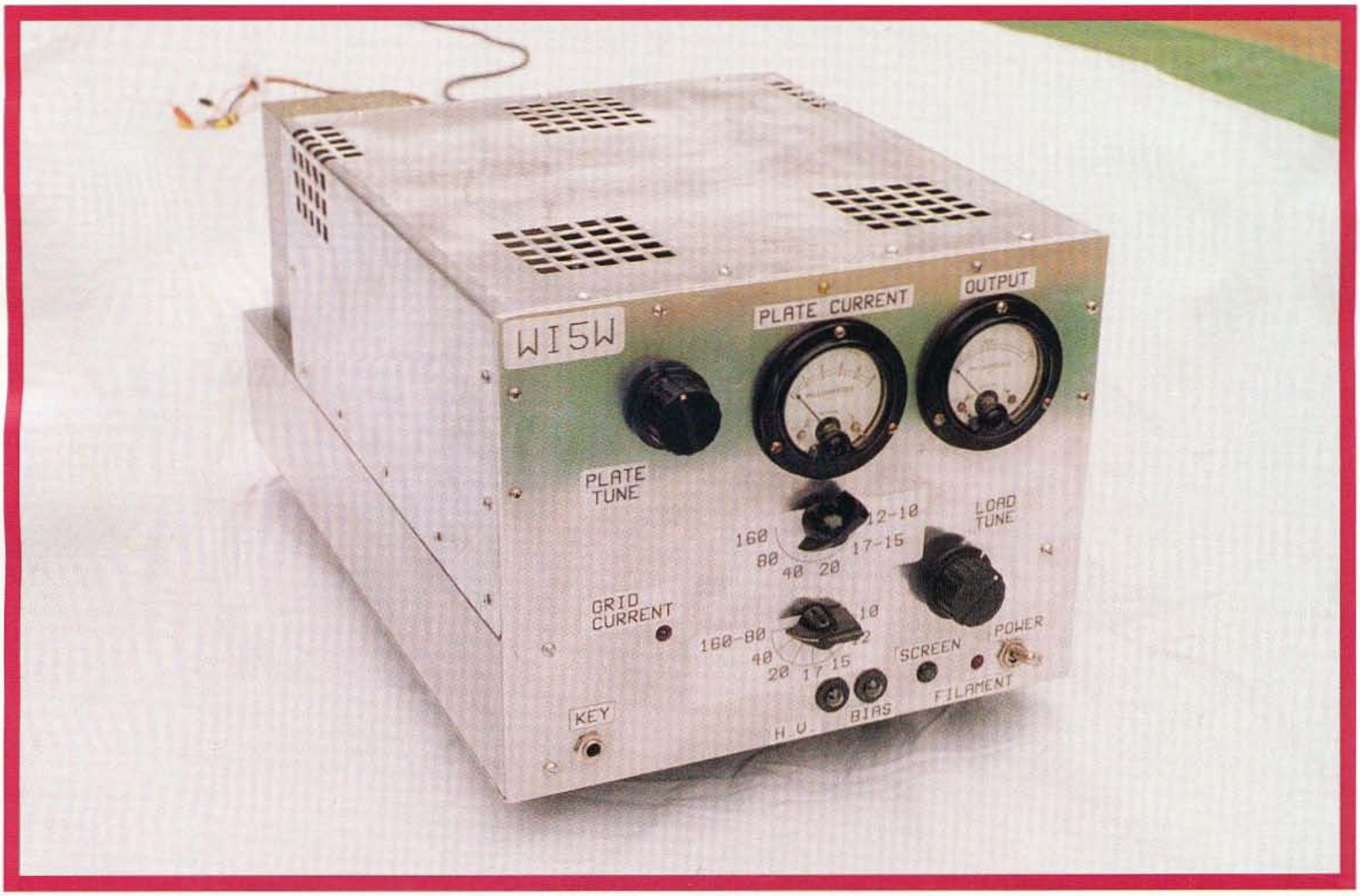
JANUARY 1999
ISSUE #460
USA $3.95
CANADA $4.95

73® Amateur Radio Today

Home-brew this 800W amp



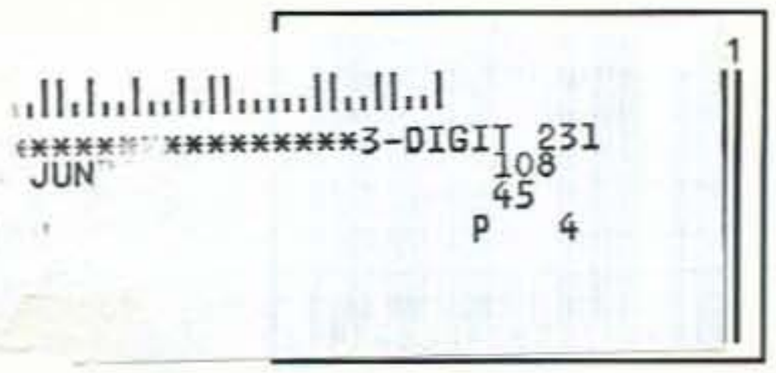
Build a hot 2m vertical!

Switching power supplies

Sunspot Cycle 23

The good news: Best DX ever

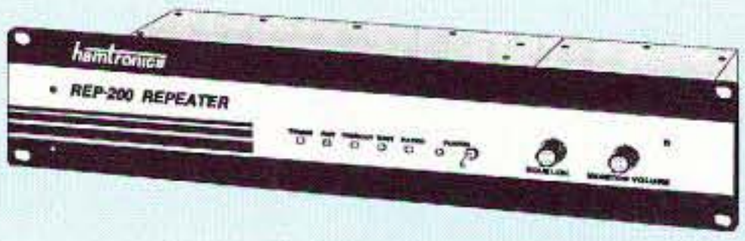
The bad news: Satellite killer?



Get more features for your dollar with our

REP-200 REPEATER

A microprocessor-controlled repeater with full auto-patch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!



- ***kit still only $1095***
- ***factory assembled still only $1295***

50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)

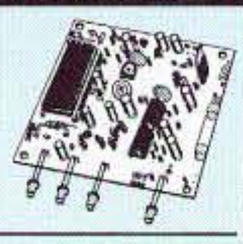
☛ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements! ..... only $100.**

REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. ..... Kit only $795, w&t $1195.

REP-200N Repeater. Without controller so you can use your own. ..... **Kit only $695, w&t $995.**

You'll KICK Yourself If You Build a Repeater Without Checking Out Our Catalog First!



Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.

COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. ..... **only $49/kit, $79 w/t.**

CWID. Traditional diode matrix ID'er. ..... **kit only $59.**

CWID-2. Eprom-controlled ID'er. ..... **only $54/kit, $79 w/t.**

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. ..... **$59/kit, $99 w/t.**

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. ..... **only $99/kit, $149 w/t.**

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. ..... **kit only $99, w/t only $149.**

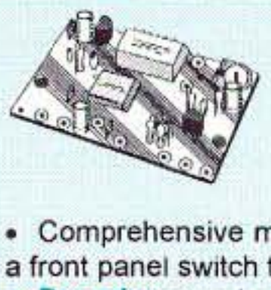
COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. ..... **$379 w/t.**

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. ..... **kit $89.**

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. ..... **kit $79.**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. ..... **kit $49.**

SUBAUDIBLE TONE ENCODER/DECODER



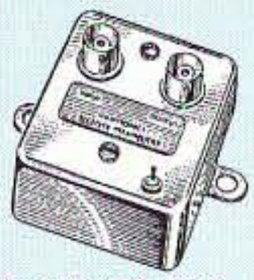
Access all your favorite closed repeaters!

- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- **Decoder** can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver. ☺ **New low prices!**
- **TD-5** CTCSS Encoder/Decoder Kit ..... now only **$29**
- **TD-5** CTCSS Encoder/Decoder Wired/tested **$49**

LOW NOISE RECEIVER PREAMPS

LNG-( ) GaAs FET PREAMP

STILL ONLY $59, wired/tested



- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- *Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.*

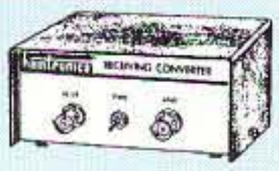
LNW-( ) ECONOMY PREAMP

ONLY $24/kit

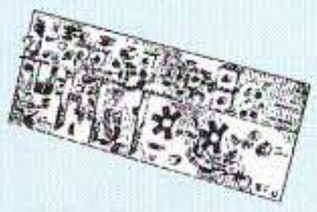
- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- *Available for 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.*

TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!



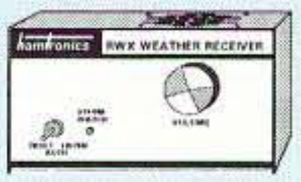
- Convert vhf and uhf signals to & from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvg Conv Kits from $49, wired/tested units only $99.



- Transmitting converters for 2M, 432 MHz.
- Kits only $89 vhf or $99 uhf.
- Power amplifiers up to 50W output.

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!



Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; **all 7 channels** (162.40 to 162.55).

Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

RWX Rcvr kit, PCB only **$79**
RWX Rcvr kit with cabinet, speaker, & AC adapter **$99**
RWX Rcvr wired/tested in cabinet with speaker & adapter **$139**

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!

A very sensitive wideband fm receiver **optimized for NOAA** APT & Russian Meteor **weather fax** on the 137MHz band.

Designed from the start for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter!

Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.

- **R139 Receiver Kit** less case **$159**
- **R139 Receiver Kit** with case and AC power adapter **$189**
- **R139 Receiver w/t** in case with AC power adapter ... **$239**
- Internal PC Demodulator Board & Imaging Software **$289**
- Turnstile Antenna **$119**
- Weather Satellite Handbook **$20**

SYNTHESIZED FM EXCITER & RECEIVER MODULES

We recently introduced new vhf fm exciters and receivers which do not require channel crystals.
NOW... uhf modules are also available!

Exciters and Receivers provide high quality nbfm and fsk operation. Features include:

- ***Dip switch frequency selection.***
- ***Exceptional modulation for voice and ctcss.***
- ***Very low noise synthesizer for repeater service.***
- ***Direct fm for data up to 9600 baud.***
- ***TCXO for tight frequency accuracy in wide range of environmental conditions.***
- ***Next day shipping. No wait for crystals.***

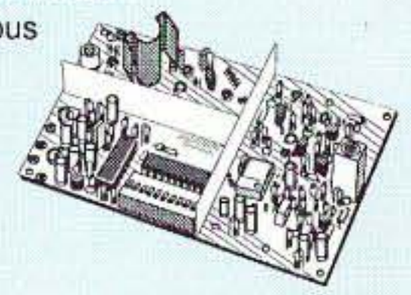
EXCITERS:

Rated for continuous duty, 2-3W output.

T301 VHF Exciter: for various bands 139-174MHz*, 216-226 MHz.

- Kit (ham bands only) ... **$109** (TCXO option $40)
- Wired/tested, incl TCXO... **$189**

T304 UHF Exciter: various bands 400-470 MHz*.



- Kit (440-450 ham band only) incl TCXO ... **$149**
- Wired/tested... **$189**

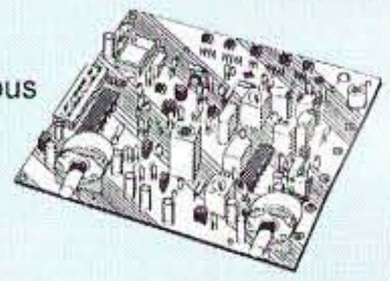
* for gov't & export use.

RECEIVERS:

R301 VHF Receiver: various bands 139-174MHz*, 216-226 MHz.

- **Kit** (ham bands only) ... **only $139** (TCXO option $40)
- **Wired/tested** ... **$209** (includes TCXO)

R304 UHF Receiver: various bands 400-470 MHz*.



- Kit (440-450 ham band only) incl TCXO ... **$179**
- Wired/tested... **$209**

TRADITIONAL CRYSTAL-CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

FM EXCITERS: 2W output, continuous duty.

- **TA51:** for 6M, 2M, 220 MHz ..... **kit $99, w/t $169**
- **TA451:** for 420-475 MHz. ..... **kit $99, w/t $169**
- **TA901:** for 902-928 MHz, (0.5W out) ..... **w/t $169**

VHF & UHF POWER AMPLIFIERS.

Output levels from 10W to 100W..... **Starting at $99**

FM RECEIVERS:

Very sensitive – 0.15µV. **Superb selectivity,** >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch. For 46-54, 72-76, 140-175, or 216-225 MHz. ... **kit $129, w/t $189**

- **R144 RCVR.** Like R100, for 2M, with helical resonator in front end..... **kit $159, w/t $219**
- **R451 FM RCVR,** for 420-475 MHz. Similar to R100 above. kit $129, w/t $189.
- **R901 FM RCVR,** 902-928MHz ..... **$159, w/t $219**

WWV RECEIVER

Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation. **Very sensitive and selective** crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.

- **RWWV Rcvr** kit, PCB only **$59**
- **RWWV Rcvr** kit with cabt, spkr, & 12Vdc adapter **$89**
- **RWWV Rcvr** w/t in cabt with spkr & adapter **$129**

Buy at low, factory-direct net prices and save!
For complete info, call or write for complete catalog.
Order by mail, fax, email, or phone (9-12, 1-5 eastern time).
Min. $6 S&H charge for 1st lb. plus add'l weight & insurance.
Use Visa, MC, Discover, check, or UPS C.O.D.

See SPECIAL OFFERS and view complete catalog on our web site:
www.hamtronics.com
email: jv@hamtronics.com

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ASTRON CORPORATION
9 Autry
Irvine, CA 92618
(949) 458-7277 • Fax (949) 458-0826 www.astroncorp.com

SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0

SS-25M With volt & amp meters
SS-30M With volt & amp meters

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

• LOW PROFILE POWER SUPPLY

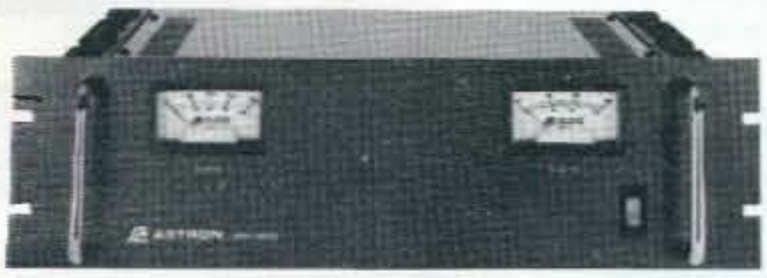
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• 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
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	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-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-70A	•		57	70	6 × 13¾ × 12⅛	48

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
RS-70M	57	70	6 × 13¾ × 12⅛	48

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
VS-70M	67	34	16	70	6 x 13¾ x 12⅛	48
• 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	Colors Gray	Colors Black	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
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

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

CIRCLE 16 ON READER SERVICE CARD

HANDHELDS

NEW with MORE POWER IC-T2H

2 Meter Single Bander • **6W @ 9.6 Volts • 500 mW Audio • 8 Programmable Keys Stenciled w/ Default Settings for Easier Operation** • Built-In Tone Squelch with Pocket Beep and Tone Scan • 40 Memory Channels • Cloning Capabilities • Uses 8 "AA" Ni-Cd (included) or Alkaline Batteries • Affordable • 2.3"(W), 5.5"(H), 1.3"(D), 14.8 oz

IC-T22A/IC-T42A (2M/440 MHz)

Single Bander • Fun, Shirt Pocket Small and Easy to Use • Large Alphanumeric Display • Wide Receive Coverage, Including Air Band • 5 W @ 13.5 V (3 W Out of Box) • Air Band Receive • 80 Memory Channels (40 w/Alpha Display) • 2.3"(W), 4.3"(H), 1.1"(D), 10.9 oz

IC-T7AHP

New 7 Watt IC-T7H* coming soon

2 Meter/440 MHz Dual Bander • Dual Bands at a Single Bander Size & Price • Very Easy to Use– No Function Key • Works One Band at a Time, Switch Between Bands with One Touch of the Band Key • Now 4 W (2M)/3 W (440) Out of the Box with BP-173 • "Intuitive" Help Display • CTCSS Encode/Decode• Very Affordable • 2.5"(W), 4.8"(H), 1.1"(D), 11.3 oz

IC-Q7A

2 Meter/440 MHz Dual Bander • Extended Rx 30-1300 MHz (cellular blocked), Airband Receive Broadcast FM and AM Receive (most TV stations, too) • 300 Mw Transmitter • 200 Memories • Uses "AA" Alkaline or Ni-Cd Batteries • Rugged Construction • Tone Squelch • Easy to Use • Splash Resistant • 6-25 KHz Channel Step • Full Scanning Capability • Receiver Attenuator • Power Save Feature • 2.3"(W), 3.4"(H), 0.98"(D) (Shown with optional antenna)

IC-W32A

2 Meter/440 MHz Dual Bander • 5 W Out of the Box • No Function Key • PC Programmable • 200 Memories with Alphanumeric Display , Messaging & Paging • "Intuitive" Help Display • Backlit Display and Keypad • Wide Band RX (Including Air Band) • V/V, V/U, U/U Operation with VHF/UHF Tuning Knob Exchange • Encode/Decode • PC/Radio-to-Radio Cloning • 2.2"(W), 4.9"(H), 1.2"(D), 12.0 oz

IC-T8A

6 Meter/2 Meter/440 MHz Tri Bander Handheld • Worlds Smallest! • Super Thin Profile/Lightweight Design • Up to 5 Watts Power on All Bands (13.5 V DC) • 4.5 Watts Out of Box with Supplied BP-200 Battery • One-Touch Band Switching • Ni-MH Powered! • RX (MHz): 50-54 (6 meters), 118 - 174 (2 meters), 400 - 470 (440 MHz) Broadcast FM and AM Receive (most TV stations, too) • Airband Receive • 123 Memory Channels with 10 Scan Edges and 1 Call for Each Band • MIL SPEC 810 C/D/E • Tone Squelch with Pocket Beep • Backlit Display with Timer • Built in Guide Function • JIS Grade 4 Water Resistance • Wall Charger Included • DTMF Encoder with 9 DTMF Memories • Handheld to Handheld Cloning Capability or PC Programming Capability** • 2.3 (W), 4.3 (H), 1.2 (D), 9.9 oz

MOBILES

IC-2100H

Optional Infrared Wireless Mic

*The HM-90 infrared optional wireless mic works with the new IC-2100H, IC-207H** and the more advanced IC-2710H. Enjoy cable-free operation on the GO!*

2 Meter • 55/10/5 Watts (selectable) • TX 144-148 MHz • RX 136-174 MHz† • 75 db/93 db IMD • 113 Memory Channels • Heavy Duty, One Piece, Die Cast Aluminum Chassis • MIL SPEC 810 C/D/E Shock/Vibration • Front Panel Programmable Alphanumeric Display • PC or Radio to Radio Cloning** • DTMF Microphone (HM-98S) • CTCSS Encode/Decode Standard – 50 Tone Frequencies • Independently Programmable Tx/Rx • Tone Scan • Auto Repeater with Busy Lockout • Priority Watch (3 types) • 5.5"(W) x 1.6"(H) x 7.1"(D), 2 lb 10 oz

IC-2710H

2M/440 MHz Advanced Dual Bander • 2M (50 W)/440 MHz (35 W) • Detachable Control Panel** • Fast Scanning • 220 Memory Channels • PC Programmable • CTCSS Encode (decode optional) • RF Attenuator • 8 DTMF Memory Switches • v/v, u/u Simultaneous RX • Built-In Duplexer • 3 Selectable Power Levels: 50 (35), 10, 5 • 5.5"(W), 1.6"(H), 8.4"(D), 3.1 lb

IC-207H

2M/440MHz Dual Bander • 2M (45 W)/440 MHz (35 W) • Super Compact Detachable Control Panel** with Big Keys, Big Knobs and a Big Display • Work One Band at a Time • 9600 Baud Ready • Wide Band RX (Includes Air Band) • CTCSS Encode/Decode • Very Affordable • 5.5"(W), 1.6"(H), 8.1"(D), 2.6 lb

BASE STATIONS

IC-821H

2M/440 MHz Advanced Satellite & Digital Base Station • All Modes • Easy to Use! • Continuous Adjustable Transmit Power • Sub Band Transmit • 9600 Full Compatibility Out of the Box • 160 Memories • Noise Blanker & IF Shift on Main & Sub Bands (independent main/sub RX) • Built-In Electronic Keyer • Satellite Tracking with Doppler Correction • Compact! 9.5"(W), 3.7"(H), 9.4"(D), 11.0 lb

"By far the easiest to use satellite radio on the market today. In less than 10 minutes after unpacking the 821H, I was on the air at 9600 baud with KO-23"
– Michael Wyrick, N4USI, AO-27
Control Operator

HEAR & THERE

Solar Cycle 23 is here. Now's the best time to upgrade your license... or your shack. When you upgrade to General Class or higher, mail us a copy of your amateur radio license. **ICOM is giving away one IC-706MKII each month,** between April 1998 and March 1999. For complete details, visit your authorized dealer today.

UPGRADE 1998 • HEAR comes the Sun with ICOM

ICOM®

www.icomamerica.com

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73 Amateur Radio Today

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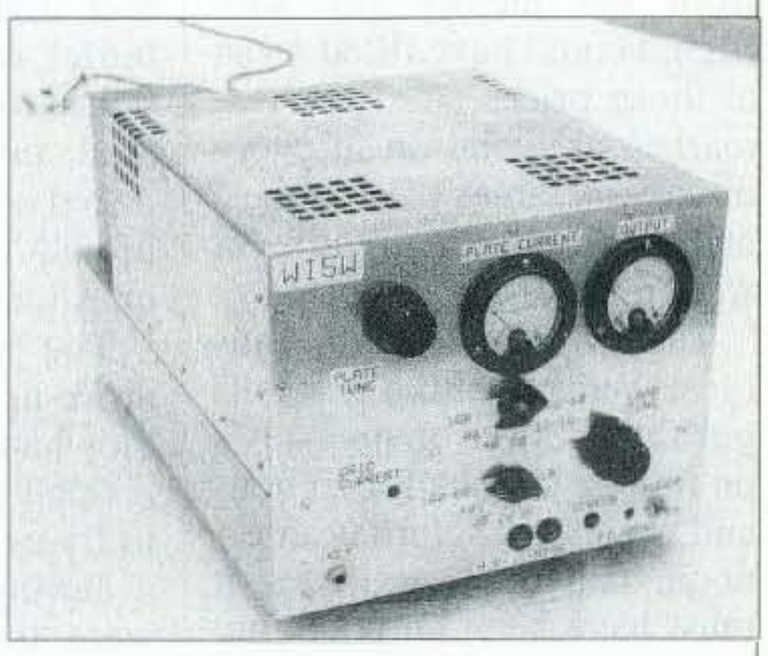

On the cover: This monster awaits you on page 10. Photo by WI5W. Don't forget: You, too, can win a little fortune and a lot of fame by submitting your cover photo candidate—with or without article. You mean you couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Peoria!

Yep, Wayne Green played Peoria again! And I had a great time. Too bad if you were within driving distance and missed it. The Peoria Superfest '98 was a humdinger. If I'd driven there my car would have been packed to the gills with some of the great stuff I saw being sold. Lordy! Video cameras for $20, great bargains on coax, Apple II™ computers with monitors that looked like they were right out of the carton from the factory for $30. Sigh. I could have filled a van at those prices. And the flea market stretched on in every direction. Tables of old tubes, and anything you could ever want in parts.

The Wayne Green fans (yes, there are still a few left) got their ration of my views on things. I spoke for an hour and a half on Saturday afternoon, and then again for it must have been an hour (but who was counting?) at the banquet that evening. Then for another hour Sunday morning.

The hamfest was held at the local fairgrounds, with the exhibits and forums being in the usual fairgrounds exhibit buildings. On Sunday, right in the middle of my talk, the rain let loose. It sounded like someone dropping a few tons of lead shot onto the tin roof. It did this a couple of times and then went away. Later I found where the storm had gone, as Chicago's O'Hare Field was closed down, delaying my trip back to New Hampshire by three and a half hours. The terminal at O'Hare was wall-to-wall passengers waiting out the delays. The lines at McDonald's never got under 15 deep, with hundreds of people sitting on anything handy, working diligently on reducing their life spans with burgers and fries.

When word got out that I was going to be coming to Peoria, the folks at the Rockford (Illinois) club went to lengths to get me to stop off there and give a talk. Instead of flying to Chicago and then on to Peoria, they picked Sherry and me up in Chicago and drove us to Rockford. We had dinner at a wonderful buffet restaurant and then I talked to the club. And talked. And talked. Well, no one dozed off, and the hands were up all over the place with questions.

The next morning they drove us to the airport, where they had hired a Mooney (it's a small plane, not a religion) to fly us to Peoria.

During the whole trip we were treated like royalty. I could get used to that. At Peoria they even had distilled water for me at both the Friday night dinner with a few club members and at the Saturday banquet.

I talked about the day that Khrushchev saved amateur radio. Yes, I was right there when it happened! And I talked about the greatest catastrophe in the history of the hobby. I also talked a lot less than I'd have liked about my approach to answering the FCC's questions about restructuring the hobby. Well, I kept getting off on tangents, just like I do with my editorials.

Basically, I'd like to see the FCC have a 5 wpm test for all classes of license. Second, I'd like to see all classes of license done away with and there'd be just one license for everyone. This silly business of making us memorize a bunch of Q&As to pass a test for upgrading doesn't make any sense to me. That doesn't teach anyone anything. You learn mainly by doing, so we should make the entry into the hobby easy and then do our best to get as many hams as possible interested in packet, RTTY, slow scan, satellites, and so on. If we get 'em into DXing they'll be learning about antennas. It's about time we got some pioneering done with HF packet anyway. We should be developing ways to get that creepy-crawly stuff up to speed. Ditto RTTY. Oh well, RTTY was 60 wpm when I got interested 50 years ago — now it's up to a mighty 100, the last I heard. Snore. Our computers can discuss things at 50,000 wpm. That's even faster than we can read — although, when I get the time, I have a speed reading course here that guarantees I'll be able to read 25,000 wpm, and with better retention than I have now.

License Drop

The August 1998 FCC license figures compared to 1997 show a continuing drop in Techs upgrading to General and Advanced licenses. There was a drop of 26% in upgrades to General and a 28% drop in upgrades to Advanced. The 1997 figures *vs.* 1996 showed only a 10% drop in General Class upgrades, so the drop is escalating. The overall decrease in upgrades has gone from 17.8% in 1996 to 22.2% in 1997 and 27.3% in 1998.

The numbers may not mean much to you until you plot them on graph paper. They form a fairly straight line, indicating that unless something changes, 1999 will give us a 33% further drop, 2000 a 39% drop over that, and 2001 a 45% drop over that.

The Bad News

The September FCC license figures show an even faster drop in new licenses, with an overall loss of licensed hams. General licenses dropped by 2953 from a year ago. Advanced dropped 2459 and Novices by 7678! The only significant increase was Techs, by 11,550. This tells us that a bunch of Generals and Advanced have dropped out of the hobby and not even bothered to renew their tickets. Others, of course, died. But, worst, the Techs are *not* upgrading. It just isn't happening.

Not to be a pest, but the next time an ARL official shows his face at your club you might ask him what in hell the Little League plans to do about this situation. I sure haven't heard anything about any plans, but then what do I know? No, that missing R *isn't* a typo. The day of message relaying is long gone, so let's forget the Relay part of their name, which is as in tune with the times as CW. Yeah, packet *is* relaying, of a sort. But show me where the ARL is a big packet supporter.

In the 1920s, when we were down on 100 meters and using spark, the only way to get a message very far was by relaying it. Then came CW and the League message handling nets which solicited unimportant messages and relayed them for the fun of it, with involved hams making like small Western Union stations. I used to enjoy how long it took messages to get through this system, and how bungled they'd get in the process.

When RTTY came along

Continued on page 6

RAMSEY

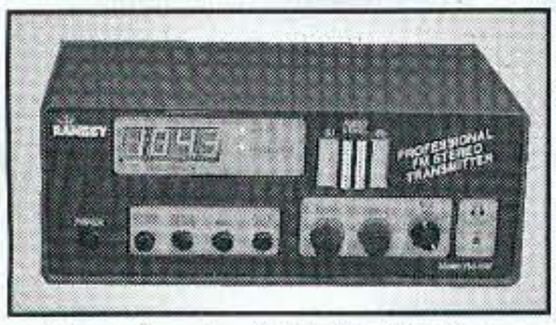
World's Smallest TV Transmitters

We call them the 'Cubes'.... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies- that's a nickel in the picture!

Transmits color or B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Audio units include sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Any of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air!

C-2000, Basic Video Transmitter Cube.....$89.95
C-3000, Basic Video and Audio Transmitter Cube.....$149.95
C-2001, High Power Video Transmitter Cube.....$179.95
C-3001, High Power Video and Audio Transmitter Cube.....$229.95

Super Pro FM Stereo Radio Transmitter

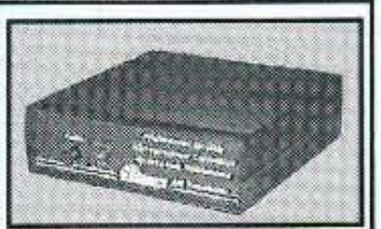


A truly professional frequency synthesized FM Stereo transmitter station in one easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set frequency easily with the Up/Down freq buttons and the big LED digital display. Plus there's input low pass filtering that gives great sound no matter what the source (no more squeals or swishing sounds from cheap CD player inputs!) Peak limiters for maximum 'punch' in your audio - without over modulation, LED bargraph meters for easy setting of audio levels and a built-in mixer with mike and line level inputs. Churches, drive-ins, schools and colleges find the FM-100 to be the answer to their transmitting needs, you will too. No one offers all these features at this price! Kit includes cabinet, whip antenna and 120 VAC supply.

We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

FM-100, Professional FM Stereo Transmitter Kit.....$299.95
FM-100WT, Fully Wired High Power FM Transmitter.....$429.95

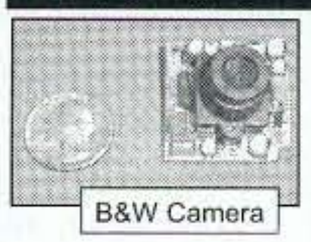
AM Band Radio Transmitter

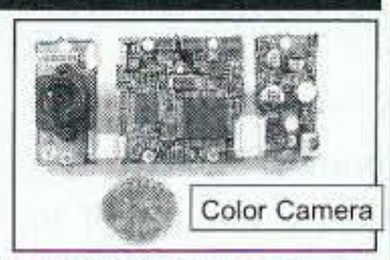


Ramsey AM radio transmitters operate in the standard AM broadcast band and are easily set to any clear channel in your area. Our AM-25, 'pro' version, fully synthesized transmitter features easy frequency setting DIP switches for stable, no-drift frequency control, while being jumper setable for higher power output where regulations allow. The entry-level AM-1 uses a tunable transmit oscillator and runs the maximum 100 milliwatts of power. No FCC license is required, expected range is up to 1/4 mile depending upon antenna and conditions. Transmitters accept standard line-level inputs from tape decks, CD players or mike mixers, and run on 12 volts DC. The Pro AM-25 comes complete with AC power adapter, matching case set and bottom loaded wire antenna. Our entry-level AM-1 has an available matching case and knob set for a finished, professional look.

AM-25, Professional AM Transmitter Kit.....$129.95
AM-1, Entry level AM Radio Transmitter Kit.....$29.95
CAM, Matching Case Set for AM-1.....$14.95

CCD Video Cameras





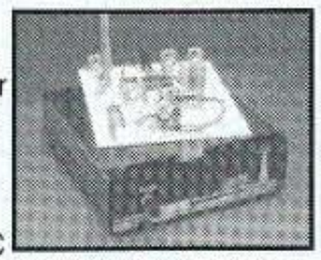
If you're looking for a good quality CCD board camera, stop right here! Our cameras use top quality Japanese Class 'A' CCD arrays with over 440 line line resolution, not the off-spec arrays that are found on many other cameras. You see, the Japanese suppliers grade the CCDs at manufacture and some manufacturers end up with the off-grade chips due to either cost constraints or lack of buying 'clout'. Also, a new strain of CMOS single chip cameras are entering the market, those units have about 1/2 the resolution and draw over twice the current that these cameras do - don't be fooled! Our cameras have nice clean fields and excellent light sensitivity, you'll really see the difference, and if you want to see in the dark, the black & white models are super IR (Infra-Red) sensitive. Our IR-1 Illuminator kit is invisible to the human eye, but lights the scene like a flashlight at night! Color camera has Auto White Balance, Auto Gain, Back Light Compensation and DSP! Available with Wide-angle (80º) or super slim Pin-hole style lens. They run on 9 VDC and produce standard 1 volt p-p video. Add one of our transmitter units for wireless transmission to any TV set, or add our IB-1 Interface board for audio sound pick-up and super easy direct wire hook-up connection to any Video monitor, VCR or TV with video/audio input jacks. Cameras fully assembled, including pre-wired connector.

CCDWA-2, B&W CCD Camera, wide-angle lens.....$99.95
CCDPH-2, B&W CCD Camera, slim fit pin-hole len.....$99.95
CCDPH-2, Color CCD Camera, wide-angle lens.....$149.95
IR-1, IR Illuminator Kit for B&W cameras.....$24.95
IB-1, Interface Board Kit.....$24.95

FM Stereo Radio Transmitters

Microprocessor controlled for easy frequency programming using DIP switches, no drift, your signal is rock solid all the time - just like the commercial stations. Audio quality is excellent, connect to the line output of any CD player, tape deck or mike mixer and you're on-the-air. Foreign buyers will appreciate the high power output capability of the FM-25; many Caribbean folks use a single FM-25 to cover the whole island! New, improved, clean and hum-free runs on either 12 VDC or 120 VAC. Kit comes complete with case set, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized FM Stereo Transmitter Kit.....$129.95



A lower cost alternative to our high performance transmitters. Offers great value, tunable over the 88-108 MHz FM broadcast band, plenty of power and our manual goes into great detail outlining aspects of antennas, transmitting range and the FCC rules and regulations. Connects to any cassette deck, CD player or mixer and you're on-the-air, you'll be amazed at the exceptional audio quality! Runs on internal 9V battery or external power from 5 to 15 VDC. Add our matching case and whip antenna set for a nice finished look.

FM-10A, Tunable FM Stereo Transmitter Kit.....$34.95
CFM, Matching Case and Antenna Set.....$14.95
AC12-5, 12 Volt DC Wall Plug Adapter.....$9.95

RF Power Booster

Add some serious muscle to your signal, boost power up to 1 watt over a frequency range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM Stereo transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat, professionally finished look, add the optional matching case set.

LPA-1, Power Booster Amplifier Kit.....$39.95
CLPA, Matching Case Set for LPA-1 Kit.....$14.95
LPA-1WT, Fully Wired LPA-1 with Case.....$99.95

Treasure Finder Kit

Search for buried treasure at the beach, backyard or park. This professional quality kit can detect metal at a depth of up to 6 inches. Easy to use, just listen for the change in tone as you 'sweep' the unit across the surface - the larger the tone change - the larger the object. Has built-in speaker or earphone connection, runs on standard 9 volt battery. Complete kit includes handsome case, rugged PVC handle assembly that 'breaks down' for easy transportation and shielded Faraday search coil. Easy one evening assembly. This nifty kit will literally pay for itself! That guy in the picture looks like he found something - what do you think it is - gold, silver, Rogaine, Viagra? You'll have fun with this kit.

TF-1, Treasure Finder Kit.....$39.95

Binocular Special

We came across these nice binoculars in an importers close-out deal. Not some cheap in-line lens jobs, these beauties have roof prisms, a super nice rubber armored housing over light weight aluminum. 10 x 25 power with fully coated optics. Includes lens cleaner cloth, neck lanyard and nice carry case. For extra demanding use in bright sun, choose the EX module with ruby coated Objective lens. First quality at a close-out price! We've seen the exact same units with the 'Bushnell' name on them being sold for $30 more!

BNO-1, Binoculars and case.....$24.95
BNO-1EX, Ruby Coated Lens Binoculars and case.....$29.95

Speech Descrambler

Decode all that gibberish! This is the popular descrambler / scrambler that you've read about in all the Scanner and Electronic magazines. Speech inversion technology is used, which is compatible with most cordless phones and many police department systems, hook it up to your scanner speaker terminals and you're in business. Easily configured for any use: mike, line level and speaker output/inputs are provided. Also communicate in total privacy over telephone or radio, full duplex operation - scramble and unscramble at the same time. Easy to build, all complex circuitry contained in new custom ASIC chip for clear, clean audio. Runs on 9 to 15VDC. Our matching case set adds a professional look to your kit.

SS-70A, Speech Descrambler/Scrambler Kit.....$39.95
CSS, Custom Matching Case and Knob Set.....$14.95
SS-70AWT, Fully Wired SS-70A with Case.....$79.95
AC12-5, 12 Volt DC Wall Plug Adapter.....$9.95

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ORDERING INFO: Satisfaction Guaranteed. Examine for 10 days, if not pleased, return in original form for refund. Add $6.95 for shipping, handling and insurance. Orders under $20, add $3.00. NY residents add 7% sales tax. Sorry, no CODs. Foreign orders, add 20% for surface mail or use credit card and specify shipping method.

Number 6 on your Feedback card

LETTERS

From the Ham Shack

Gene Lynch WA7ZRA, Box 567, Boulder MT 59632. Hi, Wayne: I suspect you don't remember me. I am the person who built the Karlson speaker cabinets about twenty years ago. I still have them and they still perform better than anything I've heard since. I still have the plans, and copies are available for anyone who wants them. Just send a large SASE. Make that two stamps.

This is a good deal! There is no speaker enclosure on the market today that can equal the Karlson. — Wayne.

Bill Nielsen KØQHF. As a fellow ham who got into reading *73 Magazine* back with issue number 1, I enjoy reading your editorials. In a recent editorial you touched on the subject of religion, so I thought I would tell you about three very interesting books I have read on the subject. You may want to read them, as they show the modern-day churches for what they are. The books: *The Forgotten Books of Eden*, Bell Publishing Company; *The Lost Books of the Bible*, also published by Bell; *Deceptions and Myths of the Bible*, by Lloyd Graham, also published by Bell. Give 'em hell, Wayne. You may not please everyone, but you sure as heck get them to think a little.

Maybe. — Wayne.

Darryl Jones VK2YDJ. Wayne, I enjoyed your *Sightings* interview and I always look forward to your Never Say Die. Perhaps with Y2K now becoming the issue it truly is, this is an excellent moment to lobby hard to have Morse dropped to bring in more amateurs and open the HF to all existing hams. We may need all the backup communication we can get come Jan. 1, 2000. Maybe you can get the hams to lobby their senators and congressmen. Keep up the good work.

At the speed things work in Washington, we should have started this push five years ago. We'll all see how Y2K plays out. More and more experts on the subject are predicting chaos. — Wayne.

Ken Dupuis WN2SQC. In all honesty, I enjoy *73 Magazine* very much and have for over three decades. The part I enjoy most is your editorials, I mean it, and I actually pull back issues to read for the nostalgia effect, but mainly for your editorials. It's like a refresher course in common sense. I was also pleased to see that ICOM America got its senses back and renewed their effort to support the best ham magazine in print. As you have pointed out so often, it takes advertiser dollars to print reader information. More bucks, more pages. Now I'm glad my new rig is an ICOM. I was also going to get a new ICOM for the XYL but the guy in the ham store wouldn't trade. After thirty-some years of editorial brainwashing I finally took your advice to heart. I quit my high paying, do nothing government job with the unbelievable bennies and used my collective knowledge (?) to advance my station in life. Unfortunately, it didn't work. I am now unemployed, broke, living in my car, and will have to pick up empty beer cans to pay for the stamp on this envelope — thanks a lot. The good news is that the beer cans are all over the floor so it's pretty easy to collect enough for a stamp. The bad news is that I can't bend over my fat gut to pick them up, so I will have to keep the next six-pack of empties handier. I built a bio-electrofryer and tried it on the family cat. Wow, no more fleas and no more cat. My old tired eyes thought it read 27 volts output when it was 270 volts. Oh well, I didn't like the cat much anyway. All kiddin' aside, keep up the good work! 73

NEVER SAY DIE

continued from page 4

in 1948 the ARL fought it fiercely. It took years of fighting the League to get the FCC to okay the use of RTTY on the HF bands. They pulled every trick they could think of. Well, they were afraid it would put their old CW network out of business with the RTTY ability to handle traffic at 60 wpm with no errors.

I think I really scared them when I set up an RTTY station on 42nd Street a half block from Times Square in Manhattan one Christmas and handled thousands of Christmas messages to our troops overseas. I made the cover of *CQ* magazine, with Bill Halligan W9AC and Faye Emerson and Skitch Henderson. I also made the Brass Pounder's League. Maybe they thought my teletype machine had brass keys.

It is the League's job to get the hobby going again. Prizes for anyone who can figure out how to wake up the directors and get them to do what they've been elected to do.

Doom!

Art Bell (W6OBB) had "Dr. Doom," Ed Dames, on his show again. It seems like Dames and Scallion (K1BWC) are trying to outdo each other in predicting doomsday scenarios. Dames said that the Y2K computer bug is not going to be a major problem ... because most of us will be dead before then. Well, it's nice that we can stop worrying about Y2K.

Dames has a group of "remote viewers" who have been busy checking out the future to see what it holds. Since scientific research has proven beyond any question that in some way we *are* able to predict the future (as I've reported before ... have you read *The Conscious Universe* by Radin yet?), I can't dismiss Dames' predictions lightly. Dames started out in this field with a group that was doing remote viewing for the military. He is now selling a course which teaches anyone interested how to do it. Golly, I wish I had the time to check that out!

Anyway, Dames is predicting that a major solar flare next April will fry most of us. Well, the Sun has been acting very strange lately, with increased UVs burning up crops and bewildering bees so they can't pollinate plants.

Dames also predicted that this fall the stock market is going to crash ... that stock markets all around the world are going to crash. Considering how volatile they are, and the weakness of their foundation, this isn't a far reach. Like banking systems, where over 90% of the money is lent out, even a small run on the banks can crash the whole system.

Look at what's happened with the Tokyo market, which was artificially built up, based on ridiculously high land values. When the air went out of that balloon drastic measures were called for ... and *not* implemented. So the fundamental weakness of the Japanese market is still a potential disaster which could bring down one market after another around the world. Remember, the Japanese have hundreds of billions invested in American companies and our government securities. A crash in Japan could result in frantic calls to liquidate these investments and, like our banks, there isn't any money there, just debt. All it takes is a small movement to get out of the market and to cash in government securities, and poof, the whole debt system can crash. And since 10 million or so people tune in to the

Continued on page 56

MFJ 1.8-170 MHz SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

***New** MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . easy access battery panel . . . smooth reduction drive tuning . . .*

***The** world's most popular SWR analyzer just got incredibly better and gives you more value than ever!*

MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning, easy access battery panel and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

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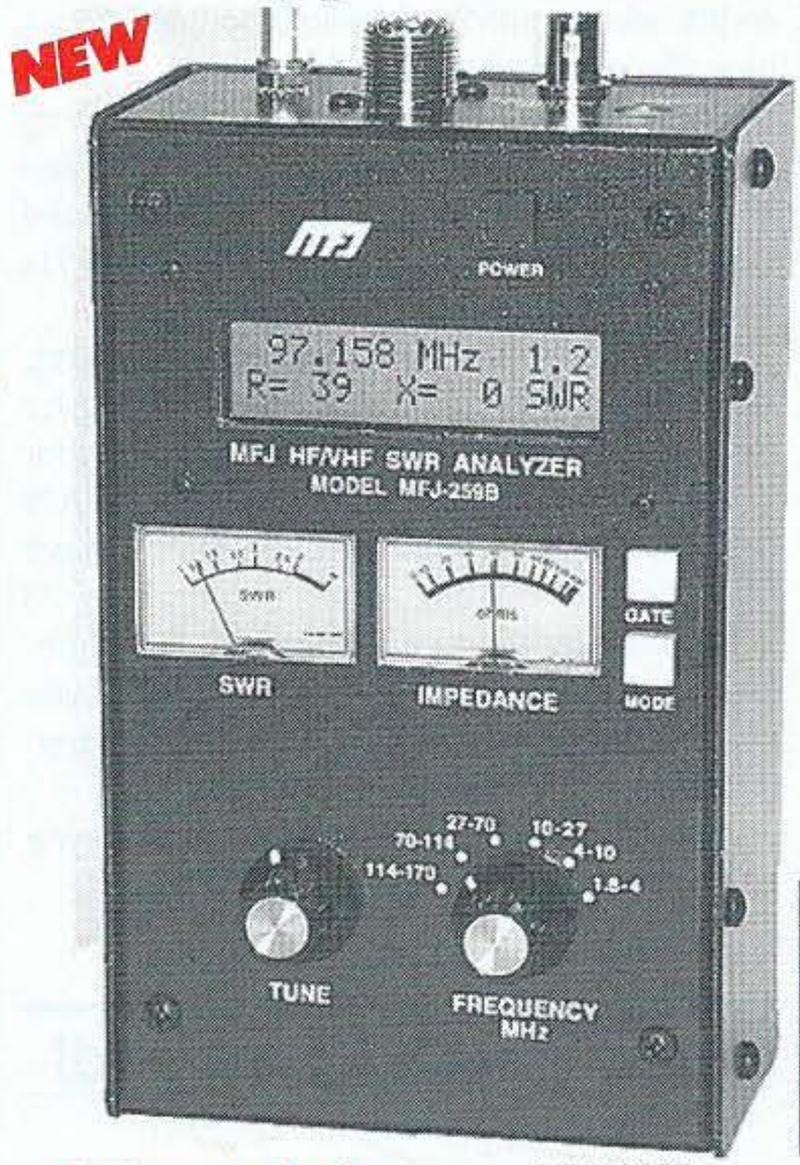

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Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment at an accredited university, college, or technical school. The awards range from $500 to $2500, with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs. Clubs, especially those in Delaware, Florida, Maryland, New Jersey, Ohio, Pennsylvania, Texas, Virginia and Wisconsin, are encouraged to announce these opportunities at their meetings, in their club newsletters, during training classes, on their nets and on their World Wide Web pages.

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Wayne on RAIN

Well-known (possibly notorious) amateur radio columnist and publisher Wayne Green W2NSD/1 has agreed to host a free-form op-ed feature for RAIN, the Radio Amateur Information Network, on its Web site [www.rainreport.com]. Dubbed "Wayne Green Pontificates" by Green himself, this weekly unscripted diatribe will provide an audio outlet for Green's diverse opinions, that, as he put it, "will range from amateur radio to good health, wealth, and wisdom." According to Executive Producer Hap Holly KC9RP, "Most of us in the blind and visually impaired community have had limited access to Green's provocative and thought-provoking writings. Now anyone on the Internet with Real Audio 3.0 capability can hear him expound weekly on the topic(s) of his choice. I've given him free rein, editing nothing but my voice; however, I have suggested he keep his chats to 10 minutes or less. How delighted we are that Wayne Green Pontificates (WGP) is Wayne's first audio column!"

Updating Fridays at [www.rainreport.com], WGP is licensed to Bohnhoff MediaCasting for Internet distribution and archiving. Intended for Web listening only, WGP is the brainchild of RAIN webmaster Mark Bohnhoff WB9UOM. "I have been benefiting from Wayne's column in *73 Magazine* ever since I developed a health problem a few years ago. I am pleased that Wayne has agreed to take the time to share his expertise with the Internet listener."

As Hap Holly says, "We are delighted Wayne has decided to get his feet wet with RAIN."

New Element Discovered!

The heaviest element known to science was recently discovered by GM research physicists. The element, tentatively named Administratium, has no protons or electrons and thus has an atomic number of 0 (zero). However, it does have one neutron, 125 assistant neutrons, 75 vice neutrons, and 111 assistant vice neutrons. This gives it an atomic number of 312. These 312 particles are held together by a force that involves the continuous exchange of meson-like particles called morons.

Since it has no electrons, Administratium is inert. However, it can be detected chemically as it impedes every reaction that it comes in contact with. According to the discoverers, a minute amount of Administratium caused one reaction to take over four days to complete when it would have normally occurred in less than one second. Administratium has a normal half-life of approximately three years, at which time it does not actually decay but instead undergoes a reorganization in which assistant neutrons, vice neutrons, and assistant vice neutrons exchange places. Some studies have shown that the atomic mass actually increases after each reorganization.

Research at other laboratories indicates that Administratium occurs naturally in the atmosphere. It tends to concentrate at certain points such as government agencies, large corporations, and universities, and can usually be found in the newest, best appointed, and best maintained buildings.

Scientists point out that Administratium is known to be toxic at any detectable level of concentration and can easily destroy any productive reaction where it is allowed to accumulate. Attempts are being made to determine how Administratium can be controlled to prevent irreversible damage, but results to date are not promising.

From Winter 1998's *Passband*, newsletter of the Onslow ARC, Jacksonville NC, Robert DeVega Jr. KF4VOM, editor.

Digital Weather Reporting on the Horizon

As anybody involved in the emergency and public service aspects of ham radio knows, the participation level that we'd like to see is not always there ... shortage of personnel is a real problem. Aside from that, more people can often help alleviate a problem, but it's no guarantee of a full "fix." After all , there are only so many people who can sit at a net control desk at the National Weather Service, and there are only so many voice repeaters that can be used in reporting.

Packet radio has been contemplated as an addition to our system [in Green Bay, Wisconsin] for the past few years, as a way to handle the less critical traffic with some degree of automation. While these reports still are important to us, they are not of critical time-value in nature. The report of a tornado, funnel aloft, or wall cloud certainly requires the speed that only voice reporting can provide. After-the-fact damage reports or heavy rainfall reports can be passed on a little later. There are also instances where a net control operator cannot instantly appear at the NWS to operate a net.

The Wisconsin packet radio network is reaching the stage where it will soon be practical for secondary or absentee reporting. The system that will be in place will have a computer operational 24 hours a day, with the ability to give information to users and get information from them. The user interface will be (or at least resemble) a BBS. It will be configured to print out any reports at any time, so that meteorologists will be able to simply tear off the report and keep it on file. There will be no direct interaction with the meteorologists; after all, even if one were available and licensed, he or she cannot operate because he or she is on duty and being paid. There will also be little interaction with the Net Control Operator, mostly because he or she will be actively operating the voice net. Keyboard chats with the NCO will not be needed to file a report.

Another feature of this system will be the ability to get timely information concerning the exact nature of any watches or warnings that have been posted for the Central Warning Area that we cover. This will allow county NCOs to get updated information without interrupting the flow of the net.

From an article in *The Wisconsin Packeteer*, Andy Nemec KB9ALN, editor; included in *Badger State Smoke Signals*, July 1998, Jim Romelfanger K9ZZ, acting editor. 73

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As many hams have discovered, building a vacuum tube-based RF power amplifier is still a good way to save money while creating a valuable station accessory. This project embodies a number of interesting ideas.

The amplifier described here allows me to substantially boost the output power of my HF station, yet my out-of-pocket expenses were a fraction of what I'd have needed to buy a commercial equivalent. I used all kinds of money-saving strategies.

On-the-air operation has resulted in comments of "very good" and "excellent" SSB signal quality. Some of the ideas I used in designing this amplifier may not appeal to everyone, but perhaps you will find one or more of these techniques helpful in your own project.

One money-saving strategy involves something other than the amplifier itself. Specifically, a transceiver or transmitter capable of 10 W or more can drive this amplifier to full output. I use it with a small multiband home-brew transceiver (described in my book, *Build Your Own Intelligent Amateur Radio Transceiver*, McGraw-Hill, 1997).

Other specifications of the amplifier include a maximum output of approximately 800 W. Input VSWR is very low, making it easy to drive with even the "pickiest" of exciters. It is capable of break-in keying (QSK) for CW, or reasonably fast turnaround T/R switching for data modes.

This is not a grounded-grid (cathode driven) amplifier. It uses a tetrode with the cathode bypassed to ground by capacitors. The cathode is 500-V negative with respect to chassis ground.

Other clues about the inner workings are apparent on the front panel in **Photo A**. Neon bulbs indicate the presence of grid-bias and plate voltage. Light-emitting diodes (LEDs) indicate control-grid and screen-grid current as well as filament voltage. Meters indicate plate current and RF output current.

Band-switching is accomplished with two separate switches for input and output circuits. Yes, this is a bit unsophisticated, but it's also simple and inexpensive. The jack labeled "KEY" at the lower left corner is a cost-related feature that ties in with issues related to T/R switching and relays.

The large pi-network coils and plate chokes in this project are fabricated by hand at a considerable savings over buying new ones. I even made the variable capacitors in the pi-network. If this seems too labor-intensive, wait until you see how they're constructed. The design is simple and easy to copy.

Circuit description

Except for the plate and screen supplies, the entire amplifier circuit including bias and control is shown in **Fig. 1**. Transmit/receive switching is accomplished by K1 and K2. The control-grid bias voltage changes from standby to operate mode when the contacts of K3 close.

The input signal is applied to the control grid. The screen grid is at RF ground as it would be in a conventional grounded cathode amplifier. An important difference here is that it is also at DC ground. I originally saw this idea in a VHF amplifier in the *1989 ARRL Handbook*. It offers the possibility of excellent input-to-output isolation because the screen grid sees a very low impedance to ground over a wide frequency range.

The control grid is supplied with bias through R8 which also acts as a load for the exciter. Loading the grid

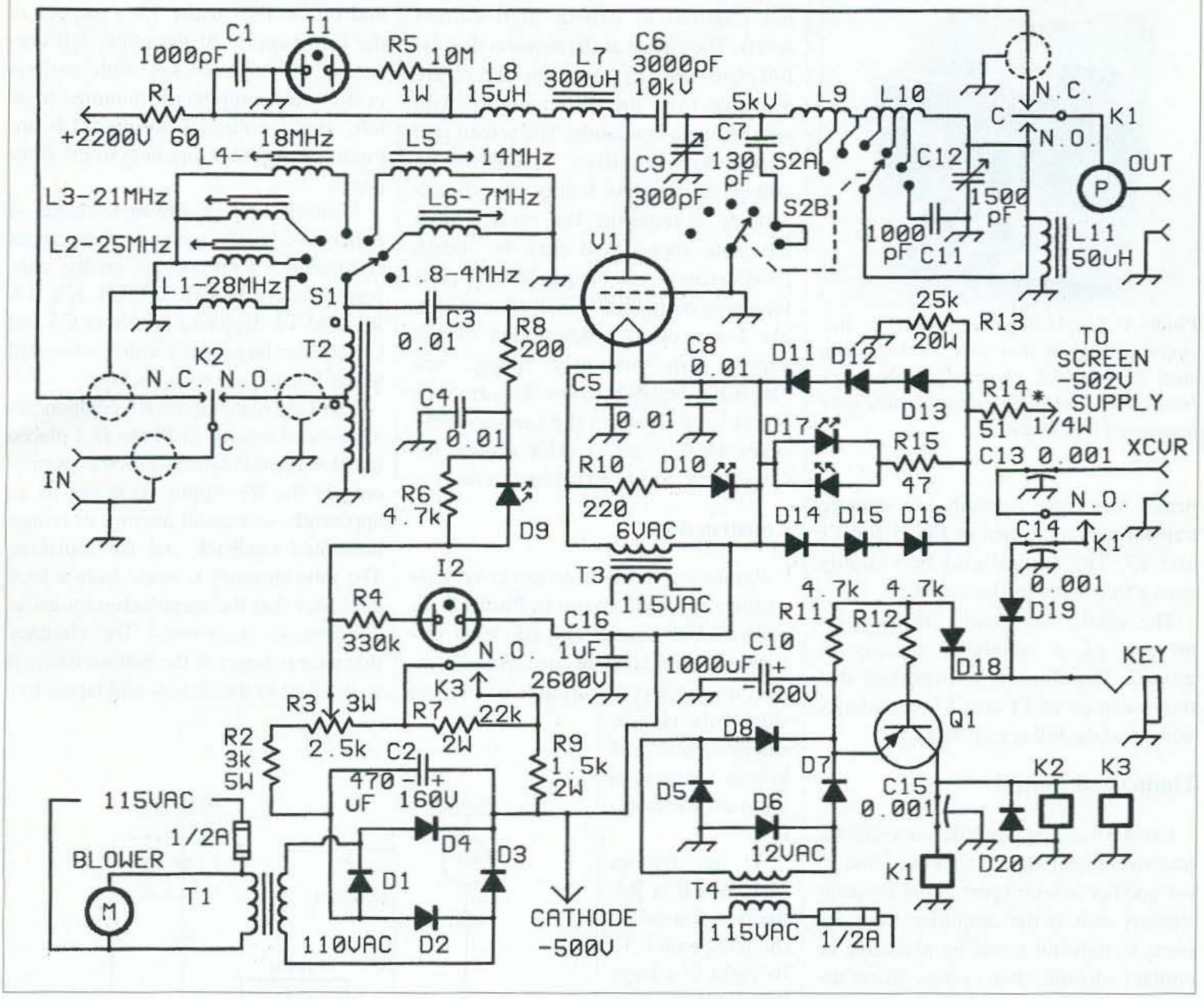

Fig. 1. *For instructions on how to fabricate C9 and C12, see text. Diodes D11 through D16 are used only to protect the bicolor D17 LED from overloads. Values for L1 through L6 are chosen to form a parallel resonant circuit with the combined grid and socket capacitance of 110 µF. L9 is formed into a 1.7-inch (ID) coil. Wind six turns over a length of two inches.*

helps dissipate the very small amount of output energy that finds its way back to the input. This also lessens the chances of parasitic oscillations occurring.

The 200-ohm load presented by R8 is transformed to one-quarter of that value by T2 for matching the 50-ohm output of an exciter. There is enough inter-electrode capacitance at the control grid and socket to cause an input mismatch on the higher bands. Coils L1 through L6 are switched in to cancel this capacitive reactance at 7 MHz and higher.

These input-coil values may have to be different if you use a different tube. Each forms a parallel resonant circuit with the combined tube and socket capacitances.

I used a low-current LED at D9 for grid current indication. It shows some illumination at 0.5 mA and is at almost full brilliance at 2 mA. When operating the amplifier in a linear manner, D9 lets me know if the drive level is too high. As soon as the grid is driven positive, D9 lights.

Screen current is supposed to be close to zero, or slightly positive, with the output properly loaded. D17 suffices for knowing if the screen current gets into a region high enough to exceed the screen dissipation rating. At least it will look excessively bright under such conditions. I have it connected to glow green with positive screen current, and red with negative screen current. This is one indicator where you should consider using a meter if you are paying very much for your tubes.

As for tubes, the 8791 is not really a common, inexpensive tube unless you happen to get some as "pulls" from a broadcast transmitter. A new socket for this coaxial-base tube is also rather expensive. I fabricated a suitable socket from sheet brass and PC-board laminate.

A number of tubes would be good candidates for use in this circuit. The 4CX800 and 4CX1000 are close to what I used, although you will need to get data about the necessary screen, control grid, plate and heater voltages.

I used a single transformer with two secondaries for the grid bias supply and

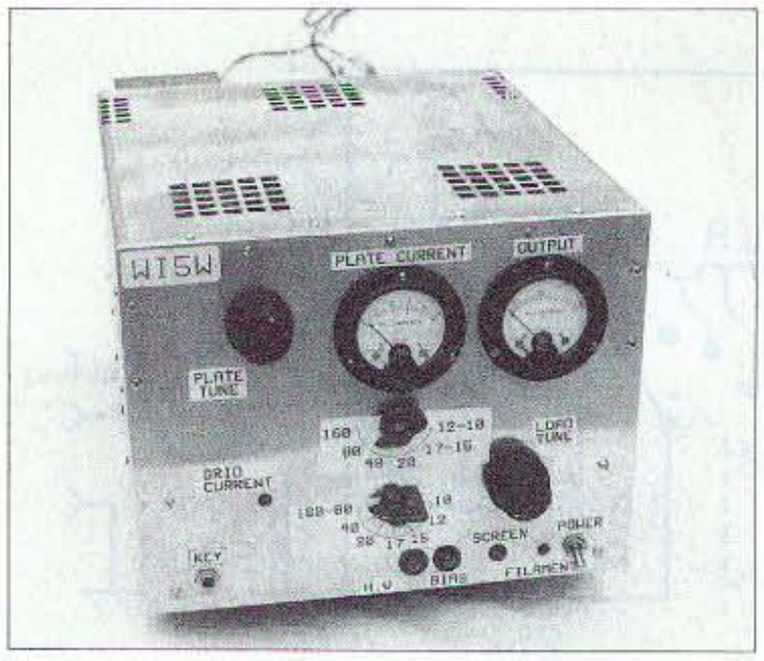

Photo A. *The U-shaped top cover is salvaged aluminum and was formed using steel angle stock clamped to the work bench. The final angles of the corners were hammered into shape.*

heater. You could certainly use separate transformers as shown in **Fig. 1** for T1 and T3. The control-grid bias supply uses a full-wave bridge rectifier.

The whole bias supply "floats" with no part of it connected directly to ground. Therefore, it is important that the insulation of T1 and T3 secondaries withstand the full screen voltage.

Timing and control

Controlling this amplifier in a slightly unconventional manner allowed me to use another low-cost part. Some amateur stations switch the amplifier from receive to transmit mode by a voltage or contact closure that comes from the exciter, usually a transceiver.

I think it makes more sense to have the amplifier control the exciter. That's the reason for the front-panel jack labeled "KEY." Regardless of the keying source (straight key, automatic keyer, computer, mike button, TNC, etc.), the amplifier has time to get its "affairs" in order before the exciter generates a signal on key-down (the start of a transmission).

The terminal in **Fig. 1** labeled "XCVR" keys the transceiver. This arrangement means that you can use a variety of ordinary relays for K1, K2 and K3.

Because of the seemingly unusual cathode and screen circuitry, I thought it might be helpful to clarify the amplifier supply requirements with **Fig. 2**. My setup is the (**a**) version. This is probably the easiest way to power the amplifier, because the screen supply is not required to deliver high current levels. The circuit at (**b**) requires that the full plate current, plus screen current, are available from the screen supply, with good voltage regulation. The screen grid in a tetrode amplifier is sensitive to voltage fluctuations. It does offer the advantage of requiring less voltage from the plate supply and may be worth considering if you happen to have parts for a very hefty (500-V in this case) supply. For a detailed description of the supply I'm currently using, see "Build a High-Voltage Power Supply at Low Cost" in the January/February 1998 issue of *QEX Forum for Communications Experimenters*.

Construction

Removing the bottom cover reveals a rather spacious layout in **Photo B**. In general, DC circuits and RF input circuits are contained in this area. Where conductors must pass through to the top side of the chassis, shielded cable and bypass capacitors are used for isolation.

At the bottom of **Photo B** is R3, the bias control on the back panel. To its right is a large hole for the blower. The large resistor running along the right edge of the photo is R1, used to give protection against tube flash over. Above the blower hole is T4 and its associated 12 VDC power supply components mounted on a copperclad board. I made the rectangular pads on the board by clamping it in a vise and raking a sharp marking punch along the straight edge of the vise jaws.

Another small circuit board below and to the left of the 12 V supply is the bias supply. At the upper left corner is the tube socket with various grid-circuit components mounted to its left. Input coils L1 through L6 are mounted at center top, next to the front panel.

A closer look at **Photo C** makes it easier to identify some of these input components. Components on the copperclad board include C3, C4, K3, R7, R8, and T2. Bypass capacitors C5 and C8 are the large mica units connected to the homemade tube socket.

All of the plate-circuit RF components are located topside in **Photo D**. I placed the blower and filament/bias transformer outside the RF-output enclosure in an apparently successful attempt to reduce unwanted feedback and RF radiation. The tube chimney is made from a food container that the manufacturer touts as "microwave oven-safe." The chimney diameter is larger at the bottom where it is attached to the chassis and tapers to a

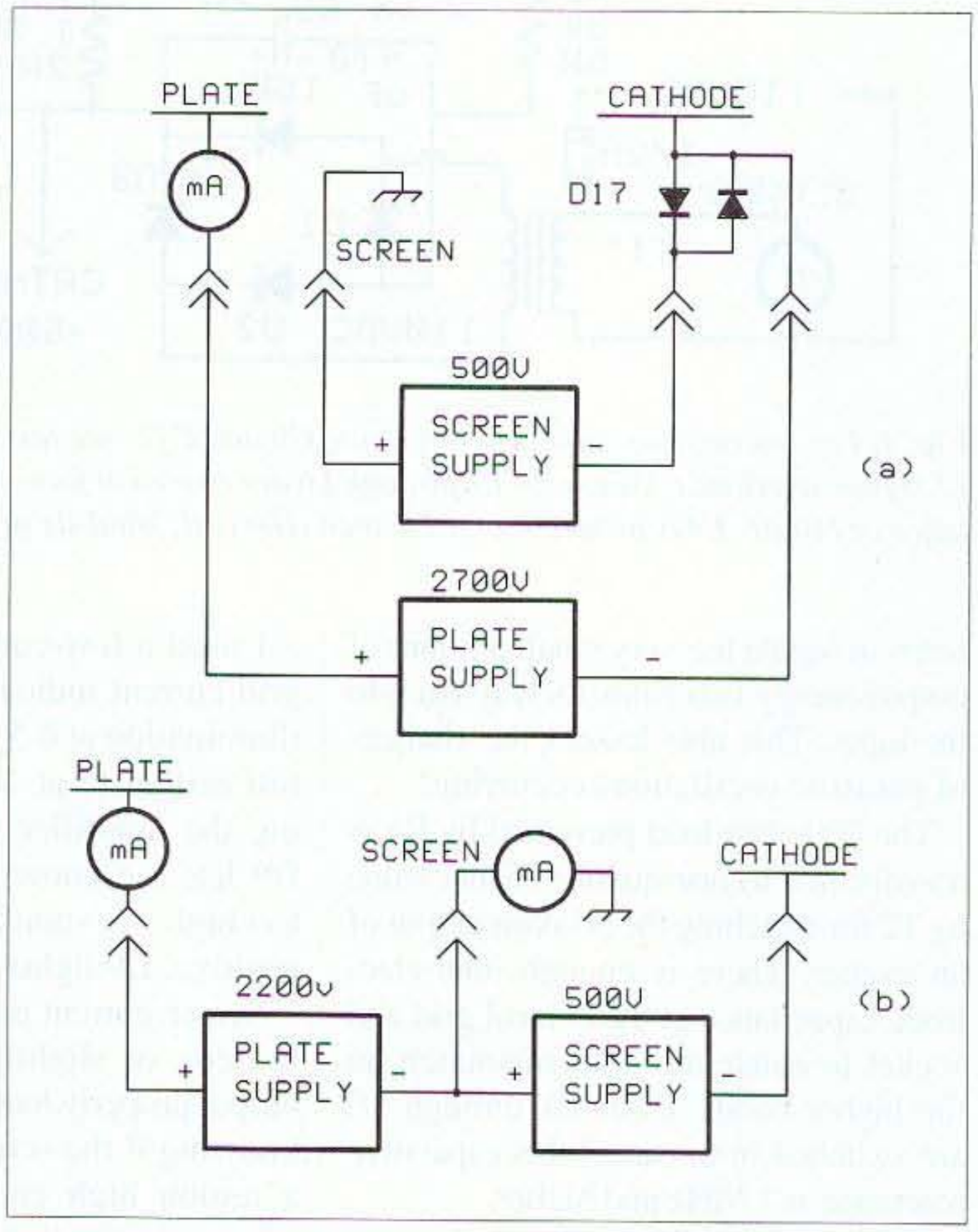

Fig. 2. *Two possible methods of powering the amplifier are shown here. You can substitute a meter for D17 if you wish. Plate current can also be monitored by putting the meter in the negative lead of the 2700 V supply in (**a**) or the 2200 V supply in (**b**). This reduces the insulation requirements of the meter housing and face.*

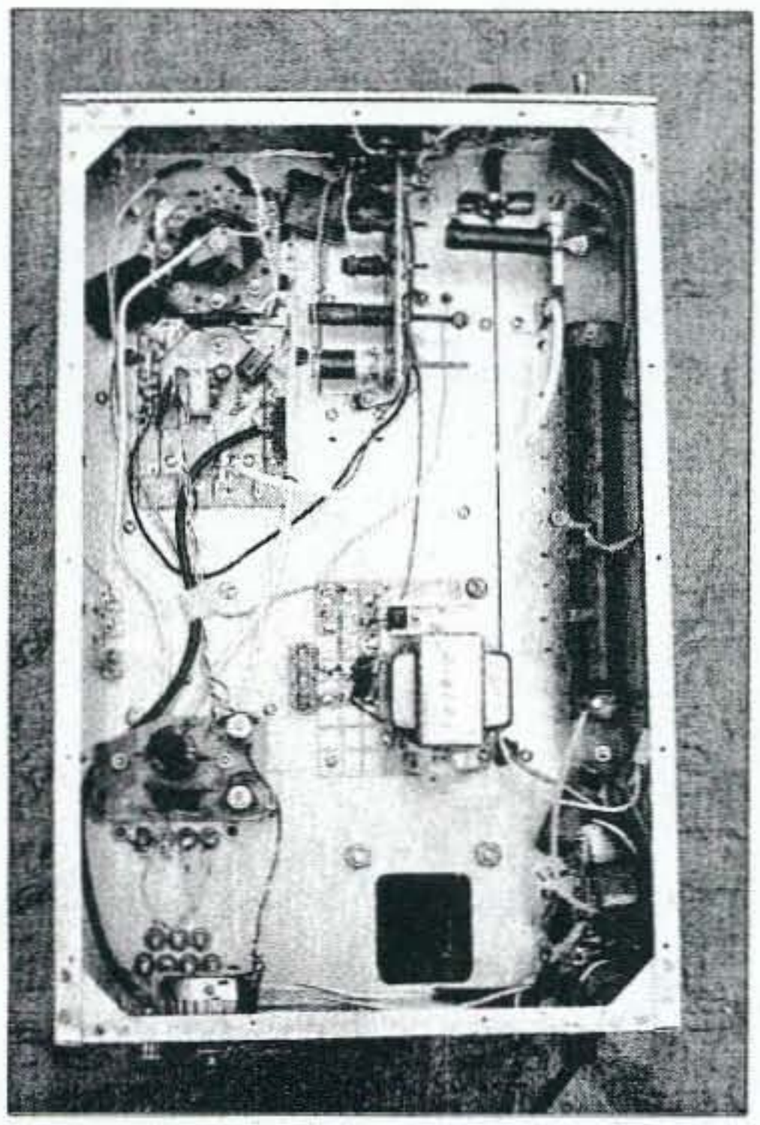

Photo B. *The mechanism for the LOAD TUNE knob is near the front panel. Part of the knob can be seen alongside the toggle switch handle in this photo. The mechanism includes a small bracket made of sheet copper soldered to a 1/4-20 nut. The bracket bears against the chassis to prevent rotation of the nut. It also has a small hole drilled in it for attaching the dial cord. A washer has been fastened to the threaded end of the decapitated LOAD TUNE bolt and the PLATE TUNE bolt to act as a stop to prevent completely unscrewing the nut. I drilled and tapped the ends to accommodate a small screw for this purpose. R3 is mounted on the back end of the chassis for ease in adjusting control-grid bias.*

Continued on page 14

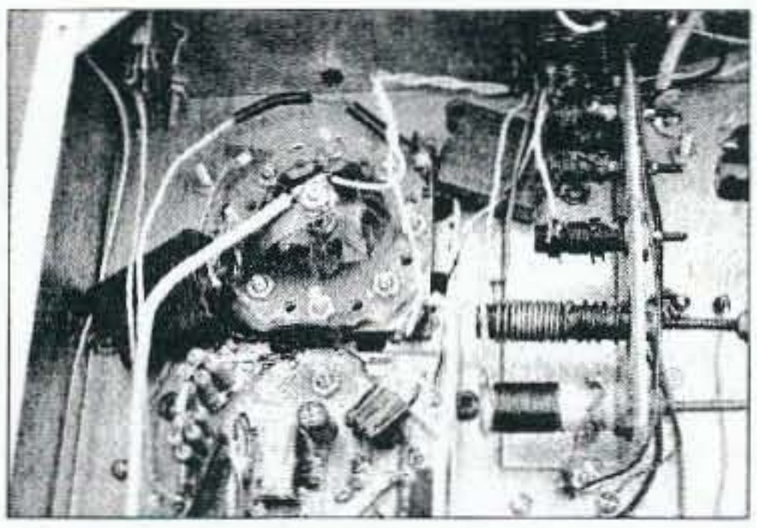

Photo C. *This is a closer look at the surroundings of V1. The homemade tube socket is a story in itself. Alternating layers of 0.010-inch sheet brass and unclad glass-epoxy board are used to make the supporting structure and contacts. The ventilated brass sheets and a small finned heat sink help cool the tube base.*

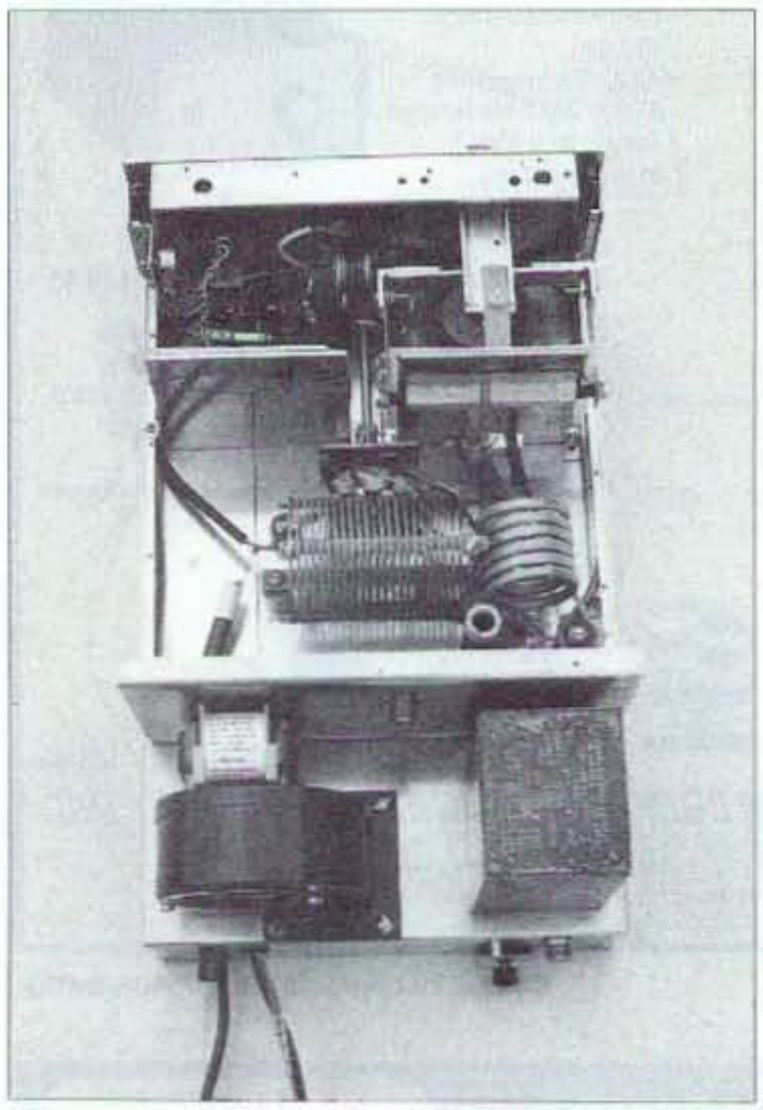

Photo D. *Copper braid from RG-59 coaxial cable is used for connections between the tank coils and band switch. A long shaft extension from the band switch is used to make part of S2B. A movable contact made from brass sheet soldered to a knob insert is mounted on the shaft extension. It rotates against a fixed brass contact mounted on a standoff insulator connected to C7.*

smaller diameter at the opening around the tube cooling fins, allowing me to place holes in the chassis around the tube socket for decreased back pressure and increased air flow.

Pi-network components

Both plate tank coils are handmade. The smaller L9 is made of quarter-inch copper tubing. The strips you see in **Photo D** supporting the coil turns in L10 are made of epoxy-glass circuit board material with the copper foil removed. Polyester resin, available in hobby stores and auto-supply houses, holds the wire in place on the strips.

Another money- and space-saving feature in this amplifier includes C9 and C12, the output pi-network capacitors. You have probably seen small compression trimmer capacitors that squeeze together two metal plates separated by a solid dielectric. Well, C9 and C12 are sort of an overgrown version. They are the large metal plates standing vertically and parallel to the front panel in **Photo D**. The variable capacitor at the upper edge is C12. Minimum capacitance for these capacitors is lower than values attainable with conventional air-dielectric variables.

An edgewise view of this capacitor in **Fig. 3a** shows how one plate is pivoted away from the other by tension from a dial cord. The dial cord for C12 passes to a small pulley at the back of the tank circuit enclosure, through the chassis deck and returns underneath to a threaded nut near the front panel. A 1/4-20 bolt, threaded into this nut, passes

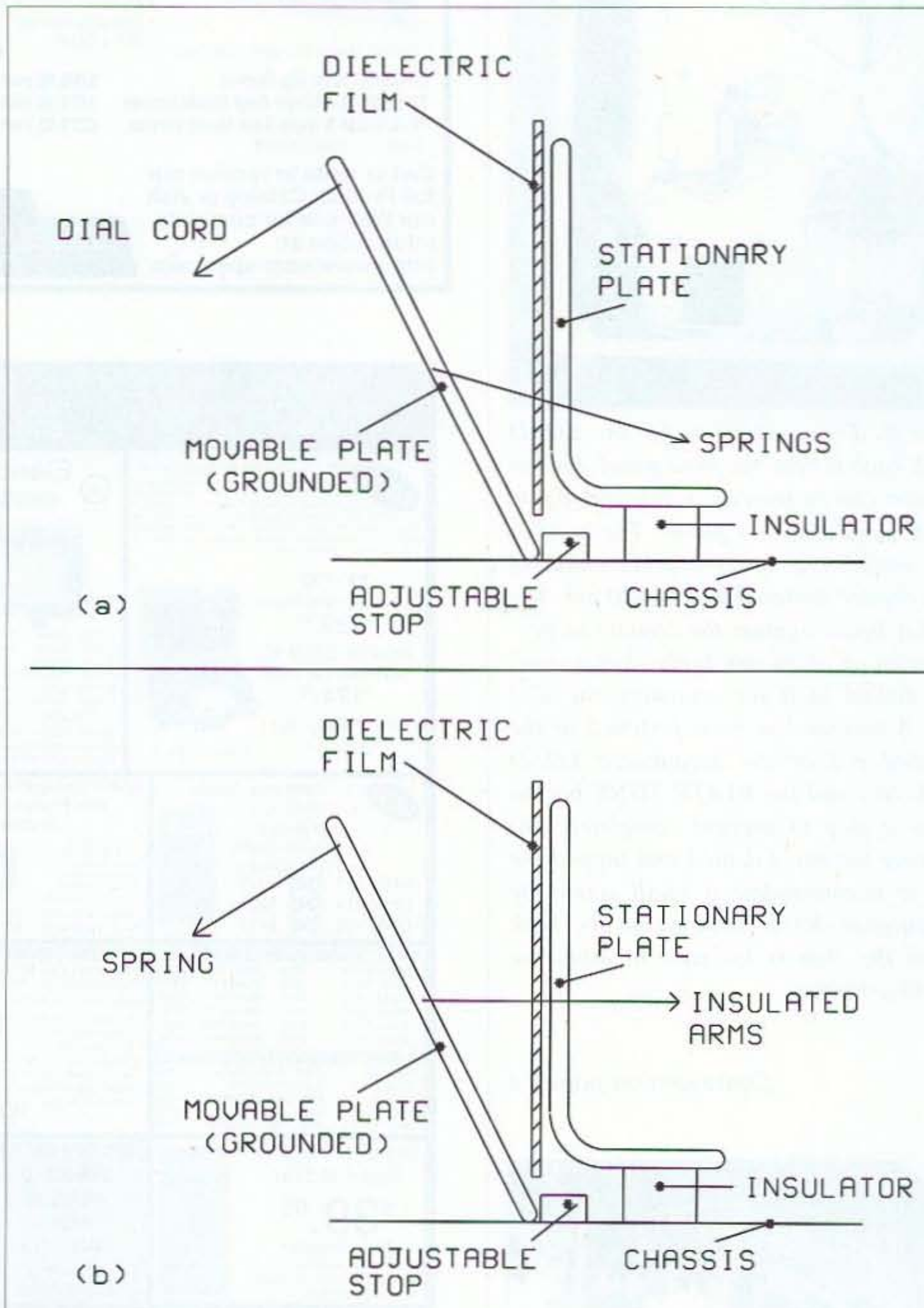

Fig. 3. *Arrows indicate the direction in which force is applied to the movable plates of C9 and C12. The adjustable stop is simply a small block of aluminum with an oversized hole (or undersized bolt) that can be positioned as needed and tightened in place. Tension from the springs and linkage hold the movable plates in a 90° corner formed by the chassis and stops. The short horizontal section of the stationary plate is actually two three-quarter-inch-wide "ears" because a "U"-shaped section is cut from the plates before bending them in a vise. This makes bending them easier. Be careful not to deform the plates. With both plates closed, the area contacting the dielectric at C9 measures four by four and one-quarter inches. The area for C12 is four by five inches. I have added a thin (0.010-inch) brass sheet between the grounded plate and dielectric sheet of C12. It is slightly bowed, which provides a less abrupt change of capacitance as the grounded plate moves.*

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Parts List	
D1–D4	400 PIV, 1 A units or equivalent bridge
D5–D8	50 PIV, 1 A units or equivalent bridge
D9	RS #276-044
D10	any 20 mA LED
D11–D16, D20	1N4002
D17	RS #276-012 or Mouser #351-5101
D18	1N4007
D19	1N5819 Schottky
I1, I2	NE-48 neon lamps
K1	10 A DPDT RS #275-218
K2	SPDT relay RS #275-241
K3	reed relay, RS #275-233 or Mouser #431-1412
L1	0.28 µH
L2	0.37 µH
L3	0.5 µH
L4	0.7 µH
L5	1.15 µH
L6	4.5 µH
L7	loaded w/ferrite rod
L8	15 µH
L9	1.4 µH 1/4" copper tubing, 1.7" ID coil, 6 turns over 2 inches
L10	20.4 µH, 23 turns of #12 wire on 2.7" diameter form, 6 turns per inch
Q1	TIP106 or similar
R1	60 Ω, 30 W or higher
R8	10 carbon comp or non-inductive 2000 Ω resistors, 2 W each, in parallel
R14	1/4 W carbon film resistor used as fuse
T1	14 bifilar turns of #26 plastic-insulated hookup wire wound on FT50B-61 toroid, Amidon Inc.
V1	8791 (see text)

Note: L1–L6 to resonate with the combined grid and socket capacitance.

Table 1. *Parts list.*

through the panel where a knob is attached for the "LOAD TUNE" control. The dielectric film is two-mil-thick polyethylene film, a fancy description of a piece of sandwich, garbage or recycling bag.

The other variable capacitor, C9, uses the dial cord and spring arrangement in **Fig. 3b**. Its Fiberglas™ arms and linkage are above V1. The ends of the Fiberglas arms are joined by a metal bar fastened to a threaded nut. It is attached to another 1/4-20 bolt turned by the "PLATE TUNE" knob. The dielectric film for this capacitor is two layers of 0.010-inch (10-mil) Teflon™. I purchased the Teflon sheet from Regal Plastics, 9342 West Reno, Oklahoma City OK, phone 1-800-444-7755.

The Teflon sheet in C9 is rigid enough to stand in place if its bottom edge rests on the chassis. The small sheet of polyethylene film in C12 is draped over the top of the stationary plate and secured to the back side of the plate with cellophane tape.

I'm using three-quarter-inch-long threaded ceramic standoff insulators to support the stationary plate of C9. Circuit board material is sandwiched between the stationary plate of C12 and the chassis. The three layers are drilled for nylon screws and nuts.

All surfaces near or in contact with the dielectric film of these variable capacitors should be smooth and polished. Instead of square and sharp, the edges of the plates should be rounded. Holes drilled for attachments should also be countersunk, smoothed and polished. This is easy to do by using several grades of sandpaper or emery cloth. Start out with a coarser grade for rounding and smoothing. Wipe off any grit residue from the coarser grade and repeat the operation with a finer grade.

After progressing through a sequence of perhaps 100-, 220-, 350-, to 600-grit, finish with metal polish. Be careful not to scratch the plates when installing them. Smooth, round surfaces are important at C9 because sharp corners and protrusions result in a concentration of the electric fields that may cause arc-over or insulation breakdown. The elimination of mechanically piercing or weakening the thin dielectric film at C12 is also a good reason for having smooth surfaces there.

I used one-eighth-inch-thick aluminum to make all four plates. Anything thinner may warp and not maintain a flat surface while you are working with it or when under tension from the control linkages. A Fiberglas stop between the front panel and stationary plate of C9 adds additional support when the movable plate is pulled against the Teflon sheets.

Setup

Before trying to operate an amplifier such as this, you should make sure the input and output circuits are set up correctly. You can do so without powering up the amplifier. Align the input coils by measuring reflected power seen by the exciter. Either energize K2 or jumper past its normally-open contacts. The dip in reflected power is very broad and should reach a low value.

To find the correct places to tap L9 and L10 in the output network, temporarily install a resistor between the tube anode and ground. This can be a single 1/4 W or 1/2 W resistor if you have some low-power method of measuring reflected power. If all you have is a regular SWR meter that requires a few watts of RF, you may have to cobble together some combination of resistors rated at one or two watts each. Don't use wire-wound power resistors. They have too much inductance.

For this amplifier, the temporary resistor should be approximately equal to the plate load resistance. For example, an amplifier operating class AB1 with a plate current of 500 mA will have a plate load of

$$R = \frac{\text{plate voltage}}{(1.5 * \text{plate current})}$$

or 3600 ohms. The units used here are amperes, volts and ohms.

Remember to leave the plate and screen supplies off and disconnected. To test the output tuning, you will be sending a signal from an exciter or other generator to the amplifier output circuit. This time, connect your SWR meter (or other instrument) to the output connector and energize K1. Alter-

natively, you can connect the SWR meter directly to C12. Again, you are looking for a low reflected-power reading.

Output tuning capacitors C9 and C12 should be adjusted to the value which produces the network-loaded Q needed for the frequency under test. When you find the position on the coil that results in the lowest SWR, that's where you tap it for the appropriate switch position—a lot safer than trying to find the correct tap with the high voltage on.

I used this procedure on my amplifier and it works well. Just don't forget to remove the temporary resistor when you apply plate voltage. If you don't have a method of measuring C9 and C12, it's probably better to err on the side of setting their capacity too high than too low. This can cause a loss in efficiency but it will result in lower levels of harmonic emissions. A loaded Q of 14 with a plate load of 3600 ohms results in the following values in picofarads. These values include tube and stray circuit capacitance.

1.8 MHz: C7 + C9 = 344, C11 + C12 = 2330

3.5 MHz: C7 + C9 = 177, C12 = 1198

7.0 MHz: C9 = 88, C12 = 599

10.1 MHz: C9 = 61, C12 = 415

18.068 MHz: C9 = 34, C12 = 232

21.0 MHz: C9 = 29, C12 = 200

24.89 MHz: C9 = 25, C12 = 169

A Q of 16 for 10 meters results in

28.0 MHz: C9 = 25, C12 = 182

It's probably a good idea to make these pi-network adjustments with the plate end of RF choke L7 disconnected. Try to arrange the disconnected lead so that it's resting very near its connected position. When you reconnect it after each adjustment, the reflected power reading should not change too much.

If the meter suddenly shows a big mismatch, the L7-L8 combination probably has a series self-resonance on or near the band you're testing. High-power operation in this condition will likely cause poor performance or destruction of the RF choke. Tune L8 by removing or adding turns to move the self-resonant frequency away from any of the desired amateur bands.

Use and operation

The only evidence of instability that I have detected in this amplifier has been a tendency toward a fuse-blowing low-frequency oscillation until I installed C16. It was not installed when **Photo B** was taken. You can use a larger value than 1 µF if necessary. After installing C16, I've experienced months of reliable operation.

Be sure to install covers over any areas with hazardous voltages. I've seen some home-brew amplifiers that work well, but they need safer enclosures and connectors. Connectors for the plate and screen supply cables are inside my power-supply enclosure and hard-wired at the amplifier chassis.

Increasing the output power of my station often allows me to use my operating time more efficiently. Operating on the lower bands often means contending with atmospheric noise when vying for the attention of another station. Single sideband signals seem to suffer from the effects of noise more than other modes such as CW and data modes that concentrate their power into a narrower frequency spectrum.

I'm pleased to find that this amplifier operates reliably, especially considering the unusual nature of output network capacitors C9 and C12. It is possible to break down the insulation of C12 by driving the amplifier hard into a large load mismatch. However, it is also very easy to repair it. Be aware that a slight detuning effect may occur as the capacitors heat and cool during operation. Most of this could probably be eliminated by using better placement, ventilation or nonconductive baffles to redirect the hot exhaust air.

Having extra power is nice, but remember to use it wisely. If you don't need the extra power to overcome path loss, noise or QRM, turn down the "wick." I hear too many operators trying to punch through QRM and annoying everyone (including themselves) when they could easily reduce power and move to nearby vacant frequencies.

Building an inexpensive well-made amplifier is a worthwhile experience. However, when it comes to being a considerate, competent operator, don't scrimp. Be a big spender and invest your best efforts.

Many thanks to Henry Just (K5SAM) and other generous amateurs whose former parts and materials are now part of this amplifier. 73

3 Ls 4 2m

This three-element stubfed coaxial vertical is dirt cheap, sturdy, and very effective.

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I had an extended J-pole antenna up at my home in the hills of Arkansas. Built of half-inch copper tubing, it worked well, but was easily bent when the wind whipped up. I needed something sturdier, but it had to be cheap and easy to build.

I can't claim invention of this antenna. Similar ones can be found in handbooks dating back over half a century. I did use a unique feed that eliminates insulators and provides a DC ground. This *might* help with lightning. It certainly reduces static buildup and its consequent noise. I also used a coaxial balun and a short length of twinlead to drive the stub. There is probably no particular advantage to this other than making it easy to drive the stub and mechanically easy to tap to the stub.

My entire antenna is made up from one-and-one-quarter-inch-OD galvanized fencetop rail. I cut and welded mine, but that is merely because I had the tools to do so. The instructions here are for PVC pipe. You might bolt yours together.

The center section is made up of a 39-inch length of one-and-one-quarter-inch pipe, wrapped with a 38-inch length of common aluminum available at the hardware store. It is sold by the foot and normally used for roof flashing. A six-inch-wide piece is just right. For those of you who might be worried about the high resistance across the overlap, the antenna currents are parallel to this, so it is of little consequence.

You might have noticed that the dimensions (**Fig. 1**) are short for two-meter use. That is because of the "fatness" of the "wire." Some shortening was necessary to bring everything into resonance. The quarter-wave stub seems especially short. Bear in mind that this stub is quite wide at six-inch spacing. Make sure that you have resonance before fixing it permanently into place. Tack weld it for tuning. The horizontal bar just below this is merely for reinforcement and makes a dandy place to connect your guy ropes.

Since putting this thing on the air, I have had great success with it. I've worked mobiles 30 miles away while running a half watt with my hand-held HTX-202 from Radio Shack™, and was full quieting. I can hear things better than ever, and a great many stations I never heard before.

Some caveats are in order. Lacking sophisticated measuring devices, I cannot be quite sure that the dimensions are the best that they can be. This thing works so well for me, though, that I'm entirely satisfied. Rain, which plagued my J-pole, doesn't affect this one. I'm waiting for the snow and ice. Also, since the wire is fat and there are three collinear elements, the tuning is quite broad. This might not suit some people, but I love it—and my scanner loves it, too.

Before sliding the half-wave center section in place, you should give the upright a good coating or two of clear acrylic to keep it from corroding (if you use metal like I did). A high resistance here will ruin performance. Two sheet metal screws, one just below and one just above the PVC, hold it in place.

When construction is completed, make sure to seal up the gaps (I used a mile of tape) and give *everything* a nice coat of clear acrylic. This not only staves off rust and seals everything, but also locks the tape in place.

Guying is a good idea if you expect any wind. I guyed my antenna with half-inch parachute cord, but that is up to you. If your antenna is mounted on a tower with very little mast extension, you might be all right. Just remember that this tubing isn't all that strong.

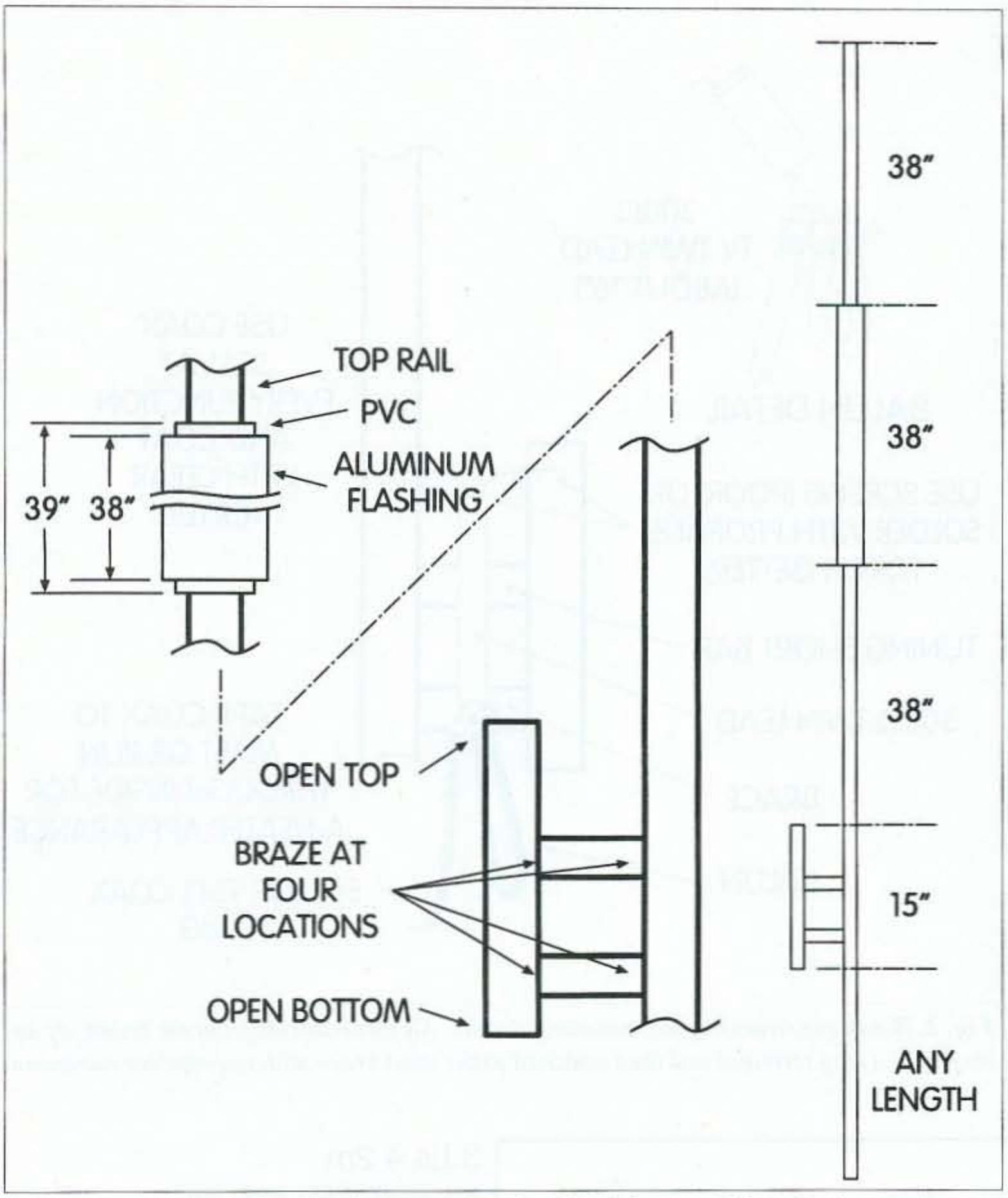

Fig. 1. Overall dimensions and construction details of the coaxial vertical.

And if it is galvanized steel, someday it is bound to rust. The clear acrylic mentioned above should protect it for many years, though.

Referring to the figures for details of the feed system should make everything clear without further explanation.

Continued on page 20

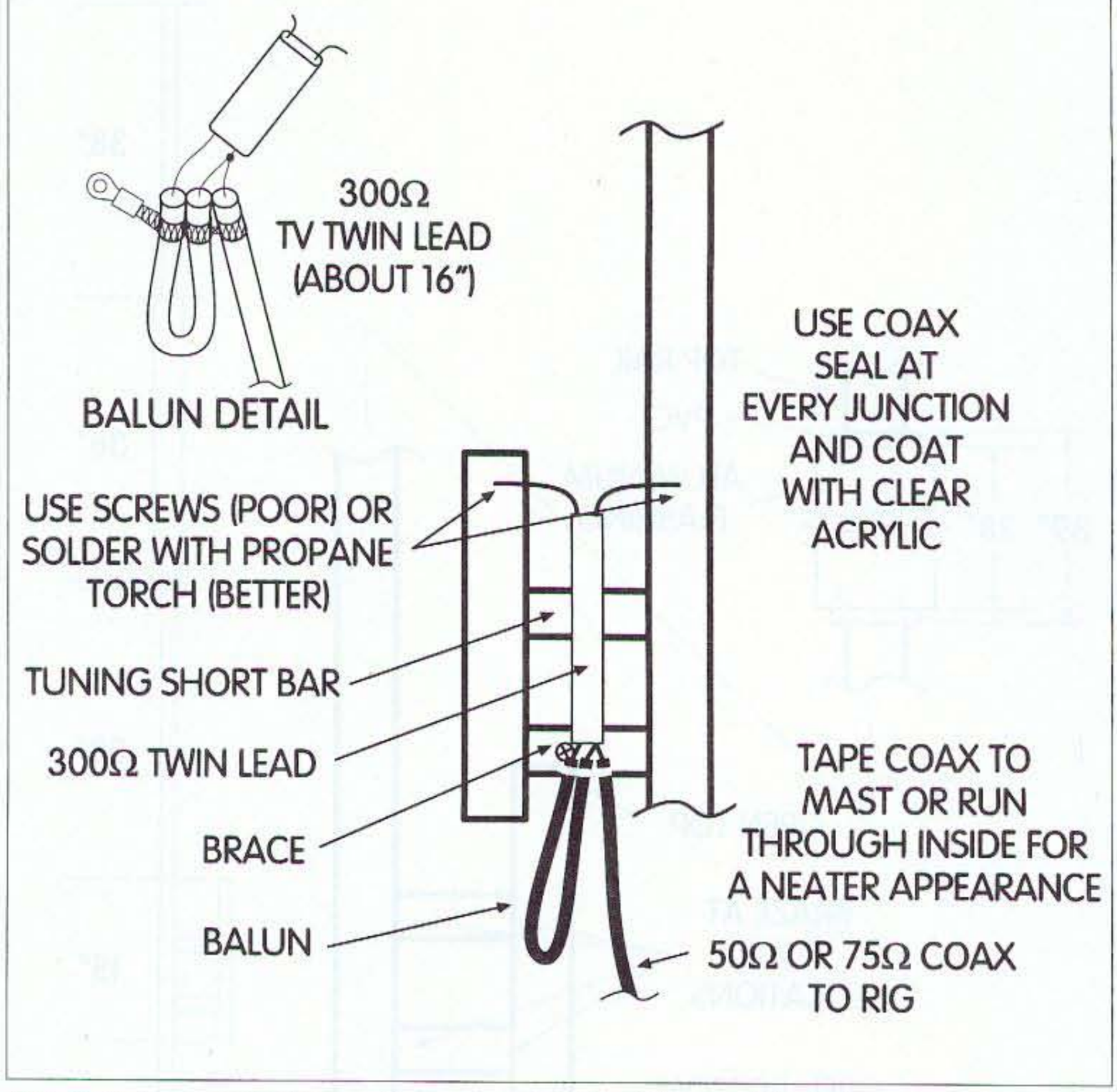

Fig. 2. Balun construction and mounting details. All three shields from the balun are attached to a ring terminal and then attached to the mast brace with appropriate hardware.

3 Ls 4 2m

continued from page 20

To make a coaxial balun, if you've never done this before, it is simply a matter of figuring the velocity factor of your coax and cutting off a half-wavelength of it. Form it into a horseshoe shape. Connect the shields of each end to the shield of your feedline coax. Connect the center of the feedline coax to one of the horseshoe's centers. That is one feedpoint, and the remaining center is the other one. Using 50-ohm coax gives a feedpoint resistance of 200 ohms. Connect a 200-ohm resistor and check it for a 1:1 VSWR. Adjust the horseshoe's length until it is 1:1 or very close. Simple, huh?

For five bucks and a little work and some coax, I have an antenna that is sturdy, good looking (no stubs sticking out of the sides for birds to perch on), *and* it works better than the commercially-made antenna that I once had. Good luck with yours! 73

The Evolution of Power Supplies

Part 2: Switching techniques.

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Part 1 of this pair of articles covered the development of dynamotor and vibrator power supplies as they applied to automobile radios. Hams took advantage of power supplies available from both military and commercial sources and used them for powering their equipment in mobile applications. During the development period for the dynamotor and vibrator supply, conventional AC wall-powered power supply design remained fairly constant, except for the changes required in the transition from vacuum tubes to semiconductors, with voltage regulation becoming the most obvious advancement.

Here in Part 2 we will cover later power supply designs utilizing switching techniques that enabled the use of simple and reasonably efficient power conversion equipment in many applications, including spacecraft. Power supplies used in the home PC are of a switching type that exhibits both reasonably high reliability and high efficiency. When they fail, a ham is usually available to catch the pieces, but what does he do with them?

Some failed switching supplies are repairable if sufficient information is available for use as a troubleshooting guide. Hopefully the following discussion will help you learn more about switching supplies, and perhaps even enable the repair of a few, too.

DC-DC converter

A DC-DC converter is designed along the lines of a vibrator power supply, and in fact is really just a solid state version of it. The primary differences between the vibrator and DC-DC converter are the operating frequency, efficiency, and performance reliability. DC-DC converters can be operated at almost any switching frequency of interest, with many operating in the 30 kHz region. At that frequency, the amount of iron required in the transformer core is reduced considerably, allowing the power transformer to be miniaturized without a loss in output power availability. The power conversion efficiency of DC-DC converters has approached 90%.

For a period of time, DC-AC inverters (switchers) were developed to produce 120 VAC from a 12 VDC power source. Many inverter kits were made available to the ham so that low-power 120 V vacuum tube equipment could be powered in automobile applications. Because of this application, inverters were designed to output 120 VAC at 60 hertz, but, unfortunately, early inverter designs were load-dependent, causing them to shift frequency with load variances. In addition, the output waveform was anything but a sine wave, so that switcher noise was evident in receivers operating in the vicinity of an inverter. Although most inverters were well filtered, it was never really enough.

In operation, one or two transistors may be used to provide the switching, as shown in **Figs. 1** and **2**. **Fig. 1** uses a single transistor and a transformer operating in an Armstrong oscillator configuration which is suitable for producing a voltage at almost any magnitude but low power. Excessive loading on the single-ended oscillator can cause it to stall. **Fig. 2** shows two transistors operating in a push-pull Armstrong oscillator, making it capable of producing a reasonably high power output. Output is taken from the emitters through winding "P" (primary) and the feedback to drive the bases is obtained from winding "T" (tickler).

Two switching techniques have been used in DC switchers: transistor saturation and core saturation. It doesn't matter which switching technique is

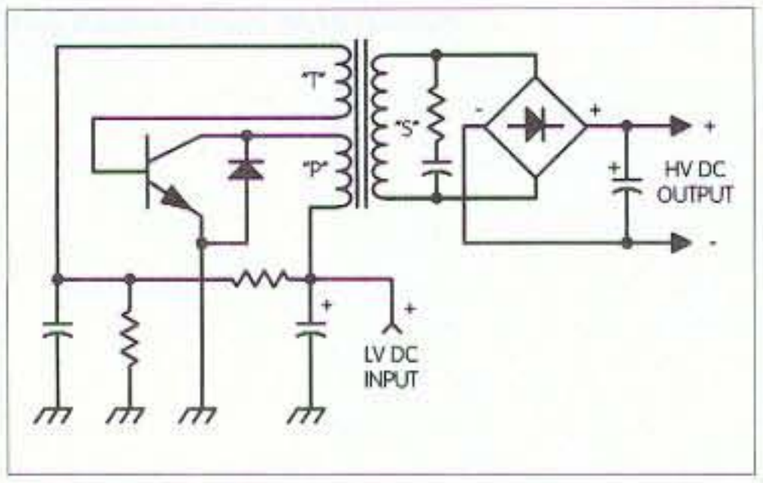

Fig. 1. *Single transistor switching power supply.*

used, but it is essential that current must increase rapidly through the primary winding to a point where saturation occurs, and that's the switch point for starting the next cycle. For the circuit shown in **Fig. 2** to operate properly, the transistors must saturate in order to obtain a low series emitter-collector resistance value. The low saturation resistance reduces the transistor heat dissipation, particularly in high power supplies.

Upon reaching the next switch point, the second transistor begins to conduct, driving the alternate transistor into cutoff until the following switch point is achieved. The circuit operates just like an electronic teeter-totter that has a hard stop at the end of each travel.

When first developed, DC-DC converters (switchers) were used to power vacuum tube circuits in which a high voltage was required for tube operation. Hams used switching supplies for mobile applications until solid state radios became available. However, DC-DC converters continue to fly in many of the older spacecraft and are used for power conversion in some solid state equipment today to power gas panel displays and particularly where a negative voltage must be developed.

Even the high power audio amplifiers (boomers) used in automobiles require supply voltages well above 12 volts and that voltage is provided by a DC-DC converter. The reliability of a solid state converter parallels that of the old dynamotor in many respects, but with an efficiency exceeding that of a vibrator supply.

Power switchers

With the advent of home computers, power supplies evolved even further. If you can remember when huge power transformers were used in electronic equipment, you'll recall that the weight became almost unbearable when the equipment needed to be moved. Of course, the evolution in TV set power supplies eliminated the power transformer, with technology advancements influencing the switcher design as used in modern home computers.

Computer power supplies still use a power transformer, but it is small in comparison to the huge 60 Hz power transformer size that would be required to handle an equivalent amount of power, which is typically in the region of 230 watts.

Switching power supplies for computers were developed around several techniques, but the typical design uses an IC oscillator with pulsewidth modulation for voltage regulation and load control. With the low cost of switcher supplies, it really isn't cost effective to repair them, but it is fun to try. Therefore, here are a few highlights about how a switching supply operates. Hopefully, the insight might enable you to try to repair a failed supply or two.

The first step in examining a switcher supply is to look at two of the common methods for driving the output power transformer. **Fig. 3** shows two transistors, *not* complementary, but of the same type, driving the transformer primary through a capacitor. Separate out-of-phase square wave signals drive the transistor bases, causing a square wave current flow through the primary winding of the transformer. The high voltage provided to the circuit is in the range of plus and minus 120 VDC at about one ampere of current in order to achieve 230 watts of output power. **Fig. 4** utilizes a slightly different design approach using complementary transistors, but the power transfer is the same as in **Fig 3.**

A block diagram of a typical switching power supply is shown in **Fig. 5**, where the major circuit components are identified. The circuit designs of other available switching supplies vary considerably, but the concept of operation is similar and **Fig. 5** will aid in understanding and repairing them.

Because switching supplies are pulse (square wave) operated, they must be loaded at all times to prevent high voltage transients from breaking down components. The +5 V output is the recommended circuit to be loaded prior to the application of 120 VAC to the input. Most switching supplies will fail to start if the load is missing or is too light. Load sensing in **Fig. 5** is sampled at both the -5 and -12 volt outputs, while other supply designs may choose to sample elsewhere. Any output can be used for no-load sensing, because voltage spikes due to a no-load condition will appear equally in the other outputs from the transformer.

Switching power supplies operate in a closed loop, which requires that every circuit must respond as designed or

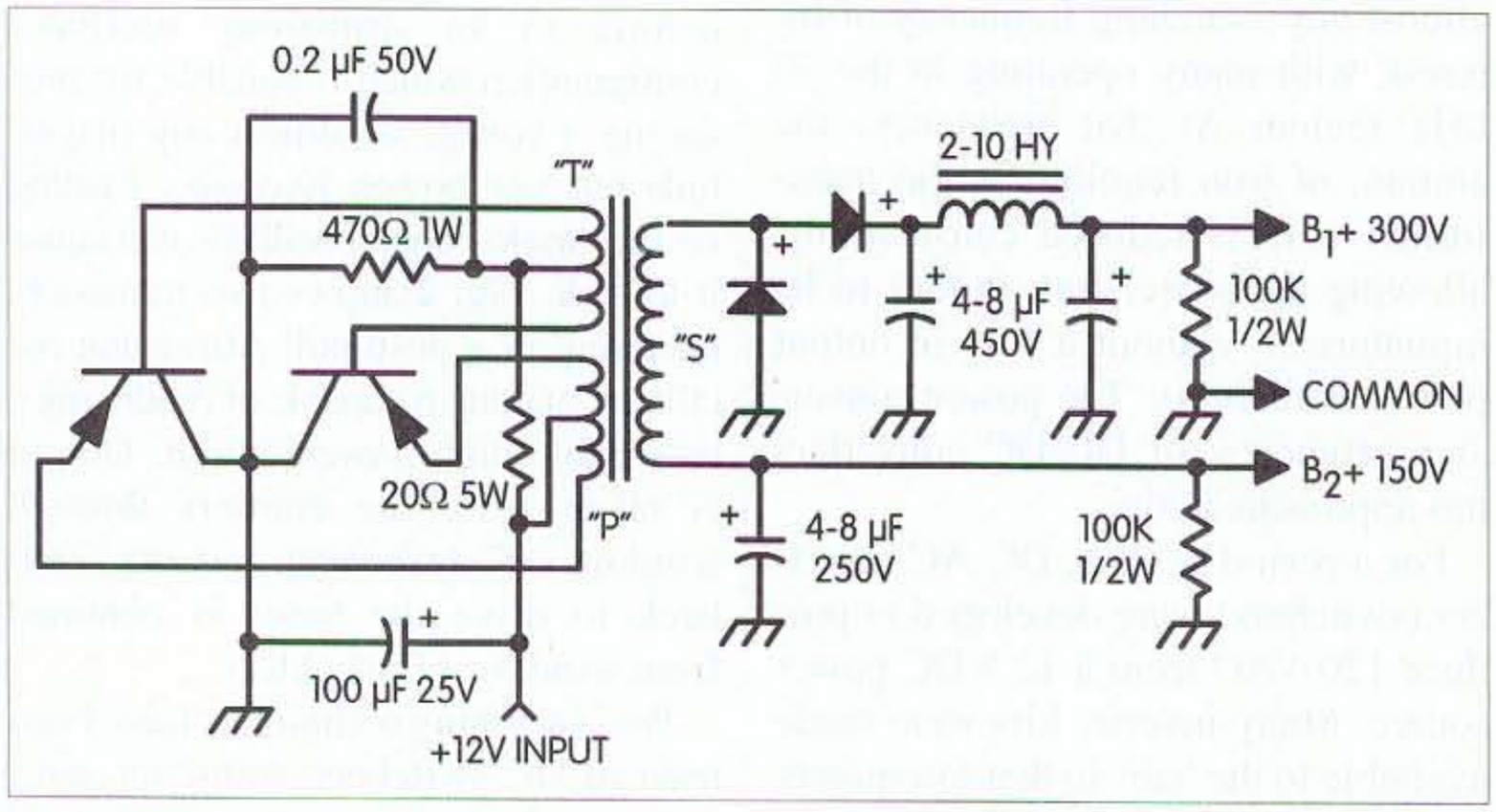

Fig. 2. *Transistor DC-DC switcher. Rectifiers configured to provide two levels of output voltage.*

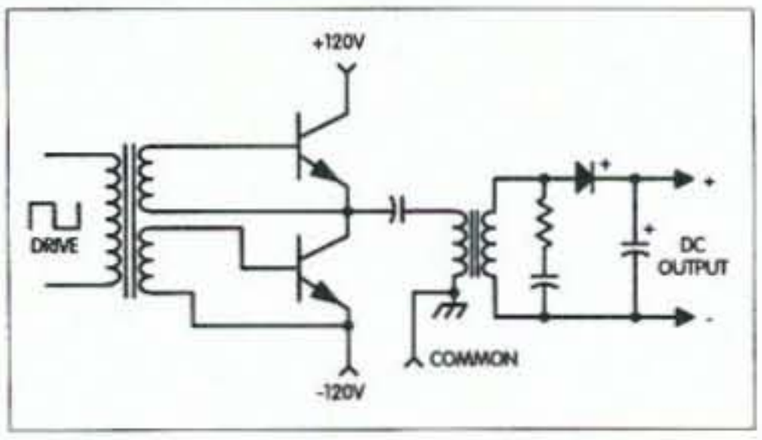

Fig. 3. *Same type transistor switch driver.*

the oscillator/PWM (pulsewidth modulator) will not allow the switching action to begin. Troubleshooting a failed switching supply becomes difficult because of the closed loop design concept. Using the teeter-totter again, the board must be whole, or it will fail to rock back and forth.

Circuit operation begins with power applied to the output driver circuit. *No DC voltage is applied directly* to the supply's output circuit or PWM. However, the initial application of AC power causes the output of T1 to pulse which is sufficient for the PWM to "start." Starting is done by IC1, which must oscillate to provide a square wave drive signal for transistors Q3-4, which are the excitation drivers that provide the drive to transformer T2. The output of T2 provides the drive signal to output transistors Q1-2. Once transistor Q1 and Q2 begin driving T1, power becomes available at each of the DC output terminals. A failure in any one of the loop elements will cause the power supply to malfunction.

Once the power supply is up and operating, voltage regulation is controlled by IC1 by changing the pulsewidth of the drive signal to transistors Q3 and Q4. The width of the supplied pulse is relative to the amount of required load power measured as terminal voltage at the -5 and -12 V outputs.

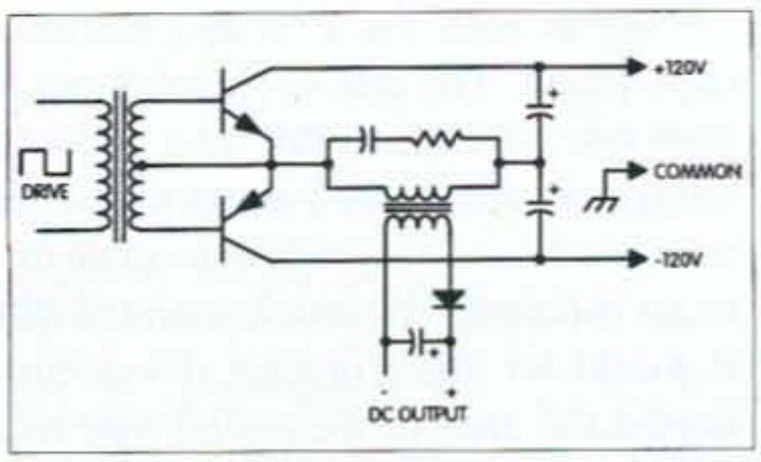

Fig. 4. *Complementary transistor switch driver.*

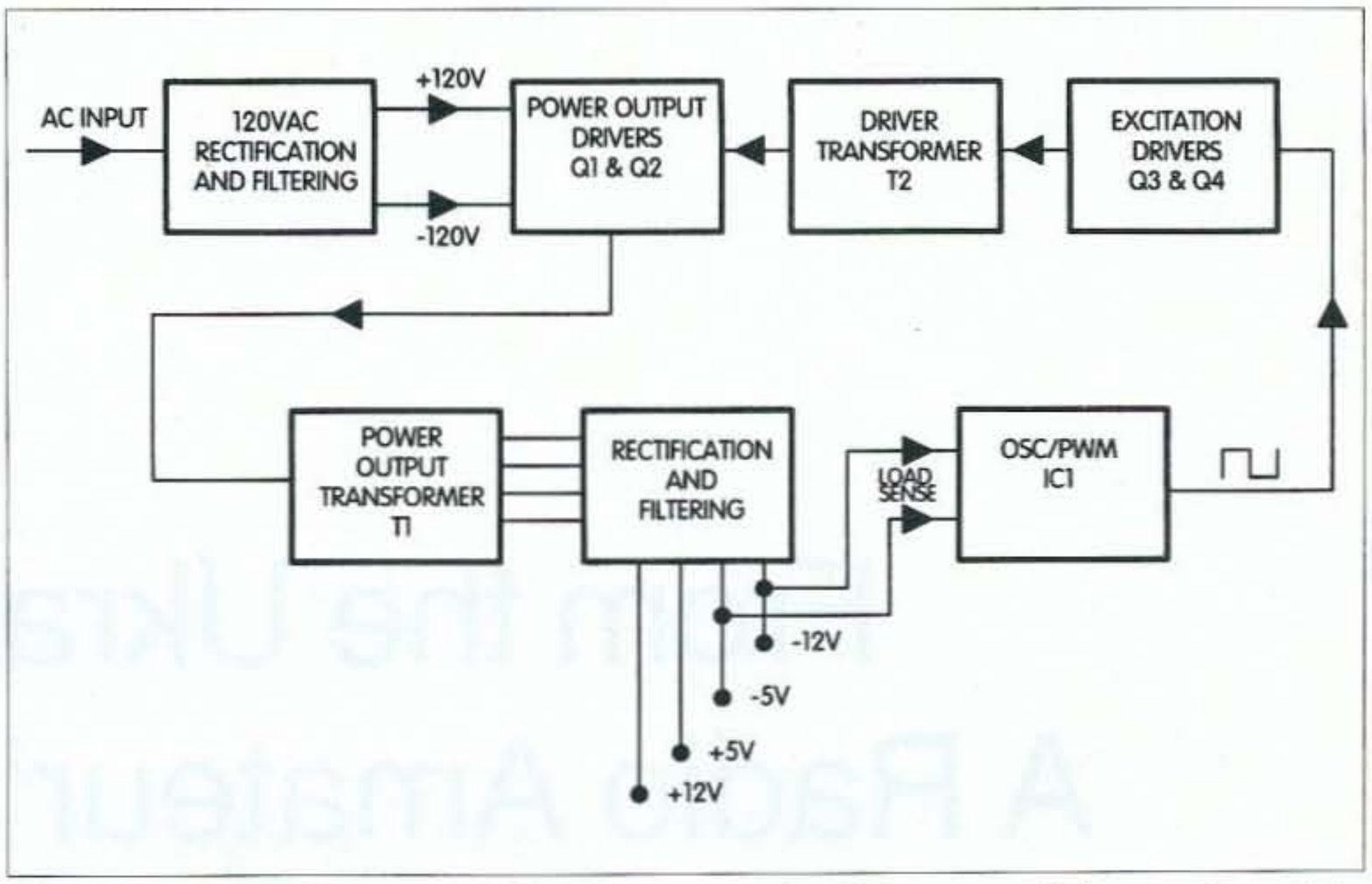

Fig. 5. *Typical 230-watt switching power supply. Voltage regulation performed by pulsewidth modulation.*

Because switching power supplies designed for computer applications require a fixed load, they are unsuitable for use with ham radio equipment where the load can vary. Of course, there are exceptions to every rule and hams will find the exception. For hams, the caution is that a suitable load (perhaps on the order of 50% of the rated amount) must remain on the supply at all times, and due to the switching nature of the circuit, an abundance of RF noise is generated and can cause RFI problems in receivers.

Conclusions

Power supplies powered from the AC mains and from automobile batteries have evolved over the years. Yet simple 120 VAC transformer-operated supplies are still very common, with their changes being primarily in the regulator circuitry. But the older automobile power supplies have evolved considerably from the dynamotor and vibrator configurations to DC-DC switching converters in applications in which a voltage is required that is greater than the battery voltage or of an opposite polarity.

The transition from vacuum tube technology to solid state technology was the primary driver for the elimination of power supplies in automotive applications. Perhaps the greatest changes in AC power supplies have been those associated with use in TV sets and computers, where the large, bulky power transformers have essentially been eliminated. Switching supplies have provided a high reliability and have retained a fairly high efficiency in the power conversion process. 73

From the Ukraine: A Radio Amateur's Story

Behind the Iron Curtain, home-brewing was the mother of invention.

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During World War II, soldiers from both the East and West fought against a common foe. Our soldiers and yours shed their blood to free the world from Hitler's tyranny. But then came the Cold War years, which kept our countries apart. For far too many years our respective armed forces gazed with apprehension across the borders between East and West. And at the citizen level, all we knew about one another was what our politicians told us. I would like to share with you my story of how I grew up in the Ukraine during those years, and became a radio amateur and engineer.

As you read this account, keep in mind that World War II left the Ukraine devastated. Technical literature and electronics parts were difficult—and in many cases, impossible—to obtain. And we youngsters of the Ukraine had to improvise. It was a period not unlike America's Great Depression years.

The beginning

I grew up in the Ukraine during the late 1950s. Mine was a poor working family. My parents rented a small room in an old private house. My father, a World War II veteran, worked both a day and a night job to make enough money to build a home for our family. My mother also worked to provide food for our family of four, which at that time included me and my little sister, eight years younger.

After completing my lessons, I would spend almost all of my time in the school library. I read almost everything there, and in a short time I was allowed to walk among the shelves and select whatever I wanted. I once found back issues of a small magazine with strange letters on the cover. Instead of a name, it had only "YT" printed on the cover. It caught my attention, and in a short time I found that the letters stood for "Young Technician." The magazine contained a lot of interesting articles for boys.

I must reminisce for a moment. My father worked as an aircraft technician serviceman, and he would talk about technical things and share stories about his work. My young mind was full of his stories. Instead of a carpet on the earthen floor of our room, my mother placed a piece of trimming plate from an old airplane wing from my father's work. I remember that green square with the nice red star in the center.

Meanwhile, those magazines impressed me so much that I read all of the back issues that were available in the library. It opened a new world of knowledge for me. Then I discovered one small book. It was the manual for the Young Technician's Group. My school did not have such a group, but I checked this book out also. It was full of practical descriptions of a variety of technical experiments and tests. And I was not able to understand most of them.

I began with the first and simplest experiment. The article claimed that if someone would take an iron nail and wind several dozen windings of copper wire around it, it would perform an unusual function. The article claimed that it would act like a magnet if you connected the ends of the coiled wire to a lantern battery. I was sure that they were joking, but I decided to hook it

up and find out for myself. But first I had to find the parts. The nail was not a problem, and I located some wire. The battery in my father's pocket lantern was also available.

After I finished building the project, I could hardly believe what happened. Old razor blades, as well as needles from my mother's sewing set, jumped to the end of the nail when I switched on the battery, and then dropped back to the table when I disconnected the wires. It was fantastic! I was very impressed and excited, but I paid for my experience with a dead lantern battery!

The next time I checked the book out, I was eager to find out what else I could do. One of the more complicated projects was a crystal detector radio. A curious thing about this broadcast receiver was that it did not need any supply voltage. This was strange indeed! At that time, my family did not have a radio, and to make such a useful item would certainly increase my prestige with my family and friends, not to mention older people as well.

The instructions recommended using a half-liter glass bottle as a support for making a coil form fashioned from several layers of paper. The layers of paper were glued together, and once the glue had set, the bottle was supposed to be removed. But I applied too much glue on the paper, and the coil form was securely glued to the bottle. I would have to use them together. This only made the project all the more intriguing.

I wound the coil using copper wire I found at the airfield. The coil was now ready, and one of my friends promised to give me the capacitor. But the main problem was to find a crystal detector. There was a drawing of the detector in the book, and I could visualize it in my mind. The detector was a rather serious-looking device. It had two solid metal legs mounted onto a piece of insulating material. It looked like a plug for AC power. On one leg was a metal lever with a handle. A spring was attached to the other end of the lever. The spring was made from a small piece of guitar string. A small stone of detecting crystal was fastened to the top of the second leg. To make such a device, you had to be clever and have steady hands.

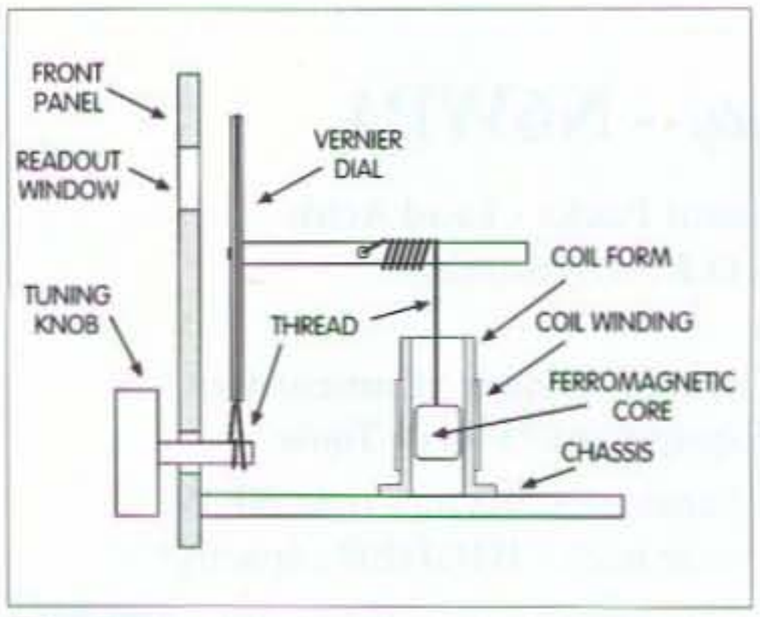

Fig. 1. "Pail-well" variable inductor.

But still the major problem was to obtain the crystal itself. The book described how to make the crystal by boiling materials in a test tube. I no longer remember the whole recipe, but I seem to recall that among the ingredients were sulfur and lead. In any case, the ingredients were to be heated until the mixture melted. After allowing this mixture to cool, the glass tube was to be broken to release the small gray stone. This stone must then be mechanically mounted to the leg under the steel spring. The end of the steel spring was very sharp and must be pressed onto the crystal stone and moved about until the active point for receiving the station was found.

Unfortunately, producing the crystal stone itself was not the greatest problem I faced. I simply was unable to produce the legs and their plastic insulator. This part of the project was doomed to failure. I attempted to remedy this by trying to buy the device at a radio parts store. This was my last hope. The salesman at the store couldn't understand what I was trying to describe. Instead of the detector illustrated in the book, the salesman offered me a small glass tube with a metal band at each end. He told me that it was a germanium diode and it could be used in my radio. But it wasn't what I needed. It was not like the picture in the book. Tears formed in my eyes and ran down my cheeks, and I sadly walked out of the store. The project was dead.

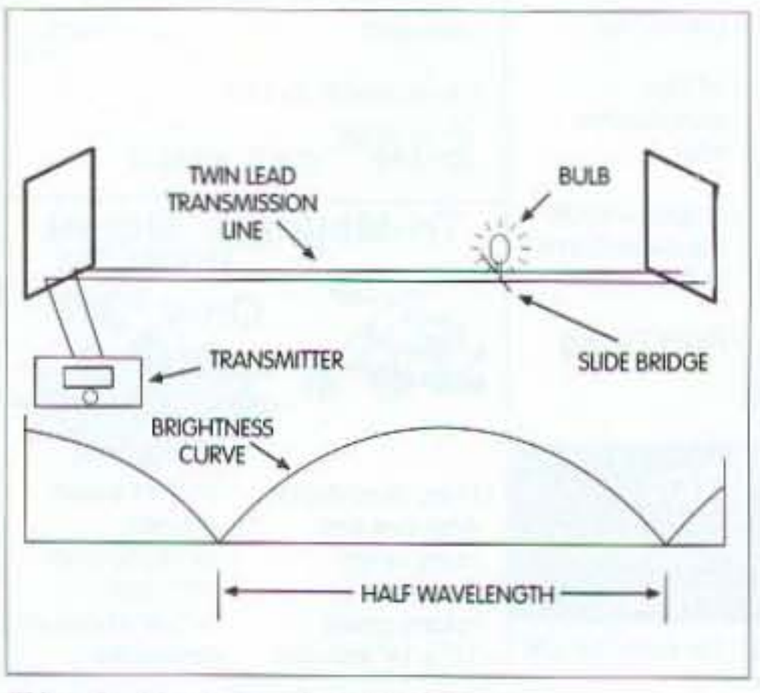

Fig. 2. Shorting load bridge.

Sounds at last!

The early '60s marked the beginning of the era of semiconductors in the Ukraine—especially transistors. Broadcast receivers employing transistors soon became available. I remember that the first one was named "Mir," which means "peace." These first radios were extremely expensive. And pocket transistor radios were not yet common. We schoolboys were in a frenzy to build our own transistor radios. Between classes we would swap schematics, ideas, and even parts.

I made several attempts to find good schematics and appropriate parts. It was my dream that my radio would at least make a weak sound. I was just a boy and there was no one to help me. I tried every schematic I could find in the library—but no success. I just couldn't understand what was wrong, and I continued to work more and more. At last I found a schematic which seemed to be better than the previous ones. It was a middle wave receiver. The receiver type was known as a 2-V-3, meaning it was 2 RF stages, an amplitude detector and three audio stages. It was very difficult to find all of the appropriate parts. For a prototype board, I used a cardboard cover from an old book. After soldering almost everything together, there was one part missing. It was a loudspeaker. It was impossible to find a small speaker in the shops or stores. It was the beginning of the transistor's epoch, and we had a shortage of everything. I would have to build my own loudspeaker.

I knew that a loudspeaker needed a coil and a magnetic core inside. It also needed a paper cone, and a case, holding the cone and membrane. Before I could make drawings, I needed to find the main parts. I thought about this for a while, and decided that there were two main parts: the magnet and the case. For the case, the easiest solution was to swap or borrow a small metal plate from my little sister's set of toy dishes. She was five years old and she played with her toy dishes in the sand. I selected one of her plates. It was two inches in diameter—this would be my speaker's case. To find a good magnet, I went to the TV repair parts store and found a magnet used for raster correction.

After preparing a drawing, I asked my father for help. He was always willing to help me. At that time, my father was a worker in one of the large factories. No one knew what they produced there. But with my drawings, he stayed after work to prepare my parts. With a large grinding machine, he made a very accurate cylinder from the magnet I bought. Another round detail was turned on a lathe.

To make the cone, I used some blotting paper that we used to remove ink from our notebook pages in school. One half of a razor blade, with a needle soldered to its center, produced the membrane. The sound coil was also wound. Everything was then assembled and glued together. With trembling hands, I soldered the ends of the sound coil wires to the receiver output. Then I switched on the battery power with great anticipation. I heard a weak noise like a trapped fly trying to escape.

With my heart pounding, I began turning the variable inductor—suddenly I heard a metallic voice delivering the midnight news. Sounds at last! I was so happy. I had finally built a working receiver! Two weeks later, I rebuilt my radio into a plastic box (soap dishes were very good for the purpose at that time). My receiver became not only a toy for me, but also for older people. My father was very proud because this radio was made by his son.

My first QSO

A couple of years later, while reading books, I learned how to prepare myself to become a ham radio operator. And I was very excited when I found unknown voices near the 41 meters shortwave

broadcasting band. They were hams operating phone on the 7 MHz band. That was the era of amplitude modulation, and it was easy to find them on an ordinary home receiver.

After several weeks of listening (without any SWL callsign, of course), I decided to search the library books for appropriate receiver schematics, especially for radio amateur use. I selected a three-tube superheterodyne: one tube as mixer/oscillator, a second as IF amplifier, and a third as an AM detector and single-stage audio amplifier. It was a four-band receiver covering the 3.5, 7, 14, and 28 MHz bands.

All my spare time after studying my lessons was spent with this project. I found two IF transformers in an old military receiver. They were 1600 kHz ones and they would work just fine. The main problem was the lack of a variable capacitor. I improvised by fashioning a "pail-well" device (**Fig. 1**). It consisted of a tuning knob with a smaller shaft to provide vernier tuning, and a four-inch-diameter disk. The shaft with the knob was connected to the disk by silk thread. Into the center of the disk, a longer shaft was tightly pressed. A piece of thread was wound around the longer shaft. From the end of this thread, a small piece of round ferromagnetic rod was suspended (it came from an old, broken American military receiver).

When I rotated the tuning knob, the ferromagnetic core would move into or out of the cylindrical coil form of the heterodyne coil. This adjusted the frequency down or up and allowed me to tune to the desired station.

After several weeks, and many adjustments, finally the receiver began to receive amateurs. I was so happy to hear them. At the beginning of 1965, after a very long wait, I got my first license and the callsign UB5EFP. It was for the simplest class at that time. It allowed me to operate phone on 10 meters and up. Morse code was not required.

I started by building a transmitter for 29 MHz. It was a three-stage rig using a 6L6GT as the final amplifier. Oldtimers will remember this tube. In the USSR the tube had another name, but it was the same tube.

When the transmitter was almost ready, I understood I needed the microphone. Unluckily, there were no possibilities of buying a new one. Microphones mostly were supplied with tape recorders. But I never had this very expensive toy and it was a task to make the microphone, too.

A solution was found at the nearest factory rubbish heap. I found there a used carbon microphone cartridge from a telephone handset. To use it for my home needs, I had to add a small transformer, a battery, and a switch. Electrically, all was connected in series. I mounted those parts into the plastic box and added feet.

This rather big construction was placed on the table in front of me. Its audio sensitivity was so high that I could hear all the countryside's sounds coming through the window. There were barking dogs as well as crowing cocks.

I was very disappointed after finishing my transmitter. I could hear myself in the headphones, but no one answered my calls. Even local operators ignored my calls. What did this mean? I finally understood that something was wrong with this transmitter, and I was unable to correct the problem.

I had an interesting idea about checking the transmitter frequency. To make this experiment, I missed one day of school. My parents went to their work, but I stayed home. I opened the door to the next room and hammered two nails into the windowsill. I repeated this process with the distant opposite window in the other room. The nails in the window sills were spaced four inches apart. By connecting wires to the nail and stretching the wires between the rooms, I fashioned a twinlead open-wire transmission line. One end of the transmission line I connected to the transmitter output, and the other end was left open. I made a shorting load bridge of hard copper wire with a small bulb in its center (**Fig. 2**).

With the transmitter on, I walked alongside the transmission line between the rooms while moving the bulb load

Continued on page 33

Here Comes the Sun

Part 1: Cycle 23 and you.

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Solar cycle 23 is growing fast, and the high-frequency ham bands are once again hopping with activity. After several years of listening to the mind-numbing hiss of a dead band, DX is back … and hams are tuning their dials ever higher in frequency as 20, 15, and even 10 meters once more produce contacts from around the world.

Good news for DX

Cycle 23 began quietly in the fall of 1997. Growing slowly at first, solar activity began to increase a few months later. By early spring of 1998, the many active spots on the sun were producing major flares, and some researchers were predicting that cycle 23 may peak higher than cycle 19, the highest peak ever recorded. If this prediction bears out, we will certainly see transoceanic contacts on six meters, and perhaps even higher.

Solar activity has historically been measured by counting sunspots. This data is averaged and recorded as the Smoothed Sunspot Number, or "SSN." The SSN for a given date is derived from data recorded for six months before and six months after the target date. This is a rather cumbersome system, but it's still used so that the data will conform to that collected since 1755, the first year for which complete data was recorded. On this scale, cycle 19 peaked in 1958 with an SSN of 201. By comparison, cycle 22 peaked at 158.

Just what is a "solar cycle"?

The planet Earth has a magnetic field. This field is a stable dipole: There is a north and a south pole, and they correspond (within a few degrees) to the rotation axis of the planet. The lines of magnetic flux travel through the center of the planet from one pole to the other, then return above the surface, flowing in the shape of a flattened sphere.

The sun also has a magnetic field, and most of the time it, too, is a dipole. However, every 11 years or so, this field does something strange: The magnetic poles start to move. Over a period of many months, the sun's magnetic field rotates 90° and becomes *toroidal*.

There is no external magnetic field at this point. The magnetic flux actually travels around the sun's equator, so there is no "north" or "south." There are, however, tremendous circulating currents *inside* the sun, and it is these currents that produce the intense electrical and magnetic disturbances we see as sunspots, flares, and coronal mass ejections.

Eventually, the magnetic field continues on, past the equator, and finally ends up a full 180° from its starting point. The field again becomes a stable dipole, although what was once the north pole is now the *south* pole, and vice versa. The solar activity quiets down, and the sun's magnetic field remains stable until the next cycle begins. The exact time can vary, from as short as seven to as long as 17 years, for an average of 10.7 years between cycles.

What does this have to do with ham radio?

As solar activity increases, so does the solar output. Sunspots may appear darker than the surrounding solar surface in visible light, but they are brilliant in the X-ray spectrum. Ultraviolet (UV) and extreme ultraviolet (EUV) output also increases dramatically from the surrounding area. This solar

radiation increases the ionization of Earth's upper atmosphere (called, appropriately enough, the *ionosphere*) and this, in turn, changes the way radio waves propagate around the globe.

The ionosphere is separated into distinct layers, each having a different effect on radio waves. The closest to Earth is the D layer, extending from 45 to 55 miles. This area is essentially an "RF sponge." As solar radiation increases, so does the radio absorption. This absorption is *inversely* proportional to frequency, which means that as solar radiation increases, we must use higher frequencies to penetrate the D layer.

At times of extreme solar activity, the D layer may become so charged that *all* radio frequencies below VHF are absorbed. Fortunately, the D layer needs direct solar radiation to maintain ionization, so as soon as night falls, the lower frequencies become usable again.

The E layer extends from 65 to 75 miles, and the F layer starts at around 90 miles and reaches to 250 miles or more. In daylight, the F layer separates into two parts, called F1 and F2. These layers have the ability to *bend* radio waves traveling through them. This bending effect is inversely proportional to frequency, so at some point the wave doesn't bend enough to return to the surface, but continues on into space. As solar activity increases, this bending effect also increases, allowing higher frequencies to be returned to the surface.

Like the D layer, the E and F1 layers need direct solar radiation to maintain ionization, and quickly disappear after sunset. The F2 layer, however, maintains its charge long into the night, and once the RF-absorbing D layer disappears, even low-powered signals can be returned to Earth thousands of miles away. During times of peak solar activity the F2 layer can return signals as high as 50 MHz.

The effect of this ability to bend high-frequency radio waves late into the night when absorption is low can be amazing. Cycle 21 peaked with an SSN of 164.5, and at that time you could literally "work the world" with only a few watts. In fact, at the peak of cycle 21, I chatted with an Australian ham for several hours on 15 meters using no more than a Ten-Tec Argonaut and a wire loop. Since the signals were pinning the S-meters both ways, I started backing down the power. From the original five watts, I reduced the drive until I could no longer see any power indication on the meter—and the other fellow never noticed!

Electrons and protons

X-rays and ultraviolet are not the only solar output with an effect on propagation. During times of intense activity, the sun also produces electrons and high-speed protons. These can interact with Earth's magnetic field to produce some interesting effects on radio communications.

Electrons from the sun become trapped in Earth's magnetic field, where they tend to "clump" on either side of the equator. When this cloud of captive electrons becomes dense enough, it will reflect radio waves between the northern and the southern hemisphere in a single long hop. This is called *transequatorial* propagation.

Protons, on the other hand, generally *disrupt* high-frequency communications. Streams of high-energy protons radiate from solar flares and, like electrons, they become trapped in Earth's magnetic field. These energetic particles spiral down along the magnetic lines of flux, entering the atmosphere at the poles. When they reach the D layer, they cause a dramatic increase in ionization and hence absorption of radio signals. The effect is most pronounced at the poles, but very large flares can disrupt communications over the entire planet, sometimes for days.

And now, the bad news ...

Hard radiation and high-energy particles from major solar flares can do far more than alter radio propagation. They can be deadly to sensitive electronics, especially when the electronic devices are located in orbit, high above the shielding atmosphere. With so many people depending on that technology today, losing our network of

satellites is unthinkable … and yet that is exactly what could happen if cycle 23 continues to grow. The last major solar cycle was in 1958, before any of this technology existed. Today we have communications satellites, weather satellites, the Global Positioning Network, and hundreds of military satellites critical to national security. All of this technology is vulnerable, and most of it has no backup.

Satellites are not the only technology at risk. If the solar flare is really large, the high-speed protons can carry enough energy to actually penetrate the magnetic field and the atmosphere and reach the surface. This happened in 1992, and again in 1997. While the exposure is certainly much less on Earth than in space, keep in mind that satellite technology uses radiation-hardened electronics, while Earth-based technology does not. Protons with enough energy to reach the surface can be harmful to living things as well.

Magnetic effects

So far, we've only discussed solar radiation: X-rays, ultraviolet, electrons, and protons. There is another solar phenomenon that occurs as solar activity grows … the coronal mass ejection, or CME.

As the solar magnetic field rotates into the toroidal phase, tremendous circulating currents grow inside the sun. These currents in turn cause enormous loops of magnetic flux to reach out from the surface, extending far out into space before arching back to the sun. We can see these loops because hot, electrically charged plasma is trapped by the magnetic flux, creating an awesome visual effect. When these loops collapse, enough energy is released to vaporize a small planet.

These magnetic loops do not always collapse. Instead, a loop will occasionally break free and fly off into space, becoming essentially a huge, toroidal magnetic "cloud," carrying with it millions of tons of solar matter, mostly protons and electrons. This is a coronal mass ejection.

Since CMEs can spin off in any direction, and Earth is a relatively small target, most of them miss us entirely. Now and then, however, scientists will note a CME breaking free of the sun that looks like a perfect ring. This "halo CME" is very likely headed straight for Earth. CMEs travel much more slowly than the solar radiation, so while we may see the X-rays and UV radiation from an eruption within minutes, it will generally take several days for the magnetic effects to reach us.

When Earth is hit by a CME, it's generally no big deal. In fact, most people never notice. The CME reaches Earth's magnetic field, and Earth's field is compressed, and this in turn causes it to intensify. This effect is fairly large far out at the fringes of the magnetic field, but at the surface it's only detectable with a sensitive magnetometer.

Another effect of the interaction of Earth's magnetic field with the CME is to make the magnetic poles wobble slightly. During a CME-induced magnetic storm, it's not uncommon to see a compass swing back and forth a few degrees. On rare occasions this effect can be quite large—variations of 10° to 15° are sometimes observed.

As every ham knows, when you move a conductor through a magnetic field, you generate electricity. The same thing applies when you move the field through the conductor. It's therefore obvious that when Earth's magnetic field changes intensity and wobbles back and forth, current will flow in every electrical conductor on Earth. Most metal objects are too small to generate any appreciable voltage, but long conductors such as power lines, telephone wires, and even railroad tracks can develop a surprising amount of electricity. All transmission lines today have surge suppressors at regular intervals, but a large CME can occasionally overload them. The result can be power blackouts and interrupted telephone service over large areas.

The big one?

As solar activity increases, flares and CMEs get larger, more intense, and more frequent. What if we were to catch a *really* big CME?

As we mentioned earlier, Earth's magnetic field is a stable dipole, at least for the moment. Geologists tell us, however, that the Earth's field has reversed itself on occasion. In fact, around *two hundred* such reversals are known to have happened in the past 50 million years or so.

If a *really* large CME were to hit, Earth's field would be compressed and would increase in strength. If the field intensity were pushed beyond a critical flux density called the Alfven-Lawson Plasma Current Limit (17KA/cm^2), the magnetic vectors would rotate 90° and collapse into a *toroidal* field—*exactly* as we see happen every 11 years on the sun. Look at the intense violence that occurs on the surface of the sun when the magnetic vector flips. Try to imagine that happening *here*.

But as bad as this sounds, there's an even bigger problem. A toroidal field is self-shielding, so while this pole-reversal is taking place, Earth would have *no external magnetic field!* At a time of peak solar activity there would be no magnetic field to protect us from the intense solar radiation. As one of NASA's solar scientists remarked when I ran this scenario past him, "That's a lot of sunblock!"

How big will cycle 23 get?

While it's impossible to predict with any certainty just how a solar cycle will develop, we can make a guess based on several factors. For one thing, we know that solar activity has been steadily increasing for as long as we've been keeping records. It's highly likely that there are cycles much longer than the 11-year pole reversal cycle, and we just have not been around long enough to measure them.

Another factor is the even-odd relationship. At least since cycle 10, all odd-numbered solar cycles have peaked from 1.2 to 1.6 times higher than the even-numbered ones. It's not clear why this happens, but it could relate to the internal circulating currents flowing either with or against the direction of solar rotation. Cycle 22 peaked at 158, so if the pattern holds true, we could see cycle 23 peak anywhere from 190 to 253.

There could be other factors to consider, too. While it's not known what actually causes the 11-year solar cycle, one of the best theories is gravitational stress. As the planets revolve around the sun, they cause a tidal effect. A small bulge moves across the solar surface in line with a planet. When two or more planets happen to line up, this effect is multiplied. This, by the way, is called "syzygy."

The planets that have the greatest tidal effect on the sun are Jupiter, Earth, and Venus. Mercury, despite its small size, also has some effect, due to its proximity to the sun. If you look at the planets over time, you will find that these alignments do tend to correspond to the times of solar maximum.

If this theory turns out to be accurate, we may be in for a wild ride indeed. As pointed out by researcher and author

Say you saw it in *73!*

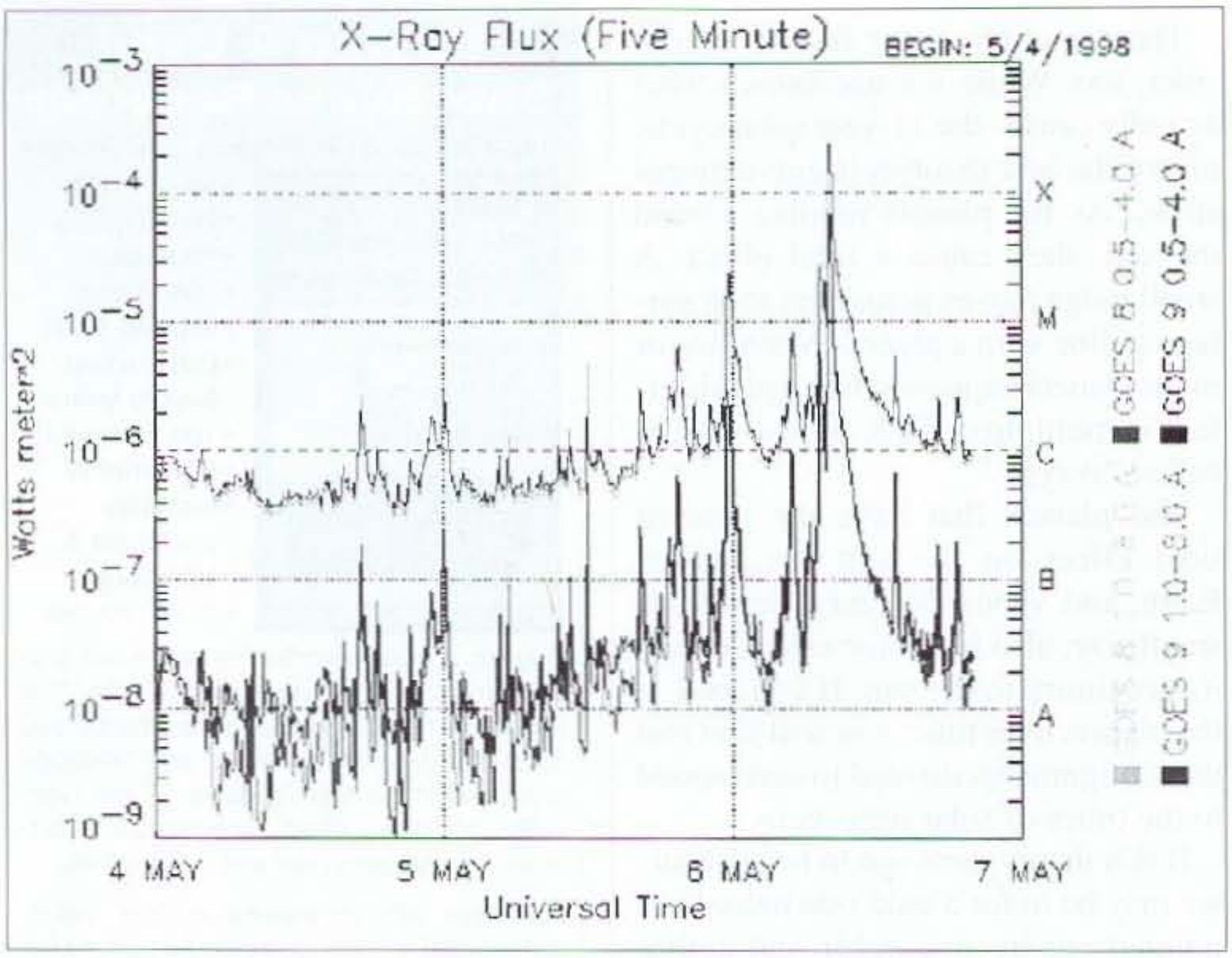

Fig. 1. *This graph shows the X-ray flux measured by the* GOES *satellites on May 6, 1998. The sharp peak is the X-class flare, the largest of a two-week series of huge flares. This information is from the NOAA Space Environment Center Web site.*

Richard W. Noone in his book 5/5/2000, there will be a nearly perfect alignment of *all* the planets *and* Earth's moon on May 5th, 2000. Noone is concerned with the gravitational effects on the polar ice caps, and the possibility of it triggering a slipping of Earth's crust. He seems to have missed the possibility of a solar effect from this alignment. By the way, the scientists from NOAA's Space Environment Center predict that cycle 23 will peak in March of the year 2000, with a window of uncertainty from June 1999 to January 2001.

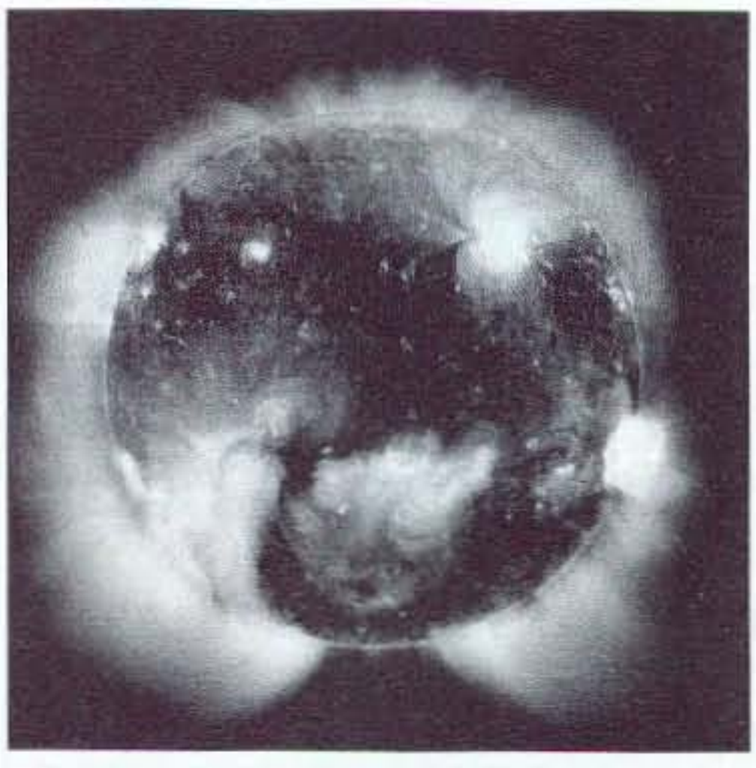

Photo A. *This image of the sun was taken with NASA's* SOHO *satellite on May 6th, the day of a huge X-class flare.*

Keep tabs on cycle 23

We have many more tools available to us today than ever before, and these are providing us with a never-before-seen look at the sun as cycle 23 grows. Thanks to the Internet, you and I have access to the data as it comes in. The Space Environment Center, a part of NOAA, posts real-time graphs showing the X-ray, electron, and proton flux, as well as geomagnetic data. This information comes from the *GOES 8* and *GOES 9* weather satellites. You can find this data (and much more) on the SEC's Web site. The URL is [http://www.sec.noaa.gov/].

Another source of solar information *was* the *SOHO* spacecraft while it was still transmitting data. The most fascinating part of the *SOHO* data was the images: full-disk high-resolution photographs in many different wavelengths showing incredible detail. You can go to [http://maj.com/sun/] to see these full-color images on the Web.

A good Internet source for current solar information as well as historical data for past solar cycles is the Solar Terrestrial Report. Go to [http://dxlc.com/solar/] and bookmark this one.

If you're in an apocalyptic mood, you might want to read more about CMEs and the danger that they pose to life on Earth. The expert in this field is Charles Cagle, and his Web site [http://www.teleport.com/~singtech/] contains technical information on this and many other interesting topics.

Information on the geomagnetic field and its interaction with the sun can be found at [http://geomag.usgs.gov/], courtesy of the US Geological Survey.

Of course, the National Bureau of Standards station WWV still broadcasts solar data and propagation warnings. The 10.7 centimeter solar flux is reported at 18 minutes past the hour.

Who ya gonna call?

Although it's certainly possible, it's highly unlikely that cycle 23 will be large enough to cause Earth's magnetic poles to flip. Other damage, especially to communications and the power grid, is much more likely, but not a certainty by any means. Still, while you sit there in front of your rig searching for those strange-sounding calls and peculiar accents, take a minute to remember that the same sun that is now bringing those signals to your antenna could also cause some very serious problems. As our civilization depends on ever-more-complex technology, it also becomes more fragile. We have not only put all our eggs in one basket ... we've also wired those eggs in series.

Amateur radio exists to serve the public in the event of such a situation. Every ham should have a disaster plan, and every ham should consider things like emergency power, backup equipment, and spare antennas. (While you're at it, don't forget food and water!) This is part of our "job description" as hams, and the reason we have a billion dollars' worth of frequency spectrum with which to play.

One last thought

On April 20, 1998, an intense disturbance on the sun started to produce major flares. During the last week of April and the first week of May, this

area produced huge "M class" and monstrous "X class" flares almost daily. A large CME was observed heading for Earth, but several days later a second CME erupted. The second CME was so energetic that it overtook the first, and *both* arrived together. The X-ray flux finally returned to normal as this active area rotated around to the far side of the sun.

Only a few days later, the *Galaxy 4* communications satellite totally failed after several weeks of problems. People all over the country suddenly discovered that their pocket pagers didn't work, and their credit cards wouldn't validate. TV stations lost their satellite feeds without warning. Happy DXing!

Next time: Geomagnetic monitoring. 73

From The Ukraine: A Radio Amateur's Story

continued from page 27

across the lines. I was fascinated by the bulb's changing brightness at different points along the line. I measured the distance between the points with minimum brightness. These points were the half wavelength of my transmitter's frequency. I now understood the problem. My frequency was far outside the band! In a couple of hours the transmitter was readjusted and the problem was fixed.

I waited until the local television station shut down for the night, because 10-meter AM transmitters produced very strong interference. I waited until a local operator finished with his QSO. I then took the mike and with trembling voice called him. I could hardly believe my ears … he answered me! He answered my call, he really heard my signals! I was so happy. I remember that date. It was a rainy fall evening, October 12, 1965.

Thanks

I would like to express my sincere gratitude to David Evison W7DE for giving me the inspiration to sit down and write this article, and for his patient reading and preliminary editing of it.

About the author

Vlad Skrypnik was licensed in 1965 with the callsign UB5EFP. In 1967, he upgraded his operating class and received a new callsign, UY5DJ. He is an active operator on HF, both CW and SSB. For outstanding results achieved in USSR contests, he was awarded a "Master of Sport" degree in 1975.

As an amateur radio constructor, Vlad has long been interested in designing amateur radio equipment and measuring devices. Since his start in 1972, his projects have been in all possible kinds of exhibitions of amateur radio design. For his achievements as a designer of some of his country's best construction projects, Vlad was issued a "Master Radioconstructor" degree in 1984.

In 1989, Vlad was awarded the rank of "Honored Radioist" by the Ministry of Communications of the USSR for his contributions to the development of amateur radio.

Vlad saw his first published article in *Radio* magazine in 1974. He has subsequently had published dozens of articles on technical projects for radio amateurs. In 1990 and 1993, two of his books were published. The first, which sold 200,000 copies almost immediately, described test and adjustment devices for ham radio. The second was about programming in BASIC and includes many useful amateur radio programs.

Vlad continues to work as an engineer in radio and electronics. 73

73's DX Dynasty Award

This is the current list of DXDA award winners. The DX Dynasty Award is the most enjoyable DX award around. Any correspondence concerning DXDA should be addressed to DXDA, c/o 73 Magazine, 70 Route 202 N, Peterborough NH 03458 USA.

BASIC AWARD—100 COUNTRIES WORKED

1. W1RFW
2. WB2DIN
3. KT1A
4. W3FDU
5. KA9JOL
6. WB1BVQ
7. NW7O
8. AK4H
9. W3HCW
10. KZ2W
11. K9FD
12. WD5N
13. KA9TNZ
14. K9GBN
15. N5GAP
16. WB3FMA
17. NN6E
18. AL7HG
19. N6CGB
20. KI6AN
21. K9JPI
22. N4WF
23. K6PKO
24. KW7J
25. VE6JO
26. WA4IUV
27. W4ZFE
28. N4KMY
29. WØHBH
30. K8KJN
31. KG1V
32. K1KOB
33. KY3F
34. PY2JY
35. YB5BEE
36. YB5BEH
37. WB9SBO
38. NØAFW
39. KA9MOM
40. N3II
41. W6DPD
42. KE8GG
43. VE6VK
44. KD9RD
45. W4WJJ
46. KØHSC
47. KI6GI
48. IK1APP
49. KJ4RR
50. K8MDU
51. N1EIU
52. K1DRN
53. WD8REC
54. ZL2BLC
55. VE3EFX
56. W9MCJ
57. N6IV
58. KN8D
59. KC5YQ
60. WB6ITM
61. KA2AOT
62. K4LHH
63. VE2QO
64. KE5AT
65. W9SU
66. W3OOU
67. NR2E
68. KF5PE
69. N3FBN
70. KB4SJD
71. N3EZX
72. IK8GCS
73. WB4I
74. NG1S
75. WB7UUE
76. HK4EB
77. KØBFR
78. N7GMT (KF7SH)
79. AA4VN
80. KA1LMR
81. N8AXA
82. NM2I
83. KD9YB
84. HC2CG
85. VE1BXI
86. YC2OK
87. N4GNL
88. GM3UBF
89. 5Z4BP
90. IØAOF
91. VE1BN
92. KA2NRR
93. 5Z4DU
94. KB8ZM
95. HK4CCW
96. W2JQ
97. HC2AGT
98. WD5N/M
99. VE1BHR
100. VE1AGZ
101. K5AOB
102. KW2D
103. PY3ARZ
104. WB4ETD
105. N2FPB
106. KD3CQ
107. K4NNK
108. VU2DNR
109. AA5BE
110. PY3OG
111. VE4ACF
112. VE4SI
113. PJ2KI
114. WB4CKY
115. W6EQB
116. KK4IY
117. IK1IYU
118. N6GCN
119. KB1AF
120. KB8BHE
121. KE2CG
122. VS6CT
123. G3IZQ/W
124. WB6FNI
125. KAØIAR
126. K9SM
127. W6BCQ
128. KA5MSL
129. WB4FLB
130. N7GLT
131. WAØX
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WBØN
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAQ
168. KI6WF
169. K2MRB
170. AA6GM
171. JAØSU
172. NU8Z
173. GØGRK
174. YB8VM
175. DV1BRM
176. WØTU
177. N7CNH
178. PY3IO
179. YBØZCA
180. YBØAF
181. VE3PQB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5NØWRE
191. AA4IP
192. JR5KDR
193. KD2WQ
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. GØFWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. NØISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJ1T
241. W4DCG
242. YCØRX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YBØHZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. WØCL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. NØIWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. NØIDT
298. KA1FUE
299. KD7EO
300. JH8MWW
301. KB8ICD
302. JA1CKE
303. N3GEE
304. JA5MG
305. KA1FTU
306. WA8KMK
307. N2IBW
308. N4THE
309. N3CYD
310. JA4TF
311. W6YLL
312. WA1S
313. KC5WA
314. N6WK
315. PY4OY
316. KG7BO
317. WB3FQY
318. WCØA
319. VE4AMU
320. YCØMCA
321. WA3LEU
322. KB2GLO
323. OZ1FNX
324. K6GCF
325. KC4PCX
326. KA7EXD
327. DK9EA
328. HL5AP
329. SM7BRO
330. ON6DP
331. WA3KKO
332. KB9ABI
333. DA2UI
334. SMØBNK
335. WA2BMQ
336. WAØQIT
337. 5Z4BH
338. KB9ALG
339. OA4ANR
340. OD5ZZ
341. VE3ZD
342. LU2ATR
343. HL5FRG
344. UB5LRS
345. N1ICC
346. UY5XE
347. PS7AB
348. IK4NPC
349. KD1CT
350. DU1CHD
351. UB4WZA
352. LU3CF
353. G7AZP
354. VE5AAD
355. IK3ITX
356. SM4SEF
357. N9CPK
358. VE2JWK
359. N7JXS
360. KO4VO
361. JE1GWO
362. JM2DRM
363. IK1SLE
364. JF7QUE
365. HL5BUV
366. VE3GLX
367. N7QXQ
368. JE6KLR

369. KK6JY
370. N2BI
371. KK4XL
372. JA3SSB
373. KBØADI
374. I1-50156
375. VU2SMN
376. EA6AAK
377. N3IHS
378. N8MOT
379. KB2NEK
380. PY2DBU
381. WA2CKP
382. WB2PPN
383. JA1-2Ø762/BV
384. AB4ZD
385. YC8EMH
386. WA8RLB
387. N5VWM
388. VE7SKB
389. KB4BCC
390. VE7GSE
391. YC8BWN
392. KN6ER
393. KD1CJ
394. G2BFO
395. KB7ROK
396. VK2EQ
397. 4X4-2175
398. JE1BGL
399. KF2LC
400. WV2X
401. LU5EWO
402. WAØCLR
403. VO1UL
404. VE6AML
405. WD4REX
406. WAØCLR
407. VE3VJC
408. WA1MKS
409. JH6FHJ
410. JE9EMA
411. WK8X
412. TI2YLL
413. KP4WN
414. KD6MOS
415. KI7CM
416. JH1IED
417. JN6MIC
418. BU7FC
419. DL1EMO
420. KD4TWP
421. 5W1GC
422. JA7JI
423. W5RUK
424. LU3OJZ
425. WD4OHD
426. 7L1MFS
427. ON4BCM
428. WØUHL
429. N4WJV
430. LU5DSE
431. HS1NGR
432. DU1SAN
433. 4X/G3WQU
434. K3BSA
435. CP8AK
436. K8IHQ
437. JA7NUZ
438. HL5FXP
439. N9PM
440. K9UQN
441. WA7SNY
442. HL5YAW
443. DS5WQT

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. NØAFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6G1
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JAØSU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5NØWRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9Q5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. GØFWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YBØHZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. NØIDT
68. KA1TFU
69. KA4TMJ
70. JA4TF
71. KA3UNQ
72. KB8ZM
73. K2EWA
74. WA1S
75. PY4OY
76. WCØA
77. OZ1FNX
78. KA7EXD
79. ON6DP
80. VE1RJ
90. N6WK
91. WA3KKO
92. KB9ABI
93. SMØBNK
94. WAØQIT
95. 5Z4BH
96. OA4ANR
97. OD5ZZ
98. VE3ZD
99. HL5FRG
100. UB5LRS
101. PS7AB
102. KD1CT
103. DU1CHD
105. IK3ITX
106. VE2JWK
107. N7JXS
108. JM2PRM
109. HL5BUV
110. VE3GLX
111. KK6JY
112. EA6AAK
113. N3IHS
114. WA2CKP
115. VE6AML
116. WAØCLR
117. WA1MKS
118. KD6MOS
119. KP4WN
120. LU5EWO
121. 5W1GC
122. JA7JI
123. W5RUK
124. LU3OJZ
125. ON4BCM
126. WØUHL
127. N4WJV
128. LU5DSE
129. VO1UL
130. DU1SAN
131. 4X/G3WQU
132. K8IHQ
133. K9UQN
134. WA7SNY
135. HL5YAW

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. NØAFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5NØWRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT
26. KA4TMJ
27. N7GMT
28. JA4TF
29. K2EWA
30. WA1S
31. PY4OY
32. ON6DP
33. VE1RJ
34. WA3KKO
35. WAØQIT
36. 5Z4BH
37. HL5FRG
38. JAI-2Ø762/BV
39. VE6AML
40. LU5EWO
41. 5W1GC
42. JA7JI
43. W5RUK
44. LU3OJZ
45. WØUHL
46. N4WJV
47. VO1UL
48. DU1SAN
49. K8IHQ
50. K9UQN

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT
10. N7GMT
11. KD3CQ
12. KB8DAE
13. WA1S
14. PY4OY
15. VE1RJ
16. 5Z4BH
17. N2BI
18. I75OI56
19. VE6AML
20. KB8ZM
21. LU5EWO
22. JA7JI
23. W5RUK
24. WØUHL
25. K9UQN

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU
5. N7GMT
6. WA1S
7. PY4OY
8. KD3CQ
9. VE1RJ
10. UY5XE
11. IK3ITX
12. VU2SMN
13. JA7JI
14. W5RUK
15. LU5EWO

350 COUNTRIES ENDORSEMENT

1. WB2DIN
2. PY4OY
3. UB4WZA
4. JA7JI
5. KD3CQ

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for 73 Magazine."

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On the Go	We provide services, save the bands	KE8YN/4	AUG 60
On the Go	Satellite disruptions and Y2K	KE8YN/4	SEP 53
Out of Sight, Out of Mind	Getting along with the neighbors	WB4BNU	MAR 80
Probing Auto Electronics	Hams can be good neighbors	W6WTU	DEC 10
Publish or Perish	Club newsletters (Reprint)	N1BLH	JAN 66
Roamin' Romania	Part 1: Timisoara...	WB2AQC	JUN 67
Roamin' Romania	Part 2: Amateurs of the Jiu Valley	WB2AQC	JUL 65
Take the Jekyll and Hyde Test	Which shack is yours?	W2CQM	JUL 34
Techno-Trouble for Know-It-Alls	50 questions	WB2WIK/6	APR 28
Techno-Trouble II	Another 50 questions	WB2WIK/6	JUN 29
The Ideal Log	Computer-style card file	W6BNB	OCT 21
The Perfect Field Day	Did everybody have fun?	N8IDA	OCT 54
The Shelby Hamfest	Shelby's 41st year	KA4J	JUL 64
Tips from a QSL Guru	Here's how to make your card count	W6BNB	JUN 64
Vintage Values	Heading for a hamfest?	W2BLC	JUL 25

Ham Radio Fun Section

A Krystal Kludge	A book excerpt from The Xtal Society	WØIZC	FEB 65
Adventures in Regulation	How to use a fixed voltage regulator	W6WTU	APR 64
Bridge Over Troubled Watters	Why buy what you can build?	NØBLX	MAR 67
Determining Antenna Feedpoint Impedance	Even you can learn from this tutorial	W6WTU	AUG 64
Don't Leave Home Without It	Ingenious tester for wallet or purse	W2UW	MAR 64
Home-Brewing Italian-Style!	A two-element phased beam for ARDF	IK8VWA	MAY 64
How About A Kinky-Interesting-Sexy-Sexy?	Down phonetics lane	GØJOE	APR 67
In Search of a Simple Capacitor Tester	A midsummer night's dream project	KD6ORG	
Letter from Down East	One ham won't clam up	W3UWH	FEB 64
Marsha and Me	Making friends via hamming	WF6P	JAN 64
No—Honestly! I'm Not a Pirate!	A tale of travail from a British Novice	2E1DPG	JAN 70
Roamin' Romania	Part 1: Timisoara...	WB2AQC	JUN 67
Roamin' Romania	Part 2: Amateurs of the Jiu Valley	WB2AQC	JUL 65
Scrounger's Delight	The Minnesota miser's magmount	NØBLX	FEB 77
The Shelby Hamfest	The weekend before Labor Day	KA4J	JUL 64
Tips from a QSL Guru	How to make your card count	W6BNB	JUN 64
Ya Gotta Shop Around	Do your homework, get the best deal	K5LAD	MAY 66

Mobile

On the Go	Mobile antennas	KE8YN/5	MAR 58
On the Go	Kenwood TS-130S	KE8YN/4	OCT 43
On the Go	Up, up, and away	KE8YN/4	DEC 47
Truckez-Vous Mon Boat?	Ham friends rescue the *Voyageur*	N4UAU	MAR 10

Modifications

A Silk Purse...	Upgrades for Heathkit SB-104 Xcvr	K9ARF	AUG 10
Modifying Your Ramsey Xcvr Kit	...the ultimate ham experience	NØBLX	APR 18
Tear Apart Your Tube Supply	Drake AC4 modifications	WB2CQM	FEB 33
Upgrading the 209 (MFJ ant. analyzer)	Add a resistance meter	KG5CM	JAN 15

New Products (by manufacturer)

Alinco	DJ-S46 HT	Staff	JUN 72
Allison Technology Corp.	O-Scope II oscilloscope module	Staff	JUL 72
AlphaLab, Inc.	Micro Alert alarm	Staff	AUG 72
ARRL	*1998 ARRL Handbook*	Staff	MAR 79
ARRL	*1999 ARRL Handbook*	Staff	NOV 48
ARRL	*Radio Frequency Interference...*	Staff	SEP 48
ARRL	*Radio Amateur's Sat. Handbook*	K2UBC	MAY 72
ARRL	*RF Exposure and You*	Staff	JUL 72
Buckmaster	*Copy this and pass™* audio CDs	Staff	DEC 48
CCTV Corp.	BC-450 and BC-935C Ball Cameras	Staff	APR 72
Comm. Spec.	ANI-1 ID Encoder	Staff	FEB 72
Contact East	1998 General Catalog	Staff	MAY 72
Cushcraft	TechExpress online tech help	Staff	OCT 48
Cutting Edge Enterprises	PowerPort PowerSafe	Staff	APR 72
Cutting Edge Enterprises	PowerPort RF-35	Staff	FEB 72

Environmental Technology, Inc.	RCD-1/ RCD-2 Passive Dehydrators	Staff	JUL 72
Grove Enterprises	SP-200B Sound Enhancer	Staff	JAN 72
Hall Bros. Manufacturing	Decoder Coin	Staff	FEB 72
Hamco	*Hidden Antennas* catalog	Staff	DEC 48
Hammond	T304 exciter, R304 receiver	Staff	SEP 48
Hamtronics	40 page catalog	Staff	APR 72
Intuitive Circuits	DTMF-8 decoder board	Staff	JUL 72
Janus Computer Services	*Little Little Book About Yaesu VX-1R*	McCully	AUG 72
Jensen Tools	Free catalog	Staff	JAN 72
Jensen Tools	HotRod Safety Screwdriver	Staff	MAR 79
Jensen Tools	Crescent® insulated nutdrivers	Staff	AUG 72
Kantronics; Creative Services Software	PacTerm 98 for the Kantronics TNC	Staff	SEP 48
Kenwood	RadCam	Staff	NOV 48
Kenwood	TK-290 and TK-390 transceivers	Staff	OCT 48
Kepro Circuit Systems	Kepro BTE-302 glass bead etcher	Staff	NOV 48
Lakeview Company, Inc.	Tri-Magnetic Mount (Cat. #375)	Staff	NOV 48
Larsen Electronics	YA3220 line of Yagi directional ants.	Staff	AUG 72
LLH Technology Publishing	*Simple, Low-Cost Electronic Projects*	Blechman	OCT 48
MAXRAD	FME Universal Connectors	Staff	JUL 86
MCM Electronics	New catalog	Staff	FEB 72
MFJ	MFJ-118 Jumbo LCD™	Staff	FEB 72
MFJ	MFJ-270 Guardian Angel™	Staff	NOV 48
MFJ	MFJ-292 Featherweight Earphone	Staff	JAN 72
MFJ	MFJ-295Y Mini-SpeakerMic™	Staff	JUL 72
MFJ	MFJ-310 HT window mount clip w/BNC	Staff	JUL 86
MFJ	MFJ-414 Morse Code Tutor	Staff	SEP 48
MFJ	MFJ-641 RapidBattery™ Charger	Staff	APR 72
MFJ	MFJ-1736 Six-meter J-pole ant.	Staff	AUG 72
MFJ	MFJ-1762 3 El 6m Yagi	Staff	DEC 48
MFJ	MFJ-2881; MFJ-288K	Staff	MAY 72
MFJ	MightyLite™ Switching Power Supply	Staff	JUN 72
MFJ Publishing	*Morse Code: Breaking the Barrier*	N1IRZ	MAR 79
Milestone Technologies	ElectroInstrument Key-8 Paddle Keyer	Staff	JUN 72
Milestone Technologies	Tokyo Hi-Mound Morse equipment	Emm	MAY 72
Mirage	B-24-G Docking Booster	Staff	JUN 72
Mirage	B-510-G 2-meter amplifier	Staff	OCT 48
Morse Express	G4ZPY keys and paddles	Staff	DEC 48
Novatech Instruments, Inc.	2950AR/01, /02, /03 Freq. Standard	Staff	JUL 86
Old West Graphics	Banners	Staff	JUN 72
RF Connectors	RFN-1001.5 N Male Universal Plug	Staff	JUL 86
Pelican Products	Alignlite™ zenon beam flashlight	Staff	AUG 72
PhotograFix	*Ham Radio: Simplified*	Cornwell	OCT 48
R.L. Drake Company	R8B	Staff	JAN 72
Sony	ICF-SCIPC Scanner	Staff	MAY 72
Svetlana Electron Devices, Inc.	*1998 Audio Tube Catalog*	Staff	DEC 48
TAB Books	*Home Video*	Yoder	NOV 48
The Radio Works	Catalog 981	Staff	JUL 86
TTE, Inc.	Model 305-1270M-60M 5-Pole Filter	Staff	JAN 72
Universal Radio, Inc.	*Discover DXing!*	Zondlo	MAY 72
Vectronics	More than 30 kits	Staff	OCT 48
Wm. M. Nye Company	Model 330C Key	Staff	OCT 48
Xuron Corporation	LX Series Micro-Shear®	Staff	DEC 48
Packet			
The Digital Port	Packet programs and SSTV	KB7NO	JAN 51
The Digital Port	HF modem for $15	KB7NO	FEB 61
The Digital Port	Freebies in ham radio	KB7NO	MAR 59
The Digital Port	Serial modem, soundcard, TNC?	KB7NO	APR 53
The Digital Port	1200b packet modem kit	KB7NO	JUL 52
Power Supplies			
Pentium-Style Positive and Negative PS	New technology is great...	N4UAU	JUN 10
The Evolution of Power Supplies	Part 1: Dynamotors and vibrators	W6WTU	NOV 13
QRP			
Announcing the QRPeanut	Compact QRP transmatch	N5GZH	DEC 14
Five-Band Magnetic Loop Antenna	Build a loop for QRP	K2KSY/HL9BK	JAN 18
QRP	Heathkit HW-8	WB8VGE	JAN 50
QRP	VFO	WB8VGE	FEB 57
QRP	HW-8 modifications	WB8VGE	MAR 57
QRP	High-current sealed battery charger	WB8VGE	APR 75
QRP	QRP rigs	WB8VGE	MAY 58
QRP	A QRP Field Day	WB8VGE	JUN 63

QRP	The basics	WB8VGE	JUL 58
QRP	New equipment	WB8VGE	AUG 61
QRP	NorCal's 38 special	WB8VGE	SEP 54
QRP	NorCal's 38 special—a closer look	WB8VGE	OCT 44
QRP	Revenge of the oscillator from hell!	WB8VGE	NOV 52
Radio Direction Finding, Fox Hunts			
Build the FoxTTL Foxhunt Transmitter	Simple, inexpensive	AH2AR/8	NOV 10
Homing In	Field Day	KØOV	NOV 47
Homing In	Friendship and foxhunting	KØOV	JAN 62
Homing In	Canadian capers	KØOV	FEB 58
Homing In	Build tough fox-boxes	KØOV	MAR 61
Homing In	Build the Montreal Fox Controller	KØOV	APR 77
Homing In	Build an offset attenuator	KØOV	MAY 76
Homing In	ARDF is off and running	KØOV	JUN 75
Homing In	Receiver hunting	KØOV	JUL 60
Homing In	Tracking owls, cranes, and foxes	KØOV	AUG 58
Homing In	Italian Connection (Guglielmo Marconi)	KØOV	SEP 51
Repeaters			
On the Go	Steve Nowak	KE8YN/4	APR 58
Reprints			
Publish or Perish	Club newsletters	N1BLH	JAN 66
Reviews (by manufacturer)			
Advance Design Labs	CodeKey	KB1UM	FEB 68
Alinco	A Real Handful–DJ-C5 transceiver	VE3EGA	DEC 24
C&S Engineering	SatTrack: Automatic Ant. Tracking	KAØSNL	JAN 32
Comm Spec	Model ID-8 Morse Station IDer	K4CHE	MAR 46
Drake TR Series	Some of the best vintage equip.	W2BLC	DEC 52
Embedded Research	Just the TiCK Kit	K4CHE	OCT 33
GMSK Data Products	High-Speed Packet Modem	G3LDI	MAY 40
Hamtronics	CC432-5 Receive Converter Kit	WB9RRT	APR 37
Hamtronics	R301 Synthesized VHF Receiver	WB9RRT	NOV 26
Kachina	505DSP HF transceiver	N1VXW	AUG 27
MFJ	MFJ-214 Linear Amp. Saver	NZ9E	OCT 18
MFJ	MFJ-224 2m FM Analyzer	NØBLX	MAR 36
NHRC Repeater Controllers	Build the NHRC-4 Linking Rptr. Cntrlr.	N1KDO	SEP 28
Paddlette Company	Paddlette Micro Keyer	WB8VGE	FEB 37
Pasokon	3.1 SSTV System	KB1UM	JUL 31
Ten-Tec	1210 T-Kit	W9NUP	FEB 39
Velleman Electronics	K2659 Morse Decoder Kit	N1FN	DEC 29
Whiterook	Model MK-88 Pocket Electronic Keyer	AD1B	AUG 42
Yaesu	VX-1R Micro Dual-band HT	KB1UM	JUN 32
Reviews (by product)			
3.1 SSTV System	Pasokon	KB1UM	JUL 31
1210 T-Kit	Ten-Tec	W9NUP	FEB 39
AX384 & AX576 High Speed Packet Modems	GMSK Data Products	G3LDI	MAY 40
CC432-5 Receive Converter Kit	Hamtronics	WB9RRT	APR 37
CodeKey	Advance Design Labs	KB1UM	FEB 68
Computer Controlled HF Transceiver	Kachina	N1YXW	AUG 27
DJ-C5 Transceiver	Alinco	VE3EGA	DEC 24
ID-8 Morse Station IDer	Comm Spec	K4CHE	MAR 46
K2659 Morse Decoder Kit	Velleman—Seeing Dits and Dahs	N1FN	DEC 29
MFJ-214 Linear Amp. Saver	MFJ	NZ9E	OCT 18
MFJ-224 2m FM Analyzer	MFJ	NØBLX	MAR 36
MK-88 Pocket Electronic Keyer	Whiterook	AD1B	AUG 42
NHRC-4 Linking Rptr. Cntrlr.	NHRC Repeater Controllers	N1KDO	SEP 28
Paddlette Micro Keyer	Paddlette Company	WB8VGE	FEB 37
SatTrack System	C&S Engineering	KAØSNL	JAN 32
TiCK Kit	Embedded Research	K4CHE	OCT 33
TR Series Vintage Equipment	Drake	W2BLC	DEC 52
VX-1R Micro Dual-band HT	Yaesu	KB1UM	JUN 32
RTTY			
RTTY Loop	Letter time	WA3AJR	JAN 75
RTTY Loop	AEA	WA3AJR	FEB 71
RTTY Loop	Klingenfuss's CD	WA3AJR	MAR 74
RTTY Loop	Klingenfuss 1998 Radio Station Guide	WA3AJR	APR 74
RTTY Loop	Teleprinter ribbons	WA3AJR	MAY 78
RTTY Loop	Letters	WA3AJR	JUN 57

RTTY Loop	22nd year Anniversary	WA3AJR	JUL 63
RTTY Loop	Letters from readers	WA3AJR	AUG 63
RTTY Loop	Elmers Web site	WA3AJR	SEP 55
Satellite Operation, EME, Space			
Hamsats	Space symposium	W5ACM	JAN 54
Hamsats	Soviet space	W5ACM	FEB 52
Hamsats	Are radio nets dead?	W5ACM	MAY 71
Hamsats	*Satellite Experimenter's Handbook*	W5ACM	JUN 58
Hamsats	European Space Agency, Arianespace	W5ACM	AUG 56
Hamsats	*Ariane 503* and *Phase 3D*	W5ACM	SEP 98
Hamsats	*TMSAT-1, Gurwin-II Techsat*	W5ACM	OCT 40
Hamsats	*SEDSAT-1*, ARISS	W5ACM	DEC 45
Test Equipment			
Already Have an Oscilloscope?	A cheaper add-on capacitor tester	N4MCZ	NOV 57
An FET Probe to MMIC	Relatively new tech for your test bench	W6WTU	AUG 48
Bridge Over Troubled Watters	RF impedance bridge	NØBLX	MAR 67
Don't Leave Home Without It	Ingenious tester for wallet or purse	W2UW	MAR 64
High Impedance Analog Volt/Test Meter	Useful gadget to build	W6WTU	MAR 26
In Search of a Simple Capacitor Tester	Construction project	KD6ORG	AUG 68
Penny Pincher's Digital Ammeter	Inexpensive, accurate, seaworthy	N4UAU	MAY 32
The ZenerMeter	Test set for zener and other diodes	KA4J	MAR 39
VHF/UHF Signal Source	Another piece of test equipment	W6WTU	NOV 21
Tutorial			
Adventures in Regulation	How to use a fixed voltage regulator	W6WTU	APR 64
A Pleasant Visit to the DDS	Direct Digital Synthesis	W6WTU	MAY 15
Ask Kaboom	Sound!	KB1UM	JAN 58
Ask Kaboom	I'm bored!	KB1UM	FEB 50
Ask Kaboom	New modes: Packet voice	KB1UM	MAR 55
Ask Kaboom	Trends	KB1UM	APR 52
Carr's Corner	Randomness; SESCOM Lab-x	K4IPV	JAN 79
Carr's Corner	More on Magnetometers	K4IPV	FEB 74
Carr's Corner	Internet: Its meaning to ham radio	K4IPV	MAR 50
Carr's Corner	Receiving loops & loop preamps	K4IPV	APR 55
Carr's Corner	Receiving loops... Part 2	K4IPV	MAY 54
Carr's Corner	SETI League, Hospital Operations	K4IPV	AUG 52
Carr's Corner	Receiver accessories	K4IPV	NOV 54
Carr's Corner	Hybrid couplers	K4IPV	DEC 42
Cool It!	Keep your transiters cooler	W2GOM/7	AUG 24
Determining Ant. Feedpoint Impedance	Theory, finding element impedance	W6WTU	AUG 64
Electronic Construction from A to Z, Pt. 3	Everything you wanted to know	N1FN/VK5FN	JAN 22
Electronic Construction from A to Z, Pt. 4	Conclusion: You can be Mr. Fix-It!	N1FN/VK5FN	FEB 44
FM Revisited	Modulation	W6WTU	JUL 21
Intro to Superhets	Part 1: History and overview	W6WTU	AUG 38
Intro to Superhets	Part 2: From oscillators to detectors	W6WTU	SEP 22
Intro to Superhets	Part 3: Accessories and conclusion	W6WTU	OCT 26
Keys to Better Operating	Much of it *is* common sense	W6BNB	DEC 17
Meeting Your Match	Understanding matching networks	W2GOM/7	OCT 47
The Digital Port	Modems	KB7NO	SEP 39
The Ins and Outs of Surface-Mount	Everything you need to know...	Davidson	OCT 10
Secrets of Deviant Behavior	Measuring FM deviation	W6WTU	AUG 18
Sensitivity Training	Increasing receiver sensitivity	W2GOM/7	MAY 19
Updates			
Beeper Short Circuit Detective	DEC 1997	Ham to Ham	MAR 84
Automatic Morse Station IDer	MAR 1998	K4CHE	APR 87
Limited Space Antenna	DEC 1997	K2KSY/HL9BK	JUL 87
SatTrack	JAN 1998	KAØSNL	MAR 84
VHF/UHF			
Above & Beyond	Frequency counters; accuracy	WB6IGP	JAN 60
Above & Beyond	Freq. reference oscillator stability	WB6IGP	FEB 63
Above & Beyond	Filters for ham microwave bands	WB6IGP	MAR 74
Above & Beyond	Oscillator considerations/1296 MHz	WB6IGP	APR 50
Above & Beyond	Surplus 1152 MHz synthesizer	WB6IGP	MAY 50
Above & Beyond	Bits and pieces for microwave & VHF	WB6IGP	JUN 61
Above & Beyond	Making antenna measurements	WB6IGP	JUL 50
Above & Beyond	Test equipment, junkyard acquisitions	WB6IGP	AUG 50
Above & Beyond	How to repair old beam antennas	WB6IGP	SEP 36
Above & Beyond	VHF to microwave preamplifiers	WB6IGP	NOV 42
Above & Beyond	HP power meters/thermistor mounts	WB6IGP	DEC 39

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the April '99 issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Special Event.

JAN 9

LOVELAND, CO The Northern Colorado ARC will host their Winter Superfest 9 a.m.–3 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. VE exams, commercial exhibits, computer and radio goodies, and more. Reserve tables from *Jeanene Gage NØYHY (970) 351-7327.* General info *(970) 352-5304.* Talk-in on 145.115 (-100 Hz), or 146.85(-).

JAN 10

SOUTH BEND, IN The 22nd Annual South Bend Hamfest & Computer Expo will be held at the Century Center, located at US 33 N. and Jefferson Blvd. The Michiana Valley Hamfest Assn. will host this event 8 a.m.–3 p.m. There will be a large flea market with setup at 6 a.m. on Sunday. 5-foot round tables are $5 ea., 8-foot rectangular tables are $15 each. 8-foot rectangular wall tables are $20 each. Electric power $26.25; please state whether you want it or not. Advanced tickets $4 ea. For info or ordering, please send a business size SASE to *Michiana Valley Hamfest Association, 21970 Kern Road, South Bend IN 46614, or contact Denny KA9WNR, M-F 7 p.m.–10 p.m. EST at (219) 291-0252.* Talk-in on 145.290(-). Several motels/hotels have offered discount rates for Sat. Jan. 9th; ask for "South Bend Hamfest discount rate." Make reservations early, discount rates expire Dec. 20th. Holiday Inn Downtown, (219) 232-3941, 1–4 persons, $79, pool. Marriott Hotel, 1-800-328-7349, 1–4 persons, $64, pool. Super 8 Motel, (219) 272-9000, 1–2 persons, $51; 3–4 persons, $65 (7267); continental breakfast. Days Inn, (219) 277-0510, 1–4 persons, $42; continental breakfast (29889). Best Inn, (219) 277-7700, 1–2 persons, $44; 3–4 persons, $51, continental breakfast.

JAN 16

HAMMOND, LA The Southeast Louisiana ARC, Inc., will present the 19th annual SELARC Hammond Hamfest at University Center on University Drive. Easy access via I-12, I-55, US 51, or US 190. Free admission, free parking. VE exams; MARS, QCWA, ARES forums. To request more info, write to *Southeast Louisiana Amateur Radio Club, Inc., P.O. Box 1324, Hammond LA 70404.*

ST. JOSEPH, MO The Missouri Valley ARC and Ray-Clay ARC will hold their 9th annual Northwest Missouri Winter Hamfest 8 a.m.–3 p.m. at the Ramada Inn, I-29 and Frederick Ave. (Exit 47 on I-29), in St. Joseph MO. There will be special room rates for hamfest participants. VE exams, major exhibitors and flea market all indoors. Free parking. Advance tickets $2 each or 3 for $5; at the door $3 each or 2 for $5. Pre-registration requests received after Jan. 5, 1999, will be held at the door. Dealers: Swap tables $10 each for the first two tables. Commercial exhibitors welcome. Write for details: *Northwest Missouri Winter Hamfest, c/o Gaylen Pearson WBØW, P.O. Box 1533, St. Joseph MO 64502, or E-mail [WBØW@IBM.Net].*

JAN 17

HAZEL PARK, MI The Hazel Park ARC will hold its 33rd Annual Swap & Shop on Jan. 17, 1999, at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. The public is welcome 8 a.m.–2 p.m. General admission is $5 in advance or at the door. Plenty of free parking. Tables $14; reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-), the DART rptr. For info about the swap, tickets, or table reservations, mail to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

RICHMOND, VA The Richmond Amateur Telecommunications Society (RATS) will hold "Frostfest 99" at the Showplace-3000, Mechanicsville Tpke. I-95 exit 75 to I-64 East, then exit 192 (Rt. 360 East), go 1/2 mi. on left. Hours 8:30 a.m.–3:30 p.m. with indoor dealers, flea market, forums. Handicapped accessible. Admission $6. Write to P.O. Box 14828, Richmond VA 23221-0828. For general info call *(804) 739-2269, ext. FEST.* The Web site is at *[http://frostfest.rats.net].* Talk-in on 146.88.

YONKERS, NY The Metro 70 cm Network will present another Giant Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, 9 a.m.–3 p.m., rain or shine. No tailgating. Indoor flea market only. Vendors: $19 1st table, $15 each additional table. All tables 30" x 5', or bring your own tables at $14 for a 6'-0" space. At the door, $25 each table, $20 for a 6'-0" space. Full payment is due with registration. The Giant Electronic Flea Market will also be held on May 2nd and Sept. 26th, so there is a special offer for vendors who want to register for all three events: $16 1st table, $13 each additional table. All 6'-0" spaces $13 each. Full payment for all three events is due with registration. No paid reservations for space will be held past 9 a.m. No refunds given unless prior notification of cancellation has been received 72 hours in advance of each event. Donation $6, kids under 12 admitted free. Table setups at 7 a.m. For registration, call *Otto Supliski WB2SLQ, (914) 969-1053.* Mail paid reservations to *Metro 70 cm Network, 53 Hayward St., Yonkers NY 10704.* We will return a receipt showing the amount paid and the table or space location reserved. Show receipt at the door for entry. Talk-in on 440.425 MHz PL 156.7; 223.760 MHz PL 67.0; 146.910 MHz; and 443.350 MHz PL 156.7.

JAN 24

DOVER, OH The Tusco ARC Hamfest will be held Sun., Jan. 24th, at the Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Exit Interstate 77 at exit #87 (Strasburg)—turn right at the exit stop sign, heading south on County Road 74 to the first traffic light. Continue through the traffic light intersection. The armory is on the right. Admission, $2 donation at the door. Tables $8 each. Open 6 a.m. for setup, 8 a.m.–12 noon for the public. Food available on site and at the restaurant next door, which opens at 7 a.m. For additional info and to reserve tables, contact *Howard Blind KD8KF, 6288 Echo Lake Rd., N.E., New Philadelphia OH 44663. Tel. (330) 364-5258.* Talk-in/check-in on 146.730(-).

VILLA PARK, IL The Wheaton Community Radio Amateurs will host their 32nd Mid-Winter Hamfest at the Odeum Exposition Center, 8 a.m.–2 p.m. The Hamfest and Electronic Flea Market will include commercial booths in the North Hall. Reserved flea market tables in the South Hall and Mezzanine, computers and software, acres of parking, and VE exams on site. Gordon West will present a seminar. Tickets $6 in advance (with four prize stubs), or $8 at the door. Mail advance ticket payments by Jan. 8th to be sure you will be in the prize barrel. Make checks payable to *WCRA.* Send with a business size SASE to *WCRA, P.O. Box QSL, Wheaton IL 60189. Tel/FAX (630) 665-7757.* Free bus service from remote parking; see the map on the Web site at *[www.w9ccu.org].*

JAN 30

ALBUQUERQUE, NM The Albuquerque Winter Tailgate Swapfest will be held Sat., Jan. 30th, 8 a.m.–2 p.m., (weather permitting) at the Del Norte High School parking lot, at the corners of Montgomery and San Mateo Blvds. Admission is free. For more info please contact *Tom Ellis K5TEE, 912 Lomas Ct. NE, Albuquerque NM 87112-5515. E-mail [K5TEE@QSL.NET]. Tel. (505) 291-8122.*

FEB 6

NO. CHARLESTON, SC The 26th Annual and Original Charleston Hamfest and Computer Show will be held Feb. 6th at the Stall High

Number 43 on your Feedback card

HAM TO HAM

Your Input Welcome Here

Dave Miller NZ9E
7462 Lawler Avenue
Niles IL 60714-3108
E-mail: [dmiller14@juno.com]

It's the January issue again already, so Sue (KA9UCK) and I would like to take this opportunity to once again wish everyone a Happy New Year.

I would also like to encourage readers to keep sending in their tips, ideas, suggestions and shortcuts for a bigger and better "Ham To Ham" column next year. Just send your ideas to the address (postal or E-mail) shown above, and there's a good chance you'll see them in print in the coming year.

Keeping a cool watch

What's perhaps the easiest way to destroy an expensive modern computer microprocessor chip? Heat! Today's computer microprocessors are compact, fast and reasonably robust, but they need to be kept cool to do all that they're called upon to do quickly. Most desktop computer microprocessors are fitted with a husky heat sink and a 12 VDC cooling fan to help maintain a safe case operating temperature for the device—but lacking forced cooling, a high-speed processor can destroy itself pretty quickly via thermal runaway. But how would you even know if your processor's case temperature was too high? Perhaps, not until it was too late!

One day, the sleeve-bearing fan on my Pentium® microprocessor gave out without my knowledge. Fortunately, I noticed that the computer was behaving oddly before the microprocessor was damaged, but I was lucky! After that incident, I installed a ball-bearing fan for the processor (which will hopefully provide longer life) as well as a processor heat sink temperature indicator in the form of an inexpensive indoor/outdoor automotive digital thermometer.

I wanted a thermometer that would neatly fit on a standard 1-3/8-inch by 5-3/4-inch computer single-bay blank panel, and I found what appeared to be the perfect one at my local automotive supply store—it measures about 1-1/8 inches by 4-1/2 inches. It was made for use inside an auto or van, and came with an "outdoor" temperature probe coupled by about 10 feet of small two-conductor wire. I used this probe as my processor's temperature sensor, trimming the 10-foot interconnecting cable down to just what I needed to reach from the computer's empty front-panel bay to the processor's heat sink; I also installed a small two-pin in-line

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School, near Ashley Phosphate Road in No. Charleston. No tailgating allowed until all tables are sold inside. Tickets $5 at the door (includes one prize ticket). Additional prize tickets are $1 each, or six for $5. Children under 12 admitted free. Pre-registered tables $8 per 8 ft; at the door $10 as long as they last. Make checks payable to *C.A.R.S. Hamfest Committee,* enclose an SASE, and send to *Jenny Myers WA4NGV, 2630 Dellwood Avenue, Charleston SC 29405-6814.* ARRL, Natural Disasters, and other forums will be held. BINGO for spouses and harmonics. VE exams will be given on site. Please bring the original and a copy of your amateur license, any CSCEs you have, and two IDs, one with a photo. All testing will be on a walk-in basis and will begin at 12 noon. For further info, call *Ed KE2D at (843) 871-4368, or E-mail [efrank@charleston.net]; or call Doc W4MUR at (843) 884-5614.*

FEB 13

HARRISBURG, PA The Harrisburg Radio Amateur Club will hold a Valentine Hamfest, Sat. Feb. 13th, at the Oberlin Fire Company in Harrisburg. Directions: I-283 to Swatara PA-441 Exit (#1). Turn north onto PA-441 (toward Bob Evans Restaurant). Turn left at the traffic light onto Eisenhower Blvd. Turn right at the next traffic light, remaining on PA-441. Turn at the stop sign. The Fire Hall is 0.2 mi. on the right. There will be signs from I-283. General admission at 8 a.m., $2; sweethearts, XYLs, and harmonics free. Table setup at 6 a.m. Friday night setup if needed. VE exams will be conducted nearby at 9 a.m. Tables are $8 in advance. Very limited tailgating, $2. For table registration, contact *N3NJB, 2501 S 2nd St., Steelton PA 17113-3009. Phone (717) 939-4825; or E-mail [n3njb@juno.com].*

FEB 14

MANSFIELD, OH The Mansfield Mid*Winter Hamfest/Computer Show will be held Sun., Feb. 14th, at the Richland County Fairgrounds, Mansfield OH. Doors open to the public at 7 a.m. Tickets $4 in advance and $5 at the door. Tables $10 in advance and $12 at the door, if available. For additional info or advance tickets/tables, send SASE to *Pat Ackerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905,* or phone *(419) 589-7133 after 2 p.m. EST.*

FEB 20

RICKREALL, OR The Salem Repeater Assn. and Oregon Coast Emergency Repeater, Inc., will present the 1999 Salem Hamfair & Computer/Electronic Swapmeet, Sat., Feb. 20th, at the Polk County Fairgrounds in Rickreall. Doors open at 9 a.m. Preregistrations postmarked by Feb. 5th will receive an extra door prize ticket with each registration. Registrations received on or after Feb. 14th will be held for pickup at the door. Participants 13 years of age or older must be registered to enter the hamfair. For preregistration, contact *Evan Burroughs N7IFJ at (503) 585-5924 (before 8 p.m.), or E-mail to [n7ifj@teleport.com].* Swap table setup will be Fri. night, 6 p.m.–9 p.m. and Sat. morning at 7 a.m. Self-contained RV spaces available. Features include: swap tables, commercial dealers; meetings—ARRL, ARES/RACES, and others as announced. No VE testing is planned. For more info contact the Web site at *[http://sra.goldcom.com/sraflyer.htm].* Talk-in on the 146.86 rptr.

FEB 28

ANNANDALE, VA The Vienna Wireless Society will conduct its 23rd Winterfest on Sun. Feb. 28th, 1999, at the Annandale (VA) campus of the Northern Virginia Community College, in the gymnasium of the Ernst Cultural Center. Admission $5, XYL free. Tailgating starts at 6 a.m. in the parking lot south of the Ernst Cultural Center. The $10 tailgate fee includes admission. VE exams begin at 8 a.m. sharp. Walk-ins permitted. For more info, call *Jim Parsons WA4LTO at (703) 392-0150, or E-mail [k3mt@erols.com].* The Web site is at *[http://www.erols.com/k3mt/vws].*

SPECIAL EVENT STATIONS

JAN 26–27

ST. LOUIS, MO All Amateur Radio Clubs of St. Louis (MO) will sponsor Special Event Station WØK during the papal visit of Pope John Paul II, Jan. 26–27, 1999. Operations from the Monsanto Amateur Radio Assn. shack will be on 10–80 meters, 24 hours per day. QSL with #10 SASE via *Rev. Mike Dieckmann KAØIAR, 703 Third St., Hillsboro MO 63050 USA.*

FEB 13–14

ALEXANDRIA, VA The Mount Vernon ARC will operate K4US 16:00Z–21:00Z Feb. 13–14 to commemorate George Washington's Birthday. Transmission will take place from Mt. Vernon (VA). Frequencies include 7.240 MHz, 14.240 MHz sideband and 10.110 MHz or 18.080 MHz CW. For an 8-1/2" x 11" certificate, send QSL and SASE to *MVARC, P.O. Box 7234, Alexandria VA 22307.* 73

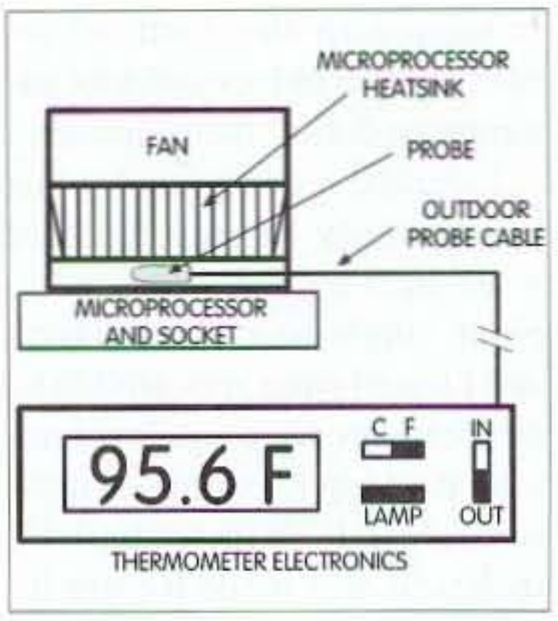


Fig. 1. *An automotive digital thermometer may be used to keep careful watch over the heat sink temperature of a computer's microprocessor.*

connector in the cable. The remote sensing probe needs only just to touch the processor's heat sink, so I was able to put a small adhesive cable clamp on the socket rim that holds the microprocessor, to accomplish what was needed in the way of a tie-down for the probe. A spare 1-3/8-inch by 5-3/4-inch computer single-bay blank panel was then drilled to pass the remote sensor's cable, and the thermometer itself was attached to the panel via double-stick adhesive foam pads, to complete the modification (see **Fig. 1**).

The "indoor" position on the thermometer's probe selector switch now reads the computer's exterior case temperature (room temperature), and the "outdoor" position reads the heat sink temperature of the microprocessor itself, buried deep within the computer. The automotive thermometer that I found places the LCD display at a 45° angle, which makes it very easy to read even in subdued lighting. The electronics for the thermometer operate from a pair of built-in "AA" alkaline cells, and should provide a reasonably long service life (so the thermometer is on, even when the computer is off). I didn't feel the need to try adapting power from the computer itself to run the thermometer, but I'm sure that it could be done. The five-volt bus from the computer's supply could be tapped, and a simple series resistive voltage dropping circuit added if you prefer to be freed from ever having to change the batteries in the little digital thermometer. The added current drain of the thermometer would be insignificant.

There are no doubt more elaborate ways of monitoring the temperature of the microprocessor's heat sink than what I've described above, but I was shooting for simple, inexpensive and easily accomplished ... which I feel that this answer was. A programmable audible alarm would be nice too, but that will have to wait for a later column.—de NZ9E.

Photo A. *WB9YBM's modified Clegg FM-76 transceiver is shown, along with samples of his outboarded synthesizers and deviation meter. If done professionally, add-ons can actually enhance the resale value of "middle-aged" ham equipment. See the full text for further details. (Photo provided by Klaus Spies WB9YBM.)*

Ahhh, middle age!

From Klaus Spies WB9YBM: Here's some advice on how to deal with middle age ... in radio gear, that is: "While much is written about both brand new and very old (antique) radio equipment, the most neglected group seems to be those radios in their 'middle years' ... and they can be a very attractive buy!

"In the mid-seventies, there appeared a series of VHF transceivers for the 144 MHz and 220 MHz bands that were nearly identical, except for the front panel name plate. Clegg, Cobra and Midland all had 12-channel, crystal-controlled transceivers that can still be seen in many shacks, packet BBSs and repeater sites across the country. They've especially found homes in repeater usage because their receiver and transmitter boards are easily separated (for split receive/transmit sites) and, like the famous bunny, they seem to just keep on going.

"The unit pictured in **Photo A** is typical. It originally came equipped with a four-pin connector on the rear apron, which was designed to provide easy access for adding a Touch-Tone® pad or a discriminator output meter. Also, unlike the cluttered rear aprons of today's transceivers, there was plenty of additional room for adding connectors to bring signals in and out for frequency synthesizers and other useful add-ons ... pretty much as the owner deemed necessary.

"Likewise, there was actually extra space inside the cabinet for carefully adding small PC boards for additional features, something that's nearly impossible to do in many of the current sets. If the extras are conscientiously built, they can actually be a bonus, rather than a hindrance, at resale.

"Here are a few considerations to keep in mind if you decide to add on to one of these transceivers. Obviously, every effort should be made to keep any add-on circuits reliable and low-profile, as well as to make sure that any conductive surfaces are well insulated. It takes just a bit of carefully placed and secured waxed cardboard to keep everything isolated, so that unforeseen shorts won't occur. Try to keep any add-on boards well away from existing RF circuitry, and digital logic boards should never be placed near low-level audio stages where the clock pulses can end up being induced into your transmitted audio signal. A little time and effort in studying the problem at the onset (perhaps even sleeping on it) will pay big dividends.

"Another advantage to middle-aged ham transceivers is their use of 'standardized' (rather than specialty) components and semiconductors. There are almost always cross-reference equivalents available for the bulk of the parts used in these sets, and even more modern parts can sometimes be substituted if all other avenues for replacements fail. All in all, middle-aged ham equipment can be a very good buy, especially considering the fact that most of the initial purchase depreciation has already been assessed. So keep your eyes and ears open at hamfests, auctions, equipment trader publications, Internet swap pages, etc., for these unsung bargains. See you at the next 'fest!"

Do it your way!

From Herb Foster AD4UA: "If you're 'borrowing' 12 VDC from your HF transceiver's power supply, and you've ever experienced a sudden, unannounced power supply shutdown, then maybe it's because your transceiver's power supply is being strained very close to its limits. It's tempting to simply hook up a number of peripherals across a transceiver's matching supply ... after all, it's just a few milliamperes here and there! It's so easy to lose count, but after some time, those few mils here and there add up! The result, of course, is an unceremonious shutdown of everything, and usually at the worst possible time, if Murphy has any say in the matter!

"My own solution to this situation was to buy a separate three-ampere regulated 12-volt power supply from Radio Shack®, along with the parts shown on the schematic in **Fig. 2** from their parts pegboards, and (happily) the problem has disappeared from my operating desk.

"It's an obviously simple solution, but often one that we keep putting off until we see how someone else has done it. My new three-amp 12-volt supply feeds into a project box via a short length of #18 gauge lamp cord and a three-ampere fuse, where it is paralleled off to six chassis-mounted, RCA phono

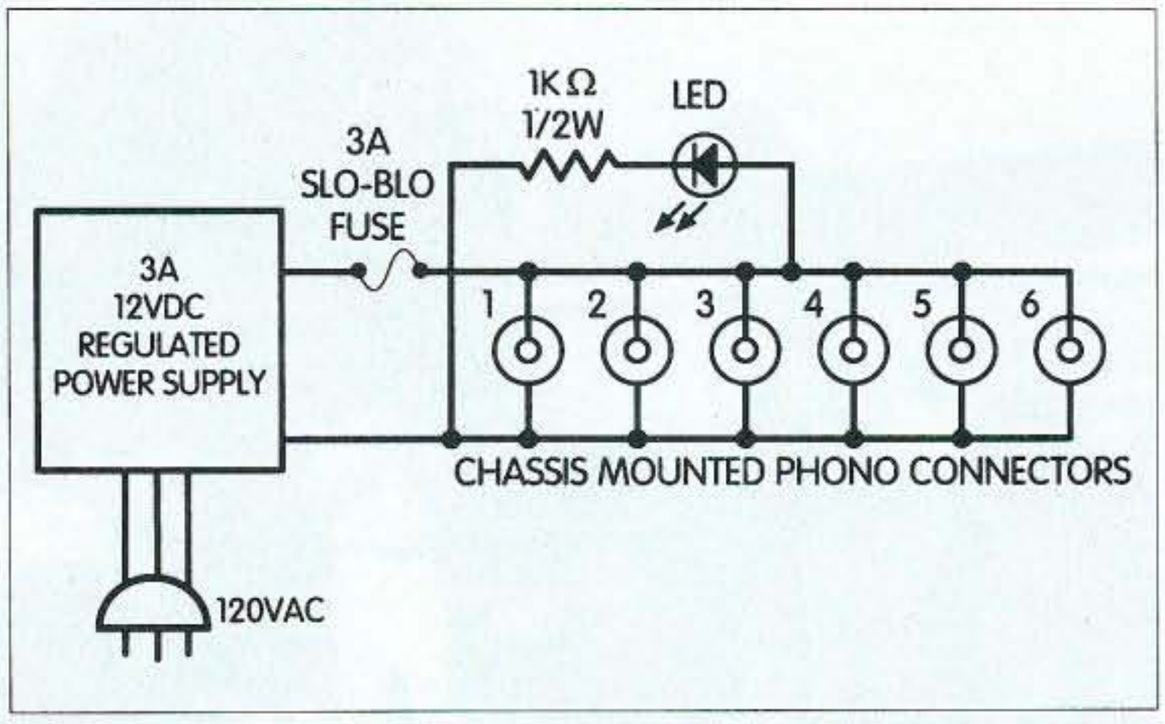


Fig. 2. *Easily-duplicated 12 VDC auxiliary power distribution box idea suggested by Herb AD4UA. See the text for a full description.*

jacks (use as many jacks as you think you'll need for now and the future). All of my 12-volt peripherals can now be plugged directly into the new 12-volt DC distribution box and easily connected and disconnected as desired.

"Use whatever style plugs and jacks that you wish, but the type specified are very inexpensive, fairly well-made, and will carry the peripheral current with little or no voltage drop. Of course the female connector should always be on the power supply side, and the male connector on the equipment side. Using only phono connectors with red plastic shells, or painting the connectors with red model airplane paint, will alert you to the fact that this is a power connector, not an audio cable.

"**Photo B** shows you how mine turned out, but feel free to add as many frills as you think might be worthwhile (such as an LED to show that power is being supplied to the box, or even a small inexpensive panel-mounted digital voltmeter). There are some commercially-made voltage 'breakaway' boxes on the market, but this one is a whole lot less expensive and it gives you the freedom to do it your own way!"

Murphy's Corollary: When all of your problems become crystal clear, that's the time when you need to begin worrying!

Many thanks, as always, to our loyal contributors. Remember, I'm always looking for interesting and innovative tips, ideas, suggestions and shortcuts to include on the pages of *73 Magazine* within this column. Just jot down your thoughts and send them to the address at the masthead.

Those who accepted the challenge this month are:

Klaus Spies WB9YBM
1709 Dennis, Apt. 3A
Mount Prospect IL 60056

Herb Foster AD4UA
3020 Pennsylvania Street
Melbourne FL 32904-9063

If you're missing any past columns, you can probably find them at *73's* "Ham To Ham" column home page (with special thanks to Mark Bohnhoff WB9UOM), on the World Wide Web, at: [http://www.rrsta.com/hth].

Note: The ideas and suggestions contributed to this column by its readers have not necessarily been tested by the column's moderator nor by the staff of *73 Magazine*, and thus no guarantee of operational success is implied.

Always use your own best judgment before modifying any electronic item from the original equipment manufacturer's specifications. No responsibility is implied by the moderator or *73 Magazine* for any equipment damage or malfunction resulting from information supplied in this column.

We will make every attempt to respond to all legitimate ideas in a timely manner, but please send any specific questions, on any particular tip, to the originator of the idea, not to this column's moderator nor to *73 Magazine*. 73

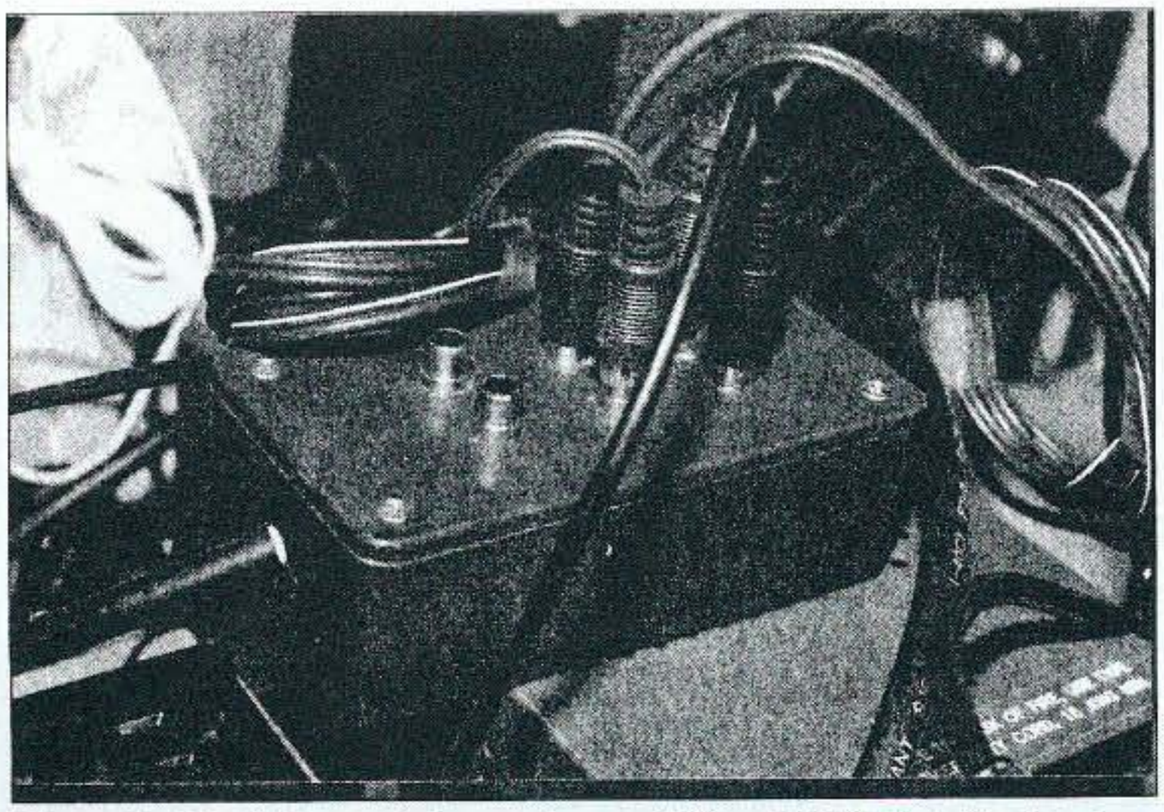


Photo B. *Herb Foster's home-brewed 12-volt DC distribution box is shown neatly tucked away amid the equipment on his operating desk.*

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083

The AMSAT 16th Annual Space Symposium and General Meeting got off to a superb start at the Battlefield Inn near the Yazoo River in Vicksburg, Mississippi. Attendees began showing up around midday Thursday, October 15th. The Vicksburg Amateur Radio Club, working in conjunction with the local AMSAT Group, provided registration services. Those who came were welcomed with packets of information about the meeting, symposium, and local attractions. Event organization was excellent.

Friday

Activities on Friday morning began promptly at 8:30 a.m. with introductory comments by Russ Tillman K5NRK, the symposium chairman. Unlike many ham radio conventions that only last a day, usually peaking during the morning hours of a Saturday, the AMSAT Space Symposium gets moving on Thursday night and continues all weekend through Monday of the following week.

Photo A. *Dr. Martin Davidoff K2UBC, author of the* Radio Amateur's Satellite Handbook, *got the presentations rolling with his amateur radio satellite history.*

Dr. Martin Davidoff K2UBC made the first presentation, with a brief history of the amateur satellite program. Marty's long association with the program brought out many bits of obscure, yet fascinating, facts about the early satellites. Did you know that *OSCAR-1* went up on a military launch, or that *AMSAT-OSCAR-6* required daily commands from the ground to stay on the air? How about the history of *Phase 3A*? This satellite was lost on the second flight of an *Ariane* rocket in May 1980. It was the first ham satellite to have its own kick motor for orbital maneuvers.

Chuck Duey KIØAG gave the second Friday talk, complete with slides, on his efforts to make contacts from over 100 grid squares via satellite. While many have obtained the ARRL VUCC award via the hamsats, Chuck has made it a personal goal to travel to over 100 grid squares, mostly in western states and Alaska, and operate portable via every available voice and CW-mode *OSCAR*. The heart of his station is the Yaesu FT-847. His antennas range from quarter-wave whips on the HF bands to beams and M-Squared "egg-beaters" for the VHF and UHF bands. Following his talk, Chuck took his gear, and most of the symposium attendees, to the parking lot for a live demonstration of his portable system via *AMRAD-OSCAR-27*. Chuck used an HT in conjunction with the Arrow Antenna hand-held dual-band yagi. Several other

Photo B. *Chuck Duey KIØAG and many others took a break from the presentations to chase* A-O-27 *from the parking lot of the Battlefield Inn in Vicksburg, Mississippi.*

Arrow antennas were also in evidence from others in the group. Vicksburg dominated the satellite during the pass.

After the long break for satellite chasing, Ken Ernandes N2WWD took the group through a technical session describing the advantages of intermediate circular orbits for amateur satellites. Most hamsats are in low circular orbits, with the current exception of *AMSAT-OSCAR-10*, with its high elliptical orbit.

As we approach the year 2000, many hams have begun to recognize that there are programs and other applications that are sensitive to date and time changes. Satellite tracking is no exception. Roy Welch WØSL talked not only about concerns and fixes associated with AMSAT satellite-tracking software, but also about potential hardware and firmware Y2K problems in computers.

Most AMSAT software has been checked for compliance with the date change to the year 2000. The programs that have shown problems have been modified. Software authors have been provided with guidelines to use when writing new software or modifying legacy code. Roy also provided some good simple tests that can be

Photo C. *Bill Tynan W3XO makes a quick contact with KIØAG's HT via* A-O-27.

Photo D. *Anthony AA2TX explains the fundamentals of his modified double-loop 70 cm antenna to one of the AMSAT members.*

tried on PCs to check for problems in the internal BIOS. Some good Internet sites to check for PC Y2K tests include [http://www.rightime.com] and [http://www.dell.com].

John Melton GØORX finished Friday morning with a presentation about his efforts to design automated satellite ground station software written in Java©. He first presented his work at the 1997 AMSAT symposium in Toronto, Canada. John has made his software available via the Internet at [http://www.qsl.net/n6lyt]. More changes are in the works, but the initial iteration offers the promise of working on any system that will support the Java 1.1 Virtual Machine™, like your Internet browser software.

One of the biggest problems with satellites is the fact that all of the amateur radio satellites move with respect to the users. Our hamsats are not geostationary like the TV satellites. The use of directional antennas for hamsat chasing requires that the user aim the antennas while the satellite travels across the sky. While this can be done with computers and the appropriate software and interface hardware, it is usually done by hand while attempting to tune out Doppler shift and keep up with a conversation through the satellite transponder. Many hams have tried simple antennas for satellite work that do not require aiming, usually with marginal results or serious compromises. Anthony Monteiro AA2TX has been experimenting extensively with a modified double-loop antenna for 70 cm reception. His paper, as presented in the *Proceedings of the AMSAT 16th Annual Space Symposium*, described the problems and solutions associated with simple omnidirectional antennas. His antenna is very similar to an M-Squared eggbeater, with a few changes to optimize it for space communications. Complete dimensions are given in his paper, along with antenna modeling plots and real-world results.

Photo E. *Bob Bruninga WB4APR gets a little extra elevation while monitoring a 9600-baud digisat using the new Kenwood HT at the AMSAT Space Symposium.*

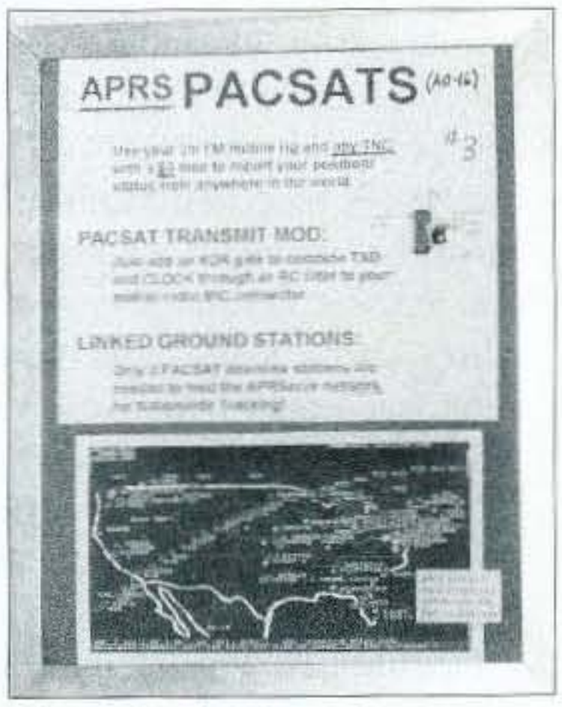


Photo F. *A $3 mod to a standard TNC can make it compatible with the required uplink signal for* A-O-16. *The result is simple APRS via* A-O-16.

Bob Bruninga WB4APR, of APRS (Automatic Position Reporting System) fame, was next. He was hard to miss in the white hardhat resplendent with digital-ready HT, SSTV camera-mike, and GPS receiver. This really got the attention of the audience. Bob provided some introductory material, and then reported on advances in the APRS network and the potential uses of the Kenwood SSTV mike and dual-band packet-ready (TNC inside) HT.

His talk, however, focused on the use of 1200-baud pacsats such as *AMSAT-OSCAR-16* for APRS experiments. While many areas of the United States have terrestrial APRS system coverage, using the pacsats would provide global coverage. Sending data to a pacsat requires about 25 watts to an omnidirectional antenna on two-meter FM, a TNC (Terminal Node Controller) with a minor modification to provide Manchester encoding, and a PC. The pacsat downlink is not easy to receive, but for APRS purposes, the uplink of locational data is the most important part of the equation. A few stations

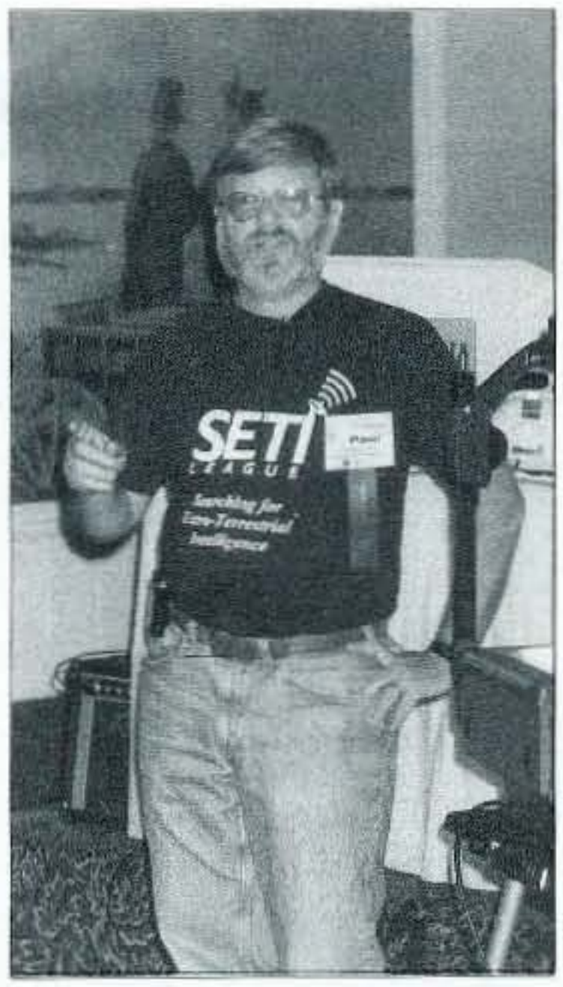


Photo G. *Dr. Paul Shuch N6TX explained advances for cheap SETI receive gear.*

around the world receive the APRS data from the pacsats and make it available via the Internet and other APRS channels. Check out Bob's site at [http://web.usna.navy.mil/~bruninga/aprs.html].

Dr. Paul Shuch N6TX has become a regular at the AMSAT meetings in recent years. His talk, "SETI on the Cheap: Affording the Ultimate DX," provided an update on some of the programs and hardware now under development for use by individuals in the Search for ExtraTerrestrial Intelligence. In addition to the serious technical side of his material, Paul always succeeds in bringing some levity to the day with his guitar and songs.

Dr. Bob Twiggs KE6QMD, of Stanford University, was part of the last afternoon session. Bob detailed efforts with a class of small satellites called nanosats. While microsats have been loosely defined as payloads in the 10 kg (22 pounds) category, nanosats are to be about one kg (2.2 pounds) in weight with a similar reduction in size from the eight-inch cube of a microsat. Bob pointed out that some serious science and intriguing amateur

Continued on page 50

Number 48 on your Feedback card

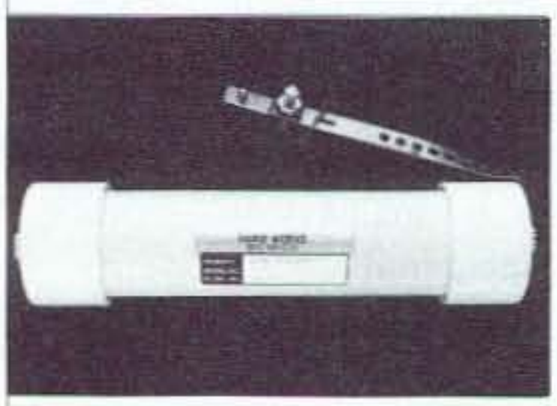
New Products

Earbud from MFJ

MFJ's HandyPal™ Earbud Earphone is the perfect companion for your speaker mike and handheld transceiver. It's a super-lightweight foam earpiece that fits comfortably and securely in your ear. You can listen to your radio and still carry on a conversation, or jog, hunt, climb mountains ... whatever!

It's durable enough for years of use, and comes in two models: MFJ-291I for ICOM, Yaesu, Standard, Alinco, ADI, Radio Shack and other compatible transceivers; MFJ-291K for Kenwood and compatible handhelds—and of course they come with MFJ's famous *No Matter What*™ one-year limited warranty—all for $4.95!

To order, or for the name of your nearest dealer, call (800) 647-1800; FAX (601) 323-6551; E-mail [mfj@mfjenterprises.com]; or take a gander at the Web site: [http://www.mfjenterprises.com].



Sorry About Calling the Bomb Squad ...

Well, wasn't that *your* first reaction to the picture? Maybe it's true, what the XYL claims about ham radio affecting the mind ...

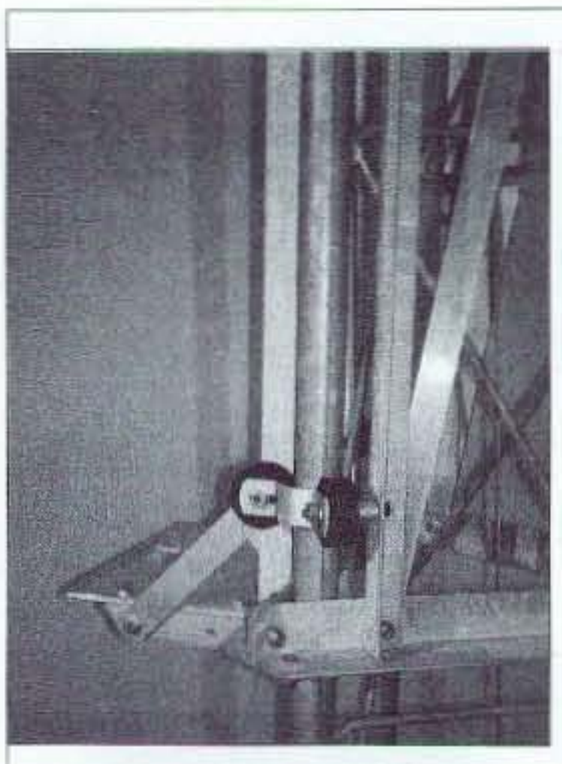
What this is, actually, is the T-4G Line Isolator™ from The Radio Works, and it achieves the maximum possible isolation by providing a direct path to ground for stray RF traveling along the outer shield surface of coaxial feedlines. With the T-4G, stray RF on the coax doesn't see a secondary path to your station equipment because of the extremely high inductive reactance of the Line Isolator's windings. Winding reactance is as much as 50% higher than with previous models.

If a direct earth ground is not available and the copper ground strap isn't necessary, try the T-4, inserted in series with coaxial cable connecting your transmitter to your linear and between your linear and your transmatch. RF in the radio room can cause TVI, RFI, and RF feedback problems—and the installation of line isolators is often the best (or only) solution. The T-4 replaces the 4KRF-LI, the 4KV-LI, and the T-3.

The T-4G is priced at $33.95; the T-4, at $29.95. Order by calling The Radio Works at (800) 280-8327. You can also get a nifty catalog by calling that number, or E-mail your request to Jim W4THU at [jim@radioworks.com]. If all else fails, write to The Radio Works, Box 6159, Portsmouth VA 23703.

He Who Dies with the Most Tools ...

... So start filling in the blank spots in your workshop with the help of Jensen Tools' latest catalog! They're always adding and upgrading, so you'll want the most recent of their great color catalogs. To get yours, call (800) 426-1194; FAX (800) 366-9662; or write to Jensen Tools at: 7815 S. 46th St., Phoenix AZ 85044.



Do You Have a Hazer?

Glen Martin Engineering produces a roller bearing set for Hazers that fit on Rohn and Martin towers. The roller bearing set improves the smooth contact of the Hazer with the tower. The bearings easily roll over tower joints or other rough spots. The bearing system eliminates any previous play or sideways movement on your Hazer.

Suggested retail price for the roller bearing set (HR-2040) for Hazer 2, 3, and 4 is $59.95. For Hazer 5 and 6 (HR-6040), you'll pay $44.00. For more information, contact Glen Martin Engineering, 13620 Old Hwy 40, Boonville MO 65233; call (660) 882-7500; FAX (660) 882-7200. Check the Web site at [http://www.glenmartin.com].

Quick Soldering Anywhere!

The EZ-Torch portable mini torch from Wahl Electronics is powered by a readily available replaceable butane cartridge that will provide 20 minutes of continuous use. You can crank up the flame and get the temperature to 2375° to perform a variety of tasks requiring high heat. The unit has a windproof, weatherproof flame and operates at various angles without extinguishing itself.

The EZ-Torch's small (palm-size), lightweight design makes it ideal for use anywhere, so make sure your tool kit and emergency go-bag include EZ-Torch. It's $21.95 well spent!

Virtual Antennas

NEC4WIN95 is an antenna simulation software running on Windows® 95, 98, and NT. It's an easy-to-use, powerful, affordable tool that will meet the needs of a broad range of amateurs and professionals. NEC4WIN95, from Orion Microsystems in Quebec, is based on Mininec 3©. Wires are entered in a spreadsheet. The software supports copy, paste, taper, rescale and rotation of wires. 2D and 3D views display the current antenna design, with sources, loads, wire dimensions and interconnections. Antenna and pattern are displayed in 3D and rotated freely, using the mouse. Also, with just the mouse, you can recompute patterns at different heights and angles. NEC4WIN95 performs a series of consistency checks and will prompt or warn users when data is missing or badly defined.

Get the full story on the friendliest antenna simulation available today for novice and expert alike by looking up the Web site at: [http://www.cam.org/~mboukri]. A 30-day personal evaluation version can be downloaded from the Web site—so check it out!

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Photo H. *Dr. Bob Twiggs KE6QMD presented two papers on satellite programs he has started at Stanford.*

HAMSATS

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radio payloads can be accommodated even within the diminutive constraints of a nanosat.

An update on the EZ-Sat project was provided by Fred Winter N2XOU and Ken Ernandes N2WWD. The program envisions the design, construction and launch of an entry-level amateur communications satellite, built and controlled by undergraduate students. Those involved with the project believe that it would be a welcome addition to the current hamsat fleet since it would emphasize ground station simplicity. The primary payload is to be a Mode "A" transponder (two meters up and 10 meters down). The design specifies a sensitive two-meter FM receiver that would achieve full quieting with a ground-based transmitter of only five watts EIRP (Effective Isotropic Radiated Power). A typical five-watt HT with a quarter-wave whip would do the job. The downlink would have 2.5 watts output on 10-meter SSB. The program has a long way to go, but the effort has been well received by educators and others intrigued by the EZ-Sat ideas.

Ellen Riddle and others from the Colorado Space Grant College at the University of Colorado at Boulder presented their paper on the Citizen Explorer Mission. The Citizen Explorer 1 (CX-1) satellite project envisions a low-cost small satellite designed to measure atmospheric ozone and UV radiation while circling the Earth. The data would then be transmitted for later study. On the educational side, the objective of the program is to involve students in grades K–12. Technology goals include studies on data communications, satellite autonomy, and fabrication using off-the-shelf components. Scientific pursuits include the investigation of global ozone levels and solar UV levels at the spacecraft. More information can be found on the Internet at [http://citizen-explorer.colorado.edu].

The Friday presentations continued late into the evening after a break for dinner. Keith Baker KB1SF and Steve Bible N7HPR provided introductory hamsat information with their talk, "Getting Started on the Sats—An Amateur Radio Satellite Communications Tutorial." Even for the long-time, advanced satellite chaser, their presentation provided insight and ideas for everyone.

Saturday

Saturday is traditionally the day for the "serious" presentations. This year was an exception. Talks on Friday were excellent and well worth the extra day away from jobs for those who could attend.

Bob Twiggs from Stanford got the Saturday presentations rolling with his slide presentation on SAPPHIRE (Stanford AudioPhonic PHotographic InfraRed Experiment). This is Stanford's first amateur radio satellite. It provides two amateur-related missions, including a digital camera that can be commanded to take pictures and then download them, and a voice synthesizer that can be easily programmed to accept text, phonetically translate the text, and generate an analog audio output equivalent to human speech. Two student-derived missions include a satellite health monitoring beacon and an attitude determination and control subsystem. SAPPHIRE is complete. The Stanford group is working to obtain a launch opportunity.

Dr. Robert Zee from the University of Toronto Institute for Aerospace Studies provided an excellent introduction to the Microvariability and Oscillations of STars (MOST) project. This new program has been selected for funding and support by the Canadian Space Agency's Small Payloads Program to be Canada's first space science micro satellite. The payload mission is to conduct long-duration stellar photometry observations from space of several nearby metal-poor, sub-dwarf stars to possibly allow a lower limit to be set on the age of the Universe.

AMSAT will provide a communications payload for ham use and will work with the Canadian groups to provide educational assistance for the satellite. AMSAT "techies" hope to build a "do-everything" transponder for the ham communications part of the spacecraft. It would use a 1.2 GHz uplink coupled to a 2.4 GHz downlink. It would be capable of everything from high-speed data operation to emulation of a voice repeater.

AMSAT's Vice President of Human Spaceflight Programs, Frank Bauer KA3HDO, could not attend the conference this year. Will Marchant KC6ROL filled in and presented a detailed update on activities associated with the amateur radio presence on the *International Space Station* (*ISS*). As reported in an earlier "Hamsats" column, the first equipment is to consist of a transportable system, similar to current SAREX (Space Amateur Radio EXperiment) gear, i.e., an HT-type transceiver, but with a better TNC for packet, and an outside antenna. Upgrades for 1999 include a 70 cm Ericsson handheld and a digitalker module capable of acting as an informative voice beacon. Later enhancements will include more bands, modes, and some pallet-mounted gear that will operate autonomously outside the station, but using station power.

Photo I. *AMSAT President Keith Baker KB1SF gave an update on the launch status of* Phase 3D.

The Saturday morning presentations concluded with an enlightening and educational description of the exploits of Ron Ross KE6JAB during his trip to Antarctica. Ron took a 9600-baud digital satellite station to Antarctica. A laptop computer, TNC, two M-Squared "eggbeater" antennas, a 19-Amp-hour Gel-cell battery, and some coaxial cable worked well to provide excellent communications from one of the most remote places on earth. Ron's slides and videotape presentation were quite entertaining and exciting.

Photo J. *Bdale Garbee N3EUA showed attendees a prototype of the Japanese SCOPE camera now onboard* Phase 3D.

***Photo K.** Bill Tynan W3XO has resigned as president of AMSAT, but remains in the position of Chairman of the Board of Directors.*

Saturday afternoon was dominated by *Phase 3D* presentations and discussions. Dick Jansson WD4FAB gave a very detailed description of the basics of spacecraft thermal design and the requirements of *Phase 3D*. Small, spinning satellites, like the microsats and most other LEO (low Earth orbit) hamsats, are relatively easy to characterize and insulate to keep the electronics and batteries at an optimum temperature. *Phase 3D*, however, is designed to present one side toward the sun. It uses an internal three-axis stabilization system instead of the easier spin-stabilization method. *Phase 3D* uses an array of heat pipes to transfer heat from the hot "sun" side of the satellite to the cold "back" side.

Keith Baker KB1SF brought up the difficult topic of the launch status of *Phase 3D*. Since the cancellation of AMSAT-DL's (Germany) contract with the European Space Agency (ESA) almost a year ago, we have not had a ride to orbit for *Phase 3D*. While ESA had control of the payloads for the first two flights of the *Ariane 5* rocket, Arianespace, the commercial company, takes over for subsequent flights. AMSAT-DL is continuing to work toward a launch on an Ariane vehicle, but is also investigating other ways of getting the hamsat into orbit. *Phase 3D* is a large satellite that was designed for flight on either an *Ariane 4* or *5* rocket. Using a different launch vehicle would require a different adapter ring or system to mate the satellite to the launcher.

A status report on the condition of the hardware and software for *Phase 3D* was given by Lou McFadin W5DID and Stan Wood WA4NFY. A complete description of the many transponders and modes of operation can be found on the Internet at [http://www.amsat.org]. The satellite is complete, and with the exception of some final tests, ready to fly.

The *Phase 3D* talks merged into the AMSAT Annual Meeting hosted by Bill Tynan W3XO and Keith Baker KB1SF. Bill and Keith discussed the financial concerns of the organization due to ongoing *Phase 3D* support. *Phase 3D* has been a large project, and the work is not done until the satellite is in orbit. The launch campaign and its associated costs remain. Following a short break the group moved on to the annual banquet. Joel Harrison W5ZN, ARRL Vice President, was the featured speaker. He was joined by the Russ Tillman K5NRK for introductory remarks and the Mayor of Vicksburg, Robert Major Walker, who welcomed the AMSAT group to the city.

Plaques and awards were presented to AMSAT volunteers, followed by the prize drawings. Over 100 prizes were donated to AMSAT for the symposium banquet. The grand prizes included a Kenwood TM-G707A dual-band mobile transceiver from the Kenwood Corporation, an ICOM IC-T7A HT from ICOM America, a Kansas City Tracker/Tuner package from L.L. Grace Communications Products, a round-trip ticket for two on Southwest Airlines from Bruce Paige KK5DO, and a $200 gift certificate to Ham Radio Outlet from the Vicksburg Chemical Company. For those attending, it was a great evening.

Sunday

Sunday began early with an Area Coordinators' breakfast, chaired by AMSAT Area Coordinator George Caswell K1ME. The AMSAT Area Coordinator volunteers promote AMSAT activities and programs at local ham events and conventions. These individuals are AMSAT's representatives to clubs and ham groups around the country. They are available to answer questions and make presentations. Contact the AMSAT office at (301) 589-6062 to find the one nearest you.

Russ K5NRK and his volunteers from the Vicksburg Amateur Radio Club arranged a tour of the US Army Engineers Waterways Experiment Station (WES) for those who stayed for the AMSAT Sunday events. The group visited the Coastal and Hydraulics Laboratory where working scale models are built to study navigation channels, harbors, and reservoirs. They then make recommendations on dredging, shoaling, groundwater concerns, and salinity problems. The Geotechnical Laboratory at WES, with the world's largest centrifuge, was the highlight of the tour. It is used to recreate field phenomena and environments under laboratory conditions. They then generate data to validate computer models and engineering analyses. You can check out their Internet Web site at [http://www.wes.army.mil/centrifuge].

After the tour of the US Army Engineers' WES facility, the AMSAT board of directors

***Photo L.** Robin Haighton VE3FRH is closely involved with the new MOST satellite project and has accepted the duties of AMSAT Executive Vice President.*

meeting began promptly at 1 p.m. The first order of business involved the agreement AMSAT has been pursuing with the University of Toronto Institute for Aerospace Studies Space Systems Group (UTIAS). The agreement and associated contract represent AMSAT's involvement in the MOST program. AMSAT has agreed to provide educational assistance to UTIAS for the design, construction, integration, and test of the MOST spacecraft. This project is a primary program for the AMSAT organization for the next three years.

Bill Tynan W3XO resigned from the post of president of AMSAT after many years of service to the organization. In

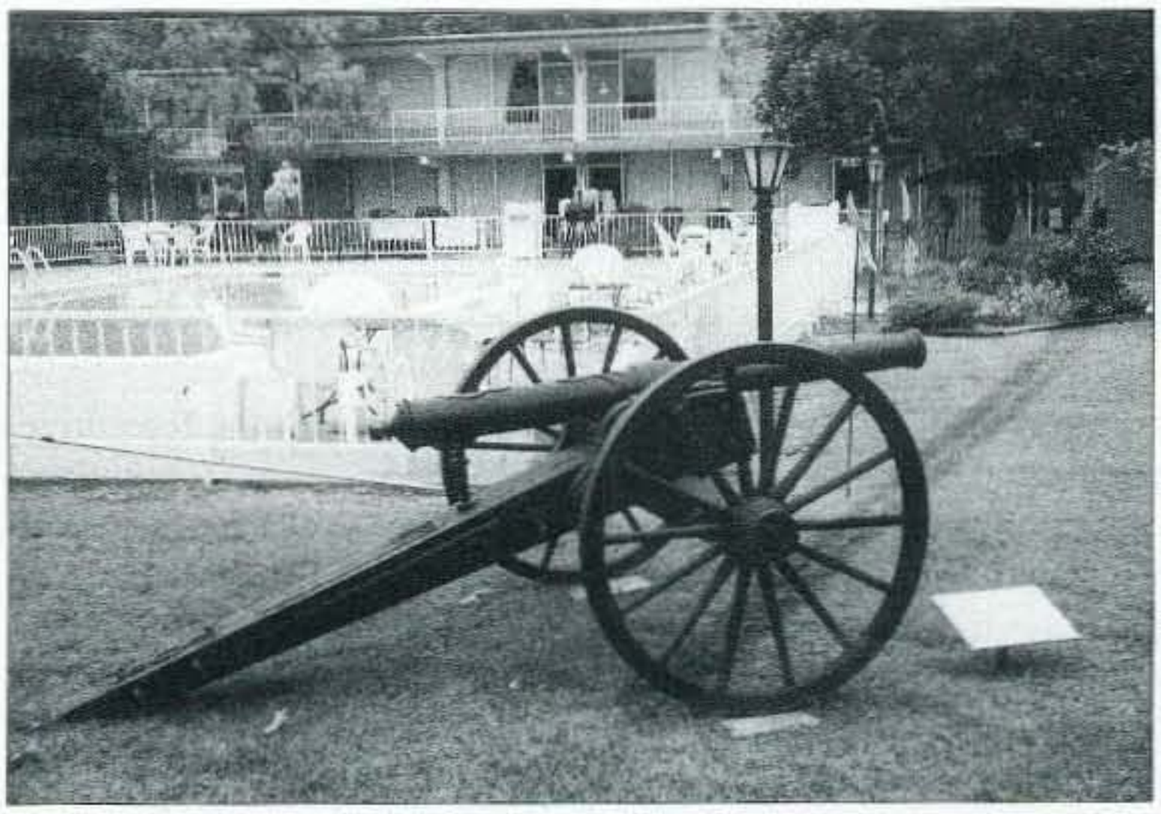

***Photo M.** This Confederate cannon by the pool at the Battlefield Inn in Vicksburg is still aimed northward ...*

Number 52 on your Feedback card

HOMING IN

Radio Direction Finding

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A Banner Year—More to Come

Hams who enjoy the sport of hidden transmitter hunting will remember 1998 as a year of firsts. It started in January, when the ARRL's Board of Directors authorized the appointment of this country's first ARDF Coordinator. This opened the door to the USA officially joining over three dozen other countries of the world in competitions of international-style foxhunting, also called foxtailing, foxteering, radio-orienteering and ARDF. Most of these multi-nation events are organized under the auspices of the International Amateur Radio Union (IARU).

An informal IARU Region 2 (North and South America) ARDF Organizing Task Force had already formed several months earlier. Its members wasted no time building E-mail friendships with other ARDF enthusiasts worldwide. One who offered lots of support was Rik Strobbe ON7YD, Interim Chair of the Region 1 ARDF Working Group. Region 1 (Europe and Africa) is by far the most active of the three IARU regions, with over two dozen European countries having formal ARDF programs.

Rik was excited about the Western Hemisphere becoming much more active in the world of ARDF. Heretofore, the USA's only participation at an IARU ARDF competition had been in 1996, when Kevin Kelly N6QAB went to Australia for the Region 3 Championships. (See "Homing In" for December 1996.) Rik encouraged us to send a team of foxhunters to the 9th ARDF World Championships, to be held in Nyiregyhaza, Hungary, in early September.

I put out the word about this event on the Internet, Amateur Radio Newsline, ARRL Letter and here in *73 Magazine*. When Dale Hunt WB6BYU volunteered to head up the USA's delegation, I knew we were on the road to success. He and other Team USA 1998 members furiously began building RDF sets and transmitters for practice. Informal training sessions were held in the Portland, Oregon, area, as well as the Santa Barbara and Orange County regions of southern California. All sessions were open, so other hams and their families could see and try ARDF adventures for themselves.

The final Team USA 1998 roster:

• Dale Hunt WB6BYU of Yamhill, Oregon, ably handled the team's administrative duties and served as Team Captain. Dale competed at the 1997 Friendship Radiosports Games foxhunt in Japan, where he finished first among all entrants from North America. (See "Homing In" for January 1998.)

• Marvin Johnston KE6HTS of Santa Barbara, California, is an avid transmitter hunter, both mobile and on foot. He says that he got his ham license because of his interest in radio direction finding. He has participated in two formal ARDF competitions in the Los Angeles area, winning first place in his age division at one of them.

• Barbara Johnston KE6OTF is the wife of KE6HTS. She served as observer and photographer during the Championships.

• Jack Loflin KC7CGK of McMinnville, Oregon, is 17 years old and lives close to WB6BYU. He also attended the 1997 Friendship Radiosports Games ARDF competition in Japan, where he won the gold medal in his age division. Jack also tracks aircraft emergency locator transmitters with his local Civil Air Patrol unit.

• Gyuri (George) Nagy HA3PA is a native of Hungary who has won medals in prior ARDF Championships. He was able to compete for the USA because he has resident slien status in this country. Gyuri generously provided additional 80 meter ARDF equipment for use by the USA team during the Championships. This offer was welcome, as our ARDF equipment-building efforts to date have primarily been for two meters.

• Dennis Schwendtner WB6OBB of Santa Barbara is a professional piano tuner who has been on mobile transmitter hunting teams for many years. He would like to compete in the World Championships when and if the IARU rules are changed to accommodate handicapped participants. (He is blind.) Meanwhile, Dennis has competed at ARDF events in the Los Angeles area with the assistance of an extender. He was USA's Team Trainer for the Championships.

The triumphant return

"This was a great ham event!" wrote WB6BYU just after his return from the Championships in Hungary. "The people were quite friendly and glad to finally have representatives from Region 2. We got a lot of advice on equipment and strategy from members of the other teams. For instance, I sat up late in the night with Tchermen Gouliev UA3BL, who was helping me repair and realign my 80m receiver. He went out the next day and won the Gold. And my receiver worked well enough for me.

"There were almost 250 competitors from 32 countries," Dale continued. "Terrain was pretty flat and sandy, mostly wood lots with an occasional cornfield or pasture. Course lengths were around 5 miles. The two meter competition was fairly straightforward, as the transmitters were in somewhat

---

addition to his long tenure as president, Bill was a part of the creation of AMSAT in 1969. Bill will continue his involvement as chairman of the board of directors. AMSAT Executive Vice President Keith Baker KB1SF agreed to take over as President of AMSAT, while Robin Haighton VE3FRH has stepped in to fill the Executive VP slot.

In addition to the beginning of the MOST project, AMSAT is working diligently to find a ride to space for *Phase 3D*. This is the focal point of AMSAT's current efforts. In October 1998, the satellite was sent to Maryland for thermal-vacuum testing. Shake testing is scheduled for January 1999, and final documentation and laboratory close-out are scheduled for February 1999. The completed satellite should be boxed up and ready to move by the end of February. *Phase 3D* will then be stored in the Orlando area to wait for a launch opportunity.

The 1999 AMSAT General Meeting and Space Symposium will be held in San Diego, California. The Vicksburg event will be hard to beat, but the volunteers from southern California are confident that they can match the quality of the 1998 effort. Many exciting satellite projects are nearing launch or just getting started. Don't miss it! 73

of a giant circle. On the eighty meter course, they were in more of a diamond with the start and finish at opposite corners, making it a more difficult decision to choose the optimum order to find them. Fastest times were around 45 to 50 minutes, and the time limit was 130 minutes. For a relatively inexperienced team (except for Gyuri), we did relatively well. Nobody was disqualified or came in last in their age division, though the latter was a real squeaker on the 80m hunt!"

Team USA 1998 members were some of the most experienced ARDF enthusiasts in the United States, but they were pitted against the best in the world. Although their running abilities did not place them among the medal winners, it is important to note that they found all but one of their 34 aggregate hidden fox transmitters. Each USA competitor got to the finish line within the allotted time, to avoid disqualification.

Winners of the overall medal count were the Russians with seven gold, seven silver, and two bronze. Ukraine also had 16 medals, but only four were gold. The Czech Republic, Hungary, Germany and Belarus followed with 13, seven, three, and two respectively. Lithuania and Romania each got one medal.

Team USA 1998's trip was a great success because our delegates created a visible presence for our country in this international sport. They generated publicity and interest in ARDF and fostered international goodwill among competing societies. They also gained intimate knowledge of the mechanics of international ARDF competitions, which will prove useful in putting on future Region 2 events. To top it off, they made lasting personal contacts with ARDFers from other countries, which will help develop the sport here in IARU Region 2.

1999 will be even better

Later that month, another ARDF first occurred. The IARU Region 2 Plenary Conference in Venezuela approved a request by the Friendship Amateur Radio Society (FARS) to include IARU Region 2 ARDF Championship foxhunts as part of its 1999 Friendship Radiosport Games (FRG-99). FARS and the Friendship Games have played a major role in developing ARDF in the USA. Stories of previous Friendship Games have been in "Homing In" for September 1991, October 1993, December 1996, and January 1998. Dale Hunt WB6BYU, team leader for the Hungary trip, will be responsible for putting on the FRG-99 foxhunts.

Now is the time to start planning for FRG-99, to be held August 10–14 in Portland, Oregon. All ITU Region 2 nations, through their IARU Member Societies, are invited to send teams for this historic event. Individual entrants from Region 1 and Region 3 countries may compete in the traditional Friendship Division. To encourage more Region 2 participation, individual entrants from Region 2 countries that are not sending teams will also be accepted. Medals will be awarded to individual contestants and to national teams for qualifying finishes in several age/gender divisions. VHF (two meter) and HF (80 meter) ARDF competitions will be held on separate days.

In order to properly plan for expected attendance, FARS-USA is requesting that any IARU Region 2 society interested in sending a team provide a Letter of Intent to Participate as soon as possible. The deadline for return of Letter of Intent Forms is January 10, 1999, but later applications may be considered if space remains available.

FRG-99 is sure to be a time of fun, camaraderie and international goodwill, especially for on-foot foxhunting enthusiasts. It could bring ARDF enthusiasts from many North, Central and South American countries as well as FARS member delegations from USA, Canada, Japan, and Russia. Mark your calendar and watch for more announcements. Further information about this event is available on the FARS USA World Wide Web Site. There you will find the full official announcement, schedule of events and dates, and Letter of Intent forms. You can get there by a link from the "Homing In" site.

If the games in Portland don't provide enough ARDF thrills for 1999, you could also compete in Asia. The IARU Region 3 Championships will take place at Konyang University in Nonsan, Korea, about 90 miles south of Seoul. It's about a three-hour ride by bus or train from the Seoul airport to the Championship venue. The events run from 21 to 26 June 1999. National teams from outside Region 3 are not invited to the Korean event, but individuals from these countries may to compete in the Friendship Division. For more information, contact me or visit the "Homing In" Web site.

And furthermore ...

Challenging transmitter hunts are a tradition at the Southwestern Division convention of the ARRL. The 1998 convention in San Diego was no exception. Doc O'Connor K6DOC of Ramona, California was T-hunt Chair this time. He enjoyed the 3-transmitter mobile hunt at the 1997 get-together in Riverside so much that his own hunt was in the same style. His three fox boxes were set out within a 1135 square mile area of San Diego County that included the San Diego metro area, a 6500-foot mountain peak and some desert terrain, too. Starting from Montgomery Field, hunters had four hours to pick up the tags at each transmitter and get back to that airport. Anyone arriving late would be ineligible for prizes provided by the convention organizers.

There were about two dozen signups at the T-hunt table at Convention Headquarters on Saturday, but only 14 vehicles

Photo A. *Dapper Doc O'Connor K6DOC gives instructions to the hunters as he starts the ARRL Southwestern Division Convention's mobile T-hunt.*

took off from the starting point on Sunday. Apparently many teams combined, as some cars were fully loaded at the start with a driver, beam turner, navigator, timer, etc. That's a good strategy on a hunt in which time is the only criterion for winning. More minds and hands should lead to better results.

The shortest route to all three Ts and back was about 100 miles. Of course there was a "home court advantage" for

Photo B. *Bob Legg W6QYY has his dual-antenna TDOA set ready for "sniffing" duty at the Montgomery Field starting point near San Diego.*

Number 54 on your Feedback card

THE DIGITAL PORT

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This month—SSTV, APRS, and packet adventures

You can just about pick your favorite digital topic this month and I may have something for you. It is a lot of fun experimenting with different ideas.

For openers, I was putting together SSTV on the laptop using Pasokon and a serial modem. This is working out well. Bob W6EUZ and I regularly trade a few images on 40 meters. We are doing this with less than 100 watts, in the daytime, about 7.190 at 12:30 local. I was having a problem with received images filling with hash from the sporadic noise, and thus began a small project.

There isn't much choice of filter systems when running SSTV on this laptop. ChromaPIX gets the hiccups and there is no plug-in board to gain DSP. But there is a solution. I was looking at the Timewave DSP-599zx and thinking how nice it would be if I could run the SSTV signal through its built-in modem. I gave it a quick try, but I think they have a different configuration at the serial port that only works with their excellent DSP-RTTY software.

Wanting to do something simple (here we go), I decided to make a breakout box to run the received audio SSTV signal through the DSP-599zx before it got to the modem. After a quick look around for jacks and a box, I decided the parts supply was exhausted and headed to the local Radio Shack™ store.

I am using telephone flat cable. One of the downsides to that is the cost of jacks. Looking over the available assortment of telephone goodies, I found a small baseboard-style double outlet which is big enough to allow the installation of two phono jacks. With jacks, the little box, and a made-up flat pigtail (I was even out of those), the total tab set me back about $11. Not bad, so far.

This was going to be a snap. The phono jacks mounted easily in quarter-inch holes. Then it was time to think. When you look at the color codes on the made-up flat wire, you realize that the colors are reversed from one end to the other. I could see a problem arising. After checking to be sure I was routing the proper audio and ground wires to the DSP unit, I reversed the wiring, colorwise, between the two factory-wired sockets within the RS box.

This little work of art kept me occupied through seemingly countless disturbances, but after about four hours, including numerous restarts, I plugged it in and it worked like a champ. The SSTV choice on the DSP-599zx says *fixed filter*. That means there is no tweaking, which is good for me—one less set of decisions to make.

I understand some other DSP units on the market cause problems with SSTV, but this one is superb. There is a bypass toggle so you can observe the effects of the filtering. When the bypass is pressed, either to take the filter out or put it back in, a noise line is inserted in the image. I won't say that is good, but it gives a definite boundary to compare the filtered to the non-filtered signal.

More on SSTV to get you started

As you frequent readers are aware, I have been dabbling in SSTV from time to time. There are several low-cost packages available to those who wish to join in the dabble process. Check **Table 1** for ChromaPIX and Pasokon. Both have sampler downloads that will get you into SSTV for a trial run in the 15- to 30-dollar bracket.

The programs are well done and you can use them forever (they aren't cripples and they don't go up in smoke at 30 days), but you will find reason to upgrade, which, inevitably, costs. That is part of participating in a great hobby. Some folks spend their money skiing and some go hunting; I know people who could have a great ham shack for the price spent skiing or hunting each year.

The only crippling factor with the ChromaPIX is that the program will only run for 30 minutes at a stretch until you register it. That isn't too bad. Some hams may find they will run the program 20 or 30 times before breaking down and sending the $120 to avoid telling their friends why there is a delay in the next transmission.

One of the neat features of ChromaPIX is that it utilizes the sound card in your PC. The program runs in Windows and you do need a fairly up to date computer. If your computer fits the parameters of a quality sound card, enough RAM, and a fast processor, the program not only works but also affords DSP for excellent reception.

The only hardware you need deal with is assembling a few cables between your sound card and your radio. One other thing: You will want to eventually assemble a PTT interface that is described on their Web site. Lacking the PTT capability, you will do some manual switching to transmit and receive. Not too difficult to master to see this work in your own shack.

The Pasokon system has an entry level EasySSTV which is a freebie piece of software. Another small catch: You must build a simple serial modem before you can use it. The cost of building the simple modem, in most cases, is less than $20. The program runs in DOS and does not require a superfast modern PC.

With the introductory level Pasokon program, you will lack the filtering to receive images

---

teams of San Diego County residents experienced at hunting on those roads and terrain. Not surprisingly, the first three places and fifth place were taken by local teams.

Only ten vehicles returned in time, five with three tags and five with only two. The best time was a little under three hours.

The "Homing In" feature on tracking burrowing owls brought excellent response from readers of *73 Magazine*. As you read this, the fall southward migration of the owls from Saskatchewan and Alberta is over. They are in their winter homes, thought to be scattered throughout southern Texas and New Mexico, and perhaps in nearby northern Mexico. More hams and monitoring enthusiasts are needed in these areas right now, as there are still tagged owls that are unaccounted for. For more information on this project, go to the "Homing In" Web site. If you don't surf the Web, send me a self-addressed stamped envelope for information by return mail.

Other wildlife tracking projects are in the works. Over 50 hams around the country have signed up to participate, and more are needed. To join, send E-mail or postal mail with your location and a description of your equipment and suitable RDF sets, if available. Tag transmitters are in the 150 to 174 MHz range. 73

when the signals become marginal. For example, a transmission of a typical image takes well over a minute, and a simple dip in signal strength can leave a blurred distortion across the image for the duration of the dip into the noise level.

Pasokon makes available state-of-the-art DOS software and a board to install in your PC to make SSTV a real pleasure to operate. To get the high-end performance, you will need to spend about $200. This can make sense when compared to upgrading your computer for the sole purpose of running SSTV if you are satisfied with the computer otherwise.

All the information you need to help make these decisions and get started can be found on the Web sites in **Table 1**. There is quite a bit of activity on 14.230 and 14.233. You can recognize the signals due to their unique warbling sound that changes as the different parts of the images are scanned.

Of interest to those who would like to get their feet wet on a "local" basis here in the west, I have been getting on 7.190 as many early afternoons as possible. The advertised 7.171 appears to have too much interference at this end of the country and the 7.190 lends itself well. There have been no complaints about it being a reserved frequency for a net or emergency service, so come and visit. Break in if it is busy. If it is not busy, I may just be monitoring. If I am there, I will transmit an occasional SSTV CQ image.

One of the hot topics nowadays with packet is the Automatic Position Reporting System (APRS). I kept running across packet signals from regular repeater frequencies as I traveled and couldn't get anyone to explain them. The signals were obviously APRS packets because I could copy the format with my regular packet program but the information didn't make sense.

So I went to the source to learn about this secret. I first bought a copy of *Getting On Track With APRS* by Stan Horzepa WA1LOU. This is good information. However, the way technology develops, it is quickly becoming out of date. A real source of info can be found at the Tucson Amateur Packet Radio (TAPR) Web page (see **Table 1**). There you'll find a wealth of information concerning theory, operation, and how-to, and you can download shareware for Windows, Mac, and DOS to get going.

I found much of the posted information was also getting the antique flavor, so I subscribed to the APRS SIG newsgroup from the same address. This has to be the busiest ham newsgroup I have ever seen. There are a minimum of 25 postings each day. The good part is that the right people are posting messages and they are serious about APRS. After about two weeks, it appeared I had my questions answered either directly or by simply "lurking" and reading messages. It was time to "unsubscribe" and get some serious work done.

I attempted to get going with the PK 232MBX. I was assured that others were using them, but there is a problem in that they revert back to other modes when turned off and the Windows APRS program won't bring the 232 up in packet mode if it happens to have gone to rest in Baudot unless you tweak the initialization in the APRS program.

I didn't want to confuse the startup parameters in the 232, so I went to the MFJ 1274. It is a little simpler (not so sophisticated) and cooperates for this purpose.

As I have mentioned before, this home QTH is a little remote and there is a disadvantage when working with a system that requires input from line-of-sight transmissions. APRS appears to be in working order. The test will be to observe what it does when I take it to the big city in a week or so. More to report after that.

Some interesting things still happen with *normal* packet radio. I received word a few months back from Jeff KF4KGQ, who is a BayPac BP-2M user, that he was building one of the kits from LDG Electronics to give to his brother when he got his ham ticket. Recently, Jeff sent me a

Current Web Addresses	
Source for:	**Web address (URL)**
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom – German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
VHF packet serial modem kit	http://www.ldgelectronics.com

Table 1. *Current Web addresses. If you encounter a problem with a European address, the network is often at fault. Try again later.*

NEVER SAY DIE

continued from page 6

Art Bell show, that group alone could start the dominoes falling.

Well, we'll see how it shakes out.

No, I don't sit up all night listening to Art Bell. As I've said, I tape it with a VCR and listen while I'm fixing and eating meals, and while I'm doing mindless stuff like collating the pages of my books. The most interesting parts of Art's show are during the second hour, and half of that can be fast-forwarded through the news and commercials. This is the hour when Art starts interviewing his guests.

Millionaires

Don't you wish you could retire with at least a million dollars salted away? The fact is, if we could straighten out our government, virtually everyone could retire as millionaires.

I've just read a very interesting book that explains just how this could be accomplished. It's *A Nation of Millionaires*, by Genetski, published by The Heartland Institute, 800 E. Northwest Hwy. #1080, Palatine IL 60067; (847) 202-3060; 168p, 1997, paperback; ISBN 0-9632027-4-X.

First, the book shows that the net family income (without the wife working) has dropped about 16% in the last 25 years. It explains the Social Security disaster ahead, which Congress can't force itself to face. Then it proposes solutions. That retirement with a million dollars isn't a rosy scenario, it's a worst case deal, where some guy is only making the minimum wage. So how do they manage this miracle?

First the book tackles Social Security. Here it cites the change that Chile made in their system, which has been so amazingly successful that one country after another has been changing to their system. Our Social Security system has unfunded benefits of $11 trillion, which Congress has conveniently taken off the budget so we don't see it. By privatizing Social Security the lowest-paid worker would, at age 67, have $380,952 in his account.

Next, by allowing workers to set up medical savings accounts, our worker would, at 67, have an additional $475,000 saved up. That comes to $856,716 total.

Next, the privatizing of education via school vouchers would cut school costs (taxes) enough to provide our retiree with an additional $25,947. Eliminating government regulations which cost the economy $600 billion a year would add another $34,000 to our suffering wage earner's retirement package. If the government got the heck out of the wasteful environmental business that would add another $35,000 to the lowest-paid worker's retirement bundle. By limiting frivolous law suits and excessive punitive damages, legal reform would add another $37,000 to the pile. That brings our suffering worker into retirement at 67 with about $1 million. The average wage earner would end up a multimillionaire.

The book goes over the math in depth and explains each change needed, and why vested interests will make it difficult to make the changes. We have to decide whether we want the entrenched interests to continue to run our government, or us. I suspect that even the prospect of several million dollars at retirement isn't enough to get most people to take any interest in changing things, or even bothering to vote at all. Few people worry enough about the future to spend any time or effort on it. If they did they wouldn't be eating the garbage they're eating and downing endless known poisons. It takes years for cigarettes to kill you, so why worry now? And yes, I know Social Security is a tax scam, but what can one person do? Where did I put the TV remote?

Starr Nonsense

Those endless negative stories about Judge Kenneth Starr originated from the White House *spinmeisters* and none are true. The White House spinners have been at work steadily from the first Whitewater investigations attacking Judge Starr. The sad part is that our journalists and the public have bought this smear. There are so few people left who seem to be able to think, that I despair. Yes, I know, our school system was imported from Prussia for the specific purpose of keeping people from thinking, and it has been a resounding success from that viewpoint. That's about its *only* success.

Every target of the Starr investigation has routinely been smeared by the White House spinners. And I'll bet you've been suckered into believing their version. How could we have elected such a sleazy president? Shame on us.

Wetbacks

Yes, America has millions of acres of unused land. Of course, most of it is owned by the government, and little of it is of any real interest for human habitation.

So what? Well, we have this controversy about immigration. Should we seriously limit immigration or should we maintain our loose borders which bring in millions of illegal immigrants every year?

Oh, I can understand how our country would benefit from allowing highly educated or skilled workers to move here, but that isn't what we're getting most of the time.

The open borders believers point to all of our undeveloped land. What they don't point to is our more and more crowded cities, which is where most immigrants head. That's where the jobs are, not out in the desert or remote mountain areas. If you've visited a city lately you've seen the jammed highways. California's freeways turn into gigantic parking lots at drive time, as do the highways around every major city. I've been in the traffic jams that surround New York City, Chicago, Denver, Dallas, and so on.

Are we going to just build more and bigger roads and watch while our cities gradually creep toward each other? In the northeast, Boston, New York, Philadelphia, and Washington have just about connected. They call it a megalopolis. Just what we need is to double the population of this area, which is what's happened within my lifetime.

Without immigrants our population has stabilized and is not growing much. So, if you really want to let in anyone who wants to come, be prepared to pay the price. The immigrants sure aren't going to pay it. And the price is stiff, with the need to virtually rebuild our city infrastructures to accommodate everyone.

Our subways are already jammed solid. Are we going to build more tracks and stations? That means digging up our streets for years, plus spending billions of dollars.

More cars and buses mean more pollution and smog. That what you want?

We have the laws limiting immigration; we're just not bothering to enforce them.

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note that the project was up and running.

The exciting part of the message was that he is the star on the opening page of the TigerTronics Web page. (See **Table 1**.) Jeff has done some remarkable things with his miniature packet station, making contact with the orbiting space station *MIR*, and there is a good write-up on his adventures there. I hope that at the time this is published the picture and story will still be there. Web sites do change.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO. 73

Every now and then I'm forced to drive on a jammed highway and I wonder at the patience of people who have to commute to and from work every day under those conditions. That's a terrible waste of time and a lousy way to live. It's even reached New Hampshire, where the interstate highway going into Massachusetts is absolutely terrible at morning and afternoon drive times.

The fact is that there are very few jobs for unskilled or uneducated workers outside of the cities, so that's where immigrants are forced to go — and forced to live under awful conditions. But that's still better than where they came from. At least here, in a generation or two, their children will be part of the middle class. They'll be Americans.

God or the Devil?

A really weird thing happened to me. I like to be a guest on radio talk shows so I can get more people interested in (a) regaining their health, (b) making more money, and (c) giving amateur radio a try. I have a long list of things I can talk about that I send to the talk show hosts. One of them has to do with the predictions of soon-to-come catastrophes which will supposedly wipe out most of mankind.

The other day on an upstate New York station I was explaining what various people (Gordon Michael Scallion K1BWC, Ed Dames, and Sean David Morton) have been predicting in the way of killer solar flares, a pole shift, a new ice age, and so on. The host cut me off and asked where these people were getting their information from. I said from remote viewing and meditation. He then asked whether these predictions were from God or the Devil. He explained that he is a devout Catholic and that any such predictions would have to come either from God or the Devil.

Hmm. I explained that I couldn't care less where people were getting their information. Their credibility with me had nothing to do with their sources, it lay entirely in the accuracy of their predictions. If they've a good solid record of past hits, I'm going to pay attention. I further explained that it has been scientifically proven that we can predict the future.

He cut me off, saying that this all sounded like the work of the Devil to him.

Sigh.

Belief

My dictionary defines belief as acceptance of the truth or the actuality of anything without certain proof. Hmm. So if you ask me if I believe that NASA faked all of the Moon landings, the answer is no. Having gone to some lengths to examine all of the evidence, I must say that it sure tends to lead one to that conclusion as being the only realistic one.

One night on the Art Bell show I was asked by a listener if I believed in God. I dodged the question by saying that there is considerable evidence supporting the concept. Well, that was better than getting into an argument with someone who is a believer and ready to quote scripture. Am I an atheist? That's someone who disbelieves in God. No, I don't disbelieve, there not being enough evidence to support such a belief. My approach to life is the scientific one of investigating things with an open mind, not with the end of proving or disproving anything. I try to let the evidence speak for itself and look at as much evidence as I can find.

Any discussion of God is a minefield, because of the strongly held beliefs. It isn't something that many people are even able to think about.

In God We Trust

I notice that Art Bell quickly cuts off any callers who start quoting the Bible. When I was a youngster my folks sent me to Sunday School at the local Dutch Reformed Church. At four and five years old the stories were no more real to me than the Oz stories. This continued off and on into my teens. I have no recollection of what I was "taught" at the time; the only thing I remember is that one Sunday when I was 14 some guy brought in a box of old radio parts and gave them to my best friend, Alfie. He took one look and gave the box to me. And that got me started on a lifetime in electronics.

It was at this same time that I auditioned for the St. Paul's Church choir, where I sang until my voice changed. That was one of the biggest churches in Brooklyn and we not only got paid to sing, but we had a free month of choir camp out on Long Island every summer.

For some reason all this churchgoing didn't "take" as far as giving me religious convictions. The singing was fun and the sermons we sat through were really boring.

Oh, I've read parts of the Bible now and then, but its 17th-century English was difficult to deal with.

I did business once with a born-again Christian who had been saved by Jesus. He took me for several million dollars.

Once I'd read the stories about how the major religions were started, I'm afraid I lost respect for them, at least as far as providing me with any guidance. But, being a pragmatist, I've kept my mind open about God. The more I've

read about what we call the next world, either as reported back by the deceased, by communications with psychics, or via near-death experiences, the more I've heard about there being a God, but not one anything like the one being worshipped by Christians, Moslems, and so on.

Frankly, Christianity has worried me. Its believers have sanctioned endless killing, such as we've been seeing in Northern Ireland, which is warfare between two Christian sects. And both are convinced that God is on their side. I won't even get into the Inquisition or the abortion clinic killings. Or abortions.

Which brings me to an interesting book I've just read. It's *In God We Trust*. The Holy Bible, the "Good Book," is held by Christian fundamentalists as being the revealed word of God. Every word in it, they believe, is true. After reading what's really in the Bible, I doubt seriously that the fundamentalists who believe in the book could have actually read it. Good grief, wait'll you read about the endless carnage that God has sanctioned, including mass murder, rape, and even abortion. That's right, abortion. See Hosea 13:16, where God orders fetuses to be ripped from their mothers.

If you are a devout Christian this is not a book you want to read. It cites chapter and verse of what the Bible says, letting God speak for Himself. I'm sure you're aware that the Pontiff in the Vatican, who professes to be the Catholic Church's direct connection to God, and who was well aware at the time of Hitler's extermination of millions of Jews, said nothing against what was going on.

God's biggest coup was the drowning of everyone and every beast, every tree, every insect, everything alive on Earth except for Noah and his group during the flood. Try to imagine the work it must have taken to feed that large an assortment, including elephants, for all that time — not to mention in the aftermath of the flood when it must have taken centuries for the trees and grasses to regrow as food. And who cleaned out the massive amounts of dung that had to be dealt with? And how did Noah keep all the animals from continuing the usual food chain system, where there was just one pair of each kind of animal or fish?

A true believer in the Bible wouldn't want to know about the histories of this same period recorded in other lands which don't mention the flood which the Bible says covered the entire Earth to a depth of almost five miles.

Say, where did Noah get kangaroos, penguins, and polar bears in the Palestine area for his ark? And eucalyptus leaves to feed those pesky koala bears?

People all though history (and way before history) used gods to explain the things they didn't understand. We're still at it, though most religions have settled on one God instead of a bunch to explain what are still mysteries to us. Science has helped to explain a lot, though our religious leaders have done their best to kill these meddlers. But science has been stopped by the mysteries of consciousness, which is forbidden territory. Both scientists and religious leaders are very nervous about the way science has been going recently, with the development of quantum and chaos theories. And then the recent scientific validation of psychokinesis, clairvoyance, precognition and such has driven many scientists into severe denial.

You can get a copy of the book from VERVE, Box 750, Madison WI 53701 for $12 ppd. But if you want to continue to believe in God, Satan, and so on, you'd better pass this up. Ignorance will probably keep you happier.

Even More Poisons!

Despite intense pressure from the food giant lobbyists on Congress and the media, the EPA plans to start this year to screen all chemicals found in food and drinking water for endocrine disrupters. They're going to sort through the 87,000 chemicals which are in common use, narrowing them down to around 15,000 which are suspected as being the most likely to disrupt the endocrine system.

By the end of 1999 the agency plans to test all 15,000 — at a cost to the manufacturers of about $200,000 per chemical — to see which are the most likely to interfere with hormones. That's a $3 billion bill the EPA will be handing to the food industry.

The worst suspects will then be tested on lab animals, with those tests running a projected $2 million each.

In the meanwhile you, the unsuspecting public, are in all probability going to continue to buy packaged food products which contain these 87,000 marvels of chemistry, most of which have never been tested for long-term effects on us. On the bright side, these chemicals do keep food from spoiling, often for decades. This is the stuff you have been eating. This is the stuff you've been feeding your family.

Scientists are worried, and with good reason, that many of these chemicals may be doing us irreparable harm, complete with genetic changes which will affect our kids and their kids.

With girls reaching puberty earlier and earlier, with birth defects escalating, with breast and testicular cancer soaring, with low sperm counts being reported everywhere, scientists are finally starting to zero in on poisons which are in our food, water, and air. We know the plastics in our cars are coating the windshields with a film, but what are these chemicals doing to us as we breathe them? No one knows yet. We put out food in plastic containers — we buy it in plastic containers — yet we don't know whether or how much the plastic may be getting into our bodies or what mischief it may be doing.

Prudent people no longer are cooking in aluminum pots and pans. Nor iron, either. For years it never occurred to people that these could poison them. How much of what metals are you getting with your Coke, Pepsi, or beer?

I've written recently about the aluminum in most deodorants and the awful stuff in pesticides and bug sprays — stuff that can be absorbed through the skin.

If you stick totally to raw food and keep it in glass containers, you're going to be fairly safe. Oh, yes, wash most of your food off well with water to remove pesticides and with silver colloid to get rid of *E. Coli*, *salmonella*, and other passengers.

Or you can carry on as you have and wait to see what those 87,000 chemicals are going to do to you and your family.

Check out the article on the subject in the 9/14/98 *Business Week*, page 105.

More Poisons

My thanks go out to Swede WDØAXP of Reno, Nevada, for a clipping from *Popular Mechanics* about the behavioral effects caused by some metal toxins. It cited the Huberty killing spree in 1984, where he killed 21 people in a restaurant. They found that, "He had the highest cadmium level we had ever seen in a human being." They've found the same problem in testing other mass murderers. The metal goes to the brain and disrupts the brain's inhibitions. Metal toxins such as cadmium, lead and manganese have been found to be contributing to children's behavior problems. Indeed, the presence of these metals in the environment has been statistically shown to significantly increase the crime rate in those areas.

A recent *Dateline* program featured the rebellious behavior of a young child. A doctor "solved" the problem by having them let the kid eat what he wanted when he wanted, go to bed when he wanted, watch whatever TV he wanted when he wanted, and so on. The family, or the doctors

they consulted, would have done well to have a copy of my $5 review of books you're crazy if you don't read. One of the books I highly recommend is *The Impossible Child* by Dr. Doris Rapp. $13.50 (ppd.) well spent.

Dr. Rapp exposes how the foods kids eat and things in the air they breathe can affect not only kids, but older people as well. Children called lazy, dumb, nasty, rude, hyperactive, irritable, with attention deficit disorder (ADD), etc., may be reacting to chemical sensitivities. A simple test for allergies is described in *The Pulse Test*, which is also reviewed in my guide.

As I watched the *Dateline* program I was yelling at my TV set to, for heaven's sake, find out what the kid is allergic to and stop feeding it to him. After reading *Lick The Sugar Habit* (yes, of course it's reviewed in my guide), I'll bet that just cutting sugar out of the kid's diet would make for a miracle in behavior improvement.

Unfortunately for those of us (and that's almost everyone) who have been taught to believe in doctors and depend on them, many (most?) doctors seem to stop their medical education at the moment they get their license to kill. If something wasn't taught in medical school, they don't know much about it. Like health, for instance.

Are you and your family still drinking tap water? Are you living downwind of a smokestack belching toxic metals?

Knowing Better

On my dad's birthday I got to thinking, if he'd only known better he'd be celebrating his 101st birthday today and going out fishing before the birthday party. "If I'd only known better" is something we tell ourselves now and then. If my dad had known better he wouldn't have smoked for 40 years, and drunk all that time too. He'd also have eaten an entirely different diet. The amazing thing is that he still managed to live 87 years, though the last 10 were spent with an oxygen bottle or generator nearby. Emphysema.

I'd be in a lot better shape if I'd "known better." But where do you get dependable information so you can "know better"? I've read hundreds of books on health, nutrition, and illness — plus health newsletters and endless junk mail/health product brochures. They all have one thing in common: None of them tells the *whole* story of how to be healthy.

My dad smoked and drank. Both of my grandfathers did the same, and their fathers before them a hundred years ago. But I was lucky. For some reason I've never been driven by peer pressure, so when I tried smoking and found it stank, I stopped. I tried drinking and didn't like that effect either. I stopped. Unfortunately, eating foods that are destructive to the body is very pleasurable and doesn't take a lot of getting used to, so I've eaten my share of doughnuts, pies, cakes, candy, and so on. I never got much into coffee or Cokes, so I was spared those addictions. I tried 'em and didn't like 'em much.

Hospitals Again

A report in the Journal of the American Medical Association (JAMA) by Drs. Pomerantz, Lazarus, and Corey said that one in 15 hospital patients has serious reactions to prescribed drugs. 5% of them die! About a quarter of them are allergy-related. In 1994 2.2 million hospital patients were affected and 137,000 died. I think that's what they call an acceptable loss. Remember what a fuss we made over 58,000 Americans getting killed in Viet Nam, and that was over a period of years! Hospitals are very dangerous places to go.

Schools

The cost of running our schools has been escalating at over double the inflation rate, much like our so-called health care costs. Meanwhile, as you know, the quality of education has been going down even faster than the costs have been rising. Well, holy moly, Batman, what can we do about this?

Unfortunately the situation is in the hands of our beloved politicians you keep reelecting, so it's going downhill from hopeless to whatever the next step in disasters is.

I've written a good deal about this before, with my efforts apparently going in one eye and out the other. Maybe it's a form of Alzheimer's caused by being too

close to an HT or something.

There are several basic problems with our public school system. One is the abysmal quality of the teachers our teachers' colleges are graduating, with their jobs protected by the enormously powerful teachers' unions. But perhaps even worse is that the whole fundamental school system was adopted as a way to take kids with a wide assortment of intelligences and temperaments and turn them into as identical a product as possible. Then there's the enormous bureaucratic overhead that's built up — which we euphemistically call administrators.

There are some private schools which have done away almost 100% with administrators, with no detectable downside.

One more obstacle to education is the many local oars in the water by local school board members. These, for the most part, assholes don't know diddly-squat about education, so they're busy arguing about how many desks to a classroom.

I'm not going to plunge into a book on the subject. Yet. But how about using the Japanese system of having the students do most of the routine maintenance? Like emptying the waste baskets, keeping the halls and walls clean? That would end all that graffiti crapola in a hurry.

Look, every kid is different. Different IQs. Different interests. Different goals. Different families. Different upbringing. If teachers offered classes as an option instead of making them mandatory they'd have to justify the time and work involved to their potential customers. Good teachers would get crowds and the lousy ones would retire to the teachers' lounge and watch Jerry Springer or the soaps. From what I know now, some 60 years later, they never would have put me through the torture of trigonometry or calculus. They could have made a good case for algebra, which I enjoyed at the time.

Many private schools have proven that they are able to turn out far better educated graduates than the public schools, and at half or less the cost. That's right, 50% of our school budget is wasted! And that's big bucks out of your pocket. And, if you're an employer, you'll suffer *again* when you hire these public school graduates and try to get them to do some useful work, or to do anything beyond the absolute minimum to get a paycheck.

Our colleges, both public and private, are no better. They just cost more.

I've proposed an inexpensive way that every public school could be provided with just about any kind of workshop needed to help teach manual skills. I've also proposed a way for kids to be taught by some of the best teachers in the country — teachers who could make their subjects fascinating and exciting to the kids and would have the kids fighting to take their courses.

If we could get kids interested in what they were learning there would be no need for any homework assignments. The kids would read books at home because they were interested enough to do it. I've been reading in every spare moment for decades — because I enjoy it so much. And, every now and then I come across a book that's so incredible that I just *have* to share it with as many people as I can, so I review it in my editorial and then add a review of it to the next edition of my *Secret Guide to Wisdom*. Parents could do a lot worse than arm their kids with my *Guide*. On the other hand, this could upset everything, because I preach that everyone should think for themselves instead of accepting conventional wisdom — which I've found to be anything but wise, and to almost without exception be a tissue of lies intended to imprison them.

Roughly, 99% of the career advice our kids get is baloney. Ditto health advice, political, religious, and so on. Boy, have I turned into an iconoclast! Society and the media pressure our kids to poison their bodies and stunt their minds, and you parents are willing co-conspirators, even if unknowing ones.

Grumble.

Drugs

We, with the help of our public school system and media, have made one hell of a mess of things. Since our journalists are a product of the same school system, it's really unfair to blame them. The end result is that we have allowed ourselves to be totally dominated by a government that's very different from that envisioned by the framers of the Constitution. We've continued to sit silently while Congress has been making a terrible mess for us.

So we, through ignorance and passivity, have allowed our government to not just waste billions of our dollars on really stupid projects, but we've seen these projects seriously hurting our country — and our quality of life.

Yes, I mean the so-called War on Poverty and the War on Drugs. But beyond those incredibly expensive fiascos, I challenge you to name one single federal project that hasn't caused more problems than solutions. Congress, bribed by lobbyists, has wasted our money on price supports which make us pay more for things, and they've seriously screwed up education, agriculture, transportation, communications, health care, immigration, and so on.

Before the War on Poverty it used to be that poor immigrants came here, worked like the devil, and their kids graduated into our middle class.

But it's the War on Drugs that's done even more damage. We managed not to learn anything from the outlawing of alcohol in 1920. That was a bonanza which brought us organized crime, which is still with us. Before Prohibition alcohol use had been dropping — particularly hard liquor. Prohibition increased the prices and the desirability of liquor. Drinking was the "smart" thing to do.

You probably were amazed at the black reaction to the O.J. Simpson verdict. I don't recall seeing much in the media about *why* that happened. If you knew that one in four blacks was either in prison or on parole, with around 90% of them there for drug arrests, and that in virtually every case the police lied at the trials, you might get a hint as to why blacks don't trust the police, our courts, or the government.

We have over two million people in prison, mostly black, and it's costing us about $60 billion a year to house 'em. So we're busy hiring more police, appointing more judges, and building more prisons to keep this farce going. We're also watching our constitutional civil rights being trashed. Yep, the Congress *you* elected (and then reelected) is spending around $300 a year of your hard earned money to continue this mess.

Am I suggesting that we legalize drugs? Horrors!

Let me explain this clearly: No one who is in favor of continuing the drug prohibition has made any effort to understand the whole picture. Well, except those who are making money as a result of the program. The police are all for it. We'd need about a tenth as many police without the "Drug War." Our lawyers and courts are making billions on the deal, so they have a powerful vested interest in its perpetuation.

It seems as if every time Congress tries to do social engineering they end up wasting billions of our money, building a new bureaucracy, and providing us with a host of really awful unintended consequences. Our school system, because of government control, is the worst in the developed world — as well as the most expensive. The same holds for our health (har-de-har) care system, welfare, farm controls, and so on. It's been one incredibly expensive debacle after another. Yet you ignore all this and happily reelect the guys who are doing this to you with your

money. Wake the hell up!

I don't even know where to start in explaining about drugs — other than that almost everything you've been told or read is probably a lie. Yes, your beloved government has been and is lying to you. These are the people who have brought you the IRS, the FDA, the EPA, and other bureaus which are gradually taking away your freedom. I should say corrupt bureaus.

Why do we have the huge escalation of crime in America? Why do we have the spectacle of hundreds of thousands of corrupt police, lawyers, judges and politicians? It's the money, stupid! The incredible profits selling drugs generates. Profits which make America the murder capital of the world. Profits which subvert all but the stupidest public officials.

You don't see anyone making a living selling beer to kids, do you? The gangsters went out of the alcohol business when Prohibition was repealed.

But, the cry goes up, if we legalize drugs, we'll have a nation of drug addicts. I heard that from Senator Humphrey when I tried to discuss the problem with him several years ago. He wouldn't even talk about it. He was ignorant on the subject and had no interest in learning. And this, even though he had picked me as one of his personal advisors.

You've heard the government mantra that smoking pot leads to the use of harder drugs. What you don't hear is that every research report on the subject says this is baloney. The fact is that pot is a lot less addictive than alcohol, and much less damaging to one's body.

In the Netherlands, where they've legalized drugs, drug use has dropped significantly.

Then there's the horror of crack cocaine. What you don't know is that when drugs are legalized crack disappears. The main reason crack is so popular is that it's easy to make and cheap. Cocaine, which is more expensive, provides a longer and better high, so those who can afford it go for the better drug. If we legalized drugs their cost would drop about 90% and our black youth could start working at jobs instead of selling dope. Murders would drop by around 95%, our prisons would gradually empty, our police would have to find more honest work, and our lawyers and judges would be up that famous creek without a paddle, there not being all that much honest work for them.

No, I'm not suggesting that our cigarette companies be permitted to sell marijuana. I do have a plan which would make it so addicts would be able to get their drugs at a minimum cost, yet would not encourage new people to get involved. This approach has worked wherever it's been tried.

Right now, as a result of the overzealous police and ever more strict laws, physicians are quite reasonably afraid to prescribe painkilling drugs which are desperately needed by dying cancer patients. The medical association has been taking the licenses away from physicians who have been doing that — backed up by our courts. The result is that if you continue to abuse your body, reducing your immune system's ability to keep cancerous cells under control, you are very likely going to be in for months to even years of excruciating pain before you die. Sure, there are painkillers which would make life bearable for you, but no doctor will let you have them. And never mind that research has shown that the medical use of narcotics rarely results in addiction.

Please read some of the literature and find out how you've been lied to by the government and the media about drugs. I wrote about this in my 1992 book (now out of print), *We the People Declare War on Our Lousy Government*. I explained the problem and the solutions that have been successfully implemented in a few other countries. Yeah, I should take a few days, update the book, and put out another edition. But there's only so much of me to go around, so that'll have to wait.

An excellent recent book is *Drug Crazy* by Mike Gray. The subtitle is: "How We Got Into the Mess & How We Can Get Out." It's $24 from Random House.

Or you can do nothing and continue to live in a crime-ridden country with ever-worsening race relations, paying around $500 a year out of your own pocket via the IRS for your laziness. Your choice.

Oh yes, I'd almost forgotten: When they legalized pornography in Denmark and the Netherlands, porno shops opened up all over the major cities. Within a couple of years they were almost all gone, just through a lack of interest and customers. As soon as the social do-gooders get something made illegal, in rush the criminals, the prices go up, and suddenly it's attractive to the public.

Today, after hundreds of billions of dollars wasted on the drug war, drugs are available anywhere in the country. There are crack houses in Manchester, New Hampshire, and I could score just about anything I want, even in tiny Peterborough. 73

Number 62 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
210 E. Chateau Cir.
Payson AZ 85541
[jimpeg@netzone.com]

January is expected to produce Fair to Good propagation on the HF bands during most days of the month. However, you may expect Poor to Very Poor conditions between the 23rd and 27th, with the 25th and 26th being the poorest. Remember that propagation conditions during the winter months are *not* as good as those during the spring and fall months in the northern hemisphere. DX signals will be weaker, and the bands between 20 and 10 will close earlier. However, QRN (static) will be less, and the HF band between 160 and 20 meters will really produce some fine DX on most days, particularly the 5th–7th; 11th–14th, and 18th–21st (see calendar).

10–12 meters

Possible openings to Europe in the morning, midday openings to Africa and South America, and late afternoon openings to Australasia and the South Pacific. Daytime short-skip openings between 1000 and 2000+ miles are likely as well.

15–17 meters

Worldwide DX possible during daylight hours, peaking toward Europe and the east in early morning, toward the southern hemisphere in the afternoon, and toward the west, South Pacific and Australasia in the late afternoon, with daytime short skip from 1000 to over 2000 miles.

20–30 meters

Openings to Europe and the east during late afternoon hours, with the bands remaining open to various areas of the world during hours of darkness until shortly after sunrise. Daylight short skip to 1000 miles and 2000 miles or so at night.

40 meters

Generally low noise prevails, and openings toward Europe and the east beginning in late afternoon, with the band remaining open all night until after sunrise to various areas of the world. Daytime short skip to about 1000 miles and over 1000 miles at night. This *could* be your best DX band this month!

80 meters

DX to all areas of the world between dark and dawn with signals peaking toward Europe and east around midnight, and to other directions just before dawn. Daytime short skip to 500 miles and nighttime openings to 2000 miles or so.

January 1999

SUN	MON	TUE	WED	THU	FRI	SAT
					1 F-G	2 G-F
3 F	4 F-G	5 G	6 G	7 G	8 G-F	9 F
10 F-G	11 G	12 G	13 G	14 G	15 G-F	16 F
17 F-G	18 G	19 G	20 G	21 G-F	22 F	23 F-P
24 P	25 P	26 P	27 P-F	28 F	29 F	30 F
31 F						

160 meters

DX possible during early evening and hours of darkness. No daytime short skip, but excellent possibilities at night from 500 to about 1500 miles.

Don't forget to work the *darkness path* (±30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. Good hunting, and Happy New Year! W1XU/7. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40	40		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15

CENTRAL UNITED STATES TO:

ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CANAL ZONE	15	20	40	40	40		20	15	10	10	10	15
ENGLAND	40	40	80					20	15	15	20	40
HAWAII	15	20		40	40	40	40	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40	40		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40	40		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20

WESTERN UNITED STATES TO:

ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40	40	20	20	15	15
CANAL ZONE	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	15	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

Radio Bookshop

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaughts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before January 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? $5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. $5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (L)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (T)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. $5 (U)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. $15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (Z)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three $5 volumes. $15 (O)

1999 Jan-Aug Editorials: 188 pages in two $5 volumes. Bringing you up to date. $10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. $5 (Q)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (V)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 wpm or 20 wpm. $5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months. $5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. $30 for six issues. (EE). A sample issue is $10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (K)

.....Wayne

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Items ordered - use letters or copy page and mark books wanted. Order total plus $3 s/h in US,$6Can.

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Yes! Put me down for a year of *73* for only $25 (a steal). Canada US$32. Foreign US$44 by sea, US$67 by air. Whew!

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls. The deadline for the April 1999 classified ad section is February 10, 1999.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

BIOELECTRIFIER™ 5 Hz micro current supply for plant and animal research. Semi-Kit $38.00. Assembled complete with batteries and silver electrodes $89.50. Add $2.50 postage. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB343

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE**, 1 (800) 213-4563. BNB6000

Cash for Collins: Buy any Collins Equipment. **Leo KJ6HI.** Tel./FAX (310) 670-6969. [radioleo@earthlink.net] BNB425

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send $1.00 & SASE. SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044 USA. BNB421

WWII MILITARY TELEVISION WANTED: Army/Navy SCR, ATJ, ATK, ARK, ARJ, CEK, CRV. Receivers, cameras, monitor, transmitters, dynamotors. **Maurice Schechter**, 590 Willis Ave., Williston Park NY 11596, P/F (516) 294-4416. BNB69

QSL CARDS. Basic Styles; Black and White and Color Picture Cards; Custom Printed. Send 2 stamps for samples and literature. RAUM'S, 8617 Orchard Rd., Coopersburg PA 18036. Phone or FAX (215) 679-7238. BNB519

WANTED: High capacity 12 volt solar panels for repeater. **[kk4ww@fairs.org]** or (540) 763-2321. BNB2630

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, $74.50. Same, but DC powered, $54.50. Add $2.50 shipping. **Thomas Miller**, 314 South 9th Street, Richmond IN 47374. BNB342

ASTRON power supply, brand-new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249, **AVT.** Call for other models. **(626) 286-0118.** BNB411

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

WANTED: NYE VIKING STATION MONITOR RFM-003, RFM-005. Paying $600. Randy Ballard N5WV, **(903) 687-3002**; [TMT@Prysm.net]. BNB5001

Orlando HamCation™ and Computer Show Feb. 12–14, Central Florida Fairgrounds. ARRL North Florida Section. Commercial areas feature over 200 vendors, and swap area includes over 400 tables. Tailgating, forums, testing. Overnight RV parking with electric and water. Commercial Information, Tim Starr, (407) 850-9258. E-mail [AE4NJ@aol.com], visit our Web pages at [WWW.OARC.ORG] or send SASE to: **Orlando HamCation™**, P.O. Box 547811, Orlando FL 32854. BNB213

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VisualRadio® is a powerful Control software for AOR, ICOM, Kenwood, JRC, YAESU and more. Starting at US $122. Download demo: [http://ourworld.compuserve.com/homepages/visualradio]. For info/order: **Computer International**, St. Johns MI. TEL/FAX: (517) 224-1791. E-mail: [Schuette@email.mintcity.com]. BNB601

Number 64 on your Feedback card

Special Addition

Hunting Indian Lions in the Air

Bangalore, the "Garden City of India" and "India's Silicon Valley," and the capital of Karnataka, is also known as "India's Ham Capital," since nearly 10% of India's hams reside in the city. It was the first Indian city to have an amateur radio club, a repeater, a digital mailbox, packet BBS, radio direction finding competitions ... and last October the Bangalore ARC held India's first hamfest, a three-day event that attracted nearly 800 attendees from all over the subcontinent of India.

The Lions Club of Bangalore North invites all amateur operators and SWLs to participate in the 28th annual Hunting Lions in the Air Contest, from Saturday, January 9, 1999 (0900 UTC), to Sunday, January 10, 1999 (2100 UTC). How many people get invited to hunt Indian lions? Don't miss this opportunity! Get in touch and get the rules at *[http://www.angelfire.com/in/vu2jhm]* or *[http://welcome.to/lionsclub]*. E-mail the Lions Club at *[lions.324d1@usa.net]*.

The Bangalore ARC issues a warm welcome for any ham visiting Bangalore, in person or on the air, especially on two meters. QSP, QSLs are handled at the BARC, Post Box #5053, GPO, Bangalore 560 001, INDIA; E-mail [vu2arc@hotmail.com]. 73

***Photo A.** Special Indian postal cover celebrated World Amateur Radio Centenary.*

JRC

JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245. . .

1 All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.

★ JST-145 COMING SOON ★

2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

3 AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.

4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply with "silent" cooling system designed for continuous transmission at maximim output.

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The New Approach to HF Radio!

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The Kachina 505DSP Computer Controlled Transceiver

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The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs if You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

Seeing is Believing American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

Windows is a trademark of Microsoft Corp.
Specifications and features subject to change without notice.

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