



HANK'S SWAP SHOP

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Phone: 542-6907 Santa Rosa, CA 95401
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call when item is sold. Ads run 2 months.

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\$75. Jim Hudson 584-3423.

YAESU FT-101ZD 160-10M, ext VFO, spkr w/
phone patch, mic, extra finals, manuals \$500.
Billy KD6IJU 763-0965.

HUSTLER MOBILE ANTENNAS 80-10 \$125.
KENWOOD 21AT w/ P/L, keypad, and asst
accessories \$175. Jim AB6EU 996-6461.

KENWOOD TS-120S 80-10, no WARC bands,
w/ power supply, AT-120 antenna tuner \$600.
John KM6XO 585-2549.

RADIO SHACK graphic scientific calculator,
EC-4033 \$25. Steve KD6FYK 869-2257 noon.

KLM 80W AMP, 2 meters \$50. Richard
KC6RDH 528-0272.

MFJ 817 SWR/power meter 144/440 MHz
\$50. John WB6FRZ 838-6398.

HEATH IO 4205 scope, 5 MHz, dual-trace,
manuals \$50. Rick K6ZWB 542-6907.

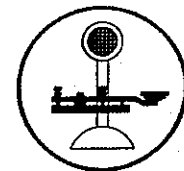
YAESU FT-102 80-10, 150W, with CW/SSB
filters \$550. YAESU mic for above \$75.
YAESU SPEAKER W/ PHONE PATCH for above
\$75. Chuck K6ZUR 546-7326. ■

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SHORT SKIP



Sonoma County Radio Amateurs, Inc.

APRIL 1993

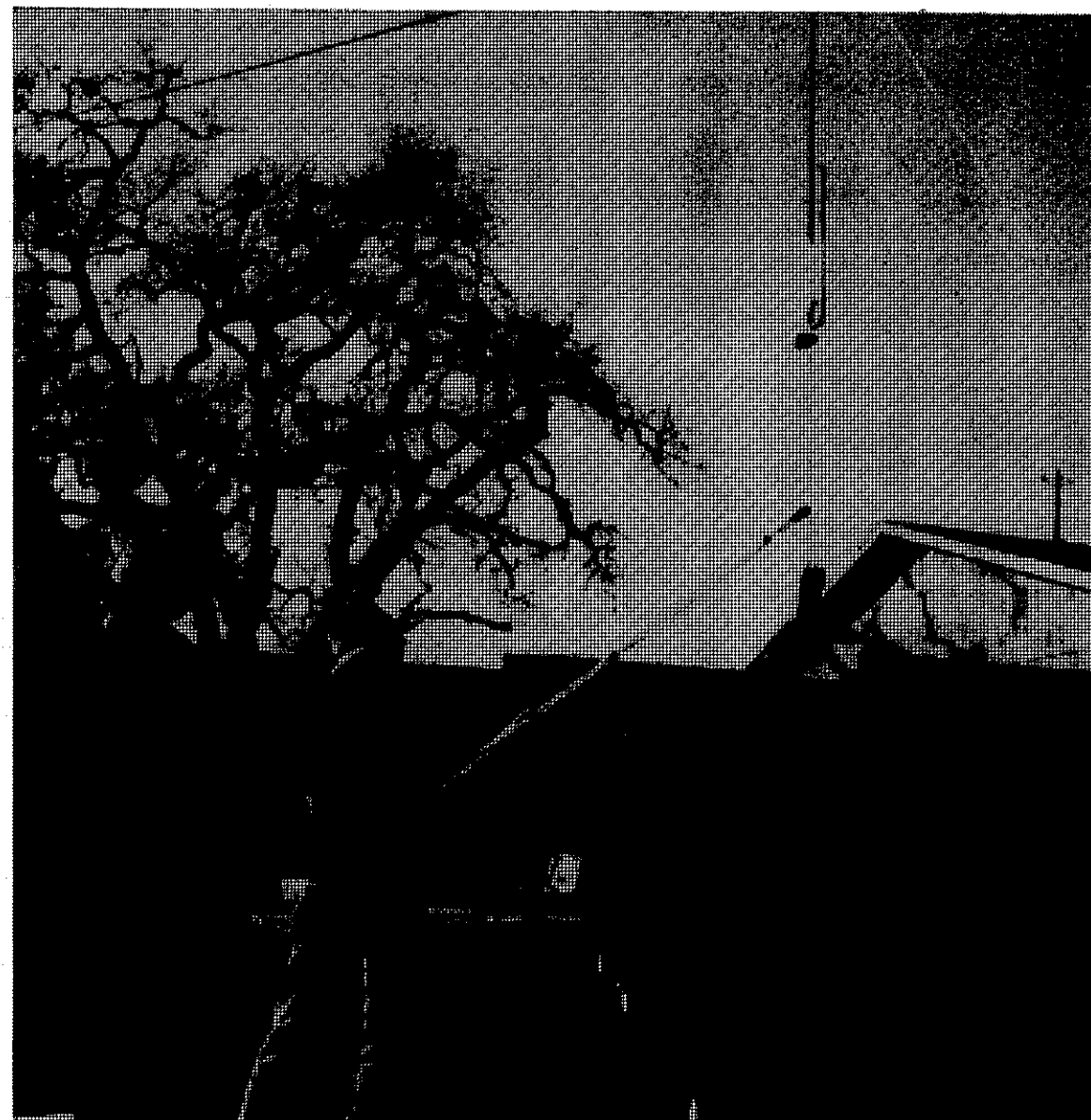
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W6LFJ

P.O. Box 116
Santa Rosa, CA 95402

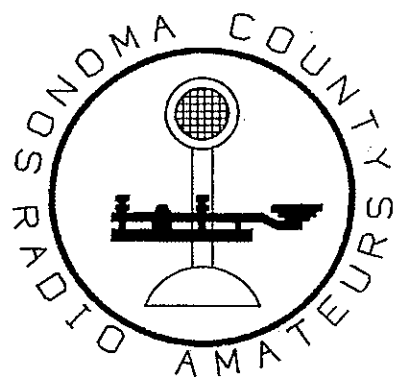
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VOL 18 #4

Just how effective are your 2 meter Vertical Antenna Radials?
(See page 5 for the answer.)



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 MEMBERS-AT-LARGE: Kelly Cureton KD6CJQ 527-1531
 ACTIVITIES CHR: Merlyn Pfeiff N6VUC 584-3898
 REPEATER CHAIRMAN: Jim Rutherford WB6PER 526-2972

SHORT SKIP STAFF:

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 1578 Los Alamos Rd, Santa Rosa, CA 95409 (d) 577-3981
 CIRCULATION MGR: Adam McLaughlin KD6POC
 SWAP SHOP: Rick Reiner K6ZWB 542-6907
 HAM NEWS: R.L. Caron KK6GP

BBS EDITORS: Pete Sourek KC6UXM, and Allan Chapman W6MEO
 AUDIO TAPING: John Breckenridge WB6FRZ, Laurel Meyer KC6FKX, Pat Malone KD6MAZ

Activities Committee:

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 QSL Mgr: Bill Splaine N6GHG 431-8636
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 Antennas: Joe Senft KM6TN 578-5824
 John KM6LI, Shep NH6ZY, N1AL
 Awards: Steve Lund WA8LLY 823-4544
 VEC Exams: Dave New AA6YX 527-0981
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 WB6FRZ AB6OL N6OLD AA6RD
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 WB6TMY K6XZ K6ZWB KC7VS
 Refreshmnts at meetings: Bob Olsten WD6DPE
 Greeter at Meetings: Shelly Sourek KD6AFZ
 Raffle at meetings: Dave Willey KD6KWM
 Membership lottery: Jim Andrews KC6PJW
 Homebrew Contest: Steve KK6VY, Chrls KK6WN
 Transmitter Hunt: John WB6FRZ, Jim KD6JZJ
 Field Day: Merl N6VUC and Steve KK6VY
 RACES RO: Jim Pelmulder N6PTM 823-7947
 ARRL Liaison: Alan Bloom N1AL 538-7115
 Badge Chair: Fred Leoni N6YEU 431-8202

Repeater Control Op's:

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 WD6CKP Hoppy 542-6750 N6VUC Merl 584-3898

SHORT SKIP ADVERTISING RATES:

Business cards: \$10

\$11 First 1/4 Column
 \$3 Additional 1/4 Columns
 (\$32 Full Page, 1 side)

Pre-printed inserts: \$32/sheet

Guaranteed circulation: 200/month
 AD DEADLINE: 10th of previous month

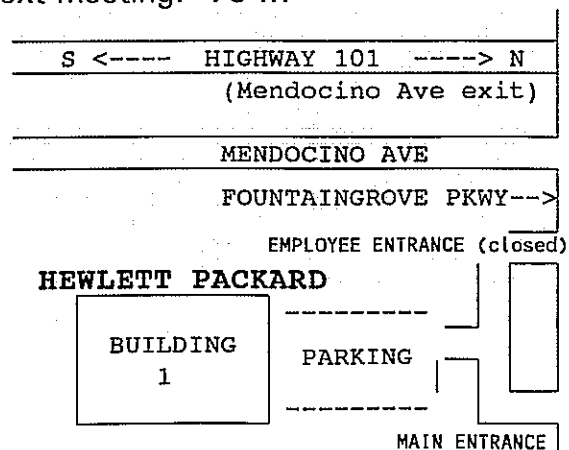
Club Meetings:

7:30 PM, 1st Wednesday each month at the
 Hewlett Packard plant in Santa Rosa. (See
 map below.) All are welcome.

Next Meeting: March 3, 1993
 Program: Homebrew Contest!
 Steve KK6VY/Charles KK6WN

ARE YOU NOT AN SCRA MEMBER?

If so, then this is a complimentary copy.
 Our club is involved with almost every area of
 Amateur Radio: Repeaters (13/73), Field Day,
 license classes (Novice through Extra),
 volunteer exams, RACES, DX programs,
 packet radio, hidden xmtr hunts -- you name it.
 We invite you to attend our next monthly
 meeting (see below) or check into the Tuesday
 night SCARS net on the 146.13/73 repeater at
 7PM. You will hear the latest Amateur Radio
 Newline broadcasts, announcements of SCRA
 activities and a Swap Shop. Membership in
 SCRA is open to anyone interested in Amateur
 Radio. If you would like to join, there is a
 membership application on page 11. Hope we
 can have an "eyeball" QSO with you at the
 next meeting! 73 ...



Board Meeting Minutes, March 10, 1993

The meeting was called to order at 5:42 PM in the Northbay
 Savings meeting room by President Rick Reiner K6ZWB.
 Other officers present were Vice President Pete Sourek
 KC6UXM, Secretary Al Bloom N1AL, Treasurer Jim
 McLaughlin WA2EWE, Repeater Chairman Jim Rutherford
 WB6PER, and Members-at-Large Kelly Cureton KD6CJQ and
 Merlyn Pfeiff N6VUC. Members Jim Pelmulder N6PTM, Joe
 Senft KM6TN, Hoppy Bravin WD6CKP, Wilbur Dale N6MGY,
 James Cureton KD6GSF, Adam McLaughlin KD6POC, Kathy
 Mahan KC6UXJ and Jim Andrews KC6PJW also attended.

REPEATER: K6ZWB led a discussion on how to make the '73
 machine a more friendly repeater. There is a perception that
 '73 is not as much for ragchewing as other local machines.
QUESTIONNAIRE: Rick will work on a questionnaire to be
 published in *Short Skip*.

A DONATION of two 500-foot rolls of RG8 coax has been
 made by the Radio Shack in Eureka. Thanks to John KA6DJY
 for working on this one.

CODE PRACTICE ON THE AIR: N6PTM and N1AL will look
 into the technical issues of installing some kind of automated
 CW practice machine on the air.

PACKET BBS: Jim KC6PJW will take over the BBS from John
 WX3K as of March 15. (John is going overseas 3/20.) This
 means there will no longer be a telephone port. The
 146.91 repeater group seems willing to maintain the Sonoma
 Mt. packet node. SCRA will handle the BBS.

FIELD DAY Co-chair N6VUC presented a 6-page proposal.
 Personnel are being identified. Do we want to go back to the
 Coast Guard base? We will be 5A category again this year.

KC6PJW notes the C.G. has some amateur satellite equipment
 that needs installing -- maybe this could be a part of FD.
 FD Committee meeting: April 1, 7 PM at the EOC.

NEW HF RADIO: N1AL has located a Drake TR-7 for \$600,
 purchased from our Los Angeles member Darrel Van Buer
 KI6VY. Al also has a line on another Drake TR4C (personal
 purchase) which could also be used for Field Day.

CLUB EQUIPMENT: KC6UXM has noticed that the Vice
 President is supposed to maintain a list of club property.
 Where's the list? K6ZWB will look through his files.

REPEATER STANDBY BATTERIES: Pete will pick up the
 surplus telephony-grade batteries generously donated by
 member Mark Walsh KM6XU to be used on the Repco.

CLUB LIABILITY: KC6UXJ relayed a concern by John Wallack
 W6TLK about what is the club's potential liability with regard
 to under-age participants in Public Service and other club
 activities. Kathy will check on getting a legal opinion.

SONOMA MT. BATTERY BACKUP: N6PTM has prepared a
 proposal to the county that the club purchase the equipment
 required to provide battery backup power for all RACES radios
 at the Sonoma Mt. site. The board voted that Jim should fine-
 tune the dollar amounts and present it to the club for approval
 at the club meeting. m/s N6VUC/KC6UXM

THE SW SANTA ROSA YOUTH CENTER Festival is coming up
 March 27. N6MGY has been contacted to ask the hams to
 bring OES-1, the County Comm trailer for a show-and-tell.
 There is also interest in getting a radio class going in the
 schools. Wilbur passed along the names and phone numbers.
 Meeting adjourned at 7:30 PM. m/s WA2EWE/KC6UXM
 Respectfully submitted by Al Bloom, Secretary.

Application for Membership in SCRA

Name _____ Callsign _____ Lic. Class _____
 Addr. _____ Phone Nr _____ () New Mbr
 _____ ZIP _____ Date _____ () Renewal

Dues: \$12/year, \$18/year family. New members also pay a \$6/person initiation fee. Dues for
 new members *only* are pro-rated \$1 (\$1.50 family) per month, starting at renewal time, March 1.

I WOULD LIKE TO PARTICIPATE IN:

- () Public Service Events
 () RACES or ARES Emergency services
 () Field day, other operating events
 () Other _____

- () Helping with SCRA Flea Market
 () Acting as club Net Control Station
 () Helping with *Short Skip* newsletter
 () Taking a Novice class
 () Teaching a Novice class
 () Taking an upgrade class
 () Teaching an upgrade class

Badge (New Members only)

Fill in this section exactly as you
 want it to appear on your badge.

Callsign _____
 First Name _____
 City _____

Membership Lottery

(\$.25 per meeting "fun lottery")

Callsign _____
 I wish to participate:
 YES () NO ()

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GOODIES FOR THE RADIO AMATEUR:

RAMSEY KITS:

- 2 Meter Synthesized FM Transceiver
- 2 Meter 30 Watt Amplifier
- All-mode HF receivers
- QRP CW Transmitters
- Etc...



ARRL BOOKS:

- ARRL Handbook
- License Manuals
- Antenna Books
- Etc...



POPULAR BRANDS:

- MFJ
- Ameco
- Larsen
- Antenna Specialists
- Sangean
- Etc...

NECESSITIES:

- Code keys
- Wire Antennas
- Surplus Electronics
- Tools, parts, Etc...

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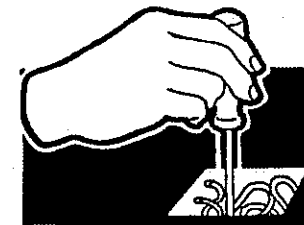
George Shedore
Manager
KS6W

6819 REDWOOD DRIVE
COTATI, CA 94931

PHONE: (707) 792-2277
FAX: (707) 792-0146

HOME BREW CONTEST

APRIL MEETING!



All club members are invited to bring in their "pride and joy" projects for the annual SCRA Homebrew Contest, which will take place at our April meeting.

Here's your chance to see what your fellow hams have built up in their shacks and workshops, and to show others what kind of activities interest you.

This is a good time to find other club members with interests similar to yours. For this to work, though, you need to bring in YOUR project.

You don't have to be building the next Space Shuttle to participate! Antennas, computer software, mechanical items, modified or improved gear, kits; in fact everything related to the hobby is encouraged.

Since we'll be looking at several aspects of the entries (for example, how well the work was documented, workmanship, utility, etc.), the most complicated project won't have an unfair advantage.

This year, there will be two entry categories. "Large" projects are those that took more than 15 hours to complete. "Small" projects are less than 15 hours.

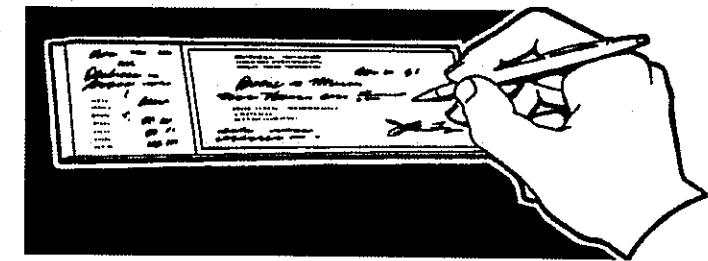
Photographs, printer listings, and QSL cards are all good to bring in, especially if your tower project is too big to move!

Remember, a clever weekend project often has more interest to other club members than a very specialized long-term effort, and it has just as good a chance in the contest.

So look around your station: I bet there's something up on the shelf that would appeal to others. Bring it to the meeting!

How Do You QSL MIR? What's the QSL route for reception/QSO reports with R2MIR onboard the Soviet spacecraft? Bob N6RMW needs to know. Bob's number is 542-5209.

No More *Short Skip* !



This is your last issue of *Short Skip* if you haven't renewed! Check your mailing label: If it says "dues are due," then our records show you haven't paid yet. Please send your check to SCRA, POB 116, Santa Rosa, CA 95402. If you prefer to pay at a meeting, please write your callsign on the check and place it in an envelope with your callsign on the outside. This is to reduce the mob scene around the Treasurer at meetings.

Also, if your address, callsign or license class has changed, let us know so N1AL can update the roster. The application on page 11 is ideal for the purpose.

Amateur Radio: My Shaky Beginning



by Michael Michlig KD6ORI

Although I am new to ham radio, my interest dates back to Good Friday 1964. I was 12 years old then, living in Anchorage, Alaska. That was the day I met Mother Nature, up close and personal. She presented herself as the strongest earthquake to hit North America in modern recorded times, 9.1 on the Richter Scale and lasting nearly five minutes.

Excuse me for saying so, but Loma Prieta was just a little sissy shaker by comparison. At the time, I was walking with a friend about half a mile from home. We were sent running by a man that advised us that the Russkies had just dropped the bomb on our nearby Air Force base. Needless to say, we wasted no time getting home. There, we were relieved to find our homes had suffered only minor damage. Commodities we so often take for granted — electricity, water, sewer and phone — were gone and would remain so for several weeks.

[Continued next page]

Ham News

by R. L. Caron KK6GP

FCC PROPOSES NEW HAM BAND, to partially offset the loss last year of 220 - 222 MHz. FCC Docket 93.40 proposes to allow hams access to 219 - 220 MHz, on a secondary, non-interfering basis. Use would be limited to mostly digital, point-to-point auxiliary stations such as packet backbones. Proponents cited the need for spectrum to establish nationwide packet networks, and the likelihood that these would encourage experimentation leading to standards supporting higher data rates. The 216 - 220 band is now used for marine radiotelephones along the Mississippi River, and nationwide for low-power tracking devices. There apparently has been little objection from current users to the proposed sharing plan. *Tnx Newslines.*

HOUSTON HAMS REACT SWIFTLY TO BOOTLEGGERS, a movie company that suddenly showed up on two frequencies in the 440 ham band. Their first reaction was to set up high-power simplex nets on top of the pirates. Cooler heads prevailed, and Plan B, to take their complaint to the local FCC office, paid off. Inspectors from the Houston field office were on the scene within hours, and seized the offending radios. It seems the movie company had rented the radios from a local communications firm, and had no idea the units were not properly licensed. Needless to say, the rental firm is in hot water with the FCC, and the hams have their 70cm band back to themselves. *Tnx Newslines.*

THE MOST RECENTLY ISSUED HAM CALLS in 6-land, as of March 1, are AB6RE for Extra Class, KN6HQ for Advanced, and KD6YSN for General, Technician and Novice licenses. Processing time at the Gettysburg, PA office of the FCC is running between seven and ten weeks. Ham matters are dealt with each Tuesday, with mailing on Thursday. That's why most new licenses arrive either on Saturday or Monday. Remember too, that VE's and VEC's each have up to ten days to pass along their paper work to the next stage. That long wait for the new ticket is at least two months, and in some cases nearly three...although it seems even longer. *Tnx ARRL.*

Shakey Beginnings

[From page 3]

The last big commercial AM radio station went off the air as the power grid went down moments after the quake started. The announcer had become somewhat unraveled and was heard "outside" (Alaska lingo for the lower 48 states) to proclaim, "This is total devastation, Anchorage is a sea of fire!" ... followed by static. Of course, our friends in the media replayed his transmissions on all three of the evening network news programs without thinking that this would cause my dear little grandmother in Wisconsin to do handsprings. [This I gotta see -- Ed.] She assumed the worst and mourned our passing. Now, Dad knew that Grandma had never gotten over us moving to this "God awful" country in the first place and her need to hear from us was frustrated by the sound of silence generated by the phone.

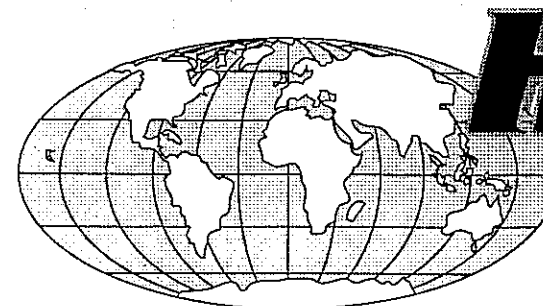
Not being one to give up easily, Dad remembered a house a few blocks away bristling with strange antennas. He knew that the owner was either a ham or Soviet spy. Hoping for the former, Dad went to this antenna orchard and found there a very weary amateur operator — a ham! This poor fellow had spent the last 48 hours sending out health and welfare transmissions by the hundreds. He

worked Dad's message in and was able to make contact with another ham in Grandma's home town in Wisconsin. You cannot imagine how important that brief projection of radio waves traveling through free space was to one little old lady. She has long since passed, but knowing her as I do, you can be assured that she personally greets every "Silent Key" at the Golden Gates.

Years have come and gone but memories of that tireless operator tapping out H & W have inspired me to get my ticket and maybe one day repay a debt of gratitude.

About the author: Michael Michlig KD6ORI, a new member of SCRA, got his ticket last October and is passing elements faster than the FCC and the ARRL can get to them. In the meantime, he passes many an hour chewing the rag on an FT-901 DM, visits the mailbox regularly for QSL cards, and is busily charging batteries for the next "Big One."

— 11 STORE BUYING POWER —



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DJ-580T

2M/440 Dual Band
40 Mem Channels
DSQ, Dual Display
CTCSS Enc/Dec Built-in
Cross Band Full Duplex



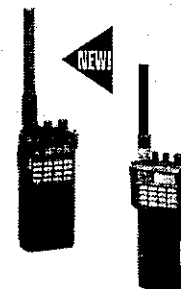
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2W 2M/1.5W 440
5W optional
Direct DC input
Built-in VOX, 41 Mem.
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2M HT
Standard 2.5W; 49 Mem
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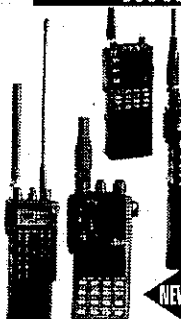


RM-1 Included
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NEW 150W MOSFET Finals • Voice Keyer Optional
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2 Meter HT • 7 Watt
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440 MHz • 5 Watt
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100W HF Gen Cov Transceiver
DDS, QSK • 500Hz CW Filter included
CALL FOR LOW PRICE

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HANDHELDS

TH-28A
2M/2.5W DTSS
240 Mem. w/optional
mem. unit
UHF RX

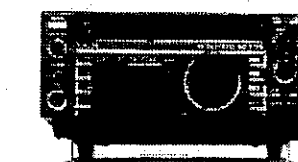
TH-48A
440/1.5W DTSS
240 Mem. w/optional
mem. unit
2 MTR RX

TH-225A
2 MTRS/5W
TH-315A
220MHz/2.5 W

CALL FOR GREAT PRICES

ICOM

IC-735



100W 12 volt • 12 channel memory
General Coverage • IF Notch & QSK
CALL FOR LOW PRICE

SCRA MINUTES

March 3, 1993



The meeting was called to order by President Rick Reiner K6ZWB at 7:35 PM. Other officers present were Vice President Pete Sourek KC6UXM, Secretary Al Bloom N1AL, Treasurer Jim McLaughlin WA2EWE, and Members-at-Large Kelly Cureton KD6CJQ and Merlyn Pfeiff N6VUC.

VISITORS: Shelly KD6AFZ introduced 8 visitors.

NEW CALL: Ed KD6KVU is now AB6QL with an Extra license.

MINUTES approved as published. m/s WX3K/KA6DYY

The TREASURER'S REPORT shows \$3,253.15 in the General Fund and \$864.05 in the Repeater Fund. Approved m/s KB6PTA/WA6OLW

REPEATER: N6PTM reports that as of two weeks ago, all RACES repeaters on Sonoma Mt. are back on the air following the recent catastrophic power failure. In addition to the 146.73 repeater, there are voice repeaters on 224.48 and 441.375 MHz and two meter and 220 MHz packet nodes. The phone line (and thus the autopatch) are still down.

PUBLIC SERVICE: Kathy KC6UXJ needs 12-13 people for the March 28 Super Cities Walk.

MAGNETIC SIGNS: Kathy passed around a sign-up sheet for a combined order.

EDUCATION: K6ZWB Rick's construction class is over. All radios are completed and working.

ACTIVITIES Chairman Merl N6VUC is still looking for volunteers: Net Control Station. (KA6DYY volunteered for April, Darlene KD6GCK will take the rest of March.). Club Historian. Education Chairman. Prize Chairman (KD6HYZ volunteered).

Merl is still collecting QSL cards from members for the QSL board. Send yours to the club PO box, or bring to a meeting.

FIELD DAY: John WX3K and Merl N6VUC are co-chairs. John has just learned that, in his Coast Guard capacity, he has been tapped to be NATO liaison officer for enforcement of UN sanctions in YU-land. KK6VY volunteered to help out.

The first question, is do we want to use the Two Rock CG base again? By show of hands, it appears the answer is "yes."

Equipment: The club voted to authorize N1AL to spend up to \$650 for a Drake TR-7 transceiver. m/s KA6DYY/WB6FRZ

MARCONI DAY is April 23. Bill N6GHG reports that the call used will be KK6H/IMD. Operators are needed.

CLUB BREAKFAST: Pete KC6UXM has a sign-up sheet so we can start these up again (if there's enough interest).

CODE PRACTICE ON THE AIR: A member has proposed we send code practice on the repeater on a regular basis. N1AL feels this might become annoying. A simplex frequency would be better. A Touch-Tone decoder could be added so a user could dial up any desired code speed, at any time of day or night. By a show of hands, about half of those present expressed an interest in the idea.

The HOMEBREW CONTEST is next month. There will be two divisions, "Big" projects (over 15 hours) and "Small" projects (less than 15 hours).

The PROGRAM was a Packet Bulletin Board System (PBBS) demo by Jim KC6PJW. John WX3K was slated to speak also, but we ran out of time.

Respectfully submitted by Secretary Al Bloom N1AL.

Treasurer's Report

de Jim WA2EWE February, 1993



| ACCOUNT | REVENUE | EXPENSE |
|-----------------------------|---------|---------|
| Refreshments at meetings .. | 9.58 | 17.62 |
| Dues and Initiations | 295.00 | |
| Raffle at meetings | 43.50 | |
| Misc | | 100.00 |
| Short Skip Newsletter | | 104.82 |
| Training and Education | | 40.37 |
| Amateur Radio Newslne | | 19.92 |
| Membership Supplies | 10.00 | |
| | 358.08 | 282.73 |

ASSETS:

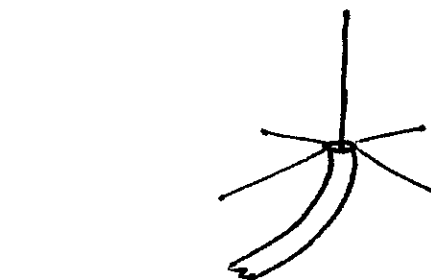
| | |
|----------------------|----------|
| General Fund Account | 3,200.22 |
| Cash/checks on hand | 52.93 |
| Total General Fund | 3253.15 |
| Total Repeater Fund | 864.05 |

COMING EVENTS:

SCARS NET: 146.73 MHz Tuesdays at 7 PM.
KIDS' NET: 146.73 MHz Thursdays at 7 PM.
EXAM HOTLINES: (408) 984-8353/255-9000

MAY:

- 1 - ARRL 902/1296/2304 MHz Sprint
- 1 - Fresno Hamfest 209-486-5377
- 1-2 - Ten-Ten 10 Meter CW QSO Party
- 2 - Tour d'Cure (KD6KVO)
- 2 - LARK Flea Mart, Livermore WU7R
- 3 - RACES etc. Net 7:30 PM
- 5 - SCRA meeting 7/7:30 PM
- 8 - Foothill College Flea Market
- 15 - Deadline for June *Short Skip*
- 17 - RACES etc. Net 7:30 PM
- 20 - CDF/VIP Meeting 7:30 PM
- 21-23 - West Coast VHF Conference, Ventura
- 22-23 - ARRL 50 MHz Sprint
- 29-30 - CQ Worldwide Prefix Contest, CW



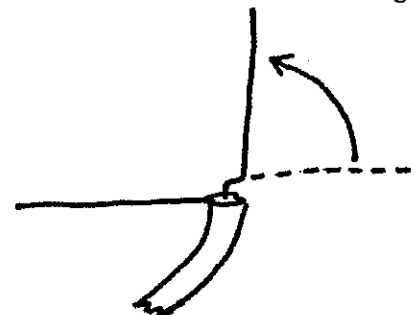
Just How Effective Are Your 2M Vertical Antenna Radials?

By John Breckenridge, WB6FRZ

What do you mean, "how effective?" How about: "What is their purpose, for crying out loud?" This article covers a "side" investigation done by myself and others in developing a phased 2 meter J antenna. Soon the question was asked: "Why do J antenna articles always claim that the J never needs radials?" And that brings up many other questions. For instance: How many radials are REALLY enough for a 2 meter ground plane antenna? Why are some radials angled downward instead of horizontal? What are those upside-down ice-cream cones on the "discone" antenna? Why, indeed.

The Vertical is Just a Modified Dipole

To understand radials, let's first consider the design of a vertical "ground plane" antenna versus a horizontal dipole. We will first construct a dipole, and then make it a vertical! A dipole is a center-fed horizontal wire where theoretically-equal currents flow in both halves of the wire. Yes, the wire connected to the "ground" braid is just as "hot" as the center conductor wire when you transmit. See the spiffy picture. First find the wire being fed by the coaxial center conductor. Pull the "loose" end of that wire vertically up in the air, 90 degrees to the horizontal wire that is connected to the coaxial braid. Consider this (still horizontal) wire to be the "ground."



Now instead of a radiator that's horizontal, half of it is vertical and the other half is horizontal. So now, as if by magic, this horizontal "radial" wire no longer radiates, right? Wrong. But it's "grounded," and that now causes no antenna currents to flow on it, right? Wrong. We haven't done ANYTHING magic to this originally very happy horizontal dipole antenna where the antenna currents flowed on BOTH halves of the wire. A dipole has one side connected to the "ground" braid of the coax, and antenna currents flow on that "grounded" wire, too.

Radials, Matching, & Feedline Radiation

This single "grounded radial" is still very much a part of the antenna. If you removed it, it would be similar to removing one half of a dipole. The antenna thus created is no longer a dipole, but rather something called a "zepp," or end-fed wire. In a coaxial feedline, equal and opposite currents flow on the center conductor, and the INSIDE part of the shield braid. If half your antenna is missing, those currents in the braid have to go somewhere.

Feedline radiation occurs when RF current flows on the OUTSIDE of the coaxial cable braid which causes the feedline to radiate some of the energy intended for the antenna. That can happen two ways: either currents on the INSIDE surface of the braid squirt out of the cable and flow down the outside of the braid, or the cable intercepts some of the radiated energy from the antenna. This is not good. First, it may make it impossible to obtain a good impedance match, and second, it affects the antenna pattern. For beam antennas, feedline radiation is usually very detrimental to the front-to-back ratio and distorts the directional characteristics.

The *ARRL Antenna Book* says, "To avoid line radiation it is always best to feed the antenna at its center of symmetry. In the case of simple antennas for operation in several bands, this means that center feed should be used. End feed is required only when the antenna is operated on an even harmonic to obtain a desired directional characteristic, and then only when it must be used on more than one band." It goes on to say, "The center-fed system will also have appreciable antenna-to-line coupling if the line is not brought off at right angles to the antenna for a distance of at least a half-wavelength." *[Next page]*

Conclusion: Why Radials Are Needed

Vertical antennas need radials because they provide a place for coax shield return currents to flow. This allows for proper impedance matching, and "decouples" the antenna from the feedline, thus minimizing feedline radiation. And remember, run your coaxial cable at ninety degrees away from the antenna radials for at least a half wavelength, which at 146 MHz is about three feet.

What About Angled Radials?

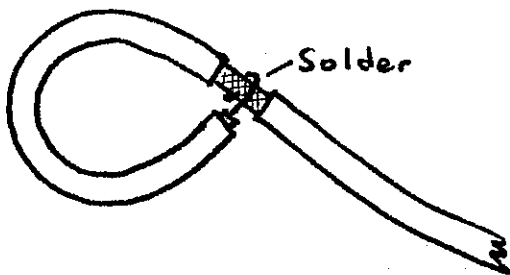
If you angle the radials on a ground plane vertical downward about 15 degrees from horizontal, the antenna match becomes MUCH better. This was confirmed in some backyard experiments of mine.

The greater distance between the radials and the vertical center conductor raises the radiation resistance up to 50 ohms.

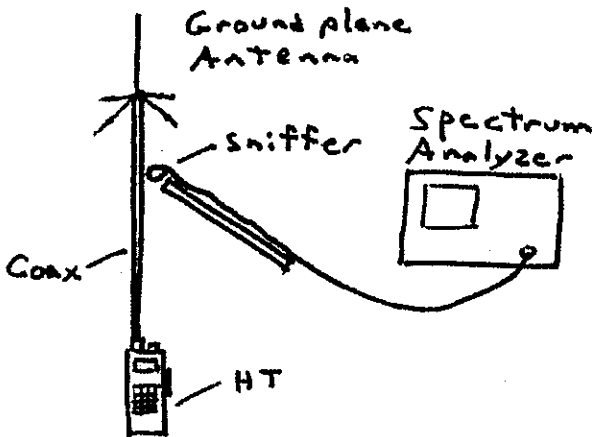
OK, But How Many Radials Are Enough?

The reason more radials are better with VHF vertical antennas is mostly because of the improved decoupling. We have all seen many VHF antennas with four radials. So is that enough? Well, since I could not find any conclusive information on this subject, Alan Bloom N1AL, Bill Marlin KD6LTA and I did some experimenting in my backyard. After several hours with a sophisticated spectrum analyzer and a homebrew antenna current probe, we came to some conclusions.

But first, here is what we did. We measured antenna currents on the coaxial cable and on the antenna. We then varied the LENGTH of the cable. Then we looked at the effects of more decoupling by adding a current balun to the bottom of the antenna and measuring again with varying lengths of coax cable. See the spiffy diagram in the next column.



Closeup of "sniffer" loop.



We "hung" a 2 meter ground plane vertical antenna in the air from its center conductor and suspended an HT underneath by a BNC adapter and cable. With a homemade current probe made of a small shielded coax loop and some plastic pipe, we "sniffed out" RELATIVE values of RF on different parts of a 1/4 wave ground plane and a J antenna. A Hewlett-Packard spectrum analyzer was our measuring device. Our arsenal also included a current balun made from a large toroid wrapped with ten turns of coax cable, and various pieces of coax cable jumpers. By combining different jumpers, we could vary the total length of coax feeder between the HT and the antenna in 1.75-inch increments up to about 97 inches!

We performed our main measurements on the quarter-wave ground plane. The procedure was this:

1. Suspend the antenna in the air by the top of its center radiator, minimizing effects of surrounding objects. Keep it there.
2. Connect the HT to the antenna. Choose an unused simplex frequency. Put a rubber band around the push to talk switch to key the radio and identify.
3. Measure the maximum current point on the antenna and record it as the "reference." This point always occurred at the very base of the vertical radiator.
4. Move the probe up and down a radial and record the maximum current measured.
5. Move the probe up and down the coax cable and record the maximum current.
6. Vary the length of coaxial cable connected to the HT and repeat steps 2 through 6.
7. Connect the current balun directly to the antenna connector. Connect the HT directly to the other end of the balun. Repeat steps 2 through 7. [Next page]

After all the data were taken, we found that there are antenna currents flowing on the outside of the coax, and they vary with length of coax. Minimum and maximum values are shown in the table:

Without current balun:

| Signal on coax relative to the antenna | Coax length |
|--|--------------|
| -3 dB | 45.75 inches |
| -11.8 dB | 42.5 inches |

With current balun:

| Signal on coax relative to the antenna | Coax length |
|--|--------------|
| -10.5 dB | 45.75 inches |
| -24 dB | 42.5 inches |

The experiment was not perfect; nothing is. For instance, there may have been some coupling into the coax cable and current probe cable due to radiation from the antenna. Personally, I suspect this was held to a minimum. [Ed: Also, I suspect the coupling factor may have been different between feedline and radiator due to their different diameters. This would add or subtract a constant number of dB's to all readings.]

Conclusions

I believe that four radials on a 2 meter vertical may or may not adequately decouple antenna currents from the feedline, as it depends very much upon the length of the feedline! It's a hit-or-miss proposition. To make it less unpredictable, construct a current balun and connect it between the antenna base and the feedline. Coax is available everywhere; a proper toroid may be obtained from Amidon, Inc. and other such supply houses.

We also tested a J antenna and guess what: We measured about 3 times (10 dB) more feedline current than in the ground plane! Oh well, so much for the old adage, "J antennas don't need radials!" They may not need radials to create a good match, but feedline radiation can sure be improved! Oh, yes, how about that Discone antenna? I believe that the

ice cream cones are RADIALS made to decouple the antenna from the line. Other articles have confirmed that they do a very admirable job of this.

I wish to acknowledge the assistance of Alan Bloom N1AL and Bill Marlin KD6LTA in these experiments, without whose help this article would not have been nearly as informative. I'm just not that smart, so it's nice to have help from people who can help you learn. In addition, I bestow honorable mentions upon Doug Carter KC6RHA and Walt Burandt KC6RHB for assisting in the development of that new J antenna I mentioned earlier. We are still working on it; stay tuned and we will publish plans for the "J" when it's finished. ■

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