all necessary connectors used on the unit.

The list price of the Signal Enforcer is $189.95. It is protected by a full-year warranty and can be purchased from Kantronics, or from many of the over 40 Kantronics authorized dealerships in the United States, Canada, West Germany, the Netherlands, and Argentina.

Please send direct inquiries to Kantronics, Inc., 1202 E. 23rd Street, Lawrence, Kansas 66044.



Portable Soldering Iron

A handy, portable soldering iron that connects to an automobile, boat, or any other 12-volt battery source, has been introduced by M.M. Newman Corporation of Marblehead, Massachusetts.

The Antex MLX 12 is a battery-operated soldering iron that quickly connects to any 12 volt source. Consuming minimal power, the lightweight, easy-to-handle iron heats up to 800°F in less than 2 minutes. Fifteen-foot-long leads with alligator clips make a quick, simple connection.

Consuming only 2 amperes at 12V, the Antex MLX 12 volt soldering iron uses replaceable, iron-plated tips that slide directly over the heating element for efficient power usage. Weighing 1¼ oz., the 8 inch non-charring plastic handle remains cool at maximum temperatures. A handy carrying case is included.

The Antex MLX 12 volt soldering iron is priced at $19.95 (retail), and packaged in a pegmount display. Literature is available on request. For more information contact: M.M. Newman Corporation, C. F. Loutrel, Jr., Marketing, 7 Hawkes Street, Marblehead, Massachusetts 01945.

More details? Ad Check page 78.

B & W Balun

Barker & Williamson, Inc., announces a new product for the Radio Amateur, the Model BC-1 Balun.

Specifications:

Impedance	50 ohms unbalanced to 50 ohms balanced
Frequency	1.8-30 MHz
Power	2.5 kW-5 kW PEP
Connector	SO-239; mates with standard PL-259
Size	2¼ inch diameter; 7½ inches long

Weight 15 ounces

For additional information contact Mr. Elmer Bush or Martin T. Zegel, Jr., at Barker & Williamson, Inc., 10 Canal Street, Bristol, Pennsylvania 19007.

New Ten-Tec "Delta" Transceiver First With All 9 HF Bands

The company that prides itself on offering many famous "firsts" has done it again by being first to offer a new transceiver with nine high frequency bands including three new bands granted to the Amateur Service during the recent World Administrative Radio Conference (WARC) held in Geneva, Switzerland.

The new Ten-Tec "Delta," in keeping with its name, offers a transceiver for the changing times. Covering 160 through 10 meters, the Delta has the present 6 high frequency bands, plus the new 10, 18, and 24.5 MHz bands. It's ready to go on all bands except for crystals 18 and 24.5 MHz segments (available when the bands open for use).

Total high frequency band coverage isn't all Delta has. The wholly new design features a new, low-noise, double-conversion receiver with 0.3 μV sensitivity, 85 dB or better dynamic range, plus switchable 20 dB attenuator, standard 8-pole monolithic SSB filter with 2.4-kHz bandwidth, optional 200 Hz and 500 Hz, 6-pole CW filters, plus standard, 4-stage, active audio filter, built-in variable notch filter, offset tuning, new hang AGC for smoother operation, optional noise blanker, WWV reception, and new digital readout featuring six 0.3 inch red LEDs.

Totally solid-state, the Delta benefits from Ten-Tec's pioneering in such high-power, high frequency final amplifiers. Power input is 200 watts on *all* bands, including 10 meters (with 50-ohm load), 100 per cent duty cycle up to 20 minutes maximum key-down time, QSK instant break-in, adjustable-threshold ALC and drive with LED indicator, adjustable sidetone level and pitch, vernier tuning, super-stable VFO, low-distortion audio, and super new styling with "panelized" grouping of controls, smaller, go-anywhere size (4-3/4 × 11-3/8 × 15 inches) and a very handsome black and bronze color styling with 2-piece aluminum case and tilt-up bail.

Priced at just $849, the new Ten-Tec "Delta" offers more features, more coverage, and more value than any other transceiver now available.

For further information, see your dealer, or write Ten-Tec, Inc., Highway 411 East, Sevierville, Tennessee 37862.

Russell Industries Digi-10 H/U

This new 10-channel, hand-held pocket scanner gives instant access to police, fire, weather and other special-interest broadcasts on high vhf and uhf bands.

Digi-10 H/U exhibits the following features:

10 channels with a scan rate of 15 channels per second.

LED display readout.

Manual/automatic pushbutton stepping from channel to channel.

Over-passing switches to lock out unwarranted monitoring.

One-second delay switch to hold desired channel position.

Rechargeable Ni/Cd batteries and an ac battery charger.

Unit weight 8.8 ounces; size 2-3/4 × 5-5/8 × 1-1/4 inches.

For more information, contact Russell Industries, Inc., 3069 Lawson Boulevard, Oceanside, New York 11572.

RATES Regular classified is available to commercial advertisers at 50¢ per word; and to non-commercial advertisers at 15¢ per word. Display classified (1 inch deep x 2¼ inches wide) is $65, or at the 12x rate is $50. All Ad Scan payable in advance. No cash discounts or agency commissions allowed.

HAMFESTS Sponsored by non-profit organizations receive one free regular classified ad (subject to our editing). Repeat insertions of hamfest ads pay the standard rate.

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.

DEADLINE 15th of third preceding month.

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COMING EVENTS

PENNSYLVANIA: Butler County ARA's Hamfest, Sunday, September 7, 9 AM to 4 PM, Butler Farm Show Grounds at Roe Airport, Butler. Admission: $1.00 donation includes small prizes drawn every 30 minutes until 4 PM. Under 12 free. Free outside flea market, indoors $3.00 per 8 ft. table space. Refreshments. Mobile check-in (W3UDX) 96/36 and 52 simplex. Directions: 84/24, 90/30 Reptr. Mobile prize awarded. Fly-In (Butler Farm Show Airport) 80 + 100 Av. gas. Fly-in prize awarded. Great prizes. For information: Dan Metrick, WA3GDS, 130 Rieger Rd., Butler, PA 16001. (412) 283-1719.

More details? Ad Check page 78.

RADIO EXPO "80" — Lake County Fair Grounds, Rt. 45 & 120. September 6 and 7, Advance tickets $2.00, $3.00 at gate. Write Radio Expo Tickets, P.O. Box 1532, Evanston, Il. 60204. Exhibitor information call (312) BST-EXPO.

SOUTH CAROLINA: The York County Amateur Radio Society's 29th annual Hamfest, October 5, Joslin Park, Rock Hill. BBQ dinner, refreshments. For information and registration: YCARS, P.O. Box 4141CRS, Rock Hill, SC 29730.

NEW YORK: LIMARC sponsors ARRL Hamfair '80, September 21, Islip Speedway, Long Island, Exit 43, Southern State Parkway, 1 block south to entrance. No reservations needed. Admission: $2.00; exhibitors $3.00. Refreshments. Heavy rain date September 28. Many awards all day. For information: call evenings — Sid Wolin, K2LJH, 516-379-2861, Nick Bellmann, KA2CAO, 516-223-1076 or Hank Wener, WB2ALW, 516-484-4322.

NEW JERSEY — Gloucester County A.R.C. Hamfest, Sunday, August 24, 1980, 8 AM to 3 PM at Gloucester County College, Tanyard Road, Sewell. Tailgaters set up at 7 AM, indoor and outdoor spaces available. Food and prizes. Tickets $2 advance, $2.50 at door. Dealers and tailgaters $5. Talk-in on 146.52 simplex and 147.78/.18. Info and tickets: Bob Grimmer, KN2QWO, 229 William Avenue, Barrington, N.J. 08007.

FLORIDA: Five Flags ARA Ham-A-Rama, Sunday, August 31, 1980, from 8 AM to 4 PM at the Pensacola Municipal Auditorium. Admission $1, swap tables $5 each. Write FFARA, P.O. Box 17343, Pensacola, Florida 32522.

WEST VIRGINIA: Bluefield Hamfest '80, 9 AM to 4 PM, Sunday, August 24th at the Bluefield Armory — Civic Center, one mile north on US 52. Food, prizes, dealers, flea market, tailgaters, forums, demonstrations, entertainment. Admission $2 advance, $3 gate, children under 12 free; admission includes prize ticket. Talk-in on 147.69/.49, and 146.52/.52 simplex. SASE to Bluefield Hamfest '80, 2113 Hemlock Hill, Bluefield, WV 24701.

ILLINOIS: Peoria Area Amateur Radio Club's Superfest '80, September 20 and 21, Exposition Gardens, W. Northmoor Rd., Peoria. Admission: $2.00 advance; $3.00 door. Forums, Amateur and computer displays, flea market, ladies' programs, kids' activities. Full camping facilities. Saturday night informal smorgasbord, Heritage House, 8209 N. Mt. Hawley Rd. Talk in 16-76, W9UVI. For information and reservations: Superfest '80, 5808 N. Andover Ct., Peoria, IL 61615. (309) 692-8763.

PENNSYLVANIA: Skyview Radio's annual swap and shop, September 21, 12:00 to 4:00 PM, Sokol Camp, Lower Burrell. Registration: $1.00 per Ham, XYL's, YL's and children free. Check-in on 04-64. For information: SASE to Jim Jackson, K3VRU, RD #1, Box 7A, Apollo, PA 15613.

OHIO: Heart of Ohio's Ham Fiesta, October 29, Marion County Fairground's Coliseum, Marion, Ohio. Flea Market, prizes, XYL drawing. Talk-in on 147.90/.30 and 146.52 simplex. Dealer space available. For more info: Paul Kilzer, W8GAX, 393 Pole Ln. Rd., Marion, OH 43302.

MICHIGAN: Blossomland Hamfest, Sunday, October 5, 1980 from 8:00 A.M. to 3:30 P.M. at the new Lake Michigan College Convention Center, one mile off I-94 exit 30 near Benton Harbor. Flea market, film tour of Heathkit factory, demos, SSTV lecture, QRP, Brasspounders Contest, XYL program. Prepaid tickets $2 each, $3 at door. YLs, XYLs, and harmonics under age 16 FREE. Tables $3 each. Talk-in 146.22/.82. Tickets and info SASE to Matt Beha, N8BPI, 3752 Lane Count, St. Joseph, Michigan 49085.

MISSISSIPPI: The Mississippi Coast Amateur Radio Association's 4th annual Ham-Swap Fest, Saturday and Sunday, October 4 and 5, International Plaza, Biloxi. Free admission. Special Saturday prize drawing. Saturday night shrimp boil. Main prizes Sunday afternoon. Flea market. Prizes for YL's, XYL's and Harmonics. Talk-in on 146.13/.73 and .52 simplex. For information: Bob Wyatt, WB5VCI, Chairman, Box 114, Whispering Pines Drive, Waveland, MS 39576.

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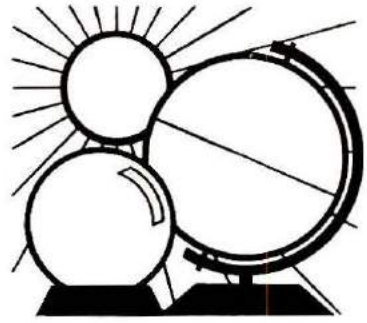

DX FORECASTER

Last-minute propagation

The first half of the month is expected to be uneventful, with a generally quiet magnetic field and stable ionosphere. You may expect a minor disturbance, perhaps a flare, between the 12th and the 15th; another minor disturbance around the 19th, on the 23rd, and again between the 26th and 28th. In general, the period between the 23rd and 30th is likely to be unsettled, with an occasionally active geomagnetic field.

September is traditionally the second-best DX season of the year, taking a back seat only to March. With only slightly declining sunspot numbers and solar flux levels, DX this month will be very good indeed, and the MUF is expected to exceed 28 MHz on many days of the month — climbing at times to 60 MHz!

The fall equinox occurs on the 22nd, full moon on the 24th, and perigee on the 25th.

Band-by-band outlook

Ten and *fifteen meters* will be open most days from shortly after sunrise to at least sunset, and well beyond on most of the days. Look for long-haul DX into the southern hemisphere, meaning South America, Australasia, and Africa, on many days of the month. The band will provide peak signal strength during the afternoon hours. Short skip will occur during the daytime on both bands.

Twenty meters is expected to continue its sensational ways, opening at sunrise and continuing to provide activity until long after dark. In some areas, it will be open around the clock. Peak signal strengths will occur several hours after sunrise, and again during the late afternoon and early evening hours. Short skip will occur both during daylight and evening hours, so expect a mix of "local" and DX stations at these times.

Forty meters is the night-time DX band in all parts of the world, with openings from shortly after sunset to shortly after sunrise to most parts of the world. In general, work eastward during evening hours, and westward during morning hours. Transequatorial openings should provide peak signal strength between midnight and sunrise. Short skip will prevail during daylight and evening hours, and thunderstorm static will be much reduced so you can expect a workout on this band — even with a modest antenna and low power.

Eighty meters will provide DX openings on many days between sunset and sunrise, and short skip will also provide good local contacts out to about 2000 miles (3500 km) in the evening. You can look for good openings to South Africa, Australasia, and South America, as well on many days. Storm-related interference will be acceptable on most days and nights.

One-sixty meters begins to look good again for DX after sunset, through the darkness hours, and into the sunrise period. Static will be bothersome at times, but generally acceptable.

Gray-line DX

At the equinox, when conditions in the ionosphere at latitudes north and south of the equator share much in common, you ought to keep your ears open around the times of dawn and sunset, and point your antennas north and south at such times. Over-the-pole DX will be common, and stations along the terminator will provide extremely strong and clear signals. Much north-south path enhancement can be expected, with enjoyment for all.

An asterisk (*) in the chart means to look for openings on the next higher frequency band.

HRH

GMT	PDT	WESTERN USA N	NE	E	SE	S	SW	W	NW	MDT	MID USA N	NE	E	SE	S	SW	W	NW	CDT	EDT	EASTERN USA N	NE	E	SE	S	SW	W	NW
0000	5:00	10	—	20	10	—	10	10	10	6:00	10	20	20	10	—	—	10	10	7:00	8:00	10	20	20	15	15	15*	15*	15
0100	6:00	10	—	20	10	—	10	10	10	7:00	10	—	20	15	15	15*	10	10	8:00	9:00	—	40	20	15	15	15*	15	15
0200	7:00	10	—	20	15	15	10	10	10	8:00	10	—	20	15	15	15*	10	15	9:00	10:00	—	40	20	20	20	15*	20*	—
0300	8:00	10	—	—	15	15	15	10	15	9:00	—	—	—	15	15	15	15	15	10:00	11:00	20	40	20	20	20	20	20	20
0400	9:00	15	—	—	15	15	15	10	15	10:00	—	—	—	20	15	15	15	20	11:00	12:00	20	40	20	20	20	20	20	20
0500	10:00	—	—	20	20	15	15	15	20	11:00	20	20	20	20	20	15	15	20	12:00	1:00	20	—	20	20	20	20	20	20
0600	11:00	—	—	20	20	20	20	15	20	12:00	20	20	20	20	20	20	20	20	1:00	2:00	—	—	20	20	20	20	20	—
0700	12:00	—	—	20	20	20	20	20	20	1:00	20	—	20	20	20	20	20	20	2:00	3:00	—	—	20	20	20	20	20	—
0800	1:00	—	—	20	20	20	20	20	20	2:00	—	—	—	20	20	20	20	20	3:00	4:00	—	—	20	20	20	20	—	—
0900	2:00	—	—	—	20	20	20	20	20	3:00	—	—	—	20	20	20	20	—	4:00	5:00	—	—	—	20	20	20	—	—
1000	3:00	—	—	—	20	20	20	20	20	4:00	—	—	—	40	20	20	20	—	5:00	6:00	—	—	—	20	—	20	—	—
1100	4:00	—	—	—	—	—	40	20	20	5:00	—	—	—	40	—	20	20	—	6:00	7:00	20	20	—	20	—	—	—	—
1200	5:00	—	—	—	—	—	40	40	20	6:00	—	—	—	—	—	20	20	—	7:00	8:00	20	20	—	20	—	20	20	—
1300	6:00	—	—	—	—	—	40	40	20	7:00	20	20	—	—	—	40	40	—	8:00	9:00	15	20	—	10	—	20	20	—
1400	7:00	20	—	—	—	20	40	—	20	8:00	20	20	—	10	—	20	—	—	9:00	10:00	15	15	—	10	—	20	20	—
1500	8:00	20	—	—	—	20	—	20	20	9:00	20	20	—	10	—	20	—	—	10:00	11:00	15	15*	—	10	—	—	—	—
1600	9:00	15	15	—	10	20	—	20	20	10:00	20	15	—	10	—	20	—	—	11:00	12:00	15	15*	—	10	—	—	—	—
1700	10:00	15	15	10	10	—	—	20	—	11:00	15	15	10	10	—	—	—	—	12:00	1:00	15	15*	10	10	—	—	—	—
1800	11:00	15	—	10	10	—	—	—	—	12:00	15	15	10	10	—	—	—	—	1:00	2:00	15	15*	10	10	—	—	—	—
1900	12:00	15	15	10	10	—	—	—	—	1:00	15	15	10	10	—	—	—	—	2:00	3:00	—	15	10	10	—	—	—	—
2000	1:00	—	15	15	10	—	—	—	—	2:00	—	15	10	10	—	10	—	—	3:00	4:00	—	20	15	10	—	—	—	—
2100	2:00	—	20	15	10	—	—	10	—	3:00	—	20	15	10	—	10	15	—	4:00	5:00	—	20	15	10	—	—	—	—
2200	3:00	—	20	15	10	—	—	10	—	4:00	—	20	15	10	—	10	10	—	5:00	6:00	10	20	15	10	10	—	10	15
2300	4:00	—	20	20	10	—	10	10	15	5:00	—	20	15	10	—	—	10	—	6:00	7:00	10	20	20	15	15*	15	15*	15
	SEPTEMBER	S. E. ASIA	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	OCEANIA NEW ZEALAND	AUSTRALASIA	JAPAN		S. E. ASIA	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	OCEANIA NEW ZEALAND	AUSTRALASIA	JAPAN			S. E. ASIA	EUROPE	S. AFRICA	CARIBBEAN S. AMERICA	ANTARCTICA	OCEANIA NEW ZEALAND	AUSTRALASIA	JAPAN

NOTE: * Means look at next higher band for possible opening.

HAM CALENDAR

September

Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Sunday
	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**	**Expedition to Venus, PA** — W32IC — **6-7** **The 15th Annual Hamfest of the Platinum Coast Amateur Radio Society** — Melbourne Civic Center, PCARS, P.O. Box 1004, Melbourne, FL 32901 — **6-7** **6**
Suffolk County Radio Club Third Annual Electronic Flea Market — Odd Fellows Hall, Port Jefferson, L.I., NY — WA2SDI — **7** **South Jersey Radio Association 32nd Annual Hamfest** — Pennsauken Senior High School, Pennsauken, NJ — W2SPV — **7** **38th Annual Findlay Hamfest** — The Hancock Recreational Center, Findlay, OH — SASE to P.O. Box 587, Findlay, OH 45840 — **7** **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**	**YLRL Howdy Days** — September 10, 1980 at 1800 UTC to September 12, 1980 at 1800 UTC — WA2DMK — **10-12** **10**	**11**	**12**	**The Pennsylvania QSO Party Sponsored by NARC** — **13-14** **13**
Porter County Amateur Radio, Inc. — Valparaiso, IN — W9SJN — **14** **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**	**The TU-Boro A.R.C.** — Odd Fellows Hall, 149-14 14th Avenue, Whitestone, NY — WB2PFO — **18**	**19**	**20**
Skyview Radio Annual Swap and Shop — Sokol Camp, Lower Burrell, PA — K3VRU — **21** **Five County Swap-N-Shop** — Southwestern High School, 1420 W. Twelfth Street, Flint, MI — Bob Ross, P.O. Box 7671, Flint, MI 48507, phone (313) 238-0397 — **21** **ARRL Hamfair '80** — Islip Speedway, Long Island, NY — KZLJH, KA2CAO, WB2ALW — **21** **21**	**Lynchburg, VA Annual Kaleidescope Festival** — K4HEX — CW operation will be 50 kHz up from the bottom of each band and SSB 10 kHz inside the General portion of the phone band — **22-28** **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**	**Delta QSO Party** — see Airtime for details — **27-28** **On-the-Air Reunion Former KZ5** — 48 hours beginning 0001Z — Listen within the lowest 25 kHz of the CW and Phone segments of the U.S. General Class portion on each band — **27** **Elmira Amateur Radio Association 5th Annual International Hamfest** — Chemung Co. Fairgrounds — WA2FJM — **27** **Calhoun County Amateur Radio Association 1st Annual Hamfest** — Municipal Auditorium, Anniston, ALCCARA, P.O. Box 1624, Anniston, AL 36202 — **27-28** **DXPO 80 National Capital DX Association** — Ramada Inn, Tysons Corner, VA — K3AO — **27-28** **27**
Radio Association of Erie, Inc. Annual HAMJAM — Rainbow Gardens at Waldmeer Beach Park — WA3HJC — **28** **Boulder Amateur Radio Club BARCFEST '80** — Boulder National Guard Armory — N0MC — **28** **Sangamon Valley Radio Club Fifth Annual Hamfest** — Sangamon County Fairgrounds, New Berlin, IL — WB9RFC — **28** **C.V.F.M. Hamfest** — King Ridge Ski Area, Sutton, NH (follow signs off I-89) — C. A. Breuning, 54 Myrtle St., Newport, NH 03773 — **28** **Adrian Amateur Radio Club's 8th Annual Hamfest** — Lenawee County Fairgrounds, Adrian, MI — Adrian Amateur Radio Club, Inc., P.O. Box 26, Adrian, MI 49221 — **28** **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**			

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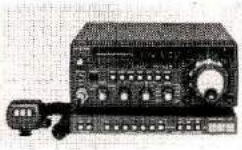

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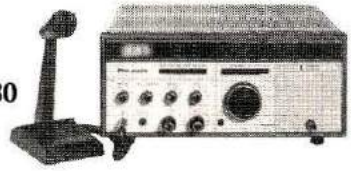

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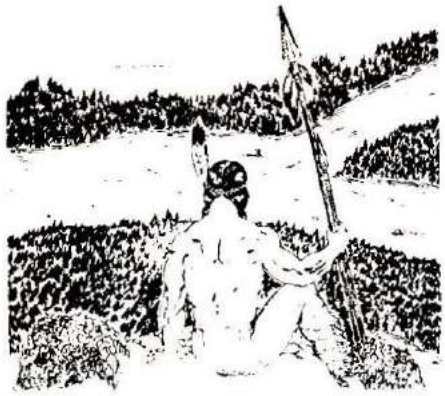

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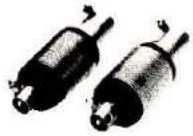

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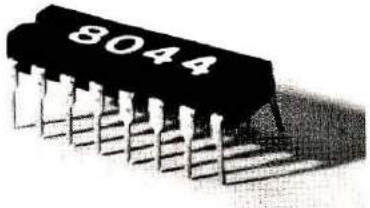

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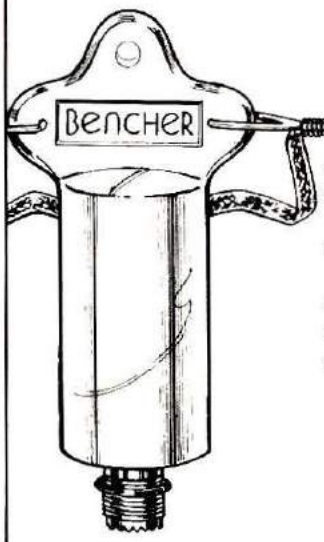

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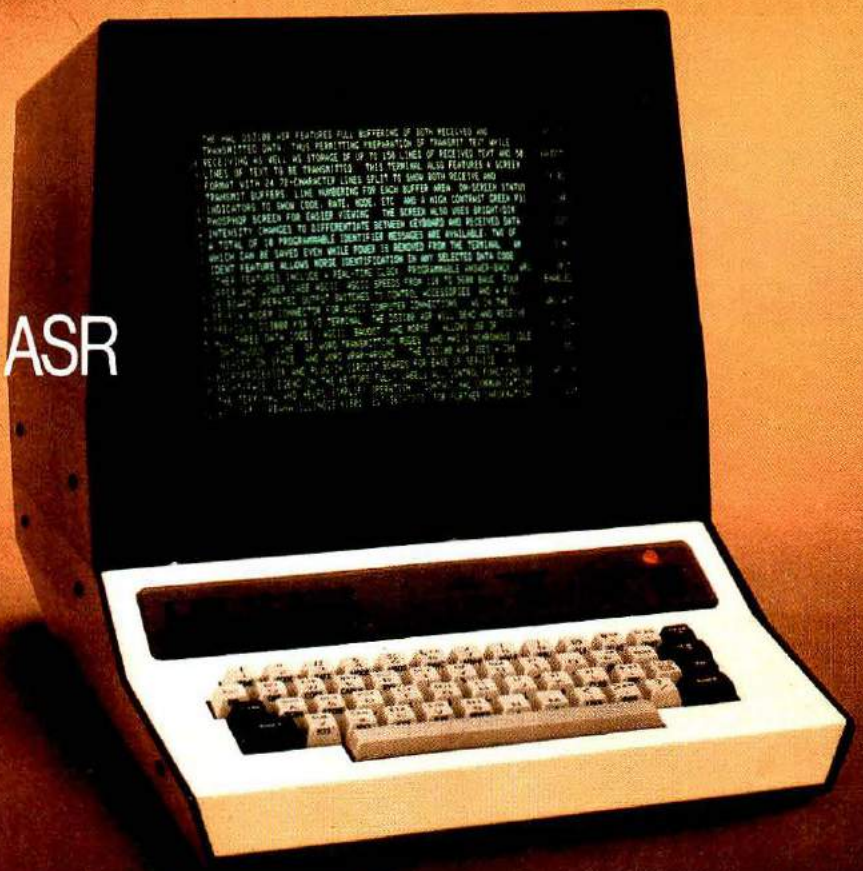

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Now most Amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 meters (including the three new bands). The TS-830S combines a high dynamic range with variable bandwidth tuning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

Ask your Authorized Kenwood Dealer about the many operating features offered by the TS-830S...at a very reasonable price!

NOTE: *Price, specifications subject to change without notice and obligation.*

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