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Amateur Radio On The High Seas

AUGUST 1979 / $1.25

HAM RADIO HORIZONS

YOUR NEIGHBORS and TELEVISION INTERFERENCE

6-METER FUN

USEFUL TEST GEAR — THE VERSATILE DIP METER

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New OMNI/SERIES B Filters The Crowd

The new OMNI/SERIES B makes today's bands seem less crowded. By offering a new i-f selection that provides up to 16 poles of filtering for superior selectivity. And a new Notch Filter to remove QRM. No other amateur transceiver we know of out-performs it.

NEW I-F RESPONSE SELECTION. OMNI comes equipped with an excellent 8-pole 2.4 kHz crystal ladder i-f filter which is highly satisfactory in normal conditions. But when the going gets rough, the new OMNI/SERIES B, with optional filters installed, provides two additional special purpose i-f responses.

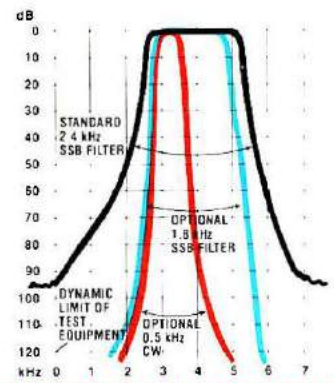
The 1.8 kHz crystal ladder filter transforms an unreadable SSB signal in heavy QRM into one that gets the message through. The 0.5 kHz 8-pole filter provides extremely steep and deep skirts to the CW passband window which effectively blocks out even the very strong adjacent signals.

Both of these filters can be front-panel switched in series with the standard filter to provide up to **16 poles** of filtering for near-ultimate selectivity. In addition, the standard CW active audio filters have three bandwidths (450, 300, and 150 Hz) to give even further attenuation to adjacent signals. In effect, OMNI/SERIES B has six selectivity curves—three for SSB and three for CW. That's true state-of-the-art selectivity.

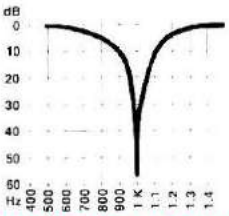
NEW NOTCH FILTER. A variable frequency notch filter in OMNI/SERIES B is placed inside the AGC loop to eliminate interfering carriers and CW signals without affecting received signals. Attenuation is more than 8 "S" units (over 50 db) for any frequency between 0.2 kHz and 3.5 kHz.

OMNI/SERIES B RETAINS ALL THE FEATURES THAT MADE IT FAMOUS.

All solid-state; 160-10 meters plus convertible 10 MHz and AUX band positions; **Broadband design** for band changing without tuneup, without danger;



OMNI/SERIES B I-F RESPONSES WITH STANDARD AND OPTIONAL FILTERS.



NOTCH FILTER PERFORMANCE ADJUSTED TO 1 kHz POINT.

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SEVIERVILLE, TENNESSEE 37862
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Choice of readouts —OMNI-A for analog dial or OMNI-D for digital dial; **Built-in VOX and PTT** facilities; **Selectable Break-in,** instant or delayed receiver muting; **Dual-Range Receiver Offset Tuning,** ±5 kHz or ±0.5 kHz; **Wide Overload Capabilities,** dynamic range typically exceeds 90 dB and a PIN diode switched 18 dB attenuator is also included; **Phone Patch Interface Jacks; Adjustable ALC; Adjustable Sidetone; Exceptional Sensitivity; 200 Watts** input to final with full warranty on final transistors for first year, pro-rata for 5 years; **100% Duty Cycle** for RTTY, SSTV or sustained hard usage; **12 VDC Circuitry** for mobile use, external supplies for 117/220 VAC operation; **Front Panel Microphone and Key Jacks; Built-in 25 kHz Calibrator** in analog dial model; **Zero-Beat Switch; "S"/SWR Meter; Dual Speakers; Plug-In Circuit Boards; Functional Styling,** black textured vinyl over aluminum "clamshell" case, complementary nonreflective warm dark metal front panel; **Complete Shielding; Easier-to-use size:** 5¾"h x 14¼"w x 14"d; **Full Options:** Model 645 Keyer $85; Model 243 Remote VFO $139; Model 252MO matching AC power supply $139; Model 248 Noise Blanker $49; Model 217 500 Hz 8-pole Crystal Ladder CW Filter $55; Model 218 1.8 kHz 8-pole Crystal Ladder SSB Filter $55;

OMNI owners note: Your OMNI can be converted to a SERIES B model at the factory for just $50 (plus $5 for packing and shipping). The notch filter replaces your present squelch control and provision is made for the two additional optional filters; a partial panel with new nomenclature is provided. Contact us for details.

Model 545 Series B OMNI-A $949
Model 546 Series B OMNI-D $1119

Experience the uncrowded world of OMNI/SERIES B. See your TEN-TEC dealer or write for full details.

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Price? You won't believe it! Just ask your dealer.

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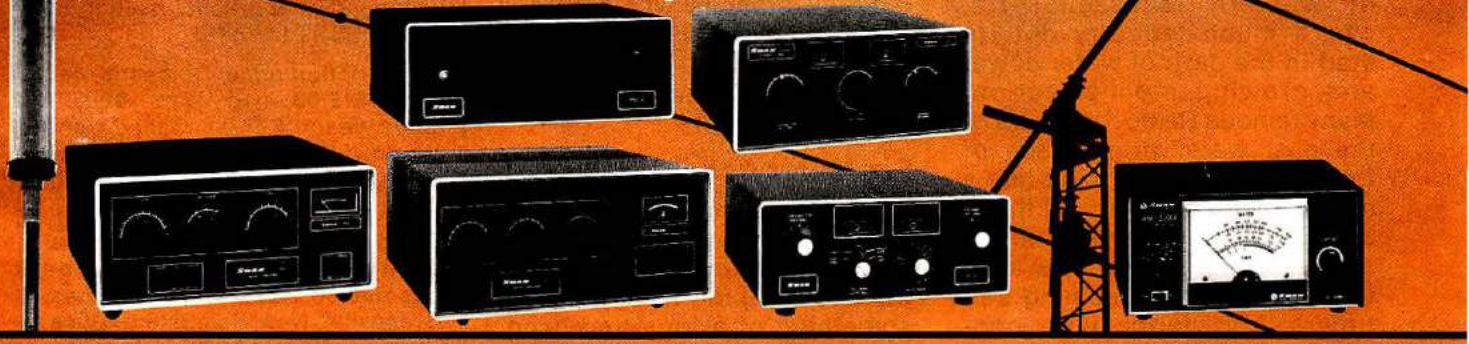
Look to Swan for Quality Accessories . . . and Service



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THIS MONTHS HORIZONS

Deck-Chair Mobile

A cruise on an ocean liner can cover a lot of the globe, and if you take Amateur Radio with you you'll get a chance to try some interesting propagation paths. To make the game more exciting, try predicting where and when the best DX openings will be. Author W0YBF made the cruise, worked the stations, and *then* looked at the prediction charts — and found that hindsight is always 20/20. But he enjoyed every bit of it, and you'll like the story, which begins on page 12.

Hampden County Radio Association

Here's another in the *Horizons* series of looks at radio clubs across the land. Hampden County is in the Pioneer Valley of western Massachusetts, where much industry got its start in the days of water power and growing mechanization. Many famous Radio Amateurs of the past were within reach of this area — and the club has a member who met some of them, and who remembers using a spark-gap transmitter. It's a refreshing tale of combining old-timers' knowledge with neophytes' eagerness to maintain a club that doesn't sit still.

TVI Complaints

There are a multitude of ways in which an Amateur station can interfere with TV sets or other entertainment devices, and it could be more than an individual can cope with in searching for a cure. The answer is to get help — the right kind of help, as explained by a couple of Amateurs who have been through the situation and lived to tell about it.

The Handy Dip-Meter

Second only to a volt-ohm-milliammeter, the dip meter is the most useful instrument in your radio shack or on your workbench. It'll probe the mysteries of frequency, check the value of some components, serve as a signal source, help tune your antenna, and even work as an intercommunications device in a pinch. The dipper is a simple gadget, really, and W1SL tells what they are and how they do their thing, starting on page 34.

Public Relations And Your Club

Tired of explaining to the casual acquaintance that the rig in your car is two-meter fm, not CB, and that you really are not limited to 40 channels and 5 watts with that impressive pile of equipment in your den? Take the direct approach — put the story of Amateur Radio before the public in every way you can. There are hundreds of publications and radio/TV stations who'll spread the word if you'll just take the initiative. Author Colvin shows you how, and it's not hard at all.

Six-Meter Activities

Have you ever thought about working six meters — or do you rate it a no-man's land, unfit for serious consideration? Six *is* something of a forgotten band, but it does have a lot going for it and should come up a winner as the current sunspot cycle unfolds. Author W8FX has the facts on what is probably our most temperamental and unusual Amateur band.

The Cover

Our feature story this month is about a ham enjoying his hobby while on a cruise ship — talking with friends and checking propagation paths from various parts of the journey. Another famous ship is in the news these days, the *Queen Mary*, permanently docked at Long Beach, California. One of the prime attractions for visiting hams and non-hams is the working Amateur station in the rebuilt "Wireless Room." A radio club, the Associated Radio Amateurs of Long Beach, is responsible for operation of the *Queen Mary's* Amateur station under the call W6RO. Licensed Amateurs can request permission to operate the station, and may wear the Radio Officer's uniform. It's a great way to promote Amateur Radio and the city of Long Beach (photographs by Bill Wade).

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Subscription inquiries and changes of address should be directed to *Ham Radio Horizons*, Greenville, New Hampshire 03048. Please include address label from most recent issue if possible.

New MFJ 3 & 1.5 KW Versa Tuners

Run up to 3 KW or 1.5 KW PEP and match everything from 1.8 thru 30 MHz: coax, balanced line, random wire. Built-in balun.

3 KW VERSA TUNER IV's

1.5 KW VERSA TUNER III's

NEW MFJ KW VERSA TUNERS HAVE THESE FEATURES IN COMMON

These 6 new MFJ KW Versa Tuners let you run up to 3 KW or 1.5 KW PEP (depending on the model) and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire. Gives maximum power transfer. Harmonic attenuation reduces TVI, out of band emissions.

All metal, low profile cabinet gives RFI protection, rigid construction, sleek styling. Black. Rich anodized aluminum front panel. 5x14x14 inches. Flip down stand tilts tuner for easy viewing.

Efficient, encapsulated 4:1 ferrite balun. 250 pf, 6000 volt capacitors. 18 position dual inductor, 17 amp, 3000 V ceramic rotary switch (3 KW version). 12 position inductor, ceramic rotary switch (1.5 KW version). 2% meters. SO-239 coax connectors, ceramic feedthru for random wire and balanced line. One year limited warranty. Made in U.S.A.

3 KW VERSA TUNER IV's

1 MFJ-984 3 KW VERSA TUNER IV

$299.95 *EXCLUSIVE RF AMMETER insures maximum power to antenna at minimum SWR. Built-in dummy load.*

This is MFJ's best 3 KW Versa Tuner IV. The MFJ-984 Deluxe 3 KW Versa Tuner IV gives you a combination of quality, performance, and features that others can't touch at this price.

An exclusive 10 amp RF ammeter insures maximum power to antenna at minimum SWR. A separate meter gives SWR, forward, reflected power in 2 ranges (2000 and 200 watts).

Versatile antenna switch lets you select 2 coax lines thru tuner and 1 thru or direct, or random wire, balanced line or dummy load.

A 200 watt 50 ohm dummy load lets you tune your exciter off air for peak performance. Efficient, encapsulated 4:1 ferrite balun.

2 MFJ-981 3 KW VERSA TUNER IV

$199.95 *Accurate meter gives SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. 4:1 ferrite balun.*

The MFJ-981 3 KW Versa Tuner IV is one of MFJ's most popular Versa Tuners. An accurate meter gives you SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. Encapsulated 4:1 ferrite balun.

3 MFJ-982 3 KW VERSA TUNER IV

$199.95 *Antenna switch lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line.*

The MFJ-982 3 KW Versa Tuner IV gives you a versatile 7 position antenna switch that lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

If you already have a SWR/wattmeter, the MFJ-982 is for you.

4 MFJ-980 3 KW VERSA TUNER IV

$169.95 *Heavy duty encapsulated 4:1 ferrite balun for balanced lines.*

The MFJ-980 is MFJ's lowest priced 3 KW Versa Tuner IV but has the same matching capabilities as the other 3 KW Versa Tuner IV's.

Features an efficient, encapsulated 4:1 ferrite balun for balanced lines.

1.5 KW VERSA TUNER III's

5 MFJ-962 1.5 KW VERSA TUNER III

$169.95 *SWR, dual range forward and reflected power meter, 6 position antenna switch, encapsulated 4:1 ferrite balun.*

The MFJ-962 1.5 KW Versa Tuner III is an exceptional value.

An accurate meter gives SWR, forward and reflected power in 2 ranges (2000 and 200 watts).

A versatile six position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

Black front panel has reverse lettering.

6 MFJ-961 1.5 KW Versa Tuner III

$149.95 *6 position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.*

The MFJ-961 1.5 KW Versa Tuner III gives you a versatile six position antenna switch. It lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 ferrite balun.

If you already have a SWR/wattmeter, the MFJ-961 is for you.

Black front panel has reverse lettering.

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Why not visit your dealer today? Compare these 3 KW and 1.5 KW Versa Tuners to other tuners. You'll be convinced that its value, quality and features make it a truly outstanding value. If no dealer is available, order direct from MFJ and try it. If not delighted, return it within 30 days for a prompt refund (less shipping). Charge VISA, MC. Or mail check, money order plus $10 shipping/handling.

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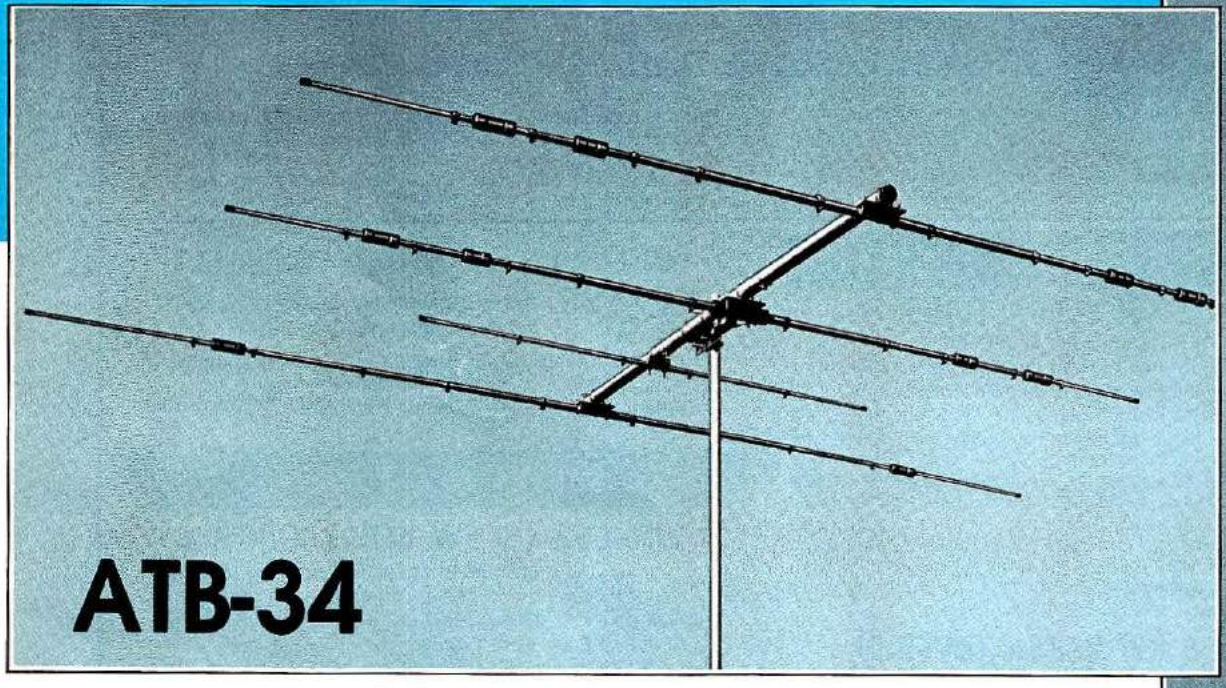

ATB-34

Punch through the pile-ups with an ATB-34. The only three band beam to give you real full size performance. Check ATB-34 element lengths, check the trap design and construction. Check the spacing and the specially developed balun. All of these features add up to the no compromise performance that you expect from Cushcraft.

SPECIFICATIONS

Gain	7.5dBd
F/B Ratio Avg.	24dB
3dB Beam Width	62°
Nominal Impedance	50 ohm
Power Handling	2000 Watts PEP
Boom Length	18'
Longest Element	32'8"
Turning Radius	18'9"
Wind Area	5.4 Ft.2
Weight	42 lbs.
Maximum Mast O.D.	2.5"

Cushcraft vertical antennas are designed to meet the exacting demands of your amateur radio station. They give top performance in easy to use packages. They can be installed at ground level or roof top.

Durability is guaranteed with double wall seamless aluminum base sections and fiberglass high Q traps. If you are interested in local contacts or long path DX communications, a Cushcraft vertical antenna is your best choice.

ATV-3
10-15-20 Meters
Height 13.8' (4.2mtrs.)

ATV-4
10-15-20-40 Meters
Height 19.4' (5.9mtrs.)

ATV-5
10-15-20-40-80 Meters
Height 24.4' (7.4mtrs.)

ALL MODELS
Power Handling 2000 Watts, Nominal Impedance 50 ohms, Maximum Mast Size 2" O.D., Termination accepts PL-259

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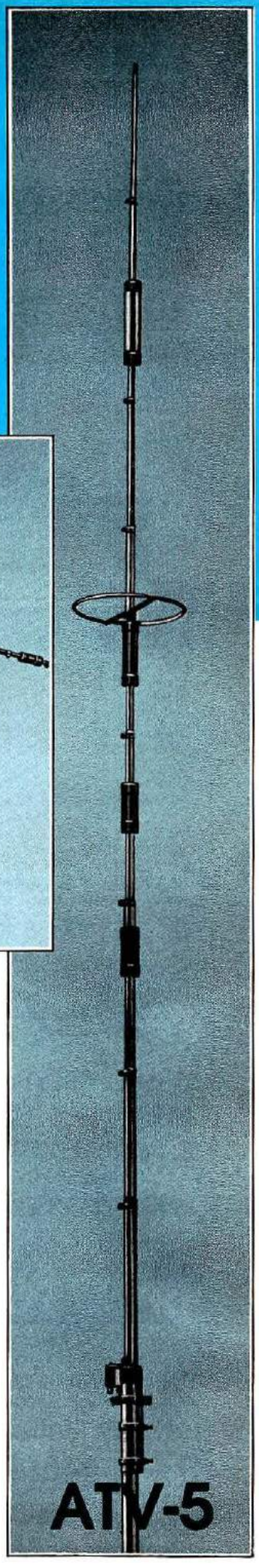

ATV-5

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Volume 3, Number 8

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CONTENTS

In the course of operating on the high-frequency amateur bands, you have probably formed your own idea of what it would be like to operate from a foreign country. You don't need many DX entries in your logbook before you begin to see some trends: power input, types of equipment that are preferred in various countries, and the antennas that are the most common. Have you ever wondered how those same DX operators visualize American radio amateurs?

Writing in the March issue of *Break-In*, the official journal of The New Zealand Association of Radio Transmitters, Harry Bourne, ZL1OI, provided some of the answers. While making contacts with more than 2500 amateurs in all call sign districts of the United States and Canada on 15 and 20 meters, Harry collected a good deal of interesting data on transmitter input power and antennas. He found, for example, that 13 per cent of the stations used less than 100 watts, 59 per cent used between 100 and 500 watts, and 28 per cent of the operators used more than 500 watts; he also found that the average power input on the 14-MHz band is higher than on 21 MHz.

In the antenna department, ZL1OI's survey showed that 48 per cent of the American amateurs use Yagi beams at heights of 30 to 80 feet, 21 per cent use verticals (either ground mounted or as elevated ground planes), 13 per cent run quads, often at rather low heights above ground, and 13 per cent depend on half-wave dipoles. The remaining 5 per cent use a variety of antenna types including Zepps, delta loops, vee beams, rhombics and indoor antennas.

ZL1OI's logbook reveals further interesting results; for one thing, signal reports confirm that antennas have a far greater effect on signal strength than transmitter input power — and it is much more effective to improve the antenna than it is to increase power. This will come as no surprise to serious DXers, but it's reassuring to have it confirmed by a DX station. And the excellent propagation conditions we've been experiencing for the past few months have made it possible for amateurs to achieve good DX results with low input powers, especially if they have a good antenna system. One late March afternoon I hooked up with a G3 who was running 150 milliwatts input on CW; he reduced power to 35 mW and we easily exchanged signal reports on ssb. That's roughly 100,000 miles per watt! And just recently I worked 7X2BK on 28 MHz using 200 mW and a 3-element beam.

When propagation conditions are good and the high-frequency bands are as hot as they have been so far this year, directional antennas are not so important for increasing signal strength as they are for reducing interference from directions other than that of the desired station. With a power input of 200 watts, excellent DX results can be obtained with simple vertical or dipole antennas, or single quad or delta loops. If you're unable or unwilling to install a larger or more sophisticated antenna system, you may not be able to crack that big DX pileup on your first call, but with good operating techniques and patience you'll be able to work any station in the world on CW. On phone it's more difficult, but only because the competition is tougher and the interference is horrendous!

If you want to improve your station performance, the message is clear: spend your budget on your antenna *system*, not a linear amplifier, and remember that includes not only the antenna, but the ground system and the transmission line. If you're using inexpensive coaxial line, or coax that's several years old, you may be surprised to find that you can greatly increase your effective radiated power by simply installing RG-213/U or other high-quality cable. If your budget won't allow a new antenna, try to increase the height of the one you already have; you may be able to double your signal strength by raising your antenna above nearby objects. And if your antenna is ground mounted, increase the number of radials; aluminum electric-fence wire is ideal and costs about a penny a foot. Unless you're already using a Yagi on a 100-foot tower, dollars invested in your antenna system will give you more bang for the buck than dollars spent in any other part of your ham station. Keep that in mind as you get your station ready for the coming DX season. The propagation forecasters all agree that band conditions this fall and winter will be better than they have been in twenty years — and conditions may not be as good for another twenty!

Jim Fisk, W1HR
editor-in-chief

Imagine All The Places You Can Tuck ICOM's Remotable IC-280. (Think small.)

The **IC-280** 2 meter mobile comes as one radio to be mounted in the normal manner: but, as an option, the diminutive front one third of the radio detaches and mounts by its optional bracket, while the main body tucks neatly away out of sight. Now you can mount your 2 meter radio in pint-sized places that seemed far too cramped before.

Measuring only 2¼"h x 7"w x 3⅜"d, the bantam-sized microprocessor control head fits easily into the dash, console or glove box of even the most compact vehicle. Or if those places are already taken by the rest of your "mobile shack," the **IC-280** head squeezes into leftover nitches under the dash, overhead, under the seat or even on the steering column.

But don't be misled by the petite size of this subdivided radio: the **IC-280** is jam packed with the latest state of the art engineering and convenience features. No scaled down technology here!

With the microprocessor in the detachable control head, your **IC-280** can store three frequencies of your choice plus the dial, which allows you to select from four frequencies with the front panel switch without taking your eyes off the road. These frequencies are retained in the **IC-280's** memory for as long as power is applied to the radio, even when power is turned off at the front panel switch. And if power is completely removed from the radio the ±600 KHz splits are still maintained!

The **IC-280** works frequencies in excess of the 2 meter band with ICOM's outstanding single-knob tuning, so you can listen around the entire band without fooling with three tuning knobs. With steps of 15 KC or 5 KC, the **IC-280** puts rapid and easy frequency change at your single fingertip and instantly displays bright, easy to read LED's.

Available Options:
- Touch Tone pad/microphone combination, which fits the mic plug on the radio face with absolutely no modification
  (Fits all ICOM 4-pin mic radios.)
- 15' unassembled cable kit for long distance remote mounting of the detachable control head

IC-280
2 meter FM, 4+ MHz
Mobile Transceiver

If you are a newly licensed novice, send for ICOM's catalog and discount purchase coupon. Mail your name, call sign and date of license to your ICOM distributor (see the bottom of this ad).

All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

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IC-280 Specifications: ☐ Frequency Coverage: 143.90—148.11 MHz ☐ Operating Conditions: Temperature: −10°C to 60°C (14°F to 140°F), Duty Factor: continuous ☐ Frequency Stability: ±1.5 KHz ☐ Modulation Type: FM (F3) ☐ Antenna Impedance: 50 ohms unbalanced ☐ Power Requirement: DC 13.8V ±15% (negative ground) ☐ Current Drain: Transmitting: 2.5A Hi (10W), 1.2A Lo (1W), Receiving: 0.630A at max audio output, 0.450 at SQL ON with no signal ☐ Size: 58mm(h) x 156mm(w) x 228mm(d) ☐ Weight: approx. 2.2 Kg ☐ Power Output: 10W Hi, 1W Lo ☐ Modulation System: Phase ☐ Max. Frequency Deviation: ±5 KHz ☐ Spurious Output: more than 60 dB below carrier ☐ Microphone Impedance: 600 ohms dynamic or electret condenser type, such as the SM-2 ☐ Receiving System: Double superheterdyne ☐ Intermediate Frequency: 1st: 10.695 MHz, 2nd: 455 KHz ☐ Sensitivity: 1 uv at S+N/N at 30 dB or better, Noise suppression sensitivity 20 dB, 0.6 uv or less ☐ Selectivity: less than ±7.5 KHz at −6 dB, less than ±15 KHz at −60 dB ☐ Audio Output: More than 1.5W ☐ Audio Output Impedance: 8 ohms

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FOCUS & COMMENT

August — the time of summer doldrums, heat waves, thunderstorms, band concerts on the town green, and a drop in Amateur Radio activities. Or is it?

It is also the time of radio-club outings, flea markets, swap-sessions, and, gasoline suppliers willing, vacation visits to places that may offer incentives and gadgets to whip up your enthusiasm for things to do in the autumn. There's nothing like getting a viewpoint from hams in a different part of the country to stir up the urge to try new bands, new rigs, or to check out the questions and answers in preparation for that higher-grade license. And, if I know hams, they're always ready to bend your ear about their projects, ambitions, and problems. You won't be a stranger to them for more than a few minutes after they know you're a ham. Most towns and cities of any notable size have an electronic-device store of some sort in them — or at least within reach of an inexpensive phone call. Almost any TV sales and repair guy will know of a few hams nearby, and you can follow his lead to eventually learn if there is a club meeting or other ham activity during your stay in the area. Take advantage of even a few hours visit to make new friends; they'll often turn into lasting on-the-air schedules once you return to your home territory.

If you should be lucky enough to fall into a flea market or auction while on your travels, now's the time to think ahead. Is there a bargain rig that looks as though it just might work with a little polish and attention? If you grab it now, you'll have time to check it out before the fall and winter operating season is upon you.

Are there some really neat metal boxes stacked up on the bargain tables — if only you knew what to do with them? Maybe you should snap 'em up. For instance, we occasionally get letters about the beginner's transmitter and receiver articles recently published in *Horizons*. One of the most common questions is, "what kind of enclosure should I use?" The answer is, "whatever you would like, that they will fit inside." As an example of how this can work — I once built a digital clock (back in the early days of digital ICs, before clock kits were truly inexpensive and sub-compact). The only enclosure I could find locally, that didn't look like a painted brick, had a price tag that would ruin a $20 bill. I waited. Lo and behold, while visiting a flea market in Florida I spotted some beautiful, modernistically styled cases for only 50 cents each. I grabbed four of them, and now three of my friends and I have blinking digital timepieces that grace our operating desks. Sometimes haste truly does make waste!

Then too, there is the "bargain" goodie that just seems too good to pass up, even though you haven't the faintest idea what you'll do with it. I found one at a Georgia hamfest several years ago. It was a black box, not too large, of unknown purpose and military background, and just loaded with hundreds of the most common components imaginable — all for a quarter. Now, how could any true ham resist a deal like that? Eventually, it paid off handsomely. I needed a resistor of a particular value (late at night, naturally), and there it was; my 25-cent bargain saved me a trip to the store the next day, plus the aggravation that comes of having to stop work on a project. That black box is still paying off — I've decided to use it to show you how to salvage good components from surplus equipment. I'll have the story written soon, and you, too, can benefit from my irresistible buy.

So, I guess what I'm trying to say is, summertime is a great time for relaxing and suntanning, traveling and visiting, but there's nothing in the rules that says you have to stop thinking ahead to the next season of operating and building in the true ham tradition. So, go ahead, take a vacation, and return with vim and vigor. The world of Amateur Radio is waiting.

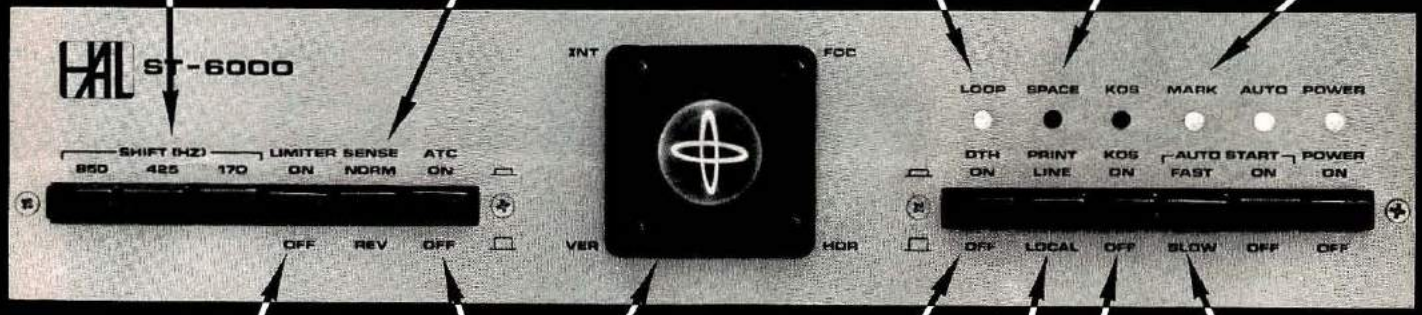
Thomas McMullen, W1SL
Managing Editor

Full Features and Superior Performance ST-6000 RTTY DEMODULATOR

Select Rx & Tx Shifts
Accurately Tuned Rx Filters
Crystal Controlled Tx Tones
True Transceive Operation

Invert Both Rx Demod, and Tx Tones

Data Status Indicators
Loop 1
Post-Autostart
Pre-Autostart



Hard-Limiting [FM] or Non-Limiting [AM] Reception

Correct for Bias Distortion

Correct For Multi-Path Distortion

Local Loop Operation

Autostart with:
- Motor Control
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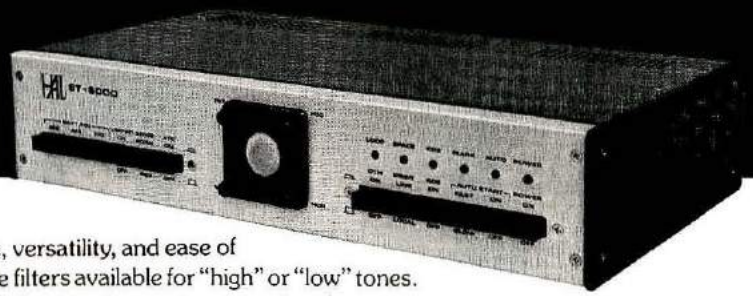

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NEWSLINE

AMATEUR RADIO PROVIDED EMERGENCY COMMUNICATIONS in wide areas of the country during the spring months. In Wichita Falls (Texas), a computer teamed up with Amateur (and other) communications networks to provide a fast and efficient means of assessing damage and answering welfare inquiries.

St. Vincent's Volcano was still acting up as of mid June, following its Good Friday eruption, with Amateurs continuing to provide around-the-clock assistance at VP2SRC.

Jacksonville, Florida got help from Amateur Radio mobile and repeater units when communications was needed for firefighters involved with a giant oil-tank fire in nearby Hilliard.

A Rescue In The Caribbean was directed by Amateurs VP2VBK, KV4FZ, VE3AUN, and others. The sailboat L'Oiseau de Passage, with ON7AP and family aboard, started sinking near Saint Martin. Amateurs in the Pacific-Caribbean DX Net heard his call for help and alerted the Coast Guard. They stayed with the rescue effort to guide a helicopter to the sinking vessel, where Alfonso, his wife, and 2-year-old child were saved just before the sailboat disappeared, taking with it the FT-277 that saved their lives.

The Tragic Crash of American Airlines flight 191 in Chicago disrupted local communications, and emergency channels were soon completely overloaded. Amateur Repeater W9SRO/R on 147.75/15 was put on emergency status, as was the CD station on 147.3 MHz in the downtown Civic Center. Many Amateurs with mobile and hand-held units provided site-to-hospital, traffic, and crowd-control communications during the first few hours after the tragedy.

OSCAR 8 IS NOW over seven minutes earlier than the figures in W6PAJ's orbit book — it's also about 10 degrees farther west than shown. At the present rate, the predicted time will be off by almost half an hour at the year's end.

RS-1 Has Been Heard (beacon only) over Europe, and the Russians are now saying they expect to have it active again soon.

SHIFT OF RFI RESPONSIBILITY from manufacturers of susceptible equipment back to users of transmitting equipment (specifically CB, but certainly including Amateurs) was the theme of a May 27 Washington Post article by Norm Eisenberg, contributer to the Post's Bookworld section. In his piece he underscores "the danger that the responsibility for such interference may be placed on the equipment interfered with," thus causing the "victims" to be penalized. He further follows the traditional manufacturer's line that RFI preventative measures would degrade equipment performance and raise prices, urging readers to write their Congressmen opposing the RFI measures of the proposed rewrite of the Communications Act.

FCC'S "ANNUAL REPORT On Major Matters" provides some interesting insights into the Commission's rule making, though in some areas — particularly Amateur Radio — a good deal of what it covers as "pending" has been disposed of in recent months. For a copy call the FCC's Office of Public Affairs, (202) 632-7260.

FCC LICENSE-FEE REFUNDS are now available to licensees who paid more than $20 for their licenses, including Extra-Class Amateurs who paid the $25 fee for a special call-sign. Applications for the refund requires a special form, which with its instruction form resembles the infamous IRS Form 1040. Applications are available from any FCC Field Office or Federal Information Center, or can be requested by mail from FCC Fee Refund Program, P.O. Box 1788, Hyattsville, Maryland 20788.

Questions About The Program (only) will be fielded during business hours on two toll-free numbers, (800) 638-0251 (outside Maryland) and (800) 492-0501 (Maryland only).

FCC'S WASHINGTON, D.C. Field Office has been moved from their downtown Washington offices to the Presidential Building, 6525 Belcrest Rd., Suite 901-B, Hyattsville, Maryland 20788; their new telephone number is (301) 436-7590.

AMATEUR RADIO WAS ATTACKED as "one of the main non-ionizing radiation hazards in the United States" at an April 9-10 meeting of the Subcommittee on Public Health Aspects of Energy, in New York. The group is an arm of the New York Academy of Medicine's Committee on Public Health, reports K6YB, who has an article on the effects of Amateur rf radiation on family and neighbors coming out in Ham Radio magazine later this year.

AN INFORMAL NBVM "ROUNDTABLE" of Amateurs interested in the new voice mode will be meeting Tuesday evenings at 0000Z at 3850 kHz, an hour before the weekly AMSAT net.

THE INTERNATIONAL VHF-FM GUIDE, a just-out 1979 revision by G3UHK and G8AUU, is a must for FMers traveling outside the U.S. In addition to Europe, the 84-page book includes FM and reciprocal licensing information for Chile, India, Israel, New Zealand and others. Postpaid price in Europe is $2.50 and it's $3.50 (air mail) to addresses outside Europe, from G3UHK, 41 Castle Dr., Maidenhead, Berks (Great Britain) SL6 6DB.

MOBILE FROM A DECK CHAIR

BY RICHARD SILBERSTEIN, WØYBF

Many hams have operated maritime mobile from yachts and many more serve as shipboard commercial-radio operators. As a cruise enthusiast, I began to wonder a few years ago about whether a passenger could receive permission to operate a ham rig aboard a ship. Inquiries led to the information that a number of passengers have done this. Permission of the captain and of the cruise line is necessary, and, of course, operation must be legal.

Various authorities led me to the conclusion that it is almost impossible for anybody to operate a rig on a ship not of the registry of his own country. Sometimes this may be due to the fact that legal permission of a foreign country may be flatly refused or may take a long time to obtain. In the course of making inquiries I contacted various ship lines. The Cunard Line sent literature but ignored the question. The P&O, which operates Princess Cruises, said it would not be possible to obtain permission from the British Government. I regret that Norwegian-American and Royal Viking have not been heard from at this time with either literature or replies. Holland America Cruises said that Dutch law permitted only the ship's radio station aboard. Thanks at least in part to the Maritime Mobile Amateur Radio Club, the FCC no longer requires even a statement of plans for citizens to operate aboard a United States ship.

A bright spot on the horizon was the advertisement in December, 1976, *QST*, by Prudential Lines* (United

States Registry), announcing a ham cruise. Later there was an article by Dr. C. H. Albaugh, W6KOS, describing his operation on an earlier voyage[1]. With the removal of the *Mariposa* and the *Monterey* of Pacific Far East Lines from service, the Prudential Line's four identical *Santa* ships became essentially the last U.S. ships to carry more than 12 passengers. The *Santa* ships carry up to 100 passengers plus about 3000 tons of cargo.

The ham-shack question

Albaugh aboard the *Santa Maria* had use of a converted projection room for a ham shack. When I contacted Prudential's San Francisco office I was told that they would be happy to convert the projection room on the *Santa Magdalena*. This was not something I felt I needed, for reasons I'll explain shortly. However, a telephone call from John Clark, W6FDG, informed me that he was going to fly to Rio and join the same voyage I was considering, and that he would bring an Atlas 210X. So we got the projection room converted. John picked up a 12AVQ antenna and stowed it aboard the ship. I did not actually use the shack and that antenna until past the middle of the trip; I had different ideas.

My reason for not being greatly interested in having a shack available was that I wanted to prove that it would be possible to operate QRP (low power) from a deck chair using battery-powered equipment, and this I accomplished.

I feel I ought to mention some of the interesting and challenging experiences in hamming as a cruise passenger before plunging into technical details. First came the matter of getting extra luggage on the flight with us to the port of departure. I used a small foot locker for tools, antenna parts, and the junk a ham must always have with him. Fortunately the loaded foot locker weighed just under 70 pounds. Continental Air Lines allowed three large bags per person, so there was no extra charge. I had the miniature station carefully packed in an under-the-seat bag, so passing security became the next mental hurdle. I say mental, because what the x-ray showed caused the lady inspector to ask for a look. However a simple explanation was all that was needed, and my wife and I were on our way.

Schedules

On the matter of schedules, since the ship is moving and one's friends are generally fixed, it is natural to set up schedules at fixed times. Dinner and entertainment aboard ship occur at fixed local times, however, so conflicts are bound to occur in the course of a voyage. Several times my wife or the dining-room steward had to bring dinner to my cabin, where I could eat it after a radio schedule.

Then there was a problem of adjusting an antenna when there was a shuffle-board game going on six inches away. Our fellow passengers were very obliging about this. Folks were all very nice. Some asked if I could find out about the floods in Orange County, California, and about many other subjects, including the State of the Union. And, as on most any cruise, there were questions from the genial octogenarian who had been a ham as a boy and had gotten out of touch.

Friendly cooperation with the radio officers was essential. With antennas so close, there were times when we were asked not to operate.

Making repairs on tiny circuit boards down in the cabin with the ship rolling took the better part of one day and made this landlubber just a bit dizzy, much to the amusement of First Assistant Radio Operator Harry Shaw, N6CG, a 40-year veteran who does such things routinely.

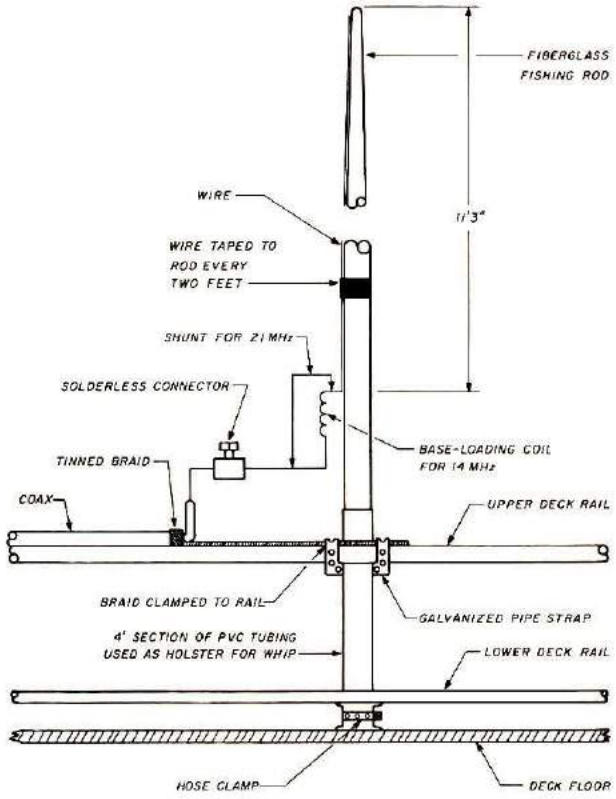


Fig. 1. A whip antenna was fastened to the deck rail by means of a PVC pipe "holster" to allow it to be removed when not in use. The loading coil allowed the whip to work on two bands, but salt-air corrosion made it difficult to keep the connections solid.

*Prudential Lines cruise ships now belong to Delta Steamship Lines, a subsidiary of Holiday Inns.

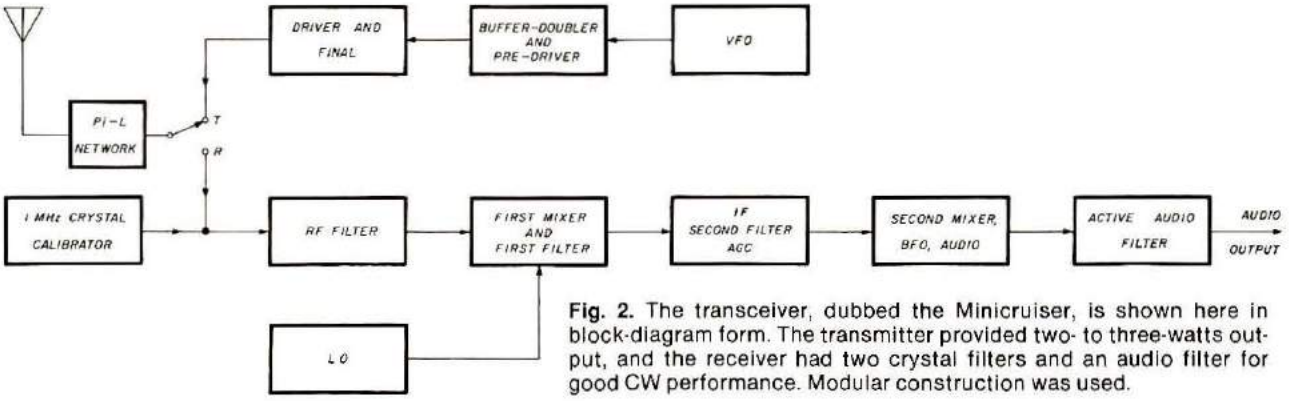


Fig. 2. The transceiver, dubbed the Minicruiser, is shown here in block-diagram form. The transmitter provided two- to three-watts output, and the receiver had two crystal filters and an audio filter for good CW performance. Modular construction was used.

The antenna

Originally, I'd had visions of strapping a loaded whip to a deck chair, but one of the disadvantages of this method of operating was the need to sit in the sun so as to be clear of metal objects. I finally found the ideal spot for sitting, under a canopy at the rear of the sun deck. Just beyond, toward the stern, well-elevated and well in the clear, was a deck rail. A 15-meter vertical was strapped to this by means of galvanized pipe strap. For 20 meters the antenna was fed through an air-core base-loading coil (8 turns of no. 20 tinned, 1-1/4 inches (32 mm) in diameter and 1-1/2 inches long). **Fig. 1** shows the arrangement.

Some problems with shipboard antennas worth considering are as follows:

1. Proximity to other antennas and to metal objects like masts, smokestacks, and superstructure can cause SWR changes and power losses (power gains in some directions) and can lead to mutual interference in the case of other antennas.

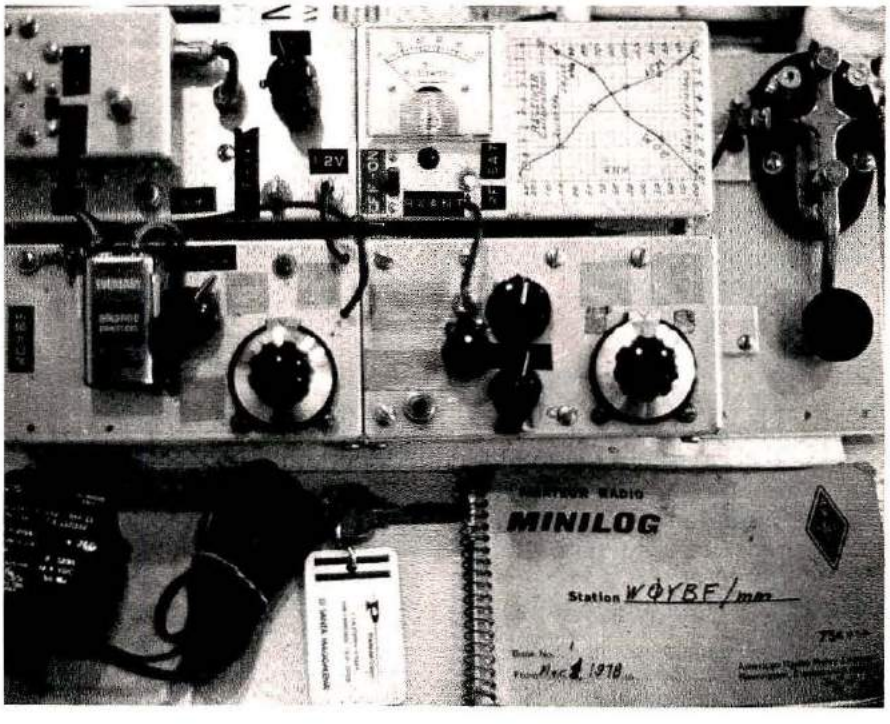
2. The height of the antenna above the sea can produce a serrated lobe pattern which might have minimum signal strength for some relatively short-distance propagation paths.

3. Noise pickup from electrical machinery can occur.

4. Corrosion in salt air is incredible to people who have never seen it. After a few days, galvanized pipe strap develops a hard gray coating through which dc contact cannot be established, even when pressure is used on the test probes. Copper and tin plating start to turn green in a matter of hours. Obviously, any unsoldered rf connections become bad very quickly. Losses due to corrosion at joints can give you an apparently good SWR reading, and a stranded wire with only one strand intact can show dc continuity but be useless at rf. Silicone grease should be used in cable connectors and may be effective where temporary connections must be tightened but not soldered.

5. Antennas take a continuous beating in severe winds. It was not unexpected on the *Santa Magdalena* when one of the ship's regular wire antennas fell after an insulator broke. A holster had to be used so that the deckrail whip could be taken down at night. The

The Minicruiser transceiver on a dresser in W0YBF's cabin aboard the *S.S. Santa Magdalena*.



original collapsible hollow fiberglass fishing pole had been cut into twice as many sections as it originally had, so as to fit into the foot locker. The sections had to be joined by means of dowels fitted tight by the use of masking tape. I found that these dowels should have been long enough to go into the mast sections several diameters, because continuous whipping in the wind eventually tears the sections at the ends. Pinning the dowel at each upper section is also necessary. Temporary repairs to weakened section joints can be made by means of small hose clamps.

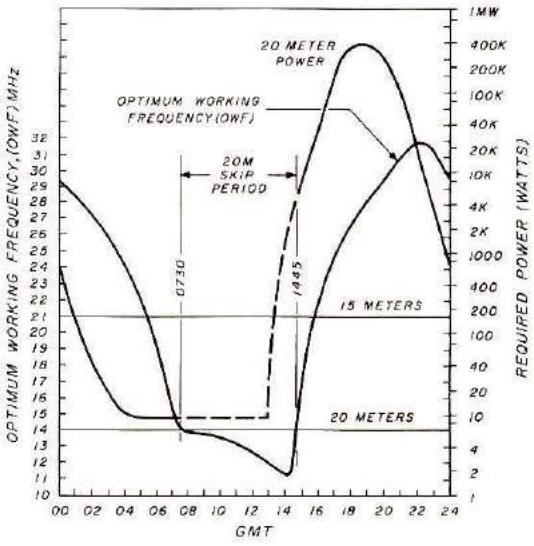


Fig. 4. Predictions for Maui, Hawaii, to Belem, Brazil, for March, 1978. The curves show the optimum working frequency (OWF), and the required power on 20 meters for an S5 signal.

The QRP equipment

The equipment used for deck-chair operating, which I refer to as "Mini-Cruiser," was developed over a period of about three years. It consists of a QRP CW transmitter delivering about three watts into 50 ohms on 20 meters and two watts on 15. The receiver covers a little more than the first 100 kHz of each CW band. (The rig is shown in the photograph.)

The equipment was designed in modular style on separate small circuit boards. Each functioning unit was developed and tested separately, and gradually all units were stacked so as to fit, by means of screws and separators, into four small aluminum chassis boxes. The four boxes were then strapped together and space was allowed for a hand key. The modular method was a good idea for designing each separate function, but with the need for interconnections to units and panel instruments, a large number of individual miniature cables was required. Besides, I had succumbed to the temptation to make the units small, so that testing and servicing of the completed system became difficult and time consuming. Ideally, after development of all modules, a completed system ought to be centered around one large circuit board with space allowed for adequate shielding of sections requiring isolation.

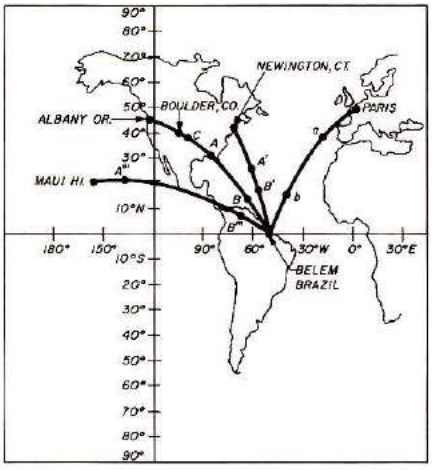


Fig. 3. Some of the great-circle paths used in predicting propagation conditions from Belem, Brazil.

Fig. 2 is a block diagram of the Mini-Cruiser transmitting and receiving systems. Each block is a unit or printed-circuit board. The receiving local oscillator and BFO are powered from a 9-volt transistor battery. The transmitting VFO is powered from a separate 9-volt battery. In this way the need for regulator circuits is avoided. High-quality batteries are essential. The rest of the power for the receiver and transmitter come from a 12-volt nickel-cadmium pack contained in one of the four boxes, with an external jack for charging.

In the receiver design, shielding of oscillators was not possible because of space limitations. Also, spacing between some PC boards is less than 1.5 mm (1/16 inch) at some points, so that receiver dynamic range is probably less than best. There is just enough AGC to prevent overloading on all but the strongest signals. Additional rf gain control is provided by means of a 500-ohm potentiometer across the input circuit, and there is also an audio potentiometer.

Intermediate-frequency filtering takes place at the output of the first mixer, which is a high-impedance, single-balanced, differential type similar to one I've used before[2], but with signal- and local-oscillator terminals interchanged. A half-lattice filter is used here, followed by another between the two i-f stages. The filter crystals are Channel 4 and Channel 5 CB crystals[3].

The receiver BFO uses an adjustable *LC* circuit, because I did not have a crystal which could be tuned to the proper frequency. The oscillators all use powdered-iron core coils, in spite of sensible admonitions to the contrary[4]. Space did not permit the use of

high-Q air-core coils. However, I noted that, in average outdoor use, frequency changes caused by outside temperature changes did not take place rapidly enough to produce problems. Frequency changes at sunset on deck in the tropics could be accommodated easily; what might happen on a high mountain is another matter.

The receiving local oscillator and the transmitting VFO are of two separate, novel designs. The receiving LO runs in the 23-MHz region to convert 20-meter signals to 9 MHz; it operates in the 12-MHz region for converting 15-meter signals. The transmitting VFO runs in the 7-MHz region for 14 MHz and near 10.5 MHz for 21 MHz. The VFO is keyed directly; unfortunately, key-click filtering in a keyed oscillator involves a compromise between key click and chirp.

The active audio filter came along as an afterthought, and was used outboard to the main unit, since the simple crystal filter was not sharp enough to eliminate the higher audio frequencies. A standard MFJ Type CWF-2 was used; an additional audio stage to compensate for the filter attenuation would be an advantage.

The transmitter VFO is followed by a buffer-doubler and predriver. The output stage of the predriver is fixed-tuned. A low-impedance cable connects it to a final circuit board containing a broadband balanced driver employing 2N2222As. These, in turn, drive the loaded bases of a balanced pair of output transistors, which may be 2N3948s or MRF207s. Their output goes to a balanced-to-unbalanced transformer driving the *pi-L* network which is on top of the final cabinet.

The entire assembly with batteries, exclusive of the audio filter, weighs a little over 5-1/2 pounds (2.5 kg). It is carried in a water-resistant backpack. A charger, Realistic Model 21-516 (Radio Shack), is used to charge the batteries overnight.

Results

The route of the ship was down the West Coast and over to Manzanillo, Mexico, through the Panama Canal, and then around South America. We left the ship at Callao (Lima) Peru.

A schedule had been set up with Steve, KH6SB, on Maui, Hawaii, and with Fred, W7LBH, in Albany, Oregon, near 21075 kHz starting at 2030 GMT, with available Boulder, Colorado, operators coming in. There was also a second schedule near 14075 or 21075 kHz beginning at 0030 GMT for W7LBH and for Boulder operators coming home after 5 PM. Jack, W0FFV, was asked to coordinate the Boulder effort.

My original objective had been to work a small group of friends, including the Boulder Amateur Radio Club gang, rather than to try for stations in various parts of the United States and the world. Things came out almost the opposite, partly because of my less-than-optimum choice of operating schedules, and partly because none of the Boulder people who were continuously active in the project were blessed with beam antennas. The relatively poor scheduling was caused by the fact that the propagation predictions which follow were made by me after, rather than before, the voyage. But some great DX contacts were made.

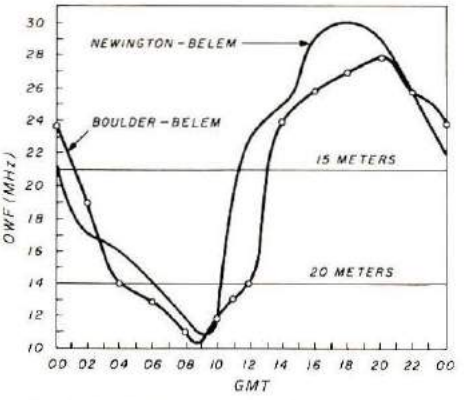


Fig. 6. Optimum working frequency between Newington, Connecticut, and Belem, and between Boulder, Colorado, and Belem.

We sailed from Los Angeles the evening of February 26, and the first contact was made on March 1 at 2100 GMT with W6IEU at Ontario, California on 14050 kHz. We were about 1000 miles (1600 km) south of Los Angeles. A day later I had my first contact with W7LBH on 15 meters at 2053, followed by one on 20 meters at 0100 (GMT). Fred was using several hundred watts and a three-element quad at about 80 feet (24 meters) on a hilltop. Much of the time I was close to his noise level.

No Boulder station came in until March 4, when the ship was 500 miles (800 km) south of Acapulco. At 0100Z, WA0WNX, Bob, using only a trap antenna but a receiver with a sharp filter, said I was RST 449. He was on 21075 kHz and worked me again on the later schedule on the same

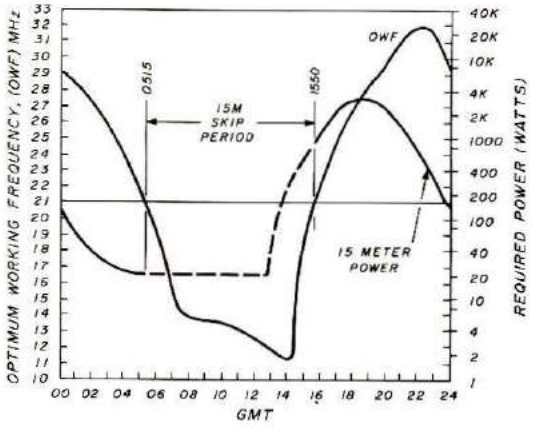


Fig. 5. Predictions for required power on 15 meters and for OWF over the Maui to Belem path in March, 1978.

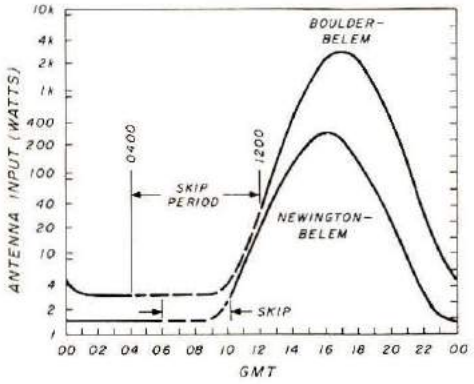


Fig. 7. A graph showing the required antenna input power on 20 meters for a 5-microvolt signal. The paths are from Boulder and Newington to Belem. Antennas considered are a three-element Yagi for transmitting and a quarter-wave vertical for receiving.

frequency. On March 5 when we were along the coast of Panama, there was another contact with him on that frequency (at 0040Z) with signals getting very weak. While contacts with both Boulder, Colorado, and Albany, Oregon, were marginal, there were much better contacts with the East Coast, where the stations were farther into darkness. The first real DX came, however, when the ship was almost at Balboa. DJ4IT, Charles, in Koln, gave my 20-meter signal a 569 report at 2223Z on March 5. This time of day put the path well into darkness. Much more spectacular contacts were to be achieved later in the trip.

Interpretation of results

To obtain some understanding of what was observed, I decided to generate some prediction charts. A reception point was chosen on the Equator at the mouth of the Amazon near Belem, Brazil, since a number of interesting results were noted along the northern coast of South America. Various great-circle paths to Belem are plotted in **Fig. 3**. Points marked **A, B**, etc., are control points used in the prediction method.

The first transmission point chosen was Boulder, Colorado, my home location, 7100 km (4400 miles) from Belem. On the same great-circle path, 1500 km beyond, is Albany, Oregon, the QTH of W7LBH, who had been worked almost to the Equator. Then Newington, Connecticut, at a distance of 5000 km (3600 miles) was chosen. Since W1AW was heard just about everywhere, it seemed logical to use the path from that station to illustrate the prevalence of East Coast stations heard and contacted during much of the voyage. Next, the path from Maui, Hawaii, to Belem, 11750 km (7000 miles), was chosen because of a schedule with KH6SB which was obviously not optimum from the propagation viewpoint. Finally, the path from Paris, France, 7300 km (4400 miles) was chosen to illustrate why many Europeans could be heard well from the region near Belem.

The first set of predictions was of the familiar maximum usable frequency (skip frequency) for each hour. Such predictions for chosen paths are published monthly in several ham journals, and at one time were of great importance to the military. They still must be used, of course, for the planning of international broadcast schedules. For long-distance transmission, reflection from the F2 layer was assumed.

Jack Clark, W6DFG, with his rig in the modified projection booth. Jack is holding his complimentary membership certificate for the Maritime Mobile Amateur Radio Club (MMARC). The equipment was strapped to the table to keep it in place in rough weather.

W0YBF operating the Minicruiser gear from a deck chair under a canopy at the rear of the bridge deck.

The value of maximum usable frequency chosen for this study is the value exceeded on 90 per cent of the undisturbed days, sometimes called the Optimum Working Frequency (OWF). From these curves one can find the expected times when the signal will skip and recover. In general, the skip will start a little later and recover a little earlier on 90 per cent of the days. The OWF curves were manually computed following prediction charts published by the National Bureau of Standards in 1959 and 1960.[5]

Actually, the conventional OWF curves alone tell only part of the story, since a large part of the time when the signal is not in the skip zone it may be too weak to compete with noise and interference. In long-distance transmission the signal is reflected largely from the F2 layer, but some of the power is absorbed as the wave penetrates the lower D and E layers. This absorption of power depends directly upon the angle at which the sun hits the penetration points; this fact is the basis for determining variation of absorption of power with time of day.

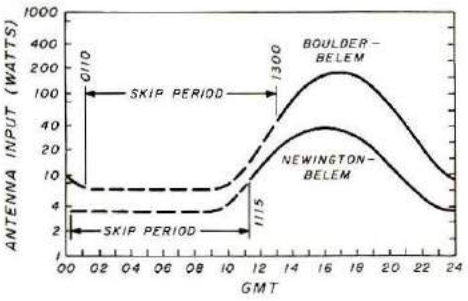


Fig. 8. Required antenna input power on 15 meters for a 5-microvolt signal over the Boulder and Newington to Belem paths. Antennas considered are the same as in **Fig. 7**.

For the lower frequencies, knowledge of how much atmospheric noise power there is for the signal to override is important. Noise was not an issue most of the time on 20 and 15 meters during the voyage, so the prediction method involving absorption was simplified to answer the question "How many watts of transmitter power are needed each hour of the day to produce an S5 signal (5 microvolts) at the front end of the receiver?"

The transmitting antenna assumed was a 3-element Yagi with 7 dB gain, mounted a half wavelength above a foreground of "good" soil. The receiver was assumed to be matched to a quarter-wave vertical with a sea-water foreground. A vertical angle-of-take-off of eight degrees was arbitrarily used, along with 3-hop propagation. Actually, a variety of modes with elevation angles up to about twelve degrees may exist. These assumptions are valid in reverse, *i.e.*, for transmission from the vertical on the sea and reception using the Yagi on land, if noise and interference are neglected.

The required-power curves have to be drawn for each operating frequency, since the absorption increases as the frequency goes down. In hours of darkness over the total path, no absorption is allowed for, so that required power is calculated on the basis of an "inverse-distance field", that is, roughly the same as in short-distance vhf transmission.

The required-power curves were computed by means of a relatively simple method published by the National Bureau of Standards in 1948.[6] Some information was used from a U.S. Army report on field intensity[7], and from another Army report on antenna radiation patterns.[8]

Predictions of required power can never yield exact results, even with the most elaborate computerized methods, because of the complexity of the ionosphere. Nevertheless, a relatively simple prediction method is a tool for understanding what to expect when planning DX contacts in the high-frequency bands.

Fig. 4 gives predictions of OWF and required power for transmissions from Maui to Belem, plotted against GMT. The lower curve is the conventional OWF. From this curve it can be seen that the skip period for 15 meters is 0515 to 1550Z, and for 20 meters from 0730 to 1445Z, frequency being read on the left-hand scale.

The other curve is of a type which does not appear in amateur predictions. The tall curve "20-meter power" shows the power required for an S5 signal on 20 meters. Required power into the antenna is read on the right-hand side as "watts" and "dB above 1 watt." **Fig. 5** repeats the OWF curve and shows required power on 15 meters.

The first thing you'll note is that, in general, power requirements are least in the hours of darkness over the path. However, during much of this time, but fortunately not all, the signal is skipping so that you don't hear it anyway. Power requirements are greatest a few hours before maximum OWF, 400 kilowatts on 20 meters (**Fig. 4**) and 3 kilowatts on 15 (**Fig. 5**). This is indeed a long path! But suppose you want to transmit just before skip time on 20, beginning about 0500Z. The power requirement is only 9 watts. And around 0500Z on 15 meters, when the lower ionosphere is not absorbing power, the required power is 20 watts (more on 15 meters because the receiving antenna's "capture area" is smaller). This condition lasts until skip sets in.

Let's see what happens when the skip lets up in the morning. On 20 meters the required power at 1445Z is already 5 kw. Propagation on 15 meters begins at 1550Z and the required power is about 1 kw at that moment. For both bands the requirement increases rapidly from that point. As darkness advances over the path the absorption falls and the power requirement decreases, but the OWF falls more slowly, creating a period of good propagation just before skip. The phenomenon is caused by the fact that absorption, taking place in the dense lower ionosphere, is directly dependent upon the sun's position, whereas up in the F2 layer the atmosphere is so thin and the free electrons (produced by ionizing radiation from the sun) are spread out so far that they take a while to recombine after sunset.

Theory tested

Looking at the real-life

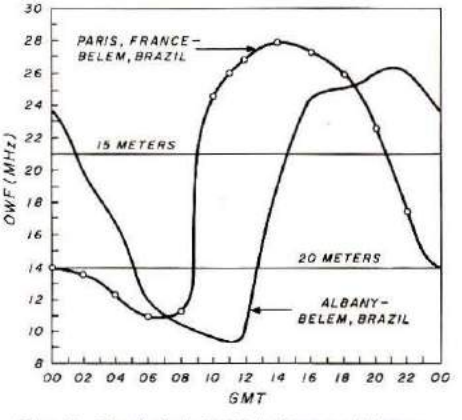


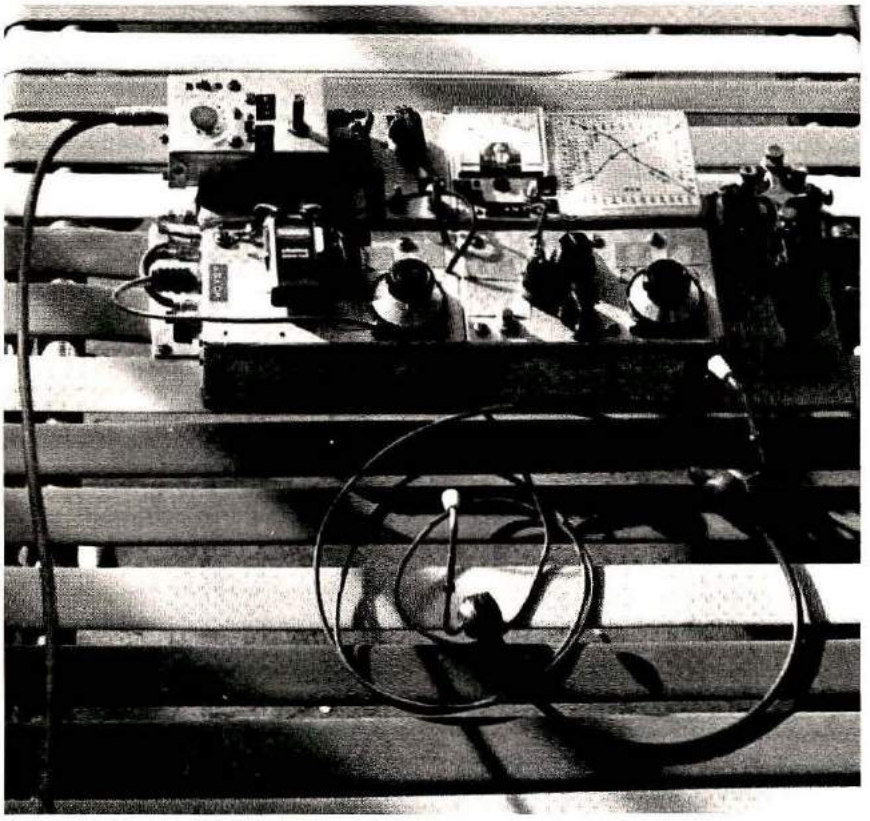
Fig. 9. Predicted OWF between Albany, Oregon, and Belem, and between Paris, France, and Belem in March, 1978.

situation of the schedules between KH6SB on Maui and W0YBF aboard the *Santa Magdalena*, the hour beginning at 2030Z was a poor choice. The 15-meter power requirement for S5 at that time, according to **Fig. 5** would have been about 2 kW. However, at 0500Z the requirement would have been approximately 20 watts for S5, but only 0.2 watt for an S1 signal (20 dB lower). A 15-meter contact with KH6SB a week earlier, when I was 2000 km (1200 miles) closer, at 2040Z produced only an S3 report from Steve. At 2100Z the same day, Del, W8BDR, gave me a 569 report from Michigan. He was much farther east and nearer to skip time.

Fig. 6 shows OWF curves for Boulder, Colorado, and Newington, Connecticut, to Belem. **Fig. 7** shows required-power curves for these locations for 20 meters and **Fig. 8** for 15 meters. These curves show at a glance why East Coast stations were heard so prevalently along the northern coast of South America. Signal strength would average about 10 dB more from Connecticut during a large part of the day. A prediction for Florida would have shown a much greater advantage for that state.

The curves show that the Boulder schedule at 2030Z was bad on 20 meters, several hundred watts being required, and not the best on 15 meters (about 50 watts required). The 0030-0130Z schedule looks good on 20, about 3 watts being required for an S5 signal. However, this was a time of severe East Coast interference in Boulder, the situation being made worse for the lack of beam antennas for reception. Beams would not have helped in the case of QRM from Florida, The same schedule on 15, before skip at 0110Z, probably would have been a little better.

The Minicruiser rig getting some sunshine on a deck chair while the author takes time off from operating and checking propagation.



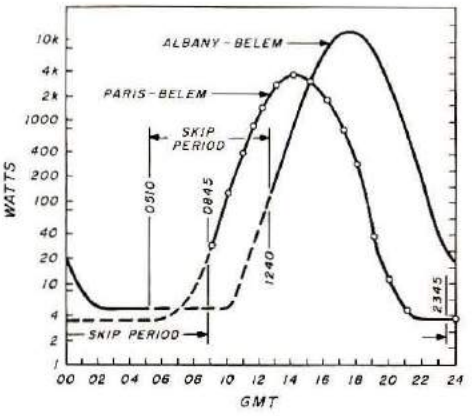


Fig. 10. Predictions of required transmitter output on 20 meters for an S5 signal over the paths from Albany, Oregon, and Paris to Belem.

Actually, by the time the ship was near Belem, Boulder was not being heard at all, the last Boulder QSO having been on 15 meters, March 11 at 0030Z with Bren, W0BY. Signals were very weak. By contrast, on March 12 at 2115Z on 15 meters there was a 579 report from Oscar, W2CGW, followed by another a few hours later, March 13 at 0100Z, from Brian, K3KO, on 20 meters. These further confirmed the superiority of the shorter path and later hours of darkness in transmitting to the East Coast even though the stations were a bit inland.

Fig. 9 shows the OWF from W7LBH, Albany, Oregon, and from Paris, France, to Belem. At Belem the distance is much shorter to Paris. In fact, along the northern coast of Brazil the best overseas signals are frequently European. **Figs. 10** and **11** show the propagation conditions to Paris. A 20-meter signal in the evening (GMT) could be four S-units higher from Paris than from Albany. The advantage on 15 meters could be two S-units.

W7LBH had been worked on 15 meters at 2045Z on March 15 when the ship was near Belem, at a time when **Fig. 11** showed about 100 watts for S5, or 2 watts for S2, and my signals were very weak. At 2004Z, I worked F6EYM on 15 meters. The Paris prediction indicates a

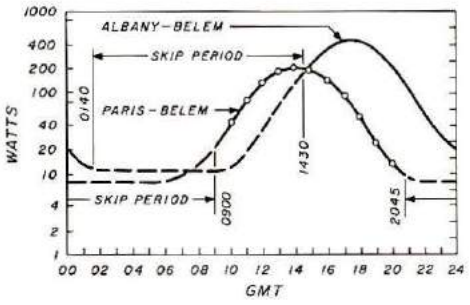


Fig. 11. 15-meter transmitter output power predictions for an S5 signal from Albany, Oregon, and Paris to Belem.

little over 10 watts for S5. My 2 watts seems about right for Guy's S2 report from St. Lo, France.

There was one opportunity to see how a morning schedule to Boulder would be when Jack, W0DW, was heard working Lew, W4BX in Punta Gorda, Florida, on 20 meters at 1430Z on March 15. Jack was putting about 500 watts into a 3-element beam, and Lew was using about the same power into a trap vertical. Jack was barely readable above noise (not interference) and Lew was much stronger, being closer on the same great-circle path. From **Fig. 7**, you can see that Jack should have delivered about an S4 signal. A schedule an hour and a half earlier, just after skip came in, would have been much better.

I should mention that contacts from ships along the northern coast of Brazil with San Francisco are said to be difficult on any commercial maritime-mobile frequency. At one time there was a two-day backlog of traffic for this reason. Conditions are said always to improve, for some unknown reason, when a southbound ship gets near the easternmost tip of Brazil. With the port schedules and the increasing distance, I was out of touch with my friends until the ship passed Valparaiso, except for the fact that when the ship was in the La Plata estuary below Buenos Aires on March 28, I heard Yardley, W0JF, calling me on 15 meters at 0030Z. He was using a beam but did not hear me. During the period after we left Brazil, however, two very-long-distance contacts were made. I wonder what it would have been like if I had really been going after DX?

The first of these DX QSOs was at 0050Z on March 24 when we were off Uruguay, when JR2VTW, Sumi, gave me a 449 report on 15 meters. Then on March 29 at 2100Z on 14090 kHz, UA0ZZ at Petropavlovsk-Kamchatka gave me a 559. We were off southern Argentina. For such long distances it is believed that focusing and ducting between layers as well as "long-route" propagation could account for much stronger signals than would conventional propagation modes.

In the Strait of Magellan I worked some nearby South Americans. On April 1 (still in the strait) I was called at about 2000Z by UA6FQ, but regrettably was unable to take the time to reply. On April 6, after a stop in Valparaiso, I worked several friends again, including ssb voice contacts with KH6SB and W7LBH. This time, however, I was using the Atlas 210X kindly loaned by W6FDG while he was off on a land tour. The 12AVQ antenna gave good results, but I still think it was mounted much too close to the smokestack. Some final trials on a long wire appeared to give better results.

By April 6 my own gear had been dismantled in preparation for leaving the *Santa Magdalena* at Callao (Lima) after a most pleasant and unusual voyage.

Acknowledgments

I am indebted to Captain Kenneth Sommers and to Chief Engineer David Marks for their personal interest in seeing that the project got off the ground, and also to the Chief Radio Operator Roger Callje, W6YPT; First Assistant Radio Operator Harry Shaw, N6CG; and Radio Operator Joe Kusick, who is now probably happier than ever that he never became a ham.

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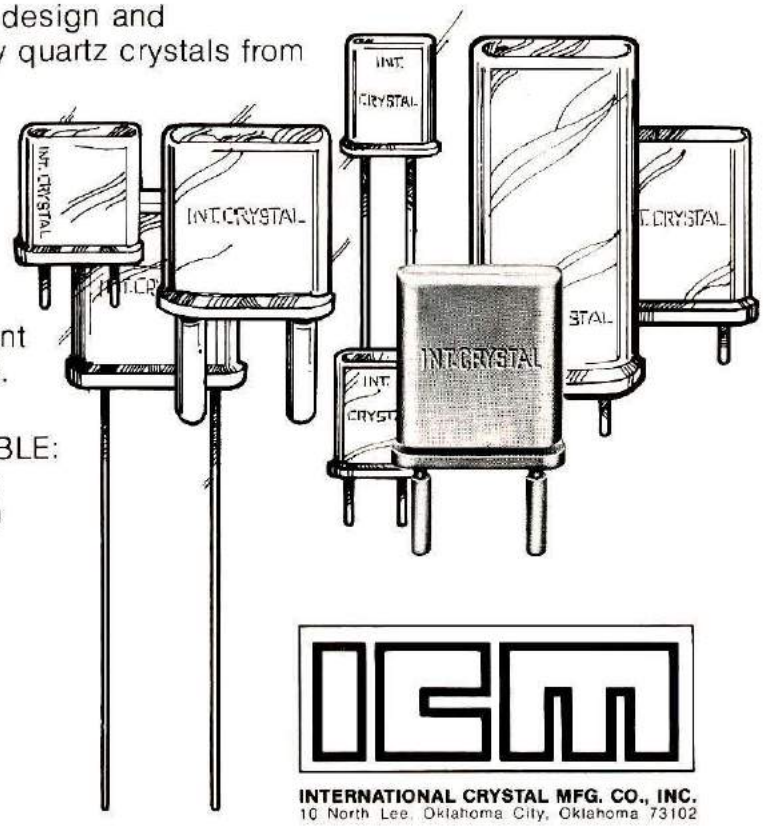

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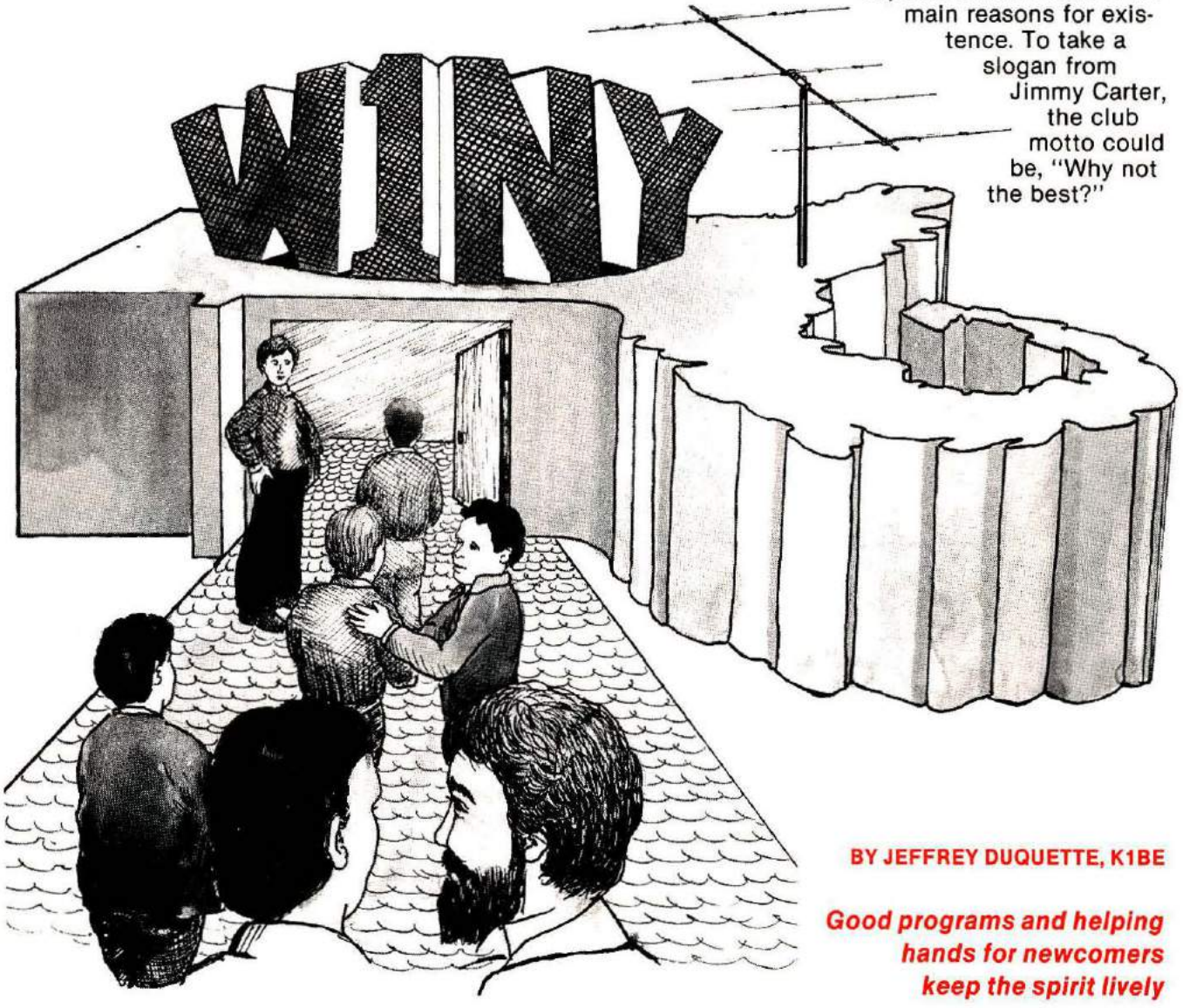
Hampden County Radio Association

How would you like to receive over 16,000 foreign QSL cards every month? The Hampden County Radio Association does! The HCRA is the number one call area's incoming DX QSL bureau. The club is located in the scenic Pioneer Valley of western Massachusetts. Originally there were three radio clubs in the Springfield area; they merged to become the Hampden County Radio Club in 1947. Their name became the Hampden County Radio Association when they incorporated in 1958. The club has been in existence for over 35 years, with time out for World War II. It is a general-interest group, with the investigation of the technical aspects of radio one of its main reasons for existence. To take a slogan from Jimmy Carter, the club motto could be, "Why not the best?"



BY JEFFREY DUQUETTE, K1BE

Good programs and helping hands for newcomers keep the spirit lively

This pursuit of excellence is exemplified by the membership. Club members have contributed to Amateur Radio's technical progress from its earliest days. Almost every issue of *The Radio Amateur's Handbook* features something from an HCRA member. The call sign W1HDQ will be recognized as that of Ed Tilton, long-time vhf editor for *QST*. Dick Stevens, W1QWJ, has been a pioneer in vhf/uhf and has his six-meter linear amplifier in the 1978 handbook. The technical abilities of the members are best exemplified by Art Zavarella, W1KK, whose career encompasses the entire history of our hobby. As a boy, Art met Hiram Percy Maxim!

The story that best illustrates Art's varied experiences goes back to when he was 17. He used to operate 1AIG, a spark-gap transmitter. Due to the interference he caused in nearby crystal radios, he kept all the shack lights turned off. However, the neighbors would discover his hiding place and throw rocks at the door. Numerous complaints finally brought in the Department of Commerce. (The FCC is now the agency that complaints are sent to.) The government inspector didn't find any violations, but a change in operating hours was suggested!

The association has continued to build on the achievements of its members. They meet once a month; the programs are varied, with technical topics being a favorite. Outside experts come in to talk about subjects like antenna design or radio telescopes. The season always includes an auction, banquets, and a flea market. President Jeffrey J. Duquette, K1BE (ex-WA1SNJ), organized a "This is Amateur Radio" spaghetti supper to get our message before the general public. "The response was overwhelming," commented Jeff, "and we filled the hall to capacity. Programs on building your own equipment, OSCAR satellites, ARES, NTS, and traffic handling were presented to show the diversity of Amateur Radio."

Many of the Hampden County Club's functions were attended by people from nearby ARRL headquarters, and you'll see some of them enjoying this annual banquet in 1953. The name was changed to Hampden County Radio Association in 1958 when the club was incorporated.

Activities

All aspects of ham radio are pursued by the members. "We participate as a club in operating events," said Bruce Felper, WA1PUX. "The vhf sweepstakes, field day, SET, and our own 10-meter net keep interest high. Almost every contest listed in *QST* has at least one club member's call. Our flea market is in May, and

Bill Hall, W1JP, goes in for portable operation and enjoys teaching code and theory courses for newcomers. Looks like he's all set to turn in a field-day score from his van.

The Section Emergency Coordinator for western Massachusetts is Bob Phoenix, WA1DNB. He practices for emergencies often, particularly in field day and SET (Simulated Emergency Test) operations. His leadership keeps HCRA well represented in the Amateur Radio Emergency Service.

we end the season in June with a banquet. Everyone has a chance to socialize and learn something." When the Barnstable Radio Club on Cape Cod sponsored the Marconi Memorial Station, KM1CC, a large contingent of HCRA people went down there to help operate it. Jean Peacor, K1IJV said, "We had a ball! The snowstorm left us stranded, but we all enjoyed helping to re-create history. That sound of the A2 spark gap was a thrill to send or hear!"

Hams in the New England states receive their DX QSL cards via the bureau, which is the HCRA. For the past five years the manager has been Eleanore Gray. She explains bureau operations: "Every month I pick up the incoming DX cards at the post office, usually about 16,000 of them. We sort them according to the first letter of the suffix. For example, W1CJK goes into the "C" pile, as would WB1CJH. Individual club members handle individual letters. Hams send in self-addressed envelopes with 28 cents in postage, and, when they receive enough cards, we mail them out. We have operated the bureau for ten years and people like Jean Peacor, K1IJV, Bob Gordon, W1KUL, Eunice Gordon, W1UKR, Tom Barrett, W1KUE, and Leo Brodeur, W1VNE, have been with it since the club took it over. There is a waiting list for the letter groups, so it can't all be hard work. We handle about 160,000 cards a year, and have very few complaints." A booth is set up every year at the ARRL New England Division convention to make it easier to file envelopes.

HCRA is an ARRL-affiliated club and a strong supporter of their programs. Novice and General courses are taught by members; as many as five different sessions have been going on at the same time! Bill Hall, W1JP, a contributor to *QST*, is teaching a General-class course in the Palmer area and loves it. William Rensier, N1BA, taught Novice and General courses in Wilbraham for two years. "They come in as CBers, learn how easy and how much fun hamming is, and they're hooked," Bill said. "Some of our best new members came out of these courses." Larry Soltz, WB1CJH, commented, "I thought at first I could never learn the code. Now I'm a General-class licensee and the club secretary." The association helps spread the word about the excitement of ham radio by distributing brochures and putting up displays in public places.

A club station

The HCRA club call is W1NY. Art, W1KK, is the station trustee, and we'll let him tell you about it: "One of our

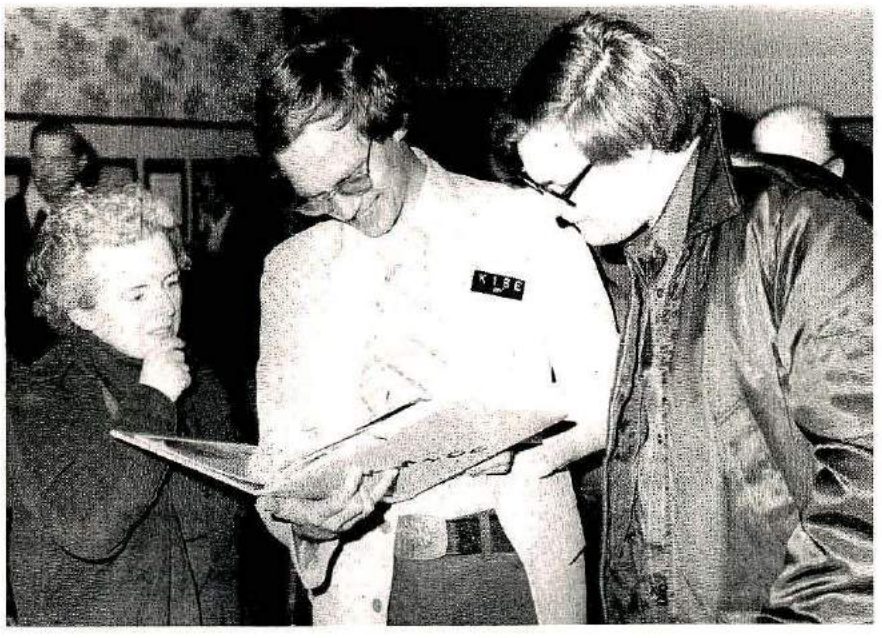
A student in the General-class course needs help with a theory problem — K1BE (standing) responds (*photo by WB1BPL*).

association's most active founding members was Hank Baier, W1NY, who became a silent key shortly after his retirement. As a youngster, Hank worked in the Pioneer Radio factory, which made the famous Murdock earphones. He later worked for the United Fruit Lines as a shipboard radioman, where he acquired that inimitable banana-boat swing to his cherished CW fist. Hank had a lifelong interest in the HCRA and inspired many present-day members to first delve into radio. In 1967 the club honored him with a testimonial and plaque for 50 years of ham radio in the public interest. Through the efforts of Ted Lockwood, WA1GZO, we were able to acquire the call, W1NY, for our club station. Field Day and contests are more fun when you're able to use the call sign of a good friend and recall the traditions he first started."

The members are also involved in *Zero Beat*, the club's newsletter. Its editors are Bob McCormick, WA1QHR, and Jeff Duquette, K1BE. *Zero Beat* features technical articles, quizzes, ham news, and news of what individuals have been doing. Bob said, "The members enjoy reading the newsletter and are quick to complain when the Post Office loses an issue. Articles are varied because they reflect what the members are interested in. One of our popular items is the zany contests with books for prizes. The crossword puzzles have been the favorites so far."

Flea-market bargains on everything from coaxial cable to boat anchors are always popular with local amateurs (*photo by WB1BPL*).

Barbara Murnane, WB1EHS, Jeff Duquette, K1BE, and Gary Potts, WA1ECR, look over some photographs from the Marconi Memorial Station operation (KM1CC). Many HCRA members manned the operating positions during that memorable week. Were you lucky enough to hear that lovely A2 note answering your call? (*photo by WB1BPL.*)



Mixers and helpers

This high level of involvement is due to the interest and hard work of so many members. Former CBers, now licensed Novices, mix with older, experienced hams. This organization has a feeling of fellowship permeating it. The members have made a commitment to Amateur Radio. People who run into difficulties have only to mention it at a meeting, and they can be sure someone can help. This association has members from all areas of hamming. Ed White, W1NPL, has operated and repaired RTTY for years. If you wanted to know about contesting, the person to speak to would be Frank Potts, WA1RWU. Frank says, "Contesting requires a sharp operator with good equipment and the best antennas available. I believe that winning scores have as much to do with the amount of preparation as the time you spend actually operating." Frandy Johnson, N1FJ, went from nothing to Amateur Extra in one long day

at the FCC. He says, "I love to operate QRP_p (low, low power), and have stacks of DX QSL cards to prove it. My other interest is in designing antennas for low-power operation. Someday I hope to load up into a wet string and make a contact!" Gerry Griffin, WA1PGT, likes to work with home computers, and has designed special terminals to help people with impaired abilities to communicate normally. "Once you understand how these special people think differently, the design becomes easy. A standard typewriter keyboard does not always suit the particular person. So I design a keyboard that fits into the individual's thought processes that makes sense to him," Gerry said. Advice is freely given, and usually you'll find the answer-man knows what he's talking about.

Public service is one of Amateur Radio's main reasons for existence. Bob Phoenix, WA1DNB, epitomizes HCRA's commitment to helping out. Bob commented, "I serve as the Section Emergency Coordinator (SEC) for western Massachusetts training nets, and participation in drills and parades prepare members of the Amateur Radio Emergency Service (ARES) for real life-and-death work." Bob Julian, W1DVW, and Percy Noble, W1BVR, are representative of the high quality of operator necessary in the National Traffic System (NTS). The ARES membership in our section reads like the club roster. Bill Werenski, W1CJK, and Don Johnson, W1UPH, are just two participants in this active group.

A strong relationship between the HCRA and local repeater clubs enables western Massachusetts to respond to emergencies. Sunday mornings, on 80 meters, the Western Massachusetts Emergency Phone Net comes on at 3937 kHz. Liaison with most of the local repeaters is made possible by stations going to two meters for check-ins. New people are greeted warmly and made to feel welcome. Training covers procedures and traffic handling, so that they are ready when an emergency strikes.

What can go wrong?

The Hampden County Radio Association is a dynamic, growing organization. But what causes a radio club to stagnate and die? Lazy club officers are one of the biggest reasons. When no one is willing to share the work load, including the officers, it is a foregone conclusion that the club doesn't accomplish much. A good officer is able to inspire many people to take on club tasks. What are some of them? Finding a meeting place and arranging for its use. If the meetings are held in different locations and everyone has to search for the place, attendance drops off. Another good way to guarantee small groups is to always start late. A dull speaker and tedious business meetings will make the most enthusiastic Novice stay home to watch the "boob tube."

A second major reason for a club's decline is formation of cliques. The high-frequency or vhf groupings that can see no good in the other bands keep everyone at each others' throats. Slogans such as "repeaters are nothing but CB on ham radio" and "technicians are glorified novices" will keep the groups apart. There are still old timers who won't accept single sideband, and continue to use

An up-to-date phone station of the 1950s. Bill, W1CJK, is still an active club member (*photo by W1CJK*).

The president's gavel goes to George Hughes, W1ALL, in 1968. George, and other club members, are active in the MARS (Military Affiliate Radio System) network in New England.

a-m. The time when we could afford in-fighting is past. All groups and clubs should work together to build on the best in Amateur Radio. The perpetual complainers and trouble-makers will always be with us. Just don't let them set the tone of your club!

A lack of imagination is what most administrations suffer from. Try spicing things up with raffles, auctions, banquets, and contests. A small door prize at every meeting gets people interested! Operating events like field day take on increased excitement with inter-club rivalry. Create interest by throwing down the gauntlet to a nearby club. Awarding the winner a plaque that can be used in future rivalries is a good idea. Hams attend meetings to be entertained with a good program and to socialize. Encourage this with a coffee break, serving soda and doughnuts, too.

The Hampden County Radio Association meets on the first Friday of every month (except in summer) at the Feeding Hills Congregational Church (just a few minutes west of Springfield). We'd be glad to have you stop by for a visit. Local repeaters will help you locate us. We welcome your comments and suggestions.

HRH

TVI Complaints

BY JOHN CARLSON, DA1TM, AND BILL PARDUE, DA1KV

How many times have you received TVI/RFI complaints from your neighbors and had no one around who could help you resolve the problem? That can be a very uncomfortable position to find yourself in, especially if you're new in Amateur Radio. Even for an old hand it can be a very difficult, and sometimes impossible, task to tackle by himself. The usual approach on the part of the complainant is not normally made in a friendly manner. It usually starts out something like, "We didn't have any problems until you put up your antenna. Since then our TV has lines in it, my wife's hair dryer won't heat, and the kid's electric train runs slower." Even though complaints like that might be a little far-fetched you can rest assured that if you have close neighbors, you're going to have some complaints as soon as you get your antenna up. Remember though, that just because your neighbor has interference doesn't necessarily mean that your rig is the cause of that interference.

Here is where you encounter your first problem: how can you operate your rig and check out what type of interference your neighbor is experiencing at the same time? If your neighbor is sharp, and can explain in detail exactly what the interference is, you're all set. However, if he's like 95 per cent of the people, lines are lines and all he's concerned about is the fact that they're on his TV. You'll never be able to convince him, or yourself, for that matter, that your rig is not at fault unless a competent and qualified person can operate your rig and observe the interference.

Getting Help

This brings me to the main reason why I'm writing this article. TVI *can* be cured, and, in most cases, relatively easily. However, many Amateurs simply resign themselves to the fact that nothing can be done, and consequently operate their rigs according to the TV schedule. The real answer is a TVI/RFI Investigation Committee from your local ham club. If you don't belong to a club, get together with some local hams and start your own committee.

The purpose of a TVI/RFI committee is threefold: it investigates the complaint and corrects the problem; it acts as a disinterested party and a buffer between the two parties; it can be beneficial to the Amateur because many times members can spot deficiencies in the Amateur station itself. This, of course, is where the investigation starts. There's no use in investigating further if the Amateur's station does not meet good operating standards (proper station ground, appropriate filters, and so forth). I'm getting ahead of my story though.

When your club members, or some local hams, decide to start a TVI committee, you'll

need plenty of information in the form of letters and pamphlets with which to educate yourselves and the complainants. You'll need all the ammunition you can get when you enter the TVI/RFI battlefield. Many of these pamphlets can be obtained free of charge by writing to the ARRL Communications Dept., Newington, Connecticut 06111, and asking for their TVI/RFI information packet. Other information can be obtained by writing to Consumer Information, Pueblo, Colorado 81009, or by researching the interference section of the *Radio Amateur's Handbook*. A very useful letter we have used with success is one describing the filters and protection devices used in the station. For example, our letter reads:

INTERFERENCE AND SAFETY PROTECTION DEVICES

This Amateur Radio station is equipped with the following devices to eliminate unwanted and undesirable emissions and to increase the safety of personnel and equipment.

A. Blitz Bugs. Safety devices installed in the transmission lines to direct outside voltages made up of static electricity and lightning to earth ground.

B. Match Box. Device to equalize the inductances of the transmitter and the antenna, thereby reducing reflected power and ensuring a clean, precise signal and maximum efficiency.

C. SWR Meter. Reflected power indicator used in conjunction with the match box to provide a constant visual indication of overall system performance.

D. Lowpass Filter. Filters out all frequencies above 30 MHz, thereby eliminating those unwanted emissions at frequencies on or near the television transmitting/receiving channels.

E. In-Line Power Filter. Filters out all radio-frequency energy that could possibly enter the house electrical power lines through the transmitter power cable.

F. All components making up this Amateur Radio station are grounded directly to a common earth ground.

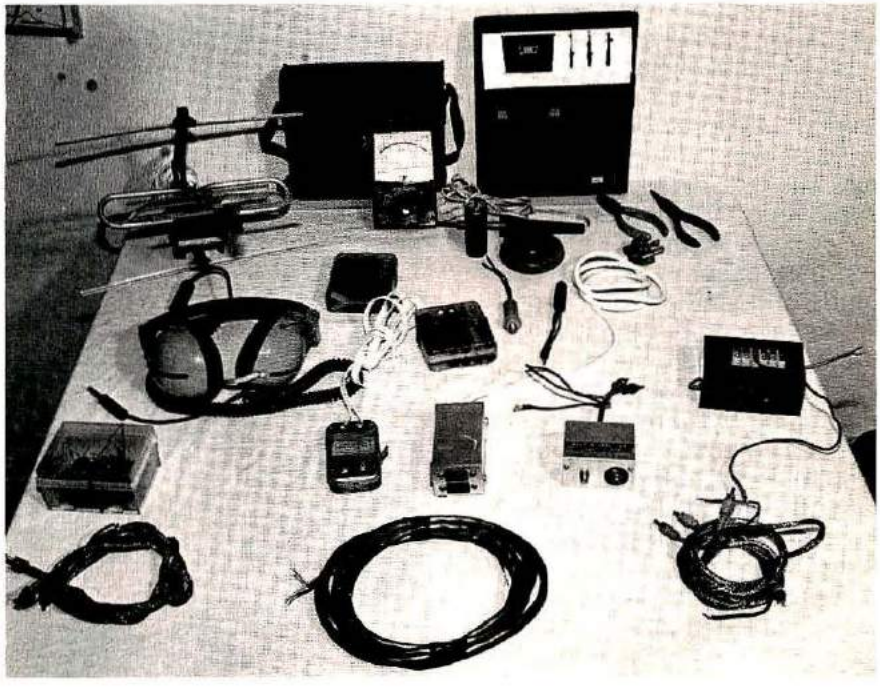
The items listed here were purchased at my own expense, at a total cost of approximately $165.00 and represent my efforts to help eliminate radio frequency interference. These items represent the total capability I have to eliminate possible interference from my Amateur station.

While you're collecting these items, you can begin organizing your committee and building or borrowing the test equipment you'll need. Much test equipment can be constructed at very little cost, based on circuit diagrams contained in the *Radio Amateur's Handbook*. Constructing the test gear yourself is not only an inexpensive method of getting this equipment, but it is also good experience for Amateurs, new and old, who have not done any building before.

Some of the test equipment that should be contained in your TVI/RFI kit is: A set of headphones to check for interference when the speakers are disconnected from a stereo system; if the interference is not present with the speakers disconnected, it is a good bet the interference is the result of the speaker wires being too long. An audio-input test box, used to filter out any rf picked up by phono cartridges or tape heads. A brute-force line filter, used to determine if the interference is entering through the power lines. Double-shielded audio-patch test cables are used if the interference is suspected of entering through poorly shielded audio cables. A multimeter, used to test TV lead-in cable for opens, shorts, or grounds.

The test TV antenna is, of course, used to eliminate the complainant's TV antenna as the source of entry of the interfering signal. A tape recorder is optional, but has proven very helpful in recording test progress and results. It also adds an air of profession-

An interference-investigator's kit should include whatever tools are necessary to help find the cause of the problem, such as earphones to substitute for speakers, shielded audio patch cords, an ac-line filter, high-pass filter for the TV or fm set, and a test antenna. As you or your committee gain experience, other useful items can be added to the package. The quality of the tools, and the Amateur's familiarity with their use, will do much to create an air of confidence when you visit a complainant's house.



alism to the entire operation. All of these items have proven very effective for our investigations, and for that reason are recommended for every kit. These are only a few of the items that could be included in the kit. Additional test equipment can be included to meet individual requirements.

Next, you'll need a chairman and co-chairman for the committee. These two individuals should be the most knowledgeable and experienced Amateurs you can find. When selecting them, take into consideration that these people will be the spokesmen for the committee, and should have the ability to deal very diplomatically with people in a sometimes hostile environment. A good first impression cannot be overemphasized; it can make the atmosphere very easy and friendly, or difficult and hostile. To give you an idea how important a friendly and professional approach is, and what a TVI/RFI investigation can and should do, I'll take you through a recent investigation we conducted.

A Case History

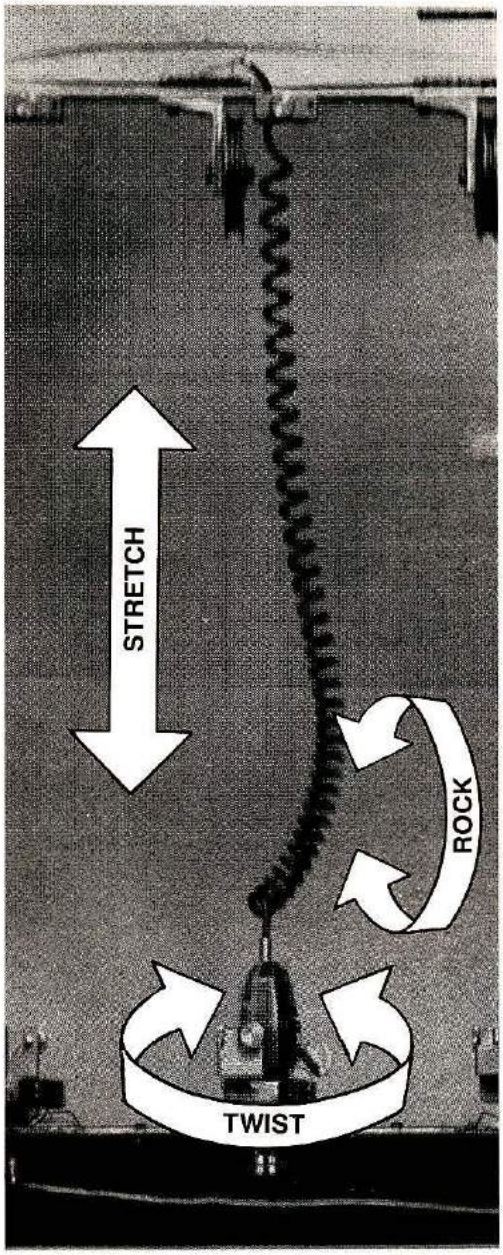
The Amateur operator involved was a newly licensed Amateur who lived in a twenty-four-family, four-story apartment building. Being new to Amateur Radio, he was totally unprepared for what was in store for him. He had received several unfavorable comments while he was putting up his antenna, like, "Not another CBer," and, "Well, there goes my TV." He hadn't yet made his first transmission, but the minds of his neighbors were already made up. When he finally did make his first contact, the results were frightening. Irate neighbors shouted several unprintable comments and offered other abusive suggestions. At this point, the Amateur had no other choice but to shut down his operation until he could get some help. With his limited experience and knowledge, he could not start any investigation on his own. He contacted a veteran Amateur and explained the situation. The veteran operator, having just established an investigation committee, concluded that this case would be a good test to see how the committee would work, and how it would be accepted by the complainants.

The investigation started with an inspection of the Amateur's station, which included checking his license, his equipment for proper installation (grounds, filters, coax, etc.) and his operating procedures. This particular station was found to be properly configured with a match box, SWR bridge, brute-force line filter, lowpass filter, and station ground. It was discovered, however, that the station ground was, by necessity, very long and was radiating rf energy. This condition was corrected by replacing the existing ground wire with RG-58/U coax shorted with two capacitors. Once the inspection of the station was completed and the "stamp of approval" was put on it, we started "Phase II" of the investigation. We decided that a test would be conducted consisting of transmissions involving all frequencies, modes of emission, and antennas. Once a date and time for the test was decided on, a letter was drafted explaining what the test would consist of, date and time of the test, a little background on the operator (class of license, call sign, what knowledge is required to pass the exam for that class license, and so on), and an invitation to visit the station to view the license and ask questions about the test and Amateur Radio. It was also requested in the letter that an attached complaint form be completed during the test, and we stated that any complaint could be lodged following the test. If no complaints were lodged, it would be assumed that no interference was experienced.

The test was to consist of a transmission on each band (10, 15, 20, 40, and 80 meters) using ssb and CW, and two antennas (vertical and beam). Each transmission was for a three-minute duration on each band,

Your credentials, and the purpose of the visit, should be carefully explained to each complainant when the investigation starts. A calm and courteous attitude is essential.

fact:
our quality assurance is your performance insurance.



Originally designed for battlefield ruggedness, the microphone elements in Shure mobile and communications microphones offer unequaled reliability. Our quality control engineers anticipate the worst possible field conditions. These microphones have been subjected to the most rigorous tests in the industry, including six-foot drops onto hard floors; violent vibration tests; temperature variation tests ranging from a bitter -54°F. to a searing 185°F.; and 100% humidity tests. We've even dragged them behind automobiles on open roads and subjected them to a battery of corrosion tests. And yes, they really work after all that!

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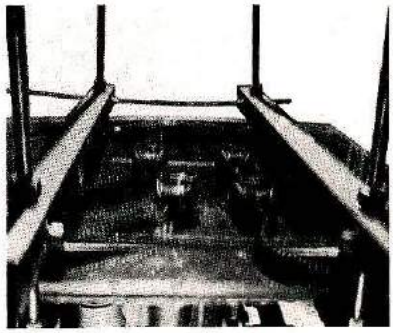

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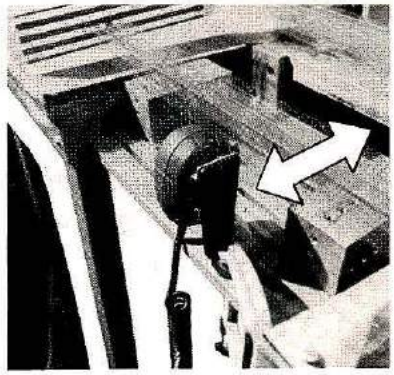
A microphone that fails spells disaster for a mobile communications system. Every Shure microphone is designed to withstand hours in our brutal 3D Shake Tester — simulating years of driving over rough, bumpy roads.



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Another abused microphone component is the switch. Shure-designed long-life leaf switches operate with a wiping action that resists the buildup of corrosion and dirt. And Shure's ongoing tests show that they continue to make contact reliably and positively after *one million switching operations.*

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The test TV antenna can be used to determine if the neighbor's antenna is defective or improperly installed.

antenna, and mode of emission. This letter was made in twenty-three copies (one for each family in the apartment building) and included attachments consisting of FCC bulletin 25, a complaint form, and a list of the protection devices installed in the Amateur station. The complaint form requested the following information: Type of entertainment device affected (make and model) and type of interference (voice, static, slashed picture).

Once the letter and attachments were complete and ready for distribution, the committee sat down to discuss how the complaints would be handled. One week prior to the test, the letter was distributed to each family and each was asked to sign for them. Signing for the letter served two purposes: It ensured that each family received a letter, and it would eliminate complaints being lodged later because "I didn't know about the test." The letters were distributed one week prior to the test to allow several days for visits to the station. It turned out that no one visited the station, but at least the invitation was made.

The day of the test, a cassette tape was played through a portable PA system stating that the test was about to begin — another way to ensure that the test was not forgotten or ignored. The actual test was accomplished in about one hour, after which a complaint station was set up in the basement to receive the complaints. As we were setting up the complaint station, our ears were tuned toward the stairs, awaiting the thunder of feet making their way down. Within five or ten minutes, we heard voices, and footsteps on the stairs, but were greatly relieved when there were only three complainants. The three were interviewed and the complaint forms were reviewed to be sure that we understood what was written. After the forms had been reviewed, an appointment was made with each resident to conduct the actual investigation. When all complaints had been lodged and the people had departed, the committee again reviewed each form, compared it with the transmission log to determine which band, mode of emission, and antenna was causing the interference.

I cannot overemphasize that when going to the complainant's house to conduct the investigation, an atmosphere of friendly cooperation is imperative. A professional, yet not stuffy, attitude is also very important. When meeting the complainant and introducing yourself, give him or her a brief summary of your purpose and qualifications. This first meeting is a very delicate and important moment, and a bad approach can jeopardize the entire investigation.

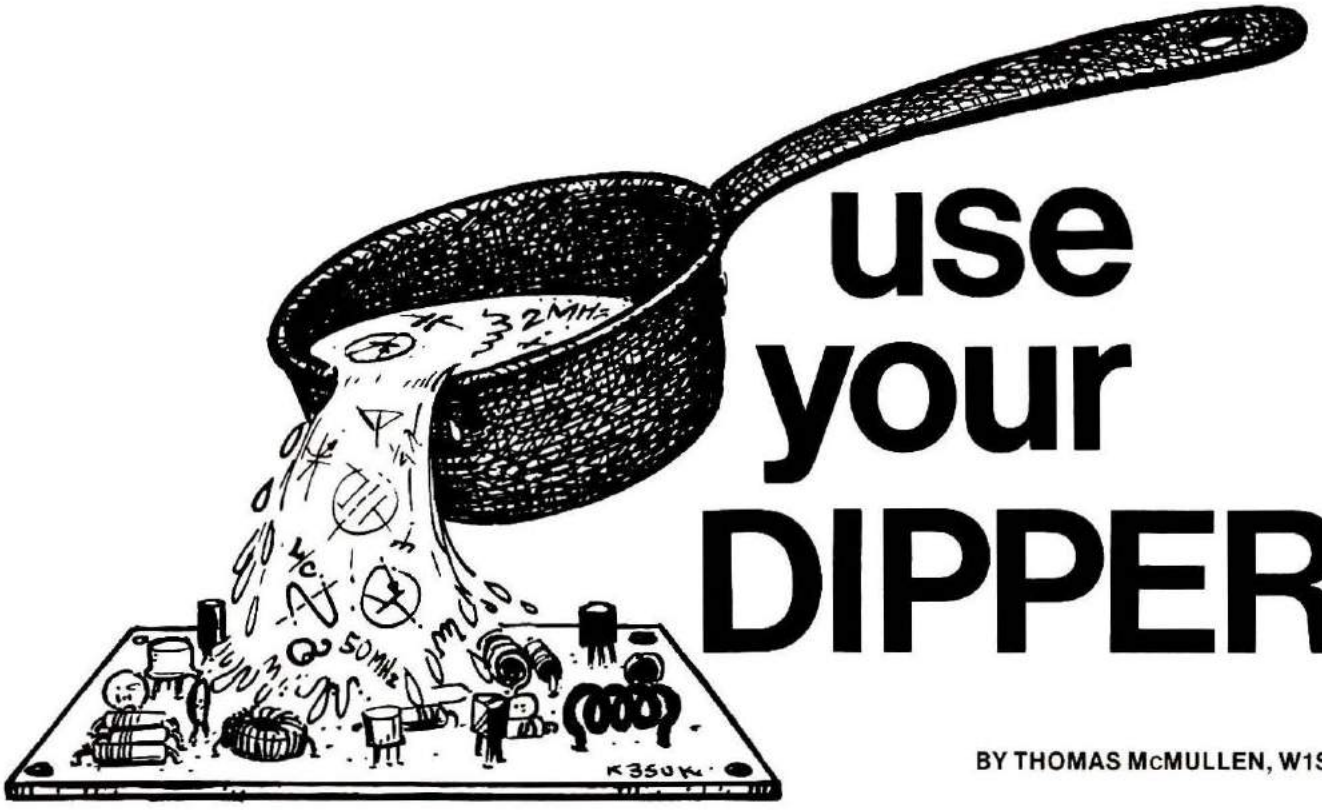
When the time for our first investigation appointment arrived, we introduced ourselves to the people once again, showed them our qualifications (class of Amateur license, letter of appointment

A satisfied neighbor is the only acceptable conclusion to the investigation of a TVI/RFI complaint.

to the investigation committee), and proceeded with the investigation. While one committee member remained at the complainant's house, another went to the Amateur station to observe the operation during the retest. This was not done to degrade the Amateur; rather, it was done to show the complainant that we were trying to conduct an unbiased investigation. Test transmissions were again conducted according to the information obtained from the complaint form, while a committee member monitored the entertainment device. A description of the interference experienced, and subsequent corrective actions, was recorded on a cassette tape for future reference. In all cases we had concerning TVI, the cause of the interference was found to be in the TV antenna system (shorted or deteriorated lead-in wire, loose or corroded connections, *etc.*). The case involving stereo interference was found to be electrical interference through the power line, and we recommended that the owner obtain a brute-force line filter at his option. When all complaints had been investigated and corrective measures taken, the investigation was considered complete.

In closing, let me re-emphasize that TVI/RFI can be corrected, but not by one person. If your club or town does not have a TVI/RFI Investigation Committee, you should start one as soon as possible. TVI/RFI has been around for many years, and will remain to haunt us until strict regulations are placed on home-entertainment equipment manufacturers, but this doesn't appear likely to happen in the near future. Until then, you have a choice to accept interference problems, and restrict your operations, or to do as we did and cure them with a TVI/RFI Investigation Committee. It really works, and we should know — DA1TM is the newly licensed Amateur, and DA1KV is the helpful veteran!

HRH



use your DIPPER

BY THOMAS McMULLEN, W1SL

There's a test instrument sitting on the shelf over my workbench, an instrument that has solved more mysteries for me than Sherlock Holmes ever told Watson about. It has probed the workings of transmitters, both during their design and after they had been constructed. It has been invaluable in perking up a tired receiver when my regular signal generator was suffering from acute power supply breakdown. It has also helped my investigation of antenna elements and the effects of fastening them to a support boom in different ways.

When I acquired this instrument, it was called a grid-dip meter. Its modern cousins no longer have grids, but sometimes the name follows it, just as many soft drinks are called "Coke," whether they are made by Coca Cola Company or not. The grid-dip meter, or GDO in the vernacular, is a simple gadget, really: a small tube, a tuned circuit, a handful of small capacitors and resistors, and a source of filament and plate voltage — plus, of course, a meter to tell you what's happening inside the circuit.

What makes a dip meter dip? It's a very simple principle that allows one tuned circuit to absorb power from another one. If you monitor the power in the circuit that is oscillating, you will notice a change when some nearby circuit is borrowing some of that energy, see **Fig. 1**. The circuit is oscillating at a frequency determined by L1 and C1. L1 is surrounded by an electromagnetic field, and

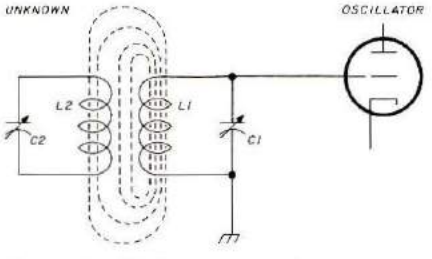


Fig. 1. A grid-dip meter works by coupling some of the oscillator's energy into an external, unknown circuit. In this case, the coupling is by means of magnetic lines of force. When the external circuit is resonant at the same frequency as the oscillator, some of the energy is "borrowed," and this decrease is indicated by a change in grid current of the oscillator tube.

some of the lines of that field cut across the coil in the nearby circuit of L2/C2. If this secondary circuit is resonant at a frequency other than the one produced by L1/C1, then it is "borrowing" very little energy from the oscillator. However, when the value of L and C are just right, so that the circuit is resonant at the same frequency as the oscillator, then the energy induced in L2 is circulated back and forth between L2 and C2 in what has been called the "flywheel effect." This cyclic charging and discharging of the capacitor through the coil requires energy, and the only place to get it is from the oscillator tube in the dip meter.

A vacuum tube that is driven hard will act as a rectifier on half of the cycle applied to its grid, allowing current to flow on the positive half of the sine wave. An oscillating circuit does drive the tube hard enough to cause grid current to flow, and the meter, M1 in **Fig. 2**, indicates the amount of current. When the circuit is oscillating without any outside

interference, the meter indicates the amount of energy flowing in the grid circuit. When a tuned circuit, L2/C2, borrows some of that energy, the meter reads less, telling you that something is sharing the wealth. This, then, leads to the action and the name of the instrument; as you tune the dipper through its range, the oscillator frequency matches that of the external circuit at one point. This causes the meter to "dip" to a lower reading as the external circuit takes some of the energy from the dipper, and you then read the frequency from the calibrated dial. You can plug in one of several coils to cover a wide range of the spectrum.

An interesting property of this combination is that the amount of energy borrowed is directly proportional to the number of lines of magnetic force that the external circuit intercepts. If the circuits are close together, a lot of energy is transferred; the greater the separation between the two, the less energy is transferred and the less the disturbance indicated on the grid-current meter. Also, the amount of energy absorbed is directly related to the quality of the tuned circuit (this is the same thing that is called Q in many discussions of tuned circuits, and is a measure of the losses or inefficiency in a circuit). A circuit that has very little internal resistance (loss) will circulate a lot of energy, and show a very sharp, deep dip in the meter reading of the oscillator. A circuit with a poor L/C ratio, lossy components, or with external resistance or loads connected to it will indicate those losses by exhibiting a broad, shallow dip in the meter. It will also require that the two circuits be closer together in order to notice a change in the meter reading.

Dipper types

Early dippers were, of course, built using vacuum tubes to sustain oscillation in the circuit. Naturally enough, when transistors appeared on the scene, there was a rush to adapt these new power-saving devices to the dipper, but not all attempts were successful. The transistor, being a low-voltage, low-current device, just didn't set up a large field of lines of force around the coil, and this made it difficult to couple to an external circuit. Also, some transistors oscillated so weakly that the current flow was very small, making it very difficult to read on a meter. Sometimes the change in current was almost microscopic, since the transistor tried to make up for the energy loss by changing its internal impedance. To try to overcome this trait, some manufacturers and experimenters tried connecting a diode to the tuned circuit, letting it rectify the rf energy and thus drive a meter to obtain a reading. In theory, this would be fine; if any external circuit borrowed some energy, there would be less to drive the meter, thereby showing a dip when the external circuit was tuned to the oscillator's frequency. In practice, this didn't always work out — the amount of energy was sometimes so low that it couldn't overcome the diode's internal resistance, therefore "dead spots" would show up as you tuned the oscillator across the spectrum.

The development of the junction field-effect transistor (JFET, or FET) saved the day here. The gate of the FET seems to behave just about the same as a grid in a tube, and allows somewhat conventional metering circuits to be applied. Still, because the current is

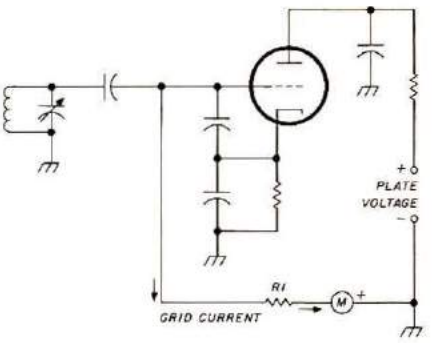


Fig. 2. Grid current flow can be measured by placing a low-range meter (milliammeter or microammeter) in the grid-return circuit. The resistor is the one normally used for operating bias on the tube.

Grip-dip meters come in a variety of sizes, prices, and styles. Here are three of several you may find if you shop around. The Heathkit unit, lower left, is available new, and is battery powered. The Eico at the lower right is ac powered, and shows up in classified advertisements and flea markets from time to time. The larger unit, at the top, is a Measurements Corporation "Megacycle Meter," no longer made but sometimes found at flea markets and used-equipment sales. It has a separate tuning head (the round object at the far left), and a very sensitive meter housed in the power-supply portion. It was made for industrial use, and therefore is more rugged and sometimes more accurate — an excellent buy if you find one, but be sure all the coils are with it.

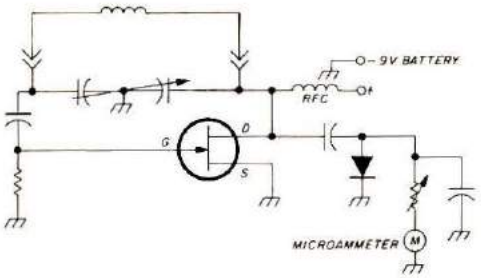


Fig. 3. Solid-state oscillators, working at lower voltages and greatly reduced power levels, produce a very small amount of current flow in the gate or base circuit. In such cases, a diode must be used to detect the amount of rf energy in the tuned circuit. Sometimes an amplifier transistor (meter driver) must be added to obtain enough meter swing to be useful.

very low, it is measured in microamperes, rather than milliamperes as in tube circuits (1 microampere = 0.000001 ampere; 1 milliampere = 0.001 ampere). See **Fig. 3**.

Another device that showed great promise was the tunnel diode. (Don't ask me to explain that one — I still think it's something right out of science fiction. Electrons tunneling from one place to another? Shades of space warps and ion drives!). Anyway, the tunnel diode worked well enough as an oscillator that several experimenters made successful dip meters using them, and one company marketed a "Tunnel Dipper" that was popular for a while.

Uses for your dipper

Enough of this theoretical stuff about how the dippers work — let's look at some ways to use a dipper.

The original, and most obvious, use is to determine the resonant frequency of a tuned circuit. It is especially useful when the circuit is wired in place in a transmitter or receiver where it has all the normal stray capacitance and inductance of tubes, sockets, bypass capacitors, and wiring connected to it. The higher the intended frequency, the more these stray items effect the true frequency of the circuit.

The ideal way to "couple" the dip meter coil to the unknown circuit is by allowing the lines of force to cut across the coil, which is called inductive coupling, shown in **Fig. 4A**. There are times when you cannot get proper coupling in this manner, so you can try capacitive coupling, **Fig. 4B**. This doesn't mean that you physically connect a capacitor between the two coils, but rather place the dip-meter coil in such a position that there is a natural capacitance formed by the two circuits being very close together. Caution: Don't try this with vacuum tube circuits with the power on! The voltage can injure or kill you, as well as zapping the dip meter.

This feature of either inductive coupling or capacitive coupling can work against you, too. Your dipper may be inductively coupled to a coil, and at the same time capacitively coupled to another nearby circuit. You must be sure you are reading the dip for the correct circuit, and one way to do this is to tune the unknown circuit to a different frequency and see if the dip meter follows it. If it doesn't, try touching nearby parts with a pencil or small screwdriver to see what it is that the meter has found.

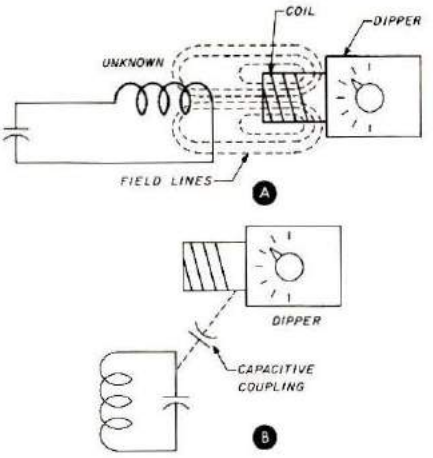
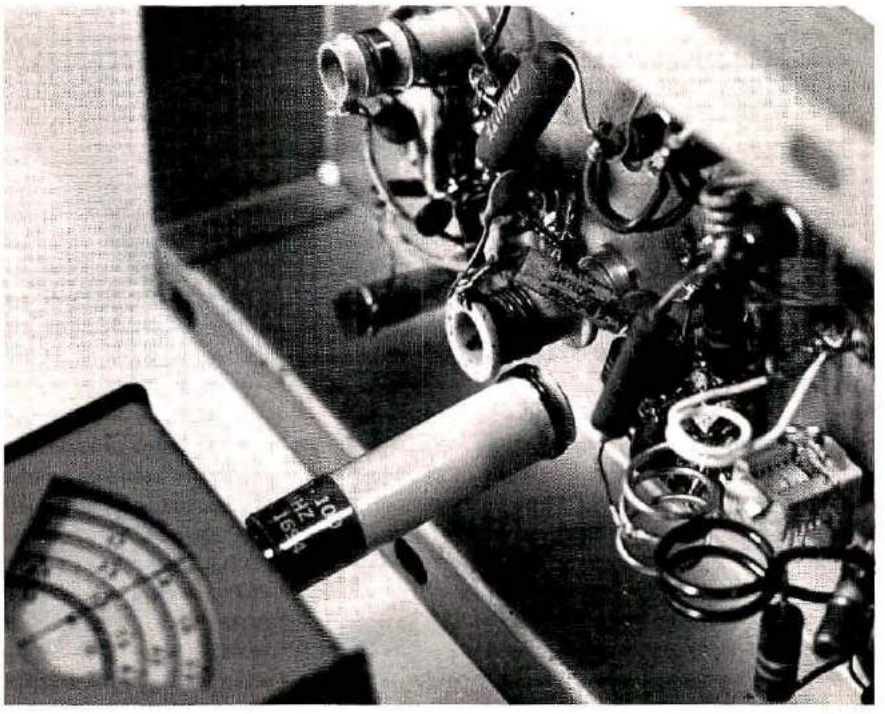
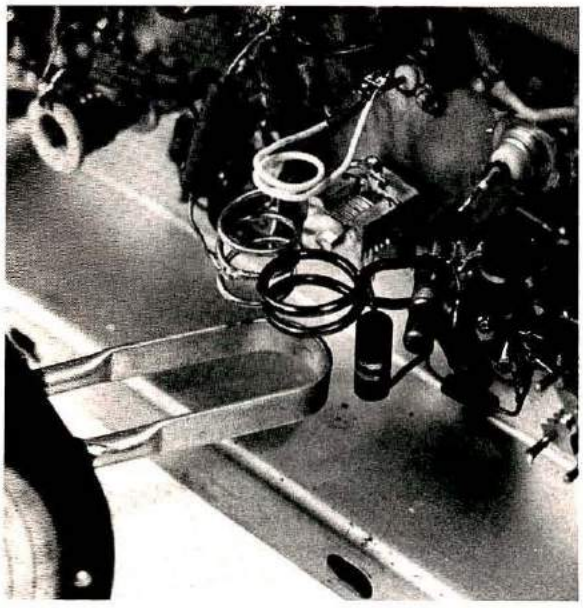


Fig. 4. The best method of using a dipper is to let the field lines couple from one coil to the other, as shown at **A**. Capacitive coupling can be used, as in **B**. This is not a capacitor that you wire into the circuit, but rather is a natural capacitance formed between two conductors close to each other. The connecting lugs on the side of the plug-in coil are usually good, sensitive spots to couple to.

You can find stray resonances in this manner, and eliminate the problems they cause. I once built an oscillator

The grid-dipper coil and the coil under test can be coupled end-to-end, or side-by-side as shown here. The important thing is that the magnetic lines from one coil are intercepted by the other. This usually happens when the wires in the two coils are roughly parallel.





Vhf and uhf dipper coils have one turn or less, and require rather close coupling to the unknown circuit. Note that the half-turn "loop" and the two-turn coil are somewhat parallel for best coupling. Be sure that the dipper coil does not make contact with the coil or any other part of the rig, thus causing a false reading.

that was supposed to work on 19 MHz. It did, but there was an unusually strong signal at the third harmonic, 57 MHz, right in TV channel 2. Snooping with the dip meter found a bypass capacitor with leads long enough to be self-resonant at 57 MHz, which gave the harmonic an unwanted boost. A different style of capacitor cured the problem. If you would like a lesson in effective bypassing, take a few common-value capacitors and short the leads together. Measure their frequency of resonance with the dip meter — you'll be surprised how poor some types are for the 6- or 2-meter range. (If they're resonant above the frequency at which you want to use them, they will not do their job.)

Antennas and feedlines

Want to know where your antenna is resonant? Couple a dipper to it. Again, you can do this either by inductive or capacitive coupling, as in **Fig. 5**. One problem is that you must have the antenna as far away from ground as possible to get the correct reading, so you may need some tall ladders. Any piece of wire has multiple resonances, so you'll get some sort of dip at each harmonic. A good trick is to check at one half and one third of any indicated frequency to see if there is a "bigger" resonance there.

You can prune twinlead or coaxial cable to exact half or quarter wavelengths by using the dipper, as shown in **Fig. 6**. Again, either type of coupling will work, but the inductive type using a simple hairpin loop seems to work best.

If you want extreme accuracy in cutting your antenna or feedline, use the very minimum coupling that you can and still get an indication, and listen to the dipper's signal on your receiver (tune in the beat note in the CW position). The added capacitance from your hands or body will change the reading, so always stand in the same spot when you take a reading.

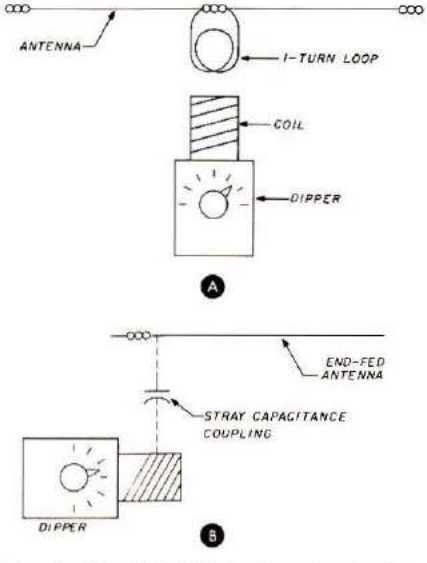


Fig. 5. To check the resonance of a center-fed antenna, connect a 1-turn loop across the insulator and couple the dipper to it, as at **A**. Keep the loop small to avoid a false indication (the more wire you add, the lower the apparent frequency of the antenna). An end-fed antenna can be checked by capacitively coupling the dipper to the end of it, **B**. In either case, you'll see dips at several resonant points — the main one at the half-wave frequency, and others at each harmonic the antenna can work at.

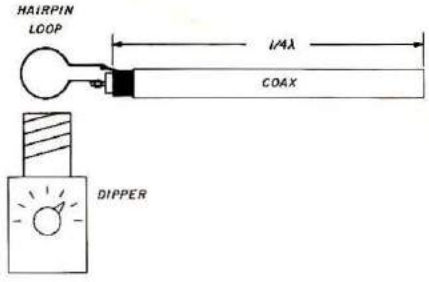


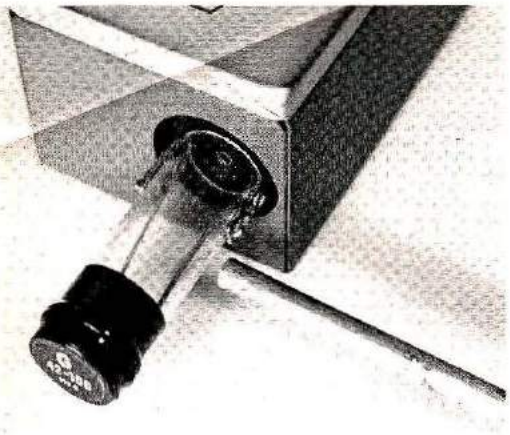
Fig. 6. A length of coaxial cable can be checked for its resonant frequency by connecting a short loop of wire to one end. If you short the other end too, it will be a resonant half-wave.

Detecting rf energy

A secondary use of a dipper that is almost as important as its intended purpose is that of an rf detector, or absorption wavemeter. When used in this manner, the device is simply a tuned circuit with a detector (diode) connected to it, and the meter reads current through the diode just as it did when the circuit was oscillating; it's detecting the presence of rf. The diode in this case is either the grid of the tube (with the plate voltage supply turned off) or the base or gate of a transistor (with the power supply turned off).

As before, the coil can be inductively coupled or placed close to the circuit for capacitive coupling. Be very, very careful about this — in order for a circuit to be generating rf, it must be alive, and the voltages can be fatal in tube-type equipment. Even with transistorized equipment, you can get a nasty burn from the energy, and these burns are deep and take considerable time to heal. If the power involved in any circuit is more than a watt, treat it with extreme respect. When used as an absorption wavemeter, your dipper will indicate the relative field around an antenna, allowing you to adjust your transmitter or matching circuit for maximum output.

Many dippers have a phone jack in series with the meter, and you can plug in a pair of earphones to listen to the transmitted energy. It's not much good for monitoring, SSB,



When checking the resonance of a half-wave antenna element, capacitive coupling can be used. In the case shown here, the nearness of the tip of the element to the metal lug on the coil form provides a tiny amount of capacitance, and this is enough to obtain a dip in the meter reading. On some dippers, one lug may show more of an effect than the other.

CW, or fm, but it will detect hum and noise on any carrier. You can also use the dipper to check for rf on the outside of a coaxial cable between your transmitter and the antenna, and to check the ac cord or speaker leads of a TV or hi-fi set to see if rf is floating around there, looking for trouble. Bear in mind that it is not a really sensitive detector — it takes a relatively strong signal to make the meter read — so don't expect to monitor the rf from a transmitter down the block.

Signal generator

In a pinch, you can use a dip meter as a signal generator for receiver trouble-shooting. It is generating a signal, naturally enough, and even the sickest receiver should show some response when you couple this signal into the i-f or rf amplifier circuitry. You won't need a direct connection — just having the dipper on the same workbench with the receiver is sufficient for most tests. In fact, you may have trouble getting the signal weak enough if the receiver is sensitive but needs only frequency adjustment. Placing the dipper in another room is a help, but this gets to be a pain when you have to run back and forth to change the frequency. Remember, however, that the absolute accuracy of any dipper is not good, so don't rely on it to tell you where the Amateur band edges are.

An intercom?

Oh, yes, I did say that, didn't I. Well, I did use a dipper for an intercom once, but it's not a system that I would permanently install. Here's how it worked. I had a home-made dipper, and it was very microphonic, as most dippers are. By tapping the case of the dipper you could make the tube and circuit elements vibrate, which would be interpreted by a receiver as various thumps and bongs. If you were to talk very close to the case, your voice would modulate the oscillator to a small degree. I simply tuned the dipper to the frequency of the fm broadcast station my wife was listening to downstairs and asked if the coffee was ready. It worked — the coffee arrived in a minute or two, along with some very curious glances and searching questions! The modulation was very poor, however, and could be understood only if the signal was very strong at the fm receiver.

The unknown components

You say you have a bunch of capacitors you picked up at a flea market, but they are not marked in any language you ever studied? Again, use your dipper.

If you use an inductor of a known value and connect a capacitor across it, you'll find the frequency of the combination with the dip meter. You can then solve an equation to find the value of the capacitor. That's great, but solving an equation for each capacitor sounds like work — even if you have a pocket calculator. Why not plan ahead and make life easier. Make a graph, using several capacitors of known value across a "standard" inductor, and plot the results on graph paper with capacitance values along the bottom and frequency up one side. Keep this standard coil with the graph, and always use it to check capacitors. Now, you can take your handful of unknowns and run through them in short order. For best accuracy, use only very good capacitors when you make your graph — the red, hard-coated, silver mica types are usually most accurate for their price, and are usually rated at 1 or 2 per cent accuracy. **Fig. 7** is a sample graph you can follow — don't use my values because these are only examples and may not be the same for coils you can find.

You can do the same test by choosing a couple of standard-value capacitors and placing an unknown inductor across it. Make up another graph to show inductance, and you can then buy bargain rf chokes and coils and sort them out easily, or even wind your own.

Where are the dippers?

There was a time when the Amateur publications were full of grid dippers, when the

A small loop at the end of a piece of coaxial cable allows you to find the resonant frequency for that length. If the cable is shorted at both ends, you'll get an indication of its half-wavelength frequency. If you short one end only, you'll see the quarter-wave frequency. I keep a loop soldered to a coaxial connector like this as a handy test-gadget, so I don't have to make up a new loop every time I want to check a piece of cable. Caution: a loop that is too long will give a false reading at vhf. At 400 MHz and above, even this one is too large.

devices were new. Again, when the solid-state era was dawning, there was a spate of advertising. Of late, however, the supply has dwindled. They're still there, but just not being advertised as much.

My all-time favorite, the Measurements Corporation Model 59, shown in the photograph earlier, is no longer made but still shows up in sales of equipment from laboratories that shut down, in surplus catalogs, and at flea markets. It's such a good instrument that when one appears, it never has to beg for buyers. There's also a military version of it, with the power supply and coils and rf head in one of those rugged, waterproof storage cases. I don't know the military designation, but you can recognize it by the dial and the coils — they're almost identical to those in the civilian version. These, too, are hot sellers; I found one at a flea market, and lost out on it only because I fumbled in my wallet and dropped a bill on the ground. As I bent over to retrieve it, someone else handed over the money and got the prize! Oh, well, you can't win 'em all.

The Heath dipper is available in kit form, from your nearby Heath store or by mail order. It's portability and battery power make it a very desirable unit, and the same can be said for any of the transistorized units for sale today.

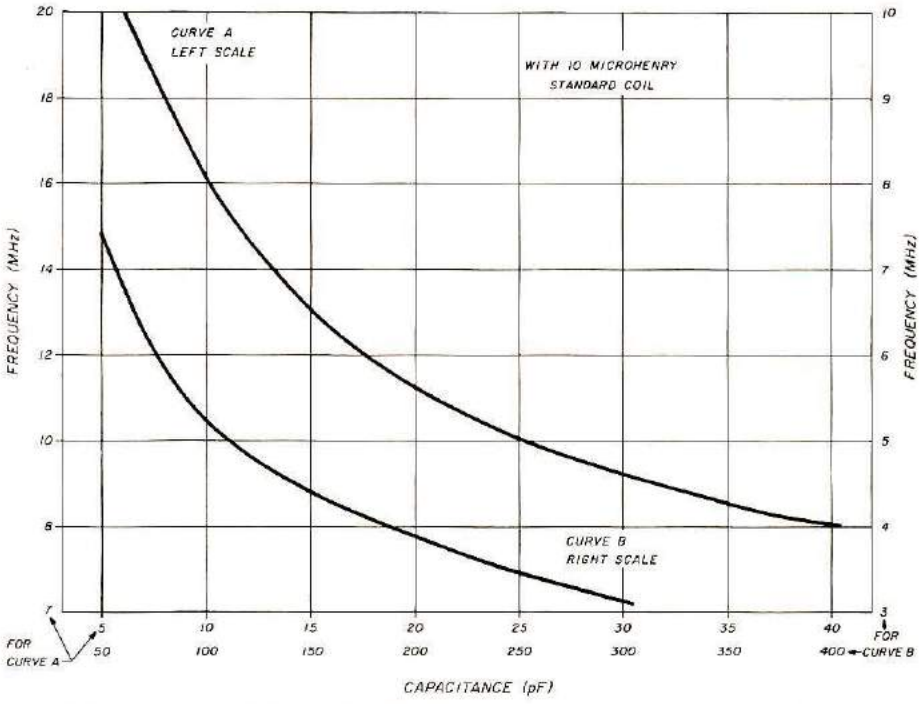


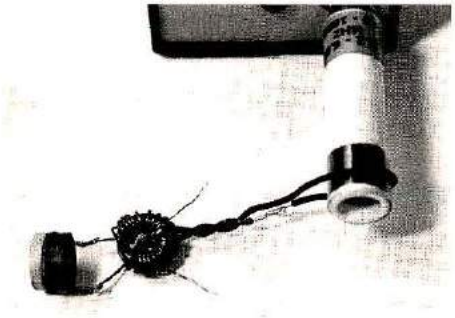
Fig. 7. You can use a dipper to find the value of unknown capacitors or inductors, if they are reasonably small and work at radio frequencies. (You cannot check power-supply components this way, for example.) Simply pick a couple of capacitors and inductors of known value, and keep them as "standard" units. Make up a graph similar to this one by substituting different values and checking the frequency of resonance with your dipper. Check the exact frequency by listening to the dipper on a receiver at a few calibration points. Don't use this graph for exact values — this is merely a sample to show how it's done. Also, don't rely on disk ceramic capacitors for standards — they're usually rated at − 20, + 80 per cent of marked value! Use the maroon-colored, dipped-mica types; you can find them with tolerances as close as 1 per cent.

You may find a dipper made by James Millen, and their older tube-type unit looks just about the same as the new solid-state one, except for the absence of an ac cord. Either one is a good buy, although the solid-state one seemed not to be as sensitive as the tube job. Eico, of course, is still with us, and you'll find their dippers in catalogs and at flea markets too. There are some imported dippers on the market from time to time, and most of these are okay. One that comes to mind is by Leader Instruments, and they have a companion impedance meter for antenna measurements. You'll see others advertised in various magazines, especially in the classified section.

There are a couple of things to watch for when you buy a used dipper. Check to see if all the coils are there, of course. You can make substitutes, but I'll almost guarantee that you cannot duplicate the winding of the original, therefore your dial markings will be way out of line. If you're willing to put in the time making up a new dial and calibrating it to your home-made coils, then a really inexpensive dipper might be a bargain.

And, of course, you can build your own. There have been several designs published in various magazines and handbooks, and we have one on the drawing board here at *Ham Radio Horizons*. Keep watching for it — we're trying to make it low cost, using parts that are easy to get and a circuit that's easy to assemble. You'll see it soon. **HRH**

Toroids are notoriously hard to couple a dipper to. A one-turn link will usually do the trick. The tuning range of a combination can be checked before wiring it in the circuit, as shown here. The tube or transistor you connect the toroid and capacitor to will add some capacitance, thus lowering the frequency a bit. Be sure to make allowance for this when testing — it's easier to add or subtract a turn or two before the coil is buried among other parts.



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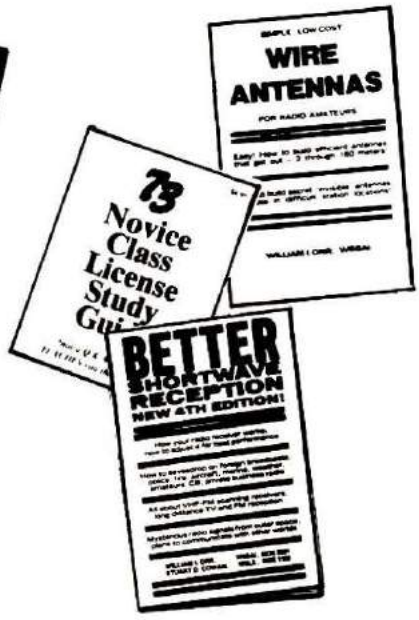

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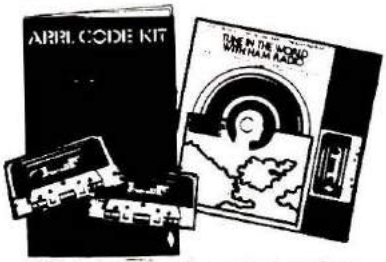

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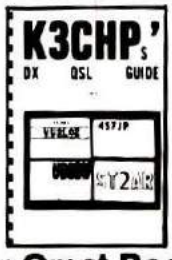

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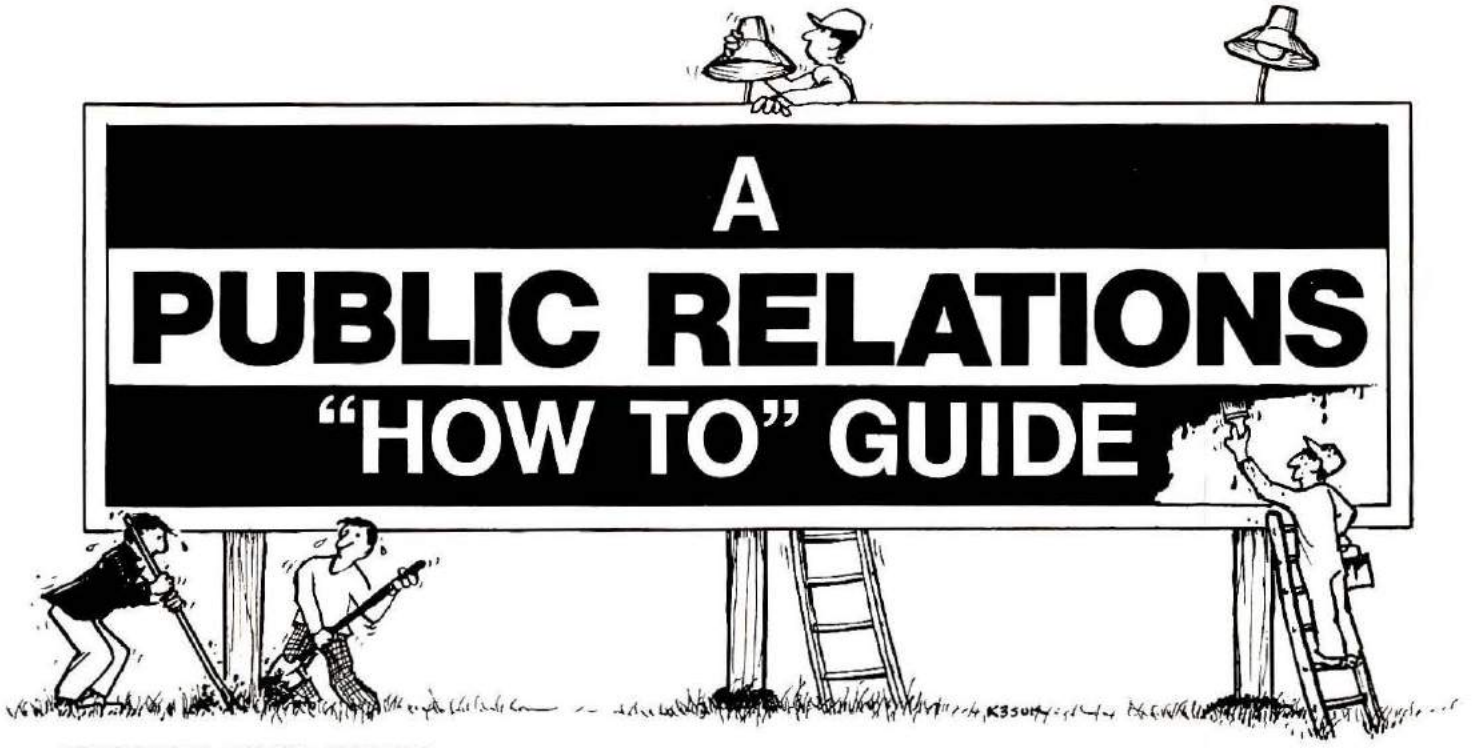

A PUBLIC RELATIONS "HOW TO" GUIDE

BY MICHAEL COLVIN, WD0AKB

One evening recently, while my wife and I made final preparations for dinner, I took some time to give our guests, a business associate and his spouse, a tour of our old Midwest farmhouse. When we passed the small room my ham gear shares with my wife's sewing machine, my friend inevitably remarked, "My, that sure is a fancy CB you have there." Hastening to explain the difference between Amateur Radio and Citizen's Band, I was suddenly aware of how little the public really knows about Amateur Radio or the services it performs. It seems strange that a hobby as old, well-organized, and service-oriented as ham radio should suffer from such a low public profile.

Aside from the chance publicity we receive because of our work in disasters, or the untoward remarks of nationally syndicated columnists, much of the news coverage we get is limited to newspaper announcements or calendar entries: the date, time, and place of the next club meeting or ham class. As important as such coverage is, there is so much more that could be done, not only with newspapers and magazines, but with radio and television as well. Both public and commercial radio and television are still under-used, in spite of the new ARRL radio spot announcements.

The ARRL has recently begun efforts to give Amateur Radio greater mass-media exposure. The recently established news service and brand new radio series, "The Wide World of Amateur Radio," have given many Americans their first close-up look at ham radio in action. The recent film, "Moving Up to Amateur Radio," is an excellent attempt to reach CBers who have become disenchanted with the QRM and lack of courtesy often encountered on 11 meters.

But the real work of public relations belongs to local Amateurs and clubs. That's where Amateur Radio is happening; during emergencies, in ham classes, at Boy Scout meetings, in contests and field days. There's plenty of news. The first problem is to get the word to the newspapers, radio, television, and local service and social clubs. The second problem is to get them to use what we provide.

Contrary to much public feeling, public relations is not a vaudeville act performed only by political campaign managers and Madison Avenue executives. It is a necessary skill for anyone or any organization that needs to create a well-informed public. It demands a level of expertise that few of us in Amateur Radio have bothered to acquire. Fortunately, public relations skills are easy to learn. Without them, however, we cannot hope to communicate effectively with the public.

This guide is written primarily for those of you who are on the publicity firing line: club presidents, secretaries, newsletter editors, and anyone else whose job it is to get the word out. Since all of us have other things to keep us busy (jobs, families, DXing, etc.), the suggestions and ideas presented here are designed for the part-time publicist. In most cases, doing an effective job of public relations will take no more than a few hours a month. But the time invested will eventually pay off in

several ways: a greater public awareness and acceptance of ham radio, an increased club membership, and a stronger organization from top to bottom.

The news release

The news release to local newspapers, radio, and television stations is the bread and butter of public relations. A news release can be used to announce the purchase of a new vhf transceiver for the city's emergency communications van, to invite the press and public to attend the club's field day or hamfest, to issue a statement on a proposed hike in fees for special automobile license plates, or to announce any other newsworthy event. These examples illustrate the three basic purposes of a press release: to provide background information, to announce events for news coverage, and to issue statements.

Form: Neatness is the first mark of your organization's credibility. The news release should show the editor that your club has respect, prestige, and public importance. A release with typos (typographical errors) misspellings, and crossed-out words will end its career in the editor's wastebasket. Those that are chosen will probably look professional. A nice looking letterhead logo for your news release forms can be easily made using rub-on lettering, available at your local art or drafting supply store.

Content — The Who, What, Where, When, Why: The first, or "lead," paragraph is the most important part of the release. Though short (no more than four lines), it should answer at least three of the five Ws. The second paragraph should answer the rest.

Make the lead as interesting and informative as possible. If the editor isn't hooked by the lead, he won't read the rest of it. A quotable first paragraph has a big advantage over the "cut-and-dried" approach.

Everything following the lead should flow naturally from it, in order of diminishing importance. Paragraphs should be short (one or two sentences). Fill in the important facts and give background information where necessary. All names, dates, places, and quotations should be double-checked before you send out the release.

Always give the title of the person you are writing about (John Jones, president of the Midtown Amateur Radio Club . . .). Call letters, however, should be used only in ham publications, since this kind of fraternal identification means nothing to the public. Names and addresses of local residents mentioned in the release should be included.

Use a brief, standard closing paragraph about the aims and purposes of your group: "The Midtown Amateur Radio Club is an association of 80 local ham radio operators dedicated to serving the community and promoting the activities of Amateur Radio in Midtown County." Be careful, however, not to editorialize or oversell your club in the closing statement. Simple is best.

Reaching the media

Mailing lists: Compile a list of the addresses of local newspapers, wire services, and radio and television stations on carbon copy labels or photocopy labels. Have several copies of the list on hand so that you

In this example of a press release for local newspaper or radio-station use, the facts are presented in a clear manner. Note that the relationship of Amateur Radio to the town and its communications system is spelled out, and that there are no Amateur terms used which would be meaningless to the general public.

MIDTOWN AMATEUR RADIO CLUB
Box 100, Midtown, Nebraska 06401

June 18, 1979
FOR IMMEDIATE RELEASE
CONTACT: Robert J. Ready

NEWS RELEASE

On Saturday, June 23, 1979, at 1:00 p.m., Midtown's mayor, J. Delbert Creeley, will unveil the city's new emergency communications system at the Central County Civil Defense Headquarters.

New equipment, purchased and installed by members of the Midtown Amateur Radio Club (MARC), will provide two-way local communication on the 2-meter VHF (very high frequency) Amateur Radio band. In case of a power outage during a flood, tornado, or other natural disaster, the communications center will automatically switch to an emergency generator for power.

During the unveiling ceremonies, Mayor Creeley will turn on the new transmitter/receiver combination and, assisted by Mr. Carson Kitberg, president of MARC, will make the first radio contact.

The Midtown Amateur Radio Club, with some 80 members, was established in 1923 to promote the hobby of Amateur Radio, and to provide a public service to the citizens of Midtown and Central County.

-30-

won't get caught short in a pinch.

Where possible, address your releases to a specific person, rather than to a title. Some cities have a media guide that contains the names you will want. Check with your local press or public relations association to see whether your area has one. If there isn't one try the local chamber of commerce or the PR department of a large business in your area. Though more time consuming, you could also call the various newspaper offices and TV/radio stations; explain who you are, and find out who should get your releases.

Cultivate personal contacts with sympathetic reporters. They appreciate being kept informed, and they may get you news coverage when they can't handle your story themselves.

Never send a release to more than one person at the same newspaper. Imagine how irritated two editors can get when they discover they've been working on the same story for two different sections of the paper.

Finally, if you have tried everything else and still don't have the names you need, address your releases to:

City Desk — daily newspapers
Editor — weeklies
News Assignment Desk — radio and TV
Local News Desk — wire services
Photo Desk — (for picture stories only)
newspapers, wire service, periodicals

The budget: In the larger cities the wire services often maintain a daily teletype list of upcoming events called a "budget" or daybook. All the media receive and use these listings. Though it is preferable to mail them a news release, you can often telephone the wire services with your story. Even if you don't send a news release to anyone else, at least be sure your story is put on the budget.

Timing: Too early is no better than too late! If your news release arrives two weeks early, it is going to be lost in the constant flurry of mail every editor receives. Mail your releases so that they arrive three to five days ahead of the event.

If you are too late to mail a release, phone it in.

Weekly newspapers will have earlier deadlines than dailies; so find out from each newspaper, radio, and TV station when their deadlines are.

Telephone follow-up: If you want to be dead certain that the media know what is going on, follow your news release with phone calls. Your personal media contacts should be called about the time news releases are mailed. They may need some lead time in order to be free to cover your story personally.

When you call, be clear. Give the reporter any last-minute details not covered in the release. Without being pushy, you should mention personalities, photo possibilities, and any special information that will give the reporter a hook.

When you should make a follow-up phone call depends on when your event is scheduled. If it's between 10 AM and noon, call between noon and 4:30 PM the previous day. From noon to 2 PM, call between 8 and 9 AM the same day, or 3:30-5:30 the previous day. Between 3 and 5 PM, call from 8-10 AM the same day.

Using photos

Generally speaking, Amateur Radio publications carry some of the worst examples of photo journalism. No one really seems to mind, however, because the photos serve the same purpose as snapshots in a family photo album. But, as far as the newspapers are concerned, it's often the photo that attracts the reader to a story. Nothing is more uninteresting to both editors and readers than pictures of ham gear or portrait shots of several people lined up staring at the camera.

The best publicity pictures show interesting people doing interesting things (raising a tower, participating in a ground search for a missing airplane, working a transmitter during field day). Each photo ought to be a story in itself. A picture is "worth a thousand words" only if it has something to say in the first place. If you want a photo to accompany a feature article about Joe Hamm being named Midtown Citizen of the Year, catch Joe doing something worthy of the award.

Photos sent to editors who don't ask for them usually end up in the trash can. On the other hand, if you think the editor will use it, don't hesitate to send a photo with your story or news release. A good photo

This is an example of what *not* to send to a newspaper or TV station for a story about Amateur Radio activities. The person is staring at the camera, and standing by an old tire that either bears no relationship to Amateur Radio, or requires a lengthy explanation. The antenna supported by the tire probably would not show up well in the newspaper. There is no activitiy to make a reader curious (*photo by Syndi Delaney*).

will capture an audience for your article.

Use 5 × 7 or 8 × 10 glossy prints without writing on the front or back. Avoid high contrast or improper exposure. Captions should be typed separately and attached to the bottom edge of the print. Identify people in the photo from left to right, and be sure to include a name and number for further information on the caption release.

Weeklies are usually your best bet for pictures, since they often have only one photographer. But, wherever you send photos, remember: photo deadlines are different from copy deadlines, so be sure to check.

Avoid sending the same photo to several places. If you do, let the editors know that the photo is not an exclusive. If an editor knows that the photo he has is one-of-a-kind, he'll be more likely to use it, *especially if it's good.*

A good photograph shows people involved in something interesting, as these two obviously are. WD0AKB, left, and WB0ZEC, right, caught in a candid shot at a local club exhibit in Waterloo, Iowa. The out-of-focus background keeps a reader's attention centered on the subjects (*photo by Syndi Delaney*).

Talking with the media

Most Amateur Radio PR falls under the category of publicity. We are rarely involved in controversy. Nevertheless, it pays to be prepared to deal with sensitive issues. Any issue from CBers to TVI and RFI has the potential to develop into a controversy. Negative issues can often be turned into positive public relations by knowing how to deal effectively with the news media.

The first principle to remember is this: the news media are *not* the enemy. Talking with reporters requires scrupulous honesty and a measure of common sense. People and organizations get into trouble with the media by being dishonest or evasive.

Reporters will often call to verify a fact, or get an opinion. Be sure a phone number is on every news release, and is offered when you call.

Be well-informed on the issue and accurate with your answers, even if it sometimes puts you in a negative light. If you don't know an answer, say so and offer to call back with one or refer the reporter to someone who can give an answer. If you promise to call back, *do it.* If you don't want to answer a question, be honest, not evasive. Say, "I can't answer that right now," or "We haven't decided on that yet." It's always best to be above board, so avoid making "off-the-record" statements.

The feature story

A good feature article for your local newspaper will bring the public right into the ham shack and show them some of the human interest and excitement of Amateur Radio. The easiest way to place a feature story is to work with a particular reporter — someone who has worked with you before and is sympathetic to ham radio. Every newspaper has a certain number of columns to fill in every issue, so reporters are constantly looking for good feature material, especially when most of the work is done for them. Even so, you will need good material and a persuasive approach.

The first step might be to write to the reporter you have in mind, explaining your idea and giving reasons why it would make a good feature. You could also enclose additional material (background information, brochures), but don't overwhelm the reporter with more than he can use. Close your letter by saying that you will follow up in a few days with a phone call.

When you call, point out the highlights of your story and explore various angles that could be developed. Be helpful, not pushy. You might suggest that the story could be tied into a specific later issue or event. Be sure to thank the reporter for reading your letter and taking time to consider your idea.

The second way of getting a feature article published is to write one and then place it with a newspaper. If that's the way you choose to go, the writing must be professional. Editors usually won't take the time to do a total rewrite of your story unless it is exceptionally interesting and compelling. Use the best journalistic skills you can muster. Make sure you check all facts, dates, names, and statistics.

Someone in your club who is

a local public figure might be the best person to write your feature story. A well-known byline enhances both reader and editor interest.

Different publications have different styles, so study the one you're interested in and aim your writing style toward it.

Scheduling an event

Many newsworthy Amateur Radio events, like hamfests, regional conventions, exhibits, and field days, often get good media coverage. But, if your club needs to make an important statement, take a stand on an issue, or make a special presentation to the mayor, you may want to call a news conference.

Issuing a short news release is the first step. The release should go out 24 to 48 hours in advance. Provide only enough information to get an editor interested in learning more. For instance, the second sentence of a release announcing a news conference might say this: "Mr. Joe Hamm, president of the association, will make an important statement concerning plans now before the state legislature to raise the fee for special vehicle license plates." Do not go into further detail.

As with other releases, provide the name and telephone number of a contact person who is also the coordinator of the event. However, the coordinator should not be the spokesman.

If you want an event to get maximum public exposure in the media, schedule it for 10 AM. The afternoon, and next morning's newspapers will be able to cover it, and TV stations will have time to film it for both the 6 and 11 PM news.

By 6 PM your event will still make the 11 o'clock news, but, unless it's good feature material, it will be old news the next day. Some television news teams now use portable videotape equipment instead of film. If stations in your area are so equipped, it would still be possible to get your story on the air within two hours of news time.

The weekends are often an excellent time to schedule a news event. They are generally slack times for news, and the media are on the alert for interesting stories.

The event coordinator should have some press kits ready with copies of ARRL brochures, pictures of club activities, a copy of the statement to be made, and any other information relating to the event. Have planty of these available to give extra copies if requested.

The coordinator's main function is to provide information and technical assistance to the media. Greet the press, and get their names and affiliations. Know where electrical outlets and fuses are. Have someone on stand-by to get tape, make a phone call, pass out coffee, etc. Help crews and photographers identify whoever is on camera. Above all, know the difference between good coordination of the event and ordering the media around.

If the event is a news conference, choose a symbolic location which is easily accessible to the media. For example, if your club is going to announce the installation of a new 2-meter repeater for emergency communications, hold the news conference at Civil Defense headquarters, and let the mayor be the first one to make a contact on the new equipment. Pick a room to match the crowd you expect. Better too small than too big.

A news conference is best staged as a panel. Lead into the main or "name" speaker with one or two minor speakers. Once the major statement has been made, open it up for questions from the media. Provide the media with a list of persons who would be willing to make further comment on the subject of the conference.

Start on time. A reputation for promptness adds to your club's credibility. On the other hand, a reputation for being late will decrease the media's attendance at future events.

Radio and television can be valuable public relations tools that go far beyond the occasional news coverage given to Amateur Radio. Ham radio can be good material for public service announcements (PSAs) or late night or early morning talk shows. Gaining access to the electronic media demands a different approach than that used for the print media. Radio and television news and public affairs people may react negatively to information or material sent to them which was clearly intended for the local newspapers. It is preferable, for example, to use the neutral term "news" rather than "press" in referring to conferences and releases. Some sensitivity to these differences between the media may result in better acceptance of your message.

Television PSAs

It is becoming increasingly difficult to place public service announcements on television, which is constantly swamped with requests for time from charitable organizations and educational institutions. Stations have only a limited amount of time to give, so, to be successful, there are some tricks to the trade you should know.

Most Amateur Radio organizations do not have television spot announcements on hand, so you should talk first with stations to see if they will assist you in filming or producing one. You should also check with local advertising or public-relations firms for help. A television spot need not be elaborate. Often an interesting slide or two and some copy for an announcer can be used, but much will depend on what your

A spot announcement on a local radio station is a good way to attract attention to Amateur Radio, and there are several available as public-service announcements (PSAs), recorded by such well-known personalities as Dick Van Dyke, Bob Hope, Joe Rudi (WA6PVA), Lorne Greene, and Captain and Tennile. Have your club president or other official get in touch with the radio-station program manager to make him aware of the tape recordings. The announcements can be obtained through the American Radio Relay League, (ARRL) Inc., 225 Main Street, Newington, Connecticut 06111 (*photos courtesy ARRL*).

local station requires or is willing to do for you.

Approach television stations personally, not by mail. PSAs which are mailed in will be passed to the film director or traffic department and filed in the wastebasket. Call the station first and find out who is in charge of PSAs, then call and make an appointment.

If you can't get an appointment, you may be able to drop by the station and ask the receptionist to let you see the person in charge of PSAs. But do not leave the spots with the receptionist. If you cannot see the right person, take the spots with you and try again later.

When you do finally get a play date, make note of it. On the day before the date, call the person you have talked to and ask for the specific air times scheduled for your spot. If someone else is in charge of the scheduling, diplomatically ask who that is — probably someone in the traffic department. Thank the person who first gave you a commitment to run the announcement and then call the person who does the scheduling to find out when your spot is entered in the log. Always express your appreciation for the service the station is providing, and build some personal rapport with the person in charge of public service announcements. The next time you need help, it will be that much easier.

Radio PSAs

Putting your PSA on radio is a lot simpler than it is for television. The ARRL has helped us all out by making available a series of radio spots recorded by entertainment personalities like Bob Hope and Dick Van Dyke. They are an excellent way to introduce the public to ham radio. But, if you want to announce the latest series of ham classes, or an exhibit at the county fair, you'll need something more specific.

The principal skill to develop

in writing a PSA for radio (or television, for that matter) is brevity. All five Ws (who, where, what, when, and why) should be answered in the first paragraph. Your release should be no longer than one page and should include a telephone contact.

When you phone the public service director, find out whether the station would prefer to receive a taped PSA or copy. Also, find out what length PSA the station will air. It is best to have prepared several PSAs with a complete range of times — 60, 30, 20, and 10 seconds. The designated times must be accurate.

If you produce your own PSA tapes, use the best reel-to-reel recorder you can find, and follow the best production techniques. A better alternative would be to get a local radio station, advertising firm, or sound studio to do the production for you.

As with television, find out when your spots are scheduled, and let the person in charge know that you heard them and appreciated their service. Many stations will provide you with an affidavit of performance listing when spots were run on your behalf. If the station doesn't have such an accounting, the public service director will usually give you a rough idea of when your announcement was run, but you will have to ask.

Radio stations like to receive feedback, especially if it's positive. If you are pleased with the service, write to the general manager or station staff and thank them.

News Featurettes

Some radio stations use a news featurette format. Several times during the broadcast day segments of a longer interview will be broadcast. This kind of format is more flexible than PSAs and results in more listener interest. If your local station uses featurettes, find out who is in charge of producing them.

Local clubs of all types are always looking for program ideas and this is an excellent opportunity to present Amateur Radio to an audience that knows little about it. A film, perhaps accompanied by a brief demonstration of Amateur-Radio equipment at work, is a great chance to educate your neighbors. Here are some sample frames from one of several movies available from ARRL, showing average hams doing interesting things (*frames from "Moving Up To Amateur Radio," copyright by ARRL, reproduced with permission*).

It may be the public service director or the news department. Explain your idea, and suggest an attractive angle that will arouse their interest. Often, the interview will be conducted over the telephone and recorded later for broadcast, or a reporter may be sent to talk with you. Either is good publicity with a minimum of effort on your part.

Radio and TV talk shows

Placing someone on a TV or radio show often requires a bit of luck and a great deal of ingenuity. Public curiosity, interest in personal communications, and your club's credibility are probably your greatest assets. If you've been getting good coverage, the producers of the show will probably know who you are.

Call the station and find out who screens prospective guests. Write the show host a short letter of introduction providing some background information and news clippings. Address your letter to the attention of the assistant who screens the guests. You might suggest a good news angle for the show, like an on-the-air demonstration of ham radio. Follow with a telephone call to the assistant and establish a good rapport. Listen carefully during your conversation for information that will help you find a focus for the interview and will strengthen its newsworthiness.

Making arrangements for a guest appearance will take time, so be patient. If time seems to be dragging on and you haven't heard from the show, make an inquiry to see what the problem is. Perhaps a new angle should be developed. Make your case strongly without arguing. You will always lose an argument.

Radio talk shows with a telephone call-in format are especially valuable public relations tools for Amateur Radio. They offer you an opportunity to deal first hand with questions from the public, and to clear up misconceptions about everything from the nature of ham radio to the cause and cure of TVI.

More ideas

The press book: The press book is a big scrapbook

containing all the pictures, news clips and feature stories that have been done about your club and about Amateur Radio in your area. The press book is a good way to keep the history of the club straight and is an excellent tool for refreshing your memory when you prepare other public relations pieces.

Speakers Bureau: Every city and town has social and service organizations ranging from the Women's Club to Kiwanis. All of them need programs from time to time. Get a list of clubs in your area from the Chamber of Commerce. Send them each a letter explaining that you have a group of persons available to speak to their club about Amateur Radio. Make a list of people from your membership who are willing to speak to groups in your area. Find out who in your club has equipment that could be set up for a demonstration. Any of the lightweight solid-state transceivers and an antrenna designed for apartment use could provide the basics for a fascinating demonstration. A 2-meter handheld unit and the local repeater would also be interesting, especially if an autopatch is available.

The speakers bureau talk could be centered around the demonstration, but doesn't have to be limited by that. The film "Moving Up To Amateur Radio" (available from ARRL, 225 Main Street, Newington, Connecticut 06111) is a great program in itself. Or, you could develop a speaker's kit with information on the various aspects of ham radio in general and the activities of local hams in particular. Include a basic speech, but let each speaker pattern it to his own style. Obtain copies of some of the available ARRL brochures to hand out to your audience, and be sure to mention when the local ham class meets in your area.

Another excellent presentation can be made with slides. Slide shows are relatively inexpensive to produce for the mileage you can get out of them. The show could be narrated by the speaker from a prepared script or recorded on cassette tape by someone whose voice has a professional sound. The advantage of a recorded narration is that club members who aren't comfortable speaking in public can still present the show. But, be sure you have a copy of the script available in case either tape or recorder fail.

Spend a lot of time getting good slides that tell a story. Your slide show should be as interesting to outsiders and non-hams as it is to your own club members. As a negative example, think about the last time you were invited to a friend's house and were treated to a family slide show.

Club Brochure: No public relations effort aimed at increasing local interest in ham radio can be complete without a local club brochure. If your club has sponsored several exhibits, or had a public-information table at field day, then you've no doubt handed out a lot of the colorful brochures contained in the ARRL exhibit kit. Why not add a brochure to that collection which highlights the activities of local hams?

The brochure should contain good basic information about meeting times and places, ham classes in your area, local repeater channels, and any other information about your club's activities.

The brochure doesn't have to be expensive, but it should be printed on good quality paper on an offset press. You might also want to include a few pictures or cartoon drawings if you have an artist in the club.

There are plenty of avenues you can use to put your story before the public, and exploring them is both interesting and educational. The rewards, to your club and to Amateur Radio, will be far greater than you can imagine. **HRH**

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Whatever your needs in frequency measurement and readout, you're sure to achieve optimum results with DSI precision digital instruments. Their portability and rugged construction — coupled with the judicious use of the latest technologies in solid-state design — have culminated in equipment that provides the best performance/price trade-offs available.

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Featuring automatic decimal points and zero blanking, and including built-in antennas and battery trickle chargers, these ruggedly housed portable instruments — that can be taken wherever you need to go — are ideal for use by service and testing technicians, communications people and sophisticated amateur/professional radio operators.

PARAMETER	MODEL NUMBERS		
	3700	3600A	3550W*
Frequency Range	50Hz-to-700MHz	50Hz-to-600MHz	50Hz-to-550MHz
Accuracy Over Temperature	0.2PPM—0 to 40°C (Proportional Oven)	0.5PPM—17 to 37°C (Oven)	1.0PPM—65 to 85°F (No Oven)
Sensitivity: (Typical) at 146MHz at 220MHz at 450MHz	10mV 10mV 25mV	10mV 10mV 25mV	25mV 25mV 50mV
Number of Digits	8 (Automatic Decimal Point & Zero Blanking)		
Digit Height	0.5 inch		
Power Requirements	115VAC or 8.2-to-14.5Vdc		
Dimensions	3"H x 8"W x 6"D	2.25"H x 8"W x 5"D	
Prices (in Single-Unit Qty.)	$269.95	$199.95	$149.95

* Model 3550K Quik-Kit (95% Assembled and 100% Tested by DSI) . . . Priced at just $99.95
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PARAMETER	MODEL NUMBERS	
	C700	C1000
Frequency Range	50Hz-to-700MHz	10Hz-to-1.0GHz*
Accuracy Over Temperature (Proportional Oven)	0.2PPM—0 to 40°C	0.1PPM—0 to 40°C**
Sensitivity: (Typical) at 50Hz-75MHz at 75Hz-500MHz at 500MHz-1GHz	50mV 10mV NA	20mV 5.0mV > 50mV
Number of Digits	8 (Auto Decimal Point)	9 (Auto Decimal Point)
Digit Height	0.5 inch	
Power Requirements	115VAC or 8.2-to-14.5Vdc	
Dimensions	3"H x 8"W x 6"D	4"H x 10"W x 7.5"D
Prices (in Single-Unit Qty.)	$369.95	$499.95

* Optional (-01) 1.3GHz Version Available.
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PARAMETER	MODEL NUMBERS	
	500HH	100HH
Frequency Range	50Hz-to-500MHz	50Hz-to-100MHz
Accuracy Over Temperature	1.0PPM TCXO Time-Base (17 to 40°C)	
Sensitivity: (Typical) at 100Hz-50MHz at 50MHz-250MHz at 250MHz-450MHz	30mV 30mV 50mV	30mV NA NA
Number of Digits	8 (Auto Decimal Point & Zero Blanking)	
Digit Height	0.4 inch	
Power Requirements	8.2-to-14.5VAC* or 115VAC (using External AC Adapter)	
Dimensions	3.5"W x 1.25"D x 5.75"H (Case)	
Prices (in Single-Unit Qty.)	$169.95	$119.95

* Built-in Rechargeable Battery Pack Included as Std.

For information on representatives and/or distributors in your area, as well as technical data/pricing details, contact your nearest DSI Regional Sales office:

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CA Exchanges Call Collect (714) 565-8402
7914 Ronson Road, San Diego, CA 92111

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FREQUENCY COUNTER CONSUMER DATA COMPARISON CHART

MANUFACTURER	MODEL	SUG'STD. LIST PRICE	FREQUENCY RANGE	TYPE OF TIME BASE	ACCURACY OVER TEMPERATURE		SENSITIVITY			DIGITS		PRE-SCALE INPUT RESOLUTION	
					17° - 40°C	0° - 40°C	100 Hz - 25 MHz	50 MHz - 250 MHz	250 MHz - 450 MHz	No.	SIZE IN INCHES	.1 SEC	1 SEC
DSI INSTRUMENTS	100 HH	$ 99.95	50Hz-100MHz	TCXO	1 PPM	2 PPM	25 MV	NA	NA	8	.4	100 Hz	10 Hz
DSI INSTRUMENTS	500 HH	$149.95	50Hz-550MHz	TCXO	1 PPM	2 PPM	25 MV	20 MV	30 MV	8	.4	100 Hz	10 Hz
CSC‡	MAX-550	$149.95	1kHz-550MHz	Non-Compensated	3 PPM @ 25°C	6 PPM	500 MV*	250 MV	250 MV	6	.1	NA	1 kHz
OPTOELECTRONICS	OPT-7000	$139.95	10Hz-600MHz	TCXO	1.8 PPM	3.2 PPM	NS	NS	NS	7	.4	1 kHz	100 Hz

* 1 KHz - 50 MHz ‡ Continental Specialties Corp.

The specifications and prices included in the above chart are as published in manufacturer's literature and advertisements appearing in early 1979. DSI INSTRUMENTS only assumes responsibility for their own specifications.

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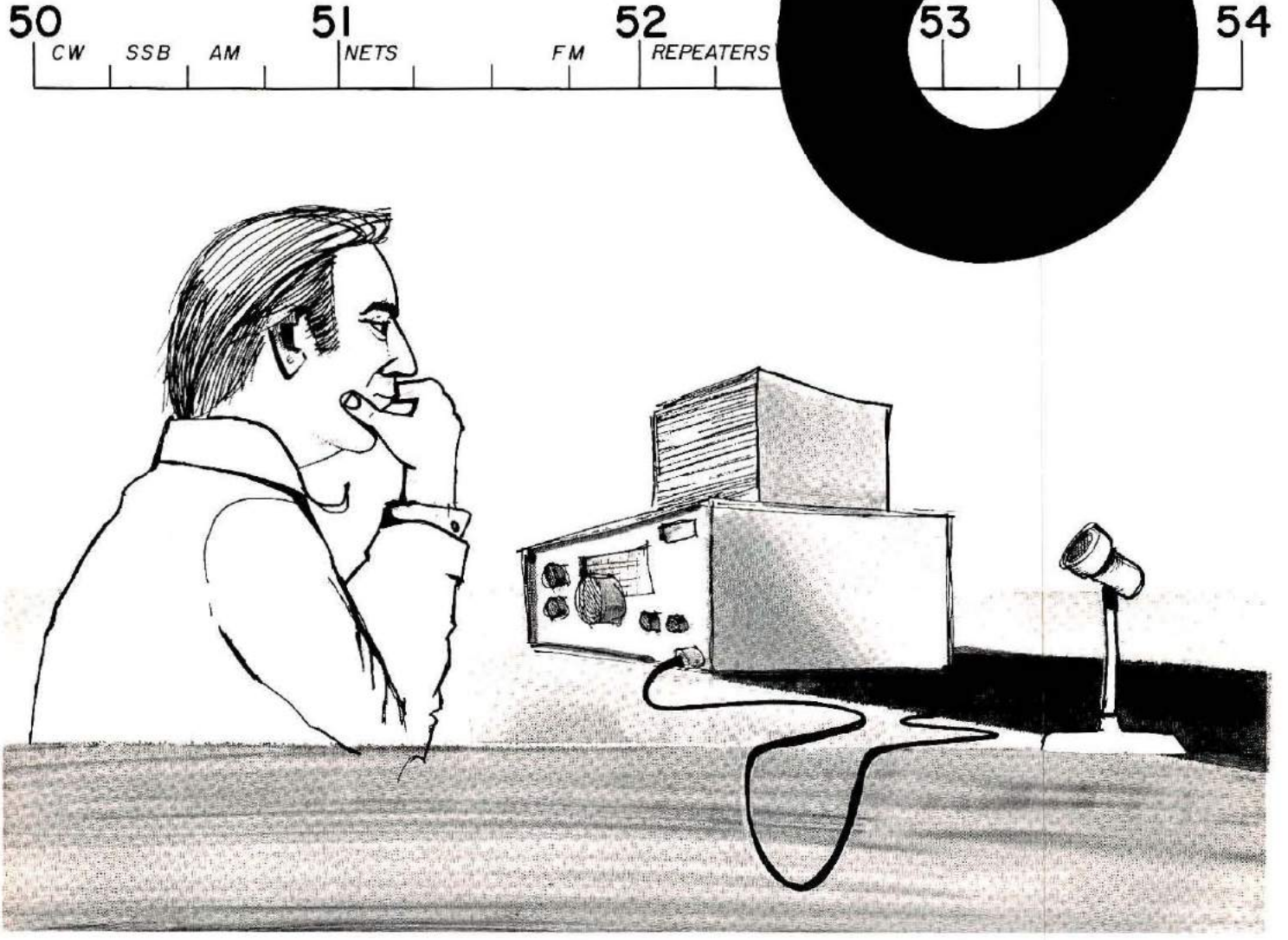
Surveying 6



A borderline band — with a personality that's part HF, part VHF, and some unusual modes thrown in for fun

BY KARL THURBER, JR., W8FX

Six meters has, indeed, had its ups and downs, and the band's popularity over the years since it was traded for the old five-meter ham band (now allocated to TV) has fluctuated almost directly in step with the eleven-year sunspot cycle. Although the band is noted for its strong shifts in performance — much more pronounced even than on ten meters — interest in six has been fairly high since the FCC first opened the band to Technician-class operators in 1955.

Along with two meters, six is a very logical choice for beginners, especially Technicians, who can now operate across the entire 4 MHz. Perhaps it is an even more logical choice than two meters, since its strategic location in the radio spectrum allows it to provide really amazing worldwide contacts at different seasons and at different points in the sunspot cycle. Six is unique in that it behaves both like a vhf band, which is normally limited to line-of-sight communications, and like a high-frequency band, such as ten meters, and as such is easily capable of earth-circling DX.

Although six is today a somewhat forgotten band, it's poised to rebound in 1979 as Sunspot Cycle 21 peaks; we'll certainly be hearing more and more about six over the next few years. With these facts in mind, let's survey six meters,

The Kenwood TS-600 transceiver is one of the new breed of multimode rigs designed for six meter, all-mode operation. Similar to its two-meter cousin, it operates on ssb, fm, a-m, or CW. It covers 50 to 54 MHz with a power output of 10 watts (*photo courtesy Trio-Kenwood Communications, Inc.*).

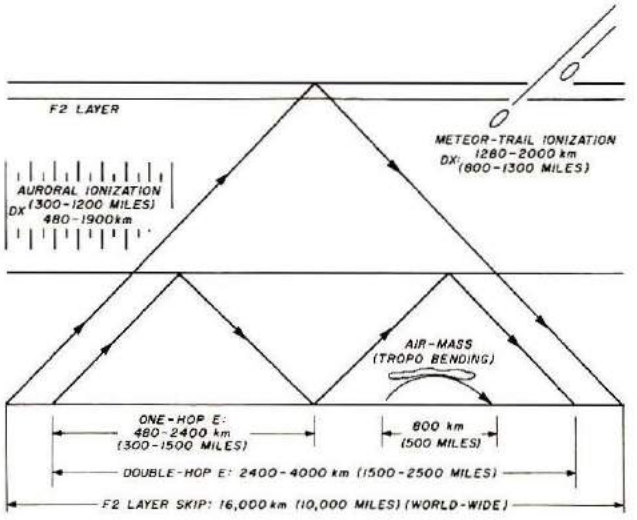


Fig. 1. Here is a quick reference guide to the major modes of six-meter propagation and the distances involved. Some scatter modes will also provide medium-distance contacts, and a special type of F-layer propagation causes transequatorial DX over a north-south path.

taking a look, first, at its very nature, then going on to discuss 50-MHz equipment, antennas, and some special problems involved in operating on the band.

The nature of the band

Six meters is very likely our most variable and unpredictable band, and, like the weather in some parts of the country, you only have to wait for a few minutes before it changes. Although it normally acts much like the other vhf bands, such as two meters, it is very sensitive to the sunspot cycle. In fact, in the peak sunspot years of the late 1940s, 50s and 60s, the maximum usable frequency (MUF) often hit or even exceeded 50 MHz, so that F-layer DX was almost as common on six as on the lower frequencies.

The fact that six meters lies in that in-between "borderline" region between vhf and high frequency makes it just about the most interesting ham band we have. Almost anything and everything happens on six: regular F2-layer DX, sporadic E "short skip," auroral and meteor-trail ionization, ionospheric and tropospheric scatter, trans-equatorial skip, and air-mass refraction. You name it and you've got it on six!

While DX on six is not as routine as on the lower bands, it does become active enough in the spring and summer of each year. Most of the time, of course, six is much like two meters, where communications is primarily local or "extended local" in nature, and the line-of-sight characteristic normally makes communications clean and interference-free. The added spice six offers over two overcomes one of the big objections to vhf work — the normally limited range. Under good to excellent propagation conditions (band openings), the usual 80 to 160 km (50 to 100 mile) contact range of the typical six-meter station can be increased tenfold or more — and under certain circumstances can be global, with contact periods lasting up to many hours.

Six-meter "short skip," or sporadic-E communications, is probably the best-known propagation that affects the band. Sporadic-E causes the band to change suddenly from local to DX; signals seem to zoom out of nowhere, and they often become extremely strong, sometimes for just a few minutes but at other times for hours at a stretch. Signals from about 480 to 2400 km (300 to 1500 miles) can be heard and worked easily, even with low power and modest antennas. Multiple-hop reflections from the ionized E-layer can extend this range out to 4000 km (2500

miles) or so, allowing one to work all of the forty-eight adjacent states, Canada and Mexico.

Sporadic-E, or "E-skip," propagation is probably caused by increased radiation of ultraviolet and soft X-rays from the sun, creating small but highly ionized patches or clouds in the ionosphere at about the same height as the normal E-layer: around 100 km (65 miles). Usually, none of the normal ionospheric layers are ionized strongly enough to reflect six-meter signals, but the sporadic-E layer is sufficiently ionized so that it can reflect signals up to 150 MHz or higher, often causing pandemonium among fringe-area TV viewers and adding spice to two-meter operations.

Most sporadic-E openings on six occur between May and September, though they can occur in any month. Sharp operators maintain a special watch for it in the mornings and evenings, starting in late April and carrying through the fall. A propagation-wise six-meter buff can easily pick up ten or twenty states during an E-skip season without elaborate equipment or fancy antennas. And the beauty of this kind of propagation is that it is fairly independent of the sunspot cycle; it can appear anytime, even in the depths of the cycle.

The "biggie" in six-meter DX work, of course, is sunspot-related F2-layer propagation — the kind that makes 19,000-km (12,000-mile) contacts possible. It may sound unbelievable if you have never tried six, but in the sunspot peak years of 1947, 1958, and 1969, working international DX was "the thing" on six, and was almost as common an occurrence on six meters as on ten. Transequatorial and transoceanic contacts were commonplace in all three recent cycles, and even back in 1947 a record DX contact on six — spanning more than 16,000 km (10,000 miles) — was made using equipment a lot simpler than that available now.

There are several other lesser, but still important, types of propagation that make life interesting on six. There is, of course, *auroral reflection*; this phenomenon can sometimes be taken advantage of in the early evening hours and can provide DX possibilities out to about 1900 km (1200 miles). If you see the northern lights on a clear night, you may want to point your beam north for an aurora session. It's easy to identify auroral propagation by the badly distorted signals. Usually CW is the mode that can best make it through the garble. *Meteor-trail ionization* is another less-familiar propagation type, and it can affect six. It occurs during specific recurring meteor-shower periods. This mode can yield DX out to about 2000 km (1300 miles) or more, but reception is usually limited to short bursts or "pings," making high-speed CW an effective mode of communications. Another, more common, form of six-meter DX results from air-mass or *temperature-inversion* phenomena, in which signals are bent as they pass through a boundary between air masses of differing temperature and humidity. When moist, warm air overrides dry, cold air, the right conditions exist for this kind of DX. This propagation can occur any time, but is most pronounced in the early morning and evening hours; contacts can be made with strong signals out to 800 km (500 miles) or more. Other forms of propagation affect six as well, and they read like a catalog — transequatorial, backscatter, ionospheric and tropospheric scatter, and

Fig. 2. Signal characteristics and times of occurrence for the most common modes of propagation on six meters.

Propagation Mode	Best Time of Day	Seasonal Peak	Signal Characteristics
Regular F-layer reflection	daytime	winter	very strong
Sporadic-E	mornings and evenings	spring through summer	weak to strong with some flutter
Auroral Ionization	afternoon and evenings	spring and fall	weak to moderate; distorted and garbled
Meteor Ionization	night and early hours	summer	strong bursts and "pings"
Air mass (temperature inversions)	anytime	all seasons	strong
Transequatorial	evenings	spring and fall	weak to moderate; some fading
Scatter			
Ionospheric	evenings	spring and fall	weak
Tropospheric	anytime	anytime	weak

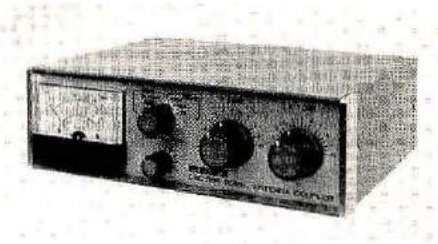
others. For a good discussion of vhf propagation see "A Guide to VHF Propagation," by K2OVS, in the February, 1979, issue of *Ham Radio Horizons*. Monthly propagation forecasts are found in almost all the Amateur magazines.

The trick in working long-haul DX on six is to be there when the conditions are right. There are several ways to find out when conditions are right, such as by monitoring ten meters or CB; when those bands are "hot," odds are that six may be, too. You can also scan the commercial and public-service bands between 30 and 50 MHz for far-distant stations overriding local communications. It pays to be a good SWL to work six — many fellows even monitor European TV audio carriers (just below 50 MHz) for activity. Others maintain a listening watch on 50 MHz beacon stations set up by hams in many parts of the world just for this purpose, see **Table 1**. You might look for Africa and Europe in the mornings and the Pacific in the afternoons, while South Americans may ride in on transequatorial skip both mornings and afternoons. Also, check channels 2 and 3 on your TV set.

Equipment for six

Six is an attractive band for several reasons: it's possible to have fun on the band with low power and simple antennas; a lot of inexpensive, used 1950 and 1960 era equipment is available; and the band is presently uncrowded. This situation may change, however, as six perks up and manufacturers decide it is worthwhile, once again, to crank out some good six meter gear.

In any case, it is important to point out a few facts about six-meter equipment selection. As far as *receiving* equipment goes, six should be treated as a vhf band, and receiving gear should be purchased that has high sensitivity, a good signal-to-noise ratio, and excellent stability. Just as on two meters and higher vhf and uhf bands, the best receiving setup is none too good, and a poor setup will be a total flop. An inadequate receiver or converter can reduce your regular operating range considerably and make it difficult, if not impossible, to hear weak-signal DX when the band is open.

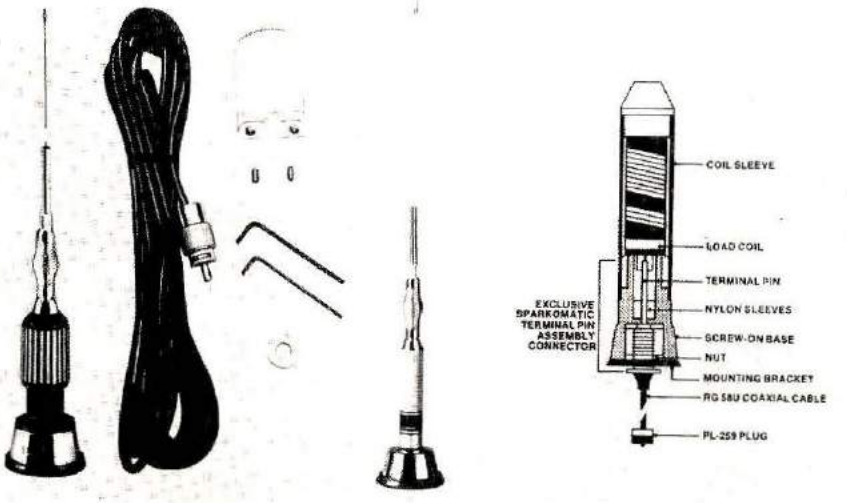


Antenna couplers (or matching units) are as important on six meters as on the lower bands. This one, by Leader, covers the range of 50 to 54 MHz, and contains an swr bridge. It is rated at 100 watts, and will match loads of 20 to 250 ohms. In addition to its matching capabilities, it offers attenuation of harmonics or spurious signals which might cause TVI or interfere with fm broadcast-band reception.

At hamfests and in the used-equipment ads, you will frequently see commercial receivers made in the 1950s and 60s that cover six (usually up to 54 or 55 MHz), rather than just to 30 MHz. Few of these receivers, even the best of them, do a good job on six; most are tube-type sets with low sensitivity and poor image rejection on the higher ranges, and, their stability on the six-meter band is often poor. Otherwise excellent double-conversion receivers (such as the SX-73, NC-183D, HRO-60, and SP-600), which cover six directly without the use of an accessory converter, lack adequate sensitivity on 50 MHz. However, these sets can make excellent tunable i-fs for a six-meter converter.

Most serious 50-MHz DX work is transacted using a receiving converter and rf preamp installed ahead of the receiver. The best kind to use is the crystal-controlled converter which uses a crystal oscillator to mix with the incoming signal to produce a variable i-f (intermediate frequency) difference signal that is fed to a convenient band on the receiver. This usually works out to an i-f around 14 or 28 MHz. (Hamtronics, 65F Moul

Some CB mobile antennas are readily adapted for either six-meter or CB use if the coil assembly can be separated from the base and whip. Obtain a spare coil and modify it for six meters by removing or shorting the windings. Switching to another band is as simple as unscrewing one coil and replacing it with another. Shown here are the Sparkomatic SA 204 CB Mobile antenna left; the SA 104, center; and a drawing of the terminal connector assembly for the SA 104 and SA 204, right (*photo courtesy Sparkomatic Corp.*).



Some high-frequency band rigs can be used on six meters by means of a transverter — such as this FTV-650B by Yaesu Electronics. It accepts low-power, ten-meter energy from a transmitter and converts it to six-meter output at a power level of 50 watts. When receiving, six-meter signals are converted to the 28 to 30-MHz range, and a normal receiver is used as a tunable i-f to detect them (*photo courtesy Yaesu Electronics Corp.*).

Road, Hilton, New York 14468 makes a complete line of converter and rf preamplifier kits if you want to go this route.)

Transmitters

As for the *transmitting* end, equipment is not necessarily different or more expensive than that for the lower bands, and there are several ways to go about getting on the air. One way is to buy an older a-m and CW six-meter transmitter of the type popular in the 50s and 60s. Many of these are available today for less than $60 and can give you a lot of fun for a modest investment. For the most part, however, you will want to use such equipment for CW DX work rather than phone, since a-m is not used very extensively in most parts of the country (although you may find an a-m net active in your area for local ragchewing). Some of the more popular equipment of this type that you may find includes the WRL Globe Scout, Globe Chief 90A, and Hi-Bander; Gonset Communicators; Heath HW-10; and the Clegg Zeus (with 6- and 2-meter coverage) and the "99'er" for six meters. Two popular transceivers that seem to "live on" on six are the Gonset G-76 transceiver and the Swan 250; since the Swan operates ssb as well as a-m and CW, it is probably the most convenient and flexible means of quickly getting on six.

Another way of getting your feet wet on six is by converting an existing high-frequency transmitter, such as one left over from your Novice days. This method probably represents the least-expensive route, and it allows you to recycle an old transmitter that might otherwise be relegated to a dusty shelf forever. Many older rigs have lent themselves fairly well to such conversion, including the Viking I and II, Johnson Ranger, and the Heath DX-35, DX-40, DX-60 and DX-100, among others. Conversion is for the experienced builder, however, and usually involves reworking coils and other components, as well as taking special precautions to ensure that TVI isn't aggravated by the circuit modifications.

If you have a high-frequency transceiver and want to use it on six, you might consider constructing or purchasing a *transverter*. This is a sort of "two-way converter," an add-on accessory that adapts the transceiver to six-meter operation. On transmit, the unit mixes the output of the high-frequency transmitter with a crystal oscillator output to produce a six-meter signal which can be fed directly to an antenna, or routed through a linear amplifier for high power operation. On receive, the transverter performs a similar function, "beating" or heterodyning received signals to a convenient band on the transceiver for detection and amplification in normal fashion. This arrangement is excellent if you are interested in CW and ssb work rather than fm operation (most high-frequency transceivers do not have fm capability) and want to get on six with a minimum of equipment duplication. Kenwood and Yaesu both make accessory transverters for their high-frequency equipment.

Still another way to break into six is by way of the *multimode transceiver*. Most of these are patterned after their two-meter cousins, and allow fm, a-m, CW, and ssb operation in one compact unit. These units will appeal to a broad range of operating interests, and if you can afford their cost ($650 and up), they probably represent the most efficient and growth-oriented way to get on six. Also, they run the least risk of becoming outdated in the near future. Kenwood's TS-600, Yaesu's FT-620B, and the Palomar Kachina 1 are popular transceivers of this type; however, unlike their two-meter counterparts, not all such multimode transceivers are designed for fm repeater work. Carefully check the specifications of the unit that strikes your fancy before you buy!

What about power? Six, like ten and two, is remarkably forgiving of the station running low power. For locally good signals (especially for fm repeater work), low power isn't a big handicap, providing that what rf is generated is radiated through a decent antenna. A 10 or 20-watt transmitter can

This transverter is intended to adapt the popular Kenwood TS-520 and TS-820 series of transceivers to 50-MHz operation. It can be used with other transceivers as well. Power output is 10 watts (*photo courtesy Trio-Kenwood Communications*).

do very well for itself when the band is open, particularly if riding on sporadic-E skip when signals tend to be very strong. Of course, for weak signal DX work, under borderline band conditions, the higher-power station enjoys a margin over lesser stations. For working the more exotic propagation modes, such as aurora and meteor-trail, the 100-watt class seems to be a good minimum power to shoot for in setting up your station. In this regard, a good yardstick to remember is the *rule of ten*, which says that a *tenfold increase* in transmitted power will result in a *10 dB increase* in signal strength on the receiving end, other factors being equal. Thus, going from 10 watts to 100 (or using a 10-dB gain antenna) would mean a 10 dB signal strength improvement, or about two S-units. This improvement might not be significant under good conditions, but if your signal is bordering on the noise level, it could mean the difference between failure and success in making a solid contact.

Antennas for six

Antennas for six are a combination of high frequency and vhf designs. Indoor dipoles or verticals can work well enough for local ragchewing, or through close-in repeaters, but for serious work a high, in-the-air antenna is a must, just as on two-meters. Polarization is not too much of a problem, although for local work and through repeaters, polarization should match on both ends to prevent excessive signal path loss (it's usually vertical for repeaters, while for DX most antennas are horizontally polarized). The most common six-meter antennas are four or five-element Yagis, with wide element spacing for higher gain. Those who don't mind the large size of the array gracing their home may stack Yagis for more gain, believing that the biggest antenna they can get in the air will produce results.

Regardless of what type of beam you use, make it rotatable; a fixed antenna, in most locations, seems always to be aimed in the wrong direction when the band is open! Most light-duty TV rotators will handle small and medium-sized arrays, since they are not much larger than television antennas. Even a simple dipole will work when the band is open, provided you can rotate it. But bear in mind that a five-element beam can produce a 10 dB ERP (effective radiated power) improvement, equivalent to boosting transmitter power from 10 to 100 watts as in our previous example. One quickly learns that dBs are a lot easier to come by in the antenna than in the transmitter!

As for range, the six-meter radio horizon isn't much different from the two-meter horizon, so you can expect to be able to work out from 80 to 160 km (50 to 100 miles) or more, depending on the equipment and antennas in use at both ends, unless you're both surrounded by hills that completely block the path between stations. As on two, hilltop sites can considerably boost your reliable operating range.

Fig. 3. Repeaters on six meters generally follow this pattern of input/output frequencies. The upper end of the band is shared by model-control operators, using frequencies of 53.1, 53.2, 53.3, 53.4, and 53.5 MHz. Both simplex operators and repeater builders should avoid operation near these channels; interference could cause the loss of expensive equipment. Not all repeaters follow this list, and some have either input or output capability on the National Simplex calling frequency.

Simplex frequencies, MHz
52.49
52.51
52.525*

Repeater frequencies, MHz	
Input	Output
52.01	53.01
52.03	53.03
52.05	53.05
52.07	53.07
52.13	53.13
52.15	53.15
52.17	53.17
52.23	53.23
52.25	53.25
52.27	53.27
52.33	53.33
52.35	53.35
52.37	53.37
52.43	53.43
52.45	53.45
52.47	53.47
52.55	53.55
52.57	53.57
52.63	53.63
52.65	53.65
52.67	53.67

*National Simplex Frequency.

Six today

Like its sister bands lying about 100 MHz higher and 20 MHz lower in frequency, six offers a lot to the veteran operator and newcomer alike — and it's a band where QRM is almost unknown. Even if you discount the DX potential entirely, it's a good band for reliable local communications, combining some of the best qualities of two and ten.

You should find that most six-meter activity is centered around 50.1 MHz — 100 kHz up from the low end of the band. Technicians can now operate all the way down to 50.0, but most operators still monitor just to the high side of 50.1, around 50.105 and 50.110 MHz. The favored operating mode is ssb, though for really serious DX work, CW (below 50.1) can't be beat, although it is infrequently heard. Slow-scan TV, radio-teletype, and wideband fm can also be used on six.

Going higher in the band you'll find the repeaters clustered between 52.01 MHz (the lowest input frequency) to 53.67 MHz (the highest output frequency). Most 50-MHz band plans call for 20-kHz-wide channels with 1000 kHz (1 MHz) spacing between inputs and outputs, the input frequency being on the "low" side as in the 146-MHz portion of the two-meter repeater band. The

national simplex frequency is 52.525 MHz, and additional simplex frequencies are pegged at 52.49 and 52.51 MHz. Scattered among the repeaters are Amateur model-radio-control channels, 53.1 through 53.8 MHz, in 100 kHz steps. A lot of coordination is required between repeater groups and hams who are R/C buffs to prevent mutual interference. At present, interference isn't too much of a problem; a scan through the 1978/79 *ARRL Repeater Directory* reveals fewer than 170 repeater listings for six, contrasted with the thousands operating on two meters.

Recognizing that the band is just coming out of the "sunspot doldrums," the ARRL has tried to stimulate activity on six by sponsoring a special "600 Club Award." To qualify, invididual hams must present QSLs that confirm contacts with enough stations to rack up the required 600 points; various numbers of points are awarded for each country and ARRL section worked, as well as each QSO made. (Contacts through a repeater don't count, and stations can be worked only once.) It's hoped that activities like this, or even variations on the ten-meter "10-10" phenomenon, will boost the number of Amateurs on the band.

Six meters: two problems

Six can be fun, but there are two main problems you'll soon find out about when you try the band: 1. TV and fm interference, and 2, inactivity.

The biggest problem in working six — especially if you live in a channel 2 area — is TVI. This is because the six-meter band runs from 50 to 54 MHz, while channel 2 is right next door at 54 to 60 MHz. The problem is aggravated in weak-signal TV fringe areas and when running high power. There are several reasons why six is so susceptible to TVI: the band is so close to channel 2; the 50 MHz 4th harmonic can blot out channels 11 to 13;

A filter may be necessary to keep transmitter oscillator and multiplier frequencies inside the rig, where they belong. This one, by Barker and Williamson, offers 40 dB of suppression of signals outside its passband, and is rated at 100 watts power handling capability (*photo courtesy Barker and Williamson, Inc.*).

stray radiation from internal oscillator harmonics in the transmitter can be radiated at least as high as channel 10; and the audio signal can be rectified by the TV set's audio circuitry. In addition, the second harmonic of your six-meter signal (100 to 108 MHz) falls within the fm broadcast band and can cause problems with fm reception if you're unlucky enough to be using an operating frequency whose second harmonic coincides with a local station's frequency.

Many of these problems are transmitter faults, while others are receiver inadequacies. But, regardless of the cause, six is a special case as far as TVI is concerned, since it is very easy to put out harmonics and spurious signals within the TV bands with a six-meter rig (some of which use 6 or 8 MHz crystals; the harmonics fall within the TV channels). And, it's not so easy to cure receiver deficiencies because the TV and ham-band frequencies are so closely related. A combination of efforts is usually required to make the situation livable.

On the transmitting end, you should know that fm usually results in a lot less interference than does ssb or a-m. Running fairly low power helps, as does keeping a good separation between your six-meter antenna and neighboring TV antennas. It's also a good idea to operate as low in the band as you can (to keep away from channel 2, which starts at 54 MHz), and to use a special lowpass or bandpass filter between your transmitter and antenna. Using a 50-MHz antenna coupler also adds a degree of selectivity to your rf output, and can even help to filter out some of the rf "garbage" which often wipes out six-meter reception when a strong channel 2 station is operating nearby.

On the receiving end, a special high-pass filter and tuned quarter-wave open stub installed at the TV set can eliminate fundamental overloading or "blocking" caused by the presence of your signal. If the filter alone doesn't do the job, the stub may be effective. It is made from 300-ohm twinlead connected across the TV set's antenna terminals, in parallel with the antenna wires. The stub's length is calculated from this formula: $L = 2420/F$, where L is the desired length (in inches) and F is the interfering frequency (in MHz); for an interfering signal at 51 MHz, the length works out to about 120 cm (47-1/2 inches). If you're using RG-59/U coax, the length would be different and would be about 104 cm (41 inches). A suggestion: cut the twinlead or coax about 5 cm (2 inches) too long and trim back 6-mm (1/4-inch) pieces until you reach the point of minimum interference from your transmitter. Just be careful not to cut the stub too short, or you can ruin channel 2 reception.

So, I've looked at the band, made some equipment and antenna suggestions, and pointed out some of the problems you might encounter in operating on six. Why try six? Try it because it's there — and it's a darn good band too!

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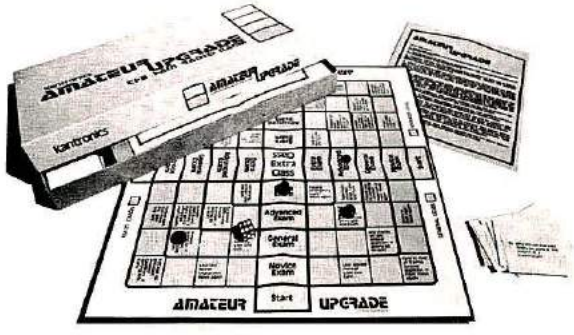

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DCA	0 - 50μA - 2.5ma - 25ma - .25A	± 3% fs
Ω	.2 to 20mΩ Range x 1 x 10 x 1k x 10k	± 3% arc
dB	+ 10db ~ +22db for 10VAC	± 4% fs
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3600A	$199.95	50Hz - 600MHz	Oven .5 PPM 17° - 37°C	10MV	10MV	50MV	8	.5 Inch	115 VAC or 8.2 - 14.5VDC	2⅛"H x 8"W x 5"D
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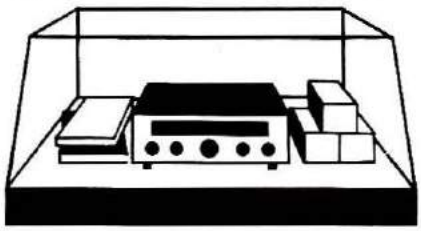
PRODUCT SHOWCASE



For literature on any of the Product Showcase items use our *ad-check* service on page 78.

Swan Astro 150 Transceiver

There's a new SSB/CW transceiver available from Swan Electronics, and it incorporates some very interesting and innovative features.

For example, their variable-rate scanning (VRS) is a new method of tuning. The main tuning knob doesn't need to be cranked from one end of the band to the other; simply apply pressure in one direction or the other and the synthesized frequency control will rapidly tune to the desired spot in 100-Hz steps. A pair of push buttons on the hand-held microphone will accomplish the same thing. The frequency is displayed on a high-intensity, orange 7-segment display. This color, and a non-glare filter, allows easy reading in most lighting conditions.

For continuous coverage between the 100-Hz steps, there is a fine-tune knob, as well as a receiver-incremental-tuning (RIT) control. This combination will allow you to precisely tune to any Amateur frequency you desire.

The Astro-150 covers the Amateur bands from 80 through 10 meters, and the Astro-151 covers 160 through 15 meters. Both feature either full or semi break-in operation, have a noise blanker, VOX or push-to-talk, and have a standby switch that allows the rig's microprocessor to remember the "last-tuned frequency," while consuming only a few milliamperes. There is also a narrow filter for improved CW operation.

In conjunction with the "standby-memory" feature, the 150/151 can remember what your last frequency was when you change bands. For instance, if you last tuned to 7125 kHz, then switched to the 20-meter band for a look, the transceiver would return to 7125 when you switched back to the 40-meter band.

The transceiver comes in a compact, rugged, and handsome case, designed for either mobile or home station use.

The 150/151 is designed to operate from 13.8 Vdc at 18 amperes (peak transmit), and 1 ampere while receiving. There is a matching power supply (PSU-5) available for home use, as well as an antenna tuning unit (ST-3) in a similar attractive case, to make up a complete station. Power input is 235 watts, all modes on all bands.

For complete specifications, write Gary Pierce at Swan Electronics, 305 Airport Road, Oceanside, California 90254, or visit your nearby authorized Swan equipment dealer.

New K6FZ Miniature Tri-Bander Antenna From Tempo

A new, miniature K6FZ 20/15/10-meter, tri-bander antenna is available for Amateurs living in apartments, condominiums, mobile homes, and other places where full-size beams cannot be erected. Measuring only eight feet square, the new antenna is based upon a half-wave long, constant-current loop design using capacitive phase shifters in the outer arms to achieve front-to-back ratios in the order of 15 dB. Gain over a full-size dipole is 1 dB.

The new Tempo tri-bander antenna is constructed mainly of fiber glass antenna rods, which are exceptionally strong and lightweight, made by Monogram Industries. A copper conductor is in the center of each rod. The basic antenna is a 20-meter loop, onto which optional 15- and 10-meter loops can be mounted. Elements go together in a matter of minutes to simplify assembly or disassembly. Overall weight of the tri-bander is 14 pounds, and the antenna can be rotated, if desired, by any inexpensive TV rotor.

Price of the complete Tempo 20/15/10-meter tri-bander is approximately $250. The basic 20-meter antenna is only $169.50. Write Henry Radio, 11240 W. Olympic Boulevard, Los Angeles, California 90064 for more details.

DE-130 Electronic Keyer

The new DE-130 Digital Electronic Keyer, by Dynamic Electronics, Inc., is designed to provide all the features required of a high-quality keyer at a minimum cost without additional accessories. For example, a heavy ac power supply is included, eliminating the need for batteries or an add-on supply. The cost of an external paddle assembly is not necessary since an electronic paddle called a "touch key" is included. The electronic touch key works on skin resistance, and plugs into the front of the keyer. This electronic key pre-

vents the keyer from "walking," since no mechanical motion is required to operate it. A keying relay is included to allow the DE-130 to directly key any transmitter, regardless of the type of circuit used. For code practice or actual on-the-air monitoring, an audio circuit drives a speaker mounted in the top of the enclosure.

An additional feature is a TUNE position on the volume control, which allows the transmitter to be continuously keyed for adjustment purposes. Because the circuits are digitally generated, the dot-to-dash ratio is exactly 1 to 3, eliminating the need for weight adjustments. Both dot and dash memories are included and no new characters

will be accepted until the memories are cleared.

An accessory socket is provided which completely interfaces the DE-130 Keyer with the DE-131 Message Storage Unit. With the optional DE-131, the DE-130 Keyer is converted into a large, 6000-bit memory keyer with six memories which store about 80 characters in each.

The price of the DE-130 Keyer and the DE-131 Message Storage Unit is $79.95 each. The units carry a one-year warranty and may be returned for a refund during a 15-day trial period. For more information, write to Dynamic Electronics, Inc., P.O. Box 896, Hartselle, Alabama 35640.

Amperex rf Power Transistor Catalog

The transistors outlined in this catalog are designed for use in applications above 1 MHz with rf power above 1 watt. The catalog divides the transistors into two categories. The first category is for transistors used at collector voltages of 12.5-13.6 volts. These devices are primarily designed for vehicular communications, including 12.5 volts SSB applications. The second category are those used at collector voltages of 28 volts — devices designed for military and base-station applications where low-current power supplies are used.

The catalog is available without charge from the Hicksville Division of Amperex. To obtain your copy, write or call Marty Burden, Product Manager, R.F. Power Transistors, Amperex Electronic Corporation, Hicksville Division, Hicksville, New York 11802.

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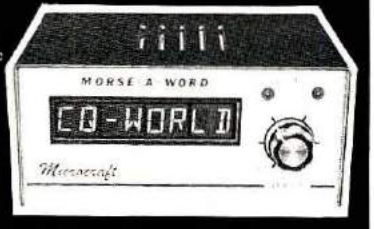

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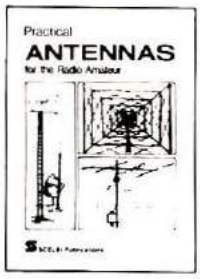

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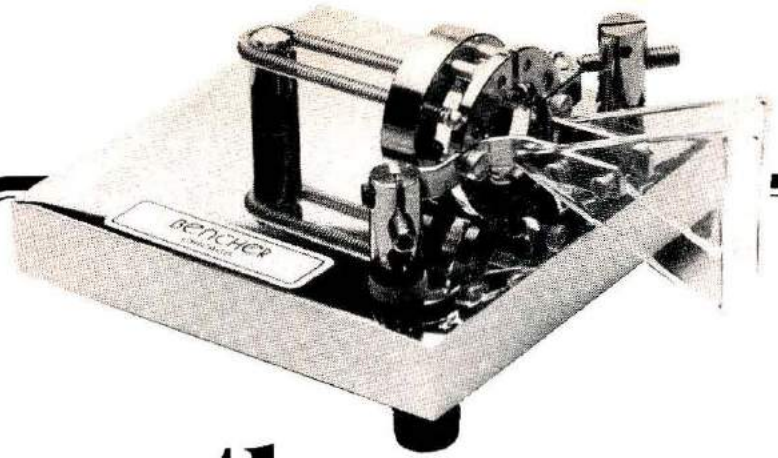

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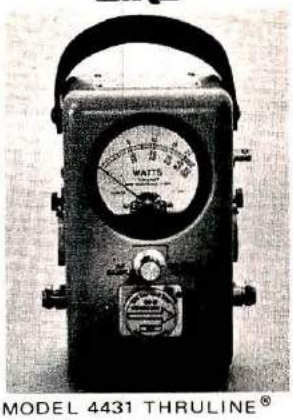

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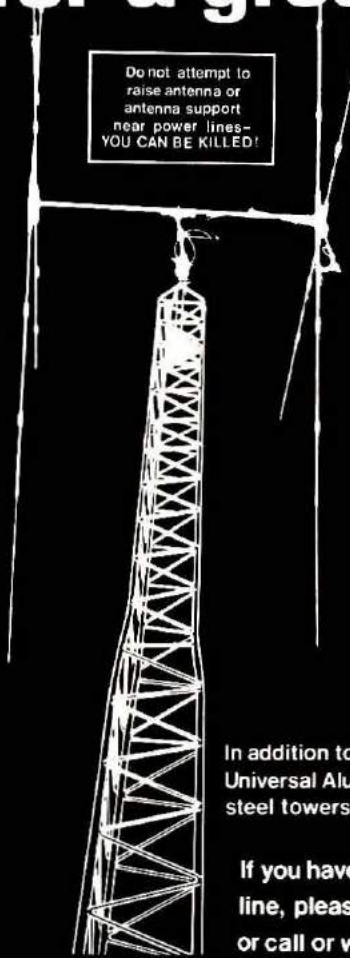

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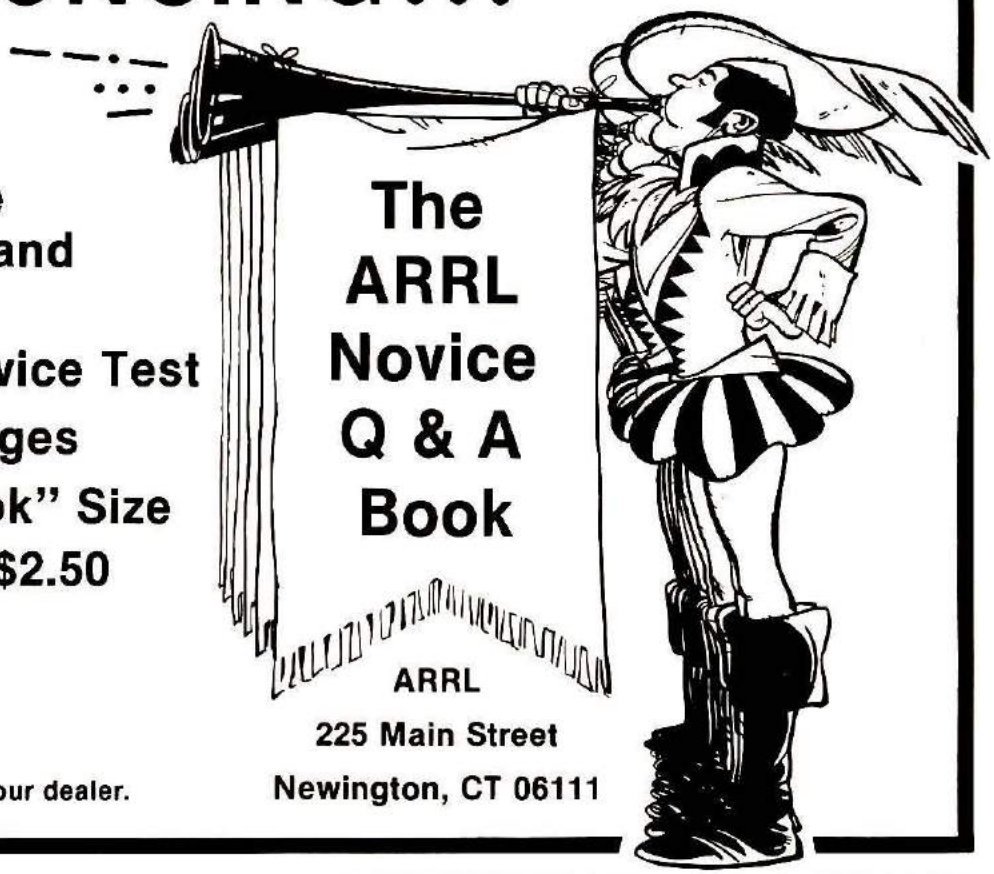

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8012 CONSER
OVERLAND PARK, KS 66204
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Store. Trade - Sell - Buy.

Maryland

THE COMM CENTER INC.
9624 FT. MEADE ROAD
LAUREL PLAZA RT. 198
LAUREL, MD 20810
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R. L. Drake, Ten-Tec, ICOM, Swan,
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Massachusetts

TEL-COM, INC.
675 GREAT RD., RT. 119
LITTLETON, MA 01460
617-486-3040
The Ham Store of New England
You Can Rely On.

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LINCOLN, NE 68504
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CONCORD, NH 03301
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17 LEWIS STREET
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RATES Regular classified is available at 50¢ 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.

SEND MATERIAL TO: Ad Scan, Ham Radio Horizons, Greenville, N. H. 03048.

NEW JERSEY: West Jersey Radio Amateurs Hamfest, August 19, 1979, 10 A.M. to 5 P.M. at McGuire Air Force Base, Wrightstown. Admission $2 at door, $1.50 advance. XYLs and children free. $2 additional for tailgate or table space (bring own table). Refreshments, door prizes, activities for all. Talk-in on 146.52 and 147.75/.15. Advance tickets: Sam Shontz, WB2GEX, 107 Spruce Lane, Rte. 16, Mt. Holly, New Jersey 08060. Information: Larry Cohen, WA2TRJ (609) 871-5852 or Mary Lou Shontz, WB2QIU, (609) 267-3063.

EZ DEALS are hard to beat. Try me and see for new or used ICOM, Cushcraft, KLM, Yaesu, Drake, Wilson, VHF Eng., Ten-Tec, Swan, Den-Tron, CDE, Hustler, Larsen, and more. W0EZ, Bob Smith Electronics, RFD 3, Fort Dodge, Iowa 50501. (515) 576-3886.

SCANNER OWNERS! "Top Secret Registry of U.S. Government Radio Frequencies (25 to 470 MHz)" by K2AES! Only book of its kind ever published! 2,250+ listings of: FCC, FBI, Secret Service, CIA, Customs, Border Patrol, Immigration, NASA, Treasury, FAA, military, and more! Only $4.95, ppd. CRB Research, Box 56-HR, Commack, NY 11725.

ARKANSAS: Second Annual Ham-A-Rama, August 4th and 5th, 1979, Arkansas State Fairgrounds, Little Rock. Talk-in on 146.34/146.94. For more information contact Morris Middleton, AD5M, 19 Elmhurst Drive, Little Rock, Arkansas 72209. (501) 568-0938.

CENTURY 21 DIGITAL $330; 18AVT $84; Omni-D $746 — All new. Supina, 525 Ridge, State College, PA 16801.

CALL TOLL FREE for an EZ deal. 800-247-2476/1793. Iowa call 800-362-2371. See ad elsewhere. W0EZ, Bob Smith Electronics, RFD 3, Fort Dodge, Iowa 50501.

QSLs with class! Unbeatable quality, reasonable price. Samples: 50¢ refundable. QSLs Unlimited, 1472 SW 13th Street, Boca Raton, FL 33432.

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CIRCUIT BOARDS: Your artwork, quick delivery, reasonable prices, quantity discounts. Richard Allran, Box 974, Dept. E, Waynesville, NC 28786.

RADIO EXPO '79 September 15 and 16, 1979, Lake County Fairgrounds, Routes 120 and 45, Grays Lake, Illinois. Manufacturer's displays, flea market, seminars, ladies' programs. Advance tickets $2.00. Write EXPO, P.O. Box 305, Maywood, IL 60153. Exhibitors inquiries: EXPO Hotline (312) 345-2525.

ILLINOIS: Indiana Repeater System Hamfest, Sunday, September 2, 1979 at the Georgetown, Illinois Fairgrounds. Gates open 6 AM. Donation $2 per person 14 years and older. Talk-in on 146.22/.82 and 146.94 simplex. Prizes and special attractions. For more information, write IRS, Inc., P.O. Box G, Catlin, Illinois 61817.

STOP LOOKING for a good deal on amateur radio equipment — you've found it here — at your amateur radio headquarters in the heart of the Midwest. Now more than ever where you buy is as important as what you buy! We are factory-authorized dealers for Kenwood, Drake, Yaesu, Collins, Wilson, Ten-Tec, Atlas, ICOM, DenTron, MFJ, Tempo, Regency, Hy-Gain, Mosley, Alpha, Cushcraft, Swan and many more. Write or call us today for our low quote and try our personal and friendly Hoosier service. HOOSIER ELECTRONICS, P.O. Box 2001, Terre Haute, Indiana 47802. (812) 238-1456.

MICHIGAN: Black River A.R.C. VHF Picnic and Swap-N-Shop, Sunday, August 5th, Allegan County Park, tenth mile north of South Haven on Interstate 196. Talk-in on 147.90/.30 and 146.52 simplex. Bring family and picnic basket. Contact Ed Alderman, WB8BNN, R.R. #2, Box 98AA, Bangor, MI 49013; Tel: (616) 427-8830.

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GEORGIA: 1979 Cedar Valley Hamfest, 8-4, August 12th at Polk County Fairgrounds, two miles east of Cedartown on US 278. Talk-in on 147.72/.12. Food, drink, prizes, contact Jim Schliestett, W4IMQ, P.O. Box 93, Cedartown, GA 30125; Tel. (404) 748-5968.

MOBILE IGNITION SHIELDING provides more range with no noise. Bonding strap sale less than 50¢ each. Literature. Estes Engineering, 930 Marine Drive, Port Angeles, Wash. 98362.

FLORIDA: 1979 Jacksonville Hamfest and ARRL North Florida Section Convention, August 4th and 5th, Jacksonville Municipal Beach Auditorium. Indoor swap area, advance table reservations $5 from Robbie Roberts, 10557 Atlantic Blvd., #31, Jacksonville, FL 32211. Advance registrations $3 from R. Cutting, 303 Tenth Street, Atlantic Beach, FL 32233. Door price $3.50. Lots of fun and big programs.

QSLs SECOND TO NONE. Same day service. Samples 50 cents. Include your call for free decal. Ray, K7HLR, Box 331, Clearfield, UT 84015.

ELECTRONIC BARGAINS, CLOSEOUTS, SURPLUS! Parts, equipment, stereo, industrial, educational. Amazing values! Fascinating items unavailable in stores or catalogs anywhere. Unusual FREE catalog. ETCO-059, Box 762, Plattsburgh, N.Y. 12901.

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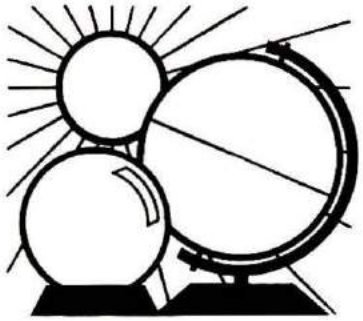
NEW CONCEPT — Novice instructional package, theory tape & study material. Complete license study package, $18.95. General study package, $21.95. MARI, 1320 Canary Drive, West Columbia, SC 29169.

RG-213/U COAX — 50Ω MIL Type (MIL-C-17). 100′ multiples, 23¢/ft. 400′ roll, 21¢/ft. Add UPS shipping. Info — SASE. JRS Electronics, (WA8OGS), P.O. Box 1893-C, Cincinnati, Ohio 45201.

ILLINOIS: Hamfesters 45th Annual Picnic and Hamfest, Sunday, August 12th, Sante Fe Park at 91st and Wolf Road, Willow Springs, IL southwest of Chicago. Famous Swappers Row. Tickets at gate $2, advance $1.50. For hamfest info or advanced tickets (send check or m.o. and S.A.S.E. to Box 42792, Chicago, IL 60642.

QSLS — Simply the best. Generous sample packet 25¢. K3QK, 226 Waldorf St., Pittsburgh, PA 15214.

ANTENNA HOMEBREWERS: Complete line of aluminum, fiberglass, and stainless-steel antenna hardware. We will custom-design for you or supply to your design at prices you can't beat! GL Enterprises, Route 1, Box 10G, Brownsville, Wisconsin 53006. (414) 583-4001.



DX FORECASTER

Propagation Special

Look for unusual ionospheric and geomagnetic field activity, possibly coupled with atmospheric storms, during the week between the 4th and the 11th. Perigee and full moon occur on the 8th and 7th, respectively. Again, during a three-day period between the 17th and 20th, there are likely to be disturbances of a major nature in both the ionosphere and atmosphere. Finally, the three-day period between the 22nd and 24th could be exciting, with the new moon occurring between the 22nd and 23rd, and an annular solar eclipse on the 22nd. The eclipse will be visible only in the south Atlantic and Pacific oceans, in southern South America, and in part of Antarctica.

The Perseid meteor shower on August 12th reaches a maximum of about 50 entries per hour with each having a visible persistence of about 5 seconds, so vhf meteor-burst propagation will be quite good after about six PM eastern *standard* time. (Begin listening at about 7 PM daylight saving time, and look for visual signs after dark.)

Band-by-band conditions

The accompanying chart will list the times, paths, and frequencies for band openings to various parts of the world. Except for very disturbed periods, DX conditions should be excellent on all bands above 40 meters. The asterisk (*) means to look at the next higher band for a possible opening at the times shown. Six and two meters are likely to be very active *for DX work* this month, so be sure to look at times when ten meters is open. Long-haul DX is both possible and likely on six-meter circuits, so stay sharp.

Ten Meters will be very active, although short-skip conditions predominate at this time of the summer. You will find that short-skip signals can be extremely loud.

Fifteen Meters is also likely to be one of the best DX bands available, being open longer than *Ten*, while giving excellent short-skip results within the U.S. *Ten* and *Fifteen* are good bets for making skeds with your friends in other parts of the United States, because you will find good, solid conditions on most days of the month.

Twenty Meters will be its usual busy self, yielding rare DX almost weekly, as DXpeditions jaunt here and there around the globe. This band is crowded with B-I-G signals, so use discretion and patience in trying to crack pileups. Guile is better than bravado if your beam is low and power is modest.

Forty and *Eighty Meters* are practically useless for DX. Be patient, for they will return in full swing in another month or so. High absorption levels and QRN keep activity at a minimum on these bands until fall. You can try for DX on those clear, cold evenings after about ten PM local time. Also, it may be worthwhile to look at local dawn and dusk for about a half hour to catch some "gray-line" DX.

In the meantime, there's plenty to keep you busy above 14 MHz! **HRH**

WESTERN USA

GMT	PDT	N	NE	E	SE	S	SW	W	NW
0000	5:00	15	15	10	10*	15	10*	10	10
0100	6:00	15	15	15	10*	15	10	10	15
0200	7:00	10	20	20*	10	15	10	10	15
0300	8:00	10	20	20	15	15	10	10	15
0400	9:00	15	20	20	20*	20	15*	10	15
0500	10:00	15	20	20	20	20	15*	15*	15
0600	11:00	20	20*	20	20	20	15	15	15
0700	12:00	—	20	—	20	20	15	15	20
0800	1:00	—	20	—	—	20	15	15	20
0900	2:00	—	—	—	—	—	15	15	—
1000	3:00	—	—	—	—	—	15	15	—
1100	4:00	—	—	—	—	—	15	15	—
1200	5:00	—	—	—	—	—	20	15	—
1300	6:00	—	20	—	20	—	20	—	—
1400	7:00	—	15	—	20*	—	20	—	—
1500	8:00	20	15	20	15	—	20	—	—
1600	9:00	20*	15*	15	15*	—	—	—	20
1700	10:00	15*	15*	15	10	—	—	20	20
1800	11:00	10	15*	15	10	—	—	15	20
1900	12:00	15	15*	15	10	—	—	15	20
2000	1:00	20	15	15	10	—	20*	10	15
2100	2:00	20	15	15	10	—	15	10	15*
2200	3:00	20*	15	10	10	15	15*	10	10
2300	4:00	15	15	10	10	15	10*	10	10

MID USA

MDT	N	NE	E	SE	S	SW	W	NW
6:00	15	15	10	15*	20	10	10	10
7:00	15*	20	15	15	20	10	15	15
8:00	10	20	15	15	20	15*	15	15
9:00	15*	20	15	15	20	15	15	15
10:00	15	20	20*	20*	20	15	15	20
11:00	20	15*	20	20	20	15	20	20
12:00	—	—	20	20	20	15	20	20
1:00	—	—	—	20	20	15	20	—
2:00	—	—	—	—	—	15	—	—
3:00	—	—	—	—	—	20	—	—
4:00	—	—	—	—	—	20	—	—
5:00	—	—	—	—	—	20	—	—
6:00	—	—	20*	20*	—	20	20	—
7:00	20*	15	15	15	—	20	20*	—
8:00	15	15	15	15	—	20	15*	—
9:00	15	15	15	15	—	20	10	20
10:00	15*	15	15	15	—	—	15	20
11:00	10	15	15	15	—	—	20	20
12:00	10	15*	15*	15*	—	—	15	20
1:00	10	10	10	10	—	—	10	20
2:00	10	10	10	10	15	—	10	15
3:00	10	15*	10	10	15	10	10	15*
4:00	10	—	10	10	15	10	10	10
5:00	15*	—	10	15*	15	10	10	10

CDT
7:00
8:00
9:00
10:00
11:00
12:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
1:00
2:00
3:00
4:00
5:00
6:00

EASTERN USA

EDT	N	NE	E	SE	S	SW	W	NW
8:00	15	20	15	10	20	15*	15	10
9:00	15	—	—	10	20	15	15	15
10:00	15	—	—	15	20	15	15	15
11:00	15	—	—	15	20	15	20	15
12:00	20	—	—	20*	20	20	20	20
1:00	—	—	—	20	20	20	20	20
2:00	—	—	—	—	20	20	—	—
3:00	—	—	—	—	20	20	—	—
4:00	—	—	—	—	—	20	—	—
5:00	—	—	20	—	—	—	—	—
6:00	—	20	20	—	—	—	—	—
7:00	20	20*	20*	20	—	20	—	—
8:00	20*	15	15	20	—	15	—	—
9:00	15	15	15	15	—	15	20*	20
10:00	15*	10	15*	15	—	15	20	20
11:00	10	15*	10	15	—	20	15	20
12:00	10	15	10	15*	—	—	15	20
1:00	15*	15	10	10	—	—	15	15
2:00	15	15	10	10	—	—	15	15
3:00	15	15	10	10*	—	—	15*	15
4:00	15	15	10	10*	—	20	10	15
5:00	15	15	15*	10	—	15	10	15
6:00	20	15	15	10	—	10	10	10
7:00	15	15	15	10	20	10	15*	10

AUGUST
ASIA FAR EAST
EUROPE
S. AFRICA
S. AMERICA
ANTARCTICA
NEW ZEALAND
OCEANIA AUSTRALIA
JAPAN

AUGUST
ASIA FAR EAST
EUROPE
S. AFRICA
S. AMERICA
ANTARCTICA
NEW ZEALAND
OCEANIA AUSTRALIA
JAPAN

AUGUST
ASIA FAR EAST
EUROPE
S. AFRICA
CARIBBEAN S. AMERICA
ANTARCTICA
NEW ZEALAND
OCEANIA AUSTRALIA
JAPAN

HAM CALENDAR

August 1979

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
*All international events such as contests are shown on the GMT days on which they take place even though they may actually begin on the evening of the preceding day in North America	The Fort Venango Mike and Key Club will be at the Drake Well in Titusville, Pennsylvania the 26th to celebrate the 120th anniversary of drilling oil. Look for W3ZIC at the top kHz of each phone band. Certificates will be issued to those wanting them by sending a SASE to Bob Culbertson, WA3YGO, 601 Cornplanter Avenue, Oil City, Pennsylvania 16301.		1	Amateur Radio Council of Arizona Ft. Tuthill Hamfest — Info: Ft. Tuthill Hamfest, C/O 8520 E. Edward Avenue, Scottsdale, AZ 85253 — 3-5 Texas VHF-FM Society Convention — Quality Inn — Irving, TX — WA5TKU — 3-5	2 3	Central Arkansas Radio Emergency Net Hamfest — Arkansas State Fairgrounds — Little Rock, AR — 4-5 Illinois QSO Party — 1800Z 8/4 - 2300Z 8/5 — Rest period 0500Z - 1200Z 8/5 Jacksonville Hamfest — Jacksonville Beach Municipal Auditorium — Jacksonville, FL — 4-5 UHF Contest — 4-5 YO DX Contest — 4-5 4
Radio Central ARC Hamfest — Mt. Sinai Elementary School — Long Island, NY — Rain date 8/12 South Hills Brass Pounders and Modulators Hamfest — Allegheny County Community College — Pittsburgh, PA 5	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM 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 9PM PDST 3540 kHz, A-1, 22 WPM 6	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) 7	8	9	Golden Spread Hamfest The Inn of Amarillo Amarillo, TX — 10-12 10	ARRL Pacific Div. Convention — MGM Grand Hotel — Reno, NV — 11-12 Burlington ARC International Field Days — The Old Lantern — Charlotte, VT — 11-12 Delaware ARA Hamfest — Springwater Park — Muncie, IN DeVry Tech ARC Flearmarket — DeVry Technical Institute — Woodbridge, NJ Kansas-Nebraska RC Hamfest/Flearmarket — Cloud County Community College — Concordia, KS — WØUQD — 11-12 WAE Contest — CW — 11-12 11
Bluegrass ARC Hamfest — Fasig-Tipton Sales Paddock, Newton Pike — Lexington, KY — WA4ONE Cedar Valley ARC Hamfest — Polk County Fairgrounds — Cedartown, GA Hamfesters Picnic/Hamfest — Santa Fe Park — Willow Springs, IL Jackson County ARC Hamfest — West Virginia FFA-FHA Conference Center — Ripley, WV 12	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 13	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) 14	15	16	17	North Alabama Ham Assoc. Hamfest — Calhoun Community College Gym Decatur, AL — 18-19 SARTG RTTY Contest — 18-19 SEANET Contest — Phone — 18-19 Straits Area RC Hamfest — Middle School — Petoskey, MI — 18-19 550 ARC and Oakland Repeater Inc. Flearmarket — American Legion Hall, Oak Street — Oakland, NJ 18
See August 4, 6, 11, 20, 25, 26  19	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM 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 9PM PDST 3540 kHz, A-1, 22 WPM 20	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) 21	22	23	24	All Asian Contest — CW — 25-26 Ohio Interstate QSO Party — 1800Z - 0400Z each day — 25-26* Tioga County (PA) ARC Hamfest — Tioga County Fairgrounds on Route 660, off U.S. Route 6 — WB3CUF or AE3Z WELI ARC Flearmarket — Radio Towers Park, Benham Street, Hamden, CT 25
Fox River Radio League Hamfest — Kane County Fairgrounds Exhibition Hall — St. Charles, IL Greater Columbus Ohio area Hamfest — Marysville Fairgrounds, 30 Miles N.W. of Columbus, OH Iowa 75-Meter Net Picnic — Hickory Hills Park — S. of Waterloo, IA LaPorte County Hamfest — County Fairgrounds on Highway 2 — W. of LaPorte, IN St. Charles ARC Hamfest — Wentzville Community Club, 25 Miles W. of St. Louis on I-70 26	FLORIDA HAM NEWS — SWAP NET By the Broward ARC 146.31-91 at 7:30PM GLENHURST RADIO SOCIETY Transmits Amateur Radio News — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB 27	AMSAT Eastcoast Net 3850 kHz 9PM EDST (0100Z Wednesday Morning) AMSAT Mid-Continent Net 3850 kHz 9PM CDST (0200Z Wednesday Morning) AMSAT Westcoast Net 3850 kHz 8PM PDST (0300Z Wednesday Morning) 28	29	30	31	"HELL DXPEDITION" By the Adrian Amateur Radio Club — 1800Z 8/25 - 1600Z 8/26. Operating frequencies will be CW — 3710, 3565, 7110, 14065, 21110, 21065 SSB — 3900, 7235, 14285, 21360, 28625 A colorful QSL certificate will be yours if your QSL is accompanied by a legal size SASE and mailed to: WB1OE, P.O. Box 111, Adrian, Michigan 49221

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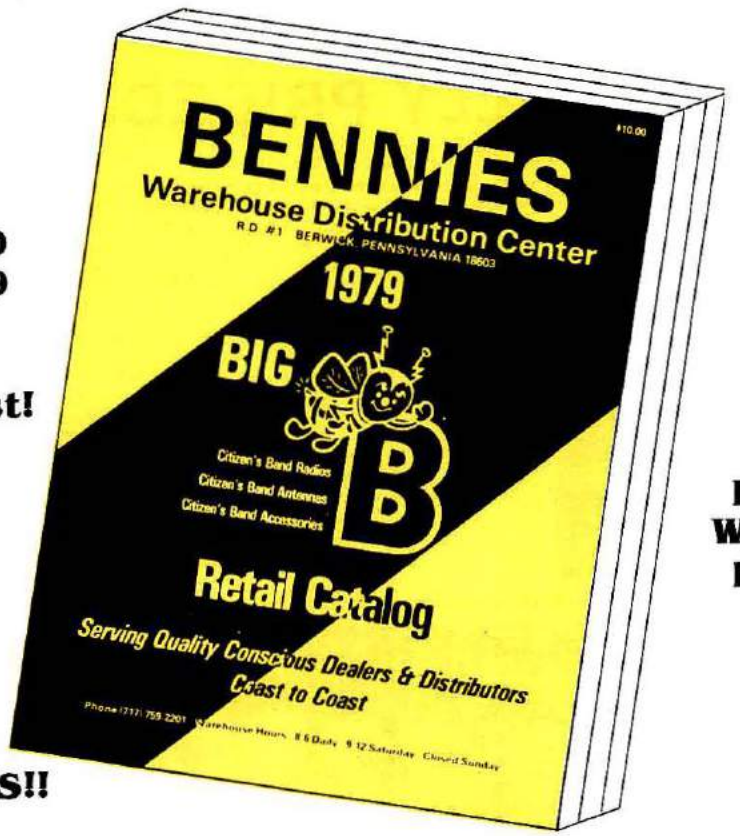

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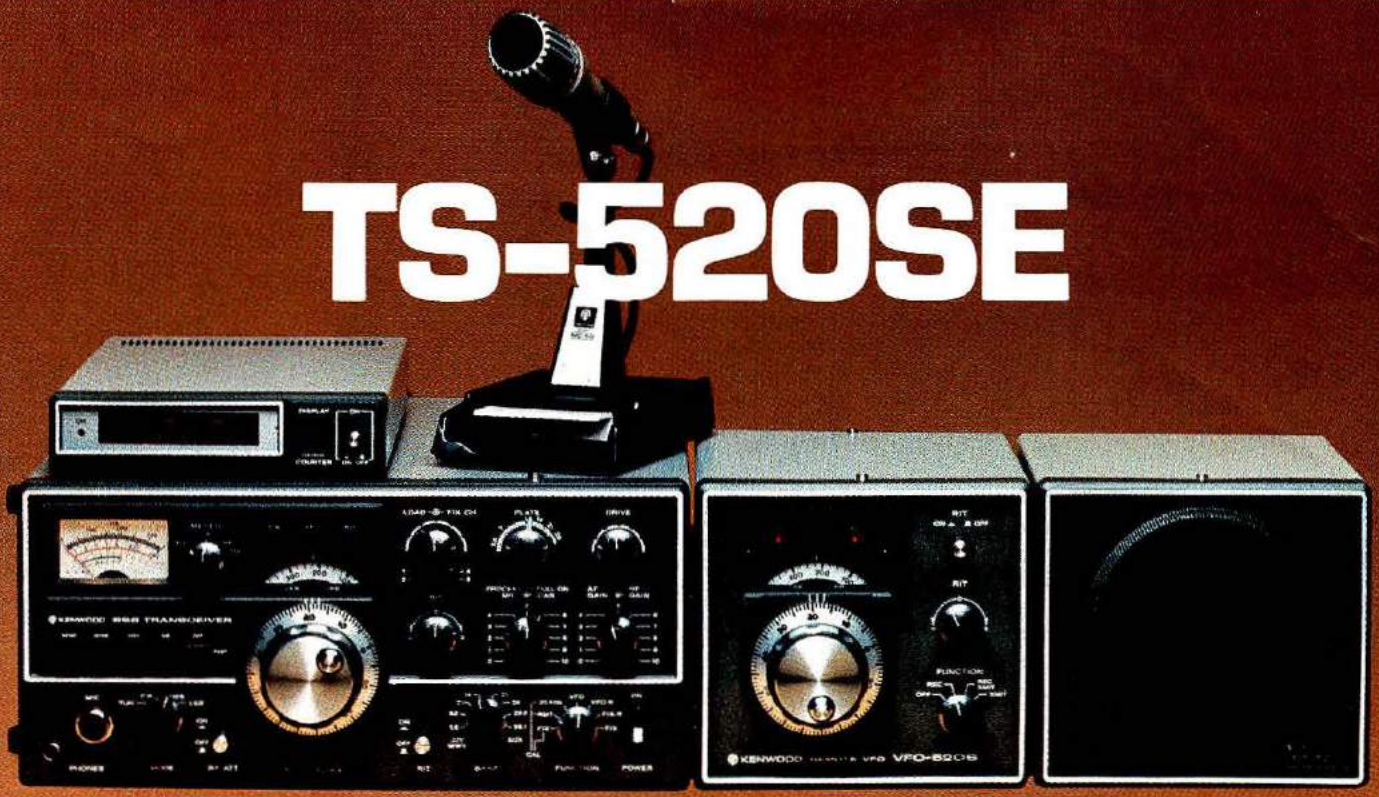

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- Removed DC converter terminals. Now it operates strictly on 120 VAC and is not intended for mobile use.
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- TL-922A linear amplifier.
- MC-50 dynamic microphone.
- SM-220 Station Monitor with BS-5 pan display module.

SPECIFICATIONS FOR THE TS-520SE

GENERAL:	
Frequency Range:	1.8- 2.0 MHz (160 m) 3.5- 4.0 MHz (80/75 m) 7.0- 7.3 MHz (40 m) 14.0-14.35 MHz (20 m) 21.0-21.45 MHz (15 m) 28.0-28.5 MHz 28.5-29.1 MHz (10 m) 29.1-29.7 MHz 15.0 MHz, receive only (WWV)
Modes:	SSB (USB, LSB), CW
Antenna Impedance:	50-75 ohms
Frequency Stability:	Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during any 30-minute period thereafter.
Power Requirements:	120 VAC, 50/60 Hz; 280 W (transmit)
Dimensions:	13-1/8 inches wide, 6 inches high, 13-3/16 inches deep
Weight:	35.2 pounds
TRANSMITTER:	
Input Power:	200 W PEP (SSB), 160 W DC (CW)
Carrier Suppression:	Better than 40 dB
Unwanted Sideband Suppression:	Better than 50 dB
Spurious Radiation:	Better than -40 dB
Microphone Impedance:	50 k ohms
AF Response:	400-2,600 Hz
RECEIVER:	
Sensitivity:	0.25 μV for 10 dB (S + N)/N
Selectivity:	SSB: 2.4 kHz/-6 dB; 4.4 kHz/-60 dB CW: 0.5 kHz/-6 dB; 1.5 kHz/-60 dB (with optional CW filter)
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IF Rejection:	Better than 50 dB
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