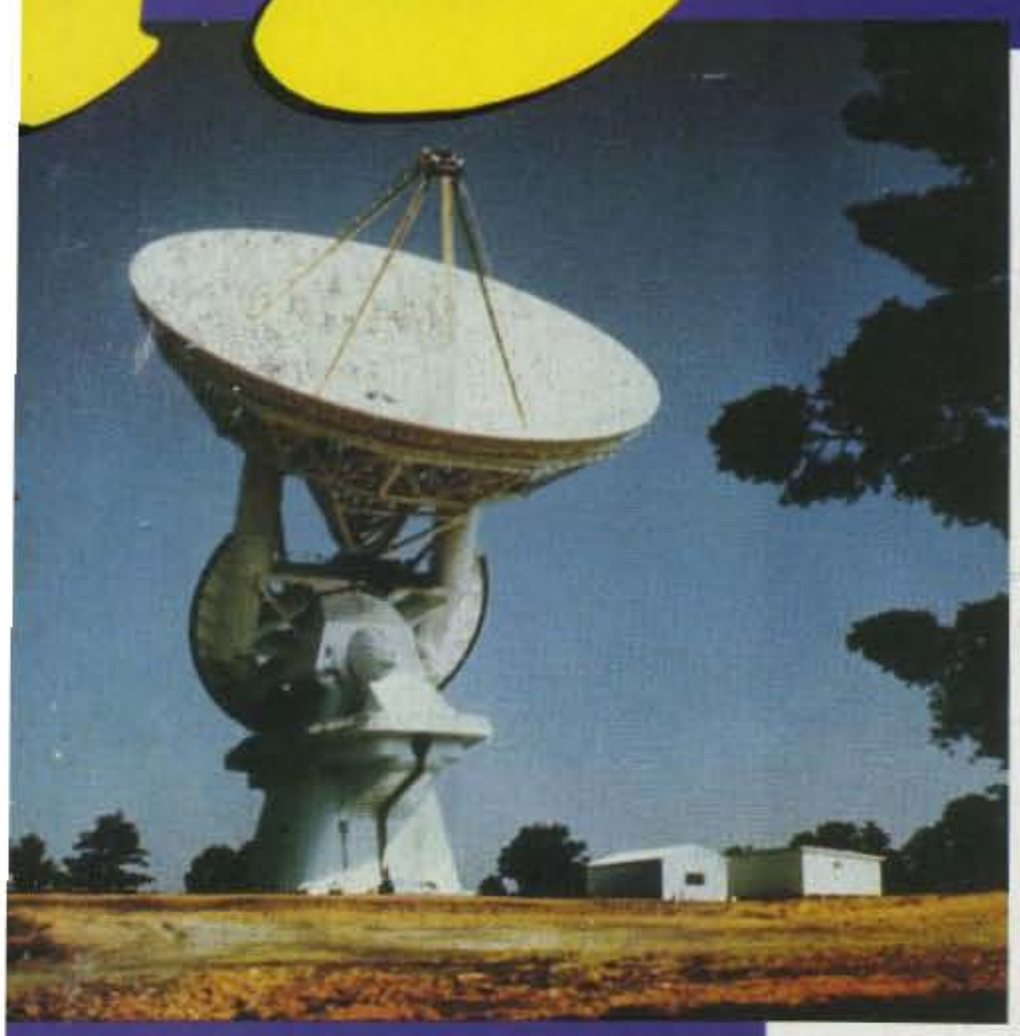
SEPTEMBER 1987
Issue #324

73® Amateur Radio

USA $2.95
CAN. $3.95
A WGE Publication



SPECIAL ANTENNA ISSUE

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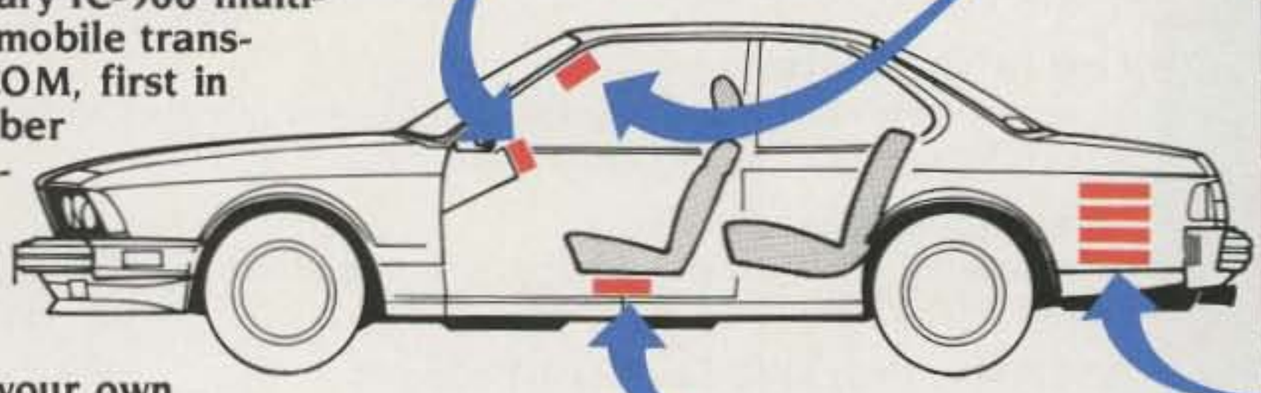
NEW

ICOM IC-900
Six Bands in One Mobile!

Speaker

Remote Controller



Band Units/Interface Unit B

Interface Unit A

ICOM IC-900 FIBER OPTIC FM MOBILE

ICOM introduces the revolutionary IC-900 multi-band FM mobile transceiver. ICOM, first in utilizing fiber optic technology in amateur radio, enables you to create your own mobile communications system. Six band combinations...10M FM, 6M, 2M, 220MHz, 440MHz, and 1.2GHz. It's the most advanced, versatile, compact, and easy-to-use mobile available.

Features Galore. The IC-900 is an operator's dream...Listen on two bands simultaneously or transmit on one band and receive on a different band when using a second speaker (**true full duplex crossband operation**), 10 memories per band, independent PL tones and offset into each memory, memory and programmable band scan, and all subaudible tones in actual Hz readout.

The IC-900 includes an ultra compact remote controller, an Interface A unit, Interface B unit, SP-8 speaker, HM-14 up/down DTMF mic, **fiber optic** and controller cables.

Remote Controller. Measuring only 2 inches high by 5.7 inches wide by 1 inch deep, the remote controller can be installed on your car's dash or sun visor with the supplied velcro. And, if you want, take the controller with you when you leave your car. The controller features a super large, highly visible LCD.

Interface Unit A is installed in a location near the driver's seat.

Interface Unit B controls the six band units and can be installed in your car's trunk. A **fiber optic** cable runs from Interface A to Interface B, which transports an abundance of information through a 3/16" cable and eliminates RF feedback.

Band Units are "stacked" onto the Interface B Unit via the supplied mounting bracket. Optional band units available are:

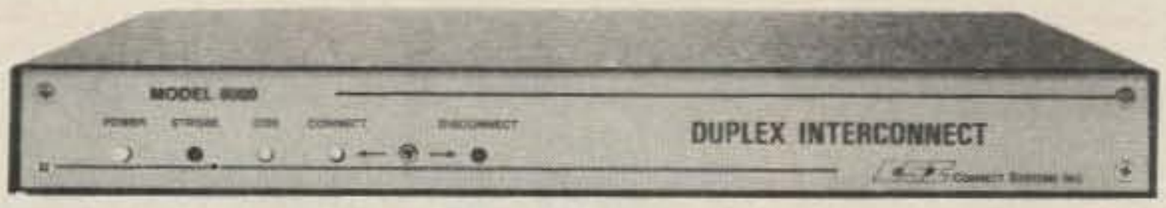
Band Unit	Power Output	Frequency
UX-19A	10W/1W	28-30MHz
UX-29A	25W/5W	138-174MHz Rx; 140.1-150MHz Tx
UX-29H	45W/5W	138-174MHz Rx; 140.1-150MHz Tx
UX-39A	25W/5W	216-236MHz Rx; 220-225MHz Tx
UX-49A	25W/5W	440-450MHz
UX-59A	10W/1W	50-54MHz
UX-129A	10W/1W	1240-1300MHz

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline** (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4

MODEL 8000 DUPLEX



- Desk top or rack mounted versions
- Pulse or fully regenerated tone dialing
- Full and half duplex operation
- Half duplex privacy mode
- Internally squelched audio
- Powerful toll call protection
- Secret toll override code
- ✱ up # down or multi-digit access
- Ringout
- End to end signalling (DTMF standard)
- Auto answer on 1st, 2nd, 4th or 8th incoming ring
- Mobile to mobile signalling
- Telephone initiated control mode
- Dip switch selectable hybrid compensation capacitance.
- Programmable timout and mobile activity timers with unique beeps
- Disconnect beep
- Separate repeat level control
- Lightning protection
- Connectors for options
- 10-16VDC powered

28 dip switches make all features user programmable and selectable.

OPTIONS

8001 ANI code validator (up to 1024 access codes)
8002 1000 call two tone signalling
8003 32 call CTCSS signalling
8004 FCC registered coupler
8005 Centralized computer billing system

NOW ANYONE CAN ENJOY FULL DUPLEX!

Merely connect a CSI Model 8000 to any duplex base (such as the Yaesu FT-2700RH) and presto. . . you have an instant full duplex mobile telephone system!

Or, the 8000 can be connected to any repeater for shared use. A landline caller can selectively call any mobile on the system with (end to end) regenerated DTMF (standard), CTCSS (optional) or two tone sequential (optional). Mobiles can even selectively call **each other**!

Knowing the correct code, a caller can **take control** of the 8000 from any touch phone and **voice communicate** with mobiles that are not equipped with touch dialers.

No other duplex patch offers so much for so little.

FIRST CLASS FEATURES and PERFORMANCE . . . COACH FARE!

MAKE YOUR MOBILE TELEPHONE SYSTEM FLY WITH A PATCH FROM CSI

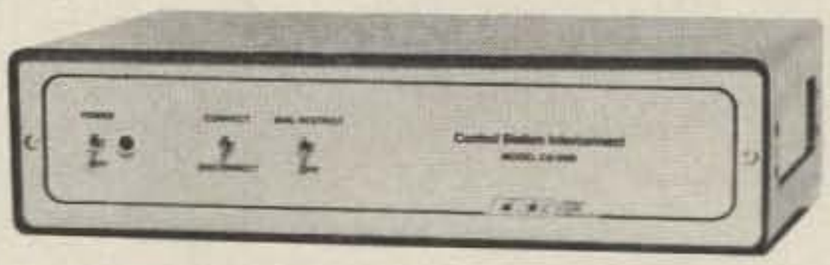
PRIVATE PATCH III

A high performance VOX based patch for simplex systems and for operation through remotely located repeaters.

Thousands of Private Patch III's are in both amateur and commercial use worldwide. Private Patch III enjoys a reputation that is second to none.

CW ID and other powerful features make Private Patch III the best deal going in Vox Simplex phone patches!

MODEL CS-9500



For exemplary simplex performance, the CS-9500 control station interconnect incorporates a full ½ second of landline to mobile electronic voice delay. Voice delay assures cr mpatibility with the slowest CTCSS or trunked repeater systems.

Attractively styled to complement any decor.

STANDARD FEATURES (Both models)

- Three simple connections to base radio
- Simplex operation (VOX, of course)
- Digital "fast VOX"
- Toll restrict
- Secret toll disable code
- Selectable tone or pulse dialing
- Automatic busy signal disconnect
- Control interrupt timer (maintains positive control in simplex mode)
- Three digit access code (eg. ✱ 73)
- Ringout (reverse patch)
- Ringout inhibit if channel is in use
- Lightning protectors
- Spare relay position
- 110VAC supply
- And much more

OPTIONS: 12 VDC or 230 VAC power
FCC registered coupler

CONNECT SYSTEMS INC.
23731 Madison St.
Torrance CA 90505
Phone: (213) 373-6803

CIRCLE 12 ON READER SERVICE CARD

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COM-WEST RADIO SYSTEMS LTD.
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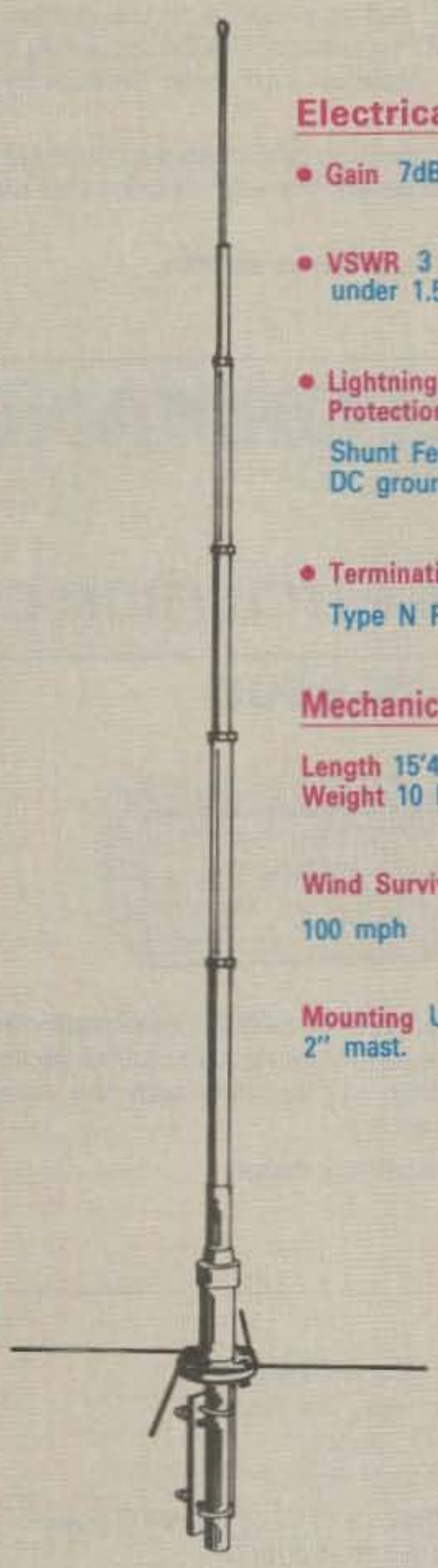
HUSTLER®

Hustler VHF and UHF antennas offer a combination of gain, durability and value which have made them the antenna most often demanded for repeater applications.

Reliability and Performance - Beyond Your Expectations

G7 - 144



Electrical

- Gain 7dBd
- VSWR 3 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

Mechanical

Length 15'4"
Weight 10 lbs.

Wind Survival
100 mph

Mounting Up to 2" mast.

G7 - 220

Electrical

- Gain 7dBd
- VSWR 4 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

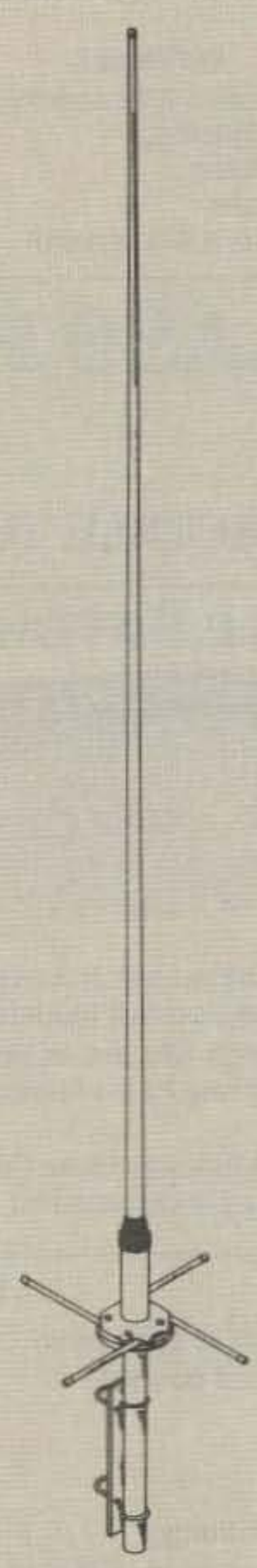
Mechanical

Length 10'2"
Weight 7.0 lbs.

Wind Survival
110 mph

Mounting Up to 2" mast.

G6 - 440



Electrical

- Gain 6dBd
- VSWR 8 MHz under 1.5:1
- Lightning Protection
  Shunt Fed - DC ground
- Termination
  Type N Female

Mechanical

Length 7'3"
Weight 16 lbs.

Wind Survival
125 mph

Mounting Up to 2" mast.

HUSTLER, INC. • One Newtronics Place • Mineral Wells, Texas 76067 • **(817) 325-1386**

CIRCLE 269 ON READER SERVICE CARD

New MFJ-1274 lets you work VHF and HF packet with built-in tuning indicator for $169.95 . . .

. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
$169.95

MFJ-1270
$139.95

Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible $169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and put it all in a new cabinet.

If you don't need the tuning indicator or the convenience of a switchable VHF/HF modem, choose the affordable MFJ-1270 for $139.95.

All you need to operate packet radio is a MFJ-1274 or MFJ-1270, your rig, and any home computer with a RS-232 serial port and terminal program.

If you have a Commodore 64, 128, or VIC 20 you can use MFJ's optional Starter Pack to get on the air immediately. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . .everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95.

Unlike machine specific TNCs you never have to worry about your MFJ-1274 or MFJ-1270 becoming obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port with an apropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them.

Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use.

You can also use the MFJ-1274 or MFJ-1270 as an excellent but inexpensive digipeater to link other packet stations.

Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

You get an easy-to-read manual, a cable to connect your transceiver (you have to add a connector for your particular radio), a connector for the TTL serial port and a power supply for 110 VAC operation (you can use 12 VDC for portable, remote or mobile operation).

Help make history! Join the packet radio revolution now and help spread this exciting network throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.

MFJ-1273, $49.95

Now you can tune in HF, OSCAR and other non-FM packet stations fast! This MFJ clone of the TAPR tuning indicator makes tuning natural and easy - - it shows you which direction to tune. All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz. 20 LEDs give high resolution and wide frequency coverage.

The MFJ-1273 tuning indicator plugs into the MFJ-1270 and all TNC-1s, TNC-2s and clones that have the TAPR tuning indicator connector.

Order any product from MFJ and try it -- no obligation. If not satisfied return within 30 days for prompt refund (less shipping).
• One year unconditional guarantee • Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

MFJ

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"When You Buy, Say 73"

NEVER SAY DIE

FLAB BUSTERS

If you've been doing your homework properly you're well aware that science is quite definite about two things. No matter what the Tobacco Institute does to muddy the waters, the fact is that smoking has two major drawbacks—one, it shortens your life substantially, adding even more to your misery by making your final years far more painful than for non-smokers—two, you're setting an awful example for your kids.

The other science fact is that the more overweight you are, the shorter your life is going to be, other things being equal.

Now, it may be that you, like a few million others in America, are living a life of quiet desperation—anxious to have it all over with, but without the guts to take a long walk on a short pier. We might call that pier pressure. It's unlikely though, for most unhappiness stems from isolation—being lonely. As a ham you have only to turn on your rig and you're immediately up to here in potential friends—unless of course you're a DXer.

DXers have no friends. Their milieu is the pileup or the list, neither of which is calculated to encourage any good feelings from either their competitors or the DX ops having to listen to the silly mess. When a DXer makes a contact, all the other DXers are angry and begrudge every second it keeps them from getting through. Tail-ending, breaking-in, swishing around the band calling, all tend to cause aggravation, not happiness. The DX op, knowing you could care less about him personally—that all you want is a lousy QSL card—isn't one of your bosom buddies either. So much for DXing—and I've worked 320 or so countries and operated from 56 so far, so tell me about it.

There isn't much I can say about smoking—as nasty a government-sanctioned drug addiction as there is, one which inevitably leads to death—usually a painful, lingering one. So light up and let's discuss that big fat beer belly of yours. I see your eyes shifting nervously—I'm hitting home for a lot of hams. Sure, I've seen you at Dayton, your lard hanging over your belt.

You know what scientists have discovered? Well, you don't want to know. They began to suspicion it over fifty years ago when they found that mice fed just above a starvation diet lived twice as long as well-fed mice. Ooops! They've been hoping this didn't apply to humans because scientists, like the rest of us, are addicted to eating.

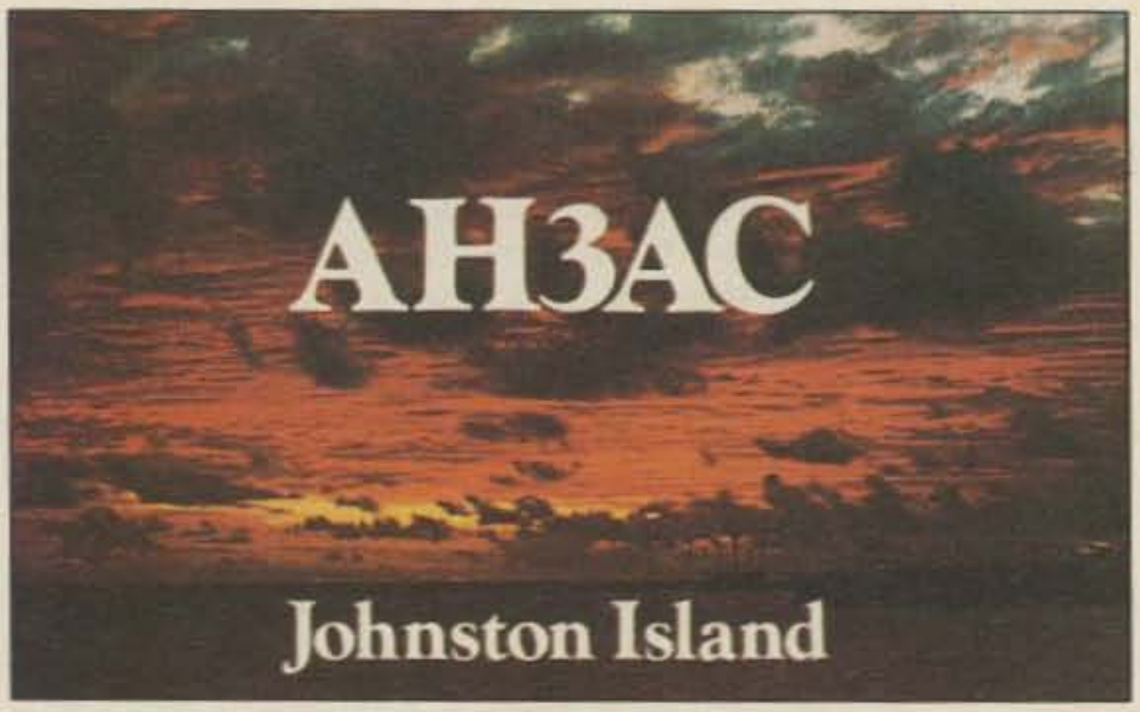
If you've got a good reason to try and stay alive longer than average—and even have hopes of doing this while staying healthy, which does tend to make it more fun—if you're interested in being one of the last surviving hams and writing a book on how we lost our ham bands, one by one, to commercial interests, then you're going to stop smoking—or even breathing second-hand smoke—and you're going to diet down until you are thin. I'm not talking average weight, I'm talking t-h-i-n.

About fifteen years ago I got tired of being fat. I'd been fat since around ten years old when my grandmother filled me full of her incredibly delicious pies, cobblers, and cakes and could find no real benefits to the condition. So I went on a 1500-calorie diet for eight months and dropped 85 pounds. Oh, I eventually put about ten back on, but in general I've held my weight ever since.

Eight months without ice cream—without cake...aaargh! Eight months of cutting the fat off my meat (don't you love ham fat?)—eschewing (not chewing) bread and butter. The fanatic dieter steps anxiously on the scale each morning, hoping for the best. It gets to where you brush your teeth, blow your nose and spit a couple of times, just to be as light as possible for the weigh-in. Good, another third of a pound gone! Whew.

I'm 65 this year so when I read

Continued on page 10



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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...pacesetter in Amateur Radio

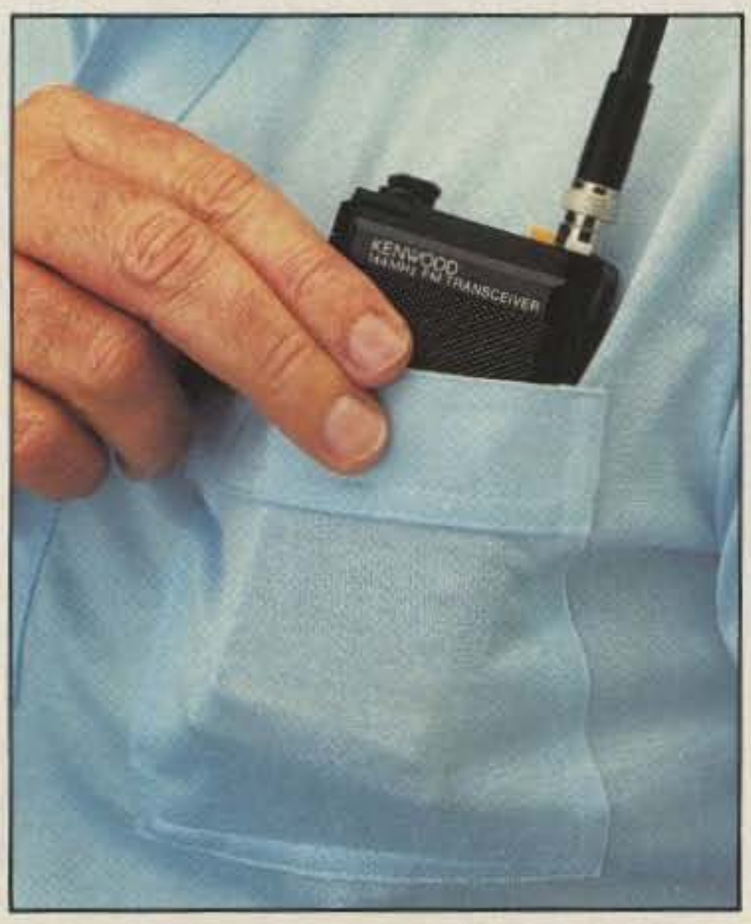
NOW BUILT-IN CTCSS!

By Popular Demand!

TH-21BT/31BT/41BT

The smallest HT™ is now even better! The new "BT-Series" gives you a plus—a built-in DIP switch programmable CTCSS encoder! Now you can access more than one "private line" over the air! The original TH-21A Series (The Smallest HT™) is still available from the VHF leader—Kenwood!

- **High or low power.**
  Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.
- **Pocket portability!**
  Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with PB-21.**
- **Expanded frequency coverage (TH-21BT/A).**
  Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.
  TH-31BT/A: 220.000-224.995 MHz in 5-kHz steps.
  TH-41BT/A: 440.000-449.995 MHz in 5-kHz steps.



- **Easy-to-operate, functional design.**
  Three digit thumbwheel frequency selection and top-mounted controls increase operating ease.
- **Repeater offset switch.**
  TH-21BT/A: ±600 kHz, simplex.
  TH-31BT/A: –1.6 MHz, reverse simplex.
  TH-41BT/A: ±5 MHz, simplex.
- **Standard accessories:**
  Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
- **Quick change, locking battery case.**
  The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.**
  The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

Optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **BC-2** wall charger for PB-21H
- **BC-6** 2-pack quick charger
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **BH-3** belt hook
- **AJ-3** thread-loc to BNC female adapter
- **RA-8A/9A/10A** StubbyDuk antenna
- **TU-6** sub-tone unit (TH-21AT/A only)

More information on the Smallest HT™ is available from Authorized Kenwood Dealers.

KENWOOD

KENWOOD U.S.A. CORPORATION
2201E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

TH-series transceivers shown with optional StubbyDuk antenna.
Specifications and prices are subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

KENWOOD

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Good for Satellite Digital QSOs

Matching Pair

Look for FUJI and PHASE III-C

TS-711A/811A VHF/UHF all-mode base stations

The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

- **Highly stable dual digital VFOs.**
  The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).
- **Large fluorescent multi-function display.**
  Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.
- **40 multi-function memories.**
  Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.

- **Versatile scanning functions.**
  Programmable band and memory scan (with channel lock-out). "Center-stop" tuning on FM. An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**
- **RF power output control.**
  Continuously adjustable from 2 to 25 watts.
- **Automatic mode selection.**
  You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.
- **All-mode squelch.**
- **High performance noise blanker.**
- **Speech processor.**
  For maximum efficiency on SSB and FM.
- **IF shift.**
- **"Quick-Step" tuning.**
  Vary the tuning characteristics from "conventional VFO feel" to a stepping action.
- **Built-in AC power supply.**
  Operation on 12 volts DC is also possible.
- **Semi break-in CW, with side tone.**
- **VS-1 voice synthesizer (optional)**
  More TS-711A/811A information is available from authorized Kenwood dealers.

Optional accessories.

- IF-10A computer interface
- IF-232C level translator
- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48B 16-key DTMF, MC-43S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters:
  SW-200A 1.8-150 MHz
  SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner
- PG-2U DC power cable

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

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QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Education and Young Hams

AMATEUR RADIO HAS OFTEN BEEN ACCUSED of being a pastime for the aging; not totally untrue in light of a recent poll which put the average ham at 58! QRX this month focusses on what's happening to bring fresh blood into our hobby. But first . . .

Larry finds Greener Pastures

WE AT *73 MAGAZINE* ANNOUNCE LARRY LEDLOW NA5E/GØCQW/9H3FS as our new Editor-in-Chief, starting in September.

Larry is bringing a great deal of pertinent experience to the post. He has been writing technical reports for, and editing, official Department of Defense publications since 1980, and has been a regular contributing editor for several journals, including *Monitoring Times*. He is also founder of the only active volunteer examining team in United Kingdom (1985), and has taught numerous U.S. licensing courses since 1983. He has also been extremely active in organizing special event stations and DXpeditions (NA5C/C56 in 1985, and 9H3FS in 1986).

We are proud that Larry chose to be with us to pursue two fine talents of his: writing and amateur radio!

Inter-Urchin Packet Mail

A PROJECT FOR PUTTING DEMONSTRATION HAM RADIO STATIONS IN ELEMENTARY SCHOOLS has provided inspiration for a pocket pen-pal message exchange in New England.

Byron "Luck" Hurder KY1T recently installed a small amateur radio station in his local elementary school on Cape Cod, and reported this in a message to "ALL." When Conrad "Butch" Ekstrom WB1GXM, an elementary school teacher in Lempster NH and an ardent ham, suggested exchanging messages between the students of the two schools, Luck and Butch prepared lists of names, ages, and sexes of their respective candidates and matched them up.

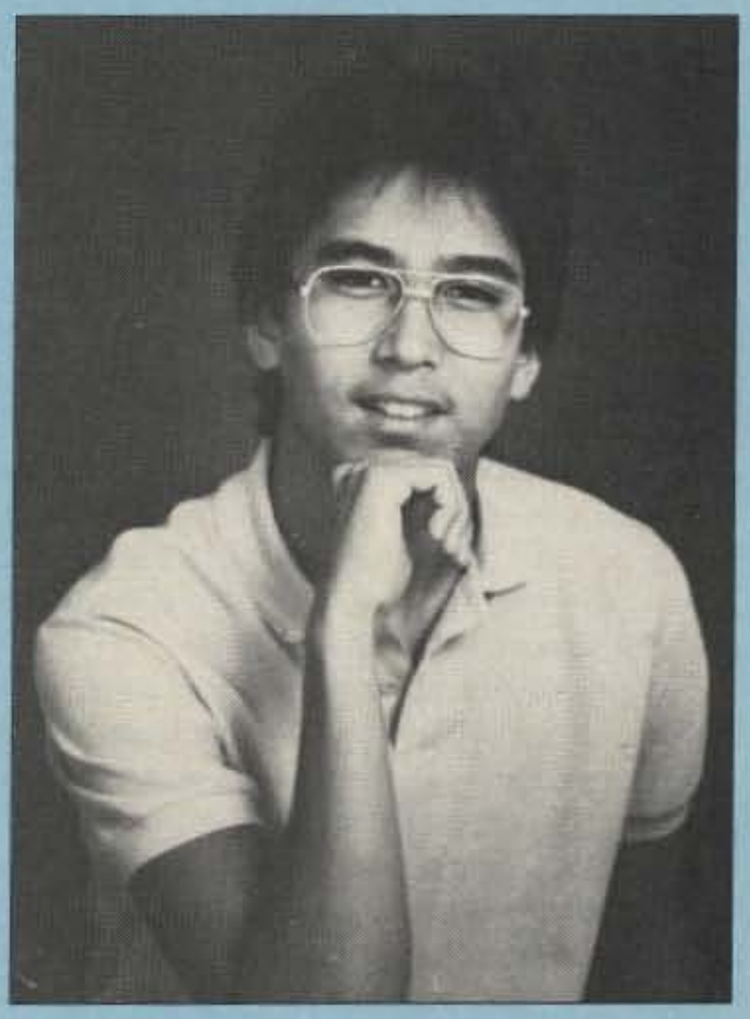
There have now been several packet message exchanges between the two schools. Other hams have already asked to participate, involving several schools around them. This is certainly a nice, easy "grass-roots" project and an excellent promotion of the hobby to young people!

Ham Scholarships

THE PRESIDENT OF THE DAYTON AMATEUR RADIO ASSOCIATION, Ray Smith KR8B, has announced the winners of the association's 1987 scholarships. They are: Douglas Kleeman KA9LWM of Shawano Wisconsin; Carol Colby KA8PLF of Midland, Michigan; Robert Jackson KA7OCV of Tucson, Arizona, and Michael Wozniak KD8TA of Martin's Ferry, Ohio. Each of these students will receive one thousand dollars toward tuition at the school of their choice.

The program is open to any FCC-licensed amateur graduating from high school in the year that the awards are given. There are no restrictions on the license class nor course of study selected by the student.

Information and applications for the program are available after January 1 from DARA Scholarships, 317 Ernst Avenue, Dayton OH 45405. The deadline for receipt of the completed applications is May 15.



Robert Jackson KA7OCV

WB2JSM On Air Again

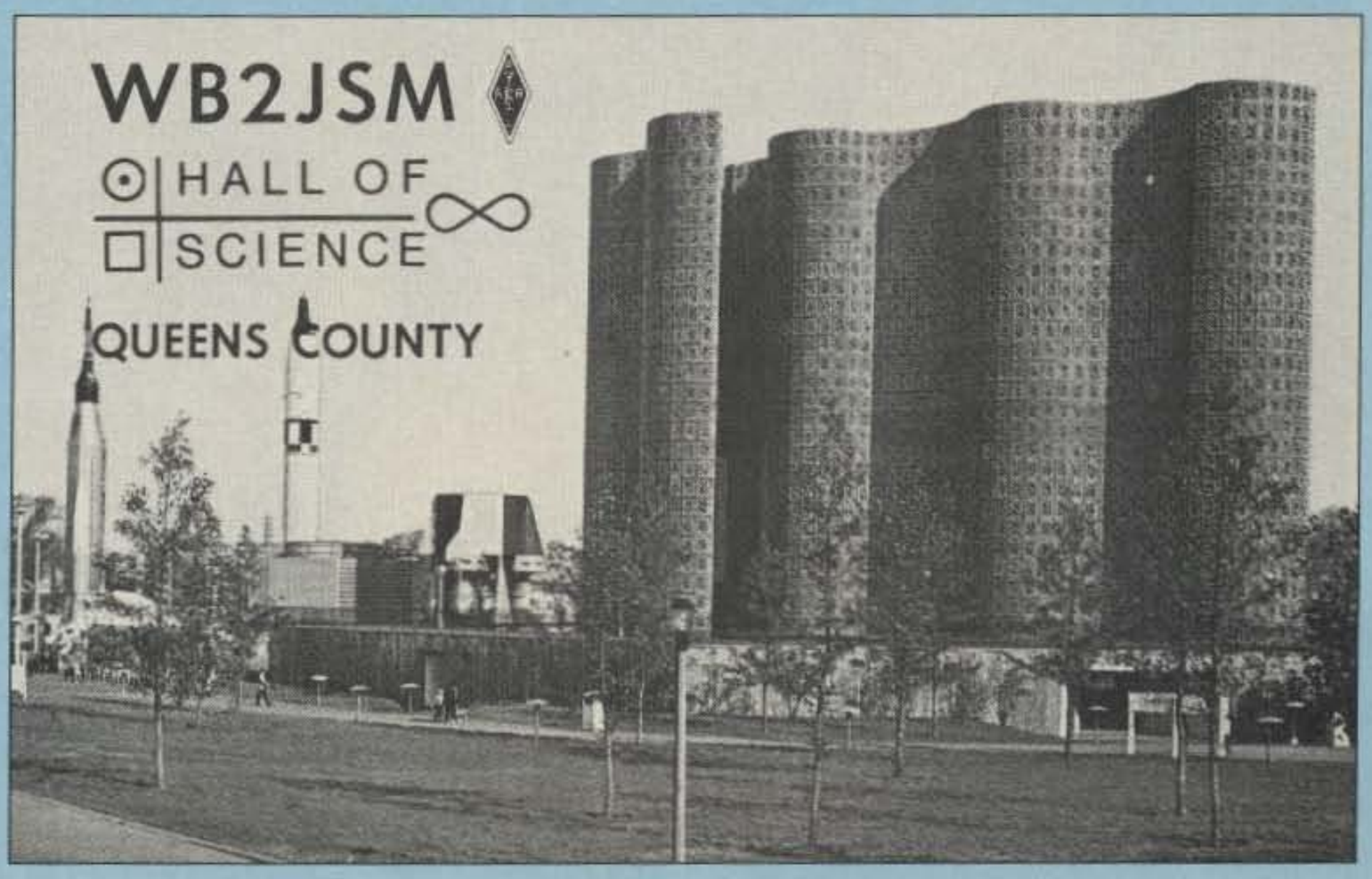
AFTER A NEARLY SEVEN-YEAR HIATUS, the Amateur Radio Club Station of the New York Hall of Science at Flushing Meadows-Corona Park is back on the air. The station had been closed since 1981, when the Hall was closed for major renovations; but now has been instituted as a permanent exhibit which will be operated on the weekend, during normal visiting hours.

This 100-member club has been cited for its many outstanding endeavors, such as traffic-handling for the New York relatives of people affected by the earthquake in Guatemala in 1979, and in Italy in 1980. The Club also visits the pediatrics section of the Flushing Hospital at Christmas to enable the children there to have a direct link to Santa Claus.

The President of the Club, Arnie Schiffman, says that there will also be special amateur radio sessions set up for school children at the Hall.

Enhancement Stats

NOVICE ENHANCEMENT WAS CREATED TO ALLOW BEGINNERS VOICE PRIVILEGES in sections of the 28-, 220-, and 1270-MHz bands, all in an effort to arouse new



interest in amateur radio, *and it is working.* The number of ticket applications in April broke the 3,000 mark, the first time in several years; and in May, the FCC received a whopping 7,065 applications! The number of 6-10 forms processed by the FCC for these two months has nearly doubled over the same two months in 1986.

Task Force Update

THE RESPONSE to the recent call in *QST* for volunteers for the ARRL Education Task Force was very good. It is now possible to organize and distribute the work of the group through the creation of separate "working groups" to address the elementary school, high school, and adult education levels. 22 hams are on the task force altogether, with five in each of the working groups.

There are two main purposes for the Educational Task Force. It will review and update curricula for the teaching of all classes of Amateur Radio, using techniques currently available in the education discipline; and explore and report innovative methods of establishing Amateur Radio clubs in elementary, junior, and senior high schools.

For more information on this, contact Tom Frenaye K1KI, ARRL New England Division Director.

Beverly Hills Hams

TWO YEARS AGO, Craig Dible KB6LAK, a social studies teacher at the Horace Mann Elementary School in Beverly Hills, brought a shortwave radio to his class. Antennas were put on the roof, and the class became known as the school's listening post. They tuned into broadcasts from all over the world, and discussed in class such issues as Japanese reaction to President Reagan's proposal to impose tariffs on their products, and how the Soviets, British, and Americans treated the Chernobyl disaster. They also monitored local police, fire, and emergency medical frequencies.

Now, after listening to many broadcasts, students wanted to become part of the action. With $3000 in state grant funds, Dible set up a ham station at the school. Six of his students have already gotten their tickets, and three more plan to take the test soon, In all, about forty of his students are using the equipment.

Paul Mazer Honor Award

IN MEMORY OF SILENT KEY, PAUL MAZER N2PM, the Board of Directors of the New York Hall of Science ARC have established the honor award in his name. This year, at a New York Hall of Science ceremony, Paul's wife Dorothy Mazer presented this special award to Joe Fairclough WB2JKJ.

Joe developed an English curriculum around Amateur Radio. Students learn the International Morse code at the start of the term and practice their spelling and vocabulary skills by using CW. Grammar is taught using Amateur Radio publications and books as texts. Through Joe Fairclough's instruction and patience, many of his students have qualified to become licensed amateur radio operators.

73 Magazine extends congratulations to Joe WB2JKJ and his Kids for a job well done.

WNZ Award

THE EDITORS OF *CQ MAGAZINE* announce the Worked Novice Zones (WNZ) Award, which is available *only* to holders of a U.S. Novice or Technician class license for proof of contact with at least 25 of the 40 CQ Zones as defined by the WAZ rules. All contacts must be made using the Novice 80-, 40-, 15-, or 10-meter bands, using modes authorized for these bands, and using transmitter power authorized for the Novice or Technician license. All contacts must be made as a Novice or Technician, although at the time of submission, the licensee may have upgraded to a higher class of license.

The WNZ award is available as a mixed mode, CW only, or SSB only. Rules for the WNZ are essentially identical to the standard CQ WAZ rules. The WNZ award may be used to fulfill part of the application requirement for the WAZ award when the operator is finally able to confirm the remaining 15 Zones.

This award is a good first step for Novices and Technicians toward the "big-league" awards. For application and zone map, write to *CQ Magazine* in Hicksville NY 11801.

W9PRN Scholarship

THE EDMOND METZGER W9PRN SCHOLARSHIP has been created for students who attend the University of Illinois, Indiana University, or the University of Wisconsin. They must be pursuing a course of study in Electrical Engineering, be a licensed radio amateur, and be a member of the ARRL. For further info on this scholarship, please contact Don Evilsizor KA9QWC, R.R. #1 Box 206, Larwill IN 46764-9726.

Articles!

GRANTED, THE DAYS OF THE TOTAL HOME-BREW STATION may be fading fast. Granted, the awesome circuitry of today's full-featured rigs daunts all but the most technically minded of us. But natural curiosity and the skyrocketing prices of equipment still keep hams constantly tinkering and coming up with a better—and cheaper—mousetrap. And, of course, the increasing sophistication of our hobby demands more than ever the talents of those who can explain complex material in simpler terms.

So, if you're sitting there saying to yourself "This project was so cheap/fast/simple/neat that I'll have to write about it some day," make that someday *today*. Call or write us about our editorial calendar. All submitted articles will be promptly reviewed.

Let hams the world over in on your great ideas—through *73 Magazine*.

Thanks to . . .

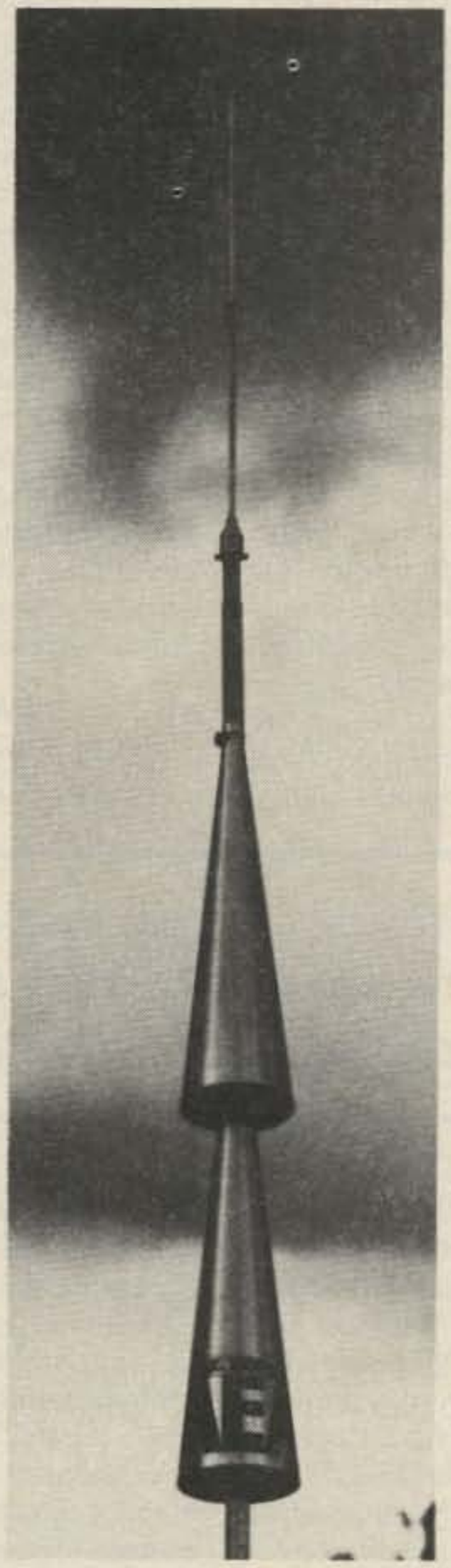
THIS MONTH'S QRX was compiled with the help of *Hamsplatter*, *The W5YI Report*, *The ARRL Letter*, the New York Hall of Science, David McLanahan, DARA, *The Los Angeles Times*, *CQ Magazine*, and the good pup Lena. Send your news and photos to *73 Magazine*, WGE Center, Peterborough NH 03458-1194, Attn: QRX.

Wayne with one of the junior members of hamdom, Jake KB5BNR, at the Dallas Hamfest. Jake was eight *when he got his ticket.*

Put More Punch in Your Packet

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station, especially for Packet operation. All Isopole antennas yield the **maximum gain attainable** for their respective lengths and a maximum signal on the horizon. Exceptional decoupling from the feed line results in simple tuning and a significant reduction in TVI potential. The IsoPole antennas are all impedance matched in the factory so that no field tuning is required. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state tranceivers. **Typical SWR is 1.4 to 1 or better across the entire band.**

A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).



High Performance Hand-Held Antenna — The Hot Rod

The Hot Rod antenna can be expected to make the same improvement to hand-held communications that the IsoPole antennas have made to base station operation. **Achieve 1 or 2 db gain** over ANY 5/8 wave two meter telescopic antenna. The factory tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave. Three Hot Rods are available; HR-1 1/2 wave 2M Ant., HR-2 for 220 Mhz, and HR-4 for 440 Mhz. Amateur Net Price on all Hot Rods is $19.95.

For either base station or hand-held operation AEA has the perfect VHF/UHF antenna. Put more punch in your Packet station with an AEA IsoPole or Hot Rod antenna. To order your new antenna contact your favorite Amateur Radio Distributor. For more information contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036, or call 206-775-7373.

IsoPole Specifications

Model	144	220	440
Freq. Coverage (Mhz)	135-160	210-230	415-465
2.1 VSWR bandwidth	›12Mhz @ 146Mhz	›15Mhz @ 220Mhz	›22Mhz @ 435Mhz
Power Rating	1 kw	1 kw	1 kw
Gain**	3 dbd	3 dbd	3 dbd
Radiating Element Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Amateur Net Price	$49.95	$49.95	$69.95

**dbd — db gain over a dipole in free space

Prices and Specifications subject to change without notice or obligation.

AEA Brings you the Breakthrough!

CIRCLE 65 ON READER SERVICE CARD

NEVER SAY DIE

from page 4

the obits of much younger people buying the farm, I get uneasy. A great many of the hams I knew when I started out are long gone. I'm running out of pens to mark old friends in the Silent Keys column. Ken Grayson W2HDM, Carmine Miranda W2MLM, Garald Silsby W1MCS, John Williams W2BFD, Dexter Miller W2MSZ, Bob Gunderson W2JIO, Oscar W2KU, Sam Harris W1FZJ.

Perhaps it's the same sense of invulnerability which lets kids drink and drive which blinds us to the consequences of swilling six-packs and chomping potato chips—or even wolfing down a Whopper, which has around 650 calories! I found that a few months of single-mindedly dieting worked wonders. As they say of cocaine, ice cream is wonderful, but is it worth dying for?

The hardest part of dieting is making the decision to actually do it. Once you've done that the rest is easy—and incredibly rewarding. Once you don't have to make a decision about ice cream and other crap like that, it's a piece of...er...salad. Oh, your body will fight back for a few days, but once you're adjusted to 1500 calories, you're never hungry and the fat just slowly burns off.

Did you catch Richard Pryor's monologue about his addiction to cocaine? Well, what he went through is a lot like your and my addiction to fattening foods. We're surrounded by temptation—the cold cereal shelf at the supermarket—the ice cream section—pies—a whole aisle of bread—a bakery boutique—the crunchies section—beer by the case—Lordy! The meat case is full of steaks marbled with fat—chicken with that deliciously fat skin—sausage—luncheon meats (packed with fat)—you have to go some to find real food.

I'm going to be watching at Dayton next year to see how weak-willed you are.

Speaking of losing our bands, which I did, how soon should we start a pool on which ham band will be the last we lose? I'll put my money on 2m, just because it's the one we're using the most.

As our ranks thin, we're going to have less and less say in what happens to our bands. A group of doddering old men who are contributing virtually nothing to the world aren't going to have much influence against well-heeled Washington communications lobbies. We're still holding on to our bands by virtue of things we did a generation or two ago, not as a result of what we're doing today.

I'd love to publish articles on spead-spectrum communications—on digitally-encoding phonetics for ultra-narrow band voice communications—on high speed packet systems–but if no one is left to experiment and write the articles, I'm sitting here with an empty in-basket. Yes, I realize that if I did get such articles that most hams wouldn't want to read about such new-fangled garbage, humph. But I'm game to try.

You wouldn't believe the Wayne Green hating which went on back in 1970 when I started publishing endless articles on FM and repeaters. Lordy, the massive reaction I got to that. But I stuck to it, pouring out articles in *73*, publishing a monthly Repeater Bulletin, organizing FM symposiums around the country. After a couple of years everyone had a 2m mobile rig and a couple of HTs.

This isn't a health magazine, so I'm not going to run hundreds of articles on getting into shape—generating another generation of Wayne Green haters. But, fellas, I talk with you on the air—I see you at hamfests—and I know many of you enjoy reading my editorials—so I feel like you're personal friends and I worry about you. I want you to be healthy—to make plenty of money and to enjoy amateur radio with me.

If we're going to have any chance of holding our bands we have to pay our dues. We've been having a free lunch for a generation now—ever since the incentive licensing disaster in 1963. Your dues these days are less using our bands (use it or lose it) than in getting youngsters involved—youngsters who will be straining at the bits (and bytes) to try new communications modes—youngsters who will pack *73* with articles on developments—articles which will build a whole new generation of small businesses like AEA, Kantronics, GLB, and so on.

In the modern communications world amateurs are still stuck with smoke-signal technology. We're pathetically ill-equipped to deal with any serious emergencies. The only bright side to all this is that, as backward as we are, we're all our country has to depend on in emergencies.

If your club is having some success in attracting youngsters and getting them licensed, please let me know about it so I can pass the word. In the meanwhile, what is your club doing to get some excitement going on 220? I'm not hearing crossband repeaters from 220 to 20m, which will allow me to talk with your local Novices. Let's see some action.

NOVICE ENHANCEMENT NEWS

How well is it working? Hmmm, if you want to keep from stepping on toes, perhaps you'd better not discuss this controversial subject over the air. Of course, the fact is we don't know yet.

"...scientists....found that mice fed just above a starvation diet lived twice as long as well-fed mice."

One thing we do know is that we have all our bets on it. I don't know of any back-up projects the ARRL, the industry, or even the FCC have in mind in case Enhancement doesn't bring in the expected flood of newcomers.

Bill Welsh W6DDB, who's been far and away the most prolific Novice licenser in ham history—he won the coveted Edison Award from GE a generation ago for his work—says he hasn't seen anything to be happy about so far. He compared the California licensing totals for the first four months of the last five years. These went 950—912—615—556—600.

Bill pointed out that the slight increase for 1987 reflected the rush by Novices to get licensed before the more difficult exam hit. Bill predicted a higher than normal April and May, then a real drop in June.

The decrease in lapsed Novices has artificially inflated the FCC's figures showing the total number of hams. This is attributable to the ten-year Novice term, not more upgrades.

Bill feels that the ARRL has sacrificed what was a simple Novice system in a vain effort to save 220-225 MHz. He belives that the ARRL has messed up again—strange words from someone who has been such a strong League supporter.

All we have to do is wait and see who's got the best crystal ball. I'm on record as being eager to be absolutely astounded if Novice Enhancement brings in a significantly greater number of Novices. I suspect Bill may be right—this may be just another case of foot-shooting. Not what we need at this time when our hobby is disintegrating before our eyes.

I'm put in mind of a man in his 50s who suddenly finds himself out of work. Panic sets in and he wastes his money and time on one foolish get-rich-quick scheme after another instead of buckling down to hard work. Desperation knocks out common sense. A man in his 50s out of work has a major problem in our society—forget it if he's 60...where the average ham age is headed.

Bill's figures sure jibe with those from W5YI showing a steady national drop in new licensees—about 10% per year. So, are we going to bet the farm on Novice Enhancement or are we going to work on some backup projects such as getting our ham clubs involved in developing Novices and radio clubs in neighborhood schools?

It's been a while since I sat down with the individual commissioners and updated them on amateur radio. We have some new ones who don't have a clear picture of our history—our past accomplishments—and how past FCC actions have almost killed an incredibly important national resource.

In the meanwhile I'll be listening for you around 14.2—my current need for penance is satisfied on 20m phone. If you indulge in similar self-abuse and have any ideas for helping amateur radio grow, but are too far along with Parkinson's to write, give me a call.

WHAT WILL EMP REALLY DO?

Despite major efforts to keep a lid on the nuclear electro-magnetic pulse (NEMP) situation, word is gradually leaking out. Looking it

Continued on page 55

Spectrum Repeater/Link

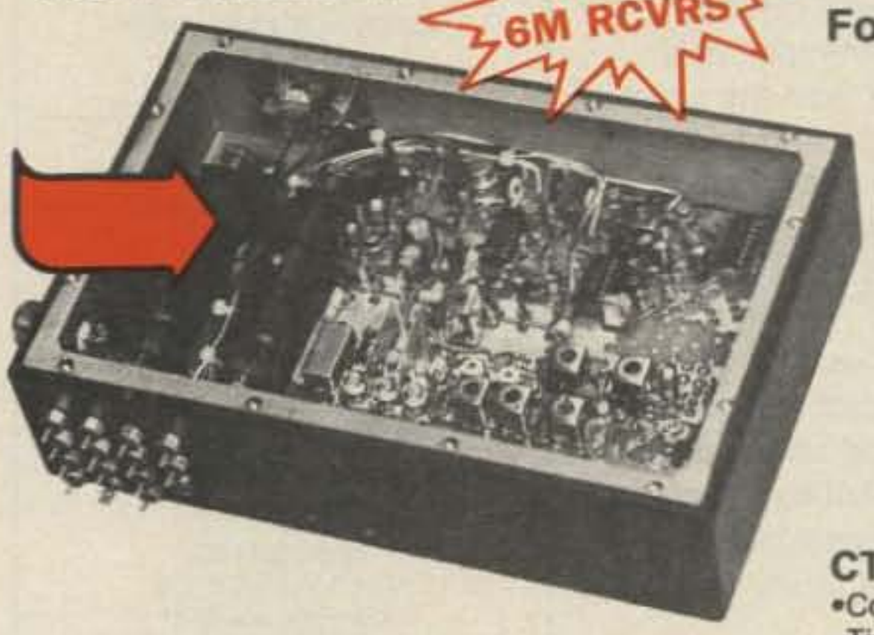
High Performance Boards & Sub-Assemblies

New FL-4 UHF Helical Resonators
Installed in Receiver or FL-4H Preselector Unit

NEW— 6M RCVRS

These are professional "Commercial Grade" Units—Designed for Extreme Environments (−30 to 60° C.) All Equipment Assembled & Tested.

For 10M, 2M, 220 MHz, & 440 MHz



COMPLETE SHIELDED RCVR. ASSY.

VHF & UHF Receiver Boards

SCR200A-VHF SCR450A-UHF

- ***Totally Advanced Design!***
- 8 Pole Front End Fltr. + wide dynamic range—Reduces Overload, Spurious Resp. & Intermod.
- Sens. 0.25 µV/12dB SINAD typ.
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- Exc. audio quality! Fast squelch! w/0.0005% Crystal. (*"Super Sharp" IF Fltr. also avail.*)
- ***New! 30 KHz B.W. IF Filter for High Speed Packet.***

Complete Receiver Assemblies

- Rcvr. Board mounted in shielded housing.
- Completely assembled & tested, w/F.T. caps, SO239 conn.
- As used in the SCR 1000. Ready to drop into your system!
- UHF Rcvr. Assy. Now Available w/Super Sharp FL-4 Helical Resonators. Greatly reduces IM & "out of band" interference!

FL-4H

NEW

Receiver Front-End Preselectors

- **FL-6: 6Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz)**
- **FL-4H: 4Hi Q Helical Resonators & Lo-Noise Tr. Amp. in shielded housing. (420-470 MHz)**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters.
- Extremely helpful at sites with many nearby transmitters to "filter-out" these out-of-band signals.

Call or Write for Data Sheets

ID250A CW ID & Audio Mixer Board

- **Improved! Now includes "audio mute" circuit and "Emergency Power ID" option.**
- 4 input AF Mixer & Local Mic. amp.
- PROM Memory—250 bits/channel.
- Up to 4 different ID channels!
- Many other features. Factory programmed.

CTC100 Rptr. COR Timer/Control Bd.

- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX local & remote Shut-down/Reset, etc.
- Includes inputs & outputs for panel controls & lamps.

Power Supply Boards

NEW

- **SCP12** 12 VDC @ 0.3A MAX. OUT.
- **SCP512** 12 VDC @ 1A & 5VDC @ 0.4A out. (1.1A total max. out.)
- **SCP512A** As above, but also w/−12VDC @ 0.1A

NEW

Plug-in Coding Card

TTC300 TOUCH TONE CONTROLLER

- High performance, Super versatile design. To control any ON/OFF Function at a remote site via DTMF Radio Link.
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NEW

SCP30 HEAVY DUTY 30 AMP RACK MT. POWER SUPPLY

- 13.8 VDC out. 115/230 in, 50/60 Hz.
- 30A @ 70% duty, 25A @ 100% duty.
- Massive 30 lb. Transformer & Heat Sinks.

Improved SCT410B Transmitter Assy.

SCT110 VHF Xmtr/Exciter Board

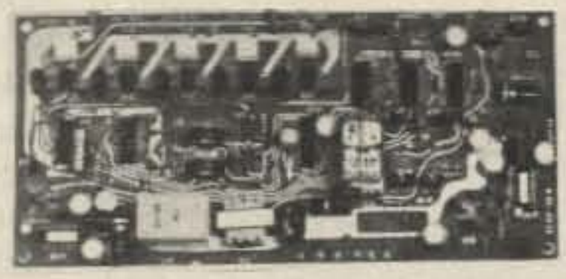
- **10 Wts. Output. 100% Duty Cycle!**
- Withstands High VSWR
- True FM for exc. audio quality
- Designed specificially for continuous rptr. service. Very low in "white noise."
- Spurious − 75 dB. Harmonics −60 dB.
- With .0005% precision grade xtal.
- **BA-30 30 Wt. Amp board & Heat sink,** 3 sec. L.P filter & rel. pwr. sensor.
- **BA75 75 Wt. unit also available**

SCT110 Transmitter Assembly

- ***SCT110 mounted in shielded housing***
- Same as used on SCR 1000 & 2000X
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ***Includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. U HF AMP. BD. & HEAT SINK**



SCAP Autopatch Board

- Provides all basic autopatch functions
- Secure 3 Digit Access; 1 Aux On-Off function, Audio AGC; Built-in timers; etc. Beautiful Audio!
- 0/1 inhibit bd. also available
- Write/call for details and a data sheet

RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater
- Includes land-line "answering" circuitry

Lightning Arrester For Autopatch

- Gas Discharge Tube shunts phone line surges to ground
- Handles up to 40,000 Amps!
- The Best device available to protect Autopatch equipment from lightning damage. $17.00 + S/H.

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"When You Buy, Say 73"

LETTERS

HF BLUES

Recently, I was on 20 meters settling down to a homely QSO with a long-lost DL friend. A couple of *overs* later, two Whiskeys (one too many?) came up on frequency with "Bill, are you there?" . . .When I tell him that the frequency is in use, he comes back and says "Yes, it is." I later found out that they were having a QSO across town with guns blazing, with S-9 plus in southern India.

Even with 400 Watts, a four-element tribander, and the best QTH in town, staying alive on twenty phone is problematical, at best, for me. I finally got the notion to go to A1 mode, in the hopes of finding freer bandspace and more courteous users. But even after making sure that I'm clear by 2 kHz on either side and calling QRL twice before CQing, no sooner than getting a QSO going and working QSK, then I hear tune-up, V. .V. .V. .V, etc, between my transmissions. And when I sign off and end KN, all hell breaks loose! No one seems to know the meaning of KN, or have any patience for the QRZ. By my second QSO, the channel is inundated with QRM, mainly due to those who don't contact with me and set up shop next door to call CQ and drift all over. It's impossible to work there, even with a razor-sharp filter. The situation is like a fish market—it stinks!

Back on phone, the situation is even worse. By the time I'm in my second QSO, everyone wants to know if the frequency is in use (to see if I copy). Adding all the tune-ups, oolahs, and bird songs of all species, it's a total assault on my ears (it's a hobby, OM, remember).

QSL cards. About *20%* QSL. I've been sending my cards direct to individual burrows and call areas; I still need W5, W7, etc. cards. I'm still waiting. . .maybe TAD after 10 years.

I'd be interested in seeing a study of cardiac problems on ham radio ops. There well may be a direct relation between the number of operating hours and increasing risk of heart attack. Stamp collecting, gold-fish watching, and star-gazing may be our alternatives.

I don't really know why I take this punishment and keep coming back for more—is it addiction?

Rajendra Kumar G. G. VU2ZAP
Bangalore India

OVERSIGHT

An important piece of information was left out of the report on the Amtrak/Conrail train crash ("Death on the Rails" April 1987): the vital role amateur radio operators played in the emergency operations. For more than three days, approximately 190 hams were on the scene or standing by throughout the Baltimore area.

Hams were the only communicators who could talk from rescue command and all trackside locations. Hams supplied direct patches to the shock trauma center: one patch even connected trauma surgeons directly between rescue command and the operating room. A command center was set up at the Pikesville firehouse at 1:37 p.m. on Sunday, Jan. 4th—just four minutes after the accident took place. The irony is that a meeting had been scheduled for Baltimore County FD hams on the eighth. The meeting, held after the fact, was attended by fire department members and goverment officials, and established guidelines for amateur emergency communications.

Whoever wants more information on this subject may contact me at Pikesville Fire company, 40E Sudbrook Lane, Baltimore MD 21208.

Firefighter Terry Turchin
Baltimore MD

ILL-EAGLE

At the end of May, I attended the Consumer Electronics Show in Chicago for the first time. Anyone who has never been there is really missing out!

As I recall, I read in *73* of certain wholesalers and retailers who are marketing the "Eagle 1" HT UHF transceiver as the ultimate CB. The trouble is is that the radio is designed to operate in the 440–450 MHz part of the spectrum, right at the top of the amateur 70 cm band! Although the fine print says FCC license required, when I asked the salesman at Samhill Corp. about licensing, he said "No problem—since they're low power, you don't really need to bother." Samhill was marketing the *Eagle 1* at the CES, as well as high-power cordless phones with an 80-km range for export only.

As I got into it with the salesman, I realized that he knew all along that the radio operates in the Amateur portion of the spectrum. In disgust, I moved along to the next booth.

Perhaps you, or any of your readers can suggest what can be done to stop these unscrupulous dealers from marketing these and other such radios as glorified CBs.

And hey—you print a great magazine!

Dan Busse KA0TER
St. Louis MO

Thanks Dan! Readers running into this kind of mischief should send a report to me—I'll see that the FCC gets it—Wayne

FEWER LICENSE CLASSES

In recent years, the Commission has seen fit to eliminate the requirement for licensed personnel in almost all phases of commercial radio and television operation. This began in the early 1950s, when it eliminated the requirement for a First Class Radio Telephone Operator to be on hand whenever a broadcast transmitter was on the air. Today, the Commission has deregulated licensing requirements in almost all phases of radio, except the Amateur Radio Service.

In 1950, there were only two classes of amateur radio licenses, Class A and Class B, and a mail-order Class C with the same privileges as B. In those days, there was some justification for having license distinctions, since almost all transmitting equipment was home-made, and maintained by the operator. In addition, technical skill and CW ability was indeed a national asset in the form of trained personnel for the armed services who still used low-tech equipment and CW as a means of communication.

In 1987, we have five classes of Amateur licenses, in an age where very few transmitters below the microwave region are built by the licensee. Maintenance is almost universally performed by skilled technicians of the manufacturer or an authorized agency.

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The armed forces and commercial agencies have practically no use for trained CW operators. We have many thousands of highly portable transceivers that can give us emergency communications vastly superior to equipment in the old days, and not requiring a large amount of technical knowledge to operate effectively.

With the above in mind, the question arises as to the necessity of the expenditure of federal funds to maintain five classes of license, with all of the paperwork required with no apparent benefit to the public and very little benefit to the Amateur Service beyond the snob-appeal and "Merit-badge" precept of the Boy Scouts. I think that such recognition can be achieved through the Code Proficiency Certificate issued by the ARRL at no cost to the government.

Therefore, I suggest that the Commission go back to a two-level licensing system. The lower class would combine Novice and Technician classes with Technician operating privileges. I would add to this all amateur frequencies and modes above 28 MHz, with a power limit of 250 Watts from the transmitter.

The advanced license would combine the privileges of the General, Advanced, and Extra-Class. The theory exam would remain the same as currently required for the General Class, and the code requirement reduced to 10 wpm. As CW becomes more obsolete, there is less reason to make it a stumbling block in the Amateur Service. It would be like making knowledge of loop-modulation, spark-gap technology, or cats' whiskers part of the current testing.

Reducing the number of classes to two would also eliminate the requirements for the controversial call-sign system that has evolved over the years which has become a mode for status seeking. If there is a desirability that call-signs designate license class under the new system, I suggest issuing 2 x 3 calls, beginning with a "K" for the lower Class, and beginning with a "W" for the more advanced Class. Almost all KC–KZ x 3 and WE–WZ x 3 calls would be available. This would eliminate a lot of paperwork and computer time over the present system.

I hope the Commission will give the above requests serious consideration.

Sheffield P. Wilds W4GVD
Pineola NC

GOOD ENGLISH

I am writing because I feel that we, as hams, have a unique opportunity to do the world a real service. As you point out, Wayne, it is becoming more and more apparent that English is the chosen language for all ham contacts. It behooves us, who are native-born Americans, to speak our language concisely and correctly! I am appalled when I hear a contact between a DX and an American station, and hear the American butcher the language while the foreigner speaks grammatically correct (however accented) English. It makes me wince to hear a ham of ours refer to his "diapole antenna", or call the wires that secure his tower "guide wires", or talk about an unknown system of early digital communication called "Morris code". I can't begin to talk about our love for using double negatives, strange contractions, and incorrect tenses; such as "ain't got no", "cain't hear ya", "don't have none", "I have went", and "He ain't went home yet". How about "Best 73s everyone?" 73 is "best regards", which makes the above phrase redundant!

Perhaps we should mount a campaign to get *American* hams to speak English before we expect the same of our foreign counterparts.

Jim Oberto WA9YYV/7
Phoenix AZ

CODE LEARNER'S PERMIT

I am a physics teacher, and supervisor of our electronics/radio club of 4–8 members, three of which are hams. I have been reading your articles about how to interest young people in radio, and definitely agree that the code requirement is a deterrent. My students are able to learn the rules and regs and the basic theory in two or three meetings, but after a full day of classes, sports, and homework, only a few highly motivated ones find the time for regular code practice. Many of my club members start enthusiastically learning the code, but their interest slowly fades as daily demands inhibit code practice, and they don't have the stimulus of being "on the air."

My daughter recently obtained her learner's driving permit and during a week-long road trip we went on, during which she shared the driving, she made tremendous progress. It occured to me while I was trying to nap during her shift (no chance), that the learner's permit concept is ideal for potential hams under the age of eighteen. I suggest, then, allocating a portion of the Novice band with full operating privileges for learner's permit holders, with a ham's supervision and guidance. They should have already passed the theory and rules exam.

This "learning by doing" is a valid concept. If you don't believe it, just look at how many kids know about computers, which they learned about through hands-on experience.

Chuck Warren WB0PAV
Ojai CA

PRO CODE

I am a 24-year-old Staff Sergeant in the U.S. Air Force, and a microwave radio technician. I have also just recently passed my Novice exam.

My gripes concern "Never Say Die" in the April issue. I first want to talk about Wayne's comments about amateur radio and the military. Speaking from experience, the military prefers to train people in their own manner. No one without their training is put directly in the field anymore. Of course, hams tend to get through the technical training more quickly. And, as far as the code goes, the Air Force still teaches it for use in contingency (wartime) situations. Let's face it: under heavy interference, the code can get through where more sophisticated modes fail.

Secondly, have you heard the normal traffic on CB lately? CBers really don't have the respect, etiquette, and technical knowledge, of hams. Thus another good reason for learning the "dreaded" Morse code. The code that Wayne seems to hate is what keeps educated, dedicated people in amateur radio; and keeps those who just want a new toy, out. People who are willing to work for something respect it when they get it. How can any non-ham hope to understand the thrill and sense of accomplishment that comes with self-studying your way to 5 wpm?

Also, despite the fact that I was trained as a radio technician, I've learned more from designing and building my station (entirely home-brew) than I ever did in school. This field teaches electronics, radio theory, and the ever-elusive antenna theory, in a fun way that will continue to interest us younger people.

William Lazure
Kirtland AFB NM

CALL ME

The Novice portion of the 10-meter band still needs an easy-to-remember calling frequency—I suggest 28.1010 MHz. So, get on that channel and give me a call!

Henry Hampel KA0TUP
St. Louis MO

FREE COUNTRY

Wayne, I've never thought much of your editorials. Most of them have made me damn mad, and I've often had to calm myself by saying that this is a free country and everyone has a right to their own opinion, however absurd it may be.

But your May '87 editorial really hit the nail on the head. I fully agree with you that the ham clubs have got to become more proactive in recruiting and keeping new hams. My own experiences with the local group have been poor. Every once in a while, I go to a meeting to check up on new and interesting items, and I am struck by the members' utter disregard to newcomers! This is not from lack of effort to involve myself, either. I've always filled in the line on the form that asks what committees I'd like to work on, and even said "tell me where you need me"—and I've never even gotten a call.

I'm especially upset about the behavior of the bunch that sold their 220 MHz rigs rather than sharing the band with a bunch of Novices. I guess these guys have forgotten what it's like to be a beginner and need a helping hand.

I'm still a ham, but I've found some hobbies where folks are friendly in person as well as on the air.

Well, Wayne, I've been reading *73* on and off for about fifteen years, I've never agreed with you before, and I may never agree with you again. Thank goodness we live in America!

Jay King N2BEB

NEW PRODUCTS

KENWOOD DUAL BANDER

Kenwood's updated TW-4100A "FM Dual Bander" is easy to operate and is 45 Watts on 2m and 35 Watts on 70cm. Features include GaAsFET front-end receiver, selectable full duplex crossband operation, compact size (5.9 x 1.97 x 7.87 inches), weighs less than four pounds, and has a large, illuminated LCD display and main knob. Frequency coverage is from 142–149 MHz and 440–449.995 MHz. Operation is also possible on certain MARS and CAP frequencies. The TW-4100A has programmable band and memory scan with memory channel lock-out.

Other features include front-panel selectable CTCSS tone (when optional TU-7 is installed) and selectable frequency step for quick and easy QSY. This Dual Bander has 10 memory channels with store frequency, offset, and subtone. A lithium battery provides memory back-up. Two channels store the transmit and receive frequencies independently to allow odd split or cross-band operation.

The TW-4100A also has a non-volatile operating system (no reprogramming or board-swapping necessary). Separate antenna ports for VHF and UHF minimize loss and increase reliability and performance.

Various options are also available. These include Digital Channel Link and a multi-function voice synthesizer (VS-2). Other options are MU-1 DCL modem; TU-7 CTCSS encoder; VS-2 voice synthesizer; PG-2N extra DC cable; MA-4000 dual band mobile antenna with duplexer; and MB-11 extra mobile mount.

Manufacturer's suggested retail price $649.95.

For further information on this product contact: Tom Wineland, 2201 East Dominguez St., Long Beach CA 90810 (213) 639-9000.

NEW HEATHKIT LINEAR AMPLIFIER KIT

The new Heathkit linear amplifier kit, SB-1000 provides a full 1000 Watts PEP output on SSB or 850 Watts on CW, as well as full HF coverage for 160–15 meters including 80% of rated output on three WARC bands. It uses a single 3-500Z tube in a high- efficiency circuit and has a hypersil steel E-I core transformer for high-performance operation. It also features a quiet computer-style fan, a stiff full-wave power supply with computer grade capacitors, adjustable ALC and plate and load controls with smooth vernier tuning.

For further information circle Reader Service number 204.

Heathkit High-performance Linear Amplifier.

MODEL HL-725D DUAL BAND AMPLIFIER

Tokyo Hy-Power Labs introduces the HL-725D dual band power amplifier for 144/440 MHz bands with low noise GaAsFET RX preamps.

The HL-725D uses a large heat sink and the circuits of THL's well-established HL-62V and HL-60U models that have proven to be highly reliable and stable. Simultaneous preamp operation of both the 144 MHz and the 440 MHz bands is possible. Various combinations of dual TX and RX amplifiers can be used.

The suggested list price is $329.95.

For more information circle Reader Service number 205.

FM Dual Band Transceiver.

New MFJ Dual Band VHF Antenna Tuners.

TWO NEW ANTENNA TUNERS

MFJ Enterprises introduces two new dual-band VHF antenna tuners that cover both the 144 MHz and the new Novice 220 MHz bands. Both handle 300 Watts PEP and match a wide range of impedances for coax-fed antennas.

The MFJ-921 has a built-in swr/Wattmeter, measures 9x2x3 inches, and retails for $69.95.

The MFJ-920 measures a compact 4 1/2x2x3 inches and retails for $49.95.

Both come with a one-year unconditional warranty. For further information circle Reader Service number 206.

NEW ALL MODE ATV RECEIVER

This new receiver from Wyman Research, Inc., receives FM-ATV on 900 MHz and 450 MHz with video and audio outputs. It also receives AM-ATV on Both 900 and 450 MHz bands with output on Channel 3 or 4.

Some features of the new receiver include 6 MHz audio subcarrier; de-emphasis circuitry for FM-ATV; internal speaker(FM-ATV); GaAsFET circuitry; lighted tuning meter; and a deluxe cabinet. It requires 12 volts at 100 mA.

Suggested retail price $374.95.

For further information circle Reader Service number 207.

MODEL TX70-1 ATV TRANSMITTER

This P.C. Electronics small transmitter (6 x 5.2 x 2.5 inches) enables Technician class or higher to transmit live action color or black and white composite video and audio from cameras, VCRs, or computers. The TX70-1 is a companion to the TVC-4G receiving downconverter. The unit is ideal for those who have a downconverter and now want to transmit without buying a full transceiver.

The unit has the improved KPA5-c transmitter board that adds a video monitor output of the actual modulated rf. The unit comes with one crystal, but has provisions for switching between two frequencies. A mike jack and "push-to-look" jack is available for low impedance dynamic microphones and transmit/receive switching. The external power requirement is 12 to 14 vdc at 500 mA. The antenna connector is type N and a BNC outputs to the receiving downconverter from the built-in rf T/R relay.

Theoretical snow free line-of-sight DX using the 1-Watt TX70-1, TVC-4G downconverter, and 6-element KLM 440-6X beams is 5 miles. For greater DX with mobile or base applications, the output power and the sync stretcher in the video modulator of the TX70-1 matches the 50-Watt Mirage D24N amplifiers linear input versus output range.

The suggested retail price for the TX70-1 transmitter is $229 for single frequency, and an additional $15 for the second crystal.

For further information circle Reader Service number 208.

KANTRONICS DUAL PORT COMMUNICATOR

The KPC-4™ Dual Port Communicator has two simultaneously operable radio ports both operating at 1200 baud. Features include a watchdog timer for each port, automatic gateway operation between ports, and is command driven with over 100 software commands. The Kantronics

Model TX70-1 1-Watt ATV Transmitter.

Personal Packet Mailbox™ is included as well as an external modem connection point. RS-232 or TTL level operation by jumper selection is also a feature. The KPC-4 also features 32K bytes RAM, 32K bytes EPROM, 512 bytes EEPROM, and 63B03X processor. Also included is a power monitor circuit to control microprocessor reset.

The protocol is the ARRL-adopted AX.25 and the unit is FCC Part 15 compliant.

For further information circle Reader Service number 209.

MOBILE ANTENNA

The Austin Tri-Band 2m/1.25m/70cm antenna puts you on the three most active repeater bands with a single 15-inch antenna on your car roof. Functions as a low swr quarterwave vertical on 2m and 1.25m and, a three quarterwave on 70 cm. Available with or without magnet mount.

Suggested retail price including magnet mount is $62.45 plus $4.50 postage and handling.

For further information on this product circle Reader Service number 210.

Austin Mobile Antenna.

REPEATER CONTROLLER

Creative Control Products new SRC-10 smart repeater controller is low-cost, low power, self-contained, and microprocessor-based. All repeater funtions have been incorporated onto a 4-inch by 6-inch G-10 glass epoxy printed circuit board with one interfacing connector for quality, ease of installation, and reliability.

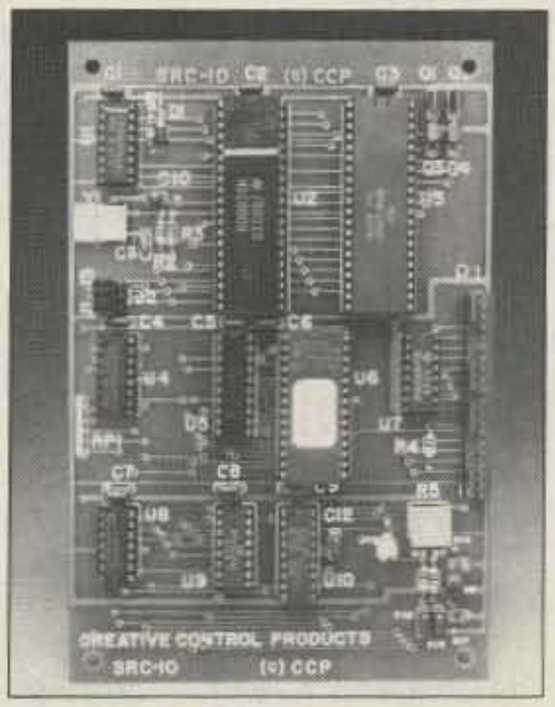
The SRC-10 controller provides up to 7 buffered auxiliary function control outputs that are selected remotely via a 3-digit DTMF touch-tone™ command. The unit responds with a Function Complete tone after each valid DTMF command. In addition are Auxiliary Function Tone Responses to indicate on or off condition. Courtesy Tone Responses are available to indicate repeater or link COS (Carrier Operated Switch) activity. A lock command is available that, when it is selected, the controller ignores all DTMF commands until the unlock command is received. This is useful in the case of repeater jammers or hackers.

Additional DTMF commands include repeater and link Courtesy Tones ON/OFF, Master Reset, DTMF Mute ON/OFF, and Force CW ID. In addition to auxiliary outputs the SRC-10 has a Repeater PTT, Link PTT, CW ID, DTMF Mute, and a CTCSS Mode output. Inputs consist of DTMF Audio, Repeater COS, CTCSS Tone, Link COS, and and alarm input for monitoring user installed events (e.g., low-battery, over voltage, intrusion, etc.).

With the optional PI-10/S synthesizer board, the frequency and offsets of the link radio may be programmed remotely. After the frequency and offset is sent in serial format from the controller, it is converted into parallel outputs to interface with the link radio's frequency synthesizer.

The SRC-10's firmware incorporates most options that would be used in a repeater configuration. Customer specified command codes are available for each DTMF function, as well as customer specified CW speed, repeater hang time, and repeater call.

For further information circle Reader Service number 211.



SRC-10 Smart Repeater Controller.

MORSE CODE TUTOR PROGRAM

MFJ Enterprises announces its new MFJ-1266 and MFJ-1267 Morse Code Tutor Program/Iambic Keyer/Keyboard.

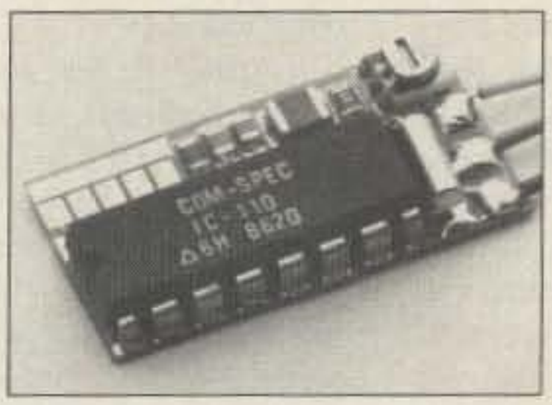
This new full-feature program for the Commodore C-64 and C-128 teaches Morse code and is also a full-fledged iambic keyer and Morse keyboard. With the optional MFJ-76 interface board you can plug in an external keyer paddle and key a transmitter or transceiver.

The program follows the format of the ARRL's "Tune in the World" and can be used with that course or it can be used with the MFJ supplied code learning course.

The Morse Code Tutor features Select Random (lets you select the letters you want to study); Complete Random (sends all alphabet, numbers, and punctuations randomly); Random Message (sends a plain English message exactly as given on an FCC test or received on the air); and Message Store (lets you enter a message from the keyboard and store for sending).

Each mode can use the normal CW spacing or the special Farnsworth spacing, where characters are sent quickly with longer spaces between them. A copy of a test similar to a FCC Novice license test is included in the manual.

For more information circle Reader Service number 212.



SS-32SMP Super-Small CTCSS Encoder.

SUPER SMALL CTCSS ENCODER

Communications Specialists has just introduced a super-small programmable CTCSS encoder for use in handheld radios and other size-restricted applications. The SS-32SMP measures only .53 x 1 x .16 inches and offers full tone versatility and high audio level.

Any 32-tone frequency between .01 Hz and 255.0 Hz may be selected for storage into a 32-bit EEPROM memory. These tone frequencies may be standard or non-standard and may be changed at a later date if desired. The required tone frequency may then be selected by soldering binary coded jumpers on the tone board. The SS-32SMP may also be ordered to work as a six-tone encoder (no switching diodes are necessary) at no extra charge. Multiple tone switching over six tones can be done with switching diode networks or a binary switch. Tone frequencies above 255.0 Hz may be ordered for a slight additional charge.

The SS-32SMP features a low-impedance, low distortion, and adjustable sine wave with adequate audio level to provide sufficient deviation for most handheld radios. It operates on 6–15-vdc so that voltage dropping resistors should never be required.

The SS-32SMP is available with a one-year warranty for immediate delivery for $27.95. A catalogue for our encoder and for our other products is available upon request.

For further information on this product circle Reader Service number 213.

NEW 8-POLE CRYSTAL LATTICE FILTERS

International Radio announces two new 8-pole crystal lattice filters for Kenwood and Yaesu radios.

The IR88H4.OC is an AM filter that has a bandwidth of 4.0 kHz at 6 dB, 2 kHz narrower than the Kenwood AM filter.

The IR88H4.OC is used to replace the Kenwood YK88A1 that is used in the R-5000, TS-940, and TS-930. The new filter comes mounted on a glass PC board like the YK88A1.

The second 8-pole filter is the new IR3.3H2.1 filter. This filter was designed to improve selectivity in the Yaesu FT-101/E/EE series radio and is an exact replacement for the original unit.

The new filter offers 2.1 kHz SSB selectivity at 6 dB and will provide additional razor-sharp selectivity for the above series Yaesu radios.

Filters are $60.00 each plus $5.00 shipping and handling U.S.A.; $10.00 Canada and Mexico; $13.00 elsewhere.

For further information circle Reader Service number 214.

Roald Steen AJØN
6217 Ridge Drive
Woodbury MN 55125

Radio at Green Bank

The active radio observatory at Green Bank, West Virginia, is also a center for preserving some of the major early developments in radio astronomy.

One of the most impressive collections of radio atennas in the world is located at Green Bank, West Virginia. This location was selected for the first large system of radio telescopes in the United States for several reasons. The hills surrounding Green Bank protect the site from man-made interference. The area has little industry and few population centers that could cause interference.

Green Bank is a very pretty location. The surrounding hills are covered with forests and in the valley there is little to disturb nature except the large radio telescopes.

The 140-foot telescope at Green Bank.

Green Bank has become a center for the history of radio astronomy as well as an active radio observatory. A replica of the first antenna that was used to detect radio emissions from space has been constructed near the administration building. The original antenna was built by Karl Jansky, a radio amateur who worked as a scientist at Bell Laboratories in Holmdel, New Jersey.

With his antenna system, Karl Jansky was studying radio noise. The antenna was constructed for a wavelength of 14.6 meters, which is near our 15-meter radio band. He discovered that the strongest noise sources seemed to follow the movement of the sky as the Earth rotated. In 1930 Karl Jansky determined that the band of radio noise that he detected seemed to coincide with the Milky Way and that it was strongest near the constellation Sagittarius, the center of the Milky Way. With the detection of this extraterrestrial radio noise, radio astronomy as a science began.

Another dedicated amateur, Grote Reber, also made great contributions to radio astronomy. Reber, an electrical engineer, built a 31-foot parabolic antenna at his home in Wheaton, Illinois, in 1937. This was the first system built expressly for radio astronomy. With this fully steerable radio telescope, he was able to make a number of important contributions to the new science of radio astronomy, including the first radio map of the sky. This was an impressive private effort—the radio telescope weighed two tons and it took four months to build the observatory.

In 1947 Reber sold his radio telescope to the National Bureau of Standards. The Bureau moved it to their location is Boulder, Colorado, the home of WWV. Here it served the Bureau for a number of years in radio research activities. After the Bureau acquired more advanced equipment, the Reber telescope was disassembled and shipped to Green Bank. Reassembled at Green Bank under the direction of Grote Reber in 1960, it can now be seen there by visitors. The site at Green Bank is listed in the National Registry of Historic Places.

Several other early radio astronomy antennas are also displayed at Green Bank. One, a horn antenna, was used in 1951 to detect neutral hydrogen radio emissions from space. This emission occurs at a frequency of 1.420 GHz and is one of the strongest radio emissions that arrive from space. Concentrated along the plane of the Milky Way, it serves as an important indicator of the structure of our galaxy.

The first large radio telescope at Green Bank was built in 1957/58. The telescope is 85-feet in diameter, fully steerable, and constructed as a parabolic antenna with a cassegrain subreflector. Named the Howard E. Tatel telescope after its designer, it is still in service as part of a 4-element interferometer.

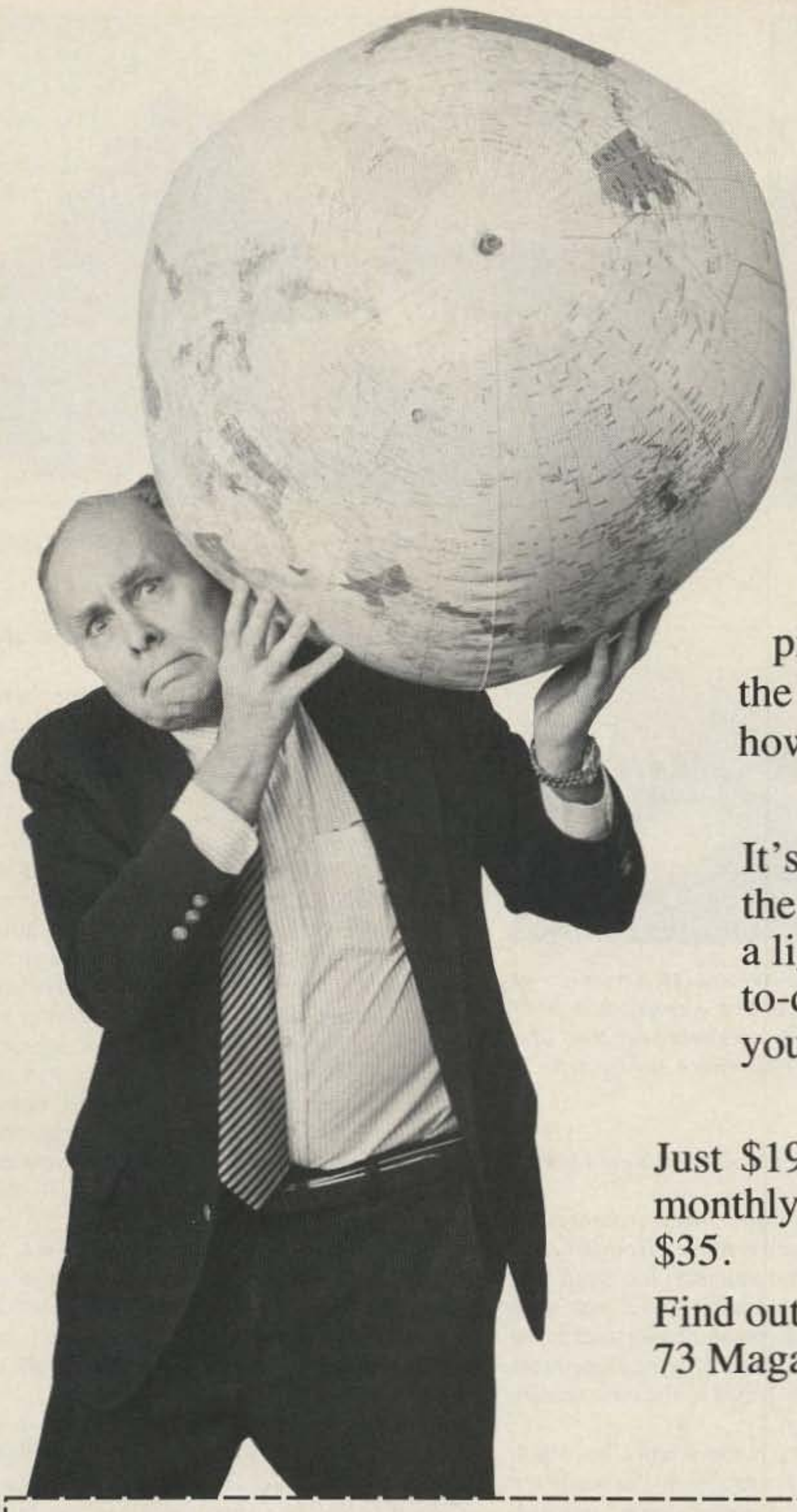
In 1960 the second largest movable radio telescope in the world was built at Green Bank. It is exceeded in size only by the 1000-foot fixed radio telescope at Arecibo in Puerto Rico and a 330-foot movable radio telescope near Bonn, Germany.

This telescope has one disadvantage: it can be moved only in elevation. A movable feed system at the focus of the parabola allows some tracking of objects as they move across the sky due to the earth's rotation, but because this capability is limited, an object can be tracked for only a few minutes. But for many observations this tracking capability is sufficient. It is one of the most valuable facilities of its type in the world, contributing to many discoveries in radio astronomy. The shape, size, and rotation of many galaxies have been mapped by this telescope.

Many pulsars (radio sources in the sky that transmit rapid pulses in a very stable pattern) were first detected with the 300-foot telescope at Green Bank.

Pulsars are believed to be the remnants of supernovas that have exploded in the Milky Way. These stars have contracted, becoming rapidly rotating and extremely small and heavy neutron stars. Pulsars emit radio waves from their magnetic poles and these can be detected each time a pole sweeps past the earth. Despite having traveled several thousand light years, these pulsars haven't been smeared out and, when they arrive on earth, can still be detected in almost the same pattern as when they were emitted from the pulsar.

The observatory is now used to map these pulsar emissions from the Milky Way and other more remote galaxies at the radio frequency of neutral hydrogen (1.420 GHz). This telescope produces far more accurate



HEAVY STUFF

Face it, the world

of ham radio is a lot more complex than it used to be. We have new modes popping up every day, satellites racing around the globe, computers, spread-spectrum . . . how can you keep up with it all?

It's easy. Every month, *73 Magazine* covers the whole spectrum of amateur radio with a light, easygoing style. We'll keep you up-to-date on what's happening in your hobby; you may even learn something new!

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73 Magazine *puts the fun back into ham radio.*

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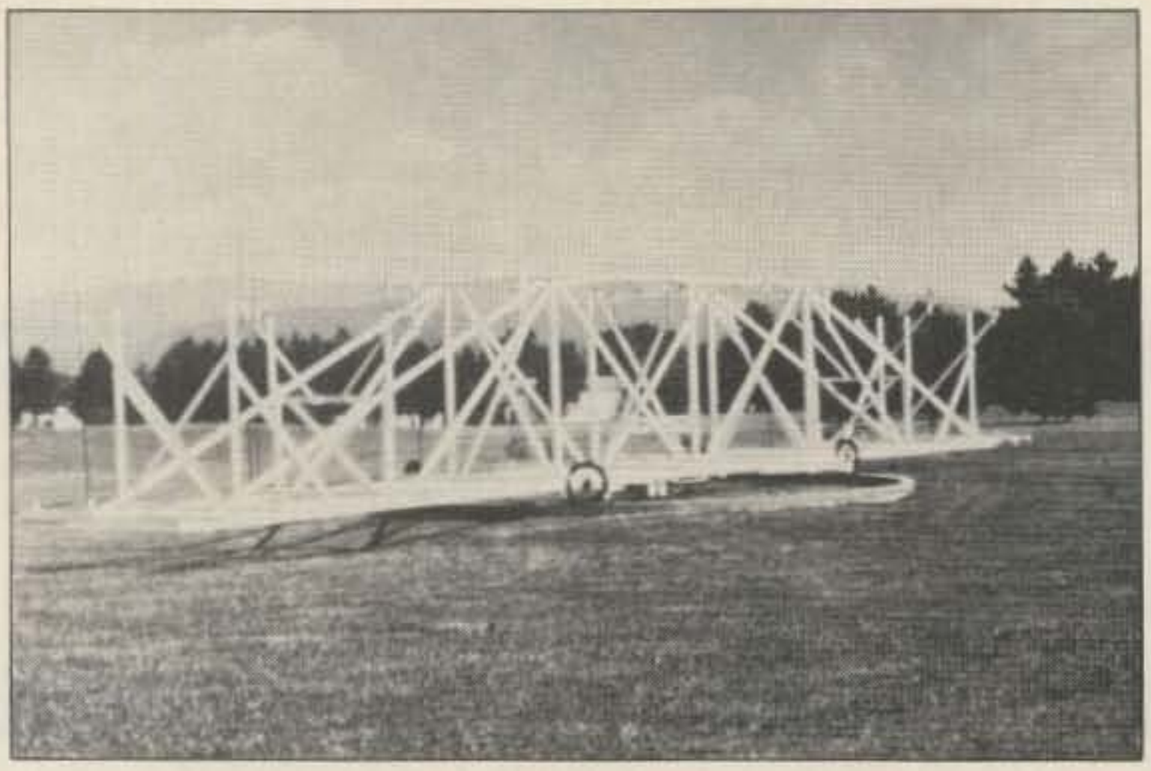

Photo A. A working replica of Karl Jansky's antenna.

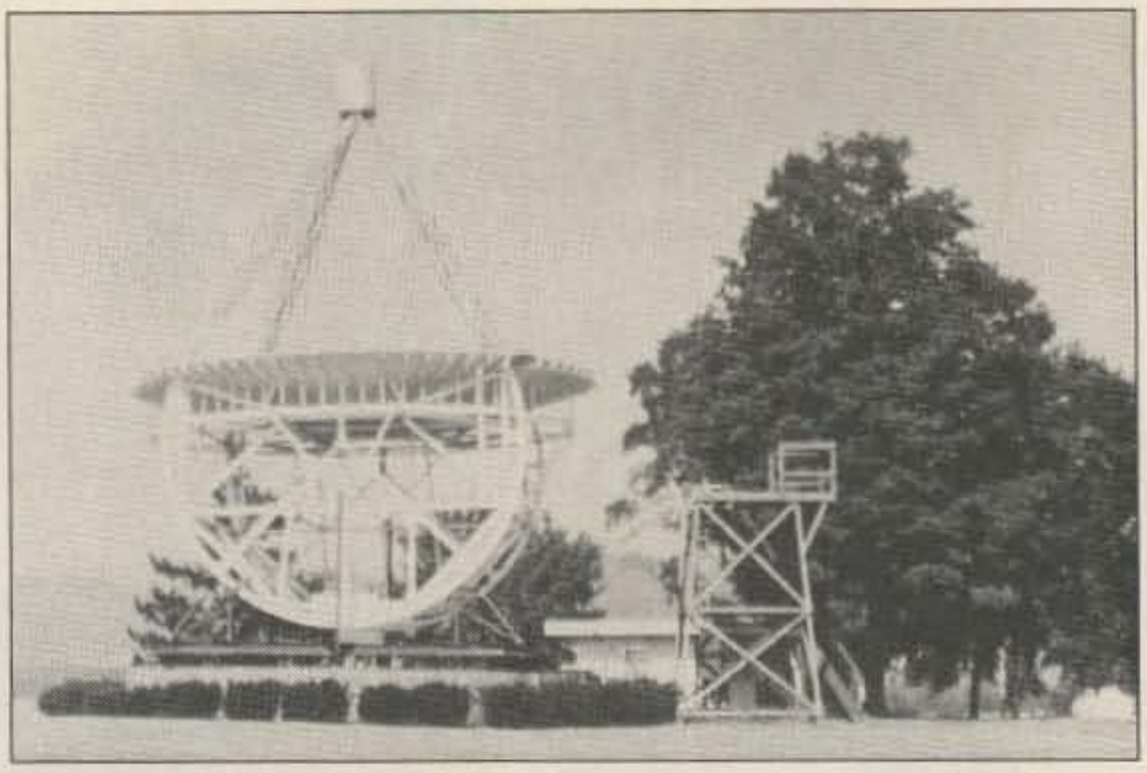

Photo B. The Grote Reber antenna. The first parabolic antenna built for radio astronomy.

maps than the old horn antenna on display nearby.

The largest telescope (140-foot) in the world with an equatorial mounting was built at Green Bank in 1965. Equatorial mounting permits rapid and accurate tracking of objects in the sky. This telescope if often used for Very Long Baseline Interferometry (VLBI) observations in conjunction with observatories in other countries, including the 330-foot telescope in Germany.

To use VLBI technology a radio telescope must have a very smooth surface compared with the shortest wavelengths which it is to observe. The smoothness of the telescope's 140-foot diameter surface is so accurate that it works well at wavelengths of 2 centimeters (15 GHz). By linking several radio telescopes together extremely detailed observations of remote objects can be achieved with the aid of communications satellites or microwave links. The information from the participating radio telescopes is recorded with accurate time measurements on magnetic tape. The (VLBI) technology is as accurate as that which would be possible with a single radio telescope with a diameter equal to the distance between the participating radio observatories.

The 140-foot reflector, constructed in the cassegrain configuration, is able to determine signal frequencies with very high accuracy. Since chemical elements in space emit a variety of radio frequencies, each emission line can be used to identify a chemical element. Doppler shifts in emission lines can then be used to determine the velocity and temperature of the objects being observed.

The 3-element interferometer at Green Bank was the first large one constructed in the United States. (An older interferometer had been constructed only at Jordell Bank in England.) The Green Bank interferometer consists of three 85-foot reflecting antennas, including the original Howard E. Tatel antenna. The Tatel antenna is stationary, the other ones can be moved along a 5000-foot-long track.

The experience gained from the pioneering work done on the Green Bank system was used in constructing the much larger, 27-element interferometer facility in New Mexico (*73*, July 1985).

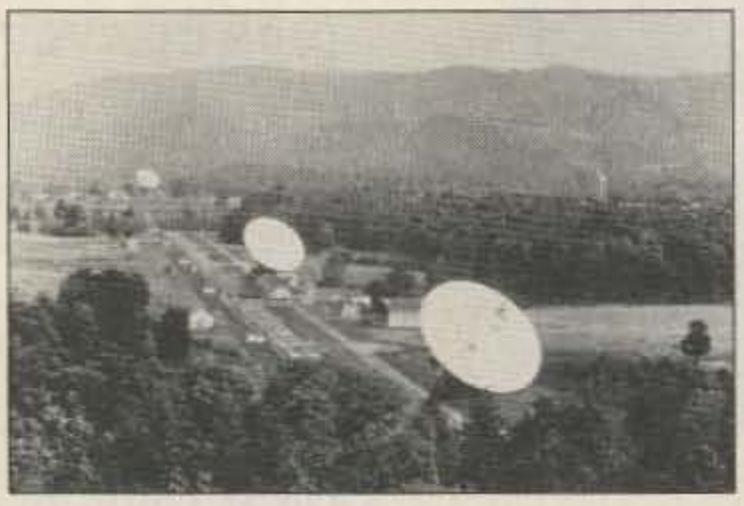

Photo C. The three-element interferometer at Green Bank. The center element has been dismantled ; the two remaining are part of a four-element interferometer dedicated to astronomy.

The three-telescope interferometer at Green Bank has been removed from service. One of the movable antennas has been dismantled; the two remaining are part of a four-element interferometer being used at the U.S. Naval Observatory. This interferometer is the first to be dedicated to the new science of radio astrometry.

Radio astrometry is the science by which the movement and rotation of the earth are accurately measured. For example, wobbles in the earth's motion of a few feet can be detected as well as minute changes in the location of the North and South poles. This science can also provide information on the composition of the inner parts of the planets. The U.S. Naval Observatory uses radio astrometry to produce accurate astronomical tables for navigation.

To accurately determine the earth's motion, very stable reference positions are needed. A four-element interferometer uses remote quasars for reference positions. Quasars are so remote that no movement of them has ever been detected. The earth's motion is measured with the interferometer by checking its movement against the position of a few selected quasars.

Two elements of the four-element interferometer are two 45-foot antennas one at Huntersville, the other at Point Mountain, West Virginia. Both of these locations are about 20 miles from Green Bank.

The Green Bank radio telescopes are owned and operated by the National Radio Astronomy Observatory (NRAO). This organization, which has its main office in Charlottesville, Virginia, also operates the Very Large Array in New Mexico as well as a millimeter wavelength observatory at Kitt Peak in Arizona.

The receiving equipment used in radio astronomy must be of very advanced construction. The receiving front ends are usually cooled with liquid helium in order to maintain a temperature only a few degrees above absolute zero. All components in an electronic circuit produce internal noise while operating. Noise can overwhelm the weak signals being received from space. Cooling reduces this internal noise in the receivers to a very low level.

A variety of receivers is being used at Green Bank. For many of the lower frequencies, Cooled Field Effect transistors are used. Cooled parametric amplifiers are used for higher frequencies, and for the highest frequencies masers are most effective.

The NRAO constructs most of its own receiving equipment at laboratories in Charlotte, Virginia, and Socorro, New Mexico. The majority of radio telescopes are built in the cassegrain configuration. In this configuration a subreflector is mounted at the focus of the parabolic reflector. This subreflector directs the received radio waves to receiving equipment at the center of the parabolic disk.

Because of the weight of the cooling system, it is difficult to support the receiving equipment in the focus of a parabola. With the cassegrain system a more stable position on the parabolic disk is possible. This system also facilitates maintainance. The only exception to the cassegrain system at Green Bank is the 300-foot radio telescope.

Visitors are welcome at Green Bank during the summer. There are daily tours during the week and also on weekends. A short, award-winning movie on radio astronomy begins the free guided bus tour of the radio telescopes. ■

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A Foldover Cheapie

Bowing to the cost of living

A few years ago, I fell heir to several 21-foot (standard-length) pieces of galvanized-steel water pipe, one 2-1/2-inch piece, a 2-inch piece, and others ranging down to 1-inch diameter. The various sizes and long lengths made them much too bulky and heavy for masts and rotor supports in the ordinary way, so they just lay outside my shack to be tripped over occasionally.

Some time later, having to scoot to the top of my 60-foot tower to repair cables and replace guy wires, I got an aerial view of these pipes. Wow! They looked like one of those expensive foldover towers I had seen

"The basic structure . . . is simple and straightforward. Two sections of pipe are telescoped together and hinged near the base. A hand-operated boat winch provides the power."

advertised in a recent issue of *73*! Deciding that this was "an inspiration from above," I set out "to restack" the pipes vertically so that I could talk *over* them rather than *about* them. There seemed to be plenty of clear area in my yard near the shack where a foldover tower would fit neatly to the ground.

(A survey of space is absolutely necessary should you decide to try this project. The foldover will be no good to you if the antenna folds over into a tree or onto the roof. Also, be careful to align the base so that the butt of the mast does not swing up into the side of your shack as the mast is lowered.)

The basic structure, shown in Figures 1A, 1B, and 1C, is simple and straightforward. Two sections of pipe are telescoped together and hinged near the base. A hand-operated boat winch provides the power. The assembly can take more sections for added height, and these may also be telescoped to prevent top-heaviness and/or add to structural strength, as well as permit greater ease in lowering the antenna in bad weather. A double pulley may be added for more power, or the hinge point raised to provide greater leverage.

I am no engineer, but I can report what worked for me; the purpose of this article is to expose you to a cheap method of building yourself an otherwise-expensive addition to your station. Pay as much attention to the concept as to the step-by-step procedure and let your imagination help you build the assembly which will be exactly right for you.

The job begins with finding an old 55-gallon oil drum. I got mine from a local farm chemical dealer. Similar drums may be found at oil company storage areas or wholesale cleaning companies (often free for the asking). The drum serves as a modular base for your tower. Next, cut the top out of the drum with a cold chisel. *Don't* take your trusty blowtorch to the top. Many chemicals will produce toxic fumes which could make short work of you, and oil drums tend to explode or burst into flames when exposed to a torch, so do it the hard way. After completing this step, knock several large drain holes into the other end of the drum. This allows the water to drain from the concrete you will pour into it, resulting in faster, and more even, curing. Finally, dig a hole large enough to bury the drum vertically with the top rim just even with the ground. Any projection above ground decreases counterbalance weight for the tower.

The Mast Support

Prepare the base support by clamping a 3″ x 3″ wood spacer about 3′ long between two 10′ 3″ angle irons (Figure 2) and drill a 5/8″

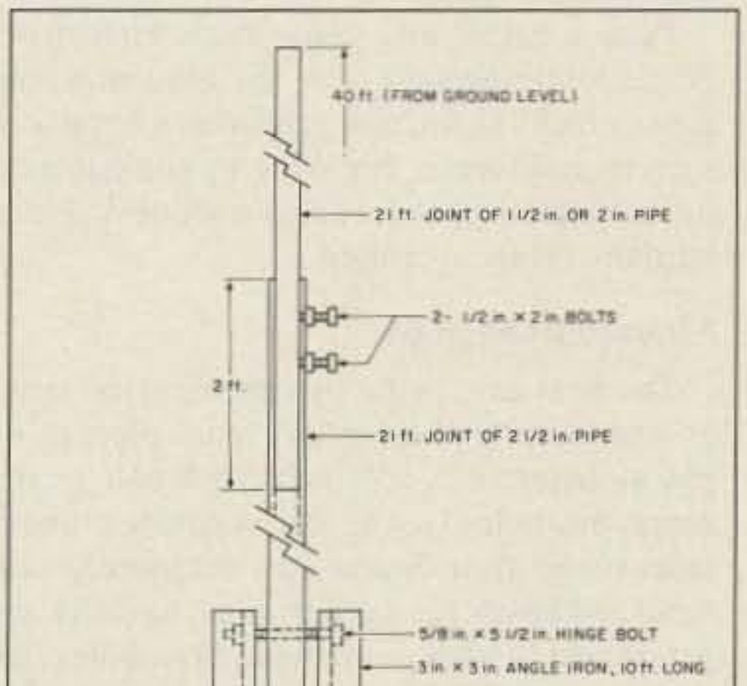

Fig. 1A. Mounting of tower base showing front view of mast-supporting angle brackets.

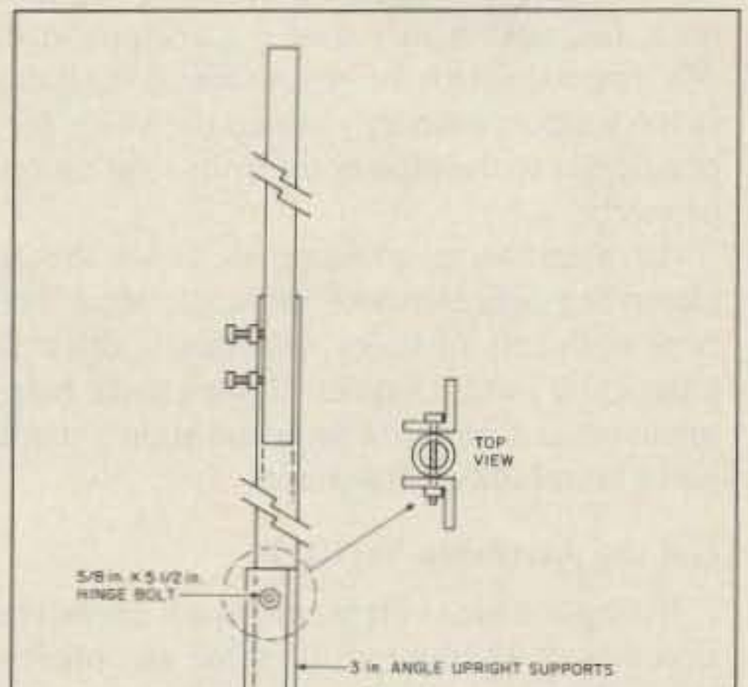

Fig. 1B. Side view of mast-supporting angle brackets and winch installation.

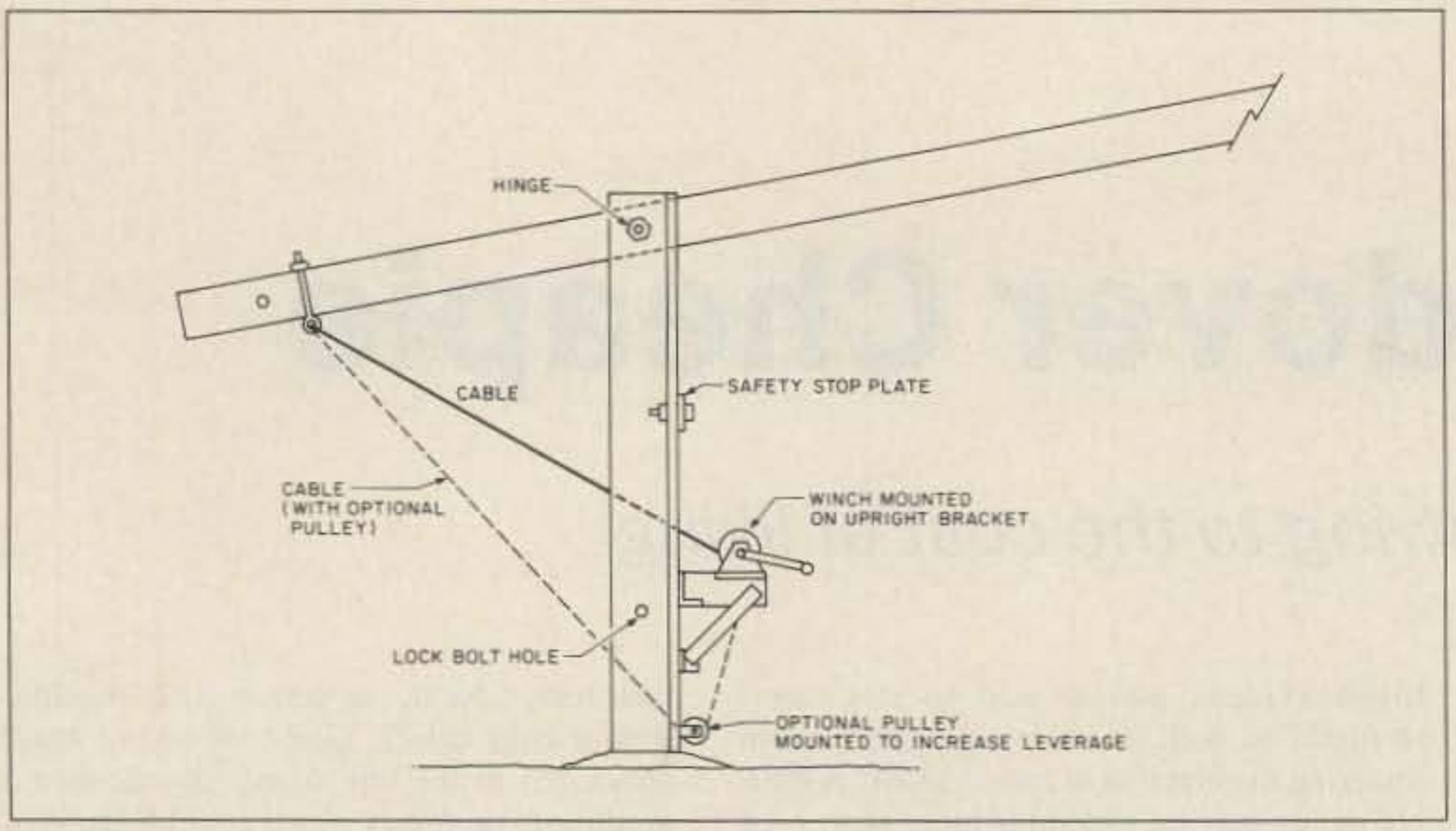

Fig. 1C. Winch assembly for the foldover.

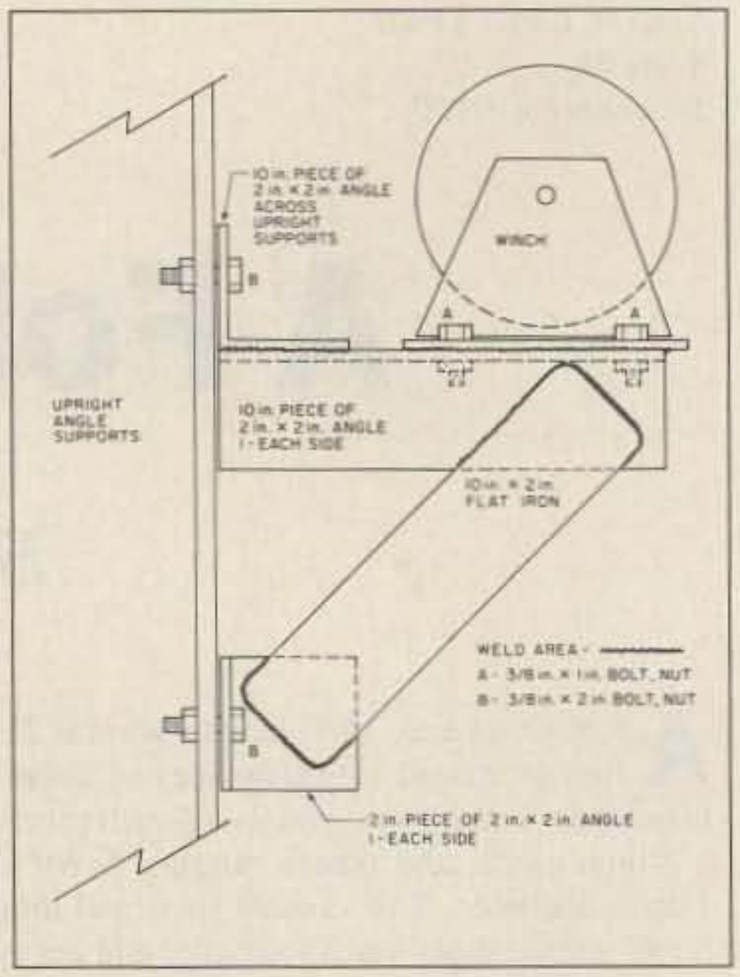

Fig. 2. Details of winch installation.

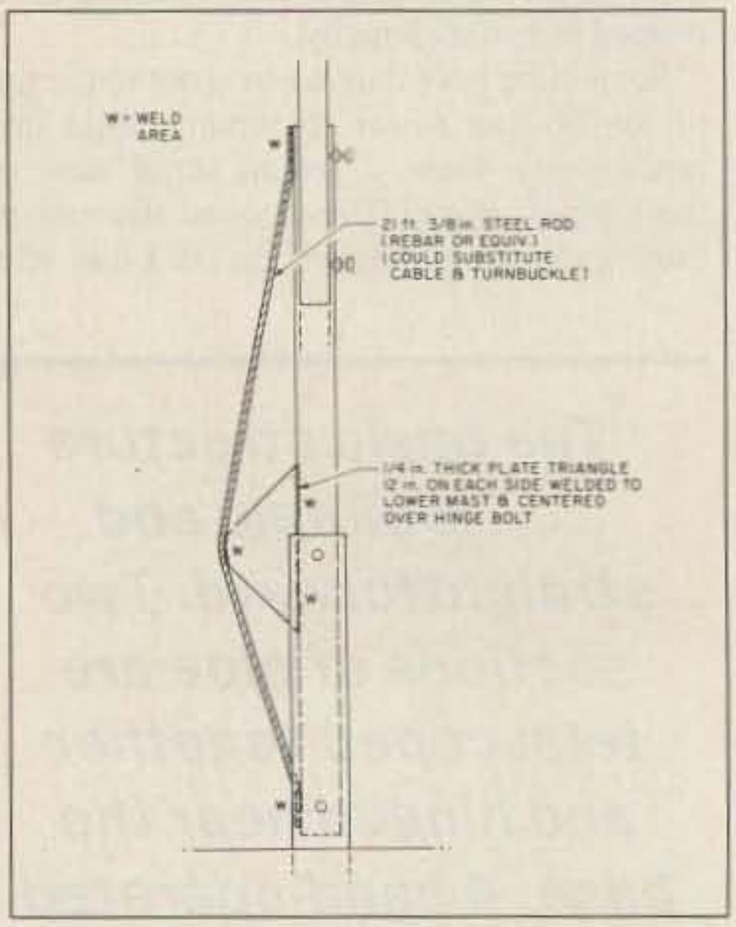

Fig. 3. Truss for lower mast section. Use this when adding another section to the tower.

hole through both pieces, about 3″ from the top end. Stand the assembly in your buried drum and mark the level of the ground, using a level or straight edge across the rim of the barrel. Measure up from 6″ to 12″ and drill another 5/8″ hole. This bottom hole will take the locking bolt that will hold the mast vertical once it is raised; the top hole is for the hinge pin for the foldover operation.

Lay the bottom pipe for your tower along the support assembly and mark the pipe at the drilled holes. *Exercise caution here!* There should be around 6″ between the ground-level mark on the support assembly and the locking-bolt hole, and the bottom end of the mast must fall within this space. Carefully drill 5/8″ holes through the pipe to match the holes in the support assembly. Keep the holes perpendicular to the pipe or the bolts won't align properly.

An alternative procedure would be to clamp the pipe between the angle irons and bore both sets of holes, but this is difficult unless you have adequate clamps and a helping hand. It is hard to clamp and align a round piece between two flat pieces.

Get the Assembly Vertical!

It's a good idea to treat metal which will be in contact with concrete the same way professional tower-installers protect base mounts on commercial towers. An aerosol can of auto-body undercoating can be used. (This is not an option if you are inserting galvanized metal into concrete.)

Now, mix , then pour, about four 60-pound bags of concrete into the drum. You could pour dry mix into the drum and drench with water, but this way it could be weeks before the concrete will be moistened enough to cure. While the concrete is still wet, stand the support assembly upright in the center of the drum, and work it down through the concrete until it hits bottom.

Balance or brace the assembly upright until it can be secured. I used old pieces of TV guy wire and tied it off in three directions. Once it is firmly secured, take your level and make sure the assembly is vertical. Now add sand, dirt, pebbles, or whatever, to the drum, and fill to within 12″ to 16″ of the rim. *Check your base assembly again to make sure it is still vertical.*

Mix up four to six more bags of ready-mix (as needed) and finish filling the barrel, rounding it off at the top so water will not collect around the mast. Tamp the soil around the barrel, using leftover soil, pebbles, and concrete as necessary to secure the base solidly in the ground. Now make a final, careful check of the plumbness of your assembly and make any last-minute adjustments needed. A very slight bit off vertical here, and your mast could end up looking like the Tower of Pisa!

Take a break and come back tomorrow. Any fooling around with the base now can cause cracks in the concrete where water can seep in and freeze, breaking up the concrete or making all your leveling worthless. Let it harden at least overnight.

Mounting the Mast

The next day, begin by removing the spacer and putting the bottom mast pipe in its place. Insert a 5-1/2 inch 5/8″ bolt in the hinge-pin holes, using flat washers on both sides of the mast. Screw on a nut loosely, and raise and lower the mast by hand to check the action and to make sure the bottom holes line up properly. If they do not, clamp the mast firmly upright and drill through the whole assembly.

Mark where the bottom of the mast comes to on the support assembly, and a few inches above the mark securely bolt a piece of 2″ x 8″ quarter-inch flat iron stock across the flat sides of the angle irons; this piece will stop the mast from swinging further than the vertical position.

With the mast bolted in the vertical position, drill a 3/8″ hole in it about 10″ from the bottom and insert a 3/8″ eyebolt with the eye facing the direction in which the tower will fold. Your winch cable will be fastened to this eye. Use either a welded-eye type bolt or have the eye welded shut. A heavy load can stretch an eye open—and such a mishap can allow a mast being raised or lowered to plummet to the ground with your prized quad and rotor!

The Winch

The winch should be mounted on the same side the tower folds on, at a height that allows easy cranking of the handle. It all works most smoothly if the cable winds up at or near the height at which the eyebolt is attached to the mast—10″ to 18″ above ground level. My tower has the winch at about waist-height which allows cranking without getting down on your knees, but creates another problem: poor leverage. I had to mount a pulley at the base of the support assembly (see Figure 1C). Feel free to experiment, but beware; I had trouble finding a pulley small enough but sturdy enough, and with the cable tracking over the pulley, and with the mounting of the pulley so that it was not in the way of the mast when vertical. It really is simpler and more economical to mount the winch as low as can be cranked comfortably when kneeling.

When you have decided on a position, mount the boat winch mounting bracket (see Figure 2). You may have an easier method of mounting the winch. Certainly, if you have access to a portable welder, this job can be done much more quickly. Just be sure the winch is centered between the angle-iron supports. The simple bolted arrangement is neat, but I personally suggest that you take the assembly to a welder and then bolt the welded assembly to the supports. (There is other welding that can be done at the same time—see "Adding Height," below.) In any case, the winch assembly must be sturdy. There is a great deal of stress involved in raising and lowering the tower, so this is no place to skimp.

Adding Height

When you have satisfied yourself that your assembly works as you wish it to, it is time to add height to the mast. With it lowered and touching the ground, bore two holes about a foot apart with the top hole about 2″ below the top of the mast (see Figure 3). While you are having your winch welding done, you also can get 1/2″ nuts welded over each of these holes. You could fabricate a clamp for this job to replace the welding. Raise the mast parallel to the ground and slide a 21-foot section of 2″ pipe about two feet into the larger pipe. Screw 2″ bolts into the welded nuts to hold the two pipe sections firmly together. Now you have a 40-foot mast which is adequate for most amateur use.

I have an ATB-34 and a CDE rotor atop my version of this tower and felt more comfortable lowering the top section about halfway into the lower section, resulting in a 30-foot tower. A third section of, for example, 1'1/4″ pipe attached in the same manner, could produce a 60-foot tower. If this is tried, I would suggest welding links of chain, or inserting eyebolts around the top section of pipe about two feet from the top, to allow attachment of guy wires—especially if any substantial antenna array is to be mounted. Getting it up there is one thing, but getting it to stay is another!

I have tried several modifications of this assembly, all the way to 50 feet without guys, including a 6-dB vertical atop stacked 7-element, 2-meter beams. It stayed fine, but I couldn't stand the swaying in the wind as well as the tower did, although the base never budged. However, guy wires would be a necessity in my book if an expanded version of my design is built. It is simple enough to disconnect the guy wires for tower lowering.

Extending the tower to 60 feet or more produces very heavy loads on the winch, even with light arrays. The optional lower-section truss brace eliminates much of the sway and bending when raising or lowering the tower. Over 40 feet you also will need the optional pulley system shown in Fig. 1. This slows operation of the foldover but doubles the effectiveness of the winch. Another possibility would be to build the upright support assembly longer. This will add counterbalance weight—and could also allow the use of larger pipe.

Conclusion

My Foldover Cheapie has been in service for nearly eight years without any problems. It is a perfect platform, even at 20 feet, for antenna experimenters. (At 20 feet you could perhaps use a 30-gallon drum or perhaps no drum at all.) A drum makes sure of enough base weight, and requires about a sixth as much concrete as would a plain hole in the ground. It also helps keep the tower from settling into the ground and cracking skimpy layers of concrete.

A final comment: *Don't try to lift too heavy a tower and load.* You risk breaking the cable and worse. Slide the top section down a little and try it out. I doubt that my range with the ATB-34 is much different at the 36 feet I use that it would be at 40 feet.

Many older hams will enjoy this type of structure because it will allow them the independence of maintaining their own antenna systems. This might make a nifty club project to help some of your older members. It also is an ideal assembly for hams living in areas subject to seasonal high winds. ■

Parts List

2	10′ pieces of 3″ x 3/8″ angle iron
1	21′ piece of 2-1/2″ steel pipe
1	21′ piece of 2″ steel pipe
2	5-1/2″ 5/8″ steel bolts with nuts and washers
2	2″ 3/8″ steel bolts with nuts and washers
1	piece of 1/4″ flat iron stock, 2″ x 10″
1	used 55-gallon drum
1	1000-pound boat winch with cable
2	2″ 1/2″ bolts with nuts and washers
10	60-pound bags of premixed concrete

For Winch Mount

1	piece of 1/4″ flat iron stock 6″ square
2	pieces of 1/4″ flat iron stock 10″ x 1″
3	10″ pieces of 2″ angle iron
2	10″ pieces of 1″ x 1/4″ angle iron
4	2″ 3/8″ bolts with nuts

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Portable Antennas for Out-of-the-Ordinary QTHs

Some ideas for antenna alternatives in unusual situations.

Some time ago at a convention I met a doctor, a medical missionary working at a relief station in the Sudan. Because of his unique QTH, we had an interesting discussion about mobile and portable antennas for communication from the boondocks. His bona fides include the fact that he is licensed to operate on both amateur radio bands and as a land-mobile or point-to-point station in the 6.2 MHz band.

The desert where he travels in one of the worst in the world. Because of the harsh conditions, the doctor's organization requires him to check in twice daily on either 6.2 MHz or 3.885 MHz (that some missionary hams in Africa use as an official calling frequency). If he misses two check-ins in a row, search and rescue planes are sent up. Because of his unique *housecalls*, he does a lot of mobile and portable operating in the lower HF region. His problem? How do you reliably get through the QRM and tropical QRN with only 200 Watts PEP and a standard loaded mobile antenna?

A KL7 government forester I met, who works in Alaska, faces many of the same problems as the doctor in the Sudan (but at temperatures 100 degrees colder). He frequently takes his 100-Watt mobile rig into the back country of Alaska. With only 100 Watts into an inefficiently loaded mobile antenna, how does he reliably cut through QRM to talk to the base station?

An earthquake or hurricane strikes your community, antenna towers collapse, tribanders are tangled masses of aluminum tubing, dipoles are snarled globs of Copperweld, and rig and linear amplifiers are smashed. All that's left is the 100-Watt HF rig in the car. Communications now are not for fun—they're deadly serious! How do *you* establish reliable communications with only a 100-Watt mobile driving a 75-meter loaded whip? Suddenly, the problems of a Sudanese doctor and an Alaskan forester aren't so remote.

Some Problems with Mobile Configurations

Because quarter wavelength antennas on low-HF band frequencies are 30–70 feet high, full-size vertical whip antennas are not practical (in fact, at frequencies below 10 meters full-size whips are rare). A typical short, mobile antenna (Figure 1) exhibits capacitive resistance, so a loading coil is added (L in Figure 1) to the radiator and its inductive reactance cancels the capacitive reactance of the antenna. The inductor can be placed almost anywhere along the radiator, although base, center, and top-loaded designs predominate. The actual inductance needed varies somewhat with coil placement as does antenna performance. (The resonators used on commercial low-HF mobile antennas are loading coils encapsulated in weather-tight housings.)

Mobile configuration is inefficient by nature and little can be done to improve matters. An antenna matching device or tuner helps optimize power transfer and should always be used (especially with solid-state final amplifiers that don't tolerate vswr as easily as do tube finals). With portable configurations, we can improve performance and look into options not available to mobile operators. A basic assumption is that operators needing emergency communication are located in remote areas with no access to the usual VHF bands which would allow them to make contact with emergency services through a repeater autopatch. Here we are dealing with HF rigs operating at the lower end of the HF spectrum in situations where a temporary antenna must be erected.

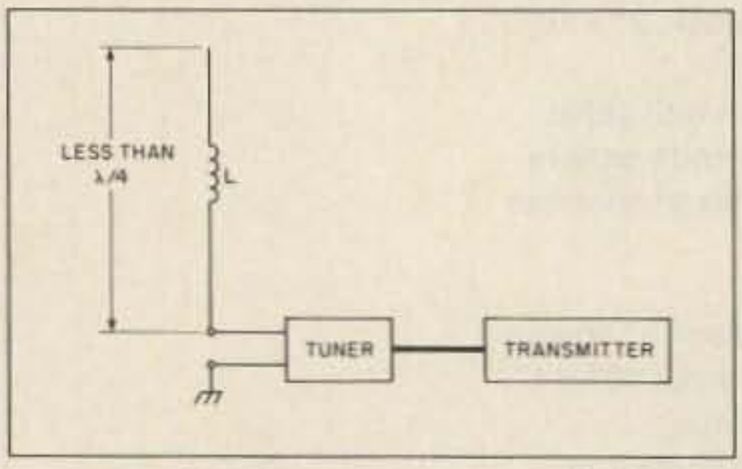

Figure 1. A typical mobile antenna for a low-HF band.

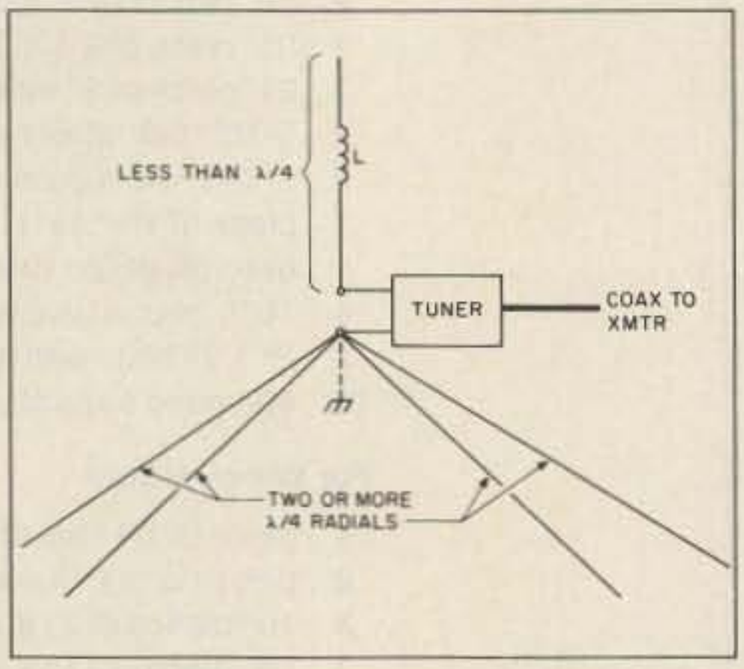

Figure 2A. The electrical system of a counterpoise ground plane.

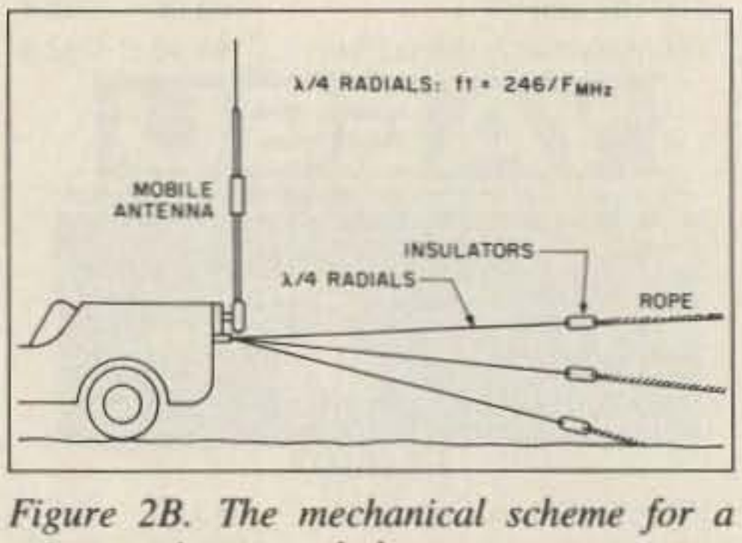

Figure 2B. The mechanical scheme for a counterpoise ground plane.

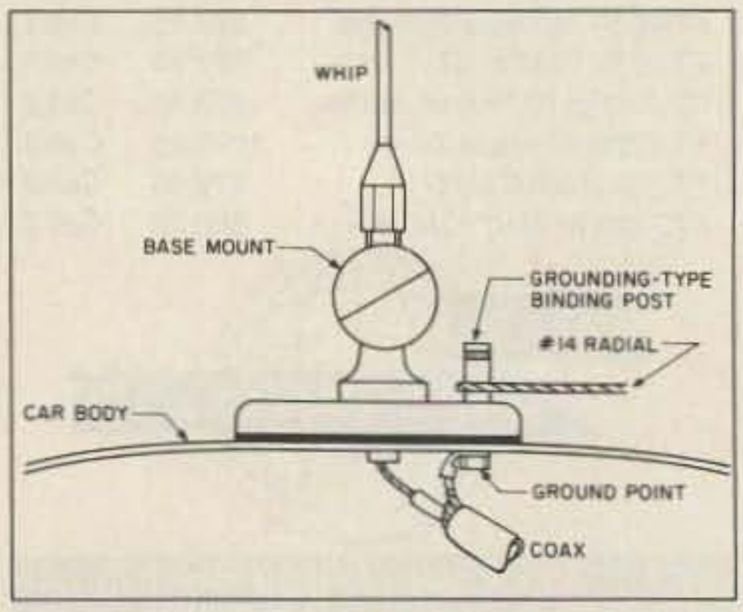

Figure 2C. An improved mobile antenna system, with two #14 radials.

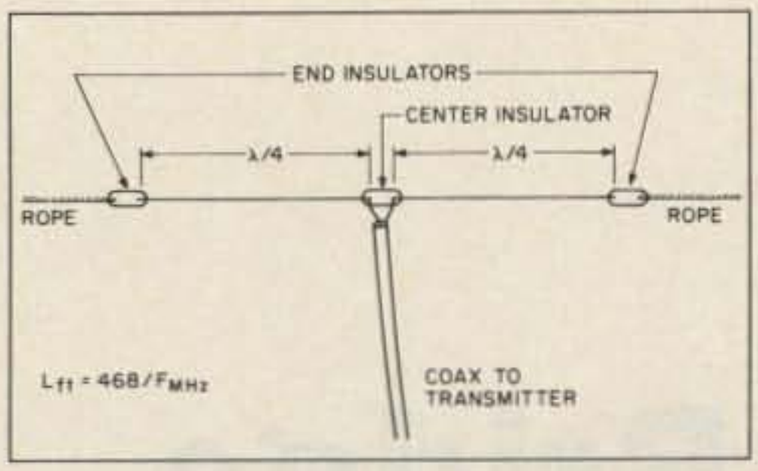

Figure 3. The common dipole and the equation for determining approximate length.

Some Solutions

One solution to these problems is to provide a counterpoise ground plane. The ground plane consists of two or more (even *one* helps) quarter wavelength radials connected to the antenna ground point (i.e., the coaxial cable shield connects to the vehicle body). (See Figures 2A and 2B.) The radials, made of #14 wire, are relatively easy to stow.

A mobile antenna system that shows considerable improvement over the unaided loaded whip, uses the normal basemount attached to the rear quarter panel adjacent to the trunk lid (Figure 2C). An all-metal, grounding binding post is installed through an extra hole drilled in the base insulator. The binding post, though small, easily accomodates two #14 radials.

Another solution is to replace the mobile antenna with a more efficient, stowable antenna that can be erected when needed. A military surplus HF whip antenna intended for jeeps and communication trucks is collapsible and efficient.

The common dipole is also capable of some impressive results. The dipole is made by connecting two quarter wavelength pieces of wire to a coaxial cable transmission line; one length to the center conductor, the other to the shield of the coax. [In an emergency zip (lamp) cord and twisted pairs of hookup wire will do for a transmission line.] Figure 3 illustrates the common dipole and the normal equation for determining approximate length. Actual length is found by trimming length until the vswr drops to its lowest point.

Mounting points for the ends of the dipole aren't always easy to find. Figure 4 shows an alternative antenna that works well for portable operation. This inverted-vee dipole does not need end supports but uses a single center support. Each leg is 6 percent longer than that of a nominal dipole. Since the applications is both temporary and emergency in nature, construction methods unthinkable in a permanent installation are acceptable.

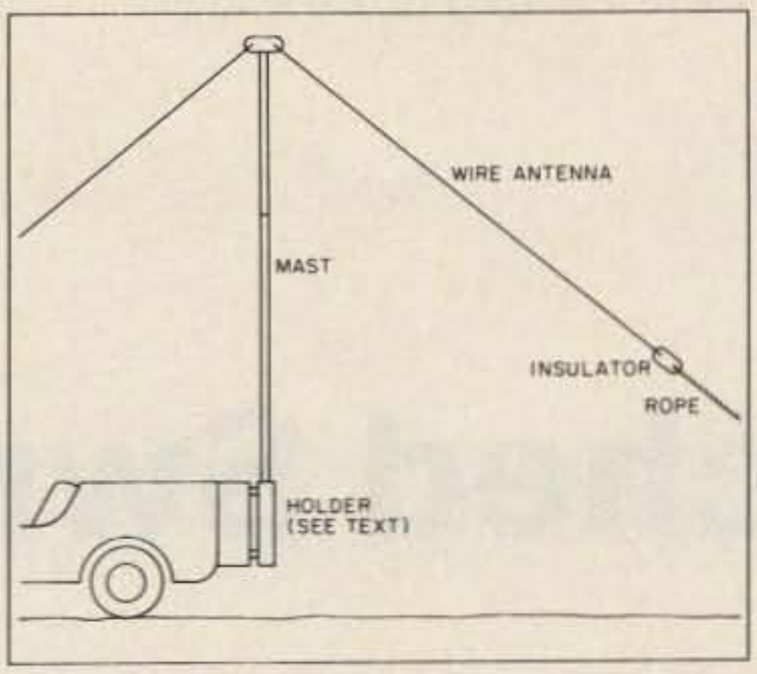

Figure 4. An inverted-vee antenna.

There are three problems: 1) the antenna must be portable for backpackers or stowable for vehicles; 2) what are the materials and means of construction for the mast; and, 3) how is the mast supported?

The Mast

One solution is using a telescoping TV antenna mast to support your antenna. A mobile whip and its associated radials can be mounted at the top, or an inverted vee installed (Figure 4). These masts collapse to 6–8 feet, but can be slipped up to 18, 25, 30, 40, or even 50 feet. Keep in mind that the larger models are heavier and require more than one person to install. Even a 30-foot model can be a bit hairy to install alone.

PVC plastic plumbing pipe can also be used for the inverted-vee antenna. If you're using a vehicle lengths of up to 10 feet are available. Longer lengths can be put together on site by joining one or more sections together with couplings (also available at plumbing supply outlets). However, PVC pipe is flexible and any diameter below 1.5-inch diameter will not stand alone without guying. While a single 10-foot section will stand alone, two or more sections will not support both itself and the weight of the antenna. Guying can be done with ropes, or on a temporary basis, heavy twine.

Another alternative is to carry steel TV antenna masts. These masts, available in 5- and 10-foot lengths, are flared on one end and crimped on the other so they can be joined to form longer lengths. Guy wire rings for additional support are also available from suppliers of these masts. Also available are a variety of roof-top mountings that will also aid in ground mounting.

Base Mountings

An unusual solution I saw on the Outer Banks in North Carolina was one used by a CB operator/bass fisherman. Steel tubes welded to either the front or back bumper and usually used for mounting surf casting rods were used by this CB operator to mount two 10-foot TV mast sections. The upper end of the mast was his 11-meter ground plane antenna (Figure 4). This same mounting method could be used for similar amateur antennas, inverted-vee dipoles, or VHF/UHF antennas.

If the antenna installation is short-term and temporary, long-term integrity is not a problem. So, if you plan to camp or are stranded for a few days, mounting the mast to the back of the vehicle with a pair of U-bolts works nicely.

For lightweight masts (up to about 25 feet) an X-shaped base of 2x4's (Figure 5A) or even a Christmas-tree holder will work. A TV antenna tripod (Figure 5B) is also easily adapted for ground use. Of course, none of these three alternatives can be depended on to be self-supporting, but must be guyed even if used for only short periods. Because of the temporary nature of the installation, aluminum or wooden tent pegs work fine in the short run to anchor guy wires.

Another Problem—Electricity

Simple tools are a must for building and repairing simple antennas in the field (for example, a 12-VDC soldering iron that runs off the vehicle battery). There are two alternatives that can be used in providing power—one, the 12-VDC from the vehicle electrical system; or second, operate from 110-VAC generated by a light plant generator.

When boondocking in a four-wheeler or other vehicle, it is wise to use a dual battery system. Two separate 12-VDC auto batteries (with high amp-hour capacity) are connected in parallel with the alternator. Diodes are rated at 100-amps, 50-volt piv, and are used to isolate the two batteries. Such assemblies are available from van conversion and recreational vehicle shops. It's definitely not to anyone's advantage to run down the vehicle battery operating the rig—not only can't you start the truck, but you can't even call for help.

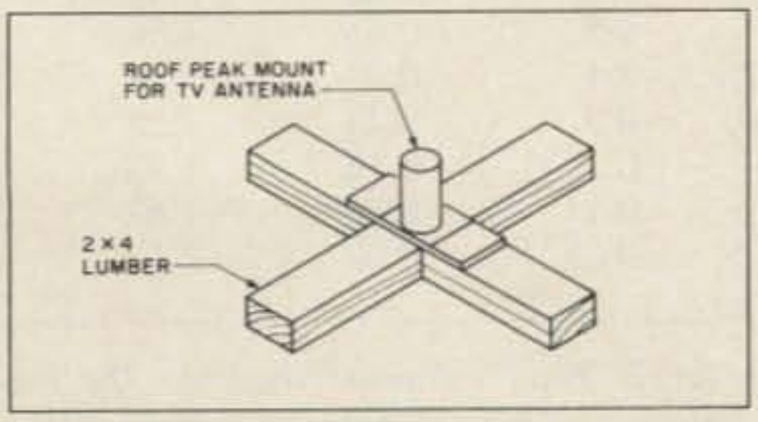

Figure 5A. Base support of 2x4's.

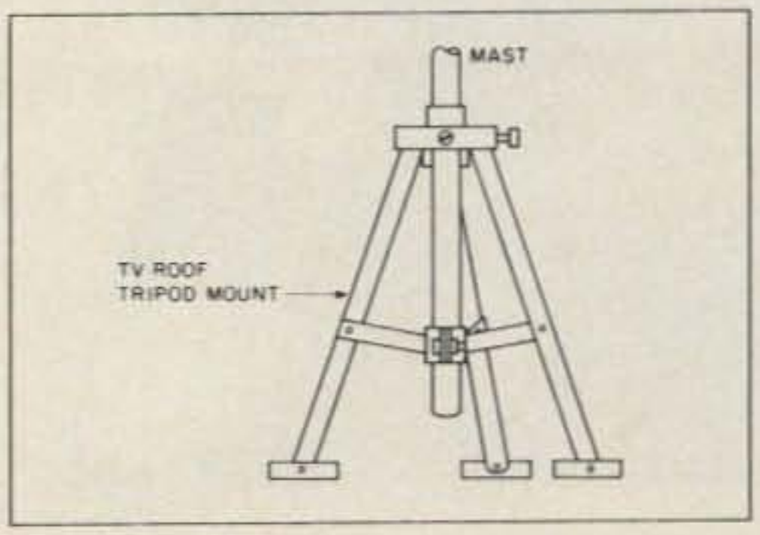

Figure 5B. TV roof tripod mount.

Conclusion

Operating radio communication equipment under primitive conditions depends on two factors: the available electrical power and an effective and efficient antenna system. Without going into detail about getting power in remote locations, I have provided some suggestions that will help you begin planning your own *survival* radio system. ■

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Non-Etched Swr Bridge

Measure antenna swr —from 7 to 435 MHz—with this simple, cheap afternoon project.

For over fifty years I have been matching my home-brew antennas to my radio, using makeshift field-strength meters, lamps, pencils (arc), or finger (ouch). My solid-state amplifiers have complained about this treatment, however, forcing me to consider methods that really define the matching in terms of standing-wave ratio (swr). The effort resulted in a very simple device that measures swr to better than 1:1 in all the bands I am interested in, 7 to 435 MHz. It can be built in a few hours for less than five dollars.

The basic method is a stripline-type directional coupler. The operating principle is that a properly terminated line parallel to, and coupled to, the transmission line will pick up energy traveling in one direction. The detected signal from this coupled line will represent either the forward or reflected energy depending upon which end is terminated. Fig. 1 gives the schematic.

Swr values are determined from the forward and reflected peak-voltage outputs:

V(FWD) + V(REFL) / V(FWD) − V(REFL)

The outputs can also be calibrated in terms of power. However, the output-voltage sensitivity of this type of directional coupler is

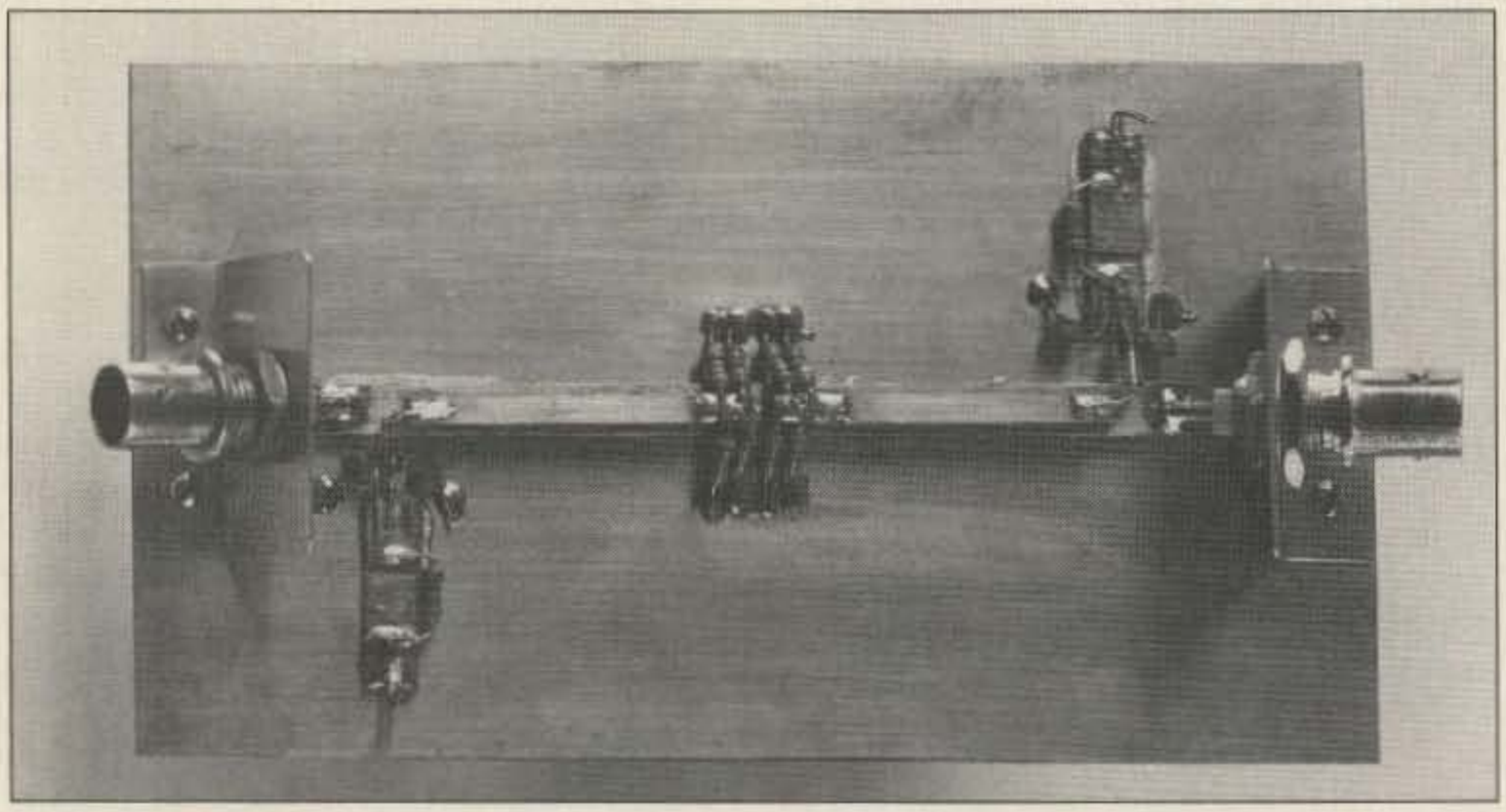

Photo A. Top view of the swr bridge.

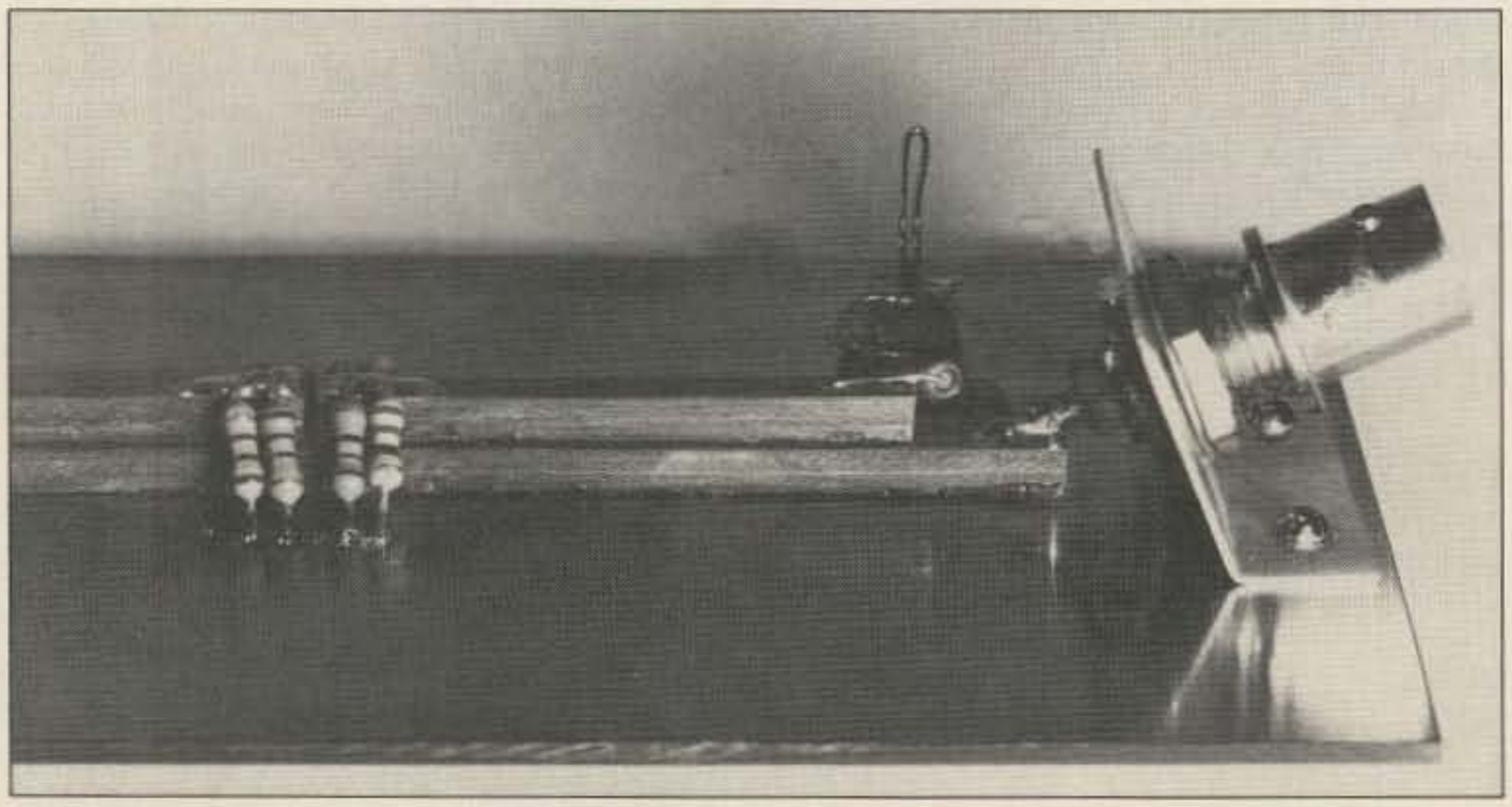

Photo B. Side view of the bridge. Note the stripline mounting.

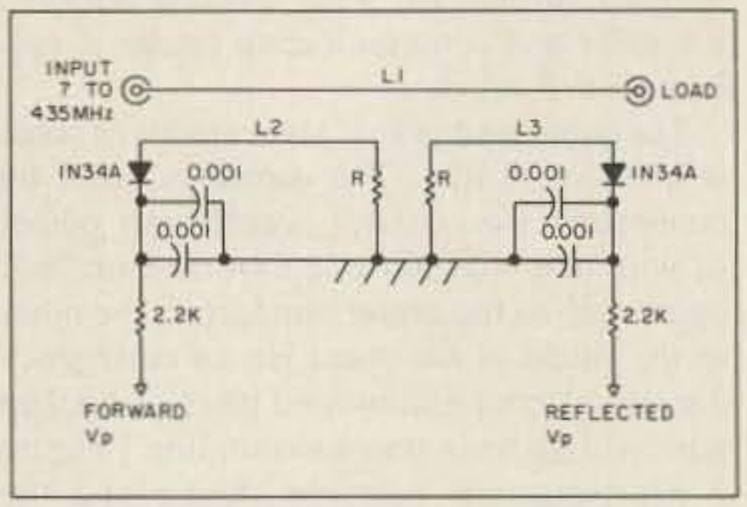

Fig. 1. Schematic for the non-etched swr bridge.

Vp In	Vp Out	Factor
5.00	4.88	1.02
4.0	3.90	1.03
3.0	2.87	1.04
2.0	1.89	1.06
1.0	0.92	1.09
0.8	0.72	1.11
0.6	0.52	1.15
0.5	0.43	1.16
0.4	0.33	1.21
0.3	0.24	1.25
0.2	0.15	1.33
0.1	0.06	1.67
0.05	0.02	2.5

Fig. 2. Peak voltmeter readout. The two columns are input readout characteristics and correction factors.

directly proportional to frequency. As an example, using this particular device at 7 MHz, 100 Watts is required to detect an swr of 1:1, while at 146 MHz, less than 250 mW will make an equivalent measurement. This power/frequency relationship is a limitation.

The effect is in the right direction, however. HF higher power is more likely available than at the VHF/UHF frequencies. Power-handling ability is also frequency related, and it is limited by the coupling-stripline termination resistors. Examples are about 4 W at 435 MHz, 35 W at 146 MHz, and 1 kW at 28 MHz. Total power dissipated at maximum power input is less than one Watt.

This project has been simplified by using a glue-down stripline technique that I have employed successfully in a number of previous projects. Striplines are cut from double-sided glass-epoxy PC board having the same dimensions that you would choose using the etched-PC board method. One side of the stripline is smeared with glue and pressed firmly against the common-base PC board. Changes can be made within minutes by lifting the glue-down stripline with a knife and replacing it with one having the altered dimensions. No dc connection is required between the glue-line foils.

In this project, two striplines are glued together to effectively double the dielectric thickness. This results in a wider stripline for a given impedance, making fabrication and handling easier.

Matching the directional coupler-line impedance with that of the transmission line is a critical parameter, significant differences resulting in a self-generated swr error. Optimum stripline width was calculated using conventional stripline theory. Assuming a 50-Ohm Z_o (line impedance), the calculations resulted in a 0.219-inch width when using two sandwiched 0.062-inch thick glass-epoxy PC strips having 1.5-ml foils (net 0.118-inch dielectric). A dielectric constant of 4.5 was assumed for the glass-epoxy material. Tests indicate that the floating center foils have no effect.

The pickup lines, glued to the top of the 50-Ohm conducting stripline, are 0.125-inch wide. Although their calculated impedance is 69 Ohms, the termination resistance in this special configuration is about 60 Ohms. This resistance is experimentally pruned to null for zero output when the pickup is in a position to detect reflected energy and when the transmission line is terminated with a non-reflective load (50 Ohms). Pruning is accomplished easily using parallel 4-W resistors.

My assembly required four: two 150s, a 330, and a 2.2k-Ohm resistor. The resistor connections are with minimum lead lengths (approximately 1/32nd inch). The assembly is reverse-connected in the transmission line to enable the pruning procedure for both pickup lines in an identical manner. Lack of fabricating symmetry will result in slightly different resistor values for the two pickup lines.

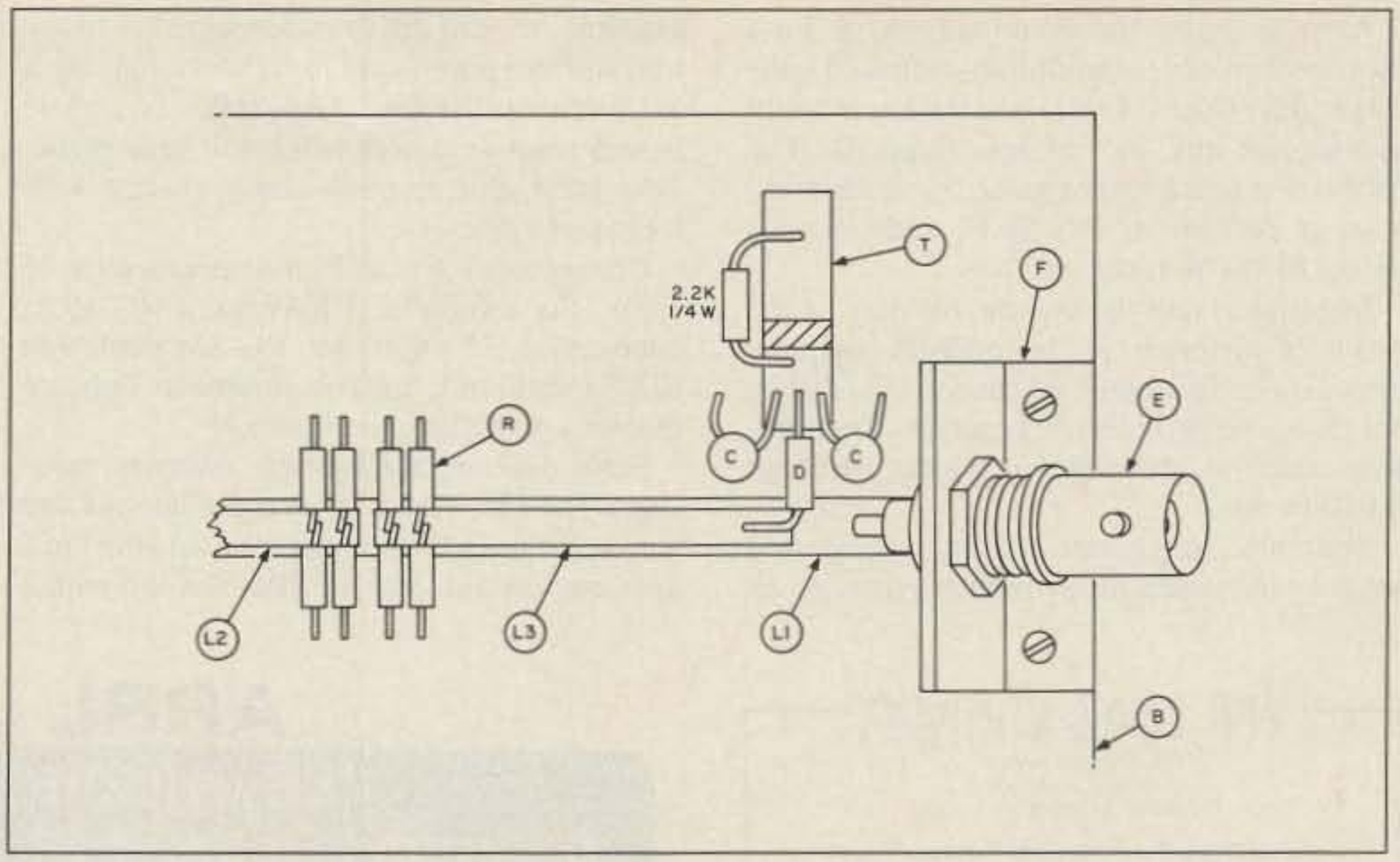

Fig. 3. Fabrication details.

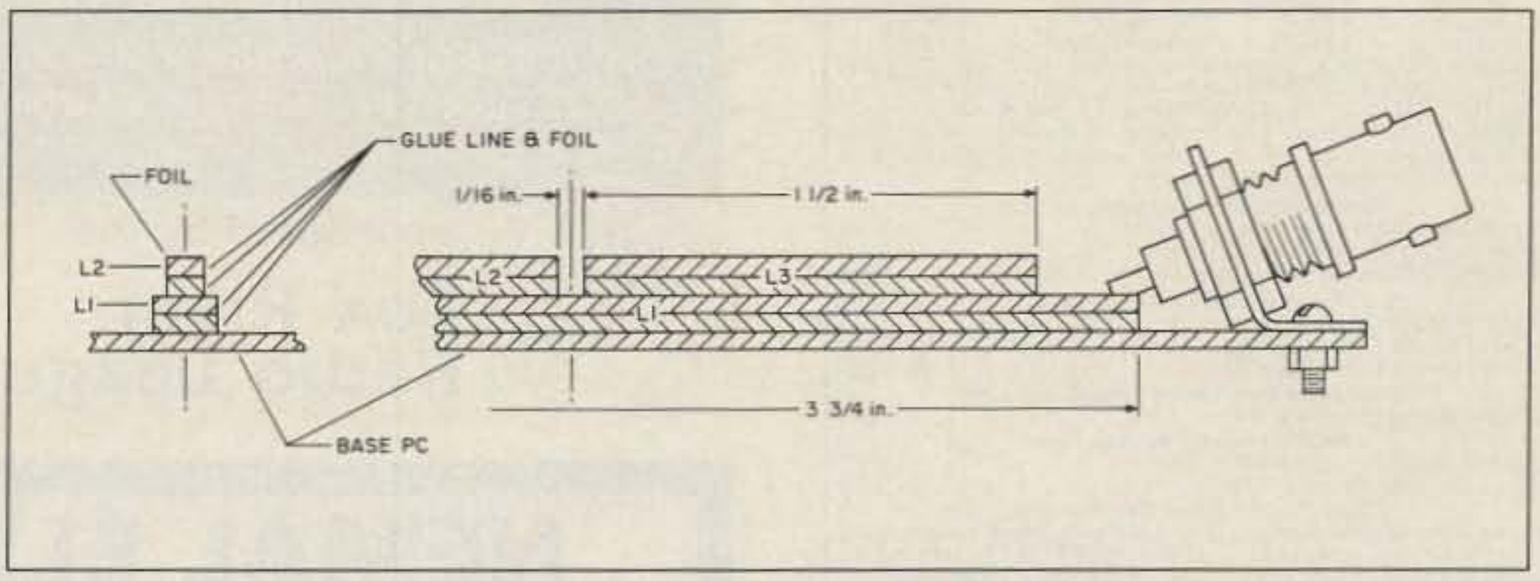

Fig. 4. Stripline cross-section drawing.

A large output-readout dynamic range enhances the usefulness of the device. As an example, only 1.2 V is indicated in the forward direction when used with my 7-MHz, 100-W transmitter. This means that to read a 1:1 swr, it is necessary to detect a reflected voltage of 0.057 V. I have found that selected 1N34As will reliably meet this requirement. In a typical package of ten diodes from Radio Shack, over half of them had a back resistance of more than 10 Megohm (less than 1 uA at 10 V).

Using these selected diodes in the peak-detection circuit together with a high-impedance (10 Megohm) digital voltmeter permits reliable readings down to 0.05 V. The table in Fig. 2 shows input readout characteristics and the correction factors. The required readout sensitivity is a trade-off of how much power is available at a particular frequency and the desired swr- measurement accuracy. The usual ham shack VOM-multimeter will be adequate for most applications.

Fabrication details are shown in the Fig. 3 layout, and the stripline cross-section drawing in Fig. 4. It is best to start by cementing the stripline sandwich and then finish trimming the edges to the required width. A file works fine, however—as does a sandpaper block, which will save dulling your file with the glass epoxy material.

The primary stripline width should be held

R	435 MHz Swr	146 MHz Swr
25	1.7	1.9
50	1.0	1.0
100	1.8	1.7
220	3.9	3.9
330	6.0	6.3
470	9.6	9.5

Fig. 5. Plotting data.

to 0.219 inch, ± 0.005 inches. I used calipers to size the striplines, but a ruler would be satisfactory if used with considerable care. Maintaining symmetry through the assembly is important. When mounting the BNC chassis connector, use a double nut so that it can be fastened in a position for minimum common-return inductance.

Final alignment is simply pruning the pickup-line termination resistors in the manner mentioned earlier (multiple 1/4-W resistors). It is best to do this procedure at the highest frequency you intend to use the swr device—I used 435 MHz. One thing required is an accurate 50-Ohm termination. I used a fifty-foot section of RG-58/U terminated with two 100-Ohm, 1/4-W resistors. The 7.5-dB cable loss reduces the estimated worst-case resistor reactance swr from a value of 1.2 to 1.03.

After pruning the terminations of both pickup striplines for minimum reflected indication (less than 1:1 swr), the device is ready to measure any swr of less than 10. The calibration results were made by terminating a short section of RG-58/U with various values of 1/4 W resistors.

Inability to null the swr device may be the result of an error in the primary stripline impedance. This could be caused by a different glass-epoxy dielectric constant. Try alternate striplines differing in widths of about 0.010 inches.

Spurious responses in the transmitted source can cause a measurement error. As an example, a −30 dB spurious signal is likely to result in a significant error when making a 1.1 swr measurement. Also, reflected signals from a reactive source will result in an error. This error will be particularly evident with large swr values.

Connectors also can be a suspect source of error. For example, I have used RG-59/U connectors (75 Ohm) for RG-8M cable (an RG-8 minifoam), and measurements indicate that they contribute to the swr.

How did my home-brew antennas measure? The 435-MHz, 15-element antenna swr was 1.2, the 2m 5-element was 1.4, the 2m J antenna was 1.4, and the 20m flat-top with a tuned antenna coupler at the transmitter was 1.5. That makes sense. I spent more time matching the UHF antenna.

In summation: You can match antennas adequately without an swr instrument, but it's a lot easier if you have this simple gadget. Besides, it's a good way to become acquainted with directional couplers. ■

Notes

1. Microstrip Design Techniques for UHF Amplifiers, Motorola RF Device Data—AN-548A.
2. PCB source (PCB-33), John J. Meshna Jr., Inc., 19 Allerton St., Lynn MA 01904.

Roger Snoke KB6MIF
339 West Artesia St.
Pomona CA 91768

A 220-MHz Portable Pocket J-Pole

Here's a cheap, quick, "handie" antenna that gives you 2-dB more signal than a half-wave pullout whip!

The 220 MHz portable pocket J-pole got its first test under actual emergency conditions. The phones in a large area of the Continental Telephone System were out of order due to a malfunction in San Bernardino CA. As a RACES member, I was called in to assist the Sheriff's Department to keep communications open for county services.

I was assigned to the San Bernardino County Jail. All lines were out and no communication was possible from the jail. The rubber duck on my HT was useless because the command center inside the jail is surrounded by solid, 12-inch-thick concrete walls and a heavy network of steel bars. The RACES 2-meter repeater was also unusable because I couldn't get a break between a flood of local hams flocking to a nearby electronics swap meet.

Solution? I hung my 220-MHz portable pocket J-pole from the jail's acoustic tile ceiling with a piece of masking tape and plugged it in my ICOM 3-AT. On 150 milliwatts, I brought up the 224.34 N6ENV repeater in Running Springs full-scale. With 5 x 9 copy I passed traffic on the technical status of the malfunctioning telephone lines to Perry Westrope WA6LLB, chief RACES radio officer, at his shack 20 miles away in Upland CA. Perry then relayed these messages, via telephone, to the San Bernardino Communications Center. We stood by for routine traffic all day—no problem!

Building The J-Pole

For those active on 220, here is an excellent project that won't take very long, and will greatly improve your HT signal.

Take a 3 1/2-foot piece of TV 300-Ohm twinlead and strip the insulation from each conductor down 1/2-inch. Twist the two pieces together and solder at the bottom end.

Next, measure 38 3/16 inches up from this J-connection and cut the twin lead.

The next step is to measure up one side 13 1/4 inches and cut away 1/4-inch from one conductor. You now have a .94/2 wave radiator and a 1/4-inch wave ground tuning stub.

Now cut a piece of RG-58/U coax about 8 feet long. (I cut mine 24 feet, but I have big pockets and like to climb trees.) Then solder on a coax connector for your HT.

Expose the twinlead conductors at a point 2 inches up from the bottom. Solder securely the ground or braid side of the coax to the short conductor. Solder the center coax conductor to the long side of the twinlead. Make sure you have good connections and separate them with electrical tape. Then wrap this connection and the bottom J-connection with tape.

For the last step, tie a piece of string to the top and secure it with electrical tape.

You can hang the antenna anywhere convenient, but make sure it's at least two wavelengths (2.5 meters) away from any large metal objects.

This antenna delivers 2-dB more signal than the 1/2 wave pullout whip that is much more expensive. And, of course, it is far superior to the rubber duck.

Good luck and enjoy 220 MHz! ■

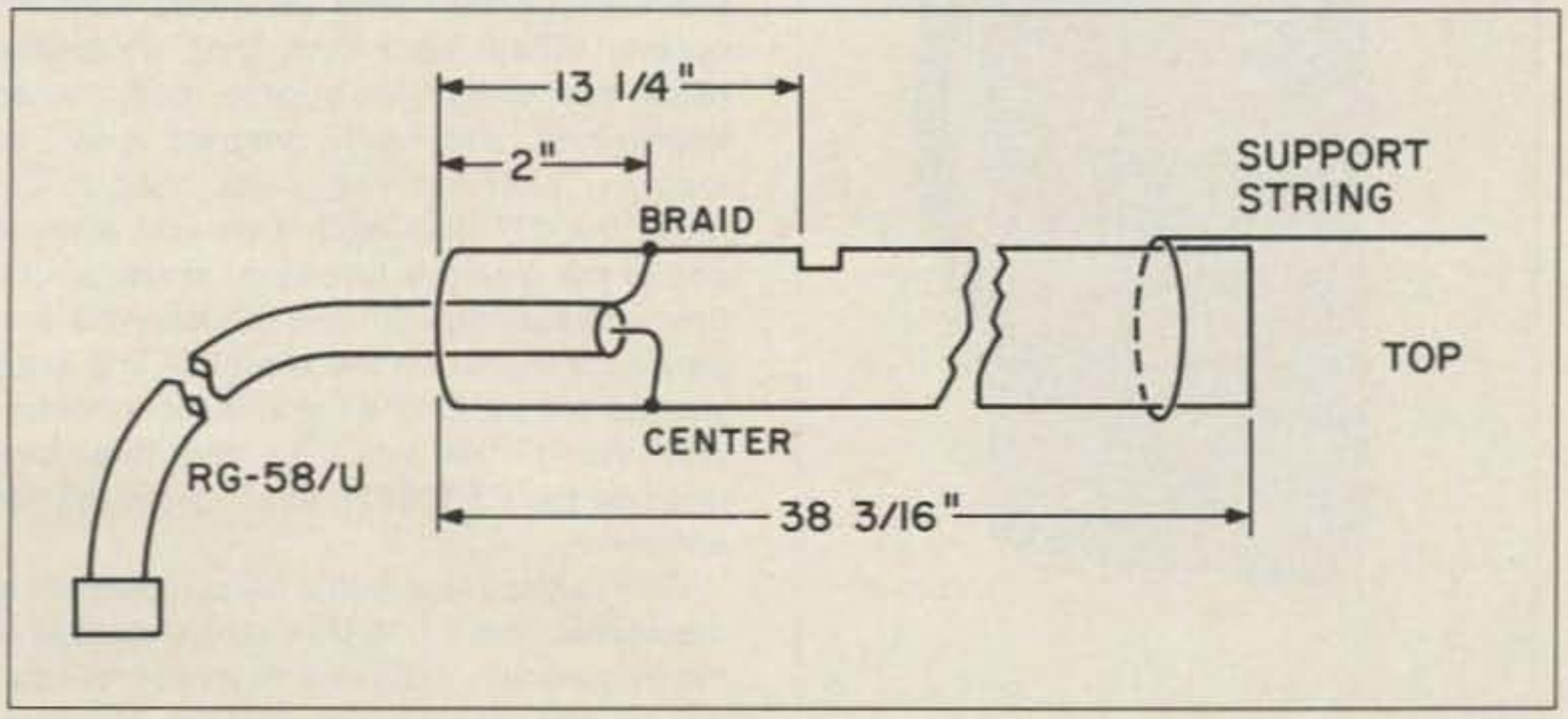

Diagram of the 220 MHz Portable Pocket J-Pole.

Photo A. Roger Snoke KB6MIF using the J-pole he built.

ICOM IC-03AT
Yaesu FT-109RH
220-MHz Hand-Held Transceivers

ICOM America, Inc.
2380–116th Ave. NE
Bellevue WA 98004
Price class: $450

by Peter H. Putman KT2B

Yaesu USA
17210 Edwards Rd.
Cerritos CA 90701
Price class: $380

This month, we'll continue our analysis of radios of special interest to Novices. Both the Yaesu FT-109RH and ICOM IC-03AT are full-featured hand-helds for the 220 enthusiast. They represent both companies top-of-the-line models (to date).

Refer to the photographs for a size comparison. Right away you'll note the large 500 mA battery pack on the FT-109RH—similar to the pack used on the FT-727 dual band HT. This increases the size of the radio but also expands the battery life and allows much higher output power. The IC-03AT checks in with the standard 270 mA pack for a lower profile and correspondingly less output. Can't get something for nothing, right?

Both hand-helds come in durable, attractive, metal cases with the Yaesu finished in gray and the ICOM in dark green. Both have easy-to-read LCD displays, with the FT-109RH display larger, at 1 1/4″ x 1/2″, than the IC-03AT's 7/8″ x 3/8″ readout. The numbers stood out better on the IC-03AT, however, in bright light. Both units feature a lamp switch to use under low light conditions. The ICOM uses a push-on/push-off type, while the Yaesu employs a momentary switch about where your thumb would be. I much prefer the latter arrangement, since you only need the lamp briefly to set up the desired frequency.

The IC-03AT . . .

. . . and its contender, the FT-109RH.

Coverage is identical on both models, with receive and transmit displayed and enabled from 220.000–224.990 MHz. The IC-03AT volume and squelch controls are textured rubber knobs for an easy grip, making them far easier to use than the lower profile Yaesu plastic knobs. Both radios employ a HI/LO rf-power switch on top, and both use a sub-mini jack for an external microphone and a mini jack for an earphone. (Anticipating your next question . . . the speaker/mikes are *not* interchangeable between the two radios.)

ICOM provides an external dc power jack on top of the HT, while Yaesu makes this connection through the bottom of the FNB-4 battery pack. The FT-109RH also has two buttons to control VOX keying and VOX sensitivity. This option is not available on the IC-03AT, unless you purchase the optional HS-10 and HS-10A headset/VOX unit. With the FT-109RH, you'll just need either the YH-2 headset or MH-12A2B speaker mike.

Both hand-helds have a shifted keypad for both DTMF signaling and frequency selection. To shift the keypad on the FT-109RH, you need to depress the yellow "F" key first, then select the desired function. Only one keystroke is permitted per selection of the "F" key. On the IC-03AT, you have to depress a FUNC key above the PTT bar on the side of the radio, but as long as it is depressed you can select as many shifted functions as you want.

For example, let's say you wanted to select a sub-audible tone frequency from the optional FTS-6 Tone Unit, then a repeater offset, then shut off the audible "beep" when keystroking, and finally program it all into memory. With the Yaesu you need to depress the "F" key each time you execute one of the previous functions, which is a bit time-consuming. On the ICOM, you just park your thumb on the FUNC key and away you go for as long as you want. (Incidentally, the "F" key times out after three seconds on the FT-109RH, if no keystrokes are entered.)

Both radios come with a full complement of memories. The FT-109RH allows storage of ten frequencies, each with its own offset information and tone squelch data (as required). The IC-03AT also permits storage of up to ten

different frequencies along with the necessary offsets and tone frequency information. One note here: The IC-03AT comes equipped for CTCSS tone generation—no optional tone generator is needed.

Scan modes are also similar. The IC-03AT provides for memory scan, as well as programmable scan (between any two frequencies). The FT-109RH goes a bit further by also allowing you to lock out certain channels you don't wish to scan, as well as providing a priority channel (also included on the IC-03AT). In addition, the FT-109RH features a call channel in memory position 0, which can be accessed by simply tapping that button. Yaesu intended this to be used on the national calling frequency or close to it (223.50 MHz) with a rapid QSY to another channel the next step.

The IC-03AT displays power output and received-signal strength through the use of an LCD bar graph display. In high power, the bar graph covers the bottom of the display, and in low power it covers about half the display. The FT-109RH uses a more conventional analog meter for both functions, which came as a bit of a surprise in this day of all-in-one LCD displays! High and low power readings are then taken from the analog meter. It does triple duty by showing you the battery condition, a function called out by an arrow pointing downward on the IC-03AT when it's time to recharge.

As you've no doubt gathered by now, the two radios are very similar in operating features, power, and size. How about performance? Hard to pick one over the other there, as well. See Table 1 for test bench data.

Here are some hands-on observations. I found the displays about equal in readability under both bright and dim light conditions. The FT-109RH multi-function display tells you more about what's going on in the radio than the IC-03AT, with the latter using very small characters to show tone select, battery low, scan, etc.

The knobs are very much easier to use on the IC-03AT than the FT-109RH, and appear to be stronger. The keypad on the IC-03AT gives a better detent feeling when depressed than the FT-109RH, and looks to more sturdily constructed. I also preferred the shift function the way it's set up on the IC-03AT to the repeated striking of the "F" key on the FT-109RH.

However, the microphone on the IC-03AT is way down the front panel near the battery pack, which is a safe move on the IC-12AT, but doesn't make sense here. The microphone on the FT-109RH is situated just above the meter display, about where you'd want it while transmitting.

The received-signal indicator on the FT-109RH is calibrated in increments from 1 to 10 (which doesn't mean much of anything) while the IC-03AT's LCD display isn't calibrated in any manner at all. (Hey—either you're full-quieting on FM, or you're not—right?) Having the higher power on the FT-109H was nice and it also has a programmable receive interval to extend battery life. This feature is not available on the IC-03AT, although with the standard battery pack or a NiCd make-it-yourself pack such as the BP-4, battery life shouldn't be a problem.

Received audio reports favored the Yaesu almost unanimously. Receiver audio output appeared to be higher as well, despite the FT-109RH's rating of 450 mW @ 8 Ohms vs. the IC-03AT's 500 mW @ 8 Ohms. The audio output had more of a high frequency component than the IC-03AT and thus sounded crisper. It did seem that I went through a charge faster on the FT-109RH, which makes sense when running 5 Watts output. I didn't have a chance to try the Power Save circuit that allows the user to leave the unit on one channel and have the receiver power up for only 300 milliseconds to check for activity at frequent intervals.

Both radios came supplied with rubber duck antennas, although the IC-03AT has the full-size duck and the Yaesu uses a "mini" duck. I guess the latter is to save on size, but replacing the "mini" with a regular duck will make a drastic improvement in your signal. Of course, you can use 1/4 wave whips with either radio for even better performance. Both radios also use the now-standard slide-lock battery pack system for quick changing of batteries, and the brackets used were equally secure.

Out of the box, the ICOM is far easier to set up, since the Yaesu includes numerous CPU functions that I personally have no interest in. Both manuals are clearly written, with the ICOM getting extra credit for a step-by-step pictoral diagram showing how to set up a function, transmit, program offsets, load memories, etc. As far as accessories go, the FT-109RH is interchangeable with the 209 and 709 series, and uses the same battery pack as the FT-727 dual band HT. The IC-03AT is interchangeable with accessories from the 02/04 series, as well as the 2AT/3AT/4AT radios.

And The Winner Is . . .

There are so many similarities between these two radios that I wonder at times if they aren't both made by the same company in Japan! (Even the supplied wall chargers are virtually identical!) I'd have to give the edge to the FT-109RH as far as its crisper audio, higher power and battery-saving circuit. I preferred the lower profile and cleaner look of the IC-03AT, but with the FNB-3 pack, the Yaesu is about the same in overall size.

Actually, the real winner is you—both radios yield excellent performance for the money spent. ■

Specification	IC-03AT	FT-109RH
Coverage	220.00-224.99	220.00-224.9
Power out		
High	3.0 Watts (BP-3)	5.5 Watts (FNB-4)
Low	500 mW	500 mW
Receiver Sensitivity,		
10 dB of quieting	.25 uV	.25 uV
20 dB of quieting	.5 uV	.5 uV
Squelch Law (Sensitivity)	.18 uV	.2 uV

(Note that the supplied battery packs for each radio determine the power output. The IC-03AT can be raised to about 5 Watts output by purchasing the optional BP-7 450 mAH pack, which will yield about the same output as the FT-109RH.)

Table 1.

Sangean ATS-803 Shortwave Receiver

by Marc Stern N1BLH

Sangean America, Inc.
8531 Wellsford Pl., Suite K
Santa Fe Springs CA 90670

There's a new shortwave receiver on the market, the Sangean ATS-803. A portable, it is Sangean's top-of-the-line, fully synthesized model.

The ATS-803 boasts a large range of features, which include a dual-conversion, superheterodyne receiver section, FM broadcast coverage, and full coverage of the LW, MW, and SW bands from 150 kHz to 30 MHz. In its AM mode, you have continuous coverage of its frequency range, while the SW (shortwave) mode gives you direct access to 120, 90, 75, 60, 49, 41, 31, 25, 19, 16, 13, and 11 meters. It also features a large liquid crystal readout, microcomputer control with 14 memories (5 of which store mode as well as frequency), automatic scanning, memory recall, adjustable gain, a beat-frequency oscillator, and a five-bar LED received signal-strength meter.

We could keep listing specifications, all of which would show that this is a highly capable shortwave receiver. But looks and lists can be deceiving.

The ATS-803 features manual as well as electronic tuning. The analog tuner is too broad; with the display advancing in increments of 20 kHz or more. How would you feel about having to listen to your tuning? With the ATS-803, you hear a constant blip-blip-blip as you tune up or down the band with the manual tuning. How would you feel with a receiver that looks as if it has stereo capability, but you are forced to use a pair of stereo headphones to take advantage of it? We were more than a little surprised to have tuned up a stereo station, only to find the speaker still playing mono. The instructions do explain the need for the headphones, but this isn't indicated at all on the radio itself. The radio has a balance control and a prominently displayed STEREO indicator.

The ATS-803 looks remarkably like other microcomputer-controlled receivers on the market, such as the Sony series, but it has a feature which the others lack: a bfo (beat-frequency oscillator). Other microcomputer-controlled receivers automate this function. The bfo would be a nice idea if it was easy to use, but it really isn't. Once you've found a CW or SSB signal you want to hear, you have to spend some time turning a slightly-raised knob until the signal is best: with CW, it was possible to do this fairly quickly, but on SSB, it was more difficult and time-consuming. In fact, it was nearly impossible at times to tune SSB signals with any great regularity. A couple of times, when we wished to find LSB, we had to turn the bfo into the USB area and vice versa. Sangean should have included automatic mode selection. It is also confusing at first to tune for CW or SSB: you must leave the ATS-803 in the AM mode, and switch a microswitch to the bfo setting.

We evaluated the ATS-803's receive capability. The ATS-803 was evaluated in a high-rf environment, created by local high-powered HF, VHF, and UHF transmitters, from a variety of government and private sources. The ATS-803's performance was compared to several other receivers, including the Kenwood R-1000. On the Kenwood and others, we attached a random length of wire as an antenna about three feet long; the ATS-803 used its built-in, 54-inch, telescoping antenna. With these antennas, we tuned to WWV on 10 MHz, and the result was little more than noise on the ATS-803, while the Kenwood received WWV quite clearly at about S-2. At times, signals seemed to overwhelm the ATS-803's front end, and it would lock up, with the signal strength LEDs all glowing brightly.

"We could keep listing specifications, all of which would show that this is a highly capable shortwave receiver. But looks and lists can be deceiving."

We noticed also that the ATS-803 had too many birdies. We found that it would constantly lock up and display a full bank of LEDs when there were no signals present, as though the ATS-803 was hearing its own microprocessor and microelectronic circuitry.

On the plus side, the controls are well laid out and large enough so they can be easily used. The keypad has large keys that feel positive, like the band selector keys. There's a large EXECUTE key which enters the frequency you have punched into the keypad, and there are two large up and down keys which allow you to step through a range of frequencies. Here, you also hear the blip-blip noise during tuning. There are also slide switches for the stereo balance, bass and treble, and volume, and there are momentary-contact switches for a "sleep" feature and panel light. There are also outputs available for a tape recorder, as well as for an external antenna and stereo headphones. There's also more than enough audio from the 4.5-inch speaker.

There's quite a list of features, but prospective buyers should be aware of the faults we found with the ATS-803. In the final analysis, we feel this radio was a good attempt, but, in light of the competition on the market, falls short of the mark. Circle Reader Service Card Number 202. ■

Dick Smith VHF Wattmeter

Dick Smith Electronics
PO Box 8021
Redwood City CA 94036
Price class: $39.95

by Allan J. Perrins WB6PHE

It is impossible to know if your are getting the most out of your rig and antenna system without a good wattmeter. When it comes to wattmeters, there is little argument that the Bird 43 is the best. However, the price of a Bird and its plug-ins is out of the reach of many hams.

Now, however, a cheap, high-quality alternative is available. Dick Smith Electronics has recently introduced a VHF version of their popular UHF wattmeter. The K-6611 wattmeter is an insertion type device capable of both forward- and reverse-power measurements. Its two ranges are 0–30 and 0–150 watts full-scale, and insertion loss is less than .1 dB. Although specified for use in the 144–148 MHz band, it is usable at 220–225 MHz with slightly less accuracy.

Construction is straightforward and can be completed in about two hours. You should begin by reading the manual and errata very caredfully. The mounting of the feed-through caps is a little unclear. The photo on page three of the manual shows the feed caps in the upper-right and lower-left corners of the main PC board. This is correct, but the photo fails to show that the outermost end is made into a loop for "flying leads", as the Aussies call them. These are the leads from the switchboard and the meter.

"The K-6611 wattmeter is an insertion-type device capable of both forward- and reverse-power measurements."

There are 10 pins to be soldered to the main board to provide a good low-impedance rf path. The manual doesn't tell you that they are also used for spacing to the tin-plate bracket used as a ground plane for the input and output connectors. I had cut all of mine off (good rf practice) and discovered that the main board didn't fit properly. Fortunately, I had some left over from another kit.

Be sure to follow the errata sheet for the assembly of the stripline board. The manual text is in error and the unit won't work otherwise.

Mounting the sockets makes for interesting construction, since you have to work inside the case. Use a 3/4-inch box wrench to tighten the SO-239 nuts. Screwing a PL-259 onto the socket will make it easier to hold during this process. After tightening the sockets, test the fit of the assembled microstrip board over the socket center pins. There is a small amount of play in the holes for the SO-239's and I found that I had to mount them as far outside as they would go so that the PC board would fit. This was the most difficult part.

Construction of the switchboard is straightforward. Follow the instructions in the manual and it will be clear that the pots mount on the opposite side of the board from the switches. Two of the "flying leads" have ferrite beads on them. I used ordinary rubber cement to secure them, rather than epoxy as the manual suggests. Silicone sealer would have worked as well.

There is a custom face provided for the meter movement. It's screened for the nomenclature of the front panel switches as well as for two calibrated power scales. The screws for the new face are taped to its rear and are quite small, so be careful not to lose them.

The calibration instructions were easy to follow and gave satisfactory results. A small improvement in accuracy was gained when the unit was claibrated against a Bird 43, but this effort will hardly be necessary for most users.

The finished unit is very professional looking. The case is black, anodized aluminum with rounded seams and recessed end caps. I did find that the end-cap screws protruded somewhat, making the unit a little unstable on a table top. Four self-adhesive rubber feet fixed that little problem. The other small item is that the connectors on the back are not marked for input and output. Looking at the unit from the rear, the right SO-239 is the input and the left one is the output. You will have to use your judgment when checking forward- and reverse-power readings to see if you have hooked up the input and output lines correctly.

The Dick Smith UHF Wattmeter will make a fine addition to Reader Service number 201. ■

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Horseflies And Grid Squares

Pete Putman KT2B and crew brave the elements on a VHF/UHF DXpedition to grid square FM27

It was the best of times. . .it was also the wettest of times. And with apologies to Charles Dickens, it was also the craziest of times! The scene was our recent S.C.O.R.E. DXpedition to Chincoteague Island, Virginia (Grid Square FM27) for the June VHF QSO Party.

Background

I had given some thought in February to such a junket to activate a rare grid square and FM27 kept coming to mind. Most of this grid lies either in the Atlantic Ocean or Chesapeake Bay, with just a small section of the DelMarVa peninsula running through it. Chincoteague seemed to be the best location. It's located along the ocean (great for tropospheric scatter) and is easily accessible by car—important especially for us, since we wanted to use a crank-up tower trailer with multiple VHF/UHF yagi beams.

FM27 has long been a desirable catch for VHF and UHF types, and the mention of a possible trip perked many an ear of those on 220, 432, 902, and 1296. Long-time residents Ken Birmingham WB2IFC and his wife Sandra WB2GRI have done a pretty good job of giving out the grid on 6 and 2 in previous contests, but the station complement doesn't include anything above 2 meters—at least for now. And Ken has been getting overwhelmed with requests for FM27 lately, so. . .

. . .S.C.O.R.E to the rescue! Our group (Society of Contest Operators and Radio Experimenters) was formed just for times like these. A rare grid. . .UHF and VHF operation. . .lots of custom antennas and rigs for portable use. . .plenty of travelling. That's what brought SCORE into existence, and the lure of Chincoteague was too powerful to resist. Knowing we would be in demand meant selecting reliable but simple stations for each of the six bands from 50 to 1296 MHz to minimize downtime and maximize the QSO rate.

It was only a matter of time before Ivars Lauzums KC2PX, and Steve Katz WB2WIK decided to come aboard and offer their talents. Steve, a veteran VHF contester, could well imagine the possibilities of an ocean side operation, especially on the UHF bands. Ivars, of course, distributes Microwave Modules and Tonna antennas, and has racked up a few pretty impressive scores himself running single operator.

We decided to use as many high-gain yagis as the 51-foot tower trailer could accomodate. Weight was also a consideration, so we chose to do it the French way and use Tonna yagis on every band, except 220, where no comparable Tonna product exists. So, we purchased a 17-element Cushcraft 220B Boomer for this purpose. Ivars suggested using stacked 55-element yagis for 1296 and stacked 23-element yagis on 902—both sharing a common H-frame and both secured near the top of the 16-foot mast.

On 6 meters, we'd split time between a 7-element KLM-LD as our primary antenna (because of its light weight and excellent front-to-back (F/B) ratio), and a secondary 5-element Tonna for fixed-mount service pointing southwest for sustained Sporadic-E contacts. Its F/B ratio is not nearly as good; but it goes together in a snap, loads up easily, and is fairly broad, with nearly 70 degrees across the main lobe—perfect for general Es work.

Two meters was an easy choice, the 17-element Tonna with Trigon reflector. I evaluated one of these last January and found it about as good as the standard 32-19 Boomer, a somewhat heavier antenna. We rounded the complement of antennas out with 2, 21-element Tonna 432 yagis and a power divider, which made for an awful lot of hardware on that 16-foot piece of aluminum. We decided to use 9913 for all feedlines above 220, since it's light, reasonably flexible, and offers fairly low-loss characteristics at 432, 902 and 1296 MHz.

The tower trailer itself is a clever design. It

Photo A. The UHF station at WB2WIK/4. From left to right are the 220-, 432-, 902-, and 1296-MHz stations.

Photo B. Ivars KC2PX plugs away on 432 MHz.

was built by Mike Crawford WA2VUN (whose DX-86 on a pedestal appeared in the September 1986 *73 Magazine*). Mike selected a stock Tri-Ex W-51 crank-up tower and designed a special mobile trailer with supports and bracing on the tower, as well as outriggers for extra stability. It works very well and has been used on numerous contest operations as well as Field Day. Ivars preassembled all of the yagis at his warehouse to facilitate on-site installation. The plan was to secure what he could to the tower trailer with shock cords and carry the rest in his Aerostar van.

After a lot of correspondence, I got permission from the Town of Chincoteague to use a public harbor facility. We scheduled our arrival for mid-afternoon, Friday, June 12 to pick out a site.

For the station, I lined up three ICOM IC-740 HF radios with Microwave Module transverters. A reliable setup I'd used many times before and had complete confidence in. Steve WB2WIK arranged to get an SSB Electronics LT33S with a companion Down East Microwave 20-watt "brick" so we could try our hand at 33-cm operation for the first time. My old trustworthy TR9000 even got into the act as the 2-meter i-f stage. You can't keep a good rig down!

And Away We Go

Friday, June 12th was somewhat overcast, but warm. I made a quick trip to U-Haul and rented a pair of 12-foot, screened tents—one to operate from, and one to sleep in. Of course, our most important piece of equipment was a 120-pound Honda 4000-watt generator that is extremely quiet.

Our proposed site had no electricity convenient to it, so a generator was a must. We also felt it might be more reliable if lightning did hit and took commercial main service down.

We had a hard time packing everything up, but managed. Ivars' van was packed to the teeth, and we had to extend his trailer platform with two long tables so we could pile additional stuff on it. Everything was strapped down (including Ivars to his steering wheel) with 5 miles of bunji cords, leaving just enough room in the car for additional camp stuff, clothes, cameras, and a personal computer for logging and duping on site.

It took us about six hours to make the trip. Everett Palmer, the harbor master apparently had no idea when we'd arrive, so, when we did arrive around 6:00 p.m., we had no idea where to set up. After a quick survey, we chose a spot near the southeastern end of the docks—a fairly remote spot on flat, dry ground (which we found out later wasn't the case!) with several nearby dunes to provide a windbreak from the stiff, southwesterly breeze. We set about getting things in order.

Our fourth operator, Rich Whiten WB2OTK was en route from Greenville, South Carolina and hadn't checked in on 144.200 SSB yet, so we set about clearing everything from the tower trailer as ominous clouds began to roll in from the west. Everett showed up about an hour later and gave us the pleasant news that a severe storm warning was in effect until 9 p.m. Just what we wanted to hear! Later, the Harbor Commission chairman, Jim Thompson, stopped by to check out our tower trailer and gave us the same weather report.

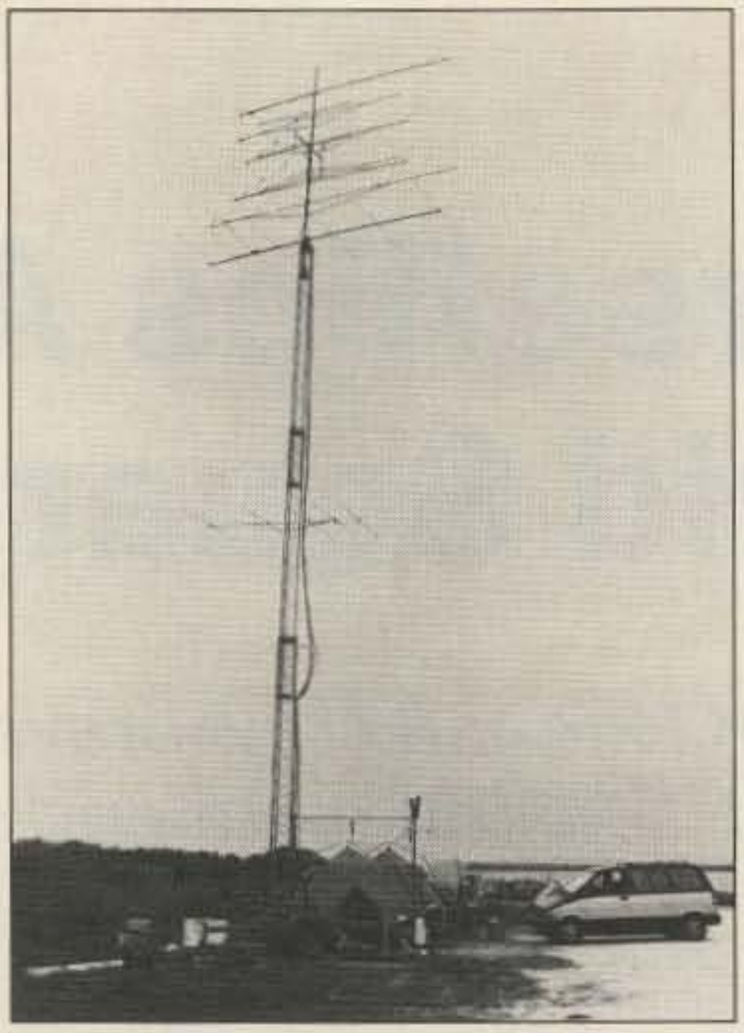

Photo C. A view of the tower trailer with Chincoteague harbor in the background.

A few squawks from the IC-290 in Ivars' van revealed Rich cruising over the Chesapeake Bay Bridge Tunnel—nearly 70 miles away! He was racing the thunderheads north while trying to work 2-meter SSB and check for 6-meter E-skip all at the same time.

Ivars built a tripod arrangement to hold the twin 55-element yagis for 23 cm and twin 23-element yagis for 33 cm during ground assembly. An ingenious H-frame was welded together by Mike WA2VUN to support both UHF antenna arrays. I often wonder where our successful DX trips would be without his welding ability! Using the tripod, we could put together these fragile antennas in a convenient manner as well as connect the power dividers and check the swr before plunking them on top of the tower.

The work went on even when the stiff southwesterly breeze turned into quite a gale and brought dark clouds with the rumbling of thunder. In this weather it took almost an hour to assemble the tents. We really began to hustle; the trailer was cleared, all of the rigs laid on the ground, and the grill fired up. Soon the rain was coming down in sheets, accompanied by spectacular lightning displays, including numerous hits on NASA's Wallops Island test site across the inlet. We huddled in the cars through the worst of it and came out to find the tents full of water. Several cardboard containers holding equipment were completely soaked. Luckily, none of the equipment suffered any damage. Even the ICOM mast-mounted preamps wound up being partially submerged, but still worked fine after a dry-out period.

About 10:30 p.m. the drizzle stopped. What better time to start loading up the tower trailer? Rich WB2OTK had arrived just before the rain and, after a quick dinner, was ready to climb the tower. We fired up the generator, connected two drop lites, and managed to string up a total of 8 yagis on the mast. By midnight, all of the antennas except 6 meters were in place with the tower cranked over and supported by the ladder, and we stumbled off to our soggy sleeping bags for the night. One thing you learn on a contest site is to work whenever the weather allows it—not when you feel like it!

The Big Day

Saturday started out better, with the skies cloudy but bright. Soaked equipment was put out to dry, and a crew set about finishing the coaxial feedlines while another crew began hooking up all of the equipment. In spite of all our efforts, virtually all of the type-N connectors had soaked up water and a lot of sand and had to be blown dry. One scary moment occurred while Steve was cranking the tower up; the handle came off in his hand and the three sections collapsed like a runaway elevator with a resounding SLAM!! Believe it or not, the only damage was a bent reflector element on the KLM 7LD 6-meter yagi and we straightened this out with a makeshift pole.

One by one, the stations came on the air. First, we set up the 6 meters with the 740/MMT 50 combination driving a 4CX250 Gonset. Ivars had added ARR GaAsFET preamps to both of our MMT50 units to "soup-up" the front end, and, boy, did it make a difference! Es was coming in and out, with signals from Florida as high as S9+60 dB at times. 2 meters was next, using the IC-275A with an MML200-S power amplifier. The 275A front end really does a good job, but with the MML's preamp it worked all that much harder, except on really strong signals, when the 275A went into compression and the preamp was shut off.

Our 220 station was equally strong—an IC-740 driving one of the new MMT 220-28S transverters with 3SK60 front end. With a Mirage C1012 amplifier, we saw 130 watts out to the 220 Boomer, mounted at nearly 70 feet—right at the top of the mast. The IC-475A went in place quickly, and a Tokyo High Power amplifier provided about 110 watts output, as well as a GaAsFET on receive. Steve took care of 903 and we saw about 20 watts output when everything was connected.

With all this safely in hand, it fell to me to interface the IC-1271A, AG1200 and my homebrew 3CX100 amplifier. This took some doing, since the only good relay I could use for "bypass"-type switching failed after we got there! We wound up jury-rigging two Dow Key 77 BNC relays to make the connection, at the cost of additional swr through those relays, but what can you do at 1:00 p.m. when the contest starts in an hour? Nevertheless, it all worked, and we got over 50 watts from the amplifier to drive the 110 elements.

And They're Off!

Two o'clock came too quickly and WB2WIK/4 was on the air for better or worse! Throughout the morning, we had been dodging the bullet of inclement weather,

but the clouds had a silver lining: Lots of Sporadic E on six meters! In fact, about 2 hours into the contest, the band opened to Florida and midwest, staying open through just about the whole contest. It was heaven! I couldn't pull the dupe sheets out of the computer fast enough to keep up with Rich and Ivars.

Two meters wasn't so bad either. We certainly had a crowd waiting for us, and three log pages filled rapidly as the long awaited "Roger, QSL, please copy Fox Mike Two Seven" went out over the air. Some operators were obviously so wound up that they tried to work us two or three times after that—the old DX fever. Rich and Ivars soon went into severe Es shock; their eyes turn red, arm and head motions became mechanical, and all questions (including what they wanted for dinner) were answered with "Roger! 59! FM27!" Logger's wrist soon set in. The pages were filling up so fast that they were using the margins, grid maps, Kleenex, and the tabletop. I even had one call logged on my arm when I leaned on the table to check the 6-meter swr.

By 8 p.m., 6 hours into the festivities, we had accumulated 177 contacts and 100 grid squares on 6 meters. Think of it–VUCC in 6 hours, averaging almost 30 contacts per hour! Two meters was hard-pressed to keep up with that kind of Q rate, turning in only 80 contacts and 28 grids for the same interval. Two things conspired against the 144-MHz station: (1) virtually every single op I knew about was on 6 for the E-skip; and (2) a spirited battle for the rotor control box was underway between the westward advocates on 6 and the northward advocates on 2 and above. Fortunately, the latter group won out on rare occasions.

The UHF activity hours began at 8 p.m. and ran through 1296 by 11 p.m.. After prying Rich loose from the HAM-M box with a crowbar, we set about giving out FM27 on 220, 432, 902 and 1296 to a very enthusiastic crowd. By midnight, we'd bagged 19 contacts and 16 grids on 220, 30 contacts and 17 grids on 432, 2 contacts and 2 grids on 903 (better than nothing!), and 8 contacts in 6 grids on 1296. Most of these were with multi-op stations, as the single-operator types chose to milk every last QSO out of six meters. We were getting out impressively, working into Vermont, upstate New York, North Carolina, Virginia, Tennessee and New England on the microwaves.

Shortly after midnight, another severe storm blew in, making our decision to shut down for a few hours a very easy one. Coaxial feedlines were tossed out of the shack. (With all of those GaAsFETs, why make an easy target for the lightning?) Our "lightning rod" was cranked down about 20 feet for the night. Steve and I had smartly closed the vents to prevent rain from coming into the tent, but the downpour was so severe the front flooded out and water came in through the bottom, soaking the sleeping bags and the rest of the computer paper for duping.

After sleeping fitfully through the drizzle and a few more cloudbursts, we woke around 6:30 and decided to try some tropo contacts. We bagged a few more grids on 220 and a handful of contacts, including some grids in New England that were sorely needed. 432 yielded another 30 QSOs by noon with 5 new grids, and 903 came to life with 4 more stations in 3 grids. The latter featured contacts to W2SZ/1 in FN32 (over 400 miles) and W3CCX/8 in FM08 (over 250 miles).

1296 brought a few more Qs and added 3 new grids, but the activity just didn't seem to be there for some reason. Could it be that ol' 6-meter E-skip again? Yep, there was Rich, glued to the IC-740, working into the southwest, midwest, and even the Pacific coast, with the rotor aimed west. We had installed that second 6-meter beam at about the 30-foot level, aimed west, but the angle seemed to vary so much for prime Es that the 7-element beam kept coming into play while stations were worked in the 5th, 6th, and 7th call areas.

By noontime we had accumulated 260 contacts and 132 grids on 6, not to mention a tremendous case of indigestion from all of the junk food we were eating and even greater numbers of green-head horsefly bites. We tried every type of repellent, from OFF™ to Cutters™ to AVON™ Skin So Soft, which worked the best. About mid-afternoon, the skip on six was so short (Ohio, North Carolina) that we looked for an opening on 2 meters. Bingo! South Texas and New Orleans were bagged in short order, and two meters was also off and running. We had a problem

here with the desensing of the 2-meter station by the 6-meter equipment, a problem that inexplicably reversed itself for the last four hours of the contest.

About 6 p.m., Steve and I decided to get some fresh shrimp, corn, and more beer for dinner. Of course, the instant we left, the antenna relay began to fail on the 6-meter amplifier, with reports stating "...Your audio sounds horrible! I can't understand you, but don't go off the air! I need the grid square!" Figure that one out! We did, in fact, have to shut down because the DPST Dow Key relay totally failed, and the station had to be rewired with an SPDT relay and the appropriate bias switching, etc.

Rich was a man possessed at this point, for I made the mistake of informing him that we had accumulated 300 QSO's and 150 grids. I compounded the error by stating that I didn't think we could reach 200 grid squares in the time remaining. Well, you don't say things like that to a 6-meter maven! The rotor control box fights started all over again, with Steve and myself trying to swing it north for the UHF activity hours and Ivars and Rich holding it west while they flushed out grids like ruffed grouse.

Our strategy on 220, 432, 902 and 1296 was simple: All 902 and 1296 work would be according to schedules. On the other bands we called CQ along with such incentives as "Last chance to work FM27 until next year!" and "Offer expires at 11 o'clock tonight!" It worked! There was a rush on 220 and 432 to make those last contacts, resulting in 6 more QSOs and 1 grid on 220, and 20 more QSOs with 4 grids on 432. 902 coughed up 2 more QSOs and 2 grids, and a turn on 23 cm brought in 5 QSOs and a new grid (calling CQ on 1296.110, incidentally).

By now two meters was blowing away the front end on 6, so both operators tried to synchronize CQs for the remaining two hours, which was pretty hilarious. But they did it! Rich finally broke the magic 200 grid square barrier at 10:21 p.m. with 39 minutes left, and went on to add four more by the time 11 p.m. rolled around. He was frantically calling KH6IAA as the final gun sounded. We managed to pull a few more out on 2 as well, finishing with 38 grid squares there.

The Final Tally

After cleaning the logs on my computer at 11:30 p.m., I came up with the totals shown in Fig. 1.

The "equipment contest" went pretty smoothly. Only two major failures occurred and they involved antenna relays of questionable origin. Both of the transverters worked extremely well, as did the three ICOM radios on 144, 432, and 1296. In fact, the 475A makes a pretty hot setup on 70 cm with a GaAsFET in front of it—even in the presence of strong signals. The AG1200 preamp really makes a big difference with the IC-1271A, even the way we used it, just ahead of the radio and not on the tower. All of the antennas performed nobly. The only casualty here was the bent reflector element on my 7 LD 50-MHz yagi that finally snapped on the way down. The Tonnas weathered the high winds without a scratch, although we did notice a slight misalignment of the top 55-element yagi for 1296—perhaps caused by the big "crash" before the start of the contest. They came down equally fast and were transported north in one piece, as was the 220 Boomer. This antenna really outdid itself as we worked into Ohio and Georgia with good reports.

BAND	QSOs	GRID SQUARES
50	459	204
144	214	38
220	51	24
432	86	27
903	8	7
1296	28	13
TOTALS	846	313

Fig. 1.

Look for us next year, when we return to the same site with two tower trailers and some Rohn sections to allow three different stations to operate independently. No sense losing good personnel in a heated battle for the rotor control! Keep your ears open for WB2WIK/4..."Roger, roger...Fox Mike Two Seven...QSL?" ■

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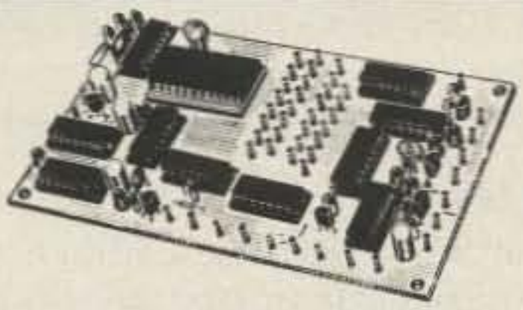

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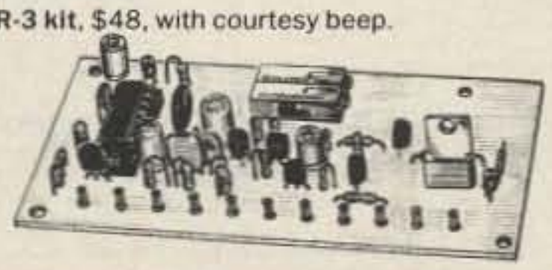

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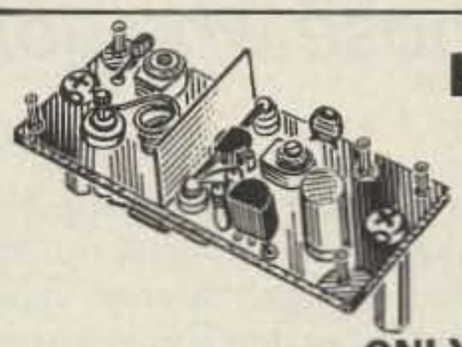

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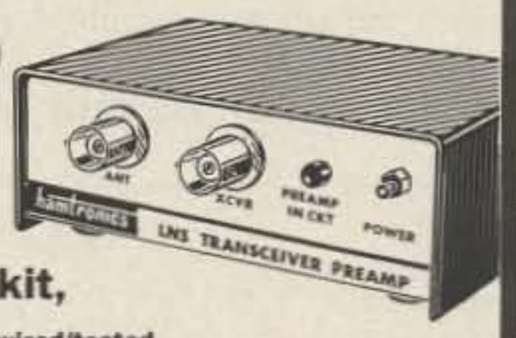
LNS-(*) IN-LINE PREAMP



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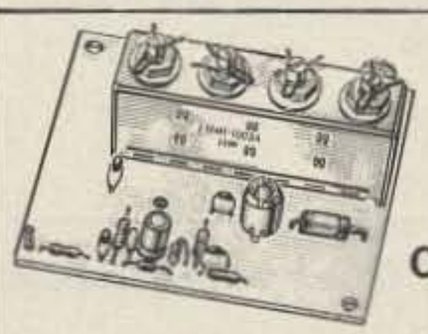

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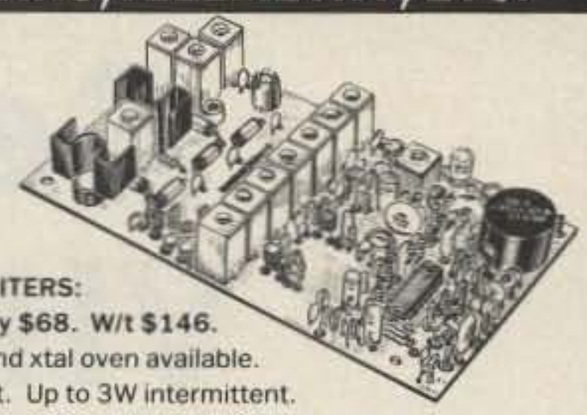

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Kit less Case	$39	50-52	28-30
Wired w/case	$69	50-54	144-148
		144-146	28-30
		145-147	28-30
		144-144.4	27-27.4
		146-148	28-30
		220-222	28-30
		220-224	50-54
		222-224	28-30
UHF MODELS			
Kit with Case	$59	432-434	28-30
Kit less Case	$49	435-437	28-30
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		432-436	50-54
		439.25	61.25
		902-928	422-448
		902-922	430-450

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		28-30	220-222
		50-54	220-224
		144-146	50-52
		144-146	28-30
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James R. Valdes WA1GPO
63 Alderberry Lane
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General Purpose VHF/UHF Antenna

This is a good, cheap broadband antenna that can be built in a weekend, and it's great for those who don't have a lot of space.

Winter storms wreaked havoc with my scanner antenna and I needed to find a replacement.

I was attracted to the discone. This type of antenna, when properly designed, is capable of operating over a 10 to 1 frequency range. With this range an antenna designed for low-end operation of 100 MHz is usable up to one GHz.

I was turned off by the cost of the commercial version; it cost nearly what I had paid for the scanner! So, I decided to build one myself. I did, however, avoid parts that needed special machining.

This project is simple to build and requires only basic tools and readily available materials (see Parts List). The basic antenna, along with the formulas for determining the lengths of the various elements, is shown in Figure 1. The RSGB VHF/UHF Manual was my reference. I decided that a low-end frequency of 108 MHz would be desirable, since this is the low end of the aircraft band covered by many of the new scanners. This allows maximum utilization of the brazing rods. The parts are cut, drilled, and assembled as shown in Figures 2 and 3.

The results have been encouraging—the swr on the amateur frequencies between 144 and 450 MHz is less than 2.5:1 over the entire range. When measured at the end of a 50-foot piece of coax, the swr is 1.5:1 or better. Spot-checks on various commercial frequencies gave similar results. A modified version provides adequate receive coverage on the VHF low (30–50 MHz) public service frequencies.

Construction details are as follows:

108–145 MHz

1. Cut the brazing rod to dimension A (27").
2. Prepare the brass pipe cap—drill and tap

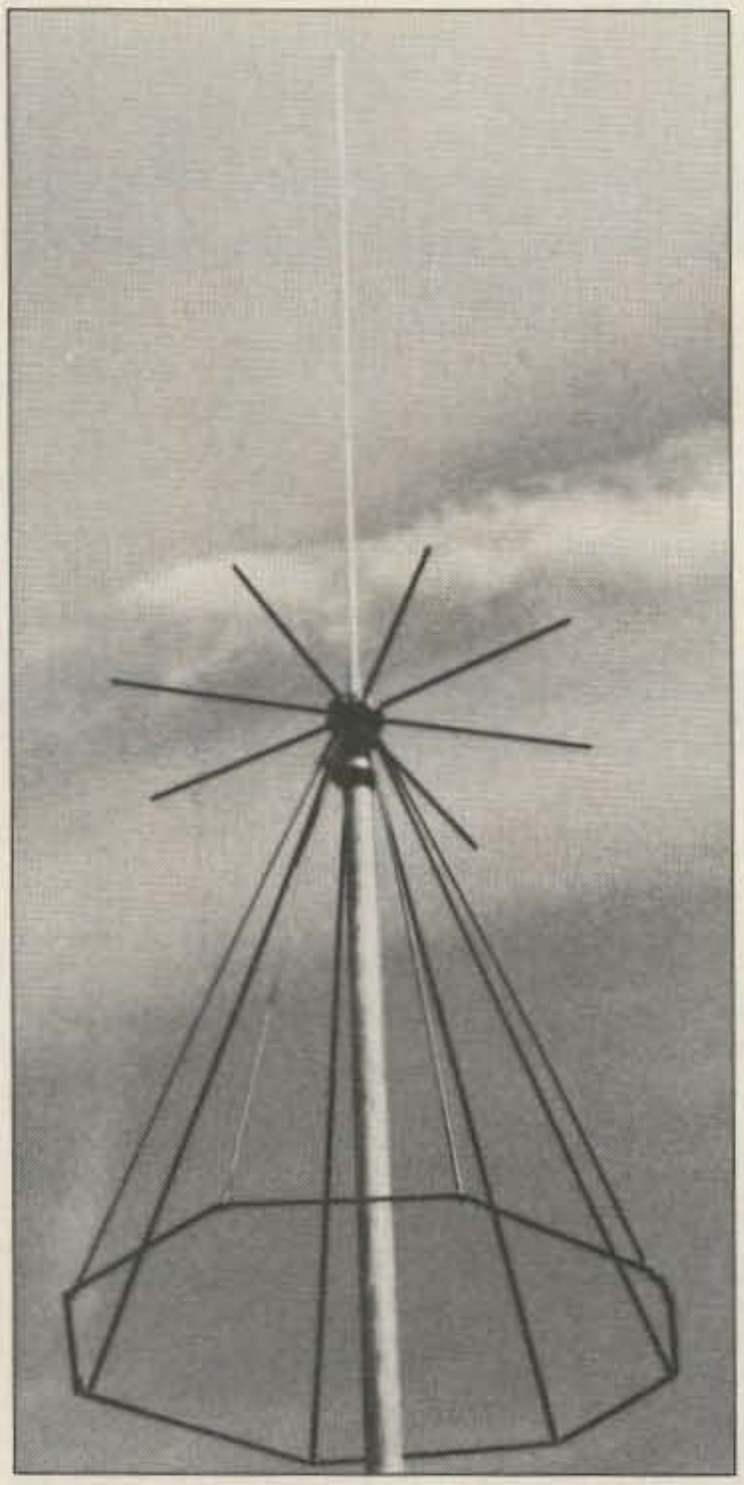


Photo A. The WA1GPO home-brew VHF/UHF discone antenna.

A Cone Element Length = 2952/F(MHz) = 27 inches.
B Disc Diameter = A x .7 = 19 inches
C Cone Diameter = as small as possible. Here is 1.25 inches.
D Space between disc and cone = .2 x C = .25 inches

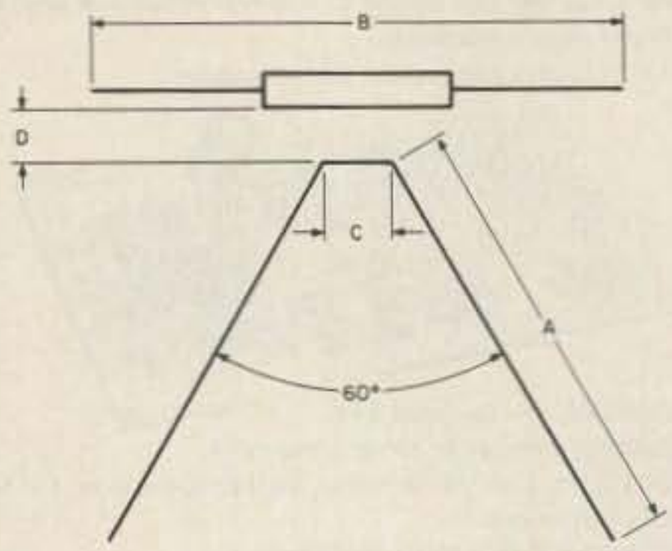


Fig. 1. Schematic diagram of the antenna and formulas for determining the lengths of the elements.

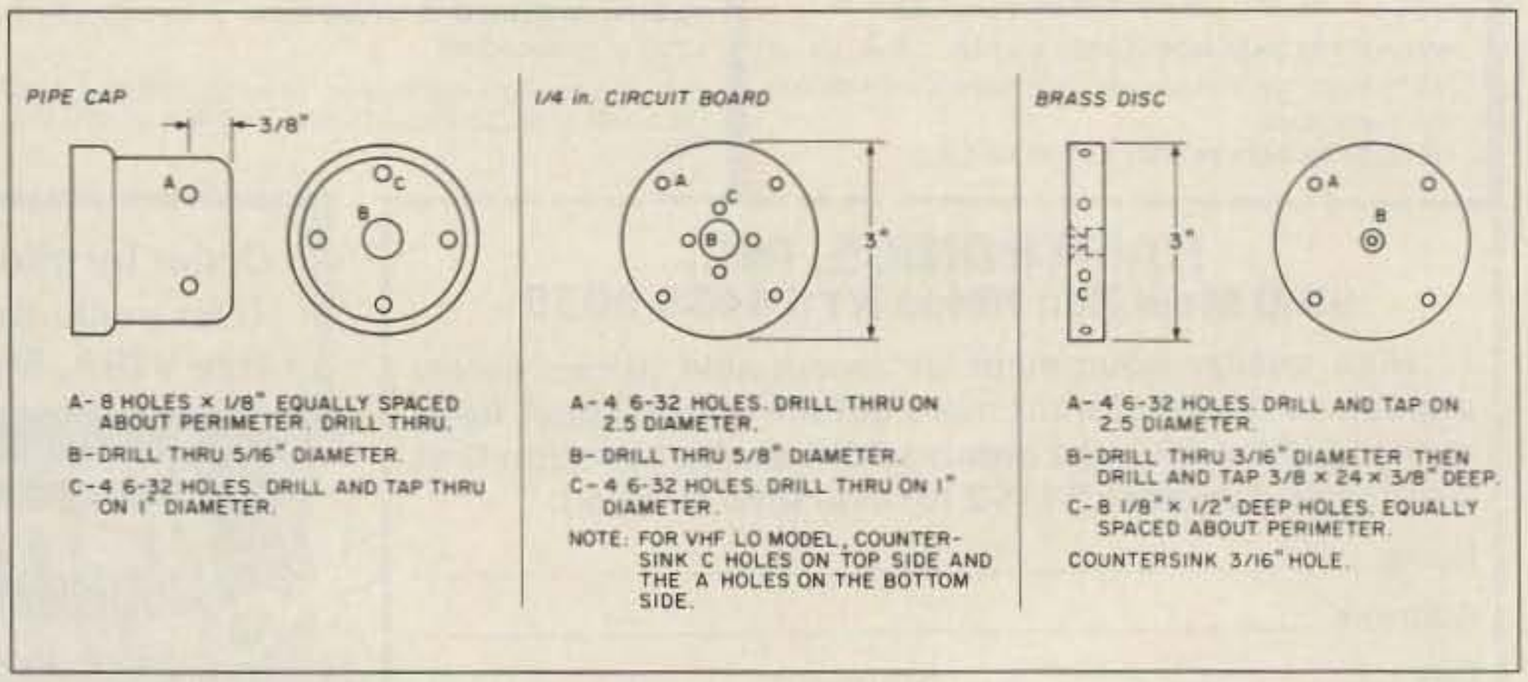


Fig. 2. Top and side views of the base assembly for the elements and vertical whip.

all holes, buff clean, and file the top of the cap flat.
3. Bend the elements to the desired 30° angle, and solder the elements on the cap.
4. Install the BNC connector in the cap.
5. Trim the circuit board to size, drill the mounting holes, and solder the remaining pieces to the brazing rod in position to form the disc, then trim the disc to a 19" diameter.
6. Attach the disc to the brass cap with nylon screws, and solder the center conducter of the BNC connector to the disc, and seal the connector hole with silicone sealer.

VHF Low and 108–450 MHz

Complete steps 1 through 4 above.
5. Trim the circuit board to size, drill and countersink all holes, mount the BNC connector on the cap, and mount the board to the brass cap with flathead s.s. screws.
6. Prepare the brass disc—drill and tap holes as required, and solder the remaining pieces of rod to the brass disc.
7. Solder a 3" piece of #18 solid wire to the BNC connector, and mount the brass disc to the circuit board using flathead s.s. screws.
8. Coil the 3" wire in the 3/8" hole, and install the modified CB whip, and trim 4" off the antenna.

The antenna can be installed using conventional pipe. In the low frequency version, the lower section of the pipe should be 84 inches long. This 84-inch section is the lower half of the sleeve dipole, and should be isolated from the mast to which it is mounted. You should select a good grade of coax to minimize the line loss; RG-59 BNC connectors fit well on RG-8X 50-Ohm cable.

Two final notes: Be careful when drilling the soft brass as it tends to "grab," and, as with any broadband antenna used for transmitting, a low-pass filter on the transmitter is recommended to minimize harmonic radiation. The photo shows the details of the discone construction. ■

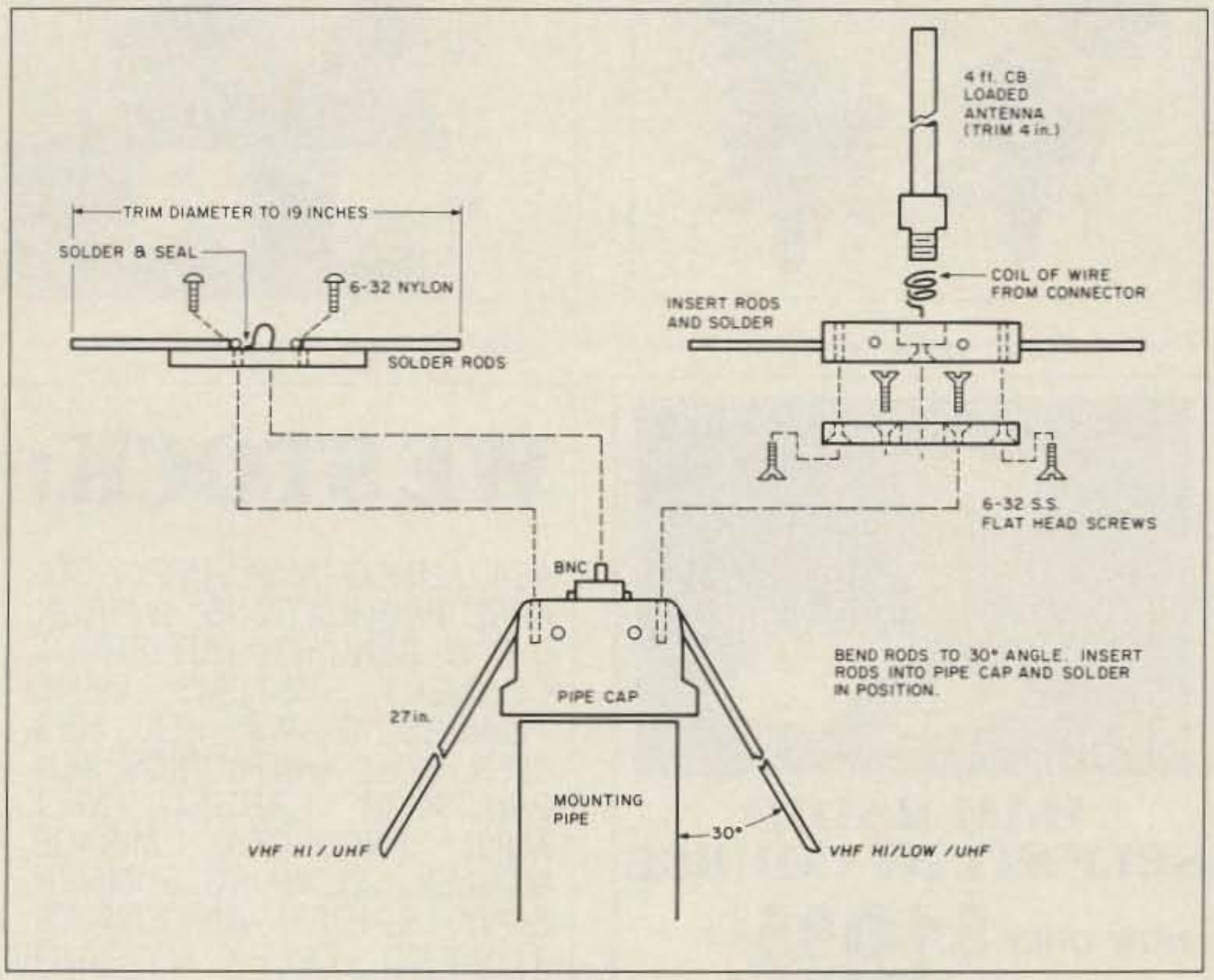


Fig. 3. Blow-up side view of the element base assembly.

Parts List

1. 1" brass pipe cap
2. BNC chassis mount connector (Radio Shack 270–105)
3. 1/4" glass epoxy circuit board, with a 3" diameter
4. 1/8" x 36" brazing rod (8 ea.)
5. 60/40 rosin-core solder
6. 6–32" x 1/2 " nylon screws (4 ea.)
7. Silicone seal

Low Frequency Version

Items 1 through 5 same as above
6. 6–32 x 1/2" stainless flathead screws (8 ea.)
7. Brass disc, 3" diameter x 1/2"
8. 4' loaded CB antenna (Radio Shack 21–934)

Bob Hunteman W9THN
7419 Hennessey Ave.
Wauwatosa WI 53213

The L'il Fixer

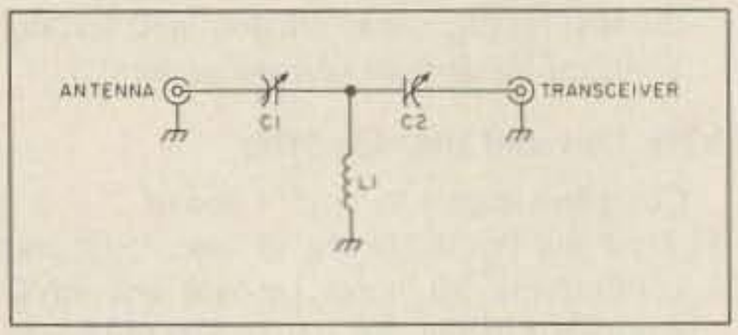
Let this tuner tame your truculent two-meter antenna!

The L'il Fixer has been in use in the Milwaukee area for the past five years and is beloved by the 2- meter, 1:1 swr aficionados. It's about time we share this boon with our fellow VHFers!

A compact little rascal that requires only two 35-pF air-variable capacitors and a four-turn coil of #20 or #22 solid copper wire (use a quarter-inch drill bit for a winding form), In fact, on my motorboat, the good ship *Layabout*, it matches an Isopole™ marine antenna (158 MHz) to a Kenwood 7950, with astonishing results. Dr. Reynold's antenna lays down a super signal when tamed by the L'il Fixer!

Build it compactly on a breadboard or plastic sheet; avoid a metal box. Note that the coil junction is off-center; by reversing the ANT and XCVR connections, you get an adjustment in inductance. Varying the coil spacing will also give some variation. Adjustable silver mica capacitors with screwdriver slots will work fine, and make for a very small unit, if the 35-pF variable caps can't be found. Any layout seems to work, but a wide ground strap between the ANT and XCVR coax fittings is a good idea.

This is really a simple project. It will give you a sense of accomplishment with a minimum of effort, and you can brag to your friends: "The swr here is one to one, OM!"■



Schematic of the L'il Fixer

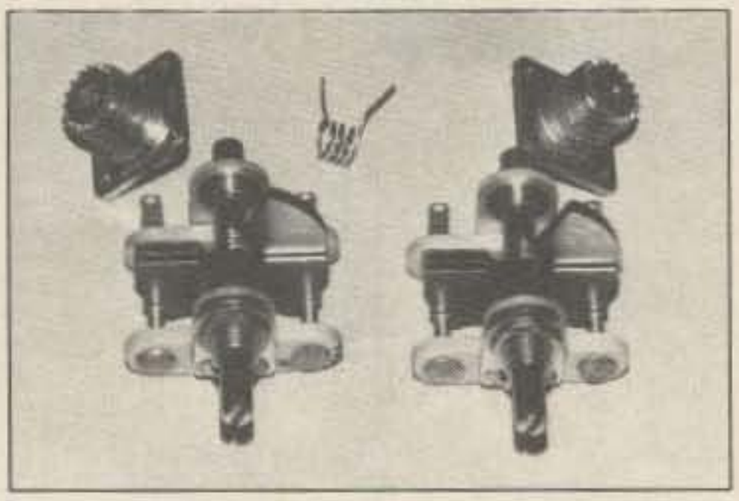


Photo A. The components for the L'il Fixer.

Photo B. Front view of the L'il Fixer.

Charles L. Kelsey WB2EDV
15 Blanchard St.
Mayville NY 14757

440-MHz Folded Dipole Repeater Antenna

An antenna immune to almost all weather conditions, virtually static-free, and practically maintenance-free.

Commercial price tags and the unavailability in the 440-MHz range helped to prompt the home-brew construction of this 4-bay folded dipole antenna. The only array that could be located for amateur use was a dual 8-bay version that cost around $500.

The folded dipole is one of the most widely used antennas in the VHF/UHF public safety and commercial spectrum. One of the reasons for this is that the antenna is almost immune to lightning damage; another is that it virtually eliminates the static build-up problems common to other antennas.

Unlike many "dc-grounded" antennas, this one ensures that both the center conductor and the shield are at true dc ground potential for each radiating element. Other antennas that may show a dc ground with an ohmmeter may use phasing coils or other matching devices between radiating sections. Inductance is introduced and the static-reducing effectiveness is diminished. Gamma-fed elements are at ground, but the center conductor is not.

Each element in this array is uniquely designed to be 50 Ohms at the operating frequency. This makes it easier to modify the array to a one-, two-, four-, or eight-element configuration. I selected the four-element one because it gives considerable gain while still exerting good vertical beamwidth for use in hilly areas. Higher-gain antennas can actually perform more poorly for mobiles and portables at close range in some instances. Gain for the 4-bay array is approximately 6 dBd omnidirectional or 9 dBd for unidirectional radiation patterns. Vertical beamwidth is 15° for the half-power points. Power levels of up to 250 Watts can be used depending on the style of phasing harness used.

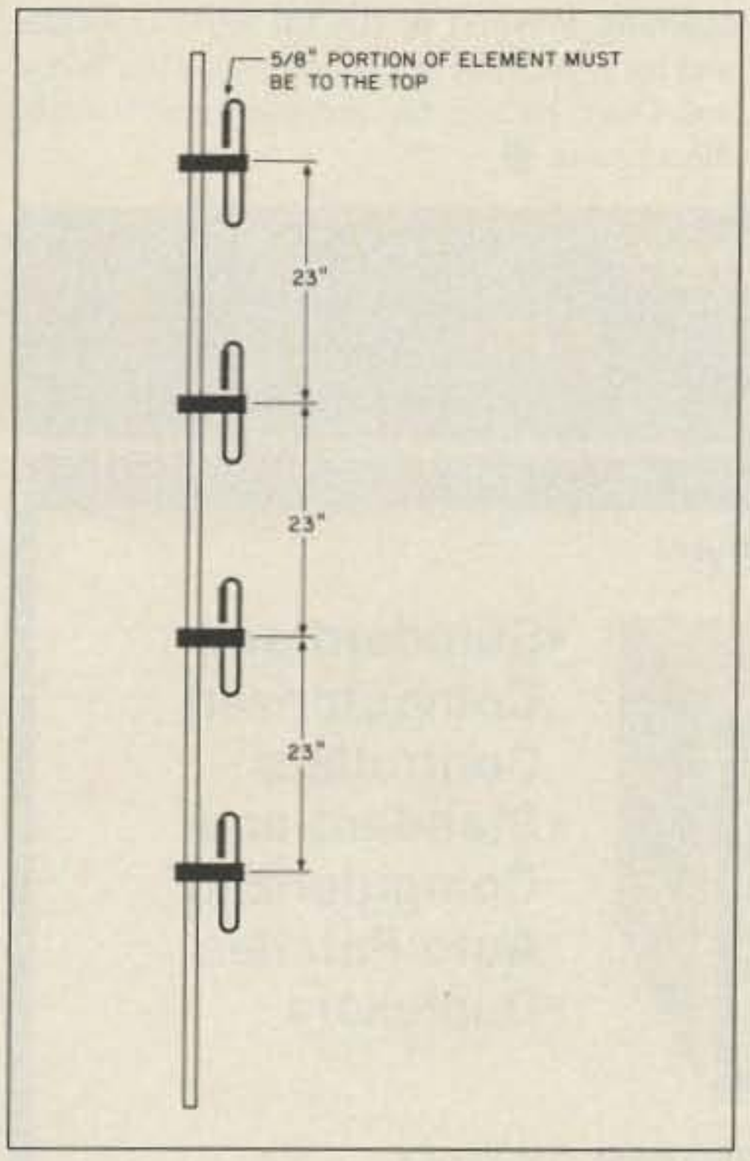


Fig. 1. Side-view diagram of the dipole mast and elements.

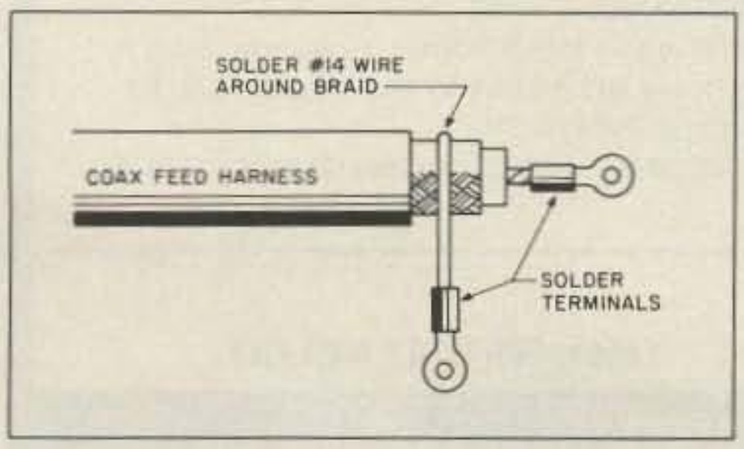


Fig. 2. Feedline attachments to the elements.

Construction

Construction of the antenna elements is much easier if you have access to a machine shop, and the necessary materials can usually be purchased there. A 3/8" and 5/8" solid aluminum rod was used for the radiating material and a 1" x 1/4" solid aluminum flat bar stock was used for the element support arm. Heavy duty materials not only provide strength, but insures that the aluminum parts will not warp from the heat when they are Heliarced together. The assembly was welded to eliminate noise generation from loose parts. Alloy aluminum (6061-T6) was selected because it machines well. Prior to welding, all parts should be completely cleaned with steel wool soap pads and water. Be sure to advise the person who is doing the welding what the alloy is.

Attachment points for the feed harness are made by drilling and tapping holes to accept 6–32 machine screws. The use of stainless steel screws and lockwashers is definitely recommended.

The element support arm should be drilled

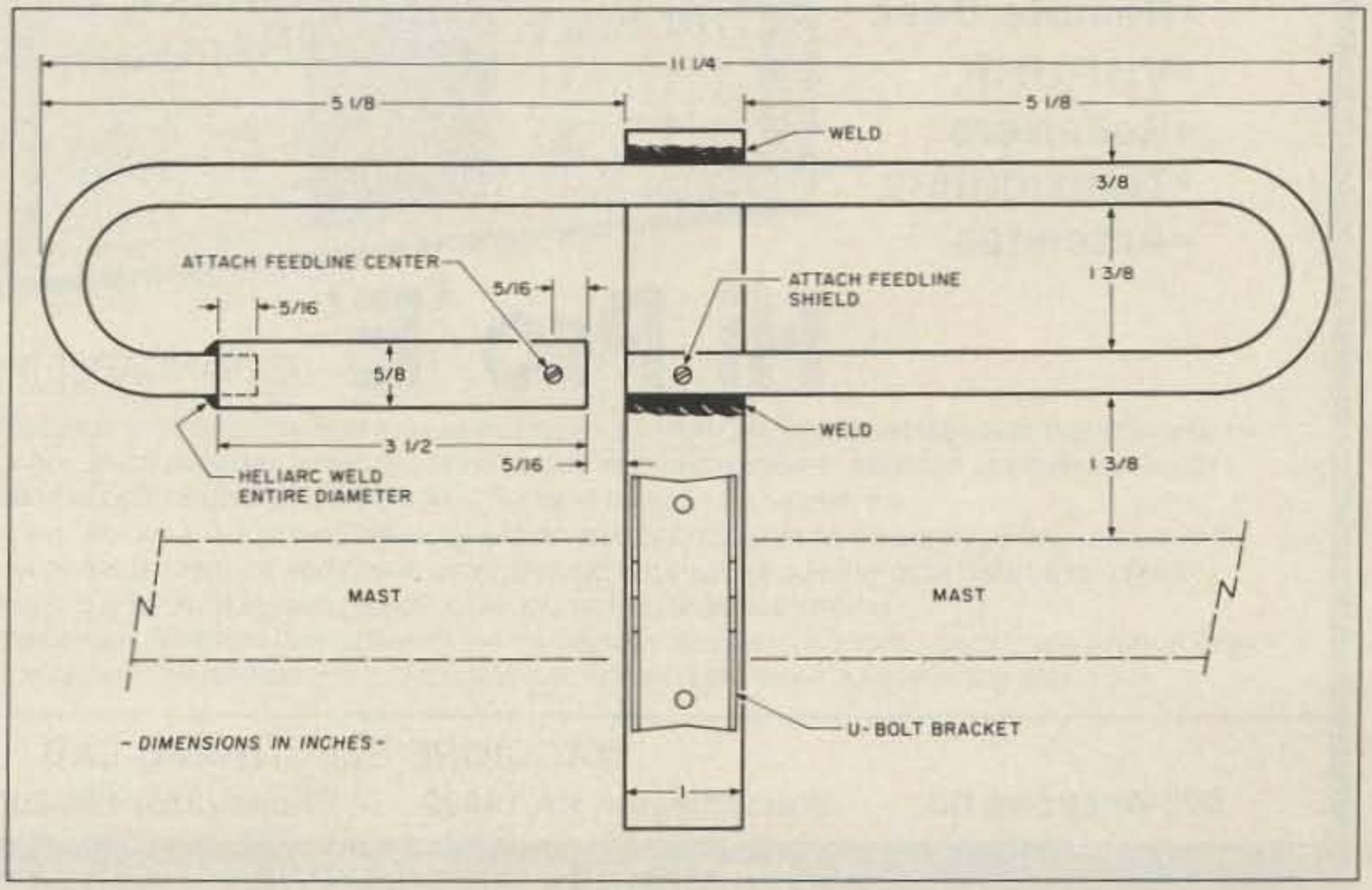


Fig. 3. Diagram of an element.

to accept an appropriate U-bolt and associated toothed bracket so that spacing is maintained (see Figure 1). This can be a little tricky because various diameter masts and U-bolts will change the spacing. Do not complete this step until the element is welded together. It is not known how critical this dimension is.

For the easiest element fabrication, the 5/8" section should be drilled in one end to accept the 3/8" material. The fit should be snug and the hole should be about 5/16" deep. This allows the 5/8" piece to slip into the open part of the element.

The builder has some options on the style of phasing harness to use. The original antenna utilized a 4-way power splitter which was put together using test equipment not normally available to most hams. Construction is not included in this article. KLM offers a similar unit which should work as well. A phasing harness can also be made with odd quarter wavelengths of 75-Ohm coax. This method is described in the *ARRL Handbook*, and in others as well. Remember that all elements must be equal lengths of 50-Ohm cable if a 4-way power divider is used. Excess cable can be attached to the mast. The divider is best positioned at the middle of the array to minimize cable lengths. It is best to use an RG-8 "flooded-braid" to help keep water from migrating up the shield. A flooding compound is put in the braid by the manufacturer to accomplish this. In any case, the ends of the cable must be weatherproofed, particularly where they attach to the elements.

Crimp-on ring terminals should be used to attach feed-line to each element. Prepare the end of the cable in the same fashion you would to attach a PL-259 connector. Use a piece of 14-guage copper wire to encircle the braid, and solder it all the way around the coax braid. Install a ring terminal to the end of the wire and put another terminal on the center conducter. Solder all terminals and position them so as to put the least amount of strain on the assembly. Weatherproof with *good* grade black vinyl electrical tape such as the Scotch 33 Plus. Stretch the tape slightly while applying, making sure to release all the tension during the last four or five windings down the cable. Additional heat-shrink tubings would not hurt, either. If you choose to use nylon cable ties to attach the feedlines to the mast, make sure that they are rated for outdoor use. Otherwise, use black vinyl tape over the each tie so that it will not deteriorate from ultraviolet light.

The array should be mounted on a mast, this then becomes part of the antenna. Masting must extend above and below the top and bottom parts of the elements by at least a few inches, at least six inches on the top if the antenna is to be top-mounted. I suggest galvanized pipe for top-mounting. If the antenna is mounted on the side of a tower, a piece of electrical conduit can be used and bent with offsets at each end to allow for top and bottom attachment to the tower leg. Spacing between mast and tower is 1/4 wavelength.

Spacing between the elements is 23" center-to-center. When attaching the element to the mast, the mast should be on the same side of the support arm as the element rod material. Make sure that all the elements have the 5/8" diameter part at the top. In tower side-mounting, the elements align one over the other, and face away from the tower. Top-mounted installations for omnidirectional coverage should have the elements arranged around the mast in 90° increments. I don't recommend this configuration.

Comments

Vswr across the band should be 1.5:1 or less. The bandwidth is at least 20 MHz wide.

In constructing the elements you should use the exact dimensions shown in Figure 3, since any deviation may produce an undesired effect. Most of the engineering in this project was trial and error rather than design.

The prototype was placed in service in the summer of 1986 and has performed beyond expectations, and the winter weather conditions at the site are harsh, often with seventy mile/hr winds and snowdrifts of up to 15 feet. Still, I expect several maintenance-free years out of it.

Thanks go to the following people who provided construction assistance: Phil Hiller WA2EQX for masting and installation; Jon Henning WA2BTW for the power divider and for providing test results; and Dan Wood and Dave Nelson for prepping and welding the antenna. ■

Joseph M. Plesich W8DYF
554 Lovers Lane
Steubenville OH 43952

The HF Half-Sloper

Here's an inexpensive, compact, and easy to build antenna that's great for DX

Here's an antenna that will cover 160, 80, and 40 meters. It's inexpensive, easy to construct, and will fit on a small city lot. It's also great for DX. It's called a Half-Sloper.

The Half-Sloper (or quarter-wave sloper) has a low angle of radiation and exhibits some directivity in the direction of the slope. The antenna's polarization is vertical. By using the loaded coils described below, a 3-band sloper can be constructed to fit into less than 60 feet of yard space.

The 3-band sloper described was built by my fellow club member, Joe Gabor WA8WEQ. Joe is retired and has built a dozen or so of these antennas for members of the Steubenville-Weirton Amateur Radio Club. (Don't you wish you had him in your club!)

Materials

The antenna is constructed of #14 stranded, insulated wire. The loading coils are made with #16 enameled magnet wire on 1 1/2-inch I.D. diameter, schedule 40 plastic pipe. Scrap pieces of 1/4-inch-thick acrylic are used for the insulators inside the coils. You can buy these items in most hardware or electrical-supply stores.

Building the Half-Sloper

First, make the loading coils by winding the #16 stranded, insulated magnet wire. Next, fasten the end of the antenna wire coming from the tower to one end of a piece of acrylic that has been cut to fit inside the 80-meter coil. Take the other end of this piece of acrylic and put it through the coil; then fasten it to the beginning end of the 13-foot 11-inch length of antenna. Solder jumper wires from each end of the coil to the antenna (Figure 1).

Now, fasten 13-foot, 11-inch piece of antenna to the next coil (the 160-meter coil) in the same way, and then fasten last length of antenna to the other end of the 160-meter coil. Make this last piece of antenna a few feet longer than the 6-foot, 5-inch length needed so you have wire to play with when you're adjusting the antenna. Solder jumpers to the coil ends as before.

A piece of scrap aluminum or other metal can be used to fabricate a clamp that can be fastened to the tower leg to hold the antenna and the SO-239 to which the RG-58 feedline is attached. There will be a jumper from the center of the SO-239 to the antenna, of course.

Operation

Having a sloper makes for some lively discussions on the ham bands. Some swear by them; others wouldn't own one. But it's a great antenna to experiment with.

My sloper angles down from a 30-foot tower (Figure 2) on which are mounted a 4-element tribander and an 11-element, two-meter beam. I also have a 160-meter dipole that is only 35 feet at the apex.

While writing this article, I disconnected the sloper from the antenna tuner and connected it directly to my Yaesu 757 to check the swr. I got 1.3 on 1925 kHz, 1.5 on 3860 kHz, and 1.1 on 7150 kHz. The swr changed rather rapidly as I changed frequency on 160 and 80 meters, but remained almost flat over the entire 40-meter band. I felt these results were to be expected with this length antenna. Received signals, especially in the direction of the slope, the favored direction, were as good as and often better than they were with my dipole.

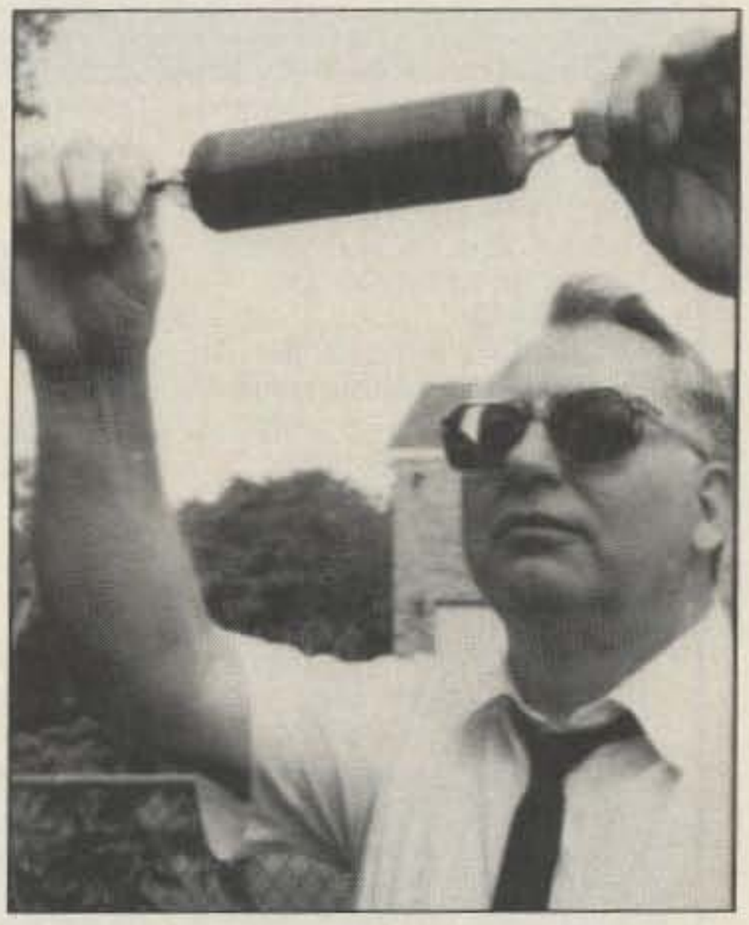


Photo. Joe Plesich holding a finished loading coil.

All installations are different. Your results could be totally different from mine. Variations in height, grounding, and surrounding objects certainly affect antenna performance. But try it! Experimenting with antennas is part of the fun! ■

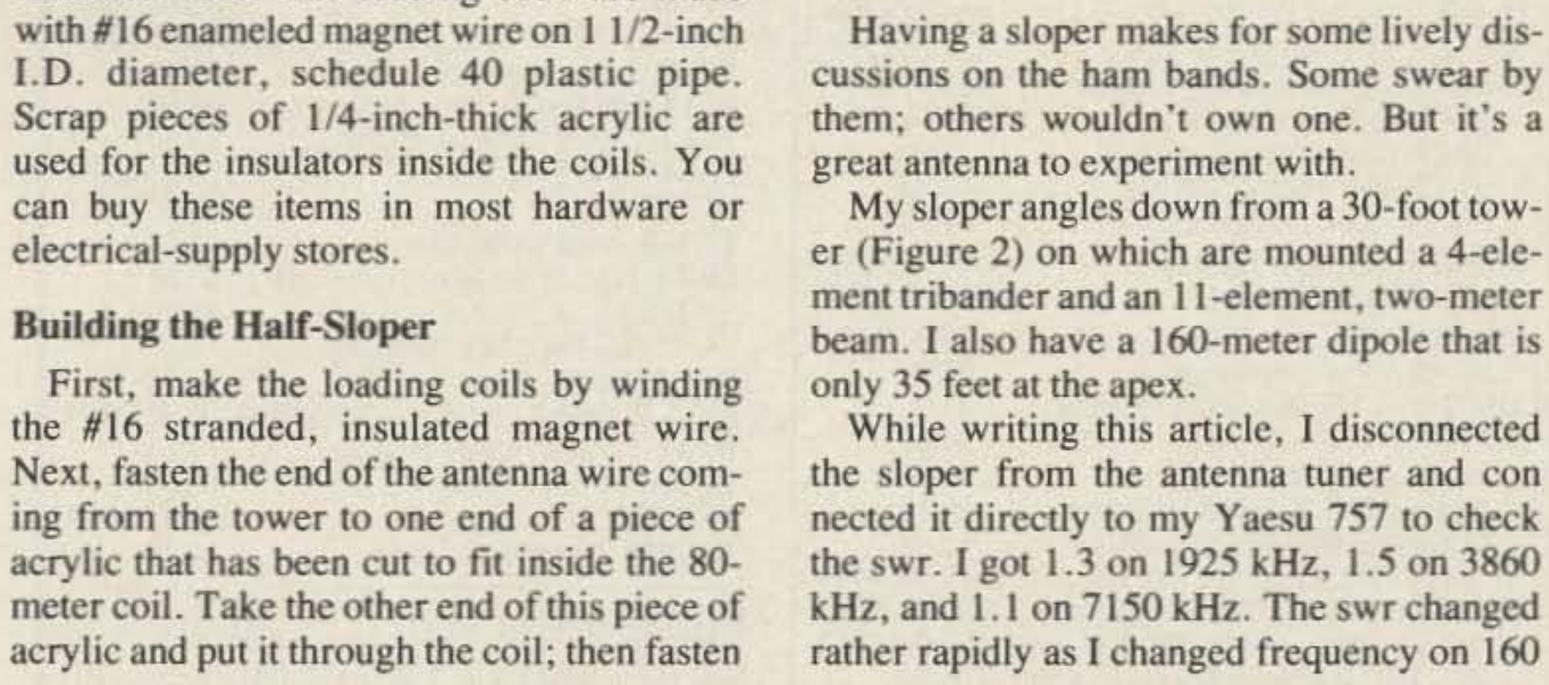


Figure 1. Diagram of the half-sloper showing details of the assembly and coils.

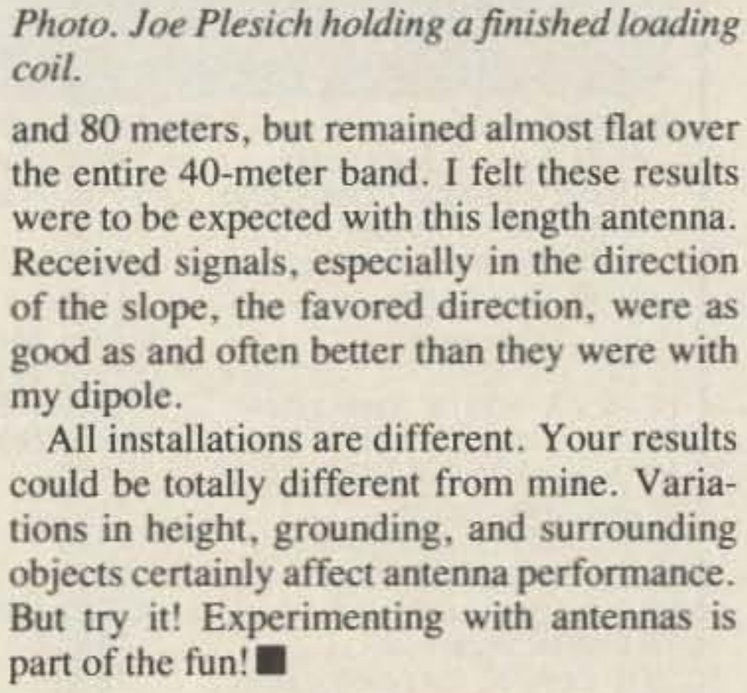


Figure 2. Half-sloper in position on tower.

HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	**2149**
SP-20 Ext. speaker w/audio filter	149.00	**134.95**
FL-101 250 Hz CW filter	69.95	
FL-102 6 kHz AM filter	56.00	
CI-V Computer interface adapter	TBA	
EX-310 Voice synthesizer	46.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	**1399**
PS-35 Internal power supply	199.00	**179.95**
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	
IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	**899.95**
PS-35 Internal power supply	199.00	**179.95**
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
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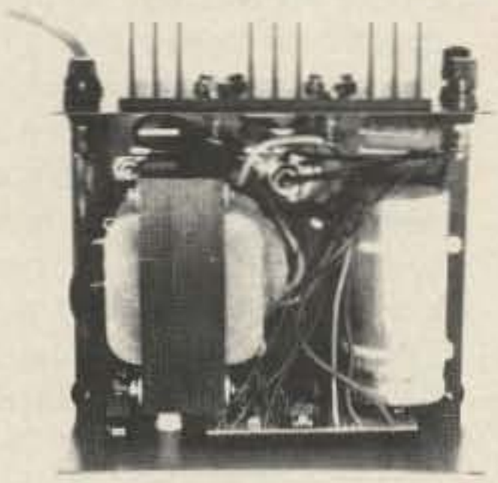

INSIDE VIEW — RS-12A

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RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

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MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

WEATHERSAT

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Mason MI 48854

DIGITAL SCAN CONVERSION

I have lost track of the number of times I have been asked about the "best" image display system for satellites. These days the answer boils down to two distinct alternatives, each of which has advantages and disadvantages. The "hot" item these days is digital scan conversion. Be they dedicated units or computer assisted, scan converters have a lot going for them. First, they are easily set up as multi-mode systems. The *Weather Satellite Handbook (WSH)** scan converter, for example, will handle fully automatic display of GOES and METEOSAT WEFAX images as well as TIROS/NOAA APT, 240 LPM COSMOS, and 120 LPM METEOR transmissions. You can look at as many pictures as you want with no up-front costs for paper or other supplies. Given the expanded memories available for today's microcomputers, it is even possible to store a satellite image at essentially full resolution. The *WSH* scan converter, when used with the 512K Color Computer 3 for example, stores 768 image lines with 1024 pixels/line. Although the display is limited to 256 x 256, you can display the entire picture at the display resolution or use the display as a "window" to move into any selected subset of the image for viewing at progressively higher resolution. Back in May, I showed you some examples of this type of display.

The real problem with scan converters doesn't arise until you want a permanent copy of a particular picture. Any approach to hardcopy, be it photography or video printers, shares the basic limitations of the display system. If you want the entire picture, it will be limited to display resolution. Yes, you can zoom into selected areas at higher resolution but you will never see the *entire* picture at that resolution. In short, scan converters are the ideal way to look at pictures, but not the best approach to printing them.

FAX machines, in contrast, are ideal for printing an image at full resolution but not without a price. The mechanical nature of FAX means that a specific machine may be able to handle some modes but not all the possibilities you may be interested in. The FAX system described in the *WSH* does a fine job with WEFAX and 240 LPM COSMOS imagery but requires another stylus drive motor (or a dual speed motor) for line-blanked NOAA APT display. It will not handle 120 LPM METEOR or side-by-side visible and IR NOAA display without a different drum motor, and if you build it with that motor, you can forget the 240 LPM modes, such as WEFAX! Most commercial FAX systems will not work directly with any satellite mode, either because of their line rate, index of cooperation, or modulation format (or all three!). The Alden *Weatherchart* recorder, which will be reviewed here in *73*, is a good example of a rugged, well-engineered FAX machine that will not handle any satellite mode without extensive modification.

Even a satellite-compatible FAX machine presents a few problems. FAX paper costs money and you must print a picture just to see what it is. FAX machines will end up costing you quite a bit of money to operate if you want to look at a lot of pictures, many of which are rejected. Most FAX machines work best in real time, so you get one shot at a specific image. Even those systems that are tape-compatible will rarely yield results on a replay that are equivalent to "live" copy. In short, FAX machines print up a storm, but are not too good for simple "looking" or for multiple copies.

Figure 1. GOES E IR quad, transmitted through the GOES C spacecraft. The image was acquired live using the WSH scan converter and a 512K CoCo 3. This particular print was made directly from the high-resolution image in the computer memory (380K of image data) and printed to the simplified SMARTFAX recorder to be described next month.

The SMARTFAX Concept

SMARTFAX is simple in concept—it combines the advantages of digital scan converters and FAX recorders, eliminating disadvantages of each! Let's assume a scan converter like the 512K *WSH* system, where the computer is actually holding in memory an image at something approaching full resolution. When we use the term "scan conversion", we usually think in terms of how the computer will handle the data for TV display, but the scan conversion process is universal in the sense that the image data in memory can be outputted in almost any other format as well, including one acceptable to a specific FAX system. Other than specific hardware and software considerations, the FAX format is immaterial—it can involve almost any line rate, index of cooperation, or video format. In effect, we use the TV end of the scan conversion process to *look* at pictures, basically for free, while we use the FAX output option to print pictures of particular interest. This approach to using the power of the computer has the potential to completely alter the way we handle and archive our image data. Basically *any* FAX machine can be used to print our images, for the original data format doesn't matter. We need print only the pictures that we want, since we can preview them in any detail using the TV output function of our scan converter. Copies of each picture can also be printed, which will be identical in quality with the original, for the computer is functioning as a digital recording system. As I will show later, if you want to build a FAX printer, the resulting project is far simpler than a standard FAX recorder with the added bonus that it will handle any image format compatible with the basic scan converter. In the following sections, I will outline some of the principle hardware and software considerations that can make SMARTFAX work with any computer, after which I will describe an ultra-simple SMARTFAX recorder which you can put to work with the *WSH* scan converter using readily available software.

Image Outputting

No matter how we are going to use the video data from the computer, we must first perform a D/A (digital-to-analog) conversion since any FAX system requires some sort of analog signal for operation. In the case of the WSH scan converter, we are in luck, for the CoCo has a D/A converter available in the form of the cassette audio output port, so no additional hardware is required in a great many applications. If you are not lucky enough to have a CoCo, you will require a latched output port with enough bits available for your video (anywhere between 4 and 8 with most systems). Commercial D/A converter chips can be used to convert the latched port data to analog form, or you can simply use an op amp as a summing amplifier.

Baseband Video

In most FAX systems, there is a point in the circuit where, regardless of the modulation format, the signal has been converted to a variable voltage to drive the printing output. Typically, some specific voltage will represent black, and another voltage will be the white limit. With suitable gain and offset adjustment, your analog video output from the computer can provide the needed drive, completely bypassing the video processing circuits of the FAX recorder. In the case of the SMARTFAX video circuit, we will use the CoCo cassette output directly, with no additional hardware. For other FAX systems, op amps may be required to provide the specific signal levels, voltage offsets, etc.

Subcarrier Modulation

If you want to output to an existing FAX machine that requires either FM or AM video, some additional hardware will be required. For FM video (1500 Hz black to 2300 Hz white) I would suggest an FM modulator circuit (see Abrams, C. and R.E. Taggart. 1984. Color Computer SSTV, Part 1. *73 Magazine*, November, pp. 10-21). If you need AM video, use the AM modulator circuit from the WEFAX test generator shown on page 7-2 of the *WSH*. Leave out U5-U14 and apply video to pin 2 of U15. Use an op amp for gain and offset adjustment so your applied video ranges from 0.2V black to 5V white, and you will be in business. Baseband video is easier, but the point is, you can make the FAX machine "see" any kind of format you want!

Output Timing

Assuming you can output your memory data in the desired format, you must also clock it out at just the right speed for the line rate of the target FAX system. Timing loops for the FAX output function are usually too hard to get precisely right and, if output timing is off, the image that is printed will have a distinct slant, if it is visible at all! The best results are achieved by using a crystal-derived clock frequency, either from an external clock circuit or from a programmable timer, if your computer has one. To keep things simple, the clock frequency can be chosen so that you latch a pixel at the output with each HIGH transition of the clock. The required clock frequency (C) in Hz is then a function of the number of pixels per line (P) and the target FAX recorder line rate (LPM):

$$C = (P \times LPM)/60$$

If we wanted to dump a WSH scan converter image (1024 pixels/line) to a 120 LPM FAX machine for example, the required frequency for the "dump" clock would be:

$$C = (1024 \times 120)/60 = 2048 \text{ Hz}$$

The WSH scan converter already has a clock at this frequency which is used to time pixel loading of image data. If we wanted to dump to a 240 LPM system, the simple clock approach would suggest a frequency of 4096 Hz, but we could accomplish the same dump using the available 2048 Hz clock by dumping a pixel to the output when the clock goes HIGH and then dumping a second when the clock goes LOW! A computer can have similar flexibility when dealing with other dump options.

One final output timing question has to be considered. Given that the computer memory contains a certain number of lines for the image in question, how many times must each line be dumped in order to obtain a FAX print of approximately the correct aspect ratio? In order to answer this question, we need to know several things: the width of the FAX printout in inches (W), the number of lines in the video memory (L), and the number of lines per inch (LPI) printed by your particular FAX machine. You should already know L (768 for the *WSH* system) and W can be determined by simple measurement in the case of a home-brew system, or from the manual in the case of a commercial system. The LPI factor is a bit more tricky. If you have a commercial recorder, the manual will usually give either the LPI and/or the index of cooperation (IOC). If need be, LPI can be calculated from IOC where:

$$LPI = (3.1416 \times IOC)/W$$

If your target machine has an IOC of 576 and an active printing width of 10 inches, LPI is equal to:

$$LPI = (3.1416 \times 576)/10 = 181$$

If you are using on your home-brew FAX a drum-type recorder with the stylus driven by a threaded rod, you can calculate the LPI value if you know the threads/inch (TPI) of the drive rod, the rpm of the drive rod motor (SM), and the rpm of the drum motor (DM):

$$LPI = DM/(SM/TPI)$$

The SMARTFAX recorder, like the WSH design from which it was derived, has a 20 TPI drive rod, a 40 rpm drive rod motor (SM), and a 240 rpm drum motor (DM):

$$LPI = 240/(40/20) = 120$$

Assuming we can figure LPI in one fashion or another, the number of times each line in memory has to be dumped to the output (N) to achieve the proper aspect ratio with a printout with a width of W, is:

$$N = W/(L/LPI)$$

In the case of the SMARTFAX recorder, where W is approximately 7 inches, LPI is 120, and the number of image lines is 768, each line would have to be repeated:

$$N = 7/(768/120) = 1.09$$

We are obviously not going to print fractional image lines so in this case, an acceptable picture would require that we dump each line only once. In the case of the Alden *Weatherchart* recorder, the LPI value is 196 and the printing width is about 10 inches. If we wanted to print the 768 image lines from the *WSH* scan converter, each line would have to be repeated:

$$N = 10/(768/196) = 2.55$$

or, in this case, either 2 or 3 times. Obviously, by using some basic information about the format of the target FAX machine and some simple math, virtually any image in the computer memory can be dumped to any FAX system.

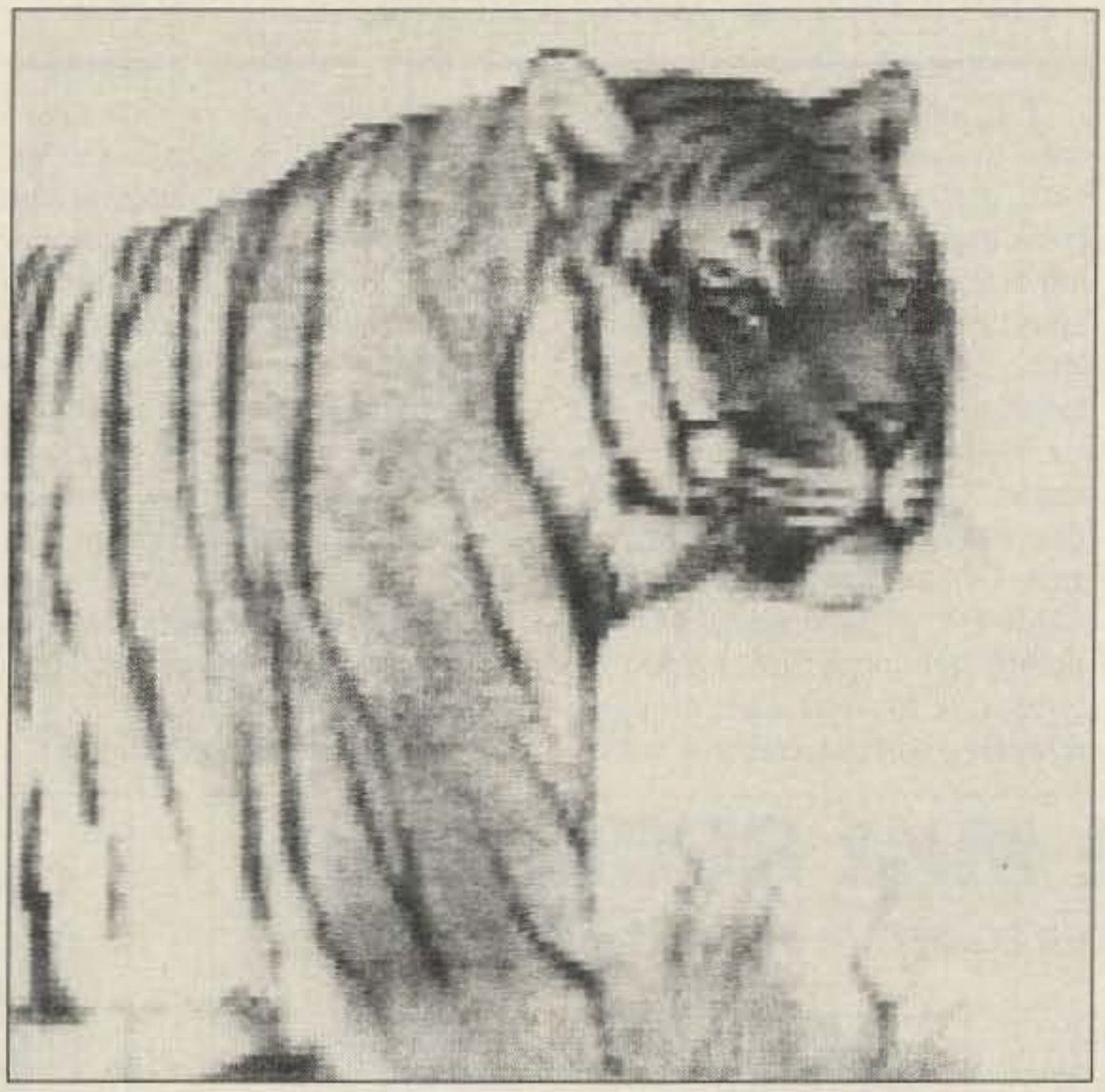

Figure 2. A 128-line SSTV image, transferred from a Robot 450C to a 64K CoCo 2 computer. The computer was used to format the image for 240-LPM FAX output, so it could be printed on the SMARTFAX recorder. This kind of trick emphasizes that the original image format is completely irrelevent—almost any grayscale or graphics image in a computer memory can be printed on a FAX machine with results that are far superior to dot matrix or video printers.

Control Signals

Commercial or home-brew recorders designed to handle standard FAX formats require certain control signals if they are to use all their operating functions, and at least some of these signals have to be created by the computer simulation of a FAX signal. The most important of these is the image-phasing interval that precedes picture transmission. Systems designed for WEFAX service expect each image to be preceded by a 20-second phase interval in which the start of each line is marked by a black phasing pulse

between 10 and 15 mS long, with the rest of each line being white. Since the image line is 250 mS long, the black phase pulse should be somewhere between 4% and 6% of the line length. If we assume, for the sake of discussion, that our system will be using a 2048-Hz clock frequency, each line of FAX video represents 512 clock pulses, and our phase pulse should therefore be somewhere between 20 and 30 clock pulses in duration—let's call it 25. A 20-second phase interval represents 80 lines at 240 LPM, so the pseudo-code for generating the phasing signal would be as follows:

(1) Load a register with 80 (the line count)
(2) Set the video output to black (phase pulse)
(3) Count 25 clock pulses (duration of the phase pulse)
(4) Set the video to white (rest of line)
(5) Count 487 clock pulses (512-25)
(6) Decrement the line count register
(7) If not 0, return to (2), otherwise begin the dump on the next clock pulse.

Except for a few pesky details, phase interval generation for a typical 120 LPM FAX recorder, such as the *Weatherchart* recorder, is similar. The differences relate to the fact that the weather map FAX systems expect a white pulse and a black line and that the line and phase pulse lengths are twice those needed for a 240 LPM system.

quired. Continuous feed systems, such as the Alden unit, can be started and phased manually, since the position of the white phase pulse is easily seen as the paper feeds out, therefore, tones are not necessary here, either. If needed, I would set up a dual 555 timer chip in an astable oscillator

"SMARTFAX is simple in concept—it combines the advantages of digital scan converters and FAX recorders, eliminating disadvantages of each!"

The only remaining control signals that might be needed are start and stop tones. Most systems expect a start tone consisting of 300-Hz square wave modulation between black and white limits for about 5 seconds. Stop tones are similar, except that 450 Hz is used and the duration is about 3 seconds. It is generally best to avoid these whenever possible, since they involve extra hardware to generate with most computers. The *WSH* FAX recorder is started and stopped manually so the tones are not required.

configuration with one side tuned to 300 Hz and the other to 450 Hz. Each tone would be routed to a bit on an input port and the appropriate tone could be generated by watching the start and stop clocks respectively, cycling the video from white to black as the clock went from high to low and vice versa. The proper time duration can be determined from the clocks themselves. Five seconds of 300 Hz is 1500 clock cycles while three seconds of 450 Hz is 1350 cycles of the clock.

That about covers some of the major theoretical points for dumping image data from a computer memory to a FAX recorder. Next month, I will describe the SMARTFAX recorder, a very simple approach to printing full-resolution images from the *WSH* scan converter memory.

Pictures of the Month

These are a couple of teasers to give you a notion of why I go through all this discussion. Both were printed on the SMARTFAX recorder, operating at 240 LPM. Fig. 1 is a basic WEFAX quad. Nothing special about this, except that it was *not* printed live. It was printed on demand from the CoCo, and I could have continued to make identical copies. I included Fig. 2 to show how powerful a concept SMARTFAX really is. This little gem is a 128-line SSTV image which my CoCo grabbed, formatted it as a 240 LPM FAX signal and shot it out to the SMARTFAX recorder. Getting interested? Tune in again next month!■

*Note: The **Weather Satellite Handbook**, 3rd Edition is available from the author for $12.50 plus $1.00 shipping and handling (U.S.; $2.00 elsewhere).

ABOVE AND BEYOND

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QRP FROM MOUNTAINTOPS

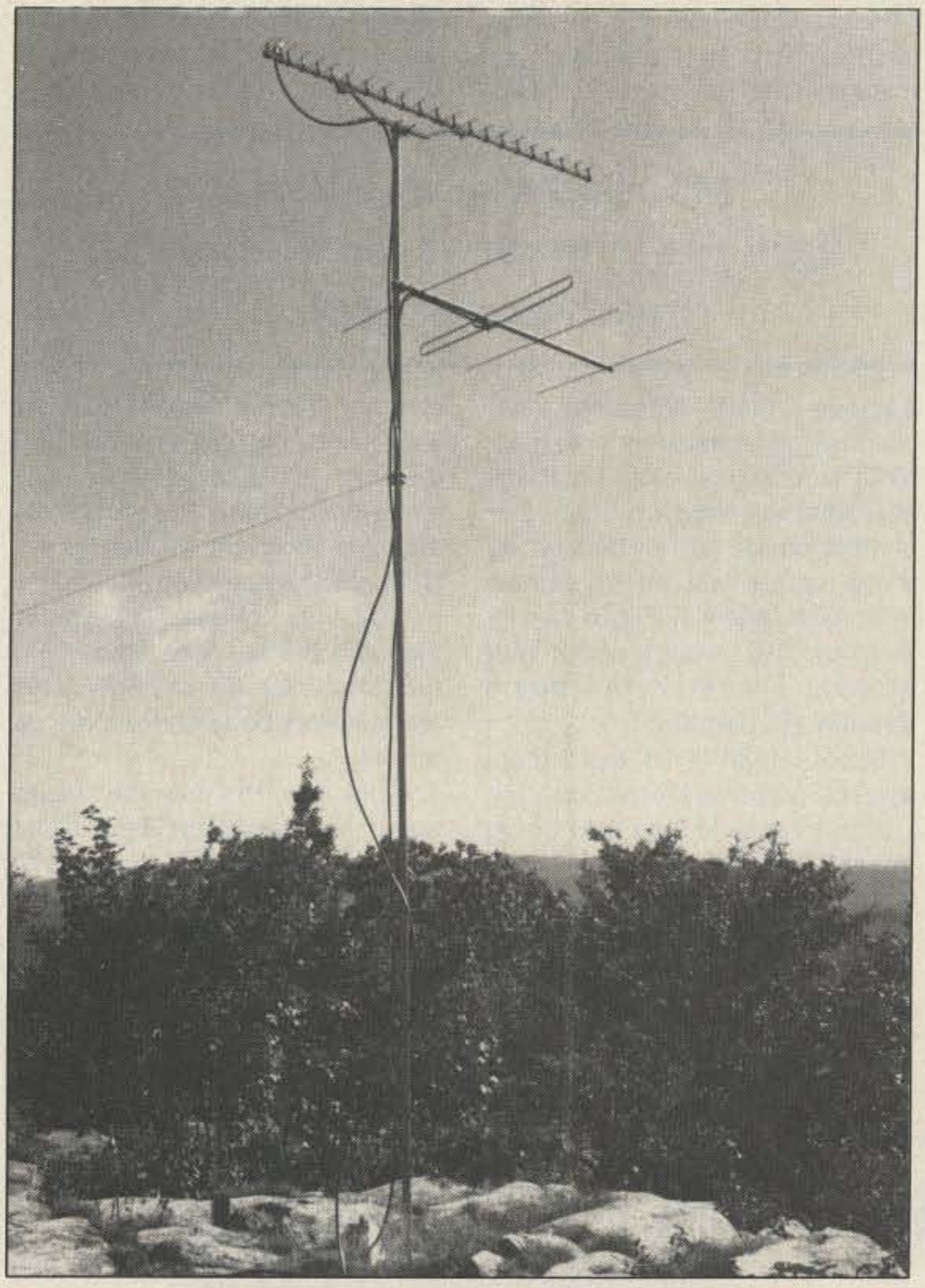
As the summer contest season draws to a close, I'd like to talk about a few portable antenna and feedline schemes I've used over the past few years to operate QRP from mountaintops. The object has always been to get the greatest gain for the least weight. In many cases, a little gain was sacrificed in favor of a lighter load.

My most popular band has been 2 meters, and I feel I've found the ideal portable antenna in the Tonna 9-element yagi (see *73,* July 1987). It's light; it breaks down very quickly; and it's made of sturdy square boom material. I've also used a KLM 4-element yagi for many years. These KLM antennas were made available with insulated through-the-boom mounts that would stay in place by themselves temporarily. For longer periods of time, KLM recommended using steel "keeper" washers fitted over the plastic insulator to snug it up to the boom.

However, I never used the keepers. I marked each of the three detachable elements with a different color and marked the boom with a corresponding color to allow for rapid, on-site assembly. A pair of these and a two-way power divider (or 75-Ohm phasing harness) take up very little room and weigh under six pounds. Each 4-element is rated at about 7–8 dB gain, so a pair will yield over 10 dB, increasing the 10-Watt signal to 100 Watts erp. The Tonna has over 10 dB to begin with—perhaps closer to 12–13 dB—and will kick your 10 Watts up close to 200 Watts erp, a very respectable mountaintop signal.

On 6 meters it's a different story. I've used the Tonna 5-element yagi, which is very light and yields about 8–9 dB gain. However, I find the pattern a bit broad. Another problem is that most of the time I use only 15 feet of masting and this doesn't quite get the antenna up a full wavelength, so the pattern is even more distorted and becomes broader still with a worsening of the front-to-back ratio. There are no easy solutions. My favorite 6-meter antenna (the KLM 50-7LD) has too long a boom to use with 15 feet of mast, so for now I'll have to get by with the 5 elements.

220 is a bit easier. The 7-element KLM works pretty well and doesn't take up a lot of room. Another good choice is the Cushcraft A-22011, which has 11 elements on only 8 feet of boom—a piece of cake to carry along. Of course, if you are handy bring some stiff wire, a bamboo or similar pole, and make a quagi (full-wave, loop-driven element) with about 6 or 7 elements. It would break down very nicely, and if it got damaged—so what?



A few sections of 20-gauge steel mast with 1296 and 144 MHz—very light with reasonable gain for their size.

432 is easier still. I've used the Tonna 21-element yagis (old style) where a clip holds the element through the boom. They were light, all right, but the element ends had a tendency to "stick" you in the kidneys when strapped to your back. Now I find that Tonna has gone to an element mount similar to their 2-meter beams, where the rod is secured to the top of the boom with a molded plastic insulator. All I need to do is rotate the insulator 90 degrees and the elements line up next to the boom—a very compact setup indeed.

On 902 and 1296 I've also used the Tonna yagis, but the plastic standoffs that hold the stiff wire pieces are not terribly strong, so I suggest a loop yagi that travels a whole lot better. If the loop gets slightly bent, just round it out. The width of the strap used in the loop adds extra strength, especially if you whack it against a tree or rock—or even if you drop it. If you want to give them a try, the Tonnas do provide about 16–17 dB gain for just 23 or so elements on a very compact boom. The feed used on 432, 903, and 1296 is a folded dipole, so no matching is needed. Keeps things simple!

It's a good idea to make a harness to secure all of the antennas together, especially those that break into sections. A simple frame can be made from 1 x 3 firring strips with small eye hooks attached for shock cords. The antennas are broken down and laid flat on the frame and strapped to it in a way that avoids element breakage from sudden impacts. This frame can be fitted with straps and secured to a backpack or the roof of a vehicle. Keeping the element ends tight against the surface eliminates the chance of damage to you and the yagis.

How about coax? I've experimented with many types, and pretty much use the RG-8/X "Mini-8" cable for short runs up to and including 432 MHz. Surprised? You shouldn't be. A piece 25 feet long with type N connectors shows only about 2-dB loss. When used with a 14-dB yagi the system gain is 13 dB, with a 10-Watt exciter that's still 200 Watts erp with a lot less weight. On receive you might want to use a mast-mounted preamp, but I haven't found that 2-dB loss hurt me significantly (except on signals 2 dB out of the noise!)

I've even used very short runs of this stuff on 903 and 1296, but the losses start to pile up, so instead I use 30-foot pieces of Belden 9913. On 1296, that means about 1.5–2-dB loss—tolerable, considering the weight involved. 9913 is heavy! Don't let that air dielectric fool you, the center conductor is a solid #9 wire. I prefer to coil this into about a 2-foot diameter circle and strap it across the points on my backpack to avoid shifting of weight.

It goes without saying to use N connectors at 432 and above. UHF types don't cut the mustard. Why bother with the extra weight of transitions? Here's another tip—when I prepare feedlines, I assume that everything will get soaking wet at some point, and use heat-shrink tubing behind the threaded barrel to make a watertight (and twist-proof) connection. You can do this easily with 9913 and 1/2" tubing. It's also quite simple with RG-8/X and two pieces of tubing—one on the cable butted against the connector, and one on the rear of the connector itself. Color code them to make the job easier on site.

Remember to bring at least one or more feedlines than you have stations. For my trip up Cathead Mountain in September 1986, I brought feedlines for three bands plus one extra piece of RG-8/X and one extra run of 9913 (didn't need 'em, fortunately!). Now, if you've planned well, you're look-

ing at about 20 to 25 pounds of antennas and cable for 4 to 5 bands.

Masting is easy. Use the lightest, cheapest "junk" swaged mast you can get from Radio Shack or a similar store. After all, how long does it have to last? I had an 8-inch-diameter plate made with four holes for stakes and a 4-inch-high collar that the mast fits into. Secure the plate to the ground using a slip ring with 1/8-inch nylon rope and additional stakes. With 15 feet of mast, you can accommodate 4 yagis quite easily, and you'll be surprised at how much wind this array can withstand.

For me, the total weight of such a package—including the radios and a power source—is between 40 and 50 pounds. (I carry the mast separately and use it as a hiking stick!) For regular hikers, that is a bit of weight but it shouldn't be too bad on leisurely trips (say up to 2 miles or so). If you've got a friend along, spread the weight around. 20–25 pounds isn't bad at all! If you're trying a mountaintop for the first time, limit yourself to one or two bands and cut the weight accordingly. Be ingenious! I often use a 220-MHz, hand-held for contacts during contests, since most multi-ops listen on 223.50 and can hear your little rubber ducky many miles away. Not much weight there!

Mini-Review—The Cushcraft 220B Boomer

I mentioned the Cushcraft 220B Boomer in the article on the Chincoteague trip in this issue. This antenna very closely models the time-proven, 32-19 2-meter Boomer design and assembles in much the same way. A T-match is used and the factory-suggested setting yields an swr of better than 1.4:1. Complaint Number 1: I wish Cushcraft would take an extra few minutes and mark the ends of joining boom sections with colored markers as KLM and Tonna have done for years. It takes longer than it should to measure each section and compare it to the diagram.

Cushcraft claims 17.2 dBd forward gain about the same as that of the 32-19. The front lobe (H-plane) is calculated to be 2 x 14.5 degrees—about 29 degrees total, which is fairly sharp. Front to back (F/B) ratio is claimed to be 30 dB at resonance, which is good. Our contest usage sort of backed up these figures, with strong signals from AB4L and K4LHB, in nearby Virginia, reduced by about that amount swinging the beam through 180 degrees.

Boom length is 18 feet 9 inches. The surprise for me was that I didn't have to use the boom brace. (That was because I didn't have enough hardware to finish assembling it!) Complaint Number 2: Lack of hardware was also a problem when I did the review on 32-19 for the January 1987 issue of *73*. (C'mon guys—put a few extra screws and nuts in the package!) We didn't really need the brace since boom sag was minimal. However, I strongly suggest using it if there are high winds or a lot of ice in the wintertime. Overall: An excellent choice for serious 220 DX work.

"Masting is easy. Use the lightest, cheapest 'junk' swaged mast you can get...."

Letters Department

Perry Yantis of Obetz, Ohio writes to ask just what the Japanese are up to in the 23-cm department. Perry would like to get on the band and has ordered an antenna, tower parts, and coaxial cable. He apparently got the impression from a Kenwood rep at Dayton that "Kenwood isn't interested in 23 cm." I've heard differently. And, I'm certain Kenwood doesn't want to miss out on Novice Enhancement! The problem is that any products we see in the USA will have been developed for the Japanese market first. So, for the time being we're stuck with the TR-50 for 23 cm FM. (This mode is very popular in Japan, by the way.)

Right now, the only multimode transceiver for 23 cm is the ICOM 1271A. This comes from stock with a less-than-average receiver, but works surprisingly well with the AG1200 preamp. The only limitation is that the preamp is rf-switched with a 15-Watt limit. This precludes tower mounting if you run any power. I assume that Perry is interested in weak-signal work. He didn't indicate this although buying a tower, antenna, and cable sure sounds suspicious to me. I predict the 1271A will stick around for a while. (I can't imagine they're selling like hotcakes, so there's no incentive to upgrade them technically.) It's a good choice, however, unless you want to go the somewhat cheaper transverter route.

Ev Tupis WB2ELB of Brockport, New York writes telling of a proposed UHF DXpedition to grid FN06 in Ontario on 220, 432, 903, and 1296 for the August UHF Contest. It will be history by the time you read this, but I'd like to hear how things worked out since this grid is quite a few miles north of Toronto—hence very rare. Ev also asks how to connect a TS-430S for transverter operation. Folks, tear this sheet out and put it in your file for future reference. Here we go!

Connecting a TS-430S

Using the standard 8-pin DIN plug, pin 1 and pin 3 are grounds; pin 2 is +12 volts at 5 mA on transmit (good for keying lines or a reed relay); pin 4 should be grounded to enable the transverter connection and to shut finals down; pin 5 is the 28-MHz receiver connection from the transverter; pin 6 is the ALC control for the transverter (if needed, usually not); pin 7 is the 28-MHz transmit connection to the transverter; and pin 8 is the optional low-band antenna (not used for transverter work).

Until October, see you Above and Beyond! ■

NEVER SAY DIE

from page 10

over, there's some good news—and there's some bad news. Which would you like first?

I might as well give you the good news first since there is so little of it. I mean, we're grasping at electronic straws here. Okay—though the effects of a bomb (euphemistically called a nuclear device) of from 10–50 megatons set off in space—around 250 miles up—and over the center of the U.S.—would be an almost total disaster for us electronically, the good part is that it wouldn't create any shock waves or fallout—it'd be a "clean" bomb, and as such would be unlikely to trigger a nuclear retaliation. There is a good deal of agreement that any attack would logically start with such a bomb.

Now for the bad part. The NEMP from such a bomb would wipe out virtually every solid-state device from coast to coast—every radio, TV, all solid-state car ignition systems (which means only very old cars would still be running—imagine the incredible traffic jam of dead cars, trucks, and buses—plus millions of people trying to get home on foot)—it'd be a mess, with all communications of every kind instantly wiped out over the entire country.

Since most of our telephone systems are solid state these days, we'd have no phone service—just like all our other emergencies—we're used to that. But, unlike other emergencies, the phone system would be out of service permanently—it wouldn't be anything which could be fixed in a few days or even months. The pulse would take out most satellites and microwave systems, so none of our communications systems would be operable.

We've been chuckling at the backward Russians, with their old tube equipment. Heck, they even use tube radios in their MIG-25 Foxbats! What dummies, right? EMP doesn't bother tube radios.

The pulse will be so intense that many people who happen to be leaning on metal fences are expected to be electrocuted. Of course, they're not sure about everything because we stopped testing bombs in space before we thought to measure NEMP pulses, so we're trying to work with the best fragmentary information we have.

Perhaps, instead of holding technology back from Russia, we might encourage them to go solid state—help them build IC plants and make it so eventually they'd be as helpless as we in the face of a high-altitude bomb.

Yes, your computers will be totally zapped—we're talking 50,000 volts per meter at ground level.

Well, what about protecting our ICs from such a blast? Yes, they're making headway with hardening solid-state circuits. The NEMP pulse is so short, around 5 nanoseconds (billionths), that our normal EMP filters—such as for lightening—are useless. What seems to work best is to build a small pi-filter with bypass zener diodes into every pin of ICs. This adds to both their cost and size, but they think it'll do the job.

The prospect of adding these circuits to every IC made so that eventually our computers, cars, telephone switchers, radios, TVs, hi-fi's, and digital watches will be operable after a blast—particularly where most of our consumer electronic equipment is designed and built in Japan and where consumers will do almost anything to save a buck (it's obvious that hardened IC are going to be more expensive than soft ones)—isn't bright.

That brings up one more good aspect of the situation for us. Many of us have been worrying that the few hams we have left, using voice and Morse circuits, would be unable to handle the enormous volume of traffic a nuclear attack would demand. Now we realize this isn't a problem at all—NEMP will wipe out everything except a few old Goony Boxes, so there won't be any ham radio—or CB—or AM—or TV. For the first time in history DX ops are going to be able to have a decent QSO, even in the American part of the bands.

Oh, there's one more good part—ground-level bombs will only wipe out electronic equipment for a short range, so we don't have to worry about a national disaster when the first terrorist group finally manages to smuggle a bomb into downtown Manhattan and sets it off. If our government can't stop tons of cocaine, pot, heroin, and hash from being smuggled, what chance have they of stopping a suitcase-sized nuke—one like we saw on the Connections PBS program a few months ago?

We have the prospect that an angry or frustrated USSR—an angry China, Pakistan, India, Israel, France, etc.—could lob a nuke up over Nebraska some day and bring the U.S. totally to a stop—no businesses can run without computers and phones—no one can get to work without a car—no business can operate without a phone—no food distribution—you get the picture.

"...instead of holding technology back from Russia...encourage them to go solid state...so...they'd be as helpless as we in the face of a high-altitude bomb."

With everything else in communications wiped out, all we'll have is our 150,000 mostly-retired hams for communications—and we'll be as out of business as everyone else. Our IC factories won't work without computer-operated numerical control equipment, so we won't even be able to start making new radios and phone switching equipment.

I admit the bad news somewhat overshadows the good, exacerbated a bit because there aren't any simple solutions. If it would do any good I'd be glad to be mad as hell over our government's consistent cover-up of this news. Even the recent effort by two public-spirited hams to try and get the FCC to get the government to level with us about the problem got tied up in the usual bureaucratic double-speak.

One approach is to just heave a sigh and say nothing can be done, so let's just hope no one gets mad at us. Hey, yes, I know everyone is already mad at the U.S., but I didn't say that was a realistic approach.

Another is to keep after the FCC and our government secret-keepers (this information is far too dangerous for us to let the public know) to give us the best information they do have on how we can protect our solid-state gear against NEMP. They certainly aren't keeping any secrets from the USSR, which by now may know a heck of a lot more about NEMP than we do.

Once we have the best information we can get we'll have something to work with. If we have to start building emergency tube radios, let's know it. If they're going to start making hardened ICs we need to know about that too. Or can we keep our HTs in completely shielded boxes which will insulate them from the burst? If so, we need to know about it so someone can start making burst-proof boxes for us to keep our transistor gadgets in. I'll need the king-size to hold a few HTs, a couple of Model 100 computers, some portable radios, TV cameras, my 35mm cameras (which are all solid-state operated these days), watches, and like that.

Did you read *Lucifer's Hammer*, a novel about what might happen should a comet hit the earth? Too bad—you missed an exciting book. Pocketbook. I'd like to see some stories on what our country would be like with all solid-state devices blown in a few billionths of a second. Suddenly no communications, little transportation, businesses stopped, food stopped—power stopped. I wonder what happens to a nuclear power station when every electronic control and the meters to see what's going on are suddenly destroyed?

Without communications could we even manage to retaliate if we wanted to? I remember all too well that the Pentagon had to rely for several days on amateur radio communications to keep in touch with their SAC bases after the big Alaska earthquake.

Did the FCC kill their all-volunteer Long Range Planning Committee, which was made up of communications industry leaders, because they were frustrated over being unable to get amateur radio growing again—realizing that am-

ateur radio was the only practical communications service which would be available in a time of extreme emergency—or did they give up even trying to encourage a communications safety net for the country because it seemed hopeless in the face of NEMP?

Unless any plans for facing this problem are so well hidden that even hints of it are invisible, it sure appears as if the fundamental government policy is that the situation is so completely hopeless that it isn't worth even trying to solve it—but, whatever we do, don't let the public know. Lordy, if the public ever got wind of this they'd demand some action—and we don't have a clue of how to cope with this.

My suggestion—information. I've read widely conflicting reports on the impact of EMP. The unsettling aspect is that the optimistic reports seem to come from writers who are just writers, not scientists—writers who accept the bland government assurances that well, it may not be so bad...we don't really know.

Unless Mars happens to be in the same neighborhood of the solar system as Earth we could find ourselves answering a Martian CQ and then listening eight or ten minutes later to see if we got through. Don't bother me about QSLs.

The bright side: some of the *73* readers are working with defense contractors on the NEMP problem—so perhaps it will be possible to get some information about it into print so we can start organizing ourselves to honor our mandate to provide communications in emergencies. I'll bet there are some solutions—or there at least will be if we start pushing.

Okay, class is out—now you can go back on two meters and discuss last night's ballgame—or take turns making my life miserable on 20m. ■

SPECIAL EVENTS

NOTE: Space limitations (we hope only for this month) required reporting only basic data plus address/phone numbers for additional information.

AUG 29
HAGERSTOWN MD

Antietam Radio Association station W3CWC on 80-,40-,20-,15,-10-meter phone, CW, and RTTY. QSL and legal-size SASE to W3CWC, POB 52, Hagerstown MD 21741.

REDONDO BEACH CA

Sixth ARRL Amateur Radio Networking Conference, 9 am to 6 pm, TRW Space and Technology facility, Compton Blvd. Call Paul Rinaldo W4RI at Newington CT (203) 666-1541 or Harold Price NK6K at Redondo Beach (213) 376-3147.

WEBSTER NY

Xerox Amateur RC station KE2T 1400Z-1900Z on General portions of the 20-,15-, and 10-meter phone bands. QSLs and also contacts through the 224.26 repeater (WB2SUN/R) to XARC, 800 Phillips Rd., Bldg. 337, Webster NY 14580.

SEP 5-6
HESTON IN

The Porter County ARC, N9RD 1300Z to 2300Z on phone-3.966, 14.266, 21.266, 28.466; CW on request. QSL: Jurgen N9RD or Tom KB8AC, PO Box 1782, Valparaiso IN 46383.

SEP 5-7
TUCSON AZ

The Old Pueblo RC, W7GV 0000Z 5th to 2200Z 7th on new Novice/Tech 10-meter SSB frequencies: SSB-3.980, 7.280, 14.280, 21.380, 28.380; CW-3.730, 7.130, 14.060, 21.130, 28.130; FM-via link and packet. QSL: 8 1/2 x 11 SA 39-cent SE to POB 42601, Tucson AZ 85733. Bill Croghan WB0ŒW, 1854 West Dominy St., Tucson AZ 85713 (602) 622-1535.

WATERFORD CT

The Tri-City ARC, KA1BB from the I-95 weigh station from 1700Z 5th to 2300Z 7th. Frequencies: 28.325, 14.295, 7.245, 3.395 MHz phone or 7.130, 7.075, 14.145 MHz CW. Talk-in to coffee stop on FM 146.52 and CB 19. QSL: Letter-size SASE Tri-City ARC, POBox 686, Groton CT 06340. Bob Dargel KA1BB, 8 Willow Lane, East Lyme CT 06333 (203) 739-8016.

SEP 6
SCHAUMBERG IL

The Schaumberg ARC, WB9TXO from 1500-2000Z. Frequencies: 7.250, 14.250, 28.400 MHz. QSL: SARC, PO Box 68251, Schaumberg IL 60168-0251.

SEP 11-12
LEDYARD CT

Tri-City ARC, K1FSC, 1400-2400Z 11th, 1800-2000Z 12th on 14.295 or 7.245 MHz phone, 7.130 MHz CW. QSL: Letter-size SASE to Tri-City ARC, POB 686, Groton CT 06340.

WINSTED CT

The Quinnipiac Council, W1GB, 2330-0400Z 11/12, and 1200-0400Z 12/13, phone-3.920, 7.240, 14.290, 21.340, 28.400; CW-3.725, 7.125, 21.150. QSL: SASE to Skip Paquette KA1EAJ, 121 West Dayton Hill, Wallingford CT 06492.

SEP 12
VALPARAISO IN

N9RD 1800Z-2400Z (see Heston IN above). 9x12 SASE.

GLEN ELLYN IL

The Northern Illinois DX Association - 35th W9DXCC Convention at the Holiday Inn, 1250 Roosevelt Rd. Contact: Howie Huntington K9KM, 65 South Burr Oak Dr., Lake Zurich IL 60047.

UNIONTOWN PA

The W3PIE, Uniontown ARC 38th annual Gabfest at the club, old Pittsburgh road just off Route 51. Talk-in on 147.045/645; 144.57/145.17. Pre-registration $3, 2/$5. John T. Cermak WB3DOD, PO Box 433, Republic PA 15475 (412) 246-2870.

WINDSOR ME

The ARRL-sanctioned Windsor Hamfest, Southern Kennebec Agricultural Society fairgrounds. Gate donation $2. Camping $3; $5/2 nights. Talk in, W1TKLC 146.22/.82 repeater. Phil W1JTH, 47 Longwood Ave., Augusta ME 04330 (207) 622-1385.

SEP 12-13
MOBILE AL

The Mobile ARC Hospitality Hamfest 9 a.m., Texas St. Rec Center. Talk-in 146.22/.82. $2 at door. MARC, POB 7232, Mobile AL 36607; N4MFQ (205)-471-4717; KB4JET (205)-865-4404.

BETHLEHEM CT

The Hen House Gang ARC W1FHP 63rd ARGI Fair.Novice band 10m, 40m, 20m SSB daylight hours. Contact: W1FHP,President, Hard Hill Rd., Bethlehem CT 06751.

SEP 13
DANBURY CT

The Candlewood ARC hamfest and flea market 9 to 3, Danbury Elk's Club, 346 Main St. Talk-in 147.72/.12. Call Gene Marino W1IDH (203) 426-8852 for table, admission rates, etc.

WILLOW SPRINGS IL

The Bolingbrook ARS Ham/Computer Fest 6 a.m., Santa Fe Park, 91st and Wolf Road in Willow Springs. Talk-in on 147.33/.93 or 146.52. Ed Weinstein WD9AYR, 7511 Walnut Ave., Woodridge IL 60517 (312)-985-0527.

LA PORTE IN

La Porte Summer Hamfest, county fairgrounds, SR 2. Talk-in on 146.52. Paul KA9UKW, PO Box 30, LaPorte IN 46350.

MARSHALL MO

The Indian Foothills ARC hamfest, Marshall Senior Citizens Building, 8:00 a.m. Talk-in on 147.84/.24. Exams 9 a.m.Randy Ebers KEØM, 125 Lakeview, Marshall MO 65340.

MONETT MO

The Ozarks ARS Club Congress and Swapfest, city park (corner of highways 60 and 37), 9:00 a.m. Talk-in on 146.37/.97.

FINDLAY OH

Findlay RC (W8FT) Hamfest, 8 a.m., at Hancock County Fairgrounds. FRC Hamfest, PO Box 587, Findlay OH 45839-0587.

BUTLER PA

The Butler Hamfest, Butler Farm Show Grounds on Route 68. Contact: John Varljen K3HJH, 174 Oak Hills Heights, Butler PA 16001 (412) 283-9403.

SEP 15-19
ATLANTIC CITY NJ

Southern Counties ARA, K2BR, from Miss America Pageant. Phone-25 kHz (inside lower General class band edge); CW-65 kHz inside lower band edge; Novice-7.125, 21.150 MHz. QSL: SASE to SCARA, Box 211, Linwood NH 08221.

SEP 18-20
WRIGHT-PATTERSON AFB OH

The Base MARS station and the Dayton ARA, 1300Z-2100Z each day, AGA1WP on 3229.5, 7528.5, 14,528.5, and 20,874.5 kHz and W8BI in General Class phone portionss of the amateur bands and Novice/Tech 10-meter phone/CW band. All QSLs: SASE to W8BI, PO Box 44, Dayton OH 45401. Contact: Paula DiGennaro KA8HQJ, 7136 PIneview Dr., Huber Heights OH 45424 (513) 233-9018.

SEP 19
DETROIT MI

Southeastern Michigan DX Association, K8JP, (Pope John Paul visit) 0001-2400Z. Phone, CW 10 thru 80 meters. QSL: SASE to Larry Zabkowski K8NLD, 18082 Gaylord, Fraser MI 48026.

NORMAN OK

The South Canadian ARS, W5OU from 1400Z-2400Z, on 7.237, 14.237, 21.337, 28.337 phone phone; 14.087 RTTY/AMTOR; 145.01 packet; FM-147.060 (± 600); and ATV-439.25. QSL: 9x12 SA 39-cent SE to SCARS c/o KD5IT, 2735 Poplar Lane, Norman OK 73072.

PONCA CITY OK

The Oklahoma Independent ARC Ham Hamgover Hamfest and electronics show, National Guard Armory, 9:00 a.m. Talk-in on .37/.97. Contact: Lin Jackson KA5ZJM, 350 South Birch St., Ponca City OK 74603 (405) 762-7299.

SEBASTOPOL CA

Sonoma County Radio Amateurs, flea market, 8:00 to 2:00, Sebastopol Community Center, 390 Morris St. VEC exams. Talk-in on 146.13/.73. SCRA, Box 116, Santa Rosa CA 95402. Table info etc., Alan N1AL, (707) 538-7115 eves; 577-3981 days.

BARRIE ONTARIO CANADA

The Hex-9 Group, Barrie ARC, Packet Radio Symposium, Georgian College, 9:30 a.m. Talk-in 146.25/146.85 VE3LSR. R.S.O. Annual Convention also. Box 254, Barrie, Ontario L4M 4T2 Canada.

SEP 19-20
PEORIA IL

EMSP Peoria Area ARC Superfest '87, Exposition Gardens, off West Northmoor Rd. 6:00 a.m. Commercial buildings open 9:00. Talk-in 146.16/146.76, W9UVI. Reserve for banquet. PAARC, PO Box 3461, Peoria IL 61614 (309) 674-5656.

WICHITA FALLS TX

WARS hamfest, Activity Center at 10th and Indiana Sts., 8 to 4 19th, 8 to 2 20th. Talk-in on .74/.14, .34/.94, 449.30/4.30. All info, reservations, Steve Guerra WB5LCN, PO Box 4363, Witchita Falls TX 76308 (817) 723-6500.

SEP 20
CAMBRIDGE MA

MIT Electronics Research Society and UHF Repeater Association Flea Market, 9 to 4 (sellers, 7 a.m.) Albany and Main Sts. Talk-in 146.52, 449.2/444.2-PL 114.8(2A)-W1XM/R. Contact: MIT UHF Repeater Association, 4 Madison St., Belmont MA 02178.

CHICAGO IL

Chicago ARC, "OPEN HOUSE—World of Amateur Radio," 11 to 5, North Park Village, 5801 N. Pulaski. Experts demonstrate all aspects of ham radio. Call 545-3622 for info; Novice classes.

ADRIAN MI

The Adrian ARC W8TQE/R 15th annual Hamfest 8 to 3, Lenawee Fair Grounds. Talk-in 145.37/444.675 W8TQE/R. Contact: Adrian ARC, PO Box 26, Adrian MI 49221.

GRAND RAPIDS MI

The Grand Rapids ARC annual Swap and Shop 8 a.m., West Catholic High School, 1801 Bristol NW. Talk-in .86/.26, 224.64. Tables, admission rates, etc. call Don Hazelswart KA8BCI (616) 363-0649; write Grand Rapids ARC, PO Box 1248, Grand Rapids MI 49501.

PENNSAUKEN NJ

The South Jersey RA 39th annual Hamfest, 8 to 2, Pennsauken Senior High School, Route 73 and Remmington Ave. Talk-in 145.290. Info/tickets: Fred Holler W2EKB, 348 Bortons Mill Rd., Cherry Hill NJ (609) 795-0577.

OLD WESTBURY NY

The LIMARC ARRL Long Island Hamfair, 7:30 a.m. sellers; 9:00 a.m buyers, the New York Institute of Technology, Route 25A/Northern Blvd. Talk-in 146.25/.85. Contact: Henk Wener WB2ALW (516) 484-4322.

SEP 26
WASECA MN

The Viking ARC 17th annual Swapfest 8 a.m., Waseca High School. Talk-in .34/.94. Contact: VARS, PO Box 3, Waseca MN 56093.

HORSEHEADS NY

The Elmira ARC 12th annual International Hamfest 6 a.m., Chemung County Fairgrounds. Info/tickewts Steve Zolkosky, 118 East 8th St., Elmira Heights NY 14903.

LUMBERTON NC

The Carolina ARL station KS4S 1300 UTC to 2100 UTC Frequencies: 3.870, 7.240, 14.290 kHz on 28.400 kHz on the half hour. Certificate: QSL to C.A.R.L., PO Box 2208, Lumberton NC 28359.

SEP 26-27
GRAYSLAKE IL

The Chicago FM club Ham and Computer Fest, Lake County Fair Grounds, Route 120 & 45. Talk-in 146.16/.76. Tickets: advance $4; gate $5. Info/tickets SASE to Expo Tickets, PO Box 1532, Evanston IL 60204.

FAIRMONT IN

The GCARC operates station W9EBN from 1700Z 26-1700Z 27. Operation 10 kHz lower end telephone band 20-, 40-, 80 meters and 28.350 Novice Band. Certificate: QSL and SASE to KA9TBM or N9FBB at call book address.

WALLA WALLA WA

The Walla Walla Valley ARC annual Hamfest 8 a.m.,Oregon Community Building, Milton-Freewater. Talk-in 147.88/.28, .52. Contact: Bernie Frazier WA7CBX, 610 South First Ave., Walla Walla WA 99362 (509) 529-9879.

SEP 27
BOULDER CO

The Boulder ARC annual Fall Barcfest Swap Meet 8 a.m., National Guard Amory, 4750 North Broadway. Talk-in 146.10/.70. Contact: Dale Scott KAØŒV, 304 East Cleveland St., Lafayette CO 80026 (303) 665-2364.

WILLIMANTIC CT

The Natchaug ARA 5th annual flea market 9:00 a.m., Elks Home, 198 Pleasant St. Talk-in .90/.30, .52. Contact: Ed Sadeski KA1HR, 49 Circle Dr., Mansfield Center CT 06250 (203) 456-7029.

GAINSVILLE GA

The Lanierland ARC 14th annual Hamfest 8:30 a.m., Georgia Mountain Center. VEC exams given. Talk-in 146.07/.67. Contact: Phil Loveless KC4UC, 4949 Red Oak Dr., Gainesville GA 30506 (404) 532-9160.

NEW BERLIN IL

The SVRC ham/computer swap, Sangamon County Fairgrounds. Camping OK. Contact: SVRC, PO Box 8252, Springfield IL 62791.

ST. PETERS MO

The St. Peters ARC 3rd annual Swapfest 6 a.m., Golden Triangle Park. Talk-in 145.41/145.33. Contact: Jason Zwyers KAØNR, 1084 Crestwood Lane, O'Fallon MO 63366.

BEREA OH

The Cleveland Hamfest Association annual hamfest/computer show setup 6 a.m; opens 8 a.m., Cuyahoga County Fairgrounds. Talk-in 146.52. Contact: C.H.A., PO Box 81252, Cleveland OH 44181-0252.

SEP 27-29
WASHINGTON DC

The Microwave Communications Associationannual convention, Ramada Renaissance Hotel. Theme: "The Future Medium for Entertainment and Education." Contact: Elena Selin, 2000 L St., NW, Suite 200, Washington DC 20036 (301) 464-8408.

QRP

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Photo A. One of the baluns on my antenna system. Note coax sealer and the soldered connection to the balun and antenna wire.

AUTUMN— ANTENNA REPAIR SEASON

Have you noticed? The days are growing longer, the night air is a bit cooler. Autumn is slowly heading our way. Before too long, we'll have snow here in Ohio. So right now is the perfect time to fix, tune, and install antennas.

The antenna is without a doubt the single most important piece of equipment outside the shack. Remember last year when I told you that your QRP signal is only 3 S-units lower than someone running 100 watts? Well, that's still true. Let's take our example one step further. Let's say Bob is running a modern 100-watt solid state radio into a dipole. You're running 3 Watts into a dipole. In this example, you'll really only be 3 S-units lower. You'll be able to break and work a fair amount of DX with that setup. However, let's say that Bob flips on the switch to his three holer (three 3-500Zs running with 2100 volts on the plate) for the kW. If you're skilled in the fine art of QRP, you still can work some of the pileups. Bob now switches over to his monoband wide-spaced beam on top of a 80-foot tower feeding the antenna with nitrogen-filled hardline. You may as well shut down and watch TV, and hope that Bob's rf doesn't interfere with *that*. You just can't compete on that level.

Antennas hold the key to successful QRP operation. Nothing less than the best will do. Anything less than optimum antennas will cause nothing but grief.

How do you go about installing the best antenna for your station? Learn the basics, purchase the *ARRL Antenna* book, and read this month's issue of *73* cover to cover. It's full of antennas to dream about and to build.

The efficiency of the antenna system is number one on your list. Antennas should be the primary consideration when upgrading the QRP station. Some of the stuff I have used to make contacts would leave most people rolling on the floor with laughter. A lot of my gear is wired and tested with alligator leads, but it works! My point is this—if it produces rf, it needs an effective antenna to work.

After moving to the city, I found that installing an 80-meter dipole within a city lot takes quite a bit of skill. I was able to shoehorn every inch of wire within the lot, but the antenna wasn't anything to write home to Mom about. How does one improve the efficiency of the antenna system? Follow these steps and you will begin to fill up those log sheets faster than before.

Let's start with the transmitter. From the coax connector to the antenna, how many OTHER things are in the line? Wattmeters? Antenna switches? swr bridges? Three dozen barrel connectors? Step one: get rid of ALL UNNECESSARY DEVICES IN THE FEED LINE TO THE ANTENNA. This is of utmost importance when running QRP. The kW boys can stand to lose a watt or two in the swr bridge, connectors, and whatnots, but you CAN'T! When you only have two watts to start with, you just can't afford to lose half a watt or so in feedline goodies. The only time I install a wattmeter/swr bridge is during testing or troubleshooting the antenna system. The only switch in the antenna line is a remote Heathkit switch mounted on the tower. When I change from one radio to another, I reach behind the radio, unscrew the antenna lead, and move it to the other radio. Yes, this is slow and wears out the connectors and the cable, but that's the way I do it. Remember that even the best antenna switch in the world has some insertion loss, even if the loss is measured in fractions of a dB. Add all those fractions together and you'll end up with a dB's worth of loss just in switches.

"Antennas hold the key to successful QRP operation."

Got an antenna tuner in line? If you try to kid yourself into thinking you can resonate your 40-meter dipole on 160, think again. It's possible, but so much of the rf is going nowhere in the tuner that very little is making it to the antenna. Antenna tuners are great critters for adjusting an already resonating antenna, enabling operation from one end of the band to another, but they are not for the purpose of resonating a poor antenna for a second band. Sometimes the use of a tuner is mandatory, as is the case with the G5RV antenna.

The curse of ham radio operators: swr. Don't concern yourself with getting the swr bridge to read exactly 1:1. It will not make much difference if the antenna swr is 1:1.8, or even a bit higher. Some of the newer, solid-state radios will reduce their output if the swr is too high, but we need not worry about swr shutdown when running two watts. I sleep just fine with an swr of 1:3; a bit higher than that, and I'll toss and turn some at night.

What type of coax is running up to the antennas? What condition is it in? When was the last time you replaced the coax? These are some of the little things that need your attention to achieve maximum antenna efficiency.

What's the best coax to use? Just get a good brand name and remember the old saying, "You get what you pay for." This is oh—so true when it comes to coax. I have been running RG-8U as the main feed to the antennas in my shack for some time now, and have found it to be perfect for connecting the antennas to my remote switch. However, some of the newer cable I've read about offers better specifications than the RG-8U. These cables include the following: Belden 9913, which is great for 2 meters; and 450, which is somewhat of a poor man's hardline. You might also use RG-213 and RG-217; the RG-213 being the most popular. The cables RG-214 and RG-223 are double-shielded versions of RG-213 and RG-217. In my opinion, the use of double-shielded cable for HF operation is overkill. RG-8U is a rather thick, heavy coax which is cumbersome to use, and I prefer to use the micro-8 cable (also called mini-8 or RG-8X). For goodness sake, don't use RG-58U cable anywhere, not even for mobile use!

Coax cable should be replaced every five years. I know. . .who does that? Well, *I* do (it is true, however, that I don't have an 80-foot tower, so the cost is very low). For a dedicated low-power operator, however, even with a high tower, it is money well spent.

From the coax to the actual antenna, what is the best antenna? The one that works on your size lot. Don't use traps in the antenna if you can avoid them, as they are "lossy"; use resonant antennas instead. To operate a multi-band antenna, try a G5RV and a tuner (another "lossy" device but necessary for the G5RV). My city lot will not hold a 40-meter dipole horizontal. I configured it to a inverted vee. If that is also your plight, keep the ends of the vee as high off the ground as possible. Use a side arm to keep the apex of the vee out and away from the tower.

Baluns—who knows how well they function, but they sure are

nice to connect coax to. Book after book has been written about the benefits and evils of these devices. I use one on every coaxial feed antenna. Do they work for me? I just can't say!

When connecting the coax connector to the antenna, with or without a balun, first wrap a layer of electrical tape around the PL-239. Then wrap the connection with some of that sticky coax connector sealer, such as Coax Seal™, which you can get at Radio Shack. The tape allows the coax sealer to be removed without too much mess. This is the ideal thing to do if you like to experiment with antennas and are constantly changing the feed line.

For 20, 15, and 10 meters, some type of directional antenna is a must. You can use a dipole, which hasn't the gain and directionality of a beam (either quad or yagi), but you're rowing upstream. I have been using a old Wilson system for two years, and find it to be quite satisfactory. For those with limited funds and smaller lots, check out the Butternut Butterfly beam.

Unless you have the time and the space for all those radials, think twice about the use of a vertical antenna. It has all those traps to worry about. The vertical would produce very good DX because of its low angle of radiation but, in most cases, the installation is not perfect and the results suffer. Vertical antennas radiate poorly in all directions.

In summary: remove all inline goodies from the coax; use resonant antennas; fit the greatest amount of antenna into the given space; use high-quality coax and replace it every five years; and seal the coax connections against the weather. Also, use a directional antenna for 20, 15 and 10 meters and resist the temptation to install traps in the antenna. Don't worry too much about obtaining 1:1 swr. Finally, remember that no one QRP'er will ever know everything there is to know about antennas. That's a fact of life.

I got letters from a lot of homebrewers who built the 6L6 special. I plan to do a 6L6 update very soon. Keep the photos coming. Who says no one builds anymore—QRP'ers do!

That's about all for this month. Next month I'll dig into the mail bag, since October marks the first anniversary of the QRP column in *73 Magazine*. ■

Dx

Chod Harris VP2ML
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Photo A. Some of the operators of VU4APR in the Andamans in front of the Tourist Home.

ANDAMANS ADVENTURE

[Bernhard Stefan DL2GAC is a world traveller who saves up his funds while working in West Germany, and then takes a prolonged (many months) DXpedition to various rare and exotic locations. Many DXers would love to follow that life style! Bernhard recently returned from several months in India, including the Andaman Islands, and he shares his experiences with *73* readers.—VP2ML]

As VU2BMS in India, I had worked the VU4APR Andaman-son the first day of their operation and the thought, "Why not go there again?" flashed through my mind. So I extended my proposed stay in India for two weeks and got a booking from Madras to Port Blair and an open ticket from there to Calcutta. In Madras I heard that two stations were set up in Port Blair, one at the Tourist Home and the other at a 5-star hotel. My flight left at 6:20 a.m. After I arrived I booked into the Youth Hostel in Port Blair, which is, at 5 rupees per night, the cheapest place to stay. An hour later I went looking for the stations. The Tourist Home I knew and it fitted as a suitable QTH. The 5-star hotel, I guessed, would probably be newly constructed (construction is still going on) Aasiana Hotel. My guess was correct, because on approaching it I could see a beam on top.

The manager of the hotel introduced me to the present and sole operator Bharathi VU2RBI and we had a two hour conversation and lunch together. I returned in that evening and met Jose VU2JOS, who was helping Bharathi to hang the 160-meter longwire antenna up higher. Bharathi had only managed two 160-meter contacts so far: one with an ON-station [ON4UN, I bet—VP2ML]; and the other, I believe, with a JA station. She didn't try very long afterwards without success and I don't think there were any other additional 160-meter contacts I observed on one side of the room the 20-meter SSB activity of Bharathi and on the other side the 40-meter activity of Jose.

I kept a low profile for the next few days, because I didn't want to spoil my really good reception through too much hanging around. For sure, I would have loved to get on the air, but my Indian license was without the necessary endorsement for operation from Andamans.

On March 15 three new operators arrived by ship and Suri VU2MY, the director of the National Institute of Amateur Radio (NIAR), came with VU2DS and JR1AIB [of the Japanese DX Family Foundation—VP2ML] by plane from Delhi via Madras. The same day I attended a presentation of our hobby to a group of about 30 local people, who were interested in getting involved and in getting a ham license. Maybe there will soon be a local licensee, since there have already been three or four similar presentations by the operators of VU4APR and VU4NRO. The operation has created a lot of awareness with the local people and the local administration, before this operation nobody knew what ham radio was all about. They probably thought of hams as some kind of secret society engaged in some illegal operation not far away from spying.

Suri had come with Daljit Singh VU2DS from Delhi who had the latest news. Daljit is working for the monitoring service in Delhi and he has been instrumental in getting a license for VU4APR. He insisted that he had come as an operator and not on an official mission, but he has some kind of presence with the authorities. Suri said that there are applications for operation from Andamans from three different groups of foreigners pending right now. One is from an OH group, one from a W6 group, and another nationality he didn't mention. The OH group applied a year ago and the W6 group fairly recently. The application for the VU4APR activity has been pending for three years.

Rajiph Gandhi [VU2RG and Prime Minister of India—VP2ML] visited the Andamans in December 1986 or January 1987 and promised assistance from the central government for the economic development of the islands. This assistance is intended to boost tourism. At present there are only about 300 hotel beds available in Port Blair. By 1990 the planned number is 1000. There is a lot of new construction that hadn't begun when I visited Port Blair two years ago.

The construction of a new hotel began in 1986. Its foundation is laid on top of bunkers left over from the Japanese occupation during World War II. The hotel faces eastward toward the open sea.

The visit of VU2RG to Andamans was probably the decisive factor in granting the present license and future licenses to foreigners. Suri and Bharathi had an audience with the Prime Minister in January and the whole VU4APR gang will have one again in April. It was shortly after their audience that the license was issued.

On March 16 there was a luncheon for all the operators, myself, and JR1AIB. Suri talked afterward about the QSLing for the operation. All QSLs should be sent "direct" to VU2APR. Any QSLs sent via bureaus will be processed very slowly. Suri said that all QSLs for VU4APR and NRO will be mailed by April 30 direct to the National QSL Bureaus of the different countries. The cards are already printed. The group is expecting to make 20,000 to 25,000 contacts, which to my mind is not a very high estimate.

I was asked if I had any comments on the operation. I could have said several things, but I only said that for future operations they should try to get more shorter callsigns. They've been discussing operations in Lakshadweep [Laccadives] and Bhutan. Operations should be under one callsign without the addition of "operator". Identifications like VU4APR/RBI/JOS are according to Indian rules. VU2DS responded that for future activities this will be no problem. He said that the next group could get VU4A, for example, as a call.■

The new hotel Aasiana, Port Blair, Andaman Islands.

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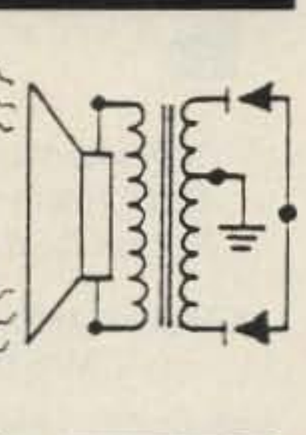

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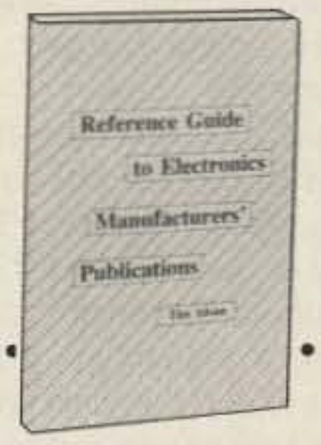

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KANSAS AND MISSOURI FACE OFF

Last month, I ended by saying I would attempt to explain the current rivalry over coordination efforts for the Kansas City area that's been plaguing Kansas and Missouri. Well, I tried. In fact, I spent the better part of several weekends trying to put together a short history of the problem. Guess what? A "short history" took up sixteen double-spaced pages. And that was far from complete! So, rather than a detailed explanation of just who is goring whose ox—let's keep it short and sweet.

About two decades ago there was *no coordinator* for either Kansas or Missouri. They weren't needed then. But, when more and more repeaters took to the air in Kansas City, a local ham set up as a coordinator to help "keep the peace." Since growth in Kansas City was more rapid than the growth in more rural sectors of both states, this system worked well.

Enter repeater politics and repeater politicians. As more repeaters came on the air, both Kansas and Missouri felt the need of statewide repeater councils. Both states then formed councils. Eventually, however, someone figured that these councils rather than the local hams should decide who would coordinate for Kansas City. As far as I can tell, it wasn't a matter of the existing coordinator doing a good or a bad job. Rather (just like in the world of big business) the normal policy of any major entity is to put its own people in charge when it takes over. And, like it or not, fair or not, that's the way that business operates. It also seems to be the way most repeater councils operate as well.

There was only one problem. The Kansas City coordinator refused to be replaced! Instead, he garnered the support of the local council of radio clubs and continued performing Kansas City coordinations. In the meantime, the Missouri and Kansas state councils became a part of a region wide "umbrella" coordination organization, the Mid-America Repeater Council (MACC). The MACC then lent its support to the Missouri Repeater Council (MRC) and the Kansas Repeater Council (KRC) rather than to the existing Kansas City coordinator. Getting rather complex, isn't it?

That was the status quo until the Nebraska state coordinator and then ARRL VHF Repeater Advisory Committee Chairman, Joe Eisenberg WAØWRI, wrote to the FCC Special Services Division Chief, Raymond A. Kowalski, asking that Kowalski make a determination in the matter. Ray did just that. In fact, he did so twice. The first letter was to Eisenberg informing him that the FCC would rely on regional or state coordinators to determine the validity of any local coordinator. Simply stated, the MRC and the KRC had the right to oust the present Kansas City coordinator. As you might expect, this didn't sit well with most of the folks in Kansas City.

They, in turn, bombarded poor Ray with their side of the story through the Mo-Kan Council of Amateur Radio Clubs. Their action persuaded Division Chief Kowalski that in this particular case some extenuating circumstances might exist that would cause him to reevaluate his earlier decision. Not that such circumstances *did* exist, only that they *might* exist.

Anyhow, at this time, that's how the situation stands. The Mo-Kan Council supports the long-time local Kansas City coordinator and the statewide councils, with the apparent backing of the regional umbrella organization, are determined to put their own man in power.

Since the FCC is so wishy-washy and refuses to make a final determination one way or the other, and, since neither side appears ready to give even a fraction of an inch, I can see only one way that a final determination can be reached. Sadly, it will probably be ham versus ham in a court of law. Worse, the outcome there will eventually have an impact on us all.

My opinion? Well, I've been to Kansas City twice during this three-year-long confrontation and I've had a chance to meet all the parties involved and listen to their viewpoints. I've also read the letter from Eisenberg to the FCC; Kowalski's response; the correspondence from Mo-Kan to the FCC; Kowalski's response to that; and I've talked to Ray on the phone many times about this and other repeater coordination issues.

Here's where I become unpopular with some sections of Mid-West ham radio society. Frankly, I feel that Ray Kowalski made the right decision when he said that in all cases, the FCC would rely on state and regional coordinators to give sanction and validity to the work of any local coordinators. No! It may not be right from the standpoint of a man who has devoted 17 to 20 years of his life coordinating repeaters and now feels as if he's been kicked in the face by a bunch of newcomers. Morally, however, it's the correct decision because it takes into consideration something far more important—the needs of the many may outweigh the needs of the few.

"The move to replace the Kansas City coordinator . . . is based on partisan politics rather than the need for greater expertise."

After all, this is 1987, not 1967, and what worked well during 60s, 70s, and early 80s may not work well in the late 80s or on into the 21st century. In the 70s, Kansas City could afford to isolate itself from other state or regional coordination efforts with little adverse impact. I don't think this is possible today. However, in the same breath I ask the MRC, KRC, and MACC why it's so "politically important" for them to replace someone who has volunteered 17 years of his life to a project. Obviously, if he didn't have the expertise, he would have been run out of Kansas City on a rail years ago. Instead, when the state-wide councils tried to replace him, an entire city rallied to his side. This, more then anything else, convinces me that the need to replace him is purely political in nature. Not that the move itself is wrong, but rather that it's based on partisan politics rather than the need for any greater expertise.

Is there any solution? Yes, and it's a simple one. Let the current and popular Kansas City coordinator continue in the role, but bring him under the auspices of the KRC, MRC, and MACC.

Will this happen? It's doubtful. Too much "ox goring" has taken place and from my observations when I visited Kansas City last April, I can only say that everyone appears intransigent. And, that's why I think that this will be the first "coordinator vs. coordinator" case to land in the courts. In the meantime, it's the hams of the area who will suffer the most.

HF HEROES

We have some new local heroes in southern California. They are hobby radio enthusiasts and they are credited with using their radio gear to save the lives of a couple on a storm ravaged yacht. But, there's an interesting twist to this story. Here's what happened.

Searchers from the U.S. Coast Guard, guided by radio hobbyists in Tahiti and southern California, rescued a couple from Washington state who had been adrift for three days on their damaged sailboat about 720 miles south-southwest of San Diego.

The drama began June 18 when an operator from Laguna Beach, California, identified only as Dean, called the Coast Guard Station in Long Beach to relay information from an operator in Tahiti named Gerard of the yacht's distress call. The Coast Guard had been looking for the boat since it was reported missing on June 18. The first search, by Coast Guard jet, had covered an area of about 3,000 square miles. In a follow-up search June 19 the Coast Guard scoured an additonal 18,000 square miles of the Pacific. Both searches turned up nothing, so the call from Dean was welcome.

According to Dean, he got a call via radio from Gerard, who said he had received a message from a ham on a distressed vessel. The *Grasse Matinee,* a 29-foot, home-built sailboat owned by Patrick and Susan Thomas of Woodinville, Washington had lost its mast in a storm.

When the Coast Guard got Dean's call they knew exactly which boat he was talking about. But they didn't know the boat's

positon or the condition of the crew. The Coast Guard asked Dean to contact Tahiti again and find out the color of the vessel and the type of radio gear on board. Dean and Gerard worked four hours on the air and were able to get not only the information requested, but they also learned that the boat had lost its rudder as well as its mast in the storm.

The Coast Guard called Dean again on Friday, June 19 to tell him that another Laguna Beach operator, Gregg, had made direct contact with the *Grasse Matinee*. Gregg was able to get the exact coordinates of the vessel for the Coast Guard. Mrs. Thomas then asked Gregg to call her mother. "I spoke with her mother," Gregg told the press, "...she was worried sick and not very optimistic." Even the Coast Guard assumed the boat had gone down. Gregg added that the couple said that with 70 gallons of drinking water and a two-month supply of food on board they had hoped to drift to Hawaii. Gregg added that while he kept Mrs. Thomas on the radio the Coast Guard was able to zero in on the exact location of the stranded boat. The Coast Guard cutter *Venturious* was sent to tow the *Grasse Matinee* into San Diego harbor.

By now you may have guessed the "twist" to the story that I mentioned earlier. While media accounts in the Los Angeles area referred to Dean, Gregg, and Gerard as "amateur radio operators, or hams," a call to Gordon West WB6NOA of Gordon West's Radio School showed this was not the case. Gordon is an avid recreational sailor and probably the most attuned person in the world to what's happening in personal radio on the high seas.

All three of the hero radio enthusiasts involved in the rescue are 10 1/2-meter HF operators, and all communication took place on 27.470 MHz and 27.800 MHz (just above the Class D CB channels and below the 10-meter amateur band). All quite legally since this was definitely an "Emergency Operation."

But here's the real zinger. Gordon only learned about this when he received a phone call from the pair of Laguna Beach radio enthuiasts asking how they could get their amateur radio licenses. West added that both are now enrolled in a ham radio training class.

By the time you read this, both of these radio heroes should be hams. The pair, who live not far from those of us who write the late shift from Los Angeles, have the right kind of stuff and will be darned good hams.■

ATV

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CLUBS AND ATV: PART II

Last month we talked about ATV Clubs and the importance of having them; how they can be a major influence on developing fast-scan TV (and SSTV/FAX) in your area. I've received dozens of letters over the past few years concerning the pros and cons of clubs and the good they do for VHF/UHF activity (even a few about how detrimental they can become when *politics* enter in and the power shifts from the do-gooders, creators, and builders to the bitchers, moaners, and complainers).

All clubs have one thing in common, whether they're horse clubs, bowling clubs, gun clubs, or amateur radio clubs. They all have MEMBERS. With members come varied ideas, opinions, levels of volunteer activity, and (no matter how you try to prevent it) politics. I've dealt with several clubs: revived some that were dead or dying, created new ones, been a passive member in others, and held offices in still others. I can see both sides of the coin.

Constitutions and Bylaws

The most important document in any club is its constitution. Unfortunately, it is usually overlooked, neglected, taken from some other group or from a general sample, or provided by the ARRL. Most clubs, in the formation stage, don't recognize the problem of just what they want their constitution to say. A constitution can be made to read and to do anything the founding fathers want it to do.

We went through our local ATV club's constitution and bylaws recently. Back in 1979 when the club was "unofficially" formed, it was a real battle getting this piece of legislation created, agreed to, and passed. First, we asked everyone's opinions about what they thought it should contain (we got very little specific material). Second, I drew up the first draft and presented it at one of the quarterly meetings. It was shot full of holes. I then broadened it, added recommended changes, retyped it, and presented it at the next quarterly meeting. Again, no decision. Copies were then mailed to all members. A few months later, another meeting. I thought for sure we'd have a decision since everyone had had time to study it in great detail. More excuses (gee, I forgot all about it, etc.).

By now we had a bunch of new members and, of course, they had "new" ideas. Talk about frustration! (See Fig. 1 for an example of "frustrated ATVers.") I'd had about all I could take, so I asked for voluteers to take over the project. One member (the one who seemed to be the most critical of and the least help with club actions and projects) volunteered. I couldn't get the paperwork into his hands fast enough! A special meeting was scheduled that would deal only with the constitution and the bylaws.

The new chairman got a taste of his own medicine trying to conduct *this* meeting. He really lost his cool, however, when some of the legislation he'd suggested (and had tried to slip into previously approved paragraphs) was voted down. After nearly a year from the first presentation and a long, long marathon session, the constitution finally passed.

We were not unique. Most clubs go through this same process. The important point that we put in our constitution and bylaws what *we* wanted to see enacted and not a lot of generalizations written for other amateur radio clubs. Our constitution is a unique, amateur ATV-based piece of legislation. If you would like a copy, send me a SASE and I'll be happy to send one.

Fig. 1. A frustrated ATV club president?

BUILD A REMOTE TRANSMITTER

One of the ways to generate new activity and interest in fast-scan UHF TV in your area is for your ATV group or club to undertake a remote transmitter project. These are easy to build and simple to interface, and the FCC has regulated the operation and control of such transmitters.

Of course, the first step in the project is to get a callsign from the FCC. Before starting construction on the project, identify a site with both physical access and access to power lines. Obviously, the higher the location the better. For actual construction of the project you will need a reliable one-Watt transmitter (P.C.'s KPA5, a TX70-1, or Wyman's new WR-1500, are ideal); power amplifiers for better coverage; a good, dependable Touchtone™ DTMF decoder system; a BNC or SO-239 multi-channel video switcher system, video feeds (computers, colorbars, cameras, packet, RTTY, TVRO, etc.) to the various channel feeds, and a built-in, 10-minute time-out unit.

WDØBCE of Davenport IA doesn't have any slow-scan TV gear in his shack, yet we have interfaced his ROBOT 400 converter into channel 7 of our fast-scan TV RT system. He watches ATV by piping the HF-toned SSTV signals over 2 meters and sends from a pre-made cassette. He even worked New Zealand late one night!

Our club's remote transmitter originally listed 10 channels of video TV feeds (see *73*, April 1986), but, recently we added a P5 color 910.25 MHz AM TV link (WBØBIZ ATV/R) that gave us ten more viewing channels for a total of 20. Our members don't know which MODE-A channel to select (computer games, align on test patterns, VCR replay, incoming weather radar, monitor cameras, etc.). A built-up system like this can add much of interest to the fast-scan TV mode in any area.

FM-TV

FM amateur TV, big in England and other countries, is just getting started here in the United States. I've been part of some early FM testing involving color reception of FM.

There is a rumor current that reception of FM TV on a standard AM TV receiver is impossible. It is also rumored that sending on 70 cm is illegal. Neither rumor has any basis in fact. Although I recommend that wideband FM be used on 1200 MHz or above, narrowband (6–8 MHz) can be transmitted and received legally on standard TV sets at 439 MHz. By using slope detection and by correct tuning, you can display some pretty great black and white pictures. Wyman Research (RR #1, P.O. Box 95, Waldron IN 46182) is currently the only U.S. distributor and commercial researcher of FM ham-TV products.

Color tests with Merle Reynolds W9DNT (a 40-mile, P4-P5 simplex FM signal) demonstrated improved color on an AM TV set over that with the AM mode. Colors so rich and full of chroma you'd think there was somthing wrong with his AM mode. W9DNT's tests, conducted through an established AM ATV repeater, worked well as long as he slid his way above the center passband of the AM recieved signal slot. Future tests are planned with a true FM receiver. I expect even more significant results. Similar tests have been conducted by the Metrovision (Washington DC) and the Virginia ATV Group on higher frequencies.

The FM signal, however, runs the amplifiers a lot harder, so make sure to keep the fans on for proper cooling. Wattage just about doubles on the Bird.

ATV: GET INVOLVED

What happened this summer on ATV?

Bill Brown WB8ELK of the Findlay OH ATV group and half of the midwest watched *live* fast-scan TV pictures from a helium balloon at 100,000 feet.

Joe Muscanere WA5HNK of Pearland TX worked Charles "Red" Seals WA4GRK of St. Peterburg FL on 1289.0 MHz, a mere 746 miles (WA4GRK and W5VDS hold the American 70 cm FSTV DX distance record of 937 miles).

The sky was alive with ham TV this summer—aeronautical mobile TV operations from the west by W6UBI and N6HO; from the midwest by WA8VWY and KA8LWR.

Marty Fitzgerald WD0BCE, Davenport IA sent and received SSTV pictures on 14.230 MHz HF via a local FSTV repeater.

Henry Ruh KB9FO brought weather radar Touchtone™ callup to the Chicago ATV area.

Seventeen new ATV repeaters went on the air across the country this summer.

COMING EVENTS

NASA's SSTVer, Dr. Tony England W0ORE will be the guest speaker at two events: the Superfest, September 19–20 in Peoria IL and the Minnesota Hamfest and Computer Expo, October 31 at the Hennepin Technical Centers. Look for color SSTV from Pitcairn Island!■

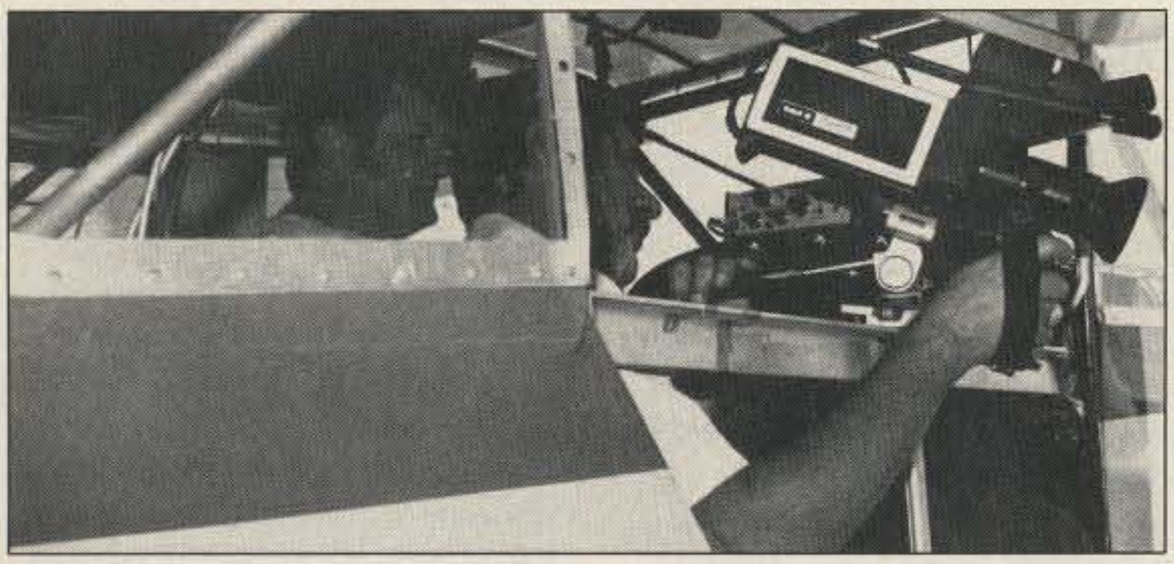

Photo A. Herb Hildebrand W6UBI and Jim Buckman N6HOS manning the 70 cm aeronautical mobile ATV system.

RTTY LOOP

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Pikesville MD 21208

For the last few months I have been covering some of the hard and software on the cutting edge of RTTY technology, computer programs, and terminal interfaces. This month, I'd like to look at one section of information exchange that remains a standard mode of education, with a content that's right up our alley. The mode? BOOKS!

Two books have been reviewed here which address themselves to the amateur who uses digital communications; one to the novice, and the other to users ranging from beginner to expert. By their publication, they continue to speak to the vitality of this segment of our hobby. Let's have a look.

The Digital Novice

In his book, *The Digital Novice*, Jim Grubbs K9EI, gives us a lighthearted look at digital communications. With chapter headings like "The Digital Cave Dweller," and "Noah's ARQ—AMTOR," he sets the tone for a volume that is both educational and fun to read. Nicely drawn cartoon-type illustrations complement the text, and provide the insight often needed for sticky concepts.

The book itself is a 128-page paperback, in the familiar 8.5 by 5.5 inch size. The type is large enough to read comfortably, is clear, and has few typographical errors. If I have any criticism, it's that the lack of alternative typefaces, such as bold or italic, makes the text visually dead.

The beginning of the book harks back to a simpler age, when man lived in caves and counted with his fingers. Fingers—digits—the Digital Cave Dweller! From this humble beginning, Jim leads us through analog vs. digital values and the origins of the modern computer.

Morse code, with its on/off states, is a digital mode, too, and that fact is not overlooked in this book. It goes on, though, to build on the base that Sam built to show the basics of radioteletype communication. There is a cursory examination of baud rate, shift, and speeds.

An examination of ASCII is next, with a brief but meaningful tip of the hat to various forms of the code, and various modes of communication circuits. After a look at AMTOR, a little less than halfway into the book, the discussion turns to packet.

There is no way Jim can tell all there is to know about packet in a fifteen-page chapter, and he makes no pretense of doing that. What he does do is give a good, basic introduction to the topic, so that when someone mentions FCS or the like you won't just squint and say, "Huh?"

His look at personal computers is biased towards Commodore products, but is generally worthwhile. Interfaces are covered in three chapters that somewhat overlap, and seem to mention most of the current "hot" topics. A for-fun last chapter gazes into the future, and lets all of us blue-sky on what's to come.

After a few appendices and licensing information, Jim concludes with a "Final Test," a self-examination to help you appreciate what you learned—painlessly! You earn the Digital Novice certificate when you pass the test. *The Digital Novice* is a wonderful introduction to what many people consider a mystical mode of communication.

The Digital Novice, by Jim Grubbs K9EI, is published by QSKY Publishing, PO Box 3042, Springfield IL 62708, and sells for $9.95 plus $2.50 postage and handling.

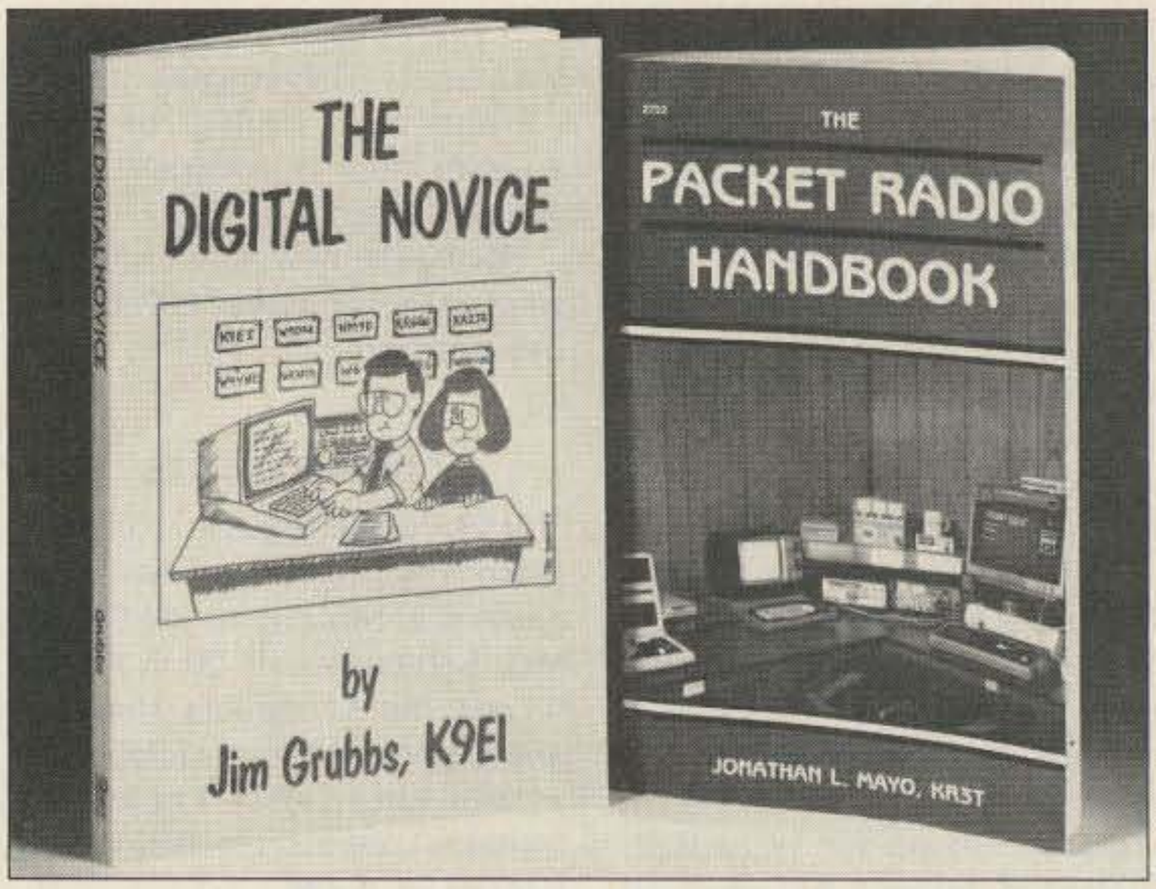

Photo 1. All you need to get started in digital communications . . .

The Packet Radio Handbook

Modestly titled *The Packet Radio Handbook*, our second book this month is written by Jonathan L. Mayo KR3T, and may well just live up to its title. This professionally-typeset paperback, a shade smaller than our previous entry, weighs in with 217 pages, and enough photographs and diagrams to satisfy any editorially-inclined individual.

Logically enough, the book begins with the question, "What Is Packet Radio?" In a comprehensive chapter, packet radio is explained in terms of a digital system, and other important aspects of digital communication are examined. There is also a brief look at integrated circuits and microcomputers.

Closer to home, the next chapter deals with packet radio in the Amateur Service. From the early history, the patterns which developed are looked at, and with that examination, some of the quizzical items often observed become clear.

A thorough description of the fabled Terminal Node Controller leads a chapter detailing hardware systems in the Amateur Service. Here we look at software TNCs vs. hardware TNCs, and all their varieties. If you have a packet signal, you need to communicate with another to make it go. A look at modulation techniques is covered as well.

Two stations are nice, but with three you get a network. Networking and other protocols are covered in great detail. Between gateways, layers, channels, and alphabet soup, it's all in there, and Jonathan does an admirable job of getting it to make sense.

Setting up a station is the next topic covered, and he covers it widely and objectively. The issues of choosing a terminal, TNC, and radio are all addressed, and there does not appear to be any overt bias toward this system or that. Some sample stations are pictured, ranging from a budget system on a shoestring to sharing a terminal with another microcomputer to setting up a portable station.

Of course, there's a chapter on operating practices. With photographs of various screen displays, all of the typical packet situations are covered in understandable language.

Covering available equipment is fraught with danger. The lead time of a magazine is bad enough; a book is far worse. I find myself thinking back to some of the books I used to state out in ham radio, some twenty-five years ago, and how dated the "modern" equipment pictured would look today, as I leaf through

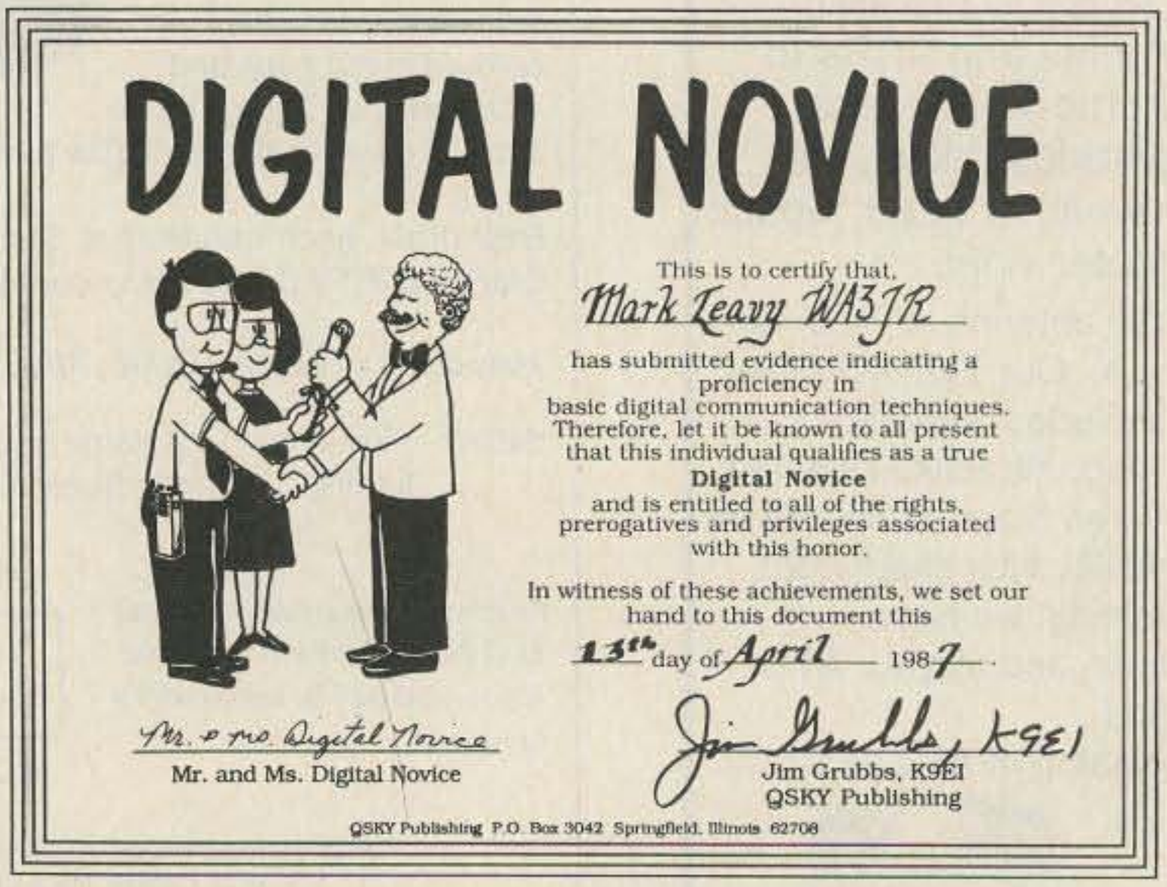

Fig. 1. Pass the "Final Test" in K9EI's book and get this certificate.

the pages of current packet equipment in this chapter. Nonetheless, at the current time the overview is useful if for no other reason than to demonstrate the diversity of equipment available with so narrow a field as packet communication.

And, as if following some divine inspiration, this book as well ends with a look into the future of packet. I'll leave that reading to you.

If you run, think you'll run, or are just curious about, packet radio, you need this book. I know I had lots of questions before reading it. I still have lots of questions, but they are more intelligent ones!

The Packet Radio Handbook, by Jonathan L. Mayo KR3T, is published by TAB Books, Inc., Blue Ridge Summit, PA 17214, and sells for $14.95. It should be available any place TAB books are sold.

If you order either of these books, be sure to tell them that "RTTY Loop" keyed you in to their excellence!

About all of the mail lately has been directed at the CoCo programs published in June and July of this year. I hate to leak this, but more is on the way, for the CoCo and other computers as well. Just make sure your subscription is up to date.

"The Digital Novice *is a wonderful introduction to what many people consider a mystical mode of communication.*"

There have been plenty of other questions, though, and next month will see the old mail sack dumped out on the desk, rummaged through, and spread out for you all to see. As always, I remain available for your comments and questions by mail, Compuserve (75036,2501), or Delphi (MARCWA3AJR). I try to keep up with you all, especially the great number of you who tell me that when you get your issue of *73*, the first place you turn is right here—to RTTY Loop!■

NK6K > PACKET

Harold Price NK6K
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I'm not getting much input from the field these days. This may be just summer inactivity, or it may be that the newness of packet is wearing off. In any case, I'm going to spend part of this month and the next saying bad things about packet; maybe the change of pace will stir up some activity.

The Ollie North Show.

Lt. Colonel Oliver North has been testifying during the preparation of this column. Aside from the obvious, several things can be learned from the hearings. Here in Los Angeles, we're getting simultaneous live coverage on ABC, CBS, NBC, PBS, and CNN. Since the video is a pooled source, (everyone taps off of the same set of cameras), the coverage is just about identical on those five stations; except when the anchors justify their salaries by talking over the audio. That's when you need a fast finger on the remote control, to find a channel where the anchor has slipped out for a trip down the hall. The best part of the hearings comes during transitions, where one committee member takes over from another one, e.g., "Well, those of us who passed their bar the first time know..."

In fact, even with identical coverage, some networks manage to bring the news to me quicker. Since I'm radio-oriented (and procrastinating like mad), I compared the various networks and found that PBS beats all the competition by about 250 milliseconds. The local PBS outlet (KCET) either gets the video direct from terrestrial microwave, or they're taking one less satellite hop. ABC and NBC tie for second, CBS and CNN are a close third.

The HF STA

Last month, I included the text of a request to the FCC for Special Temporary Authorization to allow HF stations to run fully automated and unattended. Although the text of the approval by the FCC was not available in time for this column, Dave Toth VE3GYQ reports that the FCC has granted the STA as requested by the ARRL. The STA starts on July 7 and runs for 180 days. The ARRL can add more stations to the STA simply by sending names and addresses to the FCC. Although a long time in getting to the FCC, they approved it in short order, and things are on track.

International Packet

A copy of some IARU (International Amateur Radio Union) resolutions was enclosed in a recent mailing from the ARRL to members of the Digital Committee. The IARU is a collection of national amateur radio associations; the ARRL being a member. The IARU has an administrative council, which is a sort of executive committee that meets regularly and makes recommendations to the IARU as a whole. There have been several resolutions from the IARU and from the Council that relate to packet in recent years. The examples below give you the feeling that not everyone looks forward to continued exponential growth of packet, particularly on the HF bands.

"Resolution 87-2, concerning the relaying of messages by amateur stations; The IARU Administrative Council, Noordwijkerhout, April 1987.

Recognizing: the problems caused by the handling by amateur stations of communications having inappropriate content, particularly with regard to business and commercial matters,

Recognizing: the impact on other users of the crowded HF spectrum from unattended store-and-forward ("mailbox") stations, and

Further Recognizing: that the problem of controlling the content of amateur radio communication is made more difficult by the availability of such stations,

Resolves: that the Administrative Council affirms the action taken at its Buenos Aires meeting, in urging member-societies to emphasize to their members the importance of adhering to the spirit and intentions of the ITU Radio Regulations, and of handling only that traffic which does conform; and

Further resolves: that member-societies are hereby urged to acquaint their members as to the undesirable aspects of the uncontrolled proliferation of unattended HF store-and-forward ("mailbox") stations."

The action at the Buenos Aires meeting referred to above included Resolution 86-2. This resolution congratulated amateurs for developmental work in packet radio, but went on to make some recommendations, which are excerpted below:

(86-2 resolves...)

2) that member societies are urged to encourage amateurs in their countries to confine routine HF packet operations to the segments of the bands designated for RTTY and similar modes;

3) that developmental work that takes place outside the RTTY subbands should be confined to one frequency per band, with the frequency to be designated by the International Secretariat for International Communications after consultation with the regional organizations, and by the member-societies for domestic communications after due consideration of regional band plans, international and domestic regulations, and the desirability of minimizing interference to stations using other modes of emission;...

As you can see from the above, the IARU would prefer that HF packet stay in the RTTY subbands, and that anything else, such as the STA network, be limited to one frequency per band. Unfortunately, this is in variance with current conventions, at least as practiced in many parts of the world on 20 meters. I bring this up because these resolutions were one of the major stumbling blocks to getting the ARRL to submit the HF STA in the first place; many of the prospective participants wanted more than one frequency on 20 meters. The final STA was a compromise; the ARRL dropped a limitation on the number of participants, the HF crew settled for one frequency per band for the STA.

While I think that the ultimate result of the HF STA might be the creation of a new "automatic unattended digital subband", it need not overlap the current "RTTY" subband, and need not

"...the ultimate result of the HF STA might be the creation of a new 'automatic unattended digital subband', it need not overlap the current 'RTTY' subband, and need not be limited to one 300-baud 200-Hz shift frequency."

Packet Countries List

The following countries are known to be active on Packet. Additional information is solicited. This information has been obtained from W0RLI, WD4BIW, W9ZRX, N1DL, DU1POL, KB7G, K2AAA, AD8I, HK3BCA, W3IWI, WD9DHI, WA6OWM, WB7DCH, N6IYA, VK4AHD, WA6OWM, W7LHO. As of 07/12/87, the list contains 78 countries.

3D6,	4X,	5H3,	5N,	5V,	6W,	9K2,	9M,
9V,	A4,	BY,	BV,	CE,	CN8,	CP,	CT1,
C6,	DL,	DU,	EA1,	EA8,	EI,	F,	FM,
G,	GI,	GJ,	GM,	GU,	GW,	HA,	HB,
HC,	HH,	HI,	HK,	HL,	HP,	HT,	I,
JA,	KH0,	KH6,	KG4,	KL7,	KP4,	LA,	LU,
LX,	OE,	OH,	ON,	OX,	OY,	OZ,	PA,
PJ,	PY,	SM,	ST,	TG,	TI,	TF,	T30,
VE,	VK,	VP2M,	VS6,	W,	XE,	YB,	YJ,
YU,	YV,	ZF,	ZK1,	ZL,	ZS		

be limited to one 300-baud 200-Hz shift frequency. I'd like to get your comments, and, more importantly, your *ARRL director* needs to hear your comments. More on this topic in the future.

International Packet Numbers

A survey commissioned by the IARU in 1985 was delivered at the April 1987 meeting. The report includes estimates of packet users, mailboxes, and digipeaters for European countries. The percent of packeteers in the amateur population ranges from a low of 1.3% in the UK to a high of 8–10% in France and Belgium. The UK reports a annual growth of 300%, so expect bigger numbers there next year. The U.S. estimate is 5% with a 100% annual growth. The US reported 380 mailboxes, most other countries reported 5–10, and the UK had 24. Several reported that a separate license was required to run a BBS. Where digipeating is legal, none of the European countries regard digipeated packets as "third party." This list includes Austria, Belgium, France, Hungary, the UK, Italy, Norway, Poland, and Sweden. In the U.S., strict interpretation of the rules do regard digipeaters as third-party traffic generators. This was one of the reasons for the waiver to the FCC 85-105 proceeding discussed in past columns.

ARRL Packet-Radio Conference

The Sixth ARRL Amateur Radio Networking Conference will be hosted by the TRW Amateur Radio Club and the Southern California Digital Communications Council. The conference will be held at the TRW Space and Technology facility located on Compton Boulevard (between Freeman Avenue and Aviation Boulevard), Redondo Beach CA, on Saturday, August 29, from 9 a.m. to 6 p.m.

The actual site is the TRW cafeteria just south of the white high-rise TRW administration building. A separate dining room will be set up for demonstrations. Demonstrators will be allowed to enter the facility at 8 a.m. for set-up. A beginner's presentation will be given at 9 a.m. The main conference will start at 10 a.m. The talk-in frequency is the W6TRW repeater, 145.32 kHz, with a -600 kHz input.

"The HF STA (Special Temporary Authorization) starts on July 7 and runs for 180 days. The ARRL can add more stations to the STA simply by sending names and addresses to the FCC."

The TRW ARC swap meet will be located about 1/4 mile from the main cafeteria, and personnel will be on hand for directions. The swap meet starts at 7 a.m., and runs through the morning. There are usually 300–400 sellers at this event. There are no commercial food establishments within walking distance; numerous eateries are within a short drive. Consider bringing a box lunch.

The official hotel for this year's conference is the Torrance Marriott, 3635 Fashion Way, Torrance CA; for reservations phone (213) 316-3636. Say you're going to the Computer Networking Conference and receive the special rate of $55.00 (per night/double occupancy).

The high-rise TRW building and the area near the cafeteria was the background for a scene on the planet Deneva in the Star Trek episode *Operation Annihilate*. This is just one of the "only in LA" features, so make an extra effort to attend.

You are invited to announce your intent to attend by sending a message to NK6K @ NK6K on packet, or to 71635,1174 on Compuserve.

The ARRL Digital Communications Committee will meet on Sunday, August 30, at the Torrance Marriott, and further details will be available at the Saturday conference.

See you at the conference!■

HAMSATS

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

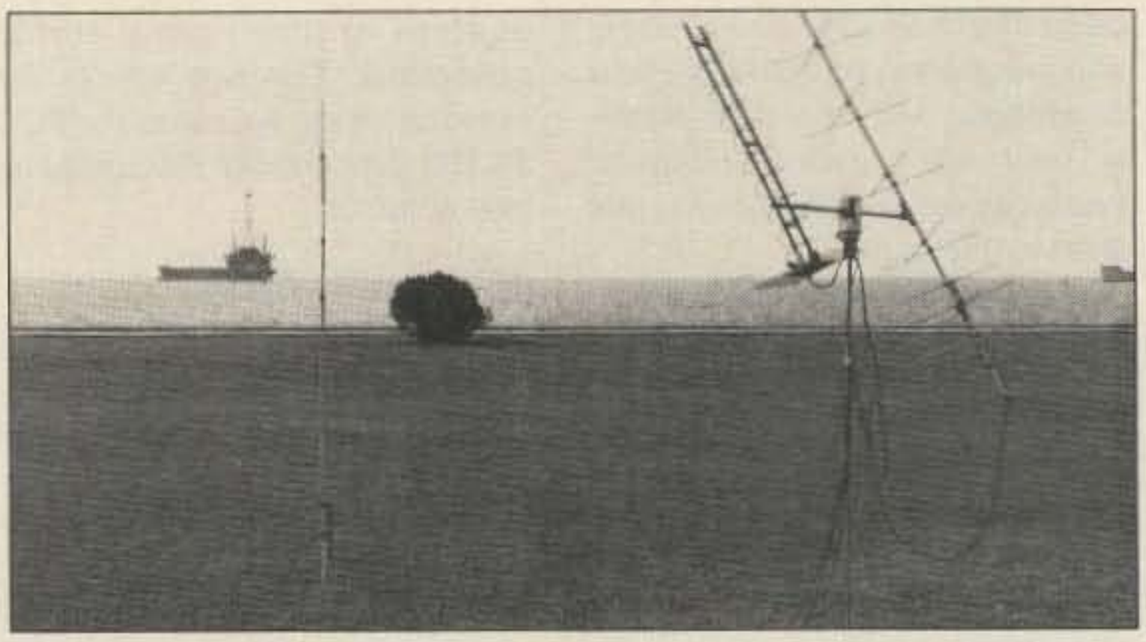


Photo A. Satellite antennas for a Field Day near Galveston, Texas. An ocean view with a vertical for RS reception, a helix for 70 cm, and a 14-element, crossed yagi on two meters.

NEW SOVIET HAMSATS

They're up! On June 23rd, RS-10 and RS-11 became our newest amateur radio satellites. They and the primary payload, COSMOS 1861, appear to be doing well. Thanks to the efforts of many launch-watchers and amateur satellite enthusiasts around the world, information concerning RS-10 and RS-11 was available within just a day or two after launch. We are still learning more details about their operation and use through monitoring and from Russian publications.

RS-10, RS-11, and COSMOS 1861 are actually all on the same spacecraft and presumably are sharing the same power system. The Soviet news agency, TASS, said COSMOS 1861 is intended to work within the space navigational system to determine the position of the USSR's sea-going vessels and fishing fleets anywhere in the world. The system resembles the U.S. NAVSTAR Global Positioning System.

The navigational abilities of COSMOS 1861 might be used by UA3CR during the joint USSR-Canadian Polar Expedition next winter.

So What's Up?

A chart of proposed RS-10 frequencies appeared in the March, 1987, HAMSAT column. Although the bands presented for each satellite mode were correct, the exact frequencies used are considerably different. Fig. 1 is a list of the new frequencies for the RS-10/11 combination. Modes A, K, and T have all been operational, and the ROBOT auto transponders have logged many contacts since launch.

Mode A is the standard two meters up and ten meters down that we've been familiar with since AMSAT-OSCAR-6. The RS 10/11 mode A transponders are non-inverting. If you transmit a signal high in the uplink passband using upper sideband, you will come out high in the downlink passband with upper sideband.

The transponders are also very sensitive. Some stations have been able to achieve reliable sideband contacts using only ten Watts to a Ringo Ranger omnidirectional, two-meter antenna. This was not always the case with the previous group of RS satellites.

Mode K was unsuccessful on previous ISKRA satellites from the Soviet Union. Mode K uses 15 meters up and ten meters down. Like Mode A, it is non-inverting and sensitive. On several occasions I have heard stations in the RS-11 downlink passband who had no idea they were being heard via satellite. They were using standard E- or F-layer propagation for their shortwave QSOs, but also were being re-transmitted through the satellite's ten-meter downlink.

For the uplink on 15 meters, about 100 Watts to a vertical should be sufficient. Some satellite chasers using three- and four-element beams have had success using as little as five Watts.

When using mode K on either RS-10 or RS-11, there are interesting limitations due to HF subband allocations. The RS-10 uplink extends from 21.16 to 21.20 MHz. In the U.S., this frequency range may be used by any class licensee including Novices. Maximum power output cannot exceed 200 Watts and only CW can be transmitted. For RS-11, with a mode-K uplink of 21.21 to 21.25 MHz, the rules are very different. Only Extra class hams can use the segment from 21.21 to 21.225 MHz. From 21.225 to 21.25 MHz, Advanced class amateurs can join the Extras. Single sideband can be used on RS-11 if you have the appropriate license. Don't let sloppy operating procedures find you running voice in the Novice band or anything in the Extra band if you don't have the license to match.

Mode T makes its debut with the RS-10/11 combo. Although 15 meters up and two meters down may sound absurd, it does work. Like mode K, the 15-meter uplink frequencies have their particular license-oriented restrictions.

ROBOT, or autotransponder, operation via RS10/11 has been similar to RS-5 and RS-7, but with a few curious differences. While listening to the RS-10 ROBOT on 29.403 MHz, pay attention to what it is transmitting. If it is calling CQ and sending "QSU 21120 KHZ", then it will be listening only on the 15 meter uplink. If it hears nothing, then it will call CQ again in about 45 seconds and announce a new uplink frequency of 145.82 MHz. It cannot monitor both uplinks simultaneously, but will alternate between the two and will spend the most time monitoring the more active frequency.

To make contact with the RS-10 ROBOT use the following sequence with your call inserted appropriately: RS10 DE WA5ZIB AR. The "AR" at the end must be a continuous dit-dah-dit-dah-dit, otherwise RS-10 will completely ignore the transmission. I have tried code speeds from ten to 50 words per minute. Best results have been around 25 wpm using a keyboard CW generator. The RS-11 ROBOT works in a similar fashion but with different frequencies. Check the discussion of ROBOT operation in the July HAMSATS column for more details.

The orbit of RS-10/11 has a period of 105 minutes, which gives it an altitude of about 1000 kilometers. This is slightly higher than AMSAT-OSCAR-8's orbit, but lower than AMSAT-OSCAR-7 and previous RS satellites.

*** RS-10 ***			*** RS-11 ***		
Mode	Uplink Band	Downlink Band	Mode	Uplink Band	Downlink Band
K	21.16-21.20	29.36-29.40	K	21.21-21.25	29.41-29.45
T	21.16-21.20	145.86-145.90	T	21.21-21.25	145.91-145.95
A	145.86-145.90	29.36-29.40	A	145.91-145.95	29.41-29.45
KT	21.16-21.20	29.36-29.40 145.86-145.90	KT	21.21-21.25	29.41-29.45 145.91-145.95
KA	21.16-21.20 145.86-145.90	29.36-29.40	KA	21.21-21.25 145.91-145.95	29.41-29.45
Beacons:					
29.357, 29.403, 145.857, 145.903			29.407, 29.453, 145.907, 145.953		
Robots (autotransponders):					
21.12 and 145.82 up, 29.403 down			21.13 and 145.83 up, 29.453 down		

Fig. 1. Frequency plan for R-10/11.

Fig. 2 shows an "element set" that will allow you to update your tracking program for RS-10/11. This set will be good for a few months at least, due to the stability of the orbit. Check the AMSAT nets for updates.

For modes A and T we can expect excellent coverage of North America, while those in the northeast will have access to Europe on appropriate passes. Satellite chasers to the west can expect good access to Alaska and Hawaii.

For DX work, mode K may provide some exciting surprises. Since two shortwave bands are used for both the uplink and downlink frequencies, line of sight isn't the only propagation mode that can be used to make contacts through the satellites. When conditions are right for long distance F-layer propagation on ten meters, the same will likely be true for 15. If RS-10 or RS-11 is in mode K, and you can hear the ten-meter downlink, you can probably make contact through the transponder regardless of the satellites' location. We will be hearing of many new DX records via low-earth-orbit satellites while RS-10 and RS-11 are in the sky.

The RS-10/11 integrated system of transponders and ROBOTs is part of a package called BRTK, which stands for "Equipment for Radio Amateur Satellite Communication." It was built at the Tsiolkovskiy State Museum of the History of Cosmonautics in Kaluga, USSR. It is likely that the mode designations K and T stand for Kaluga and Tsiolkovskiy.

The team responsible for our latest Hamsats was headed by Aleksandr Papkov and Viktor Samkov. Papkov began his satellite construction activities by building the telemetry systems for RS-1 and RS-2. These satellites were launched in 1978. Garbled telemetry can still be heard occasionally from RS-1 on 29.401 when the satellite is in sunlight. Papkov's organization has been responsible for several RS and ISKRA spacecraft.

No details have been available concerning RS-9. It has probably been shelved pending a future launch.

BBS in Orbit

The long-awaited Japanese Packet bulletin board in space became available for general use above the U.S. on June 21st. Details of its operation can be found in the Packet column and HAMSATS column in the July issue of *73*.

WB5IPM and VE3JF were the first in North America to connect to 8J1JAS on board Fuji-OSCAR-12 and leave messages in the system. G3RUH, designer of the most widely-used F-O-12 modems, was the first non-Japanese station to work the BBS. Fig. 3 presents an example of what you might see on a typical F-O-12 mode JD BBS pass.

While the satellite is running BBS software, it will not act as a digipeater. It will support access from more than one station at a time, but operations are slowed by heavy loads. Although the early versions of the on-board software can store only 50 messages, the list of users is impressive, with callsigns from all over the world.

Due to schedule constraints of the JAMSAT engineers, F-O-12 was not available for mode JA, the analog mode, during Field Day. Although this disappointed many would-be users here in the States, it provided needed BBS air time for software tests. BBS and experiment days will likely occur on weekends, while recharge- and mode-JA operation will be scheduled during the weekdays.

Field Day

Even without mode JA, satellite operation was much better in '87 than in '86. If any of you set up for F-O-12 mode JD at a remote Field Day site, I'd like to know about it! It is one thing to get a satellite station together or a Packet station on line, but mode JD is just a bit much for a trip to the woods.

AMSAT-OSCAR-10 provided great DX along with many stateside contacts. RS-10 and 11 were available for use even though they had been in orbit only four days.

A typical Field Day satellite station shouldn't be very complex. Ours included a home-brew, ten-turn helix for 435 MHz and a 14-element crossed yagi for 145 MHz. The antennas were mounted just high enough to clear the ground by a few feet when aimed at high elevation angles. For the RS ten-meter downlink, a simple ground-mounted vertical with a MOSFET preamp provided ample signal levels for easy listening. The new RS transponders have five-Watt outputs and are quite loud.

Our radios included a Yaesu FT-726R with a two-meter GaAs-FET preamplifier for A-O-10, and an old HF rig for RS reception. We had an ICOM IC-271A and IC-471A at the site, but Murphy got into them while I wasn't watching.

Even taking into account the difficulties, this year's Field Day was one of the best for satellite enthusiasts. With Phase 3C scheduled for launch early next year, Field Day 1988 could be even better.

```
Object:                  18129
Int'l Designation:       87-54A
Element Set:             15
Ref. Epoch (Year):       87
Ref. Epoch (Day):        180.79529985
Inclination:             82.9228
R.A.A.N:                 48.7368
Eccentricity:            0.0010305
Argument of Perigee:     244.6637
Mean Anomaly:            115.3451
Mean Motion:             13.71864092
Decay                    6E-08
Ref. Orbit:              89
```

Fig. 2. Kelperian element set for RS-10/11 (COSMOS 1861).

```
8J1JAS>WA5ZIB:FO-12/JAS-1 Mailbox ver. 1.01
Use H command for Help

8J1JAS>WA5ZIB:JAS>
8J1JAS>WA5ZIB:++ Available commands ++

F     : List latest 10 file headers
F*    : List all file headers
H     : Show this message
K<n>  : Kill a file numbered <n>
R<n>  : Read a file numbered <n>
W     : Write a file

8J1JAS>BEACON:JAS-1 RA 87/07/04 22:40:58
238 563 657 661 713 876 887 862 003 320
647 002 601 628 634 631 635 634 687 001
704 690 703 704 669 676 925 751 000 000
010 111 100 000 100 000 001 111 111 000

8J1JAS>BEACON:JAS-1 M0 87/07/04 22:41:00
Mailbox available.
Software loaded at 87/07/04 01:20:00
Mode JD Transmitter will be toggled ON/OFF
every two hours using this epoch.

8J1JAS>WB7QKK:
NO.   DATE   UTC    FROM     TO       SUBJECT
036   07/04 13:49  VK3DTO   VK5ZK    HI
035   07/04 13:46  VK5ZK    DH4KAH   Reply
034   07/04 10:59  I0JX     IK0CAK   CONGRATS

8J1JAS>WA4EJR:TO?
8J1JAS>WA4EJR:SUBJECT?
8J1JAS>WA4EJR:Enter text, <CR>.<CR> to end.
8J1JAS>WA4EJR:END

8J1JAS>WB7QKK:
009   07/04 18:37  WB5IPM   KA9LNV   PSK REPLY
ED.. DONT GIVE UP ON PSK NOW!!

8J1JAS>WA4EJR:JAS>
8J1JAS>WA4EJR:
016   07/04 21:36  ZS6IT    ALL      Gateway to SA
015   07/04 21:32  ZS6IT    ALL      Valve needed ur
014   07/04 18:52  WA5ZIB   ALL      FINALLY!

8J1JAS>WB7QKK:014  07/04 18:52  WA5ZIB  ALL      FINALLY!
IT TOOK A WHILE, BUT I FINALLY GOT THE BUGS OUT HERE! 73!
```

Fig. 3. A sample of F-O-12 BBS activity.

Updates

A few notes on general satellite activities are in order before I head back to the shack:

•RS-5 and RS-7 will have little or no eclipsing in August or the first days of September. If there is any life left in these veteran spacecraft, we'll find out then.

•A-O-10 will be experiencing poor sun angles toward the end of August. It will once again enter a period of hibernation in September and October. Check the AMSAT nets and publications for schedule changes.

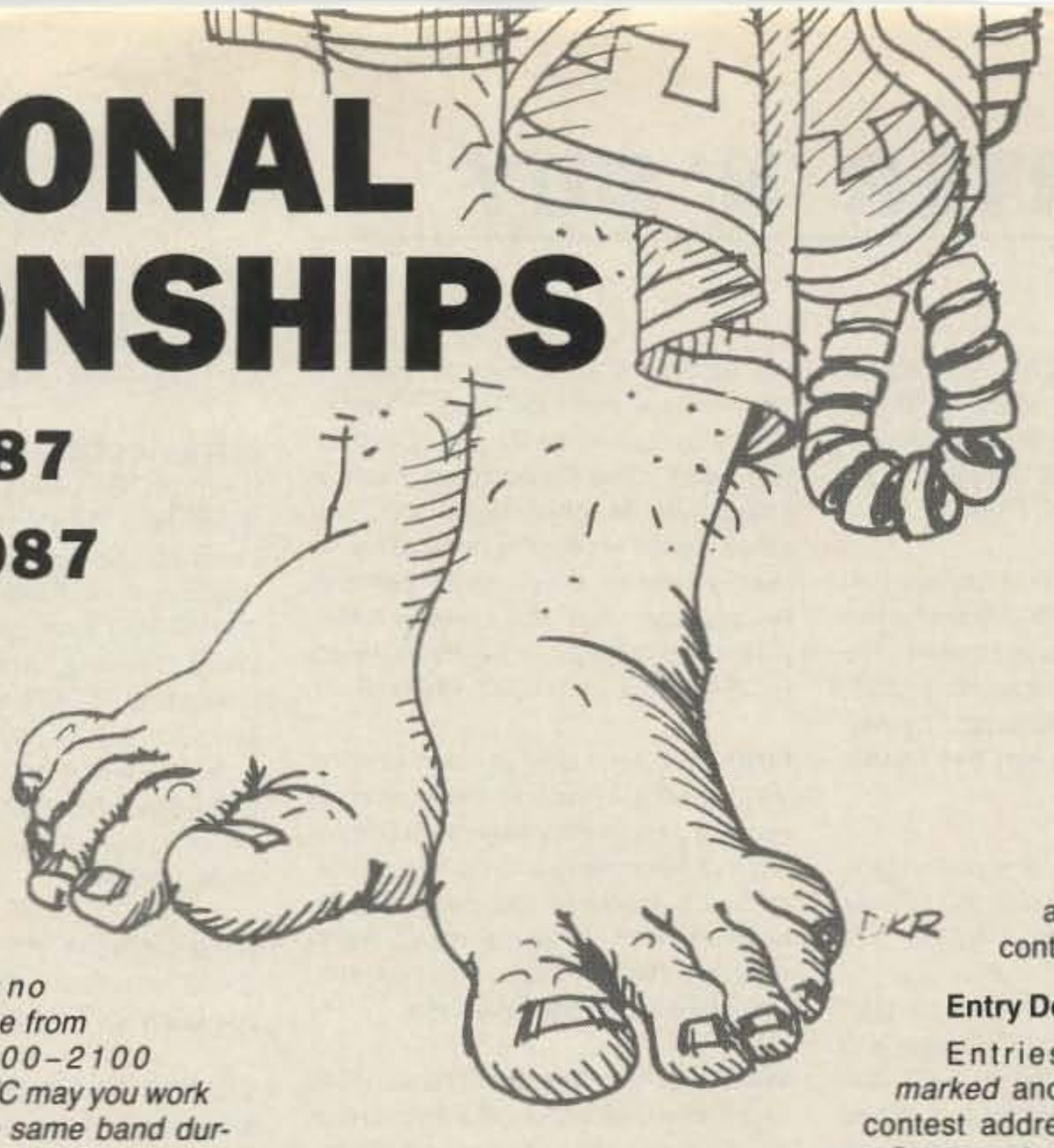
•F-O-12 BBS experiments will continue, but I am expecting a stable schedule of modes JA, JD, and D (recharge) soon. We have hoped for a schedule for almost a year. With the success of recent BBS efforts, perhaps the right time has arrived.

•RS-10 and RS-11 are likely to have a schedule we can report here next month. Modes A, K, and T via the new Soviet HAMSAT/COSMOS combo has exciting possibilities. Give them a try!■

THE NATIONAL CHAMPIONSHIPS

CW: September 5, 1987

SSB: September 6, 1987



For the first time ever, the "Little Gun" has a chance to become a National Champion! The National Championships have been designed to recognize the Contest Operator of the Year. Unlike other events, they single out the best Contest Operator in the USA, not just the station with the biggest hardware investment!

There will be a *National Sideband Champion* and a *National CW Champion*. The combination of these two contest scores will determine the *Contest Operator of the Year*.

Contestants, analyze your band plan. *Do not* take these events for granted. They are, without doubt, the most complex stress-testing events on the bands today. If you understand the rules, you'll recognize "traps" strewn in your path. Being lax could spell your doom. Should you work all bands? How do you maintain your QSO rate without sacrificing your multiplier average? Should you be using the monobander? What happens when you switch to 10 or 160 meters for the 10-point QSOs? It's up to you, the *Operator*, to do what's best for you!

EXTERNAL AMPLIFIERS ARE PROHIBITED. Run barefoot (up to 200 Watts maximum exciter output power) or your entry is disqualified.

Contest Dates

The First Annual National CW Championship Contest is at 0000–2400 UTC on September 5, 1987.

The First Annual National SSB Championship Contest is at 0000–2400 UTC on September 6, 1987.

Eligibility

Open to *single-operator stations* within the *50 U.S. States only*. A station must be capable of operating two or more bands; there are no single-band categories. Eligible bands include 10, 15, 20, 40, 75/80, and 160 meters.

Miscellaneous Rules

Stations may operate only *18 hours* of each 24-hour contest. The same station may be worked *once on each band*. For stations submitting a contest entry, *external amplifiers are strictly prohibited*. Exciter output must not exceed 200 Watts.

Mandatory Band Switching

This rule separates the men from the boys. Read it over several times, as it is the toughest rule to interpret. Be sure you understand it! Violators must be disqualified and their entries processed as check logs.

Stations submitting an entry must operate only on a single band during the following time frames: 0000–0300 UTC, 0300–0600 UTC, 0600–0900 UTC, 0900–1200 UTC, 1200–1500 UTC, 1500–1800 UTC, and 1800–2100 UTC. In other words, you must establish a band within a time frame and *cannot* move from that band until the next frame. *At no time from 0000–2100 UTC may you work the same band during two consecutive time frames.* At least one time frame must pass before the same band can be worked again. *From 2100–2400 UTC only* may stations switch to any band as often as they like.

Exchange

All stations must transmit RS(T) and U.S. State.

QSO Points

10 QSO points per valid QSO on 10 or 160 meters. 5 QSO points per valid QSO on 15, 20, 40, or 75/80 meters.

Multiplier Points

1 multiplier point for each state worked on 15, 20, 40, or 75/80 meters. 2 multiplier points for each state worked on 10 or 160 meters.

Multiplier Average

Multiplier average is determined by totalling all multiplier points and dividing them by the number of bands operated.

Antenna Multiplier

3 Antenna Multipliers for each band worked with a wire antenna design or vertical antenna. Antennas must be fed with a single feedline and not be in a phased configuration. Quads are not considered wire antennas!

2 Antenna Multipliers for each band worked with a duo-, tri-, or quad-band antenna fed with a single feedline and not in a phased configuration.

1 Antenna Multiplier for each band worked with an antenna not specified in the previous two categories.

Note that more than one antenna may be used on a band but *only one antenna may be used at a time*.

Final Score

QSO Points x Multiplier Average x Antenna Multiplier = Final Score.

Contest Entry

Entries must include a separate log for each band worked, a summary sheet itemizing QSOs per band, QSO points per band, multipliers per band, antenna multipliers per band, and total accumulated score. Entries must describe antenna used on each band and sign a declaration that the contest operator abided by the contest rules.

Entry Deadline

Entries must be *postmarked* and forwarded to the contest address below no later than October 20, 1987.

Rules, Forms, Entries

Forms are available from the contest committee. Send an SASE to: The National Championships, 2665 Busby Road, Oak Harbor WA 98277.

Disqualifications

Contestants not following the band-switching requirements will be disqualified. Stations falsely reporting antennas used or falsely reporting output power will be disqualified. Scores requiring more than a 3% scoring adjustment due to duplicate contacts or scoring errors will be disqualified. Contest committee decisions are final!

Penalties

A penalty of one multiplier point, before averaging, will be assessed for each duplicate contact count on the same band and not discounted by the contestant on his/her entry.

Awards

A minimum of 250 QSOs must be worked to be eligible for awards. Awards will be issued to the operator with the most points in each *Call District* and *U.S. State*. Plaques will be issued to the National SSB Champion and National CW Champion.

The CONTEST OPERATOR OF THE YEAR TROPHY will be awarded to the contester with the highest combined score for the two contests. ■

Send For Your National Championship Entry Forms Today

The National Championships
2665 Busby Road
Oak Harbor, WA 98277

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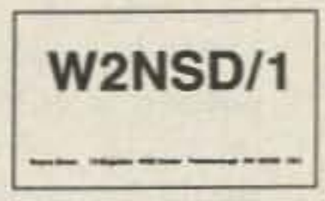

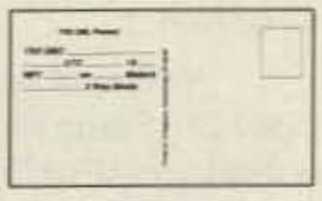

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Anything from a schematic to a complete manual for any of these items will be greatly appreciated. I'll reimburse mailing and copying costs. I have access to a high-quality copying machine if you want to send original documents, which I'll return immediately.

Gary Trustle WB8SPV
424 Franklin Avenue
Waverly OH 45690

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Wayne Elfstrom WB2NIE
76 Waterworks Road
Freehold NJ 07728

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810 N. 13th Street
Bismarck ND 58501

I am looking for an owner's manual (or a copy) for a Hallicrafters SX-100 receiver. I'll pay any charges involved.

William Pence
800 Old Stage Road
Cave Junction OR 97523

I need a schematic and/or manual for a Regency model HR-2A 2-meter transceiver. Will pay any copying and postage costs involved.

Eric Johnson KB6EPO
799 Ada Street
Chula Vista CA 92001-2603

I'm looking for a digital frequency display, preferably a Heathkit SB-650 or any other make for my Heathkit SB-401 and SB-303 rig.

Dave Adams KA1MMC
15 Woodridge Road
Durham NH 03824

I need a copy of the manual and schematic for an RCA oscilloscope, model WO-78A. I will pay for copying and postage, or I will copy and return your original and all costs for postage.

Joseph Ruk W6ZHK
1145 Elmwood Drive
Millbrae CA 94030

We desperately need the power transistor for a GTX-1T VHF handheld radio set by Genave, serial #1624. The description of the part needed is NPN/RFP MRF 227 (Motorola), or RF2067. Your help would be greatly appreciated. Thanking you in advance.

Mahmoud Idera-Abdullah
EL2CE
C/O A.I.M.
PO Box 4262
Monrovia, Liberia
West Africa

Need owners manual and service manual for Radio Shack DX-300 receiver, also Archer Dual Analog Delay I.C. SAD–1024A (276-1761). Any reasonable price paid.

Robert Koczera W1BN
PO Box 1584
Providence RI 02901

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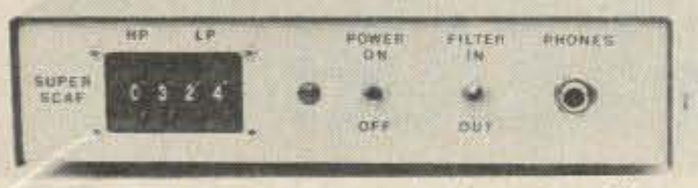

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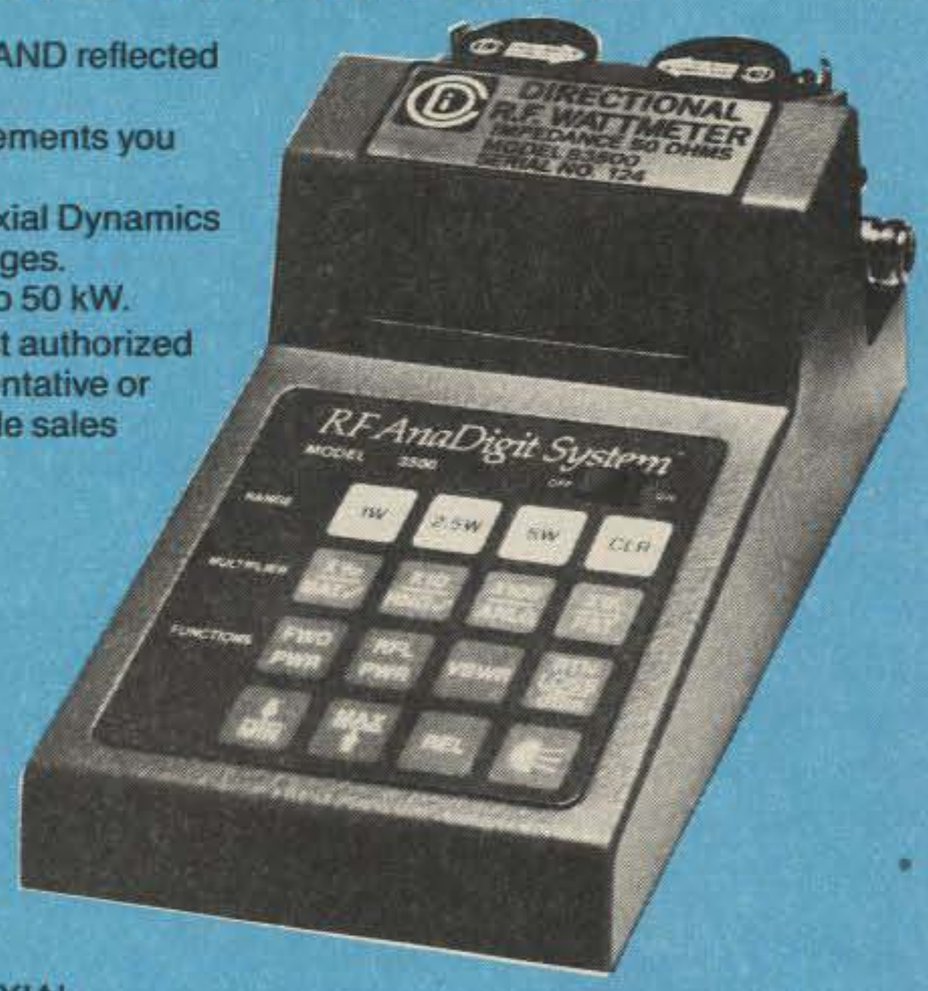

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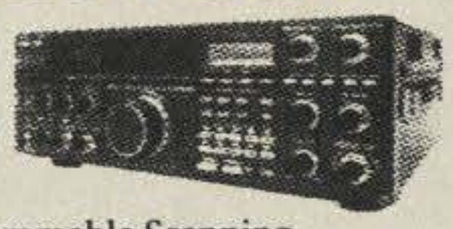

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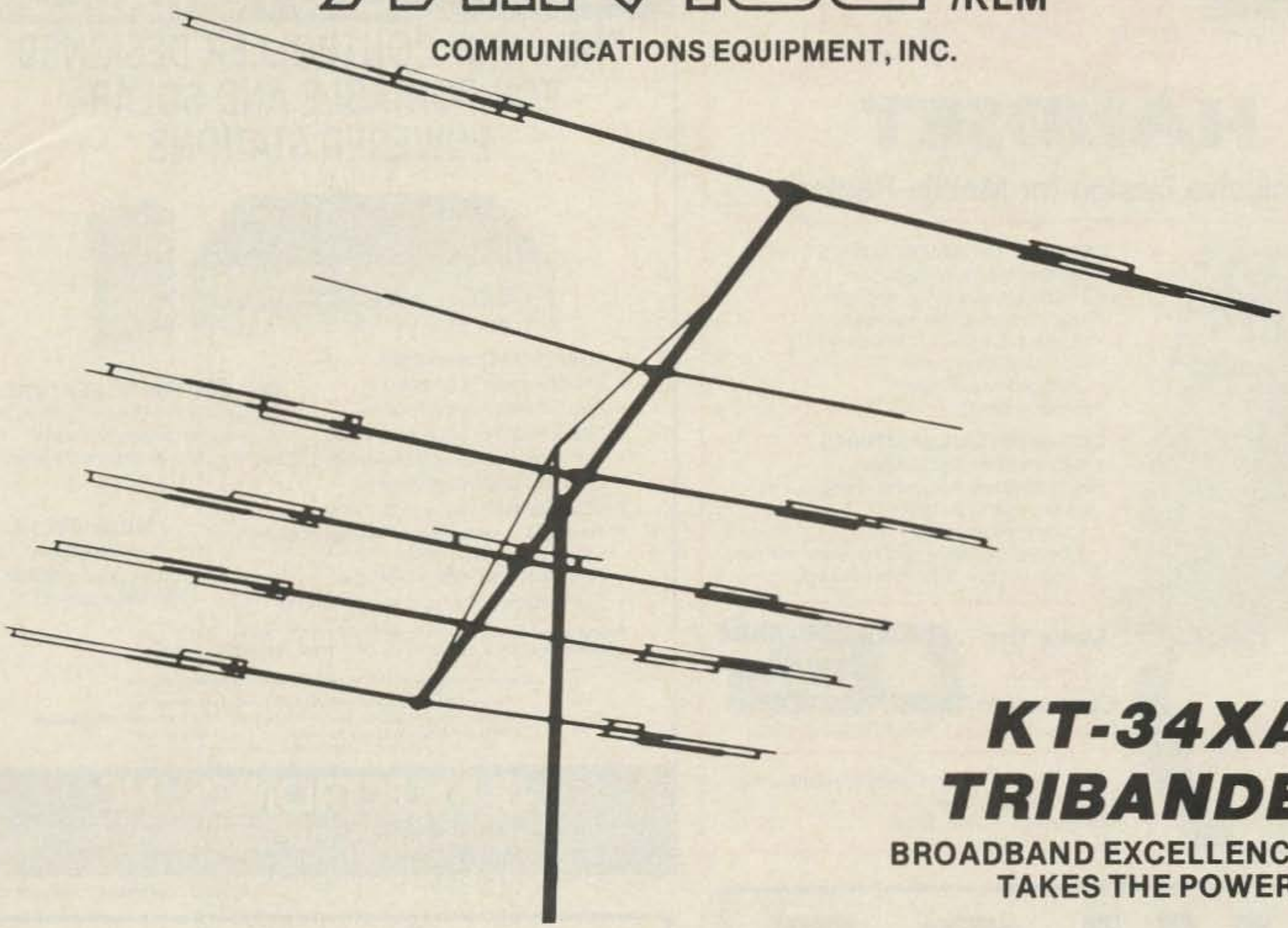

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KLM's KT-34XA TRIBANDER is the 2nd generation of a unique new series of antennas designed to provide superior **broadband** coverage on 20, 15, and 10 meters. The combination of lossless linear loading and hi-Q air capacitors enables the KT-34XA to outperform **all** commercial available tribanders and meet or exceed the performance of a conventional stacked monoband system. The lower weight and windload of a single antenna mean reduced tower and rotator requirements. Thus, overall system costs can be kept to a minimum while enjoying the best of monobander-type performance.

KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one tri-resonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart shows the remarkable performance qualities of the KT-34XA.

The KT-34XA's design represents the first major advancement in tribander technology in over 20 years! The conventional traps, coils, and capacitors have been discarded in favor of integral linear loading and hi-Q air capacitors, all composed of aluminum tubing. These give the KT-34XA a conservative power handling capability of 4 KW PEP and an unusually high level of operating **efficiency**. Linear loading also makes full ¼-wave elements possible on 15 and 10 meters, and brings 20 meters much closer to the desirable ¼-wave than any conventional tribander.

BANDWIDTHS:	14.0-14.350 MHz	**GAIN:**	8.5-9dB
	21.0-21.50 MHz		9-9.5dB
	28-29 MHz		11-11.3dB
VSWR:	1.5:1	**BOOM LENGTH:**	32 ft. × 3"O.D.
FB/FS:	20dB/40dB	**TURN RADIUS:**	21.5 ft.
FEED IMP.:	50 ohms w/balun	**WINDLOAD:**	9 sq. ft.
BALUN:	3-60-4:1 5KW PEP	**WT. (LBS.):**	75 lbs.
ELEMENT LENGTH:	24 ft.	**MAST:**	2" O.D. (standard)

Mechanically, the KT-34XA has been built to survive the toughest weather conditions. All aluminum, including the boom, is strong 6063-T832 alloy. All electrical hardware is stainless steel. Virtually indestructible "Lexan" insulators, just like those on KLM's 40 meter "Big Sticker," are used for mounting the elements and insulating them from the boom. KLM's 3-60 MHz 4:1 balun is supplied for direct connection to any 50 ohm feedline.

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73 INTERNATIONAL

NOTES FROM FN42

It is perfectly appropriate for the 73 International column to emphasize September 17 as a day to remember, because the U.S. Constitution, signed in Philadelphia 200 years ago this date, has had influence on the forms and contents of the constitutions of countries all around the world. Also, considerable source material for the Constitution came from other lands: the British (unwritten) constitution, English common law, the Magna Carta, Germany, Italy (some old papal bulls), and ancient Greece, to name just a few. Many of our Founding Fathers had classical educations.

We share September celebrations of national beginnings with 12 countries with Independence Days (plus Botswana's "Botswana Day," and that's what that is—it dropped its old name, Bechuanaland, in 1966) and 5 National Days. The twelve: 3—Qatar, 7—Brazil, 15—Guatemala, El Salvador, Costa Rica, Honduras, Nicaragua, 16—Chile, 21—Belize, and 22—Mali. The five: 10—Belize, 11—Chile, 22—Lebanon, 23—Saudi Arabia, and 23—South Yemen.

The 7th is Labor Day (U.S.), Labour Day (Canada); the 8th is World Literacy Day (hams can help reduce illiteracy, which so severely handicaps too many people); Bulgaria ended its Monarchy on the 9th (1946), and Japan has its Respect for the Aged Day on the 15th.

The 21st is Federal Thanksgiving Day in Switzerland, the 24th is Third Republic Day, Ghana, the 25th is Referendum Day in the land of the headwaters of the Nile, Rwanda, and it is Confucius Day in Taiwan on the 28th.

ROUNDUP

Cyprus. No word on whether C4LWF will be activated for the "Limassol Wine Festival" during the first fortnight of every September, "but since it has been established as an annual event" since 1961, the odds seem favorable. See the Roundup section of this column for January, 1987, for a bit more information.

Finland. The 29th Scandinavian Activity Contest is 1500 UTC on the 19th (of September) to 1800 UTC on the 20th, for CW, and September 26 to 27th (same hours) for phone. It is "To encourage...amateurs to work each other and to promote communication skills between amateur stations worldwide. Non-Scandinavian stations will try to work as many Scandinavian stations as possible." Also for SWLs. Eligible prefixes: LA/LB/LG/LJ, JW, JX, OF/OG/OH/OI/OH0/OH0M/OX/OY/OZ, SJ/SK/SL/SM, and TF. Details from your local club.

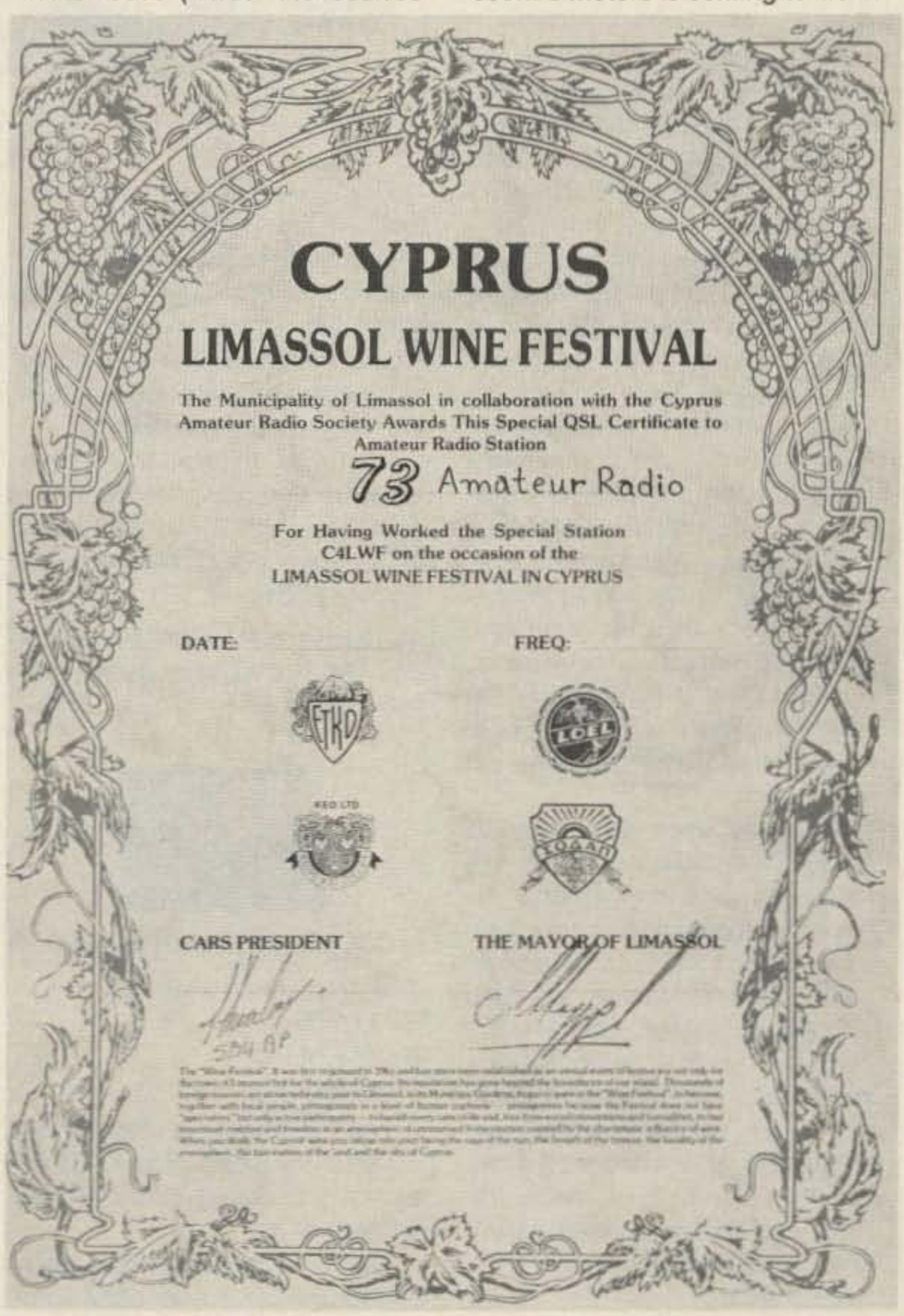
China. Chang Han Dong has replied to questions asked him by the International Editor, who recently wrote in this column, Chang Han Dong writes...."It would have been proper to say 'Han Dong writes,' " since Chang is the family name, or in his case, "Xiao Chang writes," meaning young Chang. Thanks to Xiao Chang from Lao Editor (Old Editor)....He also explained about BY1PK: This station began *again* in the 1980s. (It was "the resurrection of BY1PK [which] marked a new Spring in Chinese amateur station" activity.) Some stations existed before 1949, some were on the air in the 60s, but there was little activity and most of it was with eastern European stations. Han Dong was appreciative of the question and the "carefulness and friendliness" of the questioner. Thanks to Sil Marini WPE4IIO (SWL) who was the one who first raised it. He has a BY1PK QSL dated 2/12/64.

Israel. 4Z4MQ of IRAC's 40th Year Committee (PO Box 4099, Tel Aviv, Israel) will welcome suggestions for the celebration of the Club's 40th anniversary. (Tselil Harmoni, quoted in *Westlink Report* #499)

Europe. Also from that *Westlink Report*: Lots more 6-meter DX is coming. In Great Britain, the 50- and 70-MHz bands are becoming available to UK Class B licensees, and the 50-MHz UK allocation expands to 50.0 to 52.0. Also expanded: Region 1 70-MHz band, to 70.0 to 70.5 in Great Britain. Ireland and Gibraltar amateurs have this band, Cyprus may, soon. 6 meters is coming to life in Ireland, with 9 stations authorized; 11 more permits are pending for 50 MHz. Some 6-meter operation now permitted by Gibraltar, Greenland, Iceland, Norway, and Spain; possibly coming: from Malta, Cyprus, West Germany, and Yugoslavia. (RSGB, GB2RS News Service, G8AUU)

U.S.S.R. Russians were "the earliest to grasp the possibilities of short-wave broadcasting," according to a four-page report on "World Broadcasting" in *The Economist* for June 6, and was among the most prolific of the 31 countries now engaged in external broadcasting. The Soviet Union also has stopped jamming the Voice of America. Surveys have shown that what listeners everywhere want most is fast and accurate news. A poll of Eastern Europeans, taken while they were away from home, showed that 45% of them had heard of the Chernobyl disaster from external broadcasts, 24% from newspapers, and 24% by word of mouth.

Kenya. At least two hams in Nairobi read *73*. 5Z4BP, interested in the DX Dynasty Award, calls us an "excellent publication." Thanks! Write us some news of your area for this column—please not in the official language of Kenya (Swahili) unless you translate it also. We'll make note of your Independence Day in the December issue. How is the planning coming along for the AFBC (African Broadcasting) of TV? (Nairobi hosted 190 delegates from 49 countries almost a year ago to discuss this.) TV's potential for teaching young and old in any area you can think of is enormous. Evening schools for adults in rural areas of the Ivory Coast, for example, have been credited with bringing improvements in health care and agricultural techniques. *World Press Review* reported in January that some viewers walked 62 miles to watch programs.



AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

A CORRESPONDENT'S REPLY

Being one of the original contributors to this column, I was

pleased to see a note by the International Editor (March, 1987, issue) reminding readers to send IRCs to cover return postage if information is requested from the correspondents. I would like to add to this.

Since Australia is classed as "the flavour of the month" in America at present, I have probably had more than my share of request letters over the last four years. This, I don't mind, but as a person who works six days per week, it does not leave me much time for amateur radio, let alone to chase up some requests.

Like the gentleman [*The Editor questions that description*] who sent an eight-page letter with 10 questions, some broken into two or three parts, so, in total, 20 questions to be answered. Since most were centered on an area 1,000 miles north of my QTH, my reply involved several interstate letters plus phone calls, and plenty of time.

That was probably the worst request I have received, but others were not far behind. However, the thing that really upsets me most are the requests for articles to be sent—at my expense—books, magazines, local amateur radio publications, tourist information, etc.

A typical example was when the special amateur radio envelope was published in Australia. I publicized this fact in my column...and I am still waiting, after several years, for many reimbursements for the envelope plus overseas postage. Airmail to the U.S. is $A0.90 (letters), and books cost from $A2 to $A20 plus postage, so perhaps you can understand why requests like that now go right into the wastebasket if there is no SASE included so that I can inform them of the cost of the item and the postage required.

. . .and phone calls. It's not all bad. . .occasionally you get a laugh, like one Sunday evening, sitting down to enjoy a roast dinner, I heard the phone ring."This is W5—. I am just reading your article and thought I'd give you a call."

Into the oven goes my once-a-week roast dinner.

After preliminary discussion about the article, the gentleman [*Well, maybe this one was—Ed.*] discloses that it is 2 a.m. at his QTH and he is sitting on—that is, er, he is calling from, his toilet! After a 35-minute conversation I was really broken up by his request: a QSL card for *this* contact, by phone!

I ask you, how would you fill in a QSL card for someone sitting on a thunderbox 7,000 miles away and calling by telephone? Readability 5 Strength 9 with occasional QRM?

This chap has since rung me to confirm the contact!

RISING TO THE OCCASION

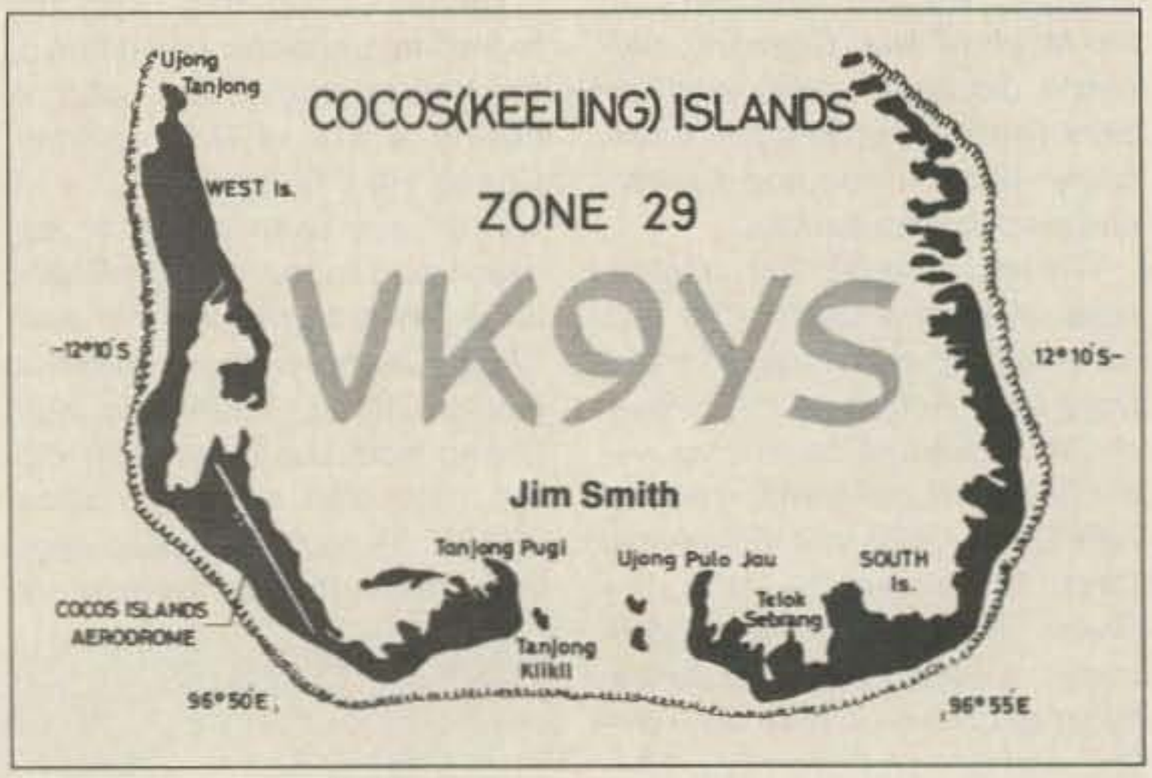
A radio operations centre, set up at only a week's notice and manned by amateurs, provided an impressive communications network for this year's Melbourne to Hobart Yacht Race. A last-minute change in the administration of the Race saw the Tasmanian Yachting Association take over the D.S.S. role, to work with the Queen Racing Club of Victoria and the Royal Melbourne Yacht Squadron. The main effect was the need to set up a roster of trained operators to man the Tasmanian end of the sophisticated network linking Victoria, radio relay ships, and every boat in the fleet, from the moment the first one left Portsea, Victoria, to when the last one tied up in Hobart.

Greg Johnson, an amateur operator for the past 25 years, who has been closely involved with communications for this Race since its 1973 inception, was asked to coordinate. Nine registered members of the W.I.A. were co-opted into a team of radio operators working around the clock on a roster system.

Although all were trained operators and many had experience in emergency radio communications under difficult circumstances such as Civil Defense emergencies, "none had ever had any experience in running a yacht race," said Mr. Johnson. The end result was so successful, however, that it is possible that radio amateurs will again help man the radio centre for next year's race.

The experience and expertise of qualified radio operators has long been used in emergency radio operations, and it seems natural to extend these in helping in such major events as the Melbourne to Hobart, where good radio contact is of such vital importance. So, for amateurs themselves, the experience has been invaluable and has made them appreciate just how much behind-the-scenes organization goes into something like the West Coast Race.

The landing strip on Cocos-Keeling; Home Island at last!



There were lighter moments, too. Like the phone call in the early hours of one morning. A question was asked: "Can you tell me something about seduction?" It took a moment for the operator to remember that there was a boat in the fleet called *Seduction*.

Operators involved in the project were VK3CCX, VK7KJ, -KJA, -KRB, -LJ, -FB, -ZAR, -NTL, -KV, -KDA, and -DJ with his two sons, Andrew and Peter.

My thanks to John VK7JK of QRM *and* The Hobart Mercury *for this information.*

COCOS (KEELING) ISLAND

J. B. (Jim) Smith VK9NS
PO Box 90
Norfolk Island
Australia 2899

The following was edited especially for the International Section by 73's DXpert, Chod Harris VP2ML—Ed.

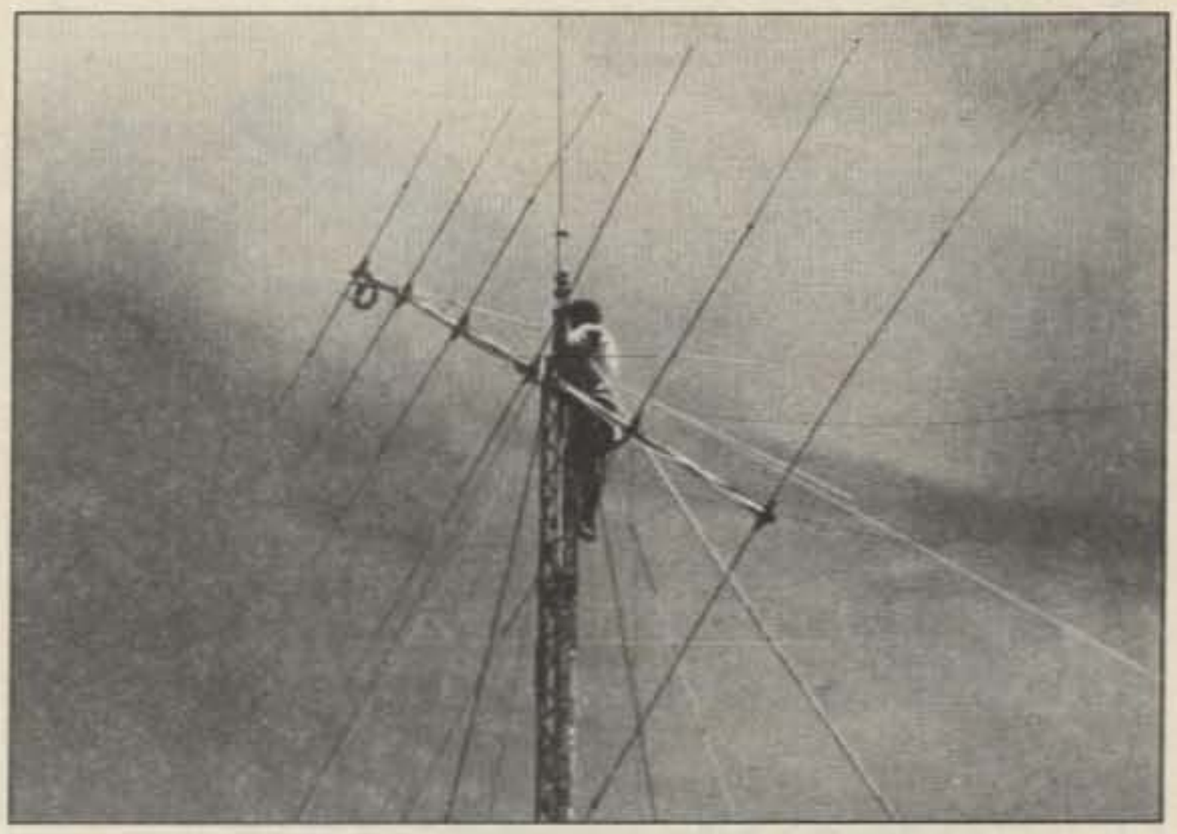
The dread amateur-radio nemesis Murphy was a constant companion on my 1987 DXpedition to Home Island in the Cocos Keeling chain. Despite almost continuous problems, however, I managed more than 10,000 QSOs as VK9YS from this rare location (38th on *The DX Bulletin*'s Most Wanted survey.)

The trip originated out of several conversations with Bob Winn W5KNE, editor of *QRZ DX*, and with Cress Clunies-Ross VK9YC, who maintains a home in the islands. We discussed setting up an amateur radio station on Home Island for the use of visiting hams who wanted to be on the receiving end of a pileup, for a change.

Murphy's first contact with the DXpedition was in breaking up the three-man crew into two groups, as Bob's and Cress's schedules could not mesh. So Cress went first to Home Island to get the station set up, with myself and Bob to follow in a few weeks.

Murphy immediately struck again, as the fully-assembled 70-foot tower with 8-element log periodic beam crashed to the ground as it was being raised. Cress worked on the repair of the tower, but had to order replacement

Bob Winn W5KNE/VK9YW celebrates the loading of all the gear into our host's truck.



John Clunies-Ross puts the finishing touches on the 18–30 MHz log-periodic beam.

parts of the beam from Australia. Then my FL2100 amplifier failed to arrive; then Bob Winn did not arrive as scheduled. Things were looking very bleak for this trip.

Fortunately Murphy took a short break from his trouble-making, since I ran into Bob at the Department of Communications, arranging for his VK9YW license. (His hotel had lost his reservation.) The rest of our day went far better, as we obtained our licenses, visas for Cocos-Keeling, and air transport without undue difficulty, although Bob's credit cards weren't accepted for the charter flight to Home. We even negotiated a reduced rate for our excess baggage. Finally, John VK6JJ offered to loan his FL2100, to replace the still-missing amp.

Cocos-Keeling Finally

The next day we survived the humorless check-in procedure, and were soon high over the Pacific, on the 2700-km flight to the remote archipelago that lies 1000 km from the Indonesian coast. As we circled Home Island for landing, we marveled at the color range of the central lagoon, from white through every shade of blue to dark purple.

Our hosts John and Vicky Clunies-Ross met us at the airport and helped us load our considerable luggage into John's truck. We repeated this procedure at the lagoon jetty, for the 8-km boat ride to the VK9YC QTH. Soon we were settled in our rooms, and spreading our ham gear among the classrooms of a 100-year-old schoolhouse.

It soon became apparent that Murphy had flown over to Home Island with us. Grounding problems plagued our two separate stations until our hosts installed two 6-foot ground rods with a power shovel. Then the 18–30 MHz log periodic proved unusable. We lowered the beam and spent the next several hours disassembling it, cleaning the elements, and reassembling them. The balun was a total loss, so we substituted an rf choke made of coax. Soon the beam was back up and running, but its frequency range limited its use to 10 and 15 meters. Further, the beam was rotated by hand, and many frozen bearings limited rotation.

We made do with a dipole and ground plane on 20 meters while we waited for the promised repair parts of the larger log-periodic. Mutual interference was a constant problem, because the antennas all hung off the same mast.

The next weekend we went ahead and erected the larger tower, even though the beam parts had still not arrived. The additional support for low-band antennas and separation from each other's antennas reduced interference and boosted our QSO rates.

Band Conditions

Although I usually made the sunrise 80-meter opening, Murphy reared his head frequently, as generator problems often took us off the air during the crucial morning 40- and 20-meter openings.

Despite the problems, Bob and I managed plenty of contacts. 160 meters was especially rewarding during the short pre-sunrise openings. 80 meters was not as pleasant, as local QRM made CW contacts almost impossible, and

The VK9YS operating position, with ICOM 740, Yaesu FL2100, and RTTY gear.

heavy interference from European low-band DXers marred the SSB operation. 40-meter CW also proved effective, and I even managed almost 500 QSOs on 40 SSB, between the broadcast stations. 15 meters yielded many QSOs; I racked up nearly 3,000 on the band, even at the bottom of the sunspot cycle. Even 10 meters produced a few hundred QSOs.

Then on Tuesday the long-awaited beam parts arrived. We spent the better part of the next two days assembling and fitting the rear boom section into the existing front half of the antenna, at the top of the tower. We now had a 20-meter beam! But Murphy wasn't through with us yet. The brand new rotor control box spewed smoke when first switched on, and the rewound transformer also blew up with a bang. I salvaged a transformer from a defunct reel-to-reel tape recorder, and supplied power to the rotor control. But now the control wire to the rotor at the top of the tower showed open. Once more we had to climb the tower and rewire the rotor. I lost count of the number of times I climbed the two towers. Finally everything was set, but we had only two days to make use of this valuable addition to our antenna farm.

Despite all the myriad problems, Bob and I logged 18,500 QSOs from Cocos-Keeling, including 87 much-appreciated contacts on RTTY. About one third of my contacts were with Japanese DXers, and about one third were on CW. Bob spent so much time leaning on his operating table during his first-ever DXpedition that he damaged a nerve in his arm. Nevertheless, he caught the DXpedition fever, and is itching to go out again soon, damaged nerve and all.

Many thanks to Cress, John and Vicky Clunies-Ross, John

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PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

The outlook for September is generally good, especially for HF bands, DX possibilities, and late operation on the higher bands (10, 15, 20). Conditions on a day-to-day basis are likely to vary according to the chart below. Trends are shown as conditions change.

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 G	3 G	4 G	5 G–F
6 F–P	7 P	8 P–F	9 F	10 F–G	11 G	12 G
13 G–F	14 F	15 F–G	16 G	17 G	18 G	19 G–F
20 F–P	21 P–F	22 F	23 F–P	24 F	25 F	26 F–P
27 P	28 F	29 G	30 G			

VK6JJ, Heather VK2HD, Ken VK5QW, Kan JA1BK, and Gin JA1ACB, and all the members of the Heard Island DX Association.

FRANCE

Chuck Martin F/AB4Y
CPU A–316
American Embassy Paris
APO NY 09777

Chuck writes that Paris closed down for the summer—he was off to the Riviera for a two-week vacation and would write us a report on amateur radio in the south of France.

The Paris International Amateur Radio Association (PIARA) is dedicated to serving the international amateur community in Paris and throughout metropolitan France. Membership is free and open to all, and all members receive the monthly newsletter, the *Bugle*.

It was started by international amateurs here because licensing and operating in a foreign country involves special problems. The bureaucracy involved in obtaining a license can be baffling, as can be regulations, written in French. It also is difficult to get parts for U.S. equipment. PIARA has helped with these problems.

PIARA meets the last Saturday of each month at *Chez Jenny*, an Alsatian "brasserie" in the 3rd Arrondissement (district) of Paris. Their specialty is *choucroute royale*, a delicious platter of sauerkraut, smoked pork chops and sausages, all steamed in champagne. Sometimes we have breakfast meetings *Chez* F/AB4Y, where we have L'Aunt Jemima and Les Hash Browns, and an international dish: Creamed Chip Beef on Croissants.

Paris has one functioning 2m FM repeater. FZ1THF *(tres haute frequence)*—very high frequency—is on channel R0: 145.000/ 145.600. Sadly, there is a great deal of malicious interference and jamming in Paris. The repeater has had to be shut down for long periods. There is simplex FM on 145.500 and 145.550. There is a superb 70-cm repeater on 431.725/ 430.125, callsign FZ1UHF. All FM repeaters in France require a 1750-Hz access tone.

Packet stations are active throughout France. There are two operating digipeaters in Paris: F6ABJ-2 and FF6KAL. There are three active PBBS systems: F6ABJ, F5LO, and FC1HPI. It is possible to connect with stations from the Channel coast to Orleans. Packet is expanding through France, and it soon will be possible to connect throughout the nation. There is no 220-MHz allocation in Europe, so interlinks are planned for the 430–440-MHz band.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

Hi from down under, again—no, we haven't dropped off the end, just having a short enforced spell under doctor's orders. Just as well I was fit and healthy this time last year when I was visiting in the U.S. and Canada. In fact, just about the time of writing this column 12 months back, I was visiting *73* and being shouted a long, cool 807 (or TU1—depending upon where you are from).

EARTHQUAKE

At 1430 hours NZT on Monday, March 2, a large earthquake centered in the Eastern Bay of Plenty, North Island, caused millions of dollars damage to the towns of Whakanatne, Edgecumb, Te Teko, Kawerau, and the surrounding rural areas of the Rangitiki Plains Basin. Widespread damage to property, telephone service, power supplies, water and sewage services, but miraculously there was no loss of life.

Amateur radio was again to the fore, providing additional communications for the overloaded Civil Defense system, which was also operated mostly by amateurs. The state of emergency was lifted on Thursday the 7th and replaced by a local emergency declaration for the Whakatane District. The length of the state of emergency was 76 hours, and the Regional CD HQ handled 697 messages on their network alone, beside the many hundreds more handled by the amateurs on their localized emergency nets, both simplex and through local repeaters.

Large factories, processing dairy products and those in paper manufacturing were the most affected by structural damage, but ground and property damage was extensive, with large cracks and gorges snaking their way through the landscape.

NZART CALLBOOK

Well, the NZART *Callbook* is out, with the many sections of useful information on such things as NZART Information, the ITU Amateur Radio Disciplines, Operating Information, an International section including the DXCC lists, DX zones, etc., other radio services within ZL, and a Data section. All this as well as the amateur callsigns for ZL1–4, ZL dependencies, and South Pacific island callsigns. Quite a bargain at $NZ13.00 (around $US7.00) plus postage and packing, from NZART Headquarters, PO Box 40–525, Upper Hutt, New Zealand.

After making sure my own entry was correct, the summary of ITU Annual Reports for 1986 caught my eye. I'm a sucker for figures (all kinds). Look at the comparisons between those in the Society who are licensed hams (first column of percentages) and the licensed hams who are members of the Society—second column:

Region I	**45%**	**48% of 352,793**
Region II	**87%**	**27% of 558,699**
Region III	**91%**	**24% of 751,130**

Wouldn't we be a strong voice if every country had a 100% membership in their society, like Indonesia has with its 40,000 licensed operators, all belonging. There are other countries in the 100% group, too, but in most cases only from 30% to 50% of licensed amateurs belong to their country's Society—which is the voice of Amateur Radio at the national and international bargaining tables. No wonder we have to fight so hard to maintain our frequencies, etc.—how much stronger would our voice be if all 1,662,622 licensed amateurs were Society members instead of the 501,595 who do belong.

RIVER CITY CONFERENCE

Our annual conference has been and gone—this year it was the "River City Conference," at Wanganui, in the North Island. Among the usual remits on frequencies, CW, power, etc., there was a report from a tribunal set up at the 1986 conference to examine "Structure and Control of Our Society," and make recommendations to NZART members and Council on any changes considered necessary to make our society functionally better.

The report was accepted, and a working group formed to oversee changes to take place at the 1988 conference. Basically, the main changes are as follows (*from* in light type, *to* in boldface):

•Control by a president, vice president, and 17 councillors elected for two-year terms. **Control by a board consisting of a president, four directors, a secretary, and a treasurer, elected or appointed for a two-year term.**

•Councillors elected on a District basis, the numbers proportional to the numbers of members in the Districts. **Zones to be created, each Zone to elect a zone chairman (by the Branch/Club delegates within the zones) who will be the link between HQ, the board, and Branches/Clubs, and members.**

The only area of contention is the number and size of branches in the proposed zones.

HANG-MOBILE

Not to be outdone by the mobile operation from the Space Shuttle, ZL amateur Guy Kendall ZL2BIV operated a mobile station from a hang glider on Sunday, March 8. Flying at altitudes of up to 6,500 feet near Lake Tekapo in the South Island, Guy had a QSO with Roger Corbett ZL3THQ through the 680 repeater nearby, and another QSO on simplex with the same station, 100 miles away. A Kenwood TR-2500 2m hand-held taped to the control bar was used. [*A nifty photo from* Break-In *could not be used for technical reasons—photos already screened and published won't reproduce well in another printing—Ed.*]

We are troubled here in ZL by hang-glider pilots using 2m handhelds for air-to-air communications, who are not licensed amateurs. They use our repeaters and frequencies, but are hard to locate since they can access the repeaters at great distances. The problem has increased since proper import licenses are no longer required and ham gear is therefore easier to obtain by non-licensed persons. Are other countries having this problem?■

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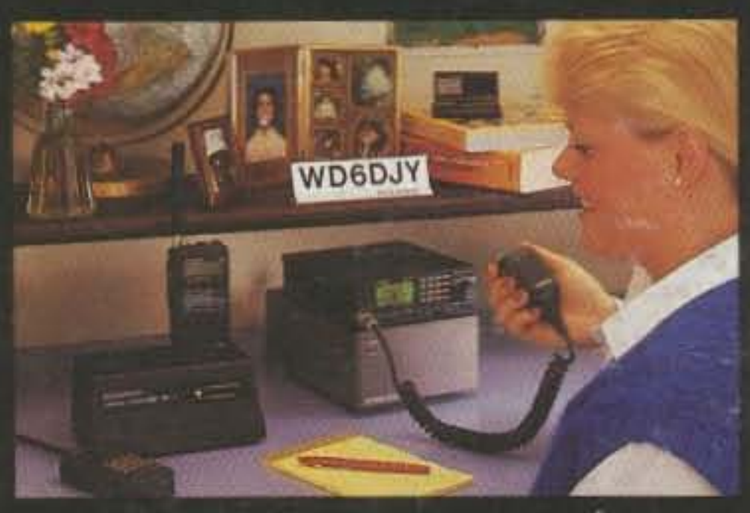

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TM-321A
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New

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TH-315A

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