



HANK'S SWAP SHOP

Hank Davis, W6DTV 7822 Washington Avenue
Phone 823-7885 Sebastopol, CA 95472
(Noncommercial ham ads are printed for free)

DRAKE TWINS: R4B T4XB Pwr supply and manuals \$350. WB6TMX 539-3627.

KENWOOD R2000 receiver \$250. MFJ 941B antenna tuner \$25. Art NR6G 579-6923.

GE single-channel solid-state 10W with manual \$15. John W6CCY 823-1357.

Sonoma County Radio Amateurs, Inc.
PO Box 116
Santa Rosa, CA 95402

ADDRESS CORRECTION REQUESTED

JOHN BRECKENRIDGE
WB6FRZ
574 WILD OAK DR
WINDSOR CA 95492

HIGH-GAIN Explorer 2, 40 M yagi \$300. N6GF 431-7706.

SCANNER, 8-channel crystal, 110/12V \$25. W6DTV 823-7885.

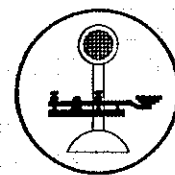
WANT: VERTICAL, 80-10 M. KJ6NZ 538-0609 H/545-8423.

ICOM 271-H 2 M 100W all-mode TR plus preamp & power supply \$785.00. D104 mic \$7.50. AT&T speaker phone \$15. TAPR TNC-1 \$50. Jim KI6KE 538-2857.

KENWOOD HT 2600A modified for MARS, batt, charger & manual \$165. Judd N6QAV 829-1365.

WANT GRID-DIP OSCILLATOR cheap. Tracy WB6TMY 527-8124. ■

BULK RATE
U.S. POSTAGE PAID
SANTA ROSA, CA
PERMIT NO. 658



SHORT SKIP



Sonoma County Radio Amateurs, Inc.

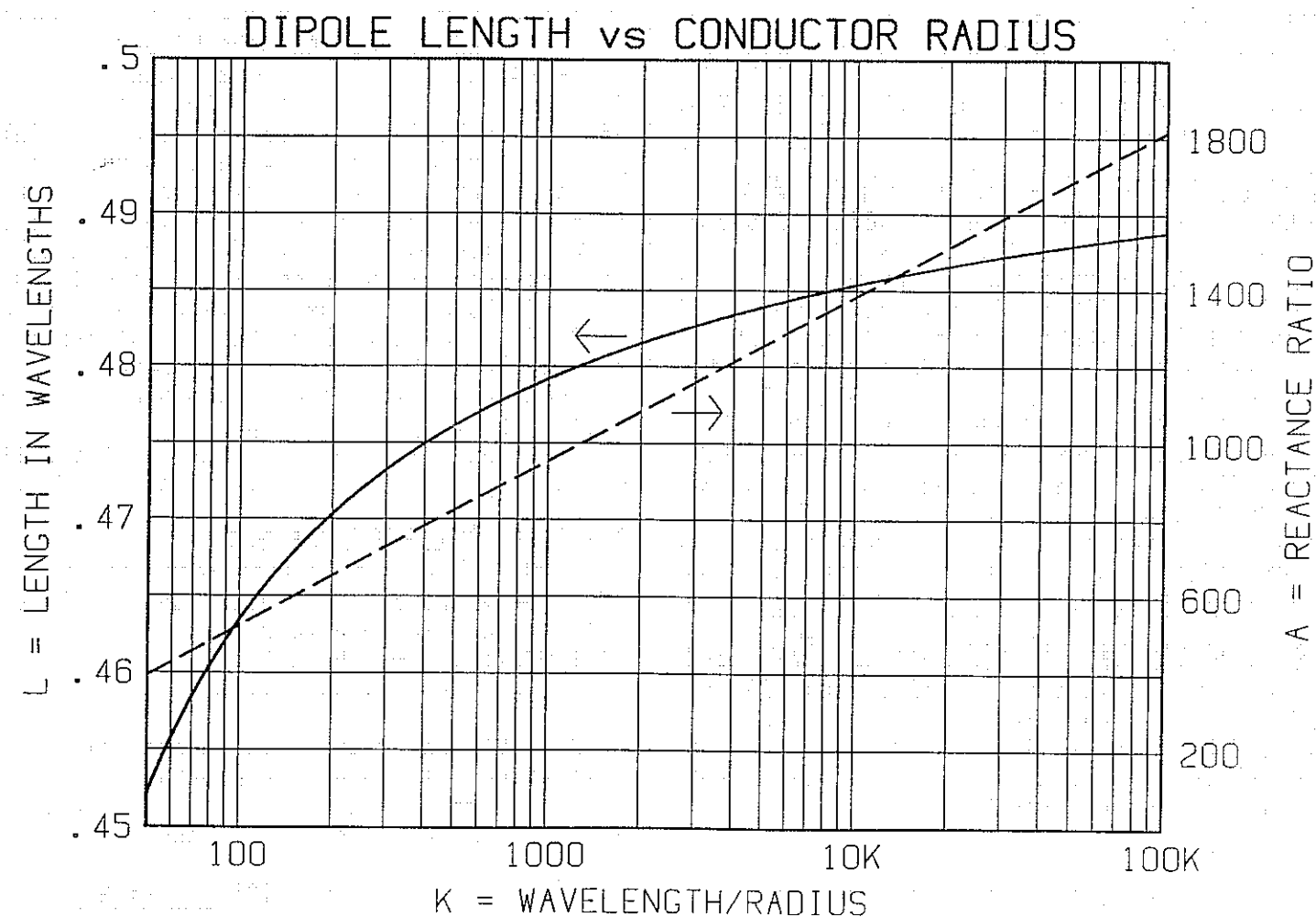
MARCH 1989

Club Station
W6LFJ

P.O. Box 116
Santa Rosa, CA 95402

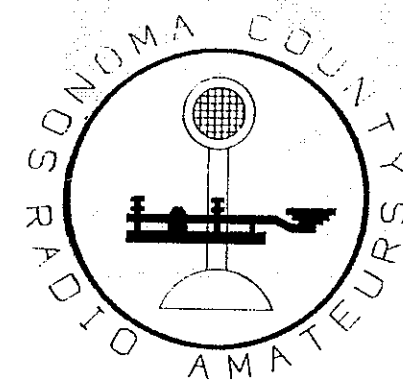
Repeater Station
WB6PVS

VOL 14 # 3



YAGI ANTENNA DESIGN

SEE PAGES 6-7



OFFICERS FOR 1989

PRESIDENT:	Glen Crownover	N6DNB	546-8955
VICE PRESIDENT:	John Wallack	W6TLK	833-1873
SECRETARY:	Alan Bloom	N1AL	538-7115
TREASURER:	Jim Pelmulder	N6PTM	823-7947
MEMBERS-AT-LARGE:	Chuck Sabin	N6DDK	795-2371
	Bob Olsten	WD6DPE	546-5593
REPEATER CHAIR:	Jim Rutherford	WB6PER	526-2972

----- SHORT SKIP STAFF: -----

EDITOR:	Alan Bloom	N1AL (e)	538-7115
	1578 Los Alamos Rd, Santa Rosa, CA 95405	(d)	577-3981
CIRCULATION MGR:	Tracy Reese	WB6TMY	
SWAP SHOP:	Hank Davis	W6DTV	823-7885

ARRL LIASON: Alan Bloom N1AL 538-7115
 ASST. DIRECTOR: Chuck Sabin N6DDK 795-2371
 BADGE CHAIRMAN: Jim Pelmulder N6PTM 823-7947
 CLUB HISTORIAN: Connie Freitas N6FYV

ACTIVITIES COMMITTEE:

PUBLIC SERVICE: Bob Sones WB6EKV 546-3873
 PROGRAM CHAIR.: Bob Olsten WD6DPE 546-5593
 REFRESHMENTS @ MEETINGS: Bob Olsten WD6DPE
 GREETER AT MEETINGS: Jane Vanderslice N6NTB
 MEMBERSHIP LOTTERY: Warren Klinger WB6RHP
 QSL MANAGER: Doug Bender WW6D
 VEC EXAMS: Steve Lund WA8LLY 823-4544
 WA6ACX N1AL K6ANP AG6C WD6CKP WN6D WW6D
 W6DTV WW6F WB6FRZ KF6FX W6RIA WB6UDR WU6W
 EDUCATION: Steve Lund WA8LLY 823-4544
 WA6ACX, WW6D, WB6PDP, W6TLK, KF6WV
 AWARDS CHAIRMAN: Steve Lund WA8LLY 823-4544
 XMAS PARTY: Steve Schaffer KD6GC 546-8860
 INTERFERENCE CHR: John Lynch W6CCY 823-1357

REPEATER CONTROL OP'S:

WD6CKP Hoppy 542-6750 W6DTV Hank 823-7885
 WB6PER Jim 526-2972 N6KMU Russ 823-9691
 WB6UAZ Kathi 544-7943 WN6D Jim 544-7943
 PACKET COMMITTEE: Al Bloom N1AL, Jim Boyett
 WN6D, Rich Freitas KA6SSL

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: 15th of previous month

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 (145.03), 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 7:00 PM. You will hear the latest Westlink Amateur Radio News broadcast, announcements of SCRA activities, and a Swap Shop. If you would like to join SCRA, please refer to the dues listed below. Hope to have an "eyeball" QSO with you at the next meeting! 73 ...

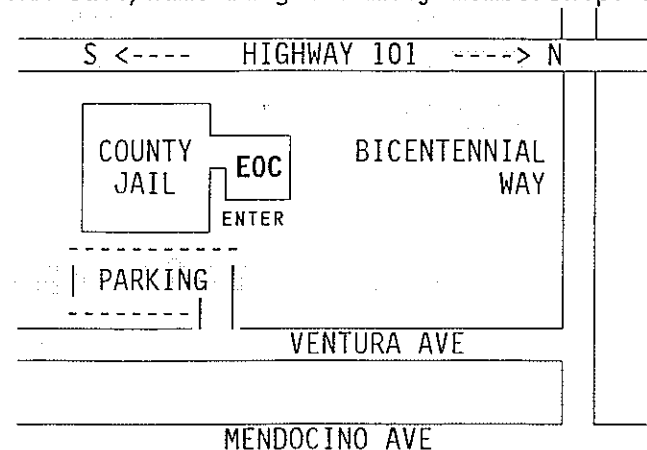
CLUB MEETINGS:

7:30 PM, 1st Wednesday each month at the EOC (Emergency Operations Center, see map below) All are welcome to attend.

NEXT MEETING: March 1, 1989

PROGRAM: ATV video tape

DUES: \$12 per year, plus a one-time \$4.00 initiation fee. Dues are pro-rated \$1/month for new members. With membership, comes an SCRA call/name badge. Family membership: \$18



H.S.C. ELECTRONIC SUPPLY

6819 Redwood Drive, Cotati, CA 94931 792-2277

Monday thru Friday 9:00 am - 6:00 pm

Saturday 9:00 am - 5:00 pm



STEPHEN ROBERTS KA80VA

Will be a special guest of H.S.C.
 Electronic Supply of Santa Rosa on
SATURDAY, APRIL 22, 1989
 starting at 9:00 AM

Steve will be here along with his Winnebiko in a special promotion of his new book, "COMPUTING ACROSS AMERICA". Steve has written many articles for both Amateur Radio and Computer magazines. Come meet Steve and have him sign your copy of his new book.

Mark this date on your calendar!! Be sure to come and meet Steve, KA80VA!!



SANGEAN RADIOS

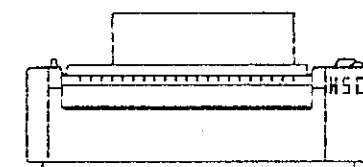
ATS-803A	\$ 249.95
MS-103	\$ 114.95
MS-101	\$ 99.95
SG-789	\$ 79.95
SG-796	\$ 59.95

NEW AND USED TUBES
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 ** Turbo XT, 30 Mb Seagate drive,
 640K, keyboard, monitor \$ 1059.95
 ** Turbo XT, 30 Mb Seagate drive,
 640K, keyboard, color monitor all for
 \$ 1259.95



PANASONIC PRINTERS

Stop by and see the new LASER PRINTER by Panasonic. It is now set up and ready for demonstrations. Also, the Panasonic 1124 Printer is on sale for only \$ 395.00.

The PACKET RADIO SYSTEM on demonstration in the Ham Radio section of the store features HSC's computer system and equipment.

15% OFF
TRIPPLITE POWER
INVERTERS WITH
THIS AD. BE PREPARED
 FOR ANY AND ALL EMERGENCIES!

SCRA MINUTES

FEBRUARY 1, 1989



The meeting was called to order by President Glen Crownover N6DNB at 7:36 PM. Other Officers present were Vice President John Wallack W6TLK, Secretary Alan Bloom N1AL, and Members-at-Large Bob Olsten WD6DPE and Chuck Sabin N6DDK. Jane N6NTB introduced the visitors.

The MINUTES were approved as printed in Short Skip. m/s N6DDK/N6RXA

The TREASURER'S REPORT will be read next month as N6PTM is out sick.

In the Treasurer's absence, the list of BADGES to be picked up was given by Hank W6DTV: KF6YL, "Mike", and Jerome N6MMH.

The EDUCATION and PUBLIC SERVICE chairmen were both QRT with the flu, so no reports were given.

NEW BUSINESS:

SWAP NET ON '73: Garry N6ONZ moved we permit WB6HEF Kurt Delzer to run his Sacramento Valley Swap Net on the 146.73 repeater from 7:30 to 10:30 Wednesday nights. Passed. (s N6KMJ)

CDF COMM. VAN: Garry also thanked the club and equipment donors for help with the van. HSC Electronics donated a scanner, antennas and RF switches. The bus has been stripped and work has started on refurbishing. In addition to the gear listed in the last Short Skip, we could use 4 boom mic/headsets.

SCARS NET: The Board has decided to resume check-ins on the Tuesday night net.

N1AL distributed sample copies if the WEST COAST SWAP SHEETS.

NOVICE CLASSES start Tues. March 7 (7-9 PM) at the EOC with Tracy WB6TMY instructing.

The TOWER-TRAILER of Warren WB6RHP is now

owned by a ham in Santa Clara. It will be stored at K6GEV's house in Petaluma and will be available to the club for Field Day and emergency work. The club voted to pay for the DMV registration so we can move it legally. m/s N6DDK/N6KMJ

The POLE MOUNTAIN ASSOCIATION is a volunteer organization that operates in conjunction with CDF's fire spotting network. It is also an excellent repeater site. The club has donated \$50 in memory of WB6RHP.

TERRY WA6RNF says "HI" from the midst of an Idaho snowstorm via landline to WA6ACX.

DUES: The Board has voted no change in 1989. Dues have been \$12 per since 1981.

The KRAFFLE pot continues to grow since KB6DJE was not present to collect. \$17.50 will be held for next month.

The meeting adjourned at 8:35, after which A1 N1AL gave a short talk on testing radios with a Hewlett-Packard 8566 spectrum analyzer. A half-dozen or so brought their gear to be checked out.

Respectfully submitted by A1 Bloom N1AL, Secretary. ■

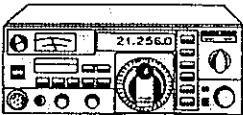
TREASURER'S REPORT

FOR MONTH ENDING JANUARY 31, 1989

ACCOUNT	REVENUE	EXPENSE
Refreshments at meetings ..	7.25	7.92
Dues and Initiations	54.00	
Fund-Raisers	3.00	
Misc	5.00	2.50
Short Skip Newsletter	74.00	
Membership Supplies.....	26.00	
Insurance Fees		310.00
	169.25	320.42
ASSETS:		
General Fund Account	949.02	
Cash/checks on hand	174.28	
Total General Fund	1123.30	
Total Repeater Fund	1981.65	

- de N6PTM

LOOSE LIPS
LOSE EQUIPMENT



Ah, yes! Going on vacation at last. I think I'll get on the repeater and tell Joe, N6NNN down the street that I am going to be in the wilds of Montana for a couple of weeks.

Bad mistake. Who else is listening to the repeater? Remember, anyone can own and listen to a scanner. That same anyone can also go to the local radio store and buy a Callbook. Thieves aren't dumb anymore. They know where to look and listen for vacant houses they can rip off. Being an Amateur Radio Operator, they might feel you are a juicy target because you will have all sorts of expensive equipment around.

One way around the address problem is to get a PO box and have that listed as your address with the FCC (and Callbook). Hard to find out where a PO box lives.

The best thing is not to advertise on the repeaters when you are leaving town for an extended period. And don't talk on the repeaters about other hams being out of town on vacation. You paid cold hard cash for your belongings, and it is a good feeling to come home from a vacation and see that they are all where you left them. ■

- Tnx KE6WC via RAIN

THANK YOU BOYS!

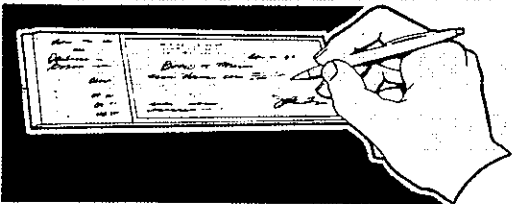
I would like to pass my appreciation and thanks to the following hams for their help in installing the 2 meter radio and antenna at the Guerneville Fire Station on Saturday 2/11/89. "A JOB WELL DONE!"

Brian Torr N6IIY, Larry Rau KF6WV, Lee Snyder KA7NZO, and Hoppy Bravin WD6CKP.

RACES is looking for a river ham to be a "First Responder" to the Fire Station during emergencies in that area. If you feel you can fill this position, please contact Jim Rutherford WB6PER at 526-2972.

Garry Palmer N6ONZ. Russian River Disaster Preparedness Committee. ■

DUES
ARE
DUE!



1989 SCRA dues come due as of March 1. Get your check to the Treasurer pronto! ■

EXTRA ITEM
FOR SWAP SHOP?

Jan 29, 1989

To: members of SCRA, Inc.

Dear OM's,

I would like to get in touch with anyone interested in exchange of a small computer like Sinclair ZX81 to Russian music records.

I have been on the air since 1960, and I'm working on CW only. All my station is home made. Now I'm going to build a RTTY & Packet Radio station, but there are some problems in gathering a port to the hardware. So, I would like your help very much.

I'm sincerely,

Igor G. Davydov UA9BR
PO Box 41
Chelyabinsk 454899
USSR

Ed note: Sounds like he needs something with a serial port. Any ideas? ■

Radio Shack

STORE NO. 3855

ZANE BATES
MANAGER

510 FARMERS LANE
SANTA ROSA, CA. 95405

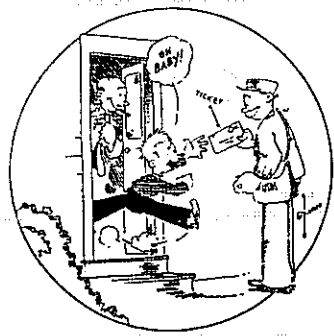
TELEPHONE
546-8423

COMMON AMATEUR EXAM QUESTIONS: By Steve Lund WA8LLY

One question that is often asked at the local amateur radio volunteer exam sessions is why we don't give Novice exams at the same time. The reasons are based on the Part 97 FCC rules as well as the limited number of VEs locally.

Part 97 separates the administration of the Novice exams from those for Technician and higher. Examiners for upgrade exams must be accredited with a regional VEC. The VECs require that examiners have Extra class licenses. All test materials are returned to the VEC (ARRL and W5YI are used locally) after the exam session. The VECs do not provide Novice test materials -- these are designed and provided by the volunteer examiners who must have a General class or higher license. The test materials are retained by the examiners, and the Form 610s are sent directly to the FCC. Because of the extra paperwork hassles (it usually takes 4 hours to fill out all the paperwork for a typical upgrade exam session), the local VE team has chosen not to give Novice exams at the same time as the upgrade exams.

Since the enactment of Novice Enhancement, there has been an increasing number of examinees who want to get the Technician license but don't realize that the Novice license must be passed first. You are required to pass the written exams for all lower license classes. Someone wanting to obtain the Extra class without a previous license would be required to take 5 written exams. The reason for this is that each written Element emphasizes different areas. Think of each as a new layer of knowledge. The only Elements that can be skipped are the code tests -- anyone who passes 20 wpm is presumed be able to copy 13 and 5 wpm. ■



AMATEUR RADIO UPGRADE EXAMS

WHEN: Saturday, March 18, 1989
Written Exams: 1:00 PM
Code Exams: 2:00 PM

WHERE: Emergency Operations Center (EOC)
600 Administration Drive, Santa Rosa.
(Next to the Sheriff's Office in the County Administration Center, directly across from the new jail construction site.)

REGISTRATION DEADLINE: Mar 16, NO walk-ins.

DETAILS: Technician, General, Advanced and Extra upgrades only. NO Novice exams will be given. Written exams will start promptly at 1 PM. This should cut the long wait that has occurred in the past for those only wanting to upgrade to Technician.

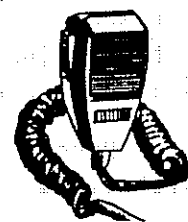
Send your completed Form 610, a check for \$4.75 made out to ARRL-VEC, and a copy of your license to:

Steve Lund WA8LLY
10180 Mill Station Rd.
Sebastopol, CA 95472-9655
823-4544 (after 7:30 PM)

The new Form 610 does not have a check-off box for the license class you are applying for. Please attach a note indicating what tests you plan to take. This will help me to determine what test materials to bring. If you need a Form 610, please send a SASE to the above address.

ON EXAM DAY, bring the following:

- Your ORIGINAL license.
- A photo-ID. (California drivers license is the best.)
- 2 soft-lead pencils and a pen.
- Calculator. If programmable, you must show the memory is erased.



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7

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(404) 263-0700
Larry, Mgr. WD4AGW
Doraville 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Ave
(415) 342-5757
George, Mgr. WB6DSV
5 miles south on 101 from SFO
East of Hwy 17

OAKLAND, CA 94606
2210 Livingston St
(415) 534-5757
Al, Mgr. WA6SYK
17th Ave. 17th St. 16th Ave

PHOENIX, AZ 85015
1702 W. Camelback Rd
(602) 242-3515
Bob, Mgr. K7RHH
East of Hwy 17


SAN DIEGO, CA 92123
5375 Kearny Villa Rd
(619) 560-4900
Tom, Mgr. KM6K
Hwy 163 & Claremont Mesa Blvd

VAN NUYS, CA 91411
6265 Sepulveda Blvd
(818) 988-2212
Al, Mgr. K6YRA
San Diego Fwy at Victory Blvd

STORE HOURS
10 AM-5:30 PM
CLOSED SUNDAYS

CALL TOLL FREE (800) 854-6046

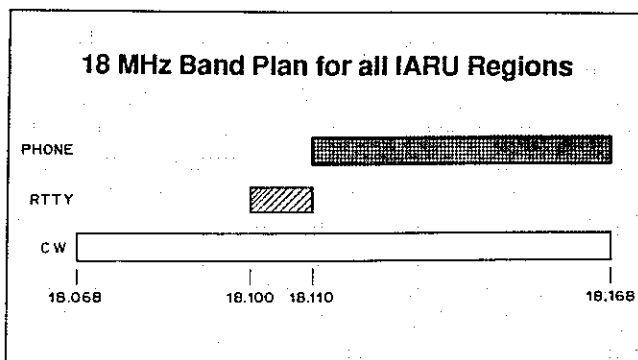
Toll free including Hawaii. Phone Hrs: 7:00 am to 5:30 p.m. Pacific Time. California, Arizona and Georgia customers call or visit nearest store. California, Arizona and Georgia residents please add sales tax. Prices, specifications, descriptions subject to change without notice.



NEWS of Amateur Radio

WE GET 17 METERS! Since Jan 31, 18.068-18.168 has been a US amateur band. Until July 1, we must avoid interfering with US government and foreign Fixed Service stations. Power limit is 1500 Watts, open to all amateurs of General class and above.

18 MHz Band Plan for all IARU Regions



PHONE: 18.068 - 18.100
RTTY: 18.100 - 18.110
CW: 18.110 - 18.168

Tnx ARRL Letter

W5YI QUILTS NARA. Claiming confusion over his relationship to the group, Fred Maia W5YI insists the no-code idea was his alone and not that of the newly-formed National Amateur Radio Assoc. Tnx Westlink Report

NEW ATLAS/DENTRON OWNER ARRESTED Michael D. Harrison WB6PTI, alias John McNamara alias Mike Hanson has been arrested and arraigned on charges of mail and wire fraud. The 12-page complaint lists 65 victims who have ordered merchandise and received neither the equipment or a refund, and the list grows every day. If you should be on it, send a detailed statement of facts with copies of advertisements, letters, receipts, etc. to: Martin T. Biegelman, Postal Inspector, POB 160, Hicksville, NY 11802. Tnx W5YI Report.

H.S.C. Electronic Supply

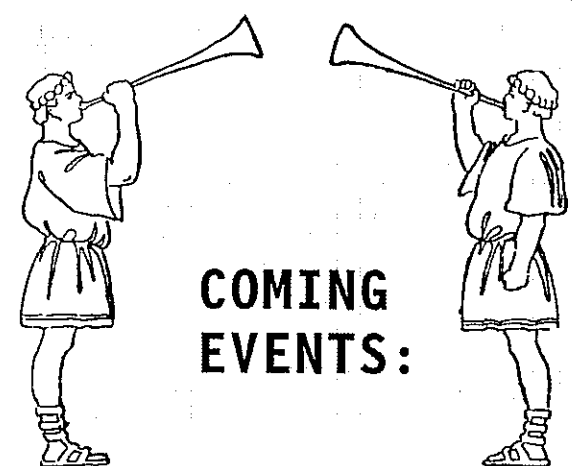
of Santa Rosa

DIVISION OF HALTED SPECIALTIES, INC.
ELECTRONICS - MICROCOMPUTERS
Parts - Equipment - Components
Amateur Radio - CB - Lasers & Optics

6819 S. REDWOOD DR.
COTATI, CA 94928

GEORGE SHEDORE
MANAGER
KS6W

PHONE: (707) 792-2277



COMING EVENTS:

Don't forget SCARS net on Tuesdays at 7 PM.

MARCH:

- 1 - SCRA meeting 7/7:30 PM DUES PAYABLE!
- 4-5 - ARRL DX Contest, Phone
- 6 - RACES etc. Net 7:30 PM
- 11 - Foothill College Flea Market
- 16 - CDF/VIP Meeting 7:30 PM
- 20 - RACES etc. Net 7:30 PM
- 25-26 - CQ WW Prefix Contest, Phone

APRIL:

- 6 - RACES Earthquake Drill, 8-11 AM
- 12 - SCRA meeting 7/7:30 PM
- 28-30 - Dayton Hamvention

MAY:

- 21 - HAMSWAP' 89, Folsom
- 27-28 - CQWW WPX Contest

JUNE:

- 2-4 - ARRL National Convention, Dallas TX
- 24-25 - Field Day

SEPTEMBER:

- 9-11 - ARRL September VHF QSO Party
- 16 - SCRA Flea Market

OCTOBER:

- 15-16 - Simulated Emergency Test
- 21-22? - CQWW SSB DX Contest

NOVEMBER:

- 4-6 - ARRL Sweepstakes, CW
- 18-20 - ARRL Sweepstakes, Phone
- 25-26 - CQ Worldwide CW DX Contest

DECEMBER:

- 1-3 - ARRL 160 Meter Contest
- 9-10 - ARRL 10 Meter Contest

VE EXAMS HOTLINE NR: 408-984-8353

AMATEUR RADIO EXAMS


IN NORTHERN CALIFORNIA

PO=PREREG. ONLY.
PP=PREREG. PREFERRED
WO=WALK-INS ONLY
SW=SOME WALK-INS

03 04 CUPERTINO----	9 AM-WO-408-243-8349
03 04 JACKSON-----	9 AM-PP-209-295-7947
03 11 LOS ALTOS-H.11	AM-WO-408-255-9000
03 11 LOS ALTOS HILLS	****FLEA MARKET**
03 11 STOCKTON-----	1 PM-WO-209-952-3013
-----TECHNICIAN ONLY-----	
03 11 NAVATO-----	9 AM-WO-415-897-8950
03 16 SACRAMENTO-6:30PM	PO-916-483-3293
-----TECHNICIAN ONLY-----	
03 18 PORTERVILLE9:30AM	WO-209-539-2429
03 18 SACRAMENTO---	9 AM-PO-916-483-3293
-----GENERAL-EXTRA CLASS ONLY-----	
03 18 CUPERTINO----	9 AM-WO-408-243-8349
03 18 SANTA ROSA-----	PO-707-794-4456
03 19 SUNNYVALE---	11 AM-WO-408-255-9000
03 19 VALLEJO-----	WO-707-644-1790
03 25 REDDING-----	9 AM-WO-916-243-7382
03 26 SANTA CRUZ---	1 PM-WO-408-255-9000
04 01 CONCORD---	1:30 PM-WO-415-254-5090
04 01 HANFORD---	12 NOON-WO-209-924-4221
04 01 CUPERTINO---	9 AM-WO-408-243-8349
04 02 CLEARLAKE---	11 AM-WO-707-994-0646
04 02 CHICO-----	1 PM-PP-916-342-1180
04 08 LOS ALTOS H.11	AM-WO-408-255-9000
04 08 STOCKTON-----	1 PM-WO-209-952-3013
-----TECH. ONLY? COULD BE UNL-EXTRA?-----	
04 09 HANFORD---	12-NOON-WO-209-924-4221
04 15 CUPERTINO---	9 AM WO 408 243-8349
04 16 SUNNYVALE--	11 AM-WO-408-255-9000
04 22 ROSEVILLE---	9 AM WO-916-484-1155
04 22 NEVADA CITY---	WO-916-273-2326
05 07 FRESNO-----	10 AM WO-209-924-4221
05 13 LOS ALTOS H.11	AM-WO-408-255-9000
05 13 STOCKTON-----	1 PM-WO-209-952-3013
-----TECH. ONLY? COULD BE UNL-EXTRA?-----	
05 21 SUNNYVALE---	11 AM-WO-408-255-9000
05 28 SANTA CRUZ---	1 PM-WO-408-255-9000
06 01 SACRAMENTO-6:30PM	PO-916-483-3293
-----TECHNICIAN ONLY-----	
06 03 CONCORD---	1:30 PM-WO-415-254-5090
06 03 SACREAMENTO--	9 AM-PO-916-483-3293
06 04 CHICO-----	1 PM-PP-916-342-1180

TNX TO: N6IIU PBBS and the SUNNYVALE VEC ARC
BOX 60142, SUNNYVALE, CA 94088-0142
UPDATES & CORRECTIONS TO: SP W6NLG @ N6IIU

CDF-VIP NEWS



SONOMA COMM. VAN

The Feb 16 meeting featured a demo of the Sonoma communications van. Sponsored by the Valley of the Moon ARC and the Sonoma Police Dept., it is available for any emergency agency to use. Kermit W6JFN explained that it currently has equipment for CDF, Police, and Red Cross, as well as amateur voice (144 and 220 MHz), packet radio, and ATV. It shortly will have a cellular phone and CHP radio as well. CHP is very interested in using it for hazardous materials incidents.

The CDF VAN is coming along. Garry N6ONZ reports that the engine runs well, the lights work, and the seats and windows have been removed. The interior plan is done and the exterior plan has been submitted.

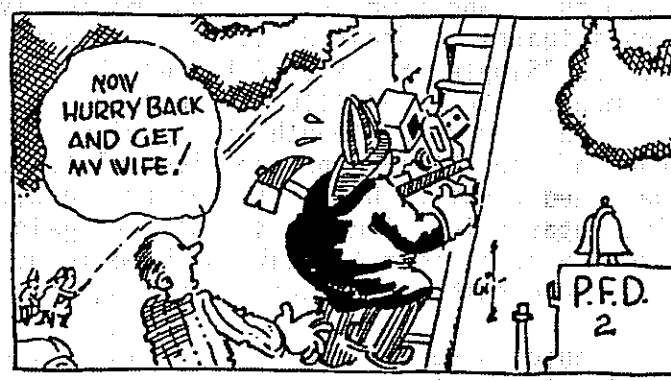
VIP PACKET TRAINING classes by Mike N6DBZ will be on Feb 22, March 8 and March 22.

The VIP RADIO ROOM at CDF HQ is awaiting transfer of the control heads by the state General Services people, according to Chuck N6DDK.

Hank W6DTV is working on a VIP GUIDEBOOK that should be especially helpful to new members.

The PROGRAM for the evening was Fire Safety, Part II by Don Uboldi of CDF.

- N1AL



BOOK REVIEW:

YAGI ANTENNA DESIGN

BY DR. JAMES
LAWSON W2PV



This book is for those who want to design their own Yagi antennas from scratch. There is no practical "nuts and bolts" information -- this aspect of antenna construction is well-covered in the *ARRL Antenna Book*.

The Forward promises "an efficient algorithm for calculating Yagi-Uda performance characteristics with a computer." Sure enough, Chapter 1 gives you all you need to know to write such a computer program -- assuming you are familiar with the method of inverting complex matrices using Gaussian elimination. This may be just a little beyond the capability of the average ham.

Fortunately, you don't have to understand all this to be able to read the rest of the book. In Chapter 1, he compares his computer predictions to careful experimental results obtained by the National Bureau of Standards and others. He shows that the gain and radiation patterns agree to within experimental error.

With the computer, you can examine dozens of potential Yagi designs in the time it would take to build and measure one real antenna. The best part of the book is Chapters 2 through 6, where Dr. Lawson systematically investigates hundreds of designs. Chapter 2 covers "Simple" Yagis of 2 through 6 elements with 1 reflector and with all directors of equal length and spacing. For each of the 204 designs, he gives plots of gain and front-to-back ratio vs frequency. One interesting finding is that both gain and F/B ratio seem to peak for boom lengths of an odd number of quarter wavelengths.

In Chapter 3 he explores the possibility of optimizing performance by tapering the

element lengths and using non-uniform spacing. He concludes that, at least for boom lengths of 1 wavelength or less, this does not increase the gain or average front-to-back ratio -- the "simple" designs in Chapter 2 are just as good as any. You can, however, greatly improve the F/B ratio by adjusting 1 or two element lengths, but this will occur only over a narrow bandwidth.

Chapter 4 covers Loop (quad) antennas. The effects of ground are examined in Chapter 5. In Chapter 6, antenna stacking is covered. Numerous plots for a 3 element and 6 element Yagi are given for various spacings and heights above ground.

All the computer simulations presented up to this point assume an element radius of .000526 wavelengths -- equivalent to 7/8 inch at 14 MHz. Chapter 7 shows how to scale these designs for other average radii, element radius tapers, and element clamping methods. While all the information is there, it is not presented in "cookbook" fashion, and requires some moderately complicated formulas. I'll include a simplified method in a separate article in this issue.

Finally, in Chapter 8, Dr. Lawson gives 12 "practical" designs for Yagis on the 7, 14, 21 and 28 MHz bands. For each, radiation patterns and gain and F/B vs frequency plots are given.

Yagi Antenna Design is published by ARRL for \$15, and is available from HSC Electronics.

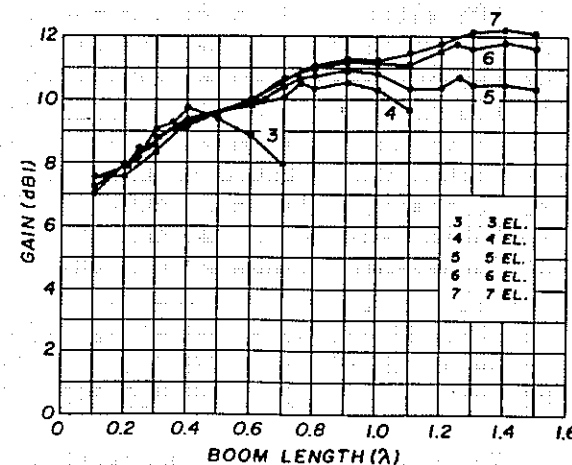
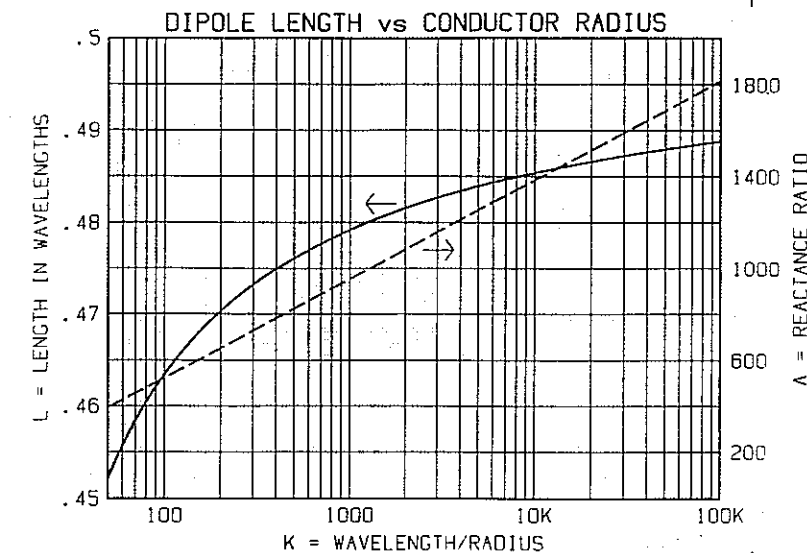


Fig. 2.12—Yagi gain for three-, four-, five-, six-, and seven-element beams as a function of boom length.



HOW TO SCALE A YAGI ANTENNA DESIGN

Yagi antennas are fickle beasts. If you don't copy that *Handbook* design EXACTLY, it may not perform as advertised. Also, it would be nice to be able to scale designs for different bands. This works fine if you change ALL dimensions by the same percentage. Unfortunately, if your original two meter beam design uses 1/2 inch diameter elements, that means your 20 meter "clone" must be built out of 5 inch diameter tubing!

The solid line in the graph above shows the RESONANT length of a half-wave dipole in wavelengths as a function of K, the ratio of a free-space wavelength to the element radius. Note that this does not take end effects into account -- for wire antennas, reduce the length another 2 or 3 percent.

Unfortunately, the parasitic elements in a beam are not resonant. It would be nice if their length changed by the same factor as the driven (resonant) element, but they don't. To scale the antenna to the new dimensions, first find the resonant length of the old antenna (using its frequency and element radius). Call this $L_p(\text{old})$.

Then find the resonant length of the new antenna, $L_p(\text{new})$. Also, use the graph to find $A(\text{old})$ and $A(\text{new})$. The new length is:

$$L(\text{new}) = L_p(\text{new}) \frac{1}{1 - \frac{A(\text{old})}{A(\text{new})} * [1 - \frac{L_p(\text{old})}{L(\text{old})}]}$$

Where $L(\text{old})$ is the electrical length of the old element design.

How to determine the electrical length? No problem for elements made of a single piece of tubing -- just consult the graph and use: wavelength (ft) = 983.6/F(MHz). The narrower the tubing, the longer the element. Now, most HF Yagis are made of telescoping tubing. It turns out that tapering the element generally makes the element even longer than if the entire length were as thin as the tip!

The easiest way to determine resonant lengths of tapered-radius elements is to measure the driven element in the old

design. If it was designed to be resonant, and if all the parasitic elements use the same taper schedule, you have your answer. If not, use the following procedure. First choose a "standard" element radius (the radius half-way out from the boom). $K_s = 1$ wavelength / radius. Then for each section of constant radius compute "m":

$$m = \frac{43.08 \log K_a - 33.9}{43.08 \log K_s - 33.9}$$

Where K_a is K for the actual pipe section.

Then, for each section, find the starting and ending positions, θ_1 and θ_2 in degrees, starting at 0 degrees at the boom out to 90 degrees at the tip. For each section:

$$f(\theta) = \frac{\sin(2\theta_2) - \sin(2\theta_1)}{2\theta_2 - 2\theta_1} * \frac{360}{2\pi}$$

Where $\pi = 3.14159$

So, the ratio of the length of a standard pipe to the length of the actual pipe is:

$$\frac{S_s}{S_a} = \frac{m + 1/m}{2} + \frac{m - 1/m}{2} * f(\theta)$$

Finally, you need to factor in the effect of the boom. Elements that go through the boom should be lengthened 70% of boom diameter. Lengthen elements that just touch the boom by 6%. Use 0% for elements that don't touch. For large boom-to-mast brackets, use the procedure in the book to calculate the correction, but it should be less than about 10% of bracket length for small brackets.

Believe it or not, the procedure in the book is even more complicated! - N1AL