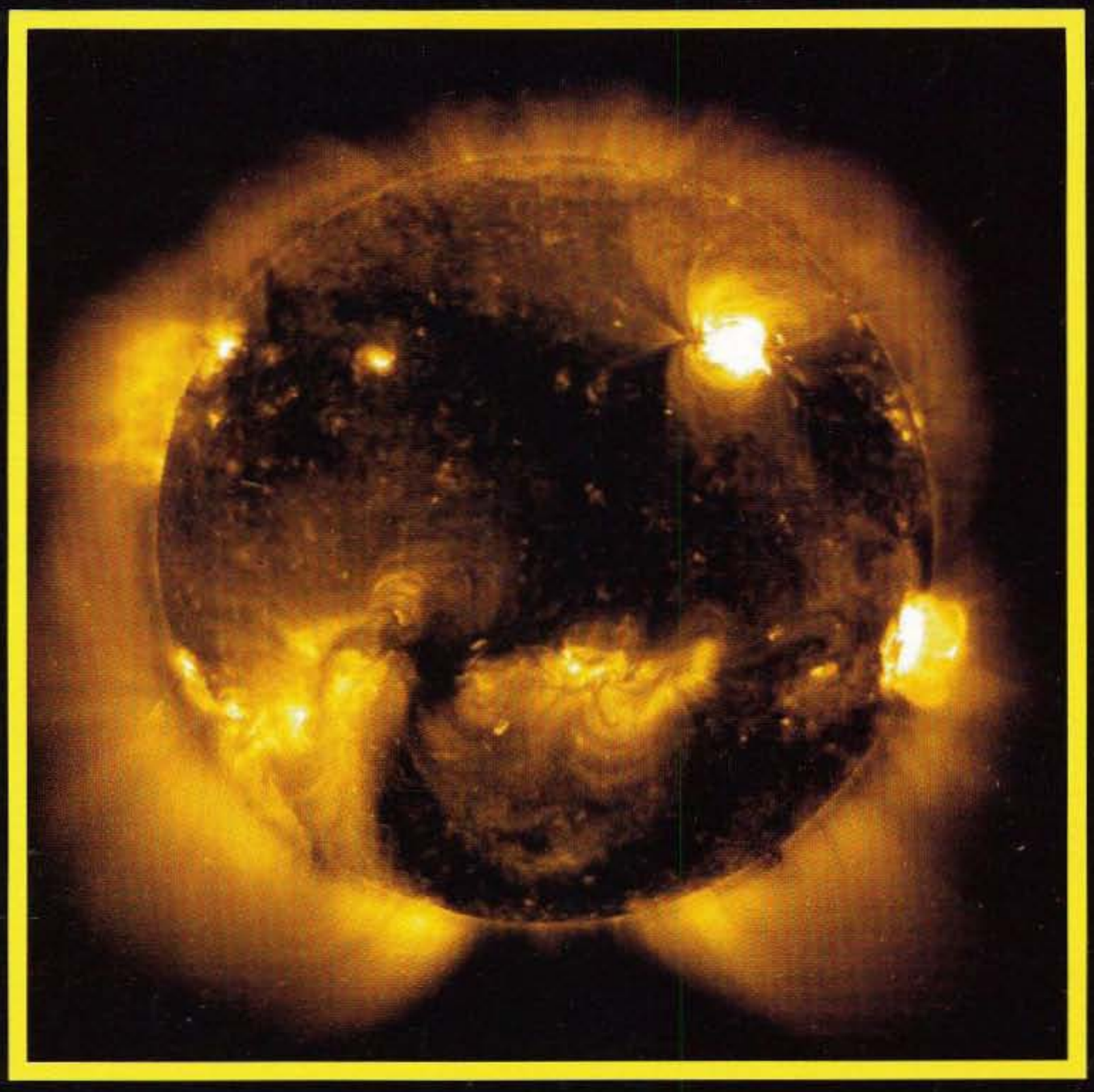
FEBRUARY 1999
ISSUE #461
USA $3.95
CANADA $4.95

73® Amateur Radio Today

Monitoring Solar Mischief



Which Antenna Is Best for You?

Really Simple 20m Antenna

Build a Dream Receiver

And a VFO, Too!

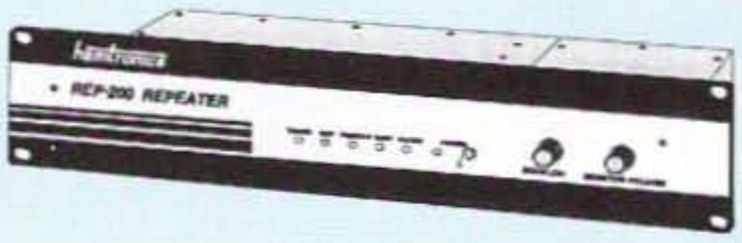
Review:

IC-706MKII — Wow!

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.)

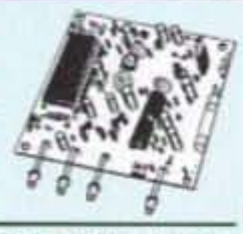
☛ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

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!

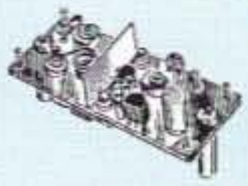
- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- **Decoder** can be used to mute receive audio and is optimized for installation in repeaters 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

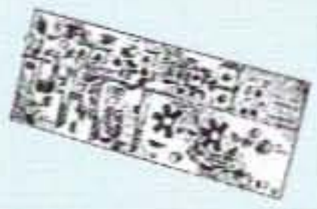
ONLY $24/kit

- 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

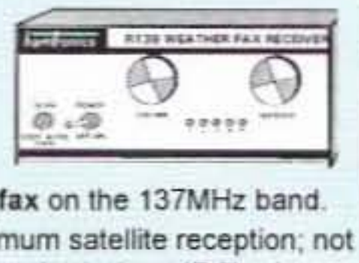
A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

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

NEW

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.***

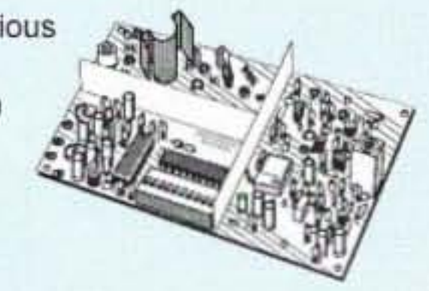
EXCITERS:

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.

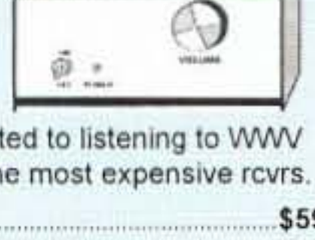
Output levels from 10W to 100W..... **Starting at $99**

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.
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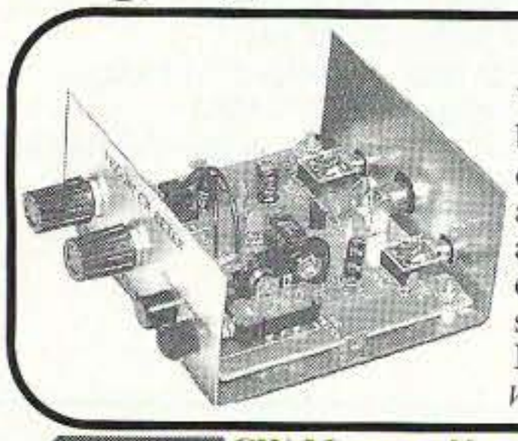
VECTRONICS® kits

High-performance electronic kits . . . fun to build and use!



Full featured CW Keyer Kit, $24.95!

VEC-201K, the best electronic keyer bargain in ham radio! Send beautiful sounding Morse Code. Self-completing dot-dashes and dot-dash memory forgive timing errors -- makes sending CW easy and accurate. Front panel volume/speed (3-65 wpm) controls. Weight adjusts 25-75%. Sidetone (300 -1000Hz) has LM386 audio amp for external speaker/phones. Select Iambic A or B, fully automatic or semi-auto "bug" mode. Tune mode for tuning rig. RF proof. Sleep Mode battery saver. Use 9V battery. 1¾x4x3½ in. *Simple skill level.*

VEC-201K shown in optional case (vinyl cover top not shown), VEC-201KC, $14.95

CW Memory Keyer Kit stores 512 characters in four 128 character non-volatile EEPROM message memories. *Carry on entire QSOs by just pressing memory message buttons.* True sinewave sidetone with soft rise and fall time eliminates harsh keyclicks. Has all features of VEC-201K CW Keyer Kit. 1¾x 6¾x5¼ in. *Simple skill level.* Order **VEC-221K, $69.95.**

20/30/40/80 Meter Receiver Kits give high performance! Covers entire band or tailor to cover desired portion. Copy CW/SSB/AM. NE602/ 612 mixer-oscillator, LM386 high gain audio amplifier. 1¾x4¾x 5¼ in. *Moderate skill level.* Order **VEC-1120K** (20 Meters),**VEC-1130K**(30 Meters),**VEC-1140K** (40 Meters), **VEC-1180K** (80 Meters), **$29.95 ea.**

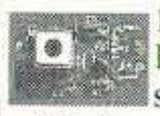
20/30/40/80 Meter QRP CW transmitter Kits let you work the world! Variable crystal oscillator tuning, front panel switch selects 1 of 2 crystals. 1 crystal for popular frequency included. Transmit/Receive switch lets you connect receiver. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1220K** (20 Meters), **VEC-1230K** (30 Meters), **VEC-1240K** (40 Meters), **VEC-1280K** (80 Meters), **$29.95 ea.**

Tunable SSB/CW Audio Filter Kit has sharp *four* pole peak and notch filters. Eliminate interference. Zero in with frequency control and adjust bandwidth for best response. Extra steep skirts. Tune frequency from 300 to 3000 Hz. Vary bandwidth from 80 Hz to nearly flat. Notch is an outstanding 50 dB. 1 Watt amplifier. Speaker/Phone jacks. 12 VDC at 300 mA. 1¾x4¾x5¼ inches. *Intermediate skill level.* Order **VEC-841K, $34.95.**

Super CW Audio Filter Kit gives you three bandwidths: 80, 110, 180 Hz. Eight poles gives super steep skirts with no ringing. Pull CW QSOs out of terrible QRM! Plugs into phone jack to drive phones. QRM down 60 dB one octave from center frequency (750 Hz) for 80 Hz bandwidth. Improves S/N ratio 15 dB. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-820K, $19.95.**

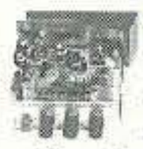
Super CW filter/amplifier Kit has powerful 1 watt audio amplifier to drive speaker. Pull CW signals out of QRM with extremely narrow 80 Hz bandwidth without ringing. 8 poles active IC filtering uses cascaded low-Q stages. Razor sharp selectivity. 3 bandwidths: 80,110, 180 Hz. Center frequency: 750 Hz. Up to 15 dB of noise reduction. Auto noise limiter knocks down static crashes, impulse noises. Use 9-18VDC, 300 mA max. 1¾x4 x3½ in. *Simple skill level.* Order **VEC-821K, $29.95.**

Super SSB Audio Filter Kit dramatically improves readability with 8 poles. Optimizes audio bandwidth, reduces sideband splatter, low, high pitched interference, hiss, static crashes, background noise, 60/120 Hz hum. 375 Hz highpass cutoff. 2.5, 2, 1.5 kHz low-pass cutoffs. Plugs into phone jack to drive head phones. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-830K, $19.95.**



144/220/440 MHz Low-Noise Preamplifier Kits soup up your antenna system. Helps pull in weak signals. Works wonders for scanner or ham-band receiver. Quality microwave type bipolar device gives great low-noise performance and immunity from damaging electrostatic discharge. 1x1½ in. *Simple skill level.* Order **VEC-1402K** (144 MHz),**VEC-1422K** (220 MHz), **VEC-1444K** (440 MHz), **$17.95.**

High-performance 2 Meter Preamp Kit pulls weak signals out of noise. Solves three reception problems -- boosts signals using a 1-dB noise figure microwave transistor, provides razor-sharp bandpass filtering, eliminates unwanted electrical noises with built-in balun. Uses 9-14 volts DC. Tiny 1½x3x1 in. fits in any size box. *Intermediate skill level.* Order **VEC-1402DK, $59.95.**



2/6/10 Meter FM Receiver Kits let you tune into the world of ham radio. Catch all the action! Each covers the entire FM sub-band and runs off your 9 volt battery. Plug in speaker or headphones for loud clear reception. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1002K** (2 Meters), **VEC-1006K** (6 Meters), **VEC-1010K** (10 Meters), **$34.95 each.**

2 Meter Monitor Kit receives 144-148 MHz. Low noise, high gain RF preamp gives you excellent 0.1 uV sensitivity. Air variable tuning capacitor has 8:1 reduction. Dual conversion superhet provides selectivity and stability. Automatically eliminates squelch tails. Built-in speaker, squelch, tone, volume controls. 19¼ in. telescopic whip. 9V battery. 2x4¼x4 in. *Intermediate skill level.* Order **VEC-104K, $79.95.**

5 Watt 2 Meter FM transmitter Kit lets you transmit voice and data -- AFSK data (up to 1200 baud) and FSK data (up to 9600 baud). Jumper select reactance or direct FM modulators. Reliable Motorola NBFM transmitter IC and PA transistor. Crystal controlled (x8 frequency multiplication). -60 dBc spurs and harmonics. Use 12-14 VDC, 1.5 amps. 5-pin DIN microphone jack. 1¾x4¾x5¼ in. *Difficult skill level.* Order **VEC-1202K, $99.95.**

All purpose Ni-Cad/Ni-MH Rapid Battery Conditioner Kit safely quick charges expensive batteries -- no overcharging -- many in less than an hour. HTs, cell phones, camcorders, lap top computers. Handles 1 to 12 cells. Charging status LEDs. Discharge before charge function reconditions batteries. Also removes memory effect. Runs on 12-15 VDC. 1¾x4¾x5¼ in. *Moderate skill level.* Order **VEC-412K, $49.95.**

Crystal radio set Kit lets you relive the experience of early radio pioneers. This baby really works! Wind your own inductor, wire up the earliest radio circuit without soldering a thing and listen to the magic of radio that needs no power. Put up an antenna, connect a ground. Stations come in amazingly loud and clear. Includes antenna wire, sensitive earphone. 1¾x5x6½ in. *Simple skill level.* Order **VEC-121K, $19.95.**

Shortwave Receiver Kit lets you listen to the world! Covers 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15 and 13 Meter bands. Explore AM, SSB, CW, WWV, RTTY and Packet signals. Vernier reduction drive, smooth regeneration control, RF stage. *Includes all metal cabinet.* 2 earphone jacks. Use 9V battery. 2½x7x6 in. *Intermediate skill level.* Order **VEC-102K, $59.95.**

Shortwave Converter Kit converts AM or AM/FM radios to shortwave receivers at a push of a button. Hear stations all over the world at various times of the day and year. Choose two 1 MHz bands between 3 and 22 MHz. Popular 13, 16, 19, 25, 31, 41, 49 and 60 Meters international broadcast bands. On/off bypass, NE-602/612 mixer-oscillator IC and tuned input circuit. Use 9 V battery. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-101K, $27.95.**

Aircraft Receiver Kit tunes entire voice aircraft band 118-136 MHz. Picks up air traffic 100 miles away. Track progress of incoming/outgoing traffic in your area, gain advanced weather information, and discover how the National Air Traffic System really works. Great way to learn about aviation. Use 9V battery. Drives external speaker/phones. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-131K, $29.95.**

AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input. Easy to connect to CD, tape deck or mike mixers. Audio level adjustment. Has high level AM modulation for low distortion. 1¾x4x3½ in. *Simple skill level.* Order **VEC-1290K, $29.95.**

TV Transmitter Kit lets you plug in camcorders, VCRs or TV cameras and transmit high quality audio/video to nearby TV sets. Imagine watching your favorite movie on a portable TV by the pool with a tape playing indoors. Create your own personal TV station for some great neighborhood fun! Use a hidden video camera to monitor remote areas. Adjustable to channels 3-6. 1¾x4¾x5¼ in. *Moderate skill level.* Order **VEC-1294K, $27.95.**

SCA Decoder Kit tunes in SCA programming hidden in FM broadcast signals. You'll find commercial free background music, all news programs, weather reports, stock quotes, digital data, ethnic programs, reading services for the blind! Tunes entire SCA band 50-100 KHz with front panel tuning/volume control. Drives external speaker. 1¾x4¾x 5¼ in. *Simple skill level.* Order **VEC-422K, $27.95.**

The *GIANT* Book of Electronic Projects, Volume I. Project book includes 19 kits on this page. Has building tips, complete parts lists, parts placement and PC board layouts, test and alignment, operating instructions, in case of difficulty, theory and specs, schematics, cabinet layout. Order **VEC-1901, $19.95.**

Inspect and download our manuals from:

http://www.vectronics.com

Vectronics kits feature a professional quality epoxy glass PC board with solder mask and component legend, simple step-by-step instructions and highest quality components.

All metal cases for most kits, $14.95.
Add "C" for case to model #. Example: "VEC-201KC". Has knobs, hardware, rubber feet and brushed aluminum-looking front panel decal.

Order Toll-Free 800-363-2922
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VECTRONICS, 300 Industrial Park Road
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ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

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

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

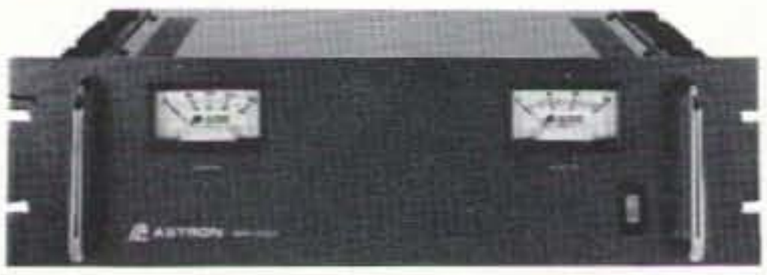
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

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

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

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FEBRUARY 1999
ISSUE #461

73® Amateur Radio Today

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On the cover: "Here Comes the Sun: Part 2" begins on page 34. Photo courtesy of NASA's *SOHO* satellite. Image taken May 6, 1998 — day of a huge X-class flare.

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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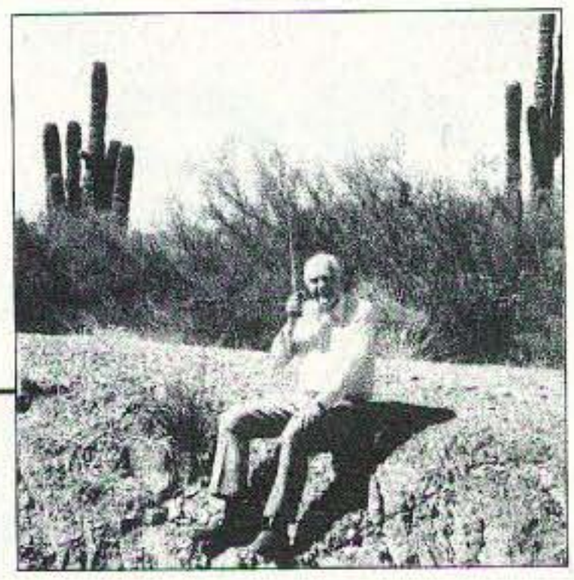
Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Cancer!

If you don't have it yet, you or someone in your family probably will. You certainly must have some friends with cancer. The wife of the chap who picks up my garbage has cancer. So does my ex-wife (the nicer one).

Once cancer strikes, the patient (victim) has two choices — go to the doctor and run up tens of thousands of dollars in hospital bills, endure the torture of chemo and radiation "therapy," or start some self-education on the subject and look for alternatives. It doesn't take much reading to find out that cancer was almost unknown a hundred years ago and that Dr. Schweitzer said he never ran across one single case of cancer in Africa until the Africans started eating the European diet. None. Golly, do you suppose that what we've been eating may be connected to the cancer epidemic?

If you know anyone with cancer who hasn't totally turned over all responsibility for their life to the medical professionals, you may be able to help them find out both why they got the Big C and how to get rid of it without the pain, suffering, and unlikely success (not to mention expense) of the accepted medical treatments. They should take the word "treat" out of treatment.

You're probably aware that the National Cancer Institute and the American Cancer Society have spent billions of your dollars looking to develop a pill or shot that will stop cancer. They haven't spent *bupkes* on looking into preventing cancer in the first place. Well, there's no money in that for them, the AMA, the FDA, the hospitals, or the drug companies. People only spend money after they get sick, then they'll spend all they and their families have.

Anyway, when someone manages to encancerate himself, my recommendation is to get the victim a copy of the $15 Dr. Bruno Comby book, *Maximize Immunity* (905-478-2201). Yes, of course, I've reviewed it in my *Secret Guide to Wisdom*. Second, I'd send for copies of Dr. Lorraine Day's videos describing how she cured her own cancer just by changing her diet (800-574-2437). Thirdly, it wouldn't hurt to nail down the cause and cure by getting a $15 copy of *Nature's First Law: The Raw Food Diet* (800-205-2350). To do any less could be to sentence your friend (or yourself) to death.

Yes, I know how much you enjoy coffee, Coke, Big Macs, chocolate, ice cream, and so on. Are these habits really worth dying prematurely for? Slowly and painfully prematurely?

The more research I do, the more I'm convinced that cancer, heart trouble, strokes, arthritis, diabetes, and all the other things that are shortening our lives, or at least making them more difficult, are completely avoidable. But getting the word out, or, worse, convincing people even to take an interest in stopping them killing themselves, seems a lost cause. So, though I'd like to say something when I see a grossly fat person — about just changing their damned diet — I know they'll get mad and don't even want to hear anything about how to cure the illness that's making their life miserable and going to cut it very short.

We have over 8,000 hospitals in America. If we could get people to change their diets, I think we could put around 6,000 of 'em out of business and cut around a trillion dollars from our medical bills. That's about $4,000 per taxpayer per year! Yeah, this would put a lot of insurance and pharmaceutical companies out of business. Tough. But without your employer having to take all those medical payments out of your paycheck before you even see it, this would amount to a four-thousand-dollar raise.

I'm sure Congress would have no problem in finding other ways to spend the hundreds of billions in federal funds this would save.

So we have a trillion-and-a-half vested interest in your *not* finding out that it's your diet that's making you sick — and killing you — when your life should be only half over, and no constituency to help bring about change. Money runs this country, not the interests of the people.

The Odds

A little item in *Time* caught my eye. Well, it mentioned cancer and nursing homes. It seems that a recent study showed that 40% of the cancer patients in nursing homes get too little or no pain medication. Not even aspirin! I don't know if you've had a family member who died of cancer, but when I lived in Brooklyn the guy across the street did and his screams of pain could be heard day and night for months.

This is, of course, of little importance to you if you are not ever going to (a) live in a nursing home, and (b) get cancer. Well, unless you change your lifestyle significantly, your odds are not good. Around 60% of our elderly are ending their days in nursing homes, where there is little to do and the food sucks. Add to that the 40% who will get cancer (heading toward 50% as we continue to smoke and sugar ourselves to death), and you are playing against serious odds.

How come all the pain? Well, two things: First, there's the cost of drugs, and second, the medical police and the drug enforcement people are looking for any doctors who've been prescribing painkillers. Several have lost their licenses just through prescribing pain-killing drugs for terminal cancer patients.

Both cancer and nursing homes are avoidable if you stop doing bad things to your body. Oh, to heck with the fat, the nursing homes, and the incredible pain of cancer — pass me another doughnut!

Another Opportunity

A chap at the Peoria SuperFest had a copy of the Karlson Enclosure booklet I put out in 1952 which he wanted me to autograph. He'd been able to buy a couple of the speaker enclosures at an auction for a very reasonable price, mainly because no one else there knew what they were.

I've been to the Consumer Electronic Show audio demonstrations in Chicago and Las Vegas and there's not one speaker system being made today at any price that comes even close to the performance a good speaker will produce in a Karlson Enclosure.

Sure, you need a good hi-fi system and a good speaker, but the last link in the chain is the speaker cabinet.

Audiophile friends who visit me are astounded at the sounds my system produces, and my

Continued on page 54

RAMSEY

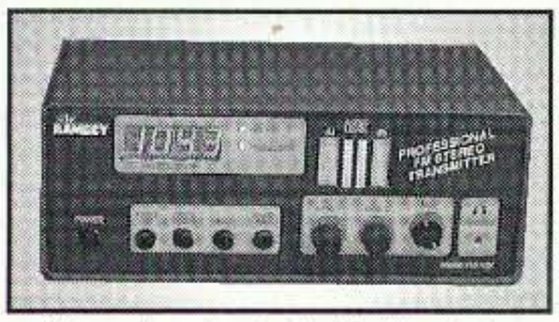
World's Smallest TV Transmitters

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

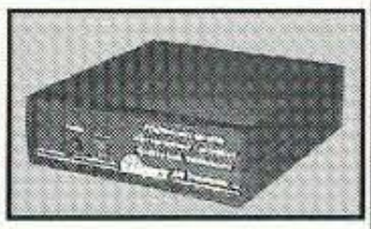


A truly professional frequency synthesized FM Stereo transmitter station in one easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set frequency easily with the Up/Down freq buttons and the big LED digital display. 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

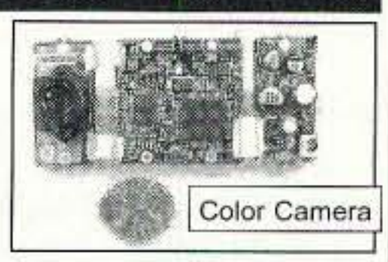
AM Band Radio Transmitter



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



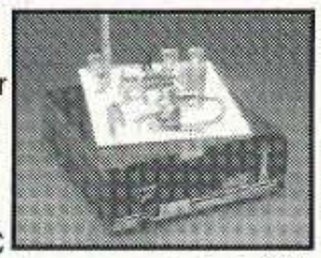
If you're looking for a good quality CCD board camera, stop right here! Our cameras use top quality Japanese Class 'A' CCD arrays with over 440 line line resolution, not the off-spec arrays that are found on many other cameras. You see, the Japanese suppliers grade the CCDs at manufacture and some manufacturers 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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QRX . . .

The Bad Ones ...

FBI Busts Georgia Ham

An FBI statement issued in December 1998 said that Kevin M. Kelly N2BYE, an Advanced class licensee, was arrested without incident November 6th at his Cumming, Georgia, home by FBI agents accompanied by FAA and FCC agents. The arrest followed a search of Kelly's residence.

Kelly was charged in a criminal complaint with four counts of breaking federal law prohibiting knowingly interfering with the operation of a "true light" or signal used at an air navigation facility. The FBI said its case stemmed from FAA reports of "sporadic and momentary radio frequency interference" between aircraft and air traffic controller communications. The FBI said an extensive investigation showed the RF interference to be coming from the Hyde Park subdivision in Cumming where Kelly lived.

The FBI described Kelly, 46, as "a highly experienced electronics engineer" who was said to have been "extremely upset" about air traffic noise above his home.

From December 1998's *Badger State Smoke Signals*, Jim Romelfanger K9ZZ, editor.

Pirates Popped

The FCC has pulled the plugs on four unauthorized HF broadcasters in Massachusetts, Illinois, Texas, and California. The stations all transmitted on 6955 kHz. Two of the operators are radio amateurs, according to an FCC spokesperson, who said the ham licenses "are definitely in jeopardy." The two hams were identified as 41-year-old Richard F. Jurrens KC5RGK, a Technician licensee who lives in Katy, Texas, and 46-year-old Henry Lee "Hank" Landsberg WB6MEU, an Advanced class licensee who lives in Sierra Madre, California. The names of the others cited were being withheld pending further official action.

In making the arrests, the FCC's Columbia (Maryland) Operations Center coordinated and provided information to FCC agents from the Boston, Chicago, Houston and Los Angeles offices. FCC inspectors from those offices then performed on-site visits to the unauthorized stations.

With the exception of certain low-power Part 15 devices, broadcasting on the HF bands is not authorized without a station license. Under the Communications Act, violators may be subject to penalties of up to $11,000 and the equipment used may be seized and forfeited by court order. Unlicensed operators also face criminal fines of up to $100,000 and/or imprisonment for up to one year, or both, for a first-time offense.

From *The ARRL Letter*, via December's *Badger State Smoke Signals*, Jim Romelfanger K9ZZ, editor.

Shame on Somebody

This appeared in the October 1998 issue of *The Algoma Amateur*, the newsletter of the Algoma ARC, Walt Kimball VE3CWE, editor.

During Hurricane Bonnie, I took the opportunity to listen to the hurricane tracking net on 14.300 kHz. It was a well-organized net, controlled out of Florida, but communications were extremely difficult, in spite of reasonably good band conditions.

I don't think I have ever heard jamming done so effectively on any frequency before. There were two distinct stations broadcasting country-and-western music, plus another that broke in periodically with chimes. One music station was in the south, and the other appeared to be out west. Both had signals at least 10 dB over 9. Sometimes both were on together, and at other times they were doing it solo. They kept this up for several days while the net was active.

When you consider the importance of a hurricane tracking net, giving warning of how and where the storm was moving, etc., you have to think of how many lives and how much damage they might be able to save—and yet these were amateur radio operators doing their best to stop communications.

From *ARNS Bulletin*, December 1998, Steve Auyer N2TKX, editor.

FCC Cracks Down on Fraud

Several sites on the World Wide Web are apparently dedicated to thwarting the FCC license fraud enforcement effort. While it is impossible to say who is really sponsoring the Web locations, the rhetoric from site to site has a familiar ring. The majority of the sites claim that everyone has the constitutional right to do and say what he wants on the ham bands. Some reportedly go so far as to say that the government cannot do anything to stop what the majority in the ham community see as malicious interference.

On one Web site there was even a scanned copy of an FCC letter to an alleged violator. The letter appears authentic, and is signed by W. Riley Hollingsworth. Hollingsworth is the legal advisor to the FCC's Compliance and Information Bureau and the point man in this latest enforcement effort. It details the complaints and advised the alleged violator to call Hollingsworth's office to discuss the matter.

Meanwhile, several Internet bulletin boards are becoming filled with rhetoric from supporters of those believed to be targeted by the government for enforcement action. The words posted urge everyone to ignore the FCC and continue to operate on the air in any way that they like.

From *Newsline*, Bill Pasternak WA6ITF, editor.

... and now The Good Ones

Emma's Radio Project

The United Kingdom's 1998 "Young Amateur of the Year," Emma Constantine 2E1BVJ, has issued a radio construction challenge that has quickly become a sponsored national United Kingdom ham radio youth contest.

Called "Emma's Challenge," the project involves building a six-meter three-watt FM portable transceiver for less than £50 (50 pounds) in British currency. Contestants have until the end of 1999 to submit their entries. The United Kingdom's Radiocommunications Agency has also pledged its support and has donated £1,000 worth of sponsorship.

The competition is open to all young British hams. Two main prizes will be awarded, for individual and group/club entries. For further information write to the RadCom office at RSGB Headquarters. The E-mail address is [radcom@rsgb.org.uk].

From RSGB, via *Newsline*, Bill Pasternak WA6ITF, editor.

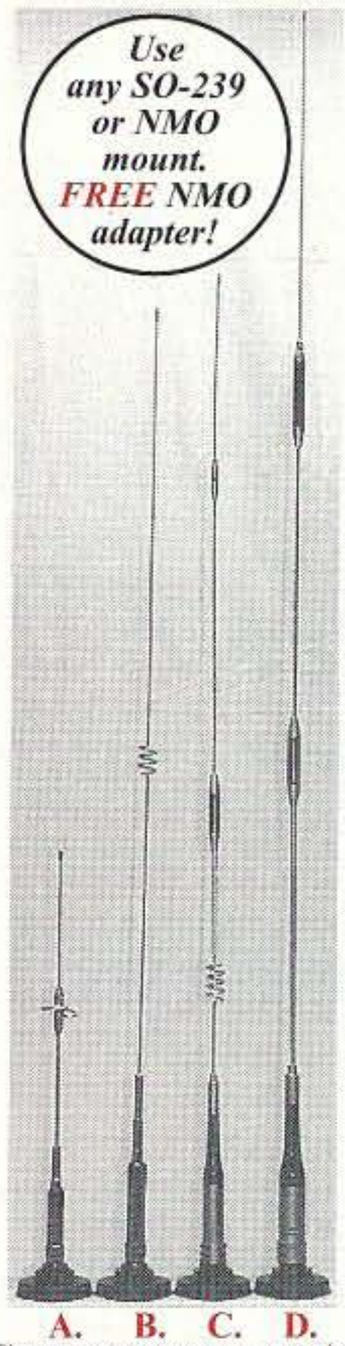
Injured Storm Spotter Honored

Ham hero Lonnie McVaigh KB9LUN, of Decatur, Illinois, has been honored as the latest recipient of the prestigious Samuel I. Keene Memorial Service Award from the Disaster Preparedness-Emergency Response Association. McVaigh received the award November 19. It carries a $1000 honorarium. McVaigh was seriously injured while on storm-spotter duty.

"Instead of simply reporting the location and movement of the funnel cloud that threatened Decatur on April 19, 1996, Mr. McVaigh warned people to get off the street and into shelters as the tornado bore down on them," a DERA statement

Continued on page 8

MFJ *RuffRider*™ High Gain Mobile Antennas



A. B. C. D.
Shown on mini mag mounts, not included.

Each MFJ RuffRider™ mobile antenna comes with MFJ's unique 90 degree "fold-over" feature -- lets you pull into your garage without knocking your antenna over!

MFJ's heavy duty bases are extremely strong to handle super rugged rides and day-to-day highway abuse.

MFJ's *RuffRider*™ High Gain dual band 144/440 MHz mobile antenna series is for the serious mobile ham who demands the highest quality, premium products at reasonable prices.

They feature the finest quality construction using precision machined components. *RuffRiders*™ battle the elements, handle rugged rides and day-to-day highway abuse.

Stacked elements with high-Q phasing coils give you outstanding gain. Stay in solid contact!

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Phased radiators flattens the radiation pattern and concentrates your power to give you *super gain.*

High-Q phasing coils are housed in weather proof high-tech plastic insulation. They're attached to stainless steel stacked radiators by solid metal end sections.

Heavy Duty Base

Rigid, heavy duty solid metal base reduces SWR flutter due to wind vibration. Two Allen set screws securely fastens radiator.

Specially treated center pin provides excellent electrical connection.

Quickly screws off -- helps prevents theft of your expensive rig.

Use SO-239 or NMO Mounts

RuffRiders™ have a PL-259 base mount for quick installation to your heavy duty SO-239 magnet, trunk/hatch, gutter or mirror mount.

A *free* NMO adapter is included for use with an NMO mount.

MFJ mounts are recommended.

All MFJ *RuffRiders*™ are dual band 144/440 MHz antennas and factory tuned for SWR less than 1.5:1 and have 50 Ohm impedance.

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All *RuffRider*™s are covered by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your antenna for one full year.

Choose from several different length and gain antennas . . .

A. ***RuffRider Junior***™**.** Premium, short 16½" antenna fits in any garage on any auto. ¼ Wave on 2 Meters, ½ Wave, 3 dB gain on 440 MHz.100 Watts. No fold-over.
MFJ-1402 **$34.95** add s/h

B. ***RuffRider High Power***™**.** Just 40" long handles full *200 Watts.* Great for high power mobile amp. ½ Wave, 3 dB gain on 2 Meters, ⅝ Wave, 5.5 dB gain on 440 MHz.
MFJ-1412 **$49.95** add s/h

C. ***RuffRider High Gain***™**.** 41½" long antenna gives extra gain with little height increase. Handles 150 Watts. ½ Wave, 3.2 dB gain on 2 Meters, ⅝ Wave, 5.7 dB gain on 440 MHz.
MFJ-1422 **$49.95** add s/h

D. ***RuffRider Hyper Gain***™**.** 62½" brute gives a whopping 5 dB gain on ⅞ Wave 2 Meters, ⅝ Wave, 7.6 dB gain on 440 MHz. Our highest gain antenna. Handles 150 Watts.
MFJ-1432 **$69.95** add s/h

144/440 MHz Antenna Tuner with ***built-in SWR/Wattmeter***
Covers 136 to 175 MHz. Handles 150 Watts. Compact 4x2½x1¼".
New! MFJ-922 **$79.95**

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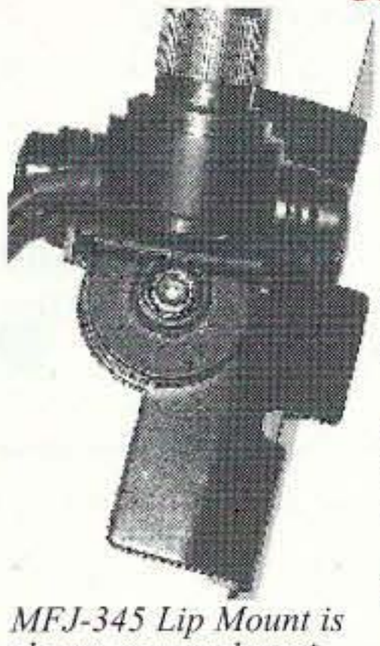
Trunk/Hatchback *Lip* Mount



MFJ-345 Lip Mount is shown mounted vertically to a mini-van's angled hatchback lip. Note extra-wide mount with reinforcing tab at right -- safely secures heavy antennas. Swivel mount is adjusted so antenna is near vertical away from mini-van to clear luggage rack.

MFJ-345 **$34.95** add s/h

MFJ's *RuffRider*™ super heavy duty solid steel Trunk/Hatchback *Lip* Mount mounts to any lip on your vehicle.

Extra-wide *four* inch lip and large reinforcing tabs on each side safely distributes the load over your vehicle's lip.

Two large set screws on each end of the mounting lip locks your mount in place. A scratch-proof rubber guard protects your vehicle's finish.

Secures large VHF, UHF and medium size HF antennas even at highway speeds.

Mounts on lips at any angle. Two axis of rotation lets you position your antenna vertically, horizontally or at any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 and locking screw, One year MFJ *No Matter What*™ limited warranty.

Mirror/Luggage *Pipe Clamp* Mount

MFJ-340 Pipe Clamp Mount is shown clamped solidly to vertical mirror support rod on a pickup truck. Antenna is slightly swiveled to the left and positioned about 30 degrees from vertical to clear cab of the pickup truck.

MFJ-340 **$34.95** add s/h

MFJ's *RuffRider*™ Mirror/Luggage *Pipe Clamp* Mount mounts on support rod of mirror, luggage rack or spare tire carrier of your truck, van, RV or SUV. Mounts on any horizontal, vertical or angled rod or pipe up to 5/8 inches in diameter.

Secures VHF, UHF and medium size HF antennas even at highway speeds.

Two axis of rotation lets you position your antenna to any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Convenient *Thumb and Finger* turn knob makes fold-over operation quick and easy. Locks in twelve positions.

Fold down your antenna at night when pulling into your garage and quickly put it back up to its operating position in the morning.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 base mount and locking screw, MFJ's famous One year *No Matter What*™ limited warranty.

MFJ's *MaxStrength*™ Hi-Flux Antenna Magnet Mounts

MFJ's *MaxStrength*™ high-flux magnet mounts give you maximum pull strength -- your antenna stays on top of your vehicle at highway speeds.

MFJ-333 **$14.95** add s/h
MFJ-335 **$19.95** add s/h

Base is *Euro-style*, black poly or chrome finish with a Mylar protective undersheet.

MFJ magnet mounts come with 17 feet of tough RG-58 coax with a PL-259 connector. Easily reaches operating position.

Choose your favorite antenna to go with these fabulous low-profile mounts for outstanding mobile performance.

MFJ-333 BS/BM, $14.95. Light to medium duty magnet mount. Low profile 3.5 inch diameter black base weighs 1½ lbs. For small to medium size antennas.

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QRX

continued from page 6

read. As time ran out, McVaigh took refuge with a family in their basement as the twister hit their house. He was seriously injured when the storm toppled the chimney into the basement.

McVaigh suffered a broken pelvis and nerve damage in his legs. He has had to endure several operations and a lengthy and difficult rehabilitation program. Because of his injuries, McVaigh can no longer work at his job and has had to rely on public assistance, Social Security, and help from friends and his church. The McVaighs have three children of their own, plus five foster children. His slow recovery continues.

DERA Executive Director Bascombe "Jay" Wilson WØAIR said the organization picked McVaigh from among candidates representing every continent. "The heroism and continued courage of Lonnie McVaigh serve as an inspiration for us all," Wilson said.

From January 1999's *LCARA Patch*, newsletter of the Lake County ARC, Painesville Ohio, Tim Culek KQ8TC, editor.

Tutu Challenge Boosts Club Membership

When Central Michigan Amateur Radio Club president Erv Bates W8ERV said he would wear a tutu if it increased the organization's membership, he probably never thought he would actually have to do it. Bates made the comment that he would wear the ballet dancewear if club membership reached 200 by November's meeting. It did—and Erv was informed that he was duty-bound to pay up at the club's December meeting.

According to club secretary Julie McLain KB8ZXR, Bates really looked cute in the "bumble bee" costume designed by Kim Carpenter, complete with antennae and wings. Want to see for yourself? Go to the club's photo gallery at their Web site: [www.qsl.net/cmarc/cp98b.html].

We were alerted to this club prez who's willing to make an extra effort to keep the ARC lively by *Newsline*, Bill Pasternak WA6ITF, editor.

Murphy's Laws of Amateur Radio

By Larry Waggoner WØKA

•Any important instruction or operating manual will have been discarded.

•Original drawings will be destroyed in the process of copying them.

•Any wire, cut to length, will be too short.

•Identical units tested under identical conditions will not be identical in the field.

•The availability of any component is inversely proportional to the need for that component.

•If a project requires X components, there will be X-1 in the junk box.

•If a particular resistance is needed, that value will not be available. Further, it cannot be developed with any possible series or parallel combination.

•A dropped tool will land where it can do the most damage. (Also known as the Law of Selective Gravitation.)

•A device selected at random from a group having 99% reliability will be a member of the 1% group.

•The probability of a component value being omitted from a plan or drawing is directly proportional to its importance.

•Interchangeable parts won't.

•Components that cannot and must not be assembled improperly will be.

•Any circuit that cannot fail will.

•A fail-safe circuit will destroy others.

•A transistor protected by a fast-blowing fuse will protect the fuse by blowing first.

•A self-starting oscillator won't.

•A crystal oscillator will oscillate at the wrong frequency ... *if* it oscillates.

•A PNP transistor will turn out to be NPN.

•A failure will not appear until a unit has passed final inspection.

•If an obviously defective component is replaced in an instrument with an intermittent fault, the fault will reappear after the unit is returned to service.

•After the last of 16 mounting screws has been removed from an access cover, it will be discovered that the wrong access cover has been removed.

•After an access cover has been secured by 16 hold-down screws, it will be discovered that the gasket has been omitted.

•After a rig has been fully assembled, extra components will be found on the bench.

•Regardless of what the club's newsletter editor sets as a deadline, the club president will submit his article two days later.

•If there are only three places to look for an item, you'll find it on the first try. If there are more than 10 places to look for it, you'll find it in the last place.

This somewhat cynical litany originally appeared in the *Bulletin* of the Kansas ARPSC; it was reprinted in the September 1998 issue of *The Electron*, the newsletter of the Sterling-Rock Falls ARS, and we borrowed it from the December 1998 *ARNS Bulletin*, Steve Auyer N2TKX, editor.

New Member

I see you at the meetings, but you never say "Hello."

You're busy all the time you're there, with those you already know.

I sit amongst the people, and yet I'm a lonesome one.

The new fish are as strange as I, you old members pass me by.

But darn it, you guys asked us in and you talk of fellowship;

You could just step across the room, but you've never made the trip.

Why can't you nod and say "Hello" and then

Go sit among your friends? Now that I'd understand.

I'll be at your next meeting, perhaps a nicer night to spend.

Think you could introduce yourself? I want to be your friend!

No author has been credited, but the December 1998 *ARNS Bulletin* (Steve Auyer N2TKX, editor) claimed that this poem had appeared in the October 1998 *SPARKS*, newsletter of the Delta ARC, David Pace KU4AS, editor.

"... And Now for Something Completely Different ..."

Intense: Where campers sleep

Kinship: Your brother's boat

Midget: Center engine of a three-engine fast plane

Observatory: What Washington asked his spies to do

Paradise: Ivory cubes used in craps and backgammon

Paraffins: Found on the sides of fish

Rampage: Section of a book about male sheep

Sarcasm: Quip lash

A bit of E-mail humor found in the June 1998 issue of *ARNS Bulletin*, and no doubt in many other places, too! 73

UPDATES

Missing Info Makes for Confusion in Montana

In the January issue, in "Letters from the Ham Shack," we ran a letter from Gene Lynch WA7ZRA. He wrote Wayne that he still had the plans for the Karlson speaker cabinets he'd built some years ago, and that copies were available for anyone who wanted them.

We didn't mean to imply that they were *free*. If you'd like a copy of the multipage plans that produce the speaker enclosure Uncle Wayne says "is unequaled today," please send $10 in US funds, plus a two-stamp SASE to:

Gene Lynch WA7ZRA
Box 567
Boulder MT 59632.

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Three great days to explore everything ham radio has to offer !
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All information, including how to become an exhibitor, flea market vendor, forum speaker, and how to obtain an ADA parking space is available on our web site at ***www.hamvention.org***

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We Must Be Dreaming

A home-brew receiver project!

Thomas K. Duncan
1107 Alta Vista Ave.
Huntsville AL 35801

With last summer's hamfest season promising all sorts of new occupants for the parts bin, I felt it was time to make room by cleaning out some of the previous several years' good finds. Homebrewing several HF receivers with Gilbert cell front ends taught me the perils of 40 meters—QRPers and half-megawatt broadcasters sharing the same band certainly tests dynamic range. As an SWL, I wanted to receive both. A receiver that would cover, say, 6.5 to 7.5 MHz seemed like both a challenging project and a way to clear space for this year's hamfest-find-of-the-century.

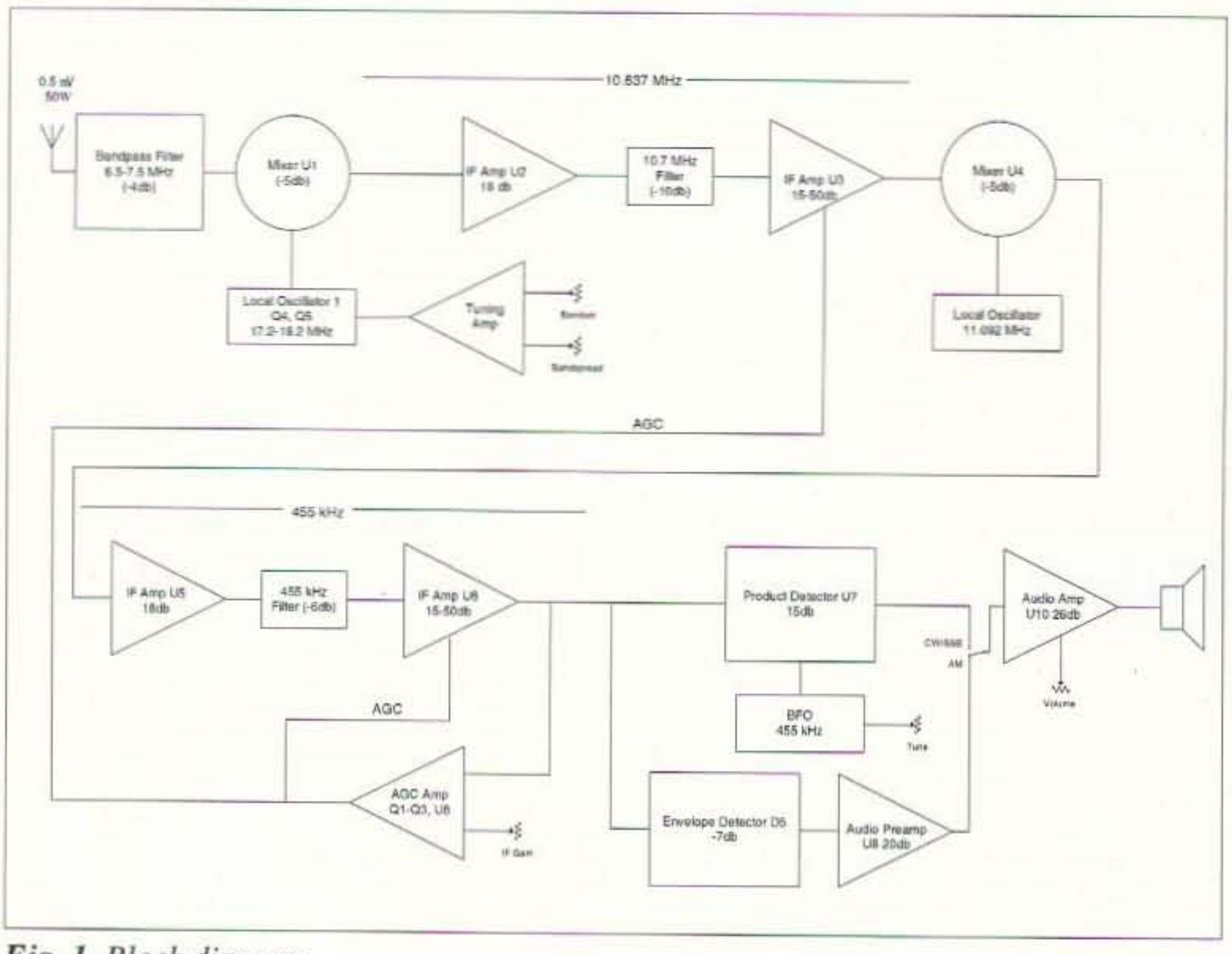

Fig. 1. *Block diagram.*

The circuit

Fig. 1 is the block diagram. Overall gain requirements were based on a 0.5 µV signal at the antenna delivering 0.25 W into an 8 Ω speaker, or 134 dB. Originally, the intent was to use OH2GF's synchronous detector for AM (*A Synchronous Detector for AM Transmissions*, Jukka Vermasvuori OH2GF, *QST*, July 1993). This requires 15 mV input into 50 Ω, so 90 dB gain is required before the detector, and 44 dB in the detector and audio sections. Ultimately, difficulty obtaining the NE604 or a suitable single-chip substitute in a standard DIP package led me to use a diode detector for AM and adapt OH2GF's product detector for CW and SSB.

The circuit is dual-conversion to improve image rejection. Double balanced diode mixers are used to generate the 10.637 MHz first IF and 455 kHz second IF. Ceramic filters are used between the first and second stages of each IF train. The MMIC first stages make up for mixer and filter losses, and provide 50 Ω terminations for the mixers. The AGC-controlled second stages provide the bulk of the gain.

The first local oscillator and BFO are both varactor-tuned. The BFO tuning voltage range is determined by two 10 k trimpots, with which my junk box still overflows. First local oscillator tuning voltage is developed through what may seem to be a needlessly complex circuit. The bandspread control is a 10-turn pot with nice smooth action, begging to be pressed into service, but at 100 Ω and 1/8 W, it cannot by itself supply a wide enough voltage difference to tune the varactors over the desired 1 MHz range. An op amp is therefore used to multiply the difference between the bandset and bandspread wiper voltages to produce between 2 V and 5 V at its output, corresponding to between 17 pF and 11 pF of tank capacitance, for a frequency range of 17.2 MHz to 18.2 MHz. The buffer amplifier adapted from a circuit in Hayward and DeMaw (*Solid State Design for the Radio Amateur,* Wes Hayward W7ZOI and Doug DeMaw W1FB; first local oscillator adapted from LO and BFO circuits for the 160 meter receiver in Chapter 6) isolates the oscillator and matches it to the 50 Ω first mixer local oscillator port. L9 adjusts the match to provide 0.5 V_{rms} (+7 dBm) injection.

The second local oscillator is a Pierce circuit using a readily available inexpensive crystal. At 11.092 MHz - 455 kHz = 10.637 MHz, the first IF is slightly off the usual 10.7 MHz, but the bandwidth of the first ceramic filter easily accommodates this. Similarly, the 10.7 MHz transformer has sufficient tuning range to adjust for a peak oscillator output of around 0.5 V_{rms} into the second mixer local oscillator port.

AGC is developed by amplifying second IF output through Q1 and Q2, rectifying through D6 and D7 and filtering the signal, and amplifying the resulting control signal through Q3 (see *1993 ARRL Handbook for Radio Amateurs;* AGC derived from Chapter 12, Fig. 43). The unity gain op amp functions as an inverter and level shifter, where the IF gain control sets the quiescent AGC voltage at pin 1 of U8 to between 4.5 and 6 V. As the second IF output increases, AGC voltage increases, reducing the gain of both MC1350s. AGC may be turned on and off by a push/pull switch mounted on the IF gain control, allowing IF gain to be adjusted manually even when AGC is used.

The other half of U8 is an audio preamplifier used to boost the envelope detector output to something near the output of the product detector. U7 has a conversion gain of around 15 dB, while the diode detector has a loss of around 7 dB. Most full-carrier AM signals in this receiver's range are broadcasters, so the 20 dB gain of the preamplifier is quite sufficient. Audio output is provided by U10, which

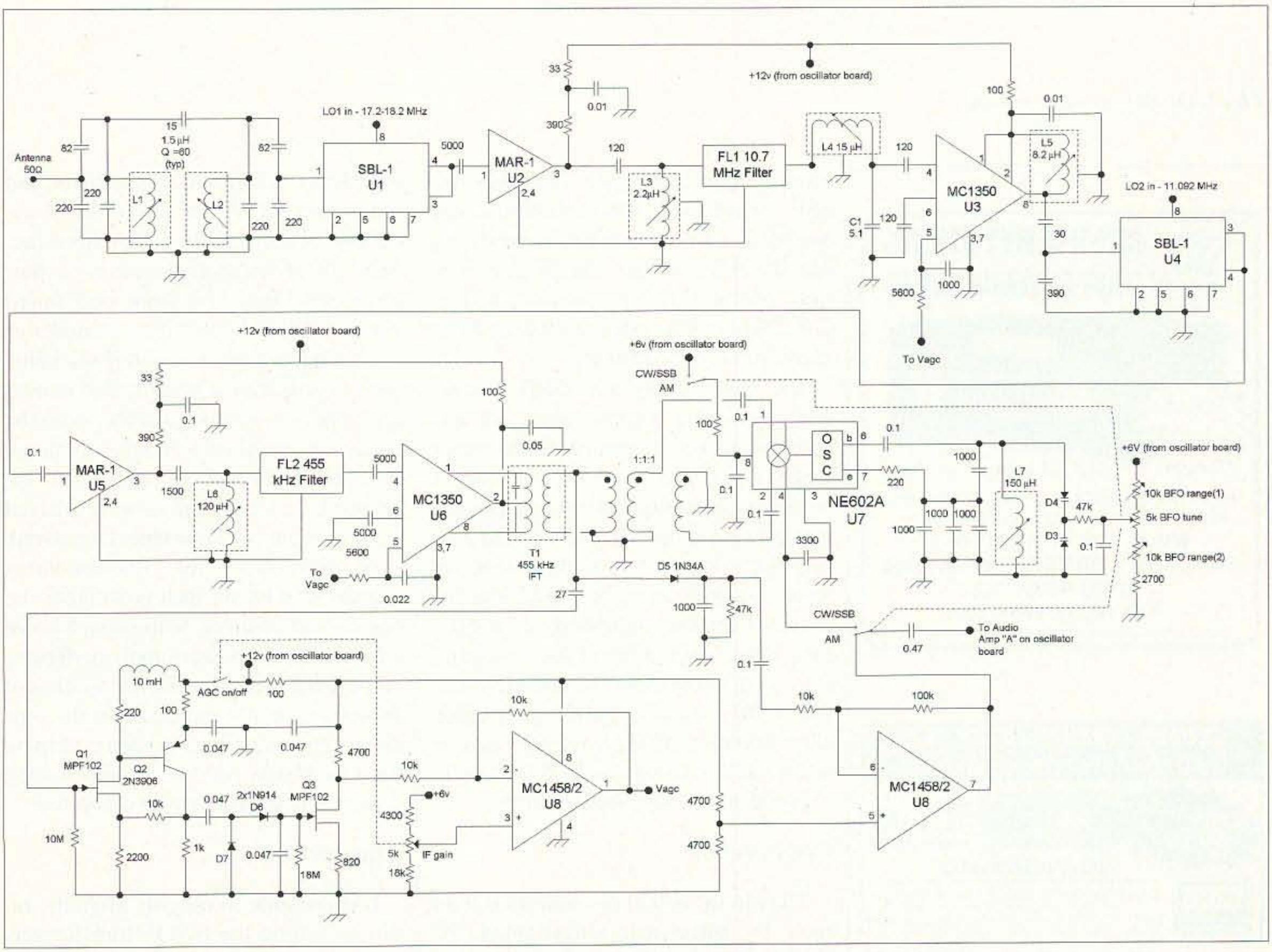

Fig. 2. *Front end board schematic.*

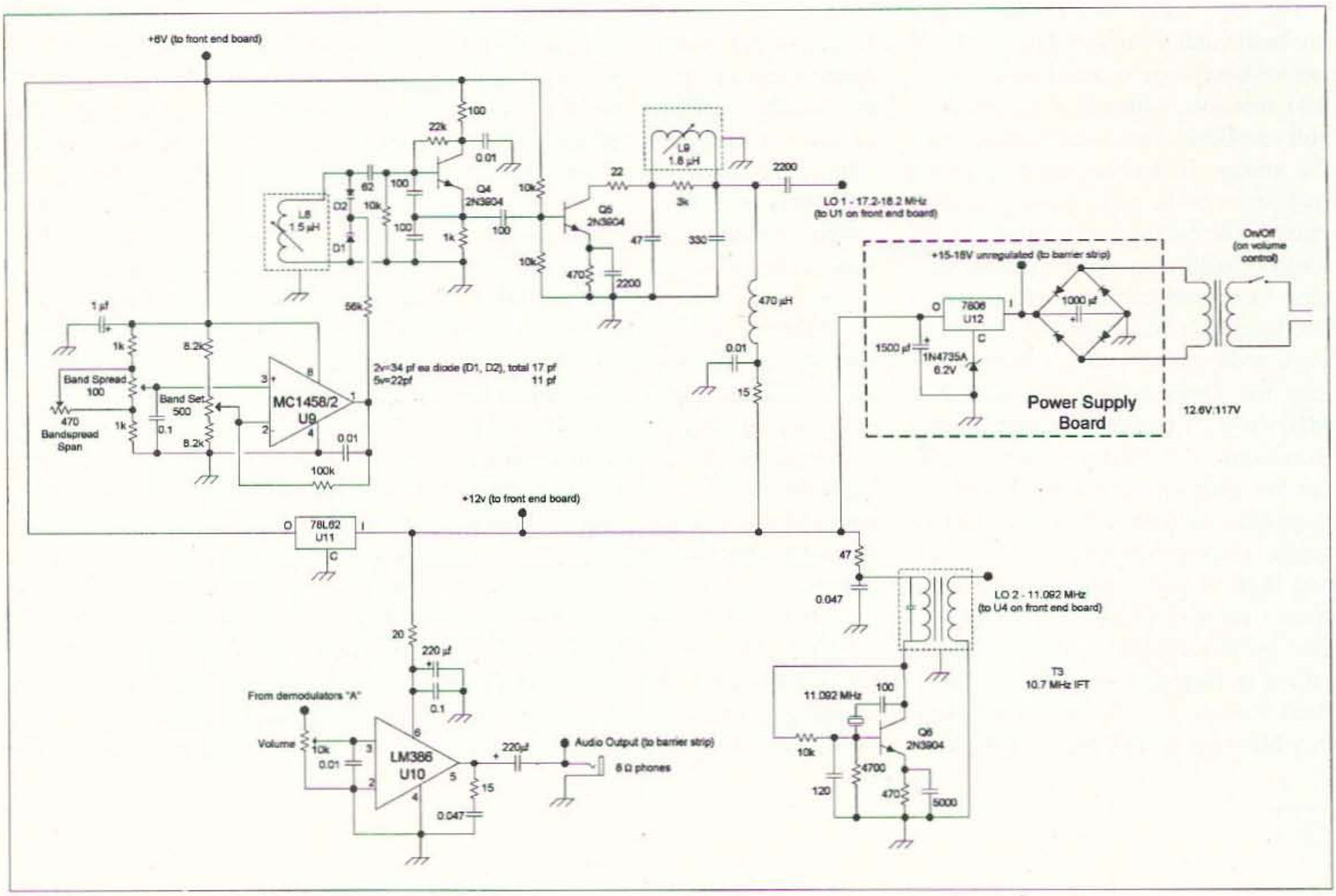

Fig. 3. Oscillator board schematic.

gives another 26 dB gain. The AM-CW/SSB switch is a 4PDT push/pull unit mounted on the BFO tuning control (just like the AGC switch and IF gain control), one section used to select AM or CW/SSB, and the other to turn the BFO on only in CW/SSB mode.

The power supply was added as an afterthought—the original board set was intended to be experimental and never make it off the work bench, but it worked well enough to justify a permanent power supply. The fact that the junk box had plenty of 6 V three-terminal regulators and zeners, but no 12 V units, accounts for the multiplicity of regulators. Those with different parts on hand may wish to replace U12 and the zener with a 7812. Auxiliary power connections allow operation off +12 V DC regulated, or +15 to +18 V unregulated. Total current required at +12 V is about 90 mA.

Construction

The circuit is laid out onto two five-inch by three-inch single-sided PC boards. The oscillator board shown in **Fig. 5** has the first local oscillator and tuning amplifier, the second local oscillator, and the audio power amplifier. Each local oscillator section is partially shielded. The front end board shown in **Fig. 4** holds the remainder of the circuit and has no overall shielding. Both boards have a good deal of unused space, but not so much that they could be easily combined onto one five-by-three-inch board. Most of the coils are shielded, so the circuit is well behaved even with the oscillator shields removed.

A three-inch by five-and-three-eighths-inch by six-inch box houses the boards and controls, with enough room left over for the power supply perfboard. Alas, the power transformer would not fit inside, so it's mounted on the outside of the rear panel. A barrier strip on the rear brings out the antenna, audio, ground, and auxiliary power connections.

Alignment

It is possible to roughly align the radio by tuning the two IF transformers "by ear" until some usable signal is

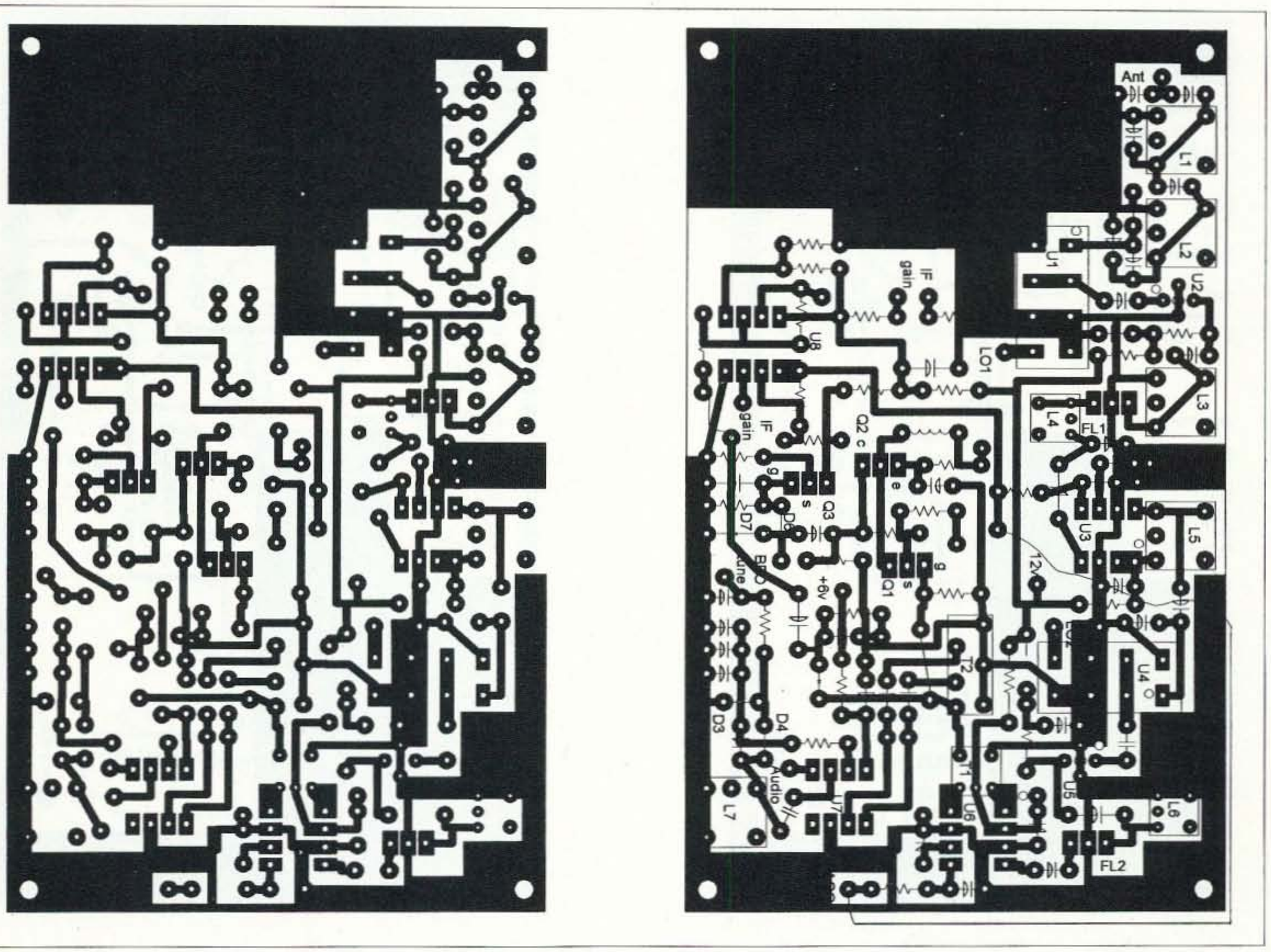

Fig. 4. *(a) Front end board. (b) Parts layout from foil side.*

found, and then adjusting L6, L5, L4, L3, L2, and L1 for peak signal. A more exact method follows, requiring a signal generator covering 7 MHz, voltmeter with RF probe or some other way of measuring RF voltages up to 20 MHz, and frequency counter.

With bandset and bandspread controls at center, the first local oscillator center frequency should be set to the center of the tuning range, 17.7 MHz, by adjusting L8's slug. L9 should then be adjusted for maximum injection into U1 pin 8, which should be around 0.5 V_{rms}. Adjust T3 for maximum second local oscillator injection into U4 pin 8, again around 0.5 V_{rms}. BFO frequency is centered by setting the two BFO range trimpots to their maximum values, centering the BFO tune control, and adjusting L7 so the signal at U7 pin 7 is at 455 kHz. The voltage at the wiper of the BFO tune control now corresponds to 455 kHz. The trimpots are then adjusted to give the desired range (say, 1500 Hz) on either side of 455 kHz.

Attach the signal generator to the antenna terminals and insert a 1 mV 7 MHz signal, reducing signal level as you proceed with alignment and overall gain increases. You should be able to find this signal with the bandspread and bandset controls. Attach both the counter and voltmeter to the secondary of T1. Rock the bandspread back and forth and adjust T1 for peak voltage near 455 kHz. Proceed backward toward the antenna, adjusting L6, L5, L4, and L3 for peak signal. With the exception of L5, these are elements of low-Q tuned circuits. Adjustment will have very little effect and is not critical.

L1 and L2 establish the shape of the input filter. You may wish to peak both coils to favor a particular frequency, or adjust them so one peaks

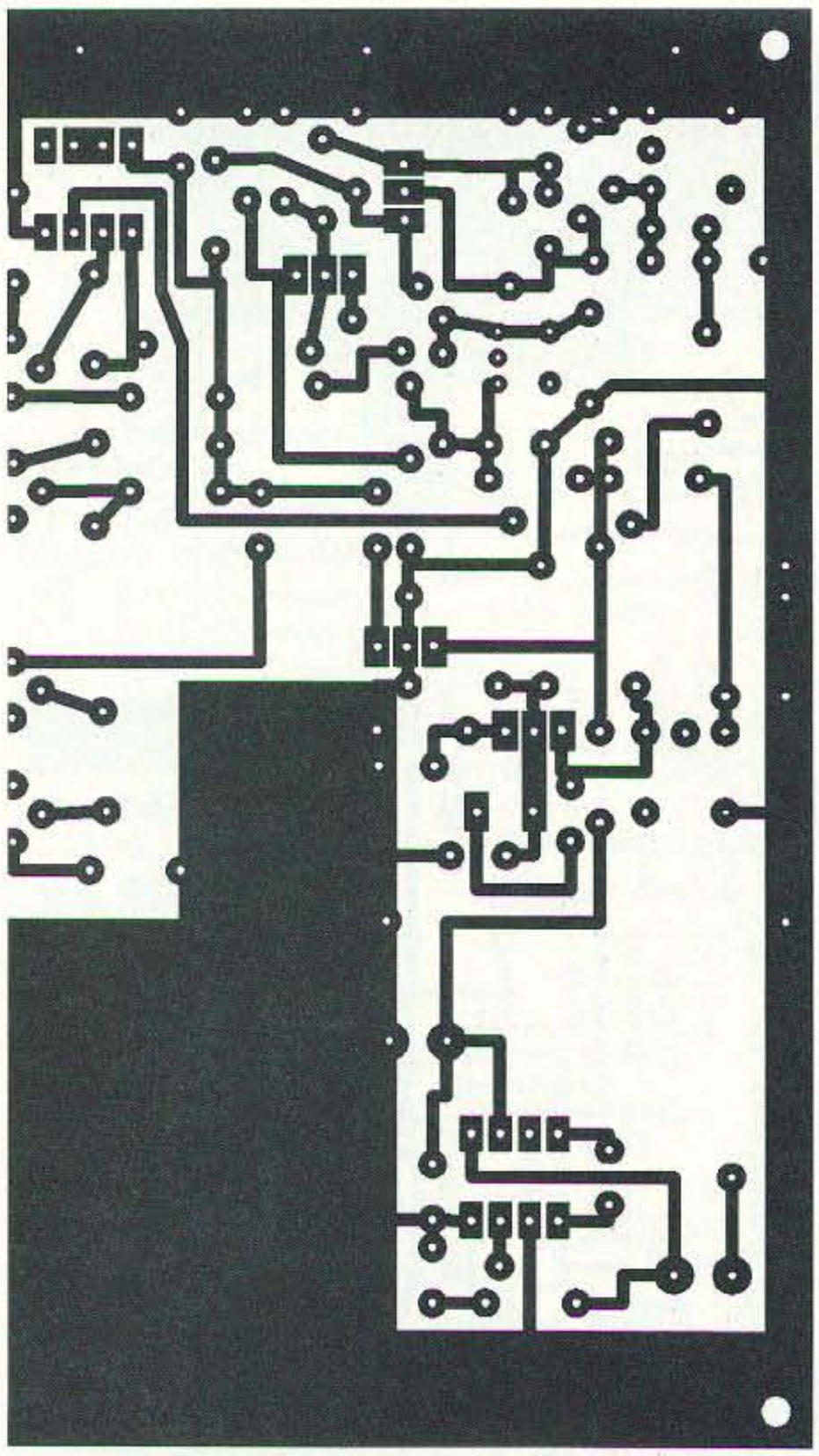

Fig. 5. (a) Oscillator board. (b) Parts layout from foil side.

below the center of the tuning range, and one above center, giving a flatter response.

Antenna

My unit was first tested on Field Day, so there were plenty of signals to practice with. Even with plenty of signals (and don't forget, lots of atmospheric noise), a short length of wire on the antenna will not suffice. At 16 feet of elevation, I have a dipole cut for 6.5 MHz, and a 75-foot random wire. Both these antennas, plus a cold water pipe ground, worked well.

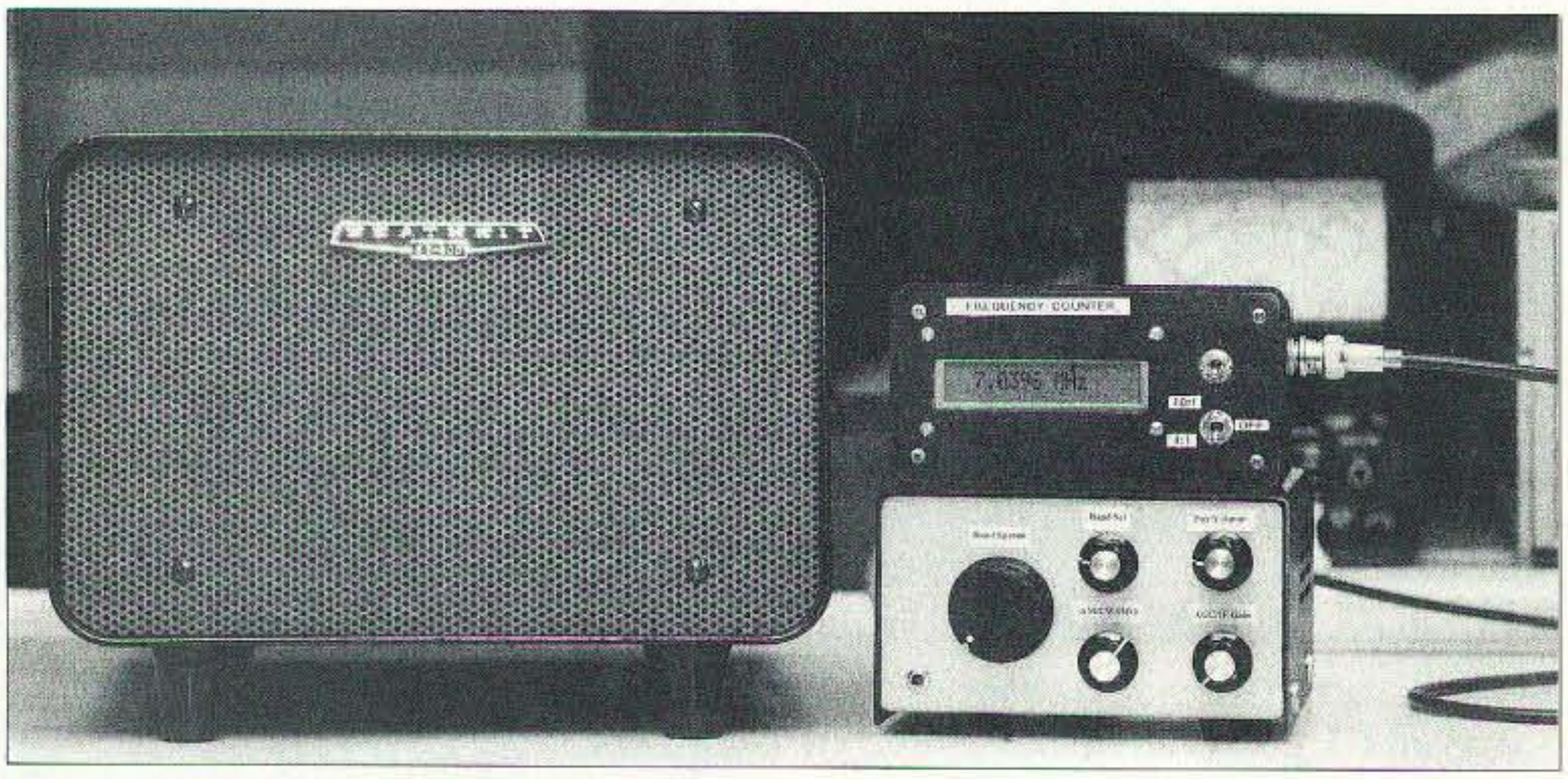

***Photo A.** Receiver shown with frequency counter and speaker. Note how the speaker, which normally accompanies my Heathkit SB-310 receiver, dwarfs both the radio and frequency counter.*

Operation

The bandset control can tune AM signals by itself if you have patience, but then that's what the bandspread control is for. I have my bandspread span trimpot adjusted to give about 80 kHz/revolution, which is fine for AM. Decrease bandspread span resistance, giving a smaller tuning range, if you concentrate on CW and SSB. When the BFO is on, set the BFO tune pot to center and locate the signal, then adjust for the desired sideband and audio quality.

I generally set audio gain to about one-third, turn on AGC, and use the IF gain control (which functions even with AGC on) to adjust overall gain. The AGC responds to severe atmospheric noise in an annoying way, so in

that case I turn it off. There is plenty of overall gain, and enough audio to drive a speaker quite nicely.

Modifications

If you adhere to my "use the junk box" rule, you may wish to change the circuit to match your own hoard of parts. The first local oscillator, for example, could use a nice vernier-driven variable capacitor in lieu of the

Parts List

D1, D2	MV209 29 pF varactor
D3, D4	MVAM108 500 pF varactor
D5	1N34A germanium diode
D6, D7	1N914 silicon diode
FL1	10.7 MHz ceramic filter, 230 kHz bandwidth
FL2	455 kHz ceramic filter
L1, L2, L8	1.5 µH slug tuned
L3	2.2 µH slug tuned
L4	15 µH slug tuned
L5	8.2 µH slug tuned
L6	120 µH slug tuned
L7	150 µH slug tuned
L9	1.8 µH slug tuned
T1	455 kHz IF transformer
T2	13 trifilar twisted turns on FT-37-77 core
T3	10.7 MHz IF transformer
U2, U5	MAR-1 MMIC wideband amplifier
U1, U4	SBL-1 double balanced mixer
U3, U6	MC1350 RF/IF amplifier
U7	NE602A mixer/oscillator
U8, U9	LM1458 dual op amp
U10	LM386 audio amplifier
U11	78L62 low power +6 V regulator
U12	7806 +6 V regulator

Table 1. *Parts list.*

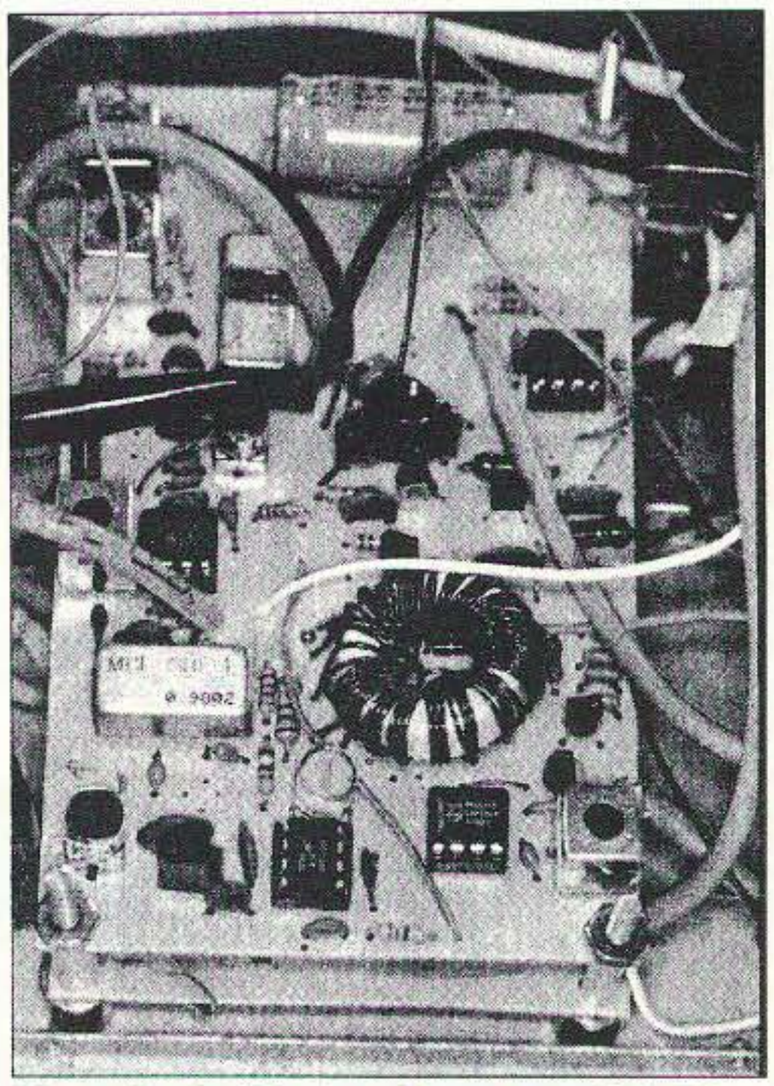

***Photo B.** Inside view. Large toroid is T2.*

varactors, thereby entirely eliminating U9 and the bandset control. The same is true for the BFO. Both these modifications would improve frequency stability, which is a little wild for the

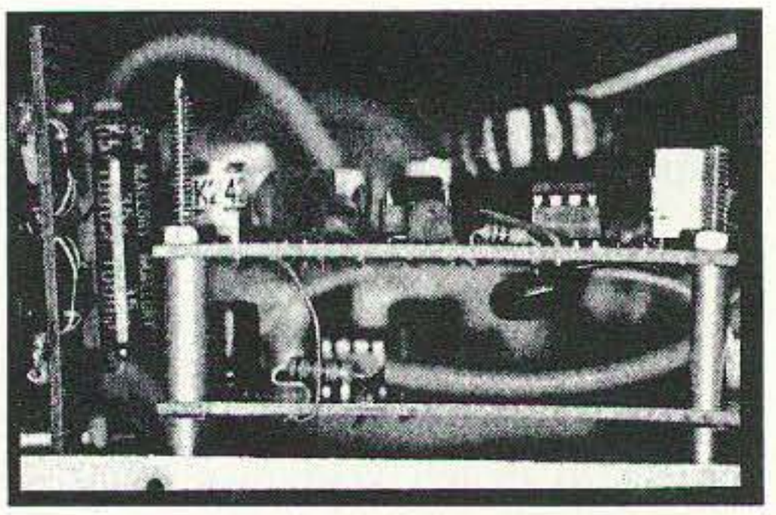

***Photo C.** Inside view showing stacked PC boards and power supply perfboard.*

first couple of minutes, but very solid thereafter.

There is enough space on the front end board to accommodate all of OH2GF's demodulator. The biggest component, T2, is already there. The SWL in particular should read OH2GF's article cited above before going ahead with the whole circuit or an AM-only version. Don't plagiarize my excuse about not being able to find an NE604!

L3, L4/C1, and L6 are impedance matching components. The circuit has sufficient gain that these components can probably be eliminated entirely. The π-section filter using L9 should not be removed, though: U1 and U4 like to see 50 Ω at each port. Speaking of filters, replacing the front end filter with one centered on 28.4 MHz would allow the low end of 10 meters to be tuned, with the first local oscillator used as is, but tuning on the low side. A single-stage RF amplifier might be needed to get the noise figure to a reasonable level.

There is only one second IF bandwidth: 6 kHz, determined by FL2. This is fine for AM, but a little wide for SSB and very wide for CW. An audio bandpass filter could be built from another op amp, and U9 has a spare section that could be used for this purpose. 73

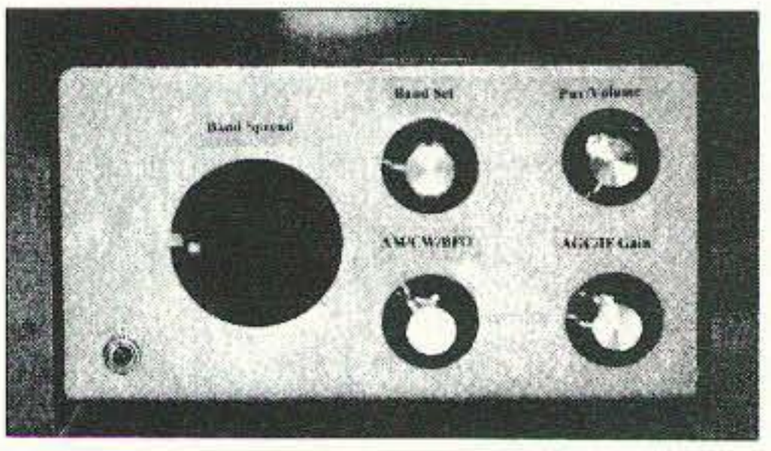

***Photo D.** Front view.*

LM- and BC-221 Frequency Multiplier

Generate detectable signals up to 1000 MHz.

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Hams have the advantage and privilege of being able to design, build, test, and operate equipment in the ham bands; these privileges come with the passing of the ham license examination. The ham license is a "license to learn," and provides the incentive to get involved with electronic equipment and circuits. A large abundance of equipment has been developed over the years since the 1930s, with a large portion of it built for World War II. Out of that equipment inventory, and of specific interest to hams, are the LM- and BC-221 frequency meters.

These measurement instruments have been superseded by counters and phase-locked loop signal generators, but the usefulness of the old frequency meter still abounds. LM- and BC-221 frequency meters are showing up at swap meets for dirt cheap prices, making them readily available for the experimenter and his applications. The LM- and BC-221 are really precision measuring instruments that had an original frequency measurement accuracy of 0.01%—some may still be that good today. Without attention over the years their accuracy may have degraded some, but the usefulness of the instruments has not. These instruments retain their short-term stability and also have a long-term stability exceeding that of most of the currently available self-excited signal sources. My point is that each of these instruments should be given a second chance as a viable piece of test equipment.

Ham ingenuity is required to find new uses and applications for desirable equipment. One such application for old frequency meters is to use them as stable frequency sources capable of generating signals up to at least 450 MHz, with some detectable signal up to 1000 MHz. The fundamental tuning ranges for these two instruments are typically 125–250 kHz and 2–4 MHz in two bands. In its original condition, the frequency meter provided suitable harmonics up to at least 20 MHz from the 2–4 MHz band. To utilize the 2–4 MHz range for use in the VHF and UHF region, it is necessary to build a frequency multiplier capable of providing some usable energy at harmonic multiples up to at least 250 times (333 times for 1000 MHz) the fundamental frequency.

There are many designs and techniques available for frequency multiplication applications; the duty of the experimenter is to find a better solution to the problem to meet his requirements. As the saying goes, "the design is never finished until the last experimenter is dead," and that's true for the frequency multiplier circuit presented here. Electronic circuits are presentations of ideas for project solutions, and for this project as well as others, experimenters are encouraged to use, modify, and change the circuit as deemed necessary to meet their application needs.

The circuit

The objective of the frequency multiplier circuit is to increase both the signal amplitude and the harmonic content of the output signal such that the signal can be detected well up into the UHF range. Some of the available frequency multiplier circuit designs and other solutions are elaborate and complex, and may use parts not readily available to the experimenter. Therefore, a simple and repeatable design was sought, one which used older available parts that would be easy to assemble.

That objective was met and is shown in **Fig. 1,** where the parts are an

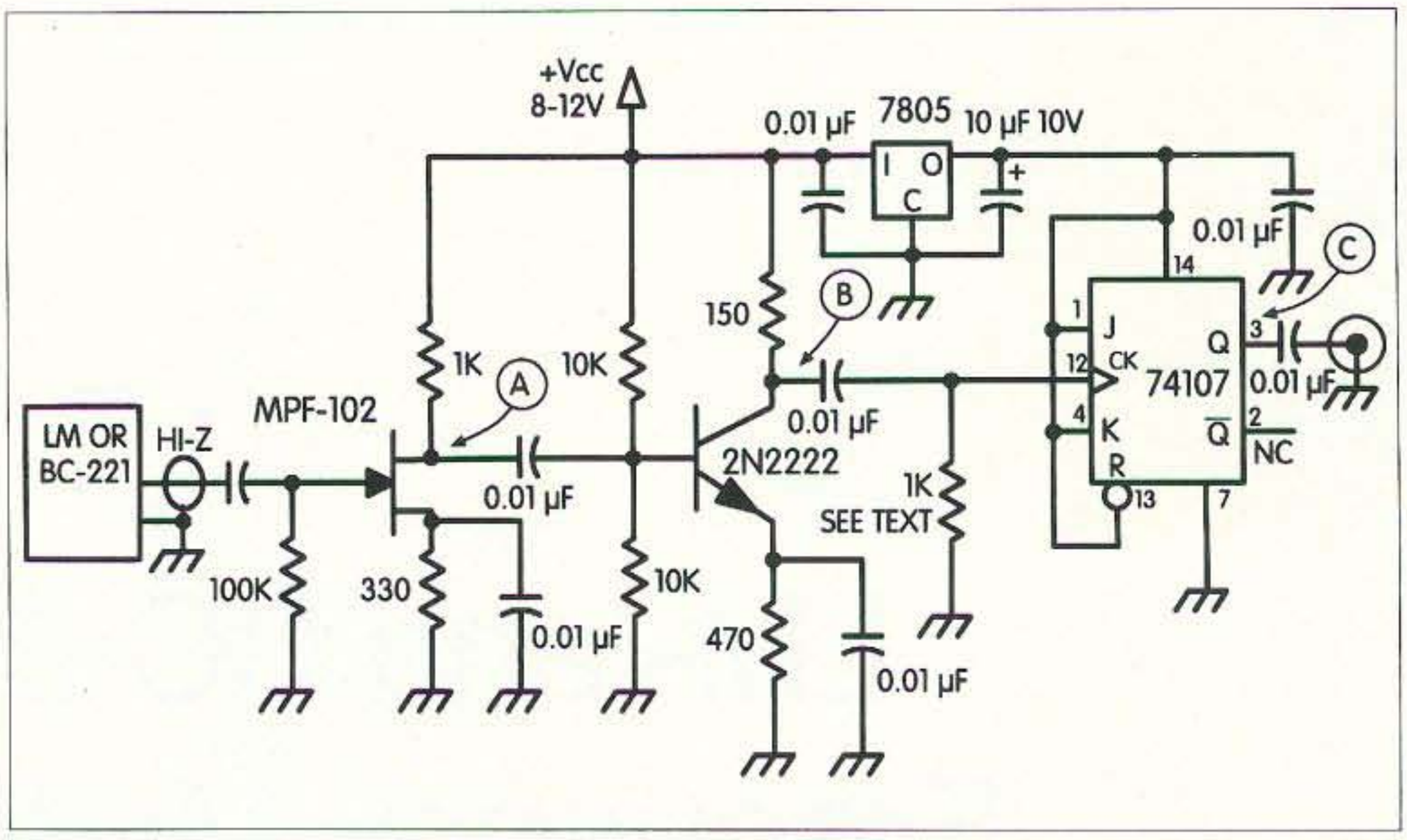

Fig. 1. *Frequency multiplier circuit that extends the LM- or BC-221 frequency output up into the UHF range.*

MPF102 JFET, 2N2222 transistor, 74107 J-K flip-flop, and 7805 (LM340-5) voltage regulator. A CMOS 4027 was tried as an alternate for the 74107, but it failed to toggle for whatever reason. The purpose of trying the 4027 was to take advantage of the higher VCC voltage tolerance. Also, selecting the 74107 part required the use of the five-volt regulator. Should a 74107 part not be available, the following parts may be considered for substitution: 7473, 74LS78, 74276, 74376, and 74F112 (the 54XX series should also work satisfactorily in this application). In any case, only one section of the chip is used for the multiplier. The remaining input pins must be grounded while the outputs are allowed to float.

An FET is used as an input stage to accommodate the high output impedance of the frequency meter. Because of the high impedance, a flexible shielded cable, such as coax, should be used to reduce extraneous signal pickup. Any length less than about four feet is suggested in order to keep down the capacitive load on the frequency meter's output circuit. Attachment to the meter is accomplished by drilling a small hole in the case near the RF terminal for a small self-tapping screw, which is used for holding a solder lug as shown in **Fig. 2**. The FET and transistor stages provide sufficient signal amplitude, though marginal, to toggle the clock input of the 74107. The resistor connected from the 74107 pin 12 to ground deserves special attention. It is necessary to select a value for this resistor which allows the clock signal to swing sufficiently above and below the "maybe" region, because the resistor establishes the DC reference level for the chip input. A 1 k resistor satisfied the requirement for the prototype circuit but may need to be adjusted slightly to accommodate a different 74107 or one of its substitutes.

Circuit waveforms

Fig. 3 shows the signal waveforms obtained at three points within the circuit; it may be used as a guide in building the frequency multiplier. Waveform A is nearly a sine wave at the drain terminal of the MPF102. The 2N2222 reshapes the waveform to a near pulse as shown in B. As expected

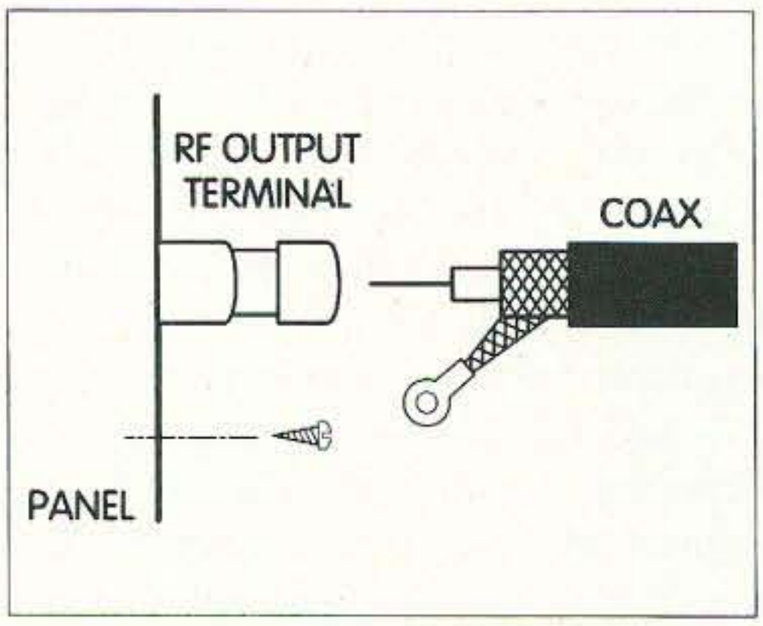

Fig. 2. *Coax attachment. Small hole drilled for self-tapping screw which is used to ground the coax shield.*

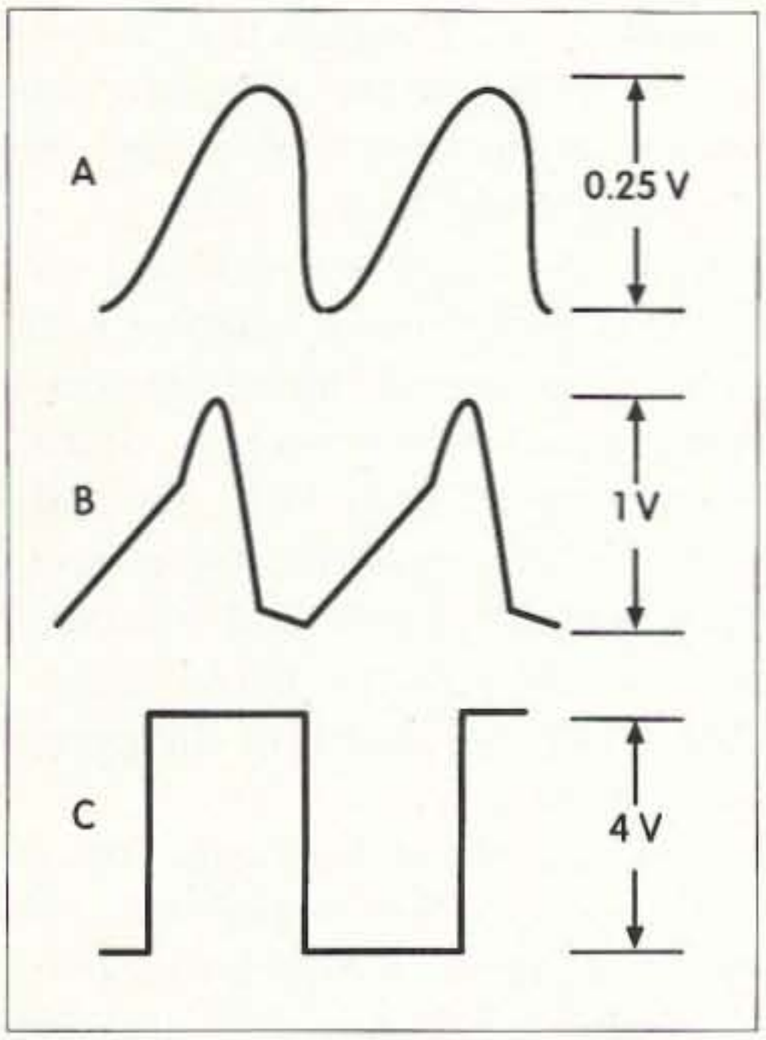

Fig. 3. Waveforms obtained at points A, B, and C as indicated in ***Fig. 1****. Voltage values are approximate.*

and desired, the waveform at C is nearly a square wave. A pure square wave would contain only odd harmonic energy of the fundamental. But sufficient distortion is present in the output of the 74107 to provide energy at both odd and even harmonics of the fundamental.

To understand the signal output characteristics, signal levels at various frequencies were measured. A curve was drawn between the points, as shown in **Fig. 4**, to show a general amplitude profile. The measurements were made using a 3 MHz signal from the frequency meter and the amplitude was measured at the indicated frequencies. At 450 MHz (150th harmonic), the signal was detected at a level of 0.1 µV. At 300 MHz, the signal rose to 0.3 mV. Judging from the test data, the frequency meter and multiplier combination is usable as a signal source up into the 450 MHz band (although marginal above 450). A signal was detected as high as 1000 MHz (333rd harmonic), but the amplitude may be useful depending upon the sensitivity of the receiver. No attempt was made to determine if a signal could be detected above 1000 MHz, but it is reasoned that some detectable signal is likely. The length of the coax between the multiplier and receiver greatly affected the detectable signal level, with short cable lengths being preferred. For measurement results shown in **Fig. 4**, the coax was six feet of RG-58.

While monitoring at 450 MHz, the source frequency was manually swept from 2 to 4 MHz to determine which frequency might produce the highest amplitude. I found that frequencies in the range of 3.4 to 3.8 MHz produced a higher amplitude, approaching 10 µV. The amplitude variance shown in the curve is a function of the distortion in

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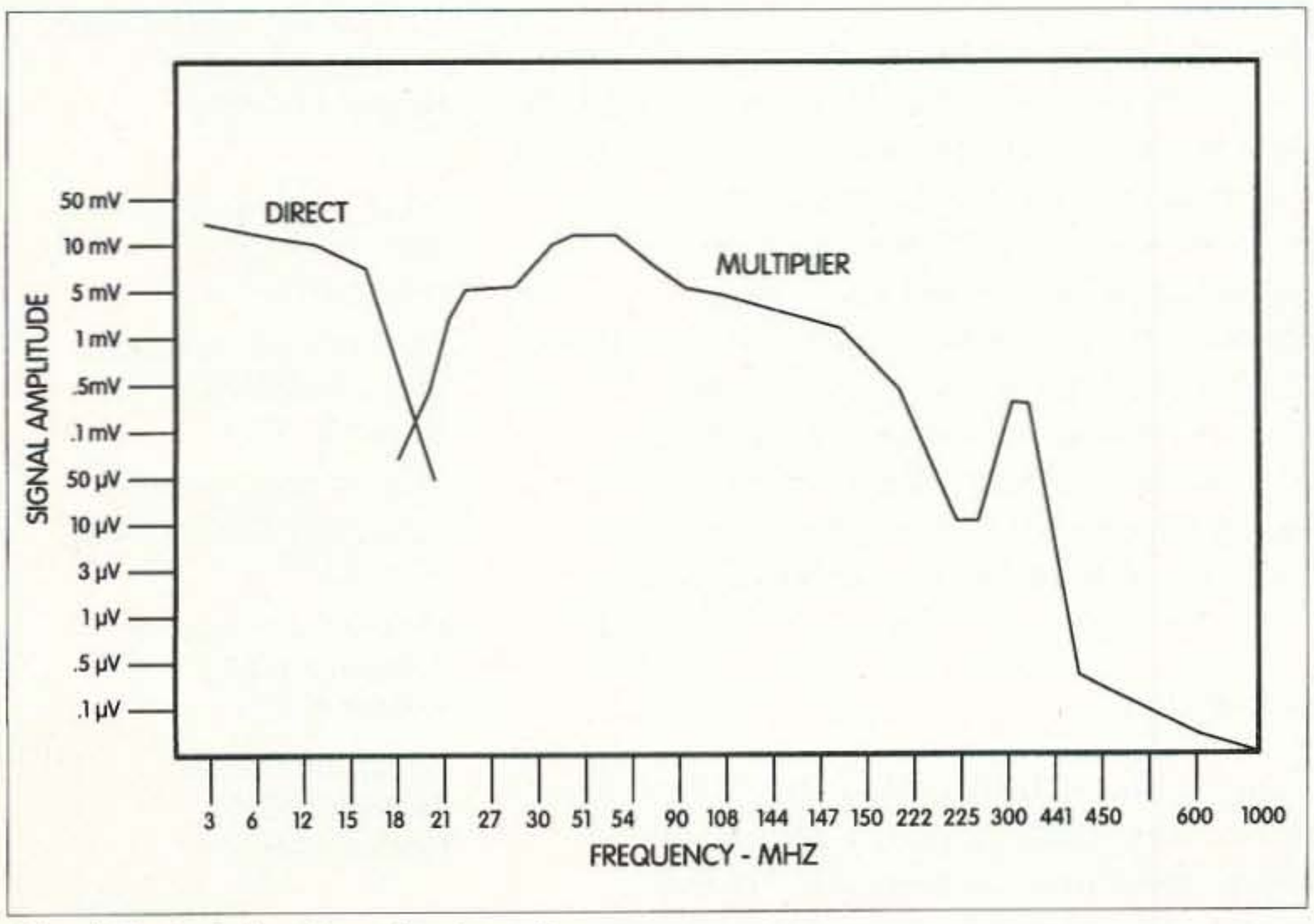

Fig. 4. Typical signal amplitude vs. frequency.

LM- and BC-221 Frequency Multiplier

continued from page 19

the 74107's output waveform as well as the harmonic number.

Different chips might exhibit a different set of energy levels at the indicated harmonic, but the general profile would be expected to remain. Should a spectrum analyzer be used to view the output of the multiplier, it would display a comb of signals, each separated by the frequency of the source. The amplitude of the comb display would follow the curves shown in **Fig. 4**.

No attempt was made to include a resonator at the desired output frequency. However, the addition of a resonator would improve the amplitude of the signal present at the frequency of resonance. Conceivably, the use of a resonator following the multiplier might create usable signals in the 900–1296 MHz bands. An experiment to prove the validity of the scheme is warranted. A suitable resonator could be made using a stripline, cavity, or coil and capacitor. The higher-Q stripline and cavity are recommended to better the chances of success.

Construction

Construction of the multiplier circuit is simple and noncritical. Common parts were selected for the project; they may be mounted using any desirable method—from the "dead bug" style to a printed circuit board.

The resistors used in the project may be from 1/8 to 1/2 W, but the board layout I used (not shown; you can easily make your own) accommodated 1/4 W ones. All of the coupling and bypass capacitors, except C8, were 0.01 µf disc ceramics. But any value from 0.005 µF to 0.1 µF is satisfactory and may be used in any combination of availability.

Conclusion

The LM- and BC-221 frequency meters were built as quality and precision measuring instruments. That quality has probably been retained over the years. I suggest that you salvage these instruments from their resting places on dusty shelves and the chopping blocks at swap meets.

Build the frequency multiplier circuit and bring your instrument back to life as an accurate and stable signal source capable of generating signals as high up as 1000 MHz. As indicated by this experimental project, everything is simple and non-complex, yet the project achieves reasonable results in terms of frequency multiplication.

Don't be afraid to change and/or modify the circuit in any way you like. The fun of a project is to experiment with different values, parts, and concepts to achieve a useful result. 73

Parts List

R1	100 k 1/4 W resistor Jameco #29997
R2, R8	1 k 1/4 W resistor Jameco #29663
R3	330 1/4 W resistor Jameco #30867
R4, R5	10 k 1/4 W resistor Jameco #29911
R6	470 1/4 W resistor Jameco #31165
R7	150 1/4 W resistor Jameco #30162
C1, C2, C3, C4, C5, C6, C7, C9	0.01 µF disc cap 50–100 V Jameco #15229, Hosfelt #15-888
C8	10 µF 16 V radial cap Jameco #94211, Hosfelt #15-853
Q1	MPF102 JFET transistor Jameco #26403, NTE213
Q2	2N2222 NPN transistor Jameco #28628, #38236 NTE123A
U1	LM340-5 5 V regulator Jameco #51262, Hosfelt #7805
U2	74107 JK flip-flop Jameco #49234, Hosfelt #74LS107

Table 1. *Parts list.*

The Ultra-Simple 20

The simplest solution to any problem is the best …

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England

And they don't come much simpler than this 20-meter band transmitting antenna. It has been used, off and on, for 20 meter CW activities over the last 30 years—or more, starting at a time when occupational activities necessitated quite frequent moves of QTH. One of those moves meant being located in Minnesota for several years, in the 1970s.

The antenna can be used indoors or in a very restricted space outdoors. It can also be put up in a hotel room, used portable, on vacation, or as an extra "occasional" antenna. The design is low cost—the antenna needs a bare minimum of parts: just some wire, some fishing line and a good variable capacitor.

Simplicity itself

The base impedance of a λ/4 vertical antenna wire is usually between 20 and 30 ohms, depending on the grounding system—not 50 ohms, as is often assumed. For 50 ohms it will require some kind of matching device. However, if the antenna is lengthened to λ/3, then the impedance will have increased to 75 ohms, which is a common feedline impedance. But, as the length and impedance have increased, so has the inductive reactance, which will have to be reduced with a series capacitor.

As the antenna was designed for 20 meter CW operation, it was initially cut so that it happily covered from 14,000 kHz to well over 14,100 kHz. The output impedance of the transmitters that have been used with this antenna was 75 ohms. The usual transmit power has been up to about 10 to 25 watts, though 100 watts *was* used in Minnesota in the 1970s.

The simple design is shown in **Fig. 1**. It consists of 23 feet of wire, supported by nylon fishing line, which also acts as end insulation. A series variable capacitor (VC) is used to tune out the reactance. The variable used was a 60 pF, though 100 pF could be used. This variable should be a good-quality small transmitting type, though a wide-spaced, well-insulated, receiving type could be used up to about 20 watts. As it is at a high voltage point, it should be enclosed in a small plastic

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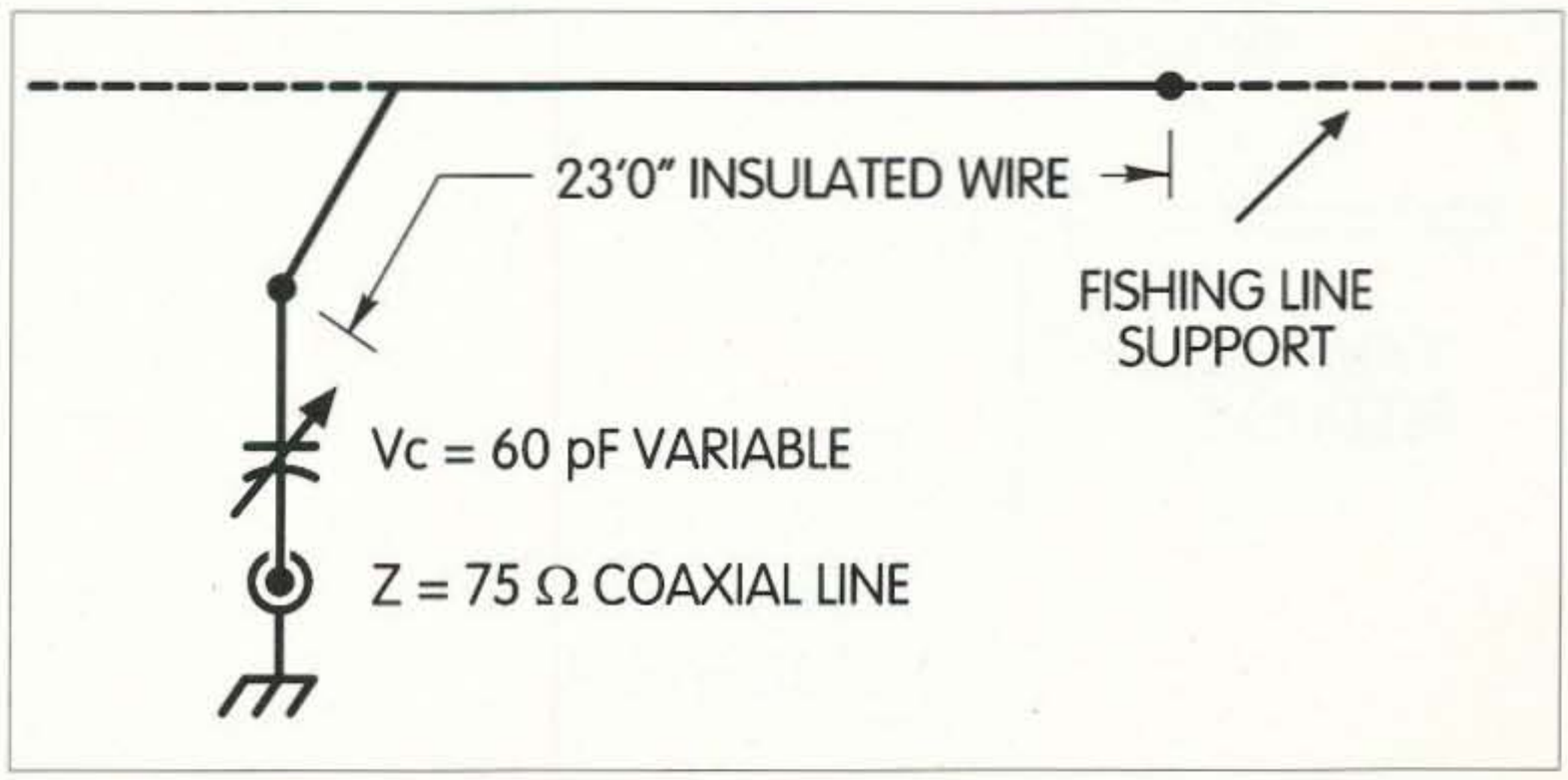

***Fig. 1.** 20-meter antenna.*

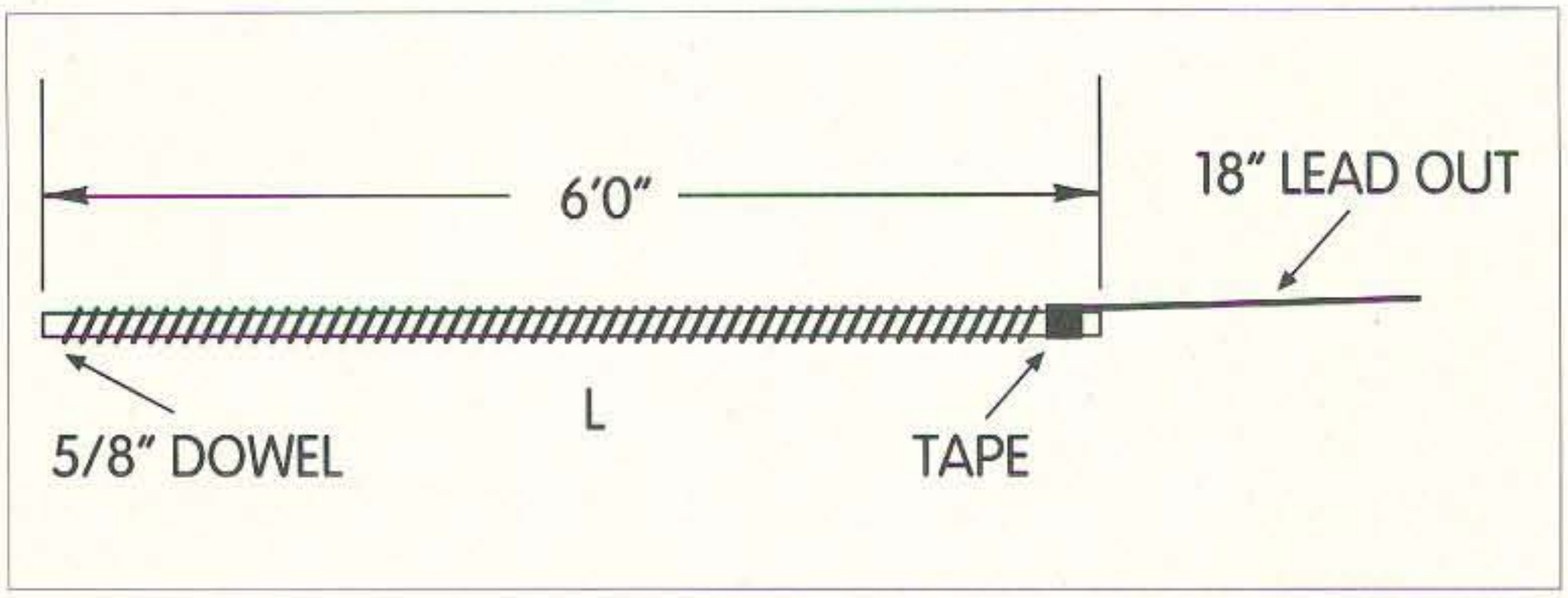

Fig. 2. *Optional "artificial" ground. Wire windings are half an inch apart on the dowel.*

The Ultra-Simple 20
continued from page 21

box, for safety and dust protection, and fitted with a short insulated shaft.

A good ground is essential, and the ground lead should be as short as possible. Using, say, a 12-foot length of wire to a water pipe could introduce all kinds of problems, as it would be over λ/8 long at 14 MHz!

Quick and slick

In the typical installation shown in **Fig. 1**, the antenna length of 23 feet represents λ/3 at 14,030 kHz. This frequency was selected from experience, on the basis that though the electrical length might change somewhat (if the antenna was bent somewhat or erected horizontally or sloping), it could still be used in the CW spectrum, 14,000–14,100 kHz or more. Past experience shows that this has held good, in various installations, in various places.

Fig. 1 is an in-room layout, with the antenna running diagonally across the room. The far end is supported by monofilament fishing line. The other end drops down for (typically) four feet, to the variable capacitor (VC) and transmitter. The angle of the bend should be much more than 90°, and supported with fishing line, as shown. A 90° bend should be avoided.

The transmitter end of the antenna goes to a good-quality variable capacitor, which should be mounted in a plastic box. An insulated shaft, with coupler, should be between VC and control knob.

The coaxial socket is also mounted in this box, and the outer conductor should be connected to a good ground, with a short lead (more on this later).

The suggested antenna wire is 20-gauge stranded PVC-covered. If the antenna is erected outdoors, this wire should be examined every few months, as extremes of temperature may cause the PVC covering to deteriorate. Also, strong braided fishing line should be used to combat winds and storms.

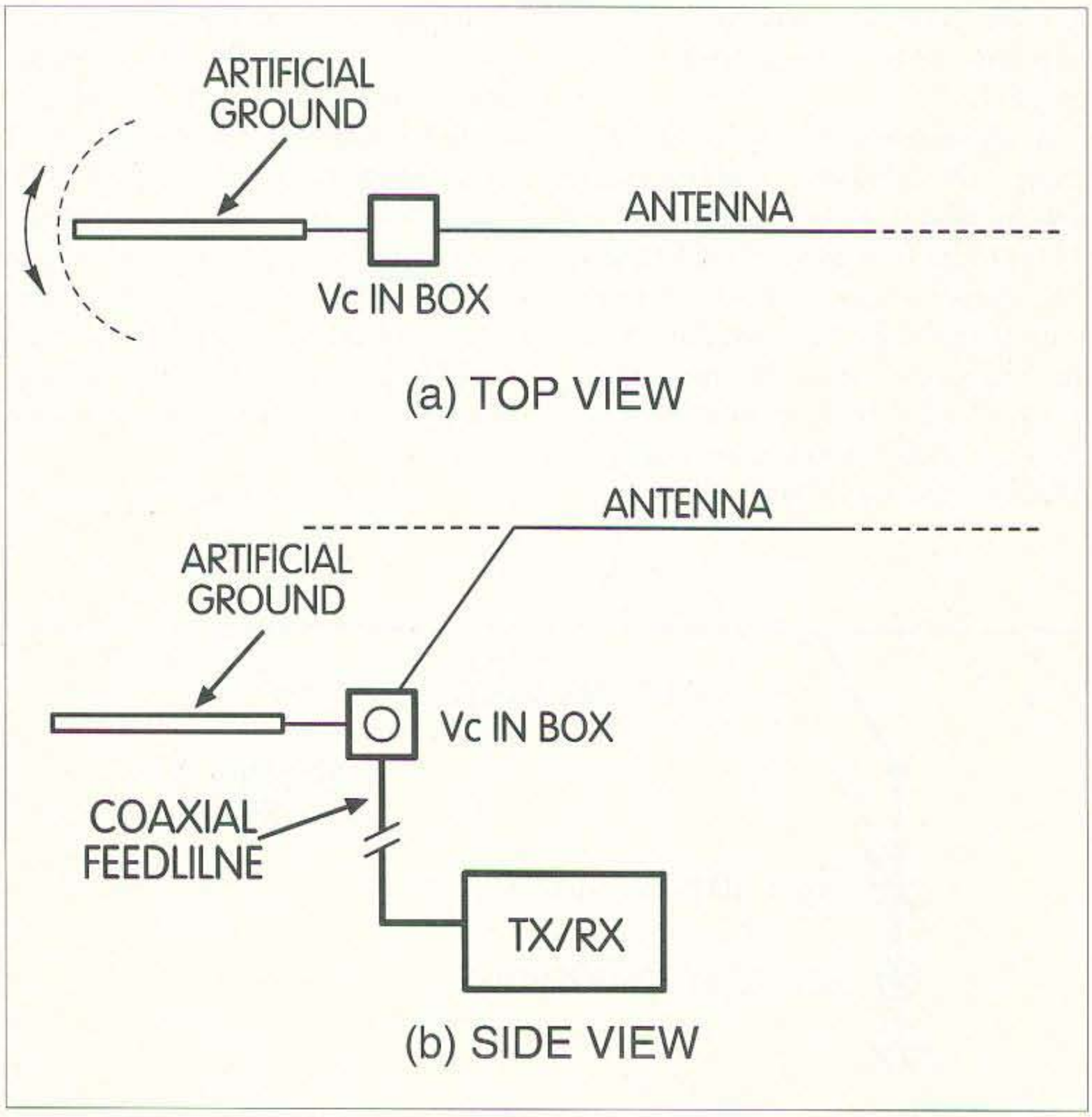

Fig. 3. *Orientation of artificial ground.*

Grounding alternatives

The ground connection lead should be as short as possible, and certainly not exceeding four or five feet. It can be taken to a convenient *metal* water pipe, if this exists. But make certain that the pipe is at ground potential!

An alternative ground used has been a λ/4-wave wire dropped out of a window, when required, with VC (in box) mounted just inside the bottom edge of the window frame.

Another successful ground was a metal frame window about 16 feet wide. The VC box was mounted on the wall, near a top corner of the window frame, and a six-inch lead clipped to the metal frame. The coaxial feedline dropped down to the transmitter, which was located directly below on a table. The antenna ran diagonally across the room. The same setup also worked well with an antenna outdoors in a very confined space.

You can see that the grounding technique used will depend on the prevailing circumstances, and may

require some individual initiative and experimentation.

An "artificial" ground

A popular "artificial ground" is shown in **Fig. 2**. It consists of 36 feet of 20-gauge stranded PVC-covered wire, wound on a 5/8-inch diameter wood dowel, or plastic tube. The wire turns should be spaced half an inch apart. The wire is extended by a further 18 inches to form a connecting lead.

The artificial ground has been particularly successful, and used at several QTHs. With a little practice it is easy to set up.

Fig. 3b shows this "ground" erected behind, and in line with, the antenna. Indoors, it should be mounted well clear of walls (hidden house wiring and pipes) and at least 30 inches above floor level. Top view (**Fig. 3a**) shows it in line with the antenna. However, it can be oriented up to 90° either way, to obtain the best loading, and to neutralize the effects of surrounding objects—hidden or otherwise.

It's a personal choice

I personally consider this antenna to be a low-power device, using up to 25 watts. No doubt it could be upgraded by individual operators using a more robust higher-voltage variable capacitor (VC) and ceramic insulators to replace the fishing line technique. However, with 15 watts low power CW, it has been found to be quite adequate. It has not been used higher up the band with SSB, and possibly this would mean a small amount of antenna length pruning. The antenna should be connected to the rig with 75-ohm coaxial feedline via a low-pass filter.

First, tune the receiver to 14,030 kHz and rotate VC for maximum signal. Recheck at 14,000 and 14,100 kHz—the VC should not need retuning.

Again, at 14,030 kHz, feed low transmit power into the antenna, and slightly rotate VC (if required) for maximum radiated signal on a nearby field strength meter. A check should be made that harmonic radiation is not occurring. Readjust VC to eliminate if needed. Recheck again at 14,000 and 14,100 kHz, and gradually move up the band to find the maximum usable frequency. If a portable TV is available, then place it under, or near, the antenna, as a simple practical TVI check.

If TVI should occur, (1) check and experiment with the ground system and (2) ensure that the antenna is clear of house wiring, which may be hidden. On one occasion when used with a 50-ohm transmitter, an existing "T" ATU was inserted into the coaxial line, as a simple quick means of matching the 50-ohm transmitter to the 75-ohm antenna. This also proved to be a most effective eliminator of TVI.

The basic concept is very simple. No doubt individual experimenters can produce variations to suit particular circumstances. Quickly assembled and erected nearly anywhere, the simple design lends itself to very confined space situations—and to almost any ham's needs! 73

The Franklin VFO

A nifty chill-chasing project for the serious home-brewer.

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The Franklin oscillator circuit makes a terrific frequency control for ham transceivers, transmitters and receivers. It is inherently stable because only the tuning tank circuit controls the oscillating frequency. Band-switching is very simple because the L/C circuit is in parallel, with one end grounded.

The Franklin oscillator is unique in that the capacitors and resistors in the oscillator circuit are not frequency-determining components. The values of the internal NPO capacitors remain the same without regard to the frequency being generated—it's a truly universal VFO circuit.

Although this oscillator requires using two JFET transistors, the actual oscillator contains only four NPO capacitors and four resistors, which remain the same regardless of frequency. There are no critical parts, no tapped coils, and no capacitive voltage dividers to provide feedback.

The tuning capacitor and its parallel inductance, plus any necessary padder and trimmer capacitors, must be of the highest quality because they are the only frequency-determining components. They also contribute to the inherent stability. The main tuning capacitor should have a ceramic frame, be double-bearing, and have plated, soldered-in brass plates. As it is relatively large, its thermal inertia adds greatly to the frequency stability.

Any variable capacitors used as trimmers or padders should preferably be air-dielectric type, although ceramic NPO trimmers are almost as good. Of course, fixed padding capacitors must be NPO ceramic-disc types of the largest diameter you can find. Because the capacitors are heated by the RF current flowing through them, the total amount of padding should be divided among several smaller-value capacitors, and the large-diameter ones can provide additional area and keep RF heating-induced instability minimal. This is not the place to use tiny monolithic COG type capacitors!

The coil used is equally important. The best would be a solidly-mounted air-wound coil such as the B&W Miniductor® series, but you may be unable to find them (hamfests and swap meets are a possible source). Almost as good is a coil wound on a hollow ceramic form of a diameter which allows close to a 1:1 ratio (diameter to length) for the needed inductance. This will provide the highest "Q." There must be no slug in the coil form.

Most of us hard-core home-brewers will end up winding our coils on iron powder toroid cores. The Amidon® Mix-7 is a good choice. The T68-7 has an AL of 50, and Mix-7 has a temperature coefficient of 30 ppm/°C, the most stable mix available today. The T50-7 has an AL of 43 if a smaller core is desired. However, the larger T68-7 core has a greater thermal inertia, and aids long-term stability.

The JFETs you choose should be of high quality, though they don't need to be expensive. Although MPF102s will generally oscillate in this circuit, they are not recommended. Among the recommended JFETs are 2N4416, 2N5486, U310, J308, J309 and J310. Other JFETs with a transconductance of 4000 or more will also be suitable *if* they have a maximum frequency rating of 300 MHz or higher. The two JFETs (Q1 and Q2) in the actual oscillator must be the same type number but they don't have to be perfectly matched.

As in any VFO, the oscillator must be isolated from the load. Normally,

this requires another JFET as a source follower, followed by a bipolar NPN Class A amplifier.

Here's what it looks like

The schematic diagram of the Franklin VFO is shown in **Fig. 1**. The components and values specified provide a stable range of 5.0 to 5.5 MHz, perhaps the most widely used VFO frequency. Changing the oscillator to cover other frequency ranges is discussed later in this article.

Operation of the oscillator, Q1 and Q2, and associated components is unusual—I don't know of any other VFO circuit like it. The four resistors, R1 through R4, establish operating conditions and the oscillator and source follower are powered with a regulated +9 V supplied by U1. The tank circuit (C11 and L1, and the parallel connected trimmer and padder capacitors, C12 through C16) is very lightly coupled to the oscillator at the junction of C1 and C2, which are very small capacitors. This essentially isolates the frequency-determining components from the oscillator and prevents loading the tank circuit, maintaining circuit "Q." C1 and C2, in conjunction with C3, cross-connect Q1 and Q2 similarly to connections used in an astable multivibrator. Thus, the Franklin oscillator is foolproof—it *has* to oscillate!

When power is applied, the slightly different transistor characteristics cause a tiny difference in current flow through the drain resistors, and this starts oscillation, which is maintained by the cross-connections of C1, C2, and C3, with frequency being controlled solely by the components connected between the junction of C1 and C2, and ground.

RF from the drain of Q2 is fed through C4 to the gate of source follower Q3. Output from Q3 is taken across RFC1 and fed through C7 to the base of Q4, an NPN bipolar Class A amplifier, which amplifies the RF and provides it through C10 to the following circuit being driven by the VFO—normally a transceiver, transmitter or receiver.

Continued on page 26

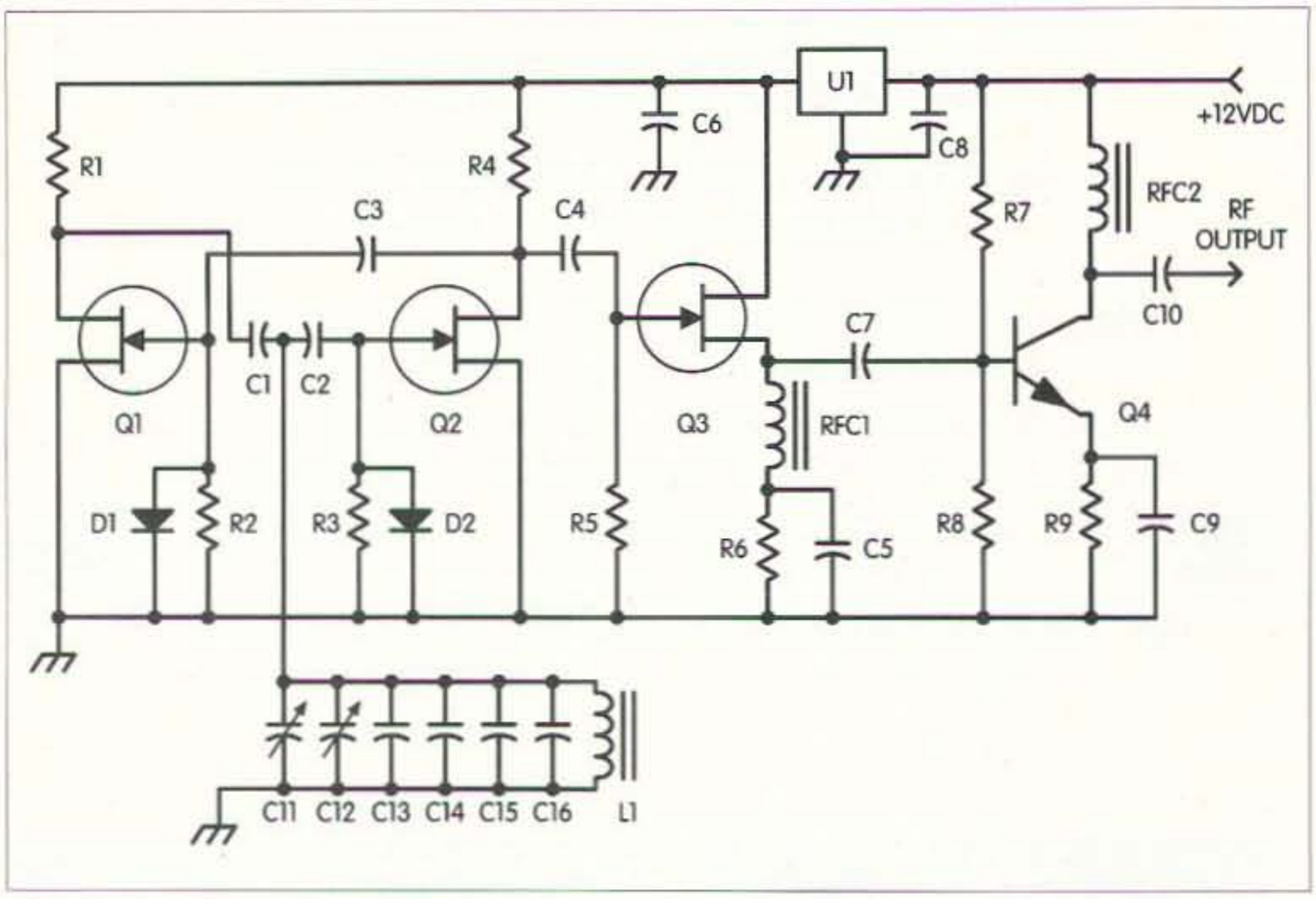

Fig. 1. Franklin VFO schematic diagram.

The Franklin VFO

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Here's how to build it

Mechanical stability is of the utmost importance for all components. The VFO should be constructed in a shielded enclosure, either aluminum or one made from double-sided printed circuit board material with soldered seams. The main tuning capacitor should be mounted through the front of the enclosure. An access hole must be drilled for tuning access to trimmer C12 so it can be adjusted from outside the enclosure. However, if an air-dielectric capacitor is installed at C12, it will mount through the top or side of the enclosure as well.

Although a single-sided glass epoxy printed circuit board could be etched and drilled for the VFO circuit, going "dead bug" style with point-to-point construction is often better, with short leads, and the transistors and L1 epoxied in place. All ground connections are made directly to the ground plane. Because tiny monolithic COG capacitors are specified for C1 through C4, little space is needed. Besides, the circuit will be completely hidden inside the enclosure and no one will see the "ugly" construction.

Use solid bare wire for the connections between C11 and C12, and from C11 to the junction of C1 and C2. Rotors of both capacitors should be connected to the ground plane with bare wire as well. Capacitors C13 through C16 can be connected with short leads across C11 or C12 or both.

Because C11 tunes from 5.0 to 5.5 MHz in 180 degrees of rotation, use a vernier mechanism to slow the tuning rate when using the VFO. They're often difficult to locate, and generally costly when you do find them. As this is written, Jackson Brothers' ball drives, 7:1 and 10:1, are available from Dan's Small Parts and Kits, Box 3634, Missoula MT 59806-3634, $13.50 and $15.00 respectively.

Similar vernier mechanisms may be salvaged from old Eico, Knight and Heathkit test equipment. National Radio "Velvet Vernier" mechanisms, although about two inches in diameter, can be salvaged from World War II-vintage military radio tuning units used with the BC-191 and BC-375 radio sets. These units tune very smoothly, but about the only places to find them nowadays is in old-timers' deep junk boxes.

There are also Japanese vernier dials, in two small diameters, which are available from a few mail-order dealers. These are not as smooth tuning as the Jackson Brothers' or Velvet Vernier mechanisms. Cost will probably be under $15.00.

Here's how to use it

Normally, adjusting C12 will center the frequency range of the VFO to cover the desired span. However, because of unavoidable stray capacities and component tolerances, including the winding of L1 and the core properties, it may be necessary to shift the tuning range up or down a small

Parts List

C1, C2	10, 12 or 15 pF COG or NPO. Must be same value.
C3, C4	100 pF COG monolithic
C5, C6, C8, C9	0.1 µF monolithic
C7, C10	56 pF NPO or COG
C11	50 pF air dielectric, double-bearing (see text)
C12	50 pF air dielectric or NPO ceramic trimmer
C13	30 pF NPO disc ceramic, largest diam. available
C14, C15, C16	33 pF NPO disc ceramic, largest diam. available
D1, D2	1N914, 1N4148 or equivalent
L1	T68-7, 35T #24 or #26 enamel wire
Q1, Q2, Q3	2N4416, 2N5486, U310, J308, J309 or J310 (see text; Q1, Q2 must be same type)
Q4	NPN 2N2222, 2N4400, 2N4401 or equivalent
R1, R4	1 k 5% 1/4 W
R2, R3, R5	1 meg 5% 1/4 W
R6, R9	100Ω 5% 1/4 W
R7	15 k 5% 1/4 W
R8	5.6 k 5% 1/4 W
RFC1, RFC2	390 µH (100 to 1000 µH suitable)
U1	78L09 voltage regulator

Table 1. Parts list.

amount. Adding or removing a turn or two from L1 and readjusting C12 is the easiest way to manage this. The tuning range may also be a bit short or a bit long, in which case more or less NPO padding capacity may be needed. When the frequency has been adjusted as necessary, be sure to put two coats of Q-Dope® or clear fingernail polish on the winding of L1, both to keep the winding from shifting, and to prevent moisture from changing the inductance.

Here's another way

Because the tank circuit and associated capacitors are the sole determinants of frequency, it will be easy to tailor the Franklin VFO to cover other frequency ranges, by substituting other values for the components specified. To restrict the tuning range, a fixed NPO or a variable air-dielectric capacitor can be placed in series between C11 and the junction of C1 and C2. Reducing the value of the capacitor used at C11 will also reduce the tuning span.

Here's what I think

The Franklin oscillator will happily oscillate just about anywhere you want it to. I have had a Franklin tossed together on a protoboard oscillating at over 30 MHz, but because of the long leads to the coil and tuning capacitor, I can't say how stable it would be. In my case it varied over several hundred hertz, but if it were solidly constructed and shielded properly, it probably would have proven to be much more stable. Certainly it would be far better than the Hartley, Clapp or Colpitts oscillators at these high frequencies.

I am currently working on the design of a band-switched HF signal generator based on the Franklin oscillator circuit, and if it proves to be as good as I think it will be, you may see the signal generator described in these pages in a few months.

I first stumbled across the Franklin oscillator in a forgotten publication more than 15 years ago, and have been intrigued by its possibilities ever since. I've built a number of them for experiments over the years, and have been quite impressed at their inherent stability, even though in most cases I built them from odds and ends out of the junk box. Though I've never learned the Franklin oscillator's provenance, I can't understand why such a simple, stable circuit hasn't had more exposure in the ham literature. Perhaps this article will give it a well-deserved boost. 73

The IC-706MKII Shack-in-a-Box

Take another look at an increasingly popular rig.

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When I first started out in amateur radio, I had a large GI-style green metal desk covered with ham equipment. More equipment was on a set of shelves that sat beside my chair. This setup made up my station and allowed me to operate HF on AM, SSB, and CW; six meters on AM; and two meters on AM.

Let's move ahead about 30 years and take a look at modern hamming. I now have a little solid state rig that allows me to operate 160 meters through two meters on AM, FM, CW, RTTY, and SSB. It is about the size of a cigar box. What is this diminutive device? It's the ICOM IC-706MKII. The MKII is the second in the IC-706 series, and has been available for about a year or so.

I have had my MKII for about 10 months, and have used it as a portable in my travel trailer and fixed in my shack. It is the latter operation that has proved so impressive. I have yet to use all the available features, but have been able to make many comparisons with my regular station equipment lineup.

The reason for this article is to give you a user's point of view and checkout of the IC-706MKII. I hope to assist you in being able to make an informed decision regarding the purchase of an MKII, which at the time of this writing was selling for about a kilobuck—due no doubt to ICOM's announcement of the IC-706MKIIG, which will include the 440 MHz band.

Open the box

The MKII is packed in a box not much larger than a shoebox. Stock equipment consists of a hand mike, power cable (for 12 VDC), some plugs, spare fuses, and an instruction manual. The manual you will find of absolute value—in fact, you cannot operate the radio without it. The hand mike is another story—I found it to be of *no* value, not even as a paperweight (more on this later).

Connect the rig to 12 VDC and an antenna. You're on the air! Well, almost. Better get that manual out, because in the beginning you will be needing it—but not for long.

Menu-driven

Much of the operation and all of the basic setup of the MKII is by menu selections. Like the most recent VHF/UHF HTs and GPS (Global Positioning System) receivers, you choose features and operations via main menus and submenus, making selections from five push-buttons. Sound complicated? Yes! Complicated to use? No! It just takes some time to learn the various menus and how to switch between them. Note that most of the menus are only used for initial setup or on rare occasions. During normal operation I select between two menus, just for switching to the narrow SSB filter or to toggle the DSP. All else pretty much stays the same.

Compare

How does the little rig compare to my other rigs? Well, first of all, the 706MKII is not easily compared to any other rig, as it is far more capable than most. This rig does HF, six meters, and two meters. For this article, I will look primarily at HF and then comment about six and two meters.

My HF mainstay is a Yaesu FT-990 with a Timewave DSP-59Y outboard filter. I think I have been able to fairly compare the MKII to the 990 by using an A/B switch arrangement. Both rigs feed identical bookshelf-style speakers.

The receiver

The ICOM 706 MKII is a very comfortable receiver to listen to. It is exceptionally quiet and very stable (an optional CR-502 high stability crystal unit is available). The rig covers 30 kHz through 199.999 MHz in all

modes. I have used it for listening to AM broadcast, shortwave, the local sheriff, and even country music [using wideband FM (WFM)].

The MKII's sensitivity is great. As with most current rigs, it's greater than what natural conditions (QRN) allow. I have noted, however, that it is outstanding at hearing weak signals on 10 meters.

Selectivity, in most instances, is excellent. The IF shift works very well and the optional SSB 1.9 kHz narrow filter (FL-223) is a very worthwhile investment. To say the optional DSP unit (UT-106) is great would be a very large understatement. The DSP is super! The NR (noise reduction) portion of the UT-106 outperforms my Timewave and the ANF (automatic notch filter) is very effective.

However, I have noticed that at times nearby strong SSB signals will cause some interference to be heard from as far away as ±6 kHz (for example, when the signal you are listening to is an S7 and a powerful signal 6 kHz away is 30 dB+). Using the 1.9 SSB filter will help, but to really combat the problem, turn the receive preamp off or use the attenuator. If the noise blanker is on, switch it off—it is a real contributor to this type of interference. This particular problem, and its solutions, are not unique to the MKII—most other rigs suffer from similar selectivity problems under like conditions.

Memories

"Thanks for memories" is the only phrase that can describe what the MKII's memory features can do. There are 99 operational memories (can be used for simplex or split operation), two scan edges (top and bottom), and a call channel (as found on many HTs).

The main memories store the frequency and all the parameters in use when programmed, such as mode, preamp, attenuation, and split operation settings. They are completely tunable, meaning you are not locked onto a memory's frequency or mode when selected. You can tune from it and then return with a simple click of the memory switch.

I use memories for everything from recalling my favorite nets to scanning the VHF bands.

The mike problem

The hand mike that comes with the MKII is designed to be noise canceling. In practice, I found it to be voice canceling. The signal reports I received were among the worst I have ever received with any rig/mike combination I have ever used. But the fix was easy!

I purchased an ICOM SM-6 desk mike and an adapter cable. The adapter cable (OPC-589) is necessary to go from the SM-6's standard round plug to the modular plug used by the MKII. This adapter cable is a requirement for using most optional ICOM mikes with the 706, except for the standard hand mike. In the future, ICOM will be offering a wider selection of mikes with modular plugs on them.

Was the solution expensive? Yes! The mike and cable cost me over $150, but it sure was worth it. The signal reports I now get are just like those I am accustomed to hearing when using my Yaesu FT-990—and those are great. Many ops who know my voice well say that they can tell no difference between the sounds of the two rigs. To me that is a great compliment for the ICOM.

I do not operate HF mobile—just portable and home—so I have no need for a hand mike. However, ICOM makes several hand mikes that should do well for mobile applications—in lieu of the stock mike.

External speaker

The audio coming from the 706 is very good, considering the size of the speaker (about three inches, from screw to screw). Great improvement can be made, however, by sending the audio to an external speaker.

In my shack, I use bookshelf-type wooden-cased speakers. As I mentioned previously, one is hooked to the FT-990 and another to the ICOM. Try this setup, and you won't be disappointed—no matter what rig you are using.

***Photo A.** ICOM's IC-706MKII.*

When portable in the travel trailer I use a set of $10 Sony headphones (with a mini plug). They are very light, give great sound, and take little space.

Using an amplifier

Although there is an accessory socket on the rear of the 706, and a plug comes with it, the MKII has no provisions for directly keying an amplifier. Some form of solid state switch or mechanical relay interface must go between the 706 and the amplifier for keying. This is not a maybe—it is required! Direct connection to an amplifier's keying circuit will damage the MKII.

I use an Ameritron ARB-70212, which picks up its control voltages and signals from the accessory socket. In turn, it keys my amplifier. After initial wiring of the accessory plug, the operation has been flawless. You can construct a switchbox should you be averse to purchasing one.

Shack-in-a-box

To summarize, the ICOM 706MKII is a complete shack-in-a-box. It is an HF rig, a two meter multimode rig, a six meter multimode rig, a VHF scanner, an AM/FM broadcast receiver, and a great SWL receiver. Plus, it has an internal DSP unit. And look at the size of this rig—its cigar box size replaces a deskful of equipment.

Want to use even less space? Remove the front panel and hide the rig and power supply up to 16 feet away (requires optional separation cable).

Do I recommend the 706MKII to others? You bet!

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Mods for the OHR 100A

Here's how to make a popular QRP rig even better.

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The Oak Hills Research Model OHR 100A monoband CW transceiver kit is extremely well designed, easy to build and align, and puts a solid five watts on the air. Unusual for a QRP rig, the 100A has five knobs on the panel: Tuning, Bandwidth, AF Gain, RIT, and RF Gain (actually, IF Gain).

The tuning range is in excess of 70 kHz. IF bandwidth can be varied from >1.1 kHz to <400 Hz. RIT is variable up and down >1.5 kHz. Two audio amplifiers are included: an LM380N-8 for phones, which drives an LM380 for an external speaker. The rig draws less than 90 mA on receive, and less than one ampere with five watts out using a +13.8 VDC supply. A drive control accessible from the rear deck allows reducing power down into the microwatt level.

The 100A includes a twin-T sine wave sidetone oscillator variable in frequency and level. Because I prefer sampling the RF output for sidetone (being congenitally unable to match two pitches), I considered changing the circuit to use the RF output for sidetone instead. Inspecting the schematic, I discovered not one but *three* receiver mute transistors—Q104, Q107, and Q111. I could not determine why such apparently redundant muting was deemed necessary, and I'm not about to try to second-guess Dick Witzke KE9KL, the designer, so this is one change I did not attempt.

However, by including an audio peak circuit and tuning for the loudest signal, I'm guaranteed to be transmitting into the center of the other ham's receive filter, and I don't have to match two pitches. More about this circuit later.

While most hams might not think much if anything would really be needed to make the 100A even better, I saw an opportunity to make this excellent kit into a superior one, much easier to use and practically idiotproof. It is now impossible to tune onto the wrong sideband. Noise is greatly reduced, and the minimum discernible signal (MDS) is dropped into the cellar. I am unable to measure MDS but it is considerably better than stock.

Because my kit is for 30 meters, I restricted the tuning range to approximately 32 kHz to cover just the CW portion of the band with a small overlap at each end. I also replaced the 10 k pot supplied for tuning with a Bourns 10 k 10-turn pot ($3.95 from Electronic Goldmine). Additionally, I built the K1MG LCD Dial/UTC Clock kit (available from Mike Gide K1MG, Blue Sky Engineering Company, 400 Blossom Hill Road, Los Gatos CA 95032, $29.95 plus $5.05 S/H, as this is written; prices may change in the future, so check before you order).

Although all the changes I made are described here, you are, of course, invited to pick and choose, incorporating only those changes you wish. At first glance it may seem that I gutted the rig—the final rig has but two knobs on the panel (Tuning and AF Gain), a push-button to activate the clock function of the LCD dial, and a toggle switch to insert or remove the peak circuit from the audio chain—I did not make any real circuit changes beyond those which can be duplicated by turning the Bandwidth and RF Gain (actually, IF Gain) controls fully clockwise. Both were mechanically programmed as if they were both clockwise because both had to be removed to make room for the LCD Dial/Clock.

There are two minor additions better made beneath the circuit board. There

is very little headroom beneath the board, about one quarter of an inch, so use care.

Solder a 4.7 µF tantalum capacitor between pin 8 (+) and pin 4 (-) of U107, an LM380N-8. Be sure there are no shorts. This may not be necessary, but it is generally recommended because it decouples the internal circuitry from the DC supply.

Locate the trace along the rear of the bottom of the circuit board which connects the center conductor (+) of the DC jack J104 and the center pin of P100. Cut this trace, and scrape the solder masking off a section on either side of the cut. Tin these spots. Then solder a 1N5818 or 1N5819 Schottky diode across the cut, making sure the anode faces J104 and the cathode faces P100.

The Schottky diode has a very low forward voltage drop and will have almost no effect on the DC voltage. In addition, an accidental reverse voltage applied will have no effect whatsoever. However, D100 (1N4007) on top of the circuit board is in shunt with the applied DC and reverse biased. This would have sufficed for reverse voltage protection if you have a one-amp fuse upstream. I don't, so this is why I installed the Schottky diode.

All the remaining changes and additions will be done on top of the circuit board and on the front and rear panels.

With the front of the circuit board facing you, locate D100 just to the right of J104 at the right rear. Although it is no longer necessary for protection, it will provide terminals for the bypassing to be applied on the DC line to prevent any electrical trash from entering or leaving the 100A. Again, this may not always be necessary, but it is always valuable insurance.

Parallel-connect a 10 µF 16 volts or higher, a 0.1 µF, and a 0.001 µF capacitor together and solder their leads, cutting off the extra leads and leaving just two: positive and negative. Because there is very limited space around D100, a tantalum capacitor is preferred over an aluminum electrolytic. Slide the leads from this parallel combination under the leads of D100, making certain the positive lead is at the end facing the inside of the circuit board. Solder both connections and remove extra lead lengths. Check very carefully so you are certain there is no danger of a short circuit.

To make room for the LCD Dial/Clock, both the Bandwidth and RF Gain (actually, IF gain) controls must be removed. P103 (Bandwidth) must have the center and right-hand pins shorted together. A jumper may be used if you have any, or you can solder them together with a short piece of wire. See **Fig. 1** for details of changes to plugs on top of the circuit board. This connection mechanically programs the IF bandpass to its narrowest point.

On P101 (IF Gain), solder a short wire from the center pin to the left end of R129, which is just forward of P101. This DC grounds pin 5 of the IF amplifier U101 (1350P) which is already bypassed by C135. This programs the IF stage at its maximum gain.

Because the RIT will have no function once the peak circuit is added, it can be removed at this time. Note the detail in **Fig. 1.** The jack is cut off the wires to the RIT pot and the insulation stripped from all three. Connect a 2.4 k resistor to the short end of the red wire at the jack and bend the resistor down toward the bottom. Solder another 2.4 k resistor to the short blue wire and bend it down the same way. Bend the white wire down between the two resistors and solder the leads from both resistors to the white wire. Plug the jack just prepared into P102, with the resistors on the rear side of the jack.

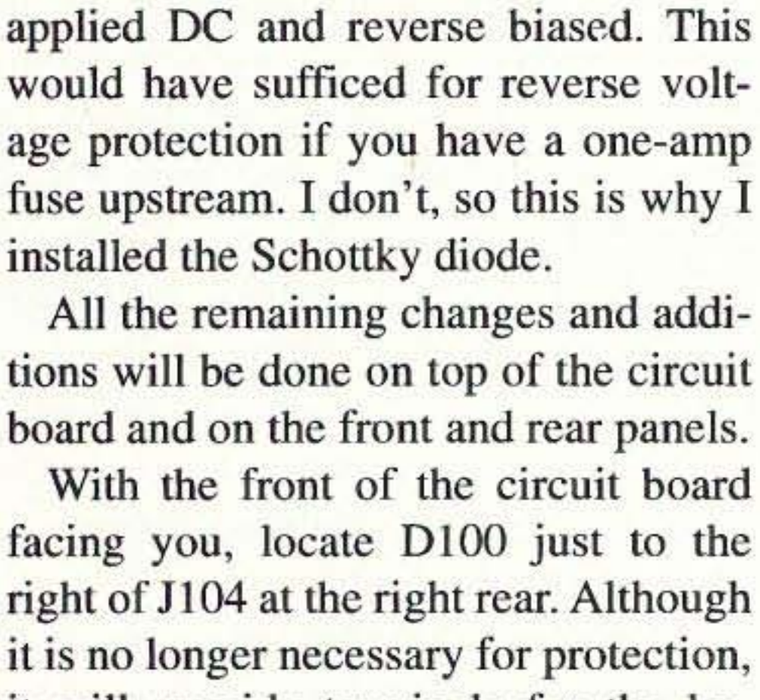

Fig. 1. *Programming board connectors.*

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Mods for the OHR 100A

continued from page 31

The peak circuit is illustrated in **Fig. 2** and includes the wiring to the toggle switch and the AF Gain pot and J105. It can be constructed on a small piece of perfboard. The back-to-back diodes across the input must be germanium type, not silicon. Their function is to prevent high signal levels from overloading the peak circuit.

The peak circuit itself is a simple controlled positive feedback circuit. Gain is established at 20 dB by the circuit components. The 10 k trimpot enables tuning the peak from about 300 to over 1000 Hz. The peak is 160 Hz wide at the -6 dB points and 360 Hz at -12 dB. Because of the narrow bandwidth and the high gain, even signals otherwise down in the noise can be put completely in the clear. The narrow bandwidth also eliminates a great deal of white noise as well as nearby QRM, and results in a very low MDS.

Because the circuit board is opaque, I could not determine if there were any hidden traces where I wished to mount a standoff just forward of C152, so I did not drill a hole there. Instead, I epoxied a 4-40 threaded brass standoff one-quarter-inch high at the edge of the circuit board forward of C152, and with a long 4-40 screw and hollow standoff, I mounted the peak circuit constructed on perfboard at one corner at the brass standoff. The SPST toggle switch is mounted in the hole from which the RIT control was removed.

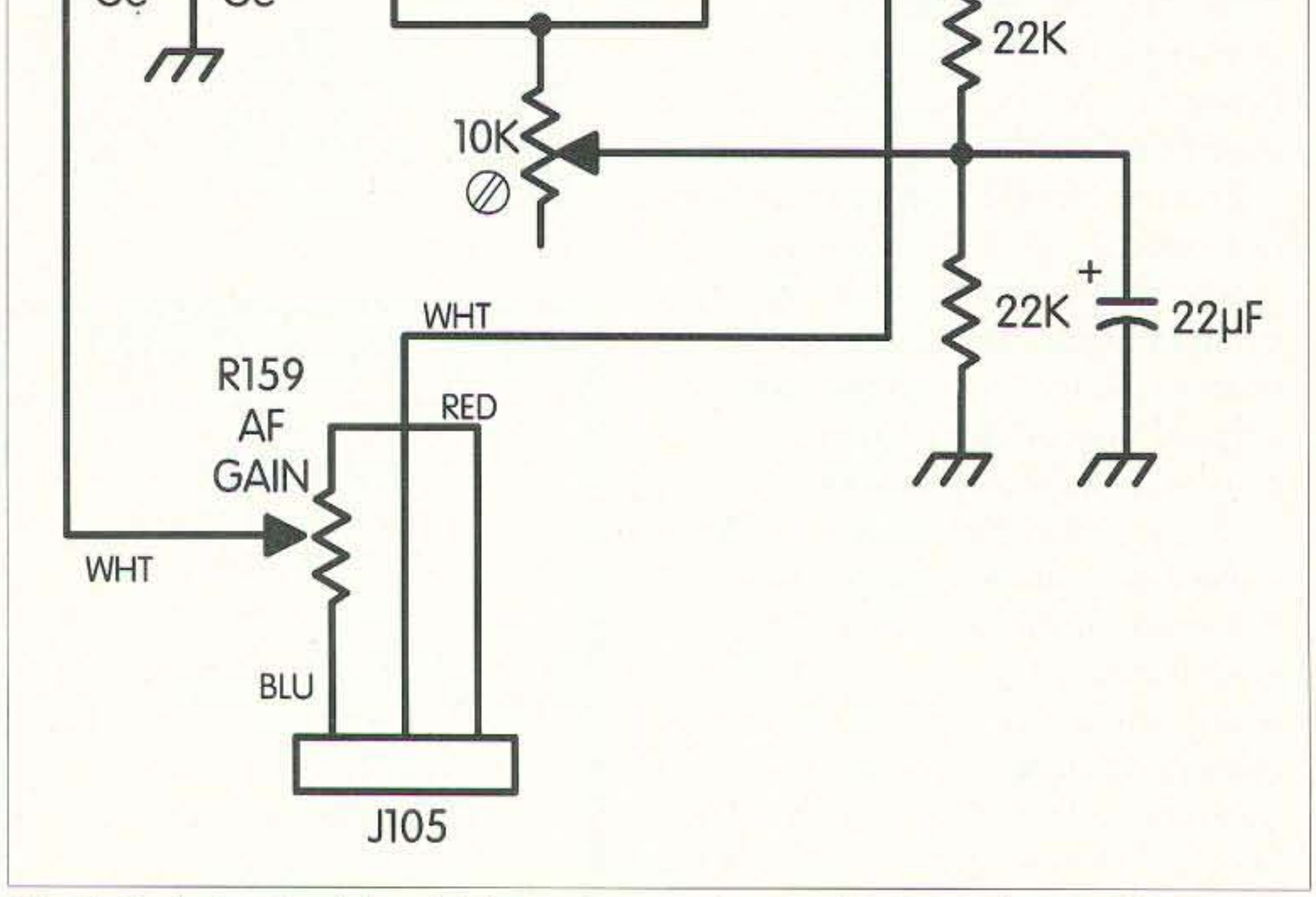

Fig. 2. *Peak circuit, with switching and connections to AF circuit, designed by Jim Pepper W6QIF. Opening the switch activates the peak circuit. Closed, the switch prevents peak from working.*

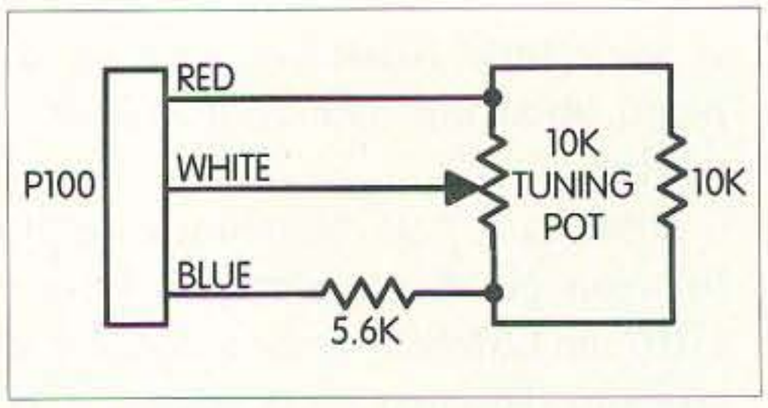

Fig. 3. *Restricting tuning range.*

If the LCD Dial/Clock and peak circuit are to be installed, you will want to eliminate a number of black silkscreened calibration marks and control identifications from the panel. Fortunately, this is very easy to do as long as you are *extremely* careful.

With a sharp knife with a very sharp point—a small penknife is preferred, or possibly an X-Acto® knife with a number eleven blade in it—use a light touch, and slowly and carefully scrape *very* lightly until the unwanted black marks disappear.

Done carefully, the markings will come off without affecting the cream paint finish on the panel. If you also intend to use the dial and/or a 10-turn pot, or restrict your tuning range, the calibration markings around the tuning pot must also be removed. When you are finished, you may be able to see a very faint "ghost" image of the marks removed, but they will be difficult to see unless you are looking hard for them. Be sure to leave intact the markings associated with the AF Gain control, and the manufacturer and model number on the panel.

If you have rub-on letters, you may wish to put "UTC" over the top of the hole from which the Bandwidth control was removed, and "Peak" or "PK" above the hole formerly occupied by the RIT control.

If you decide to restrict the tuning range by using a smaller value pot, or by shunting the existing pot with a resistor, make sure that the total resistance between the red and blue wires connecting the pot with P104 has essentially the same value as before making this change to avoid upsetting the circuit and the designer's intent. **Fig. 3** shows how I reduced the tuning range of my 30-meter 100A from over 75 kHz to about 32 kHz.

You will probably want to change the connector provided for your key. A board-mounted RCA jack (J102) at the rear panel is supplied. Because it would be difficult to remove from the board, I drilled a hole in the rear deck above J104, installed a standard 3.5 mm mono jack, and wired it in parallel with J104.

The four-digit LCD Dial/Clock is actually a microprocessor-controlled frequency meter with a maximum input frequency of 32 MHz, combined with the functions of a 24-hour clock. It operates at a clock frequency of 32,768 Hz and at 5 V to VCC to prevent RF hash when mounted in a receiver. It is supported by a comprehensive 58-page manual, step-by-step instructions similar to the old Heathkit manuals, and clear illustrations. It is three and one-half inches by one and one-half inches and normally mounts one-quarter inch behind the panel. The display is viewed by a horizontal rectangular cutout in the panel.

As many as 31 different offsets can be mechanically programmed into the dial/clock, so it is suited to multiband rigs. However, with monobanders only a single offset need be programmed. Offsets are retained in nonvolatile memories and no backup battery is needed except for the clock function. The clock requires a 6 V lithium battery for backup to keep the clock on time when the rig is not being powered. This battery is not supplied with the kit.

Default and normal readout show three digits of kHz, a decimal point, and a single digit of hertz, with a resolution of 100 Hz. A MHz button supplied displays two MHz and two kHz digits momentarily. I omitted this because I know I'm on 30 meters with my 100A.

The Clock button displays UTC in two digits on either side of a colon in a 24-hour format. Up and Down buttons on the rear of the dial/clock are used both to set the offset and to adjust the clock to the correct time.

RF to this dial is taken from the junction of C211 and C212 through a short piece of RG174/U coax.

Adjusting the peak circuit

The peak circuit must be tuned to the offset you use. Radiate a 100 kHz signal from a crystal marker generator to the OHR 100A. Be sure the peak circuit is switched off. Adjust C146 as suggested in the 100A manual for the offset you prefer while listening on the lower sideband. Then, without touching the tuning dial, adjust C103 while transmitting into a dummy load and measuring the output frequency at the SO-239 with a frequency counter.

Unkey the rig when you have an output frequency of 10.100,000. Now switch the peak circuit into the audio channel. With a small screwdriver adjust the 10 k trimpot on the peak circuit for the *loudest* signal by ear. This assumes you have not touched the tuning knob and are still listening to the marker generator signal. You will probably have to adjust the AF Gain control to reduce the signal level because of the high gain of the peak circuit.

Now your audio peak is and will remain at the offset frequency you selected. Your transmitter is offset high by this amount. When you tune in a signal at its loudest while using the peak circuit, your transmitter will automatically be zero beat with the transmitter providing the received signal, and your signal will be in the center of the other receiver passband.

Final dial adjustment

Now that your transmitter is set at exactly 10.100,000 MHz, the LCD display should indicate 100.0. If it is off a few digits, use the Up and Down buttons to display the correct frequency. Refer to the manual for the LCD Dial/Clock to make certain you have the correct offset programmed into nonvolatile memory.

A final comment

If you have made all these changes, now you not only know where you are in the band, but you also can tune in any signal for its loudest level in headphones or speaker and know that when you touch the key you will bore a QRP hole in the center of the other guy's or gal's receive filter. And you will always have the correct UTC time for your log! 73

Here Comes the Sun

Part 2: Geomagnetic monitoring.

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Even though it's possible to get geomagnetic data from the *GOES 8* and *GOES 9* satellites via the Internet, it's a lot of fun to monitor the effects of solar activity with your own equipment. While the changes in the magnetic field are much smaller on the surface than at an altitude of 23,000 miles, they still can be measured. Also, since it's impractical to monitor the Internet 24 hours a day, it would be handy to have a device to sound an alert whenever a strong geomagnetic event is detected.

One of the easiest effects to measure is "Earth Currents." Whenever the geomagnetic field changes, electricity is induced in all conductors within it, and this includes the Earth itself. By driving a pair of long copper rods into the ground 100 feet or more apart, a voltage differential can be measured between them when the field shifts. Connect each rod to the meter with shielded cable, and ground the shield at one end only. The meter must be a zero-center type, since the polarity depends on the direction of the magnetic shift. A sensitive zero-center microammeter with several switchable series resistors could be used to set different ranges. You could also use an auto-polarity digital multimeter set to the mV scale.

A second method of monitoring geomagnetic shifts is to use a compass. Since it's no fun to sit staring at the little blue arrow all day, we can build a circuit that will do this for us. The easiest way is to drill a small hole, 1/16-inch or less, through the compass disk near the rim, at the EAST position. Drill a matching hole at the WEST position so that the disk will still balance on the needle.

By shining light from an infrared LED through one of these holes and receiving it with a phototransistor below the disk, we can tell if the compass disk rotates even slightly. The circuit shown in **Fig. 1** can be used to activate a small piezo alarm when the light is cut off. You don't need the entire compass—just the disk and needle. I mounted mine on a small piece of pine board which I could then rotate slowly until the hole in the disk matched the position of the LED and phototransistor.

This device, though simple to the extreme, is actually quite sensitive, as you can prove by waving a small magnet around the room. You will need to put a box over the whole thing to prevent air currents from disturbing the compass.

An even more sensitive device is the magnetometer. Originally designed as a "UFO Detector," this device has an iron rod that serves the same function for the magnetic field as an antenna does for radio waves. The lines of flux from the geomagnetic field are concentrated in the iron, and a coil consisting of many turns of fine wire is wound around the rod. Changes in the magnetic flux induce a voltage in the coil, which can then be amplified and used to trigger an alarm.

Iron rods are not commonly found around the house, but for our purposes, milled steel will work just fine. (It is, after all, more than 90% iron.) For portable devices, a #10-32 bolt passed through the center of a coil from a small relay will make a good sensor that will fit inside the enclosure used for the electronics.

Increasing the size of the rod and the number of turns will make the device far more sensitive. The best one I've built consisted of an entire one-quarter-pound spool of #36 magnet wire. I

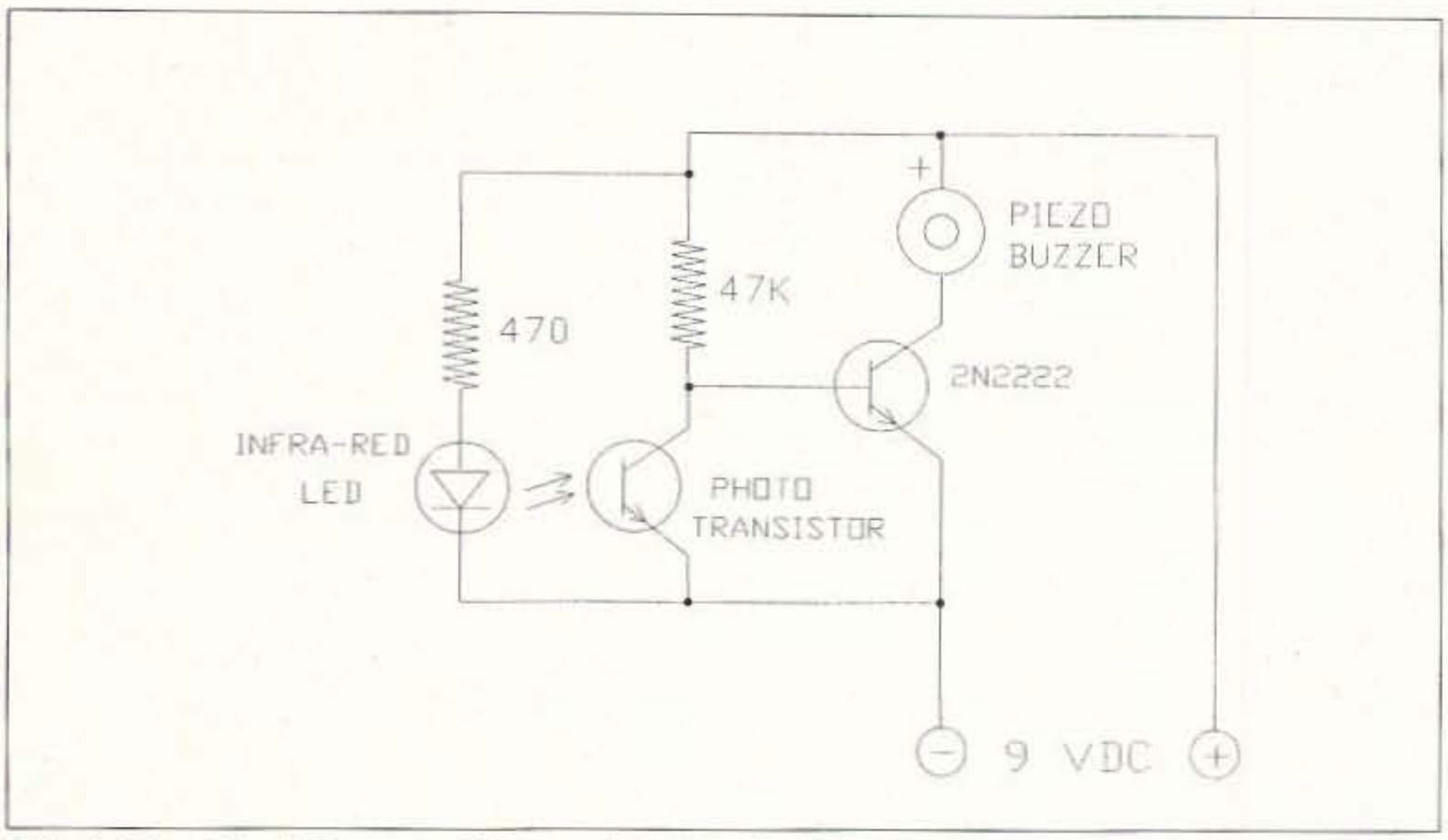

Fig. 1. *The "Dark Detector." By positioning the LED above a hole in the compass disk and the phototransistor below, the alarm will sound when small magnetic fluctuations cause the compass to rotate.*

didn't *wind* the coil—I just fished out the inner end of the wire and used the whole spool as it was. The plastic spool had a one-inch diameter hole through it, so I used a piece of one-inch round steel bar stock 18 inches long, passed through the center of the spool. Coated with urethane varnish and mounted inside a piece of plastic PVC pipe, it made a very sensitive sensor when mounted on the roof, away from stray magnetic fields.

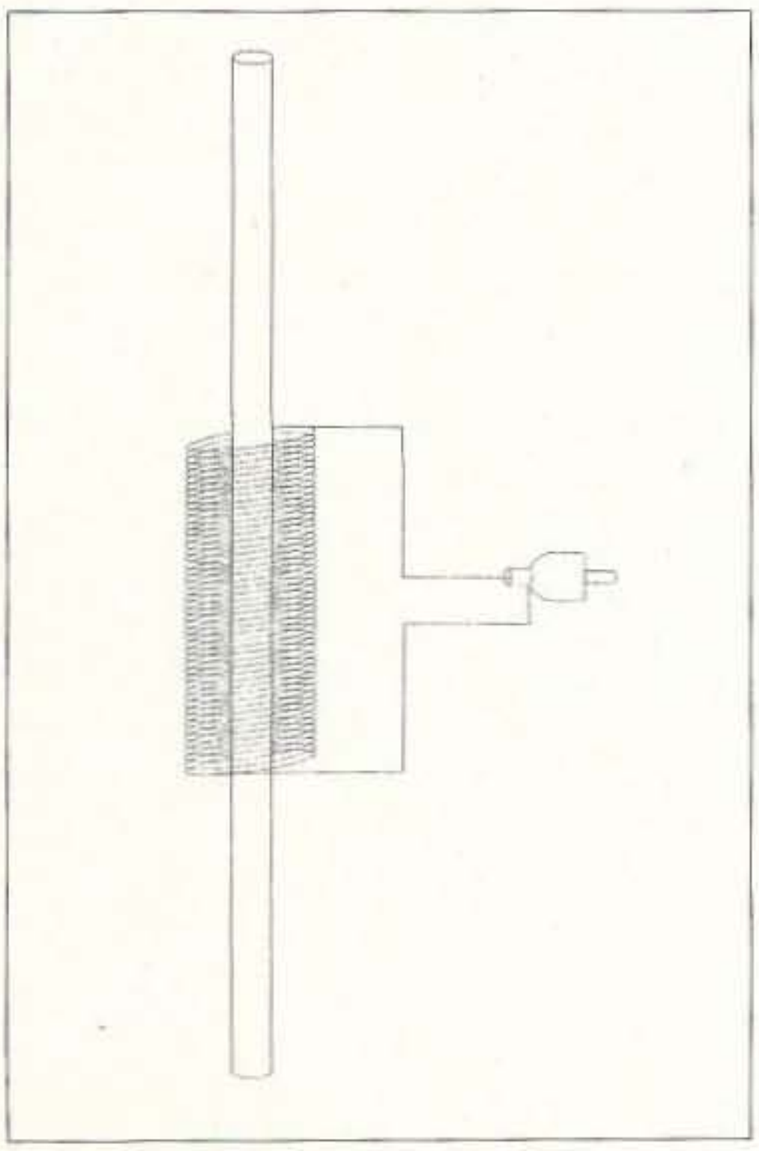

Fig. 2. *A very large coil of fine wire wound around a bar of iron or steel will detect very small fluctuations in the geomagnetic field.*

Fig. 3 shows the circuit diagram of the magnetometer. One stage of a dual op amp amplifies the signal from the sensor, which is then fed to a window comparator using an LM339. The output from the comparator triggers a 555 timer connected as a one-shot, which turns on the piezo alarm for several seconds. The gain of the amplifier stage is set with a one-megohm pot, which is adjusted just below the point at which the alarm sounds.

The second section of the dual op amp is used as an audio amplifier. The 2.2-µF capacitor couples any audio frequencies detected by the sensor to the op amp, which can then be heard via headphones or connected to an external amplifier and speaker. Some very strange sounds can occasionally be heard from this device, especially before a thunderstorm. (Of course, if you're using an outside-mounted sensor and AC line power, *do not* use this device *during* a thunderstorm ... especially when using headphones!)

The switch in series with the piezo alarm lets you turn the alarm off. This is handy for adjusting the gain, and also so that you can advance the gain to maximum and listen to the audio without being driven insane by the constant beeping.

Fig. 4 shows the printed circuit board pattern for the magnetometer, and **Fig. 5** shows the parts layout. Be sure to orient the integrated circuits,

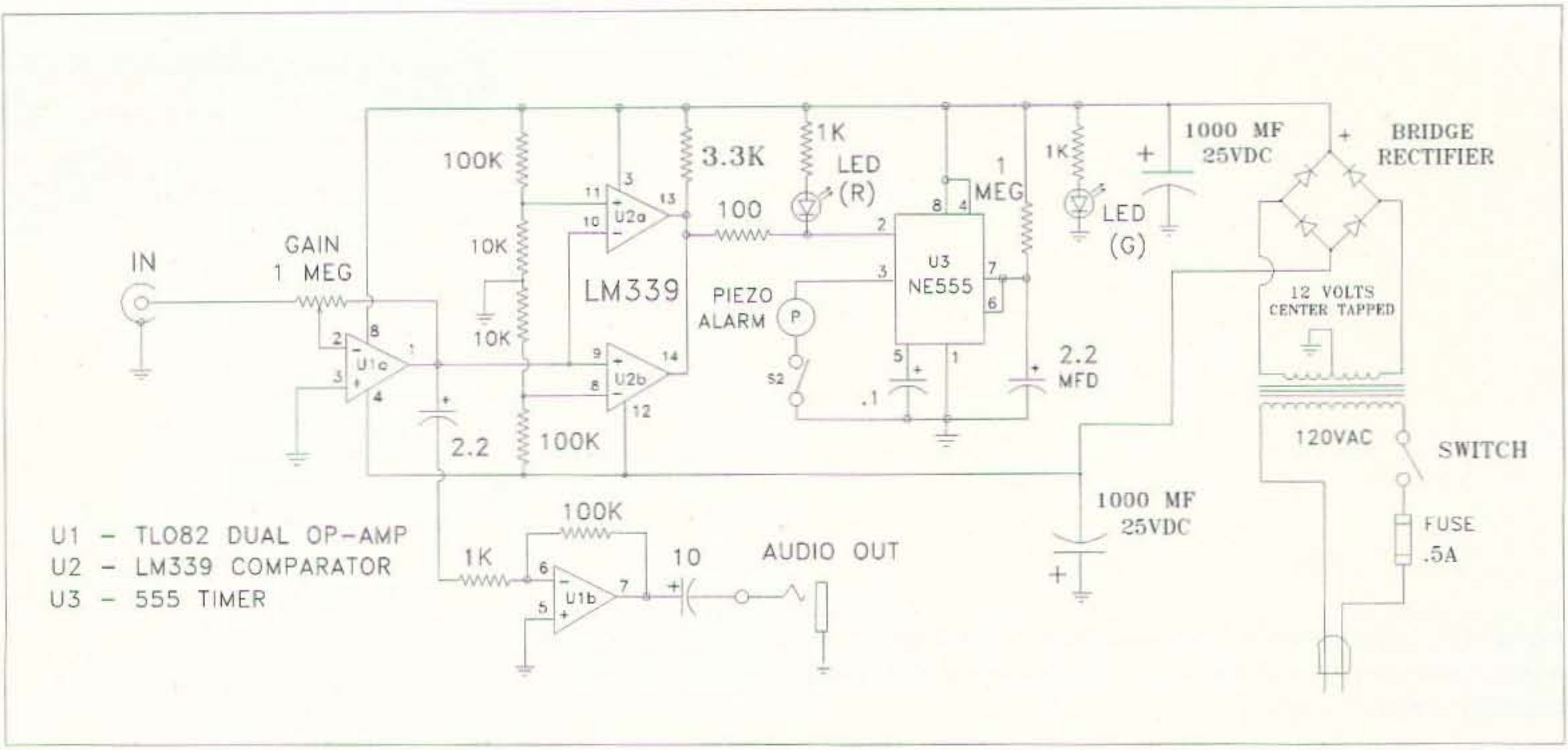

Fig. 3. The schematic diagram of the "UFO Detector" magnetometer. This circuit will amplify the signal from the sensor and trigger an alarm.

rectifier, capacitors, and piezo alarm as shown, since they will be damaged if reversed.

The circuit shown is AC line-powered, but you will probably need to use one or more AC line filters ahead of the device to prevent stray line noise from triggering the alarm. Even so, it may react to the occasional light switch or a motor starting up somewhere in the house. Using battery power (a pair of nine-volt batteries) eliminates the noise, but this makes long-term monitoring a problem, since the batteries will only last a few days. I've found that AC power works best for continuous monitoring, and I've also built several battery-powered devices which are great for portable use.

The magnetometer, used with an external sensor, is very sensitive to changes in the geomagnetic field. Besides solar-induced effects, it will also respond to large, moving ferrous objects, such as nearby cars and trucks. It will alert you to an approaching

Continued on page 54

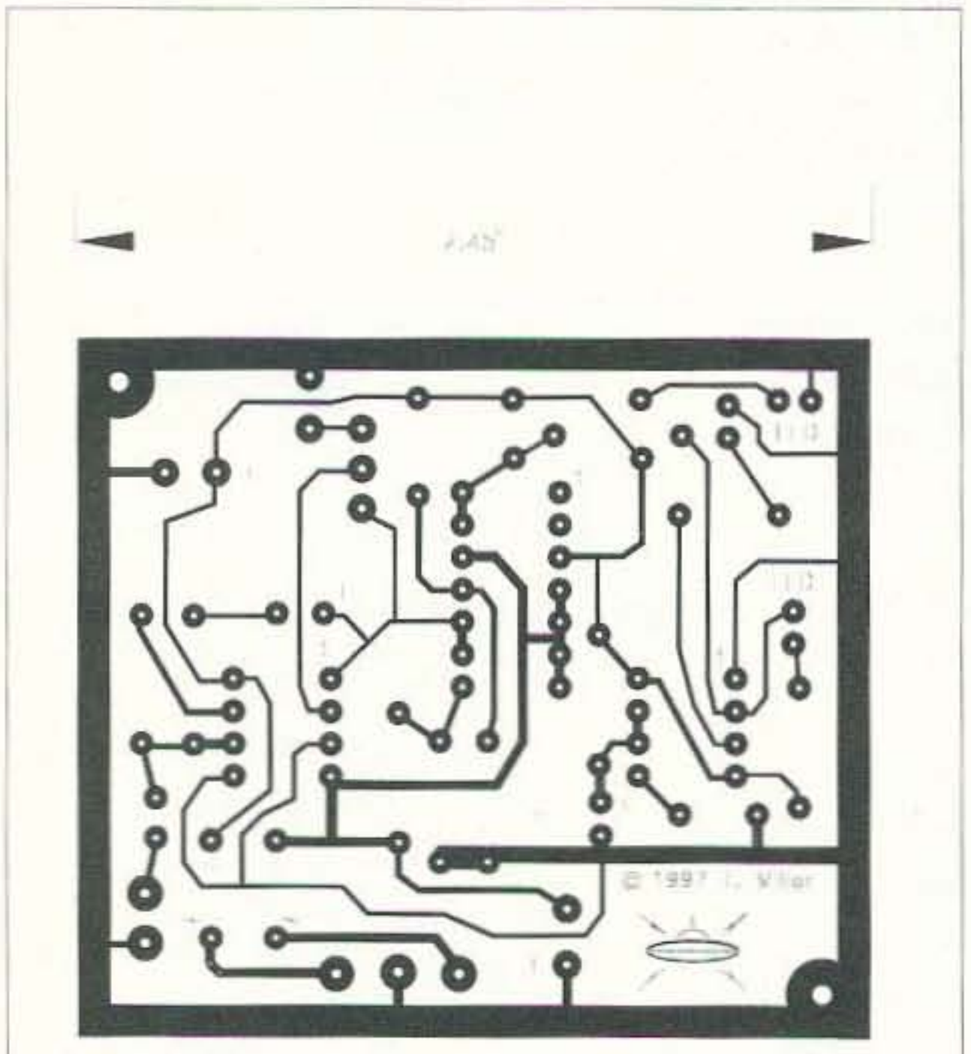

Fig. 4. Printed circuit board pattern for the "UFO Detector" magnetometer.

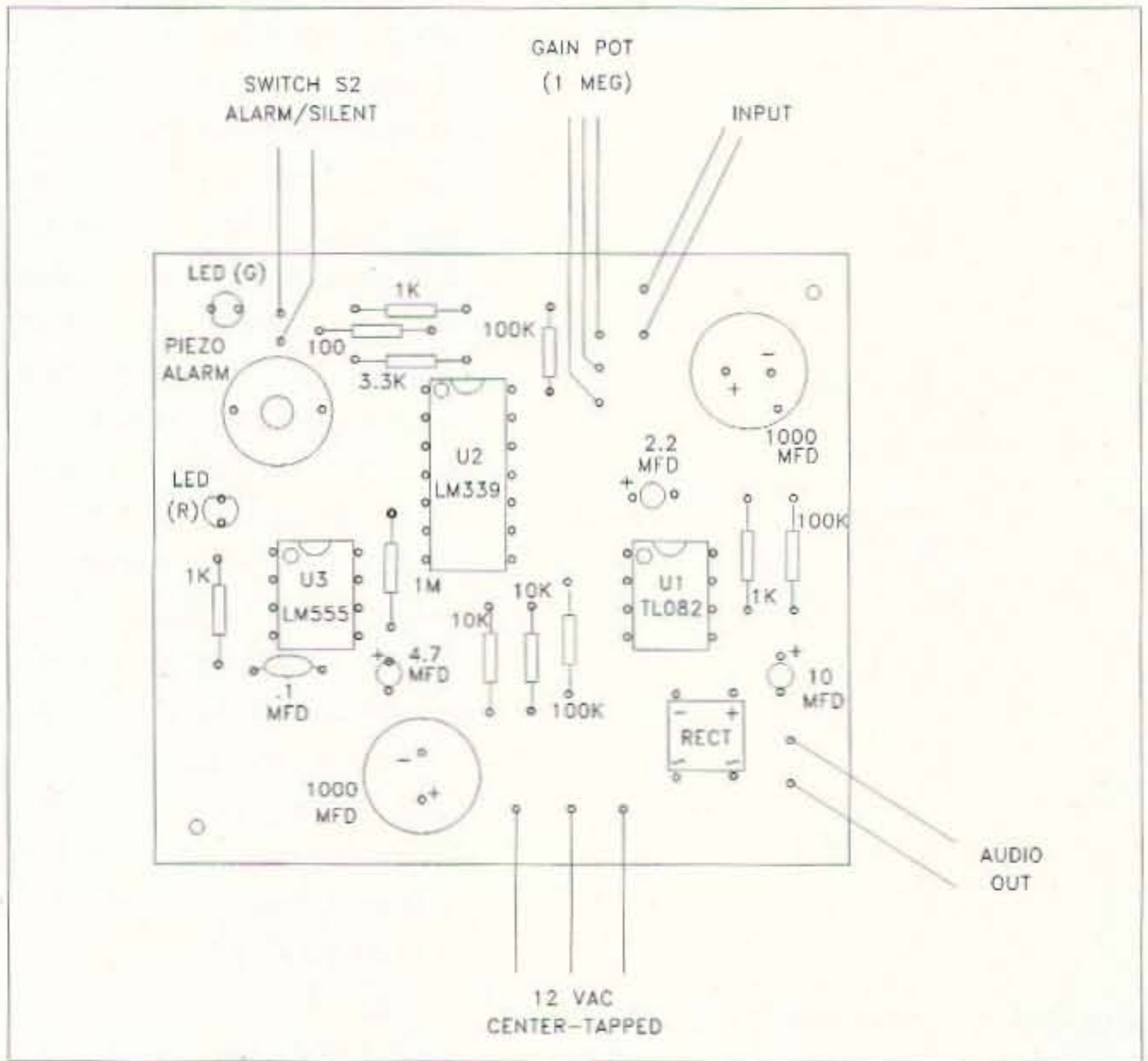

Fig. 5. Parts layout for the magnetometer circuit board. Be sure to orient the components as shown.

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 May issue, we should receive it by February 28. Provide a clear, concise summary of the essential details about your Special Event.

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 right 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].*

NEGAUNEE, MI The Hiawatha ARA will hold its 20th annual Swap and Shop Feb. 13th from 9 a.m.–3 p.m. at the Negaunee Township Hall, 42 M35, Negaunee MI. Admission $2, tables $6. Food and beverages will be available at the site. For more info, contact *Bob Serfas N8PKN, (906) 226-9782; or John Veiht N8RSE, (906) 228-9417.*

TRAVERSE CITY, MI Cherryland ARC's 26th Annual Swap-n-Shop will be held 8 a.m. to noon at the Immaculate Conception Middle School. VE exams. Pre-register or register at the Swap. Talk-in on 146.86. For more info, call *Joe W8TVT at (616) 947-8555; or Chuck W8SGR at (616) 946-5312.*

FEB 14

ROCK ISLAND, IL The 28th Annual Davenport RAC Hamfest/Computer Show will be held at the QCCA Expo Center, 2621 4th Ave., Rock Island IL, which features a large, open exhibition floor with wide aisles, ample free parking, and one-level handicapped accessibility. The hamfest features a large indoor flea market, commercial exhibits, food, and door prizes. Talk-in on the WØBXR 146.28/.88 and 146.04/.64 rptrs. Tickets are $5 in advance, $6 at the door (under 14 free). For more info on tickets or table reservations, send an SASE to *Kent Williams K9UQI, 4245 10th St., East Moline IL 61244-4154. Voice: (309) 796-0718 (4–9 p.m. only, please). FAX: (309) 796-0629 (24-hr). E-mail: [k9uqi@arcsupport.com].*

FEB 20

ELMIRA, NY The ARA of the Southern Tier will present its 18th Annual Winterfest on Sat., Feb. 20th, at the Elmira College Murray Athletic Center Domes, NYS Route 14, five miles north of Horseheads NY. Talk-in will be on 147.360(+). There will be dealer displays of new equipment, and a huge indoor flea market. Breakfast and lunch will be served on the premises. Admission is $5 at the door, children 10 and under admitted free. The event will run from 8 a.m.–3 p.m., with VE exams starting at 9 a.m. For dealer and table rental inquiries, contact *Gary N2OKU at (607) 739-0134.*

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. Pre-registrations 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 pre-registration, 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; and 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 21

FARMINGTON HILLS, MI The Livonia ARC will present its 29th Annual Swap 'n' Shop, Sun. Feb. 21st, 8 a.m.–3 p.m., at The William M. Costick Activities Center, 28600 Eleven Mile Rd. (between Middlebelt and Inkster Roads), Farmington Hills MI. Talk-in on 144.75/5.35. For info, send 4 x 9 SASE c/o *Neil Coffin WA8GWL, Livonia ARC, P.O. Box 51532, Livonia MI 48151-5532;* or call the club phone line, *(734) 261-5486.* The club Web page is at *[www.larc.mi.org].* They can also be reached by E-mail at *[swap@larc.mi.org].*

FREEPORT, NY The Winter 1999 Long Island Indoor Hamfest will be held 8:30 a.m.–1 p.m., Sun., Feb. 21st at Freeport Armory, 63 Babylon Turnpike, Freeport NY. General admission $6. Vendors $25 per space by advance registration only (no day-of-event sales). Each space includes one six-foot table and admits one person. Special close parking and/or dropoff area for vendors opens 6 a.m. for vendors only. Free parking for buyers. The flea market will feature amateur radio equipment, computers, ham equipment dealers, ARRL information, LIMARC information, and CB equipment. There will be a free VHF tune-up clinic. Walk-in VE exams at 10 a.m. for all classes (one session). Talk-in on W2VL, 146.85 rptr., 136.5 pl. For further info, call the LIMARC 24-hour infoline: *(516) 520-9311,* or write *LIMARC Hamfest, P.O. Box 392, Levittown NY 11756. E-mail [hamfest@limarc.org]; Web [http://www.limarc.org].*

NEW WESTMINSTER, BC, CANADA The Burnaby ARC's 11th Annual Fleamarket will be held at New Westminster Armouries, 6th St. and Queens Ave., New Westminster, BC. Open to sellers at 9 a.m., buyers 10 a.m.–2 p.m. Tables available in advance; please phone between 7 p.m. and 9 p.m. PT, *Harry VE7HNC, (604) 530-3962.* Talk-in on VE7RBY 145.35(-) or 442.85.

FEB 27

MILTON, VT The Radio Amateurs of Northern Vermont will sponsor the Northern Vermont Winter Hamfest and ARRL Vermont State Convention on Feb. 27th, 8 a.m.–3 p.m., at Milton High School, Route 7 in Milton, five miles north of I-89 exit 17. Features include flea market, forums, auction, dealers, book sales, and exhibits. VE exams will be given at 9 a.m. and 2 p.m. Commercial exams at 2 p.m. Admission is $3, free for under 18 years old. Tables are free while they last. Call for large setups. Talk-in on 145.15 rptr. Contact *W1SJ at (802) 879-6589; E-mail [w1sj@vbimailmail.champlain.edu].* The Web site is at *[http://www.ranv.together.com].*

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, XYLs 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].*

CUYAHOGA FALLS, OH The Cuyahoga Falls ARC, Inc., will hold its 45th Annual Hamfest Electronic and Computer Show Sun., Feb. 28th, at Emidio & Sons Party Center, 48 E. Bath Rd. at the corner of State Rd. in Cuyahoga Falls. The event will be

held 8 a.m.–2 p.m. Tickets are $4 in advance, $5 at the door, and are available from club members. Free parking. Rent eight-foot tables for $8 each; reserved tables must be paid for in advance. Contact *Carl Hervol N8JLQ, 11192 Cottingham Circle, Uniontown OH 44685-9185; (330) 497-7047.* Talk-in on 2m 147.87/.27 MHz.

MAR 5–6

PASCAGOULA, MS The Jackson County ARC will hold its 5th annual hamfest in the Pascagoula MS Civic Center, located on the Jackson County Fairground. Hours are 5 p.m.–9 p.m. Friday, Mar. 5th, and 8 a.m.–3 p.m. Saturday, Mar. 6th. Tickets are $2.50 for 12 years and older, under 12 free. Table rental is $8/eight-foot table. RV parking available on site. VE exams at 9 a.m. Saturday, Mar. 6th. For more info on the hamfest or VE exams, contact Hamfest Chairman *Charles F. (Kim) Kimmerly, 19000 Busby Rd., Vancleave MS 39565. Tel. (228) 826-5811.* Talk-in on the W5WA repeater, 145.110 (-)/146.880 (-).

MAR 6

KNOXVILLE, TN The Shriners of Kerbela Amateur Radio Service will sponsor their annual hamfest at Kerbela Temple, 315 Mimosa Ave., in Knoxville, from 8 a.m.–4 p.m. Admission is $5. Indoor vendor tables are $8 each, plus admission of $5. Setup Friday 4 p.m.–8 p.m., and Saturday 5 a.m.–8 a.m. Overnight security will be provided. Talk-in on 144.83/145.43 or 146.52 simplex. Smoking indoors is permitted in designated area only.

MAR 6–7

NEW PORT RICHEY, FL The 3rd Annual "Hamfest Under the Sun" Amateur Radio & Computer Show will be sponsored by the Gulf Coast ARC at the Fred K. Marchman Technical Educational Center, 7825 Campus Dr. Gates open Sat. Mar. 6th, 8 a.m.–5 p.m., and Sun., Mar. 7th, 8 a.m.–3 p.m. No alcohol or drugs permitted on the premises. Admission $4, tables $4, tailgaters $4. Each table and tailgate space includes an admission ticket. Commercial spaces are available. For further info, contact *Rick KF4GXS, (813) 842-2127; E-mail [richar@gte.net].* Make checks and money orders payable to *Gulf Coast Amateur Radio Club,* and mail to *P.O. Box 595, New Port Richey FL 34656-0595.* Talk-in on 146.670 or 145.330 MHz club rptrs.

MAR 7

WESTFIELD, MA The Mount Tom Amateur Repeater Assn., Inc., will sponsor the 14th Annual MTARA Flea Market at the Westfield Middle School, Rt. 202/10, West Silver St., Westfield MA. Doors will open at 7 a.m. for vendors, and 9 a.m. for bargain hunters. Admission $4, children under 12 free. Tables $15 in advance only; tailgating $5. 120 VAC available. Amateur radio equipment, computers, and parts. Help provided for loading and unloading. Handicapped parking, no stairs. Amateur and commercial VE exams given at 10 a.m.; contact *Jim WA1ZUH at (413) 245-3228* for details. Contact *Steve N1SR at (413) 593-6554,* for GROL, GMDS-O/M, ship radar, etc., exams. Talk-in on the 146.940(-) rptr. For table reservations, contact *Jim N1RUT, (413) 536-5182, or [jim.allen@the-spa.com].* See the Web site at *[www.mtara.org]* for more info and for driving directions.

MAR 13

SCOTTSDALE, AZ The Scottsdale ARC will host a Hamfest at Scottsdale Community College, 101 North - Exit Chaparral Rd., 9000 E. Chaparral Rd., Scottsdale AZ. Admission $2, tables $5. Talk-in on 147.18 and 440.00. Contact *Roger Cahoon KB7ZWI, 8501 E. Edward, Scottsdale AZ 85250. Phone: (602) 948-1824; FAX: (602) 943-3548.*

WEST ORANGE, NJ A Hamfest for Amateur Radio ops, computer buffs, SWLers, and electronics hobbyists will be sponsored by the Roseland Radio Club at West Orange High School, 600 Pleasant Valley Way, West Orange NJ, exit 7 off Interstate Route 280. Free parking, ground level access. Rain or shine. All indoors. Admission $5 at the door (no advance tickets). XYL/children under 12 admitted free. Tables reserved in advance are $12 for the first/$9 each additional. At the door, tables are $15 for the first one/$12 each additional. You must RSVP by March 1st. After that, first come, first served. Sellers only are admitted at 7 a.m., no exceptions. There is a special vendor parking lot. Talk-in on the W2QR rptr. system at 146.415(+1.0) 85.4T; 224.480(-1.6) no tone; 447.875(-5.0) 156.7T; or 146.520 simplex. VE exams. For more info contact *Jim Howe N2TDI or Liz Howe N2WGH at (973) 402-6066.*

MAR 14

STERLING, IL The Sterling-Rock Falls ARS 39th Annual Hamfest will be held at the Sterling High School Fieldhouse, 1608 4th Ave. Free parking, including areas to accommodate self-contained campers and self-contained mobile homes. There will be a large indoor flea market featuring radio, electronic, computer, and hobby items. Tickets are $3 in advance, $4 at the door. Tables are $5 without electricity, $6 with electricity. Bring your own cord. Setup Sat. 6 p.m.–9 p.m. and on Sun. beginning at 6 a.m. Doors open to the public at 7:30 a.m. Sun. Use only the north doors on Miller St. Talk-in on 146.25/.85 W9MEP rptr. For info and advance tickets/tables, contact *Lloyd Sherman KB9APW, Sterling-Rock Falls ARS, P.O. Box 521, Sterling IL 61081-0521; or call (815) 336-2434. E-mail [lsherman@essexl.com].* Advance ticket deadline is Mar. 1st. Please include an SASE with payment.

MAR 21

JEFFERSON, WI The Tri-County ARC will present "Hamfest 1999" at the Jefferson County Fairgrounds Activity Center, Highway 18 West, Jefferson WI, 8 a.m.–2 p.m. Vendors admitted at 7 a.m. VE exams for new licensees and upgrades. Electricity available. Equipment test table. Handicap accessible. Talk-in on the 145.49 rptr. Admission $4. six-foot table $5, eight-foot table $6. To reserve tables, send your SASE to *TCARC, W9MQB, 711 East St., Ft. Atkinson WI 53538. Phone (920) 563-6502 eves.; E-mail [tricountyarc@globaldialog.com].*

MAUMEE, OH The Toledo Mobile Radio Assn. will hold the 44th Annual Hamfest/Computer Fair 8 a.m.–2 p.m. at the Lucas County Recreation Center, 2901 Key St., Maumee OH. For details send SASE to *Paul Hanslik N8XDB, P.O. Box 273, Toledo OH 43697-0273. Phone: (419) 243-3836.*

HAMILTON TOWNSHIP, NJ "Hamcomp '99" hamfest will be sponsored by the Delaware Valley Radio Assn., and held at the Tall Cedars of Lebanon picnic grove, Sawmill Rd., Hamilton Twp., NJ. Take I-95 North to I-295 South; exit 60A to I-195 East; exit 2 to Yardville; South Broad St. to end, approx. 3.7 miles; go left at Yield onto Old York Rd., next right onto Sawmill Rd. The site is 1.1 miles on the right. Open to sellers at 6:30 a.m. Open to buyers at 8 a.m. Admission is $6, non-ham spouses and children admitted free. Tailgating space $10, includes one admission. Free parking, ARRL table. Covered table space $15, includes one table and one admission, some electricity. Advance covered space reservations are available. Talk-in on 146.67(-). More info available at *(609) 882-2240 or [www.slac.com/w2zq].* Send payment with SASE to *Hamcomp '99, DVRA, P.O. Box 7024, West Trenton NJ 08628.*

MAR 27

MICHIGAN CITY, IN The annual Michigan City Hamfest and Computer Flea Market will be held Sat., Mar. 27th at Michigan City High School, 8466 W. Pahs Rd., Michigan City IN, 8 a.m.–1 p.m. CST. Early setup provided for vendors. Admission is $4, children under 12 admitted free with a paid adult. Table reservations and general info is available from *Ron Stahoviak N9TPC, 5802 N 400 W, Michigan City IN 46360. Phone (219) 325-9089.*

WATERFORD, CT The Radio Amateur Society of Norwich will sponsor their 27th Ham Radio Auction, starting at 10 a.m. Setup at 9 a.m. The auction will be held at the Waterford Senior Center. From Hartford, take Rt. 2 South to Rt. 11 to Rt. 85 South. From the shoreline, take Rt. 95 to Rt. 85 North. Talk-in on 146.730(-). Bring your gear to sell (10% commission to RASON). Free admission. Free parking. Contact *Tony AA1JN at*

ABOVE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
[clhough@pacbell.net]

10 GHz fun, 1999 update: the Ramsey FR-10 receiver

Quite a few years ago, I wrote an article covering a 30 MHz receiver using a single chip receiver from Signetics, the TDA7000. The purpose of this receiver and associated modulator was to provide a simple and effective method to get started on 10 GHz with wideband FM communications using surplus Gunn diode oscillators. The Gunn diode oscillators were obtained from garage door openers and from burglar alarm circuitry.

The conversion of the burglar alarms and the door openers was mainly to toss away everything except the metal cavity containing the microwave oscillator and detector diode. While these units are not as plentiful today, they can still be located in surplus, either at swapmeets or by scrounging in electronics junk bins.

Another source for Gunn diode units is SHF Microwave Parts Co., 7102 W. 500 S., La Porte IN 46350 [FAX (219) 785-4552 or E-mail through their Web page at (www.shfmicro.com) for details]. Together, Alan and his wife Pierrett have put together a great source for Gunn diode transceivers of various models for both 10 and 24 GHz frequency ranges. Take a look on their Internet page for current material. The 24 GHz Gunn oscillator is available for $58 with varactor control (±170 MHz) at 24.150 MHz (also includes a detector). Quite a bargain for a new unit!

These devices are listed on the SHF Microwave Web page. The unit is pictured, and specifications tell you in detail what you are looking at. Other items related to microwave operation are also listed, providing a complete list of all they offer. Be sure to check out SHF Microwave Parts Co. You'll be glad you did.

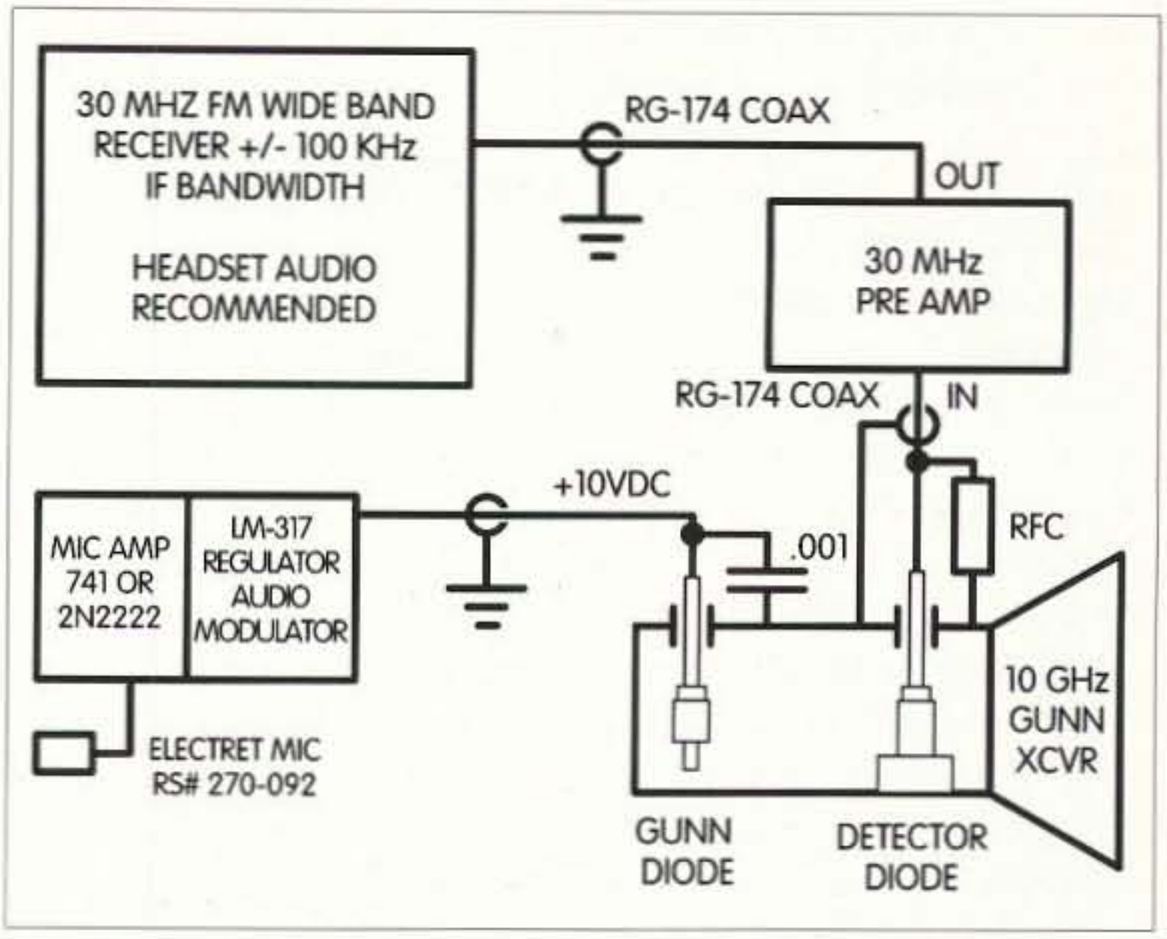

Fig. 1. Block diagram of 10 GHz system showing 30 MHz IF receiver with preamplifier, diode detector in cavity for receive, and Gunn diode in cavity for transmit. Modulator for Gunn diode is simple power supply voltage regulator, audio amp, and electret mike.

Available items include new Gunn-type oscillator detectors, and once in a while used items pop up. These units vary in complexity from simple Gunn diode oscillator detector diode units to those that are fitted with a third device, a varactor diode. The varactor diode allows for an easy frequency adjustment that is controlled by a DC voltage applied to it. While Gunn cavities that employ varactor diodes are more costly, they are much sought after for ease of operation related to varying frequency of operation.

Gunn diode oscillator systems are inexpensive to start off with, using wideband FM rather than a more sophisticated SSB system. Well, the main difference among them is price and the test equipment needed to modify and test an SSB-type system. The cost for a working wideband FM system is about $80, assuming that you purchase the components new. This differs from SSB-type systems, whose cost could run as high as $250 for a kit of parts that you still have to modify from commercial frequencies to 10 GHz. There are fully assembled transceivers available from European manufacturers in a ready-to-use assembled unit for $600 to $1000, depending on RF power output.

While I operate on both wideband FM and SSB, I still recommend wideband FM for a beginning taste of microwave operation. As a matter of fact, I am in the process of constructing a 24 GHz wideband FM transceiver for use in the ARRL 10 GHz-and-up contest and to update with the Ramsey 30 MHz FM receiver system.

As I stated earlier, I began using a Signetics TDA7000 single-chip FM receiver tuned

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(860) 859-0162, or see the RASON Web page at *[www.ims.uconn.edu/~rason]*.

MAR 28

MADISON, OH The Lake County ARA will hold its 21st annual Hamfest on Mar. 28th, 8 a.m.–2 p.m., at Madison High School on Burns Rd. in Madison. The hamfest will feature new and used amateur radio, computer, and assorted electronic equipment, amateur-radio-related forums, an equipment test bench, and VE exams for those interested in earning an amateur radio license. Admission tickets are $5 at the door. Table space for vendors is $8 for a six-foot table; $10 for an eight-foot table. Reserve tables by calling *Roxanne at (440) 256-0320*. Talk-in on the LCARA 147.21 rptr.

SPECIAL EVENT STATIONS

FEB 13–14

ALEXANDRIA, VA The Mount Vernon ARC will operate K4US 1600Z–2100Z 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-inch certificate, send QSL and SASE to *MVARC, P.O. Box 7234, Alexandria VA 22307.*

MAR 27

MACON, GA The Macon ARC will operate W4BKM 1500–2300 UTC on Sat. Mar. 27th, at the 17th annual Cherry Blossom Festival in Macon GA. Phone: 7.235, 14.240 and 21.335; CW 7.135, 14.035 and 21.135. For a certificate, send your QSL and a 9 x 12 SASE to *Macon ARC, P.O. Box 4862, Macon GA 31208.*

to 30 MHz for earlier transceivers. The modulator is nothing more than a voltage regulator that has its adjust terminal modulated with a low-level microphone-driven amplifier. The audio amp can be as simple as a single transistor or op amp, with parts availability determining how low the cost.

What then can be improved in the circuit designed earlier? Well, today the TDA7000 single-chip FM receiver design still works well and is still in my shack functioning. However, several things have come to my attention concerning parts availability and cost in general. The TDA chip I used earlier is getting hard to obtain, and the scrounging of component parts has created a delay factor for many amateurs in getting on 10 GHz quickly, not to mention 24 GHz, which is even more difficult.

Considering all this, I started to look at designing a new 30 MHz receiver (IF), but after looking at what was available on the commercial market, I have reconsidered designing a new receiver. What I discovered was a kit from Ramsey Electronics for a 10-meter FM receiver. This kit from Ramsey was very reasonably priced, making it attractive. Looking at Ramsey's literature and design specifications, I was quite taken by this very fine and inexpensive FM receiver. The Ramsey FR-10 unit will interface well for the 30 MHz FM receiver portion of the Gunn transceiver with a few simple modifications to the original design.

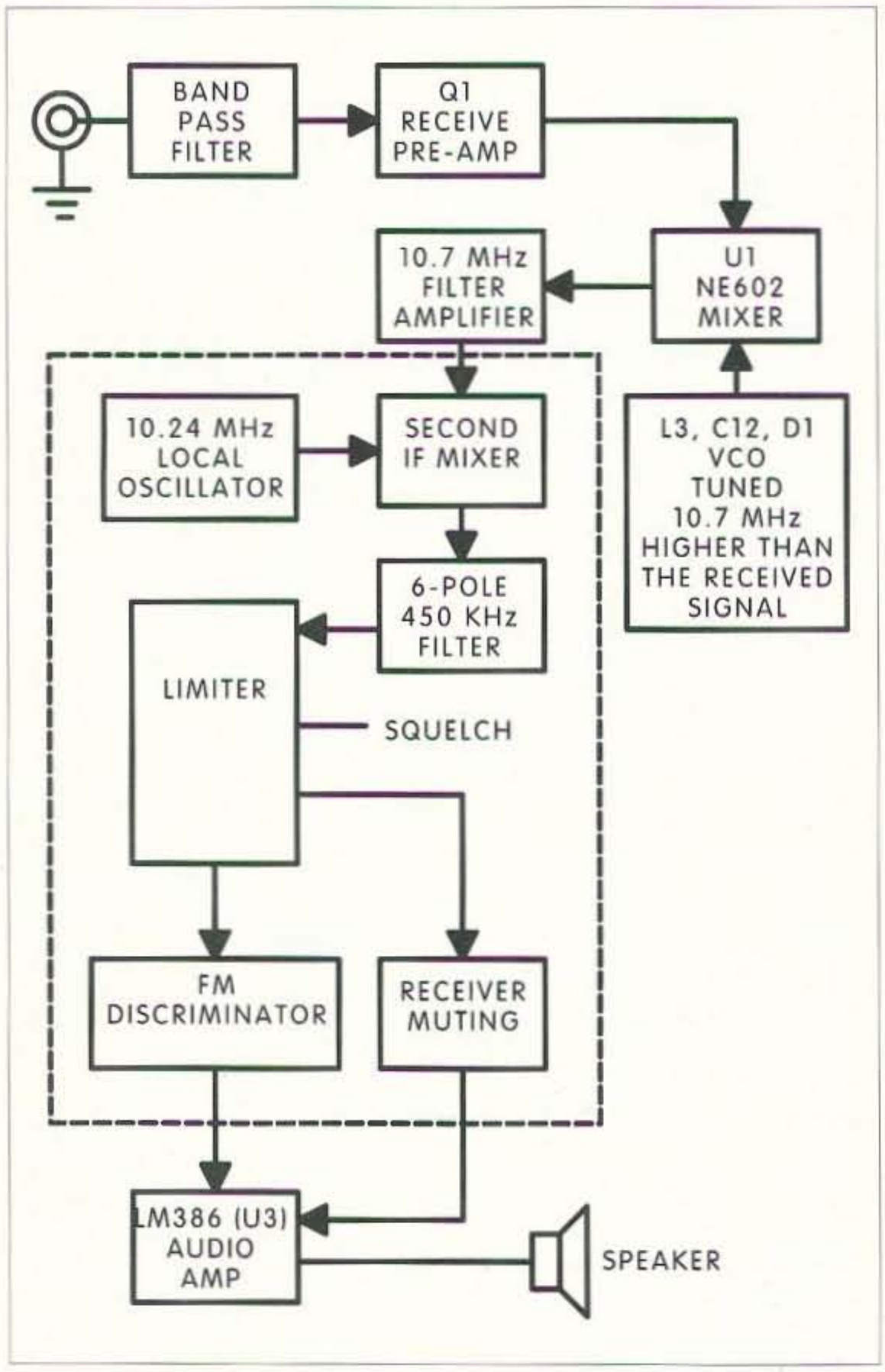

Fig. 2. Block diagram of Ramsey Electronics FR-10 30 MHz receiver kit with internal preamplifier, an excellent bargain that comes with all components needed to form an operational FM receiver. This receiver interfaces quite well with the Gunn diode transceiver system for either 10 GHz or 24 GHz operation requiring a 30 MHz wideband FM receiver system.

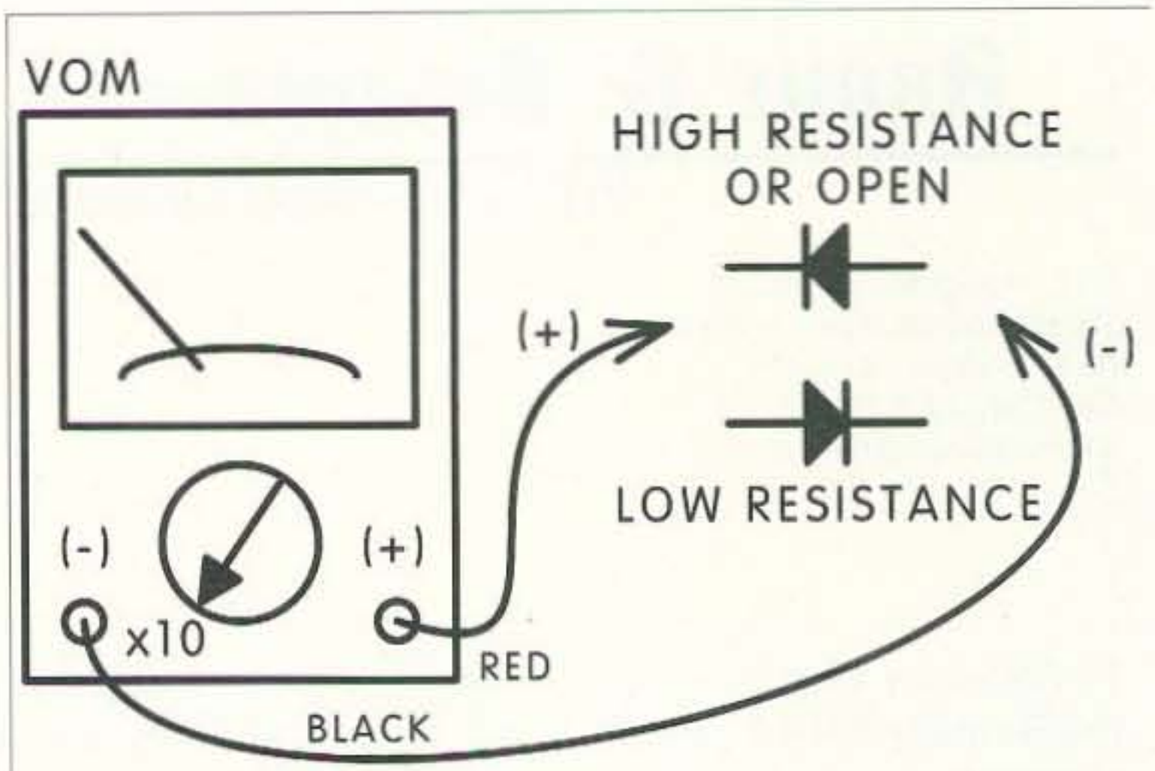

Fig. 3. Diode ohmmeter check to verify diode polarity. Application the same regardless of whether regular diode rectifier or varactor diode.

Fig. 1 shows the functional block diagram of a basic wideband FM microwave system. This month, let's limit our scope to the 30 MHz wideband FM receiver, covering the assembly and modification of the Ramsey Electronics FR-10 receiver. Next time, I will cover the construction and assembly of the remainder of the system—the power supply modulator—and describe some testing methods.

Ramsey FR-10 FM receiver

I obtained two FR-10 receiver kits to construct two separate transceivers, one for Kerry N6IZW and one for myself, to allow testing of the finished product over a test range of about three miles. Performance testing is kind of difficult without a partner, be it on 10 or 24 GHz or somewhere else. It's kind of hard to talk to yourself, making a partner very important for experimentation on microwave.

The Ramsey kits arrived, and construction evaluation began right away as I was anxious to get started. Looking over the literature supplied with the kit, I was surprised with the detail that was presented. It was quite sufficient to enable a beginner with limited construction ability to finish this kit and make it operational. The construction was presented in the Heathkit fashion familiar to many amateurs. An introduction is followed by a "how to construct your work area," a circuit description, and block diagrams on operation, all providing enough detail for familiarization with the FR-10.

After a review of the intro documentation, the component parts are checked. I might suggest a sorting procedure to avoid confusion when stuffing the PC board with components. Sort component parts onto pieces of paper with a pencil notation as to individual value. Place resistors on one paper so marked and capacitors on another. This makes for simple assembly without having to identify by color code or value once you begin construction. In sorting resistors, I always use a simple ohmmeter check to verify what these eyeglasses and magnifying lenses decode from the color bands.

A little preparation at the beginning might save you time later when you test the system out. Follow the construction details outlined in the Ramsey literature. The construction is quite easy, as each component part number is printed on top of

the circuit board to further ensure that you are placing the correct component in the proper location. The only error you could make is misidentifying and misvalidating resistor color codes or other parts values which are clearly marked.

I followed the instruction manual, and found that the presorted components helped speed construction. All components were placed with ease—even polarity-sensitive capacitors, ICs, and transistors were plainly marked as to orientation on the top of the circuit board. Such a quality PC board makes errors avoidable if you take the time to read and look at parts identification on the board and in Ramsey's literature.

There was confusion regarding only one part in the kit—a varactor diode's correct orientation, the cathode/anode positioning on the board. While the board was clearly marked with which end was which, the diode was not. To verify which lead was the anode, I used my bench VOM meter. With most ohmmeters, you should use the x10 scale (current-limited) and the meter's red lead on what you think is the anode. That's positive side of the diode to the red lead and the cathode to the black lead (negative). The diode should indicate a few hundred ohms; if not, reverse the diode. When you get a reading of a few hundred ohms, you know which end is the cathode, as it is on the black lead of the ohmmeter in this simple test. Reversing the meter leads, there should be no indication on the ohmmeter.

To prove your test is accurate and that your meter is positive on the red lead, grab any marked diode, put the black lead on the cathode and the red on the anode, and verify a reading of a few hundred ohms. See **Fig. 3**.

This was no big deal. Only one part, and minor confusion solved by a simple ohmmeter check. Even if the diode were inserted backwards it would only have disabled the frequency tuning control. A simple voltage check on the diode side of R8 would prove a fixed voltage of 0.6 volts when the diode was reversed on the board. When the diode is mounted correctly, the voltages will read from zero to six volts when the tuning pot is rotated.

A minor problem, but one that will not cause things to "go up in smoke" when power is applied. Give the PC board a good going over for solder bridges and clippings from component parts before proceeding. Make sure that the DC power input is free of shorts by using the ohmmeter, again on the x10 scale. Check the DC 9 V input leads and turn on the power switch. The ohmmeter should indicate low resistance and then rise to a much higher reading. What is changing is that the electrolytic capacitors are charging and the ohmmeter, in a few seconds, should be in the kΩ ranges. Now you're ready to apply power and check out the receiver.

I used my old URM-25 signal generator to verify operation and sensitivity at 30 MHz. Both receivers constructed performed as advertised, and sensitivity was less than a microvolt for full quieting. Follow Ramsey's instructions and all will be well. My two receivers worked right from the start. The only adjustment was L4 for audio output and L3 for proper frequency range adjustment. Ramsey thought of everything: They even provided a tuning tool to make the adjustments. What a kit! All I had to provide was my time and some solder!

Once I adjusted the RF frequency oscillator coil, I wanted to see how well the onboard RF preamplifier functioned. Was I surprised that the sensitivity was in the tenths of a microvolt for full quieting! There was some pickup of commercial FM broadcast in the 88 to 108 MHz range on very strong local stations. I had observed this before with other systems—even the TDA7000 circuit design, years ago. Note that at this stage of testing I have not placed the receiver and modulator into a metal cabinet, which is necessary from a shielding standpoint. Any receiver that is going to be co-located on a hilltop with commercial high-power radio and TV transmitters can get into trouble if shielding is not used. If you use good shielding techniques, interference will be minimized.

I can't give more importance to shielding and to proper lead bypassing with feedthrough capacitors. All power leads that leave the cabinet should be tied through a feedthrough capacitor, not a rubber grommet. This goes for the hot speaker lead as well. With a metal cabinet and feedthrough capacitors used, the interference from commercial FM was eliminated.

Modifications for wideband FM

There are modifications that need to be made once you have determined that your receiver is operating properly. These modifications are necessary for greater bandwidth than the receiver comes stocked with. The conversion is simple and includes removing FL2 (450 kHz filter) and replacing it with a 0.01 µF disc capacitor. This makes the passband about 100 kHz wide. Shunt resistor R14 (33 kΩ) with a 3.9 k on the bottom of the PC board. This further broadens the passband to about 200 kHz.

The original tuning range of the FR-10 is about 5 MHz wide. We need to reduce this to about 500 kHz, centered at about 30 MHz. Remove C12 (56 pF) and replace it with a 15 pF disc capacitor. A second 15 pF disc capacitor is added under the PC board, shunting across L3, the oscillator coil.

To add finer frequency tuning, remove 10 k pot R10 and replace it with a 10-turn 10 k pot and calibrated readout dial for really fine frequency adjustment. Also, my headphones did not fit the headphone jack that was supplied with the kit, so I just jumpered the bottom of the board to a panel-mounted jack to fit my mike/headset connector.

The PC board was fitted with four standoffs to position it off the chassis by a small distance. The cabinet was connectorized with different connectors for each of the termination leads to avoid connecting the wrong device to the wrong jack. For instance, I used a two-connector cord for DC power, and bypassed the leads inside the cabinet with feedthrough capacitors. The headset has both a miniature one-eighth-inch connector and a standard quarter-inch stereo connector. This allows a

HOMING IN

Radio Direction Finding

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Mobile T-hunting, international-style

"Won't you run out of topics?" That's what a former editor of *73 Magazine* asked when I proposed a monthly column on radio direction finding (RDF), better known as foxhunting. It's been over 10 years since then, and there are more potential topics than ever. If RDF is one of your ham radio interests, you can always find something new to do. There are projects to build, noise sources to eliminate, jammers and bootleggers to catch, wildlife to track, aircraft ELTs to locate, and hidden transmitters to find.

Recent "Homing In" columns have emphasized foxhunting under International Amateur Radio Union (IARU) rules. This on-foot sport, which usually takes place in large forests and parks, is called foxtailing, foxteering, ARDF and radio-orienteering. Many clubs in North America are adding it to their hidden transmitter hunting activities. They are looking for ways to get T-hunters out of their cars and into the woods once in a while. One way to do that is to have mobile T-hunts that follow the foxtailing format, but with foxes spread out so that hunters can drive to them, at least most of the way.

I first heard about mobile versions of international-rules hunts from hams in Australia. (They call it CarDF.) Jay Hennigan WB6RDV and Dennis Schwendtner WB6OBB of Santa Barbara, California, were probably the first stateside hams to try it. According to the report from Marvin Johnston KE6HTS, everyone thought it was fun. So I decided to give it a try when it was my duty to put on the First Saturday Night T-hunt here in Fullerton last September. April Moell WA6OPS, Tom Curlee WB6UZZ, and David Curlee KE6IPY helped out.

Not enough transmissions

IARU foxtailing rules call for five transmitters on the same frequency, each transmitting a simple MCW message for one minute in sequence. Fox #1 sends MOE MOE MOE for 60 seconds; then it goes off and #2 sends MOI MOI MOI for 60 seconds. Then #3 sends MOS MOS MOS, and so on until #5 goes off and #1 immediately starts the sequence over again. That's the way my five Ts were programmed. Even without knowing Morse, it's easy to determine which T is on the air by counting dits.

In radio-orienteering, the goal is to walk or run to all foxes, then get to the finish line first and within the time limit, usually about two hours. Late arrivals are disqualified. For this First Saturday mobile hunt, which is traditionally scored by odometer mileage, we announced that the winner would be the team that had the lowest mileage among those finding the greatest number of Ts. Mileage would be taken at T5, so teams had to find it last. The others could be found in any order. All Ts were programmed to shut off at midnight, exactly five hours after the start of the hunt. Teams not reporting to T5 by then would be disqualified.

Traditional southern California mobile T-hunts are both a "hider versus hunter" and "hunter versus hunter" game. The hiders do their best to foil the hunters using mountain bounces, not-on-the-map fire trails, camouflage, and so forth. But an international-style hunt is supposed to be a competition only among hunters, not between hiders and hunters. It's intended to teach hunters to take bearings carefully, plot them, plan an efficient route, and execute the plan.

In that spirit, we made every effort to have the hiding spots be relatively easy to find, with none of the usual signal tricks. All Ts were copyable at the starting point, though it was necessary to move around the start hilltop to get optimum signals on all of them. The fox boxes were right next to roads accessible by passenger car, except for two that were in public places less than 250 feet from roads. All of them were within 11 airline miles of the start.

The clear lesson from this hunt was that IARU's fox timing is not optimum for mobile T-hunting. The one-minute-on/four-minutes-off transmission ratio gives only 12 transmissions per hour per fox. Only one team found all five foxes, but arrived at the last fox 10 minutes after the midnight deadline. If we do it again, we will use a 12-seconds-on/48-seconds-off cycle for each fox, which will

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choice between using a mini headset or my dual padded stereo headset for noisy locations. The mike jack is a standard three-pin miniature of different size than the receive headset jacks, avoiding confusion.

The modulator that provides DC power to the diode is fed via coaxial cable and appropriate connectors to easily tell the voltage supply from the detector (receiver diode). I used a BNC on the voltage connector and an SMA for the input to the Ramsey FR-10 30 MHz receiver. This further avoids confusion when in a rush to get on the air. You cannot make a wrong connection ... unless you use a pipe wrench!

What is my recommendation on the Ramsey Electronics FR-10 30 MHz receiver kit? If you are interested in 10 GHz or even 24 GHz wideband operation, this is a most inexpensive kit that performs even better than I expected. You cannot ask for better value in a kit. Ramsey even tossed in the alignment tool, to be sure you could adjust the two coils in the kit properly. That in itself shows that Ramsey should be proud of the kits they produce. The FR-10 comes not only with a quality PC board, but also with tools and easy-to-follow instructions to ensure that the kit will function as advertised.

I constructed two kits. Both were simple to assemble and both functioned better than I expected. Sensitivity was a key issue and the 0.2 microvolt sensitivity for full quieting of the receiver at 30 MHz was very impressive. Order your FR-10 receiver kit now and be ready for the completion of this project in Part 2 next time. Ramsey Electronics is located at 793 Canning Parkway, Victor NY 14564. Their order phone is 1 (800) 446-2295, while questions or order status handling is available at (716) 924-4555.

Next time, I plan to complete this transceiver and cover the interface of the receiver and the transmitter modulator circuit. The bottom line is that this receiver can be interfaced with either a 10 GHz or 24 GHz oscillator/detector cavity for great wideband FM fun. 73, Chuck WB6IGP. 73

give hunters a chance to get a bearing on each one every minute.

The winning team was Clarke Harris WB6ADC and Richard Clark N6UZS. After the hunt, Richard explained, "We found T2, T1, T4, and T5, in that order. After four hours, we were really close to T4 and decided to forget about T3 so we could get to T5 by midnight. We figured it would take 30 minutes to drive, plus sniffing time, so we were moving really fast."

Ghosts and goblins to track

Another ham who has discovered radio-orienteering and wants to get mobile T-hunters to try it is Bonnie Crystal KQ6XA of San Mateo, California (**Photo A**). Her method was similar to mine, but her execution was far more creative.

Last October 31, Bonnie put on the monthly Pack-a-Lunch T-hunt in Fremont, California, near San Jose. Considering the date, a Halloween-theme hunt was most appropriate. In doing it, she gave hunters something they had not done before, but made it fun for everyone. According to long-time hunter Jim Sakane KD6DX, "It was one of the most elaborate and finest T-hunts I have ever participated in."

Photo A. *Bonnie Crystal KQ6XA holds one of her six Halloween fox transmitters and the fake campaign sign that concealed one of them. (Photo by Jessica Stevens.)*

Although new to hidden transmitter hunting on the ham bands, Bonnie won both of her first two T-hunts, making it her responsibility to be the hider that month. "I've used both low frequency and VHF direction finding for many years for other radio operations," she told me. "Now I wanted to start off hiding with a splash. The hunters had no prior knowledge of the style of hunt to expect. All my preparation was done in complete secrecy. The only indication I gave the week before the hunt was that I was working on a T, and hoped to have it together in time for the hunt."

Seven teams assembled at the starting point, waiting for Bonnie's signal to appear at 10 AM. At the appointed hour, her voice appeared on the local repeater, telling the hunters to check under nearby rocks for instructions. Ron Susztar N7TVE was first to spot the stack of papers containing a cryptic poem (see *Trick ... or Treat?*).

The poem disclosed nothing about boundaries of the hunt area, nor did it reveal how many transmitters there would be. But hiders who had read about international-style foxhunting realized that this method of signaling and identification would be followed. Besides the MO designations, Bonnie helped the hunters distinguish between transmitters by giving each one a different CW tone pitch. To add to the intrigue, some of the transmitters also played sound effects, sounding like a haunted house. Others had sensitive microphones to cause audio feedback as hunters approached with their handie-talkies on.

All of Bonnie's fox boxes used PicCon controllers (see "Homing In" for March 1997), programmed to start and stop the transmit sequences automatically. Only two of the foxes (T1 and T2) came on the air at the 10 AM start time. T2 (MOI) was cleverly concealed inside a steel post just 100 feet from the start point in a vacant lot

Trick ... or Treat?
A Halloween Transmitter Hunt

by Bonnie Crystal KQ6XA

Strange and mysterious! From another dimension!
This little hunt takes all your attention.
A fox of a witch waits for you to arrive.
The radio, it's haunted on 146.565!

The mind plays tricks and fools the eyes;
Believe your equipment—it never lies.
"Always trust your initial bearing,"
You might go astray when you're feeling daring.

Why walk away from your listening posts?
Clues will be there in spite of the ghosts.
Point your antennas and tune your receivers,
The path to the fox isn't paved with deceivers!

"How many," you ask, "will there be to find?"
Quite enough just to drive you right out of your mind!
Who are "MOE," "MOI," and the rest?
Just a fox in the trick-or-treat transmitter nest.

"MOE" is one and "MOI" is two,
"MOS" is three, on and on like a zoo.
Will "MOH," "MO5," maybe more appear?
Keep your ears open for what you can hear!

Always save your special li'l wrappers,
Or you'll wind up like li'l morning nappers.
If you're a-fakin' or you've been mistaken,
The witch will object to some goodies you've taken!

Get back to the start point for eleventh the hour ...
When witch casts her spells with even more power!
Then fly like a bird to the witch's lair,
When the clock strikes three, make sure you are there!

(**Photo B**). It put out only one milliwatt and the antenna was a one-inch bolt! T1 (MOE) was about a quarter-mile away, running 10 milliwatts into a quarter-wave whip. Both of them shut down after one hour.

Jim Sakane wrote, "The instructions stated, 'Why walk away from your listening posts?' So I decided to stay and get accurate initial bearings. Lucky I did, as I found the MOI transmitter in the fence post, with a microphone. I kicked it by accident and everybody heard it on their two-meter radios."

After that, it was off to find T1, which was emitting ghoulish sound effects. Bonnie had

Photo B. *Ron Susztar N7TVE is amazed that fox #1 is somewhere inside this fence post! (At least that's what his RDF equipment indicates!) (Photo by Jim Sakane KD6DX.)*

***Photo C.** Hmmm ... An ammunition can with antenna atop a sign board. And the signal is really strong! Can this be fox #3? (Photo by KD6DX.)*

taken advantage of the sign clutter that decorates the fences of most California vacant lots at election time. T1 was inside her own fake campaign sign. T-hunters can be mesmerized by watching their sniffing devices, so they might have missed the fact that the sign read "RE-ELECT FOXX." The fine print underneath was "Paid for by Californians for Bay Area T-Hunts Committee."

Instead of the traditional sign-in sheet, a bag of Halloween candy was near each of Bonnie's foxes. Each bag had a different brand of candy bars. Hunters were expected to eat one and save the wrapper, to be turned in as proof that they had found that particular fox.

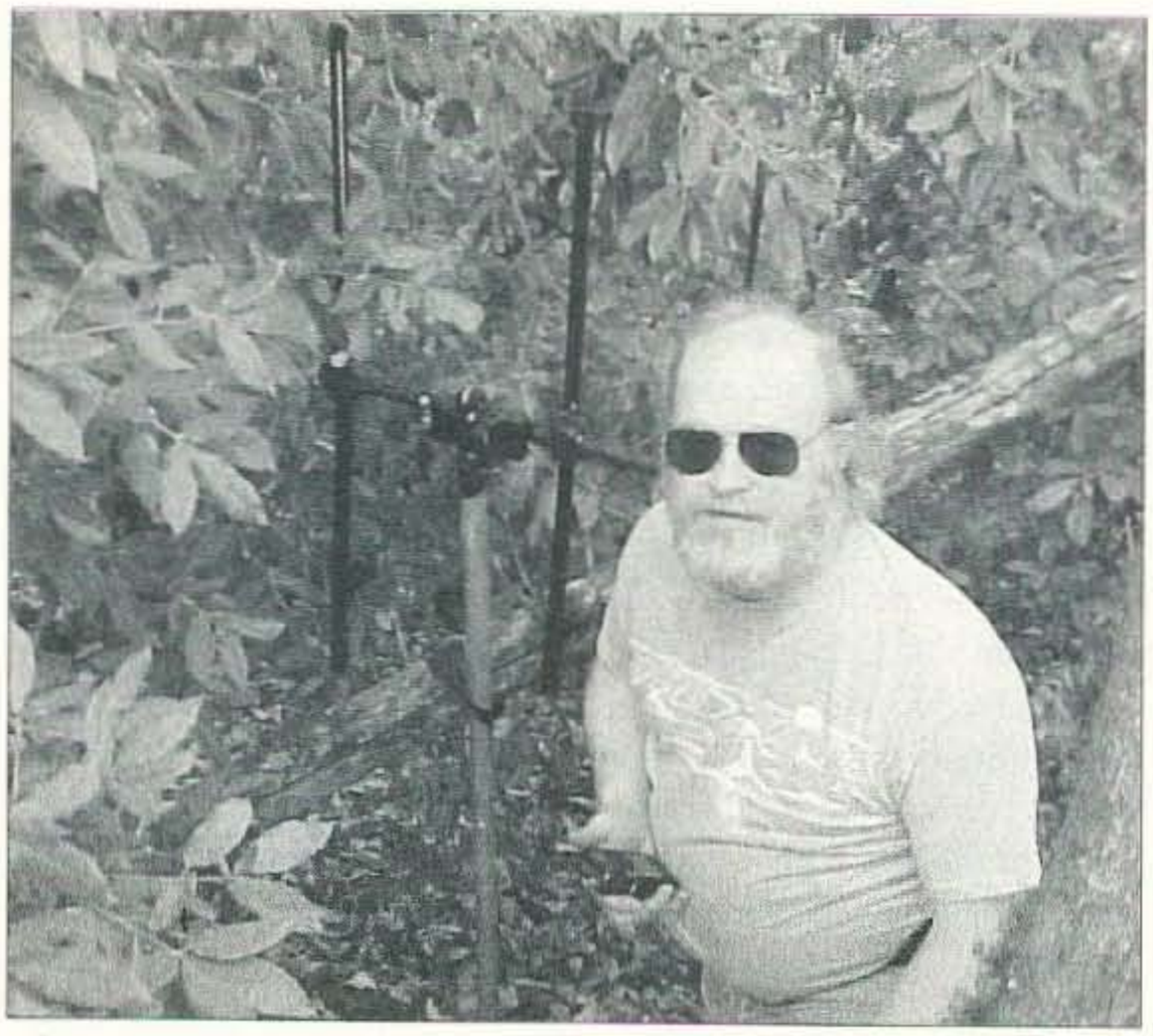

***Photo D.** Rich Harrington KN6FW just found fox #4 deep in the woods. Its beam antenna caused the signal to bounce from a mountain to the north. (Photo by KD6DX.)*

According to KQ6XA, "It took them the entire hour to find T1 and T2. Our video tape shows them walking around in circles and then walking away several times, totally befuddled."

How many more?

At 11 AM, T1 and T2 disappeared from the air, replaced by T3 (MOS) and T4 (MOH). Both were about 25 miles away, on the west side of San Francisco Bay. "Many hunters searched the same area on foot for T3 and T4 at first," Bonnie reported. "Their signal strength was similar to the earlier ones, due to their much higher power and high location."

"The MOS signal was very loud," KD6DX wrote. "I sometimes received it full-scale. I drove around the start point area and the direction did not change at all. This told me that it was not close. Greg Ottria KE6PTP and I headed off the hill to catch Highway 101 near Mountain View. We picked up lunch in Sunnyvale and continued north, ending up on Skyline Boulevard."

Upon exiting their vehicles, most hunters quickly spotted an ammunition box with whip antenna sticking out, fastened to a "Trail Closed" sign (**Photo C**). They grabbed a candy bar from the bag next to it and headed off into the woods to look for the source of the weaker MOH signal. "T4 was a little harder to find," KD6DX reported. "I had a lot of signal reflections and didn't know where to go. KE6PTP and I walked up a trail until the sniffer pinpointed it below trail level (**Photo D**).

Jim continued, "As we took the Mr. Goodbar® candies, Bonnie walked up behind us in her witch costume. She asked if we had finished looking for the three to eight transmitters. We gathered from her cryptic statement that there were more foxes to hunt. With careful attention, we discovered that there was a third signal mixing with the strong MOS and MOH sounds coming from our receivers. We got into our cars and headed north on Skyline, where the mixed signal was getting louder and stronger than T3 and T4. We parked our car in a bike trail parking lot and hunted the mixed signal, which turned out to be T5 mounted on the back fence.

"At that time we heard still another signal mixing in," Jim added. "With all these foxes transmitting at the same time, we were getting pretty confused. I discovered that the closer you get to even a weak transmitter, it will eventually overtake a strong transmitter. Rich Harrington KN6FW was the only person to go after T6. He found it about 300 feet up on a ridge overlooking the parking lot."

As the hunt ended at the stroke of 3 PM, all hunters gathered in the hilltop parking lot. They turned in their candy wrappers and waited to find out who had won. But first, Bonnie had a surprise for some of them. She opened the ammunition can—the one that was on the ROAD CLOSED sign—to reveal nothing but some heavy rocks! It was a decoy.

The real T3 was heavily camouflaged in nearby brush with its circularly-polarized yagi antenna pointed to the starting point. The decoy box was directly in the signal path. Anyone who turned in a wrapper from the decoy was penalized by having one fox deducted from the team's score. By the way, the candy next to the decoy was aptly named "Trix®."

KN6FW was the undisputed winner of the hunt. According to Bonnie, "He turned in all six wrappers from the real foxes and was smart enough to keep the decoy candy wrapper in his car. His mileage was lowest also. On the other hand, the worst mileage was over 100 miles. One hunter chased the mountain reflection from T3's beam to a mountaintop area above Oakland about 25 miles

QRP

Low Power Operation

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How many hours have you spent working on the finer details to peak the front end of a QRP receiver? Then, after hours of work, you connect your dream rig up to a ho-hum audio amplifier. Kinda trashes all your work, doesn't it? Well, this month we'll take a closer look at some of the many different audio amplifier chips available to the home builder. We'll also look at the old standby—the LM386.

Keeping it simple

Everyone likes to keep things simple, no matter what the project. However, in an audio amplifier, sometimes simple is the not the best way to go. I guess it all depends on what the end product will be. If you're only after enough audio to drive a pair of walkthing headphones, then you can get by with a few resistors and a couple of 2N2222s! If you want to enhance your audio so you can listen to the rig for hours on end, then you'll have to come up with something a bit better.

Set up some guidelines

If you are working on the audio section of a receiver, you should put some design goals on paper. If, for example, you're going to be using the receiver (or transceiver) for portable use, then current consumption is rather important. Likewise, if you're planning for portable use, do you really need a two watt output amplifier? While you and your family may like CW in the background while you camp, those of us around you may be camping to get some peace and quiet!

Another guideline is the amount of space, and thus the part counts needed to produce your desired output. If you're building a super-small rig, then you'll have to design your audio section using the minimum number of parts. In this case, perhaps the use of surface mount components may be required. And if that is so, then you once again have to look at the output power you can safely pull out of an SMT audio amplifier. On the other hand, if you're planning on building a rig that will never see the green grass of a national park, then you may want to go with lots of audio. If that is the case, there are many hybrid ICs that have very low internal distortion numbers. We'll look at a number of these chips in a moment.

As home-brewers, we can take advantage of some of the specialized audio IC chips that have sprung up from consumer goods. There are audio ICs that support up to five watts of very clean audio. In addition, you can double up the power because these chips also produce great-sounding audio. To really make things more interesting, some of these specialized audio chips have an onboard attenuator. You can remotely control the volume by varying a DC voltage instead of running audio around your chassis! Although most of this is overkill for most of us, the technology is there nonetheless. Let's get going!

The LM380N

The LM380N is an audio amplifier in a 14-pin DIP package that requires very few additional external components to make a complete 2.5 watt amplifier. The gain of this IC is fixed at 34 dB. The LM380N chip has a unique input stage that allows inputs to be ground-referenced. The output is automatically self-centering to one half the supply voltage. The LM380N has output short circuit protection with internal thermal limiting. Since this chip has the internal thermal heat sink connected to the middle pins, it allows for easy heat sink design using the PC board traces.

The LM388

This audio chip is very similar to the LM380N. The gain is internally set at 20 dB. However, by changing a few external components, (a resistor and a capacitor between pins 2 and 6), the gain can be increased up to 200 dB. The inverting/non-inverting inputs are ground-referenced, while the output is automatically biased to one half the DC power supply voltage. The LM388 will operate with low distortion all the way down to 4 VDC.

The LM384

If you're looking for something to rock your neighbors, this is the one that will do it! The LM384 will produce five watts. Having the same 14-pin configuration, you could swap out this chip with either the LM380 or the LM388, with minor pin changes on your PC board.

The LM386

Here's our old friend! Primarily, this chip is designed for low-voltage, battery-operated applications. With pins 1 and 8 open, circuit gain is internally set to 20 dB. With a 10 µF capacitor between pins 1 and 8, the gain is then set to 200 dB. The gain of this chip can be set to just about anything in between these two levels by adding a resistor in series with the capacitor connected between pin 1 and pin 8.

The TDA2040

Here is a chip that will also rattle your windows with its 20-watt output. The TDA2040 is in the five-pin SIL (single inline) package. It's a good thing that

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away on the east side of the bay and eventually gave up, notifying the hunt group via a repeater."

As I have written before, I think the best hidden transmitter hunts include surprises. Bonnie certainly fulfilled that mission, and she gave the Pack-a-Lunch bunch a good introduction to international-style foxtailing in the process. KD6DX proclaimed, "I think Bonnie and her helper Jessica should be given a five-star rating and made the exclusive fox for all Pack-a-Lunch T-hunts. But Bonnie, it doesn't have to be this hard every time!"

Bonnie and her friends are also planning some all-on-foot foxhunts following international radio-orienteering rules. She hopes to put together a team to compete at the 1999 Friendship Radiosport Games (FRG-99) foxhunts in Portland, Oregon, this coming August. As I reported last month, competitors from Russia, Japan, Canada, and perhaps other countries are expected to attend this event, which has been designated as the first IARU Region 2 ARDF Championships.

For more information on how you and your fellow hams can hold international-style foxhunts and participate in FRG-99, visit the "Homing In" Web site, URL above. If you haven't succumbed to the lure of the Web, send a self-addressed stamped envelope to my postal address above and I'll send you the information by return mail. 73

Number 46 on your Feedback card

On the Go

Mobile, Portable and Emergency Operation

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A value statement

There's a saying, often attributed to Henry Ford, that goes something like, "Whether you believe you can, or you believe you can't—you're right." There is a lot of truth in that. We tend to achieve what we believe we can achieve.

Sometimes, for example, I hear from other amateurs that they have been intrigued by mobile or portable operation, but feel that it is too expensive. In fact, most of us have heard of prospective hams who are interested in the hobby but don't pursue their interest because of this perception that it is prohibitively expensive. This may be one of the most inaccurate assumptions we face today.

I may not have the best-equipped ham shack in the world, but I've got equipment that suits my needs and provides the capabilities I'm interested in. Alongside the computer monitor sits my low-band rig and a two-meter transceiver as well as my TNC, which allows me to communicate not only by voice or CW but also by packet, teletype (RTTY), and slow scan TV (SSTV). Almost all of the components were purchased new and cost around $1500 total.

I know what you're thinking: I just proved your point that amateur radio is a very expensive hobby. But wait a minute. I did not purchase all of this equipment at one time, but added, upgraded, and traded up over the years. These are the latest acquisitions that I have, and except for the digital power/SWR meter (bought on a close-out for $20), the other equipment is between 13 and 16 years old.

It's interesting to note that the prices for today's comparable pieces (which do have a few more horns, bells, and computerized whistles) are about the same in actual dollars as they were for my equipment when I purchased it. Yes, I'm talking new, second- or third-tier-from-the-top equipment. This means that an excellent high-frequency rig can be purchased for less than $1000, and a medium-powered VHF transceiver for less than $500.

Again, this may seem like a lot of money, but there is one other factor. Remember how I mentioned that my station sits next to my computer? These days a computer seems just as necessary as a telephone. Obviously, "the kids need it for school." My older son typed one school assignment for every gazillion hours of computer games he played (and he's now majoring in computer science in college), so I wonder about that line of logic. For whatever reason, a computer is considered a necessity.

Since I bought my current HF rig in the mid-'80s, I have had an 8080-based computer, a 386-based computer, and a Pentium® and a K-6. These computers cost an average of twice what my rig cost, not counting upgrades, additional memory, and consumable supplies. It is well acknowledged that we go through a computer generation every 18 months. So, since the '80s we've been through the 8008, the 286, the 386, the 486, the Pentium, and the Pentium Pro. And you can only upgrade a system so far before it has to be replaced, because new software won't run on most previous platforms.

On the other hand, an amateur rig represents a great value. Figuring the cost over time, my HF rig has cost me just over $100 per year, while my computers have cost me over $600. Have I gotten 21¢ value from my HF rig per day? Yep. Can I still use all the modes? Again, affirmative.

Some folks may prefer to look at the cost as cash flow rather than calculate the value over time. The initial outlay of money may be the concern. I fully understand that issue as well, especially as it relates to mobile or portable operations. After all, if you have a decent rig at home, the mobile may represent a duplicate expense. That's why we have hamfests.

My mobile rig was purchased at a hamfest and included the rig, microphone, a 20 A power supply, and a phone patch—for between $200 and $300. If I had been so inclined, I could have sold the patch and power supply to further reduce my cost. If I had been faster to react at that hamfest I could have picked up a multiband Outbacker antenna for less than $100.

Odds are that most automobile-mounted two-meter rigs cost more than $300–$400 if you include the antenna. So, all things

---

this chip has a built-in over-temperature shutdown. It has internal short circuit protection, too.

The TDA7052

Here would be a good chip to replace the tired LM386. This one-watt mono amplifier is bundled in an eight-pin DIP package. The TDA7052 features internal short circuit protection, low power consumption, and good overall output stability. No external components are required for circuit function. There is no need for an external heat sink for its rated one watt output power.

There's not enough room to publish the pinouts of each of these chips, but any good reference book will do. I used the one by National Semiconductor.

Tidbits

Are you a member of the ARRL? If so, check out the new members section of the League's Web site. They are at [www.arrl.org]. Once you've entered the members-only section, check out the review of the SGC2020 rig. You can listen to the rig in both CW and in SSB. You'll need the Real Audio player plug-in for your Web browser. That's not a problem, as you can download the plug-in from the ARRL site.

You may want to check out my Web site, too: [www.seslogic.com]. I'll be installing some links to some of the QRP sites. Have you ever wanted to check out what is happening with your QRP buddies on the QRPL reflector? But you don't want to mess with subscribing to the news reader? Then point your Web browser to: [www.qth.com/stamper/search/bafoof.htm]. There you'll find lots of interesting stuff. There's a UALR lookup, QRZ, and Buckmaster callsign lookup search engines.

But what I find the most interesting is the ability to view reflector postings of the QRP, Topband, CQ-Contest, and Tower Talk. You can view and search reflector archives, too.

There's also an active DX cluster site for all the HF ham bands. Why, there's even Telnet Packet Gateways on the site! This is a slick way to keep in touch with other QRP operators—check the band conditions while you search for DX from the cluster gateways. 73

THE DIGITAL PORT

Jack Heller KB7NO
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Carson City NV 89703-1792
[jheller@sierra.net]

Budget portable/mobile digital

Some of you have wondered, I am sure, when I was going to take the SSTV, RTTY, etc., down the road. I finally did it, and it is well worth the effort, considering the time I spend away from home.

The only missing element I needed to come to grips with was a mobile antenna. The stores and ham magazine ads offer many choices, and I looked at them. There is nothing wrong with buying ready-to-bolt-on equipment. It is well worth the money. Ham equipment is a bargain when you consider that the experimenting is pretty well done by the time you buy it.

But you faithful readers know me better than that. If it can be made by a pair of human hands, surely I can do it as well. Just seems to be an attitude, and if it hasn't been cured by this time in my life, it is without doubt a hopeless case. Besides, these are learning exercises. No one should leave this earthly existence without a knowledge of mobile antenna fabrication.

Just a quick aside: Today, when I made the first 40 meter contact to get a report on the antenna, I hooked up with Dave W7DE in Palo Alto, and Forrest K6HY, who is a bit farther north in California. These hams told some old war stories about mobile antennas of yore that were not only educational, but also helped put some of my recent efforts into perspective.

Here's a quick rundown on the project. Though it is successful, I feel the dimensions are not quite ideal. Therefore, I won't give exact measurements lest you copy them and end up with a less than perfect product. What I am saying, simply, is that after careful adjustment I have an antenna with a relatively high SWR that requires an antenna tuner.

This is okay by me, since any mobile antenna, other than the constantly variable "screwdriver" variety, requires a tuner to work more than a narrow segment of the band. I have a theory, and don't take this as "from the horse's mouth," that the reason you can get good signal reports from these dinky little antennas is that the vehicle is part of the radiating device. I hope I don't draw criticism on that point, but it makes sense. How else can we explain great performance from a sixteenth-wave whip?

This budget mobile antenna costs less than $20 to assemble. The real problem with saving money is that you have to work for it. The first part was fairly simple. I purchased a scrap of half-inch PVC for less than a buck to use as a coil form. To go with that, I picked up some 14-gauge copper wire for about 15¢ a foot, another $3 or so.

An idea was forming about spacing on the smooth surface. I calculated the number of turns I wanted on the form, chucked the pipe in the metal lathe, and cut a shallow thread along its length at six and one-half threads per inch. That made winding a neat coil easy.

The standard thread dimension for mounting mobile hardware is three-eighths diameter at 24 threads per inch. I wanted to use that standard because, in the end, it might prove prudent to purchase a commercial stainless steel stinger. Real-life reasoning showed this to be wise because, for the experimental version, the stinger was first made by welding three pieces of eighth-inch gas welding rod end-to-end.

Vertical with a droop!

This was brazed to a short bolt with the proper threads, and an interesting phenomenon raised its head. Though this work of art appeared fairly straight, when it was held vertical, the top drooped over like a wilted flower. This was remedied by slipping about 50 inches of quarter-inch steel tubing over the bottom half and brazing it at both ends.

Also, after realizing this relatively stiff assembly could strike some low bridges, the length was reduced to seven and a half feet. A three-eighths nut was ground to a press fit and epoxied into the top of the coil with the coil wire attached during this operation. This made one end of the antenna complete.

The other end of the coil needed a coax fitting. This was accomplished by fitting and pressing a barrel connector into the coil form with the proper connections in place before applying epoxy. This project was taking shape rather nicely—nothing to this home-brew stuff.

Then came the rude awakening. There was no easy way to mount this contraption with readily available hardware. I was going to have to roll my own.

After a quick search through the scrap bin, the only material that was close to what was needed was a piece of half-inch aluminum plate. Sounds simple, except that this was 7075, about the toughest aluminum available. It is nearly indestructible and, consequently, difficult to cut. Still, it was the best quick choice.

Brackets were formed to clamp to the upper and lower ends of the coil and mount to the curved side of the van. That curve can really mess with your mind. Inside of a foot, there is a three-inch variation from vertical. I learned this when attaching other appliances to the inside of this old van. If you ever decide to build your own RV, take it from me: Build it into something shaped more like a shoe box.

After getting through all the tough details of forming this aluminum and getting it mounted to the side with some

Continued on page 50

considered, the price is nowhere near as prohibitive as you might think to operate HF mobiling.

And what do you get in return? First, you're not limited by repeater coverage, and many HF mobile operators have maintained a contact over a distance of a hundred miles. Sure there's some signal fading, but not much more than I experience with my fixed rig at home. Ragchewing with a foreign station seems to make a trip seem much shorter than a similar discussion on a local repeater. Plus, you're not tying up a repeater frequency in the process.

If you read this column regularly, you know that I have a passion for emergency and disaster communications. Think about how much more you can contribute with additional bands at your fingertips in the car.

Think about it. It just might be something you want to consider. If you do, drop me a line and let me know about your experiences. I enjoy hearing about different aspects of the hobby and passing them along. Even though we provide a lot of public service, ham radio is, after all, a hobby, and thus mainly a whole lot of fun. 73

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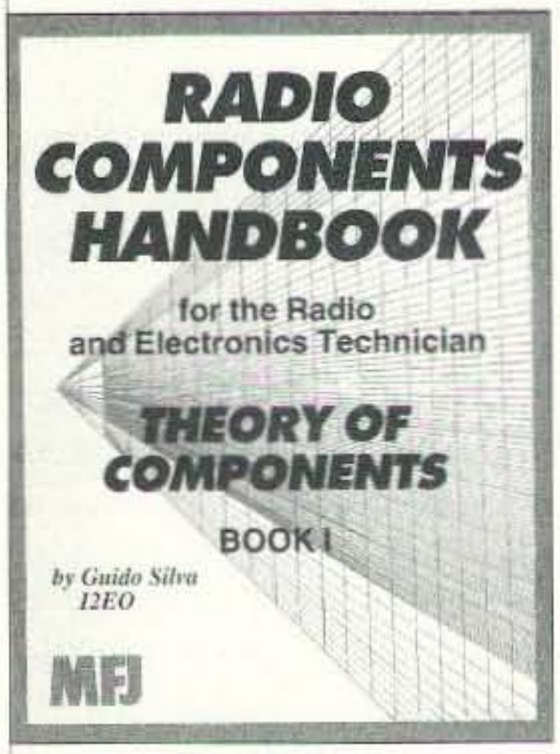
New Products



Radio Components Handbook

The full title is *Radio Components Handbook for the Radio and Electronics Technician, Theory of Components, Book 1*; by Guido Silva I2EO. Engineers, technicians, amateur radio operators and students will find direct, clear needed information in this handbook about inductors, loops, transmission lines, capacitors and more. Scores of formulas, graphs and practical construction details are included to make this softcover book a handy take-with technical manual. The author, Italian amateur operator Guido Silva I2EO emphasizes the building of circuits and parts with over 100 full-page graphs.

See your ham radio dealer or look for *Radio Components Handbook* (MFJ-3508) wherever you buy books, or contact MFJ Publishing for more details: P.O. Box 494, Mississippi State MS 39762.

Doing Something About the Weather?

Well, they're making it a whole lot easier to deal with … the folks at Peet Bros. Company, I mean. You can configure an Ultimeter system to provide you with exactly the weather information *you* need, from wind direction and flash flood warnings to temperatures and humidity levels.

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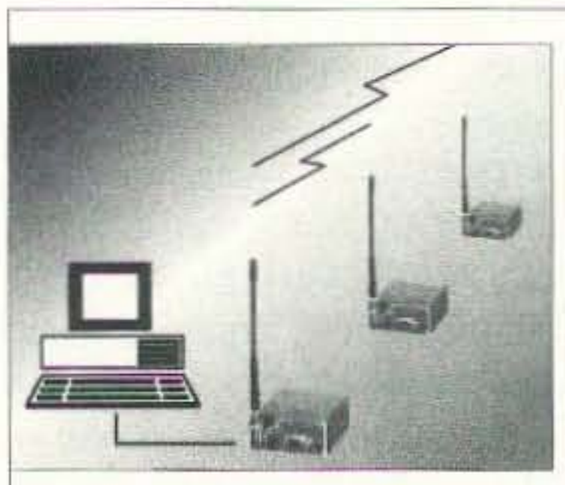
The AM-7500E is powered by AA batteries (4), an optional DC adapter (model PS-6A) or directly by some radios. It uses Adonis adapter cables, available separately, to connect to your transceiver, making switching radios a snap. All this and a full one-year warranty for $269.95!

For a free catalog with all features and specs, write to Adonis USA, P.O. Box 1124, Issaquah WA 98027; call (425) 558-9592; FAX (425) 558-9704; or E-mail [info@rflimited.com]. Check out the Web site at [http://www.rflimited.com].



Neulink 9600B Wireless Networking Base Station

RF Neulink announces low-cost, reliable, intelligent wireless networking with its microprocessor-controlled base station, the Neulink 9600B. The 9600B is offered in both the UHF and VHF ranges, and is designed to communicate through its RS 232 port to a local computer or other intelligent host devices. Network address information and data are sent to the base station via the RS 232 serial port. The Neulink 9600B base station puts the data in a packet along with a packet identifier, a destination address and a 16-bit CRC. The packet is then sent over the air at 9600 BPS to the remote network of Neulink 9600s. All over-the-air communications, including error checking and correction, transmission retries, address verification and duplicate message checking are handled by the proprietary over-the-air protocol, and is transparent to the base computer and the remote devices. A remote network of up to 65,000 Neulink 9600s are intelligent two-watt synthesized transceiver modems with 64 programmable RF channels, and a store and forward repeater capability.

For more information, contact RF Neulink, 7610 Miramar Rd., San Diego CA 92126. Call (800) 233-1728; FAX (619) 549-6345; or E-mail [rfneulink@rfindustries.com].

Back by Popular Request!

The hams at HAL proudly announce the all-new DXP38, featuring the DSP power of the P38 and the tuning indicator style of the RTTY-1. The DXP38 includes fully-adjustable Mark, Space, and Shift settings in FSK and the higher speeds of CLOVER-11. As with all HAL products, you don't pay extra for software. In addition to our standard DOS-based terminal program, the DXP38 comes with a new Windows (95/98/NT 4.0) terminal program—all for $395.00 plus shipping!

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continued from page 47

angle brackets, it was time to run the coax. This was fairly simple, since I am at liberty to drill holes wherever I want on this vehicle. With an appropriate-size grommet in place, the business end of the coax was inserted through the side of the van and I was in business. (See **Photo A**.)

The next step was to determine where to place the taps on the coil. Out came the trusty Heathkit dip meter that had been gathering dust since the last major tune-from-scratch project. After finally getting the meter to dip in the middle of the 40 meter band, I became painfully aware that I should have made the coil a bit longer. That is why there is no list of absolute dimensions given here.

The next to last exercise was to plug the ICOM 735 into 12 volts and the antenna to check the SWR. The bad news: The best reading was about 3:1, with the built-in meter on the 735. I brought out a separate meter—same thing. I knew that 3:1 could be tuned out with a tuner, so I brought out the massive desktop tuner and, sure enough, it handles it nicely.

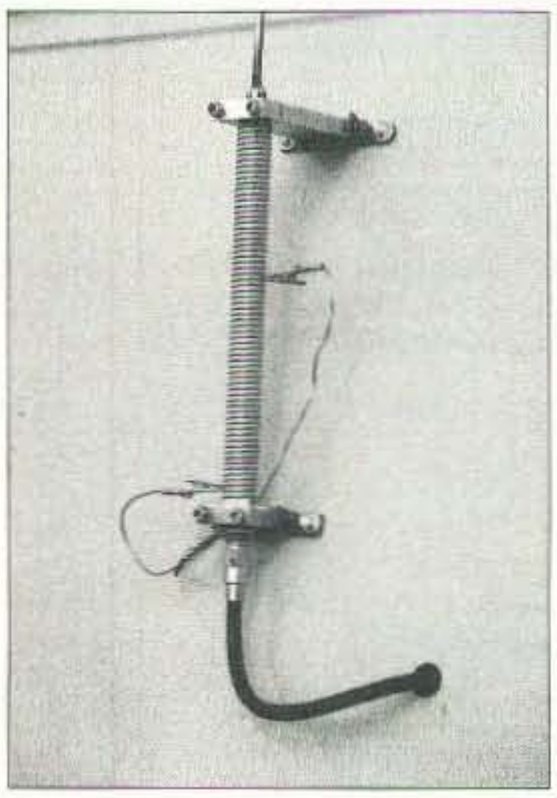

Photo A. *This is the assembled mobile antenna with temporary clips in place for testing. The mounting was the most challenging task. The desired position, high on the side, required some effort to gain a vertical installation. The aluminum brackets were bored and cut, then threaded for clamp bolts. A weather cover is coming as soon as the project is completed.*

The final test to determine if all this was worth it, if it was time to start over or scrap the whole project and go commercial, was to see if I could be heard. This was late evening time, there was a contest in progress and my little peanut whistle wasn't quite noticeable.

The next day, at the appropriate time, I drove away from the house and the side of the hill that so effectively shields me from some of my best ham contacts. With the van parked in the middle of the valley away from any obvious obstruction, I made the first contact with the new antenna and the signal report was very encouraging. The other operator was using a delta loop and the signal reports both ways were in the S8 to 9 category.

I decided to keep the not-so-perfect antenna just as-is and use it. Other priority projects were getting "behinder," and at least this works.

I learned at least one thing beyond the obvious problems faced when making do. One of those is that the grid dipper method of tuning an antenna has become pretty well antiquated. I have been reading the ads for the super antenna analyzers that are purported to tell all you need to know to get an antenna trimmed correctly, simply, and quickly. I need one of those if I am going to engage in such projects. (Maybe I should build one?)

Now, it is possible to be away from home and keep active contact in the various HF modes. I have not tried this antenna on 20 meters. The dip meter said it resonated there and on 15. I will have to load it with the tuner and see how well it radiates. If that makes it work, I will be a happy camper.

Speaking of digital amateur modes, the SSTV activity on 40 is drawing attention. I get E-mail telling me about new interest in the mode as well as those who would like to do SSTV on low power. I even ran across one ham who had tired of the usual propagation and interference problems who heard us on 7.190 during an early afternoon session.

He had become more enamored with the Internet even though he had assembled a respectable ham station. This leads me to a painful subject. This Internet is one of our greatest assets when it comes to reliable communication and data transfer, but it has become our greatest competitor for the challenging mind that was once best suited for ham radio activities.

The reasons are based around choices. Suppose you can explore what goes on in other lands by simply connecting to a server through a telephone line and running a search for that land, and you can do this immediately without passing any tests. (Some of the folks using the Internet should have to pass a test on common sense and courtesy, but if they don't have to pass any such test to get a driver's license … well? Another subject.)

And our natural rebuttal as hams is that what we do is more personalized and we get to talk to the natives and make friends, etc. We say there is a challenge to using ham radio that shows what we are made of. Kids counter by saying they have plenty of other challenges already—they want some immediate action.

All right, so this is an old story and it goes on, back and forth, and no one really wins. Let's face it. It ain't about winning, it's about what we can do to make ham radio more fascinating to the up and coming generations.

The point I would like to make here is simply this. We have, at our fingertips, a most attractive package of technology that is disguised as an old fogey's hobby. Ham radio is much more than a ticket to purchase an HT and access the local repeater.

Think about just this one item. Kenwood sees it is necessary to put a little pizzazz in the HT FM mode, so what do they do? They build a great new digital camera that interfaces with their handhelds so SSTV pictures can be taken and, within moments, sent over the air to other hams in full-quality color. That is very nearly instant gratification, plus the ability to use one of the new technologies available in conjunction with ham radio.

It shouldn't be up to the manufacturers to design equipment that will bring new heights of interest to ham radio, but Kenwood has made a step in the right direction. That is the VC-H1. It costs money, about $500, but so does any of this hi-tech stuff, and people are buying it.

I still recall the professional programmer sitting in my shack watching a packet connection in operation. He was marveling at how this was being done with no connection through telephone lines. We can display the same fascinating stuff with all the digital modes.

Consider how you might impress your technically-oriented friends if they could see packet run over the air or, better yet, SSTV, RTTY, PACTOR or WEFAX. Think of the possibilities as you tell them, "… and you could do this and more. Do you realize that, as hams, we can make contact with our own satellites and pass some of these same kinds of messages back and forth through them? I would like you to get into this so we could do these things together."

And there lies a little secret. Most people aren't really loners when it comes to learning something new. They may be competitive and want to learn more and faster than one another, but that is the advantage of two people working together. Try it.

Of course, that may mean investing 30 or 40 dollars and getting into RTTY or SSTV, but that is generally within the range of those who read this column. If you will refer to **Table 1,** you

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HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors Inc.
P.O. Box 131646
Staten Island NY 10313-0006

Famous folks

It is always nice to be in the company of accomplished, successful people. As amateur radio operators, we are all in the company of some very famous personalities. The kids in my radio classes always enjoy hearing stories about the many people from different walks of life who claim amateur radio as their hobby. Perhaps you can use the following information to enhance a lesson at school or to have fun with at a club meeting.

Writing to some of these folks may lead to some interesting experiences for you and your group. Be sure to let me know if you have a good success story to share.

KA7EVD Donny Osmond, who let his call expire—write to him

EAØJC King of Spain Juan Carlos I de Bourbon

HS1A King of Thailand Bhumiphol Adulayadej

JY1 King of Jordan Hussein I

IØFCG President of Italy Francesco Cossiga

K7UGA Retired senator Barry Goldwater, SK in 1998

LU1SM President of Argentina Carlos Saul Menem

W6EZV USAF General Curtis LeMay, SK in 1991

K4LIB Entertainer Arthur Godfrey, SK in 1983

KA6HVK Singer Burl Ives, SK in 1991

KI6M Comedian Stew Gilliam

KN4UB Rock musician Larry Junstrom

W6UK Musician/bandleader Alvino Rey

WA4CZD Musician Chet Atkins

WB4KCG Musician Ronnie Milsap

WB6ACU Rock Musician Joe Walsh

K2ORS Writer, humorist Jean Shepherd

K6DUE Retired NBC science reporter Roy Neal

KB2GSD Retired CBS anchorman Walter Cronkite

N4KET CNN anchorman Dave French

NK7U Retired Major League baseball player Joe Rudi

KB6LQS Pilot Dick Rutan

K1JT 1993 Nobel Prize winner Dr. Joe Taylor, Jr.

Information courtesy 1994 *CQ A.R. Almanac* via TSRAC *ARNB*. 73

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will find a number of opportunities to get involved in these fun activities—and they won't kill the pocketbook.

If you have questions or comments about this column, please 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

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.*

Easy Antenna Reference

Quick basics for a quick decision.

Keith Woodward VK2AT
19 Dolphin Ave.
Taree NSW 2430
Australia

If you're a beginner, or find yourself moving to a new QTH, a most important consideration is what antenna can be erected for the bands on which you intend to operate. The purpose of this article is not to give designs down to every last nut and bolt, but to discuss some basics and point you in the direction of an antenna that may meet your needs. And while these suggestions are mainly related to the HF bands, all the antennas here may also be used for VHF operation.

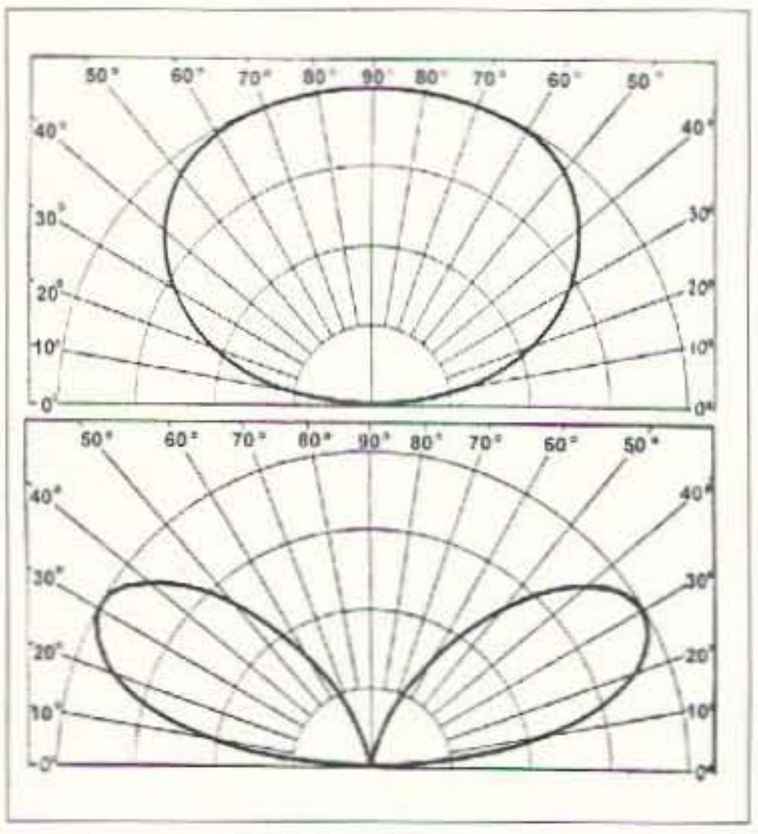

Fig. 1. *Top: dipole 1/4 wave over ground. Bottom: 1/2 wave over ground.*

The most basic antenna is the half-wave dipole. Most amateurs just run their half-wave dipole up the flag mast and see how it waves. The results that may be achieved with this simple antenna deserve some consideration. If you refer to **Fig. 1**, you will notice that the radiation pattern of the antenna will vary considerably with height. In the case of a quarter wavelength above ground, a large amount of your transmission will be confined to high-angle radiation. Increasing the height to one half-wavelength will lower the radiation angles considerably.

If you wish to confine yourself mainly to close contact, within, say, 1000 miles, then the lower height is of no concern. To extend this range then, if possible, elevate the antenna to around the half-wavelength mark. Reference to **Table 1** will show approximate heights above ground for the common HF bands. You can see why some tall trees, or artificial supports, will be handy for the lower frequency bands. Another consideration with antennas close to the ground, and other objects, is the loss from absorption or shielding. If this cannot be avoided, then go ahead and enjoy the results obtained.

I personally have enjoyed many QSOs using very low dipoles, necessary because of the restrictions of city and suburban allotments. However, long-distance contacts over 1000 miles were the exception rather than the rule on the lower frequency bands then being used. On occasion I have deliberately used very low dipoles on 3.5 and 7.0 MHz to obtain "local" coverage with excellent results.

With reasonable elevation, angles of radiation can be lowered by vertically stacking two dipoles. A simple method

HEIGHT	160	80	40	20	15	10
1/2 WAVE	83.3	41.7	21.1	10.6	7.1	5.3
1/4 WAVE	41.7	21.0	10.6	5.3	3.6	2.7

Table 1. *Typical heights for horizontal dipoles. All figures are in meters and rounded off to one decimal place.*

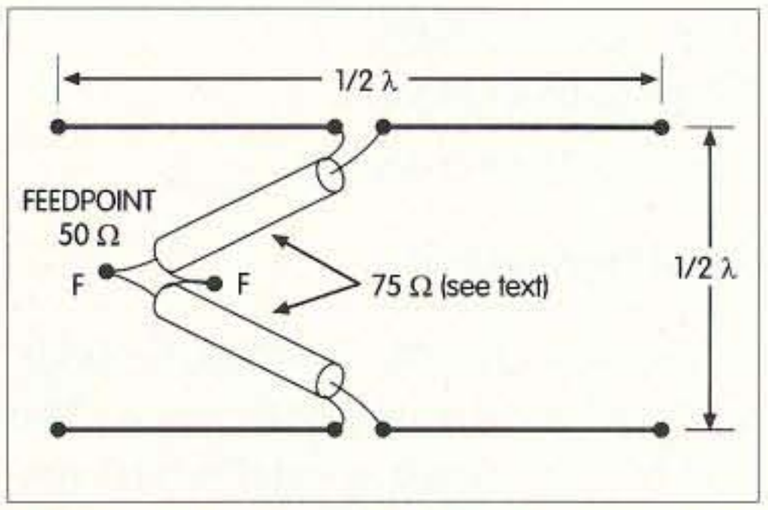

Fig. 2. *Stacked dipoles. Approximately 2.5–3 dB gain, lowered angle of radiation, simple matching, broad horizontal figure-8 lobes.*

of doing this is shown in **Fig. 2**. Please note that when calculating the matching harness, the correct velocity factor must be taken into consideration. With a nominal velocity factor of 0.66, then two 5/4 wavelengths are required for the matching harness. With a higher velocity factor such as 0.80, it would be possible to use two 3/4-wavelength sections. The size of this array does limit it to the higher bands. The gain of 2.5–3.0 dBd plus the lowered angle of radiation make this a very useful antenna. It is simple to match and has a broad horizontal lobe extending in both directions broadside to the antenna.

In restricted space circumstances, due consideration must be given to the use of vertical antennas. Vertical antennas, usually quarter-wave or loaded quarter-wave, require a good ground plane for best results. In restricted space, it is usually easier to elevate the base of the antenna and use several

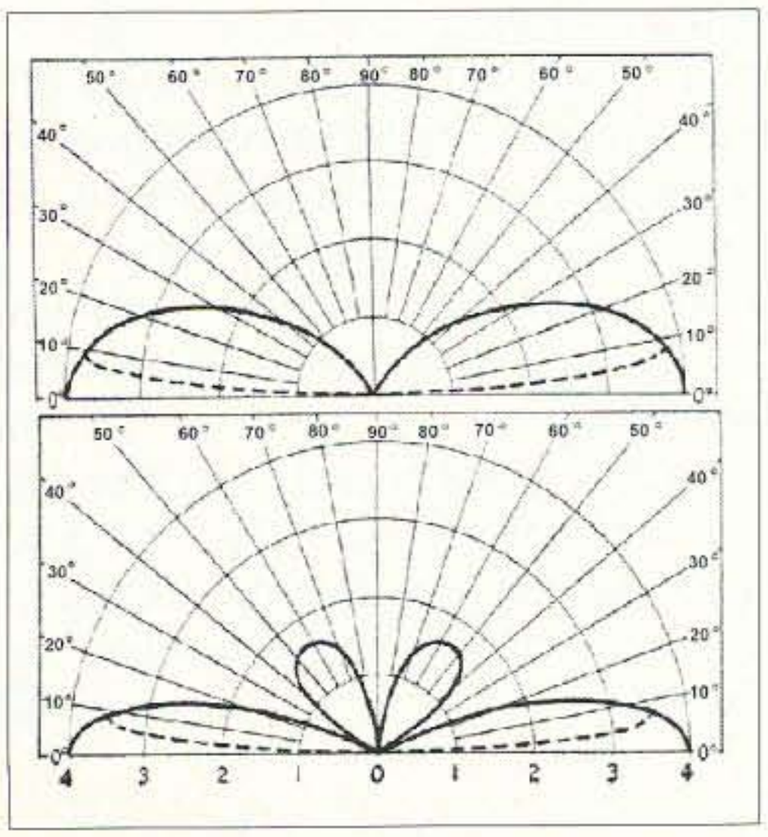

Fig. 3. *Top: vertical dipole with center 1/4 wave above perfect ground. Bottom: the same, but center 1/2 wave above perfect ground.*

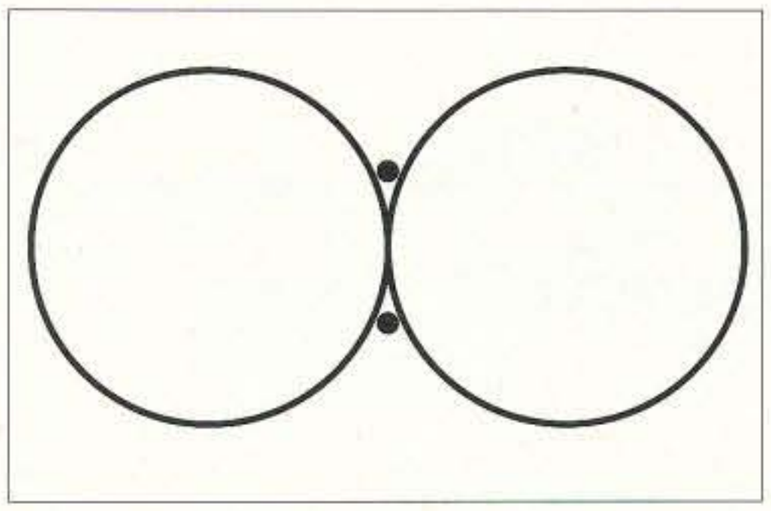

Fig. 4. *Phased vertical dipoles. Spacing = 1/2 wavelength; phasing = 0 degrees; gain = approximately 2.5–3 dBd.*

wire ground planes cut for resonance on the bands in use. The main advantage of the vertical antenna, other than its omnidirectional coverage, is its low angle of radiation. This explains why a simple vertical, well-matched, can give results which sometimes outperform those from horizontal antennas. In **Fig. 3**, a vertical antenna is shown with its radiation pattern. This is the theoretical pattern when the center is one-quarter of a wavelength above perfect ground.

A similar pattern will be achieved when a good resonant ground plane is provided with an elevated vertical antenna. Many commercial vertical antennas are available and cover more than one band. While these antennas serve a purpose, do not expect the same radiation efficiency as with a single-band vertical. As with the horizontal dipole, it is possible to combine two vertical antennas to increase the radiated signal strength in selected directions.

Two ways, out of many, of combining two vertical antennas are illustrated in **Figs. 4** and **5**. In **Fig. 4** two vertical antennas, separately matched to 50 ohms, are spaced a half-wavelength apart at the operating frequency. The same stacking harness as suggested for the stacked horizontal dipoles is used. A figure-eight polar diagram is the result of this combination and achieves approximately 2.5 to 3.0 dB gain over a single vertical antenna.

In **Fig. 5** the two verticals are spaced one-quarter of a wavelength apart and connected together with a three-quarter-wavelength matching harness made of 50-ohm coaxial cable. This phasing of the antennas produces a cardioid unidirectional pattern, which gives a gain in the most favored direction of approximately 4 dB over the single vertical antenna. In accordance with the principle of not getting something for nothing, the radiation in the opposite direction is noticeably reduced.

Returning to horizontal antennas, there is a need to provide for more than one band of operation. The easiest method is to parallel two or more dipoles from the same feedpoint. I suggest, if possible, separating the dipoles by some distance. In one case I erected a five-band dipole, spacing the elements for each band approximately six inches apart with plastic spreaders. This operated quite successfully on 40, 30, 20, 15, and 10 meters. As with all dipoles, I made all the elements too long at the lower end of the band and pruned each band's elements until I achieved resonance at my favored frequency of operation.

It's time for an unpaid commercial announcement. Over the last nine

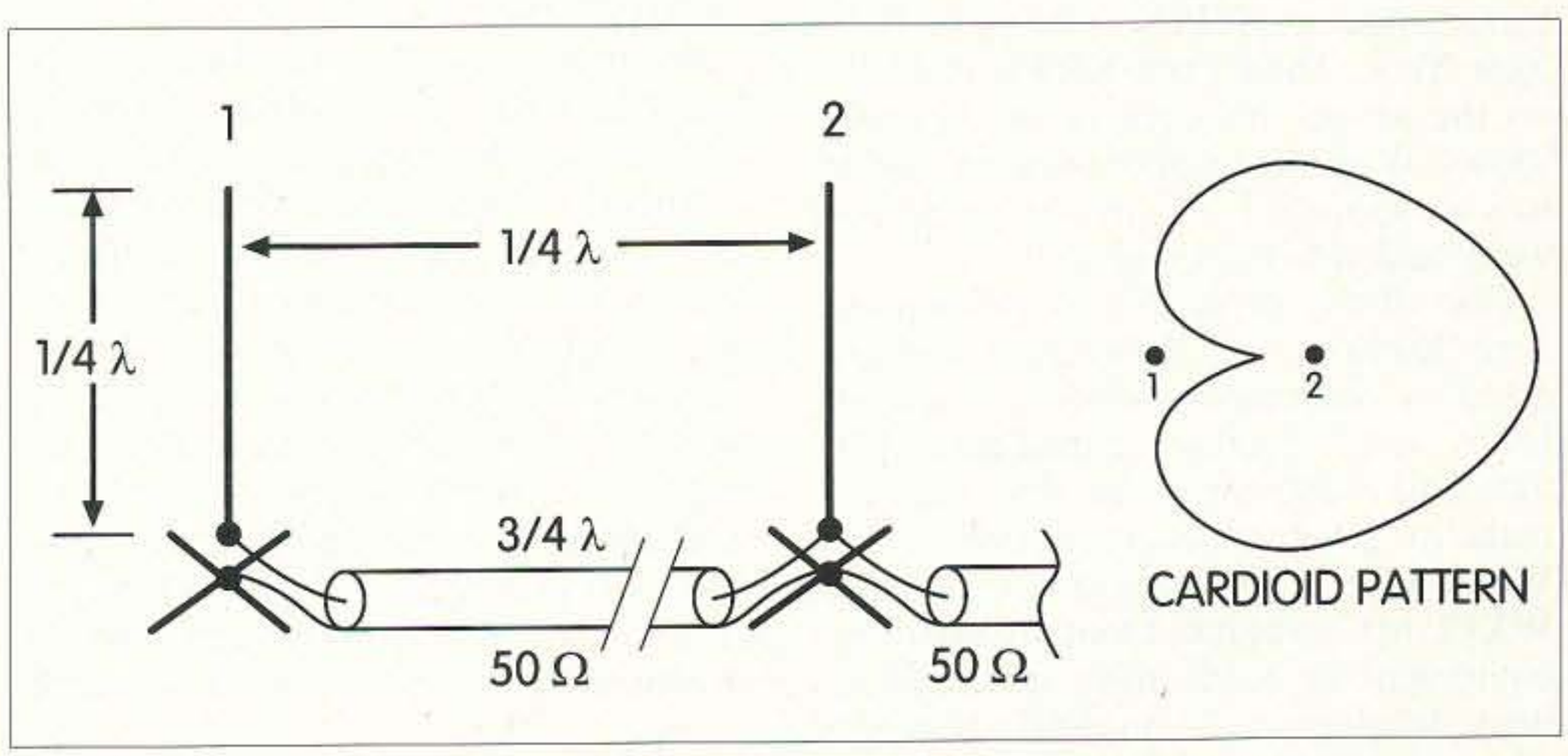

Fig. 5. *Unidirectional phased ground planes; gain approximately 4 dBgp.*

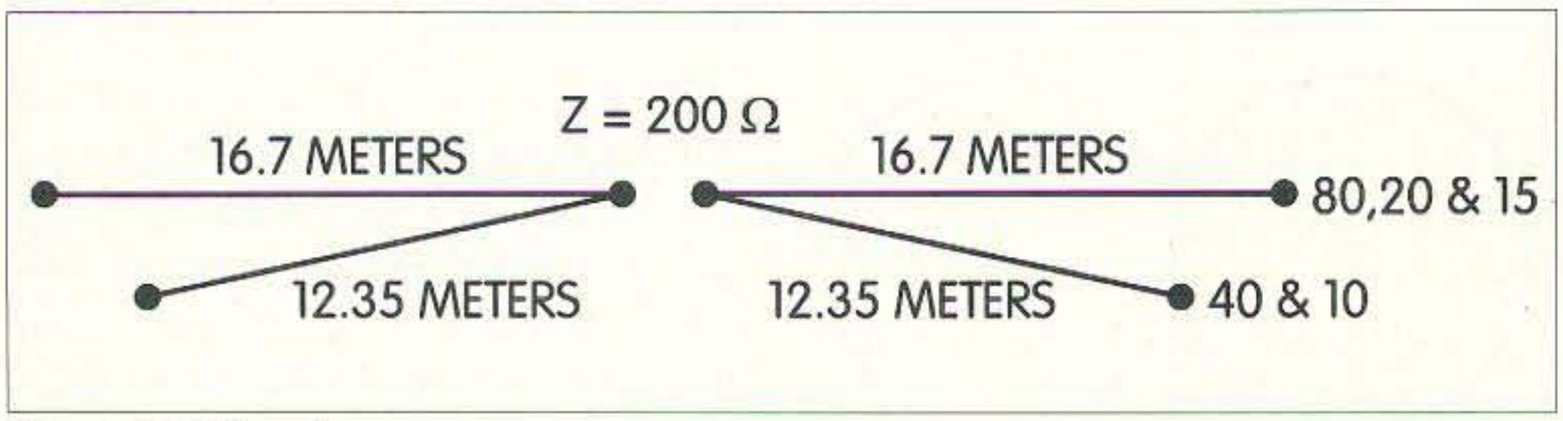

Fig. 6. *Multiband antenna.*

months, I have been in antenna heaven with my new MFJ-259 Antenna Analyzer. This has been a joy to use and has saved me untold hours during antenna construction and testing. Other methods of SWR testing may be used, but quite frankly my other test equipment is tending to gather dust.

Fig. 6 shows an antenna which quite a few of my amateur friends have tried with good results. While I have not tried this antenna myself, those whom I have worked on the air using the antenna have been quite happy with its performance. The elements are chosen not to be self-resonant on any band, but to exhibit a mean impedance of approximately 200 ohms at the feedpoint on 80, 40, 20, 15, and 10 meters. It may be fed with an open-wire, such as air-spaced 300-ohm line, a four-to-one balun, or two lengths of coaxial cable. The last method is claimed to reduce noise pickup by the feeder. The two lengths of coaxial cable should be exactly the same length—RG-58CU would be suitable for reasonably short runs. Ground the two braids at the shack and join the braids at the antenna end. The two inner conductors are joined to the antenna and to a 4:1 balun at the shack.

While theoretically the antenna should have an impedance of approximately 200 ohms on all five bands, you will probably need an antenna tuner to achieve a good match.

This does not exhaust the antenna possibilities for HF operation, but hopefully will be sufficient to help you examine your options for a quick start with a new antenna setup. 73

The IC-706MKII Shack-in-a Box

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Parting comments

The new ICOM 706MKIIG model will include the 440 MHz band. This can be considered normal model progression. ICOM must compete with the new Yaesu FT-100, which includes 440. Anything else earthshakingly new about the G model? Not really. Am I going to run out and get a G model? Nope—I don't have a need for the additional coverage. But the G model is evidence of the continuing trend toward more power in smaller boxes.

There are two after-market items I wish were available to use with the 706MKII:

• A high/low cut audio filter—without the other DSP frills (therefore inexpensive).

• A keypad for direct frequency entry—à la Stone Mountain Engineering's QSYer (no longer produced).

If any of you are interested in designing/marketing such devices, remember: They could be applicable to not just the ICOM 706 series, but also the new Yaesu FT-100 and whatever else Kenwood is cooking up to compete with, too. 73

Here Comes the Sun

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thunderstorm many miles away. A number of these devices are in use as "UFO Detectors," and the portable devices might even be useful in investigating strange phenomena such as crop circles or poltergeist activity.

More information on these and other devices can be found on the Internet by going to my site at [http://www.bioelectrifier.com] and clicking on the SOLAR link. You can also reach me via E-mail at the address at top or by clicking on the "hot key" on my Web site. 73

NEVER SAY DIE

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speakers are now almost 50 years old.

It's been a while since I told the story, but this all started when I was working at Airborne Instrument Laboratories on Long Island (NY) as an engineer. Well, I was putting in time while looking for a job as a television producer-director. I got started in that business as the chief cameraman at WPIX, Channel 11 in New York. Then I put KBTV in Dallas on the air as the director of their live shows. When that station went to all film to save money, I was out of work, so I went back into engineering.

One of my projects had an engineer, John Karlson, who'd invented and patented a wideband microwave antenna. Hmm, says I, microwaves and audio have the same wavelengths, so this ought to make a good speaker enclosure, too. When a TV directing job opened up at WXEL in Cleveland, I lent my audio test equipment to Karlson so he could get busy developing a completely new kind of speaker system. About a year later, I got really fed up with my directing job, which turned out to be strictly routine news and sports shows, and moved back to New York. There I found that Karlson had done nothing. So, with me pushing, we spent the summer using an open field as a laboratory and designed a speaker cabinet using his antenna principle. Its size was mainly determined by the size of my car door so we could cart it around. The sound it produced was awe-inspiring.

We took it to Avery Fisher (you've heard of Avery Fisher Hall at Lincoln Center?). He listened and offered to sell it with his Fisher audio equipment and give us a 4% royalty. Karlson wanted to go for that, but I saw this as an opportunity to build our own business.

Neither of us had any money, so I borrowed $1,000 from the bank on my car to get some sample units made at a local woodshop. We wrote an article for *Radio News* which brought in a bunch of prepaid orders, and we were in business. The hi-fi stores took one listen and ordered

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Tracking Dual-Voltage Power Supply

Build something handy while you wait for the year's first hamfest!

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

Upon more than one occasion a ham experimenter will find a need for a utility power supply that will provide a variable voltage as well as equal values of both positive and negative voltage to power a project. Such an occasion occurs, for example, when you are experimenting with op amps, which usually require ±15 volts. But even when a dual voltage is not required, it is nice to have a variable voltage supply available.

The power supply shown in **Fig. 1** provides a regulated variable voltage output which is adjustable from 2 to 16 V per side and 4 to 32 V between the outer voltage rails. Being a utility supply, it is not intended to be a real powerhouse, but the design concept could be used to develop one. In the configuration shown, the 2 to 16 V output on one or the other side is capable of providing a maximum current of 300 mA intermittently, but should be limited to about 100 mA to keep the transistors' heating to a minimum.

Even with the high load differential between sides, the voltage between sides will remain within about 10 mV. When the load is either divided between the two sides, or the total load is taken from the outer voltage rails, about 450 mA is available. The governing factors involved in the amount of current available are the power transformer, regulator, and transistors Q1 and Q2. However, transistors Q1 and Q2 govern the output current only when there is a current differential between the two sides.

The principle of operation is based upon floating a common reference point between the two outer voltage rails and shifting it to maintain an equal value between each side. To accomplish that, as shown in **Fig. 1**, complementary transistors Q1 and Q2 are "pass" transistors, each carrying the return path current for individual loads tied between the rails and the common point. An LM741 op amp is used to "sense" the voltage differential and shift the common reference point by driving the bases of Q1 and Q2 as needed to maintain equal (+) and (-) values. Most any typical NPN and PNP TO-220 transistors will work in this application.

Heatsinking for Q1 and Q2 is not necessary unless the power supply will be intentionally operated with a high differential current between sides. Placing a one- or two-inch-square aluminum plate on each transistor tab will provide adequate emergency heat protection for the transistors as they are normally cool, because they handle only the differential current.

I recommend that a heat sink be used on the voltage regulator because it handles the total load current. In the prototype project, a pressed sheet metal heat sink (Thermalloy #6025) was used, with the legs soldered into the board for mechanical support.

A voltage balance between the two sides is created by connecting the pot R4 between the two voltage rails and using it to locate the center value. A miniature 10–15 turn pot was selected for the application to achieve a fine adjustment setting; however, a single turn pot will work OK. The actual value of the pot is not critical, but a value between 25 k and 50 k is preferred. Should it be necessary to use a 10 k, as indicated in the parts list, two 10 k fixed resistors should be added to the circuit by placing them in series with one on each side of the 10 k pot. The objective of the added resistance is to reduce the amount of current flowing through the pot.

The balance is adjusted typically at full voltage output by alternately measuring the voltage between the common

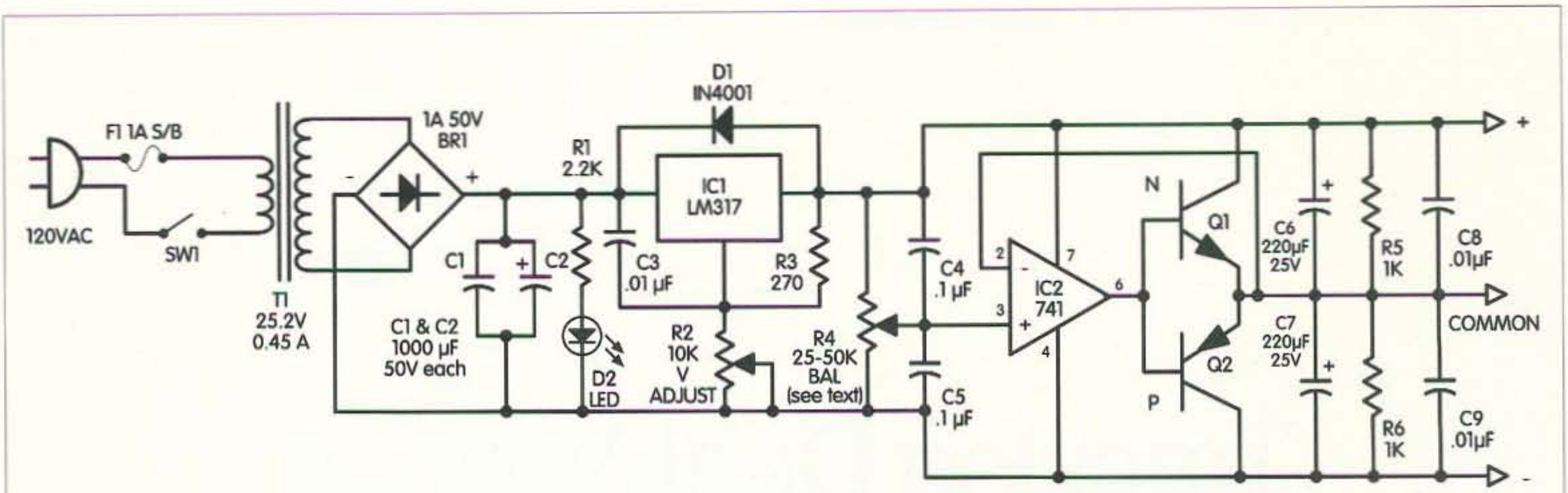

Fig. 1. *Schematic of the tracking dual-voltage power supply. Positive and negative outputs track within 10 mV.*

reference point and each rail while the pot is adjusted to create equal voltage values. An output load on the power supply is not required during the balance adjustment. Following the adjustment, a load may be used to verify that the circuit will maintain a balance while under a load. The 0.1 µF capacitors connected across the balance pot help reduce the noise voltage that might enter the input of the op amp. Any noise voltage, or hum, appearing at the balance pot input to the op amp will appear in the output voltage.

Power supply regulation is accomplished by utilizing one variable voltage regulator, and in this project, an LM317T was selected. The advantage of using the op amp and the complementary transistors is that only one voltage regulator is required. In the absence of the op amp, two regulators would be required, one for each rail, and getting them to track over a wide voltage range would become a real technical issue. The regulator establishes the maximum available total terminal voltage which is then divided between the two sides. As the regulated voltage is reduced, the voltage on each side will also reduce, but they will remain equal in value.

Here is a technical point that must be considered separately, although it must be considered for other supplies as well. In this case, there is a high in-rush current when the power switch is closed. As a result, the fuse selected must be able to handle that current. The actual fuse current value is typically much larger than the operating current. The high in-rush current is caused by the two 1000 µF filter capacitors connected directly across the output of the bridge rectifier. Upon turn-on, the capacitors exhibit essentially a short across the transformer's secondary. The capacitor charge current decreases after turn-on, allowing the in-rush current to subside. Where a 0.5 A fuse would be typical for the transformer used in this project, the in-rush current dictates that a 1 to 1-1/2 A S/B fuse be used.

Construction

Parts for the project are readily available from many sources (Hosfelt, Mouser, Radio Shack, etc.).

Construction of the Tracking Dual-Voltage Power Supply is straightforward, with no special mounting or critical wiring requirements. Parts may be mounted using any desired method. Perhaps the only critical item in the construction of the power supply is a vertically mounted heat sink for the voltage regulator, as it must be used (or the regulator could be mounted against the chassis and insulated from it) to achieve adequate cooling. If the regulator is remotely mounted, capacitor C3 must be placed right at the regulator terminal and not on the circuit board. The purpose of capacitor C3 is to reduce the gain-bandwidth of the regulator to prevent it from oscillating.

As an aside, capacitors C6 and C7 were selected to be axial lead for convenience and availability. However, you may choose to use radial mount capacitors. Any reasonable front-panel layout can be used. The panel will support the voltage adjust pot, binding posts, LED, and power switch. Calibration marks are placed on the front panel using a marking pen, with the marks placed around the adjustment knob. The positioning of the marks is determined using a digital voltmeter as a reference for each value to be marked on the panel. Although the marked voltage values won't be totally accurate, they provide a suitable reference for ballpark voltage adjustments.

Capacitors C8 and C9 are mounted behind the panel and directly on the terminals. Their objective is to reduce the output terminal impedance to an RF environment should the power supply be used around an RF circuit.

Wiring between the front panel and the board is divided between the AC power line and the rest of the wires carrying DC. The wires from the power switch are twisted and lie along one edge of the circuit board, traveling back from the front panel toward the rear panel. All remaining wires carrying DC are routed across the back side of the panel and along the opposite edge of the board. It is important to separate the AC power from the DC circuit in order to reduce the

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Tracking Dual-Voltage Power Supply

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Parts List

C1, C2	1000 µF radial cap (272-1032)
C4, C5	0.1 µF 50 V disc ceramic cap
C3, C8, C9	0.01 µF 50 V disc ceramic cap
C6, C7	220 µF 35 V axial lead cap (272-1017)
R1	2.2 k 1/2 W resistor (271-1121)
R2	10 k pot, linear (271-1715)
R3	270 Ω 1/2 W resistor (271-1112)
R4	10 k–50 k pot (271-343 = 10 k)
R5, R6	1 k 1/2 W resistor (271-1118)
IC1	LM317T adj volt regulator (276-1778)
IC2	LM741 op amp (276-007)
Q1	TIP29 NPN TO-220 trans (RSU11371168) or TIP31 NPN TO-220 trans (276-2017)
Q2	TIP32 PNP TO-220 trans (RSU11371218) or (276-2027)
D1	1N4001 diode (276-1101)
D2	Red LED (276-041)
BR1	1 A 50 V bridge rect (276-1152) or (276-1146)
T1	25.2 V 450 mA pwr trans (273-1366)
F1	1-1/2 A S/B fuse (270-1022)
S1	Toggle switch

Miscellaneous Parts

Fuse holder, panel mt (270-364)
3 5-way binding posts (274-662)
1" diam pointer knob (274-416)
Cabinet (270-253)
Power cord (278-1255)
Cord grommet
8-pin IC socket
3 1/4" standoffs
Heat sink (see text)
Circuit board (as required)

Table 1. *Parts list. Part numbers listed are from Radio Shack.*

introduction of hum into the regulator and op amp circuits.

Conclusion

There is always a need for another power supply when you are working on a project. The advantage of the Tracking Dual-Voltage Power Supply is that it functions both as a utility supply and as one that will provide simultaneous positive and negative voltages which track within a few millivolts. The dual voltages are suitable when experimenting with op amps and other circuits where a split voltage source is needed.

Construction of the power supply is simple and utilizes readily available parts from many sources. Build it, and you'll always have a suitable utility power supply available! 73

NEVER SAY DIE

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units. They were made out of 3/4-inch plywood and built like bricks, with most units covered in either blond or mahogany Formica®. We also had plain plywood units and kits.

Karlson, who was an engineer at heart, kept working for Airborne while I went to work marketing the enclosure. That meant building a national rep organization, demonstrating it at hi-fi shows all around the country, and trying to keep up with the demand. All audiophiles had to do was hear the unit and they had their wallets out. Before long it was the best-selling speaker cabinet in the country, with seven wood factories turning them out for me. I had the kits all made in La Jolla (CA), with most of them being shipped via the Panama Canal to my east coast warehouse in Brooklyn. I had an office in Altadena, run by the chap who'd hired me to work on a Guggenheim Grant project a few years earlier. Soon our sales were well over a million dollars a year, which is more like $20 million in 1999 dollars. I did the usual Porsche, airplane, yacht, and Arabian horse stuff. You know the routine.

But all through this I'd been having a ball with ham Teletype. I'd started my *Amateur Radio Frontiers* journal while at the TV station in Cleveland and was putting it out offset-printed every month, doing my best to get more hams interested in the fun I was having with RTTY. That led to an RTTY column in *CQ*.

Then, when I got *CQ*'s editor a better job (as the editor of *Popular Electronics*), I got offered the editor's job at *CQ*. I figured that would be more fun than loudspeakers, so I turned Karlson Associates over to Karlson to run. We'd been 50/50 partners and the company was growing like crazy, so what could go wrong?

Karlson ran the company his way and ignored any advice from me, so it was dead in less than a year. Pfft, and my 50% was worth zilch. Well, money never was important to me, so what the heck. I was having a ball at *CQ*, talking at hamfests, going on DXpeditions, and so on. But that's another story.

My pitch right now is that no one is making the Karlson Enclosure today and this presents a wide open opportunity for an entrepreneur. It doesn't take a lot to get started, as I proved. And, if they work with me, I know some ways to make the cabinet sound even better. Well, I've learned a lot more about acoustical design since building my own recording studio. A few small changes in the cabinet design should make it a killer.

But then you're too busy commuting to work and worrying about being downsized to get involved with starting your own company, right?

IMAX Lays An Egg

Most of the IMAX Theater films I've seen have been outstanding, so their latest releases surprised me. For my birthday, we went to Boston to the IMAX Theater in the Museum of Science, where we saw *Titanic* and *Everest*. *Titanic* was a bomb. What a waste of time. *Boooo*. *Everest* was a little better, but not a lot. Okay, it's a bitch to climb and people keep getting killed trying.

The TV ads for their newest release, *Amazon*, looked more promising, so we drove down to Boston again. This was even worse than *Titanic!* The camera work was bad, with closeups of animals that spread them across the huge screen. Endless pictures of old boats on the river. Some natives doing a tribal dance that they obviously had never rehearsed. But I learned nothing much about the natives, the destruction of the rain forest, and so on. It was a bore.

At the start of every show, they demonstrate their 70,000-watt sound system. As an audio expert I can tell you that it sounds crappy. They've tried to make up for the mismatch of loudspeaker cones to the air of the theater by using dozens of them. That doesn't cut it. You have to

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have an air-matching transformer to do the job.

The IMAX theaters could enormously improve their sound if they would get rid of that junk they have and put their speakers in Karlson-type enclosures — like the ones I used to make.

Mine were so outstanding that many hi-fi stores used a wall of them to demonstrate the speakers they were selling — since they made every loudspeaker sound fantastic.

Cruelty

While at the Peoria SuperFest I met a lot of hams who were obviously alive and thinking. But I also saw hundreds of hams wandering around with no one seemingly at home upstairs … the walking, working stiffs who are slowly poisoning themselves and their families, and who never will either make much money or leave anything significant behind to mark this particular visit to Earth.

No, it isn't their fault. They're the victims of our public schools, like their parents before them. It's an experience that few survive with any creativity or motivation. Even if I went up to these walking dead and shook them hard I don't think I'd be able to wake them up.

How bad are our public schools? Hey, if you don't believe what I've been writing, at least read what John Taylor Gatto has been saying. He's the prize-winning New York teacher who quit after 26 years as a teacher — because he just couldn't do that to kids any longer. The American public school system is a crime. It's cruel and unusual punishment for your children, and should only be used if you truly hate your kids and want to make sure they will never think or amount to much. It's also the most expensive school system in the world, by a wide margin.

Our school buildings are awful. Our teachers are, for the most part, dreadful. The school books are beyond description in bad. And then there are the administrators. In New York, about 80% of the school budget goes for administration. In New Hampshire, we're doing better — it's only 50%.

I'm exaggerating? For heaven's sake, read some of the books I review in my *Secret Guide to Wisdom*. Read some of Thomas Sowell's books. Please! Read Rita Kramer's appalling report on the 13 teachers' colleges she visited. Read the eight books I recommend about the Sudbury Valley School. Read about the Montessori schools. Please turn off the TV just for a little while and find out what you've let happen to our kids. How much of your life is either work or entertainment? How much time do you spend improving your education? My wisdom guide at least makes it so you can get a maximum of information with a minimum of effort. I've done the hard work in finding these book gems, now you do the easy part.

And don't forget to read Gatto's *Dumbing Us Down*.

It comes down to this: If you send your kids to a public school, you don't deserve to have kids. And don't whine about how were you to know? I've been writing about this for years, and so have Gatto, Sowell, and a bunch of others. It's your fault if you are ignorant, but it's your kids who will have to pay the price.

Life After Death?

In my dictionary, definition #4 of "life" includes spiritual life after death. It also includes, as #7 under "death," the death of the spirit. Thus, while life as we understand it ends with death, there is more than enough reliable information about the spirit world to convince all but the most unread or pathologically skeptical that life as we understand it does not totally end with death … that the spirit, soul, or whatever, endures.

Our English language, as marvelous and extensive as it is, just doesn't provide us with the words we need to communicate when our thoughts get away from the concepts of life, science, matter and time.

In my *Guide to Wisdom*, I recommend Michael Crichton's *Travels*, in which he describes his experience in spoon bending and with auras. I recommend Scott Adams' *Dilbert Future* for the last chapter on the power of the mind. Then there's Allan Boone's *Kinship of All Life*, which explains how you can communicate with almost any living thing. I cite Dean Radin's *The Conscious Universe*, where he shows that scientific research has proven beyond the doubt of the most cement-minded skeptic that our minds *can* influence matter, that we *can* predict the future, and that we *can* communicate mind-to-mind.

But the best book I've ever found which provides an insight into what we think of as the "next world" is May Sewall's *Neither Dead Nor Sleeping*. You need to read this book. Your friends need to read it. Anyone you know who has had a recent family death absolutely should read it. Fortunately, Dr. Lydia Bronte, the author of *The Mercury in Your Mouth*, has just reprinted this 1920-published book for us. You can get copies from Quicksilver Press, 10 East 87th St., New York 10128. It's only $15, plus $3 s/h per order, which is very reasonable.

Revolting

What can you do about some nut-farm escapee who insists on making your hobby a nightmare? One solution, I've proposed before … but, knowing how short older memories can get, particularly with those who've been using aluminum antiperspirants, or drinking beer or soft drinks from aluminum cans, I'll repeat it. This consists of making recordings of the more offensive garbage the perp has been transmitting and sending cassette copies to his neighbors, along with an explanatory note.

How do you get his neighbor's addresses? Simple: Just find someone with a phone ROM and look at the addresses near his. For instance, one of the ops said to be a long-time jammer of 7240 kHz is KK6BS. I looked his address up on my ROM, which was 9255 N. Magnolia Avenue, Space 2, San Diego. I then looked at that address and found the names of ten other families living in that same mobile park. Another reported repeated offender on 7240 is N2ENY in Buffalo. I had no problem finding the names and addresses of his neighbors.

Another approach, which I find inexcusably reprehensible, is the sending of letters to neighbors of the really serious offenders, using a letterhead such as the Pedophile Neighborhood Alerting Group (P-NAG) and asking if they have been alerted by their local police of the moving into the neighborhood of a repeated pedophile offender at such and such an address. They're not saying anyone at that address *is* a pedophile; they're just asking if the police have notified them.

I'm sure there are less nasty ways to deal with nut-farm escapee hams who are infecting our hobby. It just takes a fiendishly creative mind. What has your group found to work in a situation where some old crank is spewing filth on our bands? No, the ARRL or the FCC isn't going to help — we are supposed to be a self-regulating hobby, remember? So get busy and self-regulate.

Years back, when I was living in Brooklyn, we had a Spanish-speaking Brooklyn ham who refused to talk with locals, and was abusive about it, saying what he thought of gringos. He would only talk with Spanish-speaking stations. A few members of a local club got together one evening and visited him to explain about being more neighborly. After his broken arm healed, he couldn't have been nicer to the locals on the band. Well, no one has ever

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accused Brooklyn hams of being subtle.

Bribery

If you are a smoker, please skip this — you aren't going to like it.

With what we know about the destructiveness of smoking, anyone who continues to smoke must either be incredibly ignorant, a weak-willed spineless wimp, and/or a really stupid person. I'm afraid that I have little respect for smokers.

Thus I'm offended by the increasing number of movies that have their characters lighting up. This is not something an intelligent person does anymore, so when I see it in a movie, my first assumption is that the writers are signaling me that this is a villain. Smoking is like wearing a black hat in a western. But when I see nonvillains lighting up, I know that the cigarette companies must have paid a bunch of people off. There's no other logical explanation.

It's been brought out in hearings and court cases that the cigarette companies have known for decades that their product is a killer, and that they'd gone to a lot of trouble and expense to keep this information from the public, so there's an excuse for the writers and actors in the old movies to smoke. But today, nothing but payola can explain it.

One of my grandfathers died of pneumonia when he was in his 50s. He smoked pipes, cigars, and cigarettes, and they killed him while he was still relatively young. My dad smoked Camels. When, in his 60s, he began fainting, the doctors told him to stop smoking or he could die at any time. But it was too late — he lived on for a few years with emphysema and heart trouble, having to have an oxygen tank or generator with him 24 hours a day.

The cigarette companies are spending whatever it takes to try to make smoking attractive to kids. I see kids hanging around in the shopping malls smoking. I see the local high school kids walking by the door of my company in Peterborough smoking.

Back in 1965, I was distributing matches at hamfests which read on the cover that they were cancer-free matches. I got the local match company to make them so they couldn't be lighted.

When Siskel and Ebert recommend a lousy movie, I suspect that some money has changed hands. When I see gratuitous smoking in the movies and on TV, I know the cigarette companies are still at it.

How to Kill Your Dog

You can slowly and painfully kill your dog the way millions of other good-intentioned pet owners do — by feeding the poor defenseless creature commercial dog food. I'm talking canned food and those bags of pellets.

Unlike humans, who have been eating cooked food for several thousand years, dogs have been eating raw meat until just fairly recently. Their digestive systems aren't able to cope with cooked meat, nor with the filler the commercial dog food companies use to keep their costs down.

What can you do about it? That's simple: Make friends with a local butcher and ask him to save his meat scraps for you instead of throwing them out.

Dr. Bruno Comby, over in Paris, noticed that in one report after another, dogs and cats fed cooked food lived shorter lives and came down with human-type ailments, including cancer. But, when changed to raw meat, they quickly got well again.

Hmmm, thought Bruno, if that works magic for animals, how about humans? So he tried putting some of his sicker patients on all-raw-food diets and they miraculously were cured, even when in the last stages of cancer. Dr. Lorraine Day confirmed this when she cured her own cancer the same way.

Now, I'm convinced you don't give a damn whether you and your family get cancer, or have heart attacks or strokes or not, but at least have some compassion for your dog.

Brainwashing

You. I. All of us have been through a lifelong brainwashing experience, and part of the brainwashing is that we have accepted the whole idea that brainwashing is good. Yeah, I'm talking about our acceptance of universal incarceration for a minimum of twelve years in a government institution known as public school. Not that most private schools are much better.

Where did the idea come from that a composer, a writer, a plumber, and a military tactician all should have the exact same education? I'll tell you where if you promise not to get mad. But that acceptance has resulted in our no longer having brilliant composers, writers, plumbers, or military tacticians. Or, alas, brilliant anything else. They did it to you, you're doing or have done it to your children, and so on.

What's happened in music is typical of what's happened in all of the arts. And what's happened in science, inventing, politics, and every other aspect of our civilization. We've managed to almost totally stunt initiative, motivation, determination, perseverance, and creativity.

I keep trying to wave readers into my tent, where I ask them (you) to think. I'm brushed off as crazy, controversial, and a troublemaker. But I feel like I'm trying to plant the seeds of wisdom in a desert. The ground has been made sterile. There are no minerals left in the mental soil, only ball games, sitcoms, and Jerry Springer as artificial fertilizer. The equivalent of using totally dead chemical fertilizers on our croplands instead of crushed live rock.

We're kept in line by our addictions being fed. Keeping us thoughtless and busy. We're addicted to drugs like alcohol, caffeine, nicotine, sugar, fat, aspirin, rock 'n' roll, TV, talk radio, ball games, sex scandals, a media obsessed with reporting bad news in depth and endlessly, and so on. Hey, "it sells papers."

When I see a kid wearing big loose pants and a baseball cap on backwards, I know I'm looking at a totally brainwashed youngster who hasn't a shred of originality left in his head. He's probably smoking, too. And cruising with his friends, throwing beer cans out of the car or pickup as they finish chugalugging them.

This drive to turn us into as nearly identical cogs in the wheel as possible is also a driving force in the medical industry as well as with psychiatrists. Each tries to fit us into a diagnosis pattern they're familiar with.

But, despite every effort to make us identical, even starting with birth where we are separated from our mothers and put into a nursery, the system has failed. We *are* all different. Our genes are different. We look different. Our voices are different. Our fingerprints are different. We're allergic to different things in different intensities. The first few years of our lives expose us to a much less structured foundation for the development of our lives, though the growing use of daycare centers is gradually closing this leak in the drive to make us identical. Like the interchangeable parts for our machines.

One Size Fits All

We put all of our kids into the school hopper. Never mind that their IQs range from genius potential to troglodyte, that some kids have been given every opportunity to develop their brains and bodies during their first six years by enlightened parents, and others have been imprisoned in playpens. That some have been allowed to learn to speak fluently and accentlessly in several languages, and others have only a vague grasp of one. That some have been fed healthy diets and others have been brought up eating Froot Loops and Count

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NEVER SAY DIE

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Chocula crapola. Well, you get the picture.

Yes, there *are* a few schools that are breaking the mold, where kids learn what they want when they want, without the stress of tests and grades taking away the fun and excitement of learning. Kids, when allowed, love to learn. I remember when I had a software development laboratory with over thirty computer systems set up and we allowed any interested local school kids to come in after hours and have fun. My programmers said that these kids were like industrial vacuum cleaners when it came to asking questions and teaching themselves how to program. Some brought their sleeping bags so they could keep at it until they dropped.

CPR

Sherry and I took a CPR course at a nearby Red Cross facility. Well, heck, you never know. I'm doing my best to rebuild my body with a raw food diet after the 75 years of destruction I've done to it through not knowing any better. You know, with coffee and doughnuts after ham club meetings and at the Dayton HamVention (they're free in the exhibitors' lounge), pizza, pasta, French fries, and so on. It's a wonder I've survived this long!

Anyway, my cousin Sanger and his wife Carol stopped by to visit a few weeks ago, and Sherry was telling them about the CPR course. Carol rolled her eyes, saying that she'd never do CPR. Ugh! Sanger said, "But what about me?" Carol ignored him.

Carol called a couple nights ago to say that Sanger, who was 70, had suddenly slumped over with a heart attack. She'd called 911, but by the time the emergency team got there, it was too late. I don't think she remembered her disgust over learning CPR, but if she'd known how to do it, it's likely that Sanger would be alive today.

If you care for your mate, take a couple evenings and take a CPR course — it could mean the difference between life and death. When a heart attack hits, you have only a few minutes to get oxygen into the person or it's too late. After the heart attack happens is one heck of a time to try to learn CPR.

Of course, if you change your and your family's diet, there aren't going to be any heart attacks, but I'm pretty well convinced that you'd rather die 50 years sooner than necessary than change to a healthier diet. Well, at least a heart attack can lead to a fast and painless exit from life as compared to most of the other routes our diet is taking us.

Raw Food?

Well, bananas, apples, oranges and grapes are easy when you're considering a raw food diet, but what about stuff like potatoes, turnip, and so on? Raw potato doesn't sound all that great. Ugh.

One of my first tries was chopping up cauliflower, carrots, and broccoli in the Cuisinart and eating the mixture with some of my grandmother's cole slaw sauce on it. That was a winner.

Salads are easy. I cut up some spinach, watercress, beet greens, bean sprouts, alfalfa sprouts, some pine nuts, little chunks of Kraft's Baby Swiss cheese, and golden raisins, again with some cole slaw sauce for dressing. I generally have a large bowl of salad with both my lunch and dinner meals.

But what about the other vegetables? I got to thinking how good a New England boiled dinner is, with boiled potatoes, cabbage, beets, turnip, and carrots. Then the next night you chop the leftover veggies into red flannel hash, warm it up, and pop a soft-boiled egg on it. Now that's good stuff.

Well, maybe you don't have to boil the veggies, I thought. So I put a potato, skin and all, a beet, also with its skin, a couple of carrots (with skins on), and a quarter of a cabbage into my Cuisinart and chopped it all up together. Like everything else, with some cole slaw sauce on it, it's great! And that's raw everything, not boiled.

Chopped cabbage with the sauce on it *is* cole slaw, so that's good, too. I'm finding more and more things that are good raw. How about you experimenting and letting me know what you find?

If you've lost my cole slaw sauce recipe it's simple: two parts of extra virgin olive oil, two parts of apple cider vinegar, one part of honey, five parts of plain yogurt, some salt, pepper, and a handful of celery seeds. Whip it all up together. It'll keep for a week or so in the fridge. It may keep longer, but my supply runs out in about 10 days so I don't know if it will spoil or not.

Dr. Campbell *(Second Opinion)* recommends eating three apples a day, one before each meal. Hey, if one will keep the doctor away, just think what three can do! They also tend to cut down your appetite, so you don't eat as much during the meal.

I'm still eating a little cooked food, but I've always preferred my meat almost raw, so these days I just barely singe it. I like it a lot better that way. Have you ever tried liver cooked about 15 seconds a side? More and more people are discovering how good raw meat is. The rest are so revolted by the idea, they'll never taste it and will help keep our Social Security problem minor.

Piercing the Veil

How *could* the German people have gone along with Hitler in his killing of six million Jews, plus another three million of other undesirables that we don't hear about as much? Or the Chinese with the millions Mao killed, and the Russians with the millions Stalin wiped out?

For that matter, what could have been wrong with the Heaven's Gate group? The Jones followers? The Koresh (Waco) people? And so on. Did their leaders manage to find people different from the rest of "us"? There's nothing to be smug about — there, but for accidents of chance, go you and I. It's worse than that.

The same aspect of our human minds is at work with the religious fanatics in the Middle East, in India, Japan, and everywhere else around the world. Including fanatics here in America. That's right, the same human-mind propensity to believe in things without proof that's making life miserable for people in Afghanistan, Syria, Lebanon, Pakistan, Iraq, Iran, and Turkey is alive and well here in America.

We use the term "brainwashing," but it's the opposite of that. It's mass hypnosis. It's brain polluting, not washing, and we're all victims of it every day in every way. We are "brainwashed" to believe that ball games are important, that Monica Lewinsky is important. Our TV, newspapers, magazines, radio, the Internet, and all media are busy trying to influence what we buy, what and where we eat, what we do, where we go, what church we attend, and so on. It's an efficient system and we've all been suckered into it.

We're used to being fooled by special effects from Hollywood, so we're not too surprised when we find out that many of the shots which looked so real of the *Titanic* fooled us. But any time we think the Germans who were convinced by Hitler to help kill nine million people were different from us, we're fooling ourselves.

So here's Wayne Green, lifting the flap of the tent, saying hey, take a look over here behind the scenery. See how we've been fooled into our belief in our school system, our health care system, our jobs, the (ha, ha) war on poverty and war on drugs, and (you're going to really hate this) our religious convictions.

The sorry fact is that we're all prisoners like the Heaven's

Gate, Jonestown, and Koresh people. We don't want to look behind the stage scenery at the real world. "All the world's a stage," was more on target than even Shakespeare knew.

Follow Through

Our government seems to have its ability to waste money developed to a high art, and particularly when it comes to the so-called education field. Congress, whipped into this insanity by one of the most powerful unions in the country, the NEA, has been blowing billions of your dollars and mine. The NEA seems to have as its main goal protecting the jobs of incompetent teachers and the building of administrative empires.

Anyway, you've heard about Project Head Start, a well-intentioned effort to give kids from extra-lousy backgrounds a way to at least keep up with kids who have more caring parents. Billions of our money have been poured into this beaut — and it's still happening, despite endless surveys showing that the positive results of the program have not provided any long-term benefits.

Well, heck, if Head Start doesn't provide long-term benefits, then let's throw a few billion more into the program with Project Follow Through and see if that does the job. A number of different teaching approaches were tested to see which might be best. Some provided short-term improvements, some ways turned out to be quite negative by comparison with control groups of students. Did the negative results slow down the flow of money into the negative systems? Of course not. Did the lack of any significant positive long-range benefits stem the funding for the project? Not in our world it didn't.

While our kids have not benefited from the Head Start or Follow Through programs, Congress is continuing to fund them, with only the NEA members who are being paid to do this nonproductive work getting any benefit.

The NEA, via its hundreds of well-heeled lobbyists, keeps pushing state and federal legislators to pour more money into our school system, which they do, despite the need to continually lower our standards. There's been a lot of NEA pressure to have smaller classes, yet there are no studies showing that smaller classes actually result in better educations. Well, it sounds reasonable, so never mind all those studies showing that smaller classes just mean the hiring of even more poor-quality teachers.

What is it going to take to get you fed up with you and your children being fleeced?

Someone should start a parents' union and lodge a $10 trillion class action suit against the NEA for the damage they've done to our kids, our families, and our country.

Even More Y2K

After reading more books on the subject, plus listening to more experts on the Art Bell show, I can't help wondering what might happen to our country — to our whole civilization — if what these experts are predicting actually happens.

What if the power goes off all around the country? Not for hours — not even for days, but perhaps for weeks? This would mean no lights, no heat, no food, no water, in many cities no sewers, no police, no gasoline, no natural gas, and so on. A few hundred thousand people might be able to escape from the cities, but to where?

How many families in New York City, for example, would have emergency water set aside to last for a month? Food for a month? Food that doesn't have to be cooked or even warmed? Warm clothing to be able to live through January and February without heat?

Just how serious the Y2K problem is going to be won't be known until after it's over. But a prudent person might want to plan not to take any unnecessary chances.

Will the banks survive okay? Probably, but I sure wouldn't want to bet everything I have on them, so I'll be keeping a minimum balance. The stock market could be hit very hard, so a prudent person might get out of the market early, just in case. Or you might sell some of the more sensitive stocks short, hoping that the market will be able to survive. What would happen to the stock exchanges if all our cities closed down for weeks or even months?

How would our civilization function if a third or more of the people in our cities don't survive? There could be lawlessness on the order of what happened recently in Rwanda and not too long ago in Cambodia. What would America be like if 50 million people died in a few weeks? There wouldn't even be any way to bury the dead.

One approach is to poohpooh the whole thing. Hey, nothing like that could happen. At the worst, Y2K will just be a little bump in the road. But I do wish that I could read an encouraging report on the situation by anyone who has done a significant amount of research into it. It seems as if the experts are seriously worried and only the ignorant are unconcerned.

Y2K Strikes!

Many years ago, not realizing that, unlike all but a very few magazines, *73* would be around for decades, I sold lifetime subscriptions. Cheap. It started at a Miami hamfest, where a doctor pushed me for a lifetime subscription price. With a cover price of 37¢ (two for 73¢) and $3 for a year, $7 for a three-year subscription, I sold the first lifetime subscriptions for $37, one of the best bargains in the history of ham radio.

Well, who knew? I started the magazine in October 1960 with just barely enough money to print and mail the first issue, so the future was anything but certain. My publishing office was a little one over a grocery store in the low-rent outskirts of Brooklyn. A little over a year later, I packed everything up, including my ham shack, and moved to New Hampshire, one of my better decisions.

When I was personally maintaining the subscription records, which I did for the first couple of years, I marked the life subscribers as "LIFE." At that time subscriptions were cut into little paper stencils, and I printed the addresses on paper wrappers for the subscription copies.

Then the computer age hit and I invested in an IBM system using punched cards. My "itty-bitty-machine" demanded a number for expiration. Well, this was 1965, so I put the problem off into the far distant future by using 00. This was fine until I moved the operation to a subscription fulfillment company and they decided to use 99 for lifers — since their system read 00 as 1900. A couple years ago, we warned them that they'd better get the lifetime subscriber situation straightened out. And we kept warning them. Not knowing what to do about the problem, they ignored it. Big surprise.

Sure enough, come the time for renewal notices for subscribers whose subscriptions ended in January 1999, out went renewal letters to the lifetime subscribers.

The bright side for me was that this was an easy way to find out how many lifetime subscribers are still actually alive. I suspect that at least 90% have been ignoring my nagging about poisons and getting the right nutrition, so they may well have offed themselves many years before their bodies would have worn out if they'd given them much consideration. So, I'll see how many polite reminders or angry accusations of being a crook I get.

Yes, of course we should have checked the lifetime subscriber list every now and then to make sure that the subscribers weren't frustratedly trying from the "next world" to make contacts with their silent keys.

More Y2K Data

Enough already with the Y2K scare baloney, right? It's

Number 62 on your Feedback card

PROPAGATION

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February 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
	1 VP	2 VP-P	3 P	4 P-F	5 F	6 F-G
7 G	8 G	9 G	10 G	11 G	12 G	13 G-F
14 F-P	15 P	16 P	17 P-D	18 P-VP	19 VP	20 VP-P
21 P	22 P	23 P	24 P	25 P-F	26 F-P	27 P-F
28 F						

A glance at the calendar will tell you that February is not expected to be a good month for HF radio propagation. (Note: We have added "D," for disturbed, this month.) Your best days for success will be during the second week of the month, when the geomagnetic field and ionosphere are expected to be quiet. Unfortunately, they are expected to be disturbed and at minor to major storm levels during the first few days and the last *two full weeks* of this month.

During those periods of magnetic field disturbances and accompanying ionospheric storms, remain alert for very bad weather and other terrestrial upsets … particularly on days surrounding the 2nd and the 19th.

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.

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. W1XU/7.

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

just more Chicken Little crapola. The sky isn't going to fall. The power grid isn't going to go down. The country's food-distribution system won't be disrupted. The millennium bug, as it's called, will just turn out to cause a few sneezes, not a plague.

However, in a recent poll of high-tech execs reported in *Newsweek*, 60% of them said that they would not fly on a commercial airline on Jan. 1, 2000. Hmm? 80% of them are documenting their financial records. 13% are upgrading their personal security (alarm systems, guns), 11% are stockpiling water and canned goods, 9% are buying generators and wood stoves,

Continued on page 64

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 February 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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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!

Number 64 on your Feedback card

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 May 1999 classified ad section is March 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.
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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

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

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone:** (616) 925-5899, 8–4 ET. BNB964

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

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

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

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for $19.95 + $2.00 postage and handling to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

NEVER SAY DIE

continued from page 62

and 3% are relocating to a nonurban environment.

A prudent person might look at those statistics and wonder: What do all those high-tech execs know that I don't?

No one knows what's really going to happen, but it seems as if the more people understand the depth of the problem, the more they are likely to be preparing for some pretty bad stuff.

I hope the pollster continues to check high-tech execs to see whether the preparedness curve is going up or down as the critical day approaches and the potential for serious trouble soaks in.

Unfortunately, just the fear of what could happen can be enough to make our financial system collapse ... if enough people sell their stocks — just in case. If enough try to withdraw their savings from their banks — just in case. Down could come the whole financial house of cards. The stock market only works when there are more buyers than sellers. And banks only stay in business if you don't try to get your money back. And this run on the stock market and banks could be triggered from anywhere in the world, which is really scary when you understand that, as unprepared as our computer people are for the problem, we're way *ahead* of all the other countries.

Let's see, should I call Wayne and see if he's got some space on his farm I can rent to park an RV for next year-end? January One comes on a Saturday — what will the world be like by Monday, the third? We can't send Bruce Willis to get rid of this threat.

Oh yes, Ed Yourdon, the author of *Time Bomb 2000*, sold his New York apartment and moved to New Mexico.

Editorial Reprints

It's highly unlikely that you know anyone who is into reading and thinking, but if you do know any such weirdos you could help encourage this deviant behavior by laying reprints of my editorials on them. I've reprinted my complete editorials for 1997 and 1998, each in three four-month volumes. They're $5 per volume. The 1997 editorials run to 320 pages. 1998 runs 240 pages. When I get some time I'll separate the ham-radio-oriented stuff and reprint the rest, as I have with the pre-1997 editorials — *Grist I and Grist II.*

If you meet any hams who are into thinking, please let 'em know about *73*. 73

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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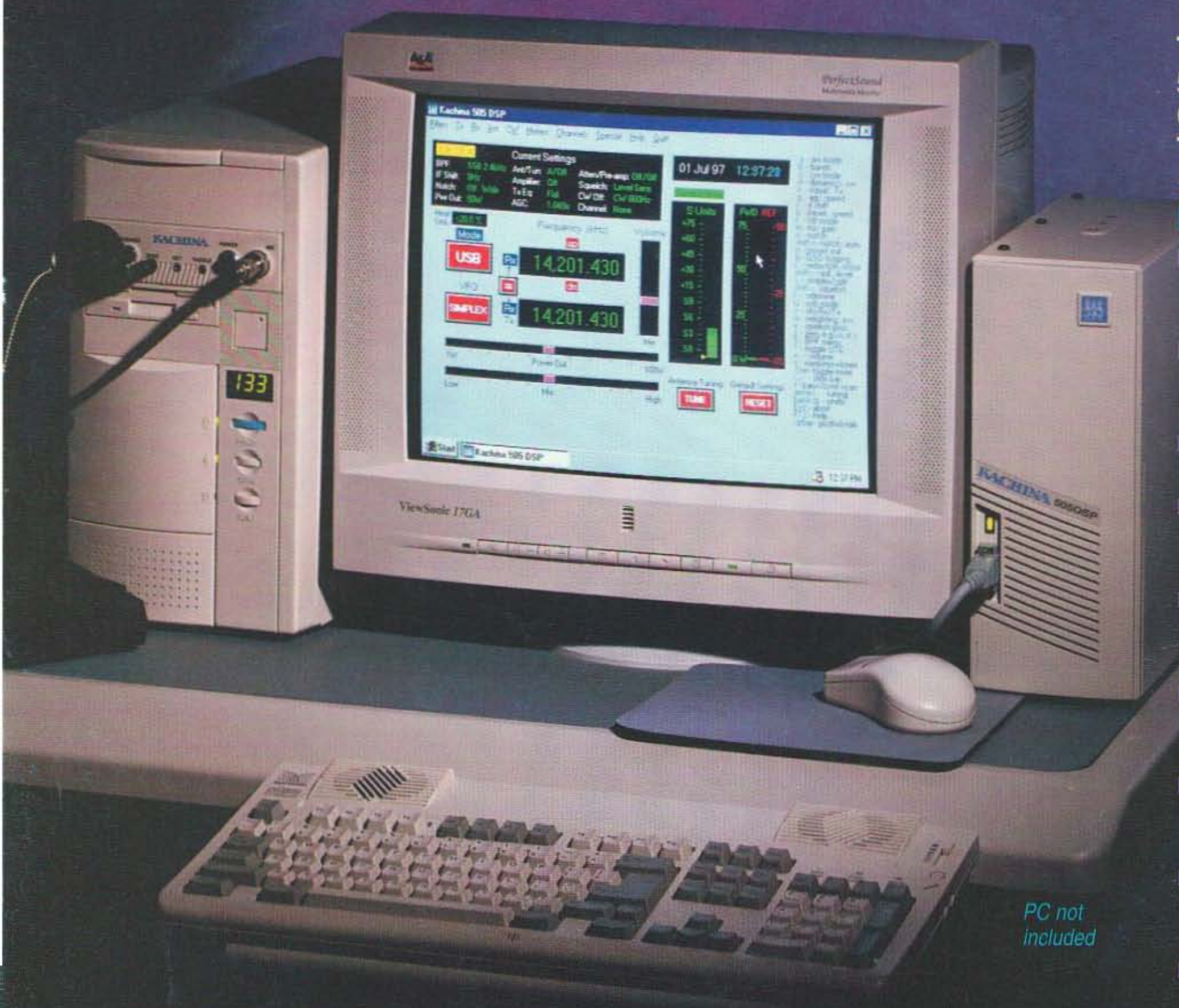

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The Kachina 505DSP Computer Controlled Transceiver

Features:

- Works with any Computer Running Windows 3.1, 95 or NT
- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

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.

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