Official Journal of
The American Radio
Relay League

QST

devoted entirely to

AMATEUR RADIO

April 1999

QST reviews:

- A trio of Maha/Rexon H-Ts
- DSP Audio by ClearSpeech

Choose the best battery

Build the QRP Buddy

Y2K and Amateur Radio

New Ham Companion:

Practical information for all hams

His Majesty King Hussein Bin Talal, JY1
1935-1999

$4.95 U.S. $5.95 Can.
04
0 71896 47322 3

LEGACY

IC-706 SERIES

The most versatile series of compact, multi-banded rigs ever made.

PROVEN PERFORMANCE:

"Great portability vs. performance ratio. It's great to have a radio where you can talk on your local repeater, work on your mobile DXCC total and still not miss out on six meter openings!"
– Kevin Olson, K3OX

"I enjoy everything about the IC-706MKII; size, ease of operation, power."
– Richard Lemme, K9FA

"This is my first ICOM & I am very pleased with it."
– Merlin R. Myers, KAØQZK,

"God, I love this rig. My little 706MKII goes with me everywhere and is on 24 hours a day."
– James H. Weidner, K2JXW

"The DSP unit works great for knocking out the heterodynes from the foreign broadcast on 40 meters. Thanks for making such a great compact rig."
– Bill Youse, N6DZS

"706 -- the love of my life."
– Gary Mashburn, KF4PTW

Try out all the latest ICOM rigs in the Funmobile. We'll be paying a visit to the Charlotte N.C. Hamfest in March and central Florida's Sun 'N Fun Airshow in April. www.icomamerica.com

NEW IC-706MKIIG*

THE BEST GETS EVEN BETTER FOR 1999
More power, 440 MHz, and still more features! The new IC-706MKIIG has 50 watts on 2 meters, 20 watts on 440 MHz, DSP as standard equipment, auto repeater, CTCSS, and backlit keys. Tried, tested and proven, the 706 series is your best choice for a complete ham rig.

NOW WITH **DSP** AS STANDARD EQUIPMENT on version 15

IC-706MKII

IN 1997, HAMS WERE "WOW"ED AGAIN
The IC-706MKII added still more features and more power. Today, the '706 series radios have earned a reputation among hams as rugged, hard working rigs. They perform as well on a serious DX'pedition as they do in a car or in a contest shack.

IC-706

ICOM options required for PC operation:
CT-17 Level Converter
OPC-478 Cable
Third party software

PC Ready!

WAY BACK IN 1995...
The ICOM IC-706 was introduced to the amateur community. Never before had so many features and so much fun been put together in such a small package. HF, 6 meters AND 2 meters in one box? Yes.

Join the thousands of hams who use ICOM's '706 series radios, and GET IN ON THE FUN! Contact your authorized ICOM dealer today, or call our 24-hour free brochure line. **425-450-6088**

*This device has not been approved by the Federal Communications Commission. This device may not be sold or leased, or be offered for sale or lease, until FCC approval has been obtained.

ISO 9001 SGS

HEAR comes the Sun with ICOM UPGRADE 1999

ICOM®

www.icomamerica.com

ICOM IC-2800H*

NEW Top-of-the-Line Dual Bander Adds Video Excitement to Audio Excellence

High Visability Color LCD

Customizing the brightness, contrast and background color to fit your operating requirements is fast and easy.

APRS, SSTV, GPS... Now You're Ready.

The '2800H's color LCD screen is more than a pretty face. Display the latest in visual ham communications, and open up a new dimension to your hobby.**

9600 BPS Packet Control.**

Packet popularity is growing. Have fun! The '2800H offers a dedicated data port on the main unit.

Independent Band Controls.

Independent controls make it easy to work V/U, U/V, or cross band repeat. Tuning, AF and squelch level, and four function switches are available per band.

External Video Input

Accepts NTSC video signals (PAL in European model). Simple connection works with most digital camera or VCR plugs.

Separate Control Head

Install the main body under a seat, in the trunk, or wherever it remains out of the way.

Full Function Microphone

Total control! Backlit keys, too.

6 Pin Data Port

*Simple packet connection.***

SPECIFICATIONS

Transmit: ..... 2 Meter, 440 MHz (70 CM)
Receive: ..... 118-174 MHz, 440-450 MHz
(guaranteed 144 - 148 and 440 - 450 MHz only)
Mode: ..... AM (118 - 135.9 Rx only), FM
Power: ..... 2 Meter: 50W/20W/10W/5W
440 MHz: 35W/20W/10W/5W
Power Supply Requirement: ... 13.8 V DC
Memory Channels: ..... 232 Total
Including 12 Scan Edges, 10 Log, 10 Repeater, and 2 Call

Size & Weight (approximate):
Control head: . 5.5(W) x 2.75(H) x 1.3(D) in.
140(W) x 70(H) x 34(D) mm.
10.2 oz /290 g
Main Unit: ..... 5.5(W) x 1.6(H) x 6.6(D) in.
140(W) x 40(H) x 165.8(D) mm.
2 lb, 9 oz /1.15 kg

FEATURES

- **Totally Separate Control Head**
  - Independent band controls
  - High visability TFT color LCD monitor
  - Connection cable included
- **Independent Tuning Controls**
  - Tuning, AF and squelch level, and 4 function control switches per band
- **Tone Squelch (CTCSS Encode) with Pocket Beep and Tone Scan (CTCSS Decode) Standard**
  - 50 independently programmable tone frequencies for repeater and tone squelch use, respectively
- **On-Screen Menu "Soft Keys"**
- **Simple Band Scope**
- **9600 BPS Packet**
- **Fast Scanning**
- **Air Band Rx**
- **Auto Power OFF**
- **Built-in Duplexer**
- **Selectable Attenuator**
- **Auto Repeater Function**
- **Rugged ICOM Construction**
- **Mounting Brackets Included**
  - One for controller, one for main unit
- **Wireless Mic (optional)**

Simple Band Scope

The high visability screen offers a wealth of information: scope, S meter, memory names, scan conditions, and more.

Easy Viewing, Easy Adjusting

User-adjustable brightness & contrast controls are located in the edit menu. Quickly find and adjust any controls.

Other Images

*Preview real time VCR or digital camera images**, monitor TV broadcasts with a TV tuner**, scan GPS maps**, and more.*

Explore SEEING as well as hearing more of today's amateur activity. Visit your authorized ICOM dealer, or call our 24-hour brochure line. **425-450-6088**

PC Ready!

ICOM options required for PC connections:

CS-2800 Cloning Software
OPC-478 Cloning Cable

A third party 6-pin serial cable is required for PC packet connection

*This device has not been approved by the Federal Communications Commission. This device may not be sold or leased, or be offered for sale or lease, until approval of the FCC has been obtained.

ICOM®

www.icomamerica.com

**Optional and/or third party equipment required.

Value, Quality, Service.

MAHA

"Your Supplier, Your Partner, Your Friend!"

MH-C777 Universal Charger & Conditioner

Charge Just About All of Your Battery Packs

- Charge almost all of your NiCD & NiMH battery packs for your handhelds, camcorders, cellular, and notebooks!
- Auto 4.8V to 12V detection.
- -dV driven microprocessors plus temperature probe.
- For home and vehicle use.
- CAR ADAPTER INCLUDED!

MH-C204F Rapid Charger & Conditioner

- Rapid charge & condition your AA / AAA NiMH & NiCD battery cells.
- BATTERY CHARGED IN 1-3 HOURS!
- Two independent banks for 2 or 4 AA or AAA batteries.
- Automatic detection PLUS trickle charge.
- Ultimate solution for your batteries on handhelds, FRS, digital camera, CD player, and toys.

Rapid Charge & Condition Your AA & AAA Batteries

Also available: MH-C124S, 1-4 cell overnight slow charger.
AA-T, 1300mAh 1.2V NiMH AA Battery Cell.

Ultra High Capacity NiMH Battery Packs

Ultra High Capacity plus Durable Reliability

- Ultra high capacity.
- No memory effect.
- Maha's legendry quality.
- Environmental friendly.
- Maintains full voltage during 80-90% of use.
- Full one-year limited warranty.
- Great selection!

1800MAH

MH-PB-39H
1800mAh 6V for Kenwood TH-G71A / D7

1050MAH

MH-PB-39
1050mAh 9.6V for Kenwood TH-G71A / D7

ICOM T8A

MH-BP-200
680mAh 9.6V for Icom IC-T8A.

Maha Communications, Inc.
2841-B Saturn St.
Brea, CA 92821
Tel: 800-376-9992 or 714-985-9132
Fax: 714-985-9221

http://www.maha-comm.com/

ICOM IC-T8A

Compact, Easy to Use 6M/2M/440MHz Tri-Bander with Loud, Crisp Wide Band Rx

FREE ALKALINE BATTERY PACK BP-197 while supplies last!

SAVE $40 ON THE SPOT

Hurry! offers end 3/31/99

see your ICOM dealer for details

SMA ANTENNA BASE
Provides extra support and durability

ADD A NEW DIMENSION OF FUN. 6 meter activity is quickly growing. Get in on the fun! With ICOM's new 'T8A, work 6 meter repeaters, right from your hand.

SIMPLICITY, STRAIGHT OUT OF THE BOX. Function keys can be confusing and difficult to learn. Fortunately, the 'T8A doesn't use any! It's so easy to use, many operators claim that they never needed to use the instruction manual.

LISTEN BEYOND THE HAM BANDS. Pick up incredibly clear, wide band* reception. Tune in a ball game (radio *or* TV broadcast), listen to air traffic control, or scan for police activity. Take the 'T8A everywhere!

*Reception guaranteed only on ham bands.

SHOWN AT ACTUAL SIZE

SPECIFICATIONS

Transmit ..... 6 meter/2 meter/440 MHz
Receive ..... 50-54, 76-174, 400-470 MHz*
Pick up UHF, VHF, FM, AM Air Band, some TV Broadcast, and Public Safety, even deep inside most office buildings
Mode ..... FM (WFM Rx)
Power ..... Up to 5 Watts (13.5V)
Memory Channels ..... 123 total
With 100 regular, 10 scan edge pairs, and 1 call per band
Size ..... 2.3(W) x 4.2(H) x 1.1(D) in.
5(W) x 107(H) x 28.5(D) mm.
Weight ..... 9.9 oz / 280 g

FEATURES

- **Slim, Powerful Ni-MH Battery****
  - 4.5 Watts @ 9.8V/680mAh (4-6 hrs)
- **Rugged ICOM Construction**
  - Die-cast aluminum chassis
  - JIS-4 water resistant rating
- **Built to Military Specifications**
- **(MIL STD) 810 C/D/E Shock/Vibration**
- **One-Touch Band Selection**
  - Work one band at a time
- **CTCSS Encode/Decode (Tone Squelch)**
  - Fully adjustable, with pocket beep
- **CTCSS Tone Scan**
- **DTMF Encoder with 9 Memories**
- **Backlit Alphanumeric Display**
  - Use a PC to name memory channels
- **Built-In Guide Function**
- **Auto Repeater**
- **Battery Voltage Indicator**
- **9 Tuning Steps**
- **"AA" Alkaline Battery Pack (optional)**
- **Wall Charger and Belt Clip Included**

**Early 'T8As (v.05) received 6.0V/700mAh batteries

TRI BAND ANTENNA
A unique loading coil allows for amazing 6 meter performance. UHF and 2 meter performance gets high marks, too

SLIM PROFILE
Back mounted Ni-MH battery (3/8" thin) snaps on with a snug "click", providing a secure fit

PC Ready!

ICOM options required for PC operation:
OPC-478 Cloning cable,
CS-T8 Cloning software

Now get the fun of 3 bands for the price of a mid-range dual-bander. Pick up a 'T8A today. For a free brochure, call **425-450-6088**

ISO 9002 ISGB

MIL STD 810 C/D/E

JIS 4 WATER RESISTANT

HEAR from the Sun with ICOM

ICOM®

www.icomamerica.com

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494. ARRL yearly membership dues (including a subscription to *QST*), are $34 worldwide. To compensate for additional postage for mailing outside the US please remit $47. Complete membership information is shown on page 5. Periodicals postage paid at Hartford, CT, and at additional mailing offices.

POSTMASTER: Form 3579 requested. Send address changes to: *QST*, 225 Main St, Newington, CT 06111-1494

Volume 83, Number 4

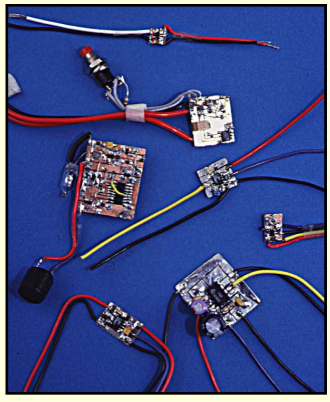
See page 10 for detailed contact information.
Telephone: 860-594-0200
Fax: 860-594-0259

Technical

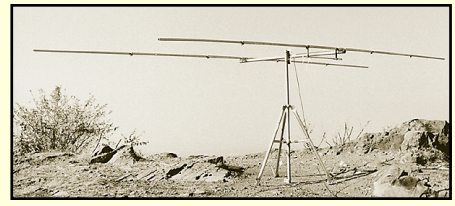

72

News and Features

New Ham Companion



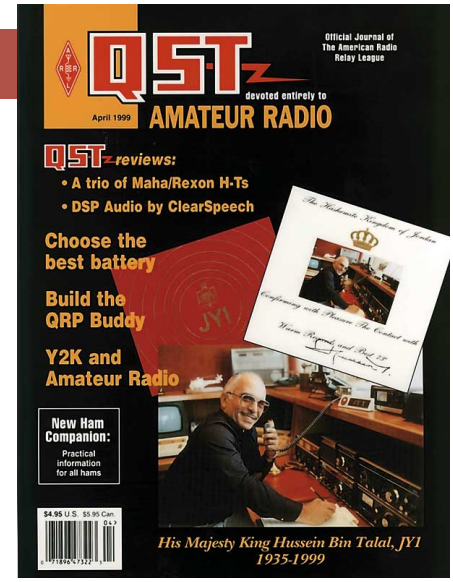
33



67

Operating

Departments



Our Cover

On February 7, 1999 King Hussein bin Talal, JY1, became a Silent Key. He leaves an enduring legacy as one of the most active supporters of Amateur Radio on the international stage. Read "The Passage of a King" in this month's issue of *QST*. *(Photo courtesy the International Press office in Amman, Jordan. JY1 QSL card courtesy Paul Shafer, KB1BE.)*

Membership in the ARRL, including a subscription to *QST*, is available to individuals at the following rates: $34 per year in the US and possessions, $47 elsewhere, payable in US funds. Age 65 and over, with proof of age, $28 (US only). Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Life membership is also available. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $34 per year postpaid in the US and possessions, $47 elsewhere. Single copies $5 in the US.

Membership without *QST* is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for $5 per year.

Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds.

QST is available to blind and physically handicapped individuals on flexible disks from the Library of Congress, National Library Service for the Blind and Physically Handicapped, Washington, DC 20542.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421

In order to ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact the Circulation Department immediately. Thank you for your assistance.

PRYME®
Radio Products

NiCd and NiMH Battery Packs

→ **FREE** one-year battery analysis *
→ **TRADE IN** policy *

PR-BP7H - 13.8 Volt, 1000 mAH NiMH battery pack for Icom IC-02AT, IC-2GAT, IC-H16/U16, or Radio Shack HTX-202, HTX-404. **Cost: $67.90 each.**

PR-BP173H - 9.6 Volt, 650 mAH NiMH battery pack for Icom IC-W32, IC-T7A, IC-T22A. **Cost: $61.90 each.**

PR-PB34H - 9.6 Volt, 1000 mAH NiMH battery pack for Kenwood TH-22 and TH-79. **Cost: $55.90 each.**

PR-FNB27H - 12 Volt, 1000 mAH NiMH battery pack for Yaesu FT-26, FT-415, FT-416, and FT-530. **Cost: $58.90 each.**

PR-FNB41H - 9.6 Volt, 1000 mAH NiMH battery pack for Yaesu FT-50, FT-10, FT-40. **Cost: $58.90 each.**

PR-FNBV47H - 7.2 Volt, 1800 mAH NiMH battery pack for Yaesu FT-50, FT-10, FT-40, and Vertex VX-10. **Cost: $58.90 each.**

Take an additonal **10% Off** *all regularly priced batteries*

Speaker Microphones

SPM-400 Series - Mini Boom Microphones

PREMIER Communications announces a new addition to its **PRYME Radio Products™** brand of portable accessories: a series of miniature, light-duty headset microphones for many models of portable two-way radio. The SPM-400 series headsets include an in-the-ear speaker and a patented rubber-covered earloop design that adjusts to comfortably fit either the right or left ear of any user. The entire headset/speaker assembly is made of durable polyurethane and rubber. The unit features an in-line Push-To-Talk switch that can be clipped to the user's lapel or belt, or the unit can be keyed remotely using an optional remote cord. Models available for use with ADI, Alinco, Icom, Kenwood, Motorola Radius, Standard, and Yaesu (including models for the FT-50 and VX-1R).

As low as **$25.95** EACH!

SPM-200/200E Series - Surveillance Microphones

PREMIER Communications offers a line of surveillance lapel microphones that are easily adaptable to a variety of uses. Our microphones secure to the user's collar, lapel, or belt with an adjustable metal clip that rotates 360° for maximum utility. The microphone's Push-To-Talk button is located in an easy to reach position on the microphone housing. These units are built to high standards, with tough plastic microphone housings and durable cords. The SPM-200 series features an in-the-ear speaker while the SPM-200E has an earphone with a patented rubber earhook, making it the most comforable survelliance mic ever! Models available for use with ADI, Alinco, Icom, Kenwood, Motorola Radius, Standard, and Yaesu (including models for the FT-50 and VX-1R).

As low as **$18.95** EACH!

SPM-700 Series - Palm Microphones

The new SPM-700 series represents a big step forward for clandestine and low profile communications needs. The unit's microphone and PTT switch are located in a one piece molded plastic unit that can be easily attached to a finger with velrco and concealed in the palm of your hand! The cords for the microphone and the included EH-1 earphone can be easily run inside clothing to keep that low profile look, but even small amounts of exposed cord blend in because of all of the wire used in the unit is flesh colored! Models available for use with ADI, Alinco, Icom, Kenwood, Motorola Radius, Standard, and Yaesu (including models for the FT-50 and VX-1R).

As low as **$29.95** EACH!

Battery Close-Outs! Limited Quantities!

PR-EBP-16H	NiMH	7.2 Volt, 1200 mAH	Alinco DJ-F1T	$27.90
PR-EBP-16N	NiCd	7.2 Volt, 600 mAH	Alinco DJ-F1T	$20.90
PR-PB-14N	NiCd	12 Volt, 400 mAH	Kenwood TH-27, TH-28, TH-78	$21.90
PR-PB-17N	NiCd	12 Volt, 600 mAH	Kenwood TH-27, TH-28, TH-78	$25.90
PR-PB18H	HiMH	7.2 Volt, 1200 mAH	Kenwood TH-27, TH-28, TH-78	$26.90
PR-PB32H	NiMH	6 Volt, 1000 mAH	Kenwood TH-22, TH-79, TK208	$26.90
PR-PB32N	NiCd	6 Volt, 600 mAH	Kenwood TH-22, TH-79, TK208	$17.90
PR-FNB27N	NiCd	12 Volt, 600 mAH	Yaesu FT-26, FT-415/416, FT-530	$22.90
PR-FNB38H	NiMH	9.6 Volt, 650 mAH	Yaesu FT-11, FT-41, FT-51	$29.90
PR-FNB41N	NiCd	9.6 Volt, 600 mAH	Yaesu FT-10, FT-40, FT-50	$26.90

*see our webpage for details

Order PRYME Batteries and Accessories On-Line:
Visit us at www.prymebattery.com!

Orders: 1-800-666-2654
8 AM - 5 PM Pacific
Monday thru Friday

The Future Has Arrived....

The next generation of amateur single band mobile radios has arrived. The new ADI AR-147, AR-247, and AR-447 bring new and exciting features to the amateur Two Meter, 1.35 Meter, and 70 Centimeter bands.

All three units feature lots of memories (81), impressive intermod immunity and receiver sensitivity, wideband receive, and more. These are also the first amateur mobile radios ever to feature both CTCSS and DCS (Digtially Coded Squelch) encode/decode, and tone scan. DCS adds 106 new tones to the radio, in additon to the 50 standard CTCSS tones, that can be used for selective calling or repeater access. This ensures that the radios will be compatible with the more advanced amateur repeater systems of the future.

The compact, ergonomic design of these new mobile radios makes them a pleasure to operate. The number of operating controls has been kept to an absolute minium to assure ease of use. Features like direct frequency entry from the supplied DTMF microphone, and DTMF redial for failed autopatch calls make mobile operation an absolute snap.

MARS operators will love the wideband performance these units offer. All three units are fully MARS expandable, with proof of license. Canadian amateur radio operators can also expand the AR-247 to cover the complete 220-225 MHz Canadian ham band.

For more information check out our web site at www.adi-radio.com or contact your local ham dealer today!

ADI AR-147, AR-247, AR-447
Advanced Monband Mobiles

Transmit Range:
AR-147: 144-148 MHz
AR-247: 222-225 MHz
AR-447: 430-450 MHz

Receive Range:
AR-147: 118-171 MHz (includes AM Air)
AR-247: 216-229 MHz
AR-447: 400-470 MHz

Power Output:
AR-147: 50 / 15 / 5 watts
AR-247: 30 / 15 / 5 watts
AR-447: 35 / 15 / 5 watts

- 80 memories plus a CALL channel
- CTCSS (50 tones) and **DCS** (106 tones) encode, decode, and tone scan
- MARS capable (permits required)
- 9 DTMF autodialer memories
- Built-in redialer for autopatch use
- Programmable band and memory scan
- Time Out Timer
- DTMF paging
- Dual frequency watch
- Auto Repeater Offset (AR-147 only)
- Direct frequency entry using multi-function DTMF microphone
- PC programmable (with optional software)
- Auto Power Off
- Frequency or channel display modes
- Four-step display dimmer
- Power line over/under voltage protection
- Small! Size: 1.5" (H) x 5.5" (W) x 6.25" (D)

Not Pictured:
ADI AR-247
Advanced Mobile Radio for 222 MHz!

*"The AR-147, AR-247, and AR-447 will be compatible with amateur repeater systems for years to come. Just another reason why ADI is the **Best Value in Amateur Radio**℠."*

See us at the DAYTON Hamvention Booths # 319 - 320

*"WOW! ADI's new radios are the first amateur mobile radios **ever** to feature both CTCSS **and DCS** encode, decode, and tone scan!"*

Win FREE ADI equipment on the web at www.adi-radio.com!

Study for your ham license or upgrade at www.hamtest.com!

ADI

by **PREMIER Communications Corp.**
480 Apollo St. #E • Brea, CA 92821
Phone: 714-257-0300 • **Fax:** 714-257-0600
E-mail: premier@adi-radio.com

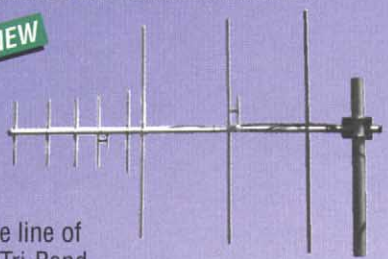
* These units have not yet been approved by the FCC. They may not be offered for sale until after such approval is granted.

Featuring the COMET Exclusive SLC System:

- **Linear Coil for Maximum Gain**
- **Soldered Element Joints**
- **ABS Radome Joints: Weather Proof/Invisible to RF for the Finest Radiation Pattern**

CYA-240 • Dual-band 146/446MHz Yagi Cable and Divider included • VHF 3 Elements • UHF 5 Elements • Max Pwr: 150 FM/300W SSB • Boom Length: 5'3" • Weight: 4lbs. 7 ozs. • Conn: SO-239 • Construction: Aluminum

NEW



GP-3 Dual-band 146/446 MHz Base Repeater Antenna 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Max Pwr: 200W • Lenghth: 5'11" • Weight: 2lbs. 9ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass

GP-6 • Dual-band 146/446MHz Base Repeater Antenna 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 5 • Max Pwr: 200W • Length: 10'2" • Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

GP-9/GP-9N • Dual-band 146/446MHz Base Repeater Antenna • BEST SELLER! 146MHz 5/8 wave x 3 • 446MHz 5/8 wave x 8 • Max Pwr: 200W • Length: 17'8" • Weight: 5lbs. 11ozs. • Conn: GP-9 Gold-plated SO-239 • GP-9N Gold-plated N-type female • Construction: Fiberglass, 3 Sections

CX-333 • Tri-band 146/220/446MHz Base Repeater Antenna 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3 • 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1 oz. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

GP-15 • Tri-band 52/146/446MHz Base Repeater Antenna 52MHz 5/8 wave • 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 4 • Max Pwr: 300W • Length 7'11" • Weight: 3lbs. 1 oz. • Conn: Gold-plated SO-239 • 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

COMET has an extensive line of Mono-Band/Dual-Band/Tri-Band Antennas for Base Station and Repeater use.

For a complete catalog of **COMET** Antenna products call or visit your local dealer. Or, contact **NCG Company** at 800/962-2611. Use **COMET** products, and enjoy amateur radio to it's fullest!

COMET

1275 N. Grove Street • Anaheim • California 92806
(714) 630-4541 • (800) 962-2611 • Fax: (714) 630-7024

"It Seems to Us..."

Pleased with More FCC Enforcement? Thank an OO!

It's almost impossible to wipe the smiles off of many amateurs' faces these days, as the FCC takes breathtaking enforcement action after action, seemingly on a daily basis. An FCC staff member has checked into nets, warning operators, and inspectors have surprised alleged troublemakers with station visits. A New Jersey ham was ordered off 40 meters after allegedly causing interference to a net on 7.240 MHz; the FCC then fined the amateur $7500. Another ham in the same state has been notified that his operating privileges below 30 MHz are being suspended for 180 days for failing to heed earlier warnings about apparent violations. The FCC socked a Florida ham with a $2500 fine for malicious interference. Numerous warnings have been sent to subjects of complaints; some have even received telephone calls. FCC field staffs have also been getting involved, as new enforcement mandates have filtered down to field offices. And indications are that the FCC is further ratcheting up its staff resources for enforcement. Message: Expect even more enforcement and less tolerance of amateur service violators.

What happened? Who do we thank for this apparent new dawn? Well, tip your hat to Riley Hollingsworth at FCC for one, who grabbed the ball and ran with it after Compliance and Information Bureau chief Richard Lee kicked it into play last spring. You will meet Riley on page 52 of this issue. These two deserve a lot of credit. But, let's look a little deeper, too.

Ever hear of an Official Observer? The *Amateur Auxiliary to the FCC* is made up of OOs across the country who, for some 60 years, have monitored the bands and identified technical and operating discrepancies as a service to their fellow hams. In 1984, the ARRL and FCC signed an agreement enabling OOs to gather and forward evidence that could be used by the FCC in enforcement actions. The FCC agreed to follow-up with enforcement action in truly serious cases developed by the volunteers. The only problem was that the FCC didn't live up to its part of the deal. Instead of helping FCC kick butt, OOs became the butt of jokes on the air for their impotence.

The OOs were demoralized a bit, perhaps, but, surprise: they did not give up. They continued to develop and forward cases, despite their ending up in the Washington black hole. The OOs continued to fulfill their part of the bargain under the ARRL/FCC agreement, in many cases with limited expectations of FCC action.

Paralleling this experience were comprehensive efforts by a special select committee of the ARRL, the Enforcement Task Force, which brought about pressure on the FCC at many levels to reinvigorate its enforcement activity. At the committee's recommendation, the League's Board authorized the filing of a petition with the FCC which set forth a comprehensive plan for increased use of our volunteers in bringing and pursuing private sector complaints in amateur malicious interference cases. We had sought to bring cases directly to the FCC's Administrative Law Judges, bypassing the agency's then uninterested, ineffective staff.

Although the proposal was effectively dismissed by the Commission in its recent biennial rules review, the agency simply could no longer look at itself in the mirror with respect to amateur enforcement. Amateur Auxiliary cases developed by OOs and submitted by ARRL HQ to FCC Washington, only to languish, were used by ARRL as evidence that the problem lay squarely at the FCC's feet, and not anywhere else. If OOs had given up, as many lesser volunteers would have, that evidence would not have existed, and we would quite possibly be back where we were a year ago, with no enforcement and violators thumbing their noses at the rest of us.

Sure, go ahead and thank the new Kennard administration, which finally has taken the FCC's head out of the spectrum auction sand and has made a renewed commitment to enforcement. Embrace Riley Hollingsworth and Richard Lee of the Commission staff for getting the ball rolling again with regard to the Amateur Radio Service. Confer praise upon a persistent committee of the League's Board; they're volunteers and they deserve it. But, don't forget to pat an OO on the back next time you see one at a club meeting or hamfest. They deserve just as much credit as the more visible players, if not more. Make a point of it.—*Rick Palm, K1CE*

We're At Your Service

ARRL Headquarters is open from 8 AM to 5 PM Eastern Time, Monday through Friday, except holidays. Our address is: 225 Main St, Newington, CT 06111-1494. You can call us at 860-594-0200, or fax us at 860-594-0259.

If you have a question, try one of these Headquarters departments . . .

	Contact	*Telephone*	*Electronic Mail*
Joining ARRL	Membership Desk	888-277-5289	circulation@arrl.org
***QST* Delivery**	Circulation Desk	860-594-0338	circulation@arrl.org
Publication Orders	Sales Desk	888-277-5289	pubsales@arrl.org
M-F Only, 8 AM to 8 PM Eastern Time (toll free)			
Regulatory Info	Tom Hogerty	860-594-0323	reginfo@arrl.org
Exams	VEC	860-594-0300	vec@arrl.org
Educational Materials	Educational Services	860-594-0301	ead@arrl.org
Contests	Dan Henderson	860-594-0232	n1nd@arrl.org
Technical Questions	ARRL Lab	860-594-0214	tis@arrl.org
Awards	Eileen Sapko	860-594-0288	awards@arrl.org
DXCC/VUCC	Bill Moore	860-594-0234	dxcc@arrl.org
Advertising	Hanan Suleiman	860-594-0207	ads@arrl.org
Media Relations	Jennifer Hagy	860-594-0328	newsmedia@arrl.org
QSL Service	Martin Cook	860-594-0274	buro@arrl.org
Scholarships	Mary Robertson	860-594-0230	foundation@arrl.org
Emergency Comm	Rick Palm	860-594-0261	k1ce@arrl.org
Clubs	Field Services	860-594-0264	clubs@arrl.org
Hamfests	Gail Iannone	860-594-0262	hamfests@arrl.org

You can send e-mail to any ARRL Headquarters employee if you know his or her name or call sign. The second half of every Headquarters e-mail address is **@arrl.org**. To create the first half, simply use the person's call sign. If you don't know their call sign, use the first letter of their first name, followed by their complete last name. For example, to send a message to John Hennessee, N1KB, Regulatory Information Specialist, you could address it to jhennessee@arrl.org or N1KB@arrl.org.

If all else fails, send e-mail to hq@arrl.org and it will be routed to the right people or departments.

Technical Information Server

If you have Internet e-mail capability, you can tap into the ARRL Technical Information Server, otherwise known as the *Info Server*. To have user instructions and a handy index sent to you automatically, simply address an e-mail message to: info@arrl.org
Subject: **Info Request**
In the body of your message enter:

HELP
SEND INDEX
QUIT

ARRL on the World Wide Web

You'll also find the ARRL on the World Wide Web at:

http://www.arrl.org/

At the ARRL Web page you'll find the latest W1AW bulletins, a hamfest calendar, exam schedules, an on-line ARRL Publications Catalog and much more. We're always adding new features to our Web page, so check it often!

Members-Only Web Site

As an ARRL member you enjoy exclusive access to our Members-Only Web site. Just point your browser to http://www,arrl.org/members/ and you'll open the door to benefits that you won't find anywhere else.

- Our on-line Web magazine, the *ARRLWeb Extra* with colorful news and features you *won't* see in *QST*.
- *QST* Product Review Archive. Get copies of *QST* product reviews from 1980 to the present.
- *QST/QEX* searchable index (find that article you were looking for!)
- Previews of contest results and product reviews. See them here before they appear in *QST!*
- Access to your information in the ARRL membership database. Enter corrections or updates on line!

Stopping by for a visit?

We offer tours of Headquarters and W1AW at 9, 10 and 11 AM, and at 1, 2 and 3 PM, Monday to Friday (except holidays). Special tour times may be arranged in advance. Bring your license and you can operate W1AW anytime between 10 AM and 4 PM!

Would you like to write for QST?

We're always looking for new material of interest to hams. Send a self-addressed, stamped envelope (55¢ postage) and ask for a copy of the *Author's Guide*. (It's also available via the ARRL Info Server, and via the World Wide Web at http://www.arrl.org/qst/aguide/.) The guide contains all the information you'll need to craft an article to meet our requirements. Send article ideas or manuscripts to the attention of the *QST* Editor (e-mail qst@arrl.org).

Press Releases and New Products/Books

Send your press releases and new book announcements to the attention of the ***QST* Editor** (e-mail qst@arrl.org). New product announcements should be sent to the Product Review Editor (e-mail reviews@arrl.org).

Strays and Up Front

Send your Strays and Up Front materials to the *QST* Features Editor (e-mail upfront@arrl.org). Be sure to include your name, address and daytime telephone number.

Interested in Becoming a Ham?

Just pick up the telephone and call toll free 1-800-326-3942, or send e-mail to newham@arrl.org. We'll provide helpful advice on obtaining your Amateur Radio license, and we'll be happy to send you our informative Prospective Ham Package.

ARRL Audio News

The best way to keep up with fast-moving events in the ham community is to listen to the ARRL Audio News. It's as close as your telephone at 860-594-0384, or on the Web at http://www.arrl.org/arrlletter/audio/.

ARRL Directors

Atlantic Division
KAY C. CRAIGIE, WT3P*
5 Faggs Manor Ln, Paoli, PA 19301
(610-993-9623);
wt3p@arrl.org
Vice Director: Bernie Fuller, N3EFN
17668 Price Rd, Saegertown, PA 16433
(814-763-1529);
n3efn@arrl.org

Central Division
EDMOND A. METZGER, W9PRN
1917 Lindsay Rd, Springfield, IL 62704
(217-546-6870);
w9prn@arrl.org
Vice Director: Howard S. Huntington, K9KM, 25350 N Marilyn Ln, Hawthorn Woods, IL 60047 (847-438-3452);
k9km@arrl.org

Dakota Division
TOD OLSON, K0TO
292 Heather Ln, Long Lake, MN 55356
(612-819-0857);
k0to@arrl.org
Vice Director: Jay Bellows, K0QB
997 Portland Ave, St Paul, MN 55104
(651-222-7253); k0qb@arrl.org

Delta Division
RICK RODERICK, K5UR
PO Box 1463, Little Rock, AR 72203
(501-988-2527); k5ur@arrl.org
Vice Director: Henry R. Leggette, WD4Q, 7335 Ginger Snap Cove, Memphis, TN 38125-4732
(901-757-0444); wd4q@arrl.org

Great Lakes Division
DAVE COONS, WT8W
932 Hedwick St, New Carlisle, OH 45344 (937-849-0604);
wt8w@arrl.org
Vice Director: George Race, WB8BGY
3865 Gibbs Rd, Albion, MI 49224
(517-531-4758);
wb8bgy@arrl.org

Hudson Division
FRANK FALLON, N2FF
30 E Williston Ave, East Williston, NY 11596 (516-746-7652);
n2ff@arrl.org
Vice Director: J. P. Kleinhaus, W2XX
29 Dirubbo Dr, Cortlandt Manor, NY 10567 (914-739-6318);
w2xx@arrl.org

Midwest Division
LEW GORDON, K4VX
PO Box 105, Hannibal, MO 63401
(573-221-7730); k4vx@arrl.org
Vice Director: Bruce Frahm, K0BJ, PO Box DX, Colby, KS 67701
(785-462-7388); k0bj@arrl.org

New England Division
TOM FRENAYE, K1KI
PO Box 386, West Suffield, CT 06093
(860-668-5444); k1ki@arrl.org
Vice Director: Mike Raisbeck, K1TWF, 85 High St, Chelmsford, MA 01824
(978-250-1235); k1twf@arrl.org

Northwestern Division
GREG MILNES, W7AGQ
740 SE 24th Ave, Hillsboro, OR 97123-7286 (503-648-6990);
w7agq@arrl.org
Vice Director: James E. Fenstermaker, K9JF, 10312 NE 161st Ave, Vancouver, WA 98682 (360-256-1716); k9jf@arrl.org

Pacific Division
BRAD WYATT, K6WR
18400 Overlook Rd, No 5, Los Gatos, CA 95030 (408-395-2501);
k6wr@arrl.org
Vice Director: Jim Maxwell, W6CF, PO Box 473, Redwood Estates, CA 95044
(408-353-3911);
w6cf@arrl.org

Roanoke Division
JOHN C. KANODE, N4MM
Box 1741 Old Chapel Rd, Boyce, VA 22620 (540-837-1340);
n4mm@arrl.org
Vice Director: Dennis Bodson, W4PWF, 233 N Columbus St, Arlington, VA 22203 (703-243-3743);
w4pwf@arrl.org

Rocky Mountain Division
WALT STINSON, W0CP,
999 S Logan St, Denver, CO 80209
(303-770-3926);w0cp@arrl.org
Vice Director: Marshall Quiat, AG0X
PO Box 200878, Denver, CO 80220-0878 (303-331-3456);
ag0x@arrl.org

Southeastern Division
FRANK M. BUTLER JR, W4RH*
323 Elliott Rd SE, Ft Walton Beach, FL 32548 (850-244-5425);
w4rh@arrl.org
Vice Director: Evelyn Gauzens, W4WYR, 2780 NW 3rd St, Miami, FL 33125 (305-642-4139);
w4wyr@arrl.org

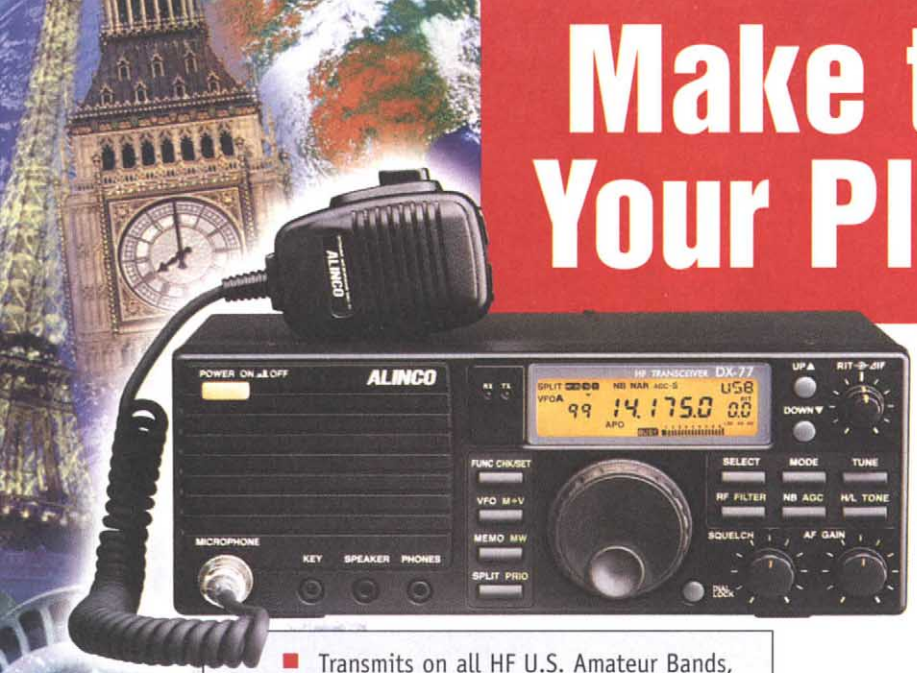
Southwestern Division
FRIED HEYN, WA6WZO*
962 Cheyenne St, Costa Mesa, CA 92626 (714-549-8516);
wa6wzo@arrl.org
Vice Director: Art Goddard, W6XD, 2901 Palau Pl, Costa Mesa, CA 92626 (714-556-4396);
w6xd@arrl.org

West Gulf Division
JIM HAYNIE, W5JBP
3226 Newcastle Dr, Dallas, TX 75220-1640 (214-352-6180);
W, (214-351-2385);
w5jbp@arrl.org
Vice Director: Coy C. Day, N5OK, RR1, Box 254, Union City, OK 73090-9726 (405-483-5632;
n5ok@arrl.org

As an ARRL member, you elect the directors and vice directors who represent your division on ARRL policy matters. If you have a question or comment about League policies, contact your representatives at the addresses shown.

*Executive Committee Member

Make the World Your Playground!



Alinco DX-77T Desktop HF Transceiver

Loaded with features at an affordable price!

- Transmits on all HF U.S. Amateur Bands, 10 ~ 160 Meters SSB, CW, AM, FM and Data
- General coverage receiver 500 KHz ~ 30 MHz, all standard modes
- 100 watts output SSB, CW and FM, 40 watts AM
- Enhanced Direct Digital Synthesis (DDS) eliminates need for SSB Narrow Filter
- Built-in speech compressor
- Front panel mounted speaker with loud, clear audio
- Front panel jacks for convenient connections of key, headphones or external speaker
- QRM/QRN reduction with IF shift, standard CW audio filter and RF attenuator
- Built-in electronic keyer, adjustable from 6 ~ 50 wpm
- Full QSK, 7-step semi break-in operation or Auto Break-In CW modes
- 100 memory channels, each stores mode, split, frequency, AGC, RF attenuation or gain
- Computer control with optional ERW-4
- Front panel CTCSS tone access for 10 Meter FM operations (50 tones)
- Two VFOs plus Memory operation mode
- Rear panel connectors for external amplifier, antenna, power, computer control/cloning

The Alinco DX-77T is a design achievement that puts a new desktop HF transceiver within your reach. And this is no "bare bones" radio! The DX-77T was designed from the beginning to be a quality HF transceiver, full of features to enhance its performance and your enjoyment. The DX-77T has "big radio" features at a low Alinco price!

"Radios in this price class typically don't include built-in CW keyers, so it was a pleasant surprise to find one in the DX-77T. Nice going, Alinco!"

"With the long list of features already included in the DX-77T, first-time buyers may be curious as to what additional capabilities they would find in the next step up."

—QST Product Review, June 1998

Options

EDX-1 manual antenna tuner
EDX-2 automatic antenna tuner
ERW-4 personal computer interface

EMS-14 desktop microphone
EDS-5 microphone extension cable
DM-340MVT DC regulated power supply

Simple ▪ Clean ▪ Dependable

ALINCO®
AMATEUR RADIO'S VALUE LEADER℠

U.S.A. Alinco Branch: 438 Amapola Ave. • Suite 130 • Torrance, CA 90501
Phone: (310) 618-8616 • Fax: (310) 618-8758 • Internet: http: //www.alinco.com

The DX-77T represents the quality, performance and value you've come to expect from Alinco!

Get to Know Your Section Manager

The 15 divisions of the League are arranged into 70 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. These news items could find their way into the pages of *QST*! If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists).Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available.

Atlantic Division

Delaware	Randall K. Carlson, WB0JJX, 121 Scarborough Park Dr, No 10, Wilmington, DE 19804 (302-655-6179); **wb0jjx@arrl.org**
Eastern Pennsylvania	Allen R. Breiner Sr, W3TI, 212 Race St, Tamaqua, PA 18252 (570-668-3098); **w3ti@arrl.org**
Maryland-DC	William Howard, WB3V, 2304 Snowflake Dr, Odenton, MD 21113 (410-551-6775); **wb3v@arrl.org**
Northern New York	Leslie Schmarder, WA2AEA, RR 1 Box 236, Elizabethtown, NY 12932 (518-873-2189); **wa2aea@arrl.org**
Southern New Jersey	Jean Priestley, KA2YKN, 7158 Chandler Ave, Pennsauken, NJ 08105 (609-662-3587); **ka2ykn@arrl.org**
Western New York	William Thompson, W2MTA, 5460 Rock Rd, Newark Valley, NY 13811 (607-642-8930); **w2mta@arrl.org**
Western Pennsylvania	Bill Edgar, N3LLR, 22 Jackson Ave, Bradford, PA 16701 (814-362-1250); **n3llr@arrl.org**

Central Division

Illinois	Bruce Boston, KD9UL, 815 E 3rd St, Beardstown, IL 62618 (217-323-9809); **kd9ul@arrl.org**
Indiana	Peggy Coulter, W9JUJ, 12330 SCR 200 E, Muncie, IN 47302 (765-288-0481); **w9juj@arrl.org**
Wisconsin	Roy Pedersen, K9FHI, 510 Park St, Juneau, WI 53039-1243 (920-386-4666); **k9fhi@arrl.org**

Dakota Division

Minnesota	Randy "Max" Wendel, N0FKU, 8539 Bryant Ave S, Bloomington, MN 55420-2147 (612-888-5953); **n0fku@arrl.org**
North Dakota	Roger "Bill" Kurtti, WC0M, RR1, Box 34, Rock Lake, ND 58365 (701-266-5646); **wc0m@arrl.org**
South Dakota	Roland Cory, W0YMB, 815 2nd Ave W, Mobridge, SD 57601 (605-845-2400)

Delta Division

Arkansas	Roger Gray, N5QS, PO Box 166, Searcy, AR 72145 (501-729-5489); **n5qs@arrl.org**
Louisiana	Lionel A. "Al" Oubre, K5DPG, 3011 Sugar Mill Rd, New Iberia, LA 70563-8624 (318-367-3901); **k5dpg@arrl.org**
Mississippi	Malcolm Keown, W5XX, 14 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**
Tennessee	O. D. Keaton, WA4GLS, 141 Medearis Dr, Old Hickory, TN 37138 (615-758-2329); **wa4gls@arrl.org**

Great Lakes Division

Kentucky	Bill Uschan, K4MIS, 800 Leawood Dr #27, Frankfort, KY 40601 (502-226-6784); **k4mis@arrl.org**
Michigan	Richard Mondro, W8FQT, 800 Dover St, Dearborn Heights, MI 48127 (313-730-2111); **w8fqt@arrl.org**
Ohio	Joseph J. Phillips, K8QOE, 2800 Jupiter Dr, Fairfield, OH 45014-5022 (513-552-8324); **k8qoe@arrl.org**

Hudson Division

Eastern New York	Robert Leiden, KR2L, 19 Willowbrook Rd, Glenville, NY 12302 (518-399-9343); **kr2l@arrl.org**
NYC-Long Island	George Tranos, N2GA, PO Box 296, Bellport, NY 11713, (516-286-7562); **n2ga@arrl.org**
Northern New Jersey	Roy Edwards Sr, AB2RE, 1512 Seventh Ave, Neptune, NJ 07753 (732-774-1650); **ab2re@arrl.org**

Midwest Division

Iowa	Jim Lasley, N0JL, PO Box 5, Chillicothe, IA 52548 (515-935-4337); **n0jl@arrl.org**
Kansas	Orlan Q. Cook, W0OYH, 12110 West 71st St, Shawnee, KS 66216 (913-631-0423); **w0oyh@arrl.org**
Missouri	Charles Boyd, KE0K, 1010 Taylor, Louisiana, MO 63353 (573-754-6584); **ke0k@arrl.org**
Nebraska	Bill McCollum, KE0XQ, 1314 Deer Park Blvd, Omaha, NE 68108 (402-734-3316); **ke0xq@arrl.org**

New England Division

Connecticut	Betsey Doane, K1EIC, 92 Mohegan Rd, Shelton, CT 06484-2448 (203-929-7759); **k1eic@arrl.org**
Eastern Massachusetts	Lawrence Ober, W1MW, 113 5C Brigham St, Hudson, MA 01749 (978-567-0942); **w1mw@arrl.org**
Maine	William Woodhead, N1KAT, 63 1st Ave, Auburn, ME 04210 (207-782-4862); **n1kat@arrl.org**
New Hampshire	Alan Shuman, N1FIK, PO Box 119, Goffstown, NH 03045-0119 (603-487-3333); **n1fik@arrl.org**
Rhode Island	Rick Fairweather, K1KYI, 106 Chaplin St, Pawtucket, RI 02861 (401-725-7507); **k1kyi@arrl.org**
Vermont	Bob DeVarney, WE1U, 43 W Milton Rd, Milton, VT 05468 (802-482-4280); **we1u@arrl.org**
Western Massachusetts	William Voedisch, W1UD, 240 Main St, Leominster, MA 01453 (978-537-2502); **w1ud@arrl.org**

Northwestern Division

Alaska	David Stevens, KL7EB, PO Box 113242, Anchorage, AK 99511 (907-345-6506); **kl7eb@arrl.org**
Eastern Washington	Kyle Pugh, KA7CSP, W 5006 Houston Ave, Spokane, WA 99208 (509-327-5039); **ka7csp@arrl.org**
Idaho	Michael Elliott, KF7ZQ, 9832 W Gurdon Ct, Boise, ID 83704-4080 (208-376-3458); **kf7zq@arrl.org**
Montana	Darrell Thomas, N7KOR, 743 33rd Ave NE, Great Falls, MT 59404 (406-453-8574); **n7kor@arrl.org**
Oregon	William Sawders, K7ZM, 19821 Ponderosa St, Bend, OR 97702 (541-389-6258); **k7zm@arrl.org**
Western Washington	Harry Lewis, W7JWJ, 10352 Sand Point Way NE, Seattle, WA 98125 (206-523-9117); **w7jwj@arrl.org**

Pacific Division

East Bay	Bob Vallio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (510-537-6704); **w6rgg@arrl.org**
Nevada	Robert Davis, K7IY, PO Box 20361, Reno, NV 89515-0361 (702-856-2826); **k7iy@arrl.org**
Pacific	Ronald Phillips, AH6HN, HCR 2 Box 6637, Keaau, HI 96749 (808-982-6513); **ah6hn@arrl.org**
Sacramento Valley	Jettie Hill, W6RFF, 306 St Charles Ct, Roseville, CA 95661 (916-783-0383); **w6rff@arrl.org**
San Francisco	John Wallack, W6TLK, PO Box 1115, Kenwood, CA 95452 (707-833-1873); **w6tlk@arrl.org**
San Joaquin Valley	Donald Costello, W7WN, 1900 N Ashby Rd, No. 9, Merced, CA 95348 (209-383-5739); **w7wn@arrl.org**
Santa Clara Valley	Geoffrey Ellis, KD6MFM, 212 Germaine Ave, Santa Cruz, CA 95065 (831-475-1262); **kd6mfm@arrl.org**

Roanoke Division

North Carolina	W. Reed Whitten, AB4W, 1208 Oxford Pl, Cary, NC 27511(919-467-7464); **ab4w@arrl.org**
South Carolina	Leslie Shattuck Sr, K4NK, 112 Park Circle, Greenville, SC 29605 (864-422-8859); **k4nk@arrl.org**
Virginia	Lynn Gahagan, AF4CD, 208 Velva Dr, Chesapeake, VA 23325 (757-545-1290); **af4cd@arrl.org**
West Virginia	O. N. "Olie" Rinehart, WD8V, 1256 Ridge Dr, South Charleston, WV 25309-2434 (304-768-9534); **wd8v@arrl.org**

Rocky Mountain Division

Colorado	Tim Armagost, WB0TUB, 6337 S Lafayette Pl, Littleton, CO 80121 (303-795-9683); **wb0tub@arrl.org**
New Mexico	Joe Knight, W5PDY, 10408 Snow Heights Blvd NE, Albuquerque, NM 87112 (505-299-4581); **w5pdy@arrl.org**
Utah	Jim Rudnicki, NZ7T, 306 North 1500 East, Layton, UT 84040 (801-547-9218); **nz7t@arrl.org**
Wyoming	Robert Williams, N7LKH, PO Box 130, Wapiti, WY 82450 (307-527-7758); **n7lkh@arrl.org**

Southeastern Division

Alabama	vacant
Georgia	Sandy Donahue, W4RU, 960 Ralph McGill Blvd, Atlanta NE, GA 30306 (404-875-9450); **w4ru@arrl.org**
Northern Florida	Rudy Hubbard, WA4PUP, PO Box 843, Milton, FL 32572-0843 (850-626-0620); **wa4pup@arrl.org**
Southern Florida	Kevin Bunin, K4PG, 3307 Lakeview Dr, Delray Beach, FL 33445 (561-496-5257); **k4pg@arrl.org**
Puerto Rico	Raul Escobar, KP4ZZ, PO Box 366051, San Juan, PR 00936 (787-760-9070); **kp4zz@arrl.org**
Virgin Islands	John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**

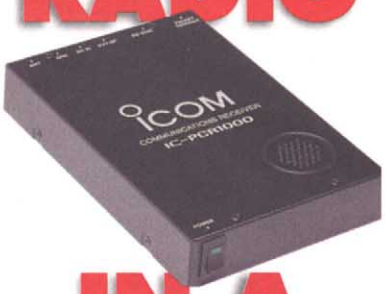
Southwestern Division

Arizona	Clifford Hauser, KD6XH, 8741 N Hollybrook Ave, Tucson, AZ 85742 (520-744-9095); **kd6xh@arrl.org**
Los Angeles	Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186); **w6bf@arrl.org**
Orange	Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394); **w6ubq@arrl.org**
San Diego	Tuck Miller, K6ZEC, 3122 E 2nd St, National City, CA 91950 (619-475-7333); **k6zec@arrl.org**
Santa Barbara	Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

West Gulf Division

North Texas	Donald Thomas, KA1CWM, PO Box 112, Coppell, TX 75019 (972-462-1333); **ka1cwm@arrl.org**
Oklahoma	Charlie Calhoun, K5TTT, 16101 E 98th St N, Owasso, OK 74055 (918-272-9872); **k5ttt@arrl.org**
South Texas	E. Ray Taylor, N5NAV, 688 Comal Ave, New Braunfels, TX 78130 (830-625-1683); **n5nav@arrl.org**
West Texas	Charles C. Royall, WB5T, 2063 Putter Dr, San Angelo, TX 76904 (915-944-0469); **wb5t@arrl.org**

WORLD WIDE RADIO



IN A LITTLE BLACK BOX

Combine powerful listening performance with go-anywhere PC convenience. ICOM's IC-PCR1000 wide band **multimedia** receiver is now available.

Keep the cover on your computer. There's **no PC internal hardware to install**. The IC-PCR1000 is 100% hardware external, about the same size as an Iomega® ZIP™ drive. **Stash it away in a laptop bag.**

External AC adapter included (not shown), or use optional DC power cord.

Take the black box with you to work, to school, on business trips, even while out camping or on a boat. **Listen to receiver activity while working in foreground applications.**

The big reception on this little radio will surprise you. Monitor **500 kHz – 1300 MHz*** on **all modes** (AM/FM/WFM/SSB/CW).

IC-PCR1000

100% PC External World Wide Receiver

Designed for **Windows® 3.1** *and* **Windows® 95.**

Also enjoy: unlimited memory channels, real time band scope, tone squelch (CTCSS) decode, 5 DTMF memories for advanced remote computer control, a 9600 baud data connection point for third party applications (like weather fax), and **optional DSP**.

Everything's included to get you started. And the latest software is always available for free downloading on the ICOM America web site. To get it, and to find your nearest authorized IC-PCR1000 dealer, visit the ICOM America website at:

www.icomamerica.com

ICOM®

Makers of the world's best radios for over 40 years.

Dealer and value added reseller inquiries welcome. IC-PCR1000 architecture open to approved third parties only.

AMERITRON *True Legal Limit*™ Tuner

Easily handles 1500 Watts continuous carrier even on 160 Meters . . . High-current edge-wound silver plated Roller Inductor . . . Two 500 pf high capacitance tuning capacitors with 6:1 vernier reduction drives . . . 3 core choke balun . . . Six position antenna switch . . . True peak reading Cross-Needle SWR/Wattmeter . . .

Call your dealer for your best price!

AMERITRON ATR-30

$599

Suggested Retail

- *Handles 1500 Watts carrier*
- ***Super High Current edge-wound silver plated Roller Inductor***
- ***500 pf tuning capacitors with 6:1 vernier reduction drives***
- ***3 core choke balun***
- ***6 position antenna switch***
- ***True peak reading meter***

AMERITRON's ATR-30 *True Legal Limit*™ roller inductor antenna tuner is ham radio's toughest! It'll handle 1500 Watts *continuous carrier output* on *all* modes and *all* HF bands into most antennas -- even on 160 Meters where most antenna tuners fail.

It's perfect for Ameritron's most powerful amplifiers where the ATR-30 just loafs.

All band coverage lets you operate 1.8-30 MHz including all MARS and WARC bands.

Super High Current Roller Inductor

You'll see Ameritron's new *super high current* air core roller inductor. It's *edge wound* from a thick solid copper strip and silver plated. This produces a large surface area and a massive conductor. It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn ordinary roller inductors.

A gear driven turns counter and crank knob gives you precise inductance control.

Two 500 pf Tuning Capacitors

Two 500 pf -- *the highest of any antenna tuner* -- variable transmitting capacitors give you no-arc wide range impedance matching for true high power performance.

6:1 vernier reduction drives makes capacitor tuning smooth and easy.

Super Balun, 6 position Antenna Switch

Super heavy duty three core choke balun lets you match virtually any balanced feedline antenna without core saturation.

A 6 position antenna switch lets you select your desired operating antenna.

Read *true* Peak Power

Ameritron's active electronic *true* peak reading meter accurately reads forward and reflected power and SWR *simultaneously* on a lighted Cross-Needle meter.

Roomy Cabinet maintains High-Q

Roomy extra-strong .080 inch thick aluminum cabinet gives highest efficiency and lowest loss. 13¼Wx5⅝Hx17½D inches.

AMERITRON ATR-15 Antenna Tuner

ATR-15, $399. Handles 1500 Watts RF output. Slightly less on 160 Meters. Bandswitched T-Network, peak reading SWR/ Wattmeter, covers 1.8-30 MHz, 6 pos. antenna switch, balun. 13½ W x5½x13¼ in. Perfect for AL-80B/AL572.

Ameritron has the best selection of *TrueLegalLimit*™ HF Amplifiers

AMERITRON's legal limit amplifiers use Peter Dahl super heavy duty Hypersil power transformer capable of 2500 Watts!

Ameritron's *most powerful* Amp

with Eimac® 8877 ceramic tube

AL-1500

$2845

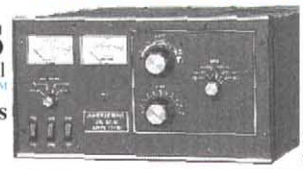
Suggested Retail

TrueLegalLimit™

Ameritron's *most powerful* amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 Watts drive gives you the full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 pounds, 18½Dx17Wx10H in.

Ameritron's *toughest* Amp

with Eimac® 3CX1200A7 tube



AL-1200

$2295

Suggested Retail

TrueLegalLimit™

Get ham radio's *toughest* tube with AL-1200. The Eimac® 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 18½Dx17Wx10H in.

Ameritron's *classic* Amp

with 2 graphite plate Amperex® 3-500ZG tubes

AL-82

$2295

Suggested Retail

TrueLegalLimit™

Most linears using 3-500s can't give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential. AL-82 is ham radio's *only* super 3-500 amp! 100 Watts in gives you full power out. All HF bands, all modes. Hefty 76 pounds, 18½Dx17Wx10H inches.

1.5 *plus* kW SSB HF Amp

with 2 Eimac® 3CX800A7 tubes

AL-800H, $2395 suggested retail. Two Eimac® 3CX800A7 tubes produces 1500 *plus* Watts SSB PEP with 55 Watts drive. 52 lbs., 8½Hx16½Dx14¼W in. **AL-800, $1695** suggested retail, single 3CX800A7, 1250 Watts out with 70 Watts drive.

NearLegalLimit™ Amp

with four Svetlana® 572B tubes

AL-572, $1395 suggested retail. New class of *Near Legal Limit*™ amplifier gives you 1300 Watts SSB PEP power output (70 Watts drive) for 65% of price of full legal limit amps! Instant 3-second warm-up. 40 lbs. 8½Hx15½Dx14½W inches.

1 kW Desktop HF Amp

with Amperex® 3-500ZG tube

AL-80B, $1299 suggested retail. Gives you full kilowatt SSB PEP output (85 Watts in) from a whisper quiet compact desk- top linear. 8½x14x15½ in. Plugs into 120 VAC outlet. Graphite plate *Amperex®* 3-500ZG tube. Nearly 70% efficiency. Weighs 48 lbs.

Precision SWR/Wattmeter

AWM-30, $149 suggested retail. Active circuit gives *true* peak/average readings on lighted Cross-Needle meter. 3000/300 Watt ranges. Remote sensor.

Call your dealer for your best price!

Free Catalog: 800-713-3550

AMERITRON®

. . . the world's high power leader!

116 Willow Road, Starkville, MS 39759
TECH (601) 323-8211 • **FAX** (601) 323-6551
8 a.m. - 4:30 p.m. CST Monday - Friday
For power amplifier components call (601) 323-8211
http://www.ameritron.com

DC Currents

By Steve Mansfield, N1MZA
Manager, Legislative and Public Affairs

Just as radio waves aren't constrained by artificial boundaries, neither is ARRL's government relations effort. "DC Currents" covers behind-the-scenes activity you need to know about in Congress, at the FCC and other regulatory agencies, as well as at worldwide bodies such as the International Telecommunication Union.

Meet Congressman Walden, WB7OCE

Recently, during one of our regular trips to Capitol Hill, we had a chance to chat with Congressman Greg Walden, WB7OCE. Mr. Walden is the newly elected representative from Oregon's Second Congressional District, where he replaced Congressman Robert F. "Bob" Smith who retired. Mr. Walden, who is the only known licensed Amateur Radio operator in the 106th Congress, took the time to duck out of a busy Agriculture Committee meeting to speak with us in a spare committee chamber.

How long have you been licensed?

I was afraid that was going to be the first question. I got my first license when I was just out of high school in Oregon. I think that must have been about 24 years ago.

What first got you interested?

It was my dad, Paul Walden, W7EQI. He's been active in ham radio since the 1930s. His professional career was in broadcasting and broadcast management in Oregon, and he has always been active on the ham bands, too. So, I grew up literally surrounded by transmitters, tubes, wires and antennas.

Are you active on the air today?

In recent years, my life has been very demanding and hectic. In addition to my political activities, my wife and I own and operate four commercial radio stations in the Hood River, Oregon, area. I still own a low band rig and a 2-meter rig. I used to be very active on 2 meters, and I keep my license up to date, but I just don't have as many opportunities for ham activity as I would like.

I understand you had a connection with ARRL back in the '80s…

That's right. I worked as a staff member for Representative Denny Smith, and I struck up a friendship with Perry Williams, W1UED, the League's Washington Area Coordinator. I always had a good feeling about Perry and the League.

Congressman Greg Walden, WB7OCE (right) and ARRL's Steve Mansfield, N1MZA met recently at Longworth House Office Building to discuss Amateur Radio concerns.

What motivated you to run for Congress?

As a small business owner, I'm naturally concerned about the governmental issues we all face. And so I've been active in the public policy arena for many years, including eight years in the Oregon legislature. I think it's very important to stay involved in the process and try to make a difference. When Bob Smith, my predecessor in the district, called me to tell me he was retiring and wanted to endorse me to run for the vacant seat, I took him up on the offer. He was chairman of the Agriculture Committee, and so I have a seat on that committee, as well as the Natural Resources and Government Reform Committees. At some point, I'd also like to serve on the Commerce Committee.

How do you feel about the recent trend toward deregulation of telecommunication?

There have been some good things as a result, the expansion of cellular and PCS services and some of the newer technologies, for example. But the concern I have is to make sure that, in the process of deregulation, we don't unintentionally damage the voluntary services like Amateur Radio and, of course, the commercial broadcast services that are charged with serving the public interest. Right now, I think all of us should be concerned about the rush toward auctioning spectrum to get every penny we can. I'm really not a big fan of auctions. In addition, the FCC is proposing dropping thousands of new FM commercial broadcast stations into communities, and I think that could prove very disruptive.

How do you see the FCC reauthorization shaping up this year?

I think we're going to see some major reforms to bring the Commission's role into the 21st century. This was a body set up under structures and demands of decades ago, and it's time for a new look. Technology is changing faster and faster, and the Commission needs to change to keep up. So, I think we're likely to see some proposals to restructure. I can't predict right now what they'll be, but I think we're going to have a healthy discussion of this issue in Congress.

Do you think the FCC's enforcement policies will be included in that discussion?

In the past, if the Commission has had a weakness, it's been in their seeming inability to shut down pirates on the ham or broadcast bands. It almost seems that two classes have evolved: those who follow the law, and those who don't. I think the Commission needs to be more aggressive in pursuing the integrity of the spectrum.

Speaking of spectrum, what's your feeling on Representative Bilirakis' pending Amateur Radio spectrum protection bill?

It's on my list of bills to read. But from what I know so far, it makes sense, and I

Amateur Spectrum Bill Readied

As we were going to press, Representative Michael Bilirakis (R-FL-9th) was preparing to reintroduce the Amateur Radio Spectrum Protection Act. Watch this page, ARRL's web site (**http://www.arrl.org/**) and W1AW bulletins, for updates!

would be supportive. Once I've had a chance to study it I'll add my name as a cosponsor. You know, members of Congress need to be reminded of the enormous assistance that Amateur Radio provides when emergencies strike in their communities. When that happens, it's a wake up call that this is an important service provided by good solid American volunteers who want to help. The Bilirakis bill recognizes the time and energy hams put into preparing for community events and emergencies. That's a value that should be preserved, not nibbled away and auctioned off to the highest bidder.

Do you have any closing words of advice to hams who might want to be more involved politically?

Yes. Good for you! Hams need to make contact with candidates when they are running, and with members of Congress and other levels of government when they are serving. There are lots of issues like antennas, RFI and so forth. In fact, just about anything that has to do with tuning a radio has a political dimension. So it's important for hams to take the time to explain the value of what they do. It's much more than just a fun hobby. It's a crucial communications link. If they don't get out and tell the story, no one else will.

Senate Telecommunications Agenda Begins to Shape Up

♦ Senate Communications Subcommittee Chairman Conrad Burns (Montana) has released his wish list of the 12 telecommunications items that he believes merit the highest priority in the Senate. Hearings and legislation are likely on bills to:

Expand the availability of broadband data networks
Expand the Internet privacy provisions that were included in last year's Omnibus Appropriations bill (HR.4328)
Loosen restrictions on computer encryption technology
Privatize the intergovernmental satellite organizations INTELSAT and INMARSAT and reform the regulatory framework of COMSAT Corporation
Expand the accessibility of government documents on the Internet
Provide for electronic authentication of online contracts and user identities
Regulate "spamming" of commercial e-mail
Reduce taxes on long distance telephone calls
Facilitate wireless (ie cellular and PCS) 911 calling
Reform the way satellite broadcasters can provide subscribers with local broadcast signals
Protect low-power television broadcasters
"Reauthorize" the FCC.

For readers unfamiliar with the "authorization" process, the fortunes of federal agencies are influenced by two specific types of bills, appropriations bills, which tell them how much money they have to spend in a given budget period, and authorization bills, which tell them what functions they are authorized to carry out. Most Hill watchers concede that a new FCC reauthorization bill is long overdue.

Media Hits

- Les Kalmus, W2LK, talked with National Public Radio live on the half-hour *Talk of the Nation, Science Friday* recently. Topics included the phase out of Morse code from the maritime service and the code's continuing popularity in Amateur Radio. During the program the ARRL was plugged as the place to call for listeners interested in getting a ham license. ARRL Media Relations Manager Jennifer Hagy, N1TDY, referred Les to the program.
- Morse code also got a plug in the *Columbus (OH) Post Dispatch* with a story that quotes Joe Phillips, K8QOE, ARRL Ohio Section Manager and Carl Deaver, AA8YY.
- Members of the Central Michigan Amateur Radio Club were treated to unexpected attention when a news crew from *WLAJ-TV* dropped in on their monthly meeting looking for hams who had worked Jordan's King Hussein, JYI. CMARC President Erv Bates, W8ERV, reports that interviewees included Bill Chapman, W8TJQ, and ARRL Vice Director George Race, WB8BGY. The piece aired on the 11 o'clock news.
- *Law and Order Magazine,* published for law enforcement professionals, featured an article on how to use a local Amateur Radio club to help out police communication functions during special events and disasters. Given special mention is the Dickson County (Tennessee) Amateur Radio Club.
- The *Dallas (TX) Morning News* extensively covered current Amateur Radio activities in its "Personal Technology" section. The article mentioned a number of Dallas-Fort Worth area hams including Johnny Roberson, KJ5LB; Melissa Rasmussen, K5MCR; Dave Blaschke, W5UN; Gerald Williamson, K5GW; Bill Byrom, N5BB; and Blake Lewis, N7PKJ. Also quoted was Ed Hare, W1RFI, of the ARRL staff.

Wireless Privacy Enhancement, Act II

The "Wireless Privacy Enhancement Act" that caused such a ruckus last year is back for the 106th Congress, but in its more benign incarnation. During the 105th Congress, what some Representatives thought was a noncontroversial bill (HR.2369) to increase the security of cellular telephone conversations, turned out to be a monster both for the sponsors and for those who felt the bill would have unanticipated consequences. Opponents included many scanner enthusiasts, NASCAR race fans, volunteer fire departments, block watch groups and Amateur Radio operators. The bill's sponsor, Representative Billy Tauzin, Chairman of the House Telecommunications Subcommittee gave ARRL and a few others a crack at redrafting the bill's language and it was revamped top to bottom. While some still objected to the bill on principle, we at the ARRL were confident its language had been tightened to restrict only manufacturing or using scanners to intercept cellular, PCS and certain types of paging signals. Moreover, it was addressed primarily to manufacturers and dealers, not to end users, who are already forbidden by the Electronic Communications Privacy Act of 1986 (ECPA) from listening to cellular conversations. The bill extended those listening prohibitions to new digital forms of wireless telephone conversation. It also forbids divulging, publicizing, or utilizing such communication. The accompanying Committee Report (available at **ftp://ftp.loc.gov/pub/thomas/cp105/hr425.txt**) stressed that the bill was intended *only* to thwart eavesdropping on telephonic communication, and would not affect those communications that have traditionally been open under the provisions of the ECPA. A Congressional document titled *How Our Laws Are Made* notes that committee reports "are perhaps the most valuable single element of the legislative history of a law. They are used by courts, executive departments, and the public generally as a source of information regarding the purpose and meaning of the law." Ultimately, the bill passed the House 414-1 . But, by the time the 105th Congress adjourned, the Senate had not acted on it.

This year, as the House began regrouping after the impeachment, the Commerce Committee looked for bills that were considered bipartisan and noncontroversial to get things rolling—particularly the bills that had already undergone hearings and votes. The Wireless Privacy Enhancement Act of 1999, HR.514, was introduced by freshman member Heather Wilson of New Mexico. *Identical* to the amended version of HR.2369, this bill has been reported out of committee, and was scheduled for a floor vote when we went to press. Cosponsors include Tauzin of Louisiana; Markey of Massachusetts; Oxley of Ohio; Eshoo and Rogan of California; Deal of Georgia; Wynn of Maryland; Cubin of Wyoming; Luther of Minnesota; Sawyer and Gillmor of Ohio; and Pickering of Mississippi.

"The quick-release remote front panel gives you so many installation options ."

"And with dual receive you can talk on one band, and listen on another!"

"Plus, the high-tech Enhanced Smart Search™ is great for finding repeaters --and you can watch it all on the dual display."

"Looks like Yaesu did it again!"

FT-8100R

Compact Dual Band Mobile

Now a dual-bander that remotes and is easy-to-use, without sacrificing the features you want!

With its quick-release, remote front panel system, the FT-8100R combines high-performance dual-band features in a simple-to-operate rugged mobile built to the endurance standards of commercial radios. The result is installation flexibility and industry-first, "must-have" advantages!

Use dual receive (V+V, U+U or V+U), or talk on one band while listening on another. Watch Yaesu's exclusive Enhanced Smart Search™ automatically seek out and load active frequencies--great for finding new repeaters while traveling.

Get wide receive coverage--from 110 to 550 MHz and 750 to 1300 MHz* for public safety, marine, aircraft, and weather channels. Enjoy up to 50 Watts of VHF power output (35 Watts on UHF) with High/Medium/Low choice on each band, and "plug and play" 1200 or 9600 bps packet. Utilize 208 memory channels--the greatest available on any remote mobile--to store repeater offset, CTCSS tone, packet baud rate, and power level.

Yaesu's popular Omni-Glow™ display provides a wide field of view, and includes a DC voltage meter. Quickly program, or clone frequency memories with optional Windows™ PC programmable ADMS-2D.

"User-friendly" describes the streamlined front panel layout. Eight clearly-marked keys, and separate Volume/Squelch controls for each band, make operation easy. And the backlit DTMF microphone includes 3 user-programmable keys...but no awkward keypad cover!

Don't sacrifice high-performance features in your dual-band mobile installation Get the easy-to-use FT-8100R at your Yaesu dealer now!

YAESU

...leading the way.℠

For the latest Yaesu news, hottest products: visit us on the internet! http://www.yaesu.com

Features

- Frequency Coverage
  - RX: 110~550 MHz
    750~1300 MHz*
  - TX: 144~148 MHz
    430~450 MHz
- Detachable Front Panel (remotable w/optional YSK-8100)
- 3 Power Output Levels
  - 2m 50/20/5 Watt
  - 70cm 35/20/5 Watt
- 208 Memory Channels
- Enhanced Smart Search™
- CTCSS Encode
- Built-in Duplexer
- S-Meter Squelch
- Dual Receive (V+V,U+U,V+U)
- Crossband Repeat (bidirectional or one-way)
- PC Programmable w/optional ADMS-2D
- Digital Battery Voltage Display
- Auto Power Off (APO)
- Omni-Glow™ Display
- 1200/9600 bps Packet Compatible
- Alternating-Band Memory Selection (ABMS)
- DTMF Autodialer (6 Memories)
- Time Out Timer (TOT)
- Accessories: Consult your local Yaesu dealer.

*Cellular & 900 MHz Cordless Phone frequencies blocked.

SUPER NEW LOW PRICE!

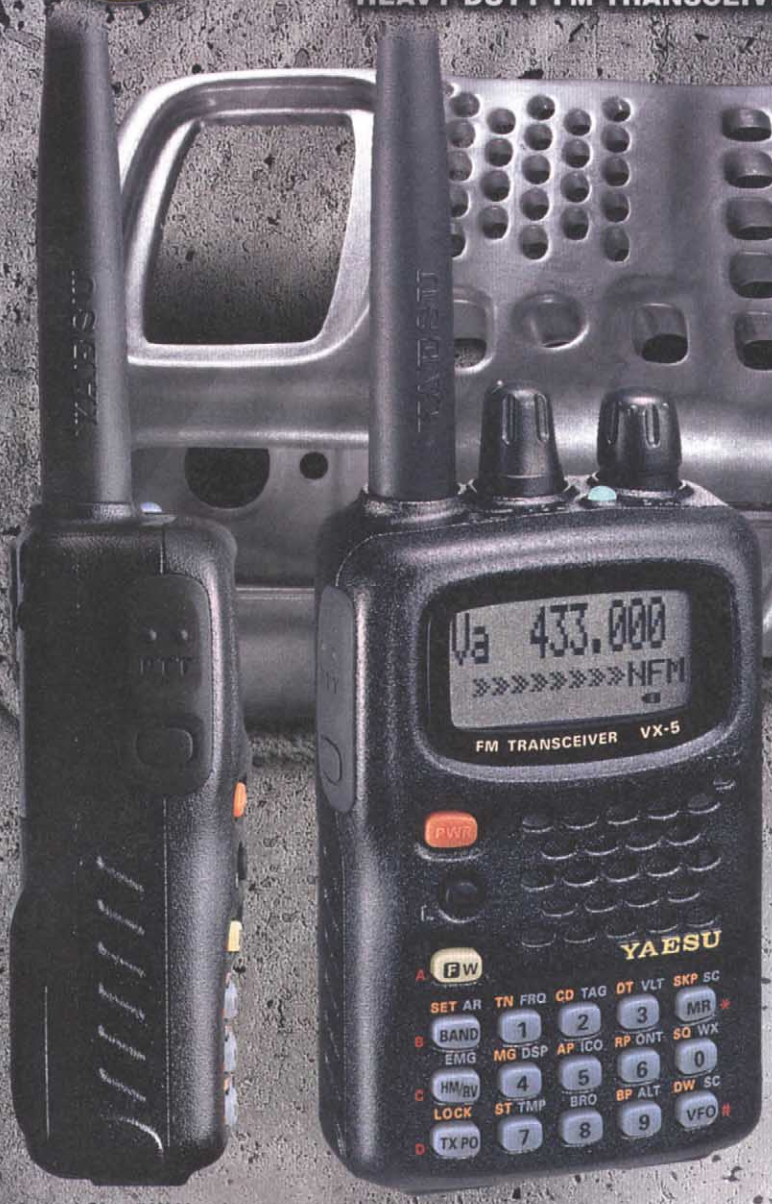
50W/VHF 35W/UHF

INTRODUCING THE MOST DURABLE HT EVER!

US MILITARY APPROVED MIL-SPEC 810

VX-5R

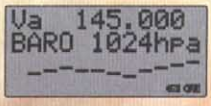
50/144/430 MHz TRIPLE-BAND HEAVY DUTY FM TRANSCEIVER



Actual Size 5 W Version

Features

- Frequency Coverage
  Wide Band Receive
  RX : 0.5-15.995 MHz 48-728.990 MHz
  800-998.990 MHz (Cellular Blocked)
  TX : 50-54 MHz 144-148 MHz
  430-450 MHz
- 5 W Power Output (430 MHz: 4.5 W)
- AM/Shortwave Receive
- AM Aircraft Receive
- Ultra Compact: 2.4" x 4.1" x 1.3"
- Aluminum Diecast Case
- MIL-STD 810 Rating
- High-Capacity Lithium-Ion Battery: 7.2 V @ 1100 mAh!
- CTCSS and DCS Built In
- Dot Matrix LCD
- Optional Barometric Sensor Unit



- Dual Watch
- Spectra-Scope™ Graphical Display
- 220 Memories plus "Home" Channels
- Ten Pairs of "Band Limit" Memories
- Ten Auto-Scan Weather Channels (North American version)
- 8-Digit Alphanumeric Memory Tags
- Convenient Icon Display Mode
- Smart Search™ Automatic Memory Loading
- Automatic Repeater Shift
- Auto-Range Transponder System (ARTS™)
- Multiple Battery Savers
- Time-Out Timer (TOT)
- Busy Channel Lock Out (BCLO)
- Versatile High-Speed Scanning
- 16-Digit 9-Memory DTMF Autodialer
- One-Touch Emergency Channel
- ADMS Windows™ PC Programmable
- Innovative Multi-Section Antenna
- Full Line of Accessories

YAESU

...leading the way.SM

FT-50RD
5 W Heavy Duty
Dual Band Handheld

VX-1R
Ultra Compact
Dual Band Handheld

For the latest Yaesu news, hottest products:
Visit us on the Internet! http://www.yaesu.com

~ It's a Ham's World ~

It's astonishing how many photos we receive that testify to the fact that hams are a national obsession.

Blatant. Easy to understand. We like it.

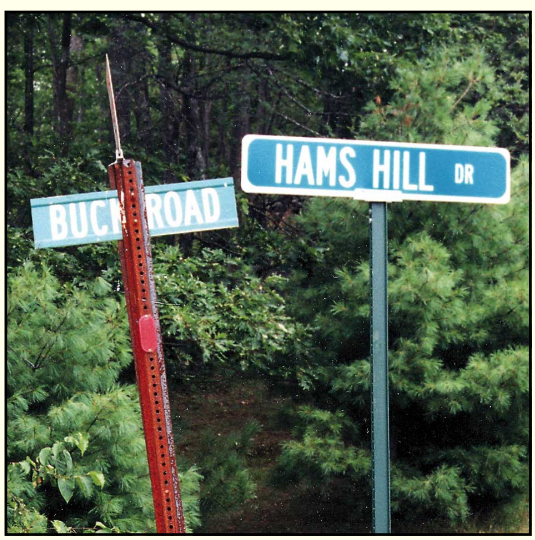
Yes, some hams are indeed "appliance operators!"

KEN WEINDL, N2VHZ

When a ham needs a turkey grinder with onions and provolone, there's only one place to go…

BOB MANN, W8LHP

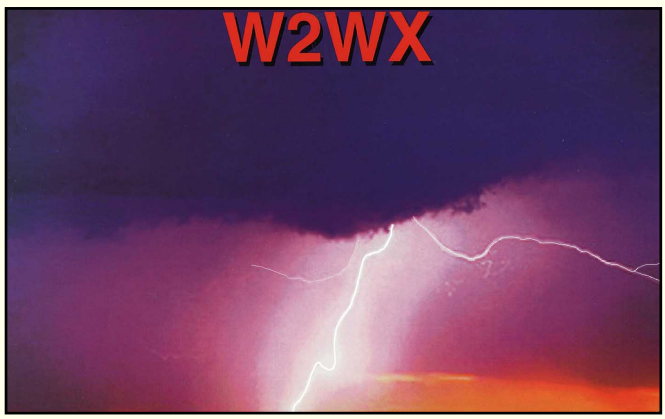
All Silent Keys welcome! We heard from our Ouija board that Heaven had recently created a special place for hams. Now we have photographic proof! *National Enquirer,* eat your heart out.



The main drag in a housing development that *encourages* ham antennas. In your dreams!

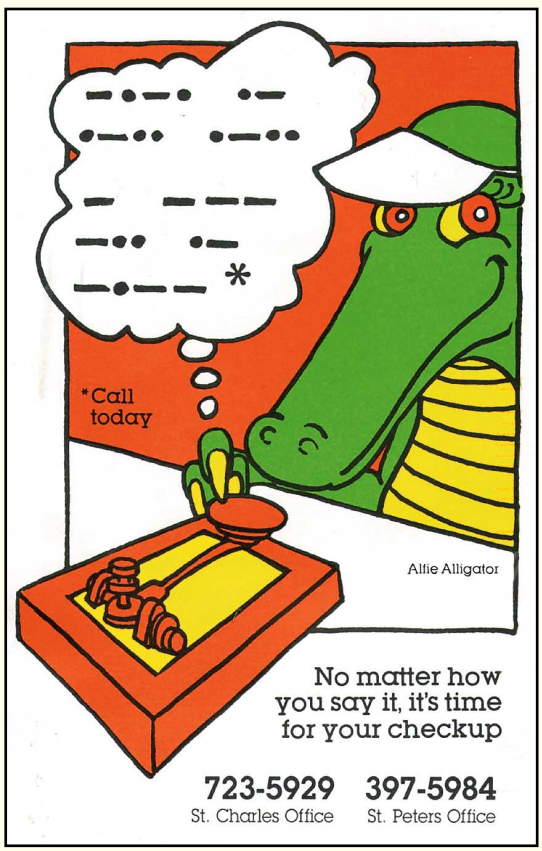
Bob Schmidt, W5GHP (right), receives a certificate of achievement from Dusty Rhodes, W5OUD (left), president of the New Orleans chapter of the Old Old Timers. Bob has spent decades in the service of Amateur Radio, including a lengthy tenure as assistant director of the ARRL Delta Division from 1964 through 1985.

Inspired by the cover of the October 1996 *QST*, which showed the LG5LG/SJ9WL station cottage that straddles the border between Norway and Sweden, Rose-Marie, KB6RM, and her husband Charles, K6BC, journeyed to the picturesque town last September. (Rose-Marie is a native of Gothenberg, Sweden.) They rented the cottage from September 11-14 and had an terrific experience.



You think of the Plains states for severe spring weather, but the East Coast receives its share of nasty thunderstorms, too. W2WX's QSL captures the fury of a storm as it pummels New Jersey.

Fourteen graduates of the "Introduction to Amateur Radio" course taught by the Museum of Science and Technology in Syracuse, New York. During four Saturday morning sessions the students enjoyed plenty of hands-on time at KC2APG, the museum's Amateur Radio station. Nearly all of the graduates say that they'll pursue their ham tickets.



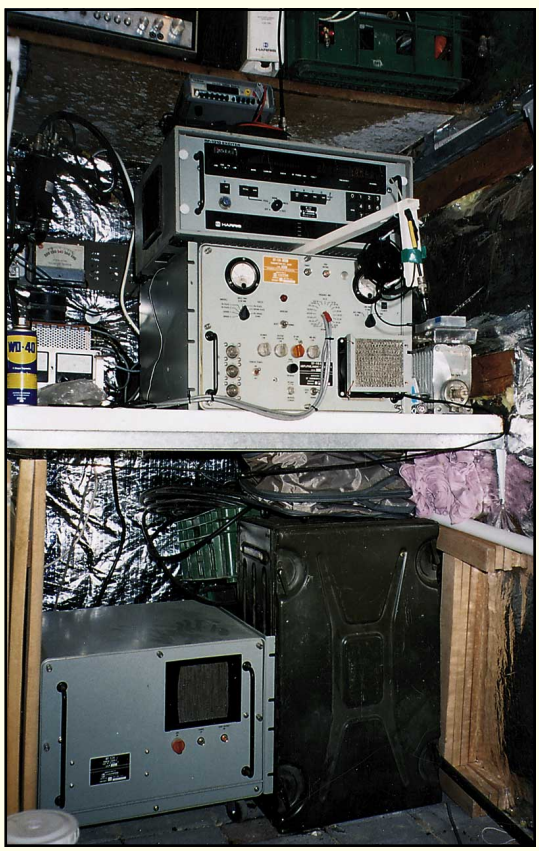
Jim Keeling, AB0HI, received this reminder from his dentist when it was time for his check-up. Thank goodness "Allie Alligator" isn't sending "root canal!"

Twenty-five watts at 6000 feet! Bil, KD6JUI, enjoyed last October's California QSO Party on the east slope of the Warner Mountains in Modoc County in extreme northeast California. With his Ten Tec Scout transceiver and a dipole antenna, Bil gave the rare county to more than 250 out-of-state hams.

Welcome to the Hotel Manutara, Easter Island. Ed, XQ0/K8VIR (left), says hams are always welcomed at the Manutara. That may have something to do with the fact that the hotel owner is Henry, XQ0YAF (right).

Once upon a time, Dave, K6JOX, and John, KE6PID, were doing some antenna work at ground level thanks to Dave's tilt-over tower. With their task completed, Dave worked the crank to raise the tower while John watched closely to make sure the tip of the Yagi's driven element cleared the edge of Dave's house on its way up. Unfortunately, neither noticed that the opposite side of the Yagi had firmly snagged Dave's lawn sprinkler!

Frequent *QST* contributor Henryk Kotowski, SM0JHF, performed a simple modification to his transceiver's microprocessor that causes the display to change color in response to varying propagation conditions. A yellow display on 20 meters (top) indicates average band conditions. On 6 meters (bottom), the display changes to deep violet to alert the operator to a band opening. Sounds almost too good to be true, doesn't it? Either Henryk is an undiscovered genius, or…what issue month is this, anyway?



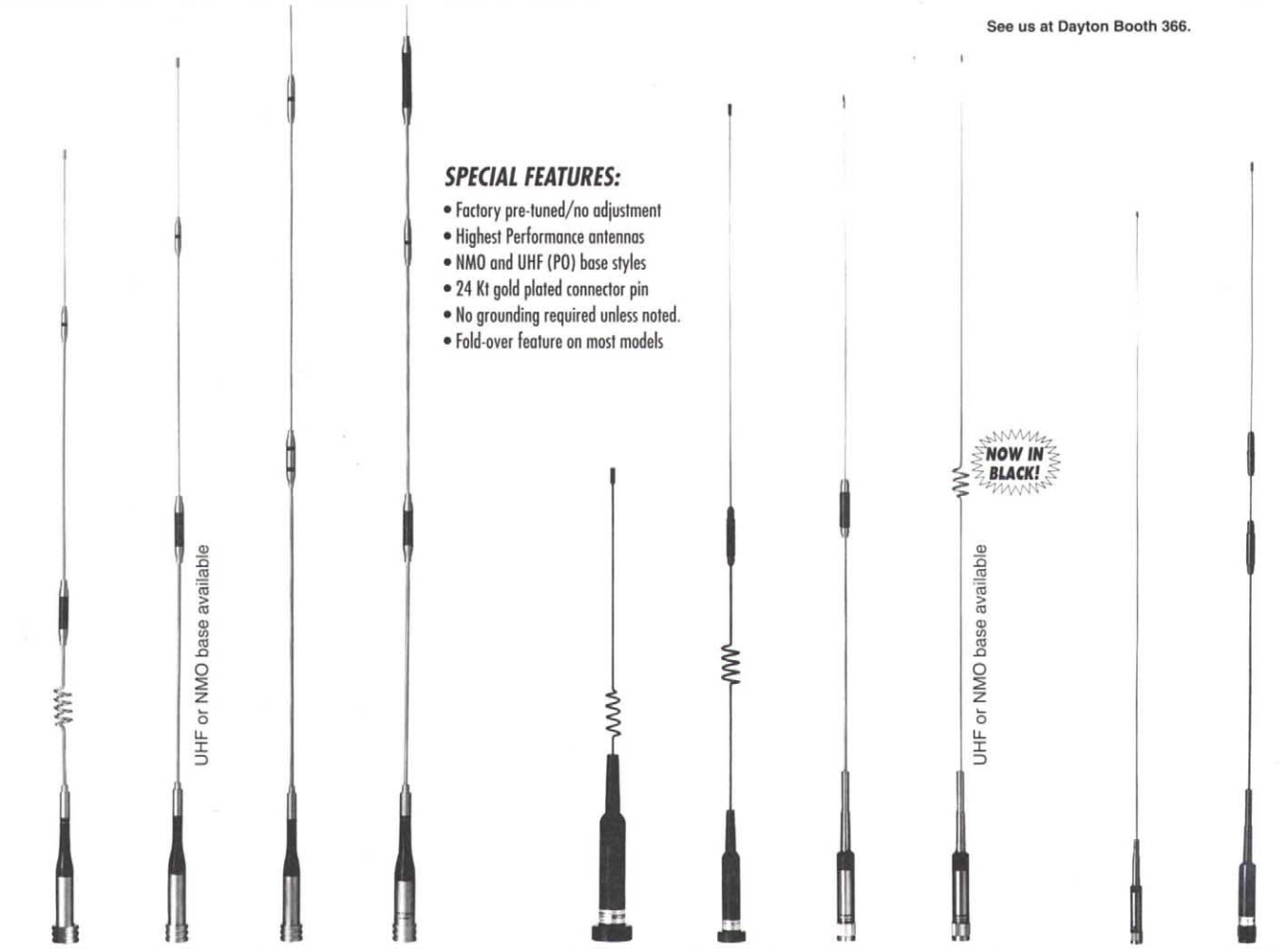
After recovering from the surgical implantation of a heart defibrillator, Hanina, 4X4MU, of Holon, Israel, discovered that RF was hazardous to his particular device. He wasn't prepared to give up ham radio, so with the help of his friends 4X6PW, 4X1FQ and 4X4WN, he reduced the output of his TS-850 transceiver to a few watts and used it to drive an old Harris amplifier installed in an RF-proof closet in the basement! They also hooked up remote control features so that Hanina could tune the amp from his operating desk.

DIAMOND'S STATE-OF-THE-ART VHF/UHF MOBILE ANTENNAS—MAXIMUM PERFORMANCE WITHOUT COMPROMISE!

You've seen the rest...now own the BEST!

DIAMOND ANTENNA

See us at Dayton Booth 366.



SPECIAL FEATURES:

- Factory pre-tuned/no adjustment
- Highest Performance antennas
- NMO and UHF (PO) base styles
- 24 Kt gold plated connector pin
- No grounding required unless noted.
- Fold-over feature on most models

MODEL	BAND	GAIN (dBd.)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
NR72BNMO[6]	2m/70cm		100	NMO	13.8	1/4λ, 1/2λ
NR73BNMO	2m/70cm		100	NMO	33.5	1/2λ, 1-5/8λ
NR770SA[6]	2m/70cm		100	UHF	16.9	1/4λ, 1/2λ
NR770HA[7]	2m/70cm		200	UHF	40.2	1/2λ, 2-5/8λ
NR770HNMO[8]	2m/70cm		200	NMO	38.2	1/2λ, 2-5/8λ
NR770RA	2m/70cm		200	UHF	38.6	1/2λ, 2-5/8λ
NR790A*	2m/70cm		120	UHF	57.5	6/8λ, 3-5/8λ
SG7000[6]	2m/70cm		100	UHF	18.5	1/4λ, 6/8λ
SG7200NMO	2m/70cm		150	NMO	36.6	1/2λ, 2-5/8λ
SG7500A	2m/70cm		150	UHF	40.6	1/2λ, 2-5/8λ
SG7500NMO	2m/70cm		150	NMO	41.0	1/2λ, 2-5/8λ

1/4λ antennas rated in dBi.

MODEL	BAND	GAIN (dBd.)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
SG7900*	2m/70cm		150	UHF	62.2	7/8λ, 3-5/8λ
SG2000*	2m		150	UHF	62.6	7/8λ
SG6000NMO[6,9]	6m		150	NMO	39	1/4λ
NR140A	1-1/4m		100	UHF	36.2	5/8λ
NR124	23cm		100	N	25	4-5/8λ
CR214S[6]	2m/1-1/4m		120	UHF	37	1/2λ, 5/8λ
CR224A*[6]	2m/1-1/4m		150	UHF	68.5	7/8λ, 2-5/8λ
CR320A[6]	2m/1-1/4m/ 70cm		200/ 200/100	UHF	37.4	1/4λ, 1/2λ, 2-5/8λ
CR627B[6,9] CR627BNMO[6,9]	6m/2m/ 70cm		120 200/100	UHF NMO	60	1/4λ, 1/2+1/4λ/ 2-5/8λ
NR2000NA	2m/70cm/ 23cm		100	N	39	1/2λ, 2-5/8λ 5-5/8λ

* Not recommended for Magnet Mount
[6] Grounding required.
[7] NR770HB same specifications but in black finish.
[8] NR770HBNMO same specifications but in black finish.
[9] 50MHz antennas adjustable

FOLD-OVER

Patented One-Touch Fold-over Feature
(Not available on NR72BNMO, NR73BNMO or NR770SA.)

DIAMOND • ANTENNA/RF PARTS • SAN MARCOS • CA 92069 • 760/744-0900
Full Catalog may be viewed at: http://www.rfparts.com

JAMECO®
ELECTRONIC COMPONENTS
COMPUTER PRODUCTS

Amazing Solutions
Incredible Prices
Unbeatable Support

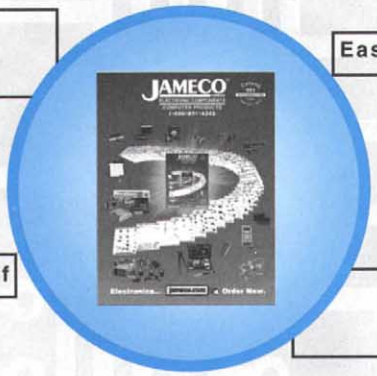
JAMECO Electronics

Mention VIP# 4K9 and receive **FREE SHIPPING***

* some restrictions apply please call for details

- Same-day shipping
- 24-hour toll free ordering
- Technical support
- New products added quarterly
- On-site warehousing
- 99.7% availability
- Competitive price matching
- Gigantic FTP site

Knowledgeable staff



Easy to use Web-site

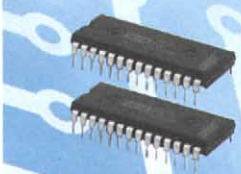
Visit us on the WEB at

http://www.jameco.com

Jameco is proud to provide products from the following manufacturers

3M	Clarostat	Hewlett Packard	Matrix Orbital	Parallax	Triplett
Aastra	Computerboards	Holtek	Maxim	Philips	Tripp Lite
Addonics	Crescent	Hsiang Motor	Mean Well	Phoebe	UVP
Advantech	Crossbow	Intel	Metex	Pomona	VCC
Alpec	Cyrix	ISD	Micro Code Engineering	Power Leap	Vector
AMD	Dallas Semiconductor	Isocom	Micro Data	Precision Navigation	Velleman
Apple	Data I/O	Ivex	Micro House	Primax	WAHL
Aries Electronics	Datak	JKL	Microchip	Protek	Wavetek
Aristo	Dataman	Kester	MicroMint	Qtronix	Weller
ART	Dolphin Peripherals	Kynar	Molex	Senix	Xcelite
BelMerit	E-Lab	Leap	Motorola	Shaxon	XYTronic
Benwin	Excel Cell Electronics	Ledtech	OK Industries, Inc.	Skynet	Yageo
BK Precision	Extech	LG Precision (Goldstar)	OWI	SL Waber	
Bomar	Fluke	LMB Heeger	OST	Teccor	
BTR Robotics	Forefront	Logical Devices	Paladin	Tech Spray	
Cebek	Hanlong	Macally	Panavise	Tektronix	

Call Now for a FREE catalog 1-800-831-4242



Integrated Circuits

Wall Transformers

Fans

Power Supplies

Test Equipment

Computer Products

Correspondence

Your opinions count! Send your letters to "Correspondence," ARRL, 225 Main St, Newington, CT 06111. You can also submit letters by fax at 860-594-0259, or via e-mail to: **qst@arrl.org.** We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Of course, the publishers of *QST* assume no responsibility for statements made by correspondents.

MY FREQUENCY

♦ (From a message scribbled on the back of a QSL card.)

You may not have realized it, but you were calling CQ on **my frequency**. I had been listening on this frequency for five hours. It was nice and quiet during my monitoring activity. I had been doing a good job until you came along and called CQ on **my frequency**. How discourteous of you. When you asked, "Is this frequency in use?" I held my breath hoping that an alert passerby would spare me from having to say "Yes." You would have taken your CQ elsewhere and my life would have returned to normal. Then, horror of horrors someone *answered* your CQ. All of this activity was violating **my frequency**.

I thought I was going to be ill. How can someone be so rude as to get on **my frequency** and use it in such a flagrant fashion? I felt like I had been personally violated. After suffering for days from the stress and trauma, I finally had to seek professional help.

Our family doctor determined that my trauma was being caused by an emotional disorder. He diagnosed the illness as apathy complicated by the need to, as he put it, "get a life." The doctor also told me that this condition was surprisingly common among hams these days. He prescribed weeks of therapy to help me remember why I had worked so hard to earn my license in the first place. It is a grueling, painful regimen of trying new modes of operating, participating in club events and learning new concepts. I'm making steady progress and someday hope to actually be able to *answer* those who call on **my frequency**.—*Nick Sues, W7ZMD, Phoenix, Arizona*

$200 LICENSING FEE—REACTION

♦ The January 1999 Correspondence entitled "Civility and Enforcement" by John Roberts, WA4JR, outlines his frustration with intentional jamming of his signal. We've all been similarly frustrated at one time or another by similar situations.

John proposes "a $200 annual license renewal fee to be levied upon every Amateur Radio operator" to support a system of tracking offenders and bring them to account. I cannot agree with John's letter per se, but I do agree that I'd like to see those few scofflaws removed from the bands. This requires funding and the FCC has to spread its budget in many different directions—Amateur Radio is but a small segment of its function. However, the Amateur Radio community isn't going to stand for a $200 licensing fee. I'd have a tough time defending this to my wife (and to myself) and she's a ham!

How about this; Charge the offender with the cost of the investigation? Let *him* pay the cost incurred to investigate, track and prosecute him. The more "clever" he is, the longer it takes to find him and the higher the ultimate fine. Tack on a fee for administrative costs as well, the same as in the private sector.

I admit, this is probably as unrealistic as a $200 annual fee, but at least it goes in the right direction. And a lot of other law-abiding hams probably feel the same way, at least in principle. With the FCC now initiating its get-tough policy, there *is* the potential to recover a lot of operating costs, wouldn't you say?—*Bob Mandeville, N1EDM, Brockton, Massachusetts*

AN UNFORGETTABLE MEETING

♦ My son and I competed in a number of swimming events at the National Senior Games that took place during May of 1997 at the aquatic center at the University of Arizona in Tucson. One of my son's events was coming up and I was on my way to the pool deck to wish him luck. Since there were more than 950 swimmers participating in the games, the pool area was pretty crowded.

One well-built athlete, a total stranger, was standing in my way with his back toward me. He was studying a heat sheet. I tapped him on his shoulder to get his attention and said, "Excuse me. Could you please look up my son Richard Hauff and tell me what heat and lane he will be in?"

"Just a moment . . . here he is. Heat 30, lane five." He looked at me quizzically, then added, "Hauff is a German name."

"I know," I replied. "I was born and raised near Stuttgart."

His mouth dropped open and for a moment he said nothing. Then he asked, "Where near Stuttgart?"

"In Goeppingen."

"I cannot believe this!" he exclaimed. "I studied my trade for four years in Goeppingen!"

I grabbed his arm and in our Schwaebisch dialect blurted, "Let's hurry and look for my son to wish him good luck. I want him to meet you." That's when I learned the name of my newfound friend.

Between our individual events we talked and discovered that we had many mutual friends who were still active in the swim clubs in Goeppingen that we also frequented in our youth. It was an astonishing conversation.

The next morning, as my son and I walked through the gate of the aquatic center, our friend was waiting to greet us. He also had looked us up on the heat sheet and knew exactly in which events we would be participating. During our frequent chats I mentioned my involvement in Amateur Radio. My friend was thunderstruck.

"I am a ham as well! My call sign is N8GMI." Both of us were speechless.

We still keep in touch. Last October I received a postcard mailed from Germany, signed by N8GMI and a number of my old swimming buddies. At age 87 I finally realized that we truly live in a small world. Thanks to Amateur Radio, it grows smaller every day.—*Frederick Hauff, W3NZ, Pompano Beach, Florida*

TEN-METER INCURSIONS

♦ Yesterday I was delighted to discover that most HF bands were open to some spectacular DX conditions, especially 10 meters. Much to my dismay and chagrin, however, I found the lower portion of 10, from 28.000 through 28.295 MHz, awash in "freebanders," or more correctly, bootleggers. While I am aware of the massive illegal activity between 27.405 (CB channel 40) and the lower end of 10 meters, I was really taken aback by the amount of illegal activity *in* our band! A couple of commercial fishing boats, apparently in the Gulf of Mexico, were on 28.050 for hours using all kinds of foul language.With the FCC's recent enforcement actions, I hope they look here as well.—*Ron Booth, WA1WRI, Windham, Maine*

"59" IS MEANINGLESS

♦ Last December I had a great time participating in the ARRL 10-Meter Contest. Band conditions were excellent. I have only one complaint/suggestion: Let's drop signal reports from contests. I would wager that 99.9% of signal reports in the contest were 59. Let me give you an example:

Station A: The VE3 station. Thanks for coming back. What's your call again?

Me: VE3JBU, you're 59 Ontario.

Station A: The call sign again?

Me: VE3JBU

Station A: Again?

Me: VE3JBU

Station A: Got it VE3JBU. What's my report?

Me: 59 Ontario

Station A: Again?

Me: 59 Ontario

Station A: Was that Ontario?

Me: QSL

Station A: Did you say Ontario?

Me: Roger, roger. Ontario.

Station A: Okay! Got it; 59 Ontario.

You're also 59 Florida.

Really? I think a 1 and 1 would have been more accurate than a 5 and 9. Let's encourage honesty by dropping signal RS(T) signal reports during contests and using only serial numbers.—*Herschell Sax, VE3JBU, Ottawa, Ontario, Canada*

STAY OUT OF THE WINDOW

♦ I am writing to express my frustration with the many operators violating 1998 ARRL 10-Meter Contest rule 6.4, which designates the 28.300 through 28.350 MHz as a "noncontest window." There were literally dozens of contest stations calling CQ in this segment throughout the contest.

I am one of the apparently few operators that don't enjoy contesting. I happen to think it is a ridiculous waste of time and spectrum. I'd much rather engage a person for a few minutes of meaningful conversation. However, I respect others' rights to pursue happiness—provided their folly doesn't degrade my own operating experience. Band conditions that weekend were great. Unfortunately, due to a few who didn't follow the rules, the noncontest window was essentially unusable.

I listened as some operators were told they were not only violating the contest rules, but were causing interference to noncontest operations. In some instances, these individuals became belligerent, refused to QSY to the designated contest frequencies, and continued calling "CQ contest!" It occurs to me that it is much easier to log a lot of contacts in a noncontest window, while those following the rules have to compete for bandwidth. Doesn't operation in the noncontest window amount to cheating?—*Mike Borowiec, N9EUZ, Naperville, Illinois.*

GET THE "BORING" OUT OF HAM RADIO

♦ For several years now the ARRL has been concerned by the lack of interest in ham radio by younger people. I wonder, however, if we are doing the wrong thing.

I recently read a quote from Seymour Papert the LEGO Professor of Educational Research at MIT. Mr. Papert received the 1997 NEC Leadership Award for Education for his pioneering research on child-computer interaction. He commented "Every maker of video games knows something that the makers of curriculum don't seem to understand. You'll never see a video game advertised as being easy. Kids who do not like school will tell you it's not because it is too hard. It's because it's boring."

Perhaps we need to address how to make ham radio less boring and not how to make it easier. The 1996 *ARRL Handbook* defines ham radio as "using a personal radio station to communicate... with other radio hobbyists." In the past Amateur Radio offered a unique opportunity—worldwide communication. The reward of global communication was so attractive that people were more than willing to master CW and electronics. Today it is easy to communicate with people anywhere in the world with technology that is much more reliable than ham radio. Why would anyone want to be a ham when there are better ways to communicate? No wonder ham parents hear their children say, "It's boring."

I would suggest that one way to get the boring out of ham radio would be to redefine it to include *any* form of wireless communication. The social aspect of chatting via radio would, of course, still be there, but look at the possibilities that open up when you think creatively:

- Remote control toys. Do kids like remote control? You bet! Would your kid think it boring if you built him an RC toy? I'd bet not. In fact, he might even want to write the program for the microcontroller in the transmitter unit.
- Wireless speakers. My wife keeps after me to get my attempt at wireless speakers for our stereo working so she can listen to it out in the yard (but she won't upgrade from her codeless Technician ticket because she thinks it is boring and a waste of time). Would your kid like a 100-W wireless speaker system to put in her playroom or car? I bet she would.

I'm sure you can think of dozens of other interesting wireless projects. I believe we need to embrace them if we want to get the "boring" out of ham radio. The infrastructure that hams already have in place would be a big advantage to this shift. The ARRL should lobby the FCC for liberalization of the rules. At the same time, *QST* should encourage a much greater variety of wireless projects. Let's get out of the past and into the future or we may wind up next to buggy whips in the history books!—*Sam Ulbing, N4UAU, Gainesville, Florida*

MORE *WEB EXTRA* KUDOS

♦ Now, here's a product I can use—the *ARRLWeb Extra*! With today's fast-paced life styles, many of us have continued to maintain membership only as a matter of conscience for the good things the League does. Even though *QST* is extremely portable, it is still inconvenient to carry a copy around for those times when one might have a few free minutes to read.

Additionally, the force feeding of features via e-mail with the electronic *ARRL Letter* seems to be less effective as a way to disseminate such information. I usually have to wade through so many messages daily that the *ARRL Letter* is often left unread and is eventually discarded from my mailbox.

Thanks to the *ARRLWeb Extra*, I can get my information the way I really want it, by browsing with hypertext links to articles of interest. I can find what I need to know without paging or scrolling through it all. (I really hate having to skim through an entire print periodical to get what I need.) The handy index page with these hypertext links is absolutely the way to go! Congratulations on producing such a fine product. —*Steve Grantham, N5DWU, Ellisville, Mississippi*

(The ARRL Letter is also available on the ARRL Web site.—*Ed.)*

This Month in Amateur Radio

Guglielmo Marconi is a hero to radio enthusiasts throughout the world, but in Italy, his home country, he achieves the distinction of being featured on a 2000 Lire note. (Our thanks to Flavio Cimardi, IK2XYU, for donating his hard-earned Lire to *QST*!) **International Marconi Day is April 24**. Listen for the Marconi Radio Club station, W1AA/IMD, operating from Cape Cod, Massachusetts. The Ocean Monmouth Amateur Radio Club, N2MO, will also be honoring Marconi on the air from Cape Evans, New Jersey, on the same day. See "Special Events" in this issue.

If you're looking for a springtime convention or hamfest, we have an excellent selection this month. The last weekend of April is particularly popular. Head on down to Little Rock for the **Arkansas State Convention**. Doors open Friday, April 23, at 4 PM. East Coast hams have two gatherings to choose from. There is the **Delaware State Convention** in New Castle and the **Eastern New York Section Convention** in Poughkeepsie. Both take place on Sunday, the 25th. The **Louisiana Section Convention** has the honor of wrapping up the month in Baton Rouge, April 29-May 1. "Coming Conventions and Hamfests" has all the details.

The race is on this month with QSO parties, QRP contests and international competitions galore!

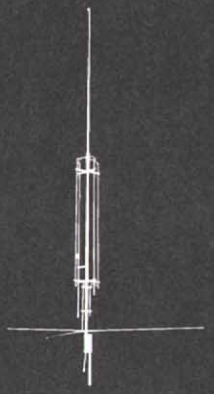
Worked All States hunters can bag **Michigan**, **Nebraska** and **Florida** this month during their respective **QSO parties**. And now that we're enjoying some decent outdoor weather, it's also time for the popular **QRP to the Field** competition sponsored by the NorCal QRP Club on April 24. The theme of this year's contest is "Run to the Borders." See "Contest Corral" in this issue for times and scoring information. Among the international competitions in April, check out the **Hevetia Contest**, sponsored by the USKA (Switzerland) April 24-25.

Don't Forget **National Exam Days—April 24 and 25!** This is one of your best opportunities to promote license classes, test sessions and Amateur Radio in general. The ARRL public relations department has press kits ready. Just call Jennifer Hagy, N1TDY, Media Relations Manager, at 860-594-0328, or e-mail **jhagy@arrl.org**. You can also check the ARRL Web site at **http://www.arrl.org/pio/**.

On April 18, 1942 Lt.Colonel Jimmy Doolittle led a squadron of 16 B-25 bombers from the aircraft carrier *Hornet* to bomb Japan in retaliation for the Pearl Harbor attack. The Stu Rockafellow Amateur Radio Society of Plymouth, Michigan, will be on the air this month (April 16-18) from the United States Air Force Museum in Dayton, Ohio, during the **Doolittle Raiders Raid Reunion**. See their listing in "Special Events."

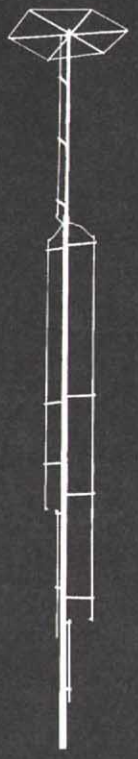
GAP: THE PERFECT ANTENNA

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX

Challenger DX



Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

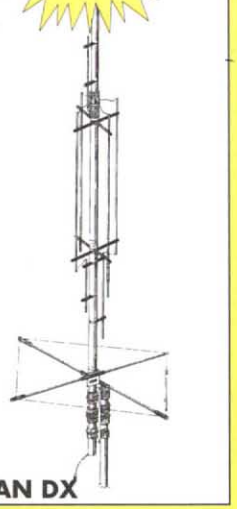
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

Celebrating 10 Years 1989-1999



TITAN DX

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$279
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$289
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$319
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

GAP

ANTENNA PRODUCTS INC.
99 N. Willow Street
Fellsmere, FL 32948

TO ORDER, CALL
(561) 571-9922

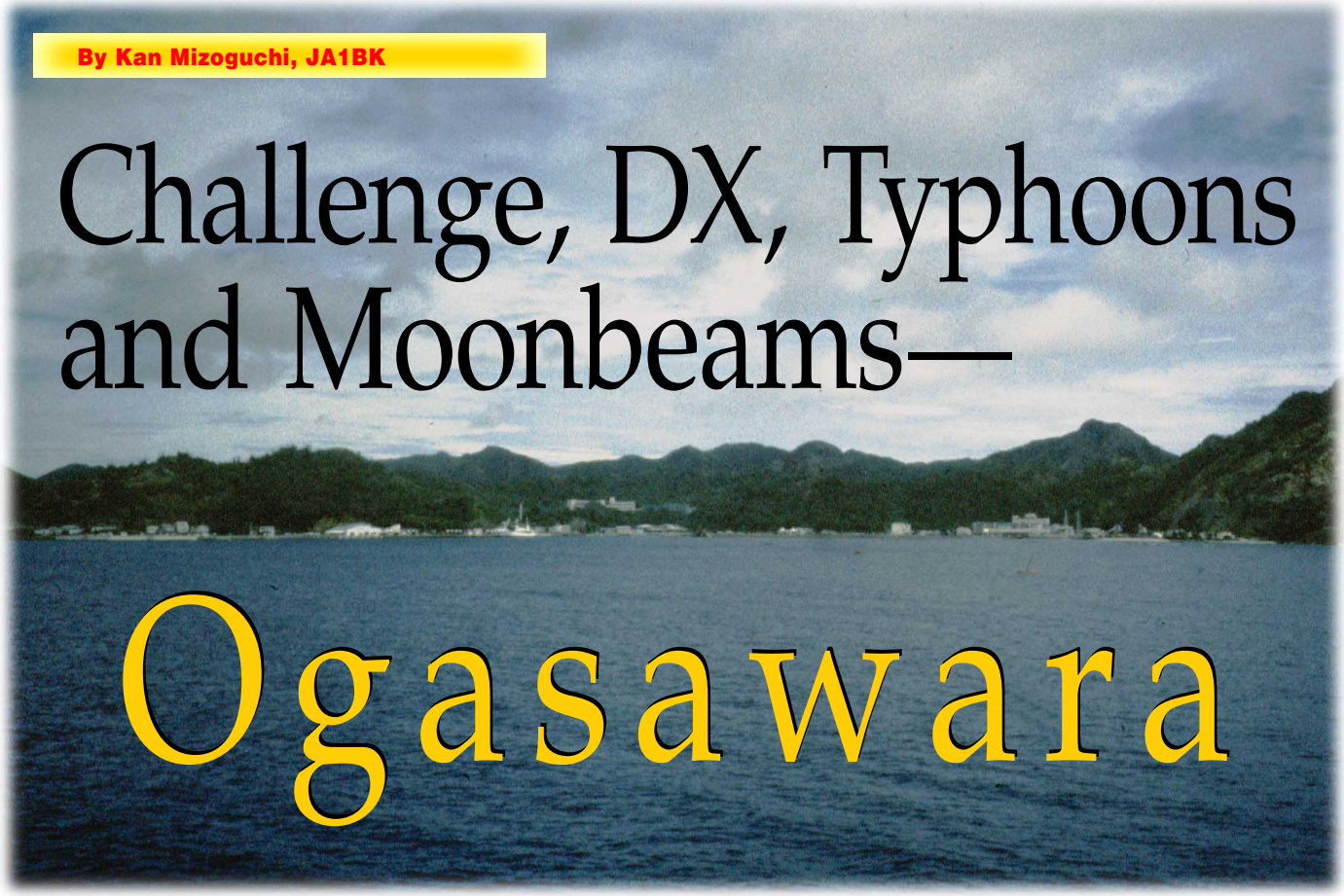
Come Visit Us At gapantenna.com

MasterCard VISA DISCOVER COD

By Kan Mizoguchi, JA1BK

Challenge, DX, Typhoons and Moonbeams—

Ogasawara



The harbor at Chichijima.

Think it's all been done before…by somebody lucky enough to have been born two decades earlier? When these veteran ops saw their DXpedition frontiers becoming ham radio suburbs, they simply invented a new frontier. They shot for the moon—and hit it!

Life is full of challenges. It's been this way for unending generations. In my business and in my hobby I have accepted and sought challenges. Without them, life would be long *and* boring.

Because of the challenge I became a DXer many years ago. I accepted the challenges of the DX Century Club—5BDXCC, 160 meters, 6 meters and the Honor Rolls. I have supported DXpeditions and have been fortunate enough to have gone on many trips to rare and delightful places.

These days, however, ham radio's challenges seem somewhat diminished. Most (but not all) DXCC-related political puzzles and global transportation problems have been solved. To move forward, I decided that it was time to look for a way to combine new dimensions in technology and DXing.

Such an effort might take our conventional HF technology into a future realm. After all, DXers were the original leaders in advancing radio technology. Why shouldn't today's DXers break from the pack and move toward 21st century technology?

While I was thinking of new challenges I spoke with Bill Kennamer, 7J2ADX (whom you will know as K5FUV, ARRL Membership Services Manager). Bill would be making his annual trip to help DXers at Tokyo's August Ham Fair. Because he was using his hard-won Frequent Flyer miles this year, he would be in Asia for almost two weeks. He wanted to know if we might go somewhere in Asia together while he was here. After some consideration, I decided we should set our sights on Ogasawara.

Ogasawara

Why the Ogasawara Islands? Although most DXers have this region confirmed, it's still in the top 100 list of most-needed DXCC countries. It's even higher in Europe. Ogasawara has a unique history, both in its position on the DXCC List and in its place in Japanese history.

Sadayori Ogasawara is believed to have discovered the islands in 1593. In 1861, the Tokugawa Shogunate found it necessary to protect the islands and finally declared them to be part of Japan. By 1895, people from Hachijo Island and other areas of Japan began to settle the islands, and the population reached 4000. For safety reasons, in 1944 the islanders were forcibly evacuated to the Japanese mainland. After 1946, the islands were administered by the United States, and only Westerners were allowed to return.

Ogasawara would be returned to Japan in 1968, but the island's political situation would be in flux for years after the transfer, and most Japanese DXers felt that the islands deserved a place on the DXCC List under the then-existing "separate administration" clause.

As a then-director of JARL, I made a visit to Newington to see DXCC Administrator Bob White, W1CW, to discuss the situation. He agreed, and the Bonin and Volcano Islands, now known as the Ogasawara Islands, remain on the DXCC List to this day. Although I had a special affection for these islands, I had never visited them myself. Bill's visit would provide a good excuse to make the long-delayed trip.

Island EME

Bill also had some thoughts about Ogasawara. Because it was only semi-rare, the DXpedition should be approached differently. He thought a greater challenge was in order, and I agreed. The new challenge in-

Fukui, JK7TKE, carries some of the equipment from the van to the "shack." Notice the sunshine. It's the last time we saw it.

volved operating EME (moonbounce) from Ogasawara. To the best of anyone's knowledge, it had never been done.

Could two EME greenhorns work this difficult mode from Ogasawara? We knew from the start that there were only a handful of ops in the world who would be able to work us, but we felt it was worth the effort from the standpoint of advancing the DXpeditioner's art. We also sought to prove that mainstream DXers could make EME a valuable tool for the future.

Bill's plan for the venture was simple: Today's radios can work HF and VHF, and there would be only a minimal performance penalty from using a multipurpose radio. We chose the Yaesu FT-847 as our mainstay.

We would also use a pair of vertically mounted VHF beams and a 200-W amplifier—the only extra equipment required. Meanwhile, I enlisted Kaz Ogasawara, JA1RJU, and Fukui, JK7TKE, in support of our cause. Bill received technical support from Gerald Williamson, K5GW, and Dave Blashke, W5UN, also helped by arranging our moonbounce schedules.

Licenses

Even with all the help and a pile of handy equipment, an EME attempt from Ogasawara wasn't a sure thing. Under Japanese law, portable stations are limited to 50 W output. All of our licenses had this limitation, so our planned moonbounce operation required that we get a special club license. Negotiations for 200 W output on 2 meters were underway as Bill was flying over.

The day after he arrived I took him and a JARD official (JARD is similar to the American VEC) to the Amateur Radio division of the Ministry of Posts and Telecommunications. After a fairly long meeting with a telecom official we were sent downstairs to the coffee shop to wait 30 minutes for the decision. We thought things were looking up, but during our wait we felt the tremors of a small earthquake. Perhaps that was an omen of things to come?

The MPT agreed to issue a high-power license, but only if we could submit the amplifier and the radio to the JARD for inspection. We arranged for a meeting at the Ham Fair the next day, and the equipment went through an hour of rigid checks. The MPT then gave us the call sign 7J1YAM. We are extremely grateful to the MPT for their special efforts in issuing our DXpedition license.

On Monday our group assembled at the pier to board the *Ogasawara Maru*, a 6700-ton ferry that's 131 meters long and has a top speed of 24.5 knots. The trip to Chichijima Island would take 25 hours, so we settled into our cabins.

Bill and I worked on setting up our laptops which, as it turned out, wasn't such a great idea. We both got a little queasy from watching the PC screens while the ship rocked back and forth. We spent the rest of the voyage resting or watching the waves pass by from the deck.

Because our cabin was equipped with a TV receiver we could watch weather reports from Tokyo and watch the ship's "GPS channel" throughout the journey. We watched a typhoon ominously moving to the north and hoped it would veer toward Okinawa.

Landfall

We arrived about midday on Tuesday. JD1BIA spotted our gear and our T-shirts as we disembarked and stopped by to say hello. He kindly offered any assistance we might need. The owner of our lodgings picked us up in his van and brought us—and our gear—to our accommodations.

I hadn't seen a photo of our operating site and was surprised to find that the cabin we had rented was in the midst of a small jungle, with only a cleared path to the door. It wouldn't accommodate an antenna for any band, especially an EME array!

I quickly discussed this with the owner, with the intention of moving to another hotel, if necessary. The owner had another property available, however, so we went to look it over. It turned out to be a small construction yard/cement plant with plenty of open space. The two construction trailers were too full of stored items to be of much use, but there was a concrete floor and a patio cover between them. The skies were darkening ominously, but we took the offer and went to lunch before tackling the antennas.

On the way to lunch we checked out the surrounding area. The Ogasawara Islands are subtropical and are comprised of 30 different islets scattered around the area. The islands are located about 1000 kilometers south of Tokyo, and our island, Chichijima, is the largest of the group.

There's no airport here, although it's possible that one may someday be built at Anijima, to the north. There is a lot of evidence of previous volcanic activity, and the islands themselves are very rough. The mountainous aspect was one of the problems we would have to deal with for our EME project.

The climate is tropical, with an average year-round temperature of 22.9° C. And there are typhoons, too, as we would discover. The islands, isolated from the rest

Fukui, Kan, and Kazu (sitting in the van). Behind the trees and down the hill is the ocean.

of Asia, have their own unique ecology and are considered to be environmentally protected. About 40% of the plant life is thought to be indigenous to the islands. There is little room available for further expansion of facilities.

About 2000 people permanently inhabit the islands, but the population swells during the vacation seasons as many divers and young people come there. Between December and April the area becomes a breeding ground for humpbacked whales (whale watching is a popular activity).

Setbacks

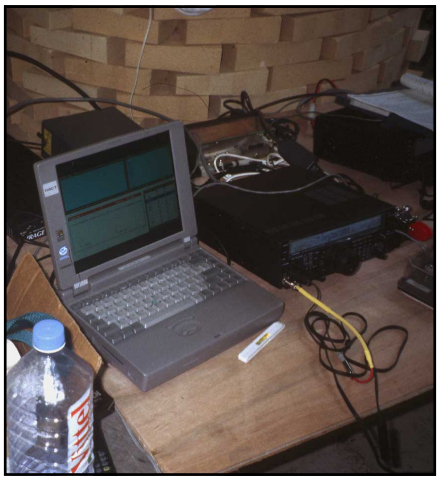
After lunch we returned to our operating area to survey the facilities and install the antennas. After getting our bearings we immediately learned that, yes, the 300-meter hill that surrounded us to the east and south did indeed block our view of the moon on the horizon when positioned for North America. Still, it was what we had to deal with, so we decided to try anyway. At least the path to Europe was clear, although in retrospect that didn't help much.

As we began to assemble the 2-meter array a light rain began to fall. As we finished, the weather got worse, so we quickly set up the inverted V that had served me so well from the Austral and Marquesas Islands. We then retreated to the "shack," such as it was, to prepare for our first EME schedules.

After the antenna was aligned and Bill began the EME scheds to Europe, I returned to the hotel to rest up for tomorrow. Every EME schedule was run without success. We don't know whether the stations were there or not.

The rain increased throughout the evening, and Bill—seeing that Fukui seemed to be running on adrenaline and Kazu was ready to stay up all night—returned to the cabin to get some sleep.

The next morning we both got up early and headed back to the shack. Kazu and Fukui had set up more of the station and were operating on 40 meters. Bill and I got things set up for our morning schedule to North America. The moon at that particular time of the month seemed to follow the sun by a couple of hours. This meant that sun noise would be



The main station consisted of an FT-847 and a laptop for logging. HF and VHF, all in one box!

The "shack." It was actually a plastic patio cover over the space between two storage trailers. At this QTH, ground gain came with elevation.

The noon meal came from the restaurant downtown. Kazu, JA1RJU, Bill, 7J2ADX, and Kan, JA1BK, have just enjoyed yet another of the island's delicacies from the sea.

"worst case" for the entire DXpedition! This, coupled with the hill in the antenna foreground, meant that with our small station we would have great difficulty working anyone.

Keeping a positive attitude, we started with the schedules anyway. Soon W5UN's powerhouse signal began to come through. Bill was keying the radio while I was listening with him. During my 15 years of weak-signal 6-meter experience I have developed a technique for picking out faint signals by sitting about three feet away from the speaker and setting the IF filter to its widest position. It this way, if the noise floor is disturbed in an orderly fashion, I can almost "feel" the signal before locking onto it with that great internal filter we all have between our ears.

As we heard W5UN, Bill began frantically sending "O O O," the signal report for a received EME sequence. We later heard K5GW and again began sending Os. Gerald, however, was not confident at that time that he had worked us. We heard no further stations that morning and went back to call Dave on the Inmarsat phone. We were really excited. Despite the hardships we had completed an EME QSO!

After a leisurely lunch in O Mura, the island's main village, we returned to the shack with the intention of trying the late afternoon European scheds. At this time of the month, most EME activity takes place in daylight. Before we made it back, however, the steady rain became a deluge.

After working HF for a few minutes it became evident that the rain and wind were getting to be too much to battle in our exposed position. Although the tarps at both ends of the shack helped, we decided that discretion here might be the better part of valor and packed much of the equipment away to protect it from the rain.

Escape from Ogasawara?

We headed back to the hotel and Bill and I began to pack. The *Ogasawara Maru* might leave at midnight—early—to avoid the main brunt of the typhoon, now named *Rex*. We had to be ready. Any thought of European EME schedules had to be abandoned.

The wind howled throughout the night and the runoff from the heavy rains turned into waterfalls outside the windows. Finally, around dawn, the rains briefly subsided and Fukui and Kazu returned to set up the equipment. Bill and I finished packing and headed up to the shack.

The *Ogasawara Maru* would leave at noon and we would have to be at the ship an hour or so before departure. The EME schedules with North America would start again at 10 AM local time, so we would have only an hour to try to work more stations.

Shortly before the scheduled times we had the 2-meter rig working. Bill tried a couple of calls on the 20-meter EME frequency, 14.345 MHz, with no results. The band didn't seem to be open to the US.

As the first schedule was nearly upon us, we heard someone tuning up. It was K5GW, this time with a much better signal than the day before! I grabbed the key and immediately sent his call sign and the required "O O O" series. We continued this sequence for several minutes, with apparently partial copy from Gerald's end.

Next up was KB8RQ, also with a good signal. Signals from both stations were strong enough that we could actually hear them from outside the shack. In fact, the audio was so strong that the copy was even better outside!

As our radio experience was peaking, the hotel's owner drove up to take us down to the pier to meet the ship. Our time in Ogasawara had come to an end much earlier than we had planned.

The weather had a tremendous effect on the overall DXpedition, especially considering our goals, yet we had made the first EME contacts from Ogasawara. We left with a feeling of success, despite the fact that our HF efforts had been somewhat waterlogged.

As we settled into the ship we looked out the window and saw Kazu, Fukui and JD1BIA on the pier. We went on deck and Kazu held up his H-T, so Bill went back to the cabin to get his. Kazu had worked the last EME schedule, a back-up with K5GW, and announced that he had made another solid contact. He planned to try the European schedules later in the day, but the weather worsened shortly after we left and the station had to be abandoned.

As we left the island, news of the storm's progress could be seen on TV. The storm was headed right for Ogasawara, with winds clocked at more than 100 miles per hour. The *Ogasawara Maru* had sailed only hours before the brunt of the storm had hit the island. We had missed the storm while at sea, but we could see that we actually seemed to be pinned between two powerful storm systems.

Heavy flooding was being shown back in Japan, even in my own Tama-city, and the Japan rail line had stopped running because of the high waters. At we pulled into Tokyo Bay we could see trash in the water from the heavy run-off the day before.

Conclusion

The purpose of this DXpedition was to take on a new challenge—and we certainly got more than we bargained for in that respect. Not only had we tried a new (to us) operating mode, we had done it with the additional challenges of weather, terrain and less-than-ideal moon conditions.

Measured by the yardstick of the DXpedition's "ultimate numbers," our impact was minimal. Considering our technical and EME achievements, however, we think things went well and we're ready to try again. With a little luck, better weather and an improved operating site, who knows what might happen?

We would especially like to thank Yuichi Kurosaki of Yaesu Musen Ltd for his help with logistics support, and Gerald Williamson, K5GW, of Texas Towers for his technical assistance. Also, a special thanks goes to the Japanese Ministry of Posts and Telecommunications, which was especially helpful in providing the operating permission necessary for the EME contacts.

You can contact the author at 4-5-3 Sakuragaoka, Tokyo 206-0013, Japan; **kanmiz@ibm.net**.

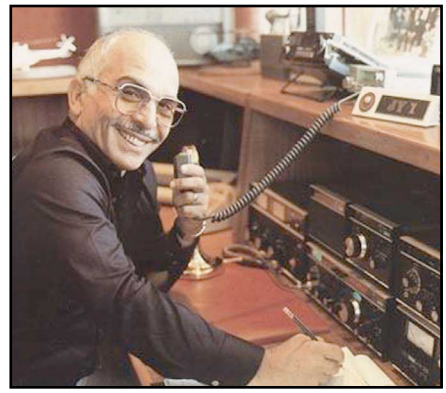
By Rick Lindquist, N1RL

The Passage of a King

Amateur Radio mourns the loss of one of its own.

On February 7, 1999 the world lost a "soldier for peace," and the Amateur Radio community lost one of its most visible and enthusiastic supporters. Jordan's King Hussein bin Talal, JY1, died of cancer at the age of 63. He was the Middle East's longest-reigning ruler, occupying the throne of the Hashemite Kingdom for 47 years. His son, Abdullah, 37, succeeds him.

Hussein had earned a reputation as a catalyst for peace and as a conciliator in the Middle East. During the most turbulent moments he often spoke as the voice of stability and reason. His thoughtful diplomacy earned the respect of world leaders. President Clinton was among the heads of state from around the globe who gathered in Jordan February 8 for his funeral.



MARY ANN CRIDER, WA3HUP

King Hussein, JY1, in a recent photo (left), and with his Drake C-line station in the late '60s (right).

A Familiar Voice on the Air

Hams throughout the world have enjoyed a friendly relationship with King Hussein for decades. The king wasn't a token amateur; he was extremely active within the hobby. Despite his celebrity, King Hussein conducted himself like an ordinary ham. He would talk to anyone at any time, and he always QSLed 100%. In fact, his QSLs are highly prized and already considered collector's items.

Hussein was a Life Member of the ARRL. ARRL Executive Vice President David Sumner, K1ZZ, called him "an enthusiastic radio amateur whose support was invaluable to us in obtaining new amateur bands at the 1979 World Administrative Radio Conference." Sumner recalled that in May 1979, International Amateur Radio Union President Noel Eaton, VE3CJ, was invited to Amman to meet with King Hussein.

"Jordan's support of the Amateur Service was much in evidence at the conference that fall, and was a crucial element in our success," Sumner said. The WARC-79 resulted in Amateur Radio's gaining the 30, 17, and 12-meter bands. That same year, JY1 was featured in the film, *The World of Amateur Radio*. Hussein regarded his 1983 contact with Owen Garriott, W5LFL, on board the space shuttle *Columbia*, as a high point in his Amateur Radio career.

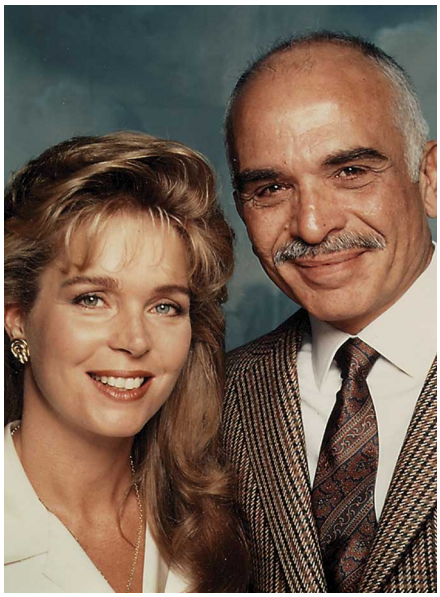
King Hussein also participated in the historic 1995 joint Israel-Jordan JY74X operation on Mt Nebo, where hams from both countries participated in a Field Day-like operation. The King put in appearances both on the air and in person, much to the

The King and the Admiral

In 1995 I was Commander of the US Fifth Fleet. After visiting His Majesty on official business (Saddam's son-in-law had just defected to Jordan), the conversation shifted to Amateur Radio. I had presented him a photo of the *USS Theodore Roosevelt*, one of the aircraft carriers then assigned to my command. He had visited the ship and we wanted to present him with an appropriate memento. As you can see in the accompanying photo, we also did a DX version, with my A92Q QSL included.—*Vice Admiral Scott Redd, USN (Retired), K0DQ/A92Q, Annandale, Virginia*

CDR T. McCREARY, USN

بسم الله الرحمن الرحيم



A Generous Amateur Satellite Supporter

In the days that followed his death, the AMSAT e-mail reflector was full of comments from amateurs who warmly remembered King Hussein, including a wonderful story from past AMSAT-NA president Tom Clark, W3IWI.

Tom remembered in 1980 when "we had lost the Phase-3A spacecraft and it was a black day for us. We were fighting to keep the amateur satellite program alive." Then President Clark received a phone call late one night from Blackie Blackburn, W4TA/JY9BB, who served as the communications and technology advisor to the King. According to W3IWI, "Blackie told me that the King was concerned about Amateur Radio's loss and asked a lot of questions about our recovery plans and needs. Blackie ended the call with a comment that he would be in touch soon."

The next week newspapers carried a small news note that King Hussein was in the United States. Tom reported a few days later that his phone rang again. Blackie was calling from Los Angeles. W3IWI was asked to hold—and moments later—a voice came on the line saying "Tom, it is a pleasure to talk to you at last. This is JY1. I wanted to tell you how proud we are about AMSAT's efforts and how sad we are about the loss of Phase-3A. I would like to offer some help, so I'm sending you a contribution."

Tom and JY1 exchanged a few minutes more of chit-chat, and then Blackie came back on the line and said "Tom, the King's contribution to AMSAT is a check for $10,000. I have it in my hand. Where should I send it?"

According to W3IWI, not only did JY1's generous contribution provide needed financial support, "it was very important in helping the AMSAT folks to rebuild their morale." AMSAT OSCAR 10 was the result of JY1's generous outreach. *—our thanks to the AMSAT News Service for this story*

delight of the participants and those waiting to work him and JY74X.

Hussein's friend Bruce "Blackie" Blackburn, W4TA/JY9BB, of St Petersburg, Florida, called him "one of the world's most respected amateurs" and recounted many stories about King Hussein as a person and an avid Amateur Radio operator. Blackburn said King Hussein "promoted Amateur Radio to the hilt in Jordan" and saw to it that Amateur Radio classes were instituted in elementary schools. King Hussein frequently dropped in on meetings of the Royal Jordanian Radio Amateur Society in Amman. King Hussein also was involved with the early satellite experiments.

Former US Ambassador to Lebanon and Iran Armin Meyer, W3ACE, recalled Hussein February 8 in a letter to the *Washington Post*. Meyer said JY1 "has for decades been promoting peace and good will among quite ordinary people." As Meyer put it: "For the king, ham radio was a different world, a community of diverse people."

All members of the Jordanian royal family automatically have Amateur Radio privileges in Jordan. Although the new king does not appear to have a call sign, King Hussein's widow—the American-born Queen Noor—is JY1NH. King Hussein's brother, the former Crown Prince Hassan, is JY2HT, while his cousin, Prince Raad, JY2RZ, is chairman of the Royal Jordanian Radio Amateur Society.

A Royal QSO

It was early 1990, and I was logged into our usual morning net of retired folks checking on each other around the nation. Although our usual net control, N9FQW (now a Silent Key) was in Illinois, propagation was deteriorating to the point where we were also using a West Coast NCS, Dick, N7MOM, in Creswell, Oregon. The net had just been turned back to Dick for more western check-ins when JY1 joined the group. He and Dick had a short chat and then JY1 asked to speak with one of our Wichita, Kansas, participants. While this was in progress, N9FQW could be heard in a stage whisper saying, "Dick! Dick! Do you know who that is?"

I knew, of course, that it was King Hussein of Jordan, and I really wanted to have a contact with him, too. I was in a quandary, though. How does one correctly address a monarch? Should I call him, "Your Majesty," "Your Worship" or "Your Highness"?

The King solved that problem for us very nicely. He said, "It is true that I am the chief executive of my country, but today I am just another Amateur Radio operator."

I did not get my royal QSO that day; JY1 had to move on. But from then on, I read of his actions in Middle East politics with renewed interest. I did not always agree with his political decisions, but I always remembered that he was willing to take time to visit with rank-and-file Amateur Radio operators. That simple act made a powerful impression on me and spoke volumes about his character.—*Bob Shelby, W7FPY*

"QSL Via WA3HUP"

My first contact with JY1 was back in 1969. I sent for my card and said that I would be deeply honored to be his QSL manager. He responded by saying that they were coping with the QSL volume at the moment but, if the need should ever arise, he would be in touch.

Sooner than I could have imagined, I received a call from an amateur, saying that JY1 was on 10 meters and would like to speak with me. I wasted no time getting on frequency! King Hussein asked if my offer was still available. "Yes, of course," I replied. On that day I became JY1's QSL manager.

Two large boxes were then shipped to me containing logs, cards that needed to be confirmed, and a lot of letters that needed to be answered. The JY1 cards were shipped soon thereafter and my operation was under way.

Being the QSL manager for this great human being was like a dream because he was so kind. My husband and I were invited to visit Jordan and we got to meet King Hussein in person. To know this man is to love him, and he enjoyed coming on the air to speak with amateurs throughout the world. The sad thing was that His Majesty had problems reading stations because so many kept calling. He was not one to just give a signal report, name and QTH. On the contrary, King Hussein enjoyed talking to everyone and learning something about them.

It was one of the greatest honors and thrills of my life to be King Hussein's QSL manager. I already miss him, and so do many others. I will never forget this great man who played such a big part in my life. Knowing him has made me a better woman.—*Mary Ann Crider, WA3HUP* QST

By Sam Ulbing, N4UAU

Surface Mount Technology—You *Can* Work with It!

Part 1—Start building your projects with surface-mount devices! I'll show you how!

As I look through the various electronic manufacturing companies' product datasheets, three things strike me. First, the large number of available ICs that perform functions formerly requiring several ICs. Second, the continuing shift to lower-power requirements, smaller size and usability at higher operating frequencies. Finally, the increasing number of new products are available *only* in surface-mount packages. It all fits together: Products today are smaller and more energy efficient. Look at modern H-Ts, cell phones, GPS equipment, laptop computers, microwave ovens, intelligent electronic ovens, TV remote controls and pocket calculators: One thing they have in common is their use of surface-mount (SM) ICs.

On the other hand, when I look at Amateur Radio projects, I see continued use of many discrete components and bulky DIP ICs that perform limited functions. Recently, I saw a voltage-controller project based on the use of transistors and relays! Frankly, it bothers me that there seems to be a growing divergence between the technology used by industry and that used by hams. The *Maxim Engineering Journal Vol. 29*, for instance, showcases such new ICs as an image-reject RF transceiver, a low-phase-noise RF oscillator that replaces VCO modules, a 3 V, 1 W, 900 MHz RF power transistor, a direct-conversion down-converter IC that replaces an IF mixer, an IF LO and SAW filter, and a low-voltage IF transceiver that includes the FM limiter and RSSI. All these multifunction ICs are available *only* in SM packages! I think hams are being left behind because they feel that SMT (surface-mount technology) is something they can't handle.

Since I built my first SM project two years ago, I have assembled a dozen others. I find that my skill levels have increased tremendously with practice, and I now routinely tackle projects I never thought possible just a year ago. Based on my experience, I know that amateurs *can* work with SMT. Perhaps

N4UAU

when we show this ability, there will be more truly state-of-the-art projects in the amateur publications. How about a very small 2 meter rig, or a 900 MHz personal communicator? The ICs already exist and we need to adapt them to ham use. First however, it is necessary to develop a few basic building skills. This article series will help you develop those skills by showing what I have learned and presenting several useful and easy-to-build projects. Once you have built these, you will be able to handle most of the SM ICs I have seen used in the industry.

Nothing New

The concept of surface mounting parts is not new to Amateur Radio. In a September 1979 *QST* article,[1] Doug DeMaw, W1FB (SK), discusses a quick and easy circuit-board design that was basically SMT; Doug also proposed a universal PC-board layout for this kind of construction. You may think that there will *always* be DIP versions of all the SM ICs so engineers can experiment, but even today, many manufacturers are making evaluation boards available to designers so they can test the part using SM devices! I suspect it's cheaper for them to sell evaluation boards than to set up a production line to make a very limited number of DIP ICs when their real volume is in SM devices.

Some of the advantages of building with SM devices include:

- Smaller projects: I built a time-out switch that fits on a PC board one-sixth the size of a postage stamp! I was able to put the circuit into the battery compartment of a voltmeter I had so it could automatically power itself down.[2]
- Many SM versions of devices outperform the original DIP versions. Lower operating voltages and quiescent currents in the microampere range offer more efficient operation.
- Most RF projects require the use of short signal leads. SM capacitors are often recommended for use as bypass capacitors because they can be placed close to an IC and exhibit very low lead inductance. Nearly all VHF projects benefit from the use of SM devices.
- Once you've had some experience in working with SM devices, you'll feel more con-

[1]Notes appear on page 38.

fident about repairing your own gear.

- Making a PC board for SM devices is easier than for through-hole parts because no component-mounting holes need to be drilled.
- Many new SM ICs have entire modules built into them making it much easier to build a complex circuit than with older ICs.[3]

Equipment Needed

Many people think you need lots of expensive equipment to work with SM devices.[4] Not so! You don't need an eagle's eyesight, either! My optometrist describes my eyesight as "moderately near-sighted, needing bifocals ($2^1/_2$ diopters)." My wife thinks I am as blind as a bat.

- A fundamental piece of equipment for SM work is an illuminated magnifying glass. I use an inexpensive one with a 5-inch-diameter lens (see the accompanying trio of tools photographs). I use the magnifier for *all* my soldering work, not just for SM use. Such magnifiers are widely available (see the sidebar "Manufacturers and Distributors of SMT Equipment and Parts") and range in price from about $25 to several hundred dollars. Most offer a 3× magnification and have a built-in circular light.
- A low-power soldering iron is necessary; one that is temperature-controlled (such as the Weller WCC100) practically eliminates the possibility of overheating a part. Use a soldering iron with a grounded tip as most SM parts are CMOS devices and are subject to possible ESD (static) failure. I have found the Weller $^1/_{16}$-inch (EJA) screwdriver tip works well. I used to use an ETJ with its finer conical tip, but it does not seem to transfer the heat as well as the screwdriver tip.
- Use of thin (0.020-inch diameter) rosin-core solder is preferred because the parts are so small that regular 0.031-inch diameter solder will flood a solder pad and cause bridging.
- A wet sponge for cleaning the soldering-iron tip.
- A flux pen comes in handy for applying just a little flux at a needed spot. I find that RadioShack's flux is too sticky and it leaves a messy residue. The Circuit Works CW8200 flux pen with a type R flux is much cleaner.
- Good desoldering braid is necessary to remove excess solder if you get too much on a pad. Chem-Wik Lite 0.100-inch wide works well.
- ESD protective devices such as wrist straps may be necessary if you live in a dry area and static is a problem. I live in humid Florida, have never used these and have not had a problem.
- Tweezers help pick up parts and position them. I find that a pair of nonmagnetic, stainless-steel drafting dividers work well as tweezers. They have two very sharp needle-like points that allow me to pick up the smallest parts; and the parts seem less likely to slip from grasp perhaps because I use less force to hold them. The sharp points are useful tools for marking the PC-board copper foil before cutting out traces (more on this later). The nonmagnetic property of stainless steel means the chip doesn't get attracted to the dividers.
- If you want to make your own SM PC boards, I recommend using a Dremel Mototool (or something similar) and some ultra-fine cutting wheels.

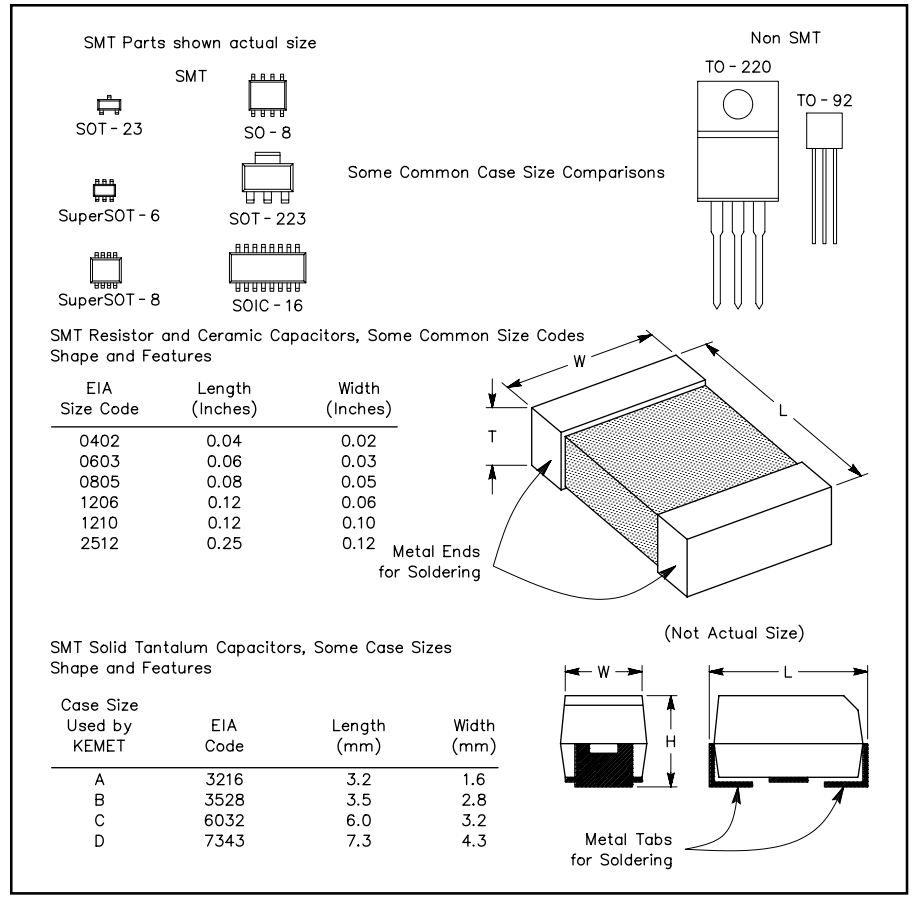


Figure 1—Size comparisons of some surface-mount devices and their dimensions.

Parts

Figure 1 shows some common SM parts. Resistors and ceramic capacitors come in many different sizes, and it is important to know the part size for two reasons: Working with SM devices by hand is easier if you use the larger parts; and it is important that the PC-board pad size is larger than the part. Tantalum capacitors are one of the larger SM parts. Their case code, which is usually a letter, often varies from manufacturer to manufacturer because of different thicknesses. As you can see from Figure 1, the EIA code for ceramic capacitors and resistors is a measurement of the length and width in inches, but for tantalum parts, those measurements are in millimeters times 10! Keep in mind that tantalum capacitors are *polarized*; the case usually has a mark or stripe to indicate the positive end. Nearly any part that is used in through-hole technology is available in a SM package.[5, 6]

SMT Soldering Basics

Use a little solder to pre-tin the PC board. The trick is to add just enough solder so that when you reheat it, it flows to the IC, but not so much that you wind up with a solder bridge. Putting a little flux on the board and the IC legs makes for better solder flow, providing a smooth layer. You can tell if you have the proper soldering-iron tip temperature if the solder melts within 1.5 and 3.5 seconds.[7] I use my dividers (or my fingers) to push and prod the chip into position. Because the IC is so small and light, it tends to stick to the soldering iron and pull away from the PC board. To prevent this, use the dividers to

LODER BROOKS, KD4AKW

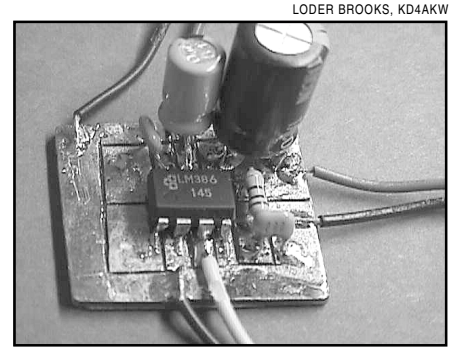


Figure 2—An LM386 audio amplifier built on a homemade PC board. The board's isolated pads are made by using a hobby tool to grind separating lines through the copper foil.

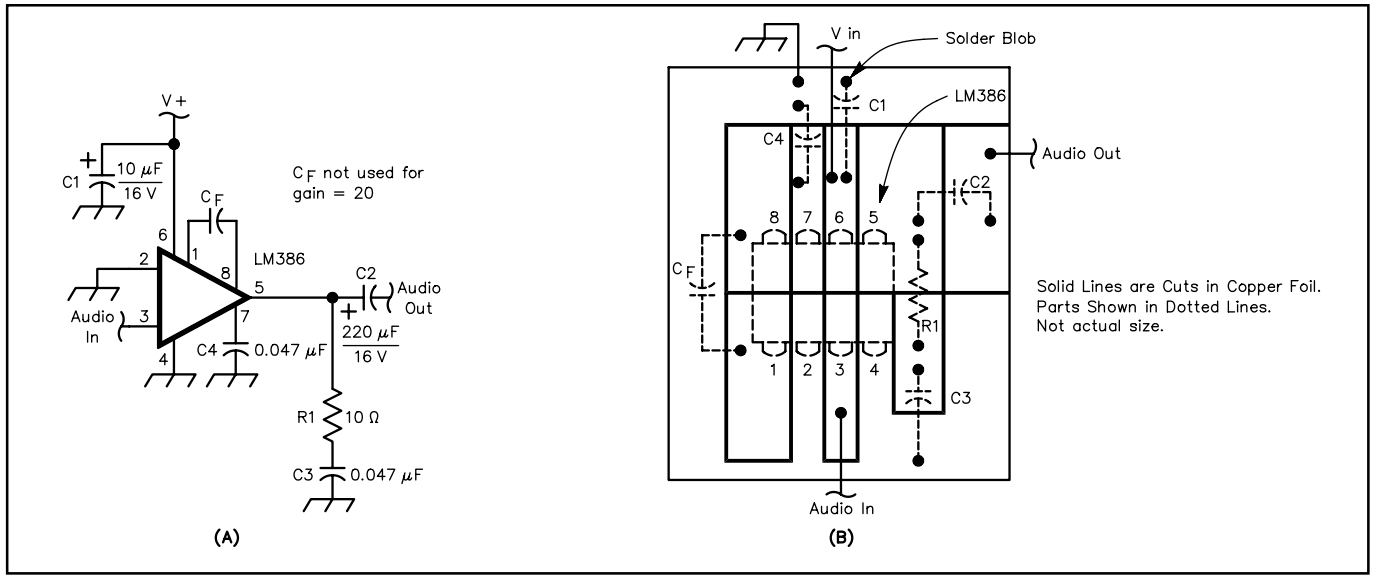


Figure 3—At A, the schematic of the LM386 audio amplifier. The component layout and PC board are shown at B. The solid, heavy lines indicate cuts made in the copper foil. This drawing is not to scale. The board is 1 inch long by 3/4 inch wide. No SM parts are used in this project, but my board-making method is shown. It allows one to get a feel for the process before tackling the smaller SM chips.

C1—10 µF, 16 V
C2—220 µF, 16 V
C3, C4—0.047 µF, 50 V ceramic
Cf—For overall circuit gains greater than 20, use 10 µF, 16 V
U1—LM386N (8-pin DIP)

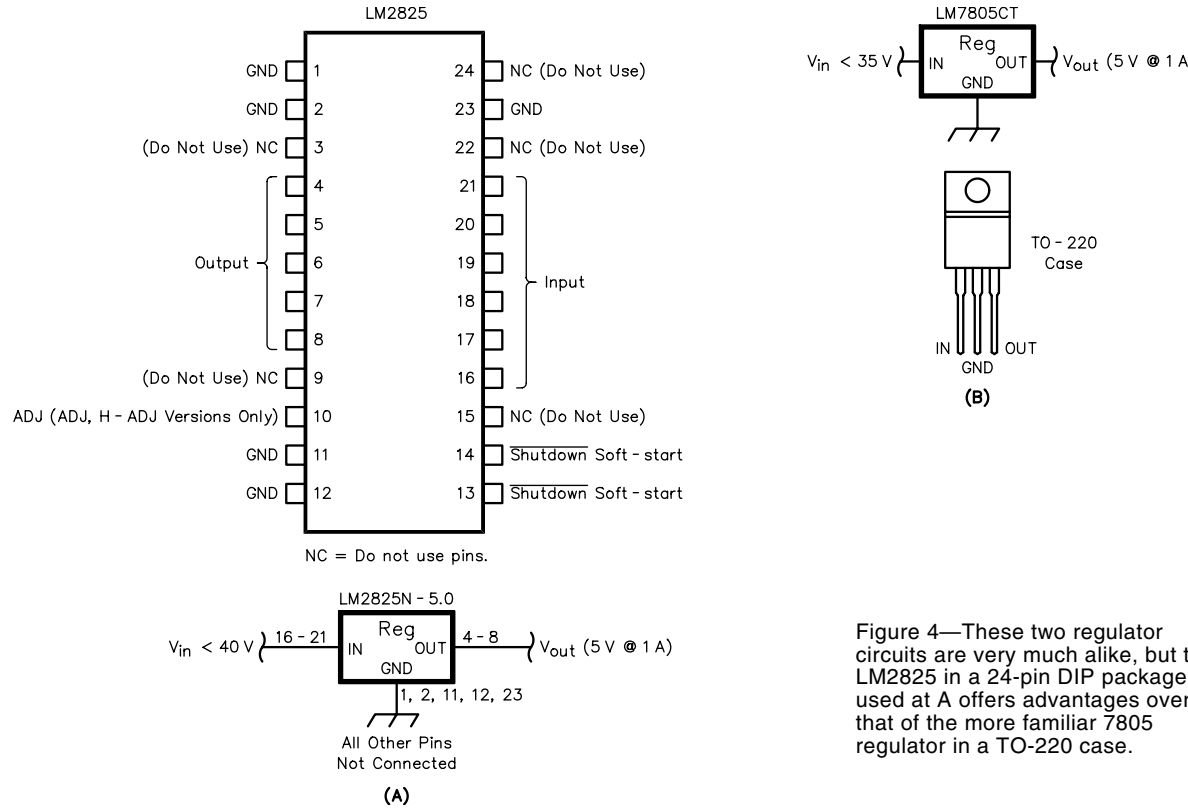


Figure 4—These two regulator circuits are very much alike, but the LM2825 in a 24-pin DIP package used at A offers advantages over that of the more familiar 7805 regulator in a TO-220 case.

hold the chip down while tacking two IC legs at diagonally opposite corners. After each tack, check that the part is still aligned. With a dry and *clean* soldering iron, heat the *PC board* near the leg.[8] If you do it right, you will see the solder flow to the IC.

The legs of the IC must lie flat on the board. The legs bend easily, so don't press down too hard. Check each connection with a continuity checker placing one tip on the board the other on the IC leg. Check all adjacent pins to ensure there's no bridging. It is easier to correct errors early on, so I recommend performing this check often. If you find that you did not have enough solder on the board for it to flow to the part, add a little solder. I find it best to put a drop on the trace near the part, then heat the trace and slide the iron and melted solder toward the part. This reduces the chance of creating a bridge. Soldering resistors and capacitors is similar to soldering an IC's leads, except the resistors and capacitors don't have exposed leads. My reflow method works well for these parts, too.

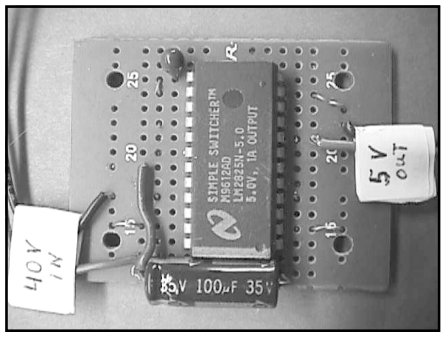


Figure 5—LM2825 circuit is constructed on readily available RadioShack perfboard (RS 276-150 or similar). Photo shows optional input filter capacitor and optional soft-start capacitor. Refer to the datasheet at the National Semiconductor Web page for suggested values for these optional components.

Attaching wires that connect to points off the board can be a bit of a challenge because even #24 stranded wire is large in comparison to the SM parts. First, make sure all the wire strands are close together, then pre-tin the wire. Carefully place the wire on the pre-tinned pad and heat it with the soldering iron until the solder melts.[9]

Making a SM PC Board

It is possible to etch SM PC boards just like a conventional board, but I recall Doug (W1FB) DeMaw's comment on etching: "If you don't mind a few brown stains here and there on your garments, etching is one way to make the board." Evidently he, like I, *did* mind, and he proposed a strong-arm method of using a hacksaw to cut square pads in the board foil. Hacksaws are too large and wide for SM use; I use a Dremel Mototool and a thin cutoff wheel. With these, I can cut a line as narrow as 0.005 inch, which lets me build with most of the available SM ICs.

To make such a "PC" board, start by sketching a layout for it. Don't worry about drawing it to scale, but make the sketch large enough to see what is happening. Normally, we think in terms of *connections between parts* because schematics show lines from point to point, representing the interconnecting wires. I find it is more useful to think in terms of the *spaces between the lines* because I am removing copper material to separate traces, not adding material to make traces. Where wires attach to the board, leave a large surface because the wires are relatively large. When making cuts, it is easiest to do it using a large piece of material that you can hold securely. Cut the board to size after you have cut all the traces.

Once I have the layout drawn, I hold the IC to the copper and used a fine-pointed tool (a 0.5 mm pencil or my dividers) to mark the location of the cuts on the PC board. I then remove the IC and use my Dremel tool to cut the copper along the marks. For critical cuts between an IC's closely spaced leads, I make one cut, then reposition the IC on the board and verify that the remaining marks are still

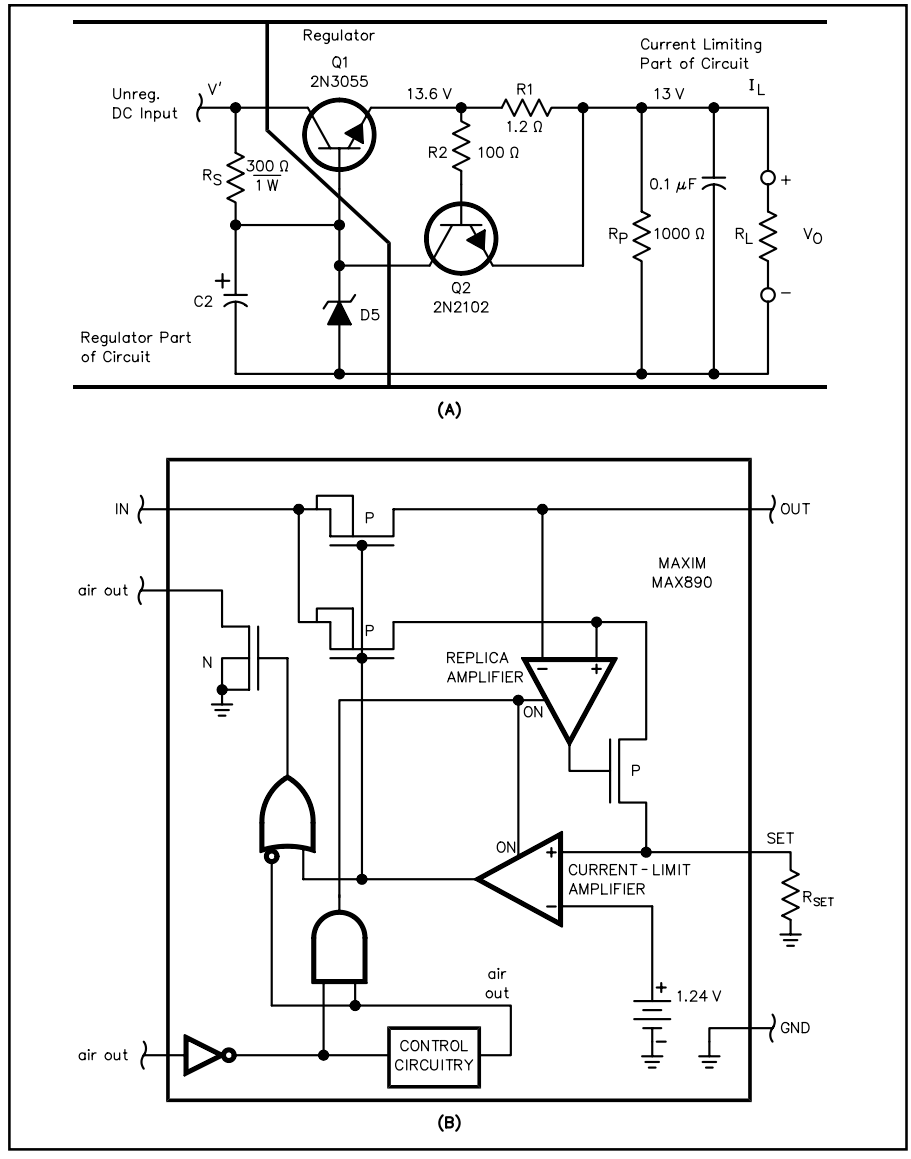


Figure 6—At A, a current-limiting circuit using older technology. Within the confines of the tiny MAX890, (B) newer technology offers a 1-A, P-channel MOSFET switch, a comparator, a voltage reference, a current-measuring circuit, control and fault-indicator circuits!

correctly aligned. I do all this freehand. Using an ultra-thin cutoff wheel, I find it is quite easy to cut in a straight line. At first, I used a fine cutting bit (#108), but that tip made a wider cut and it was difficult to cut a straight line. Dedeco (see the sidebar "Manufacturers and Distributors of SMT Equipment and Parts"), supplier of tools for jewelers and dentists, makes two ultra-thin wheels—0.009 and 0.005 inch. For the very small ICs—those in SOT23-5 and SuperSOT-8 packages—I use a 0.005-inch wheel, otherwise the 0.009-inch wheel is ideal. Be careful when handling these wheels as they break easily. Also, don't cut too deeply into the board material. At the intersection of the cuts, take care not to cut too far. Sometimes I cut close to an intersection, then use a razor blade to finish the job. A quick sanding deburrs the cuts. Run through the cuts with a small screwdriver or pen knife to ensure they are cleanly cut and without burrs. Finally, use your ohmmeter to verify that the islands/pads aren't connected.[10]

I recommend you make your own PC boards: They're easier to produce than through-hole boards, and you'll then be able to experiment with *your own* projects rather than waiting for others' projects to come along. You can use this method with SM or non-SM projects.

The Projects

All the projects I'll present are easy-to-build beginner projects, yet each offers significant advantages over similar projects based on the old (DIP) technology. As you build each project, you'll develop SM skills and wind up with some useful gadgets. I have tried to arrange the projects by degree of skill required. For those who want to make their own PC boards, I describe my layout. Ready-made PC boards are available for all of these projects except the first, Project 0A.[11]

Project 0A—Getting a Feel for SM Techniques

This audio amplifier is a good starter project for those who want to learn to work with SM devices because the technique is the same, but the parts are physically larger because no SM parts are used. I made the layout, cut the board and assembled this project in a little over an hour. Try doing that with etching and through-hole construction! I think you'll agree that the finished product looks as good as if it were assembled on a commercially made PC board (see Figure 2).

This project is shown in *The 1996 ARRL Handbook* (and subsequent editions) on page 25.8 using "dead-bug" construction.[12] All the parts are mounted on a groundplane with no component-mounting holes. It is easy to duplicate this project using SM techniques. Figures 3A and B show the schematic and board layout, respectively. I bent and trimmed the pins on the LM386 so that they look like a large SO-8 package. You can make the cuts with a 0.015-inch wheel. When cutting the ends of the traces to pins 1 and 3, be careful that you don't cut too far and run through the cut from pin 2.

An LM386 is *not* state of the art. If you want to see the difference between it and a state-of-the-art amplifier, build the SMALL.[13] It uses an LM4861, which is available only in an SO-8 package. In addition to its smaller size, the SMALL has more power output, far better fidelity and the ability to work with low-voltage power sources.

Project 0B—The World's Easiest Surface-Mount Project

You may be curious about comparing SMT with conventional technology, but not want to solder those small ICs. If so, this project is for you. It is based on the LM2825, a large DIP 5 V regulator used in the circuit shown in Figure 4A. Next, build a conventional 5 V regulator using an LM7805 in a TO-220 case, Figure 4B. Both can be built on a RadioShack universal PC board; the LM2825 project is shown in the photograph (Figure 5). Although the circuits look nearly identical, if you use a 12-V source to power both of them and put a load of 0.5A or more on each, you'll see that the LM7805 gets *very hot*, while the LM2825 stays cool. That's because the LM2825 is a sophisticated *switching regulator* with all of the tiny SM parts packed in a DIP case.

Out with the Old...

The (*1996 ARRL Handbook*) current-limiting circuit of Figure 6A uses a resistor (R1) and series pass transistor (Q1) in series with the load. R1 detects the current flow and Q1 limits it when necessary. This design has a voltage drop from input to output of 600 to 1200 millivolts depending on the load (before any overload). Its voltage regulation is poor and its efficiency is low.

...In with the New

By contrast, Maxim's MAX890 (Figure 6B) operates with voltage levels from 2.7 to 5.5 V (6 V maximum) with a current drain of only 15 µA. On this tiny chip are a 1-A, P-channel MOSFET switch, a comparator, a voltage reference, a current-measuring circuit and control and fault-indicator circuits! The maximum voltage drop across the switch is only 90 mV unless an overcurrent condition exists. Instead of using a series resistor to monitor current, the MAX890 uses a current replica circuit that controls the MOSFET limiting switch. For a short circuit—or for a large initial surge current—the circuit shuts off the switch in just five microseconds, then slowly turns it on while limiting the current to 1.5 times the maximum current. For prolonged overcurrent situations, there is a large amount of power dissipated in the MOSFET. To combat this, the chip has a thermal shutdown circuit that cycles the switch on and off, if necessary, to keep the temperature within a safe range.

Project 1—The SmartSwitch

This project is based on Maxim's MAX890, available in a common and fairly large SO-8 SM package that is relatively easy to work with. The switch is smart because it limits the current it passes to an amount you *preset*. This device not only protects your expensive electronic projects against a short circuit, but extends their life by limiting inrush current, a major cause of component

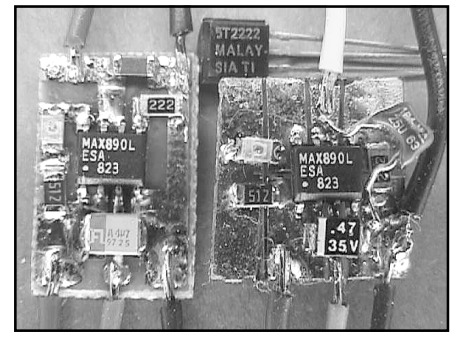


Figure 7—Here are two versions of the SmartSwitch compared in size to a TO-92 package transistor. The board on the right is homemade; the one to the left is available from N4UAU; see Note 11.

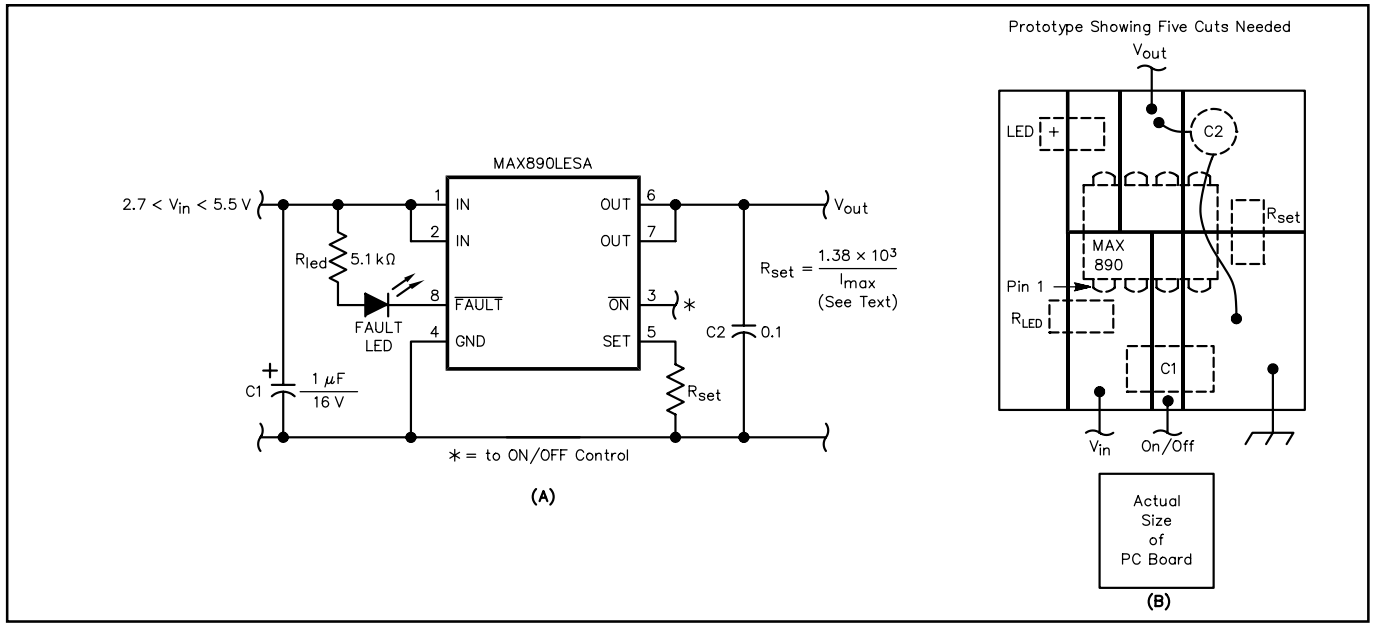


Figure 8— The SmartSwitch circuit (A) and board layout (B).

U1—MAX890LESA
Rset—See Eq 1 in text.
Rled—5.1 kΩ
C1—1 µF tantalum capacitor, 10 V or greater
C2—0.1 µF ceramic

failure. The IC has an output that can be set to trigger a fault indicator, such as an LED or bell. The **ON/OFF** pin exhibits a high impedance and can be controlled by a computer or low-output sensor such as a photoelectric cell. Building the SmartSwitch is straightforward and relatively easy. Figure 7 shows how physically small the switch is.

Figure 8A is the SmartSwitch schematic; the board layout is shown in Figure 8B. Circuit operation is simple: Power connections are made at pins 1 and 2, the high side of the switch and switched power are available at pins 6 and 7, respectively. **Rset** sets the trip current:

$$Ilimit = 1.38 \times 10^3 / \mathbf{Rset} \quad \text{(Eq 1)}$$

where *Ilimit* is the trip current in amperes, and **Rset** is the controlling resistance value in ohms.

I used a 2.2 kΩ resistor at **Rset** to establish a current limit of 625 mA. (Current-trip levels can be set to values between 200 mA and 1 A.) C1, the input capacitor, prevents input-voltage drop with current surges; in many cases, C1 can probably be eliminated. Output capacitor C2 protects the circuit against inductive spikes. When a current or thermal overload trips the switch, **FAULT** pin 8 goes low. I put a SM LED on the board to indicate when a fault occurs. Pin 8 is not intended to sink a lot of current, so I used a 5.1 kΩ resistor to limit the LED current to about 1 mA. You could use a100 kΩ pull-up resistor instead and an external high-impedance indicator.

Construction Comments

To make this project's PC board, I used a Dremel tool and a 0.009-inch disc. For my prototype, I found it easiest to use a monolithic (non-SM) capacitor for C2, mounting it across the top of the IC. (There is no rule that prohibits you from mixing technologies, and this made construction easier.) Notice how large the capacitors are compared to the IC. As is true with most SM projects, circuit layout is important: Short leads offer low inductance to promote fast switching in the event of a current overload. In case of a short circuit, the board's ground plane helps dissipate heat.

Tune In Again...

Next month, we will look at two chips that turn a positive voltage into a negative voltage and are only available in SM cases. One of these is in the large SO-8 case (as in Project 1); the other is in a smaller SOT-23 case. I hope you build Projects 0A and 1 because the skills you develop working with them will be useful in completing the projects to come.

Manufacturers and Distributors of SMT Equipment and Parts

AAVID (manufacturer)—143 North Main St, Suite 206, Concord, NH 03301; tel 603-224-9988; fax 603-223-1738; **http://www.aavid.com**; heat sinks, information about them.

AVX (manufacturer)—**http://www.avxcorp.com/products/capacitors/smtc.htm**; low-ESR capacitors

Bourns (manufacturer)—**http://www.bourns.com/**; resistors and potentiometers.

Chemtronics (manufacturer)—8125 Cobb Ctr Dr, Kennesaw, GA 30152-4386; tel 800-645-5244, 770-424-4888; **http://www.chemtronics.com**; soldering paste, solder, solder wick.

Contact East (distributor)—tel 800-225-5370, 888-925-2960, fax 800-743-8141; **http://www.contacteast.com**; flux pens, soldering equipment, illuminated magnifying glasses.

Dedeco International (manufacturer)—Long Eddy, NY 12760; tel 800-964-6616; **http://www.dedeco.com**. Manufactures the cutoff wheels I use. My 0.005-inch wheel is #5190, the 0.009-inch wheel is #5187. I found an assortment of Dedeco wheels at Home Depot, but they did not include the 0.005-inch wheel.

Digi-Key (distributor)—701 Brooks Ave S, PO Box 677, Thief River Falls, MN 56701-0677; tel 800-344-4539, 218-681-6674, fax 218-681-3380; **http://www.digikey.com**. Carries a wide selection of National, Maxim and International Rectifier ICs, many SMT parts, lithium batteries, holders and soldering equipment. They have good links to manufacturers' Web pages. Digi-Key has a $5 handling charge on orders less than $25.

FAR Circuits (manufacturer)—18N640 Field Ct, Dundee, IL 60118; tel 847-836-9148 voice/fax; **http://www.cl.ais.net/farcir**; custom PC boards.

Gerber (distributor)—Gerber Electronics, 128 Carnegie Row, Norwood, MA 02062; tel 800-225-8290, 781-769-6000, fax 781-762-8931; **http://www.gerberelect.com**. National Semiconductor products, most of the new ICs; $25 minimum order.

Hosfelt Electronics Inc (distributor)—2700 Sunset Blvd, Steubenville, OH 43952; tel 800-524-6464, 888-264-6464, 740-264-6464, fax 800-524-5414; (no e-mail address, no Web site); tilt switches and some SMT parts, 3 V lithium batteries and battery holders.

International Rectifier (manufacturer)—233 Kansas St, El Segundo, CA 90245; tel 310-726-8000, fax 310-322-3332; **http://www.irf.com**; IRF7201, IRLML2402, IRFZ46 and other MOSFETs, diodes, etc.

Kemet (manufacturer)—PO Box 5928, Greenville, SC 29606; **http://www.kemet.com**; capacitors; lots of technical information at this site.

Keystone Electronic Corp—(manufacturer), 31-07 20th Rd, Astoria, NY 11105; tel 718-956-8900; **http://www.keyelco.com**. Manufactures a complete line of battery holders, components and hardware.

Maxim (manufacturer)—120 San Gabriel Dr, Sunnyvale, CA 94086; tel 800-998-8800, 408-737-7600; **http://www.maxim-ic.com**; MAX871, MAX890 and other ICs.

Micrel (manufacturer)—1849 Fortune Dr, San Jose, CA 95131; tel 408-944-0800; **http://www.micrel.com**; MIC1555 and other ICs.

N4UAU (distributor)—5200 NW 43rd St, Suite 102-177, Gainesville, FL 32606; supplies parts kits for most of *QST* projects.

National Semiconductor (manufacturer)—2900 Semiconductor Dr, PO Box 58090, Santa Clara, CA 95052-8090; tel 408-721-5000, 800-272-9959; **http://www.national.com/**; LM2662 and many other ICs.

Newark (distributor)—tel 800-463-9275; call this number to get the phone and fax information of the representative in your area; **http://www.newark.com**. Carries products from many manufacturers including National, Maxim, International Rectifier, Micrel, Motorola, Sprague, Bourns. Many SMT parts, batteries, holders. There is a $5 handling charge for orders less than $25.

Motorola (manufacturer)—**http://www.mot-sps.com/sps/General/chips-nav.html** MC14020 and almost every other IC in the world. Motorola has a large Web site. This is where I have found the most useful information. If the site does not have what you want, try the links to other of its sites.

Sprague (manufacturer)—PO Box 231, Sanford, ME 04073; tel 207-490-7257, fax 207-324-7223; **http://www.vishay.com/products/capacitors.html**; low-ESR capacitors.

Star Micronics (manufacturer)—**http://www.starmicronics.com**—information on buzzers.

Notes

[1]Doug DeMaw, W1FB, "Quick-and-Easy Circuit Boards for the Beginner," *QST*, Sep 1979 pp 30-32.

[2]Sam Ulbing, N4UAU, "Mega-Mini Micropower Timeout Switch," *73 Amateur Radio Today*, Jul 1998, pp 42-48.

[3]I was intrigued to come across an engineer's comment in an industry magazine: "RF circuits are readily available as easy to use building blocks, so you needn't fully understand their operation to employ them in an application." Perhaps he had Amateur Radio builders in mind!

[4]Flex-mounted illuminated magnifying lenses are available at office-supply stores and electronic-component suppliers such as Office Depot, Office Max, Digi-Key, Newark, etc. Dremel tools are available from discount stores, Home Depot and Lowe's. Thin 0.020-inch diameter solder can be found at RadioShack (#64-013). Digi-Key, Contact East and Newark sell rosin flux pens.

[5]I have found the best way to locate state-of-the-art parts is via the Internet. Virtually every manufacturer has their component datasheets, applications notes and other information posted. It's a design engineer's dream! No longer do you need lots of databooks. Distributors, too, have catalogs

on-line. If you want to know if a company stocks the Maxim 890 for instance, you need only go to the Maxim home page, check out who their distributors are, then go to those sites and see if they have the part. It's true that some distributors have large minimum quantities for orders, but others don't. If you want more information on the parts in this project, see the sidebar "Manufacturers and Distributors of SMT Equipment and Parts."

[6]You might wonder "How small can they go?" National Semiconductor has recently introduced a device (the LMC6035) in a Micro-SMD package that is one-quarter the size of an SOT-23 package! According to National, the package is only slightly larger than the die itself: "This time we may have reached the packaging limits with the smallest possible footprint." Paul McGoldrick, Senior Technology Editor for *EDTN* said he "...expects to see a lot of licenses being sought in the next months for other manufacturers seeking to take advantage of this huge jump in process 'packaging' and in the lower costs associated with it," *EDTN*, Sep 1998. This is available for viewing at **http://www.EDTN.com/analog/prod194.htm/**.

[7]Per Kemet Electronics Corp monograph F-2103A, *Repair Touch Up Hand Solder—Can These Be Controlled*, by Jim Bergenthal. This and other free literature can be obtained from Kemet Electronics at their Web site (**http://www.kemet.com**). In the upper-left-hand corner of the page, select **Literature Request** after clicking on **Tantalum Capacitors**, then fill in the information form. Finally, click on **Request Selected Literature**. Or, use the Kemet mailing address given in the sidebar "Manufacturers and Distributors of SMT Equipment and Parts."

[8]See Note 7. Kemet emphasizes that: "UNDER NO CONDITIONS SHOULD THE IRON TOUCH THE PART. This is a major cause of part damage." I have touched parts often while soldering them and they have not sustained damage. Perhaps I have been lucky!

[9]Another approach to SMT soldering was suggested to me by Fred, W3ITO. He uses solder paste and a hot plate. He believes it is the only reliable method for amateur SMT (but he was dealing with equipment that had to meet military standards). I have not tried this approach as it appears to need fairly accurate temperature control and the solder paste is difficult to locate, expensive and must be specially stored in a cool dry environment. I would be interested to hear from others who may have tried this method.

[10]Universal SM prototype boards are also available from FAR Circuits. See Paul Pagel, N1FB, "Breadboards from FAR Circuits," *QST*, Nov 1998, p 74.

[11]If you are interested in learning to make your own boards as described, I have a limited number of parts kits consisting of a 3¥6-inch double-sided, copper-clad board, eight cut-off wheels (two 0.005 inch, four 0.009 inch and two 0.025 inch) and the special mandrel recommended for use with the ultra-fine cut-off wheels. This kit allows you to make boards for all the projects in this series and many more. Price $13. (Florida residents must add sales tax. For orders outside the US, please add $3 for shipping.)

Project #0B, Gerber Electronics has agreed to sell this chip to readers of this article at a special price of $12.50 ($8 less than the normal unit price) and waive their normal $25 order minimum. Be sure to identify yourself as a *QST* reader to qualify for this price.

Project #1, A limited number of parts kits are available from me for $6, without a PC board. If you want a premade PC board add $1.50. (Florida residents must add sales tax. For orders outside the US, add $1 for shipping.)

Order from Sam Ulbing, N4UAU, 5200 NW 43rd St, Suite 102-177, Gainesville, FL 32606; **n4uau@afn.org**. Credit cards are *not* accepted.

[12]I omitted the feedback capacitor between pin 1 and pin 8 to reduce the gain but my layout allows for it to be added if desired.

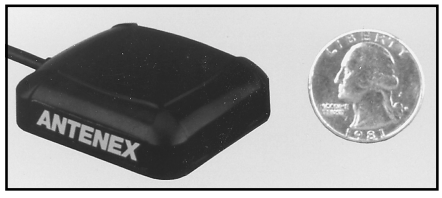
[13]Sam Ulbing, N4UAU, "SMALL—The Surface Mount Amplifier that is Little and Loud," *QST*, Jun 1996, pp 41-42 and 68.

Sam Ulbing, N4UAU, studied electronics in the 1960s, but spent his work career in the financial area. Since he retired in 1986, Sam has enjoyed exploring the opportunities offered to the amateur builder by the new ICs. He feels that electronic design for amateurs has become much easier than it used to be. Sam recalls how in the '60s, he spent hours sweating over complex equations to design even simple circuits. Now, although he has forgotten almost all of his math, the circuits he has built with the new electronics do very sophisticated functions and best of all they work! Presently, Sam is playing with three projects, choosing to build all of them using his "surface-mount style" because "It's just more fun to do it that way." You can contact Sam at 5200 NW 43rd St, Suite 702-177, Gainesville, FL 32606; **n4uau@afn.org**.

New Products

TINY GPS ANTENNA FROM ANTENEX

◊ The newest addition to the Antenex line of GPS antennas is the magnetically-mounted Micro GPS. The tiny unit has excellent isolation from cellular telephone interference and active ceramic construction. Antenex GPS antennas are also available in self-adhesive and permanent mounts. An NMO version will be available soon.



For information on the company's entire line of GPS and cellular products, contact Antenex, 2000-205 Bloomingdale Rd, Glendale Heights, IL 60139; tel 630-351-9007, fax 630-351-9009.

COMMERCIAL-STYLE SHACK SIGNS FROM W1TK

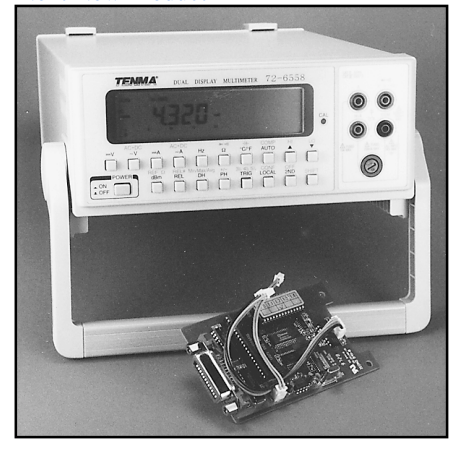
◊ Want to lend a commercial look to your shack's call sign display? The newest offering from Signs by Ron will transform your Amateur Radio call sign into a colorful, customized, commercial-looking extravaganza. Price: $19.95 plus $3 shipping and handling. For more information, contact Signs by Ron, 64 Neal Ct, Microdyne Office, Plainville, CT 06062; tel 860-632-1070, **signsbyron@snet.net**.

DUAL DISPLAY MULTIMETER FROM TENMA

◊ Tenma's new Model 72-6558 commercial-grade, dual-display, True RMS multimeter has two 5.5-digit back-lit LCDs with analog bar graphs, selectable count resolutions and can simultaneously measure two different parameters of the same test signal. The dual meter can measure ac voltage (true RMS), dc voltage (1000 V max with 1 microvolt resolution and 0.01% accuracy) current, resistance, frequency, capacitance and temperature. The built-in RS-232 interface can be used in systems with an optional IEEE-488 interface.

Price: $579. For more information, contact MCM Electronics, 650 Congress Park Dr, Centerville, OH 45459-4072; tel 800-543-4330, fax 937-434-6959, **http://www.mcmelectronics.com**.

Next New Product



Strays

EXPANDED W1AW VISITING HOURS

◊ The W1AW visiting operating schedule has been expanded. The new hours are from 10:00 AM to 12:00 PM, and from 1:00 PM to 3:45 PM EST, Monday through Friday. Questions regarding the W1AW operating schedule may be sent to **w1aw@arrl.org**, or by writing to W1AW, 225 Main St, Newington, CT, 06111.

Next Stray

By Don A. Gagnon, WB8HQS

Which Battery Should *You* Use in Your Equipment?

Batteries! Batteries! Batteries! They're everywhere! With several new battery types coming onto the scene in the last 10 years or so, it's hard to keep up with what's available today! And—even more important—how do they differ from one another, and which is best in *your* application?

The tried and true standby batteries for hand-held transceivers, video cameras and portable computers have been nickel cadmium (NiCd). For less-portable applications, sealed lead acid (SLA or gel) cells are often used. Today we have nickel-metal hydride (NiMH), lithium ion (Li-Ion), lithium polymer (Li-Polymer) and reusable alkaline. Each of these types has good and bad features, and selecting the battery for your needs can be a real headache unless you understand those features and how they may apply to your needs. Here, I'll try to shed some light on those subjects.

Selecting the best battery for your particular application can be a compromise between cost and length of service. Here is a description of some of the many types available.

Battery Types[1]

Nickel Cadmium (NiCd)—Mature technology, used where long use life, high discharge rate and reasonable prices are important. Not good where long shelf life is essential.

Nickel-Metal Hydride (NiMH)—Has been around for about 10 years, offers a somewhat better power density than NiCd, but also has a reduced total number of charge/discharge cycles and a lower peak output current (because of higher internal resistance).

Sealed Lead Acid (SLA) or Gel Cells—Best suited for higher-current power applications, or those requiring low current for extended periods of time. The downside of these batteries is their large physical size and weight.

Lithium-Ion (Li-Ion)—A somewhat new technology, really emerging in the last five to seven years, although it has been experimented with for some time. Li-Ion cells provide a much higher power density (power available per unit volume) than NiCd. The downside is that they require very tight control of charge current, charge voltage and discharge to defend against plating metallic lithium inside the battery.

Lithium Polymer (Li-Polymer)—Not commercially available yet, Li-Polymer is a modification of Li-Ion technology and promises to be less expensive to manufacture, but will have a low maximum output current. Best suited for slow drain, low-current applications.

Reusable Alkaline—Cousin to disposable alkaline cells, reusable alkaline cells are good for low-cost and low-power applications. They're known for having a very low self-discharge rate.

That, in a nutshell, is a quick overview of the battery types available today and in the near future. Table 1 summarizes and compares these battery types. Because the Li-Ion technology holds the most promise for amateur and home entertainment use, the remainder of this article focuses on Li-Ion technology, how it works, and the special precautions you must take when using Li-Ion batteries.

What Makes Lithium-Ion Batteries Tick?

Lithium is the lightest of all metals; it also has the greatest –electrochemical potential available. Rechargeable batteries using lithium metal are capable of supplying both high voltage and extraordinary energy density. However, batteries using lithium *metal* have a very severe draw-back. The cells, especially during the charging process, can grow lithium dendrites internally (small slivers of lithium metal grow between the internal electrodes). These dendrites can short the cell and send it into thermal runaway. The cell will get hot enough to melt the lithium metal and will likely explode! For this reason, lithium cells have been limited to small-capacity applications such as watch batteries.

Because of the instability of lithium metal, research shifted to nonmetallic lithium in the form of lithium ions, which are generated by using chemicals such as lithium-cobalt dioxide ($LiCoO_2$). This provides a very stable battery with reasonably high discharge rates, high power density and a low self-discharge rate. On the horizon are other materials, such as amorphous tin-based composites, which will provide even higher power densities, but these are still a few years away.

For safety and battery-life reasons, each battery pack must be equipped with control circuitry to limit the peak voltage of each cell during the charge cycle, and to prevent the cell voltage from dropping too low during discharge.[2] Most of these circuits also properly limit the charging and discharging current and monitor the cell temperature. There are many battery-monitoring microcircuits available that perform all of these functions with a minimal number of

[1]Notes appear on page 42.

Table 1
Battery Type Comparisons

	NiCd	*NiMH*	*SLA*	*Li-Ion*	*Li-Polymer*	*Reusable Alkaline*
Energy density	40-60	60-80	30	100	150-200	80
Cycle life*	500-1500	500	200-500	500-1000	100-150	10
Fast charge time	1 h	2-4 h	8-16 h	3-4 h	8-15 h	2-3 h
Overcharge tolerance	Moderate	Low	High	Very low	N/A	Moderate
Self-discharge (per month)	25%	30%	5%	10%†	N/A†	0.3%
Individual cell voltage	1.25 V	1.25 V	2 V	3.6 V	2.7 V	1.5 V
Maximum load current‡	>2C	0.5-1C	0.2C	1C	0.2C	0.2C
Typical averaged cost (with NiCd being unity)	1.0	1.4	0.5	2.0	0.9 (est)	0.1

*Cycle life is when full capacity decreases from 100% to 80%. For reusable alkaline, it drops to 65%.
†Control and protection circuitry contained within the battery pack typically consume 3% per month.
‡The C specified here refers to the cell's ampere-hour capacity. For example, if a cell is rated at 1.5 Ah and you discharge it at a 1C rate, you will be drawing 1.5 A for 1 hour. If you draw only 0.75 A from it (0.5C), the cell should last for 2 hours.

Table 2
Some Sources for Li-Ion Supervisory Microcircuits

Company Name	*Web Site*	*Part No.*	*Features*	*Functions**
Maxim	http://www.maxim-ic.com	MAX745	Monitors 1 to 4 cells.	charge
		MAX846		charge
Linear Technology	http://www.linear.com	LT1510	Works with NiCd	charge
		LT1511	NiMH or Li-Ion. Get Design Note 111 and App Note 68	charge
Benchmarq	http://www.benchmarq.com	bq2054	Monitors 1 or 2 cells	both
		bq2058	Monitors 3 or 4 cells	both
Temic (Siliconix)	http://www.temic.com	Si9730	Monitors 2 cells	both
National Semiconductor	http://www.nsc.com	LM3420	1 to 4 cells	charge
		LM3620	1 or 2 cells	charge
		LM3621		charge

*Charge = monitors and controls charging of the batteries.
Both = monitors charging of the batteries and monitors the discharge to ensure you don't bring them too low.

additional components, components that are intended to be incorporated into the battery pack itself. (These will be discussed in greater detail a bit later.) By carefully monitoring and controlling all of these parameters, we can virtually eliminate the chance of plating metallic lithium within the battery.

At present, there are two major types of Li-Ion batteries: The *coke* and *graphite* versions. The graphite version has a somewhat flatter discharge curve (with a sharper knee), has a higher peak output current, and its full discharge point is 3.0 V. The coke version must be discharged to 2.5 V (these voltage levels can also vary among manufacturers). Both types are widely used today. Manufacturers are constantly working to improve the chemistry of their Li-Ion batteries.

There are two major advantages of Li-Ion batteries for use by radio amateurs: They can be recharged anytime during their entire discharge cycle, and they can be rapid-charged. In just one hour, they go from fully discharged to 80% of capacity, and are at 100% in just 2.5 hours.

Remaining-Capacity Predictions

Another advantage of Li-Ion is a highly predictable "remaining capacity" indication. Although specific details of the methods used to obtain remaining capacity information are beyond the scope of this story, I will give you an inkling of the two most popular methods.

Analog-to-Digital Conversion

This method uses a low-value series resistor as a current sensor, amplifies that signal, and applies it to the input of an 8 to 16 bit ADC, that provides a dynamic range of about 450:1, producing a digital level that is a fairly precise indication of the battery's output voltage. By knowing the precise discharge curve of the particular cell(s) you are working with, a well defined "remaining time" can be calculated. The main disadvantage of this method is that at low current draw (as during standby), the ADC accuracy is not very good, because it is at the low end of its resolution.

Voltage-to-Frequency Conversion

The second method is similar, but it uses a voltage-to-frequency conversion, and a microcontroller does the calculations for you. This approach also requires a stable clock source, but it can have a dynamic range of more than 4500:1, and will be much more accurate at all levels of usage.

Safely Charging and Discharging Li-Ion Battery Packs

There are a number of microcircuits available today that perform all of the needed functions to properly supervise from one to four cells, and do so with a minimum number of additional components. These are all designed to be built into the battery pack itself, so that charging the batteries involves simply attaching a proper voltage source to two terminals

Table 3
A Few Sources of Li-Ion Batteries

Model No.	*Vendor*	*Voltage*	*mAh Rating*	*Physical Size (inches)*	*Supplier's Web Site*
ICR-18650	NEC	3.7	1500	0.72 dia×2.56 long (cyl)	http://www.nec.com
ICR-17670	NEC	3.7	1300	0.67 dia×2.64 long (cyl)	http://www.nec.com
IMR-18650	NEC	3.8	1350	0.72 dia×2.56 long (cyl)	http://www.nec.com
IMP-220665	NEC	3.8	600	0.87×2.56×0.34 thick (rect)	http://www.nec.com
IMP-341065	NEC	3.8	1550	1.34×2.56×0.39 thick (rect)	http://www.nec.com
Eli-18650	Energizer	3.7	1350	0.71 dia×2.57 long (cyl)	http://www.eacnet.com
UR 18650	Sanyo	3.6	1300	0.71 dia×2.56 long (cyl)	http://www.sanyo.ca
UR 18500	Sanyo	3.6	900	0.71 dia×1.99 long (cyl)	http://www.sanyo.ca
UF 812248	Sanyo	3.6	550	0.87×1.89×0.32 thick (rect)	http://www.sanyo.ca
4/3A	GP Batteries	3.7	1220	0.67 dia×2.64 long (cyl)	http://www.gpbatteries.com
DR201	GP Batteries	10.8	3600	2.09×8.48×0.76 thick (rect)	http://www.gpbatteries.com
DR202	GP Batteries	10.8	3900	3.52×5.89×0.79 thick (rect)	http://www.gpbatteries.com

and the battery pack does the rest! These microcircuits are available from several manufacturers (see Table 2), but here I will discuss the Benchmarq bq2058 circuit in particular.

The Benchmarq device is a bq2058SN, factory set for an overvoltage threshold of 4.25 V. Several other thresholds between 3.4 V and 4.375 V are available, and you can consult their spec sheet for more information. With the addition of 10 resistors, 10 capacitors, a Zener diode and four switching FETs, you can build a complete three or four-cell (10.8 or 14.4 V) Li-Ion battery pack, that draws only 0.7 µA while sleeping (not in use), or 25 µA when the battery is being discharged or charged. The Benchmarq device provides over- and undervoltage and overcurrent protection—essentially everything you need for a complete battery pack. Benchmarq also offers a complete supervisor module with everything but the batteries themselves, fully assembled on a 2.6×0.7 inch PC board (bq2158). You can get a spec sheet from their Web site (see Table 2).

With a battery pack such as described in the Benchmarq data sheet, you could have a 14.4-V battery pack for your H-T that will likely give you twice the operating time, quick recharge capability and long shelf life. A ham's dream come true!

Battery Form Factors and Availability

There are many sources of Li-Ion cells; I have compiled basic information on several of them. Although Sony is probably the world's largest manufacturer of Li-Ion batteries, at this time they have chosen to keep that manufacturing captive and not sell them to outside users. See Table 3 for some basic information on a few of the sources.

Summary

All in all, the hobbyist has several choices today in battery power, and Lithium Ion appears to offer the best overall performance for use in H-Ts and similar electronic equipment. The one "gotcha" you must pay very close attention to is the careful control and monitoring that is necessary during charging and discharging. Luckily, there are several microcircuit manufacturers that can supply ready-to-go solutions to those issues.

Notes

[1]Definitions of battery types are courtesy of the CADEX Web site at **http://www.cadex.com**.

[2]Li-Ion charging characteristics data was courtesy of the Power Conversion and Intelligent Motion Web site at **http://www.pcim.com**.

Don A. Gagnon, WB8HQS, was first licensed in 1970. In addition to ham radio, Don's hobbies include general electronics and computers. Don is a Staff Component Engineer at ITT Industries, Aerospace/Communications Division. You can contact Don at 2805 Nordholme Ave, Fort Wayne, IN 46805-2945; **dagagnon@pipeline.com**.

New Books

AMATEUR RADIO MOBILE COMMUNICATIONS GUIDE and CRUISER'S RADIO GUIDE (2nd Ed)

Roger Krautkremer, K0YY

Published by FMS Services, 2539 S Fairplay Way, Aurora, CO 80014-2522; tel 303-695-8715; e-mail ***rogerk0yy@aol.com***. Amateur Radio Mobile Communications Guide: *1998, softcover, spiralbound, 8½ × 5½ inches, 178 pages with index and appendices, B&W illus/ photos. $14.95. Available from major Amateur Radio retailers and bookstores;* Cruiser's Radio Guide *(2nd edition): 1997, softcover, spiralbound, 8½ × 5½ inches, 179 pages with index and appendices, B&W illus/ photos. $19.95. Available from Ham Radio Outlet and at major nautical bookstores and marine retailers.*

Reviewed by Rick Lindquist, N1RL, Senior News Editor

Two activities I happen to enjoy immensely are driving and boating. To expand my pleasure, I've integrated Amateur Radio into both my car and my boat, so I was pleased to see these two little books by Roger Krautkremer, K0YY, show up on my desk.

While these separate volumes have distinct audiences, a lot of parallels exist between mobile and marine/maritime mobile installations. The fact that the two guides also duplicate this common territory reflects this reality. Both books are sized to be handy for storing in the glove box of your vehicle or stowing in a (dry) compartment in your vessel. Both books also contain information about their respective subjects that you're not likely to find all in one place, although much of it is available elsewhere. This might be their most valuable aspect. Of course, I was pleased to see that Krautkremer references *The ARRL Radio Amateur's Handbook* as "an excellent general radio technical reference."

The author's style is, for the most part, a no-nonsense, straightforward approach. These texts reminded me of the operating procedures at a government-owned defense plant I once worked at, complete with the obligatory notes and safety warnings. But it's not *all* dry. At one point in the *Mobile Communications Guide*, the author talks about the special terms used in mobile operation and ham radio. "They are designed to make 'old heads' feel important and have newcomers hold them in awe," he writes. "There are secret lists of these terms carefully hidden in the Glossary and the Net Special Terms appendices."

My favorite bit of advice in the *Mobile Communications Guide* concerned how to deal with intentional interference. "Experience has shown many times, the best course of action is to ignore it. Any comment adds fuel to the fire," he admonishes. Another terrific piece of advice was to turn off that speech processor (compressor) when operating from a vehicle or a vessel (often they just boost the background noise).

Each of Krautkremer's guides covers a great deal of territory—or "waterfront" in the case of the *Cruiser's Guide*. The tables of contents for both guides take up four pages, single-spaced. Topics in the *Mobile Communications Guide* include everything from basic information and frequently asked questions through equipment selection and installation, operating, and a single chapter devoted to "Full-Timer Mobile Information" aimed at RV owners and others who spend more than the average amout of time in their vehicles (over-the-road truckers get some space here, for example). Some of the discussion seems aimed at getting RVers into ham radio (possibly as an alternative to CB).

The *Cruiser's Guide* covers a similarly broad list of topics, but this book also incorporates discussion of the Maritime Radio Service in addition to Amateur Radio. At one point, Krautkremer lists the pros and cons of each service as opposed to the other.

The downside here is that a manual of fewer than 200 pages cannot address any single topic in detail. As a result, some topics many mobilers would consider essential stuff are glossed over. Other relatively superfluous or tangential topics get covered in greater detail than many might consider necessary. A few examples: Today's cars don't offer much space for amateur gear. Even mounting a VHF/UHF mobile can be a challenge. I'd hoped to see more information in the *Mobile Communications Guide* on meeting this challenge, but the author devotes but a couple of pages to this topic. Don't get me wrong: these pages contain some great advice ("Check behind where you're about to drill!" is an apt warning), just not enough of it.

Fortunately, there's more information on the thorny topic of mobile antenna systems, mounts, automatic antenna tuners, routing coax, noise suppression (including a section called "I've tried it all and it's still there!"), and even how to solder a connector.

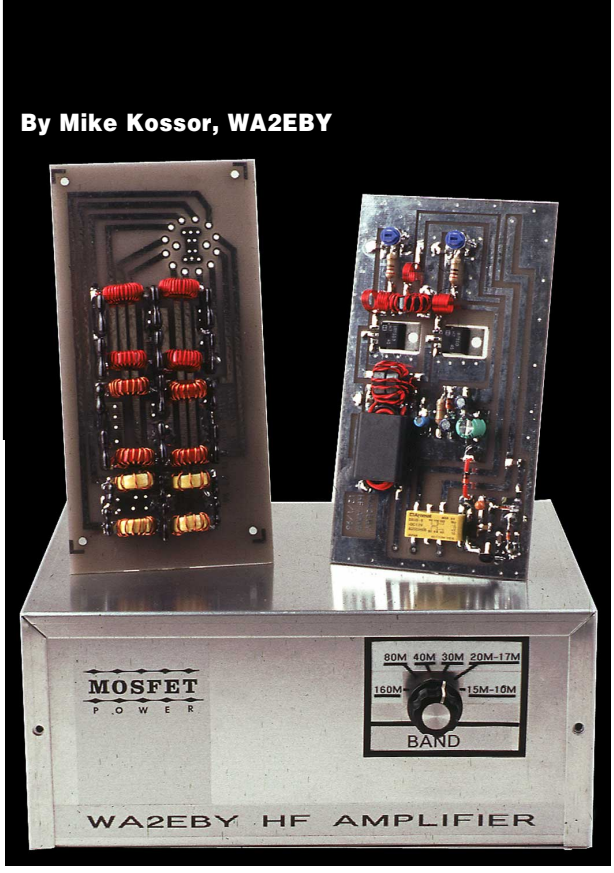
One maritime mobiling subject I'd hoped to find elucidated in the *Cruiser's Guide* is the perennial problem of how to create a suitable RF ground aboard a vessel that has a fiberglass hull. I was disappointed to discover that RF grounds get just a couple of pages in both books, and some of the information is identical. The one-page diagram of "RF Grounding Techniques" was instructive. "Install as much as practical," Krautkremer advises, but additional practical detail is warranted here.

Additionally, there's no mention of electrolysis (galvanic corrosion) in the *Cruiser's Guide*. Electrolysis damage of marine gear—from hull fittings to propellers, shafts, and stern drives or outboard motors—is a constant concern for boaters. Certain RF grounding methods can upset the balance of means taken to prevent galvanic corrosion, so this issue deserves at least a few paragraphs here.

For the benefit of newcomers who might stumble across a copy of either of these guides, the author has included a fair amount of information on licensing, operating practices, net procedures, operating modes and protocols, regulations, and other information that the experienced operator will probably skip. Boaters will find the information on marine radio operating useful, even if they don't have ham gear aboard. The author also includes a handy list of amateur maritime mobile nets around the world.

Both books also include lists of AMTOR, PACTOR, and CLOVER mail boxes, comprehensive glossaries, Web sites, WeFAX frequencies, and other nice-to-know information. But even new arrivals to the world of Amateur and Marine Radio will find these guides useful and informative—and Krautkremer approaches both with an eye toward recruiting additional operators to the Amateur ranks.

By Mike Kossor, WA2EBY



A Broadband HF Amplifier Using Low-Cost Power MOSFETs

Part 2—Let's put the finishing touches on this all-band HF amplifier!

Last month,[11] *I covered the history and development of this 40 W (average) amplifier. I'm sure you're anxious to get* your *amplifier finished and on the air, so let's get going!*

Amplifier Construction

The amplifier is constructed on a double-sided PC board with plated through holes to provide top-side ground connections. I used chip resistors and capacitors to simplify construction, but leaded capacitors may work if lead lengths are kept short. First, assemble all chip capacitors and resistors on the PC board. Tweezers help to handle chip components. Work with only one component value at a time (chip caps and resistors are very difficult to identify!). Chip capacitor and resistor mounting is simplified by tinning one side of the PC board trace with solder before positioning the capacitor or resistor. Touch the soldering iron tip to the capacitor or resistor to tack it in place. Finish mounting by soldering the opposite side of the component. *Don't apply too much heat to chip capacitors*. The metalized contacts on the capacitor can be damaged or completely removed if too much heat is applied. Use a 15 to 20 W soldering iron and limit soldering time to five seconds.

Mount axial-leaded resistors, diodes and remaining capacitors next. To avoid damaging them, mount inductors and transformers last. L1 and L2 are wound on a 0.25-inch drill-bit shaft. By wrapping the wire around the shaft 10 times, you'll get 9½ turns. The last turn arcs only a half-turn before entering the PC board. L3 is wound on a 0.190-inch diameter drill bit with 3½ turns wound the same way as L1 and L2. Mounting K1 is simplified by first bending all its leads 90° outward so it lies flat on the PC board. Use a wrist strap connected to ground through a 1 MΩ resistor to bleed off static body charge while handling MOSFETs, and do the work on an anti-static mat connected to ground via a 1 MΩ resistor. The gate input can be damaged by electrostatic discharge!

[11]Notes appear on page 46.

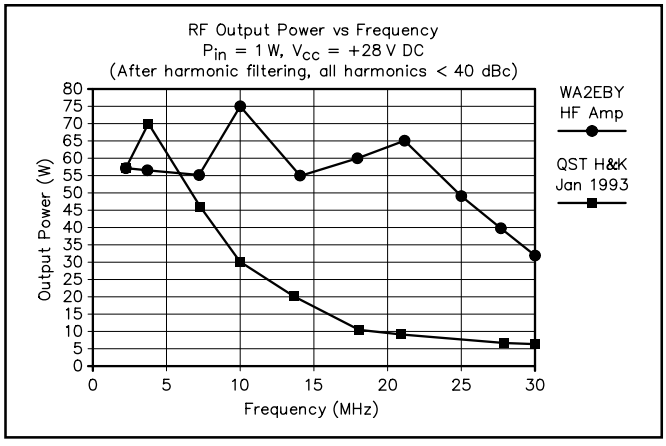


Figure 4—RF output power comparison of the Hint and Kink amplifier and this design.

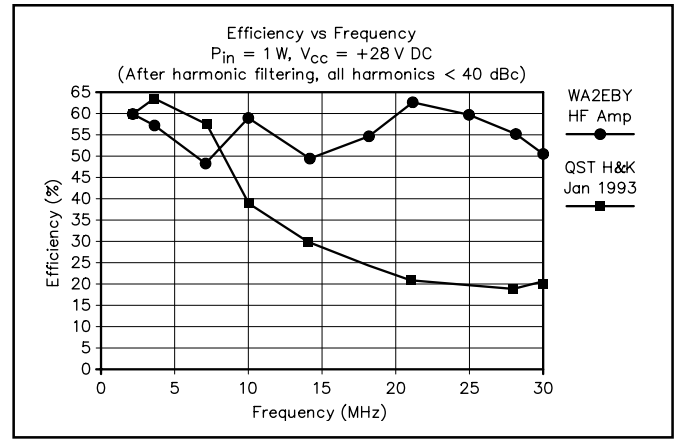


Figure 5—Efficiency comparison of the Hint and Kink amplifier and this one.

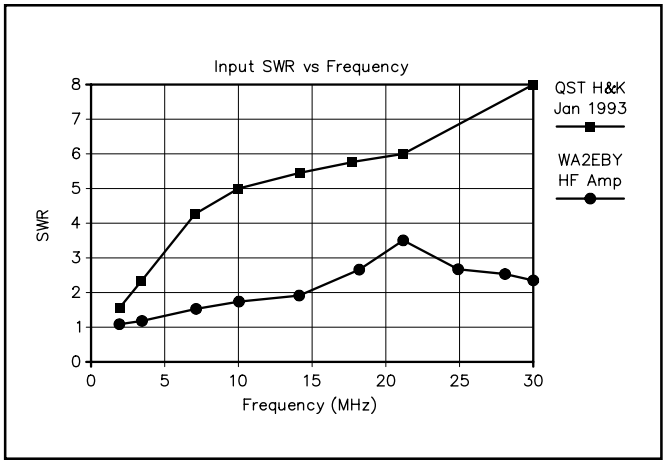


Figure 6—Input SWR comparison of the two amplifiers.

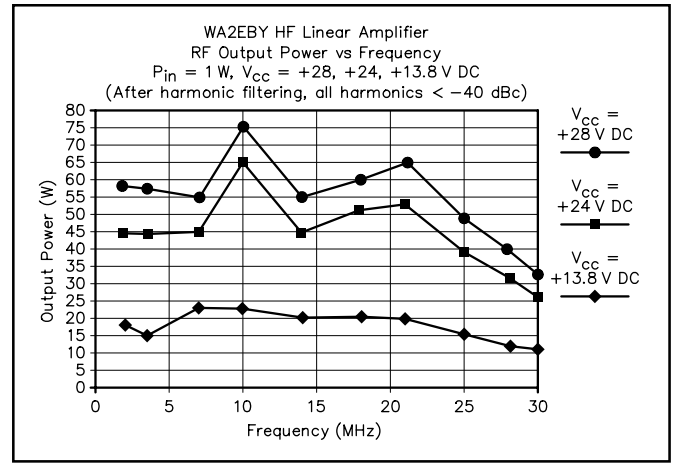


Figure 7—RF output power versus supply voltage of this amplifier.

When winding T3, wind the primary first and add the secondary winding over the primary. Be sure to use Teflon-insulated wire for T3's windings; the high operating temperatures encountered will likely melt standard hook-up wire insulation.

Heat Sinking

Together, Q1 and Q2 dissipate up to 59 W. A suitable heat sink is required to prevent the transistors from overheating and damage. I used an AAVID 244609B02 heat sink originally designed for dc-to-dc power converters. The amplifier PC board and heat sink are attached to an aluminum enclosure by two #4-40 screws drilled through the PC board, enclosure and heat sink at diagonally opposite corners. A rectangular cutout in the enclosure allows Q1 and Q2 direct access to the heat sink. This is essential because of the large thermal impedance associated with the TO-220 package (more on this topic later). Mark the locations of the transistor-tab mounting-hole location in the center of the heat sink in between the cooling fins. Disassemble the heat sink to drill 0.115 inch holes for #4-40 mounting screws, or tap #4-40 mounting holes in the center of the heat-sink fins.

Use mica insulators and grommets when mounting Q1 and Q2 to prevent the #4-40 mounting screws from shorting the TO-220 package drain connections (tabs) to ground. Coat both sides of the mica insulator with a *thin* layer of thermal compound to improve the thermal conduction between the transistor tab and the heat sink. Be sure to install the mica insulator on the heat sink *before* assembling the amplifier PC board to the enclosure and heat sink. The mica insulators are larger than the cut outs in the PC board, making it impossible to install them after the PC board is mounted.

Low-Pass Filter Construction

Inductor winding information for the low-pass filters is provided in Table 1.

Single Band

A PC-board trace is available on the amplifier PC board next to amplifier output (J3) to allow the installation of a single-band low-pass filter between the terminals of J3 and K1's input, J4. This is handy if you intend to use the amplifier on one band only. The input inductor of the low-pass filter connects from J3 to the single PC trace adjacent to J3. The output inductor connects in series between the single PC trace to J4. The three filter capacitors connect from J3, J4 and the PC-board trace near J3 to ground. *This single trace is not used when multiple filters are required*. Remember to remove the single trace adjacent to J3 on the amplifier PC board before attaching the amplifier board between the RF connectors on the enclosure's rear panel.

Multiple-Band Filters

Using the amplifier on more than one band requires a different approach. A set of six low-pass filters is built on a double-sided PC board with plated through holes to provide top-side ground connections. A PC-board mount, two-pole, six-position

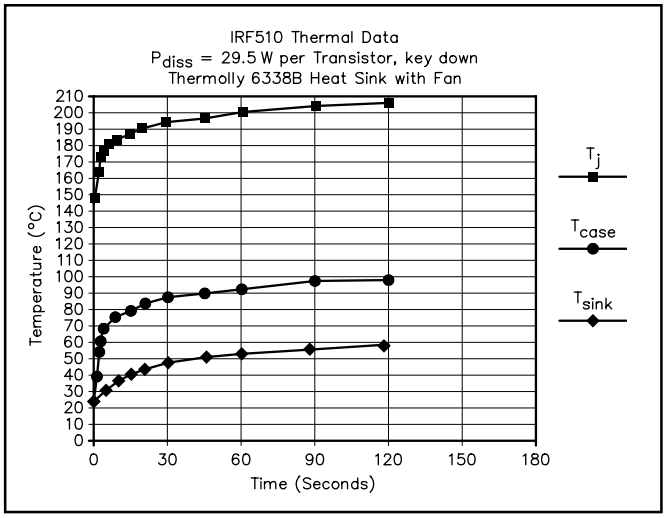


Figure 8—Thermal performance of the amplifier during key-down conditions.

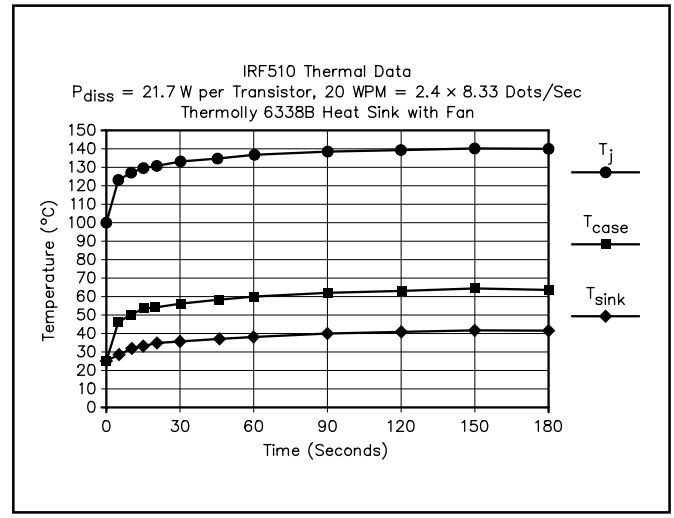


Figure 9—Thermal performance of the amplifier during simulated CW conditions.

rotary switch does all low-pass filter selection. Silver-mica, leaded capacitors are used in all the filters. On 160 through 30 meters, T-50-2 toroids are used in the inductors. T-50-6 toroids are used for inductors on 20 through 10 meters. The number of turns wound on a toroid core are counted on the toroid's OD as the wire passes through the core center (*The ARRL Handbook* [12] provides complete details for winding toroids). Assemble one filter section at a time starting with the 160, 80, 40-meter filter, then the 30-meter filter. With the switch mounting position at your upper left, the filter input (C1) is near the top edge of the board and the filter output (C3) is near the bottom edge. *The last two filters are out of sequence;* the 15-10 meter filter comes *before* the 20-17 meter filter) and the inputs/outputs are reversed to simplify the PC-board layout. The input capacitors, C13 and C16, are mounted on the board *bottom edge*, and output capacitors, C15 and C18, are on the *top edge*.

Use care when assembling the rotary switch. All 14 terminals must fit through the PC board without damaging or bending the pins. Make sure there are no bent pins before you attempt assembly. Insert the rotary switch into the PC board. Do *not* press the rotary switch all the way into the PC-board holes flush with the ground plane! If you do, the top flange of the signal pins may short to the ground plane.

Table 1
Low-Pass Filter Inductor Winding Information

(Refer to Figure 3 in Part 1)

Inductor Number	*No. of Turns*	*Core*
L1, L2	30 turns	T-50-2
L3, L4	22 turns	T-50-2
L5, L6	16 turns	T-50-2
L7, L8	14 turns	T-50-2
L9, L10	11 turns	T-50-6
L11, L12	8 turns	T-50-6

Note: All inductors are wound with #22 enameled wire except for L1–L4, which are wound with #24 enameled wire.

Bias Adjustment

The biasing procedure is straightforward and requires only a multimeter to complete. First, set R1 and R2 fully counterclockwise, (0 V on the gates of Q1 and Q2). Terminate the RF input and outputs with a 50 Ω load. Next, connect the 28 V supply to the amplifier in series with a multimeter set to the 0-200 mA current range. Measure and record the idling current drawn by the 5 V bias supply. The value should be approximately 9.5 mA (28 – 5.1 V) / 2.4 kΩ = 9.5 mA). Set Q1's drain current to 10 mA by adjusting R1 until the 28 V supply current increases by 10 mA above the idling current (9.5 + 10 = 19.5 mA). Next, adjust R2 for a Q2 drain current of 10 mA. This is accomplished by adjusting R2 until the 28 V supply current increases by an additional 10 mA (to 29.5 mA).

Amplifier Performance

With a 28 V power supply and 1 W of drive, the RF output power of this amplifier exceeds 40 W from 1.8 MHz through 28 MHz. Peak performance occurs at 10 MHz, providing about 75 W after filtering! A performance comparison between this amplifier and my modified version of the Hint and Kink amplifier mentioned earlier is shown in Figure 4.

As shown in Figure 5, this amplifier achieves an efficiency of better than 50% over its frequency range, except at 7 MHz where the efficiency drops to 48%. In contrast, the Hint and Kink amplifier delivers greater efficiency between 1.8 and 7 MHz, but it drops rapidly to only 20% as frequency is increased.

Figure 6 compares the input SWR of the two amplifiers. The Hint and Kink amplifier's SWR is acceptable (< 2:1) only at 1.8 MHz. This amplifier is better, however it, too, exceeds 2:1 above 14 MHz. The input SWR of this amplifier can be improved to better than 2:1 on all bands by adding a 3 dB pad (R8-R10 of Figure 2) at the input and supplying 2 W to the pad input. This keeps the amplifier drive at 1 W.

Figure 7 graphs this amplifier's RF output power as a function of drain supply voltage. During this test, the amplifier RF drive level was kept constant at 1 W. As you can see, even when using a 13.8 V dc supply, the amplifier provides over 10 W output (a gain of more than 10 dB) from 1.8 to 30 MHz.

Operation

The amplifier requires no tuning while operating on any HF amateur band. You must, however, *be sure to select the proper low-pass filter prior to transmitting*. If the wrong low-pass filter is selected, damage to the MOSFETs may result. Damage will likely result if you attempt to operate the amplifier on a band with the low-pass filter selected for a lower frequency. For example, driving the amplifier with a 21 MHz signal while the 1.8 MHz low-pass filter is selected will likely destroy Q1 and/or Q2.

The amplifier can also be damaged by overheating. This limitation is imposed by the TO-220 packages in which Q1 and Q2 are housed. The thermal resistance from junction to case is a whopping 3.5°C/W. This huge value makes it virtually impossible to keep the junction temperature from exceeding the +150°C target for good reliability. Consider the following conditions: key down, 1 W input, 53 W output on 7 MHz (worst-case band for efficiency). The amplifier consumes 28 V × 4 A = 112 W, of which 53 W are sent to the antenna, so 59 W (112 W – 53 W = 59 W) are dissipated in Q1 and Q2. Assuming equal current sharing between Q1 and Q2, each transistor dissipates 29.5 W. To keep the transistor junction temperature below +150°C requires preventing the transistor case temperature from exceeding 46.8°C (150 – [3.5 × 29.5]) while dissipating 29.5 W. Also, there is a temperature rise across the mica insulator between the transistor case and heat sink of 0.5°C/W. That makes the maximum allowable heat-sink temperature limited to 46.8 – (0.5 × 29.5) = 32°C. In other words, the heat sink must dissipate 59 W (29.5 from each transistor) with only a 7°C rise above room temperature (25°C). Even if the junction temperatures were allowed to reach the absolute maximum of 175°C, the heat sink temperature must not exceed 57°C. Accomplishing this requires a heat sink with a thermal resistance of (57 – 25) / 59 = 0.54°C/W. This is far less than the 1.9°C/W rating of the AAVID 244609B02 heat sink I used. The situation may seem bleak, but all is not lost. These calculations make it clear that the amplifier should not be used for AM, FM or any other continuous-carrier operation. The amplifier should be used only for CW and SSB operation where the duty cycle is significantly reduced.

Thermal performance of the amplifier is illustrated in Figure 8. Data was taken under dc operating conditions with power-dissipation levels set equal to conditions under RF operation. A RadioShack brushless 12 V dc fan (RS 273-243A) blows air across the heat sink. Key down, the maximum rated junction temperature is reached in as little as five seconds as illustrated in Figure 8. Prolonged key-down transmissions should be avoided for this reason.

Under intermittent CW conditions, the situation is very different. Transistor-case temperatures reached 66°C after operating four minutes under simulated CW conditions at 20 WPM (60 ms on, 60 ms off). The corresponding junction temperature is +141°C (based on an equivalent RMS power dissipation of 21.7 W per transistor). This keeps the junction temperature under the 150°C target (see Figure 9). One simple way to reduce power dissipation is to reduce the power-supply voltage to 24 V. RF output power will decrease about 10 W from the maximum levels achieved with a 28 V supply.

From a thermal standpoint, the IRF510 power MOSFET is a poor choice for this RF amplifier application. Although I must say I am impressed with the robustness of these devices considering the times I spent testing them key down, five minutes at a time, without failure. Q1 and/or Q2 may need to be replaced after a year or so of operation because of the compromise in reliability. Considering their low cost, that is not a bad trade-off.

Stability

High gain, broad bandwidth and close input/output signal routing (within the TR relay) all work against stability. With a good load (< 2:1 SWR) the amplifier is stable from 1.8 MHz through 39 MHz. Oscillation was observed when the transmitter frequency was increased to 40 MHz. The

output load match also affects stability. Oscillation was observed on 27.5 MHz when the load SWR was 3:1. This should not be a problem since the frequency is outside the ham bands. I spent a great deal of time trying to make this design unconditionally stable even with loads exceeding 3:1 SWR without sacrificing output power (gain) at 28 MHz without success. I did identify some reasonable compromises.

One of the easiest ways to improve stability and the input SWR seen by the RF source is to add an RF attenuator (pad) at the amplifier input. An attenuator is absolutely required if the transmitter (driver) provides more than 1 W to the amplifier. R8, R9 and R10 form an RF attenuator that attenuates the transmitter drive level, but does not attenuate received signals because it is only in the circuit when K1 is energized. To drive this amplifier with a 2-W-output transmitter requires use of a 3-dB pad. The pad improves the amplifier input SWR and the isolation between the amplifier's input and output. The drawback is that 1 W is wasted in the pad. Likewise, a 5-W driver requires use of a 7-dB pad, but 4 W are wasted in the pad. (Values for R8, R9 and R10 to make a 3-dB pad and a 7-dB pad are given in the parts list.) Installing a pad requires cutting the PC-board trace *under R9*, otherwise R9 would be shorted out by the trace. Make a small cut (0.1 inch wide) in the trace under R9 before soldering R9 in position. R8 and R10 have the same values, but may have different power ratings. Connect R10 between the RF input side of R9 and ground. Install R8 between the amplifier side of R9 and ground.

An impedance mismatch between the output of a 1-W-output driver and the amplifier input can be a source of instability. (Obviously, if the driving transmitter's output power is only 1 W, you can't use a pad as described earlier.) If you encounter stability problems, try these remedies: Place a resistor in parallel with L1 and L2 to decrease the Q of the amplifier matching network (try values between 50 and 220 Ω). Try reducing the value of L3 or eliminating L3 entirely. Both of these modifications improve stability, but reduce the amplifier's output power above 21 MHz.

Summary

This project demonstrates how inexpensive power MOSFETs can be used to build an all-band linear HF power amplifier. Frequency of operation is extended beyond the limits of previous designs using the IRF510 and improved input-impedance matching. Long-term reliability is recognized as a compromise because of the poor thermal performance of the low-cost TO-220 package.

If you have been thinking about adding an amplifier to your QRP station, this project is a good way to experiment with amplifier design and is an excellent way to become familiar with surface-mount "chip" components. I made arrangements with Mouser Electronics and Amidon Inc to provide parts kits for this project at a discounted price (see the parts list in Part 1). These parts kits make it very easy to get started and more economical to "homebrew" this project.

Acknowledgments

I want to thank the following individuals associated with this project: Harry Randel, WD2AID, for his untiring support in capturing the schematic diagram and parts layout of this project; Al Roehm, W2OBJ, for his continued support and encouragement in developing, testing, editing and publishing this project; Larry Guttadore, WB2SPF, for building, testing and photographing the project; Dick Jansson, WD4FAB, for thermal-design suggestions; Adam O'Donnell, N3RCS, for his assistance building prototypes; and my wife, Laura, N2TDL, for her encouragement and support throughout this project.

Notes

[11]Mike Kossor, "A Broadband HF Amplifier Using Low-Cost Power MOSFETs—*Part 1*," *QST*, Mar 1999, pp 40-43.

[12]R. Dean Straw, N6BV, *The 1999 ARRL Handbook for Radio Amateurs*, (Newington: ARRL), 76th ed, pp 25-23*ff*. QST

Strays

I would like to get in touch with...

◊…hams who have lived and worked on Kwajalein Atoll, Marshall Islands. I'd like to set up a meeting at the Hawaii Kwaj Reunion in 2000 and build a database of Kwaj hams. Contact Bernard Fineberg, AB7HB (ex-KX6AG, V73I) at **fineberg@oregontrail.net** or PO Box 208, Irrigon, OR 97844-0208.

◊… the ham who worked with me to build the radio-controlled Comet sailplane model that was flown in the 1940 and 1941 AMA National contests in Chicago. Bob Reder, 2104 Valley Lo Lane, Glenview, IL 60025.

◊…anyone who has an operating manual for a TRACOR rubidium frequency standard Model 600A (preferred), or for model 304B, C, or D. Tom Barton, **thbarton@worldnet.att.net**; tel 212-292-4444.

◊...other radio amateurs of the Seventh-Day Adventist faith. Contact me at **kw8t@cwix.com**, or write to 58 Byron Dr, Smithsburg, MD 21783-1565. Jim Hoffer, KW8T.

◊...anyone who has specifications for the ADI/Pryme AT-600HP dual-band radio so that I can make my own programming interface. Please e-mail W6NCT at **w6nct@hotmail.com**.

◊...anyone who has QSLs from my father, William (Bill) Prater, W5BLT. He became a Silent Key in April 1978. I've been able to obtain my father's call sign thanks to the vanity call program and I am trying to find his old QSLs or any other materials in order to establish my (our) call heritage. Please contact me via e-mail at **w5blt@ix.netcom.com**. Bob Prater, W5BLT.

WORKED ALL TEXAS

◊ The Temple Amateur Radio Club is sponsoring the Worked All Texas Award for amateurs who make contacts with stations in Texas counties. There are five certification levels: 50 counties, 100 counties, 150 counties, 200 counties and 254 counties. Holders of the CQ USA-CA award automatically qualify (submit USA-CA award number with date the award was achieved). All others must submit a list of counties along with the call signs of stations worked in each county. The entry must include the signatures of three nonrelated hams. They are to witness the QSL cards or MRCs that confirm the QSO with the stations in the counties being claimed. For more information and a list of Texas counties, send an SASE to: Worked All Texas Award, c/o Temple Amateur Radio Club, PO Box 616, Temple, TX 76503, or visit their Web site at **http://www.tarc.org**.

Next Stray

New Products

NEW LIGHTNING SURGE PROTECTOR FROM DYNAMIC ELECTRONICS

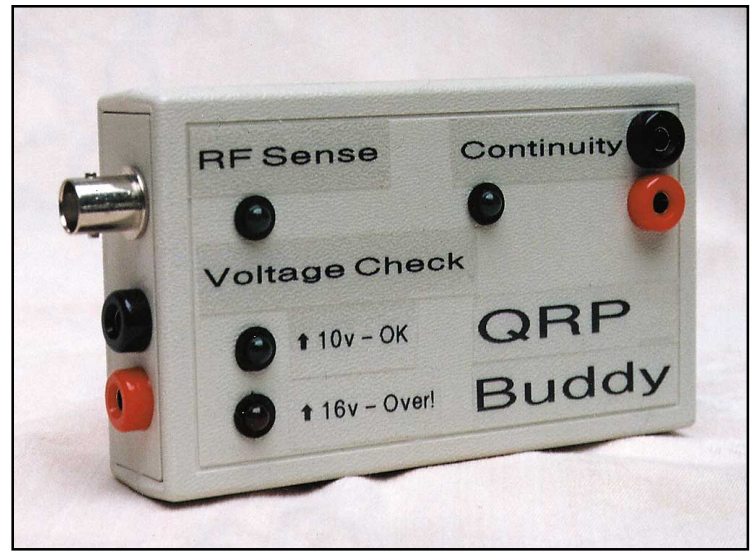
◊ The LP-1 lightning surge protector uses a normally closed 12 V relay in a metal enclosure to automatically short the center conductor of your coax feedline to ground when your station is not in use. 12 V to open the relay for normal operation can be provided by the 12 V accessory output on the back of many current transceivers or by connection to your main 12 V station supply. An RCA type phono cable for power and 3 feet of RG-58U with PL-259 connectors are included. The LP-1 is designed for use from 160 to 2 meters. For more information contact Dynamic Electronics Inc, PO Box 896, Hartselle, AL 35640; tel 256-773-2758, fax 256-773-7295, **dei@whnt19.com**, **http://www.hsv.tis.net/~dei**. Price: $39.95 plus $4 s/h.

Next New Product

By Mike Aiello, N2HTT

The QRP Buddy

Here's everything you need to do battle with Murphy in the field—all in a lightweight, compact package!



Recently, while planning a business trip to the Midwest, I decided to bring a QRP station with me. Although time is usually tight during these trips, this stay was to extend over several days—the odds favoring at least one evening's opportunity for some hotel-room QRP! Luggage space was at a premium because I was carrying quite a bit of work-related gear and documentation. So, I pared my QRP station to a minimum: tiny rig, tiny Transmatch, tiny key, tiny power supply, headphones borrowed from a personal stereo and a spool of 28-gauge enameled wire to use for antenna fabrication. The entire package was impressively… tiny. It all nestled comfortably in a corner of my checked luggage.

As it turned out, the first day of the trip presented the only opportunity to play radio. Having the evening off because of an unexpected change of schedule, I set up my station in the room. Everything went smoothly, including the improvisation of a 20-meter wire dipole, half in the room and half out the window. (Well, it wasn't *exactly* a dipole, but the antenna tuner works really well.) I adjusted my headphones, flipped the power switch and was welcomed by the rush of…absolutely nothing! As I stared at the station in disbelief, I realized that I had *no way* to tell me what the problem was or where it lay—I hadn't brought a multimeter with me. I did what I could to troubleshoot the failure, including moving lamps around the room to make sure the wall outlet I was using was live. In the end, I was pretty sure it was a "no power" problem, but whether the fault was in the power supply, the cabling or some failure in the radio, I couldn't tell.

The next day, I borrowed a DMM from the lab I was visiting and determined that the power supply was fine. It was the fuse in the power cable that turned out to be the culprit. Although the fuse *looked* okay, it exhibited a very high resistance, but wasn't completely open. I guess it was damaged, perhaps by vibration or mechanical shock. (I wonder what they did to that suitcase?) The paring-down of my QRP kit had done away with the plastic bag containing spare fuses, and my schedule prevented me from shopping for some. I never did get on the air that trip.

Reflecting on the experience afterward, I decided it would be a good idea to have a compact, lightweight troubleshooting aid that was in scale with my station—something that could give simple go/no-go indications of some critical parameters. The instrument should provide for checking fuse continuity and have a visual indication that the dc supply voltage was okay. I also wanted visual confirmation of RF output when keying the rig. Without being overly complex, a tool like that would give me enough information to isolate the cause of a no-go situation. With these goals in mind, I put together an electronic multipurpose tool that I dubbed my QRP Buddy.

Voltage Checker

My QRP rig is happy with a supply voltage between 10 and 16 V dc, and I wanted an indicator that showed when the input voltage was between these limits. A minimal display, with one LED illuminating at the lower voltage limit and a second lighting up to indicate too high a voltage, would do the trick. A circuit to accomplish this ought to be straightforward.

My first thought was to use two comparators. A comparator is a differential amplifier: a circuit which outputs a voltage when the voltage you are testing exceeds a reference voltage in magnitude. I discounted this idea though, because I thought I'd need a really high supply voltage to cover the voltage range of interest. I envisioned the voltage checker requiring a pair of 9 V batteries in series—definitely not what I had in mind. As I discovered later, comparators turned out to be the way to go, but at first I spent considerable time playing with Zener diodes.

Zener Experimentation

A Zener diode does not conduct when reverse biased until the reverse voltage reaches a specific value. At that point, the diode becomes a low-resistance current path. Why not use a Zener diode as a voltage-controlled on/off switch? I tried a circuit consisting of a 10 V Zener diode, an LED and a series current-limiting resistor.

It worked—sort of. Unfortunately, the current characteristics of a Zener diode are such that the diode doesn't just suddenly start conducting when the breakdown voltage is reached. Instead, the LED in the circuit glowed dimly at very low voltages, got brighter as the voltage increased, then suddenly got very bright as the Zener voltage was achieved. This was not what I had in mind.

I then tried adding a transistor to act as a switch. I hoped that by using the Zener to bias an NPN transistor, with the LED grounded by the conducting transistor, the LED turn-on would be crisper. This idea worked a little better than the first circuit, but the transistor turned on too soon at the 16 V upper limit. Again, the trickle of current as the Zener approached breakdown

was enough to forward bias the transistor and light the LED at about 12 V.

Resigning myself to using comparators, I sought the help of a friend and colleague, who has the advantage of being a *real electrical engineer*.[1] He provided me with the key idea to build the comparator circuit without requiring an 18 V supply. See Figure 1.

My friend suggested I use a very low-voltage Zener diode (D1) as a voltage reference, and compare it not to the input voltage directly, but to the input voltage scaled down by a voltage divider. Using a low-voltage Zener ensures that the diode is fully in the conducting state when the input voltage is in the range of interest, guaranteeing a stable reference voltage.

The voltage dividers consist of two sets of resistors (R1/R17 and R6/R18) connected between the input-voltage terminal and ground. The ratio of the resistance values is the same as the ratio between limit voltage I'm testing for and the Zener reference voltage. The Zener diodes I had on hand were 3.6 V units, so my resistance network needed a ratio of: 10 V / 3.6 V = 2.78 for the 10 V lower limit, and 16 V / 3.6 V = 4.45 for the 16 V upper limit.

A little playing around with standard resistor values got me pretty close to the required ratios. I used a variable resistor in each divider (R17 and R18) to allow for final tweaking of the limit voltages that illuminate the LEDs. The absolute magnitude of the resistances used in the network should be high—in the neighborhood of 1 MΩ—because you don't want a lot of current flowing in the divider network. Using high resistance values allows you to employ low-power resistors, as the power dissipated in the network is negligible.

LM339s are readily available and contain four independent comparators. I use only two of them, one for each voltage limit; the other two comparators are unconnected. Although any pair of comparators will do, I used comparators A and D of U1 because their input pins are on opposite sides of the chip.[2]

Because the LM339 is an *open collector* configuration, the pin floats high until the comparator circuit pulls it to ground, and allows current to flow through the LED. If I had connected the Zener reference voltage to the comparator's V– input, and the test voltage to the V+ input, the LED would light when the voltage was below the limit, and extinguish when the voltage went above. So rather counterintuitively, the Zener reference connects to V+ and the test input voltage to V–. Note that the circuit uses the test input voltage to power U1 and the LEDs. No batteries are required.

Zener diodes are excellent noise generators. Disconnect the voltage checker from the power supply before operating your rig, or you may be hearing your QRP Buddy and little else.

[1]Notes appear on page 49.

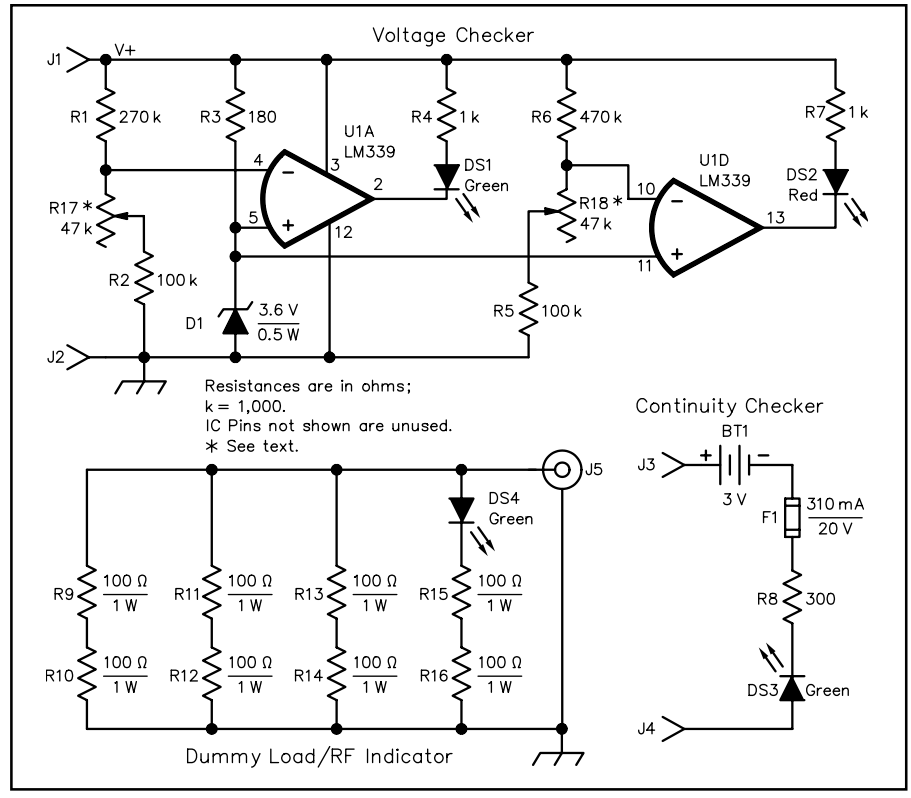


Figure 1—Schematic of the QRP Buddy. Unless otherwise specified, resistors are 1/4 W, 5% tolerance carbon-composition or film units. RS part numbers in parentheses are RadioShack. Equivalent parts can be substituted. All resistors used in this project (except for R9-R16) were obtained from a package of 100 assorted 1/4 W resistors (RS 271-306).

D1—1N5334B 3.6 V, 5 W Zener diode used here, but 0.5 W unit suitable (ECG5006A, 1N747A, 1N5227B, etc), available from sources such as Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701-0677; tel 800-344-4539, 218-681-6674, fax 218-681-3380; **http://www.digikey.com**; Mouser Electronics, 958 N Main St, Mansfield, TX 76063; tel 800-346-6873, 817-483-4422, fax 817-483-0931; **sales@mouser.com**; **http://www.mouser.com**, and others.
DS1, DS3, DS4—Green LED (RS 276-022)
DS2—Red LED (RS 276-041)
F1—310 mA, 20 V, fast-acting, 5×20 mm glass fuse (RS 270-1046)
R1—270 kΩ
R2, R5—100 kΩ
R3—180 Ω
R4, R7—1 kΩ
R6—470 kΩ
R8—300 Ω
R9-R16, incl—100 Ω, 1 W metallic-oxide film resistor (RS 271-152)
R17, R18—47 kΩ pot (RS 271-283)
U1—LM339 quad comparator (RS 276-1712)
Misc: PC-board-mount fuse clips (RS 270-744); lithium battery holder (RS 270-430); lithium battery CR2032 (RS 23-162); PC board (RS 276-150); banana jacks (RS 274-725); female BNC, chassis mount (RS 278-105); dual IC perfboard (RS 276-159); project box (RS 270-211); LED snap holders (RS 276-079).

RF Indicator

Thinking back to stories my Elmer had told me about using a light bulb as a visual indicator that RF energy is present, I decided to build an illuminated dummy load. A dummy load presents a 50 Ω, purely resistive load to a transmitter. Low-power (1 W) metallic-oxide resistors are inexpensive, readily available and present a purely resistive load at HF. By combining several higher resistance values in parallel, you can make a load capable of handling several watts that still presents a 50 Ω load. To dissipate n watts, you need n resistors in parallel, each with a resistance of r, where

$$r = n \times 50 \qquad \text{(Eq 1)}$$

I wanted the load to dissipate 4 W continuously, so it could consist of four 200 Ω, 1 W resistors in parallel. I used four parallel pairs of two series-connected 100 Ω resistors.

To make the dummy load light up, I inserted an LED (DS4) into one leg of it, so the 200 Ω resistance of that leg does double duty: It contributes to the total 50 Ω resistance and acts as a current-limiting resistor for the LED. The resulting circuit is a safe dummy load that lights up when RF is pumped in. It's 100% solid state, and a lot more compact and rugged than a light bulb. (True, the SWR is slightly off from 1:1 because of the presence of the LED, but not enough to matter.)

Continuity Checker

This part was easy. A voltage source

(BT1), an LED (DS3) and a current-limiting resistor (R8) are all you need. Finding a voltage source that met my goals of compactness and light weight turned out to be a little tricky, though. Of course, a 9 V battery would do the job, but would add weight and bulk to the project. I thought I might be able to use a 6 V photographic battery, as they are tiny and readily available. Unfortunately, they do not fit any commonly available holder. They have a slightly larger diameter than common AA or N batteries. Then I noticed that RadioShack[3] sells 3 V lithium button batteries, (intended for computer-memory backup) and a little plastic holder for them as well. These batteries have a very long shelf life, and are well-suited to intermittent use in a continuity checker.

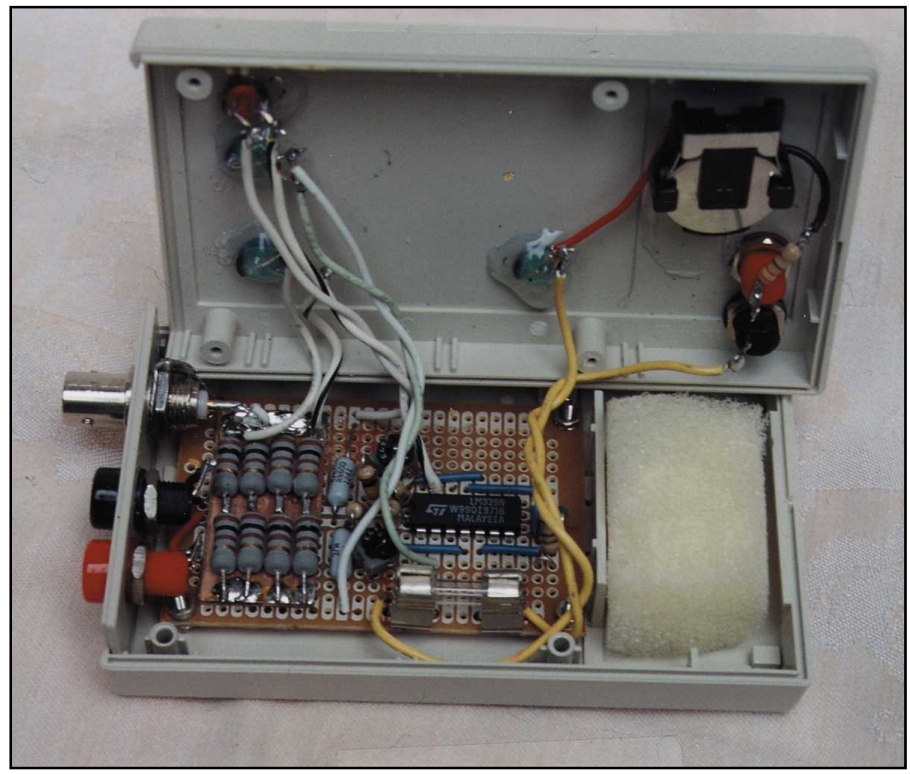
To prevent potentially hazardous battery damage if I inadvertently connect the continuity checker to a voltage source, I added a fuse (F1) to my continuity checker. The LED draws but a few milliamperes of current, so I used the lowest-current fuse I could find (0.31 A).

Construction

The QRP Buddy has two distinct parts: the dummy load and everything else. The "everything else" portion does not have any critical layout requirements, and any construction approach will do. I built the voltage comparator and the continuity checker on a piece of perfboard.

The dummy load (R9-R16 and DS4) is another matter. Resistance network dummy loads are usually constructed on copper-clad board, in a way that minimizes lead inductance and capacitance. This usually means keeping lead lengths to an absolute minimum and keeping the resistors as close to the ground plane (copper foil) as possible. I built my dummy load on a piece of double-sided PC board approximately 1 inch square, then glued it as a module to the perfboard for installation in a box. First, trim the resistor leads to length, then glue each resistor in place on the PC board before soldering it. Krazy Glue (a cyanoacrylate) works well for this purpose because it sets almost instantly. (Caution: These glues bond instantly to skin. Wear eye protection when using such adhesives and keep a bottle of the debonder near.) Solder one end of each pair of 100 Ω resistors to the copper foil. Connect three of the free ends together and attach the RF input lead from J5 to them. Solder the LED leads between the RF input jack and the free end of the last resistor pair. Solder the ground lead of the dummy load directly to the copper foil. After the dummy load module was finished and tested, I used cyanoacrylate glue to attach it to the main perf board.

I chose the smallest practical RadioShack box for the QRP Buddy. This box has a hatch on the back to allow access to the batteries, which is a plus. The voltage comparator and continuity checker use banana jacks as inputs (J1/J2 and J3/J4, respectively), sharing one pair of test leads between them. I use a BNC connector at J5; it occupies less bulkhead space than an SO-239 connector. I carry PL-259-to-BNC adapters anyway, because my rig sports a BNC antenna jack.



An inside view of the QRP Buddy. Secured to the top cover are BT1 (at the far right), J3 and J4, along with LEDs DS1-DS4. J1, J2 and J5 are mounted on the left-hand panel. Immediately behind the panel is the dummy load/PC board module. The two pots are just visible beneath the wires connecting the perfboard to the LEDs. F1 is in the foreground.

Calibration

The voltage comparators must be calibrated before use. If you have access to a variable-voltage dc power supply, fine. Set the supply for the lower limit voltage and adjust R17 until the low-limit LED (DS1) just lights. If it is not possible to get the LED to extinguish (or turn on) as you adjust the pot, you may need to switch the pot to the other side of the resistance network, or change the value of one of the resistors to alter the voltage ratio. After calibrating the low-limit LED, repeat the process for the high-limit comparator (R18 and DS2), with the supply set for the maximum safe voltage your rig can tolerate.

In the absence of a variable-voltage bench supply, you can get the voltages you need by using a collection of batteries and a voltmeter. Because the comparator circuit draws little current, any combination of common household batteries (AA, C, D, 9 V) can be connected in series to make up the voltages you need.

Summary

Although not quite the same as a complete electronics test bench, the QRP Buddy delivers essential information when troubleshooting problems in the field. Its compactness makes it easy to take along without overburdening a miniature QRP kit. Since I built mine, I haven't had any problems with my kit in the field that I couldn't resolve. Of course, I've learned my lesson: I don't travel anywhere without a bag of spare fuses!

Notes

[1]I am just a software guy who likes to play with radios. Thanks to my good friend Rich Galante for his invaluable guidance on the comparator circuit.

[2]You can use an LM393 8-pin dual comparator in place of the LM339.

[3]Valuing convenience over cost-effectiveness, all the parts I used to build this project are from RadioShack, except for the 3.6 V Zener diodes. These are common parts, and may be mail-ordered from suppliers such as Digi-Key, Mouser and others (see the caption of Figure 1).

Mike Aiello, N2HTT, has held an Advanced license since 1988, and enjoys working all modes on HF. He's been a software developer since 1969, working originally in finance and insurance applications, more recently in medical systems. Mike's areas of expertise are in embedded systems, robotics and analyzer/information system interfaces. Presently working on an MS in computer science at Polytechnic University of NY, Mike graduated from Cooper Union in 1972, with a BE in chemical engineering, followed by an MS in Management Technology from Polytechnic University in 1994. You can contact Mike at 7 Old Albany Post Rd, Croton, NY 10520; **n2htt@bestweb.net**.

By Steve Meltz, N2QLQ

The "New" HF Digital Modes

"I'll see you in Hell!" Insult, or technical challenge?

Most hams are familiar with some form of digital communication. Our oldest mode, CW, is actually binary data sent as a single tone turned on and off. The other modes in common use by hams are RTTY, Packet, AMTOR, PACTOR, PACTOR II, Clover, and G-TOR. These modes use combinations of two or more tones, which vary in frequency, phase, and/or amplitude. Except for RTTY and CW, the aforementioned modes are all capable of software error detection and, in some cases, error *correction* as well.

There are several "new" modes that are starting to gain ground. Some are truly new, while others are modern incarnations of old techniques. A small but growing group of amateurs in Europe, Australia, New Zealand and US have begun using them, and have been having a lot of fun in the process. Let's take a brief tour of four of the most popular of these.

Feld-Hell ("Hellschreiber")

Invented by Rudolf Hell in 1929, FeldHell was first used to send newspaper text over phone lines, and was later adapted by the German army for field use in World War II. Hell (which sounds like high speed CW) generates each character as a series of dots in a grid, looking something like the output of a dot-matrix printer (see Figure 1). To minimize errors in timing and/or phase, the inventor used the method of printing each character twice for each single transmitted character.

Due to the nature of the timing in Feld-Hell, characters tend to be slanted; therefore a specially designed font is used to maximize readability. While there is no electronic error correction, Hell is error *resistant*. The "wet-wear" between your ears is very good at decoding noisy visual input, and up to 20% of the signal can be corrupted before the text becomes unreadable.

MT-Hell (Multi-Tone Hell)

Originally described in 1937, MT-Hell has only been implemented in the past year. Concurrent MT-Hell uses combinations of 7 to 16 tones sent at the same time. This allows higher throughput, vertical characters, and the ability to use different fonts, underlining, bold, and italics (Figure 2).

PSK31

Initially developed by SP9VRC as *SLOWBPSK* and then later reworked by Peter Martinez, G3PLX, PSK31 is a very narrow bandwidth mode with a low 31 bit/

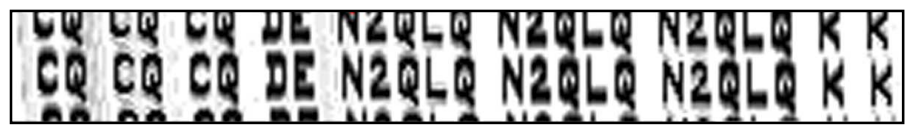


Figure 1—Feld-Hell in action.

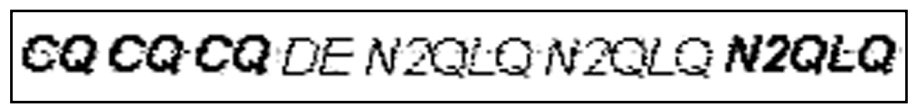


Figure 2—Changing fonts in midstream with MT-Hell.

Web Resources

Digitally active hams increasingly make use of the Web to exchange ideas and software. By going to the Web addresses shown below, you'll find plenty of software and helpful advice.

http://www.tapr.org/tapr/html/DSPF.html
KC7WW DSP56002EVM applications

http://www.tapr.org/
TAPR home page

http://members.xoom.com/ZL1BPU/Contents.html
ZL1BPU's "Fuzzy Hellschreiber" page

http://aintel.bi.ehu.es/psk31.html
EA2BAJ's PSK31 resource page

http://det.bi.ehu.es/~jtpjatae/ham.html
EA2BAJ's home page

http://www.accessone.com/~tmayhan/
K7SZL's "Unofficial" Hamcomm page

http://mars.superlink.net/driller
N2QLQ Home Page

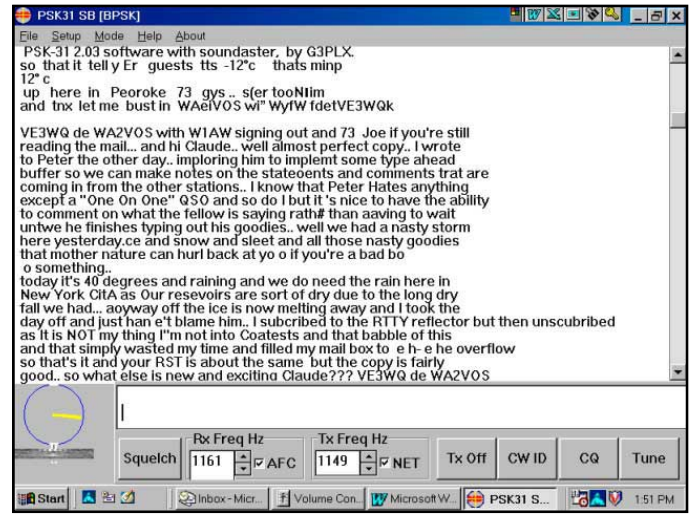


Figure 3—Could this be the successor to RTTY? PSK31 enthusiasts think so!

second data rate (hence the name). When operating in the QPSK mode, errors are corrected using a mathematical operator called a Viterbi decoder. The Viterbi decoder can keep track of its "guesses" for the past 20 received symbols, and can calculate how well the phase shifts match. This introduces a delay of about 640 ms into the received text, which is acceptable. A longer decoder would make even fewer errors, but the time delay would be too long for a normal QSO. Because of the narrow bandwidth, tuning PSK31 is touchy and needs stable VFOs (Figure 3).

Of all the modes discussed in this article, PSK31 seems to be winning the popularity contest at the moment. It offers weak-signal performance that rivals CW, yet achieves this without synchronized handshaking protocols. (PSK31 does not "chirp," it "warbles.") This means it has all of the advantages of Baudot RTTY in that it shares the ability to conduct roundtable QSOs, as well as the rapid-fire exchanges necessary for working contests and DX pileups. Its popularity was given a boost recently when a freeware version of the PSK31 software was released for sound-card-equipped PCs. (More about this in a moment.) Hams have started jumping on the PSK31 bandwagon in significant numbers; even W1AW has been making on-air PSK31 tests and contacts. (Look for a beginner's guide to PSK31 to appear soon in *QST*.—*Ed.*)

Requirements

Now the next logical question is; "What do I need to start using these modes?" If you have done any digital communications or SSTV, you probably have the necessary hardware for at least one or two of them.

If you use a sound card (true Creative Labs Soundblaster SB16 compatibility) or a Hamcomm type interface, you can get free software to enable transceiving of Feld-Hell and MT-Hell through DOS or *Windows*. PSK31 can be used with a sound card and *Windows* thanks to a release of new software by G3PLX. There is also a version for a sound card and the *Linux* operating system. All of the modes have software for the 56002. The 56002 is also being utilized for other amateur uses such as receiver filtering and demodulation. See the "Web Resources" sidebar for more information on how to track down the software and components.

The interface , if necessary, is connected to the audio in and out connectors of your SSB transceiver. While several of the digital modes you are familiar with use LSB (such as Baudot RTTY), the Europeans and VK/ZLs use USB, and that has become the defacto standard for the "new" modes. Transmit/receive switching can be accomplished by using VOX or a simple transistor switch keyed off one of the COM port lines.

Summary

No matter how long you have been involved with Amateur Radio, there is always something new to learn. One of the great aspects of our hobby is that it is not static. These new modes have the added appeal that they are slow speed and therefore meant for one-on-one QSOs. They will never be used for unattended use and will therefore keep the human contact aspect of the hobby alive!

I would like to thank Pesi Sorab, G3NDO, and Fred Salzwedel, OH/DK4ZC, for initiating my interest in these new modes, and their patient help in getting me up and running.

You can contact the author at 1081 Tullo Farm Rd, Bridgewater, NJ 08807; **driller@superlink.net**.

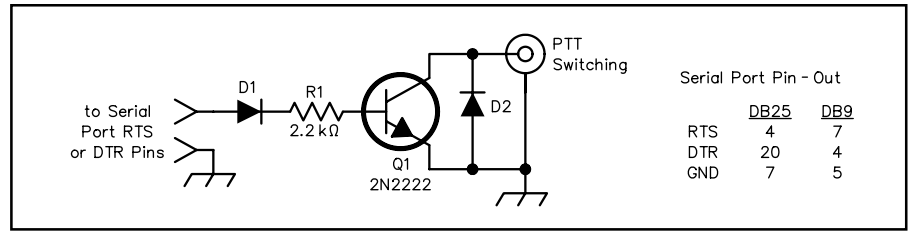


Figure 4—You can use this simple circuit to allow your computer to control transmit/receive switching from the serial (COM) port.
D1—1N914 diode
D2—1N4001 diode
Q1—2N2222 transistor
R1—2.2 kΩ 1/4 W resistor.

New Products

10-METER SSB ADVENTURE RADIO FROM MFJ

◊ MFJ expands their line of single-band HF transceivers with the addition of the MFJ-9410X 10-Meter SSB Adventure Radio. The compact '9410X offers 20 W USB output and features MFJ's *ConstantCurrent* speech processing. Frequency coverage is 28.300 through 28.600 MHz. An optional module for semi-break-in CW can be added.

Additional features include an analog S-meter, a dynamic hand microphone, a built-in speaker, vernier reduction analog tuning and a 2.3 kHz SSB ladder filter. A built-in 7-element lowpass filter is provided to reduce interference to TV and FM broadcast frequencies.

The MFJ-9410X is backed by MFJ's one-year warranty. For more information see your favorite Amateur Radio products dealer or contact MFJ Enterprises, Inc, PO Box 494, Mississippi State, MS 39762; tel 800-647-1800, fax 601-323-6551, **http://www.mfjenterprises.com**.

BUYING A USED SHORTWAVE RADIO

◊ Now released in its fourth edition, Fred Osterman's handy book, *Buying a Used Shortwave Receiver: A Market Guide to Modern Shortwave Radios*, helps cut through the confusion of choosing and buying one of the many used shortwave radios available at hamfests, radio shops and on the internet. The compact volume has pictures, specs and recommendations that cover more than 100 of the most popular models from Drake, Kenwood, Yaesu, Realistic, JRC and many more.

Price: $5.95. For more information, contact Universal Shortwave, 6830 Americana Pkwy, Reynoldsburg, OH 43068-4113; tel 800-431-3939, fax 614-866-2339, **dx@universalradio.com**; **http://www.universalradio.com**.

LAKEVIEW'S GP-28 10-METER GROUND PLANE

◊ Lakeview now offers the GP-28—a quarter-wave ground plane 10-meter antenna for fixed station use. The design is based on their "Hamstick" mobile antenna. The manufacturer claims a 2:1 bandwidth of 1 MHz and a maximum power rating of 600 W. Overall height is just under 10 feet. Three sloping helically wound 48-inch fiberglass radials provide the ground plane. All hardware needed for mast mounting is included. Price: $54.95. For more information on this product check with your favorite Amateur Radio products dealer or contact Lakeview Co, Inc, 3620-9 Whitehall Road, Anderson, SC 29626; tel 864-226-6990, fax 864-225-4565, **hamstick@hamstick.com**; **http://www.hamstick.com**.

JOE CARR'S CIRCUIT HANDBOOK

◊ Howard J. Sams and Company and Prompt Publications present *Joe Carr's Circuit Toolkit*—an extensive collection of Joe's favorite analog electronic circuits. This 256-page paperback covers a wide variety of useful, easy-to-build circuits including RF and wideband amplifiers, power supplies, oscillators, RF hybrids and combiners, waveform generators, NE-602-based receivers, attenuators, an extensive assortment of filters and more. Each circuit includes an explanation of the basic theory and simple mathematic equations to help you tailor its characteristics to your specific application. A section on construction hints is also included.

Joe Carr, K4IPV, is a prolific author, having published more than 80 books and 600 articles on electronics since 1968. He is currently a regular columnist in several magazines including *Popular Electronics*, *73*, *Nuts and Volts* and *Popular Communications*.

For a more complete description of this book and a tremendous assortment of additional electronics related publications, visit **http://www.hwsams.com** or contact the publisher directly: Howard W. Sams and Company, 2647 Waterfront Pkwy E Dr, Indianapolis, IN 46214; tel 317-298-5789, fax 800-552-3910.

Next New Product

By Rick Lindquist, N1RL

The New Age of Amateur Enforcement

Hams across the country these days are reporting less malicious interference and a marked improvement in on-the-air decorum. The credit belongs to the FCC's point man for amateur enforcement, Riley Hollingsworth, K4ZDH.

The FCC's Riley Hollingsworth, K4ZDH, is part evangelist and part avenger. As he sees it: "This is a new day at the Commission and a new day for Amateur Radio!" The man whose name since last fall has become synonymous with FCC amateur enforcement preaches a simple gospel of on-air rules compliance and good manners. Since last September, the 52-year-old attorney from South Carolina has almost single-handedly revived the FCC's moribund amateur enforcement effort and resurrected the specter of federal sanctions for scofflaws and troublemakers.

"Church is out now!" Hollingsworth declared in December as he began to ratchet up the enforcement effort a few notches. "We mean business and we're strapped in and ready to ride."

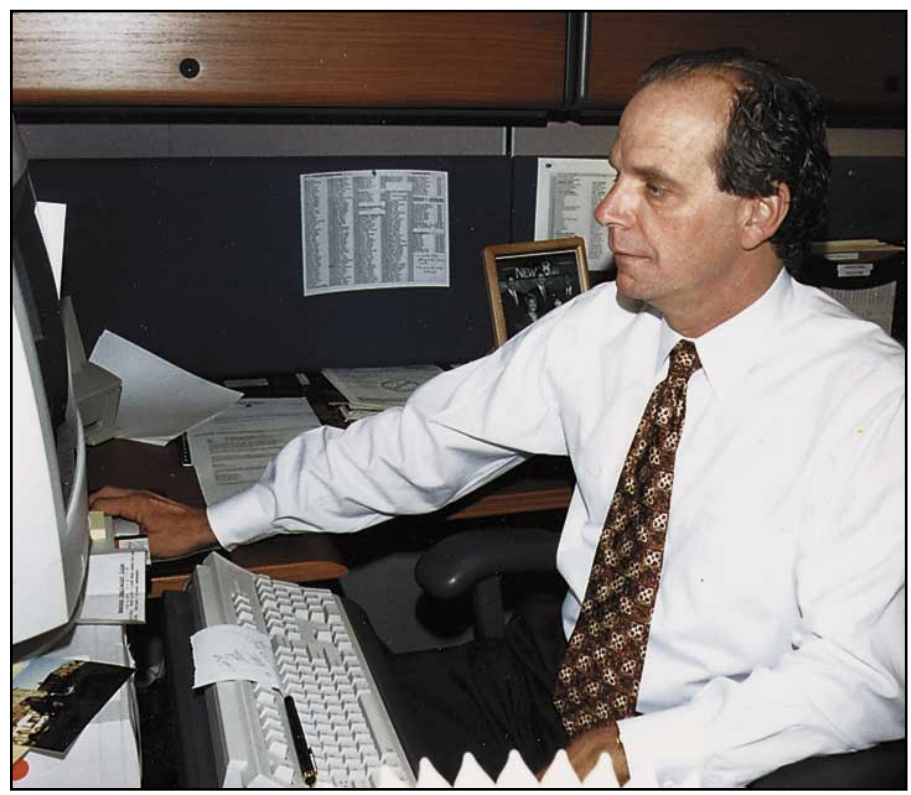
In Hollingsworth's book, blatant, persistent rulebreakers tempt the FCC's wrath in the form of stiff fines, license suspensions, and even equipment confiscation. But Hollingsworth's gospel also makes room for the backslidden to repent—to go and sin no more.

Making Up for Lost Time

Long gone are the days when a ham could expect to get a "pink ticket" or advisory notice from an FCC monitoring station about second harmonics or forgetting to ID every 10 minutes. That's due in part to a reshuffling of FCC priorities and galloping technology. A one-time "Nader's Raider," Hollingsworth is the first to admit that the FCC had abandoned Amateur Radio enforcement. "Amateur enforcement should have gotten more direct attention over the last few years," he conceded when he took on the job last year. "A lot of people think the FCC doesn't care."

Amateur Auxiliary volunteers who leaped into the enforcement vacuum often wound up overwhelmed by offenders' defiant attitudes and frustrated by an indifferent FCC that seemed to expect iron-clad evidence—"silver-platter cases" Hollingsworth calls them. The agency only infrequently wielded its enforcement club, and on-the-air behavior deteriorated along with the morale of the Amateur Auxiliary.

"The Auxiliary has done a tremendous job, and I'd hate to hear what the amateur bands would be like without them," Hollingsworth said. "The evidence I have seen from Auxiliary members has been first-class, but they didn't get the antici-



FCC Legal Advisor for Enforcement, Riley Hollingsworth, K4ZDH, has been receiving a lot more e-mail at his Gettysburg, Pennsylvania, office since the FCC began its latest amateur enforcement initiative.

pated help from us." From this situation, Hollingsworth admits, arose an unsavory atmosphere of "retaliation and vigilante tactics, because we weren't there."

As reported incidents of malicious interference and other problems mushroomed on the amateur bands, calls by the ARRL and others for beefed-up enforcement more than once fell on deaf ears. In an era of spectrum auctions and burgeoning wireless services, the FCC's Wireless Telecommunications Bureau—then charged with the bulk of ham enforcement—had greater priorities. It was a low-water mark for amateur enforcement.

"I don't think we'll make that mistake again," says Hollingsworth.

Last year's change in FCC chairmen—from Reed Hundt to William Kennard—spelled a change in enforcement attitude at the top. The most public display of Kennard's enforcement emphasis has been the crackdown on so-called "pirate" broadcasters across the US. He's also proposed establishing a separate Enforcement Bureau, the details of which are still being decided.

Kennard empowered the Compliance and Information Bureau, headed by Richard D. Lee, to assume jurisdiction over amateur enforcement, a task CIB formerly shared with the Wireless Telecommunications Bureau. Lee also had heard from the ARRL and became convinced something needed to be done, and he decided Hollingsworth was "the right person at the right time for the right job."

A CIB veteran and a licensed amateur, Hollingsworth jumped joyfully into the breach on the Amateur Radio front. "I've always liked special projects that seem to be a nightmare to untangle," he said. "Some areas of enforcement are more appropriate for CIB, and I think this is one of them."

Agent Betty Mallay, KL7AP, scans screens at the FCC High Frequency Direction Finding Group facility in Columbia, Maryland. Signals from 14 sites converge here.

The Hollingsworth Philosophy

A ham since age 13 who espouses a genuine reverence for the hobby, Hollingsworth hit the ground running in his efforts to remove the tarnish from the hobby. His overarching philosophy is simple: "I think the Commission has an obligation after it issues a license to maintain basic service, so the privileges are worth something," Hollingsworth says.

He started out by attempting to get a handle on the scope of the enforcement problem on the ham bands. Within a few days of opening the Amateur Enforcement Line (202-418-1184) and announcing his e-mail address (**rholling@fcc.gov**), he began detecting a pattern in the reports he was hearing from other amateurs. He talked with hundreds of people on the telephone and received letters and e-mail from hundreds more.

Slowly, he compiled a profile of amateur enforcement issues. He tallied a list of the top-ten Amateur Radio offenders, which he has declined to make public. He sent out hundreds of "informal" warning letters to hams others had complained about, inviting them to get in touch with him to talk things out. Hollingsworth also acted on several cases that had been languishing within the FCC.

While the formal warnings and violation notices to some alleged high-profile offenders generated some initial fanfare, Hollingsworth often prefers to counsel rather than condemn those accused of violating the rules. He tries cajoling them into compliance rather than immediately letting go with both barrels. These sorts of warning shots are a deliberate part of his plan.

Hollingsworth has even showed up on the air a couple of times. His foray onto a well-known 75-meter "hot spot" January 13—a first for an FCC official of his stature—came about when he attempted to break up an argument between two hams that was becoming increasingly nasty. Hollingsworth then stayed around to discuss compliance and on-air deportment with the assembled multitude. "You could have heard a pin drop," recounted ARRL member Neal Fisher, N4HAF, of North Carolina, who listened in awe.

Even as he attempted to conciliate, someone tried to jam Hollingsworth's transmissions—although the majority of those on frequency behaved politely. He also caught some flak from self-appointed critics who felt he was being "too friendly" with an alleged offender on the air. "I was not befriending anybody but imploring everybody," Hollingsworth later explained.

Some also have criticized Hollingsworth for not taking a stronger stand and clearing the decks through heavy fines and suspensions. That very well might happen, Hollingsworth says. He's just not there yet. As he sees things, he's still making up for lost time, rectifying the damage wrought by the FCC's years of apathy toward amateur enforcement.

Hollingsworth's "informal" warning letters program has led to demonstrable improvement. "In almost every case, the recipient has contacted us," he said. "In one case, the licensee apologized, and reports since that time indicate that the licensee has become a model operator."

Things improved so much that the ARRL Board of Directors in January indicated a willingness to postpone a request to the FCC to further privatize amateur enforcement.

In late January, Hollingsworth and FCC engineering staff further put the fear of God into the hearts of Amateur Service violators by paying a visit to two amateurs in the Carolinas who had been the subject of complaints.

Commission personnel, local sheriff's deputies in tow, inspected the stations of John A. Abernethy, K4OKA, an Extra licensee in Hickory, North Carolina, and Richard Whiten, WB2OTK, a General licensee in Easley, South Carolina.

Hollingsworth said both operators "were the subjects of many complaints about their operations on the 75 and 20 meter amateur bands." Results of the inspections were "under review," the FCC said, declining further comment.

But word of the FCC's up-close-and-personal approach generated extensive comment, both on the air and the Internet. Hollingsworth sees station visits as yet another weapon in the Commission's arse-

nal. "I think you'll see more of that, and more routinely too," he said, "sort of like an audit function."

Hollingsworth also has acted in several cases of alleged amateur license fraud. In one ongoing investigation, serious questions were raised about how four individuals received credit for the Amateur Extra license. All four subsequently were stripped of their Extra privileges (one of the four had been unlicensed prior to the examination session in question), while the FCC looks into allegations that the examinees might have been coached or given test answers. More recently, he called in at least one amateur for retesting, an FCC prerogative.

Six-foot tall poles like these—each an active antenna—have replaced rhombics and Yagis for HF monitoring at FCC facilities. These are part of an interferometric array.

Separating Wheat and Chaff

The "big picture" view that has evolved from his first six months at the helm of CIB's amateur enforcement initiative might surprise those who believe Amateur Radio is beyond redemption.

"Fully half of the amateur problems on HF relate to a specific group of jammers—malicious interferers who apparently enjoy disrupting as much amateur communication as possible," Hollingsworth says. "Enforcement action against this group is long overdue."

Hollingsworth says that jamming and deliberate interference are the most common problems, accounting for 31% of all complaints. Repeater misuse and jamming account for another 29%. Other general problems accounted for another 17% of the complaints, Hollingsworth says. A full 10% of complaints concerned an unlicensed individual in California who already has spent time in jail for past convictions.

In step with the rest of the agency, Hollingsworth has his sights set on the major violators at this point. That's not to say that neither he nor the FCC cares about the minor rules. He figures that if there's a better sense—a heightened awareness—of enforcement overall, then hams will follow the small rules too. The real job, as he sees it, is to cure the enforcement problems that are degrading the service.

"We can deal with minor violations," he says, "but if hams sense that the Commission cares about the Amateur Service, then they'll care about it too," and things will get better.

While the real, hard-core violators represent "a very small fraction of a percentage" of the amateur population, Hollingsworth says it doesn't take much to destroy the bands either. That's because the on-air antics of the worst-behaved typically generate spinoff QRM from self-appointed and often well-intentioned "band cops" and from those who unwittingly allow themselves to get sucked into the ensuing melee. The result can be chaos and definitely not something you'd want to tune in to demonstrate ham radio to the neighborhood kids.

Hollingsworth's been attempting to peel away this outer layer. He wants to give those hams caught up in the atmosphere of degenerating civility and outright lawlessness to have a chance to step back from the brink—before the awakening FCC dragon swishes its tail and they get slapped along with the "real" troublemakers. The "informal" warning letters, the on-air chats, the telephone and e-mail exchanges make more sense in the context of a surgical strike.

"I don't want to see good people lose their licenses who got into this because of our absence," Hollingsworth said. He hopes the vigilantes and hangers-on will "back off and let the FCC do the job we were supposed to be doing."

Hollingsworth says every ham has to ask, "Am I going to be part of the problem or am I going to be part of the solution?" Most hams, Hollingsworth is willing to bet, "care about the hobby and consider it a great pastime." In the end, he believes, the FCC will only have to break bad on the hardcore few. Even so, Hollingsworth is realistic. He knows the FCC won't be able to nail all the lawbreakers. "There will always be a few high-profile cases," he says.

Restructuring and Enforcement

Hollingsworth favors some sort of Amateur Radio "restructuring," and he doesn't believe a "streamlined" approach to licensing necessarily will affect on-the-air behavior one way or the other. "We've got to do whatever we can to keep new blood coming into the hobby," he says, pointing to "increased competition" for the attention of the younger generation. He disagrees with those who suggest that altering or reducing the present requirements to obtain an Amateur Radio license will make life more difficult for him in the enforcement end.

"It sounds good if you say it fast," he quips, adding that problems related to lowered entrance standards "are just nil." The opposite isn't true either; higher standards don't necessarily make more compliant operators, he says ruefully. "My experience is that higher-class ops are the problem ops."

More rigorous testing? "I have a gut feeling that it won't matter in the long run," he says of restructuring proposals to ramp up the level of knowledge required by incoming amateurs. "Most of our problems aren't technical."

The First Amendment versus Spectrum Preservation

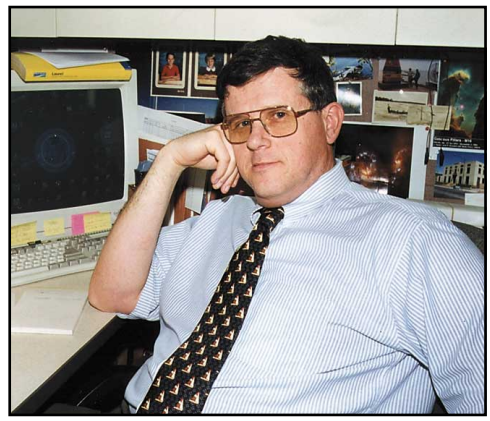
Hollingsworth acknowledges that some have attempted to derail the FCC's enforcement initiative by raising "free speech" issues. The FCC, he points out, is not interested in regulating the content of amateur communications beyond what is already stated in §97.113 of the rules (ie, prohibitions against broadcasting music, obscenity, certain business-related communication, false distress calls, etc). Hollingsworth maintains his focus is on jamming and malicious interference. He hasn't seen any pure obscenity cases so far. Still, some urge him to go after those hams whose transmission content might be controversial—even offensive. "It isn't a content problem," he says, "even though you might find it distasteful," he says of the hatemongers and baiters who haunt certain frequencies.

Where repugnant on-air behavior leads to enforcement issues, however, is when other stations cannot resist the urge to engage the "offensive" station or, worse yet, respond by dumping a carrier on top. "That's when you turn the tuning knob," he advises. "It takes two people for an argument. Don't dignify somebody like that with a response."

Still, he insists, if not illegal, content acknowledged as offensive by most hams is harmful to the future of Amateur Radio. That's because hams are such big—perhaps the biggest—HF users, and HF has an international reach, he says, explaining his emphasis on HF violations. Hollingsworth

The FCC's Many Monitors

Is Big Brother listening, routinely scanning for potential violations on 75 or 40 or 10 meters? Not under the current FCC regime of HF monitoring. Today, the HF Direction Finding Group, under Chief Watch Officer Dave Larrabee, K1BZ, in Columbia, Maryland, only tunes in when Riley Hollingsworth or one of his CIB colleagues requests an "alert" to keep tabs on a "target of interest" as monitoring personnel call it. "Riley is one of our customers," says Larrabee, a Maine native who used to help staff the Belfast, Maine, monitoring stations in the days when FCC engineers patrolled the bands and sent out warnings and violation notices.



HFDF Group Chief Watch Officer Dave Larrabee, K1BZ.

Today, maybe a half dozen FCC staffers work the spectrum below 30 MHz—down from the 75 or so who used to do this—and ham radio has assumed "the lowest priority," according to Larrabee. Since the mid-1990s, computerized technology has made it possible to control an entire HFDF network from a single site. Interference resolution is the primary objective. "The Holy Grail of all this is to know where the guy is," says Larrabee. "The computers crunch all the numbers." Rhombics and other elaborate antenna systems have given way to arrays of six-foot poles that contain active antennas.

Decreasing commercial HF use helped to fuel a reorganization of the bureau. "Either do it cheaper or don't do it at all," is how Larrabee characterized the directive. The Pentium chip made it economical and possible" to use interferometric techniques coupled with DSP.

Today, the HFDF Group—located in an 19th century farmhouse that's within the barbed-wire ringed Columbia Operations Center compound in the Maryland countryside—handles and processes data from 14 sites (including Columbia) in the contiguous US, Alaska, Hawaii, and Puerto Rico. Each site can return a line of bearing—or LOB—on a given signal. The HFDF network can determine the location of transmitters operating from 250 kHz to 30 MHz, worldwide, via skywave. It operates all day, every day. As Larrabee likes to demonstrate, the system is so efficient that it can establish the likely vicinity (an ellipse of 5×10 miles) of an unknown signal that only transmits for a fraction of a second. "The ellipses at first were so small we didn't believe them ourselves," Larrabee said. "This means we can get a DF within a 10 or 15-minute drive of the transmitter."

maintains that the hobby is not well-served in the long run by tolerating offensive on-air behavior in an environment that telecommunications officials in other countries might like to reallocate for broadcasting or other purposes. "We have to realize we're on a mission here—to save Amateur Radio," he says.

"The League should caution people to think about the original purpose of ham radio and to not get sucked into a discussion that will destroy the civility of the Service," he admonishes. "Don't get provoked into a response." Same goes for situations where someone is playing back another station's transmissions, spewing racial epithets, or otherwise attempting to outrage.

Sometimes, content and compliance issues intertwine. In January, the FCC issued a stern warning to an Indian River County, Florida, ham who, Hollingsworth said, had been using the amateur air-waves to transmit information on, among other things, the credit reports, criminal records, and mortgage foreclosures of other hams and their families. "You have apparently made these disclosures and broadcasts for the purpose of deliberately and maliciously interfering with licensed amateurs operating on those bands, and for harassment or perceived retaliation," Hollingsworth's letter said. While conceeding that the information transmitted was in the public record, Hollingsworth questioned as much the propriety of airing it as the legality. "Such disclosures and broadcasts over the amateur frequencies for the purpose of harassment, intimidation or retaliation cannot be tolerated and reflect adversely upon your qualifications to remain a licensee," the FCC letter from Hollingsworth declared.

"We view this matter as extremely serious," Hollingsworth later told the ARRL. He called the alleged operation "contrary to the purpose of Amateur Radio" and said it "endangers the entire Amateur Radio frequency allocation internationally."

The Future of FCC Enforcement

To back up his commitment to enforcement on all levels, FCC Chairman Kennard has announced plans to establish an Enforcement Bureau. Among its supporters is Sharon Bowers, Chief of Informal Complaints and Public Inquiry Branch within the Wireless Telecommunications Bureau. "People want enforcement," she said. "They want to know that the watchdog isn't sleeping." A task force is in place to make the new bureau happen within the FCC. Hollingsworth says he's enjoying his Amateur Radio enforcement role and wants to stick with it, no matter where he ends up on the organizational chart.

"I've been Deputy Chief of Licensing, I've been an Enforcement Trial Attorney for 10 years, but this Amateur Radio project is the most meaningful and the most needed, and I just wish I had 20 more hours in the day to work on it," Hollingsworth said. "I have never been happier at work."

It's believed that David Solomon of the FCC General Counsel's office will head the new Enforcement Bureau, while Hollingsworth's current boss, Richard Lee, is to become chief of a new Public Information Bureau. Hollingsworth says that whichever way the wind blows at The Portals—the Commission's new home—"as far as this enforcement effort, reorganization is not an issue."

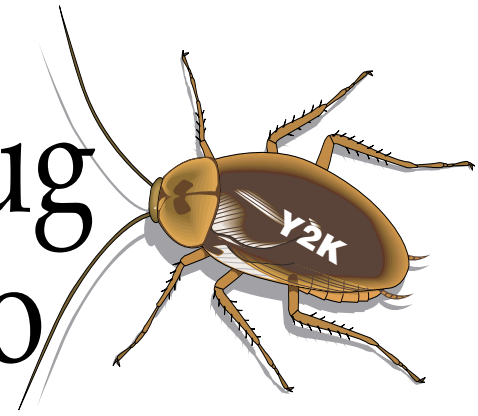
Recognizing the self-policing tradition of Amateur Radio, he looks forward to the day when the Amateur Auxiliary again can assume a larger role in amateur enforcement. And he thinks that day is not far off. "We owe them a debt of gratitude, and we're going to make up for lost time in backing them up," he said. "Right now, though, they are possibly a little demoralized, and if they are, it's our fault. I am going to make up for that."

As much as he enjoys his current enforcement rule, Hollingsworth concedes, "it's always better not to have the government involved, I think." QST

All photos Rick Lindquist, N1RL

By Karl F. Anderson, W6JUA

The Millennium Bug and Amateur Radio



The dreaded appearance of the Y2K bug is only months away. Should you be concerned?

So what is all this "Millennium Bug" stuff, anyhow? Good question. Would you believe the Millennium Bug is a construction project scheduled for the January 2000 issue of *QST* for an advanced automatic keyer that transforms your thoughts into perfect Morse code? Sorry, it isn't. The Millennium Bug, known as Y2K for short (since it relates to the arrival of the year 2000), is simply the effect of the long-accepted practice in digital computer systems of using only two digits to hold "year" information instead of four.

So what? After all, everyone knows that "1/1/99" really means January 1, 1999 just by looking at it. And, it takes less space in memory to represent a year by its last two digits. An obviously simple solution to an obviously simple problem. So what is the big deal? Really, it is no big deal until you consider what happens when computers start to work with dates on and after January 1, 2000 (1/1/00 for short).

Oops! Does that abbreviation mean January 1, 1900, 2000 or what? That's the problem. This trivial question is having an impact already measured in billions of dollars.

The Potential Impact is Global

Since digital systems and computers faithfully carry out the instructions developed by their designers and programmers, the machines will do the best they can when the calendar rolls over to January 1, 2000, but what will be the result? Well, that depends. It depends on what happens as dates and times are processed within the hardware and software. *Everywhere*.

If you've been around computer systems you know the answer instinctively—the computer will either do just fine, give invalid results, or hang. Just fine is just fine. Invalid results are a pain, to say the least. And, if something is wrong, having a computer hang may be better than blissfully accepting invalid output from an apparently valid process.

Lots of folks are working lots of hours on the Y2K problem in the world of big computers, personal computers and their software. You may have already heard representatives from various utilities, businesses and government saying something like, "We understand the Year 2000 problem and we are working on it very hard. We expect to be ready when the time comes. But, we cannot be certain that our suppliers will all be ready too. So, it may be prudent to take some appropriate precautions."

For the sake of this discussion, let's just say that the big computers and their software will all be ready if you simply upgrade what needs to be upgraded. That oversimplifies things quite a lot, but it lets us focus on what may be the more significant problem for radio amateurs —the digital aspects of our radio equipment and its accessories, including your personal computer (PC).

Hams and Y2K

So, what do you as a radio amateur do about this bug? First, you have to find its hiding places; here's where you start a list. Second, you look in each likely place to see if the bug is actually there. Eliminate the bug and check that item off your list.

That doesn't seem so complicated, but don't become too complacent. Judging by how hard it can be to find, the Millennium Bug almost seems like a digital mutation of RFI.

So, where does this bug hide? Basically, it can hide anywhere in a digital system that time is kept or processed. (Not beats of time in a musical sense, but rather time in years, months, days, hours, minutes, seconds, milliseconds, etc.)

If hardware that involves time keeping is fine, software can still handle the numbers inappropriately. That is to say, the bug may be hiding in the software. If software that involves time keeping is fine, hardware can still handle the numbers inappropriately—the bug can also hide in the hardware. What makes the bug seem like some cousin of RFI is that it is likely to be hiding in several places at once.

Macintosh computer hardware and operating systems seem to be generally free of the bug, but not necessarily the application software they run or their peripherals. PCs are another matter entirely. The hardware time-of-day clock in a PC may have problems. Even fairly recent BIOS software that is hardware-resident in your PC may have problems. And the latest PC operating systems may be affected. Sometimes the problem doesn't appear until date and time information has been processed through several hardware/software stages.

This is a bug whose contamination can spread from one program or data file to another. Consider a set of "good" programs and their "good" data that happen to receive some "bad" data as their input. The technical term for this situation is "garbage in-garbage out" as bad input contaminates a good data set.

For this reason, *never* just plug in a 2000 date and see what happens. Create at least two backups of *everything* before you even consider trying a post-2000 date in your computer system. A proper back-up set puts you in a position to restore your software and files should a nasty surprise happen during your testing.

One simple test for PCs is to close all applications and exit to the DOS prompt. Type DATE and enter 12-31-99. Type TIME and enter 23:59:30. Now wait for at least 30 seconds. Type DATE again and see what you get. If you see 01-01-2000, your PC is probably Y2K compliant. Re-enter the correct time and date to return your computer to the present and you're done. This test does *not* prove that your software is bug free, however.

The Bug Hunt

So, how do you go about looking for this bug in your stuff? The best way is to find out what problems may exist from its original maker, if you can. Remember, this problem would not exist today if designers in the past

Y2K: Good News for Hams

By Joe Bottiglieri, AA1GW, Assistant Technical Editor

The amateur transceiver manufacturers currently advertising in *QST* indicate that none of their equipment manufactured up to this time use date information in the control algorithms. Those that offer optional computer programming kits for their units state that the included software also does not use date information in any calculations. Many of these manufacturers have posted specific notices to this affect on their Web sites.

Media information and misinformation on the possible effects of the year 2000 computer problem have raised the concerns of the general public and public safety officials in our communities. Ham clubs active in public service will no doubt want to offer emergency communications for the big event, but will the backbones of our local amateur communications systems—the repeaters—be adversely affected by the rollover?

Not according to the repeater controller manufacturers. Contacts with eight of the major producers indicate that their units also do not process date information in any way in their internal control operations. Is your repeater's controller included? If not, check with its manufacturer.

It certainly wouldn't be a bad idea to give your repeater system's backup power and voltage spike protection systems a thorough going over. If the millennium bug doesn't directly result in a power failure, we'll probably bring one on ourselves as we stumble through our homes in the wee hours of January 1, 2000—switching on every device from our home computers to our electric can openers—searching for possible glitches!

Packet and data communications are also an important ingredient in our amateur emergency communications network. Many TNCs do store and, in some applications (such as automatic mail forwarding), use date information. If you are using a TNC as a BBS or in message forwarding applications, now is the time to contact the manufacturer and software provider for specifics on its readiness for the dawn of the next century. Some manufacturers already have information on easy fixes on their Web sites.

How about APRS? Bob Bruninga, WB4APR, the father of *APRS*, has stated that *APRS* time-tags all positions by day, hour and minute—the year is not used. If your computer's operating system is stable through the transition and your GPS unit functions properly, your APRS system will not be affected.

Are you using satellite-tracking software? Some of these programs will require patches to assure that they behave properly next year. If you purchased your tracking software through a donation to AMSAT, you're in luck! Have a look at **http://www.amsat.org/amsat/features/y2k_results.html**.

You'll also find an excellent article by Roy Welch, W0SL, software librarian for AMSAT-NA, on his efforts to assure AMSAT offered software would work properly into and beyond 2000. He includes some basic tests to check your PC and links to pages with additional information. See **http://www.amsat.org/amsat/features/y2k_transition.html**.

For information on software that's available as freeware or shareware in AMSAT's ftp files, contact the program's author directly. For tracking programs obtained elsewhere, you'll also have to contact the specific author or retailer.

Station log keeping is probably one of the earliest applications of the home PC in our ham shacks. There are dozens of different logging programs available today, and many more that have come and gone. If you are using an older program and can no longer contact the author, perhaps 1999 would be a good year to shop for a new one. While your present software may have no problem with date information for the next hundred years, they are your records. You decide.

Logging software suppliers presently advertising in *QST* can supply information and in most cases updates for earlier versions of their software. Many can also provide assistance in moving accumulated data from other logging programs into their applications.

It's up to each individual to determine how best to prepare. I'm going to buy stock in companies that manufacture generators, freeze-dried food and batteries. Of course, I'll be converting my profits into bottled water, ammunition and Krugerrands in the last few days of '99. (Just kidding!)

The following is a list of amateur equipment manufacturers that I contacted in preparation for this article, along with their comments concerning Y2K compliance. Most reported "no problems." That is, their equipment and/or software is either Y2K compliant or does not contain components that would be affected by the Y2K bug.

Transceivers and Related Programming Software

Alinco—No problems.

Drake—(**http://www.rldrake.com/tech/faq/Y2K.htm**) No problems with shortwave or amateur equipment. *PC Pakratt for Windows* and *PPLite for DOS* software supplied with the TNC accessory packet board for the TR270 are **not** compliant. For information on upgrades for this software contact Timewave Technology, Inc.

ICOM—(**http://www.icomamerica.com/y2k.html**) No problems with hardware or programming software.

Japan Radio Company—No problems.

Kachina—No problems with Amateur Radio hardware or control software.

Kenwood—No problems with hardware or programming software.

Maha/Rexon—No problems.

Premier—No problems.

SGC—No problems.

Standard—No problems.

Ten-Tec—No problems.

Yaesu—(**http://www.yaesu.com/year2000.html**) No problems with radios or programming software.

TNCs

AEA—See Timewave.

Kantronics—(**http://www.kantronics.com/year2000.htm**)—If you are using a Kantronics TNC other than the KPC-3 Plus or the Kam '98 versions 8.3, and you use your TNC for mail forwarding applications, you may need to change the date string. If you do not use the mail forwarding capabilities, no changes are required. Visit their Web site or contact Kantronics for details on the required changes. *Hostmaster II Plus* and *Pacterm 2.0* software do not use date information.

MFJ—No known problems.

Timewave—No known problems.

Logging Programs

Log EQF—*Log-EQF* users running versions below 8.50, and *Jr-EQF* users with versions below 3.63, will find that sorting by date and time will place QSOs in year 2000 before those in the 1900s. No loss of data or rollover problems should occur in these earlier versions, however. Registered users of *Log-EQF* Version 8 and *Jr-EQF* Version 3 may download the latest versions at no charge from the EQF Software Web site at **http://www.itis.net/eqf**.

Datamatrix (*Prolog*)—No problems with the exception of version 3.75 (Jan '97). Contact Datamatrix for a patch.

HyperLog 4.0 (HyperSoft)—A complete update is now available and it includes full year 2000 compatibility. Earlier versions need to be updated.

DMW Systems (*LOGPlus!*) All versions of *LOGPlus!* after version 3.1 are Y2K compliant.

Rapidan Data System (*DX4WIN*)—No problems.

MFJ—No problems.

TRLog—Y2K compliant (all versions).

WriteLog—Y2K compliant (all versions).

Satellite Tracking Programs

AMSAT—Information on year 2000 compatibility of satellite tracking and various other utility programs that are available for a donation to AMSAT can be found on their Web site at: **http://www.amsat.org/amsat/features/y2k_transition.html**. For information on shareware or freeware programs that appear in their ftp files, contact the specific program's author.

NOVA—Y2K compliant.

APRS

APRS—Y2K compliant (all versions).

Repeater Controllers

Connect Systems, Inc (CSI)—No problems.

Link Communications, Inc—No problems.

Computer Automated Technology (CAT)—No problems.

Communications Specialists—(Repeater tone Control units)—No problems.

FF Systems—No problems.

Hamtronics, Inc—No problems.

MicroComputer Concepts—No problems.

S-Com—No problems.

Spectrum Electronic Products—No problems.

had been required to cope with dates in the year 2000 in their designs. And, the older the equipment or software, the less likely that year 2000 compliance was in mind.

Also, the hardware or software maker may no longer be around and, even if they are, they may not know enough about some of their older designs to tell you what you would like to know. Their design work may not be sufficiently documented and the folks who did the design may be long gone.

The good news is that, for widely used products like PCs, third parties are getting into the act with software that is designed to snoop safely in and about the hardware and operating system. As time goes by, some of these products check applications and data files as well. It is sort of like a virus detection process—when you know what "signatures" to look for you can automate the search.

Joe Bottiglieri, AA1GW, at ARRL Headquarters has been doing research for possible Y2K bugs in Amateur Radio equip-ment and software. His report is summarized in the sidebar, "Y2K: Good News for Hams."

The Threat of Imbedded Controllers

The world is full of imbedded controllers. There are over 40 *billion* in service worldwide. Most of them are soldered in place along with their software fixed in read-only memory. And they are buried in virtually everything that is "modern," from digital watches to VCRs to microwave ovens to automobiles to the automatic process controllers that are the engines of automation from satellites to pipelines to railroad switching gear to the electrical power grid.

Not all of these controllers perform functions that involve "knowing" what date it is. However, others do. Software systems are easier to track down and fix, but the ubiquitous controllers are another matter. If a "date critical" imbedded controller is not replaced or updated, the result may hit us where we all live—on schedule.

What Is Going To Happen on January 1, 2000?

The simple answer is: *nobody* knows. In the coming months you are going to see and hear stories of dire Y2K predictions. The media will capitalize on these stories because they have the potential to boost ratings. As this article was written, television commercials were already appearing for so-called "Y2K Survival Seminars." One sensational commercial depicts an airliner in flight as it suddenly loses power at the stroke of midnight on New Year's Eve. Aircraft manufacturers have already issued statements declaring that such a frightening scenario is impossible, but that doesn't stop unscrupulous people from using the threat as an effective scare tactic. To make matters worse, some religious groups have expanded the Y2K problem to Biblical proportions—literally. They believe that Y2K is the herald of Judgement Day.

Will there be Y2K problems? The answer is almost certainly "yes." The debates become foggy when people begin arguing the *magnitude* of the problems. Some predict minor nuisances; others fear global calamity.

So where does that leave the radio amateur?

Preparation is Key

The best advice is to expect the least, but prepare for the worst. Don't become swept up in the Y2K hysteria, but make some calm, prudent preparations so that you'll be ready to cope with whatever may happen.

Prepare for Y2K as you would for any natural disaster—or for Field Day. Have plenty of batteries on hand, or perhaps a generator. Stockpiling a supply of fresh water, first-aid gear, food and flashlights is also a good idea. You should probably have these items on hand anyway—Y2K or not. Check your radios and antennas thoroughly. As radio amateurs, we may be in for the opportunity of the millennium to be of service to our fellow man and, in the process, earn respect that will bode well in future spectrum allocation struggles.

Don't spend the end of the century hunkered down in your basement awaiting the end of the world. No doubt this will be a celebration unlike any you've ever seen and it would be a shame to miss it! Simply make your checks and inspections well beforehand and have your radio at the ready—just in case.

Karl Anderson is an Advanced radio amateur first licensed as KN0JHC in 1957. His information technology experience includes responsibility for flight research instrumentation systems and all ground research and test facilities engineering at the NASA Dryden Flight Research Center during his civil service career from 1964 to 1995. Inventor of the Anderson loop, NASA's patented measurement circuit topology developed to improve on the Wheatstone bridge, Karl is the author or editor of numerous NASA technical publications, conference papers, magazine articles and user's manuals involving Anderson loop circuits. After his retirement from NASA, he founded Valid Measurements to promote Anderson loop technology. Karl can be contacted at 3761 W Ave J-14, Lancaster, CA 93536; **karl@vm-usa.com.**

Y2K Resources on the Web

International Telecommunication Union

http://www.itu.int/Y2K/

Federal Communications Commission

FCC—Year 2000 home page: **http://www.fcc.gov/year2000/**

FCC—Year 2000 Problem and the Communications Industry: **http://www.fcc.gov/Speeches/Powell/spmkp818.html**

General Information

Y2K information in *RealAudio* format: **http://www.audiocentral.com/y2k/audio.html**

ZD Net AnchorDesk Year 2000: **http://www.zdnet.com/anchordesk/bcenter/bcenter_287.html**

PC Week's Y2K Watch: **http://www.zdnet.com/pcweek/y2k/y2k.html**

ABC News.com "Millennium Bugged:" **http://archive.abcnews.com/sections/tech/millennium/millennium _intro.html**

Yahoo! **http://headlines.yahoo.com/Full_Coverage/Tech/Year_2000 _Problem/**

Y2K News Magazine: **http://y2knews.com/index.html**

TechWeb: **http://www.techweb.com/wire/technews/year2000.html**

Microsoft Y2K FAQ: **http://www.microsoft.com/technet/year2k/2kfaq/2kfaq01.htm.**

New Products

DYNAMIC ELECTRONICS DTMF DECODER

◊ Plug the compact DTMF-1 into your computer's 25-pin COM port, load the included software and insert the 1/8 inch audio connector into your receiver or transceiver's audio output, and received DTMF tones will be decoded and displayed on your computer's monitor. The software will run in *DOS* or *Windows*. When used with *Windows 95* or *98*, the decoder remains active while other tasks are being performed.

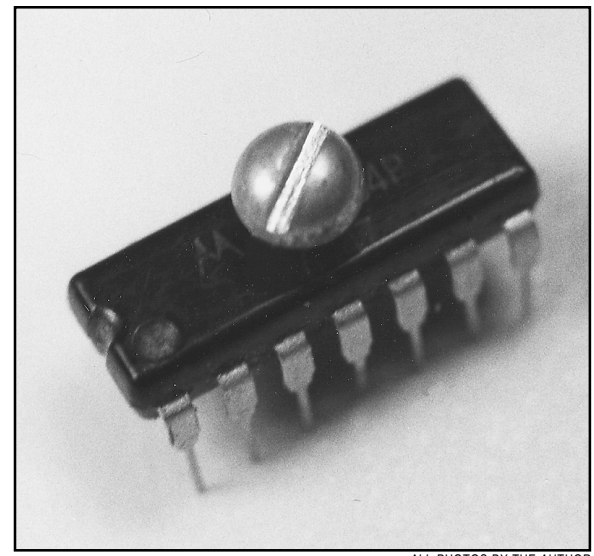
Two transistor drivers with RCA type output jacks are provided, allowing you to connect external relays for various remote control applications. Additional uses include repeater control and remote base operations. The DTMF-1 can also be used with a telephone interface to keep a record of telephone calls. For more information contact Dynamic Electronics Inc, PO Box 896, Hartselle, AL 35640; tel 256-773-2758, fax 256-773-7295, **dei@whnt19.com**, **http://www.hsv.tis.net/~dei**. Price: $89.95 plus $4 s/h.

Next New Product

By Sumner Weisman, W1VIV

The Smoketron

For the first time—field-repairable solid-state electronic components for new circuit designs



ALL PHOTOS BY THE AUTHOR

The development of electronic components over the past 40 years has been impressive. As an electronic engineer I have watched the steady progress of the electronics industry with fascination as we went from vacuum tubes, to germanium diodes and transistors, to silicon devices.

The first crude integrated circuits were RTL, then DTL, then TTL and, of course, CMOS. We progressed from SSI (small state integrated circuits), to MSI (medium state), and then LSI (large state).

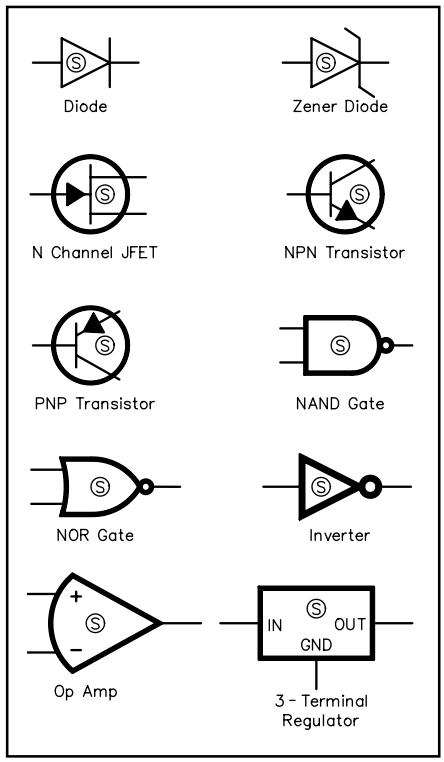


Figure 1—Schematic symbols for Smoketron devices.

Microprocessors allowed miniaturization and automation of nearly everything, and these, along with improvements and great price reductions in memory chips, provided major enhancements in ham radio electronics. Compare your new pocket-size H-T with a WWII "walkie-talkie" (from an old movie, perhaps) and you'll appreciate the progress we've made.

Unfortunately, all of these fine components have one major weakness. Once they fail, they're gone. You have to purchase a replacement device and carefully solder it in place. If you're electronically challenged, you'll have to send your equipment out for an expensive repair that could tie it up for weeks—or even months.

Wouldn't it be great if you (or a local service shop) could repair failed devices and put them back in service quickly and inexpensively? Think of the benefits. Repairs would be much faster and less expensive. DXpeditioners wouldn't have to bring all that back-up equipment. NASA astronauts could even make repairs in space!

The good news is that the impressive progress I mentioned above is still continuing, and the latest breakthrough of interest to hams—the field-repairable Smoketron—will soon be available.

Presently under development by a major Silicon Valley semiconductor manufacturer[1] is an entire family of *field-repairable* monolithic chips. As the only ham on the

[1]Notes appear on page 60.

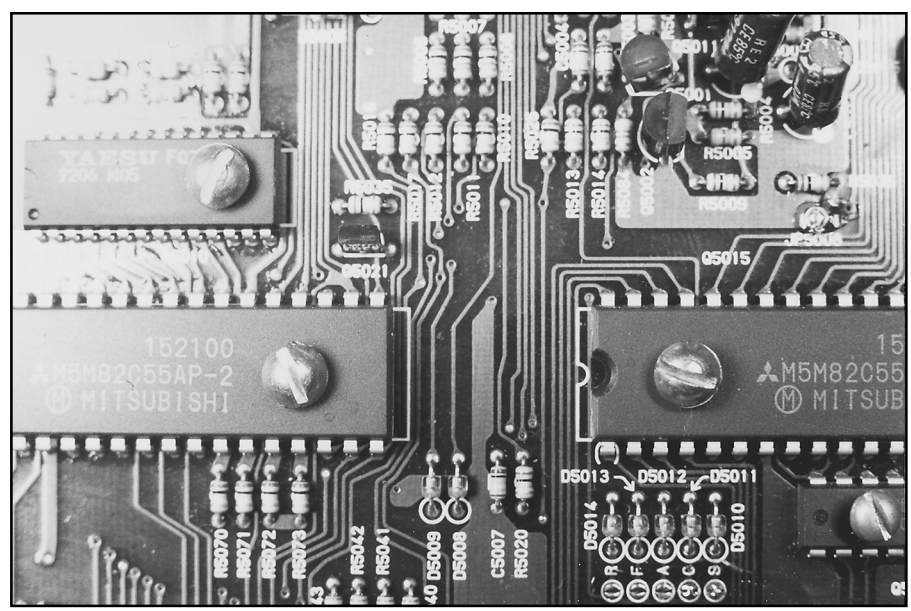


Figure 2—A Yaesu FT-990 transceiver circuit board upgraded with prototype Smoketron integrated circuits.

How all Electronic Devices Work—The "Smoke Theory" of Electronics

The Smoke Theory was first suggested on the Internet several years ago. It has been adapted, modified and refined by the Smoketron development team.

The ingredient that allows all electronic devices to operate is *smoke*. Consider your own experiences. Remember when all the smoke was let out of your transmitter's power transformer? It immediately stopped working! When that new integrated circuit sprung a leak and all the smoke escaped, it also stopped working. When that big electrolytic capacitor gave off its smoke, the rig quit again. Remember when all that smoke was vented from your computer power supply and it wouldn't compute anymore?

From these observations, therefore, it's logical to deduce that smoke is the ingredient that allows electronic components to work, and once the smoke is allowed to get out, nothing works anymore.

My own experiments have proven this theory. Using my SSB transceiver, I first went on the air and proved to myself that my rig was operating perfectly. Then, I drilled (*Caution—wear safety glasses and be sure to disconnect the rig from the power line when drilling)* a small hole in the power transformer. See Figure 3. *At power-up* (*Caution—check for proper fusing before reapplying power.)* I observed a flash of smoke and fire escaping the transformer as shown in Figure 4. Immediately thereafter I was unable to work *any* stations, even when the bands were hot.

I then took my back-up transceiver and drilled a small hole in its microprocessor. The same thing happened. Once the smoke was lost, I called CQ for hours without a reply. I was convinced. It seemed logical to me, therefore, that if the smoke was reinserted, the device could operate normally. That breakthrough led to the development of the Smoketron.

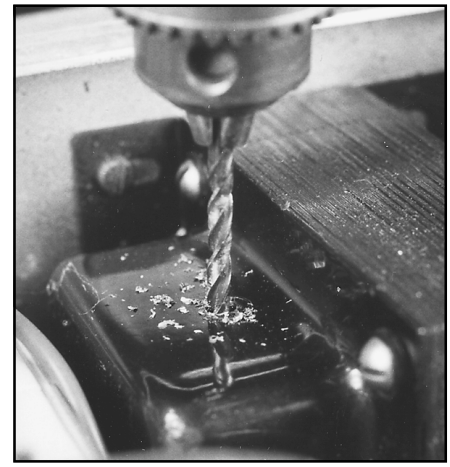


Figure 3—A hole being drilled in a Heathkit SB-220 transformer during early testing.

Figure 4—After loss of smoke, the transformer was inoperative.

development team, I feel fortunate to have been involved since the beginning of the program some three years ago. It's exciting to anticipate the future benefits to Amateur Radio. Because the development has been kept under wraps until now, this is the technology's first "unveiling" in any major journal.

Figure 1 shows some of the many common devices that may be replaced by the Smoketron. In addition, microprocessors, memory chips and virtually all other existing solid-state components may eventually benefit from the new technology. Because the technology's schematic symbols are intentionally similar to existing symbols, designers should have little trouble changing over.

Field Repair—How's it Done?

A close look at Figure 2 shows that, unlike ordinary devices, Smoketron packages have an access port. During normal operation the access seal should be left intact. Once a failure occurs, however, the port may be opened using a small screwdriver, and the chip may be recharged. Using a rubber or plastic syringe (the type usually used to apply adhesives), the recharging agent is inserted into the device and the chip is then resealed. If a small torque wrench is available, about 30 inch-ounces of torque should be applied to match factory specs. The reconstituted device, once recharged, has the life expectancy of a new component and may be put into service immediately.

How the Smoketron Works

The recharging agent—amazingly enough—is readily available smoke[2,3] that has been filtered[4] to remove particulate matter that could contaminate the chip. As this article shows, when smoke is sealed within the housing of an electronic device, it has a beneficial effect that causes the device to work perfectly.

Once the seal is accidentally broken (the usual failure mode for solid-state devices), air[5] is allowed to penetrate the package and the smoke ions take on a positive charge. This positive charge immediately attracts all the electrons (negative charges) flowing in the circuits. The negative charges are neutralized and all current flow ceases. There's no electron flow and no current flow. It's just like shutting off a switch.

It seems logical, therefore, that if we can control the smoke, we can control the chip. Smoketron transistors operate by using a built-in piezo-electrically controlled microstructure nozzle that precisely aims a narrow stream of positively charged smoke ions at the base-emitter junction.

If the smoke is gated on and off, the device is a switching transistor. If the smoke stream is controlled in an analog fashion, the transistor is an amplifier and the amplified signal (180 degrees out of phase with the base signal) may be taken from the collector circuit. Large arrays of these transistors make up Smoketron integrated circuits.

The Future

Monolithic Smoketron prototypes will soon be available to equipment designers for testing and evaluation.[6] They will be pin-for-pin compatible with existing devices for easy interchange in the field, which allows much of your existing equipment to be upgraded. In the near future, new families of Smoketron-driven equipment—fully field repairable—will come on the market. This is an exciting breakthrough in electronics reliability and a major benefit to Amateur Radio.

You can contact the author at PO Box 3109, Framingham, MA 01705-3109; **sweisman@gis.net**.

Notes

[1]To maintain developmental secrecy, the manufacturer wishes to remain anonymous until the first products are released to the industry.

[2]Smoke from a good Cuban cigar has been found to be effective and pleasurable.

[3]Caution—the US Surgeon General has determined that smoking is bad for your health.

[4]The filter must be non-hygroscopic so that it will not retain moisture. Recommended porosity is 0.1 to 1 micron. Recommended materials are sintered stainless steel or borosilicate glass.

[5]Air is defined as a gas consisting of approximately 78% nitrogen (N_2) and 21% oxygen (O_2). Exposure to this gas modifies the smoke, adding a positive charge.

[6]The wait should be short. When queried about availability (just before press time), the manufacturer replied, "Real soon now." QST

Q Daryl Pate, KC5SLQ, asks, "I recently began using an Alinco DX-70 HF transceiver with an antenna tuner and a multiband wire dipole antenna (using a coaxial feed line connected directly to the antenna—no balun). For a while, everything was fine. Now, however, I suddenly find that the SWR remains extremely high on all bands. I inspected the antenna and the feed line and they appear to be okay. Do you have any suggestions?"

A Obviously something has changed in your tuner and antenna system. Try the easy steps first (see Figure 1).

Get a volt-ohm meter (VOM), disconnect the antenna coax from the tuner and measure the resistance between the center conductor and the connector shell. It should be infinite. If the VOM reads zero, you have a short somewhere in the feed line or at the antenna. Inspect the antenna again. Look for loose or broken connections between the coils or traps.

If you can get your hands on a dummy load, disconnect the coax *at the antenna* and substitute the dummy. A dummy load is just a resistor (or several resistors) in a box or can. It acts like an antenna without radiating much RF. Your transceiver should see about a 1:1 SWR on all bands and your tuner should be able to "match" this easily. If your tuner and transceiver behave properly when the dummy is connected, you've just eliminated them from your list of possible suspects.

But if the antenna tuner still doesn't work with the dummy load, it's time to pop the cover and do a visual inspection. Rotate both tuning capacitors. If you hear a mild scraping or feel the plates rubbing each other at any points in their rotation, you must attempt to reposition the plates so that they don't touch at any point. Look for errant blobs of solder that could be shorting a coil or capacitor. Gently tug on the wires to make sure they are firmly soldered in place.

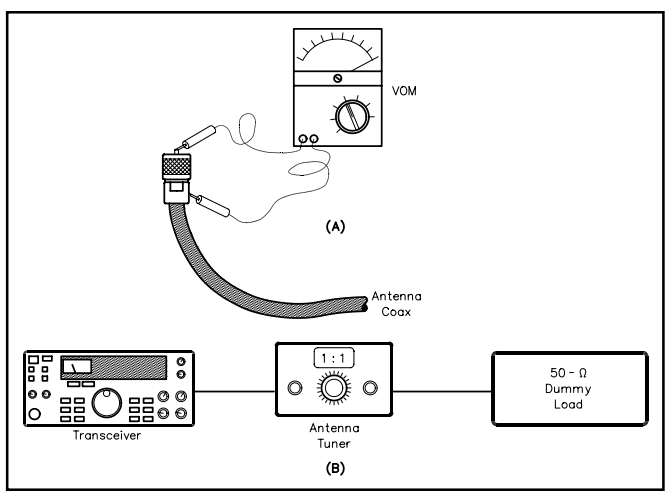


Figure 1—A volt-ohm meter provides a quick test for possible feed line shorts (A). Test the function of the tuner and feed line by substituting a dummy load for the antenna (B).

Q I enjoy 6 meters, even when the band isn't open. I've found that it is a terrific band for "local" communications up to a few hundred miles away. Some of the local signals, however, have an odd fluttering characteristic. What causes this? Does the fact that I live near an airport have anything to do with it?

A Take a look at Figure 2. The energy traveling directly between the horizontally polarized transmitting station antenna and receiving station is attenuated to about the same degree as in free space. But unless the antennas are very high or quite close together, an appreciable portion of the transmitted energy is reflected from the ground as well as from buildings and towers. These two signals combine at your antenna, and that's where things get particularly interesting.

When the signal strikes another surface, its phase is reversed. If the distances traveled by both signals were exactly the same, and if the reflection phase reversal was exactly 180°, the signals would arrive out of phase with each other and cancel completely. This never happens in the real world or you would hear nothing at all! Instead, the reflected signal travels a little farther. Combine this with the less-than-180° phase reversal and you have partial cancellation at the antenna, not total. Your statement about living near an airport provides an important clue. Signals bouncing off aircraft can arrive at your receiver with rapidly varying phase and amplitude, causing considerable flutter.

Q George Wilson, KC8IXH, asks, "As an apartment dweller I find it difficult to put up an HF antenna. I've been told that I should look into a small 'broadband antenna.' I'm not sure what this means."

A The term "broadband" refers to the fact that the antenna can provide a low SWR (less than 2:1) over a relatively broad range of frequencies. Many modern transceivers begin reducing their output power when the SWR rises above 2:1, so having an antenna that can offer a low SWR across a large portion of a band is convenient.

The problem with designing a broadband antenna is that there is always a trade-off between broadbandedness and efficiency.

Unfortunately there is no ultimate antenna for apartment dwellers. You could probably design and build a small antenna that would present a terrific SWR bandwidth, but you wouldn't radiate much RF. After all, a dummy load has an extraordinary SWR bandwidth, but most of the RF power applied to it is wasted as heat.

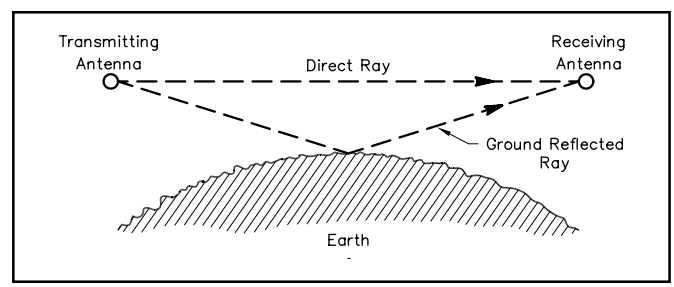


Figure 2—Part of the signal energy takes the direct path to the antenna, but another portion arrives as a wave reflected from the ground or other objects. There is a phase reversal with each reflection, and the distance the wave travels is greater as well. The signals combine at the antenna, adding and subtracting from each other.

You may want to consider a compact, narrow-bandwidth design such as the portable HF antenna described in the February 1999 *QST* ("A Briefcase-Portable HF/VHF Antenna" by Robert H. Johns, W3JIP).

Q Al, KA1FFO, asks, "I need to find an H-T that will let me transmit on both the 2 meter band and the aviation band. I fly an ultra-light aircraft and need to be in contact with airstrips, as well as my ham friends on the ground. Is there an H-T that will do both? What about the legal aspects of using such a rig, if it exists?"

A Part 97 rules are restrictive on this subject. Section 97.11 (b) states:

> The station must be separate from and independent of all other radio apparatus installed on the ship or aircraft, except a common antenna may be shared with a voluntary ship radio installation. The station's transmissions must not cause interference to any other apparatus installed on the ship or aircraft.

The first part ofSection 97.11(b) effectively bars the use of the dual ham/aeronautical H-T. The ham transceiver cannot be "separate from and independent from all other radio apparatus" if it is also part of an aeronautical transceiver! The solution would be to use a separate amateur H-T and an aviation band H-T. Since weight is a problem, you should look into some of the tiny credit-card size amateur hand-helds.

Q Albert Webb, KB1N, asks "I need help in eliminating an alternator whine in a remote speaker in my 1998 Ford Explorer. I mounted a Yaesu FT-8500 transceiver under the passenger front seat with Yaesu wiring to the remote faceplate on the dashboard. I hear the alternator whine in the speaker, but it is not heard on my transmitted signal. What filtering can you suggest?"

A Most of the time, the "whine" problems with Ford vehicles are not the fault of the alternator, but the fuel pump. There is one easy diagnostic. After the vehicle has been sitting overnight, turn on the radio, then turn on the key without starting the motor. If you hear the whine for a second or two, after which it stops, this pretty much indicates the fuel pump. (After all, the alternator is not running yet. The pump stops when the fuel system is pressurized, in most cases.)

Fuel-pump noise is probably "the" Ford RFI problem. Reports we have received from the field are mixed—some folks report that installing a filter at the fuel pump worked perfectly; others say the benefit was negligible.

If the test doesn't implicate the pump, suspect other things in the car. The ECM is one possibility, but usually, when the ECM creates noise, it is not broadband in nature, but consists of semi-discrete birdies, bleeps, tunable buzzes, etc.

One way to diagnose the ECM is to remove its fuse. If the noise goes away, it is probably the module. Are there any other devices in the general vicinity? Prime candidates for broadband noise sources include motors and switch-mode power supplies.

If it is the alternator, yours would be among the first reports we've received of alternator whine from a Ford vehicle. This might indicate that something is wrong with the alternator. Replacing it may be the best, albeit expensive, solution. The usual cures would work—capacitors from each of the lines to the case, and inductors in series with the leads. An alternator can deliver a *lot* of current, so the only way to put an inductor in series would be to wind one onto a ferrite core (FT-140-43, about 10 turns or so), using the same size wire as used for the alternator. (Watch out for fusible wires.) If you suspect alternator noise, start by temporarily putting capacitors from each lead to ground. If they make a difference, think about adding inductors.

Q George, W1KBO, asks, "I am told that if you have ever held an Amateur Radio license at any time in your life you can be reinstated by showing some sort of proof that you held a license in the past. Is this true?"

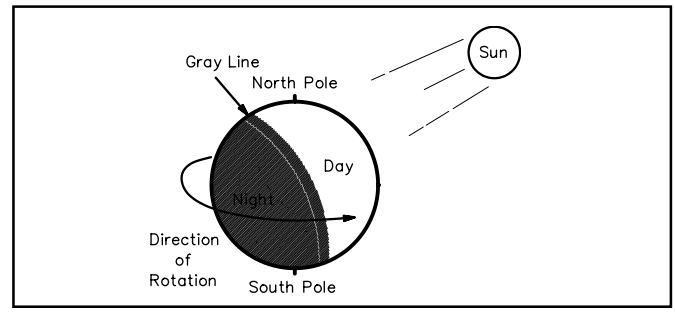


Figure 3—The gray line is a transition region between daylight and darkness. One side of the Earth is coming into sunrise while the other side is just past sunset.

A Alas, no. Several years ago, the FCC proposed to give credit for licenses that had lapsed. ARRL suggested that the operator license be valid for a lifetime. On March 20, 1997 by WT Docket 95-57, the FCC denied both of these ideas stating that attending a VE session was not a hardship and that there is a two-year grace period for amateurs who fail to renew.

Q This morning I was listening to 160 meters when, to my astonishment, I heard a moderately strong signal from Australia (a VK6)! That's on the other side of the world from my location on the East Coast. About 30 minutes later, he vanished. What caused this?

A You've just experienced the magic of *gray line* propagation. The gray line (astronomers call it the *terminator*) is a band around the Earth between the sunlit portion and darkness. It is an area of diffused light (see Figure 3). On one side of the Earth the gray line is coming into daylight (sunrise), and on the other side it is coming into darkness (sunset). Propagation along the gray line can be very efficient, so greater distances can be covered than might be expected for the frequency in use. One major reason for this is that the D region of the ionosphere, the region that absorbs HF signals, disappears rapidly on the sunset side of the gray line, and has not yet built up on the sunlit side. Think of this as a temporary DX window.

I'm willing to bet that you heard that Australian sometime around, or probably before, your local sunrise. On the other side of the world, it was probably his local sunset.

Do you have a question or a problem? Ask the doctor! Send your questions (no telephone calls, please) to: "The Doctor," ARRL, 225 Main St, Newington, CT 06111; or e-mail doctor@arrl.org.

New Products

TIMEWAVE'S DSP UPGRADE FOR PK-232s

◊ New from DSP veteran Timewave Technology is a DSP upgrade kit for the AEA/Timewave PK-232 multimode communications processor. The user-installable kit adds sharp, accurate filters for all data modes (PACTOR, packet, AMTOR/SITOR, Baudot, ASCII, Morse, weatherfax, TDM and Navtex), improved noise and QRM rejection and upgraded firmware (version 7.2) that automatically selects filter modes appropriate for the user's chosen data mode. The kit adds mailbox, PACTOR, gateway and APRS-GPS support and is compatible with all existing terminal software.

Price: PK-232 upgrade kit, $150; PK-232MBX upgrade kit, $125. For more information, contact Timewave Technology, 58 Plato Blvd East, St Paul, MN 55107; **jdouglas@timewave.com; http://www.timewave.com.**

New New Product

By H. Ward Silver, N0AX

Test Your Knowledge!

What's the word? Word up!

Returning to the multiple-choice format this month the topic is vocabulary. No hobby is complete without a serious complement of impenetrable jargon. We all have our pet phrases. Can you decipher these?

1. Pair up the first and last words of each two-word phrase:

First	*Last*
a. zero	i. fed
b. grid	j. link
c. sky	k. bias
d. phase	l. point
e. data	m. leak
f. split	n. wave
g. end	o. core
h. guy	p. lock

2. Match the Q-signal with what it references:

a. QSP	f. frequency
b. QTC	g. ready
c. QRG	h. check-in
d. QRV	i. relay
e. QNI	j. traffic

3. Pick the correct meaning for each of the following:

a. Mode J	h. RF-tight connection
b. Digipeat	i. on all conductors
c. Stop Band	j. fastest spot for operating
d. Choke Flange	k. uplink/downlink pair
e. Common Mode	l. filter rejection
f. Run Frequency	m. between sync and video
g. Front Porch	n. packet relay

4. Which most often indicates higher quality?
a. High or Low SNR
b. High or Low Noise Figure
c. High or Low SWR
d. Few or Many Retries
e. Full or No Quieting

5. Which of the following does *not* belong?
a. susceptibility
b. permissivity
c. remittance
d. reluctance
e. permeability

6. Match the abbreviation with the concept it represents:

a. CRC	g. regional communications chief
b. ALC	h. signal level regulation
c. ATU	i. nonlinear distortion products
d. SM	j. digital radio protocol
e. TOR	k. impedance matching device
f. IMD	l. error correction code

22916-107th Ave SW
Vashon, WA 98070

7. What word is replaced by the following Morse abbreviations:
a. ES
b. GG
c. WX
d. CDX
e. HI

8. Which of the following is *not* an impedance matching design?
a. beta
b. gamma
c. theta
d. omega

9. Traffic handling requires several special bits of jargon. Match the definitions.

a. check	e. relative priority
b. ARL	f. number of words in the message only
c. handling	g. collection of similar messages
d. book	h. abbreviation for common phrase

10. What is a *rover?*
a. a station that operates from several grid squares during VHF/UHF contests
b. a station handling traffic off-frequency
c. a DXpedition moving between locations
d. a satellite in low-earth orbit

Bonus: What other implement of punishment is most commonly associated with the "Rettysnitch"?

Total Your Score!
This quiz has a total of 37 possible answers, not including the bonus question. Give yourself one point for each correct answer.

30—43 You speak "ham radio" like a native!
15—29 Not bad, but a bit of brushing up may be in order.
1—14 Hamspeak is mostly gibberish to you.

Answers
1. a-k, b-m, c-n, d-p, e-j, f-o, g-i, h-l
2. a-i, b-j, c-f, d-g, e-h
3. a-k, b-n, c-l, d-h, e-i, f-j, g-m
4. a-High, b-Low, c-Low, d-Few, e-Full
5. c—the rest are all electrical parameters
6. a-l, b-h, c-k, d-g, e-j, f-i
7. and, going, weather, conditions, ha! (laughter)
8. c
9. a-f, b-h, c-e, d-g
10. a
Bonus: the Wouff Hong

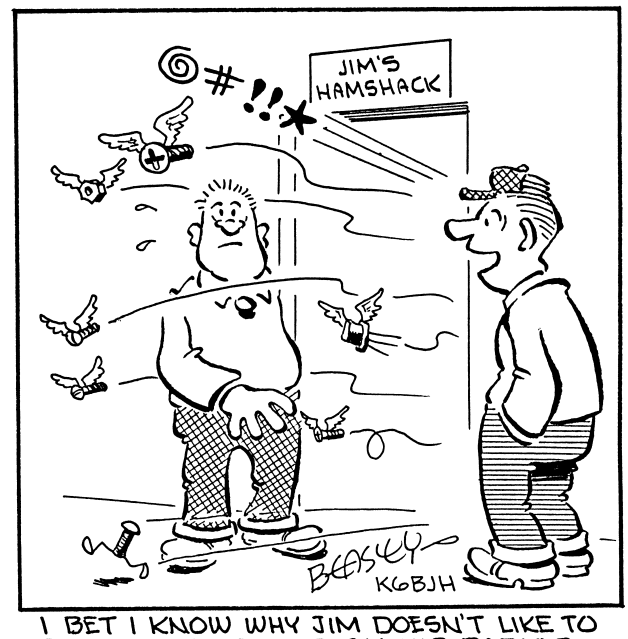
By Jay Craswell, W0VNE

DIY Ham Radio Repair

One man's trash is truly another man's treasure. And in this no-holds-barred primer, W0VNE lays it on the line…says it like it is…and fixes some spectacularly dead radio stuff with only a few tools and a keen sense of smell. Listen up, greenhorns—he's talking to you!

They say there are three sorts of lies: Lies, big lies and statistics. To this I add editorials! Especially the ones that say home-brewing is dead and that hams don't repair their own equipment. To this I say, "Sez you!" Of course, there are folks who don't have the curiosity that God gave a raccoon. And, of course, some hams *are* interested but spend too much time reading that the new technology is too hard, too small or too high tech.

You might be comforted by the idea that this same pile of rubbish has been shoveled since year zero. Every piece of equipment in your shack has been built, fixed or designed by human beings—mere mortals. No big-headed space aliens with glowing communications crystals or magic wands were required. And remember, repairs require far less brain power than does design. Compare a typical auto mechanic with the eggheads who designed your car! The same goes for Amateur Radio gear.



I BET I KNOW WHY JIM DOESN'T LIKE TO DO HIS OWN REPAIR ON HIS RADIOS

Detective Work

I didn't get along well with my electronics teacher. At least not after he learned that I was related to my brother, who accidentally dropped a soldering iron in his lap. I still learned a few things from him, though. During the first day of class he told us that most repair work diagnoses could be accomplished with a screwdriver, a 10-kΩ resistor and our eyes and nose. Before you start ripping apart your rig or heating up the soldering iron, get a notepad and pencil and start your detective work. What works? What doesn't? Try to stay positive.

One of my projects (an IC-28H) was struck by lightning. My initial reaction was to drop it into the wastebasket. Now it's playing every day in my wife's car (N0KJH). So, if your radio seems totally dead, don't give up too easily. A burnt reverse-polarity diode is one of the easiest fixes around (the diodes tend to fry when you connect the 12-V power leads "backwards"). Anyway, list exactly what works and what doesn't. Knowing this is essential to diagnosing your problems.

Screws

When you disassemble a piece of equipment you need to save enough of the screws and miscellaneous hardware to put the thing back together without any missing or extra parts. If you're an Old-Timer, save some pill bottles for screw storage. If you're a new family man, those baby food bottles are worth their weight in gold—or at least in missing screws. Note: Take the food / pills out before using the containers for storage….

If you're like me you might want to put the screws in the holes they came from. Unscrew the case, PCB, or whatever and return the screws to the holes (minus the top, PCB, etc). Yes, it makes for more screwing and unscrewing, but the little buggers don't get lost. This habit can be a lifesaver if your rig's designer decided to mix metric and US fasteners (horror!) in the same design.

Tools

If you've decided to disassemble your rig you'll definitely need some tools. Some hams are as nutty about tools as the guys on *Home Improvement*'s "Tool Time." Others have no tools at all. They're no doubt convinced that they need a truckload of expensive test equipment to do anything in radio, or they believe the editorials that say everything it too hard to work on and that we're all dolts.

Although it *is* fun to have some fancy test equipment and tools scattered around the shop, it's not required. And the stuff doesn't have to be expensive. Don't worry about the fancy stuff until after you get your hands dirty and really understand the value of doing your own work.

What Tools do I Need?

Something that's handy in every shack is a collection of screwdrivers (regular size and maybe a nice set of mini-screwdrivers from RadioShack). And while you're shopping, be sure to get a proper set of *plastic* alignment tools. *Never* use metal screwdrivers to adjust coils. The coils *will* break—believe me!

Being able to measure voltage and resistance is very desirable. That makes a DVM (digital voltmeter) no longer a luxury. You can find nice units for $20 to $300. If you're nostalgic (or a glutton for punishment) you can get a VTVM (vacuum tube voltmeter) for next to nothing at the next flea market.

Every amateur needs a soldering iron. Because this is an essential resident of your toolbox, spend a few bucks for an adjustable-temperature iron. If you plan to work on anything less

than 20 years old, a soldering gun just won't cut it. (Note: Big soldering guns come in handy if you want to solder the ground braid on antenna connectors!)

How about solder? *Please* don't use acid core or water-soluble solder. Acid core solder will ruin your electronics. Water-soluble solder will make you want to ruin the stuff yourself! How? By leaving a nasty conductive residue that's almost impossible to remove—even with a full water wash! (Note: In my experience, even a trip through the dishwasher doesn't work.) Instead, use time-tested, reliable, rosin-core solder.

Now that you're set up to solder you'll need a way to remove parts. A "solder sucker" is a big help when removing parts from PCBs. These spring-loaded vacuum plungers come in a variety of shapes and sizes. Basically, when you've heated the solder to the melting point, the solder sucker will vacuum up the mess, allowing you to remove the previously soldered component. As a bonus, solder suckers are fun to use! I like the small units and am not too happy with the big blue "solder gulpers." But to each his own. Let's wrap it up. What do we need?

Screwdrivers
Needle-nose pliers
Alignment tools
Digital volt-ohmmeter or VTVM
Soldering iron (adjustable)
Solder
Solder sucker
Diagonal cutting pliers (wire cutter)

If you shop around and paw through the bins at the nearest surplus store you can pick up all this stuff with only major injury to a $100 bill. Brand new from Jameco, Techline or Acme you might have to double the damage. Either way, consider it an investment. The last time I checked, service time was $75 an hour!

Basket Case #1: An HP8640B Signal Generator

I bought an HP signal generator that had been dropped on its head. In slightly better condition it retailed for more than $2000. The front panel was bent and the display cover was cracked. It still had a working display and the PLL section still worked, but it didn't have much output. And what it did have didn't seem to be adjustable. Still, for less than $500, it wasn't a bad deal.

I looked into a factory repair and was astonished to see that an alignment alone was $795! This is what HP charged to twiddle some knobs on a working unit! I decided to look into the problem myself.

Actually, the problem probably couldn't have been found any easier. HP likes to use LEDs to show that each power supply is working correctly. Clearly, in viewing my unit's LEDs, one was not up to snuff. A quick check with my cheapo digital voltmeter confirmed 0 V where 44.6 V was supposed to be.

I sniffed the regulator card. It smelled burnt. After looking it over, I noticed that one of the transistors had black "plastigoop" that had melted out of the bottom. Remember to use your eyes and nose before you start reading schematics or turning on test equipment.

What is it?

The regulator looked like it had been very hot at one time. Unfortunately, it was an ancient thing in a package I hadn't seen since my first days in electronics. Because HP didn't seem to label parts with anything useful—like the actual part number—I became a bit frustrated. How could I test this thing? The only thing it did was blow fuses!

I carefully removed the dead part along with a known good unit in the 5-V section. I swapped the good and bad units and powered things up. Now both supplies failed to work! I swapped again and the 5-V unit came back to life. At this point I knew that the regulator was bad. (I had also risked killing the good regulator chip in the process. Whatever killed the first one might have destroyed the second one.)

Stuck with a dead power supply with unnamed parts, I tried searching the Web for repair outfits. My goals were: (1) free advice; (2) to potentially acquire a good regulator board; or (3) to send the unit in for repair.

My first call was a great success. The technician was more than willing to help me learn a few tricks of the HP repair trade. He told me to check out a section in the owner's manual called *Replaceable Parts*. I had overlooked it thinking it only listed HP part numbers. He told me, "The description may help you select a part, but even more importantly, HP didn't have time to reassign *all* the parts, so a few are listed with *real* part numbers." After some page flipping I found that my regulator was our old friend the 723 and my fried transistor was a 2N5415! Thanking him, I asked what an alignment would cost. Less than $100. Progress!

Square Peg, Round Hole

Realizing that I couldn't get a replacement 723 in HP's ancient package, I dug out a modern DIP version and kludged it together in a wirewrap socket. The results weren't physically attractive—but it worked! And because I'd had the part on hand, it cost nothing.

The transistor was a bit more difficult. My pitiful supply of transistors didn't "fit," so I bought two replacements at a local jobber. Sure, I was gouged for a few extra bucks, but the replacement made the power supply (and the signal generator) work! So who cares?

IC-28H FM Transceiver Repair

Once I had a working signal generator I went to work on an IC-28H that was given to me by Don, N0BVE. This is a 45-W, 2-meter FM mobile rig from ICOM. Once again, step one was to determine what worked.

With trusty yellow pad in hand I noted that the radio blew fuses when I switched to high power. Because I had a limited number of fuses, I replaced the original fuses with monster 20-A units and connected the radio to a little 2-A power supply that has internal circuit breakers.

The radio's display worked but there was no audio and the rig seemed to transmit only a fraction of a watt on low power. I opened the case, being careful to save all the screws, and examined the radio.

Sniffing around I could tell something had burnt to a crisp. I initially missed the blown-up audio chip. Curiosity, not brilliant deductive reasoning, tempted me to open a small metal compartment that was "boilerplated" with screws. Good thing I did. An electrical discharge from the lightning strike had turned some of the components into toast.

The inside of the cover was plastered with the remains of the enamel that had been painted on the coils. Seeing that these were fried, I started to feel forlorn. I reminded myself of what was working. In particular, the LCD and its associated CPU all seemed to be playing. The PLL was still working on transmit. Although the audio was totally gone, I made a test transmission from another hand-held—and the S-meter jumped! It seemed that the receiver was still working.

For the second time the ICOM avoided being heaved into the dustbin. Working my way backwards, I tried a different loudspeaker. Well, that was wishful thinking. It worked no better than the paper-thin speaker inside the ICOM.

Working my way back to the fancy audio chip, I saw what was causing the heavy burnt smell. The chip had exploded! I wondered if the damage had traveled down the chain to other circuits and components. I quickly connected the audio input of my stereo receiver to the input of the blown chip. I was pleased to hear the reassuring rush of static and the voices of local friends on the 146.88-MHz repeater. I wiggled the squelch knob and noted that it also worked. Things were looking up!

Schematics and Service Manuals

I wanted to get my hands on a service manual, but the cost was too high for a radio that might still be classified as a basket case. Gary Fiber, aka **75540.525@compuserve.com**, at ICOM

America, was kind enough to send me a photocopy of the schematic for a few bucks and answer lots of dumb e-mail questions as I tried to figure out what I had on my hands. ICOM seems to have a pretty good attitude about helping hams work on their equipment. It's always a good idea to explore outside help.

Cross-Referencing Fiasco (Mother of Invention Part Deux)

I rushed downtown to an electronics parts store and picked up a replacement for the rig's audio chip. Unfortunately, the cross reference for the part was totally incorrect. Putting it into the radio made things that used to work fail. Frustrated, I put the rig aside for a few weeks.

One day, for some odd reason, I looked at the chip's packaging and noted that its description had nothing to do with audio—or even radio. In fact, the only thing it had in common with the original part was the number of pins and the package.

I tried calling ICOM, but the part was rather pricey and I was far from convinced that this project would result in a working radio. I thought I would compare notes with home-brewing buddy Roger, WA0VLL. He seemed surprised that I was stumped by an audio chip replacement.

"Jay-Bob...what audio chips *do* you have?"

Well, "duh," I thought to myself. This is ham radio. I don't have to restore the rig to factory-new condition. Best of all, I had a drawer full of LM-380 audio chips from an ancient computer project. Tacking one on top of another 8-pin DIP, I managed to work up a nice little audio circuit with junk box parts. Total cost? Nothing!

I Used to Hate Coils

Back to the RF section that had been toasterized. I started testing and replacing the components that had the most obvious damage. Instead of relying on cross-referenced parts, I ordered replacements through MCM. The total cost was a few bucks for parts and a few more for a fancy Japanese data book that I had been eyeing for a while.

I had most of the RF deck fixed, but the coils had me worried. Where would I go to buy replacements? Naturally, the solution for replacing the "toaster elements" was to wind new ones.

I picked up a small package of "magnet" wire from RadioShack for less than $4. Getting the right diameter coil form on which to wrap my new coils stumped me for a minute. When I opened my case of jeweler's screwdrivers, however, I realized that the various Phillips-head screwdrivers could double as coil forms.

Using the burnt coils as examples, I twisted together some replacements. I soldered the new coils in place and hoped for the best.

Jay's Patented Repair Tips

- Always use silicone heat sink goop to ensure proper heat transfer from a device to its heat sink. Nothing is more frustrating than component failure because of a lack of 2 cents worth of heat sink compound.
- Get an MCM Electronics catalog. Call MCM at 800-543-4330 or point your Web browser to **www.mcmelectronics.com**. MCM sells parts in small quantities at fairly reasonable prices and stocks hard-to-find Japanese components.
- When I remove a screw from an older piece of equipment I like to put a drop of oil on the threads to make future removal a little easier. I may never remove that screw again, but some other poor sap "might," and he will thank me for it.

I got it! Everything worked as advertised. I had to tweak some pots to set the proper power output and get the proper S-meter readings, but otherwise everything was looking up. And believe me, nobody was more surprised than me. I'd been reading those editorials, too!

Nope, hams simply don't fix their own equipment. Yeah, right!

Final Touches

Fairly satisfied, I looked at the rig. What was wrong? No backlight. In the dark Minnesota winter, this was a critical issue! After more disassembly I discovered a pair of "grain of wheat" bulbs that had died. Believe it or not, merely getting to the two pilot lamps was harder than fixing the rest of the lightning damage!

There are a *lot* of screws in an IC-28H. Because I didn't ever want to dig those bulbs out again, I substituted two high-output LEDs. The brightness of next-generation LEDs is fantastic. The rig's backlight is bright enough to hurt your eyes (or use as an emergency flashlight, perhaps?)!

Conclusion

There is nothing like taking a piece of "junk" and restoring it to working status at low to no cost. It gives you a pretty great feeling to boot! It's what Amateur Radio is all about. So, don't be too shy about digging in and getting your hands dirty. Work carefully…seek advice and assistance…and go for the gusto!

321 West 4th St
Jordan, MN 55352-1313
73016.27@compuserve.com

New Products

FIRST CALL COMMUNICATIONS TOWER INFORMATION NEWSLETTER

◊ First Call Communications, a direct distributor for US Tower Corp products, now offers a quarterly newsletter packed with useful information for potential tower purchasers.

Issue 1 of *The Informa Newsletter* includes sections on maintaining wire rope, mast material considerations, lightning protection, concrete rebar installation and rotator selection. The newsletter also contains information on how to obtain a sample tower permit application and a package with tower specifications and stress analysis data for submission with your permit request.

Three options for US Tower purchase and erection, ranging from customer assembly to a complete "turnkey" commercially installed system, are also covered.

The newsletter is free and can be obtained by sending an SASE to First Call Communications Inc, 28 Grove St, Spring Valley, NY 10977; tel 800-426-8693, fax 914-357-6243, **firstcall@cyburban.com**, **http://www.firstcallcom.net**.

ANTENEX *SCADA* NO-TUNE YAGI ANTENNAS

◊ Antenex adds to its broad selection of antennas and related accessories with their new line of *Scada* Yagi antennas.

Intended for extreme weather conditions including ice, snow, winds up to 175 mph and temperatures ranging from -80° F to 140° F, these rugged antennas are constructed of heavy duty aircraft quality aluminum with welded on solid rod elements and gold anodized coatings. Models with 3 to 7 elements covering frequencies from VHF up through 928 MHz are available and come pre-tuned to your desired frequency. A heavy duty cast aluminum mounting bracket and mast attachment hardware is included. For more information on these antennas and the entire line of Antenex products, contact Antenex, 2000-205 Bloomingdale Rd, Glendale Heights, IL 60139; tel 800-323-3757 or 630-351-9007, fax 630-351-9009, or visit them on the Web at **http://www.antenex.com**.

Next New Product

By Al Alvareztorres, AA1DO

Two on 10

Hankerin' for more performance on 10 meters? Wanna greet the upcoming sunspot peak with gusto? This home-brew two-element beam is the perfect introduction to rolling your own gain antenna.

Living in a condo has many advantages, none of which is being able to mount a tribander on a 60-foot tower. So I make do with a long, thin random wire that works nicely as long as the New England wind, snow and ice don't conspire to give my hamming a holiday (which happens more often than I'd like). And although it's somewhat directional on the higher bands, I haven't figured out how to rotate 200 feet of wire without the neighbors becoming suspicious. One answer is to operate mobile. A bumper-mounted vertical is fine for casual operation, but it leaves a lot to be desired when mountaintopping for rare DX. With the solar maximum just around the corner, I decided that a portable 10-meter beam was necessary.

The beam had to fit in the trunk of my Subaru (limiting the largest component to about four feet in length) and had to be easy to assemble and erect on site by one person. In this article I'll describe the antenna and provide some construction tips that may help you avoid some pitfalls if you take on this worthwhile project.

The Boom

From past experience I know that TV masts make good booms for smaller antennas. They're lightweight, strong and readily available at most RadioShack and home stores. The light-duty stuff is plenty strong and comes in five-foot lengths. That was my starting point.

At 28.4 MHz, for an antenna made of tubing and not supported at the ends, a half wavelength is 491.8 divided by 28.4 MHz, or 17.3 feet. To accommodate my "Subaru factor," four feet divided by 17.3 feet produces a boom length of 0.116 wavelength, a size that gives a nice gain and a feed-point impedance that can be easily matched to your coax line.

The TV mast (with the crimped end lopped off) fits in my trunk and allows two elements to be mounted 4 feet apart and fed with RG-58 coax. So far so good. I would be building a two-element beam.

Now, how to mount the elements to the boom and the boom to the mast (another 5-foot TV mast section)? In the past I had used a **U**-bolt and clamp arrangement, but this technique requires care in keeping the elements parallel to each other and to the ground. This is fine for permanent installations, but not something to be bothered with while operating portable.

I decided on right-angle pieces permanently mounted to the boom (see Figure 1). I used 1/2-inch 1 × 2 aluminum angle scrap because it "looked about right." Your local hardware store has aluminum angle in various dimensions and lengths. I cut six, 3-inch pieces of angle to make the **U**-bolt mounting brackets—two to hold each element and two to hold the mast.

Drilling the two holes in the angle's smaller dimension—the part that attaches them to the boom—isn't critical as long as you drill the holes on the boom the same distance apart. The angles will be permanently mounted to the boom using 2-inch bolts, nuts and lock washers. When you mount them, be careful not to crush the tubing. It's not terribly strong, but it *is* lightweight. We're going for portability here!

The holes in the larger dimensions should be tailored to allow the mounting of the 1 1/4-inch **U**-bolts for the elements and the 1 3/4-inch **U**-bolts for the mast. Because the element mounts must be as parallel as possible and the boom mount must be at right angles to them for maximum efficiency (and so your antenna doesn't look like it's under the influence), make the boom holes with a drill press if possible.

Now for the Elements

Most beam antennas are made with aluminum tubing because it's strong, lightweight and available in sizes that "telescope" into each other. The telescoping feature is important. It helps in transportation and makes tuning the antenna a snap.

The beam's driven element should be 17.3 feet. The length of a reflector for a two-element Yagi with 0.116-wavelength element spacing should be 18 feet 1/2-inches.

I needed 35 feet of tubing (plus some to fit inside each telescoping joint for support). Because the tubing comes in 8-foot lengths, this worked out to five lengths of assorted sizes. The three telescoping sizes available at my local hardware store were 1 inch, 7/8 inch and 3/4 inch—perfect! Because the 1-inch section was going to be the center part of the two elements, I picked up **U**-bolts and nuts while I was there. You'll also need eight hose clamps sized to fit your tubing.

This is how the material was cut up. One 1-inch tube was cut in half, yielding two four-foot lengths. The two 7/8-inch tubes

Figure 1—Two pieces of angle aluminum are attached to the boom with two nuts, bolts and lock washers. Your drilling must be accurate, so use a drill press if possible. In addition to drilling the boom holes, you'll need to drill four holes in each angle piece: two for accepting the boom-mounting nuts and two for the U bolts that will hold the element.

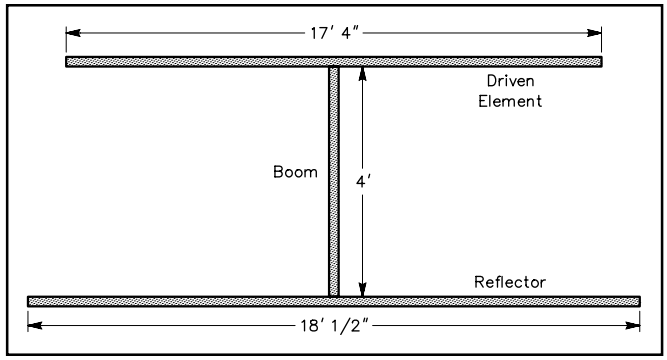


Figure 2—Dimensions and mounting configurations for the boom, driven element and reflector element.

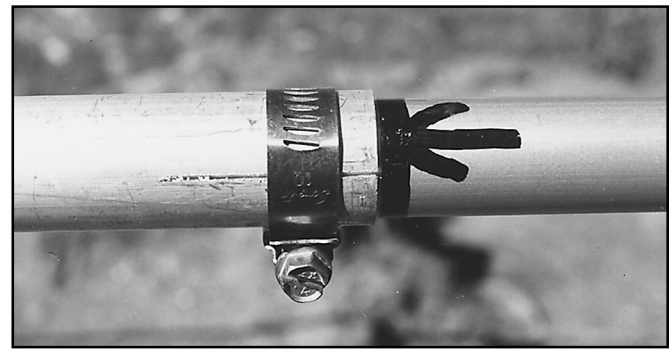


Figure 3—Use hose clamps to compress the slotted ends of the telescoping elements and keep everything in place. Marking the exact positions of the sliding tubes makes it much easier to assemble the antenna in the field.

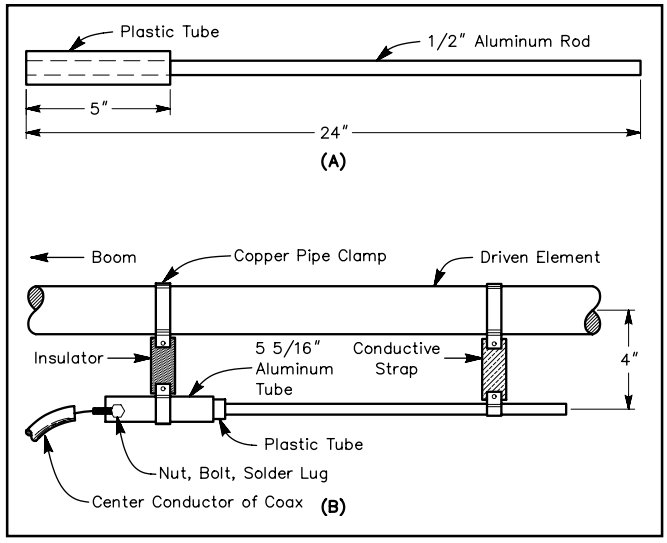


Figure 4—Making your own gamma match is easier than you think. Construct the variable capacitor element by sliding a 5-inch piece of 1/2-inch diameter plastic tubing over a 24-inch piece of 1/2-inch diameter aluminum rod (A). Then, slide the plastic-sleeved end of the rod into a 5 5/16-inch long, 3/4-inch diameter aluminum tube and attach the entire assembly to the driven element (near the boom) using one plastic insulator and one conductive strap as shown (B). Note that the assembly must be separated from the driven element by 4 inches, center-to-center.

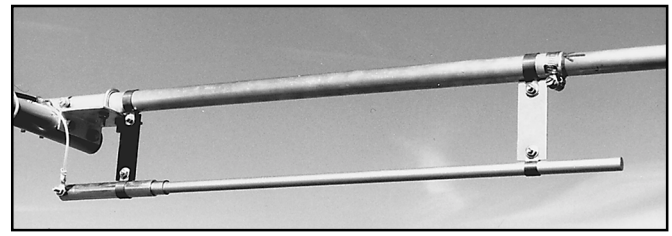


Figure 5—The finished gamma match mounted and ready for action.

were cut in half to yield four four-foot lengths. One 3/4-inch tube was cut in half to yield two four-foot lengths. From the remaining 3/4-inch tube I cut off an 8-inch piece (for later use in the gamma match) and cut the remaining length in half to yield two lengths a little over 3.5 feet each. I then took the 1-inch tube and cut a slot in each end to a length of about 1 1/2 inches. Pushing the tube endwise into a band saw makes a really nice double-slot arrangement. I did the same at one end of each 7/8-inch tube. When the elements are assembled, hose clamps will pinch the slots closed and keep the element sections in place (see Figure 3).

Slappin' Together Time

In the garage I erected a 3-foot tripod. I then cut a small piece off the un-swaged end of the second five-foot TV mast (so it would fit in the trunk) and installed it into the tripod. I mounted the boom on the mast with **U**-bolts and clamps and attached the two 1-inch tube sections to each end of the boom with **U**-bolts and centered them for balance. I then slid the unslotted ends of the four 7/8-inch tubes into the ends of the 1-inch tubes, holding them in place with hose clamps. I inserted unslotted ends of the four remaining tube sections in place (using the two shorter 3/4-inch tubes on the driven element). You won't believe how big a 10-meter beam seems when it's inside a garage!

Some Last Element Details

I drilled a hole at the center of the driven element and installed a bolt to attach the shield of the coax. I drew a ring around both 1-inch tubes with permanent markers to show the exact center for easy assembly. I used black when marking the driven element and red on the reflector. That way, in the field I wouldn't have to stop to figure out what was what (that's also why I cut slots into only one end of some of the element sections).

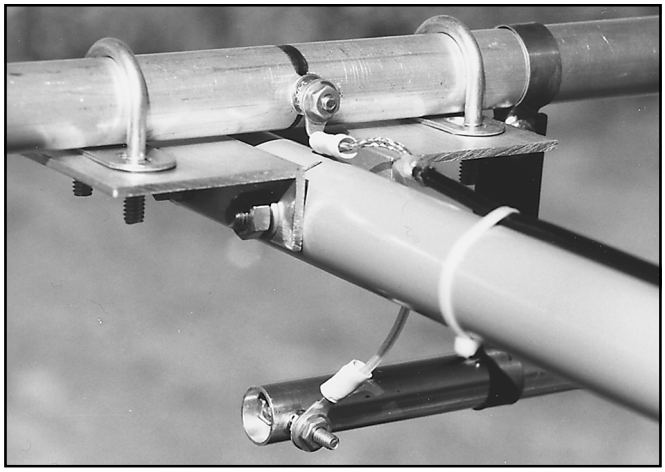
Feeding the Antenna

As you may have noticed, this antenna uses "plumber's delight" construction. The driven element isn't split into two legs like a conventional dipole. In this case, the driven element is one piece, and everything is shorted to the boom, to the mast and to ground. To top it off, the whole mess is fed with unbalanced coax. So, how does it work? Like magic! And the magic words are *gamma match*. There are actually several ways to feed a plumber's delight antenna, but the gamma match is probably the simplest.

How a gamma match works is beyond the scope of this article. In short, the braid of the coax is connected to the center of the driven element (since this is where the voltage null occurs in a half-wave conductor). The center conductor of the coax is connected to the same driven element through a capacitor some distance away from the center. In the old days we used tuning capacitors from discarded AM radios. Tuning caps are as scarce as hen's teeth nowadays, so I decided to try a technique I'd come across in the 1974 *ARRL Antenna Book*—incorporating the capacitor into the structure of the gamma match.

Building the Gamma Match

I took the 8-inch piece of 3/4-inch tubing that I had set aside before and cut it to 5 5/16 inches. I cut a piece of 5/8-inch plastic



The shield braid of your coaxial cable attaches to the driven element using a nut, bolt and solder lug. The center conductor, however, must attach to the end of the gamma match capacitor, as shown here.

Bill of Materials

(2) 5-foot light-duty TV mast
(1) 1-inch x 8-foot aluminum tube
(2) 7/8-inch x 8-foot aluminum tube
(2) 3/4-inch x 8-foot aluminum tube
(1) 1/2-inch x 4-foot aluminum rod
(1) 1-foot section of clear vinyl tubing
(1) 2-foot aluminum angle
(2) 1 3/4-inch U-bolts
(4) 1 1/4-inch U-bolts
(8) Hose clamps to fit on 1-inch tubing
(6) 2-inch bolts & hardware
(2) 1 1/2-inch bolts & hardware
(4) 1/2-inch bolts & hardware
(1) 3-foot tripod
(3) 1-foot metal tent pegs

tubing to a length of 5 inches and cut a 1/2-inch aluminum rod (tubing will work) to 24 inches. Sliding the plastic tubing onto the 1/2-inch rod until their ends were flush, I now slid this assembly into the 5 5/16-inch tube until 1/2 inch of the plastic tube was left exposed (see Figures 4 and 5). I now had a capacitor!

I drilled a hole near the end of the 5 5/16-inch tube and installed a small bolt for the center conductor of the coax. This assembly was mounted to the driven element so that the larger end (the one with the bolt) was directly under the center of the element and the two tubes were four inches apart center-to-center.

The gamma match is held on by an insulated strap at the end closer to the center of the driven element and by a conductive aluminum strap at the other end. The locations of the straps aren't critical at this point. The straps themselves can be made of any sturdy insulating and conducting materials. I used flat plastic stock and flat aluminum stock (1 inch by 1/16 inch worked fine) held in place by copper clamps (designed to hold copper pipes to a wall). These clamps come in all sizes, are easily bent to the proper size, already have holes in them for attaching to the straps and are inexpensive. Mechanically, everything looked good! But would it work?

Tuning the Antenna

I was fortunate that it was a beautiful summer day and that I had my wife, Donna, AA1DQ, to help me. I disassembled the monster in the garage and reassembled it on the lawn. Everything went together nicely in about 15 minutes. I attached the braid of the coax to the driven element and the center conductor to the gamma match. The fact that it was only four feet off the ground would have little effect on the tuning, although the overall performance would be affected by the high angle of radiation. Leaving the hose clamps over the element slots loose, I adjusted the driven element length to about 17 feet and the reflector to about 18 feet 1/2 inch.

I would make the adjustments while Donna, visible through the shack window, keyed the transmitter and recorded the SWR readings. It goes without saying that visual (or some other positive) contact is imperative for safety. She could see that I was clear of the antenna before keying the transmitter.

I find that it's best to keep a written record when tuning an antenna (even if it's only a dipole) so that I know where I am and which way I'm going. I make a chart with frequency on the Y axis and antenna length on the X axis. I then enter the lowest SWR point (resonance) at the appropriate X-Y position. As I change the length I can easily see what's happening.

If you find that the SWR at your chosen frequency is unacceptable, begin adjusting the gamma match by sliding the center bar in or out. If you can't achieve a match, slide the entire matching section toward or away from the center of the driven element. As a last resort, adjust the driven element length. This will also have an effect. Remember to keep records. Otherwise you may get your adjustments all out of whack and won't know where you are. When you're done, tighten the hardware on the gamma match, as it will not be moved again.

I was lucky. After only a few adjustments I obtained a 1:1 match at any chosen frequency (28.0 to 28.5 MHz). A match of 1.3:1 was attainable beyond these frequencies (up to 28.6 MHz). Your mileage may vary.

I was overjoyed. The beam showed very good side rejection and a respectable front-to-back ratio. I marked the element sections at their contact points with a ring using the same permanent markers. When erecting the system I could simply slide the sections to the rings and tighten the hose clamps. There was nothing left to do but try it out on Beseck Mountain. Along the way I got some foot-long metal tent pegs to hold the tripod steady.

The Verdict

The antenna has been used several times mountaintopping and contesting. It performs well and can be erected by one person in about 15 minutes. It was well worth the effort. I have since gotten another section of mast and, with two people, it can easily be put up at 10 feet.

I haven't experimented with the reflector length yet to see the effect on the gain and the front-to-back ratio. As they say, "If it ain't broke, don't fix it!"

225 Main St, Newington, CT 06111; aa1do@arrl.org QST

New Products

HI-RES WX SAT SOFTWARE FOR WINDOWS

◊ New from Timestep is *HRPT for Windows*, software for resolving and displaying high-resolution digital images from NOAA 12, 14 and 15 weather satellites. The package, compatible with *Windows* 95, 98 and NT, features automatic scheduling, automatic channel switching and unattended operation. Orbital data for the satellites are available through an automatic Internet update. For pricing and information on required receiver hardware, check out Timestep's Web site at **http://www.time-step.com**. QST

Next New Product

By Ian Poole, G3YWX

A Brief Guide to Phase-Locked Loops

Phase, frequency and "what goes around comes around."

Phase-locked loops (PLLs) are an essential part of radio technology. They are used in a variety of applications to enable receivers and transmitters to achieve the flexibility and performance we expect today.

Although the PLL concept has been around for many years, it was not widely used until integrated circuits were available. Once these became available in the early 1970s, the use of PLLs increased sharply and they started to be found in many applications. Now they are very well established and found in virtually every new receiver or transceiver for amateur use.

What is Phase?

The operation of a PLL is based on the idea of phase and phase difference. The signal shown in Figure 1 is a sine wave, which is a repetitive waveform (although only one complete cycle is shown in the diagram).

You can pinpoint any position within the cycle and this is effectively the cycle's *phase*. The easiest points to define are the most obvious—the positive and negative peaks, and possibly the points where the waveform passes through the zero line. However, it is often necessary to define points in between.

A convenient method for visualizing phase involves the use of a circle. Progression through the waveform can be compared to a point moving around a circle, as shown in Figure 2. As the waveform moves through its cycle, so an equivalent point can be viewed moving clockwise around the circle. If the circle has its radius equal to the peak amplitude of the waveform, then the amplitude of the waveform is that given by the vertical displacement of the point on the circle above or below the zero line.

Using the circle it is possible to define every point on the waveform, simply by using its angle. In this way the first peak can be said to be 90° along the waveform, the point where it crosses the zero line 180°, and so forth. Similarly the angles can be measured in radians, where 2π is one complete cycle.

Phase Difference

The concept of phase is handy when we need to measure the difference between two waveforms. Compare the two signals shown in Figure 3 and you can see that at any given time they are at a different position on the waveform.

If the phase of the two waveforms is measured at any instant, the difference between the two is the *phase difference*. You can also see that if the phase difference is constant, then the two waveforms must be varying at the same rate and must therefore be on *exactly the same frequency*. It is this concept which is at the very heart of the phase-locked loop.

The Basic Loop

The basic phase-locked loop consists of three building blocks: the phase comparator; the voltage controlled oscillator (VCO), and the loop filter. The reference is sometimes included in diagrams, but although a reference signal is needed for the loop to operate, it is not strictly part of the loop.

In the loop shown in Figure 4, the incoming reference signal from an external source enters the phase comparator. Here an error voltage is produced, which is proportional to the phase difference between the two signals. This error voltage is critical, as you'll see.

This signal is passed through the loop filter. This determines

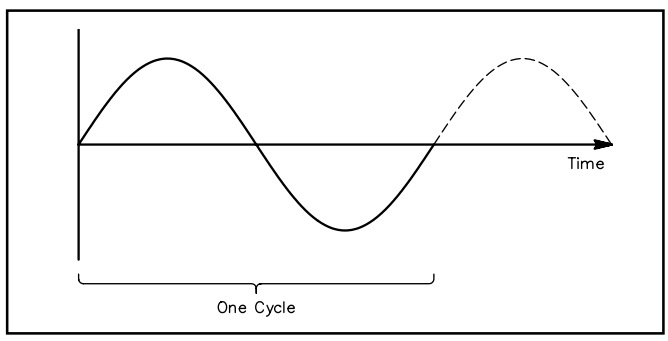


Figure 1—A sine wave.

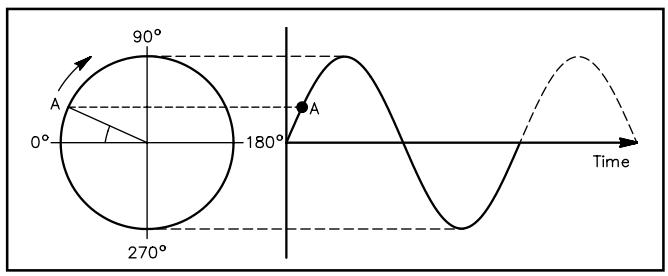


Figure 2—Representing phase as an angle.

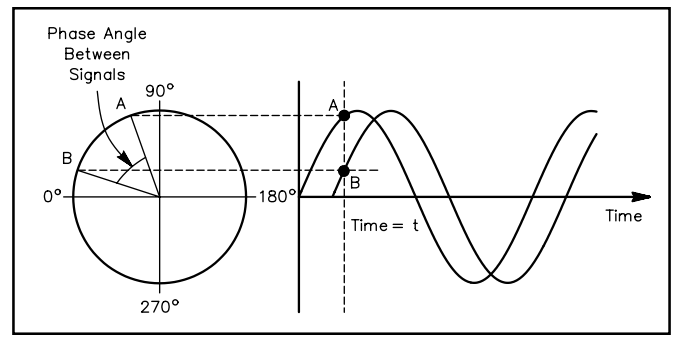


Figure 3—Phase difference between two signals.

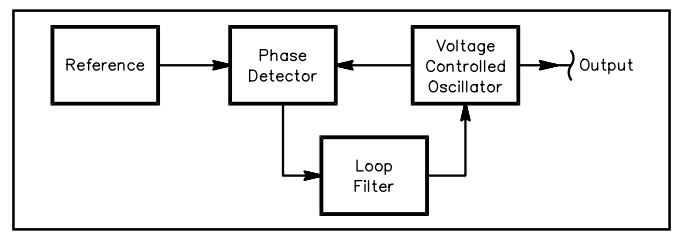


Figure 4—The basic phase-locked loop.

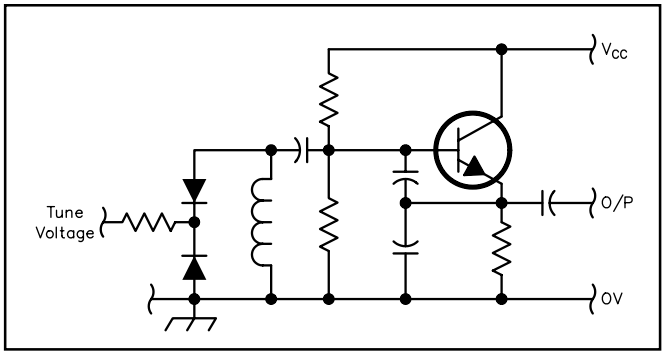


Figure 5—A Colpitts oscillator as a voltage controlled oscillator (VCO).

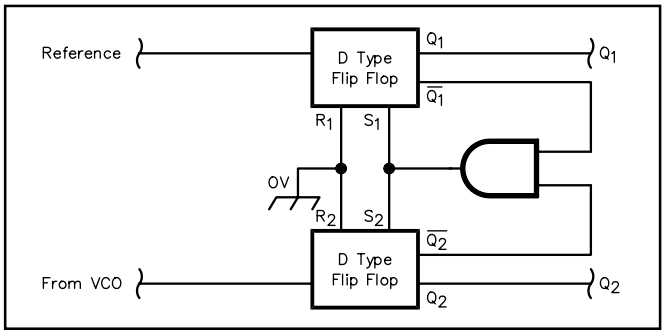


Figure 6—A dual D-type phase detector.

many of the loop characteristics. Finally, the error voltage is applied to the control terminal of the VCO. The sense of the voltage is such that it reduces the phase difference and hence the frequency difference between the two signals. Eventually a point is reached where the phase difference cannot be reduced any further and there is a small, steady error voltage, indicating a small and constant phase difference. The fact that the phase difference is constant means that the loop is *in lock* and the frequency of the VCO is *exactly* the same as the reference. (The loop can also lock if the reference and VCO are exact multiples of each other.)

The Voltage-Controlled Oscillator

A wide variety of oscillators can be used in PLLs. For many Amateur Radio applications, versions of the familiar Colpitts oscillator are quite popular. Essentially all that is required is an oscillator that can be tuned by varying the voltage on a control terminal. In the Colpitts configuration, this can be achieved by replacing the variable capacitor with varactor (Varicap) diodes. Normally they are placed in a back-to-back configuration, as shown in Figure 5. This prevents them from becoming forward biased by the oscillator signal itself.

The Phase Detector

A PLL's phase detector can be made from a variety of different types of circuits. The simplest is a double balanced mixer. When there is a frequency difference, the sum and difference frequencies are produced as normal, and when the PLL is in lock a dc voltage proportional to the phase difference is produced. The problem with this type of detector is that when the loop is out of lock an ac signal is produced with a frequency equal to the frequency difference. If the frequency of this signal is above the cut-off frequency for the loop filter, it will not appear at the input to the VCO and the loop will not lock.

There are also a number of digital circuits that can be used as phase detectors. The dual D-type circuit is shown in Figure 6. This has the advantage that when the loop is out of lock a steady

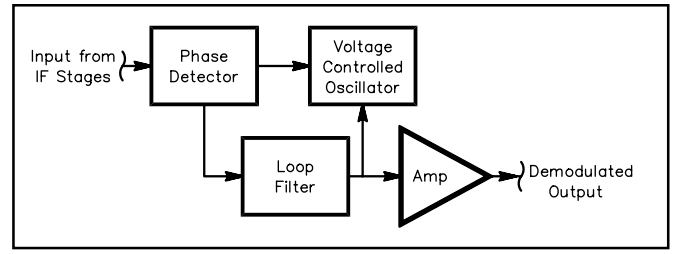


Figure 7—Using a PLL as an FM demodulator.

voltage is produced. As it has no ac component, the signal will pass through the loop filter and enable the loop to lock (provided it is within the tracking range of the VCO). Digital filters of this nature are more widely used because they enable the loop to lock more easily than mixer types.

The Loop Filter

Although the loop filter may only consist of a few components, its design is critical to operation of the PLL. Its parameters will determine many of the critical elements of performance. However, these are often conflicting, so the choice of values in the filter is usually a careful compromise between these requirements.

The filter performs a number of functions. The prime function is to remove the components of the input signal to the phase detector. If these were left on they would modulate the VCO, giving spurious signals at the output. Suppression of input signal is particularly important when a PLL is being used in a frequency synthesiser.

The loop filter has to be designed very carefully. Certain parameters must be met; otherwise the whole loop can become unstable. When this happens the control voltage will appear to oscillate and the VCO will be swept over the operating range of the loop. Naturally this must be avoided at all costs!

The PLL as an FM Demodulator

Let's take a look at a simple real-world application of the phase-locked loop—the demodulation of an FM signal. Here PLLs can give extremely high degrees of linearity. As a result they are widely used in hi-fi tuners.

The incoming FM signal from the IF is connected to the reference input of the phase detector, as shown in Figure 7. The loop will lock to this signal. When the loop is in lock, the voltage on the control input to the VCO begins to track the signal's frequency. Remember that with FM we modulate the signal by changing its frequency. As the FM signal moves up and down in frequency in time with the modulation, the loop remains in lock with the VCO following the instantaneous frequency of the incoming signal.

The VCO control voltage is now in perfect step with the changing frequency (modulation) of the FM signal. When used as an FM demodulator or detector, this signal is passed through a buffer amplifier and then passed to the external circuitry for audio amplification before being passed to the loudspeakers or headphones.

Phase-locked loops are a very convenient and cost effective way of demodulating FM. They have the advantage that the circuitry can be contained in one IC and only a few external components are required. Another advantage is that they do not need a coil, which is required in many other FM demodulator circuits. For the equipment manufacturer this is a distinct advantage, because coils are costly and bulky. Neither are they as easy to handle and fit to printed circuit boards, especially when most components these days are surface mounted and placed by machine.

This article originally appeared in RadCom*, published by the Radio Society of Great Britain.*

5 Meadway, Staines, Middlesex TW18 2PW, United Kingdom

Product Review

*Edited by **Joe Bottiglieri, AA1GW** • Assistant Technical Editor*

The Maha-Rexon RL-501, RL-115 and RL-112 Hand-held FM Transceivers

Reviewed by Jean Wolfgang, WB3IOS
ARRL Educational Program Coordinator

Maha Communications has recently followed the lead of another well-known accessory supplier by taking the leap into the crowded VHF/UHF amateur transceiver market. With the release of four new H-Ts—three single-banders; the RL-112, RL-412 and RL-115, and one dual-bander; the RL-501—Maha-Rexon is hoping to wedge their way in by offering rock-bottom pricing on nicely equipped units.

Maha's original Amateur Radio product lineup consisted mainly of accessories such as NiMH replacement batteries, rapid chargers, VHF and VHF/UHF amplifiers and speaker microphones. These new H-Ts come packaged with NiMH battery packs. NiMH batteries exhibit lighter weight, longer operating time and less critical charging parameters than NiCads, certainly making them an attractive feature.

Our review team looked at three of these units, the RL-501 2-meter/70-cm, and the RL-115 and RL-112 2-meter FM hand-helds. (The RL-412 is simply a UHF version of the '112.) All of our review units were purchased in the HP (high power battery) version.

This time around, we've selected reviewers with a wide range of experience. Carol, N1NAM, and I are relative newcomers to the frequencies above 50 MHz, while Joe, AA1GW; Dan, K3UFG; and Larry, WR1B; have spent quite a bit of time on VHF and UHF.

The RL-501HP 2-Meter/70-Cm FM H-T

The RL-501HP provides nearly all of the advanced features found on the top-of-the-line H-Ts offered by the "Big Four"—but at a considerably lower price.

Highlights include true dual band operation with simultaneous receive and full duplex capabilities, (allowing cross-band and crossband repeat operation), 202 memory channels, CTCSS encode and decode, dual watch, DTMF paging, 10 DTMF autodial memories, a switchable attenuator and wireless cloning. Multiple scanning modes such as 10 channel block scanning, memory skip, band scan, 1 MHz scan, range scan and even tone scan are provided.

The radio offers expanded receive on VHF from 130-175 MHz and is capable of AM mode reception (although it doesn't tune low enough for most of the US AM aircraft band). UHF receive range covers from 400 to 470 MHz.

It's a bit larger (especially in thickness) than we've come to expect with most modern H-Ts. This is partially due to the 12 V NiMH battery that's included with the HP version of the radio—it has a capacity of 1000 mAh! Although it's quite hefty, this pack is about the same size you would expect to see used for a 600 mAh 12 V NiCd battery.

Separate dual concentric knobs control volume and squelch for each band. A single rotary encoder changes frequency or memory channel on the selected "main" band. Jacks for an external speaker/mike and the antenna BNC connector are also mounted in the top panel.

The LCD display, the DTMF pad and seven additional control buttons can all be backlit for nighttime operation. All the reviewers agreed that the backlighting on the '501 is excellent. Operating the radio in low or no light is not a problem. Lamps located behind the left and right of the display do a good job of lighting the entire window. The keypad backlighting is nearly bright enough to illuminate the secondary function legends printed on the radio's case above each key. The frequency digits shown on the display are large and easily seen in any light, but some of the function icons, especially those along the top edge of the window, are very small and a bit more difficult to make out.

The display normally shows VHF and UHF frequencies simultaneously. You can, if desired, disable either band and shut off its corresponding half of the display. The relative power output or received signal strength is indicated using a bargraph meter with eleven segments. Separate meters are provided for each band.

Most of the dials and buttons on the radio are well labeled—the only exception is the on/off switch. This tiny push button is located on the right side of the rubberized top cover of the radio. The **PWR** legend, molded into the rubber material, is virtually invisible under most lighting conditions. It's fun to hand this radio to the uninitiated and challenge them to power it up!

Before you pick up the manual, you may want to reach for your glasses—the print is very small. We found the operating instructions clear but the order was not

Bottom Line

With rock-bottom pricing on a nice variety of hand-helds—ranging from simple basic single banders to a well appointed dual-bander—Maha-Rexon provides some attractive alternatives to the budget-conscious ham.

Table 1
Maha-Rexon RL-501HP, serial number T830082

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency Coverage: Receive, 130-162, 400-470 MHz; transmit, 144-148, 430-450 MHz.	Receive, 130-175, 400-470 MHz;[1] transmit, as specified.
Power requirements: 6.0-16.0 V dc; receive, 80 mA; transmit, 1.3 A (max, high power).	Receive, 0.23 A (max volume, no signal); transmit, 1.3 A, tested at 13.8 V.
Size (HWD): 6x2.75x1.4 inches; weight, 16.0 ounces.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: 12 dB SINAD, VHF; 0.16 µV; UHF, 0.18 µV.	For 12 dB SINAD: VHF, 0.11 µV; UHF, 0.18 µV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 62 dB,* 10 MHz offset from 146 MHz, 77 dB. 20 kHz offset from 440 MHz, 57 dB,* 10 MHz offset from 440 MHz, 75 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 60 dB, 20 kHz offset from 440 MHz, 57 dB.
Spurious response: Not specified.	IF rejection, VHF, 92 dB; UHF, 130 dB; image rejection, VHF, 33 dB; UHF, 48 dB.
Squelch sensitivity: 0.16 µV at threshold.	VHF, UHF: 0.04 µV at threshold.
Audio output: 200 mW at 10% THD into 8 Ω.	320 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power Output (H / M / L): VHF, 5 / 2.5 / 0.5 W; UHF, 5 / 2.0 / 0.35 W.	VHF, 5.2 / 2.4 / 0.5 W; UHF, 4.8 / 2.2 / 0.39 W.
Spurious signal and harmonic suppression: 60 dB.	VHF, 66 dB; UHF, 65 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, VHF, 170 ms; UHF, 130 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 150 ms; UHF, 130 ms.

*Measurement was noise limited at the value indicated.

[1]Sensitivity degraded below 420 MHz and above 450 MHz.

to everyone's liking. When entering a repeater frequency with a CTCSS tone into a memory, for example, we found ourselves jumping around in the book while trying to follow the steps.

Figuring out the basic functions—entering frequencies, offsets and tone information—seemed easy and fairly intuitive to our experienced reviewers. Accessing and adjusting some of the more advanced operations, especially those located in the **SET** menu, found us all reaching for the manual. Each of the 29 menu items, including settings for parameters such as tone frequency, tuning step selection, audible key beep etc, are identified alphanumerically. The names, however, are a bit cryptic. For instance, these three are tagged "CF," "St" and "b2." A handy chart in the manual, with page number references for more detailed function explanations helped us all sort things out.

Since I'm not always anxious to read directions, I was very glad to find the manual included instructions both in text and pictorially. These graphics not only showed what the display should look like for each step, but also the buttons to push and the proper sequence. In comparison to the text, the graphics are of adequate size. This made it much easier to set things up!

Other than the small font and the need to hunt around a bit for information, overall the manual is pretty good. Some minor shortcomings are worth mentioning though. The manual seems to indicate that the unit comes with a dry cell battery case. While I certainly prefer the rechargeable battery supplied, no charging instructions are included. Since I have never owned radios that use NiMH batteries before, I am a bit curious about the proper procedures for charging and maintaining them. (Maha is now posting this information on their Web site. See **http://www.maha-comm.com/support/techfact/q&a/nimhbp.htm**.—*Ed.*)

The book also shows an "included" dc adapter with a cigarette lighter plug. This adapter is an optional accessory in the US market. The manual also refers to the CTCSS board as being "optional," this *is* included in radios sold here—a fair tradeoff, I guess.

There are a number of typographical errors in the manual, but they are not significant enough to lead to any confusion. A schematic diagram is not provided.

The on-the-air performance of this radio is very good, The high capacity pack and three adjustable power levels result in plenty of operating time between charges. We did notice that the back of the unit does get very hot to the touch if you transmit on high power for extended periods of time.

We were especially impressed with the audio on both transmit and receive. I was pleasantly surprised by the realistic sound of my husband Larry's voice. I have listened to him on several different radios where this was not the case. With the RL-501 there was very little coloration of transmitted audio. In ham radio, you are generally known for the sound of your signal. Clear audio—especially for transmitting—is always important.

During the course of our field testing, the '501 we purchased for product review developed an intermittent problem with VHF receive. While receive signals were indicated on the signal strength meter, no audio was heard—almost as if CTCSS tone squelch was engaged. Microprocessor reset did not seem to clear this up. After conversations with Maha service, the unit was returned for repair. A second unit we borrowed to complete our evaluation performed flawlessly.

One of the neat (and entertaining) aspects of this radio is the variety of key beep sounds it generates—some unique to specific functions and operations. Our review team speculated that these musical talents may be of value to sight impaired hams.

The overall consensus on ease of use varied on this radio. Some of the more experienced hams thought its wide range of advanced capabilities could make it a bit intimidating to a newcomer. I, on the other hand, found it to be fairly easy to program. The manual, especially the graphics, made it possible for me to learn a little more each time that I tried a new function. We all feel that this radio includes almost all the features important to even the most experi-

Table 2
Maha-Rexon RL-112HP, serial number T809992

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency Coverage: Receive, 138-174 MHz; transmit, 144-148 MHz.	As specified.
Power requirements: 5.0-16.0 V dc; receive, 35 mA (stand by); transmit, 0.95 A (max, high power).	Receive, 0.22 A (max volume, no signal); transmit, 0.93 A, tested at 13.8 V.
Size (HWD): 6.4x2.6x1.4 inches; weight, 15.8 ounces.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: 12 dB SINAD, 0.16 μV.	For 12 dB SINAD: 0.14 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 60 dB,* 10 MHz offset from 146 MHz, 78 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset from 146 MHz, 60 dB.
Spurious response: Not specified.	IF rejection, 106 dB; image rejection, 74 dB.
Squelch sensitivity: Not specified.	0.07 μV at threshold.
Audio output: 250 mW at 10% THD into 8 Ω.	661 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power Output (H / M / L): 5 / 2.5 / 0.35 W.	5.3 / 2.3 / 0.28 W.
Spurious signal and harmonic suppression: 60 dB.	66 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 250 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	100 ms.

*Measurement was noise limited at the value indicated.

enced operators. New hams, as they gain more experience and confidence, won't find themselves wishing for additional features left out of some of the less sophisticated alternative units.

At the time of this review, the average street price for the RL-501HP is around $260. Our impression of the RL-501 is that if you are looking for a unit with simultaneous dual-band capabilities, this one represents a good value in this price range. The '501 includes most of the advanced features common to the high end H-Ts marketed by the others. Some of the things you won't get are slim packaging, alphanumeric memory tagging, independent transmit and receive CTCSS tone capability and computer programmability. If you can live without these features, the RL-501HP deserves a serious look on your next radio shopping excursion.

The RL-112HP 2-Meter FM H-T

The RL-112 is very similar in size to the RL-501. The high power version comes with the same high capacity 1000 mAh NiMH battery pack.

This transceiver features two banks of 10 memory channels (21 total memories including the call frequency), CTCSS encode and decode, dual watch, DTMF paging and a wide variety of scanning capabilities.

Separate volume, squelch and frequency encoder knobs are mounted on the top panel. The volume control also serves as the on/off switch. Squelch level is adjusted using a small knob tucked in close to the BNC antenna connector. Jacks for an external speaker/mike are also top mounted.

The LCD display shows the operating frequency and memory channel number in digits that are large enough to be easily viewed. Icons indicating the activation of various features are small, but are well positioned in the window. A 14-segment bargraph along the lower edge of the screen shows relative power output and receive signal strength. Backlighting is provided for both the display window and the generously sized 16-button keypad. Although the backlighting is adequate for low-light operation, it is not as bright as that on the '501.

CTCSS encode and decode is included—but there are some limitations. The unit is capable of storing a maximum of six different CTCSS tones in the memory positions. Memory positions 1 and 2 of either of the two banks will retain any CTCSS frequency. If a tone is programmed into either memory position 3, this tone will be used in memory positions 4 through 9 in that bank as well.

In this area, several of our repeaters use a common CTCSS tone, so this was not a major shortcoming for us. We simply put groups of repeaters that happen to use common tones in memories 3 through 9. You may want to check the tones used on repeaters in your area to see how this arrangement will affect you.

Provisions for independent CTCSS tones on transmit and receive for the same frequency or repeater frequency pair are not available.

The documentation supplied with this transceiver is very similar to that of the RL-501. The highpoints and shortcomings are nearly identical. Text is small, but pictures are again used to help simplify the steps and sequences, making programming the radio fairly straightforward.

This unit uses a slightly different arrangement for accessing and varying settings in the **SET** menu. Most of the items in this menu, with the exception of the CTCSS tone settings, are not ones you'll need to adjust regularly. After spending a few minutes with the manual the procedure for programming CTCSS tones should be easily memorized.

Our review team gives the '112 very good marks for both transmit and receive audio quality. Receive audio volume is slightly louder than that of the '501. The three RF power levels and the high capacity NiMH battery again resulted in extended operating periods between charges.

Some commented that although the relatively short rubber duck supplied with the transceiver made it comfortable to wear the radio on your belt, the convenience seemed to come at the cost of range. A longer accessory antenna will extend your range or allow you to run the unit at a lower output power setting, adding even more operating time per charge.

One gripe voiced by all of our reviewers was the unit's belt clip. After a couple of cycles on and off the belt, the clip bent out slightly and did not hold the radio securely. The other two radios in this review had a slightly different clip. We didn't experience any problems with these. All of these clips share the same attachment pattern. I would strongly recommend ordering one of those clips and substituting it for the included one—hopefully *before* the radio

Table 3
Rexon RL-115HP, serial number T840010

Manufacturer's Specifications	***Measured in ARRL Lab***
Frequency Coverage: Receive and transmit, 144-148 MHz.	Receive, 136-174 MHz; transmit, as specified.
Power requirements: 5.0-13.8 V dc; receive, 42 mA (squelched); transmit, 1.5 A (max, high power).	Receive, 0.13 A (max volume, no signal); transmit, 1.4 A, tested at 13.8 V.
Size (HWD): 6x2.5x1.2 inches; weight, 13.1 ounces.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: 12 dB SINAD, 0.16 µV.	For 12 dB SINAD: 0.18 µV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 146 MHz, 57 dB,* 10 MHz offset from 146 MHz, 70 dB.
Adjacent-channel rejection: 60 dB.	20 kHz offset from 146 MHz, 57 dB.
Spurious response: Not specified.	IF rejection, 76 dB; image rejection, 75 dB.
Squelch sensitivity: Not specified.	0.05 µV at threshold.
Audio output: 200 mW at 10% THD into 8 Ω.	300 mW at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power Output (H / M / L): 5 / 0.6 / 0.18 W.	5.0 / 0.7 / 0.21 W.
Spurious signal and harmonic suppression: 60 dB.	70 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 126 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	86 ms.

*Measurement was noise limited at the value indicated.

bounces off the pavement!

With a current street price of around $160 for the high power NiMH battery version, and an adequate complement of the most important capabilities, the RL-112HP is certainly a good value for the money.

The RL-115HP Compact 2-Meter FM H-T

With the RL-115HP, Maha-Rexon presents a transceiver with the more compact dimensions and slimmer styling we're seeing in the latest offerings of the other major manufacturers. Unlike the battery used on the RL-501 and RL-112, nearly half of the slim 9.6 V 1000 mAh NiMH battery pack on this radio slips up into the chassis in an area behind the keyboard.

A large display window with big digits for the frequency and memory channel numbers, adequately sized icons for the various active functions and a large 10-segment relative power and signal strength meter earned praise from all our reviewers. The keypad has generously sized buttons and the legends on the keys and those printed on the case of the radio are also large enough for very easy viewing. Available backlighting for the display window, the keyboard and two additional control keys makes operation in limited lighting easy.

The top panel of the transceiver has two small knobs—a **PWR/VOL** and an **ENC/SQL** control. A small red LED lights on transmit. A set of speaker/mike jacks and a dc power socket are mounted on the right side panel.

In addition to the updated look, this radio also incorporates some expanded capabilities you won't get with the RL-112. The RL-115 features 72 memory channels, CTCSS encode and decode, 8 DTMF autodial memories, a time out timer, busy frequency lock out, DTMF paging, automatic repeater shift and selectable musical keys.

While setting up and operating this radio seemed intuitive to our more experienced operators, one particular programming characteristic can be tough on beginners. Some of the programming steps must be completed within a specific amount of time (approximately 5 seconds). If you take too long between entries, the radio reverts back to the original settings. It can be difficult to read through the directions in the manual and simultaneously perform the steps fast enough to complete the programming sequence.

The manual for the RL-115 was considerably different than those included with the other two units. The helpful programming step diagrams that were included in the others are replaced by button representations and display diagrams interspersed in the text. While the text is a bit larger and easier to read, those separate programming pictorials seemed much easier to follow, especially if you are trying to play "beat the clock!" One notable improvement in this documentation is a section with charging instructions for the NiMH battery. A chart near the end of the manual listing approximate operating times using various batteries unfortunately does not include estimates for the included NiMH battery.

The RL-115 takes the musical keys concept found on the RL-501 to a new level with a feature that can add unique DTMF tones to a number of key press and programming operations.

Transmit and receive audio reports turned in by our reviewers on this unit are very good, but not quite as good as that on the other two units. As with the other units, this radio also gets pretty hot if you transmit on high power for extended periods. Information in the manual recommends you limit transmit/receive duty cycle in the high power position to 1-minute on/3 minutes off. As with the '112, a higher performance antenna would make a useful accessory, as it might allow you to use the high power setting more sparingly.

Typical street pricing on the RL-115HP is around $200. This makes it slightly lower than other similarly styled and equipped 2-meter H-Ts. If you consider the advantage of the additional capacity and charging convenience of the included NiMH battery, the RL-115HP should be a very popular choice for the budget-conscious ham.

Manufacturer: Maha Communications and Electronics Inc, 2841-B Saturn St, Brea, CA 92821; 800-376-9992; fax 714-985-9221; **maharexon@maha-comm.com**, **http://www.maha-comm.com/**. Manufacturer's suggested list price, RL-501HP, $360; RL-112HP, $220; RL-115HP, $290.

The ClearSpeech-Speaker and ClearSpeech-Line DSP Audio Filters

Reviewed by Joe Bottiglieri, AA1GW
Assistant Technical Editor

Noise and interference plagues me in both my home and mobile station. Nearby neighbors seem to select new home electronics devices based primarily on the level of RF interference they generate. Since my own electronic devices (read—*amateur radio transmitters*) probably result in some reciprocal interference, I often hesitate to approach them to suggest "cures" for these unintentional signal sources.

As for the car, I should spend the time with the recently updated edition of the *ARRL RFI Book* and use the information in the chapter on automobile RFI to track down the RF noise. Most likely it's coming from the decade old ignition wires or distributor components. I hate to do this though, as it would eliminate one of our product review test fixtures for evaluating noise blanker performance in mobile HF transceivers.

Many times, the level of interference I encounter is not high enough to completely obscure the signals I am trying to receive. Typically the racket is more just an inconvenience, making listening for any length of time fatiguing at best.

The ClearSpeech-Speaker

The ClearSpeech-Speaker is an attractive external mobile speaker featuring built-in DSP-based noise filtering. Connect it to a 12 V dc source, plug it into your radio's external speaker connection, switch it on, and its adaptive DSP circuitry automatically tracks and reduces the background noise, helping to make voice and CW signals more intelligible and considerably easier to listen to. The only control on the unit is a noise filter on/off switch, so there's no messing around trying to optimize various knob setting as is usually required with most other audio DSP units.

You will notice some coloration of the sound of the desired audio. Individual word syllables or CW notes seem slightly choppy, and the commonly noted "watery" quality heard in the processed audio with nearly all audio DSP systems, both built-in and external, is evident. My feeling, especially for mobile applications, is that the reduction in background noise is worth it. Though the unit does not entirely eliminate the raspy buzzing I usually suffer—the level of noise is reduced to an acceptable level. Desired signals strong enough to be heard above the noise with the filter switched off are much more pleasant to listen to with the DSP engaged.

I experienced one of the more convincing examples of the unit's effectiveness while traveling on my daily commute. A power pole not far from my house seems to be the source of a tremendous amount of electrical noise. The resulting peak S-meter reading as I drive by is typically well above 10 dB over S9 across the entire 20-meter band (and most of the other HF bands as well). I usually turn the HF radio's volume down, or shut the set off, rather than listen to the incredible racket.

With the filter switched on, the noise level in the speaker rises only very slightly, but not to the level where I'm tempted to crank down the volume. Stations that I am listening to as I approach the noise source will disappear when the signal level of the electrical noise exceeds their signal strength, only to reappear as I pass the pole and reach a similar distance on the other side.

One problem I encountered when using the ClearSpeech-Speaker is a considerable reduction in the volume level of my mobile installation. The maximum audio output level when using the device is just barely adequate in my moderately noisy vehicle.

Discussions with Noise Cancellation Technologies' technical service department revealed that the audio input circuitry of this unit is designed for use with radios providing about 5 W of audio. My transceiver's specifications indicate about 2 W of audio output. If you need a higher level of audio output in your application, you may want to consider adding a small amplifier to the line between the radio and the filter.

The ClearSpeech-Line

The ClearSpeech-Line is a DSP filter in a small black metal enclosure. Noise Cancellation Technologies indicates that the DSP circuitry in this device is essentially

Table 4
Noise Cancellation Technologies ClearSpeech-Speaker

Manufacturer's Specifications	*Measured in ARRL Lab*
Power requirements: 13.8 V dc, 0.18 A.	0.22 A, tested at 13.8 V.[1]
Size (HWD): 5x6.9x2.6 inches; weight, 20.4 ounces.	
Audio output: 6 W.[2]	
Noise reduction: 12 dB.	15 dB.
Tone reduction: 50 dB.	65 dB, tested at 1 kHz.

[1]When the noise reduction is active, the current consumption drops below 0.18 A.
[2]Volume is not adjustable within the speaker unit, so the speaker output depends upon the audio output of the transceiver. For typical HF transceivers, this figure will be approximately 2-3 W.

Table 5
Noise Cancellation Technologies ClearSpeech-Line

Manufacturer's Specifications	*Measured in ARRL Lab*
Power requirements: 13.8 V dc, current not specified.	0.10 A, tested at 13.8 V.
Size (HWD): 0.82x2.75x3.2 inches; weight, 4.3 ounces.	
Noise reduction: Not specified.	15 dB.
Tone reduction: Not specified.	55 dB, tested at 1 kHz.

identical to that in the ClearSpeech-Speaker. The audio output of this filter is at line level. This unit must be used with an external amplified speaker.

Initial installation of the filter can be a bit confusing. You'll need to provide a cable from your radio's external speaker jack to the 3.5 mm mono jack on the rear panel of the unit, labeled "TO MIC." For my application this was a cable with 3.5 mm mono plugs on each end. The cable for connection to your amplified external speaker is provided. On one end of this cable is a 2.5 mm mono plug, on the other end is a 3.5 mm mono plug. You insert the smaller plug into the jack on the back of the filter labeled "TO CRADLE." For my installation, I used a 3.5 mm mono to stereo adapter on the larger end of the cable and plugged this into the stereo line-in jack on my station computer's sound card (although direct connection to any sufficiently amplified speaker will work). 12 V dc is also required to power the filter. A dc cable is provided—an ac adapter is available as an accessory.

The unusual labels on the rear panel are due to original intended application for this filter. Noise Cancellation Technologies designed this device for use in a wide variety of communications and telephone systems. In those systems, this DSP filter is typically used to remove background noise from microphone audio. Some minor circuitry changes are made to make the unit suitable for use with the audio output of receivers.

To gain a better understanding of the wide variety of applications these DSP filters are finding, visit their Web site at **http://www.nct-active.com**. The site also provides several *wav* files so you can hear the performance of these filters under various background noise conditions.

As with most audio-based filtering systems, these units cannot do much to recover signals that are significantly below the level of the interference. Unlike some of the other DSP filters, they are also not intended to reduce QRM. They work best on constant or near constant noise sources.

After setting the filter up and tuning around the HF bands, I was pretty impressed with the performance of this unit. Tuning around on SSB, listening in to various QSOs and switching the filter on and off revealed very similar performance to the ClearSpeech-Speaker.

I spent quite a bit of time comparing the performance of this DSP filter to my home transceiver's built-in DSP. For QRN type noise, the ClearSpeech-Line did a significantly better job of reducing constant and near constant background noise and did not introduce as high a level of audio coloration as the built-in DSP. Any nearby carriers that appeared were quickly tracked and eliminated by the adaptive circuitry. The filter is not effective, however, for reducing QRM from nearby band activity. It is not intended for this type of rapidly varying interference.

On CW, the unit really shined. Listening to CW activity on 40 meters in the late evening I found the device to be extremely effective for significantly reducing the audio level of the background noise and for eliminating heterodynes from AM shortwave broadcast stations—without sacrificing the ability to hear even the weakest signals.

As we all know, the best way to eliminate any interference is at its source (please *do not* tell my neighbors this!). For my home station, I've found an antenna noise-cancellation unit to be very helpful in reducing the noise floor caused by local interference. The addition of one of these ClearSpeech DSP filters as a "second line of defense" can sure make extended listening considerably easier on the ears.

Manufacturer: Noise Cancellation Technologies Inc, 1 Dock St, Suite 300, Stamford, CT 06902; tel 203-961-0500, fax 203-348-4106, **http://www.nct-active.com**. Price: ClearSpeech-Speaker $109, ClearSpeech-Line $99.

Hi-Res Communications Collins KWM-2 Video

Reviewed by Rick Lindquist, N1RL
Senior News Editor

Billed as "Everything you ever wanted to know about the KWM-2 but were afraid to ask," the Hi-Res Collins KWM-2 video provides a cook's tour of these vintage and still-popular classic HF transceivers. This 1992 video features Dennis Brothers, WA0CBK, a former Collins employee and acknowledged expert on Collins repair, maintenance and modifications within the Collins collector community. As the video points out, Brothers' Western Nebraska Electronics is one of the two Collins-authorized service facilities in the US. This production avails KWM-2 owners of Brothers' extensive Collins expertise and experience.

The KWM-2 video comes on two VHS cassettes—four hours of material in all! Along with the tapes you get 18 double-sided photocopies including factory service bulletins, a list of parts needed for modifications and a table of contents indicating the elapsed time locations on the video tapes for various subjects. You'll also find three double-sized pages that make up a complete schematic diagram containing Brothers' handwritten notes.

Producer Floyd Soo, W8RO, has divided the video into major sections: Tools and Equipment; Transceiver Operation; Troubleshooting and Repair; Modifications; Alignment; and General Hints. These are sensible general categories, and, as the video advises, "It is recommended that you familiarize yourself with the section of the videotape that you'll be working with."

It's clear from the outset that Brothers knows his stuff. This tape puts you almost literally at the feet of the master, so to speak. Brothers' running, ad-lib narration is very good and to the point. He doesn't bumble or stumble, although sticklers for detail might note that he isn't always quite grammatical. For the most part, the tape uses this sort of running narrative technique throughout, so the viewer gets to see most operations in "real time."

Obviously, given Brothers' intimacy

with the KWM-2 he works pretty quickly, so you have to pay close attention and maybe even take notes. It can be a bit like a college lecture. His familiarity also means that he is quite comfortable with working on a "live" chassis, something that most probably would prefer to avoid whenever possible. Of course, taking voltage readings (the video includes a section that covers the essentials) requires working "live," but the video needs to include liberal safety warnings in this regard.

Newcomers to Collins also should be forewarned that Brothers occasionally uses Collins jargon. While this can be confusing at first, his meaning usually becomes clear within the context of the discussion at hand.

There's lots of great stuff in here. If you've got a KWM-2 or have ever yearned to own one, you'll not only consider this videotape a "must have," but you'll probably want to take the time to view it from start to finish (we'd recommended taking a few breaks along the way) to get a better feel for the radio and how to service or modify it. For example, the 70K2 oscillator can be a source of trouble for this transceiver (and for other Collins gear that use it). This tape includes a section that explains the highlights of removing and rebuilding this unit, including cleaning and relubrication to make tuning smooth as silk.

The Modifications section (which includes the 70K2 rebuild) is long. While Brothers says that 39 mods are available for the KWM-2, the video does not cover ones he considers "frivolous." But the several that he does cover are ones that can lead to tremendous operational improvement—some of them covered in various Collins service bulletins.

The Alignment section information was excellent. Brothers' reveals a much easier and more accurate IF alignment procedure than the one described in the original Collins Manual. I wondered whether this should come a bit sooner in the video instead of in Part 2. One nugget of information I found interesting was that Brothers sets up his KWM-2s for an optimum 0.75 µV of sensitivity with a 21 dB s/n ratio. He also explains neutralization in detail, and here the closeups work pretty well.

The General Hints section also was quite useful. Brothers shows where and how to look for general problems, things to clean, adjust, or tighten. For example, he suggests torquing down all tube-socket hardware, since these often are used as grounding points beneath the chassis. The KWM-2 owner might want to check out this information first, before actually moving on to Alignment or Modification.

Owners of classic gear like the KWM-2, often want (or need) to clean it up. Brothers cleaning technique includes spraying on a detergent solution (using a detergent that's available at Kmart), rinsing with water, and drying *in the oven* at 150° F for a couple of hours! His technique to beautify and protect the front panel uses an application of a solution of acrylic floor wax. Relays are another potential trouble source. Brothers spends several minutes discussing relay maintenance and cleaning, including which tools and cleaners to use, and which to avoid.

Overall, if I had any additional complaints about this video, they were not so much with the content as with the production values. My major gripe was that most shots were too wide and insufficiently lighted to ensure a usable depth of field. Some of these problems are probably due to the difficulties of filming "on location" in Brothers' small shop. On several occasions, Brothers points to components beneath the crowded KWM-2 chassis that are invisible or indistinguishable to the viewer—either because the videographer is unable to get a tight enough shot or because Brothers' hands or fingers are in the way or shadowing the viewing field. Frequently, the videographer focuses in vain to bring Brothers' point of discussion into clear view, but he's hampered by the narrow depth of field. Liberal use of macro shots would have gone a long way to improving the information presentation. I would like to see more "cuts" and fewer "zooms" and "pans" in the shooting too, but these additions would have increased the level of post-shoot production considerably.

There were other, minor annoyances, too, such as the 8 or 9 seconds of blank screen where the narration continues (between the introduction and the "meat" of the video on Part 1). In another case, Brothers' audio has a distinct ac hum on it. One segment had Brothers in profile, paging through a manual and discussing additional modifications. His hair is distinctly out of focus, giving him an otherworldly appearance. A straight, on-camera shot of Brothers (whose full face we only briefly get to see) would have been preferable for this. Then there are instances of jump cuts and places where transitions could have been a bit smoother, and I would have liked better "miking" of Brothers to begin with. Apparently, Soo uses a mike on set rather than on Brothers himself. The result is audio with less presence and more room ambiance. Also, the video is not close-captioned for the hearing disabled. By and large, however, these production deficiencies do not detract from the value of the overall information.

Several years ago, I owned a KWM-2A (that's the model that covers additional bands). I came away from the Hi-Res KWM-2 with a strong desire to own a KWM-2 or 2A again, and that my next purchase after that should be this video set.

In addition to this set, Hi-Res also offers similar repair and maintenance videos for a wide range of Collins gear and the Hammarlund SP-600-JX.

Producer: Hi-Res Communications, 8232 Woodview Dr, Clarkston, MI 48348; 248-391-6660; **hires@rust.net**; **http://www.rust.net/~hires**. Price: $90 for the two-videocassette set. QST

New Products

AMERTRON'S *TRUE LEGAL LIMIT™* ANTENNA TUNER

◊ Designed to handle the demanding requirements of high-power antenna matching, the Ameritron ATR-30 is rated for 1500 W continuous or 3000 W SSB/CW from 1.8 to 30 MHz. A high-Q, high-current edge wound silver plated roller inductor and two 500 pF capacitors in a T-match arrangement can match nearly any antenna fed with coax or balanced feed line. Additional features include a three-core choke balun, a six-position antenna switch and a 6:1 gear driven inductor control with a turns counter. A large illuminated cross-needle SWR/wattmeter with peak or average settings and full-scale ranges of 300 or 3000 W is provided. Power for the metering circuit can be supplied by an internal 9 V battery or from an optional external AC adapter. The ATR-30 is covered by a one-year warranty. For more information, visit your favorite Amateur Radio products dealer or contact Ameritron, 116 Willow Rd, Starkville, MS 39759; tel 800-713-3550 or 601-323-8211, fax 601-323-6551, **mfj@mfjenterprises.com**; **http://www.ameritron.com**.

NEW TRIODES FROM SVETLANA

◊ Svetlana Electron Devices Inc expands its line of power tubes with the release of a 8874/3CX400A7 and the announcement of a soon to be available 3CX800A7. These Russian-built high-performance triodes are exact drop-in replacements for equivalent tubes. The Svetlana 8874/3CX400A7 is currently available from stocking distributors; the 3CX800A7 will be released this summer.

For more information on Svetlana products, or to find a distributor in your area, contact Svetlana Electron Devices, 8200 S Memorial Pkwy, Huntsville, AL 35802; tel 256-882-1344, fax 256-880-8077; **info@svetlana.com**; **http://www.svetlana.com**.

Next New Product QST

Hints & Kinks

*Edited by **Bob Schetgen, KU7G** • Senior Assistant Technical Editor*

HEATH SA-5010 KEYER MEMBRANE-SWITCH-PAD FIX

◊ The first membrane-switch label on my keyer lasted from when I built it in 1986 to the early '90s before it peeled apart and became inoperative. The replacement label never did stick properly; it kept peeling away from the plastic case and separating internally. First, the **OFF** button failed, then the **TUNE** button, neither was any real problem, but then the **ON** button quit; *that* was a problem! I tried many different glues to keep the whole thing in place (none of which worked), but of course they had no effect on the internal separation of the switch-label circuits. I searched for a replacement keypad, but since it needed 22 buttons, I found nothing. About this point, we wore out our second VCR. So, what do you do with a dead VCR? After years of keeping it and its predecessor going, I had noticed that each VCR had a number of little (about 1/4-inch-square) momentary-contact switches in it. Guess what? This dead one (a Mitsubishi HS-316UR) had exactly 22 of them!

Using a small soldering iron, I soon had them removed, and an ohmmeter showed that they had two parallel-connected pins on each side of the switch, which would help secure them in their new home. The old switch label and glue cleaned up easily with a nonchlorinated automotive brake cleaner.

After drawing a diagram of the switch pad labeled with the pin connections to the PC board (see Figure 1), I decided it would make wiring easier if I moved four of the switches. I transposed **PRAC** with **WT** and **TUNE** with **WPM**. Thus, the whole top row of keys (now: **WT**, **7**, **8**, **9**, **WPM**) and the two outside keys in the row below (**RPT**, **SPC'G**) each have one side of their switch connected to pin 7 on the PC board. I drilled a bunch (four per switch) of holes to fit the switches, using the smallest bit I had (1/16 inch).

I pressed the top row of switches in place (I didn't even glue them) and laid a bare #26 solid bus wire against the intersection of the case and the leads to pin 7. Each switch lead protrudes through the case just enough to contact the bus wire. Solder the wire (dead-bug style) to each pin-7 lead. Next bus-connect all switch leads that go to pin 8—these are on keys 0 through 6. Then bus-connect all leads destined to pin 6 (**PRAC**, **P/C**, **LD**, **SND**, **STOP**) and then the leads for pin 9 (**OFF**, **ON**, **TUNE**).

Connect single wires (4 to 6 inches long) to one spot on each of the buses for connection to the circuit board. I used #26 stranded wire, but my PC board holes are too small to pass tinned, stranded wires. A piece of solid wire soldered to the end of each stranded wire proved much more workable. In retrospect, it would be easier to use solid wire throughout—or enlarge the holes a little. Add a wire from the open side of each switch (simply poke the end in the hole alongside the pin and solder) that will go to the PC board. Be sure to label each wire with its destination pin—I simply wrote on clear tape put around the wire like a flag. Check each connection with an ohmmeter as it is completed.

Chop the connector on the PC board into many pieces and then unsolder the pins one at a time. This is much less likely to ruin the foil traces on the board, than removing the connector as one piece.

The wires from the new switch array can now be soldered to the board in order. The board is marked with two numbers, for pin 1 on the right and pin 14 on the left, viewed from its component side. You are now ready to put it back together and back into service.

I always liked this keyer, and although there are some nice ones on the market, they all have something this one does not—a price tag. Total cost of this project: zero! I sure do miss Heath; no other company has such good manuals. It's too bad many of today's hams have missed the wonderful experience of building a Heathkit. Nevertheless, there are still kits on the market (not to mention repairs like this)—build one and get a *real* feeling of accomplishment.—*Robert W. Whitford, WA7STA, 13201 Persons Rd, Bow, WA 98232;* **slvrqtrs@skat.net**

Table 1
SA-5010 Keypad Connections

Key Label	*PC-Board Pins*	
OFF	9	14
ON	9	13
TUNE	1	9
STOP	2	6
P/C	6	11
LOAD	6	10
SEND	3	6
WPM	2	7
SPC'G	3	7
WT	7	11
RPT	7	12
PRAC	6	12
0	5	8
1	8	11
2	4	8
3	2	8
4	8	12
5	8	10
6	3	8
7	7	10
8	5	7
9	4	7

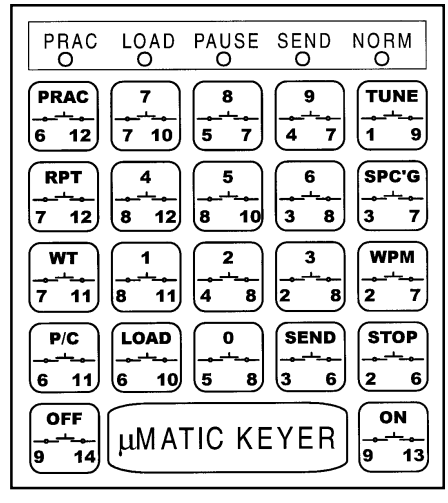


Figure 1—A diagram of the SA-5010 keypad showing labels and pin numbers for PC-board connections.

DIMMING BACKLIT DISPLAYS (FT-900)

◊ The FT-900 frequency display is backlit by 10 parallel rows of LEDs (labeled "BL" in the FT-900 manual). Each row consists of four series-connected LEDs and a couple of resistors. These 40 LEDs mount behind the LCD display. That's how you make a low-current backlit display without incandescent bulbs, which run hotter, draw more current and fail periodically.

The backlight on the FT-900 was too bright for my taste, but there's no dimmer control for it. I solved the problem by installing a resistor in series with the +9 V lead of the LED array. This reduces the current and therefore the brightness of the entire display. The idea is adaptable to any similar display scheme.

The backlight assembly is connected to the PC board by two flexible wires: +9 V and ground. I put the resistor in the 9 V lead (labeled "9" in the FT-900 manual). I used a 1/4 W resistor, and the resistor does not get hot, but I wouldn't want to try it with a 1/8 W. In this case, I found 43 to 47 Ω an ideal range for me. Experiment with differ-

ent resistance values to get the brightness you want, or install a potentiometer (say, 500 Ω to 1 kΩ—*Ed*). If the resistance is too great, you'll get no light out of the display.—*George Beloin, WA1PIX, 4 Daniels Farm Rd Unit 275, Trumbull, CT 06611*

SAVE-A-BATTERY, SAVE $40

◊ After a couple of NiCd battery packs (#19-300) for my RadioShack HTX-202 failed prematurely with a shorted cell, I decided it was time to dig into a pack. Maybe a failure analysis would reveal a way to save it. I've been dealing with NiCds for a long time, so I recognize a hopeless case when I see one. Conversely, if a $40 pack can be saved, then I say, "Let's do it!"

The indication of a pack failure is a blank screen with the radio turned on. The pack will not take a charge. To ascertain if your project has any hope of success, measure the voltage between the plate on top and the positive screw terminal on the pack. If it measures a constant 6 V or so, even after a standard charge, you probably have a shorted or dead cell. (Five cells × 1.2 V = 6 V.)

Let's proceed through a repair, and you will see that it's worth a try if you possess minimal soldering experience. You'll need a 40 W chisel-tip iron, rosin-core solder, ordinary tools found around your shack, a voltmeter, a roll of good electrical tape such as Scotch #33 or #88 and replacement cell(s) with solder tabs on them—RadioShack #23-191. They're $6 for two; save the second one for another pack that's bound to go soon.

Locate a small, covered plastic container or bag to hold the six small—very small—very special metric screws that hold the case together. Pay close attention to these little devils. The top, or "tension plate," has three self-tapping screws and one machine screw. The case bottom has two machine screws. To be sure that you replace all screws in their proper positions, make a drawing as you remove them. Store the screws carefully.

Now, lift up the tension plate and split the case in to its halves. This will give you access to the shrink-wrapped six-cell pack. Measure the voltage on each cell to locate the bad guy: the cell at 0 V. Don't attempt this repair if the NiCds don't have solder tabs on them; do not solder directly to a cell.

Now comes the surgery. Slit the shrink-wrap covering and discard it. The pack will not fall apart because the cells are interconnected with battery straps. Peel back the straps on the positive electrode and negative case of the defective cell. Two resistance welds attach each strap to the cell. Remove the cell by pulling it out of the pack and replace it with a new solder-tabbed RadioShack NiCd cell (with the *proper* polarity).

Orient the cell so that its straps line up with the straps on its neighbors in the pack, but you do have some leeway. The cells in the packs are series connected. You will connect the strap from the case (negative) of one old, good cell to the positive-electrode tab of the new cell. Then connect the strap from the case (negative) of the new cell to the positive electrode of another old, good cell. Solder strap-to-strap only and make sure that the straps from positive electrodes clear the case. Apply the iron only long enough to make a solid solder connection between the straps.

Be careful handling the pack now; don't short-circuit any cells. Clean off excess flux with a cleaner; alcohol will do it. Finish the job by wrapping a layer of electrical tape all around the battery pack. Cover bare electrodes where you can and generally reproduce the original shrink sleeve, but allowing the original wiring to remain loose. There is a mysterious unlisted part "buried" among the cells that is probably a thermistor or heat-sensitive fuse. We will leave that be.

Position the pack in its case, squeeze the halves together and replace the tension plate with the three self-tapping screws and machine screw located in their proper positions. Install the two machine screws in the bottom of the case and "*Voila!*" you've just saved yourself about $40. Check the voltage before you celebrate. It should be about 7 V. Now for the difficult part. Don't install the pack and use the radio yet. Completely recharge the pack first! A fully charged pack should measure about 8.2 V for about an hour or so after a recharge and then slowly drop off.—*Budd Meyer, K2PMA, 6505 Yellowstone Blvd, Forest Hills, NY 11375*

References

B. Meyer, K2PMA, "Charge It! Your NiCd, That Is," *QST*, Mar 1977, pp 29-31.

B. Meyer, K2PMA, "Nickel-Cadmium Pandemonium," *QST*, Mar 1982, pp 32-34.

LADDER-LINE SPACERS

◊ I was attracted by the article in Hints and Kinks, August 1996, "Make High-Quality Ladder Line at Home." Here's a new idea for a spreader, a sample is shown in Figure 2. The material is salvaged from vinyl siding jobs very cheaply—free! Simply cut them out with the width determined by the impedance required. Drill two holes slightly smaller than the 14 TW covered stranded wire, I use a 7/64-inch drill, then with a pair of shears or tin snips cut into the holes from the side—and you have it!

They are good for any temperature, do not deteriorate in any way or move out of position and the big thing—they can be clipped onto the line in minutes. I have used these in Canada's rigorous climate for over 25 years. Try these high-quality spacers.—*Key Orton, VE7BLU, 3116 Rock City Rd, Nanaimo, BC V9T 1T4*

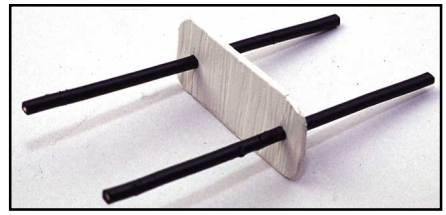


Figure 2—VE7BLU's ladder-line spreader cut from surplus vinyl siding.

CRYSTAL-RECEIVER IMPROVEMENTS

◊ Anyone inspired to build a crystal broadcast receiver by W7DE's interesting article in December 1997 *QST* may profit from the following suggestions resulting from breadboard experimentation several years ago:

- Provide five or six coil taps, each tap connected to a pole of a selector switch. It is often desirable to increase volume (higher tap) or increase selectivity (lower tap).
- Provide an SPDT switch for quick changes between two 1N34 diodes, each diode mounted in Fahnstock clips for easy replacement. There is a great difference among diodes with regard to weak reception. Two glass-bubble Sylvania 1N34s I had significantly outperformed plastic-encased (probably silicon—*Ed.)* diodes. Diodes from the same manufacturer differ in performance.

With a 60-foot antenna only nine feet above the ground and only one local broadcast station, I was able to comfortably receive about 20 stations from Chicago to Los Angeles at night.—*Benson Boss, K2GHM, Star Rte 2 Box 15D, Deming, NM 88030*

Hints and Kinks items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters (see page 10), or via e-mail to **rschetgen@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments.

New Products

ANTENEX *TRAPPER*™ LIGHTNING ARRESTER

◊ The Antenex *Trapper* lightning arrester is designed to prevent damage to sensitive radio equipment by limiting energy surges to less than 45 V within approximately 100 nanoseconds. Specifications indicate insertion loss of less than 0.1 dB up to 500 MHz and less than 0.25 dB from 500 to 1000 MHz.

Available in inline and bulkhead configurations, these units feature rugged gold anodized housings; brass plated type N connectors and user replaceable gas discharge tubes.

For more information on the *Trapper* and their entire line of antennas and antenna related products, contact Antenex, 2000-205 Bloomingdale Rd, Glendale Heights, IL 60139; tel 800-323-3757 or 630-351-9007, fax 630-351-9009, or visit them on the Web at **http://www.antenex.com**. QST

Next New Product

Technical Correspondence

*Edited by **Paul Pagel, N1FB** • Senior Assistant Technical Editor*

ELECTRICAL SAFETY

By Jack G. Hollenbeck, W6JIC, 21110 Phoenix Lake Rd, Sonora, CA 95370

◊ Of late, there seem to be a number of "weekend electricians" coming out of the woodwork—and most of them don't know what they are doing! (I happen to know one or two.) These do-it-yourselfers take chances and often knowingly don't adhere to the electrical codes. In addition to creating a hazardous condition, they fail to realize that should there ever be a fire and their "shortcut" is found, their insurance company may refuse to reimburse them for ensuing damage. In many cases, they do not!

In Amateur Radio circles, a common offense is tapping into a 30 A dryer line, an electric-oven feed, or a 50 A range feed to deliver power to the ham shack for an amplifier. To tap into either is against the *National Electrical Code* (NEC), and the codes of all local building-inspection departments with which I am familiar—this includes most of the cities and counties in the San Francisco Bay area. If one of those circuits is not being used for its intended purpose and is therefore available, an extension box of the proper type and size equipped with properly sized breakers, may be used as a small electrical-distribution panel to deliver power to an Amateur Radio station. Contact your local city or county building department; they'll provide you with the help you need in finding out the best way to do this. Those departments have the final say about electrical installations. The employees are there to protect and help, not hinder homeowners.

Using a home's electrical protective (safety) ground as a shack's station ground should be avoided at all costs. I have found situations in which a protective (safety) ground was as much as 10 V positive to the neutral wire. Such a condition is caused by static build-up, and there isn't much that can be done about that. Grounding a protective ground at more than one point is asking for trouble with ground loops.

Houses in some communities are required to have the green (or bare) wire attached to the *individual outlet*. In other communities, all that is required is that the ground wire be connected to the *outlet box*—if the box is metallic. If the *outlet box* is *nonmetallic* (many plastic boxes are in use today), the ground wire must be connected to the individual outlet. Many contractors use plastic outlet (and other) boxes with fair success. Personally, I don't care for them because the outlet-mounting screws sometimes strip and don't hold properly. It is most difficult to replace such an outlet/switch box in an existing wall.

In plating shops, where many chemicals are used, plastic conduit is mandatory and the ground wire must be connected to *each* outlet. In most laboratories, metal conduit is usually called for, sometimes rigid pipe and other times, electrical metallic tubing and metal boxes. As a rule, grounds there must be connected directly to each outlet. With the usual three-wire with ground, 120 V outlet, the outlet yoke is common to the green grounding screw.

For quite a few years, many communities have required the service neutral bus be connected beneath a house's foundation, or to a ground rod driven into the soil. This practice is known as a "Eufort ground." Water-pipe grounding is rarely used nowadays because most outdoor water-service pipe is plastic.

Over the years, I have often seen instances in which a light in one room brightens when a light in another part of the house is turned off. This is a *most dangerous condition,* and the electrical utility company, or an electrical contractor, should be called to inspect the condition as soon as possible. *Do not attempt to fix this situation yourself!* Somewhere, the ground system has broken down; trying to repair it without the proper equipment can result in injury or death. To be exact, the grounding system at the distribution step-down transformer has opened and the house grounding system has also opened. Should you get between the ground wire and the ground connection (or ground rod), *you* become the circuit-completing conductor!

All houses being built today should have at least a 200 A service. With so many electrical appliances on the market (and more will come), it doesn't take long to overload a lower amperage service.

One person I know has a home at a summer resort. The air conditioner there blew fuses when it started. After some checking, I discovered that the contractor had used 40 A fuses, because the *running current* of the motor was slightly less than that value. What the contractor had forgotten (or did not know) is that the *starting current* of a motor can momentarily exceed the running current by a factor of seven or more, depending on the pressure in the system when the motor starts. I installed 50 A fuses, and to my knowledge, the system has never acted up since.

I spent over 55 years troubleshooting, examining and building installations. During many of those years I found engineers had tried different (illegal) methods of doing their jobs. I performed electrical work on many different projects, including the building, maintaining and operation of the Stanford Linear Accelerator Center (SLAC), at Menlo Park, California. I retired from the Accelerator at the end of 1981, and try to keep myself up to date on current NEC changes.

I first learned about the Eufort ground at a union meeting some 30-odd years ago. The local inspector will tell the contractor or builder that he wants a specific length and size of bare copper wire laid in the bottom of a trench *before* the house foundation is poured. The wire is brought to the main neutral bus in one continuous length. In some localities, a driven rod is sufficient for the electrical service. Up here in the foothills (at an altitude of 2500 feet), the soil is 95% fragmented granite, with huge boulders, making it nearly impossible to use a driven rod! With so many underground public water systems using nonmetallic pipe, water pipes are no longer used to ground (stabilize) an electrical service in most localities.

BATTERY POWER SOURCE ADD-ONS

By Don Gagnon, WB8HQS, 2805 Nordholme Ave, Fort Wayne, IN 46805-2945; **dagagnon@pipeline.com**

◊ Here are a pair of add-ons to accompany "A Versatile, High-Capacity Battery Power Source" described earlier in *QST*.[1] The circuits of Figures 1 and 2 interconnect with U6 of that project (see pages 34 and 35 of the referent). An audible tone warning for the two lowest voltage levels monitored appears in Figure 1. Figure 2 shows a circuit that automatically "pushes" the **BATTERY TEST** switch (S5) every few minutes.

With the circuit of Figure 1 in place, when the **BATTERY TEST** switch is pushed, if the battery voltage is below 11.0 V, U6C pin 14 goes low (its LED [DS6] extinguishes) and turns on U1 of Figure 1. If the battery voltage drops below 10.5 V, U6D pin 13 goes low (its LED [DS7] extinguishes), U2 turns on and U1 is disabled. The tone frequency of each oscillator in Figure 1 is set by their respective potentiometers, R3 and R9. A range of 700 to 1400 Hz is available.

I tried to implement the circuit of Figure 2 with a pair of LM555 timers but found the '555 too unstable for use as a multivibrator. U1 is a free-running oscillator that, with the RC values shown, has a period of about 3.5 minutes. The output supplies a

[1]Don Gagnon, WB8HQS, "A Versatile, High-Capacity Battery Power Source" *QST*, Sep 1998, pp 33-36.

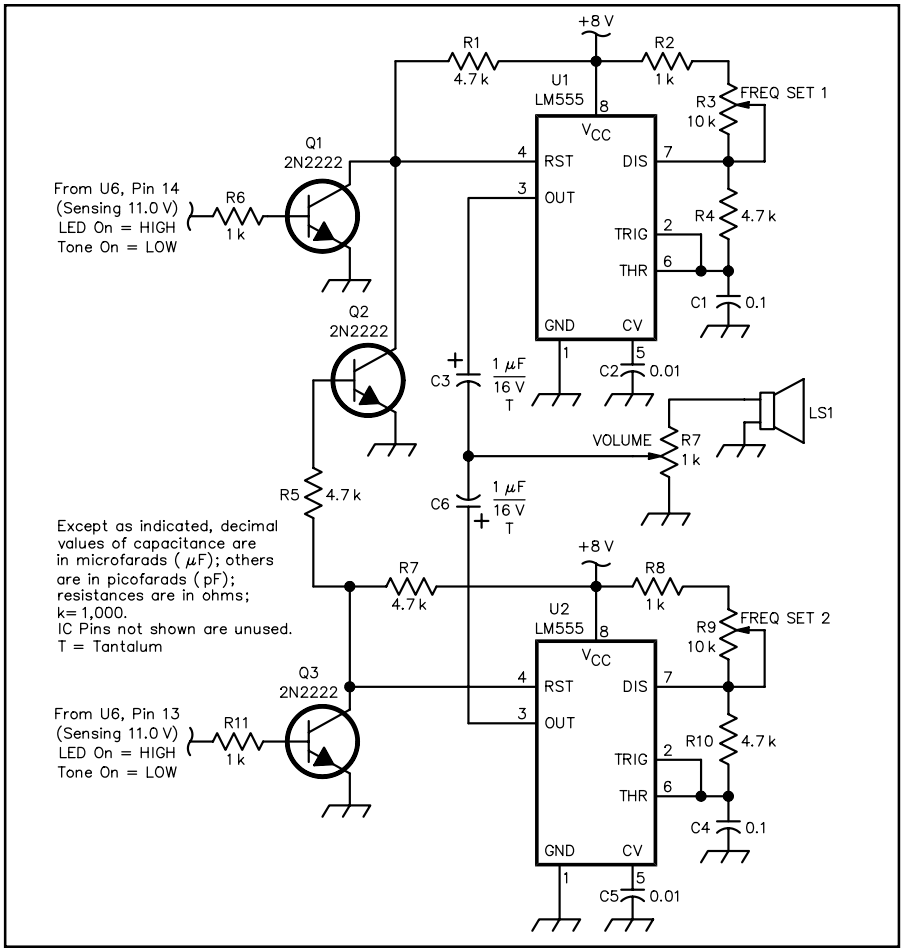


Figure 1—Schematic of the tone-generator circuit. Unless otherwise specified, resistors are 1/4 W, 5%-tolerance carbon-composition or film units. Equivalent parts can be substituted.

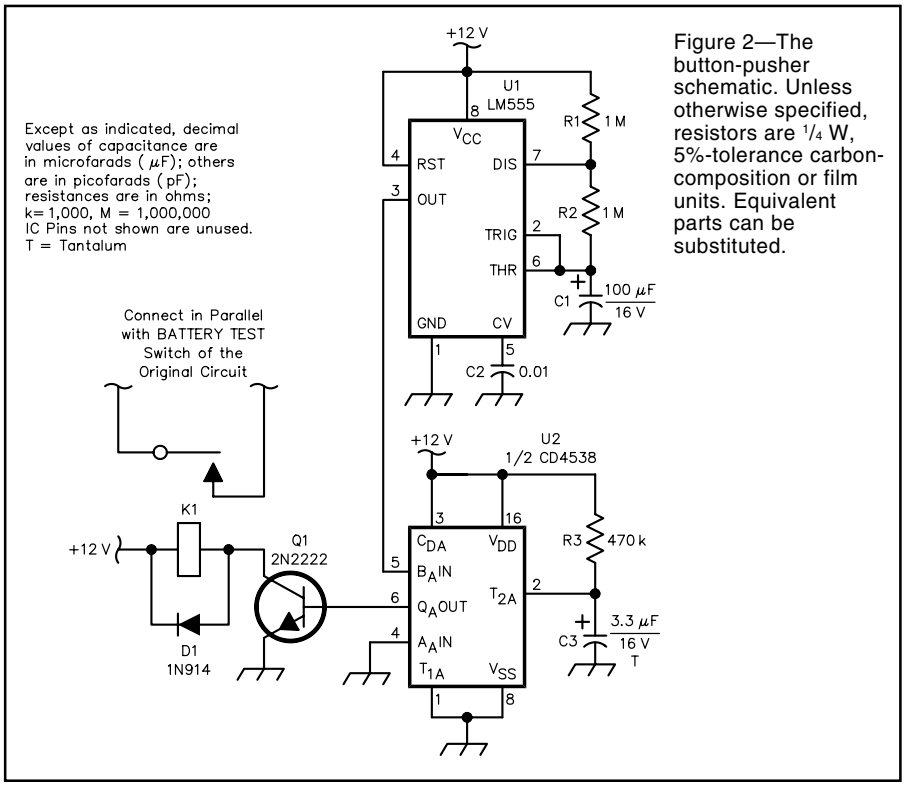


Figure 2—The button-pusher schematic. Unless otherwise specified, resistors are 1/4 W, 5%-tolerance carbon-composition or film units. Equivalent parts can be substituted.

negative-going pulse every 3.5 minutes to the input of one-half of a CD4538 dual, monostable multivibrator, U2. When U2 gets the negative-going pulse, its output goes high for 1.5 seconds and turns on Q4, which energizes the relay, K1, and shorts the **BATTERY TEST** switch contacts. Thus, every 3.5 minutes, a battery test is performed. If you use the tone-generator circuit of Figure 2, you can have an audible alert if the battery voltage is getting low.

I tried to use commonly available components throughout. Although this is a low-duty-cycle circuit, use a relay that requires a low operating current. For the circuit of Figure 1, +8 V is available at the output of U5 in the referent circuit. The +12 V supply for the circuit of Figure 2 is obtained at the **OUTPUT** connector, J1; anywhere after the main power switch is fine.

Use the following equation to calculate U1's period (Figure 2):

$$\text{Period (in seconds)} = (R1 + 2 \times R2)\, C / 1.44 \quad \text{(Eq 1)}$$

where R is in ohms and C is in microfarads.

Resistor tolerance can be as great as ±10%; electrolytic-capacitor tolerance can be ±20%. So, if you want a precise time, measure the component values before installing them.

Letters for this column may be sent to Technical Correspondence, ARRL, 225 Main St, Newington, CT 06111, or via e-mail to **ppagel@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing a work, please send the author(s) a copy of your comments. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

Feedback

◊ Please refer to "A Computer Keyboard CW Encoder," *QST*, Dec 1997, pp 32-35. In Figure 1, page 35, an inset shows two optional transistor keying circuits that are indicated as possible replacements for K1. It has come to our attention that these transistor circuits do *not* work properly; don't use them. In addition, we've received one report (from Stark W. Craddock, WB4NHC [**scrad@prodigy.net**]) of circuit lock-up evidently caused by the absence of a missing internal pull-up resistor in the 87C751. If your unit experiences lock-up, author Ron Alspaugh, W6NKS (**ron@gv.net**) suggests adding a resistor externally. Connect a 150 kΩ, 1/4-W resistor between U1 pin 9 and ground. To date, approximately 350 of these encoders have been built. Finally, note the author's e-mail address change.—*tnx Stark W. Craddock, WB4NHC and Ron Alspaugh, W6NKS*

Edited by **Rick Lindquist, N1RL** • Senior News Editor

Hams Respond As Killer Tornadoes Rake South

Hams in Tennessee and Arkansas responded as unusual tornadoes threatened, then struck, Tennessee and Arkansas in January, killing 16 people. Tornadoes in the Jackson, Tennessee, area January 17 killed eight people. Another eight died when tornadoes struck in the vicinity of Little Rock and White County, Arkansas, January 21. Additional severe weather hit parts Louisiana, Texas, Mississippi, and Alabama the following day. Losses were expected to top $1 billion.

The National Weather Service called it "an unprecedented outbreak of tornadoes for January." In Arkansas, the NWS confirmed that between two and three dozen tornadoes damaged or destroyed homes and businesses in Little Rock, Beebe, Searcy, and in other locations to the north and east. Large hail also was reported.

Arkansas

"For the first 24 hours," we were it," Arkansas Section Manager Roger Gray, N5QS, said of Amateur Radio's communication support."We have had an incredible response from the amateur community."

In addition to health-and-welfare and damage assessment traffic, he said Amateur Radio filled the gap as long-distance telephone circuits became overloaded.

Keeping SKYWARN net control stations on the air turned out to be a bit of a challenge. White County Emergency Coordinator James Wiles, KK5WM, in Beebe, was forced to seek shelter after his home suffered tornado damage. He was later able to return to salvage his radio equipment and set up a station at a Red Cross shelter. Some of those who took over also found themselves dodging the storm. In all, five operators took turns handling net control duties. Later taking stock of the emergency response, Gray proposed constructing a permanent emergency net control site in the center of White County.

"Another wild night in Arkansas," said ARRL Vice President Joel Harrison, W5ZN, in Judsonia, who reported "lots of damage." "I have to tell you, in my 41 years of living here, I have never seen storms like we had last night," he said. Harrison said the first line came through around 5 PM, "then another, and another, and another for what seemed like every half hour till about 10:30 PM." Even the Governor's Mansion in Little Rock did not escape damage.

A health-and-welfare and disaster recovery net evolved from the storm-spotting net after the storms had passed through, and net control moved to Red Cross headquarters. Damage in the stricken area was widespread.

Juanita Freeman, KD5DDS, assists at the Beebe, Arkansas, Red Cross shelter.

Michael Goodman, KD5FAQ, in front of the brand new Beebe Junior High School building destroyed in the January 21 tornado, assists with health-and-welfare traffic.

David Nailing, KF4JYP, and Rickey Brown, KE4CES, of the West Tennessee Amateur Radio Society, handle ARES and Red Cross net control duties in Jackson, Tennessee.

Ham stations were established at two Red Cross shelters and at the police station in the badly damaged town of Beebe. Salvation Army teams from Little Rock and Jonesboro integrated ham gear into feeding stations in Beebe and McRae. "Over the course of the net, the stations handled untold numbers of Red Cross messages and probably 50 to 100 health-and-welfare messages," Gray said. Three crossband repeaters allowed low-power stations to access distant repeaters.

Gray said more than 70 hams assisted with traffic for the Red Cross and Salvation Army as well as health-and-welfare inquiries, emergency, and general disaster recovery. Several amateurs also worked with cleanup crews, disaster assessment teams, or Red Cross mobile feeding stations.

Gray himself drew climbing duty when a group of amateurs made repairs January 24 to the Beebe Ambulance base station antenna, located atop a water tower. Formal nets ended on January 27.

"The hams of this area have been great and bounced right back," Gray said in early February. Hams even managed to participate in the School Club Roundup February 8-13 from the McRae High School gymnasium. "Almost every student we talked to remembered one of their teachers [Larry Sicks, AC5AV, a math teacher at the school—*Ed*] sitting in the lobby all day talking on the radio, and it gave them another perspective of our hobby."

Tennessee

Madison County EC Kenny Johns, AB4EG, reported more than 300 homes, apartments and mobile homes completely destroyed, and an equal number badly damaged. The police department and city hall were demolished, and the downtown area was heavily damaged.

Johns said a SKYWARN net was activated following a severe weather alert, but no tornadoes were expected. Two ham weather spotters saw the twisters—illuminated by the lightning—and took shelter. After the storms struck, more than two dozen ARES members in Montgomery County handled health-and-welfare traffic at the emergency operations center for 22 hours. During that time, the EOC repeater was knocked off the air, but amateur repeaters, including one at the EOC, remained up. Johns later worked with volunteers from the Memphis area and other communities to assist the Red Cross with damage assessment in 19 affected counties. Tennessee hams made good use of the VolNet, a

2-meter net interfaced via a 440-MHz link that provides coverage from Little Rock to Nashville, as well as parts of Mississippi, Missouri and Kentucky. Johns credited early weather warnings via VolNet with helping to save hundreds of lives.

Delta Division Vice Director Henry Leggette, WD4Q, visited the Jackson area January 28 and met with members of Johns' club, the West Tennessee Amateur Radio Society, who were coordinating activities on VHF and UHF. He reported that more than 200 hams helped out in some way after the storms. "This made me very proud to be an Amateur Radio operator," Leggette said.

A few days later, early on the morning of January 22, twisters struck the town of Clarksville, Tennessee, causing significant damage. As the storm approached, members of the Clarksville Amateur Radio Transmitting Society's (CATS) disaster team, under the direction of Albert Furlow, KA1FFO, activated a SKYWARN net. After the storm, CAT members worked with the Red Cross and emergency officials, passing spot information and later assisting with damage assessment. Furlow reports hams also donated communication and volunteers for a weekend storm cleanup in late January.

COLOMBIAN QUAKE SPRINGS HAMS TO ACTION

Amateur Radio nets activated in short order on 20 and 40 meters following an earthquake January 25 in West Central Colombia. The quake, measuring 6 on the Richter scale, killed upwards of 1000 people, injured thousands of others, and caused major structural damage in Colombia's mountainous coffee-growing region.

Dallas Carter, W3PP, in Laurel, Delaware, monitored some of the first reports of the quake via Amateur Radio on a 20-meter relief net run by HK3SA and HK3RQA. He also assisted as a US net control—sometimes for as long as 12 hours a day.

Ham radio was a major source of information out of the affected area in the hours immediately following the disaster. Carter said HK3SA was flown into the city of Armenia and set up an HF operation to maintain contact via 40 and 20 meters to directly handle international health-and-welfare requests as well as keep in touch with Bogota, the capital. He said 2-meter repeaters were being used for local emergency coordination.

The Salvation Army Team Emergency Radio Network (SATERN) established a net on 14.265 MHz and helped with inquiries about victims. As of late February, three Salvation Army disaster relief teams were helping residents of Armenia and Pereira to recover from the massive earthquake. According to SATERN, immediate aid, including meals, vaccinations and clothing, was being provided from a Salvation Army base camp. The International Red Cross in Colombia also dispatched a relief team, plus equipment and supplies. The ARRL has offered its assistance to the Liga Colombiana de Radioaficionados (LCRA), the League's IARU sister society in Colombia.

Call Center Established

Hams were helping to staff a Miami telephone call center for those seeking to get in touch with family and friends in Colombia's earthquake-stricken region. Many of those staffing the call center are affiliated with the Sociedad Internacional de Radio Aficionados (Society of International Radio Amateurs). SIRA also helped mobilize Amateur Radio assistance in the wake of Hurricane Mitch, which devastated parts of Central America.

David Rosen, K2GM, of the Radio Readiness Group says continued spotty telephone service to the region has kept the call center busy since it started up February 2. The center resulted from an AT&T request to the Radio Readiness Group and SIRA for help in furnishing information about the affected region to callers unable to get through.

With the assistance of AT&T, BellSouth of Florida, and the Florida Public Service Commission, 12 incoming lines were set up to the Colombian Information Center, 305-805-5550. Callers on AT&T who can't get through to the affected region in Colombia automatically are referred to the Colombian Information Center number.

Rosen said the center was getting dozens of calls seeking information about family and friends in the stricken communities. Call center volunteers were seeking to obtain the requested information using Amateur Radio, the Internet, and other resources, and pass it back to the callers.

Rosen received FCC approval on behalf of the US stations involved in the relief effort to operate SSB on frequencies between 7050 and 7100 kHz to maintain direct contact with emergency nets operating in that part of the band. "Having the ability to communicate directly with the Colombian nets on their own frequencies is much more efficient than working the HK stations crossband," he said.

FCC TO DELAWARE HAM: RETEST OR LOSE TICKET

The FCC has notified a Delaware ham that she must take her Amateur Radio examinations again or lose her license. The FCC's Riley Hollingsworth, K4ZDH, said "questions were raised" about how Sheila Bowden, N3QQS, of Millsboro, upgraded to Extra, and that the FCC was requesting that Bowden start from scratch and retake "all the elements." Hollingsworth notified Bowden by letter February 16.

The FCC has the authority under Part 97 to re-administer exam elements previously administered by VEs. The FCC may administer the exam itself or designate a VEC or VE to administer the retesting session—typically employing a VEC that's different from the initial testing session.

The FCC told Bowden that she must retake the Amateur Extra Class examination series at an ARRL/VEC session before March 19 or lose her license. "You will be granted an Amateur Radio license consistent with any elements that you pass upon re-examination," Hollingsworth's letter said.

Hollingsworth said the FCC planned to call in additional amateur licensees for retesting in the near future. In all of those cases, Hollingsworth said, the FCC has reason to suspect the integrity of the examination process.

"The ham community needs to have a sense of confidence in the examination system," Hollingsworth said, adding that enforcement must not focus solely on operating violations.

In January, the FCC dismissed four Extra class grants, including one formerly held by Bowden's husband, Wayne, after the Commission discovered "irregularities in the administration of the examination by the Volunteer Examiners." Wayne Bowden, formerly AA3RT, took the complete Amateur Radio examination series at an October 4 W5YI-VEC session. He had not held an amateur license before then.

An FCC probe continues into alleged testing irregularities at Pennsylvania W5YI-VEC sessions October 4 and 6, including allegations that examinees might have been coached or given test answers. Also dismissed were the Extra class grants of Elmer Smith, N3UNR; Kenneth Sharp, AA3RU (now N3TPN); and Philip DiGenova, N3UNS.

Hollingsworth advised the four applicants that if they still wished to upgrade, they would have to take a new exam under another VEC and VE team. But he cautioned three who took their exams at an October 6 session in Warminster, Pennsylvania, that "additional issues" about the initial exam session "may be raised at that time."

In addition, Hollingsworth told Bowden that the FCC had information that he had been operating as AA3RT after the four applications had been set aside by the FCC last November 10 pending a final determination. "You are cautioned that such operation is unlicensed, and will result in monetary forfeiture," Hollingsworth wrote. "It would also seriously jeopardize any future applications to become an Amateur Radio Operator."

FCC SUSPENDS JERSEY HAM'S HF PRIVILEGES

The FCC has suspended for six months the HF privileges of a New Jersey ham. The FCC notified Walter P. Miller Jr., W2YEE, of Edison, New Jersey, that his privileges to operate below 30 MHz were being suspended for 180 days.

The license-modification letter February 16 from the FCC's Riley Hollingsworth, K4ZDH, came in the wake of an earlier warning letter to W2YEE. Hollingsworth alleged that W2YEE's 75-meter operation on the evening of February 4 was contrary to the Amateur Service Rules. Hollingsworth said Miller violated Section 97.1, basis and purpose of Amateur Radio; Section 97.101(a),

good engineering and good amateur practice; and Section 97.119, identification requirements. The alleged operation took place on 3901 and 3950 kHz, the FCC said.

"Specifically, you were apparently broadcasting and talking to no particular station for several hours, during which time you prevented the use of the frequencies by others and maliciously interfered with other stations attempting to use the frequencies," Hollingsworth wrote. He said the Commission also had information indicating similar behavior occurred the next evening on 75.

"Such operation endangers the basis and purpose of Amateur Radio as a service, degrades it for other licensed operators and cannot be tolerated," Hollingsworth wrote.

Section 97.1 Basis and purpose, of the rules discusses the public service value of Amateur Radio, as well as its contribution to advancing the state of the art; expanding the reservoir of trained operators, technicians and technical experts; and enhancing international goodwill. Hollingsworth is on record linking certain types of on-air behavior with a negative perception of Amateur Radio in other countries.

A warning letter had gone out to Miller January 8 regarding similar operation. The FCC informed Miller at that time that he faced license revocation and fines.

Miller had 30 days to formally protest the modification.

HAMS STILL ON HOLD FOR ULS

While the FCC's Wireless Telecommunications Bureau began using the Universal Licensing System (ULS) on February 16, hams remain in a holding pattern on ULS until the FCC establishes a ULS Amateur Service database. That's not expected to happen until later this year. This means that hams must continue to use Form 610 and its variations. These so-called "pre-ULS forms" are valid until further notice. On-line services are limited to Form 900 renewals within 120 days of expiration and Form 610V vanity call sign application. License modifications are not yet available on-line unless done at the same time as a renewal.

The ULS is a new, interactive licensing database developed by the WTB to consolidate and replace 11 existing databases and licensing systems, including the Amateur Service. Among other things, it will replace the venerable FCC Form 610 series with a new Form 605 and will provide for electronic fil-

ARRL HONORARY VICE PRESIDENT J. A. "DOC" GMELIN, W6ZRJ, SK

CIRCA DECEMBER 1977 *QST*.

Former ARRL Pacific Division Director Jean A. "Doc" Gmelin, W6ZRJ, of Los Osos, died February 11, 1999. He was 71. An ARRL Honorary Vice President, Gmelin was Pacific Division Director from 1968 until 1978. He also had served as an assistant Pacific Division director, as Santa Clara Valley Section Communications Manager, and as an Assistant Section Manager for public service and external relations in Santa Barbara.

First licensed in 1947, Doc was a past officer of the Santa Clara County Amateur Radio Association, the Merced Amateur Radio Association, and the Northern California Traffic Association. He was active in the Southern California CW Net. He was a member of the A1 Operators Club and had been active in RACES.

A Life Member of the ARRL and a member of QCWA, Gmelin contributed feature articles to *QST* and was a columnist for *Worldradio* magazine.

Born in Michigan, Doc Gmelin was raised in California and graduated from San Jose State University. He served in the Naval Reserve as an aviation photographers' mate and later worked for several San Jose-area newspapers as a photographer. Later, he taught electronics and math and was audio-visual coordinator at a high school in Sunnyvale, California.

"Doc was known as the 'West Coast George Hart,' owing to his profound commitment to the National Traffic System," said ARRL Field Services Manager Rick Palm, K1CE. "He was dedicated to the perpetuation of the System and was one its strongest advocates. I respected his opinions. Doc was also a good personal friend and I will miss him greatly."

ARRL International Affairs Vice President Larry Price, W4RA, said Gmelin made significant contributions to Amateur Radio and to the League over the years. "He was a traditionalist who also believed in new technology and the necessity of change." he said.

David Long, K6EVQ, in Ventura, California, called Gmelin "the epitome of what a gentleman should be."

A combined Amateur Radio and Masonic memorial service was held February 14. Gmelin's wife, Caroline, K6BGM, is among his survivors.

MOONBOUNCE PIONEERS JOHN DEWITT JR, N4CBC, AND HANK BROWN, W6HB, SK

The man credited with being the first to bounce a radar signal off the moon—John DeWitt Jr, N4CBC (ex-W4ERI)—died at his Nashville home January 25, some 53 years after making radio history. A few days earlier, on January 21, the man who engineered the first Amateur Radio Earth-Moon-Earth contact in 1960 with hams on the East Coast—Orrin "Hank" Brown, W6HB—died in California. Both DeWitt and Brown were 92.

While awaiting US Army discharge following World War II, DeWitt and his Project Diana team—named for the Roman moon goddess—got the OK from the War Department to investigate the possibilities of bouncing a radio signal off the moon. At the time, DeWitt was a lieutenant colonel assigned to the Signal Corps Laboratories in Ft Monmouth, New Jersey. Project Diana achieved success January 10, 1946, when the team detected the radar signals reflected off the moon's surface. The event was trumpeted in the news media of the day as a major achievement, proving that radio waves could penetrate Earth's atmosphere.

DeWitt later returned to Nashville and broadcasting, eventually becoming president of WSM radio. Coincidentally, Brown also did stints in radio at KPO and KSBR. Brown later worked at Eitel-McCullough and served as Eimac's marketing director for 20 years.

Brown had been licensed continuously since 1923, and was a League member for nearly 50 years. He also was a charter member of the Santa Clara County Amateur Radio Association. In 1961, he received an ARRL Merit Award. He was a founding member of OSCAR and a project leader for OSCAR-3, the first real-time repeater satellite of any type.—*thanks to Julia Brown Sneden and Bob McKinley Jr, W2OMR; some information from press reports*

ROBERT PAGE BURR, K1MI (ex-W2KQP), SK

TV and electronics pioneer Robert Page Burr, K1MI (ex-W2KQP), of Matinicus Island, Maine, died December 31, 1998, of complications following heart surgery. He was 76. Page Burr once wrote that getting his ticket in 1937 set him on the path of a lifelong interest in Amateur Radio and electronics. After a stint in the Navy during World War II, Burr spent 10 years with Hazeltine Corp and was a key member of the team that developed the US color television standard. He chaired the National Television Standards Committee that eventually persuaded the FCC and the television industry to adopt the NTSC standard. Burr also is credited with many other inventions and developments and held more than 200 patents. He retired in 1987 as senior scientific officer of Kollmorgen Corp. He was a member of the Institute of Radio Engineers, the Institute of Electrical and Electronic Engineers, and the ARRL. He received the Charles J. Hirsch Memorial Award from the IEEE in 1977 for his contributions to engineering. Burr won the July 1972 *QST* Cover Plaque Award for his article, "The Flashlight Sidebander."

ing, modification, and renewal for amateurs.

The new licensing rules and revised application forms adopted by the Commission are contained in the *ULS Report and Order* in WT Docket No. 98-20. The FCC also took the occasion to amend the rules to make it easier for foreign hams to operate temporarily in the US. A subsequent February *Public Notice* (DA 99-314) outlined ULS filing procedures and revised forms. It also summarized how these changes will affect the application and licensing process for all wireless services, including services currently using ULS and those services in which ULS has not yet been deployed.

In January, the ARRL asked the FCC to make some minor alterations to its impending ULS rules. In a petition for partial reconsideration, the League said it wants the FCC to continue to issue paper license documents; to come up with a way for applicants not having a Taxpayer Identification Number—typically a Social Security Number—to meet ULS requirements to provide one; and to include on Form 605 a section for Volunteer Examiners to certify that an applicant has met the requirements for a new or upgraded ham ticket.

In addition, the League will ask the FCC to restore wording in Section 97.15(e) that references the limited federal preemption, PRB-1. The section was inadvertently deleted during the Commission's redrafting of the rules to accommodate the ULS changes.

The FCC subsequently did make provisions to assign TINs to those doing business with the Commission who lack other legal means to obtain one. The "assigned" TINs will consist of the letter "A" followed by eight digits. Alien licensees needing an assigned TIN should contact FCC Technical Support at 202-424-1250.

Prior to its latest filing, the ARRL had expressed concerns that the FCC might do away with paper license documents altogether and rely instead on the "license grant"—the virtual document that resides within the FCC's computerized amateur database. The League pointed out in its January petition that some states regulate possession of scanning receivers but exempt amateurs, and inability to produce a license document could result in "arrest and criminal prosecution as well as seizure of equipment by local law enforcement." The League said hams operating overseas also often must produce a paper document. The ARRL noted that the CEPT agreement requires US hams traveling in CEPT countries to possess a US government-issued license document and that ITU regulations "appear to require" a government-issued license document.

ARISS MEETINGS STRESS COOPERATION

Space officials from the US, Russia and several other countries gathered in Houston January 21-27 to continue plans to put Amateur Radio aboard the International Space Station. The effort ultimately will provide Amateur Radio with a permanent berth in space aboard the ISS. The so-called "Amateur Radio ISS accommodations meetings" at NASA's Johnson Space Center included a representative from Energia, the Russian space company that is building portions of the ISS. The Houston sessions focused on finalizing the design of the "initial station" ISS ham radio hardware. But perhaps even more important, the Houston meetings helped to clarify and firm up the role of the multinational Amateur Radio on the International Space Station (ARISS) program within NASA and Energia and highlighted the spirit of cooperation among the ARISS partners.

Initial station amateur hardware—primarily hand-held, dualband transceivers—will get to the ISS aboard a NASA shuttle. NASA has subsidized the NASA/Energia-required flight qualification testing for the initial station gear. Additionally, the agency devel-

In Brief

• **Next SAREX flight delayed *again:*** The only Space Amateur Radio EXperiment (SAREX) flight scheduled for 1999 has been delayed yet again. NASA sources say the STS-93 shuttle *Discovery* mission—originally set for January and subsequently delayed until March, then April, then May—now has been bumped until July 9. Schools on the schedule to have their students talk to the astronauts via Amateur Radio were to be contacted. The postponement will allow TRW Space and Electronics Group to evaluate and correct a potential problem with several printed circuit boards in the Chandra X-ray observatory, a *Discovery* payload. The problem has been traced to poor conductivity between different layers of the boards (ie, through-plating), according to NASA, which has directed TRW to remove and replace the boards in the main unit. The boards are made by B.F. Goodrich Aerospace. Reportedly, some 100 boards are involved.—*NASA and other sources*

• **Vanity update:** The FCC office in Gettysburg reports it received a total of 12,152 vanity applications during 1998. It picked up another 1417 in January, attesting to the program's continued popularity within the amateur community. The vast majority of applications were filed electronically. The FCC reports that fewer than 20% of last year's applications arrived on paper.

• **ARRL at NAB:** The ARRL will have a booth at the National Association of Broadcasters (NAB) annual convention April 17-22 in Las Vegas (exhibits open April 19). Heading up the volunteer staffing effort for the second year is Bill Cornelius, KC7GHX, of Henderson, Nevada. The NAB has donated the booth space for use by the League; volunteers will be hams from the Vegas area. The booth will offer copies of public service announcements, copies of *QST*, publication catalogs, ARRL membership applications and a variety of other handouts. In addition, the ARRL will provide copies of *The ARRL Handbook for Radio Amateurs* and *The ARRL Antenna Book* as prizes during a reception for hams attending the convention. Last year, more than 600 hams turned out for the event. Steve Scott, KD8S, of KVWB television in Las Vegas invites hams to use the Las Vegas Radio Amateur Club repeaters at 146.94 MHz (100 Hz CTCSS will be turned off) and 449.700 MHz. "Local broadcasters, Society of Broadcast Engineers Chapter 128, and club members will monitor the repeaters and provide assistance as needed during the convention," Scott says. General ham radio information is available on the 146.73 MHz "QST machine" at DTMF 5; *ARRL Audio News* is available at DTMF 7. For more information on Amateur Radio activity in Las Vegas, contact Steve Scott, 702-382-2121; e-mail **kd8s@skylink.net**; **http://www.lvrac.org**.

• **ARRL ham equipment insurance:** A special enrollment period for the ARRL's "All-Risk" Ham Radio Equipment Insurance Plan ends May 1, 1999. Since 1980, more than $6 million in claims have been paid to League members. The plan provides protection from loss or damage to stations and equipment by theft, accident, fire, flood, tornado, and other natural disasters. It's available to members and to affiliated clubs for $1.50 per $100 of replacement cost value, with a deductible of $50 per claim and $25 per item for repairs. New equipment valued at up to $1000 automatically is protected during the policy term with no additional premium. The plan also can provide coverage for computer software, TVs, recorders and other monitoring systems as related ham radio accessories. Protection includes equipment and accessories in your car as well as your home (antennas, towers and rotators are not covered). For more information, contact Albert H. Wohlers & Co, ARRL Insurance Plans, 1440 N Northwest Hwy, Park Ridge, IL 60068-1400; toll-free 800-503-9230; **cusv@ahw.com**.

• ***QST* Cover Plaque Award:** Larry Tyree, N6TR, received the January *QST* Cover Plaque Award for his article, "Kid's Day!" Congratulations, Tree!

• **ARRL/VEC telephone hours change:** For 1999, the ARRL/VEC telephone coverage hours are 8 AM until 5 PM, Monday through Friday. To contact the ARRL/VEC, call 860-594-0300; e-mail **vec@arrl.org**; fax 860-594-0339. Call sign inquiries can be directed to **http://www.arrl.org/fcc/fccld.html** or to the FCC, toll-free, at 888-225-5322 (an automated inquiry system is in place at the FCC to handle after-hours inquiries).

• **"Miss Vicky" retires from HQ staff:** ARRL Club Administrative Assistant Vicky Armentano, a 22-year League HQ staff employee in Field & Educational Services, retired January 29. She handled the coordination of affiliated and special service clubs with the ARRL. Best wishes, Vicky!

oped the safety analysis package for the ham equipment and oversaw the actual testing and flight-preparation activities for the ham hardware. Both NASA and Energia have agreed to support astronaut space walks required for antenna installation work aboard the ISS.

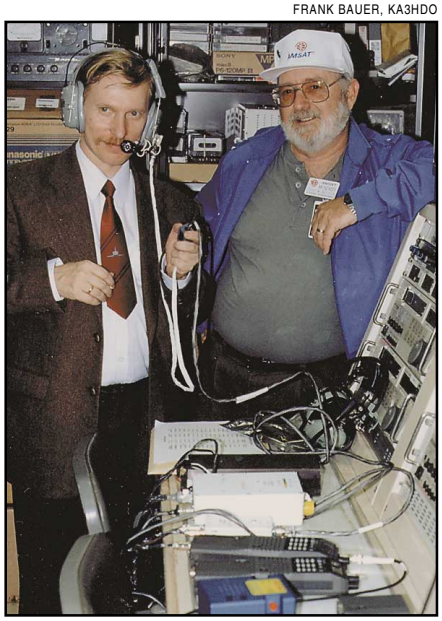
Frank Bauer, KA3HDO, represented NASA, ARISS and AMSAT-NA as one of the ARISS international partners. Sergej Sambourov, RV3DR, represented Energia, AMSAT-Russia and ARISS-Russia. Bauer called the meetings "extremely successful" and said he was impressed with ARISS's "teamwork, camaraderie and cooperation" during the NASA-Energia meetings. "Together we share a common vision to develop and operate a multifaceted Amateur Radio station on ISS," he said. Bauer said the ISS ham station "will be a great recreational outlet for the on-orbit crews, an exciting DX-pedition station for hams on the ground, and an outstanding educational outreach tool for students."

Sambourov, who's chief of Energia's Cosmonaut Amateur Radio Department, confirmed the availability of four dual-use antenna feedthroughs on the Russian service module to support Amateur Radio and ISS video during space walks. According to Bauer, Sambourov expressed a strong desire "to work with the ARISS international partners to develop a single coordinated Amateur Radio station on ISS."

Bauer said that NASA officials at the meetings were pleased at the high level of flight hardware expertise and on-orbit operations knowledge ARISS was providing to NASA and Energia.

The initial station includes 2-meter and 70-cm hand-held radios, a packet radio system and power supplies, provided by the US team; a digitalker, designed and built by the German team; antenna feedthroughs, power and space accommodations provided by the Russian team; and an antenna system developed by the Italian team. The design was solidified during an ARISS meeting in Surrey, England, last July.

FRANK BAUER, KA3HDO



Sergej Sambourov, RV3DR (left), of Energia, AMSAT-Russia, and ARISS-Russia checks out some of the ARISS equipment with AMSAT-NA's Lou McFadin, W5DID, of the ARISS Hardware Team.

The multinational ARISS developed more than two years ago, in part out of the need for a single, international focal point to coordinate Amateur Radio development and operations for the ISS. ARISS is composed of IARU and AMSAT representatives in Russia, Italy, Germany, England, France, Canada, Japan and the US.

In addition to Bauer and Sambourov, the initial station ARISS team attending from various IARU and AMSAT groups at the meetings were Ron Parise, WA4SIR, and Lou McFadin, W5DID (ARISS-US hardware team); Matt Bordelon, KC5BTL (NASA and ARISS-US); Thomas Kieselbach, DL2MDE (ARISS-German hardware team); Alberto Zagni, I2KBD, Fabrizio Bernardini, I0QIT, and Luca Bertagnolio, IK2OVV (ARISS-Italian hardware team).

In the wake of the Houston sessions, ARISS repeated its request for proposals from the ham community for follow-on Amateur Radio hardware. The ultimate ISS ham radio complement—Phase 3—will include equipment to operate from HF through the microwave bands with SSB, CW, FM, packet, ATV, compressed ATV, and SSTV capabilities. The German team also will supply a full-duplex repeater.

TEXAS HAMS MOUNT PRB-1 EFFORT

At the request of radio amateurs, a bill was introduced in the Texas House of Representatives to incorporate the essence of the limited federal preemption, PRB-1, into that state's laws. The measure, HB 1345, was introduced by State Rep Patricia Gray at the request of Karl Silverman, N0WWK. Silverman is president of the Johnson Space Center Amateur Radio Club.

The bill would amend the Local Government Code in Texas to prevent local jurisdictions from enacting or enforcing ordinances that fail to comply with PRB-1. The bill further would require ordinances dealing with Amateur Radio antenna placement, screening, or height based on health, safety or aesthetics to "reasonably accommodate amateur communications" and "represent the minimal practicable regulation to accomplish the municipality's or county's legitimate purpose."

A letter Silverman circulated to Texas clubs to gain their support for the measure cites the success of Virginia hams in passing the nation's first and only specific tower protection bill. Silverman's appeal asks hams to contact the governor and state lawmakers to express support for the pending legislation.

Last year, the Plano Amateur Radio Klub (PARK) was instrumental in negotiating an amateur tower compromise in that Texas city in the wake of concerns over Amateur Radio antennas and interference. The compromise would permit 50-foot towers or units that could be cranked up to 75 feet while in use without requiring a special-use permit.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Colorado, Georgia, Los Angeles, Sacramento Valley, San Francisco, South Texas, Eastern Washington, Western Washington, and West Virginia sections. You are hereby solicited for nominating petitions pursuant to an election for section manager (SM). Incumbents are listed on page 12 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are *not* acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. We suggest the following format:

(Place and Date)

Field Services Manager, ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the _____ ARRL section of the _____ division, hereby nominate _____ as candidate for Section Manager for this section for the next two-year term of office.

(Signature___ Call Sign___ City__ZIP__)

Any candidate for the office of Section Manager must be a resident of the section, a licensed amateur of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination. Petitions must be received at Headquarters by 4 PM Eastern Time on June 4, 1999. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 1, 1999, to full members of record as of June 4, 1999, which is the closing date for nominations. Returns will be counted August 24, 1999. Section managers elected as a result of the above procedure will take office October 1, 1999.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 1999. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the October 1999 *QST*. A section manager elected through the resolicitation will serve a term of 18 months. Vacancies in any section manager's office between elections are filled by the Field Services Manager. You are urged to take the initiative and file a nomination petition immediately.—*Richard Palm, K1CE, Field Services Manager*

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the North Texas and Wyoming section manager elections by the deadline of December 4, 1998, nominating petitions are herewith resolicited. See the above for details on how to nominate. QST

Public Service

Rick Palm, K1CE • *Field Services Manager*

National Hurricane Center Operators Commended

For more than 20 years volunteer amateurs have worked for the National Hurricane Center in Miami, Florida, gathering and disseminating weather data from fellow hams around the US coastline and throughout the Caribbean basin. This data has been critical to Center forecasters who use it along with other data to prepare forecasts. Director Jerry Jarrell said "Despite technological advances in satellite imagery and modern hurricane hunter airplanes, the hams are the only ones that can tell us what is actually happening on the ground and for this we are grateful."

On January 23, 1999 Deputy Director Max Mayfield presented certificates of commendation to the operators of station W4EHW located at the Center. During the busy 1998 season operators logged more than 180 hours for Hurricane Georges and nearly 90 for Hurricane Mitch, plus many hours for other storms. During Georges, W4EHW received almost 500 reports by radio, fax or the Internet.

The support to the Center started in a humble way, in the 1980 hurricane season. Julio Ripoll, WD4JNS, carried a borrowed HF radio in a cardboard box to and from the Center whenever a storm threatened. He set it up on a forecaster's desk, ran a wire antenna, and with a crew of five volunteers, operated for 12-hour shifts. Today W4EHW sports a donated state-of-the-art station that includes HF, VHF, and UHF radios, six antennas, and two computers that run APRS and Internet communications. Thirty volunteers work 3-hour shifts. Operators work with the Hurricane Watch Net on 14.325 MHz.

Last season, operators located the eye of Georges as it approached Cuba after devastating Haiti. Satellite imagery did not clearly show the eye, and because it was very close to Cuba, Air Force planes could not fly into it without violating Cuban airspace. A forecaster asked the W4EHW operator if he could locate a ham in Cuba. Contact was made with a ham on the eastern end of the island. He transmitted that he was standing on a chair with water on the floor and he was afraid of electrocution. He yelled into his mike "We are now having constant winds of 108 kph and water is coming from everywhere. I don't know if the walls will hold." The forecaster wanted to know the direction of the wind. As the operator's signal began to fade, he managed to transmit the direction. This information helped the forecaster adjust the estimated position of the eye for the next advisory.

W4EHW operators stand in front of the National Hurricane Center, Miami, Florida.

The goal is to obtain *measured* weather data from affected areas. If you have a home weather station, W4EHW can use your data (wind speed/direction; barometric pressure, falling or rising). Do *not* send third party TV or radio reports! Send reports to W4EHW via the Hurricane Watch Net on 14.325 MHz, by e-mail to **w4ehw@fiu.org** or as a last resort via fax at 305-553-5495. Please use the report form available on the W4EHW Web site at **http://www.fiu.edu/orgs/w4ehw/**.—*John McHugh, KU4GY, Amateur Radio Coordinator, National Hurricane Center*

PUBLIC SERVICE DIARY

Road workers hit a natural gas line on Highway 129 east of Gainesville, Georgia, on Thursday morning, November 5, 1998. Families were evacuated. As gas company workers attempted to cap the line, area residents returning to their homes from work and school were not permitted to enter the area.

The Northeast Chapter of the American Red Cross provided canteen services for emergency workers. Faith; Doug, KD4HMD; Joy, KF4ACW; and Grace Simmons, KF4DQN, of the Red Cross Disaster Assistance Team responded quickly with canteen equipment that they have provided for a number of years.

By 3:30 PM, workers were attempting to put a sleeve over a break in the line. If it did not hold, the threat of explosion would continue long into the night and evacuees would have to find somewhere to spend the night. Hall County Fire established a shelter at Fire Station One, a safe distance from the break. The Red Cross disaster assistance team prepared to staff the shelter.

ARES was called to support this multi-location effort. Debbie Johnson, KD4IAW, staffed the Fire Station shelter, the Simmons' continued to work the canteen at the break site, and Gwen Darby, KE4PWU, ran the 2-meter net and landline link to the Red Cross chapter house.

In the end the sleeve held. By 5:00 PM, families were permitted to return home. The canteen and Fire Station shelter were secured by 5:30 PM. The ARES team showed that it could respond even during a bad-weather business day.—*Rick Darby, KE4NJX, Hall County ARES EC*

The W3AA station at the Franklin Institute Science Museum in Philadelphia had a visitor in need on September 22, 1998. Sister Ana Perez, WP4HKV, of Yauco, Puerto Rico, wanted to establish contact with her family at home. Hurricane Georges had hit the island and taken out the phones. Sister Ana, with help from volunteer operators Al Tribble, W3STW, and Steve Hoch, WU3I, contacted stations in Puerto Rico who were able to inform her that the primary damage in her family's area was downed power lines. Electricity was gone, as was the Internet. They took her personal information to relay a message to her family and arrange a reply through a station coordinating messages in the Chicago area. The Chicago ham contacted Sister Ana at Saint Veronica's Convent in Philadelphia with the return message from her family.— *Stephen Hoch, WU3I, Station Trustee* QST

Amateur Radio Forum Slated for National Hurricane Conference

A program entitled "The Role Of Amateur Radio In Hurricane Communications" is scheduled for Tuesday, March 30, 1999, from 1:00 PM until 5:00 PM, at this year's National Hurricane Conference, set for Orlando, Florida. The conference runs March 29 to April 2. The venue is the Omni Rosen Hotel.

The program, moderated by conference vice chairman T. Michael Carter, N3PDK, features segments on Amateur Radio operations in support of state and local disaster relief, wide-area Amateur Radio hurricane operations, and a roundtable discussion on the future of Amateur Radio emergency communications. Presenters include ARRL Field Services Manager Rick Palm, K1CE; Virgin Islands Section Manager John Ellis, NP2B; Southern Florida Section Manager Kevin Bunin, K4PG; Northen Florida Section Manager Rudy Hubbard, WA4PUP; Section Emergency Coordinator Manny Papandreas, W4SS; District Emergency Coordinator Steve Richbourg, KO4TT; National Hurricane Center Amateur Radio coordinator John McHugh, KU4GY; Hurricane Watch Net Manager Jerry Herman, N3BDW; Steve Hailey of the American Red Cross National Headquarters; and John Fleming, WD4FFX, of the Florida Division of Emergency Management.

Topics of discussion will include an overview of Amateur Radio disaster operations; Amateur Radio operations in the Florida Keys, panhandle, and Caribbean during Hurricane Georges; and the role of ARRL Headquarters, the Hurricane Watch Net, National Hurricane Center operations, and National Red Cross Disaster Operations Center.

"This is a great opportunity for emergency planners and amateur licensees alike to gain a fuller understanding of Amateur Radio in the context of major hurricane disaster planning and operations," Field Services Manager Palm says. "The programs have been well-received at past conferences."

Conference sponsors have agreed to allow any Amateur Radio operators to attend the Amateur Radio session without registering for the conference, so spread the word and bring other ARES/RACES officials along. For more information, contact Rick Palm, K1CE, at ARRL Headquarters; **k1ce@arrl.org**.

Field Organization Reports

Public Service Honor Roll
January 1999

This listing is to recognize amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following 8 categories (as reported to their Section Managers). Please note the maximum points for each category: (1) Checking into a public service net, using any mode, 1 point each; maximum 60. (2) Performing as Net Control Station (NCS) for a public service net, using any mode, 3 points each; maximum 24. (3) Performing assigned liaison between public service nets, 3 points each; maximum 24. (4) Delivering a formal message to a third party, 1 point each; no limit. (5) Originating a formal message from a third party, 1 point each; no limit. (6) Serving as an ARRL field appointee or Section Manager, 10 points each appointment; maximum 30. (7) Participating in a communications network for a public service event, 10 points each event; no limit. (8) Providing and maintaining an automated digital system that handles ARRL radiogram-formatted messages; 30 points. Stations that qualify for PSHR 12 consecutive months, or 18 out of a 24-month period, will be awarded a certificate from HQ on written notification of qualifying months to the Public Service Branch at HQ

479 K9RTB
353 WB8SIW
291 KB8ZYY
271 WD8V
260 NZ4O
250 WB4GM
247 W0OYH
237 WB0ZNY
225 WB2UVB
223 KA2ZNZ
222 WA4GQS
217 W6DOB
214 K7BDU
211 N2LTC
208 W7TVA
207 WA9VND
206 W4PIM
201 WB5NKC
198 K4SCL
195 KE4OAV
194 KA4FZI
185 KC2ACL
184 N2OPJ
183 KB5WEE
180 N4ZNO
179 N2YJZ
178 N5IKN KU4IJ
177 WA1TBY
176 K7VVC
174 KT1Q N5JZ KT1Q
171 K6YR
170 W4EAT W4YQZ
161 W9CBE
168 WA5AA KA2GJV
165 WB5ZED
164 KB2RTZ WA4QXT N2RPI
161 K4IWW
160 AD4DO KB2VVB
159 N2WFN W3YVQ N5NAV W6IVV
158 NY2V WA7EES
156 K2UL
154 KA2CQX
N3WKE W4ZJY KF1L
153 KK3F N2JBA NR2F
151 N2VQA
150 KC2ALG
149 AF4FG
147 KB5W N0KJ WN0Y W6QZ KC5QZZ N1LKJ
146 N2XOJ N5OUJ
145 W7NWP
144 KD2AJ AA3SB N2CCN KC5OZT
143 N1VXP K4RBR WA1FNM
142 WD4JJ KO4A KC2AHS
141 N8FWA KC4ZHF KT6A
140 W0LAW K5DPG AA2ED N2WDS KD4GR K5AO KF4TQX WA6ODQ
139 N5XGI K3JL WB2ZCM
138 WO0A WD8DHC WB2GTG W2MTA N9BDL W9YCV KA9KLZ W7GB KC7ZZB W7ZIW
137 AB7NK W5GKH

KB5YAM NZ1D AD4BL
136 KS4FB KS4DW AC4CS K2CSS W2EAG
135 KE4JHJ N3WK K2DN WB1GXM
134 NX1A WX8Y WA5I
133 KA4UIV
132 KJ3E KC4RNF N1CPX W7LG
131 N2AKZ K8GA K4FQU WX4H
130 KA1GWE K2BCL N2XJ KC5PNM KF4NFP
129 KA2JXH KB2LML KE1AI KO4OL WB2WII
128 WA0TFC KI4YV NN2H WB2QIX AF9FA KB5TCH
127 W5ZX
126 N3ZKP KC4TLG
AF2K WA2UKX
125 KG6TU KG2D
124 KB8UEY W2RJL W1PEX WA1JVV KC5QGI KE4DNO
123 K5MC KD1LE
122 AA2SV W1ALE
121 W1JX K2BTP W2FR W4BNY KA7AID
120 K5IQZ W5CDX KL7Q KA5KLU K7GXZ W7GHT
119 KA8WNO N7DRP N7YYS
118 K5VV K0PIZ WB0WNJ W3OKN W4CKS K9GBR N9KHD KE4IFD W7VSE
117 W2AKT AG9G
116 KC3Y W9ZY KA1OTN
115 N3DRM
K5MXQ KN4VL WB5NKD
114 N4YYQ KC4PZA N2IKR N1DHT N3RB N1DHT
113 WD0GUF N3WAV WB2CZW KC5VLW
112 N8DD W5MEN N4GMU
110 N1ZYD N7AIK WA4EIC
108 W4XI WB2FGL W2PII KT4SJ K8VFZ W2MTO K7MQF
107 AA3GV N1IST
106 WA8SSI K5UCQ
105 KG5GE N5JUU WA2GUP
104 W4CC W1QU K8QIP K5VY K2PB
103 WA2CUW WA8EYQ KE3OX WA1QAA K8LEN
102 KE6MIW
KB2ETO KA4LRM
101 W2AZ W4DGH
100 N2AYK K8IG
97 KB0DTI AB5RV KB2VVD KJ4N
96 KF5A WA1D N1TAT
95 KB2VSD KF5A K3UWO
94 WB2IJH KC6SKK KB4WBY
93 KF6OIF KD6YJB
92 KD7ME
91 K4AIF W1JTH AA2NX
90 N2ZM
89 NR9K N8ZJU N1LAH N1SGL
88 KB2YUR W4RRX KD4HGU KE4WBI
87 KA1VEC W4ET W0MZI AA8SN
86 N0UOD
WD9FLJ WR8F AA8PI K1SEC WB7VYH
85 W2CC
84 AE4NW WA5FXQ
83 K2VX WB9GIU
82 N8VES KA7TTY
80 KD4JMV AC5Z
81 WA4EYU
79 WA4GLS
78 KA1VAX
77 KB2UQZ WB4PAM K8SH
76 W5XX KC5VOG KC8HTP W7EP KE3FL
74 NN2Y W4ZBA NB2D
72 KA0DBK WI8K N4MM
71 KK5GY
70 KB2VSR KB2YBU N2MSM KB2RHI N2WOT W5HK KG2OY KA9FVX

The following stations qualified for PSHR during the month of December, 1998, but their results did not appear in last month's column: WB2UVB 411, WA2CUW 211, K2UL 176, KA2CQX 170, N2WFN 158, N2VQA 155, KB2RTZ 146, KB2CDB 141, KA2YKN 138, AA2SV 131, KJ4N 114, N2FHJ 112, KC2ATQ 79, NN2Y 73, N2FHK 72, KB2HJJ 71, KB2VSR 70, KB2YBM 70, N2SOE 70.

Section Traffic Managers Reporting
January 1999

AL, CO, CT, DE, EMA, ENY, EPA, EWA, ID, IL, KS, KY, LA, MDC, MI, MN, MT, NC, MN, NFL, NNJ, NTX, OH, OK, OR, ORG, SB, SC, SD, SDG, SFL, STX, TN, VA, VT, WI, WMA, WNY, WPA, WWA.

Section Emergency Coordinator Reports
January 1999

There are 41,841 ARES members accounted for in SEC records. The following section emergency coordinators reported: CT, EWA, IN, KY, MDC, MI, MN, NLI, OH, SD, SFL, TN, VT, WA.

Brass Pounders League
January 1999

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
NM1K	732	293	911	4	1945
WX4H	1	899	1033	10	1475
N2LTC	0	509	534	33	1076
W0WPD	31	584	0	414	1029
W1PEX	0	130	873	10	1013
W7AMM	291	117	444	28	980
KE4DNO	3	429	463	4	899
K9RTB	0	482	69	321	872
KT6A	2	437	370	1	810
K0YFK	31	441	235	91	798
K9JPS	1	452	38	296	787
W6DOB	2	276	396	67	741
WA9VND	10	429	271	19	729
W5YQZ	0	347	374	2	723
K7VVC	16	323	373	2	714
KA4FZI	8	304	312	29	653
W0LVI	25	349	0	270	644
K4DOR	74	224	298	0	596
KF5A	0	299	292	2	593
KI0JO	—	—	—	—	560
N5IKN	0	279	95	184	558
K7BDU	29	180	304	17	530
WA4QXT	16	271	232	10	529
KK3F	2	256	234	22	514
N2YJZ	—	—	—	—	512
WB5NKC	58	92	348	5	503
WB9YPY	0	235	267	0	502
W9IHW	2	275	73	152	502
W3KOD	0	278	222	1	501

BPL for 100 or more originations plus deliveries: NZ4O 394, N0JUS 215, N0DDK 209, K8LJG 174, KB8ZVY 163, WB8SIW 156, K9GU 154, W0GGP 137. The following station qualified for BPL during December, 1998, but was not recorded in March *QST*: W6DOB 982.

The World Above 50 MHz

Emil Pocock, W3EP*

What Propagation Mode Is That?

Readers have asked from time to time how is it possible to tell what propagation mode is responsible for the signals they hear on the VHF bands? There are a bewildering number of possibilities (see Table 1), yet some operators seem to be able to identify in an instant the propagation mode of any signal they hear with a good deal of apparent confidence. How do they do it? How can anyone tell meteor scatter from backscatter, aurora from auroral E or distinguish among any of the other propagation modes?

There are no simple answers or secret methods. Those who are most proficient in this art have probably spent a good deal of time listening to a variety of signals under many different conditions. Although listening experience counts for a good deal, it is necessary to compare what you hear and observe with the known characteristics of various propagation modes in order to make reasonable deductions. Most of the time, you can identify the propagation with reasonable assurance, but even the most experienced VHFers cannot be certain in every case.

*Send reports to Emil Pocock, Box 100, Lebanon, CT 06249. Leave voice messages at 860-642-4347, or fax 860-594-0259 or e-mail w3ep@arrl.org.

Propagation Diagnosis

Each propagation mode has distinctive characteristics. Table 2 is a list of 20, or so, diagnostic indicators that can help create a characteristic profile for each mode. These profiles can be compared with what you hear to come to some justifiable conclusion. There are occasions when no profile seems to fit well and experience is little help either. Often there are alternate plausible explanations, such as the involvement of two propagation modes simultaneously, but sometimes the responsible propagation mode simply remains uncertain.

Operating frequency is a good place to start. Most propagation modes affect only a particular range of frequencies, and this characteristic provides the first diagnostic filter. The most common frequency ranges for each propagation mode are shown in Table 1. In some rare instances, frequencies outside the normal range might be affected, but these cases must be evaluated carefully and in light of all other observations.

This Month

April 8-9	Southeastern VHF Society Conference (Marietta, GA)
April 25	Good EME conditions

Check the higher and lower bands at the same time to get some sense of what range of frequencies are being affected. Perhaps you hear some stations on 144 MHz booming in from 1500 km away and suspect sporadic E. Check for activity on 50 MHz. Sporadic E affects lower frequencies first, then higher ones. Sporadic E on 144 MHz almost certainly means there is sporadic E on 50 MHz as well. If you hear nothing on 6 meters and no one else is reporting E skip on the band, it is probably not sporadic E you are hearing on 144 MHz. Check 432 MHz. You hear more strong stations! The resulting frequency profile—strong signals at a great distance on 144 and 432 MHz, but nothing on 50 MHz, strongly points to tropospheric ducting, not sporadic E.

Signal strength and quality also provide valuable indications. Signals propagated by sporadic E, for example, can be exceedingly strong, but may come and go over short time periods and fading can be severe. Signals propagated by aurora have a characteristic distortion variously described as a buzz or broad mushy hiss that, once heard, is easy to identify again as

Table 1
Propagation Modes, 50 MHz and Higher

Formal Name	*Informal Names and Abbreviations*	*Common Frequency Range*	*Ordinary Distance (km)*
Troposphere			
Tropospheric forward scatter	Tropo, normal tropo	50 MHz-300 GHz	1-800
Tropospheric ducting	Ducting, lift	50 MHz-300 GHz	100-4000+
Precipitation scatter	Rain or snow scatter	10 and 24 GHz	5-400
E-layer			
D/E-layer ionospheric forward scatter	Forward scatter	50-144 MHz	800-2000
Meteor scatter	Scatter, ms	50-432 MHz	800-2300
Field-aligned irregularities	FAI	50-144 MHz	100-2300
E-layer backscatter	E backscatter	50-144 MHz	50-2000
Sporadic E	E-skip, E_s	50-144 MHz	500-2300
Auroral E	Au-E	50-144 MHz+	500-5000+
Aurora	Au	50-432 MHz	50-2300
F-layer			
F-layer refraction	Skip, F_2	50 MHz	2,000-20,000
F-layer backscatter	Backscatter	50 MHz	100-2000?
F-layer sidescatter	Sidescatter	50 MHz	2000-6000?
Transequatorial field-aligned irregularities	Transequatorial, TE	50-222 MHz+	4000-8000
Reflection and diffraction			
Earth-Moon-Earth	EME, Moonbounce	50 MHz-300 GHz	50-20,000
Knife-edge diffraction		50 MHz-300 GHz	10-600
Solid-object reflection		50 MHz-300 GHz	10-800

unmistakably aurora. The various scatter modes and field-aligned irregularities also impose distinctive distortions on signals. Indeed, most propagation modes have characteristic profiles of signal strength, quality and fading that are often nearly conclusive by themselves.

Physics and geometry also put limits on the minimum and maximum distances over which radio signals can be propagated by various modes. Table 1 provides a general guide to normal distance limits. Path location and orientation are also important, as most propagation modes are limited to certain zones of the Earth or are more common over some regions than others. Auroral E is normally confined to the auroral zones, and signals propagated by E-layer field-aligned irregularities (FAI) always create radio paths skewed to the north in the Northern Hemisphere. Other propagation modes have strict orientation requirements. Signals propagation by transequatorial field-aligned irregularities (TE), for example, must be perpendicular to the geomagnetic equator.

Temporal considerations, including time of day, season and duration of openings also provide valuable clues. D/E-layer forward scatter is most prominent around noon local time and is unlikely at night. In contrast, auroral E is almost exclusively a nighttime phenomenon. Some modes have distinct seasonal cycles. Sporadic E is much more common and intense from May to August than at other times of the year. Ordinary F-layer propagation is possible only during the peak of the solar cycle. Nearly all modes have favored times of day that can provide some clues about what propagation mechanism is more likely.

The weather over a VHF path can help determine if a tropospheric mode, such as ducting, is responsible or help rule out such a possibility. Ducting is unlikely, for example, if thunderstorms appear anywhere along a signal path. Weather plays no known role nor provides reliable clues about any ionospheric conditions. Solar and geomagnetic activity provides valuable indicators in cases of suspected aurora, auroral E and F-layer propagation.

Equipment used can also provide useful information, especially when compared against signal strength. Weak signals may not be significant if participating stations ran low power, used simple antennas and were in unfavorable locations. Similarly, high power and large antennas are practically a requirement to make use of some propagation modes, like ionospheric forward scatter. Even transmission mode can be helpful. As a practical matter, it is unlikely that FM stations can really make effective use of aurora because of the distortion involved. Antenna gain and direction can also yield important clues, especially for identifying modes that have skewed paths.

Finally, some propagation modes usually appear only in association with another mode. FAI, for example, depends on the prior existence of a strong region of sporadic E. It would be unusual for an FAI contact to take place without simultaneous reports of sporadic E. In some cases, the simultaneous appearance of two propagation modes are required to explain unusual contacts. Sporadic E sometimes serves this role by providing a strong link into the F layer or into transequatorial regions that would otherwise be unreachable. Many unusual contacts that seem to fall outside the normal profile of any single propagation mode may very well be due to a combination.

Table 2
Diagnostic Indicators

Frequency
Operating frequency
Conditions on adjacent bands

Signal
Strength
Fading characteristics
Quality

Geography
Path length
Path location
Local geography

Temporal
Duration of opening
Time of day
Season
Solar cycle position

Weather and Solar Conditions
Weather along the signal path
Solar activity
Geomagnetic activity

Equipment
Antenna gain
Antenna polarization
Antenna headings
Transmitter power
Transmission mode
Receiver characteristics

Presence of other propagation modes

Mode-by-Mode

You can make your own identifications using the diagnostic indicators in Table 1. Note the frequency, signal strength and quality, path length, time of day and other indicators of the signal you wish to identify. Compare the profile you derive with the known characteristics of each propagation mode. Read about the characteristics of various modes in any reliable radio handbook or guide to propagation. You may want to extend the list in Table 2 by adding additional indicators as you learn about them. Ask more-experienced operators to help identify what you are hearing, but be sure to ask them *how* they know.

It will take many more pages to detail the characteristics of each propagation mode according to the 20 indicators suggested in Table 2. As column space permits over the next two years or so, look for short features headed "Is That Aurora?" or some other propagation mode. Those short pieces will discuss in greater depth the diagnostic indicators that can help you identify the propagation modes that make the world above 50 MHz so interesting.

ON THE BANDS

The mid-winter propagation blahs caught up with us in January. The nine days with single-hop 6-meter sporadic-E contacts were typical of the winter season. F-layer 6-meter DX declined noticeably, despite flux levels that exceeded 150 for several days. Tropospheric ducting, aurora and meteor scatter activities were scant, but there were eager operators on hand to take advantage of whatever was available.

Six-Meter DX

There was nothing new to report during January. The number of north-south openings between Europe and Africa, Japan and Australia and from South America to the Caribbean and southern US declined noticeably. Nestor Zucchi, LW5EJU, logged just one contact with EH8BPX, but reported no stations in Europe during the month. Transequatorial activity should be picking up again as you read this.

There were some 6-meter openings across the Pacific, primarily from California, Arizona, New Mexico and Texas to Australia and New Zealand on January 2, 6, 9, 11, 14, 15 and 25. All the reported contacts took place between 2300 and 0300. Dave Batcho, N5JHV (DM62), found three VK2 stations on January 2. Larry Lambert, NØLL (EM09), heard a VK2 near the calling frequency on January 6 via a sporadic-E link, but could not make contact due to QRM from California stations calling CQ right on 50.110 MHz.

During the January 9 opening, K5LLL and other Texans worked VK4s, N5JHV added VK7GK and N6XQ (DM12) hooked up with VK9VS along with several VK2s. On the 11th, John Butrovich, W5UWB (EL17), and others across the southwest worked a handful of ZL stations. New Zealand was in again on January 14 and 15. Chip Margelli, K7JA/6 (DM03), was delighted to work VK2DN with his 100 W and seven-element Yagi on the 25th.

More 144 MHz TE

Argentines LW5EJU and Alberto Petrucelli, LU2EG, continued to report 2-meter contacts with Puerto Rico via transequatorial field-aligned irregularities (TE). LU2EG worked KP4EIT on January 4 and 5 with his 25 W and two seven-element Yagis. On January 17, LW5EJU found KP3A, and on the 26th, he hooked up with WP4O and WP4IPM.

Sporadic E

The minor winter sporadic-E season yielded nine days of brief single-hop 6-meter openings on January 1-4, 9, 10, 14 and 16. Bill LeBaron, WØMTK (DM59), who provides monthly reports of his daily monitoring, did not record any opening that lasted longer than an hour and a half, at least prior to January 21. Even so, Bill Ralston, N1BR/7 (DN30) was delighted with conditions. Bill had just put up a five-element Yagi and used his 100 W transceiver to work nearly a dozen stations in North Dakota, Alberta, British Columbia and Washington on January 14 after 0330. Others from Kentucky to California and northward to the Canadian prairies found the band open for about an hour and a half that evening, one of the more widespread sessions of the month.

Six meters also opened across much of the West and Midwest for a three-hour period after 0100 on January 16. Many stations reported some sporadic E over the contest weekend, January 23

EMIL POCOCK, W3EP

EMIL POCOCK, W3EP

The ultimate roving machine of Stan Hilinski, KA1ZE. The aluminum telescoping mast extends to 30 feet with electric winch lifters (left). The mast, with the antennas permanently fixed on pivoting fixtures, folds over and collapses flat to fit neatly over the truck (above). The whole thing can be put up or taken down by one person in fewer than five minutes. The compartments contain a generator, amplifiers, tools and test equipment. Transceivers, transverters and controls are built into the cab.

and 24, especially throughout the midsection of the country. A lucky few reported 6-meter grid totals of more than 100, quite exceptional for the January contest.

It was also heartening—perhaps remarkable—to hear stations calling "CQ" every few kilohertz from 50.130 all the way up the band to 50.200, especially on Saturday! There was certainly much less QRM and contacts went much more easily and quickly. Congratulations to all who found their own quiet spot. One station was heard calling "CQ contest" on 50.110 (shame!), but thank goodness he did not stay long, probably because few contesters were willing to reply right on the DX calling frequency.

Tropo, Aurora and Meteor Scatter

CO2OJ (EL83) reported strong 144-MHz signals from Florida to Texas on the morning of January 27, but he was hampered by exceedingly high local noise at his end. Even so, he hooked up with K5LOW (EM22) and WA4EWA (EM63).

Weak aurora briefly appeared on 50 MHz during the late afternoons of January 14 and 24. KC8AGW (EN90) worked half a dozen stations from New England through the Great Lakes region during a 20-minute period after 2215 on the 14th. VE6XT (DO21) reported a few stations from Washington around 0000 near the end of the ARRL VHF Sweepstakes.

The Quadrantids have a reputation for high rates during a brief one or two-hour period on January 3. Shelby Ennis, W8WN (EM77) observed a definite peak between 1900 and 2000, when 50.125 MHz was impossibly jammed up with stations. K4MRW (EM64) thought the shower was best on 144 MHz from 1830 to 2000. Bart Jahnke, W9JJ/1 (FN31) heard W9JN (EN54) nearly every sequence of their 2-meter schedule after 1800.

MICROWAVE NEWS

Activity on 10 GHz and higher so far has been confined to certain regions of the country, often where population density is high or where a critical group of experimenters have gotten equipment going for the bands. Certainly Southern California and the Northeast generally are well represented with 10 GHz and higher operators.

The Chicago area is also emerging as an activity center, mainly due to the efforts of W9ZIH, K9PW, K3SIW and Jim Mitzlaff, WB9SNR, who recently sent out a report of what the group had recently accomplished. The four of them purchased 24 GHz DB6NT-designed modules together and got them working almost immediately (they already had 10 GHz gear). They could run all of 60 mW into 1 and 2-foot dish antennas. What distances could they span with that basic equipment from portable locations?

Their best distance so far has been 113 km across Lake Michigan, from the shore at Waukegan, Illinois, to St Joseph, Michigan. During one notable test when signals on 10 GHz were as much as 30 dB above S9, they heard their peanut 24 GHz signals at S3. More typically, they work 80 km over various land paths. Mountains are difficult to find in the Midwest, but they are checking out all the hills in the area and plan additional tests this year.

One possibility is for spring ducting across the lakes. Strong ducts may form quite readily over the cold, even ice-covered Great Lakes, when relatively warm air from the south suddenly flows over the cold lake waters. These ducts might be quite pronounced, but shallow—that is only 20 to 100 feet high. Ducting conditions might be unnoticeable and unusable on the lower frequencies, but they might be quite sufficient at 10 and 24 GHz. It will be interesting to know if anyone has observed this effect.

VHF/UHF/MICROWAVE NEWS

Spring Sprints Resurrected

The ARRL announced in early January that the annual spring VHF and UHF sprints had been dropped from the contest schedule. Contest Branch Manager Dan Henderson, N1ND, cited lack of participation. He explained that the number of operators submitting logs had been declining over the past several years, and ARRL could no longer justify the space in *QST* or *NCJ* to report results.

Several groups have rushed to fill the vacuum. A coalition of regional VHF clubs is promoting a series of sprints in a format similar to the former ARRL events. The dates and times (all local except for 50 MHz) are listed in Table 3. Exchange grid locators. The score for each sprint is number of contacts times number of different grids worked. Separate logs for each band can be sent in standard ARRL format to **wz1v@ntplx.net**. See "Contest Corral" on page 100 for more information.

CQ VHF announced a series of Spring Activity Weekends that encompass FM activity (March 19-21), SSB and CW (April 23-25) and digital modes (May 21-23) on all bands above 30 MHz. Entry categories and scoring are a bit complicated, so you might want to check with *CQ VHF* before submitting logs.

Table 3
Revived Spring Club Sprints

Band (MHz)	*Date and Time*
50	May 15, 2300-0300 UTC
144	April 12, 7-11 PM
222	April 20, 7-11 PM
432	April 28, 7-11 PM
902-2304	May 8, 6 AM-1 PM

EME Annals

Some readers may be a bit uncertain about the meaning and significance of the "Total Contacts" column that appears in the EME Annals, most recently published in the March issue. "Total contacts" refers to the number of *different stations* worked by each listed call via EME only. Some EME operators refer to this as their "initial contacts," which is perhaps more specific. Repeated contacts with the same station do not count as total contacts in this listing. Indeed, some EME purists will not add to their list of initial EME contacts a QSO with another station that uses multiple calls, such as a club station that allows its members to use their own calls when operating. State and DXCC totals should also reflect accomplishments made only via EME. Presumably, an EME station in Rhode Island, for example, that claims all 50 states worked via EME has worked another RI station via the Moon.

QST

Edited by **Bernie McClenny, W3UR**

Do-It-Yourself Propagation Predictions

By Carl Kratzer, K3RV

Do you miss the HF propagation charts that were previously published in "How's DX?" If so, don't despair! There are still a number of resources available at your fingertips to generate or access propagation predictions. If you have a PC, you may choose from a variety of commercial and public domain software programs that enable you to produce custom predictions of maximum usable frequency, received signal strength and other key parameters. Each program has pros and cons, so it is recommended that you contact the vendor of each product to determine which one best meets your needs. Additionally, attention should be paid to the minimum hardware and operating system requirements to run the software. Here is a brief summary of my favorite programs…

CAPMAN: This is a full-featured DOS program based on the US Department of Commerce *IONCAP* model. It includes detailed treatment of antenna gain for many typical antennas and permits importation of custom patterns from *Mininec* and *Elnec*. The results are generated in a variety of tabular or graphical formats. This program is especially suited for the advanced user who intends to perform detailed system analyses. A contour mapping add-on option is also available. Information can be obtained from Kangaroo-Tabor Software, Rt. 2 Box 106, Farwell, TX 79325. Also check the Web site **http://www.taborsoft.com** for specifications.

Wizard 2: This is a *Windows* program based on the same *IONCAP* model as *CAPMAN*, but with limited treatment of antenna gain patterns. A simplified user interface includes point-and-click map and call sign browser for selection of transmitting and receiving locations. Colorful customizable output graphs can be generated. This program is recommended for beginner and intermediate users. An earlier version of *Wizard* without the graphing capabilities is also available, but the *Wizard 2* graphing version is worth the extra expense. Information is available from the Kangaroo-Tabor Software address and Web site shown above.

HFx: This Windows program is based on an International Telecommunication Union CCIR model. It has a user-friendly graphical user interface, including radio prefix browser, gray-line mapping display and attractive output screens. This program is suitable for beginners and intermediate users, but printing of output results requires some manipulation of *Windows* commands. Information is available from Pacific-Sierra Research, 2901 28th Street, Santa Monica, CA 90405. For more information check out their Web site at **http://www.psrv.com/hfx**.

VOACAP: There are several free propagation programs in the public domain, but this is by far the best. A very versatile program developed by the Department of Commerce for the Voice of America and based on the *IONCAP* model. Provides results in tabular and graphical formats. This software is recommended primarily for advanced users, as it requires some familiarity with propagation concepts and intermediate computer skills. *VOACAP* is available in *DOS* and *Windows* versions at **http://elbert.its.bldrdoc.gov/hf.html**.

In addition to the propagation prediction software that you can run on your PC, there are an abundance of Web sites that offer on-line predictions or other information on ionospheric conditions and related topics. Naturally, it would be impossible to list them all in the space allotted, but some of my top choices are listed below. These sites often have links to other interesting sites, providing additional sources of information.

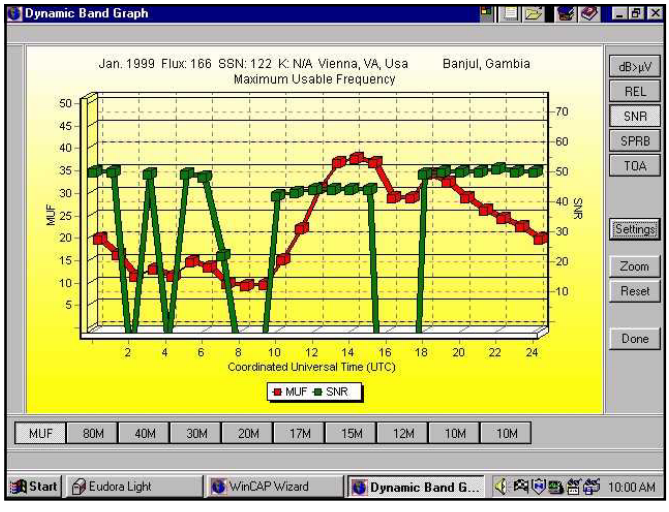
ARRL: If you really miss the propagation charts that were formerly printed in *QST*, they are available on-line in an improved form at the ARRL's own Web site **http://www.arrl.org/qst/propcharts**.

K1TD: The former ARRL Technical Editor provides a very straightforward interactive prediction applet based on the *IONCAP* model. It computes MUF and signal to noise ratio for 136 different paths for the current month. Try it on the Web at **http://www.concentric.net/~jerrhall/**.

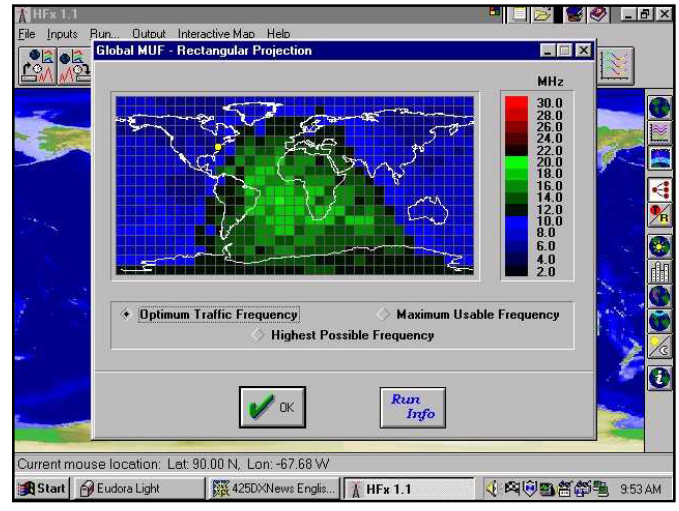
IPS: A wealth of information, including real-time HF predictions, is available from this Australian government site. IPS also markets an excellent but expensive software program called *ASAPS*. An excellent tutorial source on propagation is available at **http://www.ips.gov.au**.

STD: This Canadian site offers real-time reporting and forecasts of ionospheric data. STD also contains some informative

*3025 Hobbs Rd
Glenwood, MD 21738-9728
howsdx@dailydx.com



The dynamic band-graphing function of the *Wizard2* propagation software package.



HFx is capable of creating a global map/display of propagation conditions.

background information on propagation and markets some advanced software products at **http://solar.uleth.ca/solar/**.

SEL: This Department of Commerce site has a number of services of interest to the radio amateur, including current and forecasted ionospheric conditions for more information go to **http://www.sel.noaa.gov/radio/radio.html**.

RSGB: This excellent site by the Propagation Studies Committee of the Radio Society of Great Britain has many links to other sites and should be checked periodically at **http://www.keele.ac.uk/depts/por/psc.htm**.

Radio Netherlands: This is another site that is particularly useful for its collection of links to other related web sites and is located at **http://www.rnw.nl/realradio/practical/html/propagation.html**.

There is yet one more option for PC users which requires neither an Internet connection nor the softwareinstallation and computation associated with a prediction program. The recently introduced CD-ROM version of the *ARRL Antenna Book* includes not only the entire text of the printed version (18th edition), but also 70,000 pages of propagation tables in Acrobat "PDF" file format, produced by Dean Straw, N6BV. The tables display the signal strength (in S-units) from approximately 140 transmitting locations around the world to receiving locations in each of the 40 CQ zones, on each of the six amateur HF contest bands, at each sunspot level, for every month of the year.

Sadly, if you do not have a PC or some form of access to the Internet, your options are somewhat limited. There may be a few Amateur Radio and DX publications that still offer some type of propagation charts, but printed literature on this subject is becoming increasingly scarce (in addition to *QST*, *Canadian Amateur* has also discontinued its printed propagation charts). With the cost of new and used PCs dropping to rock-bottom levels, prediction software or Internet access should be considered by all serious DXers. As a final word of advice, please remember that propagation predictions are very useful as a planning tool, but should be treated only as a general guide. Actual radio conditions will vary from the estimated values on a day-by-day basis based on current solar and geomagnetic phenomena. Good DX!

TL5A—A SIGNAL FROM THE HEART OF AFRICA

By Alex van Eijk, PA3DZN

During the period of June to December 1998 I was on the air from Bangui, Central African Republic (TL). Contrary to my earlier operations from Africa, such as 9X5EE, 9Q2L, ZS6/PA3DZN, and D25L, this time I was aiming at setting up a high profile station that would be competitive in the bigger contests. Special attention would be paid to "uncommon" modes and bands, such as RTTY, 6 meters and 160 meters. Furthermore, the general idea was to have as many DXers as possible log a QSO with TL. I carried 150 kg of

Alex, TL5A, in his shack.

equipment and antennas for this purpose.

For HF operations I brought along a Force-12 C4 (10-40 meter) Yagi and lots of wire to make 80 and 160 meters antennas. HAL Communications made a DSP4100 modem available, and WF1B provided RTTY contest software. Because my Yaesu FT-847 transceiver includes 6 meters the idea was born to reactivate TL on this band, too. Dutch 6-meter enthusiasts PA3BFM, PA0JMH, and PA7MM (ex-PA3DWD) organized a 5-element Tonna 6-meter Yagi and gave me a crash course on "DX on six." Together with the antenna and a long 6-meter beacon list I was sent on my way! (Logging is done entirely with a laptop computer running *CT*. Alex, PA1AW (ex-PA3DMH) volunteered to take care of the QSL chores, as he had done for previous operations as well.)

Upon arrival in Bangui, the capital city, finding a good station location and a fancy call sign were high on the list of priorities. The location was found fairly quickly, situated on wet grounds with a big garden, a stable electricity supply and comfortable distance from the city noise. Obtaining the call was not difficult, either. Although the standard procedure dictates that you will be assigned a call with a TL8 prefix and your name initials as the suffix, we were able to negotiate TL5A.

During the three weeks that it took to arrange for the documentation, I built up the station. The most important item missing was a mast to support all the Yagis. By sheer coincidence I ran into Charles, TL8CK, while shopping in a local hardware store. Most every HF DXer knows Charles, who has been living in Bangui for over 20 years and is still active on 80 through 10 meters. He arranged for me to meet TL8GR (no longer active) who had a fold over mast lying in hisgarage! One week later that 12-meter mast decorated my garden with all the Yagis on top. That same garden, by the way, has beautiful 30-meter high trees, in which inverted-**L** antennas for 80 and 160 meters were installed.

The first time I activated my new call on 17 June 1998 was indescribable. A wall-to-wall pileup on 20-meter CW netted more than 200 contacts in the first hour of operation. It seemed as if Central Africa had not been on the air for decades! All this attention was certainly due to the unusual prefix, TL5, which provided the proverbial "10 dB extra gain."

My radio activities were limited to evenings and weekends as a result of my work commitments during the day. Nonetheless, contact 10,000 was logged on 19 July. Until the end of the year TL5A logged 10,000 contacts per month on average. There was a huge demand for RTTY activity; I was often making RTTY contacts at a rate of three contacts per minute.

During the first few months of operation the 160 through 30-meter bands were practically useless. Not so much because of poor conditions, but largely due to enormous static. Near the equator the seasons are not defined as winter and summer, but instead as dry and rainy. With the rainy season comes fierce thunderstorms an the almost continuous lightning crashes make operation almost impossible.

TL was active on 6 meters once before in 1991 by TL8MB. An increasingly large number of DXers have been seeking the Central African Republic for their 6-meter DXCC. I had never operated on 6 meters before and didn't know what to expect. I spent weeks listening to nothing but white noise on 50.110 MHz when I was not working on HF. This would last until 3 July 1998, at 1851Z, when the first sign of life was detected by virtue of 4Z5JA who was calling CQ! That would be all the excitement I would get for a while; my next encounter with 6-meter activity didn't take place until the first week of August. As a result of my limited operating time I probably missed many openings during the daytime. However, there were regular openings around my sunset to the Mediterranean area. A total of 230 contacts were made on 6 meters in 30 countries.

On 160 meters things were going slightly better, but the results were still somewhat disappointing. Despite my efforts only 393 contacts were logged on this band, mostly with Europe, although I also spoke with 40 Japanese stations and 36 Americans. In particular, the propagation to the Western Hemisphere was lacking. You would think that it would be relatively easy to work the East Coast of North America, but only a few good openings were available during this period.

Topband conditions were mediocre this winter season. Even on 80 meters it was unusual to work North American stations. The best openings took place between 2000-2300Z for Europe and Asia, while the expected sunrise peak time from 0300-0430 did not yield many results. Almost every day I was active around those times on 1.833 MHz hoping for an extraordinary opening. To my delight I managed to work my first US stations on 27 July 1998, 0207Z with W4DR, followed 15 minutes later by K1UO. A very productive sunrise opening on 1 October produced 18 contacts with North America.

By the end of October already more than 50,000 regular TL5A contacts were logged. This definitely influenced my contest productivity; so many stations had already worked TL5A that they were not interested in contacting me again during a contest. This was very apparent during the CQ WW SSB competition when it took minutes of calling CQ on a wide-open band just to gather a couple of contacts. This had to change! The week following the contest I applied for the exclusive contest call sign TL0R. The difference was immediate!

QSL cards for TL5A and TL0R go via Alex van Hengel, PA1AW (ex-PA3DMH), Schoener 85, NL2991JK Barendrecht, Netherlands. Logs are available on the Web at **http://www.igr.nl/users/pa1aw/** on the "QSL Page." It is also possible to apply for an electronic bureau QSL at this site.

Wrap Up

Thanks, Carl and Alex, for your submissions, graphics and pictures for this month's column. Alex returned to Central African Republic in early February and will continue to hope for that 6 meter opening to North America. He also plans to remain active on 160 meters. Keep checking 1.833 MHz at TL sunrise and 50.110 MHz. Mark your calendars now for April 9, 10 and 11 for the Fresno DX Convention sponsored by the Northern California DX Club. For more details see their Web site at **http://www.amateur-radio.org/ncdxc.htm**. Becky, N3OSH, and I plan to be there. Until next month, see you in the pileups!—*Bernie, W3UR*

Coming Conventions

Edited by ***Gail Iannone*** • *Convention Program Manager*

ARKANSAS STATE CONVENTION

April 23-24, 1999, Little Rock

The Arkansas State Convention, sponsored by the Arkansas Emergency Radio Services and 9 other clubs, will be held at the Expo Center, Exit 126 off I-30 in SW Little Rock, near the Pulaski County line. Doors are open Friday 4-9 PM, Saturday 8 AM to 4 PM. Features include flea market, computer and equipment dealers, vendors, tailgating, special exhibits and displays, forums, technical table (test your own equipment), contests, foxhunts, Wouff Hong ceremony, ARES/RACES, VE sessions, handicapped accessible. Talk-in on 146.85. Admission is $7. Tables are $30 (8 ft, dealers), $20 (flea market, electric power $5 per outlet). Contact Jim Blackmon, K5VZ, 1008 Pine St, Arkadelphia, AR 71923-4919, 870-246-6734 or 870-246-7833; fax 870-246-6736; **lrhamfest@usa.net**; **http://www.aristotle.net/~ares/hamfest/**.

DELAWARE STATE CONVENTION

April 25, 1999, New Castle

The Delaware State Convention, sponsored by the Penn-Del ARC, will be held at the Nur Temple on Rte 13, 1/4 mile N of the intersection of Rtes 13 and 40. Doors are open for setup 6:30 AM; public 9 AM to 2 PM. Features include vendors, tailgating ($10 per space; first-come, first-served basis), certified SKYWARN spotter training class, VE sessions, ARRL and club leaders forum, special guest speakers (Ron Cohen, K3ZKO, will present a program on "lightning protection and proper station grounding techniques"; and Steve Ewald, WV1X, from ARRL Headquarters), refreshments. Talk-in on 147.225, 224.22. Admission is $5, under 12 free. Tables are $15 (with electricity), $12 (without electricity); by reservation only (send payment to Penn-Del Hamfest '99, Box 1964, Boothwyn, PA 19061). Contact Hal Frantz, KA3TWG, 302-793-1080, **hfrantz@snip.net**; **http://www.magpage.com/penndel**.

EASTERN NEW YORK SECTION CONVENTION

April 25, 1999, Poughkeepsie

The Eastern New York Section Convention, sponsored by the Mt Beacon ARC, will be held at John Jay High School on Rte 52 (Fishkill); Exit 15 off I-84, turn right on Lime Kiln Rd, left onto Rte 52; school is on left after passing Hudson Valley Research Park. Doors are open for setup 6 AM; public 8 AM to 1 PM. Features include flea market, vendors, tailgating ($6 per space), ARRL forum, VE sessions, free parking, refreshments. Talk-in on 146.97. Admission is $5. Tables are $10 (6 ft, with reservations), $12 (without reservations); $6 (8 ft space, bring your own tables). Contact Ken Akasofu, KL7JCQ, 8C Hudson Harbor Dr, Poughkeepsie, NY 12601, 914-485-9617, fax 914-485-2402, **kl7jcq@iname.com**; **http://www.mhv.net/~fritzing**.

1999

March 27-28
Maryland State, Timonium*

April 9-10
Southeastern VHF Conference, Atlanta, GA*

April 9-11
International DX, Fresno, CA*

May 22-23
Washington State, Yakima

May 29-30
Wyoming State, Casper

June 4-5
Iowa State, South Sioux City, NE

June 4-6
Atlantic Division/New York State, Rochester

June 4-6
Northwestern Division, Seaside, OR

*** See March *QST* for details.**

LOUISIANA SECTION CONVENTION

April 30-May 1, 1999, Baton Rouge

The Louisiana Section Convention, sponsored by the Baton Rouge ARC, will be held at The Great Hall of the Bellmont Hotel, 7370 Airline Hwy; approximately 4 miles N of I-12 on US 61. Doors are open for setup Friday 7 AM; public 5-9 PM, Saturday 8 AM to 4 PM. Features include hamfest/computer show, flea market, forums, bench testing, VE sessions (Saturday noon). Talk-in on 146.79. Admission is $4 in advance, $5 at the door. Contact Herb Ramey, W5LSU, Box 68, Greenwell Springs, LA 70739, 504-654-6087 or 800-256-3378, **daveramey@worldnet.att.net**; **http://www.brarc.org**.

ALABAMA SECTION CONVENTION

May 1-2, 1999, Birmingham

The Alabama Section Convention, sponsored by the Birmingham ARC, will be held at the Zamora Shrine Temple, 3521 Ratliff Rd, Exit 27 off I-459, follow signs. Features include hamfest/computer show, flea market, vendors, commercial exhibitors, tailgating, dealers, forums, VE sessions (Saturday). Talk-in on 146.88. Admission is $5. Tables are $20 (for both days). Contact Dan Morgan, KB4MDI, 632 Stonehaven Dr, Birmingham, AL 35226, 205-822-5242 or 205-970-0622, **kb4mdi@scott.net**; **http://bro.net/barc/fest.html**.

WEST TEXAS SECTION CONVENTION

May 1-2, 1999, Abilene

The West Texas Section Convention, sponsored by the Key City ARC, will be held at the Abilene Civic Center, 1100 N 6th; I-20 to Pine St Exit, S on Pine to the intersection of Pine and N 6th, Civic Center on NW corner. Doors are open Saturday 8 AM to 5 PM, Sunday 9 AM to 2 PM. Features include forums, VE sessions, limited RV parking for nominal fee, handicapped accessible, free parking, refreshments. Talk-in on 146.76. Admission is $7 in advance (must be received by Apr 27), $8 at the door. Tables are $6. Contact Peggy Richard, KA4UPA, 1442 Lakeside Dr, Abilene, TX 79602, 915-672-8889; **jimr@swconnect.net**.

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Hamfest Calendar

Edited by ***Gail Iannone*** • *Convention Program Manager*

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date.** For example, your information must arrive at HQ by **April 1** to be listed in the **June** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

†ARRL Hamfest

†Alabama (Albertville)—Apr 17; set up Friday 1-5 PM; public Saturday 8 AM to 3 PM. *Spr:* Marshall County ARC. Albertville Recreation Center, W McKinney Ave. Tailgating, vendors, VE sessions, RV parking. *TI:* 147.2 (100 Hz), 145.11 (107.2 Hz). *Adm:* $5. Tables: $1 per foot (mostly 8-ft tables). Buddy Smith, KC4URL, 102 George Washington Dr, Boaz, AL 35957, 256-593-2516; **kc4url@airnet.net**.

Alabama (Birmingham)—May 1-2, Alabama Section Convention. See "Coming Conventions."

†Alabama (Moulton)—May 1; set up Friday 6-9 PM (overnight security provided); public Saturday 9 AM to 4 PM. *Spr:* Bankhead ARC. H. A. Alexander Park, 1 mile W of Moulton on Court St. VE sessions (promptly at 9:15 AM; bring original license, photo ID, CSCE, $6). *TI:* 146.96, 442.425. *Adm:* $3. Tables: $6. Rex Free, KN4CI, 256-905-0822; or Ed Weatherford, K4EKW, 256-974-0436; **http://www.Symetric-Inc.com/N4IDX**.

†Arizona (Phoenix)—Apr 17, 6 AM to 2 PM. *Spr:* Arizona ARC. DeVry Institute of Technology, 2149 W Dunlap Ave, South parking lot; I-17 to Dunlap Ave, go E approx 1 mi, follow signs. *TI:* 147.28. *Adm:* $1. Tables: $5. George Cooney, KQ7C, 21 E Colter St, Phoenix, AZ 85012; 602-274-6212; **georgie@aztec.asu.edu**.

Arkansas (Bentonville)—Apr 24. Betty Weiberg, N0XWQ, 417-435-2332.

Arkansas (Little Rock)—Apr 23-24, Arkansas State Convention. See "Coming Conventions."

†**California (Sonoma)—Apr 24;** set up 7 AM; public 8 AM to noon. *Spr:* Valley of the Moon ARC. Sonoma Valley Veteran's Memorial Building, 126 First St W, 1 block N of the central Sonoma Plaza, Hwy 12. Electronics swapmeet ($10 per space), VE sessions (walk-ins register 9 AM, exams 10 AM, all license elements), forums, operating QRP station, display of homebuilt equipment, beginner's DF hunt, refreshments. *TI:* 145.35 (88.5 Hz). *Adm:* Free. Darrell Jones, WD6BOR, 358 Patten St, Sonoma, CA 95476; 707-996-4494.

Colorado (Longmont)—Apr 3. Fred Pilz, KB0UUD, 303-817-5526.

†**Colorado (Monument)—May 1,** 8 AM to 2 PM. *Spr:* Pikes Peak RA Assn. Lewis Palmer High School, 1300 E Higby; I-25, Exit 158 (Baptist Rd), right (E) on Baptist Rd for 50 ft, then N to Struthers Rd to Higby Rd, turn right to school. Programs, operating stations, VE sessions. *TI:* 146.97 (100 Hz), 146.52. *Adm:* $4, under 17 free. Tables: $12 (for first table with one free admission), $10 each additional table. Robert Ryals, KI0GF, 3390 Blodgett Dr, Colorado Springs, CO 80919-5438, 719-265-9950, **rryals@pcisys.net**; **http://www.qsl.net/ppraa/swapfest.htm**.

Connecticut (Bristol)—Apr 11. Jack McLaughlin, WK1S, 860-621-6623.

Delaware (New Castle)—Apr 25, Delaware State Convention. See "Coming Conventions."

†**Florida (Gainesville)—Apr 23-24;** Friday 5-8 PM, Saturday 8 AM to 4 PM. *Spr:* Gainesville ARS. Alachua County Fairgrounds, County Rd 222 (39th Ave), 1 mile E of Hwy 24 (Waldo Rd), next to Gainesville Airport. *TI:* 146.82. Walter Johnston, W4TKE, 352-332-3386; **w4tke@gator.net**.

†**Idaho (Idaho Falls)—Apr 17,** 9 AM to 3 PM. *Spr:* Eastern Idaho UHF Society. Elks Lodge, 640 E Elva St; Yellowstone Hwy N to Elva St, turn right (E) on Elva, lodge on right side of road. Hamfest/Computer Swapmeet, VE sessions (all license classes). *TI:* 147.15, 443.0. *Adm:* advance $2, door $3. Tables: advance $5 (includes 1 admission), commercial $35 (includes 2 admissions); door $7 (includes 1 admission), commercial $40 (includes 2 admissions). Jay Greenberg, WA4VRV, 2582 Granite Way, Idaho Falls, ID 83402, 208-524-1388, **wa4vrv@srv.net**; **http://www.srv.net/~wa4vrv/hamfest.htm**.

†**Illinois (Arthur)—Apr 25,** 8 AM to 1 PM. *Spr:* Moultrie ARK. Moultrie/Douglas County Fairgrounds, SE edge of Arthur, S of Rte 133. *TI:* 146.655, 444.275. *Adm:* $5. Tables: 8 ft $10. Ralph Zancha, WC9V, Box 55, Lovington, IL 61937, 217-543-2178 days or 217-873-5287 eves, **rzancha@one-eleven.net**; **http://home.stlnet.com/~jhudson1/hamfest.htm**.

†**Illinois (Decatur)—May 2,** 8 AM to 1 PM. *Spr:* Cenois ARC. Richland Community College, Shilling Hall. VE sessions (10 AM, Roger VanRheeden, WA9KCN, 217-864-2673), camping (Fairies Park Campground, 217-421-7461). *TI:* 146.73, 442.25 (103.5 Hz). *Adm:* $5, under 16 free. Tables: $1 per foot (plus admission). Tracy Ruble, N9VIM, 217-423-0314; **n9vim@springnet1.com**.

†**Illinois (Galva)—Apr 25,** 8 AM to 2 PM. *Spr:* Area Amateur Radio Operators. Galva National Guard Armory; 15 miles S of Galva, Atkinson Exit off I-80, 15 miles E of Woodhull Exit, I-74, follow signs. Flea market. *TI:* 145.49 (88.5 Hz), 146.46. *Adm:* advance $5 (2 stubs), door $5 (1 stub). Tables: 6 ft $10. Bill Anderson, WB9TEW, 103 SE 2nd Ave, Galva, IL 61434-1854, 309-932-3023; **bill@inw.net**.

†**Illinois (Grayslake)—Mar 28;** set up 6 AM, public 8 AM to 2 PM. *Sprs:* North Shore RC and Libertyville & Mundelein ARS. Lake County Fairgrounds, NW corner of US 45 and IL 120; N and S bound I-94, exit at IL 120 W to US 45, continue W one-third mile to entrance on right. Large indoor radio, computer, and electronics hamfest; commercial vendors; VE sessions (9 AM to noon); free parking; refreshments. *TI:* 147.345, 146.52. *Adm:* advance $5, door $6. Tables: swapfest $10, wall tables $15, commercial $25. Anne Diamond, N9QFP, 3812 Harvest Ln, Glenview, IL 60025, 847-272-8347 (until 10 PM); **http://www.ns9rc.org**.

Illinois (Sandwich)—May 2. Bob Yurs, W9ICU, 815-895-3219.

Illinois (Taylorville)—Mar 21. Walt Harwell, N9KNF, 217-287-2010.

†**Iowa (Deloit)—Apr 11,** 7 AM to 2 PM. *Spr:* Denison Repeater Assn. Deloit Community Building, 320 Maple St; from Denison go N on Hwy 39 to Deloit (6 miles), right on Wolf St, left on Maple St. *TI:* 147.09. *Adm:* $2. Tables: $2. John Amdor III, KD6MXL, 1234 Fairmount Ave, Council Bluffs, IA 51503-6701, 712-388-8042, **johnmxl @radiks.net**; **http://www.radiks.net/~johnmxl/deloit.html**.

†**Iowa (Des Moines)—Apr 24;** set up Friday 7-10 PM, Saturday 6-7:30 AM; public 8 AM to 1 PM. *Spr:* Des Moines RAA. Iowa State Fairgrounds "Hall of Law" area under E end of grandstand; enter Fairgrounds at E 30th and Grand Ave from University, follow signs to hamfest. Vendors, free tailgating, forums, VE sessions (10 AM, all levels), refreshments. *TI:* 146.94. *Adm:* $5, under 12 free. Tables: first $15 (includes 1 admission), additional $10 each (no admission included). Write DMRAA, Box 88, Des Moines, IA 50301; or call Duane Bower, WB0UCY, 515-287-6542.

Kentucky (Dawson Springs)—May 8. Curt Beshear, KE4UZE, 502-797-9117.

†**Kentucky (Elizabethtown)—Mar 20,** 8 AM to 1 PM. *Spr:* Lincoln Trail ARC. Pritchard Community Center, 404 N Mulberry; I-65, exit to Hwy 62. Equipment, computers, forums (ARRL, ARES, 10-10), VE sessions. *TI:* 146.98. *Adm:* advance $4, door $5. Tables: $7. Harold Bennett, AI4HB, 1579 N Dixie, Radcliff, KY 40160, 502-351-9599, **hbennett@bbtel.com**; **http://www.qsl.net/w4bej**.

Kentucky (Fallsburg/Louisa)—May 1. Fred Jones, WA4SWF, 606-638-9049.

†**Kentucky (Murray)—Apr 17,** 8 AM to 3 PM. *Spr:* Murray State University ARC. National Guard Armory, State Hwy 121 W; from US 641 and State Hwy 121 go W 2 miles, Armory on left. VE sessions (Novice through Extra, walk-ins; commercial exams by appointment). *TI:* 146.94, 147.24. *Adm:* $5 (nonham spouses and children free with paid ham admission). Tables: $10 (first), $7.50 (second), $5 (each additional). Pat Compton, KF4FMZ, Box 9228, Richmond Hall, Murray, KY 42071, 502-762-6433, **patrick.compton@murraystate.edu**; **http://mursuky.edu/clubs/msuarc/hamfest.htm**.

Louisiana (Baton Rouge)—Apr 30-May 1. Louisiana Section Convention. See "Coming Conventions."

†**Maryland (Grasonville/Kent Island)—May 1**; set up 6 AM; public 8 AM to 3 PM. *Sprs:* Kent Island and Anne Arundel ARCs. VFW Post Grounds, VFW Ave; Rte 50E, Exit 43B or Rte 50W, Exit 44. Tailgating (free), QLF contest, refreshments. *TI:* 147.105, 146.94. *Adm:* $4. Tables: Free (call or e-mail for availability). Tony Young, WA3YLO, 12016 Long Ridge Ln, Bowie, MD 20715, 301-262-1917, **tonyy@juno.com**; **http://www.home.att.net/~n3szw/aarc.html**.

†**Maryland (Hagerstown)—May 2,** 8 AM to 3 PM. *Spr:* Antietam Radio Assn. Hagerstown Community College Athletic and Recreation Bldg; from I-70 take Exit 32B to Edgewood Dr, turn right at Home Federal Bank, college entrance is located approx 1.4 mi on left. Hamfest/Computer Show, vendors and tailgating ($5 per space), seminars, VE sessions (on site), refreshments. *TI:* 147.09. *Adm:* $5, under 12 free. Tables: $15 each (1-8 tables), $10 each (over 9 tables). Don Jones, KB8WHW, 1164 Halltown Rd, Harpers Ferry, WV 25425, 304-728-7769, fax 304-728-3024, **kb8zqm@intrepid.net**; **http://www.erols.com/rjlong61/ara**.

Massachusetts (Cambridge)—Apr 18. Nick Altenbernd, KA1MQX, 617-253-3776.

†**Massachusetts (Framingham)—Apr 11;** set up 7:30 AM; public 9 AM to 1 PM. *Spr:* Framingham ARA. Framingham High School, Mass Pike to Exit 13, Rte 30 W to Rte 126 N, 1.3 mi to A St, school on left. Flea market, tailgating ($10), dealers, radio equipment, computers, commercial vendors, ARRL info, VE sessions (Dick Marshall, K1KTK, 508-303-8336), refreshments. *TI:* 147.15. *Adm:* $3. Tables: advance $10, door $14. Bev Lees, N1LOO, c/o FARA, Box 3005, Framingham, MA 01705; 508-626-2012.

†**Michigan (Cadillac)—May 1;** set up 6 AM; public 8 AM to 1 PM. *Spr:* Wexaukee ARC. Cadillac Middle School. AR/Computer Swapmeet, vendors, VE sessions (1 PM, all classes), free parking, refreshments. *TI:* 146.98. *Adm:* $5. Tables: $6 (8 ft). Dan Schmidt, KE8KU, Box 163, Cadillac, MI 49601, 616-775-0998; **ke8kudan@juno.com**.

Minnesota (Blaine)—Apr 17. Jerry Dorf, N0FWG, 612-537-1722.

†**Minnesota (Shakopee)—Apr 18,** noon to 5 PM. *Spr:* Southwest Metro AR Transmitting Society. Canterbury Park, US 169 and Canterbury Rd (Cty Rd 83). Flea market, vendors, VE sessions. *TI:* 147.165. *Adm:* advance $4, door $5. Helen Haynes, WB0HOX, Box 144, Chaska, MN 55318, 612-556-0077, **smarts@maven.mn.org**; **http://www.wavefront.com/~tim_fogarty/**.

Missouri (Joplin)—Apr 17. Ray Brown, KB0STN, 417-781-4967.

New Hampshire (Rochester)—May 7-8. Joe Demaso, K1RQG, 207-469-3492.

New Hampshire (Twin Mountain)—Apr 10. Richard Force, WB1ASL, 603-788-4428.

New Jersey (Edison/Trenton)—May 1-2. Marin Light, 800-631-0062.

†**New Jersey (Harmony Twp)—Apr 24,** 8 AM to 2 PM. *Spr:* Cherryville Repeater Assn. Warren County Farmers Fairgrounds, Exit 3 off I-78, W on US 22 to Rte 519 N, 4 mi to Fairgrounds on left. Outdoor flea market ($10 per space), VE sessions, handicapped accessible, free parking, refreshments. *TI:* 146.73, 147.375. *Adm:* $6, nonham spouses and under 12 free. Tables: $15 (discounts available). Randy Vance, N2MQZ, 437 Vulcanite Ave, Alpha, NJ 08865, 908-788-4080 or 908-454-4370, **n2mqz@aol.com**; **http://w2cra@qsl.net**.

New Mexico (Albuquerque)—Apr 24. Chuck Opdyke, KC5GA, 505-858-0306.

†**New York (Montgomery)—Apr 11,** 8 AM to 2 PM. *Spr:* Orange County ARC. Valley Central High School, 1175 State Rte 17K; I-84 to Exit 6 (Rte 17K and Montgomery), take Rte 17K W, 5.6 miles to high school on left. Tailgating ($7 per space; weather permitting), VE sessions (exams 9-11 AM; for Novice/Tech only 11 AM to 2 PM). *TI:* 146.76 (100 Hz). *Adm:* $5. Tables: $10 (we supply), $7 (you supply). Edward Moskowitz, N2XJI, 123 Harold Ave, Cornwall, NY 12518-1701, 914-534-3492, **n2xji@banet.net**; **http://www.idsi.net/~mshovan/**.

New York (Poughkeepsie)—Apr 25, Eastern New York Section Convention. See "Coming Conventions."

†**New York (Yonkers)—May 2,** 9 AM to 3 PM. *Spr:* Metro 70 cm Network. Lincoln High School, Kneeland Ave; NYS Thruway (87 S) to Yonkers Ave Exit, go W to St Johns Ave, go 2 blocks, turn right on Theresa Ave, next block turn left on Kneeland. Giant electronics flea market, vendors, VE sessions, free parking, unlimited free coffee. *TI:* 146.91, 449.425 (156.7 Hz), 223.76 (67 Hz). *Adm:* $6. Otto Supliski, WB2SLQ, 53 Hayward St, Yonkers, NY 10704; 914-969-1053.

†**North Carolina (Raleigh)—Apr 11,** 8 AM to 4 PM. *Spr:* Raleigh ARS. NC State Fairgrounds, Jim Graham Bldg, 1025 Blue Ridge Blvd; I-440, Hillsborough St, W. Forums (ARRL, DX, MARS, APRS, ARES, NTS), contests, VE sessions (exams 11 AM), Saturday night "Welcoming Party". *TI:* 146.64. *Adm:* advance $5, door $6. Tables: $10 each (5 or more $9 each). Wilbur Goss, WD4RDT, 4425 Watkins Rd, Raleigh, NC 27616, 919-266-7883; **k4hf@juno.com**.

†**Ohio (Athens)—Apr 25,** 7 AM to 2 PM. *Spr:* Athens County ARA. Athens Recreation Center, 733 E State St; E on E State St exit off US Rte 33, go 1/4 mile to signs indicating parking. Flea market, exhibits, commercial vendors, refreshments. *TI:* 145.15. *Adm:* $5, nonham spouses free. Tables: advance $8, door $10 (outdoor flea market free). Drew McDaniel, W8MHV, 61 Briarwood Dr, Athens, OH 45701, 740-592-2106, **dmcdaniell@ohiou.edu**; **http://www.seorf.ohiou.edu/~xx017/hamfest.html**.

†**Ohio (Canfield)—Apr 25;** set up 6:30 AM; public 8 AM to 3 PM. *Spr:* Twenty Over Nine RC. Canfield Fairgrounds, Rte 224 to Rte 46. Flea market (outdoor spaces $2 per 10-ft section), dealers, computers, electronics, handicapped accessible, free parking, refreshments. *TI:* 147.315, 443.225, 145.275. *Adm:* $5 (under 12 admitted free with adult admission). Tables: $10 (plus admission; guaranteed until 9 AM with advance reservation fee, others on a first-come, first-served basis). Sharon Spencer, N8VPQ, 424 Peffer St, Niles, OH 44446, 330-544-3666; or Don Stoddard, N8LNE, 55 S Whitney Ave, Youngstown, OH 44509, 330-793-7072.

†**Ohio (Coalton)—Mar 20,** 8 AM. *Spr:* Jackson

County ARC. James A. Rhodes Community Center on Rte 93 between Jackson and Wellston. Hamfest/Computer Show, vendors, VE sessions (10 AM, all classes of licenses, walk-ins welcomed; John Vaughn, AE4QR, 740-286-0798), handicapped accessible, refreshments. *TI:* 146.79. *Adm:* $5. Tables: Free (first-come, first-served basis). Edgar Dempsey, KD8XL, 740-286-3239, **pops82@juno.com**; or Jim Dennett, W8ZUA, 740-286-5454.

†**Oklahoma (Lawton)—Apr 17.** *Spr:* Lawton Ft Sill ARC. Comanche County Fairgrounds. Forums, demonstrations, VE sessions. *TI:* 146.91. *Adm:* advance $5, door $7. Bob Morford, KA5YED, 1415 NW 33rd St, Lawton, OK 73505; 580-355-6120 or 580-353-8074.

Oklahoma (McAlester)—May 8. John Petersen, KM5ES, 918-452-2279.

Ontario (Ottawa)—May 1. John Barnhardt, VE3ZOV, 613-521-8910.

†**Pennsylvania (Monroeville)—Apr 18;** set up 6-8 AM; public 8:30 AM to 3 PM. *Spr:* Two Rivers ARC. Monzo's Palace Inn, Rtes 48 and 22; Exit 6 PA Turnpike, take Business Rte 22 W, turn left at light, Palace Inn is 200 ft on right on Rte 48; from Pittsburgh take Parkway E to Monroeville Exit, take PA Rte 48 S. Forums (packet, ARES, WPA Repeater Council, ARRL). *TI:* 146.73, 147.12. *Adm:* $5. Tables: $10 (no electric). Michael Kowalcheck, KV3L, Box 225, Greenock, PA 15047-0225, 412-751-9657 (phone and fax); **w3oc@nb.net**.

†**Pennsylvania (Wrightstown/Bucks County)—May 2;** set up 6 AM; public 7 AM to 1 PM. *Spr:* Warminster ARC. Middletown Grange Fairgrounds, Penns Park Rd; vicinity of Rtes 413 and 232; 25 miles N of Philadelphia. Indoor/outdoor flea market, vendors, tailgating (before Mar 31 $8, door $10), VE sessions, equipment checkout table, free parking, refreshments. *TI:* 147.09, 146.52. *Adm:* $6. Tables: advance $10 (by Mar 31), door $15. Tony Simek, N3YNH, 340 Centennial Rd, Warminster, PA 18974, 215-674-5218; **tsimek@aol.com**.

†**Tennessee (Dayton)—Apr 17,** 9 AM to 3 PM. *Spr:* Rhea County ARS. Dayton Skills Center, 200 4th Ave, 1 block W of the intersection of Hwys 27 and 30. Forums. TI: 147.39. Adm: $5. Tables: Free with early registration. Tom Mize, KO4SY, 433 Magnolia Ave, Dayton, TN 37321, 423-570-0840, **ko4sy@arrl.net**; **http://www.volstate.net/~ko4sy/page11.html**.

Tennessee (Manchester/Decherd)—Mar 27. Larry Marshall, WB4NCW, **mtars@cafes.net**.

†**Tennessee (Nashville)—May 1;** set up Friday noon to 11 PM, Saturday 5-7 AM; public 8 AM to 5 PM. *Spr:* Nashville ARC. TN State Fairgrounds; I-65 to Exit 81 (Wedgewood Ave), go E for 1/2 mile to Fairgrounds. Free parking. *TI:* 145.47. *Adm:* $5. Tables: $10. Bob Malone, WB5ZDS, 258 Emmitt Ave, Madison, TN 37115, 615-865-6225; **wb5zds@juno.com**.

Texas (Abilene)—May 1-2, West Texas Section Convention. See "Coming Conventions."

Texas (Belton)—Apr 17. Mike LeFan, WA5EQQ, 254-773-3590.

†**Texas (Chicota)—May 8;** set up Friday 11 AM to 7 PM, Saturday 6-8 AM; public 7 AM to 7 PM. *Sprs:* Red River Valley ARC and ARES of Lamar County. Chicota Community Center. Tailgating ($5 per space, reservations requested). *TI:* 146.76, 146.48. *Adm:* $1, under 13 free. Tables: $10 (inside, advance payment preferred). Don Honsinger, KB5MUS, Rte 1, Box 541, Powderly, TX 75473, 903-732-3290; **honsinger@neto.com**.

Toronto (Durham)—Apr 17. Ian Smith, VE3ITG, 905-427-4873.

†**Virginia (Chesapeake)—Apr 24;** set up 5:30-7:30 AM; public 8 AM to noon. *Spr:* Chesapeake AR Service. Old Gertie School House, Ballahack and Bunch Walnuts Rds, between Rtes 17 and 168. Outdoor AR Tailgate Hamfest ($5, includes admission; bring your own tables), free parking. *TI:* 146.61, 146.97. *Adm:* $5. Jim Cannon, KF4RQQ, Box 2035, Chesapeake, VA 23324, 757-382-0193; **http://www.qsl.net/cars**.

†**Washington (Vancouver)—Apr 24,** 8 AM to 2 PM. *Spr:* Clark County ARC. Salmon Creek American Legion Hall, 14011 NE 20th Ave; I-5 or I-205 to 134th St Exit, go 1/4 mile N on 20th Ave. Seminar, VE sessions, refreshments. *TI:* 147.24. *Adm:* advance $3, door $4. Tables: $10. Luther Brisky, KC7KVL, 13901 SE 18th Circle, No 4, Vancouver, WA 98683, 360-254-5082 or 360-896-8909, **lwayne@e-z.net**; **http://www.w7aia.org**.

†**West Virginia (Ripley)—May 2,** 9 AM to 2 PM. *Spr:* Jackson County ARC. Ripley Middle School. Flea market, VE sessions (bring original and copy of license), free parking, refreshments. *TI:* 146.67. *Adm:* $4. Gary Casto, AG8RY, Rte 1, Box 59, Statts Mill, WV 25279; 304-372-2849.

†**Wisconsin (Cedarburg)—May 1;** set up 6:30 AM; public 8 AM to 1 PM. *Spr:* Ozaukee RC. Circle-B Recreation Center, intersection of Hwy 60 and County I, 20 mi N of Milwaukee, W of Grafton. Swapfest, VE sessions (exams 9 AM), refreshments. *TI:* 146.97, 146.52. *Adm:* $4. Tables: $5 (4 ft, limited power available on request). Send SASE to Joe Holly, AA9HR, 1702 Holly Ln, Grafton, WI 53024, 414-377-2137, **aa9hr@execpc.com**; or Skip Douglas, 414-284-3271.

†**Wisconsin (Madison/Middleton)—Apr 11,** 8 AM to 2 PM. *Spr:* Madison Area Repeater Assn. Middleton Conference Center, 1313 John Q. Hammons Dr (located next to the Marriott); from Hwy 12 (the Beltline) exit on Greenway Blvd, go W, turn left at first street (John Q. Hammons Dr). VE sessions, free parking. *TI:* 147.15. *Adm:* advance $6.50, door $8. Tables: advance $18 (6 ft), door $25 (if available). Paul Toussaint, N9VWH, Box 8890, Madison, WI 53708-8890, 608-245-8890; **n9vwh@hotmail.com**.

†**Wisconsin (Manitowoc)—May 8;** set up Friday 6-9 PM, Saturday 6-8 AM; public 8 AM to noon. *Spr:* Mancorad RC. Manitowoc County Expo Center, intersection of Hwys 42-151 and I-43 on Co Hwy R, follow signs. Electronics and Computer Swapfest, flea market, dealers, VE sessions (Silver Lake College, Hwy 151 W, all classes, test registration closes at 9 AM), camping (920-683-4378), refreshments. *TI:* 146.61. *Adm:* advance $3, door $4. Tables: $6 (8 ft, electric outlet $5). Send SASE to Mancorad RC, Box 204, Manitowoc, WI 54221-0204; call Red Pajula, N9GHE, 920-684-3733; or Fred, 920-682-9312.

†**Wisconsin (Superior)—May 1,** 9 AM to 2 PM. *Spr:* Arrowhead RAC. Multi Purpose Building, I-35 to US 2/Bong Bridge, left on Belknap, right on Tower, approximately 2 mi to Fairgrounds, turn left. VE sessions. *TI:* 146.94. *Adm:* $5. Jeff Daniels, N0VQF, 309 Third St, Box 467, Moose Lake, MN 55767-0467; 218-485-8131. QST

W1AW SCHEDULE

Pacific	Mtn	Cent	East	Mon	Tue	Wed	Thu	Fri
6 AM	7 AM	8 AM	9 AM		Fast Code	Slow Code	Fast Code	Slow Code
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	Visiting Operator Time				
1 PM	2 PM	3 PM	4 PM	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
2 PM	3 PM	4 PM	5 PM	Code Bulletin				
3 PM	4 PM	5 PM	6 PM	Teleprinter Bulletin				
4 PM	5 PM	6 PM	7 PM	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
5 PM	6 PM	7 PM	8 PM	Code Bulletin				
6 PM	7 PM	8 PM	9 PM	Teleprinter Bulletin				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	Voice Bulletin				
7 PM	8 PM	9 PM	10 PM	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
8 PM	9 PM	10 PM	11 PM	Code Bulletin				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ Morse code transmissions:

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7 1/2, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by W6OWP, with K6YR as an alternate. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Send a 9×12-inch SASE for a certificate, or a business-size SASE for an endorsement.

♦ Teleprinter transmissions:

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ Voice transmissions:

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ Miscellanea:

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors from 10 AM until noon, and 1 to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy.

In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day.

Silent Keys

By Kathy Capodicasa, N1GZO

It is with deep regret that we record the passing of these amateurs:

W1AXV, Raymond H. Smith, Hermon, NY
W1DND, Attilio Avallone, Torrington, CT
*W1EBJ, Amos L. Hadley, Old Town, ME
KA1EKD, Harry A. Crowley, Silver Springs, FL
*KB1FK, Albert T. Libby, Newington, NH
N1FNN, R. F. Grogan, Newington, CT
*K1LBG, Julius E. Heck, Westbrook, CT
W1NBH, Edmund Orange, Cranston, RI
‡W1OEN, Darwin E. Turner, Bangor, ME
W1RQN, Clifford A. Maynard, Wethersfield, CT
W1SHW, Edward W. Cushing, Bristol, CT
KX1T, Alfred F. Pariseau, Sandown, NH
W1ZIS, Roger E. Emery, Keene, NH
WA1ZMF, Don Coburn, South Windham, VT
W2ABO, Fred R. Mackenzie, Metuchen, NJ
NC2C, Owen L. Clute, Cooperstown, NY
WB2DDD, Michael Kubishen, New Port Richey, FL
WB2FXU, George W. Brodsky, Vestal, NY
*W2IEG, Alvin H. Battison, Vestal, NY
WB2IEO, Oliver W. Adams, Poughkeepsie, NY
WA2NVN, John A. Livreri, Brooklyn, NY
WA2PAJ, Mel Levine, Bronx, NY
*WB2TNR, Raymond Deyette, Queensbury, NY
KA2YZM, Richard A. Bernstein, Tamarac, FL
W3IJD, Raymond Crowell, College Park, MD
NM3J, Garvin M. Herigstad, York, PA
K3QNU, Theodore J. Dingle, Carlisle, PA
KA3SPS, Leon D. Platky, Edgewater, MD
*W4AMI, Robert W. Barbee, Memphis, TN
W4AZV, Alvin A. DeSpain, Buffalo, KY
WD4BAV, Lee F. Groller, Charlottesville, VA
K4BJ, Lawrence E. Felton, Seminole, FL
W4CNX, Sanford A. Lipford, Bassett, VA
K4DIP, Rosser W. Callaway, Sturgis, KY
AD4DY, Jesse C. Gartman, Alpine, AL
WA4EXC, Ralph H. Joiner, Montgomery, AL
*K4FSK, James C. Sorah, Mount Carmel, TN
KE4IYU, David L. Sharps, Martinsville, VA
KA4KJG, Charles E. Myers, Elizabethtown, KY
W4LDJ, Herbert W. Patterson, Largo, FL
AC4MO, Robert E. Monroe, Lake Placid, FL
K4MPR, James P. Rule, Mayfield, KY
N4MRD, Olive O. Albrets, Birmingham, AL
*WB4ONL, Dennis R. Bowman, E Ridge, TN
W4PFK, Phil Hentges, Dundee, FL
KM4PN, C. D. Underwood, Celina, TN
WA4QGH, Edmond L. Crowe, Mentone, AL
WB4RDV, Sherman B. Winings, Centralia, MO
WD4RER, William H. Davies, Alexandria, KY
KF4SZE, Wesley Lawson, Starke, FL
*WA4UJJ, Phil E. Kern, Fernandina Beach, FL
K4UXU, Walter H. Lepley, Murfreesboro, TN
WA4VBG, Douglas Johnson, Inman, SC
KD4VHZ, Elizabeth S. Jackson, High Point, NC
KE4YAU, Gregg Rinko, Raleigh, NC
WA5LEJ, Clyde Cobb, Batesville, MS
*K5MM, Dale D. Jones, Bellingham, WA
N5MMY, J. R. Griffith, Austin, TX
N5OBT, William K. Douglas, Albuquerque, NM
KC5PKC, John V. Covell, Ft Worth, TX
W5QFU, Homer J. Johnson, Malvern, AR
K5RIS, Bob Meinecke, Ozona, TX
K5VPM, Lyle E. Armstrong, Little Rock, AR
*KC5WC, Fred A. Andreucci, Fort Worth, TX
KE5YP, Howard E. Greenley, Henryetta, OK
K6AZE, Richard W. Steele, Brookings, OR
N6BGH, Charles E. Schrader, Northridge, CA
W6DTV, Henry E. Davis, Sebastopol, CA
WA6DVY, Donald L. Starn, Santa Cruz, CA
K6EDV, Loren Peterson, Fair Oaks, CA
W6HYG, Albert E. DeYoung, Huntington Beach, CA
**W6KS, Peter Bertelli, San Diego, CA
W6LTA, Lewis F. Franklin, Hayward, CA
W6NGK, Otto F. Dedrick, San Pedro, CA
KH6OS, Thomas Hori, Honolulu, HI
W6PAF, Leonard W. Anderson, Tacoma, WA
K6PHH, Samuel W. Westfall, Modesto, CA
K6PWR, Louis F. Stavros, Summerland, CA
K6RWF, Russell D. Brown, Lancaster, CA
W6SLY, H. S. Shaw, San Diego, CA
WA6TJK, Clarence H. Boren, Mayer, AZ
KB6VEZ, James A. Mercante, Davis, CA
W7EJW, Francis G. Perrins, Seattle, WA
N7GWK, Arthur W. Coffland, Kirkland, WA
N7HHN, Dick Pen, Everson, WA
W7IGU, Garth F. Mason, Tucson, AZ
K7IMN, William B. King, Seattle, WA
W7IOS, Frank R. Babcock, Seattle, WA
WA7IRZ, Hiram E. Fite, Tempe, AZ
K7KG, Fred W. Keller, Puyallup, WA
W7LZY, Carl Egge, Twin Bridges, MT
N7SV, Bradley Wells, Port Orchard, WA
KA7YEW, Donald R. Marshall, Bothell, WA
W8AI, Frank T. Lenc, Punta Gorda, FL
N8EHZ, Charles A. Brooks, Bradenton, FL
KE8JI, Earl H. Durand, Southgate, MI
N8JOD, Le Roy Adams, Akron, OH
K8KAR, Fred Degerstrom, Dayton, OH
*W8QCU, Philip D. Brust, Springfield, OH
KB8QWE, Carol J. Leiber, Petoskey, MI
W8REY, Fred W. Schilling, South Point, OH
K8SWZ, Laurie Turner, Utica, MI
WA8TQX, Harold N. Lucas, New Carlisle, OH
W8VKD, Robert L. Shellman, Athens, OH
N8WIT, Richard M. Teague, Toledo, OH
KG8YD, Rudy M. Sossa, Streetboro, OH
W8ZTA, Carl W. Stull, Chagrin Falls, OH
W8ZYO, Michael J. Stefforia, Harper Woods, MI
N9CC, Rudolf A. Redl, Morristown, TN
W9EMI, Lance R. Holt, O Fallon, IL
WA9KZS, Frank O. Hechinger, Mooresville, IN
W9OFM, Wilbert F. Klopp, Ladson, SC
KA9OGD, Junior Tibbett, Kingman, IN
KB9PO, Ellis T. Mason, Monona, WI
W9RLP, Steve O. Sholand, Monument, CO
N9SYE, David W. Jones, Fort Wayne, IN
W9URD, Leland L. Heaton, Pleasanton, TX
W9VVN, Charles S. Holt, Bemidji, MN
K9YXS, James A. Cox, Portland, IN
KA9ZBT, Orville J. Creason, Markeville, IN
N0DX, Frank Weigelt, Iowa City, IA
KQ0H, William L. Martin, Newton, IA
WK0I, Terry J. Parker, Burlington, IA
W0KJO, George E. Rasmussen, Colorado Springs, CO
W0LOJ, Charles B. Persons, Brainerd, MN
KB0NWR, Thomas D. Smith, Kansas City, MO
K0PSU, Gene D. Watters, Colorado Springs, CO
W0PSX, Leland D. Edelmaier, Arvada, CO
K0SZJ, Walter L. Bruns, Sioux Falls, SD
W0WRE, Robert J. Foster, Omaha, NE
WB0WRU, Charles H. Neeland, De Soto, KS
K0WTX, Benjamin L. Martin, Stanberry, MO
JY1, Hussein bin Talal, Amman, Jordan
GU2HML, B. W. Aldwell, Guernsey, Channel Islands, Great Britain

*Life Member, ARRL

**Charter Life Member, ARRL

‡Call sign has been re-issued through the vanity call sign program.

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111.

75, 50 and 25 Years Ago

April 1924

◊ The cover illustration, by Clyde Darr, 8ZZ, shows the poor ham in the wintertime, looking wistfully up at his antenna pole and holding the broken ends of the rope that had been supporting the three-wire "hundred footer" until last night! The editorial discusses the April election of Directors, and discusses "broadcast listeners," pointing out that many of them can be brought into Amateur Radio because of their technical interest in the field.

M. B. Sleeper tells about "Something New in Radio Frequency Amplifiers"—the Sleeper variometer and the Sleeper fixed coupler. Maurice Goldberg, 9ZG, discusses "Loose-Coupled Transmitting Circuits." In "The Amateur Scores Again," K. B. Warner relates how "Dozens of American amateurs do valiant emergency work when [a] blizzard paralyzes [the] Middle West." *QST* Technical Editor S. Kruse presents Part 2 of "Amateur Wavemeters." F. D. Fallain, 8ZD-8AND, tells "The Story of the Royal Order of the Wouff Hong." William Harper asks the question, "Should Regeneration Be Eliminated?" and describes the pros and cons of regeneration in tuned radio-frequency amplifiers. In the "International Amateur Radio" column, it is announced that "A genuine Australian boomerang, suitably engraved" will be awarded "to the American or Canadian amateur who is first to definitely establish two-way radio communication on amateur wave lengths between New Zealand, or the continent of Australia, and North America!"

April 1949

◊ The editorial addresses "Membership Dues," explaining that, because *QST* is the official organ of the ARRL, the dues—rather than being just a subscription to a magazine—must provide support for the membership as well as fund representation of the ARRL on the US and international scene.

Richard Smith, W1FTX, tells about "Getting Back on 160," via his homebrew single-band 200 W rig, which uses a single 812 in the final. HQ's Technical Director George Grammer, W1DF, provides "Pointers in Harmonic Reduction" to help the poor ham face up to the new problem of television interference. Robert Fairbrother, W1PYO, describes getting "Better Results with the 522," to help hams who are using the surplus SCR-522 on 2 meters. Under the umbrella heading, "Some Ideas for Low-Frequency Antennas," James Hunt, W5TG, tells about "Grounded Folded Dipoles," and Stuart Dunkle, W7BHN, describes "A Vertical Antenna for 75 Meters." ARRL National Emergency Coordinator Albert Hayes, W1IIN, in his article "Deep Freeze," gives a review of the public service efforts of hams during "the most extensive blizzard in history." A letter from George Turner, FCC Assistant Chief Engineer, accompanies the article and praises the hams' work. The famous Larson E. Rapp, WIOU, presents very sensible food for thought in "A New Approach to Antenna Design."

April 1974

◊ The cover is "… an artist's conception of the Amsat-Oscar 7 satellite now nearing completion." The editorial discusses "Trends" and "Basics." The former used a poll to determine the ham community's operating habits as well as reading habits (66% of the hams surveyed read *QST* regularly!). The latter tells how well the magazine's "Beginner and Novice" column has been received by the readership, and this issue begins a more structured approach to helping the beginner learn radio theory and application.

Orlando Okleshen, W9RX, describes "A Four-Band Whopper" antenna—starting the article with the statement, "Now that my 5-band DXCC is under the belt … I feel a call to share some of the 'secret weapons' with my fellow competitors." Doug DeMaw, W1CER, and Lew McCoy, W1ICP, explain about "Learning to Work with Semiconductors," the first part of a theory and application course about semiconductors. After his four-part series on SWR and reflections that appeared in 1973 issues of *QST*, Walt Maxwell, W2DU/W8KHK, presents "Another Look at Reflections; Part V—Low SWR for the Wrong Reasons." Glenn Dickson, WB5BAF, describes "A Tone-Burst Generator for Repeater Access." Wes Hayward, W7ZOI, gives us Part II of "A Competition-Grade CW Receiver." A letter from Joel Jensen in the "Correspondence" column points out that the February 1974 issue carried the February 1924 issue's retrospective look under "25 years ago," and February 1949 under "50 years ago." Joel suggests that perhaps the conversion to the metric system may have confused the editors so badly "that they no longer can tell time"!—*Al Brogdon, W1AB*

Edited by **Diane P. Ortiz, K2DO***

A YL at the YCCC

It's a plain fact that there are usually more men than women at most Amateur Radio club meetings—unless it's a meeting of a YL group such as the Buckeye Belles or Cactus Keys (among many others). Confirming this are your letters and e-mail, as well as my personal experiences. Of course, it's just a reflection of the demographics of ham radio in general.

This was on my mind as I suggested to my husband George, N2GA, that we drive four hours to attend a regional meeting of a large contest club we were interested in joining—the Yankee Clipper Contest Club (YCCC). Ordinarily we would not travel that far to attend a ham radio event, except for the Dayton Hamvention or another major convention, but I had an ulterior motive. The meeting was being held close to one of my favorite ski areas. What could be better than combining two fun hobbies in one weekend? We could go up on Friday night, ski on Saturday and go to the meeting on Sunday.

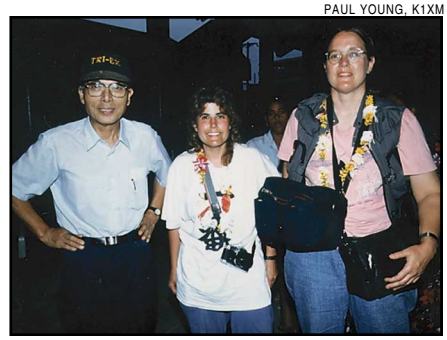
Preparations

All the arrangements fell into place. We found suitable (inexpensive) lodging near the ski area, yet not too far from the college where the bimonthly meeting was going to be held. We used the Internet to find directions and our repeater directory to get the local frequencies.

The weekend approached quickly and I started to become apprehensive about the meeting. I assumed that there would be few women present. I knew my husband would quickly become involved talking to the other male contesters there and I would be left to fend for myself. So what did I do? I found another woman who I thought might be attending and asked her to meet me for lunch before the meeting. Some would say that's cheating; I would respond: it's just female common sense!

There is a happy ending to this story. The only person we knew at the meeting of over 100 hams was the woman I had contacted, Ann Santos WA1S. She's a very active member of the Yankee Clipper Contest Club and introduced us to many of her friends and colleagues at the meeting. Ann and I had corresponded, but had never formally met (her adventures on the Willis Island DXpedition appeared last year in this column). It was especially nice to be able to talk in person and share our thoughts on ham radio as well as other subjects. Ann is a very accomplished contester and last year was the first woman to win first place in the CQ World Wide DX Contest, SSB, single operator, low-power, unassisted category.

PAUL YOUNG, K1XM



Sam, V63KU, welcomes Ann, WA1S (center) and Charlotte, KQ1F (right) at the Chuuk airport. Chuuk was the last island they visited in Micronesia.

Great Meeting!

There were many presentations including a talk by ARRL Membership Services manager Bill Kennamer, K5FUV, about changes in the ARRL HQ Contest Branch and the way scores are reviewed (very carefully!). Bill also offered an explanation of "UBN reports" (something you really don't want to get into unless you are a diehard contester—suffice to say that it involves computerized comparisons of contest logs).

Some of other the women attending the meeting were Charlotte Richardson, KQ1F and "Max" Reid, N1LYA. Charlotte, Ann Santos and Paul Young, K1XM, recently went on a trip to Micronesia, a chain of tiny tropical islands situated 5,150 km west-southwest of Hawaii, and about three-quarters of the way between Hawaii and Indonesia. The islands are the result of volcanic activity millions of years ago. Some of the atolls are the rims of sunken volcano craters. The Federated States of Micronesia is a group of self-governing islands within the geographical area of Micronesia. The four states—Kosrae, Pohnpei (formerly Ponape), Chuuk (formerly Truk) and Yap—were once part of the US Trust Territory of the Pacific Islands and will become an independent nation by the year 2000.

The trio made a two-day trip from the East Coast to reach the islands. (They showed us the special antenna they had adapted to fit into a hard-shell golf bag for travelling.) They had pictures from their trip and there were many photos of the extensive antenna farm they erected on Kosrae Island in Micronesia, as well as some beautiful underwater shots. One of Paul and Charlotte's other hobbies is scuba diving and, according to Charlotte, between their diving, photography and ham radio equipment there was barely enough room for clothing. They used a special contest call, V63X, for the CQ World Wide CW contest from Kosrae. Charlotte KQ1F/V63HC and Ann WA1S/V63HO also operated on other modes using their individual calls from Kosrae, Chuuk and Pohnpei. Over the course of the trip they made over 15,000 QSOs and used 92 rolls of film!

It was exciting to hear about their experiences and everyone was anxious to see their photo albums. Although most of us can't travel to exotic locations to enjoy our hobbies, it's almost as good to see the pictures and hear about it firsthand!

By the end of the YCCC meeting I felt I had made some new friends, learned more about ham radio, and had gotten a look into what I previously considered an "exclusive" group. Just like any other club, the YCCC is eager to attract new members to the hobby and are quite focused on recruiting young people in particular. Many of the hams at the meeting were enthusiastic about becoming involved both as mentors and as "students" (the students were those who felt they needed mentoring in order to enhance their skills). It was gratifying to see other members extending invitations to participate in contests at their stations. The entire atmosphere was one of warmth and welcome—something we can use more of in Amateur Radio!

Don't Forget...

…to attend the Dayton Hamvention May 14-16 and the YLRL convention at the end of July in Long Beach, California. I hope to see you at both events. Also, listen for me signing VP5GA from Providenciales during the CQ WW WPX CW contest May 29-30, and VP5/K2DO before and after the contest (SSB & CW)—*33, Diane, K2DO.* QST

*PO Box 296
Bellport, NY 11713
hamyl@aol.com

Contest Corral

Edited by **George Fremin III, K5TR***

Feedback

In the **1998 IARU HF World Championship** results, **WU4G** and **N3BB** were listed correctly in the Top 10 box, but *incorrectly* in the score listing. WU4G finished with 1,796,005 points and N3BB accumulated 1,792,036 points. **K6EST** competed in the East Bay section rather than SV.

AB5SS (West Gulf) established a new Division Rover record with his score of 43,148 in the **September VHF QSO Party**. **N1MU/R** was omitted from the scores with a total of 7 grids activated and 9,159 points. The University of Texas Amateur Radio Club **N5XU** (KA5WSS, KM5FA ops) was incorrectly listed as K5XU. The call sign of **WB0ULX** in the SD section was reported inaccurately. **KC2AGL** should be included to show 34 QSOs on 6 meters with 20 grids for a score of 680. **AA2GF** (Single Op) is missing from the WNY Section with a total of 27,528 points. **KA7YOU/R** scored 9,432 activating 6 grids.

W1AW Qualifying Runs are 10 PM EST Tuesday, April 13, and 4 PM EST, Monday, April 26. The **West Coast Qualifying Run** will be at 9 PM PST on Wednesday, April 7. Check the W1AW schedule for details.

April

3-4

EA RTTY Contest, sponsored by Union de Radioaficionados Espanoles, from 1600Z Apr 3 until 1600Z Apr 4. 80 40 20 15 10 meters, single op all band and single band, and multiop all band. Send RST and CQ Zone (EA stations send RST, province prefix). Everyone works everyone. Score 1 pt/QSO on 20 15 10 meters within own continent; 2 pts/QSO on 20 15 10 meters outside own continent; 3 pts/QSO on 80 and 40 meters within own continent; and 6 pts/QSO on 80 and 40 meters outside own continent. Contacts within your own DXCC country are valid for multipliers, but not for points. Final score is QSO points × DXCC countries (including EA, EA6, EA8, EA9) and EA provinces worked per band. Awards. Send logs by May 9 to EA RTTY Contest Manager, Antonio Alcolado, EA1MV, PO Box 240, 09400 Aranda de Duero, Burgos, Spain, or e-mail to **alcolado@redestb.es**.

SP DX Contest, sponsored by the Polski Zwiasek Krotkofalowcow (PZK), 1500Z Apr 3 to 1500Z Apr 4. Phone and CW, 160-10 meters (except 30/17/12 meters). Single operator, all band or single band, mixed mode, phone only or CW only; multioperator (multiband, mixed mode only). Non-Polish stations send a RST and 3-digit QSO number. Polish stations send RST plus two-letter province designator. Work stations once per band and mode. Count 3 pts/SP-station QSO. Multipliers are provinces (49 max) Final score is QSO points × multipliers. Awards. Mail entries by Apr 30 to P.Z.K., SPDX Contest Committee, PO Box 320, 00-950 Warszawa, Poland. E-mail **spdxc-logs@writeme.com**. For more information on the Web, see **http://www.silesia.top.pl/~jancom/rules.html**.

5

Low Power Spring Sprint, sponsored by the Slovak ARA, 1400Z-2000Z Mon Apr 5. CW only, 160 80 40 20 15 10 meters on IARU recommended contest band segments. Single op only: single band, three bands, all bands. Exchange RST, Maidenhead grid square (eg FN31 — see Apr 1994 *QST*, p 87) and power category (A = <1 W; C = <5 W; Q = <25 W; X = <50 W; Y = <100 W). Count 3 pts/QSO with own continent, 9 pts/QSO with other continents and 18 pts/QSO with OM stations. Multipliers are grid squares and prefixes (WPX rules) worked per band. Final score is QSO pts × multipliers. Send entries within 30 days to SS Contest, Radioclub OM3KFV, PO Box 129, 036 01 Martin 1, Slovakia.

9-11

Japan International DX Contest, CW, high-band portion (20-10 meters) Apr 9 to Apr 11; see January *QST*, p 84.

Elettra Marconi Contest, sponsored by the Italian YLRC, from 1300Z Apr 10 until 1300Z Apr 11. Phone or mixed (phone/CW/RTTY). 80 40 20 15 10 meters. Send RS(T) and serial no. (IYLRC members will add "RC"). Work stations once per band; YL-YL, YL-OM and OM-OM QSOs permitted. Score 1 pt/ QSO with OM nonmembers; 2 pts/QSO with OM members; 3 pts/QSO with YL nonmembers; 5 pts/ QSO with YL members. Final score is QSO points × DXCC countries worked per band. Awards. Send logs within 30 days to Pina Lazzarini, IK5GBL, PO Box No 45, 55049 Viareggio (LU), Italy.

His Majesty the King of Spain Contest, sponsored by Union de Radioaficionados Espanoles, 1800Z Apr 10 to 1800Z Apr 11, Single Operator, Multi-operator and SWL. Phone and CW are separate contests and require separate logs. 80 40 20 15 10 meters. Exchange RST and serial number, Spanish stations send RST and province. Count one point per QSO. Only work Spanish stations, Spanish stations work everyone. Multipliers are Spanish provinces on each band. Final score is total QSO points × total multipliers. Awards. Send logs by May 14 to URE Contest Manager, PO Box 220, 28080 Madrid, Spain. E-mail **ure@ure.es**.

QRP ARCI Spring QSO Party, CW, sponsored by QRP ARC International, from 1200Z Apr 10 until 2400Z Apr 11. Single band, all band, high band (20 15 10 6 meters) or low band (160 80 40 meters). Operate 24 hours max. Work stations once per band. Send signal report, state/province/DXCC country and ARCI number (if member), or power out (if nonmember). 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.128. Score 5 pts/ QSO with ARCI member, 2 pts/QSO with nonmember on same continent and 4 pts/QSO for nonmember, different continent. Final score is QSO points × states/provinces/DXCC countries × power multiplier (0-250 mW, × 15; 250 mW to 1 W, × 10; 1-5 W output × 7; < 5 W × 1). Team competition. Awards. Mail entry (SASE for results) to QRP ARCI Contest Manager, Cam Hartford, N6GA, 1959 Bridgeport Ave, Claremont, CA 91711; **CamQRP@cyberg8t.com**; **http://www.qrparci.org/.**

12

VHF/UHF Spring Sprints, 144 MHz, 7 PM to 11 PM local time on Mon, Apr 12. (Other Spring Sprint dates are 222 MHz on Tue, Apr 20; 432 MHz on Wed, Apr 28; 902 MHz/1296 MHz/2304 MHz on Sat, May 8; and 50 MHz on Sat-Sun, 2300Z, May 15 to 0300Z May 16.) The 902 MHz, 1296 MHz, and 2304 MHz Sprints will run simultaneously on Sat, May 8, 6 AM to 1 PM local time; you may work any five consecutive hours during this time period. The 902, 1296 and 2304 MHz Sprints are separate, but run concurrently. The usual VHF/UHF rules apply. Exchange grid-square locations (see Apr 1994 *QST*, p 87). Signal reports are optional. Score 1 pt per valid QSO. Final score is QSO pts × grid squares. Contests are separate; there's no accumulation of scores. The official entry forms, found in the *1998 ARRL Contest Yearbook*, are recommended. Logs must indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log. Submit separate log and summary sheets for each Sprint entered and mail Sprint entries in separate envelopes. Entries may also be submitted via Internet (as noted), Entries for each contest must be submitted no later than two weeks after the closing of the event. Awards. Mail to: **144MHz Sprint**, Rocky Mountain VHF+ Group, PO Box 473411, Aurora, CO 80047; **nrclog@aol.com**; **222 MHz Sprint**, *50 MHz DX Bulletin*, 12450 Skyline Blvd, Woodside, CA 94062; **frank@horizon.sri.com**; **432 MHz Sprint**, North East Weak Signal Group, 458 Allentown Rd, Bristol, CT 06010; **wz1v@ntplx.net**; **902/1296/2304 MHz Sprints**, Badger Contesters, 2342 Glendale, Appleton, WI 54914; **akyser@edci.com**; **50 MHz Sprint**, Great Lakes VHF/UHF Group, 434 Pattie Ave, Jackson, MI 49202; **vhfuhf@voyager.net**.

16-18

DXYL-NAYL Contest, CW, sponsored by the YLRL, from 1400Z Apr 16 until 0200Z Apr 18 (phone contest is Apr 23-25). YLs only. Send RS(T), QSO no., and section/province/DXCC country. W/VE YLs work DX YLs, and vice versa. KL7 and KH6 count as DX. Work stations once per band. Score 1 pt/QSO. Multipliers are sections/provinces/DXCC countries, and count once. Stations running <150 W output (phone: 300 W PEP) multiply score by 1.5. Final score is points × multipliers × power multiplier. Awards. Send logs within 30 days to Cleo Bracket, K0JFO, 810 Towne Square Dr, Fremont, NE 68025; **http://home.earthlink.net/~tenmtryl/ylrl/ylcontst.htm**.

Holyland DX Contest, sponsored by the Israel ARC, from 1800Z Apr 17 until 1800Z Apr 18. 160 80 40 20 15 10 meters. Single-op all band and multi-single. Phone and CW. Send RS(T) and serial no. (Israeli stations send RST and area). Work Israeli stations only. Work stations once per band and mode; no crossband or crossmode contacts. Score 2 pts/QSO on 160 80 40 meters, and 1 pt/ QSO on 20 15 10. Final score is QSO points × Israeli areas worked per band. Awards. Send logs by May 31 to Israel ARC, POB 17600, Tel Aviv 61176, Israel. **http://hamgate.netvision.net.il/contests/**.

Michigan QSO Party, sponsored by the Mad River Radio Club, from 1600Z April 17 until 0400Z April 18. Stations may operate the full 12 hours. Phone and CW. 80 40 20 15 10 meters. Single op, multiop, QRP and mobile; only one transmitted signal at a time. Work stations once per band and mode. MI-to-MI QSOs allowed. Work portables and mobiles again as they change county. Exchange signal report, QSO no. and QTH (county for MI stations, state/province/DXCC country for others). CW—3.545 7.045 14.045 21.045 28.045; phone—3.850 7.225 14.250 21.300 28.450. Count 1 pt per phone QSO and 2 pts per CW QSO. Power multiplier: × 5 < 5 W, × 2 100 W, × 1 >100 W. Final score = QSO points × power multiplier × total mults. Awards. Mail logs no later than 30 days after the contest to Mad River Radio Club, c/o Dave Pruett, 2727 Harris Road, Ypsilanti, MI 48198; **http://www.tir.com/~k8dd/miqso99.htm**.

23-25

DXYL-NAYL Contest, Phone, see April 16-18

Weak Signal Activity Weekend, sponsored by *CQ VHF*, from 6 PM local time Apr 23 to 12 AM local time Apr 25, on 50 MHz and up running SSB, CW or any digital mode that takes up the same bandwidth as an SSB signal. The operating period is broken up into nine 6-hour periods. You can work stations again during each 6-hour period. Exchange grid square. QSO points are: 1 point per QSO for below 200 MHz, 2 points per QSO at 200 to 500 MHz, 3 points per QSO at 500 to 1300 MHz and 4 points per QSO above 1300 MHz. Final score is the total points × total multipliers. Send logs to *CQ VHF*, 25 Newbridge Rd, Hicksville, NY 11801; **weekend@cq-vhf.com**; **http://www.cq-vhf.com**.

Six Meter Sprint, sponsored by Six Club, 2300Z Apr 24 to 0400Z Apr 25, 6 meters only. Exchange grid square. Count 1 point for each QSO in your

*913 Ramona Street
Austin, TX 78704
k5tr@arrl.org

country and 2 points for QSOs outside your country. Final score is total QSO points × total number of grid squares worked. Awards. Send logs before May 22, 1999 to Six Club, PO Box 307, Hatfield, AR 71945; **http://6mt.com/contest.htm**.

Florida QSO Party, sponsored by the Florida Contest Group, 1600Z Apr 24 to 0159Z Apr 25 and 1200Z-2159Z Apr 25. 20 hours total time. 40 20 15 10 meters. Categories: single op, mobile (single op or multiop), Novice/Technician (mixed mode, phone only, CW only); multi-single and multi-multi (mixed mode only; max 1 signal per band). Three power classes for all categories: QRP (<5 W), low power (<150 W) and high power (>150 W). Exchange signal report and state/province (DX stations send DX); Florida stations send county. Work stations once per band and mode. Work Florida mobile stations again as they change county. Suggested frequencies: CW 35 kHz, phone, 7.260 14.260 21.335 and 28.485. Count 1 pt per phone QSO, 2 pts per CW QSO. Multipliers—for Florida stations, 50 states; Canadian areas (MAR, NL, VE2-VE8, YT); DXCC countries (except W, VE, KH6, KL7). All others count Florida counties (67). Count multipliers once per mode. Final score: Multiply QSO points by total multipliers by the power multiplier (<5 W, × 3; <150 W, × 2; >150 W, × 1). Logs must be postmarked by May 25, 1999. send your entry to Florida Contest Group c/o Jim White, K4OJ, 1508 W Patterson St, Tampa, FL 33604; **FLQSOParty@aol.com**; **http://home1.gte.net/wd4ahz/fcg/ssqp.htm**.

Helvetia Contest, sponsored by USKA (Switzerland), 1300Z Apr 24 to 1300Z Apr 25. 160 80 40 20 15 10 meters (CW only on 160 meters). Mixed mode only, single op or multi-single. Work stations once per band. Send RS(T) and serial no. HB stations will also add Canton prefix. Count 3 pts/QSO with HB stations. Multipliers are Cantons worked per band (max 26 per band). Awards. Send logs by May 31 to Nick Zinsstag, HB9DDZ, Salmendorfli 8, CH-5084 Rheinsulz, Switzerland.

Nebraska QSO Party, sponsored by the Nebraska QSO Party Group, from 1700Z Apr 24 until 1700Z Apr 25. Single op, multi-single, mobile, and Novice/Tech. Send RS(T) and state/province/DXCC country (NE stations send county). Work stations once per band and mode. CW—1.805 and 60 kHz up from band edge; phone—1.865 3.860 7.260 14.260 21.360 28.360 146.46; Novice—28.380 and 10 kHz up from band edge. Score 1 pt per phone, 2 points per CW QSO. NE mobiles may add 50 QSO pts for each county operated from; NE portables may add 100 QSO pts for each county operated from (excluding county of residence). Work mobiles/portables again as they change county. Final score is QSO points × NE counties (max 93); NE stations multiply by states (50), provinces (8) and DXCC countries (max 35) for a possible maximum of 93. Club Competition (3 entries min). Awards. Send logs by May 31 to Nebraska QSO Party, POB 375, Elkhorn, NE 68022-0375.

Ontario QSO Party, sponsored by the Ontario DX Association, 1800Z Apr 24 to 1800Z Apr 25. Phone and CW, 160 80 40 20 15 10 meters and all VHF/UHF bands (no repeater QSOs and no QSOs on 146.52 MHz clear). Categories: Single operator low power (<150 W on HF and <50 W on VHF/UHF); single operator high power; single operator, single band; mobile; HF QRP (<5 W); VHF/UHF FM QRP (<5 W); multioperator; CW, SSB or mixed mode. Exchange signal report state/province/DXCC country. Ontario stations exchange signal report and county/district/regional municipality. Work Ontario stations only (Ontario stations work everyone). Work mobile and portable stations again as they change county/district/regional municipalities. Work stations once per band. Count 1 pt/QSO, 10 pts (each band) for working VE3ODX and VA3RAC. Multipliers are Ontario county/district/regional municipalities (For Ontario stations: county/district/regional municipalities, and state/province/DXCC countries). Final score is total QSO points × total multipliers worked (max 48). Awards. Send logs by May 31 to Ontario DX Association, Box 161, Stn A, Willowdale, ON M2N 5S8 Canada; **ve3sre@rac.ca**; **http://www.durhamradio.ca/odxa/**.

QRP to the Field, sponsored by the NorCal QRP Club, 1600Z to 2400Z Apr 24. CW HF QRP only (5 W max), 160 80 40 20 15 10 meters. Exchange RST and state/province/country (SPC). This year's theme is "Run to the Borders." Stations operating from an SPC border get an extra multiplier for each SPC intersecting at their exact location (see scoring details). Example, KI6DS operates from the CA-AZ border, getting a ×2 "border operator" multiplier. He must exchange a signal report with each state (eg. 579 CA, 579 AZ). Stations working KI6DS would get SPC multiplier credit for each state, as well as QSO pts for each separate signal report received. Scoring: Count 5 pts/QSO. Multipliers: SPC total per band; for border operators, the number of SPCs intersecting at your position; and location (home ×2, field ×4; field = battery power and temporary antennas). Final score = QSO pts × SPC total × location × border operator multiplier. Awards. Send logs by June 1 to Joe Gervais, AB7TT, PO Box 322, Peoria, AZ 85380-0322; **vole@primenet.com**; **http://www.fix.net/~jparker/norcal.html**. QST

New Products

K5ZI AZIMUTHAL EQUIDISTANT MAPS ARE BACK AND BETTER THAN EVER

◊ Bill Johnston, K5ZI, is now making available an updated version of his popular azimuthal equidistant (great circle) world maps. These maps, custom generated and centered on your station location, provide quick and easy short path beam headings to any other point on earth. K5ZI's maps have been used for illustrations in many ARRL publications over the years, including appearances in several editions of the *ARRL Handbooks, Antenna Books* and *Operating Manuals*.

Previously computer-generated and plotted using a Tektronix 4662, the new maps are now printed using an over-sized professional ink jet printer in black ink on 11×14-inch heavy stock white paper. Smaller sizes (great for use as rotator display overlays) are also available.

Beam headings are marked in 2° increments along the circumference of the map. Scales for estimating path length in kilometers and miles are also included. You can specify map titles up to 24 characters in length—typical choices include station call and/or location.

In addition to the maps, Bill also publishes a wide variety of beam heading charts custom generated for your specific location. These charts list great circle bearings, path length in miles and kilometers, and return bearings from the distant location to your station. Several versions of "DX" charts—listing US and DX locations, and "Foxhunt/Intruder Watch" charts—listing US or US and DX locations, are available.

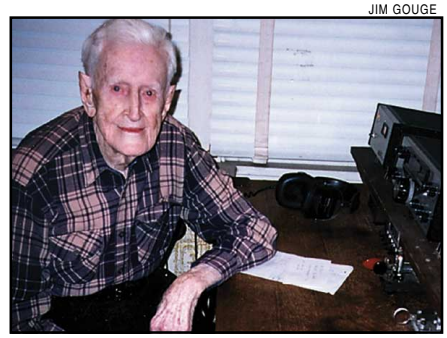
The custom-generated azimuthal equidistant maps in full or reduced sizes are $20 each. Beam heading charts range from $10 to $28. Prices include postage worldwide. For additional information and a complete description of all these products, send an SASE to Bill Johnston, K5ZI, PO Box 640, Organ, NM 88052; tel 505-382-7804; **johnston@zianet.com**. QST

Strays

OLDEST ACTIVE HAM?

◊ Wilbur Dearing, W5QN, of Bonham, Texas is going to celebrate his 100th birthday on June 11, 1999. Wilbur became a ham in 1913, using a spark-gap transmitter that he built himself. Even as he nears the century mark, Wilbur still pounds the brass, chatting with friends almost daily on 20 meters.

JIM GOUGE



SETI@HOME

◊ For all armchair radio astronomy SETI searchers, some good news! You too can participate in the search for extra-terrestrial intelligence through the SETI@HOME project. SETI@HOME utilizes a screen saver program on your home computer to analyze radio astronomy data.

The *SETI@HOME* program will use data collected by the thousand-foot radio telescope at Arecibo, Puerto Rico. A central computer at Berkeley will split up data from the Arecibo telescope into 250,000 byte chunks. It will automatically parcel out the data to home computers through the Internet. The transfer should take a few minutes with a modem. Like a normal screen saver, *SETI@HOME* will kick in whenever your computer sits idle for a few minutes. When the analysis is complete, anywhere from a few days to weeks, depending on the speed of your computer and how often it is available to analyze, the results will be transmitted back to SETI and a new slice of the sky will be sent out to your PC.

To sign up for the SETI@HOME project, get on the Web and go to **http://setiathome.ssl.berkeley.edu**. You can register there and, when the program is ready to begin, you'll receive the data and the screen saver program that analyzes the data.—*Vincent Caracci, Society of Amateur Radio Astronomers*

I would like to get in touch with...

◊...anyone who has a manual for a Hickok VTVM, model 203. Herman Stavanja, W8LXS, 5806 Chaparral Cir, Farmington, NM 87402-4880.

Special Events

Edited by ***George Fremin III, K5TR****

San Antonio, TX: Southwest Research Center Amateur Radio Club, W5RRA, 1400 to 2200Z **Apr 10**, commemorating the 52nd anniversary of the Southwest Research Institute. 7.245 14.185 28.375 50.185. Certificate. Tim Haby, Southwest Research Institute, 6220 Culebra Rd, San Antonio, TX 78238.

Port St. Lucie, FL: Port St. Lucie Amateur Radio Association, K4PSL, 0000Z **Apr 1** to 2400Z **Apr 10**, commemorating the discovery of Florida by Ponce de Leon in 1513. 14.030 14.250 21.250 28.335. Certificate. Dr Maurice Sasson, W2JAJ, 8598 Florence Dr, Port St Lucie, FL 34952.

Gloucester, VA: Middle Peninsula Amateur Radio Club, W4HZL, 1300 to 2100Z **Apr 3**, operating from the thirteenth annual Gloucester County Daffodil Festival. 7.237 14.237 21.370 28.370. QSL. Carter Clements AD4VQ, HC 74 Box 1680, Shacklefords, VA 23156.

Green Valley, AZ: Green Valley Amateur Radio Club, N7GV, 1800Z **Apr 10** to 2100Z **Apr 11**, for the eighth annual commemoration of the closing of all Titan 2 missile sites. 7.272 14.272 21.372 28.372. Certificate. GVARC, 601 N La Canada, Green Valley, AZ 85614.

Milton, FL: Milton Amateur Radio Club, W4V, 2100Z **Apr 9** to 0100Z **Apr 18**, operating from Santa Rosa's "Old Fashioned County Fair." 7.230 14.240 21.350 28.340. QSL. Milton Amateur Radio Club, PO Box 4072, Milton, FL 32572-4072.

Denmark, Iceland, Greenland, Faeroe Islands: Maritime coastal stations will be operating on amateur frequencies from 0000Z **Apr 10** to 2400 **Apr 11**, to commemorate the end of the international maritime distress watch on 500 kHz. The following stations and call signs will be active: Greenland—Qaqortoq Radio, OX3OXF; Nuuk Radio, OX3OXI, Aasiaat Radio, OX3OYR; Iceland—Reykjavik Radio, TF3TFA; Faeroe Islands—Torshavn Radio, OY3OXJ; Denmark—Lyngby Radio, OZ1OXZ, OZ5OXZ and OZ1OXB. 1.830, 3.535, 7.025, 10.125, 14.035, 18.075, 21.035, 24.905, 28.035. QSLs will be available from individual stations. Awards will be issued for confirming QSOs with three of the four participating countries, all four countries or all eight amateur call signs. Submit award requests to Radio Amateur Group, Lyngby Radio, Bagsvaerd Moellevej 3, DK-2800 Lyngby, Denmark.

Brooklyn, NY: Brooklyn QRP Club, N2Y, 1600Z **Apr 10** to 2100Z **Apr 24**, commemorating the first anniversary of the Brooklyn QRP Club's Field Operation. 7.040 7.285 14.060 14.285. Certificate. Kevin F. Glynn, 429 73rd St, Brooklyn, NY 11209.

Piscataway, NJ: Piscataway Amateur Radio Club, K2VOA, 0000Z **Apr 10** to 2400Z **Apr 11**, operating from Voice of America relay station WBOU. 7.245 14.200 21.345 28.445. Certificate. Piscataway Amateur Radio Club, PO Box 1233, Piscataway, NJ 08854-1233.

Cheraw, SC: Chesterfield County Amateur Radio Society, KF4GPE, 1200Z to 2100Z **Apr 11** during the annual Spring Festival. 14.272 28.400. Certificate. Lee Peele, 202 Country Rd, Cheraw, SC 29520.

Santa Rosa, CA: Sonoma County Radio Amateurs, W6LFJ, 1700Z **Apr 17** to 0100Z **Apr 18**, operating from the Kendall Jackson Winery celebrating the start of the grape growing season. 14.275 21.350 28.350. QSL. SCRA, PO Box 116, Santa Rosa, CA 95402.

*RR1, Box 322
Johnson City, TX 78636
k5tr@arrl.org

Vieques, PR: Calena El Conquistador, NP3P, 1600Z **Apr 17** to 1600Z **Apr 18**, operating from the 22nd Vieques Cultural Festival at Fort Count Mirasol, IOTA 99. 14.300 21.350 28.350. Certificate. Cadena El Conquistador, NP3P, PO Box 161, Fajardo, PR 00738.

Virginia Beach, VA: Virginia Beach ARC, K4V, 1400Z **Apr 17** to 2000Z **Apr 18**, commemorating the thirty-fifth anniversary of the Chesapeake Bay Bridge Tunnel. 7.130 14.270 28.363 146.55. Certificate. VBARC, PO Box 62003, Virginia Beach, VA 23462.

Louisville, KY: Bullitt ARS, KY4KY, 1600 to 2400Z **Apr 17**, for the Kentucky Derby Festival Kick-off and Bullitt ARS Elmering Day. 7.255 14.255 21.255 28.455. Certificate. Bullitt ARS, c/o KC4WQ, 1229 Zoneton Rd, Shepherdsville, KY 40165.

Dayton, OH: Stu Rockafellow ARS, N8D, 1300Z **Apr 16** to 1600Z **Apr 18**, during the Doolittle Raiders WWII B-52 Raid Reunion at the USAF Museum at Wright-Patterson AFB. 7.270 10.116 14.270 28.370. Certificate. Dave Langston, KB8RAP, 1000 Town Center, Suite 1200, Southfield, MI 48075.

Ocean Springs, MS: West Jackson County Amateur Radio Club, N5D, 2200Z **Apr 23** to 2200Z **Apr 25**, celebrating the 300th anniversary of D'Ibervill's landing in Ocean Springs, MS. 7.255 14.255 21.355 28.455. QSL. West Jackson County ARC, PO Box 1822, Ocean Springs, MS 59564.

Port St. Lucie, FL: Port St. Lucie Amateur Radio Association, K4PSL, 0000Z **Apr 23** to 2400Z **May 2**, celebrating the arrival of the New York Mets to their Port St Lucie spring training camp. 14.030 14.250 21.250 28.335. Certificate. Dr. Maurice Sasson W2JAJ, 8598 Florence Dr, Port St Lucie, FL 34952.

Roseville, MI: L'Anse Creuse Amateur Radio Club, N8LC, 1500 to 2100Z **Apr 24** to introduce Amateur Radio to the public. 7.230 14.330. Certificate. N8LC, c/o Diane Scalzi, 21621 Briarcliff, St Clair Shores, MI 48082-1299.

Bellevue, NE: Bellevue Amateur Radio Club, W0WYV, 0600Z **Apr 24** to 0600Z **Apr 25**, celebrating the 40th anniversary of the Bellevue Amateur Radio Club. All HF bands plus 50.125 and 147.39. QSL. John A. Sheffield, N4OWG, 6904 Capehart Rd, Papillion, NE 68133-2632.

Camp Evans, NJ: Ocean Monmouth Amateur Radio Club, N2MO, 0000 to 2359Z **Apr 24,** operating from Marconi's receiver site during Marconi Day. 14.035 14.235. QSL. N2MO, PO Box 267, Oakhurst, NJ 07755.

Cape Cod, MA: Marconi Radio Club, W1AA/IMD, 0000 to 2359Z **Apr 24**, celebrating International Marconi Day, 7.270 14.270 21.310 28.470. QSL. W1AA/IMD Marconi Radio Club, PO Box 1193, Lakeville, MA 02347.

Mt Clemens, MI: Utica Shelby Emergency Communications Association, W8DFG, 1100 to 1700Z **Apr 25**, for the March of Dimes Walk America, 7.260 14.260. Certificate. USECA, PO Box 1222, Sterling Heights, MI 48311-1222.

Aquinah, MA: Fall River Amateur Radio Club, W1ACT, 1600Z **Apr 30** to 2100Z **May 2**, operating from Martha's Vineyard at the Gay Head lighthouse, IOTA NA046. 3.755 14.250 21.260 28.460. QSL. Roland Daignault, N1JOY, 19 Davis Rd, Westport, MA 02790.

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to address listed in the announcement. To receive a special-event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form. Copies of this form are available via Internet (**info@arrl.org**), or for a SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Requests Form" in the lower left-hand corner. You can also submit your special-event information on-line at **http://www.arrl.org/contests/spevform.html**. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; ie, a special-event listing for **June** *QST* would have to be received by **April 1**. Submissions may be mailed to George Fremin III, K5TR, 913 Ramona St, Austin, TX 78704; faxed to ARRL HQ at 860-594-0259; or e-mailed to **events@arrl.org**.

QST

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators (indicated in *italics*) for each band listing. The numbers after call signs refer to endorsements. The totals shown are for credits given from December 12, 1998 to February 1, 1999. The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the Web at **http://www.arrl.org/awards/vucc/**. Please send an SASE if you cannot download the form online. VUCC lapel pins are available for $5 each. If you have questions concerning VUCC, send an e-mail to **vucc@arrl.org.**

Compiled By Bill Moore, NC1L, Century Club Supervisor

50 MHz

100

825	WD5K
998	N3XBG
999	K5BJW
1000	N5YK
1001	NY2Z
1002	KC8JTK
1003	N7UN
1004	N5MYH
1005	WW2R/EL09
1006	K8EB 175
G8BQX	400
WA1OUB	750
WA2AEY	400
W2CNS	500
WA2HFI/0	225
K3HZO	200
KJ5RC	200
KB8RJS	150
K8EB	175
W8WG	200
N8IEZ	150

144 MHz

100

556	N8VEA
557	KB8RJS
558	N8HTV
559	K8EB
560	N8IEZ
I1ANP	450
WA2AEY	150
N5FAC	225

222 MHz

50

100	WB4JEM

432 MHz

50

K1VYU	60
N4CH	70

1296 MHz

25

K3HZO	70
K3HZO	65

3.4 GHz

5

56	K7NQ

5.7 GHz

5

37	K7NQ

10 GHz

5

99	K6JEY

Satellite

100

88	K5OE
89	K5NRK
KC7QFS	275
N7SFI	525

QST

Straight Key Night 1998

By **Dan Henderson, N1ND**
Contest Manager

Thank goodness for the College Bowl Alliance. No longer will the active brass pounder have to choose between two passions: Straight Key Night and the national championship college football game! And judging from the 110 entries received, dits and dahs fared well against touchdowns and two point conversions. A total of 1247 QSOs were reported in the 1998 event. Reports of vintage keys were numerous. What jumps out immediately is the quality of the QSOs: 64 different hams received votes for "Most Interesting QSO." Congratulations to **W3TFA** and **K3LN** for garnering the most support in this category. How good it is to see so many operators carrying on great QSOs, not just "work 'em and move on."

K3LN pulls off the "double" for SKN as he also tied **W1LIC** and **W8EGI** for most votes for "Best Fist." **W2GR** edged out **N2FX** as most active during the event by one QSO (60 to 59). Activity was reported to be good on lots of bands, including the Novice/Tech plus subbands. Start planning now for SKN 1999/2000 December 31- January 1. If you subscribe to the theory the new millennium begins with 2000, you have a chance to be the first person to make a CW QSO in the next millennium. You can avoid the Y2K terror, put away the computer and not worry about a system crash. Pound the brass, gang! And pray they don't move the Championship game back to New Year's Day.

Now we all know why K0JW had such a big signal.

AB5YY rocking 2-week-old Natalie to sleep with the sweet sounds of the code.

Key Clicks

It was exciting to hear a little of the history of each key and its operator (WN9U)… I have found no better way to bring in the new year (WB0B)… This year I also decided to use a transmitter built from a Ross Hull article from a 1928 *QST* (WB2AWQ)… W9EX told me he had been a ham for 63 years. I hope I can make that too (WB8RFB)… Nothing sounds better than good CW with a straight key. It is music to the ears (KA7T)… I don't think I will put the straight key away just yet (W1NJN)… The best fist I worked was W0CDJ using a Japanese navy key (W4QBE)… I started with my 1957 novice rig and when the new year began I switched to a home-brew rig based on the 1995 *ARRL Handbook* page 17.79: one watt and 3 QSOs, two over 1200 miles (W3IRZ)… I was encouraged that the Novice/Tech portions of 40 and 80 meters were buzzing with SKN activity (W9SUL)… It was so nice to talk to people, not just name, RST, QTH, rig, age, weather and 73 (KG4BIG)… How about SKC (Straight Key Century)? (AA1KF)… It was very gratifying to discover that courtesy, mutual respect and enjoyment are still part of ham radio (NT8X)… I was fortunate to be able to use a famous key: the J-38 key used to send the message to the President on December 7, 1941, that Pearl Harbor was being attacked (W4HZD)… The spirit is willing but the wrist was weak since my last SK contacts were some 30 years ago! (AA2AD)… I enjoyed limbering up on a key I have had for 72 years (W4GC)… I've been on every SKN since it started. This year I made 15 more amateur friends (W5ETK)… We can use straight keys all the time but how many of our computers would be confounded by our small imperfections in sending? Oh dear! We might have to start listening again! (K3LN)… The code always seems easier for others but fleeing a challenge only stunts your growth (K9LCK)… Technology has come a long way but communication will never attain a higher art form (WA1CFX)… My mother always told me to stay off the streets on New Year's Eve. I follow her advice and do SKN (W9EZN). QST

New Books

SIMPLIFYING DIGITAL SIGNAL PROCESSING

By Rajesh J. Shah

Published by Prompt Publications, an imprint of Howard W. Sams & Co, 2647 Waterfront Pkwy, E Dr, Suite 100, Indianapolis, IN 46214-2041. First edition, 1998. 127 pages with index; 7 1/2×9 1/4 inches, B&W illus; ISBN 0-7906-1136-8. $29.95.

Reviewed by Paul Danzer, N1II
ARRL Technical Advisor

Don't read this book—at least not cover to cover—because no matter who you are, and no matter your technical ability and background, there are parts of this book that will be too simple for you and parts that will be too complex.

What Shah has done is put together a book on digital signal processing (DSP) that covers a wide variety of topics. In order to fulfil the promise of the title, much of the mathematics is simple, but much is *over*simplified, so some readers will have trouble understanding the real meaning of some of the one-line equations.

Many of us learned radio techniques by looking at equations and waveforms. This book is about digital processing, where the waveforms are converted to digital values and in place of circuit blocks (such as filters, amplifiers or mixers) mathematical computations are made. In order to understand this approach, you have to have a feel for the mathematical representation or model of a waveform, and this is what is done in chapter 2.

Now you can proceed to see what processing you want—filtering, detection or a number of others. These are shown in a block diagram representation (chapter 3) and the actual calculations (or transforms) in chapter 4.

All well and good, you might add—but we still live in an analog world. The signals in your transceiver are analog. As you might expect, they must be converted from analog to digital before going into the processing and from digital to analog when going back into the transceiver, transmitter or receiver. Chapter 5 contains the explanations of this input/output process.

Finally, chapters 8, 9 and 10 include simplified explanations of filtering and other applications. Not as many as perhaps you and I might want, but enough to make the point that digital processing is here to stay.

Add to your library or not? If you want a simple mathematical explanation of some to the elements in digital processing, many of the chapters and the list of contributors (actually references) makes the book something you should look at. But if you want a readable explanation of digital signal processing, geared specifically to ham radio applications, take a second look at chapter 18 (Digital Signal Processing) of any recent edition of *The ARRL Handbook for Radio Amateurs*. QST

1999 IARU HF World Championship Rules

1. Eligibility: All licensed amateurs worldwide.

2. Object: To contact as many other amateurs, especially IARU member-society HQ stations, around the world as possible using the 160, 80, 40, 20, 15, and 10-meter bands.

3. Date and Contest Period: Second full weekend of July. Begins 1200 UTC Saturday, ends 1200 UTC Sunday (July 10-11, 1999). Both Single and Multioperator stations may operate for the entire 24-hour period.

4. Entry Categories:

4.1. Single Operator:

Categories

4.1.1.1. Phone only.

4.1.1.2. CW only.

4.1.1.3. Mixed Mode.

4.1.2. One person performs all operating and logging functions.

4.1.3. Use of spotting nets is not permitted.

4.1.4. All operators must observe the limits of their operators' licenses at all times.

4.1.5. Single-operator stations are allowed only one transmitted signal at any given time.

4.2. Multioperator, Single Transmitter, mixed-mode (only).

Must remain on a band and mode for at least 10 minutes before changing band or mode.

4.2.2. Only one transmitted signal allowed at any given time. Exception: Only IARU member-society HQ stations may operate simultaneously on more than one band, with one transmitter on each band/mode. Only one HQ station call sign per member-society per frequency band is permitted.

4.2.3. All operators must observe the limits of their operators' licenses at all times.

5. Contest Exchange:

5.1. IARU member-society HQ stations send signal report and official IARU member-society abbreviation. IARU club station NU1AW counts as a HQ station. Members of the IARU Administration Council and the three IARU regional exceutive committees will send "AC," "R1," "R2," or "R3" as appropriate.

5.2. All others send signal report and ITU zone.

5.3. A complete exchange must be logged for each valid QSO.

6. Valid Contact:

6.1. The same station may be worked once per mode per band. Mixed-mode entries may work a station once per mode (but only in the generally accepted portions of that band for that mode. Note: Reworking a station in the phone portion of the band on CW is not permitted). Example: On any band, a station may be worked once on phone (in the phone segment) and once on CW (in the CW segment) for additional QSO credit. However, this counts as only one multiplier. Cross-mode, cross-band and repeater QSOs do not count. Where contest-preferred segments are incorporated in regional band plans, participants should observe them.

6.2. **The use of non-Amateur Radio means of communication (eg, telephone or the Internet) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement. Active use of packet clusters (ie "please come work me" spots or self-spotting) is not within the spirit of the contest.**

7. QSO Points:

7.1. Contacts within your ITU zone, as well as QSOs with all IARU HQ member-society stations, count one point.

7.2. Contacts within your continent (but different ITU zone) count three points.

7.3. Contacts with a different continent count five points.

8. Multipliers: Total number of ITU zones plus IARU member-society HQ stations worked on each frequency band, with IARU officials representing a maximum of four multipliers per band: AC, R1, R2 and R3. (Note: HQ sations and IARU officials do not count for zone multipliers.)

9. Scoring: Multipliers times the total number of QSO points.

10. Reporting:

10.1. Entries must be postmarked or e-mailed no later than 30 days after the end of the contest (August 10, 1999). No late entries can be accepted. **Any entry received after mid-October 1999, even if mailed in time, may not be received in time to be included in the printed results.** Use official forms or a reasonable facsimile. You may submit an entry on diskette or send your entry to ARRL HQ via Internet.

Electronic entries must conform to the ARRL Standard File Format, (see **http://www.arrl.org/contests/announcements/99/rules-all.html**) and should be sent via the Internet to**: iaruhf@arrl.org**.

Any entry which has been generated using a computer must be submitted either as an attachment to an e-mail or on 3.5 inch diskette. **Any computer generated entry which does not include the log and summary data files will be made a checklog. The files must show your call sign (example: W1AW .log or W1AW.sum) not names like IARU99.sum. The contacts must be listed in chronological order.**

10.2.1. Files may be sent as attachments not as the text of an e-mail to: **iaruhf@arrl.org.**

10.2.2. Files may be sent by mail. Foreign entries should use airmail to ensure prompt delivery.

10.2.2.1. Use an MS-DOS formatted disk, 3.5 inch.

10.2.2.2. Diskette labels must clearly indicate the call sign used, contest name, entry class, and date of the contest.

10.2.2.3. include one entry only on each diskette or e-mail.

10.2.3. They may be sent by Anonymous FTP to: **ftp://ftp.arrl.org/logs/**.

10.2.3.1 (If you use a non-Web-browser FTP client, FTP to **ftp://ftp.arrl.org** and change directory to /logs, with the command cd/logs.)

Logs must indicate band, mode, date, time in UTC, calls and complete exchanges (sent and received), multipliers and QSO points. Multipliers should be marked clearly in the log the first time they are worked.

10.4. Paper entries with more than 500 QSOs total must include cross-check sheets (dupe sheets). Contest summary, logs, and cross-check sheet (if required) or diskettes should be sent to IARUHQ, Box 310905, Newington, CT 06131-0905, USA.

11. Awards:

11.1. A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode and multioperator entrant in each state, each ITU zone and each DXCC country.

11.2. Achievement-level awards will be issued to those making at least 250 QSOs or having a multiplier total of 50 or more.

11.3. Additional awards may be made at the discretion of each country's IARU member-society.

12. Conditions of Entry: Each entrant agrees to be bound by the provisions of this announcement, by the regulations of his/her licensing authority and by the decisions of the ARRL Awards Committee, acting for the IARU International Secretariat.

13. Disqualification: An entry may be disqualified if the overall score is reduced by more than 2%. Score reduction does not include correction of arithmetic errors. An entry may be disqualified if more than 2% of duplicates are left in the log. A three-QSO reduction will be assessed for each duplicate QSO found during log checking or for each miscopied call sign. QST

Prefix, Continent and ITU Zone

1A0	EU	28	8P	NA	11	CT	EU	37	FY	SA	12	LA-LN	EU	18	T33	OC	65	VP2	NA	11
1S	AS	50	8Q	AS,AF	41	CT3	AF	36	G-GX	EU	27	LO-LW	SA	14, 16	T5	AF	48	VP5	NA	11
3A	EU	27	8R	SA	12	CU	EU	36	H4	OC	51	LX	EU	27	T7	EU	28	VP8(F)	SA	16
3B6-9	AF	53	9A	EU	28	CV-CX	SA	14	HA, HG	EU	28	LY	EU	29	T9	EU	28	VP8	SA	73
3C	AF	47	9G	AF	46	CY	NA	09	HB, HE	EU	28	LZ	EU	28	TA-TC	EU/AS	39	VP9	NA	11
3C0	AF	52	9H	EU	28	D2, 3	AF	52	HC, HD	SA	12	OA-OC	SA	12	TF	EU	17	VQ9	AF	41
3D2	OC	56	9I-9J	AF	53	D4	AF	46	HH	NA	11	OD	AS	39	TG, TD	NA	11	VR6	OC	63
3D2(R)	OC	56	9K	AS	39	D6	AF	53	HI	NA	11	OE	EU	28	TI, TE	NA	11	VS6, VR2	AS	44
3D2(C)	OC	56	9L	AF	46	DA-DL	EU	28	HJ-HK	SA	12	OF-OI	EU	18	TJ	AF	47	VU	AS	41, 49
3DA	AF	57	9M2, 4	AS	54	DU-DZ	OC	50	HK0(M)	NA	12	OH0	EU	18	TK	EU	28	XA-XI	NA	10
3V	AF	37	9M6, 8	OC	54	E3	AF	48	HK0	NA	11	OJ0	EU	18	TL	AF	47	XA4-XI4	NA	10
3W, XV	AS	49	9N	AS	42	E4	AS	39	HL, DS	AS	44	OK-OL	EU	28	TN	AF	52	XT	AF	46
3X	AF	46	9Q-9T	AF	52	EA-EH	EU	37	HO-HP	NA	11	OM	EU	28	TR	AF	52	XU	AS	49
3Y	AF	67	9U	AF	52	EA6-EH6	EU	37	HQ-HR	NA	11	ON-OT	EU	27	TT	AF	47	XW	AS	49
3Y(P)	AN	72	9V	AS	54	EA8-EH8	AF	36	HS, E2	AS	49	OX	NA	5, 75	TU	AF	46	XX9	AS	44
R1MV	EU	29	9X	AF	52	EA9-EH9	AF	37	HV	EU	28	OY	EU	18	TY	AF	46	XY-XZ	AS	49
R1FJ(FJL)	EU	75	9Y-9Z	SA	11	EI-EJ	EU	27	HZ	AS	39	OZ	EU	18	TZ	AF	46	YA	AS	40
4K	AS	29	A2	AF	57	EK	AS	29	I,IS0,IM0	EU	28	P2	OC	51	RA-RZ,	EU/	19-26,	YB-YH	OC	51, 54
4L	AS	29	A3	OC	62	EL	AF	46	J2	AF	48	P4	SA	11	UA-UI	AS	29-35,	YI	AS	39
4P-4S	AS	41	A4	AS	39	EP-EQ	AS	40	J3	NA	11	PA-PI	EU	27			75	YJ	OC	56
4U(ITU)	EU	28	A5	AS	41	ER	EU	29	J5	AF	46	PJ2, 4, 9	SA	11	UJ-UM	AS	30	YK	AS	39
4U(UN)	NA	08	A6	AS	39	ES	EU	29	J6-8	NA	11	PJ5,6,7,8	NA	11	UN-UQ	AS	30, 31	YL	EU	29
4X, 4Z	AS	39	A7	AS	39	ET	AF	48	JA-JS, 7K-N	AS	45	PP-PY	SA	12,13,	UR-UZ,EM-	EU	29	YN	NA	11
5A	AF	38	A9	AS	39	EU, EV, EW	EU	29	JD(Minami)	OC	90			15	EO			YO-YR	EU	28
5B	AS	39	AP-AS	AS	41	EX	AS	30, 31	JD	AS	45	PY0	SA	13	V2-4	NA	11	YS	NA	11
5H-5I	AF	53	BV	AS	44	EY	AS	30	(Ogasawara)			PY0(T)	SA	15	V5	AF	57	YT, YU, YZ	EU	28
5N-5O	AF	46	BY, BZ, BT	AS	33, 42,	EZ	AS	30	JT-JV	AS	32, 33	PZ	SA	12	V6-7	OC	65	YV-YY	SA	12
5R-5S	AF	53			43, 44	F	EU	27	JW	EU	18	S0	AF	37	V8	OC	54	YV0	NA	11
5T	AF	46	C2	OC	65	FG	NA	11	JX	EU	18	S2	AS	41	VE,VA,VO,	NA	2-4, 9,	Z2	AF	53
5U	AF	46	C3	EU	27	FJ, FS	NA	11	JY	AS	39	S5	EU	28	VY		75	Z3	EU	28
5V	AF	46	C5	AF	46	FH	AF	53	K,W,N,	NA	6, 7, 8	S7	AF	53	VK	OC	55, 58,	ZA	EU	28
5W	OC	62	C6	NA	11	FK	OC	56	AA-AK			S9	AF	47			59	ZB	EU	37
5X	AF	48	C8-9	AF	53	FM	NA	11	KG4	NA	11	SA-SM	EU	18	VK(LHI)	OC	60	ZC4	AS	39
5Y-5Z	AF	48	CA-CE	SA	14, 16	FO (Clip)	NA	10	KH0	OC	64	SN-SR	EU	28	VK9(W)	OC	55	ZD7-9	AF	66
6V-6W	AF	46	CE0A	SA	63	FO	OC	63	KH1	OC	61, 62	ST	AF	47, 48	VK9(X)	OC	54	ZF	NA	11
6Y	NA	11	CE0X	SA	14	FP	NA	09	KH2	OC	64	SU	AF	38	VK9(C, K)	OC	54	ZK1-3	OC	62
7O	AS	39	CE0Z	SA	14	FR	AF	53	KH3-7	OC	61	SV-SZ, J4	EU	28	VK9(M)	OC	56	ZL-ZM	OC	60
7P	AF	57	CM, CO	NA	11	FT8W	AF	68	KH8	OC	62	T2	OC	65	VK9(N)	OC	60	ZP	SA	14
7Q	AF	53	CN	AF	37	FT8X	AF	68	KH9	OC	65	T30	OC	65	VK0(H)	AF	68	ZR-ZU	AF	57
7T-7Y	AF	37	CP	SA	12, 14	FT8Z	AF	68	KL	NA	1, 2	T31	OC	62	VK0(M)	OC	60	ZS8	AF	57
						FW	OC	62	KP1-5	NA	11	T32	OC	61, 63						

Edited by **Steve Ewald, WV1X** • Assistant Field Services Manager

The ARRL Field Organization Forum

Field Organization Abbreviations

ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
DXFR	DX Field Representative
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall K. Carlson, WB0JJX—e-mail: wb0jjx@arrl.org. Web site: http://gographics.com/staff/randall/secpage.htm. The 1999 Delaware State Convention will be held in conjunction with the Penn-Del Hamfest on April 25 from 9:00 AM to 2:00 PM. The Convention program will feature an ARRL/Club Leadership forum. Many thanks to the Penn-Del club for their efforts in putting this on. I hope to see you all there. Field Day is just around the corner. It's not too early to start planning. The number of clubs that has been participating has dropped over the last few years. Those with older members just don't have the membership to staff a station for 24 hours. Unfortunately, Field Day is one of the few events during the year that clubs can get together as a unit and operate. So consider setting up a portable operation even if only for a few hours. And above all have fun with it. Traffic (Jan) DTN: QNI 127 QTC 21 in 20 sess. DEPN: QNI 34 QTC 5 in 5 sess.

EASTERN PENNSYLVANIA: SM, Allen R. Breiner, W3TI—SEC: Eric Olena, WB3FPL. STM: Harry Thomas, W3KOD. OOC: Alan Maslin, W3DZI. SGL: Cully Phillips, N3HTZ. TC: ASMs: WY3K, K3TX, N3KYZ, WB3FQY. An Official Observer appointment was made to K3HQ. Technical Specialist appointments go to W3ZHW and KB3CFV and OES goes to WB3GCK who is an active member with the Chester Co ARES/RACES. This is the year your area electric supply company in cooperation with the Nuclear Regulatory Commission, FEMA, PEMA, and your county EMA will run their annual nuclear evacuation drill at various times during the summer. EC KC3XL and Chester Co ARES/RACES members KB3DU, WA3CQT, N3ZAU, N4SEN, W3STA, KD3OK, KJ3V, W3QT, N3MEL, KU3V activated HAZMAT for a toxic spill of 1000 gallons of methyl ethyl ketone. SKYWARN spotters N3ZRR, N3OMA and KB3CXD were QRL supplying data for the National Weather Service during the January storms. The 1999 officers for the RF Hill Amateur Radio Club are: N3YSI president, N3CRP vice president, KA3MOP, secretary, KA3VVG treasurer. The Holmesburg ARC will be using their new vanity call, W3P, for future on-the-air activities. The Mid-Atlantic Amateur Radio Club joined the "Main Line Volunteer Force" that is a consortium of organizations that support a number of local charities. New upgrades are KB3CXS and KB3CRY to Tech Plus and N3ORC made it to Big "X." W3FM added a computer derived CW to his station in conjunction with his hand-cranked variety. A radio club somewhere in the Ukraine is now very fortunate to have won a computer that was donated to them through the joint efforts of K3KFD and KF3CD. Make plans now to attend the ARRL EPA Section Convention at Bloomsburg fairgrounds on June 12. Stop by the section manager booth to say hello. Did your club or group have an activity or perform a public service? Let's hear about it; give us details and the call letters of those participating. If you recall in prior reports, we give fair warning regarding closing the barn door after the horse is gone. Well, it happened! A radio club member in the western part of our section spoke to me asking information regarding RFI and a commercial tower under construction. Upon completion of our conversation, they applied for an LGL appointment and joined the rest of our local government liaison information network. Hopefully, the data that we supplied was received in time to prevent their horse from being stolen. Does your radio club have an LGL, or is your barn door still locked? Don't wait, act now. Tfc: W3KOD 501, N3DRM 374, N3EFW 294, W3IVS 167, W3HK 105, N3YSI 104, W3IPX 71, NR9K 36, N3HR 34, WA3EHD 32, W3JKX 30, AD3X 18, K3TX 17, N3SIN 14, W3TI 13, KA3KMH 12, N3KYZ 12, N3DCG 11, N3IRN 9, W3CKA 5, K3ARR 4, W3TWV 4, W3ZQN 4, W3BNR 3, N3AT 2, WB3GCK 1, N3NNH 1. Section nets: EPA 172, EPAEP&TN 126, PTTN 100, PFN 73, MARCTN 17, SEPTN 14, LCARES 13, D6ARES 5, D8ARES 2, EPAS 2.

MARYLAND/DC: SM, Bill Howard, WB3V—MDC Section Web homepage **www.erols.com/wb3v/mdc/**. **PRGE** EC KA3PVS reported that the 4-wheel program for PRGE is on track with training as drivers and ride along radio operators beginning in February. **HOWA** WA1QAA reports that on January 14, freezing rain and rain fell throughout the eastern portion of Maryland, continuing throughout the night and into the early morning hours on Friday. HOWA RACES/ARES was called to provide communications for HOWA Emergency Management. HOWA EOC opened shelters and K3EF, KF3BO, N3OYF, and N3JKK manned operating positions at the EOC and the shelters. Later N3AC, KC3EV, WA3WZX and WA1QAA relieved these operators then K3EF and W3CCI took over. Thanks to all operators who provided assistance during this emergency. **GARR** EC N3KAT reports 13 members, 4 nets. ALLE EC KO4UU reports 13 members, 5 nets on 146.88. **MONT** EC K3XO reports Montgomery County RACES/ARES was activated by the County twice in January. On Friday, January 15, RACES/ARES activation was due to widespread power failures in Montgomery County. Participants were WA3WOD, K3CSX, WB3JHG, N3NFW, W3KIT, KA3ZMW, and K3XO. Also on standby were WK3X, and WB4AEJ. W3KIT set up his cross-band repeat capability. KA3ZMW is the new president of the Montgomery Amateur Radio Club (MARC) for 1999. RACES/ARES was activated to support Montgomery County Hospital Radio Net in response to explosion at PEPCO substation in Olney/Sandy Spring, MD. Participants were WA3WOD, KA3CTR, N3JEY, K3CSX, WK3X, and K3XO. On standby were WA2WDT and KD3PQ. **CARR** EC N3JIA reports 20 members, 4 net sessions on 145.41 with liaison to MEPN, MDD, and MSN by KE3FL and liaison to MEPN, BTN, DTN, WVA, Central Region and Western Region nets by KG6TU. With the nets: Net/NM/QND/QTC/QNI: MSN/KC3Y/31/43/354, MEPN/KE3OX/31/70/688, BTN/AA3LN/31/51/392, SMN/KE3OX/0/0/0, Tfc: KK3F 514, KJ3E 190, W3YVQ 145, N3WKE 83, AA3GV 77, AA3SB 60, KC3Y 55, N3WK 53, KO4A 53, KE3OX 48, KB3AMO 32, N3ZKP 24, WA1QAA 13, KG6TU 13, WA3WRT 5, WA3GYW 4, KE3FL 2. PSHR: W3YVQ 159, N3WKE 154, KK3F 153, AA3SB 144, KO4A 142, N3WK 135, KJ3E 132, N3ZKP 126, KG6TU 125, KC3Y 116, AA3GV 107, KE3OX 103, WA1QAA 103, KE3FL 76.

NORTHERN NEW YORK: SM, Les Schmarder, WA2AEA—ASMs: KD2AJ, WB2KLD, N2ZMS, WA2RLW. ACC: WZ2T. BM: KA2JXI. OOC: N2MX. PICs: N2SZK,WA2RXO. SEC: KF2GC. STM: N2ZGN. TC: N2JKG. Web site: **http://www.northnet.org/nnyham**. January BBS Reports, B/P/T: KA2JXI 1896/496/19, KD2AJ 1706/460/70. Net Reports, QNI/QTC/QND: BILL'S GERITOL 220/20/20, CVARCCPN 18/0/2, CVARCSN 40/0/5, CVARES 26/4/4, MVARC 26/0/4, NNYARES 362/14/31, NNYSVC 301/18/31, Q NET 493/6/31, SIRR 750/44/31, W2UXC SWAP 41/0/4. NNY Service Net formerly known as NDN. The Spring walkathon season cometh! These events are great light-duty opportunities to get more ops involved in ARES, and to get to know the capabilities of simplex and the various repeaters in different areas. This can be valuable knowledge for when we are called on to provide assistance in communications. 73, Les, WA2AEA.

SOUTHERN NEW JERSEY: SM, Jean Priestley, KA2YKN (@K2AA) e-mail: ka2ykn@arrl.org— ASM: W2BE, K2WB, W2OB, N2OO, KB2TME. SEC: KB2TME. STM: WB2UVB. ACC: KB2ADL. TC: W2EKB. SGL: KB2WKY. OOC: K2PSC. PIC: N2YAJ. TS: W2PAU, W2BE, AB2Y, K2JF, WB2MNF, KD4HZW, WA2NBL. Months fly by and again we say hello to spring and public service. MS Walks and March of Dimes in April kickoff activities in most areas. Just a few hours of your time goes a long way. The SM's net is now open to all in the Section. Look for the South Jersey Section Manager's Info Net on 147.345 on the first Monday of each month. Staff business will be conducted and then the net will open to all. The Int'l world of Amateur Radio mourns the loss of a truly great Amateur Radio operator, King among kings and humanitarian, JY1, whose key is silent and voice missing from the airwaves, will be missed. I count it as a personal loss to never have made a contact with him. SJVN nightly at 10:30 PM on 147.345. Traffic stats for January: WB2UVB 147, WA2CUW 126, K2UL-4 89, AA2SV 80, N2WFN 70, K2UL 61, W2AZ 42, KB2RTZ 32, N2VQA 30, KA2CQX 14, NN2Y 7, KB2VSD 3, N2AYK 2, 1 each, KB2VSR KB2YBM N2ZMI N2MSM KB2RHI N2WOT N2FHJ N2FHK N2SOE KB22CDB KB2HJJ. Put your call on the list.

WESTERN NEW YORK: SM, William Thompson, W2MTA—WNY Web: http://www.dreamscape.com/phaedrus/WNY. WNY LOs: SEC K2KIR; STM KA2GJV; DECs KA2ZNZ, KF1L, N2KPR, WA2UKX; NMs AF2K, K2KIR, KA2ZNZ, KB2UQZ, N2JRS, N2LTC, N2NCB, W2YGW, WA2PUU, WB2QIX. CLUB NEWS: STARS renewed SSC, CCARES Man-of-Year N2SYP, Liverpool Ham-of-Year WB2BJW. CLUB OFFICERS: BARA KB2SCF KB2YVS N2PQX N2NCB, MOARC KG2DI KC2DKV KB2WEO KC2BHM, Orleans N2LVW K2ZUT KB2RMO KA2BCF KC2BQZ, Skyline N2MRE KB2LUV W2JYS KB2AED, TCARC N2IKR KC2DYR N2DEM KB2ETO, Utica AA2CU WA2TVE NA2A N2MTT, Xerox KC2DTT KG2NY AA2LQ WW2J. HAMFESTS: Drumlins Mar 27, Owego May 2, Rochester June 4-6, Cortland June 12, Batavia July 10, Utica July 17, Auburn Aug 7, Rome Aug 14, Lancaster Aug 15, Hamburg Sep.18, Elmira Sep 25, RAGS Oct 2, Traffic Handlers Picnic @ Annapolis MD Oct 1-2. SILENT KEYS: too many FB fists that went SK recently — K2HYO, K2MA, KS2I, WA2EIJ, WA2LYF and lovable reporter and STARS NCS Guz WB2EZU. Y2K PLANNING: Sure do hope that you ARES folks are thinking ahead on preparation to assist locally if and when the need arises, and that includes long term auxiliary power sources. Remember January is a cold month and furnaces need power, just like H-T batteries need a battery charger now and then (Solar ?).

Net	QNI	QSP	QND
Early Bird Net-FM	524	000	20
NYS RACES-SSB	076	009	05
NYS RACES-CW	028	005	05
#NYS/M-CW 3677	241	124	31
CHN-SSB 3925	191	043	31
#WDN/M-FM	552	077	31
#NY PHONE-SSB	265	354	31
#NYPON-SSB	393	161	31
ESS-CW 3590	339	183	31
NYSPT&EN-SSB	372	036	31
OCTEN/E-FM	1500	218	31

Net	QNI	QSP	QND
#STAR-FM	449	021	31
#WDN/E-FM	540	103	31
#NYS/E-CW 3677	420	263	31
TIGARDS-FM	019	004	05
BRVSN-FM	249	004	31
STTHN-FM	045	007	08
#CNYTN-FM	353	084	31
#OCTEN/L-FM	676	172	31
#WDN/L-FM	520	029	31
#NYS/L-CW	294	248	31
[# - NTS net]			

ARES Report: OMEN 025-002-002. [* - Public Service Honor Roll] Traffic (Jan):N2LTC*1076, KA2ZNZ*611, KA2GJV*483, KF1L*448, KA2QIK 400, NN2H*310, W2MTA*263, K2BCL*249, WB2IJH*204, W2FR*189, WB2QIX*147, NY2V*143, AF2K*99, W2PII * 66, KG2D*65, N2IKR*60, N2CCN*58, N2WDS*55, KB2UQZ*42, AA2ED*26, K2DN*23, KB2VVD*23, WA2GUP*21, KB2ETO 20, W4BNY*19, KB2TIY 18, KG2OY*17, KB2WII*13, WA2UKX*12. (Dec) N2IKR 34, KC2BYA 37. Jan BPL KA2QIK, KA2ZNZ, N2LTC. DATALINK: K2DN R3/T1, NY2V R5/T20, KA2GJV R57/T12, N2LRTC R246/T115. In 1998 net reports approx. tally QNI 87K, QSP 30K, DATALINK 5K. FCC licensees 718K vs 438K in '88 and 353K in '78. The Old Geezer says — Worried about growth? Why? Worried about folks getting more involved in Amateur Radio public service? You betcha! Support your local ARES and NTS operations, be prepared. That's no April Fool's joke either! 73. w2mta@juno.com.

WESTERN PENNSYLVANIA: SM, Bill Edgar, N3LLR—ASM: N3MSE. ACC: N3SJR. ASM-ARES: WB3KGT. SEC: N3SRJ. ASM-Packet: KE3ED. ASM-Youth & Education: KE3EE. PIC: W3CG. STM: N3WAV. TC/OOC: WR4W. DEC-SO: KD3OH. DEC-N1: N3QCR. DEC-N2: KA3UVC. DEC-S1: KA3HUK. DEC-S2: KB3AQA. Are you prepared to help with SKYWARN this spring should help be needed? Last year, WPA saw a number of severe storms and tornado warnings. I have heard predictions that the number of severe storms will be greater than normal this year also. SKYWARN provides good local communications for the Weather Service to determine local weather conditions during severe weather. Doppler radar provides the Weather Service the tools to "see" where storms are, but not the ability to "see" how the weather is affecting a given locality. This radar can determine a funnel cloud is over a given area, but not whether the funnel cloud has touched down and doing damage. Amateur Radio operators perform a very necessary function within the SKYWARN program to let the Weather Service know what the weather is doing on the ground. In Western PA, the Amateur Radio Emergency Service (ARES) serves the Weather Service as its first priority. Disaster communications for the Red Cross is its secondary priority. If you'd like to help out, check with the ARES Emergency Coordinator for your county. If you're not certain who your county's Emergency Coordinator is, feel free to contact Rich Beaver, N3SRJ, WPA Section Emergency Coordinator. January Net Reports: net name, sessions, traffic, check ins, net mgr; WPAPTN, 31, 103, 624, N3KB; WPA CWN, 31, 218, 176, N3COR; NWPA2MTN, 29, 39, 173, WA3ZSC; EAMBN, 18, 15, 116, N3PBD; WPA 2MTN, 30, 34, 215, KA3BGC. Tfc: W3OKN 83, 106, 189; N3ON 21, 63, 87; W3NGO, 32, 46, 79; WA3UNX, 33, 43, 78; N3WAV, 40, 14, 67; N3KB, 39, 19, 64; W3GJ, 13, 12, 34;

Continued on page 114.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Marv, K6VIV, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa

SUNNYVALE, CA
510 Lawrence Exp. #102
94086
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Bob, N9GG, Mgr.
RT.13 1/4 mi., So. I-295

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Ray, KI7TN, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Phil, N4DRO, Mgr.
Doraville, 1 mi. no. of I-285

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston

12 Store Buying Power!

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

YAESU

Call For Spring Yaesu Specials!

FT-840

- 100W • 12V DC • DDS
- Gen. Cov. Rx, 100 mem.
- Optional Ext. Auto • Tuners Available

Call Now For Our Low Pricing!

FT-1000MP HF Transceiver

- Enhanced Digital Signal Processing
- Dual RX
- Collins SSB filter built-in
- 100W, Power supply built-in

Call Now For Low Pricing! NEW!

FT-100 HF/6M/2M/70CM Transceiver

- Compact Transceiver w/detachable front panel
- Rx 100kHz to 970mHz (cell blocked)
- Tx 100W 160-6M, 50w 2M, 20W 70CM
- Built-in DSP, Vox, CW keyer
- 300 Memories

Call Now For Low Pricing! NEW!

NEW!

VX-5R

50/2M/440HT

- Wideband RX, 6M-2M-440TX
- 5W output
- 220 mems, opt. barometer unit
- Alpha Numeric Display
- CTCSS/DCS built-in
- Li-Ion Battery

Call For Low Intro Price!

VX-1R

2M/440 Sub-Mini HT

- 290 Memory Channels
- .5W output
- Receives 76-999mHz plus AM BCB (Cell Band Blocked)
- Lithium Ion Battery

Call Now For Your Low Price! NEW!

FT-50RD

2M/440mHz Compact HT

- DVR, Decode, Paging Built-in
- Alpha numeric display
- Wide Band receive
- Battery Saver
- 112 Memories
- Mil-Spec
- HiSpeed scanning

Call For Your Low Pricing!

FT-847

Ultimate Base Station, HF, VHF, UHF

- 100w HF/6M, 50w 2M/430 mHz
- DSP • Full Duplex Cross-band
- 1200/9600 Baud Packet Ready

Call for Low Price! NEW!

FT-3000M

- 2M 70W Mobile • Wide Band RX
- AM Aircraft RX • Dual Watch
- 9600 Baud Compatible • Alpha Numeric Display

Call For Low Pricing!

FT-920 HF+6M Transceiver

- 100w 160-6M, 12VDC
- Built-in DVR, CW Memory Keyer
- DSP, Auto-Notch • 99 Memories
- Computer controllable, CAT System

Call For Low Pricing! NEW!

FT-8100R 2M/440 Mobile

- Ultra Compact • 50w/35w 2m/440
- 110 memories • Wide Band RX
- Backlit mic • Remotable front panel w/opt. YSK-8100

Call Now For Special Pricing NEW!

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest To You!

12 Store Buying Power!

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

ICOM HF ...THE LEGACY CONTINUES!

IC-706MKII IC-706MKIIG*

Proven Performance Mobile or Base

- All mode HF/6M/2M
- 0.03-200 MHz all mode
- All mode HF/6M/2M/70cm
- 50W on 2M, 20W on 440 MHz
- CTCSS encode/decode (COMING MARCH 1999)

$100 Mfg. COUPON (MKII only)

DSP standard in 706MKII ver. 15, and 706MKIIG

IC-746 All Mode 160M-2M

Great HF Performance

$200 COUPON + Free Logbook

- 100W output for all bands
- IF-DSP+ twin pass band tuning (PBT)
- Large, multi-function LCD with band scope
- Versatile filter combinations (3 filter slots)
- Memory keyer, vox, and more

IC-756 All Mode Transceiver

- HF + 6 meters
- 4.9 inch multi-function LCD
- IF-DSP for Tx & Rx (front panel user adjustable)
- Twin PBT & noise blanker
- Vox & QSK
- Memory keyer

EXTREME VALUE

IC-2100H 2M Mobile Transceiver

- Cool dual display
- 55 watts
- Superior intermod rejection
- Backlit remote control mic

IC-207H Dual Band Mobile Transceiver

- 2M/440 MHz
- Wide band rx (includes airband)
- 9600 BPS packet ready
- 45W VHF (2M), 35W UHF (440 MHz)
- CTCSS encode/decode
- 4 power settings per band

IC-2800* Dual Band Mobile Transceiver

- 2M/440 MHz
- 9600 baud ready
- Band scope
- CTCSS encode/decode
- Selectable squelch attenuator
- 232 memories

IC-T8A 5 W Tri-Band Transceiver

FREE Alkaline Battery Case!

IC-T8A includes BP-200

- 6M/2M/440MHz
- Easy intuitive operation
- 123 Memories (incl. 10 scan edges and 1 call for each band)
- Tone Squelch with Pocket Beep

IC-R2 AM, FM, WFM Receiver

- Wide band coverage: .5 -1300 MHz **
- 400 memory channels
- High scan speed (30 channels/sec)
- Small - compact design
- Excellent audio
- Uses 2 AA alkaline or Ni-Cd batteries
- PC programmable

IC-PCR1000†† & IC-PCR100

LOW PRICES on PC-Controlled Rec.

- AM/FM/WFM/CW/SSB
- Freq: 10 kHz-1.3 GHz **
- 1000 memories/file (files limited by disk space)
- 3 display panel screens
- Optional DSP available

AM/FM/WFM •
Freq: 10 kHz-1.3 GHz ** •
1000 memories/file •
(files limited by disk space)
2 display panel screens •

EXTREME PERFORMANCE

IC-Q7A Dual Band Transceiver

- 2M/440 MHz transceiver
- Wide band receiver - 30 to 1300 MHz**
- 200 memory channels
- Ultra compact
- Monitor function
- Large built-in speaker, 100 mW audio
- Tone squelch with pocket beep
- Multiple scan modes including band, VFO, priority, program

IC-T7H 6W, Dual Band Transceiver

- Designed for Easy Operation!
- 2 M/440 MHz
- 9 DTMF memories
- 70 memories
- Great audio
- CTCSS encode/decode
- Auto repeater

IC-W32A Dual Band Transceiver

- 2M/440 MHz
- 5W @ 13.5 V
- Crossband operation
- 200 memories w/alpha naming
- CTCSS encode/decode
- Backlit keys & display
- PC programmable

ICOM®

*This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until approval of the FCC has been obtained. **Cellular blocked; unblocked OK to FCC approved users. ††IC-PCR 1000- (pictured), Computer not incl. ❖Coupons: Check with your ICOM dealer for details/restrictions- valid through Mar. 31, 99'. © 1998 ICOM America, Inc. AM-4036 APR (2/99) The ICOM logo is a registered trademark of ICOM, Inc.

CALL TOLL FREE

Phone Hours: 9:30 AM – 5:30 PM
Store Hours: 10:00 AM – 5:30 PM Closed Sun.

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; all HRO 800-lines can assist you. If the first line you call is busy, you may call another.

West.....800-854-6046
Mountain.....800-444-9476
Southeast.....800-444-7927
Mid-Atlantic...800-444-4799
Northeast.....800-644-4476
New England..800-444-0047

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Marv, K6VIV, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa

SUNNYVALE, CA
510 Lawrence Exp. #102
94086
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Bob, N9GG, Mgr.
RT.13 1/4 mi., So. I-295

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Ray, KI7TN, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Phil, N4DRO, Mgr.
Doraville, 1 mi. no. of I-285

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
SALES@HAMRADIO.COM
Exit 1, I-93;
28 mi. No. of Boston

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Marv, K6VIV, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa

SUNNYVALE, CA
510 Lawrence Exp. #102
94086
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Bob, N9GG, Mgr.
RT.13 1/4 mi., So. I-295

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Ray, KI7TN, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Phil, N4DRO, Mgr.
Doraville, 1 mi. no. of I-285

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston

12 Store Buying Power!

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

KANTRONICS

True Dual Port Simultaneous HF/VHF Operation

KAM PLUS

NEW KAM Plus features 128K RAM, EPROM space for 1 MB, on-board clock, expanded personal mailbox and Pactor! And G-TOR!Operating modes include CW/RTTY/ASCII AMTOR/PACKET/PACTOR/ WEFAX Terminal programs available for PC, Commodore and Macintosh computers.

Call For Our Special Price!

KPC-3 Plus/KPC-9612 Plus

A high-performance, low power TNC, for new and experienced users. Features dual level command set with 23 and 130 commands, respectively. Battery backed 128K RAM expandable to 512K. PBBS includes two-way forwarding, message header editing, remote sysop access and KA-NODE.

Call For Special Low Price!

Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world.Continuously moving - areas of day and night change as you watch.• Mounts easily on wall. Size: 34 1/2" x 22 1/2".

Reg $1295. SALE $999.95

ADI

exp. 3-31-99

AT-201HP 2M Handheld

- 40 memories + CALL channel
- Wide receive 130-180 MHz
- Built-in CTCSS enc./dec.
- Full-sized, backlit keypad
- 5 watts RF output

NEW!

exp. 3-31-99

AT-600HP 2M/440 Handheld

- Wide receive from 100-174, 340-480, and 850-985 MHz (cellular blocked)
- Dual receive • 200 memory channels
- 6 character alphanumeric display
- Crosband repeat • Auto repeater shift
- CTCSS enc./dec. • CTCSS tone scan

exp. 3-31-99

AR-146 2M Mobile

- 3 select. pwr. settings (5/10/50w)
- 40 memories plus a CALL channel
- Built-in CTCSS encode/decode
- Wide receive cov. 130-180 MHz

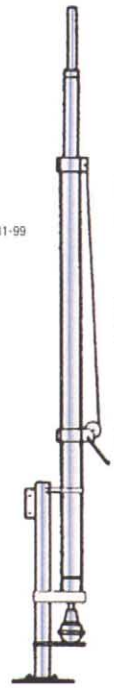
(AR-446 also shown)

concepts

VHF/UHF Solid State Amplifiers

Contemporary design, quality and a 1 year warranty on parts and labor. 1 year on the RF Final transistors.Most amplifiers have GaAsFET receive pre-amps and high SWR shutdown protection

US TOWER



Shown with Optional Rotor Base

MA-40

40' Tubular Tower

REG. $809
SALE $679.95

MA-550

55' Tubular Tower
Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

Reg.$1369
SALE $1069.95

TX-455

55' Freestanding Crank-Up
Handles 18 sq. ft. @ 50 mph
No guying required
Extra-strength const.
Can add raising and motor drive acces.

Towers Rated to EIA Specifications
Other Models at Great Prices!

SALE $1399.95

All US Towers shipped truck collect.

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest To You!

12 Store Buying Power!

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

HRO SPRING SALE! Alinco DJ-S11T or DJ-S41T **$88** EACH + shipping

Hurry - Limited Quantities Available!

HRO 12-Store Buying Power Working For You!!

ALINCO

DR-605TQ 2M/440 Dual Band Mobile

- 50W 2M, 35W 440
- Built-in Duplexer
- 9600 Baud ready
- 50 Memory chanels
- RX Range 136-174mHz/420-470mHz
- CTCSS built in

NEW!

Call For Low Pricing!

DJ-C5T

- 2M/440 Tx + Rx
- Extended Rx VHF/UHF
- Built-in Enc./Dec.
- 300 MW Tx output
- 50 Mems. + Scanning
- Built-in Lithium-Ion battery
- Complete w/fast charger

Call For Low Price!

DJ-S41T/DJ-S11T

440 Tiny HT 2Mtr Tiny HT

- 340 mw
- 21 memories
- Uses 3 "AA" Batteries
- Encode built-in
- Pivot antenna
- Less than 5" high and 2 1/4" wide (DJ-S41T)

(DJ-S41T shown)

Now 100W 6m DX-70TH

DX-70T HF Transceiver

- 100W 160-10 Mtrs • 10W 6M, Gencov. Rx
- Full QSK, 100 Mems. • Compact, Remotable
- Dual VFO, 12VDC • 6.2 lbs.

Now In Stock! New Low Price!

COMET

SMA-501 Dual Band

Dual band "Miracle Baby" style antenna, with a male SMA connector.

Shown on the popular FT-50R by Yaesu. The antenna is only 1.75 inches tall, and exhibits surprising performance.

NEW!

Call For Low Intro Pricing!

SBB-1/SBB-1NMO 2M/70cm

Dual band Mobile Antenna with flexible whip..

The perfect antenna for high profile vehicles. The heavy-duty whip bends to enter garages, drive-thrus, etc.

Available with a PL-259 connector (SBB-1), or an NMO connector (SBB-1NMO).

Very Flexible!

Call For Low Intro Pricing!

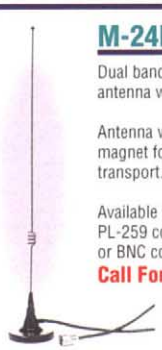
M-24M/M-24B

Dual band 2M/70cm mag mount antenna with 12' RG-58/U coax.

Antenna whip unscrews from the magnet for easy storage and transport.

Available with a soldered-on PL-259 connector (M-24M), or BNC connector (M-24B).

Call For Low Pricing!

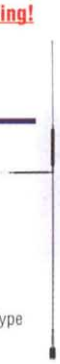


CA-HV

40 /15/10/6/2 Meter moile antenna
20/17 meter optional

Designed for use with the ICOM IC-706, and ALINCO DX-70. The CA-HV is tuned for constant operation on 6-2M. To operate HF, simply screw on 1 or 2 HF coils for quad-band operation!! The CA-HV is easy to mount on a standard trunk lip, hatch-back etc. type of mount. It folds over, too.

Call For Low Pricing!



CALL TOLL FREE

Phone Hours: 9:30 AM – 5:30 PM
Store Hours: 10:00 AM – 5:30 PM Closed Sun.

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; all HRO 800-lines can assist you, if the first line you call is busy, you may call another

West.....800-854-6046
Mountain.....800-444-9476
Southeast.....800-444-7927
Mid-Atlantic...800-444-4799
Northeast.....800-644-4476
New England..800-444-0047

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Marv, K6VIV, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa

SUNNYVALE, CA
510 Lawrence Exp. #102
94086
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Bob, N9GG, Mgr.
RT.13 1/4 mi., So. I-295

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Ray, KI7TN, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Phil, N4DRO, Mgr.
Doraville, 1 mi. no. of I-285

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Marv, K6VIV, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(619) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa

SUNNYVALE, CA
510 Lawrence Exp. #102
94086
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Bob, N9GG, Mgr.
RT.13 1/4 mi., So. I-295

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Ray, KI7TN, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Phil, N4DRO, Mgr.
Doraville, 1 mi. no. of I-285

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston

12 Store Buying Power!

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

Call For Spring Specials!

KENWOOD

NEW!

TH-D7A 2M/440

- 2M/440 Dual Band
- Built-in 1200/9600 Baud TNC
- APRS Compatible
- DX Packet Cluster Monitor
- 200 Mems., CTCSS
- VC-H1 Messaging Control

Call Now For Intro Pricing!

TS-870S HF Transceiver

- DSP in I.F. Stage! • 100W, 12V DC
- Dual mode noise reduction
- Digital Filtering (no opt. filters req.)
- Built-in RS232,Windows software incl.

NEW!

TS-50S/TS60S HF Trans. • 6M

- TS-50S - World's smallest HF trans.
- 100W out, (90W TS-60S, 50MHz only)
- SSB, CW, AM, FM, • 12V Gen. Cov. RX,
- 6.4 lbs., 7.16 x 2.4 x 9.32"
- 105 db dynamic range, 100 Mems.
- Opt. ext. ant. tuners available (TS-50S only)

Call For Special Low Price!

VC-H1
Visual Communicator

Compatible w/all FM VHF/UHF • Transceivers + HF SSB Send/Rec Digital Images • (32 seconds) for download Store pictures in memory • 1.8" Color TFT LCD Display • Built-in speaker + mic • Download to PC • (with special software)

Call For Low Intro. Price!

TM-261A 2M Mobile

- 50W + Mid and Low • Mil-Spec
- 61 Memory Chanels
- Alpha Numeric Function
- Dual Menu, DTMF Memory
- Backlit mic & built-in encode

NEW!

TM-V7A 2M/440Mhz

- 50W/35W • 280 Mems • Visual Scan
- Alpha Numeric • Enc/Dec & Duplexer Built-in
- Computer Programmable • 9600 Baud Ready
- Cool-blue Reversible LCD • Backlit Mic

Call Now For Low Price!

TH-G71A 2m/440

- 2m/440 Dual Band HT
- 200 Mems • PC Programmable
- 6w 2m, 5.5w UHF @13.8 VDC
- Alphanumeric Display
- CTCSS Built It • Backlit Keypad

NEW!

Call For Low Price!

5w High Power Also Avail.

TH-22AT

- Ultra Compact
- 2M HT, 5W optional
- 40 memories
- Encode Built-In

TS-570DG/TS-570SG DSP Enhanced

- 100w HF, (100w on 6M TS-570SG only)
- QSK, CW Auto Tune • Autotuner incl 6M
- DSP • Large LCD Display • Elect. Keyer
- RCP2 Radio Control Program Compatible

NEW!

Call Now For Your Low Price!

Limited Time!

FREE 2M/440 Duplexer

TM742AD 2M/440Mhz

- Optional 3rd band available • Back-lit mic
- Up to 303 memories • 101 per band
- PL Encode Built in • Detachable front panel

Call Now For Your Low Price!

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest To You!

Meet the Kenwood Family

Built-In TNC
APRS/GPS mapping & messaging. Advanced sky command and VC-H1 functions.

KENWOOD
Pace-setting product
Send color images on VHF/UHF or HF SSB/FM.
(PC downloadable)

UBZ-LF14
FRS

TH-22AT
2 meters

TH-G71A
2 meters & 440 MHz

TH-D7A
2 meters & 440 MHz w/TNC

TH-79AKSS
2 meters & 440 MHz

VC-H1
Visual Communicator

TM-261A/461A
2 meters/440 MHz

TM-331A
220 MHz

TM-G707
2 meters & 440 MHz

TM-V7A
2 meters & 440 MHz

TM-541A
1200 MHz

TM-742AD/642AD
2 meters & 440 MHz/2 meters & 220 MHz

TS-50/60
HF All Mode/6 meter All Mode

FREE
Operating Manuals via the FTP site*

TS-570D(G)
HF All Mode

TS-570S(G)
HF & 6 meter All Mode

TS-870S
HF All Mode

TS-950SDX
HF All Mode

KENWOOD
Amateur Radio Products Group
98ARD-1840

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support/Brochures (310) 639-5300
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

ISO 9001
JQA-1205

INTERNET
Kenwood News & Products
http://www.kenwood.net
Kenwood Bulletins
* ftp://ftp.kenwood.net

MOSLEY .....The Tradition *"A Better Antenna"*

M.E.I.

Mini Mono 3 Element Beams For 10 or 15 Meters

MB-10, MB-15

Specification and Performance Data

Forward Gain:	10 Meter	
	15 Meter	**Call**
Front-to-Back:	10 Meter	
	15 Meter	
Power Rating:	CW	.5 KW
	SSB	1.2 KW
SWR at frequency:	1.0/1 to 1.6/1	
Boom Length:	10 Meter	9'
	15 Meter	12'
Turning Radius:	10 Meter	6' 10"
	15 Meter	9' 10"
Mast Size:		1-1/4
Maximum Element Length:		
	10 Meter	10' 11"
	15 Meter	16' 11"
Assembled Weight:	10 Meter	6 lbs.
	15 Meter	10 lbs.
Wind Surface Area (sq.ft.):		
	10 Meter	1.30 sq. ft.
	15 Meter	2.09 sq. ft.
Wind Load (EIA, 80 M.P.H.):		
	10 Meter	28 lbs.
	15 Meter	42 lbs.
Shipping Weight:	(UPS Oversize 35 lb. rate)	
Warranty:		2 Years
Price: MB-10		$119.95
MB-15		$159.95

Mini and MY-Series Mast Plate

The MB-Series gives you a reduced size single frequency antenna for 10, or 15, Meters. On average, the overall size of the antenna is reduced by 34%. This gives you a very low profile and a very light weight antenna, which can be rotated with a TV rotor.

The MINI-33

A Very Small Tri-Band Beam

This is the ***SMALLEST*** true beam performing antenna for 10, 15, and 20 meters.

Use a roof mount and a TV rotor for a great time on 10, 15, and 20 meters. Bring back the fun to ham radio with the Mini-33 and a 100 watt transceiver, without all of the room and headaches required for larger installations.

Specification and Performance Data

Gain:	10M	
	15M	**CALL**
	20M	
Front to Back: (Avg.)		
Power:	CW	500 w
	SSB	1,000 w
	RTTY	250 w
	AM/FM	250 w
Turning Radius:		8' 9"
Longest Element::		16.8'
Sq.Ft.:		2.5sq.ft.
Wind load:(@ 80 M.P.H.)		38 lbs.
Assembled Wt.:		10 lbs.
Mast Size:		1-1/2"
Coax:		RG-8/RG-213
Boom:		1.25" x .058" x 6'
Tubing: (Drawn)		6061T6/6063T832
Warranty:		2 Years
Shipping:		UPS/Oversize
Price:		**$339.95**

All of the Mosley antennas use stainless steel hardware, are pre-drilled, color coded, and have a 2 year warranty. Mosley, "A Better Antenna"

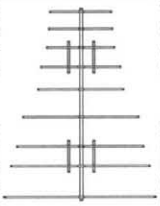
(--... ...--)

Web Info: ***Mosley-Electronics.com***

Mosley VHF/UHF

The "2N6"

Get "two" beam antennas on "one" boom. This is an excellent 5 element 2 meter beam and a 4 element 6 meter beam all in one! The 2N6 uses two separate feed lines, which allows individual use, but only requires one mounting system!



The 2N6 is rugged. Made out of aircraft tubing and uses stainless hardware and 1/4-20 stainless U-Bolts. The antenna is pre-drilled and color coded, which makes assembly a "snap"! Check it out!

Specification and Performance Data

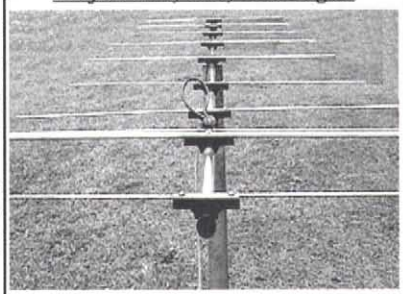
Forward Gain:	6 Meter	
	2 Meter	**Call**
Front-to-Back:	6 Meter	
	2 Meter	
Power Rating:	CW	1.5 KW
	SSB	3.0 KW
SWR at frequency:		1.0/1 to 1.6/1
Boom Length:		14 ft.
Turning Radius:		8' 9"
Mast Size:		1-1/2"
Maximum Element Length:		9 ft. 8"
Assembled Weight (approx.):		21 lbs.
Wind Surface Area (in sq. ft.):		2.5 ft.²
Wind Load (EIA standard 80 M.P.H.):		50 lbs.
Shipping Weight (approx.):		35 lbs.
Price: (Regularly $449.95)	Sale:	$309.95

"A" Series, SIX Meter Mono Band Beams

Specification and Performance Data

A-503-LS		3 Element
Forward Gain:		**Call**
Front-to-Back Ratio:		
SWR at resonance:		1.1/1
Max. Element Length:		9 ft. 9 in.
Boom Length:		6 ft.
Turning Radius:		6 ft. 5 in.
Matching:		Gamma
Wind Load:		1.3 sq. ft.
(EIA standard 80 MPH):		22 lbs.
Assembled Weight:		7.5 lbs.
Price:	Sale!	$79.95
A-504-LS		4 Element
Forward Gain:		**Call**
Front-to-Back Ratio:		
SWR at resonance:		1.1/1
Max. Element Length:		9 ft. 9 in.
Boom Length:		12 ft.
Turning Radius:		7 ft. 5 in.
Matching:		Gamma
Wind Load:		1.65 sq. ft.
(EIA standard 80 MPH):		31 lbs.
Assembled Weight:		12.5 lbs.
Price:	Sale!	$119.95
A-505-LS		5 Element
Forward Gain:		**Call**
Front-to-Back Ratio:		
SWR at resonance:		1.1/1
Max. Element Length:		9 ft. 9 in.
Boom Length:		14'
Turning Radius:		8' 6"
Matching:		Gamma
Wind Load:		1.85 sq. ft.
(EIA standard 80 MPH):		39 lbs.
Assembled Weight:		17 lbs.
Price:	Sale!	$124.95
A-506-LS		6 Element
Forward Gain:		**Call**
Front-to-Back Ratio:		
SWR at resonance:		1.1/1
Max. Element Length:		9 ft. 7 in.
Boom Length:		24 ft.
Turning Radius:		12 ft. 10 in.
Matching:		Gamma
Wind Load:		2.15 sq. ft.
(EIA standard 80 MPH):		49.5 lbs.
Assembled Weight:		21.5 lbs.
Price:	Sale!	$229.95
A-507-LS		7 Element
Forward Gain:		**Call**
Front-to-Back Ratio:		
SWR at resonance:		1.1/1
Max. Element Length:		9 ft. 10 in.
Boom Length:		28 ft.
Turning Radius:		18 ft. 6 in.
Matching:		Gamma
Wind Load:		2.85 sq. ft.
(EIA standard 80 MPH):		51.0 lbs.
Assembled Weight:		29.5 lbs.
Price:	Sale!	$299.95

Mosley Ultra Light Weight, Low Profile 144, 220, 440 Yagis.



Shown is an earlier MY-144-9, which had been up for 26 years in the mid-west and is in no need of repair, except for new coax!

The Mosley MY-Series VHF/UHF beams are capable of 80 mph winds and 1KW of output power, but are ultra lightweight and low square footage. These antennas are perfect for stacking above your existing system without hardly increasing the wind load on your tower or mounting system. The MY-Series of antennas are also great for chimmey or othe light mounting sytems. These antennas can be turned with a standard TV rotor.

For just a few dollars you can have a complete VHF/UHF "super station" without going broke, and as with all Mosley antennas the MY-Series comes with a two year warranty, stainless hardware and aircraft boom tubing and 6061T6 element rods.

The MY uses a folded dipole driven element, which gives you excellent bandwidth and a consistent radiation pattern. Our driven element was designed over 40 years ago and just in the past few years other manufacturers have discovered the value of it's design and have started using the Mosley concepts. ***Mosley...still "A Better Antenna!"***

Specification and Performance Data

Model:	MY-144-5	MY-144-9	MY-220-9	MY-430-14
Freq.	144 to 148	144 to 148	220 to 225	430 to 450
Power Rating:				
AM/CW/FM	1 KW	1 KW	1KW	1KW
SSB	2 KW	2 KW	2 KW	2 KW
Forward Gain:				
dipole		**Call**		
isotropic				
F/B:				
Feed Pt.:	52	52	52	52
SWR:	1.0/1	1.0/1	1.0/1	1.0/1
Matching:	Folded	Folded	Folded	Folded
Elements:	5	9	9	14
Longest El.	3' 5"	3' 5"	27"	15"
Boom:	4' 6"	9' 0"	8' 2"	6' 10"
Mast Size:	1"/1-1/4"	1"/1-1/4"	1"/1-1/4"	1"/1-1/4"
T. Radius:	2' 10"	4' 10"	4' 2"	3' 10"
Wind Area (sq. ft.):	0.4 ft.²	0.8 ft.²	0.7 ft.²	0.66 ft.²
Wind Load (EIA 80 MPH):	6.6 lbs.	10.5 lbs.	7.0 lbs.	7.0 lbs.
Assembled Wt:	2.0 lbs.	3.5 lbs.	3.5 lbs.	3.5 lbs.
Shipping Wt:	(Oversize 35 Pound Minimum UPS charge)			
Warranty:	2 Yrs	2 Yrs	2 Yrs	2 Yrs
Price:	$49.95	$69.95	$69.95	$59.95

"You can't get a better dollar value, than you can with these antennas advertised in this ad. I have put together a group of products that will meet the increasing needs of low profile, light weight, durable, great performance, and reasonably priced. These antennas will give you years of enjoyment on the bands.

For those of you that have been using Mosley products over the last 60 years, we still have parts that will allow you to bring that Mosley up to "Brand New " status. Just contact our parts department and they will be glad to help you. Thanks for your continued support!" K0VUW, President.

To review our current catalog and price sheet, check out our Web page! Or call or write to: Amateur Sales Department, to receive our current catalog.

(Prices do not include shipping, handling or insurance charges. Prices, materials, and specifications are subject to change without notice or obligation.)

Mosley Electronics, Inc., 1325 Style Master Drive, Union, Missouri 63084

Eng. (314)-583-8595 Fax. (314)-583-0890 Sales (800)-325-4016 or (800)-9-MOSLEY or (Web) Mosley-Electronics.com

WB8KPE, 18, 6, 33; WA3QNT, 12, 18, 30; K3JHT, 9, 6, 23; KC3NY, 8, 1, 18; N3HBB, 7, 5, 16; N3IBT, 6, 0, 12; AA3ML, 1, 1, 4; AD4XV, 1, 1, 3; KB3IN, 1, 1, 2.

CENTRAL DIVISION

ILLINOIS: SM, Bruce Boston, KD9UL—SEC: W9QBH. SGL: WA9AQN. ACC: N9KP. STM: K9CNP. PIC: N9EWA. TC: N9RF. OOC: KB9FBI. DEC-Central N9FNP. The Sangamon Valley RC is once again offering special-event vehicle plates to commemorate the annual ARRL Field Day event. These plates are $35 and can be displayed on your car from May 1 through Field Day. To order a set send your payment and a copy of your vehicle registration to Sangamon Valley Radio Club, 1025 S. Sixth St., Springfield, IL 62703. The new officers of the SVRC are pres KA9LBI, vp KE9FO, sec KA9KQH, trea KB9BIV. The club has moved its meeting night to the first Thursday of each month. The club meets at 7:30 PM in the IDOT building at Capital Airport. New officers for the Fox River Radio League are pres W9AN, vp K4CEO, sec KD9XP, trea N9TLJ. W9ICU reports the DeKalb Public Library will host a display of Amateur Radio equipment during April. The local radio group may also conduct some on-air demonstrations from the library. New officers for the Hamfesters RC are pres K9PB, vp KB9CYL, sec WB9ZHZ, trea KC9IX. Congratulations go out this month to several deserving amateurs in the Illinois section: Hamgab newsletter editor AA9BV has been named Hamfester of the Year; W9ZJX was named "Member of the Year" by the Schaumburg ARC; N9EJS has become a member of the ARRL A-1 Operator Club. Congratulations also go to KB9FBI on receiving the Guy E. Trone, KB9FAY, Memorial Award. The award was given by the Jacksonville ARS in recognition of his dedication and hard work for the club. The 1999 officers for the York RC are pres WK9U, vp KB9RTP, sec KE9VC, trea K9BFU. *Podunk News* from the Egyptian RC and the electronic edition of *Static*, the newsletter of the Starved Rock RC, both featured articles on how amateurs should be prepared to respond in the event there are problems arising from the Y2K issue. Some authorities have indicated there may be disruptions to some services. In view of this, radio amateurs might be in a position to provide assistance. It is something for your ARES group to consider as the deadline moves closer. Tfc: K9CNP 158, W9HLX 79, N9DT 41, WB9TVD 35, NC9T 20, KA9IMX 10, W9FIF 8, WA9RUM 6. ISN via WB9TVD QTC 99 in 31 sessions. ILN via K9CNP QTC 11 in 31 sessions. ITN via KF9ME no report. NCPN via W9OUF QTC 49 in 26 sessions. IPN via KA9CYJ QTC 20 in 24 sessions. IEN via K9HEZ QTC 12 in 5 sessions. Ninth region C4 report for Jan via W9FC—traffic 246 sessions 62 time 405 min avg 3.96 rate .607 percent rep 92%—QNI—ILN K9CNP, KF9ME, NS9F. D9RN report via AF9FA Cycle 1/Cycle2: sessions-26/24, QTC-76/86, QNI-36/33, QTR-431min/ 379min, avg-2.9/3.5, rate-0.176/0.226. W9VEY Memorial Net de K9AXS 6 with 185 check-ins.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZB. ASEC: WA9ZCE. STM: AA9HN. OOC: KA9RNY. SGL: WA9VQO. TC: W9MWY. BM: KA9QWC. ACC: N9RG. Sympathy extended to the families and friends of Silent Keys, 1/5. Thomas J. Fitzgerald, W9NUA, Bloomington; 1/19. Wayne Jack Linkhart, N9JFT, Fort Wayne. Things I know of at this writing to put on your calendar. Apr 11, Ind Radio Club Council, Jun 6, Wabash Co. ARC Hamfest, July 10, Central Div Convention and Hamfest at Indy, Aug 15, Lafayette Hamfest, Oct 24 Boone-Clinton Co. Hamfest at Lebanon. If you let me know dates of activities in time will list them. Congratulations to Randy, N9STQ, receiving Ham-of-the-Year award from Whitley Co. ARC. The Ft. Wayne ARTS had a work out during the snow storm. They worked a total of 63 hrs. Those involved N9AR, KA9FFT, N9FNW, WD9HII, KB9LDU, N9NNT, KB9TFC and N9ADS. Many others were on standby but not needed. Howard Co. had 22 amateurs with 9 more standing by who provided 201 hrs of service to the Kokomo area. I'm sure there were many others busy during the snow storm but if I don't know I can't tell about it. What is your club doing of interest? Our SEC extends his thanks to all appointees who took the time to report the activities of their ARES Groups, sending their annual EC reports and SET reports. NMs ITN/W9ZY, QIN/N9PF, ICN/AA9HN, WN/AB9AA, VHF/AA9HN.

Net	*Freq*	*Time/Daily/UTC*	*QNI*	*QTC*	*QTR*	*Sess*
ITN	3910	1330/2130/2300	3125	523	1582	93
QIN	3656	1430/0000	no report			
ICN	3705	2315	no report			
IWN	3910	1310	1963	–	310	31
IWN VHF Bloomington			476	–	465	31
IWN VHF Kokomo			665	–	155	31
IWN VHF Northeast			939	–	620	31
Hoosier VHF nets (10 nets)			636	31	944	42

D9RN total QTC 162 in 55 sessions represented by WB9QPA, K9GBR, W9UEM, N9ZZD and KB9NPU. 9RN total QTC 246 in 62 sessions represented by N9PF, KO9D, K9PUI, WA9QCF, AA9HN, WB9UYU and W9FC. Tfc: W9FC 286, W9ZY 126, K9GBR 125, N9ZZD 114, WB9QPA 89, KO9D 77, AB9AA 57, WA9QCF 50, K9PUI 49, W9JUJ 48, KA9EIV 30, K9RPZ 22, KA9QWC 20, KB9NPU 20, N9WNH 12, W9CSJ 11, W9EHY 8, AB9A 5, K9DIY 4, K8LEN 3, WB9NCE 3, W9XD 2, N9JAI 1.

WISCONSIN: SM, Roy A. Pedersen, K9FHI—BWN 3985 0600 W9RCW. BEN 3985 1200 KE9VU. WSBN 3985 1715 WB9WHQ. WNN 3723 1800 KB9OCZ. WSSN 3645 1830 N9BDL. WIN-E 3662 1900 WB9ICH. WIN-L 3662 2200 W9UW. 9rc4 had N9KHD, K9LGU, W9CBE, W9YCV, N9CK, W9UW as checkins, thanks guys. Congratulations to the following wedding anniversaries! John & Jill Westimyer, N9LGD, 29th. Robert & Helga Willet, K9UML, 40th. Ed & Esther Smith, W9DYO, 54th. Robert & Doris Giesfeldt, WB9JWT, 58th. (Hamtrix) Ozaukee Radio Club is having another one of their "Post Everything Party." Lots of fun and eyeball QSOs. (ORC Newsletter). I regret to report the following. Silent Keys: W9PWG, W9VOG. Space Place Amateur Radio Center, SPARC, put on a crash 2-day course on Technician level, and had 24 in the class and 18 passed Technician and 1 General, congratulations to the students and also the teachers, good job. WD9HXC has Extra. Congrats, Brian. (Short circuits). Our new SEC is sending

MFJ 1.8-170 MHz SWR Analyzer™

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

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

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

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

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

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

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

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

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

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

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

Here's what you can do

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

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

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

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

Check SWR outside the ham bands without violating FCC rules.

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

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

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

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

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

NEW

Call your dealer for your best price!

MFJ-259B **$249.95**

Call or write for *Free* Manual

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ *SWR Analyzers*™

MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $129.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

Made of special foam-filled fabric, the MFJ-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

MFJ-99, $54.85. Accessory Package for MFJ-259/B/249/B/209. Includes *genuine* MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1315 110 VAC adapter. ***Save $5!***

New! ***Tunable Measurement Filter***™

MFJ-731, $89.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

Free MFJ Catalog

Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders from MFJ

MFJ-224 **$159.95**

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¾ in.

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (601) 323-6551; **Add s/h**
Tech Help: (601) 323-0549

More hams use MFJ SWR Analyzers™ than any others in the world!

information to each EC in the state, look for better things. Ozaukee County ARES helped search for Linda E. (Ozaires Newsletter). Congratulations to Chuck Forster, WA9ACI, as being Ham of the Year from the FLARC. Nice to have N9IAI back on the nets, welcome back Bob. Ham-of-the-Year for RRRC is KA9BAC, XYL of K9FHI. New officers Madison DX club: pres K9EMG; vp WT9Q; sec/trea KF9AQ. New officers Watertown ARC: pres N9EAJ vp NO9-U, sec WA9OAY, trea WA9YVE. Beware of people who fall at your feet. They may be reaching for the corner of the rug. Tfc: K9RTB 872, K9JPS 787, WB9YPY 502, W9IHW 502, K9GU 408, W9CBE 245, N9KHD 149, AF9FA 77, N9BDL 76, N9CK 71, W9UW 70, KA9KLZ 69, AG9G 69, W9YCV 64, KE9VU 57, KA9BHL 52, K9LGU 50, K9HDF 42, AA9BB 31, KG9B 31, K9FHI 31, KA9FVX 27, WB9ICH 24, WD9FLJ 14, N9JIY 13, W9ODV 9, W9PVD 4.

DAKOTA DIVISION

MINNESOTA: SM, Randy "Max" Wendel, N0FKU— The ARES 320 district EC vacancy has been filled by Doug Hedin, K0OFB who lives near Hutchinson. ECs and ARES members are asked to give Doug your full support in continuing to fulfill our mission in ARES functions. Tnx, Doug, for volunteering! We still seek a DEC in the metro, not to mention several counties in the state which we still seek ECs for. If you are interested in ARES membership, let your county ARES EC know of your interest. Please note: All ARES members must have an ARES ID card. Your ARES EC must issue your ID card once you have applied and meet the minimal requirements. A big congrats goes to W0ZQJ, Ken Covey of Moorhead, who received the Red River Radio Amateurs award of Ham of the Year 1998 and Lifetime Achievement Award presented to him at the RRRA Xmas party a few months ago. About the time you read this news column we will mark the 1-yr anniversary of the St Peter tornado on Mar 29. It was yet another example of the various ways ARES and Amateur Radio communications played a vital role in recovery efforts and served as an example of the many ways we can build ARES to be a much more effective organization. The bottom line is YOUR participation and the organizational efforts put forth by your appointed ARES EC. You may never think a disaster could affect you or require your resources in radio communications. Think again. Ask the hams in St Peter. Ask the hams in Grand Forks. Ask the ARES members in Winona and Rochester who responded to BOTH disasters. Then, ask yourself what importance is ham radio and how you could be a part of the valuable resource ARES is and can be. Why not be pro-active and become a part of the team. The reward is wonderful. 73, N0FKU. Tfc: WB0WNJ, KB0AII, W0LAW, WA0TFC, W0GRW, W0HPD, K0PIZ, KN9U, KB0AIJ, K0WPK, W3FAF, WO0A, W0WVO, WD0GUF, N0JP, K0OGI.

NORTH DAKOTA: SM, Bill Kurtti, WC0M—Plans are made for the Peace Garden Hamfest second weekend in July 9–11. Large flea market, vendors, ladies' events, meetings, transmitter hunts, Saturday night dance with live band and Sunday morning breakfast are included in admission price. At this time, I'm camping near Quartzsite, AZ, again. Attended the Good Sam hamfest at the Mobile Antenna shootout. We found out this year that putting 4 ft of extra mast under the coil gives 3 db on 75 meters. Congratulations to N0MBE for winning the spotter of the year award for the Bismarck club. Good work, Rick. Thanks to Otto, K0IAB, for hours of work he did getting the new communications trailer ready for TRARC. Tfc: N0RDJ 17. Net reports: Goose River 5/81/1. DATA 29/675/25. Wx net 50/1151/55. NM KE0XT.

SOUTH DAKOTA: SM, R. L. Cory, W0YMB—S Dakota ham K0AIE, Albert Gull, has been honored by the National Weather Service for being a volunteer weather observer for them for 50 years. The ceremony was held on Jan 24 at the Edgemont United Methodist Church. He has been a ham for 42 years. Huron ARC will not have a hamfest this year with 3 other ones scheduled for eastern South Dakota. They felt that was enough. They will have testing on April 24, Sept 25 and Nov 26. Their new officers are WA0TDK pres, KB0VYR vice president, WB0ULX sec/treas, and activities WA0NHJ. Sioux City hamboree will be held on June 4-5 at the Marina Inn. Watertown Club LARK has reported an increase in activity with their 3 club-sponsored nets. Don't forget to mark your calendar for Aug 7-8 for Watertown Dakota Division Convention.

DELTA DIVISION

ARKANSAS: SM, Roger Gray, N5QS, e-mail n5qs@ arrl.org — This has been a very active month in the Arkansas Section. We have experienced the most tornadoes ever recorded in 1 day with some damage over a large portion of the state and major damage in White County. The response from the amateur community was excellent with some nets running continuously for 5 or 6 days. The cooperation between different groups was excellent. I had contact with ARES, RACES, SATERN, and several other local nets during the storms and later during disaster recovery. On to the more pleasant, I attended what appears to me to be one of the best hamfests I have seen in the last couple of years. This was the first annual Delta ARG Hamfest in West Memphis. All tables were sold and the parking was totally packed as were the aisles during the first 2 hours of the event. I hope this is an indication of the condition of upcoming hamfests this year. I just finished working with the NCAARS group at the McRae High School operating the School Club Roundup. The operation was set up in the next building over from where the Red Cross Shelter had been only 1 week before and only 3 blocks from the center of damage for the tornado that struck the town 2 weeks earlier. I also contacted the stations at Dunbar Jr High and ASU Beebe during the event. The recent tornadoes gave the students at McRae an actual incident they could relate to where Amateur Radio had touched them personally. Support your ARRL Traffic Nets. AR Phone Net (APN) M-S 6:00 A 3894.5; AR Mockingbird Net (AMBN) M-F 4:30 P 3928; AR Razorback Net Daily 6:30 P 3987.5; AR CW Net (OZK) Daily 7:00 P 3592, these are good practice for actual disasters like the one we just experienced. Tfc: K7ZQR 84, AB5SG 44, K5BOC 31, AB5AU 14, KA5MGL 14, W5HDN 7, AB5ZU 4, KC5UEW 2.

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

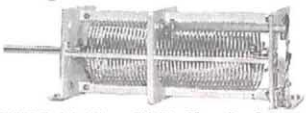
The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).



MFJ AirCore*™ *Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

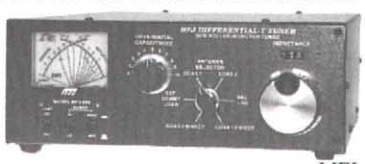
Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ *No Matter What*™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) *no matter what* for one year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™



MFJ-986 **$329.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 10¾Wx4½Hx15 in.

MFJ-962D *compact* Tuner for Amps

MFJ-962D **$269.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$189.95**

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E **$149.95**

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position *Precision48*™ inductor, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 3½Hx10⅝Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E **$119.95**

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10½Wx2½Hx7D in.

MFJ-945E HF+6 Meter *mobile* Tuner

MFJ-945E **$109.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$99.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6½x2½ inches.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$79.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-16010 *random* wire Tuner

MFJ-16010 **$49.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$79.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 144/440 MHz Tuner

MFJ-922 **$79.95**

Ultra tiny 4x2½x1¼ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground

MFJ-931 **$79.95**

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Free MFJ Catalog
and Nearest Dealer . . . 800-647-1800
http://www.mfjenterprises.com

1 Year *No Matter What*™ warranty · 30 day money back guarantee (less s/h) on orders from MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (601) 323-6551; **Add s/h**
Tech Help: (601) 323-0549

LOUISIANA: SM, Lionel A "Al" Oubre, K5DPG— e-mail k5dpg@arrl.org, Web Page **www.aisp.net/k5dpg**. ASM: KB5CX, K5MC. ACC: KA5IJU. BM: K5ARH. TC: KE5FZ. SEC: N5MYH. OOC: WB5CXJ. PRC: KB5QVI. STM: KG5GE. NM LTN: WB5ZED. NM LCW: W4DLZ. As the season turns to spring and our thoughts turn to more outside activities, remember that when doing work on towers and antenna devices, one should keep safety procedures in mind. We do not want to hear of accidents due to carelessness. Upcoming hamfests are: Lafayette March 13-14. Go out and support our area hamfest events. Officers for 1999: BRARC Pr K5AHE, VP W5RLK, Sec N5ADF, Tr N5ADP; SELARC Pr N5ZCV, VP KC5IHR, Sec KI5LH, Tr WD8LLR; DARC Pr NV5A VP WB5RYR; SARC Pr K5WOD, VP KB5BUS, Sec KA5FOG, Tr WB5PWR; AARA Pr KC5FES, VP KN5GRK, Sec K5DPG, Tr K5ARH. Don't forget to update your club records on the ARRL Web site. Louisiana Section Net Schedule: LTN 6:30 PM, local, 3910 kHz, nightly,WB5ZED, mgr. LCW 6:45 PM local, 3673 kHz, nightly, W4DLZ, mgr. Reports for January 1999: LTN QNI 353 QTC 124 in 31 sessions. LCW QNI 189 QTC 39 in 29 sessions. PSHR WB5WBZ 65, KG5GE 105, K5IQZ 120, W5CDX 120, K5MC 123, K5DPG 140, WB5ZED 165. Tfc: N0KWA 6, WB5WBZ 13, KG5GE 22, W5CDX 25, K5DPG 74, K5IQZ 74, K5MC 135, WB6ZED 218.

MISSISSIPPI: SM, Malcolm Keown, W5XX—Welcome to new ASM N5EZX. Congratulations to 99 VARC officers: N5JGK Pres, N5QDE VP, KC5DNY VP, N5EZX S/T, KB5WJJ EC, WB5YKR Rpt Mgr, and KC5GIB, Prop Officer. Warren Co EC KB5WJJ reports that the VARC assisted out-of-town line crews in locating downed lines during the Great Ice Storm of '98 using the club repeater for coordination. The Jackson Hamfest was a resounding success with over 1000 attending. General Chairman AB5WF passes kudos to Committee Chairmen WA5GYM, KB5KII, KM5GE, AA5CI, KC5FEX, KD4NLP, K5XU, KC5FAD, KK5ME, and KG5YV plus the membership of JARC and VARC. EC Report: N5XGI, N5XXX, KB5WJJ, KK5BY, KB5DZJ, KB5ZEA. OO Report: K5XQ. Net Reports: sessions/QNI/QTC. MSPN: 31/2878/30, MTN: 31/154/69, MSN: 31/1126/3, PBRA: 31/1036/0, Jackson Co ARES: 31/425/28; MSSN: 21/125/4, MLEN: 5/108/1, MBHN: 5/31/1, Stone Co ARES: 5/52/0, MCARA: 4/73/0, LARC: 4/72/0, JARC: 4/55/3. PSHR: KB5W 147, N5XGI 139, K5VV 118, W5XX 70. Traffic: KB5W 359, N5XGI 59, K5VV 13, W5XX 5.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ACC: WA4GLS. ASM: WB4DYJ. SEC: WD4JJ. STM: WA4HKU. OOC: AD4LO. TC: KBLJV. The big news from TN is the tornadoes that ravaged this section during the month of January. The radio amateurs did a great job in their efforts to relieve pain and suffering to those who were affected. I shall not attempt to name those who were helping because I might forget or not know some at this time. I feel sure that you will hear much more about this great effort in the near future. Many thanks to all who assisted in this disaster. As I look through the club newsletters, I see announcements in almost all of them. "Dues are due," so if you have not paid your club dues, please do so before you forget it again. RACK members KD4LDL, KF4VMJ, KE4HSM, KF4RLJ & KE4JQA participated in the Jingle Bell Run for Arthritis. Thanks to all. Richard Randolph, KT4OR, was presented the JCARA's Ham-of-the-Year award at its Dec banquet. The display of the "Tesla Coil," by K4ANH and KA4AIJ was well received at the Jan meeting by NARC. BMRC/KARC elected new officers: KE4SYP, pres; KC4LKG, vp (BMRC); KF4ENS, vp (KARC), KA4TNN sec/treas (BMRC), N7LY, sec/treas KARC; AE4WT, Editor of *Zero Beat*. BARC officers for 1999, W4NP, pres; KA4GMC, vp; W4YAE, sec; W4JH-treas. DRN-5 rpt 62 sess, 726 mess, 1453 QNI, TN rep 89% by W4OGG, WB4GIIJ & K4WWQ. Net sess/QTC: TMPN 31/33, TCWN 23/44, TEMPN 21/34; TEPN 25/129; TSCWN 24/12. Tfc: NZ4O 386, WB4GIJ 118, N4LA 68, N4PU 65, WA4FMR 63, WA4HKU 57, W4SQE 44, WB4DYJ 31, WA4GLS 23, W4SYE 22, WD4JJ 20, KA5KDB 16, WA4GZZ 14, KI4V 8, W4HZD 4, W4IKK 4, W4PSN 4.

GREAT LAKES DIVISION

KENTUCKY: SM. Bill Uschan, KC4MIS—Congratulations to Ernie Farmer, AD4RU, for joining the ARES team in Kentucky. Ernie has taken the EC appointment for Estill County and has an ARES net on Friday nights at 8:00 PM on the 147.015+ repeater. It has come down from the League that local ECs should communicate with local public service agencies to have a MOU signed and ready. Greater Cincinnati Hamfest was February 27-28, 1999, followed by the Cave City Hamfest on March 13, 1999. April 17 is the Murray State Univ Hamfest in Murray, KY. May 1 will have the Louisa Swapfest just north of Louisa, KY. Contact Tom Lykins for more information. It is with deep regret that we mention that Pauline Alsobrook, the mother of Merlin Alsobrook, AE4IF, passed away in January. Also we mention that AC4KO, Benny Metcalf, became a Silent Key January 27, 1999. Also our prayers and thoughts go out to Craig and Sandy Still for the loss of her father in January 1999. We want to welcome a new net to the section. The Central KY Traffic Net meets on Monday, Wednesday, and Friday nights on the 146.76 repeater in Lexington. The net manager is KF4EBC. Mr Lykins, K4LID, the father of Ron Brandenburg, KA4MAP, passed away. Net QNI/QTC/Sess. MKPN1323/42/31. KTN 1392/71/31. KSN 203/78/31. CARN 428/29/21. Tfc: KF4EBC 35, W4ET 13, N4GD 22, AE4NW 40. KO4OL 68, KF4RBK 14, K4YKI 14.

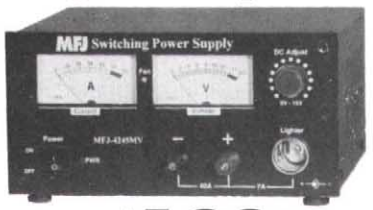
MICHIGAN: SM, Dick Mondro, W8FQT (w8fqt@arrl.org)—ASM: Roger Edwards, WB8WJV (wb8wjv@centuryinter.net). ASM: John Freeman, N8ZE (n8ze@arrl.net). SEC: Deborah Kirkbride, KA8YKK (ka8ykk@concentric.net). STM: James Wades, WB8SIW (wb8siw@aol.com). ACC: Sandra Mondro, KG8HM (kg8hm@arrl.net). OOC: Donald Sefcik, N8NJE (fdsmith@tir.com). PIC: David Colangelo, KB8RJI (dcolangelo@ameritech.net). SGL: Ed Hude, WA8QJE (edhude@juno.com). TC: Dave Smith (DSmith@smithassoc.com) VHF/UHF Net Manager Ray Knuth, KB8ZYY. Section Newsletter Editor: Dave Colangelo, KB8RJI (dcolangelo@ameritech.net). QRV Bulletin Editor: Mike Pearsall, N8MP (n8mp@concentric.net). Spring is in the air and summer is not too far behind and have I got a deal for you! If you like the outdoors in the summer and like to do

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 Meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

NEW!



MFJ-4225MV 25 Amp **$149.95** Add s/h

MFJ-4245MV 45 Amp **$199.95** Add s/h

MFJ's new adjustable voltage switching power supplies do it all! You can power your HF transceiver or 2-Meter/440 MHz mobile or base and accessories.

MFJ's *MightyLites*™ are so lightweight and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky power supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp version is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . .

Your buddies won't hear *any* RF hash on your signal! *You* won't hear any in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

Low ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

Fully Protected

You won't burn up these power supplies! They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Easily replaceable fuse.

MightyLites™ . . . Mighty Features

MFJ *MightyLites*™ feature a front-panel voltage control. It lets you vary the output voltage from 9 to 15 Volts DC and gives you a highly regulated voltage output.

You get an easy access front-panel with five-way binding posts for heavy duty use and a cigarette lighter socket for mobile accessories. The MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Large 3 inch dual meters are brightly illuminated to make it easy to monitor load voltage and current.

A *whisper quiet* internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D inches.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D inches.

MFJ No Matter What™ Warranty

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

MFJ 35/30 Amp *Adjustable* Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

NEW!

MFJ-4035MV **$149.95** Add s/h

MFJ's heavy duty conventional power supply is excellent for powering your HF or 2 Meter/440 MHz transceiver and accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for shack accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾ inches.

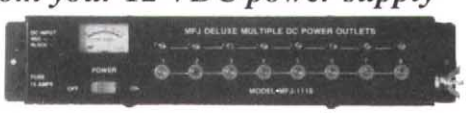
Your MFJ-4035MV is protected by MFJ's famous *No Matter What*™ one year limited warranty. MFJ will repair or replace (at our option) your power supply for one full year.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

MFJ-1118 **$69.95** Add s/h

MFJ-1116 **$44.95** Add s/h



MFJ-1112 **$29.95** Add s/h

MFJ-1118, $69.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. It lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC power supply.

Two pairs of *super* heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total. "ON" LED.

Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with an "ON" LED indicator.

Built-in 0-25 VDC voltmeter. You get 6 feet of super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs.

Heavy duty aluminum construction. 12½x2¾x2½ inches.

MFJ-1116, $44.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $29.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

Free MFJ Catalog

Nearest dealer/Orders . . . 800-647-1800

http://www.mfjenterprises.com **FAX: (601) 323-6551**

• 1 year *No Matter What*™ warranty • 30 day money back guarantee (less s&h) on orders from MFJ • **Add s/h**

MFJ ENTERPRISES, INC.
P.O. Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon-Fri
Technical Help: (601) 323-0549

MFJ . . . the world leader in ham radio accessories

things with the family, while still enjoying radio, you will want to register for the Michigan ARPSC Leadership Training Campout that takes place on July 30 thru August 1 at the River Valley Campground in Gladwin MI. If you are a member of the Section Leadership, or would like to be, this is for you. Topics include Grant Writing, SET/Field Day, Nets, Public Service, Community Relations, Public Information, Technical Topics and more. We encourage you to bring your family! There will be swimming, horseshoes, potluck dinner, campfires and other organized activities. We'll even feed you the best outdoor breakfast you've had in a long time, all cooked and served up by your Section Staff. How much will this great outdoor weekend cost? We simply ask that you pay for your stay at the campground and meals. We will be providing all the necessary materials, brochures, etc. The cost of camping is approximately $30 per night. How do you register? Contact John Freeman, N8ZE, at 1106 Park Road, Alger, MI 48610, n8ze@arrl.net and he will get back to you, or you can look for one of our flyers at various swaps or radio stores and fill out the form and return it. Sound simple? Well it is and we guarantee a great time for all, and you might even learn something from the experience. The best part is that you will have an opportunity to socialize with others and their families and perhaps build some lasting friendships. Hope to see you there. Congratulations go out this month to the new officers of CMARC in metro Lansing: President James "Erv" Bates, W8ERV, Vice President John Crawford, N8LLC, Secretary Julie McLain, KB8ZXR, Treasurer Joseph Denomme, N8VYS, Director Donald McLain, KB8RAD, Director Bill Mathews, KB8TTS and Under 22 Director Judd Gunderson, KC8IRG. Traffic reports for January 1999: K8LJG 235, KB8ZYY 163, K8GA 137, AA8PI 133, K8AE 100, WX8Y 85, N8FPN 76, K8GXV 66, KC8GMT 54, W8RNQ 49, WA8DHB 46, K8AI 40, K8UPE 36, WR8F 31, KB8HGM 82, WI8K 42, K3UWO 24, W8YIQ 21, N8OSC 20, AA8SN 19, K8ZJU 15, N8JGS 13, W8YZ 6; KA8LAR 4. NET QNI/QTC/Sess: QMN/805/416/65. MACS 369/46/30. MITN/502/127/31. UPN 1446/49/31. GLETN/639/53/31. SEMTN/237/60/31. WSSBN/875/33/31. ARAHH/42/05/05. TATN/173/06/18/KC8FXF.

OHIO: SM: Joe Phillips, K8QOE, Fairfield, (to contact me, see page 12)— For 1999, we have been spotlighting lesser known station appointments (Jan, TCs; Feb, LGLs; March, PIOs; and May, Affiliated Clubs). This month, let's spotlight ORS, the stations who handle traffic (messages) from Ohio traffic nets and local city traffic nets. These hams follow standard message form procedures, make sure hams and non-hams receive the messages sent and make monthly reports to the STM. All ORS hams regularly participate in the service that defines our public image - the ability to provide an alternate method of moving messages when necessary. Points competition in the Public Service Honor Roll (PSHR) makes it fun. Interested? Contact the STM or me for an ORS appointment. Congratulations to Massillon ARC officers, W8DEA, Pres; W8AU, Veep; K8KIP, Sec.; and W8UDL, Treas; and to Don Finley, W8DEF, as Massillon Ham of the Year. Also, Tom Wayne, WB8N, Bedford; Bill Carpenter, AA8EY, Westerville and Al Haller, W8PBX, Maineville for appearing with their Morse Code keys in major Ohio newspapers, the *Cleveland Plain Dealer*, the *Columbus Dispatch* and the *Cincinnati Post* respectively in February stories about CW. To Lancaster and Fairfield County ARC for holding special radio nights at the club station which encourages making low band and CW contacts. To Cuyahoga Falls ARC for sponsoring the Ohio Winter QSO Party in March. Great fun and helped sharpen our operating skills. To Portage (County) ARC for again volunteering to work the telephones during their local Public TV subscription drive. Excellent idea for your club—your local public broadcasting station always needs volunteers. Why not check out the Web page of the Division and also Ohio Section. Available at http://facops.albion.edu/arrl/ on the Internet. For all newsletter editors or club database managers - the SM, your area ASM, PIC, ACC should be receiving your newsletters and club activities. It is to your advantage to spread the news around. Hamfest this month 20/9 ARC in Youngstown, April 25 de K8QOE. Now for our October traffic reports.

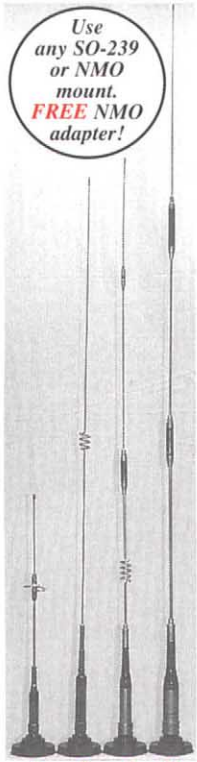
Net	QNI	QTC	QTR	Sess	Time	Freq	Mgr.
BN (L)	223	99	575	32	2200	3.577	NY8V
BNR	147	42	1043	31	1800	3.605	W8LDQ
OSN	157	32	574	32	1810	3.708	WB8KQJ
OSSBN	2017	492	2217	93	1030,1615,1845	3.9725	KF8DO

Tfc: W8PBX 203, W8STX 130, NS8C 129, N8FWA 118, N8IIP 102, N8CW 100, KD8HB 90, W8RG 82, WA8HED 82, KB8TIA 80, KA8FCC 79, N8DD 76, WA8EYQ 76, KA8VWE 76, N8TNV 70, K8OUA 70, WB8FSV 61, KA8VYB 61, N8RRB 55, K8JA 48, K8WOQ 47, K8IG 45, WA8SSI 45, WD8KBW 44, KD9K 43, W8LDQ 42, K3RC 41, KC8DWM 39, KB8ESU 35, WD8MIO 35, KI8GW 33, NY8V 29, W8BO 27, KB9GGA 26, N8YXL 20, WD8JAW 19, KC8FWU 19, WB8KWD 18, N8YWX 18, WB8HHZ 18, KB8UEY 16, KC8KYP 16, N8VES 14, KF8DO 13, KF8FE 13, KI8O 12, N8GOB 12, N8WLE 11, KC8HFV 10, N8PAI 10, W8GAC 10, K8QIP 9, W8GBO 7, W2INO 6, N8WCT 5, K8WC 5, KE8FK 4, N8RAK 3, WB8SIA 3, KC8UR 2, KA8OQF 0.

HUDSON DIVISION

EASTERN NEW YORK: SM: Rob Leiden, KR2L—STM: Pete Cecere, N2YJZ. SEC: Ken Akasofu, KL7JCQ. ACC: Shirley Dahlgren, N2SKP. SGL: Phil Bradway, KB2HQ. PIC: John Farina, WA2QCY. BM: Ed Rubin, N2JBA. OOC: Hal Post, AK2E. TC: Elmer Sharp, WA2YSM. ASM: Tom Raffaelli, WB2NHC. ASM: Bob Chamberlain, N2KBC. ASM: Andrew Schmidt, N2FTR. ASM: Richard Sandell, WK6R. Net Reports (January 1998) Check-ins (QNI)/Traffic handled (QTC+ QSP): AES 55/8 CDN 408/118 ESS No rpt HVN 492/227 NYPHONE 265/718 NYPON 393/324 NYS/E 420/544 NYS/M 241/258 NYS/L 294/500 SDN315/103 CGESN 58/0 Section News: It's official! ENYCON is 4/25 at Beaconfest. Look for the spec event station, the club exhibits and another Battle of the Emergency Comm Vans. See you there! It's not too soon to think about FIELD DAY '99. Some event you want to see in print? Drop me a line about 2 months in advance. 73 de Rob, KR2L. PSHR: N2YJZ 179, N2JBA 153, WB2ZCM 139, K2CSS 136, K2BTP 121, W2AKT 117, KB2YUR 88. Tfc: N2YJZ 512,

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!

Phased Radiators

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.

MFJ's *No Matter What*™ Warranty

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, 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, gain on 2 Meters, ⅝ Wave, 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, gain on 2 Meters, ⅝ Wave, gain on 440 MHz.
MFJ-1422 **$49.95** add s/h

D. ***RuffRider Hyper Gain*™.** 62½" brute gives a whopping gain on ⅞ Wave 2 Meters, ⅝ Wave, 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 4x2½x1½". *New!* MFJ-922 **$79.95**

MFJ *RuffRider*™ super heavy duty Antenna Mounts

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.

Trunk/Hatchback *Lip* Mount

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.

MFJ-335 BS/BM, $19.95. Medium to heavy duty magnet mount. Super strong 5 inch diameter *chrome* base weighs a husky 2½ pounds. For medium to large size antennas. It's perfect for MFJ's *RuffRider*™ High Gain mobile antennas.

Order BS for SO-239 connector.
Order BM for NMO connector.

Free MFJ Catalog
Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders from MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (601) 323-6551; **Add s/h**
Tech Help: (601) 323-0549

MFJ . . . the world leader in ham radio accessories!

K2CSS 120, N2JBA 60, WB2ZCM 48, W2AKT 29, KC2BUV 27, KB2YUR 22, N2DB 21, N2AWI 10, KC2DAA 8, KL7JCQ 2, NM2M 2, KC2DMB 2.

NEW YORK CITY / LONG ISLAND: SM, George Tranos, N2GA. ASM: KA2D, N1XL, K2YEW, KB2SCS. SGL: N2TX. SEC: KA2D. ACC: K2EJ. PIC: N2RBU. TC: K2LJH. BM: KG2M. OOC: N1XL. STM: WA2YOW. Thanks and good luck to Addison, KD2YA, who steps down as ASM as he has moved to Virginia. Addison was a great help to me in the transition last April and will be missed. A new ASM for Suffolk County will be named shortly. Congratulations and thanks to Mike, KG2M, and the Mid Island ARC for their help in the Columbia Earthquake in January. In conjunction with Tom, KA2D, MIARC functioned as US Net Control for quite some time, expediting movement of needed supplies and medicines. This is a true example of Amateur Radio providing needed services when other lines of communication are down—congratulations to all involved! A section staff meeting was held March 14 in North Linderhurst. NYC/LI VE exam list follows: Islip ARES, 1st Sat 9 AM, Slip Town Hall West 401 Main St. Slip, Addison Levi, KD2YA, 516-234-0589. Bears VE: ABC Bldg Cafeteria, 125 West End Ave at 66th St. Call Hotline 212-456-5224 for exact dates & times, Jerry Cudmore, K2JRC. Grumman ARC (W5YI) 2nd Tues 5 PM. Northrop-Grumman Plant 5 S Oyster Bay Rd via, Hazel St Bethpage, NY. Bob Wexelbaum, W2ILP, 516-499-2214, LIMARC, 2nd Sat 9 AM NY Inst of Tech, 400 Bldg Rm 409, Northern Blvd. Old Westbury, Al Bender, W2QZ, 516-623-6449. East Village ARC, 2nd Friday 7 PM, Laguardia HS, Amsterdam Ave and West 65 Street, Manhattan. Robina Asti, KD2IZ, 212-838-5995. Great South Bay ARC, 4th Sun 12 PM, Babylon Town Hall, ARES/RACES Rm 200 E Sunrise Hwy N Lindenhurst, Michael Grant, N2OX, 516-736-9126. Hellenic ARA: 4th Tues 6:30 PM; Pontion Society, 31-25 23rd Ave, Astoria, NY, George Anastasiadis, KF2PG, 516-937-0775. Larkfield ARC: 3rd Sat 9 AM, Huntington Town Hall, 100 Main St, Huntington, NY, Joe Coffield, W2DDZ, 516-266-3192, Columbia U VE Team: 3rd Mon 6:30 PM, Watson Lab 6th.floor 612 W 115th St NY, Alan Crosswell, N2YGK, 212-854-3754 PARC: exams held every three months at Southold School Oaklawn Ave, Southold, NY, on next to last Friday of the month.6:30 PM all classes of licenses. For info contact Ralph Williams/N3BT 516-323-3646. Mid-Island ARC, Last Tue. 7 PM, Brookhaven Rec Ctr, 20 Wireless Rd, Centereach, NY. Mike Christopher, KG2M, 516-736-9126. Report all changes to N2GA before the 12th of the month. Tfc: WB2GTG 382, N2AKZ 229, W2RJL 78, N2XOJ 67, KC2ACL 47, WA2YOW 26, NB2D 20, AA2NX 16.

MIDWEST DIVISION

IOWA: SM, Jim Lasley, N0JL, n0jl@ ke0bx—ASM: N0LDD. SEC: NA0R. ACC: N0IJP @ KE0BX. BM: K0IIR @ W0CXX. SGL: K0KD. TC: W0DIA. New officers at CVARC are N0UTS, pres. W0OF, treas. There are several pages of notes on the ICARC Ham Rad organization in the CVARC newsletter. Looks like you've done a good job. How about a write-up for *QST*? KI0FE has three new antennas, but if you don't know where to look, you won't find'em. Check with a CVARC member to see where they put them. TSARC is still doing fund raisers and working on the van. TIDXC is fine tuning its constitution. New officers at SEITS are KE0BX, KA0UKA, and N0IJP. For TIDXC: N0ICI, K3HQ, K0JGH. CAARC has received the call W0YUE in memory of Joe Sayres. TSARC has implemented a "standard" power cable for all radios to make them swap. Good idea. FMARC now has the call WF0RT. W0DIA needed a new challange. He has now worked 56 countries QRP. DMRAA has a nice writeup on the Cenex fire. I regret to note that WA0EEF, W0SCK, W0GAG have become Silent Keys. As of Feb 8, I have been SM for five years. I keep track because that is my youngest daughter's birthday. Long story. In those five years, there have been NO BPL certificates awarded in Iowa. There have been several new A-1 Ops, but probably not enough. Document your activity, please. Newsletters were received from CVARC, NIRAA, TSARC, TIDXC, MPARC, SEITS, IIARC, CIRAS, CAARC, OARC, FMARC, DMRAA, ARCS, NIARC. 73 de N0JL. Tfc: W0SS 116, KA0ADF 90, NR0E 29, N0JL 13.

KANSAS: SM, Orlan Q. Cook, W0OYH— ASM/ACC/OCC: Robert Summers, K0BXF. SEC: Joseph Plankinton, WD0DMV. SGL: Marshall Reese, AA0GL. Hi gang. Tom, WB0ZNY, our Kansas QKS CW tfc net manager, made BPL in Nov, Dec and Jan, so he has a BPL Medallion coming his way. He originated (third party tfc) 100 + messages each month. Congrats! The North Central Kansas Radio Club has been given the "GO" to host the 1999 ARRL State Convention Aug 22. Now is the time for YOU to put this on your calendar. Let me speak directly to 7033 licensed Kansas amateurs. This convention could be the last if you do not support it with your presence. You being there is a vote cast for a future convention. About 500 Kansas amateurs have been attending the conventions for the last few years. Those who put it on have had to dig down into their personal pockets for the dollars to pay for it. This is not fair! I am thinking of calling a Kansas Section Meeting in June or July, a pre-convention meeting to see what we can do to help the Salina group make this a "FINE 99." I say to the Wichita clubs and individual members who hosted our last convention, "WELL DONE!" I am sorry my KS section didn't support you as you did us with a great convention. Dec. Kansas Nets: sessions/QNI/QTC,KSBN 31/1227/119 KPN 21/ 265/17 KMWN 31/256/571,KWN 31/1062/641, CSTN 27/2006/114QKS 57/308/180 QKS-SS 8/17/2.Tfc: N0KJ 514 WB0ZNY 215 W0OYH 183, KX0I 41 NB0Z 36 K0RY 24 KB0DTI 22, W0WWR KB0NTD 13, KB0GUS 12, KB0BJ 10 N0LL 11.

MISSOURI: SM, Charles Boyd, KE0K—ACC: Keith, WE0G. ASM: Karen, N0TDW. ASM: Tom, KI0JO. OOC: Mike, N0QBF. PIC: Dennis, AA0A. SGL: Ern, KD0UD. SEC: Fred, WA0US. STM: Tom, KI0JO. TC: Mac, K4CHS. How many of you belong to other organizations? Do you attend meetings of the VFW, American Legion, Elks, etc? How many of you have used these meeting nights to tell someone you cannot do this or that because you must attend this meeting? But how many of you have told someone you can't do this or that because of a ham club meeting? As your section manager, I ask

MFJ *tunable* super DSP filter

Only MFJ gives you tunable and programmable "brick wall" DSP filters

U.S. Patent D374,010

MFJ-784B

$249.95

NEW!

MFJ's *tunable* super DSP filter automatically eliminates heterodynes, reduces noise and interference *simultaneously* on SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite.

You get MFJ's *tunable* FIR linear phase filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 57dB attenuation 75 Hz away.

***Only* MFJ gives you 5 *tunable* DSP filters. You can *tune* each lowpass, highpass, notch, and bandpass filter including optimized SSB and CW filters. You can *vary* the bandwidth to pinpoint and eliminate interference.**

***Only* MFJ gives you 5 *factory* pre-set filters and 10 *programmable* pre-set filters that you can customize. Instantly remove QRM with a turn of a switch!**

MFJ's *automatic notch* filter searches for and eliminates *multiple* heterodynes.

You also get MFJ's advanced *adaptive noise reduction*. It silences background noise and QRN so much that SSB signals sound like FM.

The *automatic* notch and *adaptive* noise reduction can be used with *all* relevant tunable pre-set filters.

***Automatic gain control* (AGC) keeps audio level constant during signal fade.**

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in MFJ's exclusive *tunable* FIR bandpass filters.

You can tune the center frequency from 300 to 3400 Hz, and vary the bandwidth from 30 Hz to 2100 Hz -- from super-tight CW filters to wide razor-sharp Data filters.

You can use two tunable filters together. For example, tune one to mark, one to space and set bandwidth tight for a super sharp RTTY filter.

Tunable highpass/lowpass filters

You can tune the lower cutoff frequency 200 to 2200 Hz and the upper cutoff frequency 1400 to 3400 Hz. This lets you create *custom* filters for Voice, Data and other modes.

Signals just 75 Hz away literally disappear -- they are reduced 57 dB!

Automatic notch filter

MFJ's automatic notch filter searches for and eliminates multiple heterodynes in milli-seconds. It's so fast, that even *interfering* CW and RTTY signals can also be eliminated.

You can *selectively* remove unwanted tones using the two *manually tunable* notch filters --an MFJ exclusive. Knock out unwanted CW stations while you're on CW.

Adaptive Noise Reduction

Noise reduction works in all filter modes and on all random noise -- white noise, static, impulse, ignition noise, power line noise, hiss.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

15 *pre-set* filters -- factory set or you custom program

You can select from 15 *pre-set* filters. Use for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode.

If you don't like our pre-set filters, you can program your own -- *an MFJ exclusive!* Save center frequency/bandwidth, lowpass/highpass cutoffs, auto/manual notch, noise reduction -- all filter settings -- in 10 *programmable* filters.

Plus more . . .

A push-button bypasses your filter -- lets you hear the *entire* unfiltered signal.

2½ watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9½x2½x6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315, $14.95. Cable Pack, MFJ-5184, $7.95, includes receiver cable, DC cable, 2 open-end TNC cables.

New Features

MFJ's exclusive tunable *Spotting Tone*™ -- accurately tunes even the narrowest CW filter.

MFJ's exclusive *Adaptive Tuning*™ -- tuning rate automatically becomes finer as you narrow bandwidth -- makes narrow filters easy-to-use.

MFJ's exclusive *FilterTalk*™ -- sends precise filter settings in Morse code.

Has automatic notch with *variable* aggressiveness, new quieter 2½ watt audio amplifier, new speaker switch keeps phones always active.

Manual and automatic notch can be used together. Noise reduction, automatic notch and tunable manual notch can be used when a custom filter you saved in memory is selected.

You get an accurate easy-to-use input level indicator, improved manual notch in the CW mode, adjustable line level output, more Mark-Space frequencies and baud rates for data filters and auto- matic bypass during transmit for monitoring CW sidetone, voice or data by sensing the PTT line.

Firmware Upgrade

For MFJ-784, order **MFJ-55, $29.95.** Gives you most features of the MFJ-784B.

NEW! 60 dB Null *wipes out* noise and interference

MFJ-1026

$169.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise-- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker because interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequencies from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network*. You can combine two antennas to give you various directional patterns. You can null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312B, $12.95. 6½x1½x6¼ inches.

MFJ-1025, $149.95. Like MFJ-1026 less built-in active antenna, use external antenna.

Add DSP to *any* Multimode

MFJ-781

$129.95

Add "brick wall" DSP filtering to *any* TNC or multi-mode data controller.

Copy signals buried in noise and QRM.

Under severe QRM, DSP greatly improves copy of Packet, AMTOR, PACTOR, GTOR, Clover, RTTY, SSTV, WeFAX, FAX, CW -- nearly any digital mode. Automatic gain control, ON/OFF/Bypass switch. Plugs between transceiver and multi-mode. Uses 10-16 VDC or 110 VAC with MFJ-1312B, $12.95. 4½x2½x5in.

DSP for your MFJ-1278/B

MFJ-780

$99.95

Plug a MFJ-780 "brick wall" DSP filter into your MFJ-1278/B multi-mode and you won't believe your eyes when you see solid copy from signals completely buried in QRM! MFJ-1278/B *automatically* selects the correct DSP filter for Packet, AMTOR, Pactor, RTTY, ASCII, FAX, Color SSTV, Navtex or CW.

Plug in a MFJ-780 and copy signals that other multi-modes can't. Some soldering needed.

Free MFJ Catalog

Nearest Dealer . . . 800-647-1800

• 1 year *unconditional* warranty • 30 day Money Back guarantee (less s/h) on orders from MFJ • Add s/h

MFJ ENTERPRISES, INC.
P.O. Box 494
Mississippi State, MS 39762

• **MAIN** 601-323-5869 • **FAX** 601-323-6551 • **TECH** 601-323-0549
• **Call** 8-4:30 CST, Mon-Fri • **E-Mail:** mfj @mfjenterprises.com

Web Site: http://www.mfjenterprises.com

MFJ . . . the world leader in ham radio accessories!

each of you to ask a non-ARRL member to become one. Show your support for the organization. Only as members in numbers can we keep our frequency spectrum for being eaten away. Only if we show numbers can we get more. Tell the world you're a ham and proud of it. Recruit a new member today. Nets: HARC 4/191/0 N0YLF. QCWA #35 4/84/0 K0YML. CARL ARC 4/29/0 KC0MV. AUDRAIN ARC 4/40/1 WB0SEN. SWMO SKYWARN 5/80/3 N0UAM. ROLLABILLBOARD 31/347/16 NA0V. MOTN 31/734/16 K0IPM. WAARCI 5/140/0 KB0VZP. PAUL REVERE 5/547/0 N0IWA. WJC ARES 5/48/0 K0UAA. MON 1&2 59/172/30 W0WFF. Tfc: KI0JO 560, KE0K 173, KG0IV 56. PSHR: KE0K 148, KG0IV 121, KI0JO 102.

NEBRASKA: SM, Bill McCollum, KE0XQ—ASMs: W0KVM, N0MT, WB0ULH, WY0F & WB0YWO. It is with deep regret to inform you that Dwight Craft, KC0XU, of Pilger, has become a Silent Key. He was a member of EVARC and was on the Board for Madison/Stanton Red Cross. It gives me great pleasure to announce that Bill Montz, KC0ERW, has been appointed EC for Johnson, Nemaha and Pawnee Counties. He also has been appointed PIO and OES. The Bellevue ARC is celebrating their 40thyear as a club. A 40th Anniversary Dinner was held on Mar 18 at the Old Country Buffet in Bellevue. A special event station (W0WYV) will operate on April, 24 from 0001 and 2400 CST. Check *QST* for more details. The Lincoln ARC donated 5322 man-hours of public service to the Lincoln community in 1998. The club's tornado spotter, working with Lincoln/Lancaster County Emergency Services, were called out a record 16 times and generated 1288 man-hours. The remaining 4034 man-hours were accumulated by providing communications for 24 community events during the year. Tfc: K0PTK 100, KE0XQ 35, W0AP 11, WY0F 10, W0RWA 8, AA0KQ 4, W0UJI 4, WC0O 4, W0EXK 2, K0SW 2, KA0DOC 2, K0RRL 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—Asst. SMs: N1API, NK1J, K1STM, KZ1Z. BM: KD1YV. OOC: WA1TJT. PIC: W1FXQ. SGL: K1AH. STM: K1HEJ. TC: W1FAI. Congrats to the Stamford Amateur Radio Association on celebrating 25 years as a club! N1FOA and KA1SLG were chief cooks at a dinner to celebrate the event. I understand they had a terrific time! The Greater Norwalk ARC elected John, K1OE, President who succeeds Tom, N1RRE. Tom, you sure did a FB job—congrats to John. I am sure that the Club will continue to be very active under your leadership. GNARC is working very closely with the Norwalk OEM with regularly scheduled training nets. Club members are also working with the local fire department where they are being trained on the proper operation of their fire radios. A smoother working relationship really does occur when ops know something about the procedures of the agencies they serve. GNARC is planning to sponsor a SKYWARN training session May 23—watch for more word about this event. Joel, N1JEO, of Meriden ARC is starting a Novice / Technician Class on March 23 which will run for 10 weeks. The Tri City ARC heard a talk by Paul, KA1ANX, on evaluating RF antennas and propagation in the Arctic and Antarctic. Paul is an electrical engineer at the Naval Undersea Warfare Center in Newport, RI. Let's get together at the Southington ARC Hamfest on Sunday, March 21. We will have an ARES meeting at about 11:00—watch for details. ARES members, it is real important that you attend this meeting. Come with your ideas, please, so that we can work out some organizational details and of course keep in touch! April 11 is the date of the ICRC Hamfest in Bristol so mark your calendars! The annual traffic handlers dinner will be held on April 24—contact Ann, K1STM, and John, N1IWT, for details. A hardy welcome back to Phil, KA1YIQ. He's once again in the CT Section from Florida. Net sess/QNI/QTC: ECTN 31/253/278; WESCON 31/381/145; NVTN 31/248/137; CPN 31/260/127; CN 30/96/44; BEARS of Manchester 28/399/443. Tfc: NM1K 1945, WA4QXT 529, KA1VEC 480, KA1GWE 229, K1STM 170, K1HEJ 136, NVXP 120, N1ZXD 92, WA1D 88, KE1AI 59.

EASTERN MASSACHUSETTS: SM, Larry Ober, W1MW—ASMs: WA1IDA, KB1BCF, N1GTB, N1UGA, N1SGL. ACC: N1AKG. BM: N1IST. OOC: K1LJN. PIC: N1PBA. SEC: W3EVE: K3HI. STM: WA1TBY. TC: W5SVU. EMA ARRL: voice: 978-567-0942. Packet bulletins: ARRL@EMABBS. e-mail: w1mw@arrl.org. e-mail list:ema-arrl@netcom.com. Web: ttp://www.qsl.net/ema-arrl. A reminder to club newsletter editors—please send newsletters to my new home address as it appears in the front of *QST*. My callbook address is a post office box which is only visited periodically. It's never too early for Field Day. The Capeway RC is reserving Wompatuck State Park in January. The Whitman ARC reports 350 contacts made during their special-event weekend last Thanksgiving at Plimoth Plantation. Framingham ARA members Steve, AA1Z; Bob, W1RH; and Ed, K1EP; will be operating the ARRL CW contest from Grenada February 19-21. The Quannapowitt RA has renewed as a Special Service Club. More early Field Day planning from the Boston ARC. The Boston ARC and AD/ASM Bob Salow, WA1IDA, are organizing for this year's Boston Marathon support. Quite a number of clubs and informal groups have enthusiastically taken to foxhunting. Among them is the South Shore Foxhunters Association who continue to search for the little critters. The Acton-Boxborough ARC had to cancel their January meeting due to the season's only really bad weather so far. They will be rescheduling the annual auction that was to have taken place. The Algonquin ARC's flea market was held on February 13. It was well attended and marks the beginning of the 1999 flea season. Framingham follows soon and then it's the "big one" north of the "border." The Southeastern Massachusetts ARA has received permission from the Dartmouth Board of Appeals for a 180 foot tower. Congratulations on a FB effort! The Norwood ARC will hold their annual dinner meeting on February 25. Until next month 73 de W1MW. Tfc: W2EAG 361, NZ1D 350, WA1TBY 332, WA1FNM 147, N1LKJ 139, N1TAT 78, N1TDF 75, K1SEC 59, N1LAH 56, N1IST 45, N1AJJ 45, N1SGL 43, K8SH 42, KD1LE 42, K1BZD 37, WA1LPM 34, KB1EB 33, NG1A 25, KA1VAX 21, N1XQC 10, KB1DHG 4.

MAINE: SM, Bill Woodhead, N1KAT—ASMs: WA1YNZ, KA1TKS. STM: NX1A. BM: W1JTH. SGL: W1AO. ACC: KA1RFD. OOC: KA1WRC. PIC: KD1OW. SEC: N1KGS.

MFJ-1270C *VHF/HF* Packet TNC

The world's most reliable TNC! Many work 24 hours-a-day for years without a single failure

MFJ-1270C Packet TNC has a world-wide reputation as *the most reliable TNC in the world!*

Thousands are dedicated as digipeaters, nodes, BBS and used in all kinds of commercial applications working 24 hours a day -- many work for years without a single failure.

Fully TAPR TNC-2 Compatible

All software and hardware designed for the TAPR TNC-2 standard works with the MFJ-1270C without modification, including NETROM, theNET, X1J, Rose Switch and many others.

VHF and HF Operation

Get high performance VHF *and* HF modems as standard equipment -- doubles your fun. True DCD circuit drastically reduces sensitivity to noise and dramatically increases completed QSOs.

MFJ-1270C **$119.95**

KISS Interface and MFJ Host Mode

MFJ's KISS interface lets you run TCP/IP. MYSYS and MFJ's Host Mode™ makes it easy to write efficient application programs.

MFJ Anti-Collision™ Technology

MFJ *Anti-Collision*™ technology prevents packet collisions and improves performance on busy channels.

Enhanced Personal Mailbox

Enhanced *EasyMail*™ uses your call-sign for your mailbox. Your mailbox stays on while you operate. Auto forward or reverse forward mail.

Plus much, much more!

32K RAM, IC sockets for easy service. 256K ROM, speaker jack, lithium battery backup, RS-232 and TTL serial ports, radio cable (you add a connector for your radio), *Fast-Start*™ manual, much more!

2400 & 9600 Baud MFJ-1270Cs

MFJ-1270CT, $149.95. All the features of MFJ-1270C plus built-in 2400 baud modem.

MFJ-1270CQ, $239.95. All the features of MFJ-1270C plus built-in 9600 Baud G3RUH modem.

MFJ-52, $29.95. TNC2 Deviation Meter Board. TheNet X-1J Node and users can check transceiver packet FM deviation, temperature and voltage.

MFJ *PacketOnly*™ transceivers

MFJ-8621 **$119.95**

Runs all data rates from 1200 to 9600 Baud

Why tie up your expensive 2 Meter rig on a single packet channel? For an incredibly low $119.95, you can enjoy dedicated high performance packet from 1200 to 9600 baud on 2 Meters, 24 hours a day!

MFJ's *PacketOnly*™ data radios are compatible with all TNCs with hardware DCDs and most TNCs with software DCDs.

Getting started couldn't be easier -- just plug in an appropriate TNC cable (also available), your antenna, 12 VDC and you're ready to enjoy error-free Packet!

MFJ-8621, $119.95. Ready-to-operate on 145.01 MHz. For other frequencies, order plug-in crystals for just $24.95 per frequency.

MFJ-8621X1, $139.95. *Ready-to-use* APRS (Automatic Packet Reporting System) transceiver. Crystals pre-installed and transceiver precisely aligned. Ready-to-operate on 145.79 MHz.

MFJ-8631, $149.95. *PacketOnly*™ 220 MHz Data Radio. Has all the features of the 2 Meter version, ready-to-operate on 223.700 MHz

MFJ-9606, $159.95. Use Voice or Packet with MFJ's new 6 Meter *FM Communicator*™ Transceiver. Perfect for No Code Techs and Veterans alike. Crystalled for 52.525 MHz calling frequency. Easy to re-channel. **MFJ-9606X, $169.95.** Includes Mic.

TNC ACCESSORIES

MFJ *MultiCom*™ for Windows

Incredibly easy-to-use. Just point and click to enjoy *all* the power of your MFJ-1278/B/DSP. Run two TNCs at the same time in separate windows. **MFJ-1289W, $59.95**, includes 3½ inches HD disk, RS-232 serial cable and manual.

MFJ *MultiCom*™ for DOS

Powerful DOS software for MFJ-1278/B/DSP, MFJ-1289M, **$59.95**. Includes 3½ inch HD disk, RS-232 serial cable and manual.

MFJ Starter Packs

An MFJ Starter Pack, **$24.95**, gets you on the air *instantly*. You get interface cable, software on disk and instructions -- just plug it all in and start enjoying packet. Order **MFJ-1284** for DOS, **MFJ-1287** for Macintosh or **MFJ-1282** for Commodore 64/128.

2400 Baud Modem -- $29.95!

MFJ-2400, $29.95. Add *fast* 2400 baud Packet to most versions of MFJ-1270, MFJ-1276 and MFJ-1278. Plugs in MFJ TNCs for easy installation.

9600 Baud Modem

MFJ-9600B, $109.95, G3RUH compatible 9600 baud modem. Plugs into MFJ TNCs. Not all radios compatible with 9600 baud.

Real Time Clock

MFJ-43, $19.95. Ends resetting TNC clock everytime you turn it on. Maintains correct time even when TNC is off. Plugs into RAM socket. Works with MFJ TNCs and TAPR TNC clones.

The world's *most powerful* multi-mode data controller!

DSP . . . 10 Digital Modes . . . GPS Compatible

MFJ-1278B/DSP **$379.95**

The world class MFJ-1278B with built-in "brick wall" DSP filters gives you ham radio's *most powerful* multi-mode data controller!

You won't believe your eyes when you see solid copy from signals completely buried in QRM! The MFJ-1278B/DSP, your transceiver and computer are all you need for exciting digital QSOs! You'll discover a whole new world of ham radio. You'll communicate in ways you never knew existed!

You'll marvel at *full color* FAX news photos as they come to life on your screen, and you'll see weather changes on highly detailed weather maps in all 16 gray levels. Eavesdrop on late-breaking news!

MFJ-1278B/DSP gives you DSP and 10 digital modes -- Packet, PACTOR, AMTOR, RTTY, Color SSTV, 16 Gray Level Fax/Weather FAX, ASCII, Navtex, CW, Memory Keyer.and is GPS compatible!

Enjoy all the power of your MFJ-1278/B/DSP with MFJ's *MultiCom*™ software. **MFJ-1289W, $59.95,** for Windows. **MFJ-1289, $59.95, for DOS.**

Call *for free FastStart™ Manual for more details.*

MFJ-1278B/DSP, $379.95, has powerful DSP. **MFJ-1278B, $299.95,** less DSP. **MFJ-1278BT, $329.95,** built-in 2400 baud modem, less DSP.

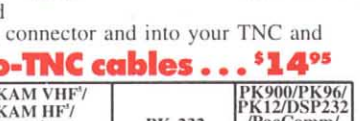
MFJ-44, $19.95. Plug-in scope tuning adapter.

MFJ TNC/Mic Switch

Switch between your TNC or Mic by pushing a button!

Switch between your microphone and TNC by pushing a button!

MFJ-1272B/M **$39.95**



You won't have to unplug your microphone and plug in your TNC *everytime* you want to work packet or other digital modes.

Just plug these pre-wired cables into your rig's microphone connector and into your TNC and you're ready to go -- no more hard-to-find connectors and wiring up cables.

Works with HF, VHF and UHF radios with 8 pin mic connectors -- including Kenwood, ICOM, Yaesu, Alinco, Radio Shack, Standard and others. *For radios with 8-pin RJ-45 modular telephone jack, select the new "M" models.*

Plug-in jumpers let you quickly set-up for virtually any radio. Factory set for Kenwood and Alinco. Includes easy-to-follow instructions. Has audio-in and speaker jacks. 3¼x1¼x4 inches.

MFJ-1272B/1272M, $39.95, for MFJ TNC/multimodes,TAPR TNC-2 clones.
MFJ-1272BX/1272MX, $39.95, for PK-232.
MFJ-1272BYV/1272MYV, $39.95, for KAM VHF/KPC3.
MFJ-1272BYH/1272MYH, $39.95, for KAM HF Port.

Pre-wired Radio-to-TNC cables . . . $14.95

TNC Type / Radios	All MFJ TNCs and Multimodes	KAM VHF[1]/ KAM HF[2]/ KPC3[3]/ KPC9612[4]	PK-232	PK900/PK96/ PK12/DSP232 /PacComm/ other TNC-2 compatibles
Alinco[6]/Stdrd HT	MFJ-5022	MFJ-5022YV	MFJ-5022X	MFJ-5022
Icom[7]/Yaesu/ Radio ShackHTs	MFJ-5024	MFJ-5024YV	MFJ-5024X	MFJ-5024B
Kenwood[2] HTs	MFJ-5026	MFJ-5026YV	MFJ-5026X	MFJ-5026
Yaesu 8-pin	MFJ-5080	MFJ-5080YV MFJ-5080YH	MFJ-5080X	MFJ-5080Z
Icom[3] 8-pin	MFJ-5084	MFJ-5084YV MFJ-5084YH	MFJ-5084X	MFJ-5084Z
Kenwood/Alinco 8-pin	MFJ-5086	MFJ-5086YV MFJ-5086YH	MFJ-5086X	MFJ-5086Z
Yaesu 8-pin modular	MFJ-5080M	MFJ-5080MYV	MFJ-5080MX	MFJ-5080MZ
Icom[4] 8-pin modular	MFJ-5084M	MFJ-5084MYV	MFJ-5084MX	MFJ-5084MZ
Kenwood 8-pin modular	MFJ-5086	MFJ-5086MYV	MFJ-5086MX	MFJ-5086MZ
Radio Shack 8-pin modular	MFJ-5088M	MFJ-5088MYV	MFJ-5088MX	MFJ-5088M

1. does not include IC-W2A
2. does not include 2500
3. does not include 25A, 255A
4. does not include IC-100H, IC-2700H
5. YV for KAM VHF port, YH for KAM HF port. Other Kantronics use YV models
6. YV for KP9612 1200 baud port
7. YH models for KPC9612 9600 baud port
8. Excludes DJ-100, 120T, 200, 500

PACKET *plus* PACTOR TNC

You get all the features of the MFJ-1270C HF/VHF TNC plus . . . PACTOR . . . precision HF tuning indicator . . . extra 32K mailbox memory . . .

PACTOR combines the best of Packet and AMTOR for HF. You get excellent weak signal operation, error correction, faster baud rate, data compression and full 8-bit word transmissions.

MFJ-1276 **$149.95**

A 20 LED bargraph makes HF tuning easy. Just tune your radio to center a single LED and you're precisely tuned in to within10 Hz -- and it shows you which way to tune!

You also get an extra 32K of memory for your enhanced *Easy Mail*™ packet mailbox.

$179.95, same as MFJ-1276 but includes fast 2400 baud modem. Lets you operate 300, 1200, and 2400 baud packet.

FREE MFJ Catalog

Nearest Dealer/Orders . . . 800-647-1800

http://www.mfjenterprises.com

E-mail: mfj @ mfjenterprises.com

Technical information: 601-323-0549

• 1 year *unconditional* guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • **FREE** catalog

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon.- Fri.
FAX: (601) 323-6551; **Add s/h**

MFJ . . . the world leader in ham radio accessories

Asst Dirs: W1KX, KA1TKS, K1NIT. Web Site: N1WFO. With 33,215 sq mi. Maine is undoubtedly the largest of the New England states, but thanks to the newly linked repeater system by KQ1L, you can now talk from Machias to Kittery and the AMSAT activity by W1ME has brought the thrill of working amateur satellites to many new and some older hams. Also, the link system of WZ1J is keeping the amateur community well informed on radio activity around the world with the *Radio Newsline*. Keep in mind the repeater systems are exposed to some of the most extreme conditions on the face of the Earth, requiring constant maintenance and repair. So do your part and offer your financial support in helping to keep these systems up and running. Attention: clubs sending out newsletters, please check to see if the current SM is correct. Tfc: NX1A 181, W1KX 64, AF1L 61, W1JX 55, W1JTH 49, W1QU 47, W1LCI 42, N1HYF 31, K1UNQ 28, KA1RFD 16. 73, Bill, N1KAT.

NEW HAMPSHIRE: SM, Al Shuman, N1FIK—ASMs: W1NH, N3CLZ, N1FIL, N1KIM. TC: WA1HOG. STM: WA1JVV. PIC: KA1GOZ. OOC: W1GTA. SGL: K1KM. BM: KH6GR. ACC: NA1E. SEC: N3CLZ. (www.nh.arrl.org). By all accounts, it appears that the NH QSO Party was a resounding success. Logs are beginning to arrive as I write this column. It was nice to hear the call W1FZ on the bands again. Jim Thayer's family graciously gave W1FZ to the GBRA as its club call. New QSO party certificates are being designed and will be printed shortly. Thanks to the QSO party committee who made the 1999 contest go smoothly. Good wishes go out to Harry, K1JNJ, and Larry, N1SHM, both are recovering from heart attacks. The NHARA is badly in need of new blood. Anyone interested in helping revitalize the council of clubs is urged to contact me. Sad to report the passing of Paul Cleveland, W1OHA. Paul was a long-time member of the CVRC. NH is now in the process of issuing the new style auto license plates. As the ham ranks continue to shrink, it is less likely that the NH Department of Safety will consider issuing ham radio specialty plates. I have received a number of requests since the appearance of the new plate. 73 Al. Net sess/QNI/QTC: GSFM 31/261/66; GSPN 35/140/69; TSEN 4/44/4; VTNH 31/191/184. Tfc: W1PEX 1013, K1TQY 337, N1CPX 177, KA1OTN 103, WA1JVV 94, WB1GXM 69, K1ZO 41, W1ALE 36, AE1T 9.

RHODE ISLAND: SM, Rick Fairweather, K1KYI, e-mail k1kyi@juno.com. Of the 15 attendees at the Nat'l WX Serv's February SKYWARN strategy session in Taunton, four were from the RI section including SEC N1JMA, DEC (Prov Co) N1YKH, KB1CMD from Woonsocket, and me. In mid and late April, there will be more SKYWARN training in the Coventry and Westerly areas...stay tuned for more info on the Swap and Sell net on Saturdays at 9 AM on the 146.70 repeater. W1PRO, DEC (Kent Co), SEC: N1JMA, N1WOJ, N1SMK and a few other ARES members, met with officials from Warwick in February to coordinate ARES with the city's needs. They will work together to develop an emergency action plan for the city. Fidelity Radio Club had a presentation by SEC N1JMA and me about ARES. The club is helping RI Emergency Mgmt. setting priorities and goals for the club to assist them. The Newport Co RC is searching the Portsmouth and Middletown areas for a new site for the W1SYE club station. The RI traffic specialists did us all proud again with 100% representation on FRN. Tfc: KA1JXH 58, K1KYI 6. PSHR: KA1JXH 129.

VERMONT: SM, Bob DeVarney, WE1U—A nice quiet month—no ice storm this year! Had a super time with the W1B Snowflake Bentley special event station in the Vermont QSO Party. If you've never been to one, then it's time to start! It's also time to start getting ready for Y2K. We will most likely be called on to help, and that's the wrong time to find out your H-T battery is dead. 73 de WE1U.

Net	*Sess*	*Checkins*	*Traffic*
VTNH	31	191	184
VPEN	5	35	1
Green Mountain Net	26	730	19
TSFMEN (Keene)	4	44	4
Rutland Co ARES Net	4	30	
Windham Co ARES Net	1	3	

PSHR Stations: KT1Q 174, N1DHT 114. Traffic: KT1Q 434, N1DHT 126, KA1YLN 15. Vermont had 95% representation on 1RN/Cycle 2.

WESTERN MASSACHUSETTS: SM, William C. Voedisch, W1UD—w1ud@arrl.org—ASM: N1LZC. ASM (digital): KD1SM. STM: W1SJV. SEC: K1VSG. OOC: WT1W. It looks like it is going to be a good spring. Propagation is on the upswing and a number of DXpeditions are heading to exotic places around the world. Check on the DX Web-sites for times and operating schedules. How long has it been since your club had a homebrew night? It used to be a regular scheduled winter meeting, but for the past few years it has been ignored. MARA had their second in recent years, and I was amazed at the turnout. Both people with and without projects. I really wonder if CW has taken a back seat. Many of the projects were Morse oriented. QRP transceiver kits that only operate CW. Keyers were in abundance. Both kit and homemade. The younger licensed gang is coming to realize you can have more QSOs using CW than you can on phone. Two meter antennas and other projects for that band were in abundance. Bob, W1JTL, brought a 6-meter transmitter and AM modulator that he built during the '60s. That really drew the attention of the young crowd. Some had never seen a tube let alone a complete transmitter and modulator using them. It was the showpiece of the night! Tfc: W1UD 193, W1ZPB 93, KD1SM 19, W1SJV 8.

NORTHWESTERN DIVISION

ALASKA: SM, David Stevens, KL7EB—OOC: KL7IKX. SEC: NL7DL. DEC: KL7JBV. DEC: WL7GK. TC: AL7CE. TS: KL7CC. ASM: WL7BJ. ASM: KL5T. Sniper net 3520 daily 1900 AST, Bust net 7087 daily 2000 AST, Motley Group 3933 daily 2100 AST, and Alaska Pacific net 14.292 M-F 0830 AST. Richard O'Connor, WL7CPG, of Diamond High School is the Alaska nomination for Hiram Percy Maxim Award. Congratulations, Richard, for your achievements in ham radio. Ken Slossen, WB7FSO, has the MARA club re-

MFJ ACCESSORIES

MFJ *W9INN* Balun Box

MFJ-912
$49.95

Lets you use coax from your antenna tuner to the MFJ-912 mounted outside your ham shack. The MFJ-912 converts the unbalanced coax to a balanced transmission line (ladder line). Provides same function as an internal balun except it is located away from tuner. Giant 2 core balun wound with *Teflon*® wire connected to high voltage ceramic feedthru insulators. Handles full legal power with ease. 3¼x2¼x7 inches.

MFJ Artificial RF Ground

MFJ-931
$79.95

Creates artifical RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding.

Greatly improves your signal if you're using a random wire or longwire antenna with an ineffective ground.

Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

20 Meter CW Transceiver

MFJ-9020
$189.95

Throw this *tiny* MFJ 20 Meter CW Transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full break-in, much more. *Free* manual. See *free* MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

Super *Active* Antenna

**``World Radio TV Handbook''** says MFJ-1024 is a ``first rate easy-to- operate active antenna...quiet...excellent dynamic range...good gain... low noise...broad frequency coverage... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote has 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC with MFJ-1312, $12.95.

$129.95 MFJ-1024

Cross-Needle SWR Meter

MFJ-815B
$69.95

Peak/ average Cross-Needle SWR/ Wattmeter. Shows SWR, forward/ reflected power in 2000/500 & 200/50 watt ranges. 1.8-60 MHz.

Mechanical zero. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ Coax Antenna Switches

$49.95 MFJ-1701

$21.95 MFJ-1702B

$59.95 MFJ-1704

Select any of several antennas from your operating desk with these MFJ coax switches. They feature mounting holes and automatic grounding of unused terminals. One year *"No Matter What™"* unconditional warranty.

MFJ-1701, $39.95. 6 position antenna switch. SO-239 connectors. 50-75 Ohm loads. 2 KW PEP, 1 KW CW. 10x3x1½ inches. DC-60 MHz.

MFJ-1702B, $21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 Ohm. 3x2x2 inches. **MFJ-1702BN, $31.95**, N-Connectors, DC-1.1 GHz.

MFJ-1704, $59.95. 4 position cavity switch with lighning surge protection. Center ground. 2.5 KW PEP, 1 KW CW. 50 dB isolation at 500 MHz. 50 Ohm. 6¼x4¼x1¼ inches. **MFJ-1704N, $69.95**, N-connectors. All have MFJ's famous *"No Matter What™"* 1 year unconditional warranty.

MFJ *Compact* Speaker Mics

MFJ's *compact* speaker mics have first-rate electret mic element and full size speaker gives superb audio on transmit and receive. Earphone jack, PTT, light-weight retractable cord. Gray. 1¼x2x3 in. **MFJ-284** fits Icom, Yaesu, Radio Shack and Standard. **MFJ-286** fits Kenwood.

COMPACTS: MFJ-284 or MFJ-286 **$15.95**

MFJ *Mini* Speaker Mics

MFJ's *mini mics* give excellent audio from electret mic element and speaker. Has swiveling lapel /pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with "L" or regular connector. Tiny 2x1¼x¼ inches.

Order MFJ-285/285L for Icom, Yaesu, Alinco, Radio Shack and Standard; **MFJ-287/287L** for Kenwood; **MFJ-283** for split plug Alinco; and **MFJ-285W** for IC-W2A.

MINIS: MFJ-285, MFJ-285L, MFJ-285W, MFJ-287 or MFJ-287L **$15.95**

Dry Dummy Loads for HF/VHF/UHF

MFJ has a full line of dummy loads to suit your needs. Use for tuning to reduce needless (and illegal) QRM and save your finals.

MFJ-260C, $29.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 650 MHz. 2½x2½x7 in. *MFJ-260CN, $34.95, N connectors.*

$29.95 MFJ-260C

$59.95 MFJ-264

MFJ-264, $59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. 100 watts/10 minutes, 1500 watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 in. *MFJ-264N, $69.95, N connector. MFJ-5803, $4.95, 3 ft. coax/ PL-259.*

MFJ Low Pass Filter

MFJ-704
$39.95

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive *Teflon® Dielectric Technology™* capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/ RFI protection. *Full legal power* 1.8-30 MHz. Mounting tabs. **MFJ-702, $24.95.** 200 Watts Low Pass TVI filter. 1.5-30 MHz.

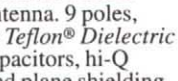
MFJ Iambic Paddles

MFJ Deluxe Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. For all electronic CW keyers.

MFJ-564
$49.95

Full Color FAX

MFJ-1214PC
$149.95



Use your computer and transceiver to receive, display and transmit *brilliant full color* news photos and incredible WeFAX weather maps with all 16 gray levels. Also receive/transmit RTTY, ASCII and CW.

Animate weather maps. Display 10 global pictures simultaneously. Zoom any part of picture or map. Manager lists over 900 FAX stations. Automatic picture capture and save.

MFJ/Bencher Keyer

MFJ-422D
$144.95

The best of all CW worlds --a compact MFJ Keyer that fits right on the Bencher iambic paddle! **Iambic** keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4⅛x2⅝x5½ in.

MFJ-422DX, $79.95, keyer only for mounting on your Bencher or MFJ paddle.

"Teflon® is a registered trademark of Dupont"

High Pass *TVI* Filter

MFJ-711
$19.95

Don't let harsh TVI ruin your DXing and your wife's favorite soap opera! Keep peace with your family and neighbors.

MFJ's exclusive *ShieldBreaker™* high pass filter effectively suppresses annoying TVI! Wipe out TVI caused by broadcast, commercial, two-way, amateur and CB radios operating below 30 MHz. Use between cable/ antenna and TV/VCR. For 75 ohm cable or 300 ohm twin lead.

12/24 Hour LCD Clocks

$19.95 MFJ-108B

$24.95 MFJ-112

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to -see. Brushed aluminum frame.

MFJ-112 shows hour/minute/ second, day, month, date, year at any QTH on *world map*. 12 or 24 hour display. Daylight saving time feature.

VHF SWR/Wattmeter

MFJ-812B
$34.95

Covers 2 Meters and 220 MHz. 30 and 300 Watt scales. Relative field strength 1-250 MHz, SWR above 14 MHz. 4½x2¼x3 in.

Code Practice Oscillator

MFJ-557
$24.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable. 9-volt battery or 110 VAC with MFJ-1305, $12.95.

Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ in.

MFJ Multiple DC Outlet

MFJ-1118
$69.95

Use your rig's 12 VDC power supply to power two HF/VHF rigs and six or more accessories with this MFJ *high current* multiple DC outlet.

2 pairs of 30 amp 5-way binding posts separately fused for rigs. 6 switched, fused pairs for accessories. DC voltmeter, "on" LED, RF bypassed, 6 ft. of 8 guage power cable. 12½x2¾x2½ inches.

MFJ-1116, $44.95. 8 DC outlets, voltmeter, on/off switch, RF bypass, fuse.

MFJ-1112, $29.95. 6 DC outlets.

Free MFJ Catalog
Nearest Dealer . . . 800-647-1800

• 1 year *unconditional* guarantee • 30 day money back guarantee (less s/h) on orders from MFJ •Add s/h

MFJ ENTERPRISES, INC.
P.O. Box 494
Mississippi State, MS 39762

• **MAIN** 601-323-5869 • **FAX** 601-323-6551 • **TECH** 601-323-0549
• **CALL** 8-4:30 CST, Mon-Fri • **E-Mail** mfj@mfjenterprises.com
Web Site: http://www.mfjenterprises.com

MFJ . . . the world leader in ham radio accessories!

peater, 146.85, working much better, by tuning the duplexers and raising the antenna. Tina Johnson, KC5ZLV; Mike Sambuco, AL7KC; and the Elmendorf Amateur Radio Society had a great Radio/Computer Swapfest again Feb 27, 1999. Susan Woods, NL7NN, is the new EC for Anchorage.

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—The ARRL Board recommended that ARES groups get to know your local public utilities and public safety agencies to enter into MOUs and conduct some drills in preparation of the Y2K computer issue. The newly appointed vice director for the NW Division is James Fenstermaker, K9JF, of Vancouver. The Spokane Co. ARES conducted a postponed state-wide SET on Feb 6 involving HF Phone on SSB, CW, 2 M VHF, and packet. A number of non-emergency type written traffic messages were sent cross-state involving about 7 counties. Thanks to all the stations that participated. The Lilac City ARC Hamfest is in Spokane on April 10. Net Activity (for Jan.): WSN: QNI 917, tfc 240; Noontime Net: QNI 8317, tfc 213; WARTS: QNI 3572. Tfc 148. Tfc: K7GXZ 256, W7GB 234, KA7EKL 83, K7BFL 74, KK7T 41. PSHR: W7GB 138, K7GXZ 120.

IDAHO: SM, M.P. Elliott, KF7ZQ — OOC: N7HGV, SEC: AA7VR, STM: W7GHT. The Idaho section is in need of volunteers for several positions. Positions open include Assistant Section Managers, a Technical Specialist for central Idaho, several District Emergency Coordinators, and Emergency Coordinators (for Benewah, Nez Perce, Adams, Idaho, Boise, Owyhee, Valley, Blaine, Camas, Gooding Jerome, Lincoln, Minidoka, Twin Falls, Bannock, Bear Lake, Caribou, Franklin, Oneida, Power, Butte, Clark, Fremont, Jefferson, Lemhi, Madison and Teton counties). If you can help or would like further information please drop me an e-mail at kf7zq@arrl.org. 73—Mike, KF7ZQ. Tfc: W7GHT 377, KB7GZU 99, WB7VYH 57, and N7MPS 41. PSHR: W7GHT 120, WB7VYH 86, and N7MPS 53. Net (SESS/QNI/QTC/Mgr.): FARM 31/2591/31/ N7OGR; NWTN 31/1689/64/ KC7RNT; IDACD 21/573/19/ K7UBC; IMN 31/503/151/ N7MPS.

MONTANA: SM, Darrell Thomas, N7KOR—I would like to welcome back the Gallatin Ham Radio Club as an ARRL Affiliated Club in the Montana Section. It has been a couple years since their status lapsed, and we sure are glad to have it renewed. The club also held a very successful class and test session in January which resulted in 8 new Technician and 4 new Technician Plus hams. Congratulations and keep up the good work. The Montana Traffic Net held daily at 00:30 UTC on 3880 continues to be a popular gathering place. The recap for 1998 shows 21,241 check ins, 897 pieces of traffic handled during 6540 minutes of net time. Thanks to Les Belyea, N7AIK, Net Manager, for the statistics. Net/QNI/QTC/NM MSN 156/0 W7OW; MTN 2344/66 N7AIK; IMN 503/151/N7MPS. PSHR: N7AIK 110.

OREGON: SM, Bill Sawders, K7ZM—ASM: KF7KE, ASM: KG7OK. ASM: KK7CW. STM: WA7EES. SEC: WB7NML. PIO: KC7YN. SGL: N7RFM. STC: AB7HB. OOC: NB7J. The state is moving forward and doing an excellent job in preparing for Y2K. Bruce, N7RFM, has been appointed the new State Government Liaison and has put together an excellent Y2K State Web-site at **www.empnet.com/codxc.** Handling the State Packet Radio System is newly appointed ASEC, Ken, N7QQU. That Y2K Web-site is located at **wken@ home.com**. Don't wait until the last minute to check both Web-sites out!! Bob Shelby, W7FPY, is heading up the task force in introducing PRB-1 (the tower bill) into Oregon Revised Statutes. The bill is moving forward with help from State Senator Beyer, and ARRL Northwest Division Director, Greg, W7AGQ. For updates on this project, tune in to the weekly ARRL Oregon Section Management net held Saturday morning at 8 o'clock on 3980 kHz. While you're there, be sure to "check in." The Oregon QSO Party, sponsored by the Central Oregon DX Club, takes place early next month. The March *QST* Section News column has more information. Also, check the "contesting" sections in all major amateur magazines. Harold, KC7ZZB, of Hillsboro, continues to excel in local NTS operations, and has been appointed by STM, Dave, WA7EES, Official Relay Station (ORS). Keep up the great work, Harold! 73, and keep in touch! Bill, K7ZM. NTS traffic totals for January: WA7EES 202, N7DRP 187, K6AGD 130, W7VSE 82, K7NLM 73, KC7ZZB 67, W7ODG 50, KA7AID 27.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—ASM & ACC: W7QGP. STM: W7ZIW. PIC: KC7IAY. OOC: AA7KE reports hearing amateur conversations that reflect a renewed interest in keeping the bands free of problems, much do to the efforts of FCC's Riley Hollingworth. Observer notices sent include observations of several 30 minute plus conversations with no identification. We have also observed this on local Seattle repeaters. STM ,W7ZIW, reports on a mid-winter SET conducted by Spokane ARES folks and with several west-side stations also participating. Over 15 reports of Silent Keys were received by this station in a 30-day period. Long time member and former NCS for the WARTS Net, Ron Smith, W7IGC passed away in early Feb as did Paul Morris, W7GT. Anyone that has been around awhile will remember Paul. SEC, N7NVP, reports on one other. Dist 5 DEC Ken Weber, K7CLL, has joined the ranks of the Silent Keys. Ken was a real bright spot in Amateur Radio. He did double duty as the Clark Co EC and kept the county active on a number of fronts. We'll miss all of them. Randy Greeley, NU7D, has assumed the Dist 5 DEC duties and Bob Goodale, K7YFJ, is the new Clark Co. EC. The City of Longview flood exercise was a success. It re-enforced strengths and found weaknesses. Montey Simpson, W7MLS, has been appointed as the DEC 3 DEC. The Clallam Co team was activated during mid-winter to monitor the level of the Dinginess River. Jay Sashnet, K7TTZ, and Richard Rosenau, KK7JA, both have been nominated as ARRL educators of the year. Congratulations. A King Co think tank committee has been meeting monthly since fall to re-evaluate the present county ARES structure and make specific recommendations for the future millennium and the new world of communications. In the world of traffic K7BDU leads the field again for January, and his PSHR score is 530. Other traffic: W7LG 137, KD7ME 63 K7MQF 216, W7NWP 148, N7PIP 6, K7SUQ 15, KA7TTY 8, W7TVA 212, K7YOH 9, N7YSS 109, W7ZIW 246. Clark County ARES & Info Net QNI 138, Puget Sound Traffic Sys-

Deals Are Popping Up All Over!

Universal Radio Inc.
1•800•431•3939
Local (614) 866•4267 FAX (614) 866•2339
http://www.universal-radio.com
6830 Americana Pkwy.,
Reynoldsburg, Ohio 43068
Universal is just east of Columbus.
Visit our showroom.
Store Hours: Mon-Fri. 10-5:30, Thur. 10-7, Sat. 10-3

LENTINI COMMUNICATIONS INC.
1•800•666•0908
Local (860) 666•6227 • FAX (860) 667•3561
Visit our web site at
www.lentinicomm.com
21 GARFIELD STREET,
NEWINGTON, CT 06111
STORE HOURS: M-F 10:00am-6:00pm,
SAT., 10:00am-4:00pm

Austin Amateur Radio Supply
1•800•423•2604
Local (512) 454•2994
FAX (512) 454•3069
www.aaradio.com
5325 North I-35
Austin, Texas 78723

Radio City, Inc.
1•800•426•2891
Local (612) 786•4475 FAX (612) 786•6513
2663 County Road I, Mounds View, MN 55112
http://www.radioinc.com
Store Hours: M &Th 10:00am-7:30pm
Tu,W, F 10:00am-6:00pm
Sat., 10:00am-5:00pm

YAESU
Call for NEW Yaesu Specials


FT-1000D

Price Slashed! QUADRA HF/6M Amplifier


NEW! **FT-100**
All Mode HF/6m/2M/440MHz


FT-847
All Mode HF/6m/2M/440MHz


FT-920
All Mode HF/6m
Free FM-1


VX-5R
Mini
Tri-Bander
NEW!


FT-1000MP
New Low Price

Super Low Price


FT-2500
2M Mobile


Dual Band Handheld
Wide Band Coverage
290 Memories
Ultra Compact
GREAT AUDIO!
VX-1R


FT-8100R
Dual Band Mobile
New Low Price


FT-51R
Dualbander


FT-50R
Dual Band HT


ROTORS


New Low Price
2 Meter Mini Handheld
FT-10R


2M Mobile
FT-3000M

ICOM

$40 Coupon
Now with Rechargable Battery & Charger
Free Battery Case


IC-Q7A
Mini Dualband


IC-T8A
6M/2M/440
Tribander
5 watts

$100 Coupon (MKII only)


New IC-706G*
IC-706 MK II
DSP Now Included
HF, 6 Meters, & 2 Meters!

ICOM'S SPECIALS end 3/31


IC-821H


$200 Coupon
Free Logbook
IC-746
Dual Band Mobile Transceiver


NEW!
IC-2800*

IC-756
Lower Prices!

$20 Coupon


IC-W32A
2M/440
Dual
Band
5 watts


IC-T7A/HP
Dual Band HT


IC-T22A

$30 Coupon


IC-207H
2M/440MHz mobile

New for '99!
IC-T81*
IC-2800*
IC-R75*

NEW!


6M,
2M,
440MHz
& 1.2 GHz
IC-T81A*

New Low Price


IC-2100H

New Low Price R-10!

NEW R-2
Scanners/Receivers


R-2


New Low Price!
R-8500


New low price
PCR-100 & PCR-1000
Free Freq. database on PCR-1000


R-10

New Low Price


IC-2710H

KENWOOD
Call for NEW Kenwood Specials


TM-V7
with tone encode & tone decode


New Low Price
TS-570D & TS-570S w/6M
HF Transceiver with *DSP*


VC-H1


NEW!
TH-D7A DATA COMMUNICATOR
FM Dual Bander


TH-G71A
Dual Band HT


TH-79AAKSS
Dual Band HT


TM-261A
New Low Price
Compact 2 Meter Mobile

ALINCO ELECTRONICS INC.
COMET

Prices, products and policies may vary between dealer locations

All prices and promotions subject to change. Not responsible for typographic errors. *Some items not approved for sale.

MasterCard DISCOVER VISA

tem QNI 31, NTN 8317, NWSSB 728 and WARTS 3572.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF—KF6RCO. SEC: N4OGL. DECs: WA6TGF/Alameda County, KO6JR/Contra Costa County, WA7IND/Napa County, K6USW/Solano County, N6UOW/Training, KE6HCI/Administration, KE6NVU/Finance, W6CPO/Technical Services. STM: K6APW. OOC: W6NKF. TS: KF6NY. Check out the EB WWW Page at http://www.pdarrl.org/ebsec/. Webmaster is KB6MP. EBARC honored WD6GGC, WB6IZE and AA6ZX with "1998 Amateur-of-the-Year" medallions. For info on their CW class, contact AB6WJ at 510-336-1120 or photo@dnai.com. Oakland ARES will be installing VHF antennas at 26 sites throughout the city. SARS member WB6YZF provided various equipment to the club for sales to the members, with half the proceeds going to the club treasury. VVRC mourns the loss of long-time member KA6ELQ. Members providing comms for the annual Vacaville tree lighting ceremony were K6HEW, KD6FZY, WH6AB, KE6FGG, N6ZGB, KD6JSB, KA6FDI, KC6WLY, KD6BYQ, W6ROY, KF6KFQ, KE6MDM, KF6ACG, KA6FDH, WB6FIS, KF6PQX, KE6IFC & KC6WYC. CCCC welcomes new member KF6JKT, and congratulates KE6RS on his upgrade to Advanced. MDARC pres, KE6VTA, thanks K6BIV, KE6TIP, N6BHX, KE6PTT, KT6Y, N6PMF, KD6ZMP, K0HPS, KM6QX, WA6CIE, KC6SOE & KC6WYA for their tireless efforts in keeping the club repeaters working. HRC 1999 officers are KE6PID, pres; W6ATV, vp; KF6HFK, secty; N6OJJ, treas; KF6BIR, parliamentarian; and K6EMT, sgt at arms.

NEVADA: SM, Bob Davis, K7IY—ASM: Jan Welsh, NK7N. SEC: N7JEH. TC: NW7O. ACC: N7FFP. STM/SGL: N7CPP. PIC: WW7E. OOC: N7ELV. Greetings to the Nevada Section. This Spring and Summer promise to be busy with many group and club activities already set to go. Picnics, race support communications, BBQs, ball games, hamfests, repeater system improvements and maintenance, walk-a-thon support, off road vehicle races, pony-express runs, motorcycle races, on-the-air contests, field day, just to name a few. What this means is a place for everyone that wants to get involved. Not everyone fits into every facet of the hobby, but that's what makes it such a great hobby. This year also promises to be full of changes for us, but whatever the case, there is a continuing effort by others to acquire our bands and a strong and united front is more important than ever. Now and in the future, the ARRL will continue to provide that front, only if we continue to support the League. Do your part to help bolster your local club and the League. Nevada Section HF ARES net on Sat. 8:30 AM, 3965. Thanks and 73. Bob, K7IY.

PACIFIC: SM, Ron Phillips, AH6HN—SEC: Dennis Carvalho, KH7H. ASM: Harry Nishiyama, KH6FKG. ASM: Lee Wical, KH6BZF. ASM: Jim Reid, KH7M. ASM: George Heloca, Sr, KH6ANA. ASM: Mel Fukunaga, KH6H. TC: Chuck Cartwright, AH7Y. PIC: Russ Roberts, KH6JRM. ACC: Bob Schneider, AH6J. Adrian DiTucci, KH7GK, reports the following checkins for Dec 1998. Sun 47/48 min; Mon 19/23 min; Tue 101/2 hrs 5 min; Wed 20/20 min; Thur 68/1 hr 40 min; Fri 38/52 min. Sat no reports from NCS. KH6RS reports that the Maui ARC new Board Members for 1999 are: President: Jon Star, KH6X; VP: Den Niles, KH6XT; tres: John Hultquist, K6GSS (and equipment custodian), Sec: Bob Murdock, KH7FX. Directors: Jason Kohama, WH6BXK. Randy Leval, AH6GR, and Satoshi Manabe, WH6CTO. Mike Wiley reports a call sign change: from WH6CSB to WH7T. Congrats, Mike. Please keep letting me know *QST* deliveries. 73, Mahalo, Aloha.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Among those volunteering their time and experience to Amateur Radio are the section staff: K6BZ-SEC, W6KJ-BM, WB6RBE-TC, WA6WJZ-STM, WA6OWH-PIC, WY6O-OOC, W6RFF-ACC/SM, N6IG-SGL. Emergency Coordinators; KF6BOI-Butte, KC6KZX-Shasta, KO6NH-Nevada, AC6CN-Alpine/E.El Dorado, KM6AM-Colusa, KC6LIX-Placer, KJ6MD-Lassen/Modoc, N6LYK-Amador, K6HOY-Siskiyou, N6CVF-Tehama. District ECs; W7KEH, AB6OP, WA6SLA. Also acknowledge the good work that the VEs and teachers do during the year. Hamfests/Swap Meets planned by Yuba-Sutter ARC, River City ARCS, North Hills RC and Golden Empire ARS. Pacificon again in October. Nevada Cty. ARES will hold a SET with the Pet Rescue group. NARC working on incorporation Non-Profit status. I was a guest at the Amador County ARC's annual dinner. Always a good turn-out. N6SNO spoke to the River City ARCS on Contesting. Yolo ARS's ARES group assisted the Veterinary Medicine Teaching Hospital at Davis in an animal rescue and care exercise. Mother Lode DXCC was named a 100% Club for 1998, by the ARRL. Promote ARRL membership in your club and become a 100% Club. New club members; Amador Cty: WE6EXY, KF6TAZ, KF6TEP, KE6ZNQ, W6HDB, KF6NTY. North Hills: KC6NON, W6OUK. Membership in a local club and the ARRL are important in keeping Amateur Radio alive. JOIN! 73.

SAN FRANCISCO: SM, John Wallack, W6TLK—ASMs: N6KM, KE6EAQ. OOC: KD6VWD. PIC: N6BWS. SEC: WB6TMS. TC: N1AL. New appointment: KA6SPQ. DEC: Del Norte County. WB6MYF reports that the Far West Repeater Assoc has a new call of K6FWR. W6VV reports that the call for the new San Francisco Ham Radio Club is NO6PW. KN6ZU reports that the Southern Humboldt ARC 1998 Ham-of-the-Year is KM6TE. As EC for the Garberville area he attends monthly Disaster Planning Group meetings. He maintains 3 local repeaters (146.790, 146.940, 146.610) and he is on the BOD of the Far West Repeater Assoc. Congrats and a job well done to KM6TE. KF6JKP reports that W6UDS donated a van to the Marin ARC. It will have club call plates W6SG. Club members will install UHF, VHF, HF, Red Cross and County OES radios and will be used for a variety of events. K6RIM reports that the Redwood Empire DX Assoc had a very good 1998 with an average of half of the club members attending each dinner meeting with informative and entertaining DX programs. Membership now includes hams throughout the SF Bay Area. Traffic: W6JCG, ORS 70.

SAN JOAQUIN VALLEY: SM, Donald Costello, W7WN—ASM: Mike Siegel, KI6PR. ASM: John Lee, K6YK. ASM: Pat Fennacy, W6YEP. SEC: Kent LeBarts, K6IN. OOC: Victor Magana, AH6AH, It is now that time of year when all affiliated

BACK TO BASICS

HOW IT ALL STARTED

We wanted to offer the most affordable HF rig in the industry and still provide real performance for even the most experienced ham. In recent years, many hams requested a "back to basics" transceiver that was simple to use. We reviewed all the latest design techniques, selected the best concepts from the 20 rigs we designed over these 25 years and asked 500 hams across the country for their ideas.

WE CALL IT THE SCOUT

Every feature can be mastered in minutes. No modern rig is as easy to use. It only takes a second to change bands. Plug-in modules are available for 160-10 meters including WARC. Single conversion and crystal mixing are the foundation of this 90 dB dynamic range receiver. That's the strong signal performance of rigs costing 3 times as much! It's sensitive and receive audio is sparkling clean with less than 2% distortion. The ideal selectivity for every band condition is at the touch of a knob. This patented "Jones" filter provides variable I-F bandwidth from 500 Hz to 2.5 KHz.

HERE'S HOW IT'S USED

MOBILE

Hams complain about today's cars having precious little space for gear. The SCOUT is the smallest HF rig in the industry (excluding QRP) measuring only 2.5" x 7.25" x 9.75" and runs directly off the 12 VDC car battery. If the SCOUT won't fit your car, nothing will. The optional noise blanker reduces ignition noise from both your car and the one that just drove by.

PORTABLE

Business travelers and vacationing hams typically set up a briefcase or small travel bag to include the 5 lb SCOUT, wire or whip antenna and lightweight power supply. It is surprising how many hikers and cyclists take along their SCOUT using some clever battery arrangement.

NEW HAMS

The SCOUT is the most economical way to get started in ham radio. Consider the choice a new ham must make just to test his interest in HF: (1) Spend nearly $1000 or more on a new rig, (2) buy a used radio and take a chance on its condition, or (3) invest in a SCOUT at $549 with a one year factory warranty and our legendary TEN-TEC support.

OLD TIMERS

Operators with years of experience and a shack full of expensive HF gear also buy the SCOUT. It's refreshing to many who say "It takes 5 minutes to learn and without all the complicated features, there is only one thing to do with a SCOUT, work someone!" Experienced hams call us constantly to report "I can't believe this receiver, it outperforms my $1400 synthesized rig".

CALL TODAY:
1-800-833-7373
(U.S. & Canada)

Call Ten-Tec from 9:00 AM to 5:30 PM Eastern time, Monday through Friday for more information or to order. You can reach our repair department at 423-428-0364 from 8:00 AM to 4:00 PM. You can also FAX at 423-428-4483 or write us at 1185 Dolly Parton Parkway, Sevierville, TN 37862.

E-mail: sales@tentec.com
Homepage: www.tentec.com

- "SYNCHRO-LOCK" software keeps VFO virtually drift free regardless of temperature variation.
- SSB and CW 50 Watts Output Adjustable To 5 Watts
- Runs Off 12-14 VDC, TX -10 Amps, RX -.6 Amps
- Receive Offset Tuning
- Built-in Iambic Keyer with Legendary QSK. Speed adjustable on front and shown in display.

$549* Includes one band module of your choice

$29* Each additional band module

SCOUT ACCESSORIES:

MODEL		PRICE*
296	Mobile Bracket	$15.00
297	Noise Blanker	$19.50
937	11 Amp Power Supply	$79.00
701	Hand Mike	$24.00
607	Weighed Key Paddle	$39.00
291	Antenna Tuner	$89.00

VISA, MC, DISCOVER
*Plus shipping and handling; call toll-free for charges.

TEN-TEC

MADE IN USA

Introducing CENTAUR– a great amp for hams on a budget. Only $749. Call for information at 800-833-7373.

radio clubs of the San Joaquin Valley Section need to submit their annual affiliated club reports. This year the affiliated annual club reports may be submitted via the Internet on the ARRL Web-site. Please check out the new service provided at the Web-site that enables ARRL members to obtain a call sign e-mail address that will deliver e-mail to whatever Internet provider you want. Once signed up, you can change Internet providers and still get your e-mail using the same ARRL e-mail address, provided that you notify the site of the change of Internet provider. Example: w7wn@arrl.net. April 9 through April 11 the International DX Convention will take place in Fresno. I am pleased that the International DX Convention takes place every year in the San Joaquin Valley Section in either Visalia or Fresno on an alternating basis. Information on the DX Convention may be obtained from: Gordon Girton, W6NW, P.O. Box 60307, Sunnyvale, CA 94088—e-mail: gordon@svpal.org or e-mail at: w6nw@amateur-radio.org—Web page: http://www.amateur-radio.org/ncdxc.org.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASMs: AB4S, KE4ML, KC4ACE. SEC: K4MPJ. ASECs: WA4MOK, N4UCO, KD4RYE. STM: K4IWW. ASTM: W4EAT. TC: K4ITL. SGL: KI4AN. OOC: W4ZRA. PIC: KN4AQ. ACC: W4CC. BM: KD4YTU. Section Web Site <http://www.ncarrl.org> The Tar Heel Emergency Net is our section's HF ARES net (3923 kHz at 7:30 PM eastern). This net has been meeting for over 50 years and has a rich history. Monday nights are devoted to an on-the-air ARES meeting; Tuesday has a discussion of emergency communications; every night has good fellowship and all are welcome. During an emergency, this net serves as our initial response, with amateurs from all our nets participating. Check in, or just listen, and learn how to operate efficiently during emergencies. Our SKYWARN nets are another important part of ARES and provide crucial information to NWS. This is an emergency communications activity that is very visible to non-amateurs with scanners as well as through TV coverage. During a SKYWARN activation, only report the specific weather information requested by the net control station. Although NWS occasionally asks for observations from a specific area, they are usually only interested in reports that meet their severe weather criteria, which the net control will repeat frequently. Please follow instructions and DO NOT make unnecessary transmissions. Our PIC, PIOs and SKYWARN ECs do a great job getting publicity for these nets and for SKYWARN training sessions (which are a great source of new amateurs). We still need 2 mtr NTS nets in northeastern and western North Carolina. If you want to help start a local NTS net in your area, please contact your STM K4IWW. There are 19 hamfests scheduled this year in our section. Gastonia Hamfest May 1. Tfc (Jan): W4EAT 330, AB4E 233, K4IWW 225, KI4YV 147, K4AIF 108, W4IRE 93, KE4JHJ 82,AC4DV 78, W3HL 46, N4AF 39, WA4SRD 36, AB4W 34, W4CC 31, AA4YW 29, KF4VDW 22, KF4OZF 16, WD4MRD 15, WA4ZWC 13, NT4K 8, KR4ZJ 7, KT4CD 6, KF4YHG 3, N2JLE 3, W4DYW 3, K2EZX 2, KB4USN 2, KE4BKR 2, N4YXU 1.

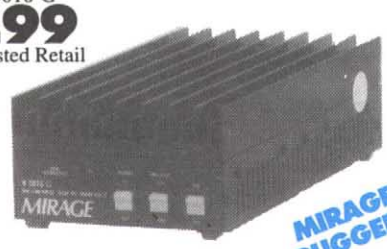
SOUTH CAROLINA: SM, Les Shattuck, K4NK—ACC: AE4ZJ. OOC: N4ENX. SEC: K8AFP. TC: KM4TN, PIC: K4LEO. STM: WA4UGD. SC SSB NET 3.915 nightly at 7 PM QCWA Palmetto Chapter net SAT at 9:00 AM. 3.930 join us! This month I would like to address some appointment issues. First we have a new Public Information Coord. Ed Henderson from Greenwood has taken over effective Feb 1. Please send any noteworthy amateur news to Ed. Along these lines, I would like to encourage every club in the section to pick a member (ARRL membership required) to be the club PIO—that is public info officer. This would enable us to have a network across the state, and we in the upstate would know what is going on in the low country. I have the applications. How about some volunteers! The Charleston Hamfest had about 500 attendees and I had a great time meeting with all of you. Congratulations to the all YL VE team down there. And to all the VEs, best wishes for a successful 1999 testing year. I got word that the League might be thinking about bringing up the old issue of changing its name again. Well, I must go on record against it and would like to get your input. Tfc (Jan '99): W4DRF 101, KA4LRM 89, KT4SJ 88, KA4UIV 74, KT4FP 42, WA4UGD 35, W4CQB 31, WT4F 9, KF4HAV 8, KQ4SY 6, K4NK 5. PSHR congratulations to: KA4UIV 133, KA4LRM 102, KT4SJ 108.

VIRGINIA: SM, Lynn Gahagan, AF4CD—ASM: W4TLM. SEC: K4EC. SGL: KK4IY. TC: W4IN. OOC: KR4UQ. PIC: W2MG. STM: AF4CD. On Thursday, Jan 28 at 7:01 PM, the Dickenson Co Amateur Radio Emergency Services (DCARES) was activated. Net control, KB4AKS, called the following amateurs to volunteer to help. From Russell Co: K4CBE, KD4JTK, KF4UJB, KF4UEL, W4DGW. From Dickenson Co: KB4RFN, KB4KTH. From Wise Co: KC4MAI, N4ADH, K4AGH, KT4KD and others from surrounding areas. They were called to assist the Dickenson Co Rescue Squad, Fire Department and Civil Air Patrol personnel. Earlier that evening, a horse was spooked and threw its rider down a steep embankment. As a result, the victim suffered a broken leg and was not able to move. In the midst of this event, the team of amateurs provided much needed communications and became a vital link to the safety of others as well as the victim. Congratulations to all on a job well done. K4EC reports the following new EC appointments for the section. Ricky Wilder, KB4AWY, is the new EC for Wise Co and Scott Galloway, AE4TC, is the new EC for Hanover Co. Congratulations on your new appointment, Ricky and Scott. Don't forget about the Chesapeake Amateur Radio Service Springfest '99 on April 24. Same location as last year at the Wallaceton Ruritan Club on Campbell Rd in southern Chesapeake. Call Jim, KF4RQQ, at 757-382-0193 or visit the CARS Web site at www.qsl.net/cars for more information. Well it has been almost one year now since I took office as your SM, and I hope that everyone is pleased with the progress we as a team have made over the last year. There is much more to do and your leadership throughout the Section is working hard. I appreciate the overwhelming support that everyone has provided. I would like to announce that W4IN, Edward Forman, will be the new Technical Coordinator for the Section as of Feb 5. Ed's e-mail address is **eforman@**

MIRAGE ...160 Watts on 2 Meters!

Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer . . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .

B-5016-G
$299
Suggested Retail



MIRAGE RUGGED!

Power Curve -- typical B-5016-G output power								
Watts Out	*130*	*135*	*140*	*145*	*150*	*155*	*160*	*165*
Watts In	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*

The MIRAGE B-5016-G gives you 160 watts of brute power for 50 watts input on all modes -- FM, SSB or CW!

Ideal for 20 to 60 watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

RC-1B, $45, Remote Control. On/Off, preamp On/Off, selects SSB/FM. With 18-ft cable.

Draws 17-22 amps at 13.8 VDC. 12x3x5½ in.

More 160 Watt, 2 Meter Amplifiers . . .

B-2516-G, $299. For 10 to 35 watt mobile or base stations. 160 watts out for 25 watts in.

B-1016-G, $379. MIRAGE's most popular *dual purpose* HT *or* mobile/base amplifier. 160 watts out/10 W in. For 0.2-15 watt transceivers.

B-1016-G Great for ICOM IC-706!

B-215-G, $379. MIRAGE's most popular *handheld* amp. 150 watts out/2 watts in; 160 watts out/3½ W in. For 0.25 to 5 watt handhelds.

100 Watts for 2 Meter HTs

B-310-G
$199
Suggested Retail

Power Curve -- typical B-310-G output power							
Watts Out	*25*	*50*	*75*	*95*	*100*	*100+*	*100+*
Watts In	*¼*	*½*	*1*	*2*	*4*	*6*	*8*

- *100 Watts out with all handhelds up to 8 watts*
- *All modes: FM, SSB, CW*
- *Great for ICOM IC-706*
- *15 dB low noise GaAsFET preamp*
- *Reverse polarity protection/SWR Protection*
- *FREE mobile bracket*
- *Auto T/R switch*
- *FREE handheld BNC to B-310-G cable*
- *Ultra-compact 4¾x1¾x7¾ inches, 2½ pounds*
- *One year MIRAGE warranty*

***Boost** your 2 Meter handheld to 100 Watts!* Ultra-compact all mode B-310-G amp is perfect for *all* handhelds up to 8 watts and multimode SSB/CW /FM 2 Meter rigs. *Great for ICOM IC-706!*

35 Watts for 2 Meter HTs

B-34-G
$89.95
Suggested Retail

Power Curve -- typical B-34-G output power								
Watts Out	*18*	*30*	*33*	*35+*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*

- *35 Watts Output on 2 Meters*
- *All modes: FM, SSB, CW*
- *18 dB GaAsFET preamp*
- *Reverse polarity protection*
- *Includes mobile bracket*
- *Auto RF sense T/R switch*
- *Custom heatsink, runs cool*
- *Works with handhelds up to 8 watts*
- *One year MIRAGE warranty*

MIRAGE RUGGED!

35 watts, FM only . . . $69.95

B-34, $69.95. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

MIRAGE Dual Band 144/440 MHz Amp

BD-35
$159.95
Suggested Retail

MIRAGE RUGGED!

Power Curve -- typical BD-35 output power							
Watts Out (2Meters)	*30*	*40*	*45*	*45+*	*45+*	*45+*	*45+*
Watts Out (440 MHz)	*16*	*26*	*32*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*

- *45 Watts on 2 Meters/35W on 440 MHz*
- *Auto Band Selection*
- *Auto T/R switch*
- *Full Duplex Operation*
- *5x1¾x5 inches*
- *FREE mobile bracket*
- *"On Air" LEDs*
- *Single Connector for dual band radios and antennas*
- *Reverse polarity protection*
- *Works with all FM handhelds to 7 watts*
- *One year MIRAGE warranty*

Add this Mirage *dual band* amp and boost your handheld to a *powerful* mobile or base -- 45 watts on 2 Meters or 35 watts on 440 MHz! **Mirage's** exclusive *FullDuplexAmp*™ lets you talk on one band and listen on the other band at the same time -- *just like a telephone conversation.* (Requires compatible HT).

6 Meter Amplifier

FCC Type Accepted

The A-1015-G, $389, is the *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 watts out for 10 in. For 1 to 15 watt transceivers.

70cm Amplifiers (420-450 MHz)

D-3010-N, $365, -- 100 W out/30 in. For 5 to 45 watt *mobile/base*. **D-1010-N, $395**, 100 W out/10 in. *Dual purpose* -- for handhelds or mobile/base. **D-26-N, $269**, 60 W out/2 in, for *handhelds*.

Amateur TV Amps

Industry standard ATV amps -- **D-1010-ATVN, $414**, 82 watts PEP out / 10 in. **D-100-ATVN, $414**, 82 watts PEP out/2 in. (without sync compression).

Remote Control Head for Amps

RC-1, $45, remote controls most MIRAGE amps. Power On/Off, preamp On/Off, switch for SSB/FM. 18 foot cable (longer available). 1¾x3¾x2½ inches.

Repeater Amps

11 models -- continuous duty all modeFM/SSB/CW repeater amps for 6, 2, 1 1/4 Meters, 70cm, 450 MHz ATV.

Low noise GaAsFET preamps

KP-1

KP-2

High gain *ultra low noise* GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 160 Watts. **Choose** In-*Shack* model or *Mast-Mount* (includes remote control) model to reduce loss. Rugged die-cast enclosure.

Frequency (MHz)	*In Shack $139*	*Mast Mount $195*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

1¼ Meter Amps (223-225 MHz)

Choose from 10 models -- 20 to 220 watts out for 2 to 50 watts in, $129 to $655.

Commercial Amps ($199 to $395)

FCC Type Accepted

Commercial amps for 150 - 174, 450-470 MHz and VHF marine bands, 70 -130 watts out.

Accurate SWR/Wattmeters

Read SWR directly andForward/ Reverse, Peak/Average power. Remote Coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

One Year Mirage Warranty

Call your dealer for your best price!
Nearest Dealer/Free Catalog: 800-647-1800

http://www.mirageamp.com

Technical: 601-323-8287 Fax: 601-323-6551

MIRAGE

COMMUNICATIONS EQUIPMENT
300 Industrial Park Road
Starkville, MS 39759, USA

MIRAGE . . . the world's most rugged VHF/UHF amplifiers

ARRL VIDEOS: THE FAST, EASY, FUN WAY TO YOUR LICENSE!

Video That Really Teaches!—Pass Your Exams!

Learn through the magic of 3-D animation, full-screen "monster" graphics and live-action video. You'll find even the most difficult material easy to understand—and remember. Your video course puts you in complete control, learning at your own pace. You can stop, rewind, and review any part of the course whenever you like.

You can be confident your ARRL video courses cover everything the FCC wants you to know. They are produced by King Schools, Inc., world leader in the production of exam preparation video courses, and get the job done like no other medium can.

In addition, the veteran hams here at ARRL Headquarters stand ready to answer your questions.

GENERAL: Covers All New Questions!

Your Complete ARRL Home Study Video Exam Course Includes:

- Three exciting video tapes—hours of invaluable instruction covering everything you need to pass your written exams.
- Course Book with detailed notes.
- Every exam question, with correct answers and detailed explanations.
- Practice exams to "tune you up" for the real thing. On the big day you'll be more than ready, with no surprises!

- **The General Course also includes Morse code software, *Morse Academy*!**

Ensure Your "Test Success" With ARRL's Computerized Exam Review.

After you've taken your video course, let your computer make it fun to ensure a top score on your exam.

The ARRL Computerized Exam Reviews are fun, user-friendly programs that let you choose questions by subject, or take them all. At your command, you'll see on-screen correct answers with ARRL's detailed explanations.

Plus…the program selects unanswered or previously missed questions, tracks your progress, and gives you a personal Report Card so you can watch your score improve!

Windows compatible.

A $59 value.
With your ARRL video course, only $30

Here's what our graduates say:

"Great course! A must for everyone...!"
— Markus Powell, KE6QXJ, Citrus Heights, California

"The tapes were wonderful, especially for someone like me, who has no background in electronics!"
— Robin Krueger, N2YQE, New Jersey

"The course is the perfect combination of easy-to-understand video lessons and computer practice. I only had to study for one week!"
— Robert Webster, WH6DX, Tucson, Arizona

"I could not have passed the test without this course!"
— Roger Caauwe, WDØFTS, St. Paul, Minnesota

We Guarantee Your Success.

Order Risk Free

Examine your course for 20 days. If it's not what you expected, simply return it for a full refund—no questions asked. You will pass your FCC written within one year, or you can return your course materials for a full refund—every penny. You pass, or you don't pay! (Include a dated proof of purchase and the date and location of your VEC-administered exam session when you return your course.) Offer not valid after course expires.

Call 1-888-277-5289 Or Tear Out And Mail Today!

YES! Send me my ARRL course now. *Rush me the package checked below.*

☐ **Complete Video Course and Computerized Exam Review Software,** only $129
- ☐ Technician Class (good through 6/30/2001)
- ☐ General Class REVISED (includes *Morse Academy*). (good through 6/30/2002)
- ☐ Advanced Class (good through 6/30/99)

☐ **Complete Video Course** (without exam review software) .. $99
- ☐ Technician Class (good through 6/30/2001)
- ☐ General Class REVISED (includes *Morse Academy*). (good through 6/30/2002)
- ☐ Advanced Class (good through 6/30/99)

☐ **Additional Course Book** (with course purchase only) $19
- ☐ Technician Class (good through 6/30/2001)
- ☐ General Class REVISED (good through 6/30/2002)
- ☐ Advanced Class (good through 6/30/99)

SHIP TO:
NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____
TELEPHONE ( ) _____
CHARGE TO: ☐ MASTERCARD ☐ VISA ☐ DISCOVER ☐ AMEX
CARD NO. _____ EXP. _____
☐ CHECK OR MONEY ORDER ENCLOSED

TOTAL PURCHASE $ _____
CT add 6% tax
CA add 7.25% tax
VA add 4.5% tax
SUBTOTAL $ _____
SHIPPING & HANDLING
☐ UPS SURFACE $5
☐ 2 DAY AIR $15
☐ Foreign $69
TOTAL AMOUNT $ _____

The American Radio Relay League
225 Main Street, Newington, CT 06111
860-594-0355 • Fax 860-594-0303
E-mail: pubsales@arrl.org

QS11

Also available from your local Amateur Radio dealer.

ICOM

IC-746 HF/VHF Transceiver

6m/2m • IF-DSP, front panel adjustable • 100w • All-mode • Twin passband tuning • Automatic antenna tuner • 11"w x 4½"h x 12⅛"d ..... © **$1599**[95]

IC-756 HF + 6M Transceiver

Big 4.9" concentrated information LCD display • 5-100w output–variable • All modes • Built-in antenna tuner • Dual watch • Twin passband tuning • 101 memories • **IF-DSP** – noise reduction; IF notch filter; Selectable audio peak; Phase shift • Network demodulation • CI-V computer interface • Mem. keyer • Level/width blanker controls • Speech synthesizer • CW announc. • 13.8V option **$1999**[95]

IC-707 HF Transceiver

100w • All mode • General coverage receive • 32 memory channels • 100% duty cycle • Min. # controls • Front facing speaker • Large display..... **$659**[95]

IC-775DSP HF Transceiver

200w–all modes • IF-DSP • Auto IF Notch DSP noise reduction • Noise Blanker PSN modulation • Auto peak filter • Dual watch • CW pitch control • Electronic & memory keyer • Power MOS FET final • Built-in power supply..... **$3599**[95]

IC-706MKII HF/VHF Transceiver

6m (100w); 2m (20w) • Detach. control panel/display • 101 mem. • .03-200MHz broadband all mode receiver • Cross band split • Noise blanker • IF shift • Preamp/attenuator • CW keyer • Full break-in (QSK) • CW pitch • Speech processor • VOX/XFC • LCD display • Scroll menu system • Tone enc. • 9½"w x 3¾"h x 9⅛"d, 9.1 lbs • **WITH DSP** ..... © **$999**[95]

IC-821H Transceiver

2m/440 MHz • Advanced satellite and digital base • All modes • 9600 full compatibility • Sub band transmit • 160 memories • Noise blanker • Adjustable transmit power • Satellite doppler correction ..... **$1399**[95]

IC-2710H Dual Band U/V Mobile

2m (50w) /440 MHz (35w) • Detachable control panel • 220 memory channels • NEW full control, easy to use microphone (HM-98) • High speed scan ..... **$469**[95]

IC-207H Dual Band Mobile

2m/440MHz FM • 50w/35w • Wideband receive • 182 memory channels • 9600 baud capability – PC ready • 50 frequency en/decode • Backlit TTP mic..... © **$349**[95]

Super LOW

IC-2100H FM Transceiver

144MHz, 55w • FM switchable • PC ready • 14 channel DTMF • 113 memory channels • Selectable squelch delay • Optional HM-90A 5½"w x 1⅛"h x 7½"d ..... **$199**[95]

R-8500 Receiver

0.1-2GHz (cell blocked)....**Special** **$1499**[95]

RECEIVER FOR PC

PCR-1000 .5-1300MHz PC-controlled • Power supply • AM/FM/SSB • Built-in speaker • Antenna • RS-232 cable and software • cell-blocked • **FREE Percon Spectrum from Icom thru 6/30/99**.....**Special** **$399**[95]

PCR-100-12 .01-1300MHz PC-controlled • AM/FM/WFM • CTCSS • Antenna.....**$299**[95]

HANDHELDS

IC-T22A *Affordable Beginner's HT!* 2 meters • 3w (5w @ 13.5V) • Small, easy to use • Alphanumeric display • Air band rx • 80 memories; 40 with alphanumeric display **$239**[95]

IC-T2H 2m 6w • Wide band receiver • 43 mem. • 8 program. keys • 8 AA batteries. **169**[95]

IC-T7H 2 meters/440MHz Dual band • Dual bander at a single bander size and price • Easy! Works one band at a time • 6w 2 meters/440MHz @ 13.5V • No function key and "intuitive" help function • Built-in CTCSS encode/decode ..... **279**[95]

IC-T8A/HP 6m/2m/440MHz • 123 mem.....**FREE** BP-197 batt. case **LIMITED TIME** © **309**[95]

IC-Q7ABC 2m/440 • 300mw • rx: 30-1300MHz cell blkd • 200 mem • w/batts & cgr **199**[95]

IC-W32A 2 meter/440MHz dual bander • 3w, 5w with BP-173 • Independent band controls • Simultaneous receive of both bands • 200 memories (100 per band) with name capability • PC/radio-to-radio cloning capability • Built-in encoder/decoder • Backlit keypad and LCD • Auto repeater function • Weather channel receive capability ..... © **289**[95]

HANDHELD COMM. RECEIVERS

R-10-05 (pictured) Wideband coverage: 0.5-1300MHz (cell blkd) • FM/WFM/AM/USB/LSB/CW modes • 1000 memories • 8 chara. alphanumeric LCD • 7 scan modes w/priority • Cloning • **FREE CS-R10 software & OPC-478 cable from Icom thru 6/30/99**.....**Special** **$359**[95]

R-2-06 .5-1300MHz • AM/FM/WFM • w/chgr & batt.. **$219**[95]

Other ICOMs not Pictured

A-22 5w Navicom Air HT ..... **$549**[95]
AH-2A Auto tuner for whip/wire.....**C/O** **199**[95]
AH-4 80-6m/120w/auto anten tuner.... **319**[95]
AT-180 Auto ant. tuner HF + 6m..... **499**[95]
IC-2GXAT/HP 7w 2m HT .....**Closeout** **229**[95]
IC-281H 50w 2m FM/TTP/9600 .....**C/O** **199**[95]
IC-4008A Family radio service HT ..... **109**[95]
R-100-11 1MHz-1.8GHz Receiver..... **849**[95]

© w/Instant Coupon, coupons expire 6/30/99

Prices subject to change without notice.

AMATEUR ELECTRONIC SUPPLY® LLC

5710 W. Good Hope Road Milwaukee, WI 53223 • 414-358-0333 • Fax 414-358-3337 • Service 414-358-4087

BRANCH STORES			STORE HOURS
28940 Euclid Ave Wickliffe, OH 44092 440-585-7388 1-800-321-3594 Fax 440-585-1024	621 Commonwealth Ave Orlando, FL 32803 407-894-3238 1-800-327-1917 Fax 407-894-7553	1072 N Rancho Dr Las Vegas, NV 89106 702-647-3114 1-800-634-6227 Fax 702-647-3412	Monday-Friday 9am to 5:30pm Saturday 9am to 3pm Over 42 Yrs in Amateur Radio

Internet **www.aesham.com** • E-mail **help@aesham.com** • Toll Free **1-800-558-0411**

ORDER TOLL FREE 1-800-558-0411

6:00 A.M. Pacific to 8:30 P.M. Eastern
Monday – Friday • Saturday to 6:00 P.M.

erols.com. K4EC reports that the new RACES ID cards by the Va Department of Motor Vehicles has been authorized. The new card will be physically similar to the new driver's license. It will take several months to iron out all of the administrative details, so don't start asking to get the card yet. The RACES license plate bill has been attached to SB720. This bill has passed the Senate without dissent and has been sent to the house for a vote. 73 de AF4CD. Tfc: K4DOR 596, N4ABM 180, K4MTX 174, KR4MU 137, WA4DOX 133, KE4PAP 97, W4CAC 93, WB4ZNB 62, KF4FXT 55, AF4CD 53, W3BBQ 52, K0IBS 37, KE4HFX 22, W4YE 18, K4IX 15, W4JLS 14, WB4UHC 14, WA8AHV 13, W4TZC 13, KE4NYY 7, KB4CAU 7, WB2KQG 6, KF4HJW 5, KB4AXR 4, K4JM 2, W4IN 2, N4FNT 2, KC4YWY 2.

WEST VIRGINIA: SM, O.N. (Olie) Rinehart, WD8V—STM: W8IMX. SEC: W8XF. ASEC: KA8ZOO. SGL: K8BS. TC: K8LG. OOC: N8OYY. ACC: WD8MKS, APRSC: W8XF. It is quite obvious that 1999 is here. I have no idea what happened to 1998. It seemed to pass fast and furious, but when we reflect back quite a bit was done. Let's look to the new. The long-awaited and much needed FCC action against serious violators of the rules, regulations and operating practices is becoming obvious by several means. Riley Hollingsworth, K4ZDH, and his Compliance and Information Bureau (CIB) are issuing written citations, openly monitoring on the air by visiting nets and joining in QSOs. They have visited several amateur station locations (local law enforcement in attendance), and rescended several improper license upgrades. Let's continue to monitor our frequencies, and help the FCC in their endeavor. Thanks to Mac, WX8F, SEC, and his PR, it would appear DAREN is now linked with VA and NC Emergency Nets. Partial explanation of the ARRL not sponsoring the VHF/UHF Spring Sprint, is the past record of very low participation, ergo, the VHF/UHF Sprints is not a contest which requires a National Organization to sponsor, and with some 1/2 million loss in income by drop in membership, the ARRL must cut. By the way, sprints are being picked up by other organizations and contesters. Tfc: KA8WNO 361, WD8V 271,WD8DHC 100, W8FZP 40, W8WWF 36.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WB0TUB—ASM: Jeff Ryan, N0WPA. SEC: Mike Morgan, N5LPZ. STM: Mike Stansberry, K0TER. ACC: Ron Deutsch, NK0P. PIC: Erik Dyce, W0ERX. OOC: Karen Schultz, KA0CDN & Glenn Schultz, W0IJR. SGL: Mark Baker, KG0PA. The Mountain Amateur Radio Club has a fabulous linked system of repeaters designed to cover Teller County. They do (!)... and more. The MARC/PARK Net on Tuesday at 7:30 PM has checkins as far away as from Pine Junction, Leadville and Evergreen. Join the net on 146.82/448.65 Woodland Park; 147.015 Cripple Creek; 146.685 Badger Mt; or the new 447.475 Springs link. Lots of Swapfests getting Convention status…the latest is the PPRAA and their upcoming 'fest. The DRL 'Crockfest' has applied for March. Day after tomorrow is the ARA swap at the Adams County Fairground ...always a good one. Membership in the ARRL is losing ground. Remember, belonging to the ARRL is more than a magazine! It is help with the FCC, WARC and OUR voice to the powers that be! Get a friend to join! Y2K is being addressed by the Colorado Section Cabinet. We plan to visit as many clubs as is possible so that we may assist with your Y2K information. If your information on the report forms is old, let us know so we may get in touch with your club to arrange a visit. The Y2K issues are being drawn together by your Section Emergency Coordinator, Mike, N5LPZ. Watch for his information coming to the EC nearest you! We Amateur Radio ops would much rather be part of the solution not part of the problem! Tfc: NTS traffic totals: W5JCV 215, K0TER 105, N0UOD 18. CAWN totals: W0WPD 1029, K0YFK 798, W0LVI 644, N0JUS 458, AA0ZR 453, N0DKK 442, K0HBZ 380, W0GGP 266, KI0ND 219, WB0VET 191, WB7VTY 141, 73! WB0TUB.

NEW MEXICO: SM: Joe T. Knight, W5PDY—ASM: K5BIS & N5ART. SEC: K6YEJ. STM: N7IOM. NMs: WA5UNO & W5UWY. TC: W8GY. ACC: N5ART. New Mexico Roadrunner Net handled 134 msgs with 1271 checkins. New Mexico Breakfast Club 200 msgs with 1066 checkins. Yucca 2-mtr Net handled 16 msgs with 793 checkins. Caravan Club 2-mtr Net handled 4 msgs with 85 checkins. SCAT Net handled 15 msgs with 611 checkins. Four Corners Net handled 20 msgs with 398 checkins. GARS Net handled 5 msgs with 32 checkins. Rusty's Net handled 111 msgs and 681 checkins. Valencia Co Net handled 5 msgs with 19 checkins. Enjoyed an extra fine winter tailgate in ABQ, thanks to K5TEE and crew. We greatly appreciate Rick Roy, KB5KJT, plowing through the snow and ice from Lubbock, TX, to be here for the tailgate. A special thank you goes to Toby Cross, KK5GX, for all he has done for ham radio in New Mexico. His donation of equipment and the time he has spent at the ABQ VA radio station, "N5VA," is to be highly commended. We have again had our share of SKs with the passing of Robin Adair, ex WA4JQI, W5RM (longtime broadcast engineer), and W5GVX. Vy best 73, W5PDY.

UTAH: SM, Jim Rudnicki, NZ7T—Greetings. Much to write this month, not enough room. First off, victory in Kaysville! After many months of negotiating the Kaysville Planning Commission deleted language in their ordinance with regard to height of amateur antennas. Many thanks to Tim Seely, KK7AF, who was instrumental in working with me in getting it done. DCARC's new prez,Clark Dowding, N7TDT is off to a fine start this year. He has created a great e-mail server to get information out to the membership. Interested hams can subscribe by sending e-mail to DCARC@ onelist.com. The UBET (Utah Box Elder-Thiokol) ARC will be holding their annual Golden Spike Special Event Station and QSO Party from 8 AM local May 8 to May 10 midnight. Contact Bob Anderson, AA7TR, for more information, or on the UBET Web site. **www.vii.com/~rndjohn/ubet/html**. In closing, I would like to announce that I will not be running for a third term as your SM. After many years as club prez, and SM, it is time to step back and spend more time with my family. Between my shift work schedule, and other volunteer duties, I have not been able to keep up! I thank you all for your patience and support for the last four years. 73 de NZ7T.

WYOMING: SM, Bob Williams, N7LKH—The Jackalope Net has a new net manager, Frank Moore, WB7FFK. He takes over for Monty, W7ILL, who is indisposed. The Wyoming Section has again been asked to provide communications for the Tour De Wyoming Bicycle Tour. It will take place 25-July 25-30 and the Tour Director is Amber Travsky. For those wishing to sign up for the Tour, she may be reached in Laramie at 742-5840. This year the route begins at Dubois and goes to Laramie with overnights at Lander, Jeffry City, Rawlins, Baggs and Encampment. I shall be contacting the ECs and Clubs along the way for help in organizing and staffing the communications operation. This can be a subject for discussion during the State Ham Meeting at the Hamfest in Casper over Memorial Day weekend. I look forward to seeing everyone in the Wyoming Section there. Net Reports for January: Jackalope 358 checkins, 0 traffic; Cowboy 889 checkins, 1 traffic. PSHR: NN7H 129.

SOUTHEASTERN DIVISION

ALABAMA: SM, Scott Johnston N4YYQ—Springtime has finally made its appearance. The weather sure has been nice and warm. All the seasons have their own weather patterns, of which we are familiar with. Though the days may be bright and sunny, we should all pay close attention to the weather. As Mother Nature has proven all too well...she can pack a wallop from time to time! And it's these "from time to times" that can catch us off guard, and unprepared. As has been reiterated over and over and over, be weather conscious and prepared! Incorporate in your daily routine to keep batteries charged and on hand for your HTs and flashlights, have well stocked first-aid kits, extra water, emergency lighting, clothing, rain gear, and any other needed supplies. We, as Amateur Radio operators, know that Amateur Radio is a service. And during those "from time to times," emergency communications is a must! So preparedness also includes checking into nets, "knowing" how to handle traffic, and serving as a net control station. From our daily QSOs with friends to net participation, traffic handling, and serving as an NCS, we are putting our preparedness into action! Thank you. Tfc: WB4GM 325, W4PIM 236, W4CKS 179, WA4GQS 135, W4ZJY 131, N4ZNO 119, AC4CS 66, KU4IJ 61, KL7Q 45, N4YYQ 40, W4ZBA 30, W4DGH 17, W4XI 15, KC4RNF 12, KE4OLE 0.

GEORGIA: SM, Sandy Donahue, W4RU—ASM/So Ga: Marshall Thigpen, W4IS. ASM/Legal: Jim Altman, W4UCK. SEC: Tom Rogers, KR4OL. STM: Dick Baxter, K5TF. SGL: Charles Griffin, WB4UVW. TC: Eddie Kosobucki, K4JNL. ACC: Jud Whatley, W4NZJ, OOC: Monroe Gaines, KF4NXD. PIC: Chuck Calmbacher, AD4JU. April 9-10 brings the 3rd Southeastern VHF Conf at Marriott NW at I-75 and Windy Hill Rd. See the Web-site **http://www.svhfs.org.svhfs** for details and registration. Condolences to the family of Tony Boden Sr, K4JJH, who passed away Jan 24 in Roswell. Athens ARC passed the Red Cross disaster Assessment class as a club project. New officers in the ARC of Savannah: pres. KC4WSD; vp KD4RDB; sec. KE4TQB; tres. AD4KA; act mgr. KD4DOY; trustee WA4IDI. The club named Karen Aaron, AD4KA, as its Amateur of the Year. Congrats to the Cherokee Capital ARC in Calhoun which has qualified to be a Special Service Club in Georgia. I will be doing a club program at the Carrolton ARC, May 11. If you are not going to the Dayton Hamvention then plan to attend the Statesboro fest May 15. Hope to see you at the VHF Conference. 73 Sandy. Tfc (Jan): WB4GGS 180, K4BEH 173*, WU4C 142*, KE4NAY 83*, KA4HHE 83*, W4AET 79*, K1FP 65*, KT4ST 43, K2UFT 14, K4BAI 8, K4JNL 8 *=PSHR.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM-APRS: WY8O. ASM-Youth: KO4TT. ACC: WA4B. OOC: WB4GHU. PIC: KF4HFC. SEC: WA4NDA. STM: WX4H. TC: KO4TT. Packet: N4GMU. The Florida Volunteer Organizations Active in Disasters committee met in Orlando to establish goals and objectives for 1999. They elected executive officers for the year. The ARRL Northern and Southern Florida Sections were represented by yours truly. The Committee urges local reps to join the VOAD organizations in their area. The Emergency Coordinators in particular should make contact as a need exists for emergency communications. All of the reps requested the desire for the EC to become a member of the locals. The Amateur Radio Clubs are urged to recruit members into the ARRL. Why? There are several good reasons, but do you realize the average age of an operator is 60 years old. The younger people are either not interested in Amateur Radio or if they obtain a license, they are not joining the League. The League is a strong supporter of saving the frequencies, by representing us to the U S Congress. HR 3572 is still very much alive, and many Congressman have not supported the legislation. Has yours? The Citrus County ARES Newsletter is commended for an excellent presentation of the Northern Florida Section Emergency Operations Procedures. There should not be any misunderstanding on what and how to operate during a disaster. Thanks to Bill, W4MCF, for an outstanding presentation. NFL DX Association elected officers for 1999: P-Mike Reublin, NF4L; VP-Steve, AB4UF; Sec-Frank,W3KT; Treas-Jim, KC4FWS. Joe Bushel, KI4BI, is now in Florida and appointed DEC for the Suwanne District. 73, Rudy. Tfc: KE4OAV 486, KE4PRB 229, KF4GUA 224, NR2F 222, KF4NFP 114, AD4DO 110, KF4TQX 112, KK4ND 102, W5MEN 75, AD4BL 72, N4ORZ 70, AF4FG 67, KF4TM 56, WB2FGL 54, W4KIX 48, KS4FB 48, KS4DW 48, N0ZO 46, WA4PUP 42, KJ4HS 25, WB2IMO 22, KB4CDR 22, AB4PG 21, KF4VRS 16, N4GMU 13, WA4EYU 12, WB9GIU 10, W8IM 8, KF4YHX WB8NER 4, KM4WC 3.

PUERTO RICO: SM, Raul Escobar, KP4ZZ—We all hate to think about it, but hurricane season is less than 3 month away. Congratulations to the new directive of PRARL: KP3G, pres; WP4LNY, pres-elect & dir, WP4NNC, vp; KP4EZ, tres; NP4FW asst tres; KP4PQ, Sec; KP4TN, dir, KP4YA, dir. Remember to collect all your QSLs in the bureau with Luis De La Vega, KP4WI, the QSL manager. 73, Raul.

SOUTHERN FLORIDA: SM, Kevin "KB" Bunin, K4PG; k4pg@arrl.org—ASM/STM: KA4FZI@aol.com. ASM for Youth Activities: **WB9SHT@gate.net**. SEC: W4SS, **mpapandr@co.palm-beach.fl.us**. Asst SECs: **WB2WPA @naples.net**, **KD4GR@hotmail.com**. TC: **KI4T@ix .netcom.com**. BM: **dibble@strato.net**. PIC: WA4ATF, **aj_gauz@ juno.com**. OOC: **WB4GHU@aolcom**. ACC: **W3BLW@ij .net**. SGL: KC4N, **hillsj@worldnet.att.net**, pkt mgr: **KB4VOL@n4exo**. Miami Hamboree is over and it was

KENWOOD

TS-570D(G) HF Transceiver

160–10m Ham Band operation • 500kHz–30MHz receive • 100w output • Auto antenna tuner • 16-bit DSP technology • Scrolling menu; 46 types of func. • "One-touch" DSP filter wide mode • Enhanced CW DSP including 11 user-selectable CW DSP filters • RS-232 port for up to 57,600 bps PC control • Electronic keyer • Different settings for TX & RX • 9-step operator controllable NR1 • 10⅜"w x 3¾"h x 10¹⅛"d • 15 lbs .....**Special $1099.95**

TS-570S(G) 160-10m/6m**Spec 1389.95**

TS-950SDX HF Transceiver

150w 160-10m all mode w/100kHz-30MHz rcve • Built-in antenna tuner • 100 mem. Select. tone/CTCSS • Dual rcve • 23 position AF digital filter • Speech processor QSK semi-break-in • Computer interface 5½"h x 15.8"w x 15¾"d • 51 lbs. **$3999.95**

TS-870S HF Transceiver

160–10m amateur band operation • 100kHz - 30MHz general coverage rcvr • 100w output • IF-digital signal processing func. • AIP sys. • Vari. AGC voice equalizer • Speech processor • Electronic keyer • Multi scan modes • Menu func. • 13.8V DC @ 20A 13"w x 4¾"h x 13"d, 25 lbs **Spec $2299.95**

TS-50S HF Transceiver

Super compact! • 160–10m Amateur Band operation • 500kHz–30MHz General Coverage receiver • 100w output • Dual vfos • DDS (Direct Digital Synthesizer) with "fuzzy-logic" control • AIP system • 100 memory channels • Dual-menu system • Multi-function mic • 12V DC @ 20A • 7"w x 2¼"h x 9"d, 6½ lbs.....**Special $819.95**

TS-60S VHF Transceiver

All-mode 50MHz transceiver w/90w output. Same features/looks as TS-50S .. **$999.95**

TM-V7A Dual Band FM Transceiver

50w 2m/35w 440 • Five-in-one programmable memory • 280 multi-function memory positions • 180 channels • Auto band change Built-in duplxr • CTCSS enc/dec • 10 DTMF mem. • Cross band repeat. func. • Reversed LCD • 5½"w x 1⅝"h x 7½"d.**Special $459.95**

TM-G707A Dual Band FM Transceiver

50w 2m/35w 440 • High visibility LCD Detachable front panel • 180 memory channels • Alpha numeric display • CTCSS encoder/decoder • Duplexer built-in • Priority scan • 5½"w x 2¼"h x 7½"d .**Special $339.95**

TM-742AD Dual Band Transceiver

2m/440 50/35w dual-band FM • **FREE duplexer for a LIMITED TIME.Spec $649.95**

TS-642AD Dual Band Transceiver

Same as TM-742AD but is a 2m/220 dual-band FM **$739.95**

TM-261A 2M FM Transceiver

144-148MHz tx; 118-174MHz rx • 50w • MIL-STD 61 multi-funct. mem. channels plus 1 call channel • Mem. name funct. • DTSS selective calling • Multi-scan capability • Dual menu sys. • Multi-funct. mic • DTMF mem. funct. CTCSS tone enc; opt. dec • 13.8V DC @ 11A • 5½"w x 6⅜"h x 6¼"d...**Special $189.95**

TM-461A 70cm FM Transceiver

Same features and looks as TM-261AD but 438–450MHz transmit, 400-470MHz receive, 35w output **$439.95**

VC-H1 Visual Communicator

Outdoor SSTV • Compatible w/ any FM xcvr • 10 image mem. • Connects to PC w/opt. kit to save pics as JPEG • Call sign superimpose • 270,00-pixel CCD image sensor • Rotatable, detachable camera head • Built-in mic & spkr • 1.8" color display • 4 AA batt. • 2⅝"w x 1⅜"h x 6¾"d .....**Special $429.95**

Other Products Not Pictured

BC-15A Desktop quick-chrgr **Closeout $29.95**
BT-6 6 AA battery holder.....**Closeout 19.95**
MC-45DM Multi-func TT mic.....**Special 39.95**
PB-32 6V, 600ma. battery.....**Closeout 19.95**
PG-3E cigarette cord w/filter ...**Closeout 19.95**
SC-35 case; 78A w/PB-13/BT-8.....**C/O 99¢**
SC-36 case; 78A w/PB17/18 ...**Closeout 99¢**
TM-331A 25w/220 FM xcvr **499.95**
TM-541A 10w 1.2GHz FM xcvr...**Spec 449.95**
UBZ-LF14 Family Radio Service HT **119.95**

Latest New, Used & Demo Pricing is available on our Web Site.
Prices subject to change without notice.

AMATEUR ELECTRONIC SUPPLY
MILWAUKEE, WI APRIL 9 & 10

April 9
2 to 7P.M.

April 10
8:30 to 3:30P.M.


TH-79AKSS


TH-D7A


TH-G71A


TH-22ATH

TH-22ATH 144MHz single band operation • MOS FETpower module • 5w output • DTMF keypad 40 mems, 1 call channel • Multiple scan functions (VFO, call, mem.) • Dual scan stop modes 2.2"w x 5.7"h x 1.0"d.....**Special $229.95**
TH-42AT 2.5w 440MHz version .....**Closeout 289.95**

TH-79AKSS 2m/440MHz dual bander • 5w output • MOS FET power module • Dual receive Cross-band repeat • 82 memories • ID and DTMF memory • Built-in CTCSS encode and decode 2.2"w x 5.1"h x 1.0"d.....**Milwaukee Only 469.95**

TH-D7A 5w 2m/440 handheld • w/1200/9600 TNC **449.95**

TH-G71A 5w 2m/440 dual band • Multiple scan modes • Wide range receive including aircraft CTCSS encode/ decode • One band at a time • 10 DTMF autopatch mem. • PC programmable plus DTMF remote control to your Kenwood TM-V7A • 2⅜"w x 4⅛"h x ¾"d....**Special $279.95**

AES purchased Kenwood's entire inventory of the CLOSEOUT items below!

AT-850	Auto tuner; TS-850S	**$199.95**	**PB-37**	12V 5w batt; TH-235	**$19.95**
BT-10	6 AA alk. case; TH-235A	**6.95**	**SC-33**	Case; TH-28A/48A/PB13/BT8	**9.95**
DFK-3B	9' cable kit; TM-733A	**29.95**	**SC-34**	Case; TH-28A/48A/PB17/18	**19.95**
DFK-4B	13' cable kit; TM-733A	**39.95**	**SC-41**	Soft case; PB-32	**9.95**
DFK-7B	22' cable kit; TM-733A	**59.95**	**SC-43**	Soft case; TH-79/PB-33/34	**9.95**
DTU-2	Digital paging; TM-541A	**19.95**	**VP-1**	Bumper mount, spring	**19.95**
IF-232C	Level trans.; TS-50/950	**99.95**	**YG-455CN-1**	250Hz CW fltr; TS-950SDX	**99.95**
MB-13	Mobile mt; TS-50S	**29.95**	**YK-455C-1**	500Hz CW filter; TS-140S	**99.95**
MB-14	Mobile mt; TM-742AD	**29.95**	**YK-88A-1**	AM filter; R-5000	**99.95**
ME-1	Mem. expand unit; TH-28A	**9.95**	**YK-88CN**	270Hz CW filter; R-5000	**69.95**
PB-36	7.2V batt; TH-235	**19.95**	**YK-88S-1**	2.4kHz SSB filter; TS-450	**99.95**

AMATEUR ELECTRONIC SUPPLY® LLC

5710 W. Good Hope Road Milwaukee, WI 53223 • 414-358-0333 • Fax 414-358-3337 • Service 414-358-4087

BRANCH STORES

28940 Euclid Ave
Wickliffe, OH 44092
440-585-7388
1-800-321-3594
Fax **440-585-1024**

621 Commonwealth Ave
Orlando, FL 32803
407-894-3238
1-800-327-1917
Fax **407-894-7553**

1072 N Rancho Dr
Las Vegas, NV 89106
702-647-3114
1-800-634-6227
Fax **702-647-3412**

STORE HOURS

Monday-Friday
9am to 5:30pm
Saturday
9am to 3pm
Over 42 Yrs in Amateur Radio

Internet **www.aesham.com** • E-mail **help@aesham.com** • Toll Free **1-800-558-0411**

ORDER TOLL FREE 1-800-558-0411

6:00 A.M. Pacific to 8:30 P.M. Eastern
Monday – Friday • Saturday to 6:00 P.M.

a good one. The National Hurricane Center hosted a meeting from 8:30 AM to 11 AM. Jerry Herman, N3BDW, and Julio Ripoli, WD4JNS, did an outstanding job. Each attendee received a certificate. The Carribean was well represented by Raul Escobar, KP4ZZ, SM of Puerto Rico, and NP2B, John Ellis of Virgin Islands. W4EHW was represented by John McHugh, KU4GY and his gang and ARRL by Rick Palm, K1CE. KA4FZI, Phylisann West, reports the welcome booth went very well. Bruce Reid, WB9SHT, was in the next booth with the youth exhibit (mostly hands on). The Lighthouse ARC was approved as an Affiliated Club (WA2HPV). Florida Gulf Coast AR Council Tampa Hamfest will be ARRL Florida State Convention on November 20-21, 1999. Received an EC Annual Report from Ray Kassis, N4LEM (sent by Ira Bickham). On the back is a history of BEARS, Brevard Emergency ARS, Inc. Beginning April, 1996 up to the present, Brevard County Clubs are organized to handle all emergency situations under the BEARS banner. For info, contact Ira Bickham, 407-453-2309. Many county governments and agencies are behind in Y2K problem solving. Some will simply not be ready. Now is the time to involve your ARES program. We hope Gary Arnold, WB2WPA, is feeling better after being under the weather with the flu. This month the section received one request for OO appointment and one for OBS. A Section Level Staff Meeting was scheduled for February. A report will appear here next month. ECs, your report must go to David Smith, **KE4UEI@gate.net**. Received an e-mail on FLARES from KR4YL, Paul Knupke, of the Florida Repeater Council about a proposal to use 1 MHz offsets for 2-meter repeaters where and when all of the pairs are occupied. This would utilize some of the rarely used simplex frequencies, i.e. 146.405 MHz input, 147.405 MHz output. Opinions are always welcome. The Manatee ARC (K4GG) newsletter announced the start of license class (Frank, AC4MK). The ARRL Information Net (AIN) meets Saturday mornings on 3.940 MHz at 7:30 AM or right after the FPTN, whichever occurs first. The South Florida ARES Net (SFAN) meets after AIN at 8:00 AM on the same frequency. 73 de K4PG. Tfc: W7AMM 980, WA9VND 729, KA4FZI 653, K4SCL 349, KB4WBY 338, KC4ZHF 319, AB4XK 244, KD4GR 161, KD4HGU 156, K4FQU 152, WA4EIC 144, KD4JMV 126, KE4IFD 124, WB4PAM 122, K4PG 122, AA4BN 89, KJ4N 86, K4RBR 68, W4DWN 64, KE4WBI 53, KT4XK 48, KE4EOF 33, WA4CSQ 23, WD4JNM 19, W4WYR 12, W3JI 10, W6VIF 8, KF4UTH 4, K3KT 4, K43NA 1. PSHR: WA9VND 207, K4SCL 198, KA4FZI 194, K4RBR 143, KC4ZHF 141, KD4GR 140, K4FQU 131, KE4IFD 118, WA4EIC 110, KJ4N 97, KB4WBY 94, KD4HGU 88, KE4WBI 88, KD4JMV 80, WB4PAM 77.

VIRGIN ISLANDS: SM, John Ellis, NP2B, St Croix—ASM: Drew, NP2E, St Thomas. ASM: Mal, NP2L, St John, SEC: Vic, WP2P, St Croix. PIC: Lou, KV4JC. St Croix, ACC: Debbie, NP2DJ. St Thomas, NM Bob VP2VI/W0DX, Tortola. The St John Amateur Radio Club has just completed moving their 146.63 repeater from the grounds of the Myra Keating Clinic to the new Ackley tower on Bordeaux Mountain near Coral Bay. The new location and a recent factory retune of the duplexer has resulted in a significant improvement in signal coverage. The repeater now easily services all of the BVI & USVI. Special thanks to KP2N, Ron, for his superb tower work and other contributions. Also to NP2L Mal, KP2Z Tony, NP2FO Sam, KE3QL Marie and KP2G George who all contributed time, materials and expertise to making the move successful. "Team RITTY" from St Thomas planning major assault, NP2E, with new rig. Watch for the VI in this one. NP2EF, Bill, now has tower back up, those helping with the raising were KV4JC, Lou, KJ6OI Carl, NP2FK Matt and NP2B John. 73, John, NP2B

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford Hauser, KD6XH—I am sitting here reading 6 newsletters, from Sierra Vista, Prescott, Phoenix, Flagstaff, Phoenix, and Tucson. They are telling their members of new officers, local happenings, new Web pages, and asking for help with local public service events. Amateur Radio will be aboard the new International Space Station. Amateur Radio has such a wide range of activities from using local repeaters to HF to talking with and through satellites. When you are operating or talking with others, what impression do you make when it comes to Amateur Radio? Each community has several public service events every year. With our weather improving, these events will begin to happen. Tucson has already had the "Climb A Mountain"; Flagstaff has completed the "Sled Dog Races" and the "Winter Special Olympics." What have you done to help your community or just the local club? Art Phillips, NN7A, and Mike Sharp, NG7S, operated from Turneffe Islands, in Belize Central America during early February. You can get free e-mail forwarding service through ARRL if you are a member. Call or write Headquarters for details or sign up on the "Members Only" Web site. My Arizona club listing was mailed the first part of January. I received 7 back for incorrect mailing addresses. If your club has not received the new listing, please let me know so I can up-date my records. We have over 55 clubs here in Arizona with at least one (1) located in every major and minor city in Arizona. The 1999 DX Convention will be held at the City of Fresno (California) Holiday Inn downtown (telephone number 209-268-1000) on April 9-11, 1999. The Southwest Division Convention for 1999 will be held in October on the first weekend (01-03) in Long Beach, California, on the *Queen Mary*. Don't forget the DeVry Hamfest on April 17 1999 and the Sierra Vista Hamfest on May 1 1999. I plan to be at both events and hope to see you all there. Not much else to report this time. 73, Clifford Hauser, KD6XH. ATEN 31 sess, 106 QNI, 124 QTC. Tfc: K7VVVC 714, AB7NK 128, W7EP 110, W7UQQ 55, K7OBB 15.

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF —Traffic totals for the past month are W6SX, Hank, 53 and AD0A, Jerry, 134. Jerry has been active locally in lecturing to local clubs about the ARRL, traffic nets and traffic handling. If you would like Jerry to speak to your club, or if you need more information about other speakers and other subjects for your club programs; check out our Web site **www.qsl.net/arrlsw/lax**. You can go from our LAX Web site to the Division Web site or, on to the ARRL HQ Web site. You can do many good things from the HQ Web site. Like renew, your, ARRL membership, order books, or get the latest official ham news stories. Try the HQ Web site, it has been up dated and provides

YAESU

FT-1000D Transceiver

tx: 160–10m **rx**: 100kHz-30MHz • 200w • 100 memories • Dual receive • Antenna tuner & AC • Dual bandpass filter • Temp. compensated crystal oscillator • 2.4kHz & 2kHz SSB filters, 500Hz CW crystal filter 6"h x 16"w x 15"d, 58 lbs .**Spec $4199.95**

FT-1000MP Advanced features • EDSP Collins mech filter.....**Special $2799.95**

FT-847 All Mode Transceiver

Ideal for HF & satellite oper. • HF/50 MHz: 100w–144/430 MHz: 50w • Cross-band full duplex oper. • Normal/ reverse tracking • Dedicated satellite mem. • DSP filters (Notch, NR, BPF) • Low noise VHF/UHF • Preamps built-in • High resolution 0.1Hz • Tuning steps, ultra smooth tuning • Shuttle jog • CW sidetone and pitch control • CTCSS/DCS enc/dec • Direct freq. keypad entry • 1200/ 9600 bps packet ready • **FREE ATAS-100 motorized mobile antenna or FC-20 automatic tuner from Yaesu thru 3/31/98**.....**Special $1699.95**

FT-920 HF Transceiver

6m • 50MHz w/100w • AF-DSP • Auto antenna tuner • 127 memories • FET RF amp • Digital voice memory system • Dual display • Keyer • **FREE FM-1 FM unit for a LIMITED TIME**.....**Special $1499.95**

Affordable Beginner's Radio!

FT-840 HF Transceiver

transmit: 160 to 10m, **receive:** 100kHz to 30MHz • 100 memories • 100 watts • Twin VFOs • Optional FM • Repeater offset • CTCSS encode • 13.8V DC @ 20A • 10"w x 3⅜"h x 9½"d,18 lbs.....**Special $749.95**

FP-712 10A switching power supply . **$129.95**
FP-1023 23A switching ps w/fan... **159.95**
FP-1030A 25A ps w/meters..... **249.95**

Prices subject to change without notice.

NEW!

FT-100 Field Commander

160-6m mobile xcvr + 2m and 430-450MHz rx: 100kHz-30MHz, 30-970MHz (cell blocked) • 100/50/20w • DSP • SSB/CW/AM/FM/AFSK/ Packet oper. • Built-in CTCSS/DCS • 300 mem. • IF Shift • IF noise blanker • VOX • Dual VFOs • Electronic memory keyer • Speech processor • 6¼"w x 2"h x 8"d..... **$1349.95**

FT-8100R Dual Band Transceiver

2m 144–148MHz tx, 110–550 & 750-1300 MHz (cell blkd) rx • **70cm** 430–450MHz tx/rx • 208 mem. • 50-35/3/5w • CTCCSS encode • 5⅛"w x 1½"h x 6¼"d.....**Special $469.95**

FT-3000M 2m FM Transceiver

70w • 110 to 180MHz, 300 to 520, 800 to 999MHz receive (cell blocked) • 81 memmories • 1200/9600b comp. • 5½"w x 1⅜" x 6¼"d, 2¼ lbs .....**Special $399.95**

Quadra System HF/6M Amplifier

Amateur band coverage: 160–15 and 6m • 1000w • Power out @ 220V AC 500w on 6m • Built-in high-speed antenna tuner • Two RF inputs • Four RF outputs • Auto bandwswitching with FT-1000D, FT-1000MP, FT-920 and FT-900 • Separate amplifier and PS units • 16½" x 5⅜" x 16¼" • (amp) 33 lbs; (power supply) 26 lbs .....**Special $3999.95**

FT-2500M 2m FM Transceiver

144–148MHz transmit, 140-174MHz receive, 50/10/5w • 31 memories, odd splits • Alphanumeric display • CTCSS encode • 5 scanning functions • Track tuning • Backlit DTMF mic • 6"w x 1⅛"h x 7"d.....**Special $199.95**

FT-290RMkII 2m Transceiver

144 to 148MHz transmit/ receive • 25w • FM/SSB/ CW or 2w portable power with 12VDC at 1A or optional battery case • Dual VFOs • 10 memories • DTMF up-down mic scanning • 2⅛"h x 6¼"w x 7½"d, 2½ lbs **Special $519.95**

VHF/UHF Repeaters

25w • 8 channels • PLL synthesized • Fully programmable • CTCSS encode/decode • Time out & hang timers • Wall/ rack mt. • 13.8V @ 6A • 14¾" x 1¼" x 4¾", 25 lbs

VXR-5000VADC 135–175MHz..... **$1199.95**
VXR-5000UCDC 400–512MHz..... **1199.95**
VXR-5000V/TA 2m rptr w/PS **1399.95**
VXR-5000U/TC 440 rptr w/PS **1399.95**
VXD-40VA2 2m Duplexer **199.95**
VXD-40UB 440 Duplexer **199.95**

FRG-100B Receiver

50kHz-30MHz, SSB/CW/AM modes, FM opt. • 50 mem. • Selectable bandwidths • Dual ant. inputs • 9¼"w x 3⅜"h x 9⅜"d.... **$619.95**

Antenna Rotators

Light, medium, heavy & extra heavy-duty models, plus elevation & azimuth – elevation.

G-450A Lt/medium, 10 sq. ft..... **$259.95**
G-500A Elevation, 12 sq. ft .**Closeout** **259.95**
G-550 Elevation 12 sq ft..... **299.95**
G-800S Medium, 17 sq. ft..... **339.95**
G-800SDX Same, w/presets..... **429.95**
G-1000SDX Heavy, 23 sq. ft..... **519.95**
G-2800SDX ExtraHD, 23 sq. ft..... **1139.95**
G-5400B Azim./elev.11 sq ft.....**C/O** **539.95**
G-5500 Azimuth/elevation 11 sq ft .. **629.95**

Handhelds

FT-10 2m HT (several models) .....**CALL**
FT-11R/HP 5w 2m HT.....**Special $269.95**
FT-23R-12 5w 2m HT..... **199.95**
FT-33R 5w 220 MHz FM HT **299.95**
FT-40 440 HT (several models)..**Spec CALL**
FT-50RD/41B 5w w/FTT-12...**Special** **279.95**
FT-51R/HP 5w 2m/440.....**Special** **379.95**
FT-411E/HP 5w 2 meter FM HT..... **259.95**
FT-911 1w 1.2GHz HT..... **469.95**
VX-1R 500mw 2m/440 HT..**Special** **229.95**
VX-5R 5w 6m/2m/440 HT **359.95**

VXA-100-16/41B 5w air HT w/VOR .**549.95**
VXA-100-6/41B 5w air HT..... **359.95**

VXF-10 FRS HT w/wx..... **119.95**

MISCELLANEOUS CLOSEOUTS

CA-8 Chrg sleeves; NC-50/416/530..... **$4.95**
CD-2 Mobile rapid charger; 11/41/51R **29.95**
CSC-24S Case; FT-23/33/73R/FNB-12S.. **2.95**
CSC-35 Case; FT-411E w/FNB-17..... **2.95**
CSC-50 Case; 415/416/FNB-25..... **2.95**
CT-20 Mic cable for use w/MD-1C8 ..... **9.95**
DVS-3 Voice; 2200/5200/6200/7200 ... **69.95**
FNB-49 600MA 6V battery..... **19.95**
FP-700 20A Power supply w/spkr.... **129.95**
FRA-7700 Indoor active rcvr ant **39.95**
FRC-4 Pager unit; 5200/6200..... **14.95**
FRC-6 Pager unit; 2500M/7400H **9.95**
FTS-6 Encoder/decoder; 09 series **9.95**
FTT-12 16# keypad/dec/dvrs; FT-50R.. **29.95**
FTT-4 TTP unit; FT-23R/33R/73R **19.95**
FX-1 Xcvr-fax interface/controller..... **69.95**
MMB-21 Mobile bracket; 09/727R **4.95**
MW-2 Remote control wireless mic **59.95**

a great resource for FCC and technical information.K6HV, Bill Stewart and W6BF, were visited by Jay Miller, KK5IM, the author of a recent publication about Collins Radio Equipment. They have published a beautiful pocket guide to Collins equipment 1946 to 1980. These classic equipment photos are fist class. Each Amateur Radio product photo is followed by a short list of specifications. If you are a Collins fan, you should check out this publication. Vy 73, de W6BF, Phineas.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Joe, KO6XB, 909-685-7441; Org CoArt, W6XD 714-556-4396; SB CoJames, KE6LWU, 909-824-2454; Sec News/PIC-Gwyn, KE6JOF, 909-685-7441. SEC: Ted, N6RPG, 909-947-1769. Hats off to new officers: WARA: Pr, Fred Austin, KF6MGJ; VP, Mark Christian, KB6SRT; Sec, John McCreary, KF6PMD; Tr, John Oppen, KJ6HZ. WPSS: Pr, Lindsay Simmons, KD6EB; VP, Jerry Whitney, WA6ZZK; Sec, Tracy Black, WA4TGQ; Tr, Joe Zboril, WB2DRH. SCDXC: Pr, Harvey Laidman, W8DX; VP, Jim Zimmerman, N6KZ; Sec, Chuck Constantine, KR6C, Tr, Skip Bolnick, KJ6Y. BCWS reminds us that the CMRA SwapMeet is on again, held on the 3rd Sat each month at Cal Poly, Pomona, parking lots F8, F9 and F10. For info call 714-537-4230. TASMA's Jim Keck, N6JIM, invites all who want to find solutions to problems facing hams who use the 2M band to get involved in TASMA. Check their Website at **www.primenet .com/~tasma/index.html** Recommended reading: OCRACES' 1998, Yearbook, put together by Walter Wilson, K7WWW. Congrats to WARA's Ambassador of the Month, Jack Johnston, KF6JCU. SATERN was a great success. Congrats to Tony, KE6JZF, and the group. Al, WB6BBH, and Alice, WB6GXI, e-mailed W6UBQ that the Hemet City Council voted to pay $27,500 for a 28' enclosed trailer for San Jacinto Valley RACES. The 50th Int'l DX Conv, will be hosted by the No Cal DX Club on 4/4-11/99 at the Holiday Inn Centre Plaza, 2233 Ventura St, Fresno, CA 93709. Download reg forms from **www.amateur-radio.org/ncdxc.htm**. STM N6GIW reports for January 99: Tfc totals: KC6SKK 94, N6GIW 87, KO6RZ 504, W6QZ 83, AD6HR 63, KD6EYI 21, N3IVO 9, KF6RNO 4. Digital tfc: W6QZ NTS BBS 198. N6GIW NTS MAILBOX 91. PSHR: W6QZ 145, KC6SKK 84. Check into NTS each eve at 9 PM on 146.820, neg offset, no PL. A vital training for H/W tfc Vy 73, KE6JOF for W6UBQ.

SAN DIEGO: SM, Tuck Miller, K6ZEC, 619-475-7333—Are you interested in receiving all the latest news and info for the San Diego Section? Would you like to receive late breaking news on club activities, as well as public service groups, including but not limited to ARES, RACES, and SKYWARN? If the answer to both these questions are yes, do I have a deal for you. The only catch is you have to have e-mail capability. Send an e-mail to **sdgarrlsection-subscribe@onelist.com**. You can type anything you wish in both the subject and text areas, as this is ignored. A reminder, if you are an ARRL member, you qualify for an e-mail address designating you as a member of our organization. To get your ARRL e-mail reflector, send an e-mail to **register@arrl.net**. Hope to see many of you at the DX Convention on April 9-11. A lot of good programs and seminars are planned, and I am sure the food will be great as well. Speaking of the DX Convention, have you attended the local DX club? The San Diego DX club meets the 4th Wednesday of each month at the Hindquarter Restaurant, on Miramar Road. They try to start dinner around 6:30 PM with the meeting starting at 7:30. Ed Runge, former major league umpire, was the guest speaker at the February meeting of the Amateur Radio Club of El Cajon. Tfc: KT6A 810, WA6ODQ 312, KD6YJB 290, KD6IVF 5, KO6BU 2. BPL: KT6A 810. PSHR: KT6A 141. WA6ODQ 140. KD6YJB 93.

SANTA BARBARA: SM & STM, Rob Griffin, K6YR, 805-543-3346 & **k6yr@arrl.org**—SEC: Jack Hunter, KD6HHG. AAC: Michael Atmore, KE6DKU. BM: (vacancy). OOC: Tom Perkins, KD6BXM. PIC: Jeff Reinhardt, AA6JR. TC: Warren Glenn, KM6RZ. ASMs: Doc Gmelin,W6ZRJ & Don Milbury, W6YN. DECs: SB - Dave Lamb, WA6BRW. SLO – Bill Peirce, KE6FKS, & Ven - Dave Gilmore, AA6VH. SoCal DX Club has elected its 1999 Officers & Board: Prexy, W8DX; VP, N6KZ; Secy, KR6C; Treas, KJ6Y, Member Chair, K6EXO; Dirs, KF6LFB & WU6T, & Ex Officio, K6NDV. See the SCDXC Web site: **scdxc.org**. Make plans early for the SW Div HAMCON '99 in Long Beach on the *Queen Mary* in October. Details: **qsl.net/arrlsw/hamcon/**. Not too late to register for the 50th Int'l DX Convention, April 9-11 in Fresno. Details: POB 60307, Sunnyvale, CA 94088. License up-grade classes? Few Ham Clubs offer them, but the SBARC does! Contact Darryl, KF6DI, 969-2326. Thanks, SBARC. QNI SCN/SB NTS Net: 9 P on 147.000+ (131.8), 224.90-(131.8) & 448.875-(100). PSHR/Tfc: K6YR 171/106 W6ZRJ-/48 KE6MIW 102/41 KF6OIF 93 & KM6RZ-/2. 33 in respect for Silent Keys who gave much of themselves to ham radio: Hank, W6HB, "Doc", W6ZRJ & Gene, W6ZZM. 73, K6YR.

WEST GULF DIVISION

NORTH TEXAS: SM, Don Thomas, KA1CWM—SEC: K5UPN. STM: KC5OZT. TC: W5CWO. BM: KB5YAM. SGL: N5GAR. OOC: WB5UDA. ASMs: K5RE, W5IWE, W5FB, KK5QA, KK5NA. (**http://www.lsic.net/net/ntexas.html**). We want to express our appreciation to Lanny Priddy, K5LP, for his service as Assistant Section Manager. Lanny has indicated that he doesn't have sufficient time to devote to ASM activities and will relinquish that appointment. However he will remain active as an ARRL Volunteer Counsel—antenna matters. He reports that he has two antenna cases under way at this time. The first Traffic Message Training Class held in Garland was reported as a success and others are being scheduled. One to be held at Ham-Com in June and another at the hamfest in Denton later in the year. Those wishing to get involved in traffic handling should plan on attending one of these new training classes. New classes will be announced in the bi-monthly section newsletter. Planning is already underway in many of the clubs for Field Day and clubs wishing to have their locations published in the section newsletter may send the information to **ntx-news@juno.com**. E-mail requests continue to pour in from hams wishing to be placed on the section newsletter distribution, keep them coming, right now we have approximately 1/3 of the hams in the section on the distribution list. I don't need to tell you its the spring storm season in Texas, so everyone be on the alert and anyone wishing to join one of the storm

WOW! New from Alpha Delta!

Why didn't someone think of this before?

ALPHA DELTA Models DH-1 and DH-2 Hydraulic Dampened Fold-Over Mast Fixtures for HF Verticals and Small VHF/UHF Ground Planes

Now one person can raise and lower an HF vertical in a simple 30 second operation!

- Easy antenna adjustments and maintenance.
- The vertical can be lowered out of view when not in use.
- Small VHF/UHF ground planes and discones can easily be raised.
- The Model DH-1 fold-over fixture includes a powder coated steel pedestal--$249.95 ea.
- The Model DH-2 excludes the pedestal and mounts on a 4x4 wood post or sturdy wood fence post-$229.95 ea.
- Stainless steel hardware, aircraft grade aluminum and "post-hole" type mounting with premix concrete. Designed for verticals up to 29ft. and 25 lbs. weight. DH series fold-over fixtures are pre-assembled and include a hydraulic dampener for safe operation.

User supplied mast tubes shown in photos.

Now You See It—

Now You Don't!

QTH of W8AD

Model DH-1 in action!

Toll free order line (888) 302-8777 ***(Add shipping & handling, exports quoted)***

ALPHA DELTA COMMUNICATIONS, INC.

P.O. Box 620, Manchester, KY 40962 • (606) 598-2029 • fax (606) 598-4413

Alpha Delta —*Compelling You Into the 21st Century*

AA

MasterCard VISA

spotters groups should contact the ARES Emergency Coordinator in your respective county as shown on the section Web page or send a e-mail to **ka1cwm@arrl.org** and we will put you in contact with the proper person. It is recommended that all members take advantage of the e-mail service now available through the ARRL. Also you might want to update your personal information including e-mail address in the QRZ data base because this is used extensively when trying to find name, address and e-mail for a specific call sign. January Traffic Reports: KC5VLW 227, K5AO 171, N5JZ 108, KC5OZT 101, KB5TCH 84, K5MXQ 81, KB5WEE 81, WA5I 69, KB5YAM 52, KC5QGI 39, KC5SMC 36, N5NY 34, KC5QZZ 24, AC5Z 20, KC5EIV 18, KD5AHW 10, KC5PNM 8. 73, Don Thomas, KA1CWM.

OKLAHOMA: SM, Charlie Calhoun, K5TTT—ASMs: N6CL, K5CPZ. SEC: W5ZTN. STM: AB5RV. ACC: KB5BOB. PIC: WA9AFM. OOC: K5WG. SGL: W5NZS. TC: KB5RV. Updates are being made to the Web site on a regular basis. You can now add your own net to the net list, Post Announcements on the OK Section Bulletin Board and get a list of nets being held for the day. Green Country Hamfest was a great success! I mentioned the Stillwater Club's new club station last month. They also have an online newsletter, **http://www.provalue.net/sarc**. Larry Brewer, K5VVD, Chief of Operations Support for the OK Dept. of Civil Emergency Mgmt., notes that the State Emergency Operations Center will be sponsoring a Statewide Emergency Management Exercise sometime this fall (Sep or Oct). They are planning to use Amateur Radio stations to relay message traffic for the exercise, which will be Y2K related. They are also encouraging local emergency managers to have pre-exercises in their communities concerning the Y2K issue and the use of amateurs to fill the communications gap should it occur. SCARS, OUARC and the City of Moore Department of Emergency Management sponsored a successful National Weather Service SKYWARN spotter's class on March 9. 73, for now. Tfc: KF5A 593, N5IKN 558, WB5NKC 503, K5GBN 362, WB5NKD 84, WA5OUV 75, KE4JE 74, AB5RV 56, KK5GY 52, KC5VOG 38, W5REC 29, KI5LQ 24.

SOUTH TEXAS: SM, E. Ray Taylor, N5NAV—ASMs: NR5ED, N5WSW, W5GKH, K5DG, N5LYG, WA5UZB, KK5CA, WA5TUM, KB5AWM, WA5JYK, K5PFE, and K5SBU. STM: W5GKH. SEC: K5DG. ACC: N5WSW. PIC: KA5WSS. TC: KJ5YN. BM: W5KLV. OOC: W5JAM. SGL: KM5HY. South Texas is really starting to awaken to the true purpose of Amateur Radio communications, and that is disaster communications. This is the only reason we have not lost a lot of our frequencies to the highest bidder. We now have a working system for any disaster that might occur. We now have operators monitoring 3873, 3935, 7285, and 7290 kHz almost around the clock. If that doesn't work at 2 or 3 AM, call me at 830-625-1683. The greatest complaint, during a disaster, has always been communications between the different agencies. Having spent most of my career in emergency and networking communications, I tried for several years to get some of the agencies to change their way of thinking, but with no success. I hoped some day to be able to prove it. With this new way of operation, all agencies meet on the same frequencies. You first note who has the most trained personnel available, ARES. Second, where can you find and alert the system, wide coverage nets. You have a large number of trained NCS to draw from. Third, all agencies join in on the same frequencies. All get the same warnings and information at the same time, regarding the disaster. There is no chance of misunderstandings, transferring information from one agency to the next. The time saved is very critical in a disaster. This all started when tropical storm Charlie came ashore near Corpus Christi and later causing the flood in Del Rio. This has worked for Francis, Georges, and the greatest flood of South Texas. It's wonderful to see the FCC cleaning up the ham bands. Soon we will be able to have our grandchildren in the operating room. I happen to be coaching some young people, in our church, to become amateur operators soon. While monitoring one of the San Antonio repeaters, some of the most foul language was heard. These kids couldn't understand why that should be allowed on ham radio. What a shame. It will be a great day when the FCC has the time to cleanup 2 meters also. I still enjoy reading all the club newsletters. I noticed KK5DO, contacted King Hussein, JY1, while he was in the US. I think that is great Bruce. King Hussein was a true leader and Amateur Radio operator. He will be missed by all around the world. One word to those that have let your membership run out, you will miss out on some great happenings this year, unless you re-new soon. Everyone have a great April. 73 for now and God Bless. Tfc: W5YQZ 723, NR5ED 246, W5KLV 160, N5NAV 145, KA5KLU 125, W4ZX 90, W4RRX 82, W5GKH 73, N5OUJ 38, K5UCQ 33, KA5FXQ 333, W5SHN 27, K5VY 18, WA5AA 11, N5JUU 8, N5LF 2, W5HK 1.

WEST TEXAS: SM, Charlie Royall, WB5T, 915-944-0469, **cnroyall@wcc.net**—ASMs: Cley/K5TRW; Ron/ KB5HGM; Jerome/K5IS; Fred/W6VPI; Sandy/W5MVJ. SEC: Alex/ N5LRH. OOC: John/KO5D. OBM: Frank/N5WT. New ofcrs for '99: Pecos Co ARC, P/Richard McGee/N5DXL, VP/Larry Mercado/KC5SLN; San Angelo ARC, P/Gil Gilstrap/KK5YZ, VP/Nan Royall/ KC5YTG; WTARC/Odessa, P/Robert Jordan/N5RKN, VP/Jerry Naylor/WB5THR; El Paso ARC, P/ C.W. Hiett/ N5HRD, VP/Clay Hamilton/AA5AP; Midland ARC, P/ Ray Schulze/N5SR, VP/Steve Hopkins/N5RS. Welcome to 21 new hams, Lubbock leading the way with 11; the rest of the section, 10. So far in 99 we have had 7 Silent Keys. Newly departed are R. V. Allison/W5WLC, Wall; Howard Bently/W5EBO and Mike Smith/W5MLS, Midland; Jay Applegate/KB5OMW, El Paso. New officers, don't forget to update your club information on ARRL Web. San Angelo ARC celebrates 74 years as an ARC (est 1925) and 45 years of ARRL affiliation—lots of things coming up: hamfests, club visits, and unsettled spring weather. Time to get in gear and start planning your Field Day activities and events. CUL & 73, Charlie.

RT SYSTEMS

TAMPA, FL
1-800-387-8570

HUNTSVILLE, AL
1-800-723-6922

YAESU

FREE SAM Callsign Database with every Radio Purchase

NEW Triple-Band HT
144/430/50 MHz
Compact, Rugged
FM Transceiver
With Ultra-Wide Receive
Including Shortwave

VX-5R

ADMS Radio Computer Programming Software for Mobiles & Handhelds

FT-8100R

FT-847

FT-1000

ROTORS

ICOM

FREE SHIPPING with any radio purchase over $100

HF, 6M, 2M

IC-706MKII

Very Wide Receive! Including 800-900 MHz (cell blocked)

IC-2710H

Dual Receive, Dual Band

Very Wide Receive! Including 800-900 MHz (cell blocked)

IC-W32A

KENWOOD

HF All Mode with 6 meters

TS-570SG

FREE Kenwood programming software on disk w/radio purchase!

TH-G71 **TM-V7A**

MFJ-969

MFJ
Substantial Savings off retail price! Call today!

NEW!

MFJ-259B

FULL LINE DEALER with accessories, books, antennas, wire and connectors. Service department for warranty and out of warranty repairs. We Don't Care Where You Bought It (documentation may be needed to substantiate warranty claim).

Service/Technical Support: 256-880-3093

RT SYSTEMS

AMATEUR RADIO SUPPLY

8207 Stephanie Drive, Huntsville, AL 35816
137 West Windhorst Road, Brandon, FL 33510

email: sales@rtsars.com • web page: www.rtsars.com

VISA · American Express Card · MasterCard

CABLE X-PERTS, INC.

Showering you with this cool APRIL 1999 SPRING *SPECIAL!*

JAKE the reign of Terrier.

500ft reel. RG213/U MIL SPEC TYPE
NON CONTAMINATING/DIRECT BURIAL JKT
Price: $170.00/ea

ON THIS SPECIAL ONLY: UPS Shipping included within the 48 states only. Shipping applies to all other destinations and products listed herein. Sorry NO COD's. Illinois residents add 8.25% state sales tax.

COAX (50 OHM"LOW LOSS" GROUP)

	100FT/UP	500FT	1000FT
"FLEXIBLE" 9913 STRD BC CNTR FOIL + 95% BRAID 2.7dB@ 400MHz NC/DB/UV JKT...	.58/FT	.56/FT	.54/FT
LMR 400 SOLID CCA CNTR FOIL + BRAID 2.7dB @ 450MHz WP/UV JKT	.59/FT	.57/FT	.55/FT
LMR 400 "ULTRA-FLEX" STRD BC CNTR FOIL + BRAID 3.1dB @ 450 MHz TPE JKT	.79/FT	.78/FT	.77/FT
LMR 600 (OD.590") SOLID CCA CNTR FOIL + BRAID 1.72dB @ 450 MHz WP/UV JKT	1.25/FT	1.22/FT	1.20/FT

COAX (50 OHM "HF" GROUP)

	100FT/UP	500FT	1000FT
RG213/U STRD BC MIL-SPEC NC/DB/UV JACKET 1.2 dB/2500WATTS @ 30MHz	.36/FT	.34/FT	.32/FT
RG8/U STRD BC FOAM 95% BRAID UV RESISTANT JKT 0.9dB/1350WATTS @ 30MHz..	.34/FT	.32/FT	.30/FT
RG8 MINI(X)95% BRAID UV RESISTANT JACKET 2.0dB/875 WATTS @ 30MHz	.15/FT	.13/FT	.12/FT
RG58/U 95% BRAID UV RESISTANT JACKET 2.5dB/400 WATTS@ 30MHz	.15/FT	.13/FT	.11/FT
RG58A/U STRD CENTER 95% TC BRD UV RESISTANT JKT 2.6dB/350 WATTS @ 30MHz	.17/FT	.15/FT	.13/FT
RG214/U STRD SC 2 95% BRD NC/DB/UV JKT 1.2dB/1800WATTS @ 30MHz		.25FT/UP	1.75/FT
RG142/U SOLID SCCS 2-95% SILVER BRAIDS *Teflon®* JKT 8.2dB/1100WATTS @ 400MHz		.25FT/UP	1.25/FT

COAX (75 OHM GROUP)

	100FT/UP	500FT	1000FT
RG11A/U STRD BC (VP-66%) 95% BRAID NC/DB/UV JKT 1.3dB/1000WATTS	.44/FT	.42/FT	.40/FT
RG6/U CATV FOAM 18GA CW FOIL + 60% ALUM BRAID	.20/FT	.13/FT	.11/FT
RG6/U CATV FOAM 18GA CW FOIL *QUAD SHIELD*	.25/FT	.18/FT	.16/FT

LADDER LINE GROUP

	100FT/UP	500FT	1000FT
"FLEXIBLE" 450 OHM 16GA COMPRESSED STRD CCS(PWR-FULL LEGAL LIMIT+)	.20/FT	.18/FT	.16/FT
"FLEXIBLE" 450 OHM 14GA COMPRESSED STRD CCS(PWR-FULL LEGAL LIMIT++)	.25/FT	.24/FT	.23/FT
300 OHM 20GA STRD (POWER: FULL LEGAL LIMIT)	.15/FT	.13/FT	.12/FT

ROTOR & CONTROL CABLES

	100FT/UP	500FT	1000FT
5971 8/COND (2/18 6/22) BLK UV RES JKT. Recommended up to 125ft	.20/FT	.18/FT	.16/FT
5971CPS125. 125ft (cable same as above) w/Jones plug to socket assembly	*$39.95/ea*		
1618 8/COND (2/16 6/18) BLK UV RES JKT. Recommended up to 200ft	.35/FT	.34/FT	.32/FT
1418 8/COND (2/14 6/18) BLK UV RES JKT. Recommended up to 300ft	.47/FT	.45/FT	.43/FT
1216 8/COND (2/12 6/16) BLK UV RES JKT. Recommended up to 500ft	.78/FT	.74/FT	.70/FT
1806 18GA STRD 6/COND PVC JACKET Recommended for Yaesu Rotors	.23/FT	.21/FT	.19/FT

ANTENNA WIRE (UNINSULATED BARE COPPER)

	100FT/UP	500FT	1000FT
14GA 168 STRD *"SUPERFLEX" (great for Quads & Portable set-ups etc.)*	.14/FT	.12/FT	.10/FT
14GA 7 STRD *"HARD DRAWN" (perfect for permanent Dipoles etc.)*	.10/FT	.08/FT	.06/FT
14GA SOLID *"COPPERWELD" (for long spans etc.)*	.10/FT	.08/FT	.06/FT
14GA SOLID *"SOFT DRAWN" (for ground radials etc.)*	.10/FT	.08/FT	.06/FT
ROPE: 3/16" DOUBLE BRAID *"DACRON"* 770# TEST WEATHERPROOF	.12/FT	.09/FT	.08/FT

FLEXIBLE 2/COND RED/BLK DC POWER "ZIP" CORD

8GA (rated:40 amps)	25FT $16.00	50FT $31.00	100FT $60.00
10GA (rated:30 amps)	25FT $10.50	50FT $19.00	100FT $36.00
12GA (rated:20 amps)	25FT $8.00	50FT $14.00	100FT $26.00
14GA (rated:15 amps)	25FT $6.00	50FT $10.00	100FT $18.00

Teflon® is a registered trademark of DuPont.

COAX CABLE ASSEMBLIES

with USA made Silver/Teflon® Gold Pin PL259 connectors.

FLEXIBLE 9913 strd BC cntr foil+95% braid 2.7dB 400MHz NC/DB/UV JKT.
150ft $99.95 100ft $69.95 75ft $54.95 50ft $39.95 25ft $24.95 6ft $12.95 3ft $11.95

RG213/U strd BC Mil-Spec NC/BD/UV JKT. 1.2dB 2500 watts @ 30MHz.
150ft $69.95 100ft $49.95 75ft $39.95 50ft $29.95 25ft $19.95 6ft $11.95 3ft $9.95

RG8/U strd BC foam 95% braid UV resistant JKT. 0.9dB 1350 watts @ 30MHz.
150ft $64.95 100ft $44.95 75ft $34.95 50ft $24.95 25ft $14.95 6ft $11.95 3ft $9.95

RG8 MINI(X) strd BC foam 95% braid UV resistant JKT. 2.0dB/875watts@ 30 MHz
150ft $34.95 100ft $24.95 75ft $19.95 50ft $15.95 25ft $10.95 6ft $4.95 3ft $3.95 *(3ft & 6ft are China made)*

RG303/U Teflon® 95% silver braid 8.6dB 1100 watts. Crush resistant.
18ft $24.95 6ft $14.95

With USA made Silver/Teflon®/Gold Pin male "N" connectors.

FLEXIBLE 9913 strd BC cntr foil+95% braid 2.7dB 400MHz NC/DB/UV JKT.
150ft $110.95 100ft $80.95 75ft $67.95 50ft $54.50 25ft $39.95 6ft $16.95 3ft $15.95

With USA made Silver/Teflon®/Gold Pin PL259 to male "N"

FLEXIBLE 9913 strd BC cntr foil+95% braid 2.7dB 400MHz NC/DB/UV JKT.
6ft $14.95 3ft$13.95

With connectors as noted

3ft RG58/U Right Angle BNC to SO239...$14.95 3ft RG58/U Right Angle BNC to PL259...$14.95
3ft RG174/U male BNC crimp to Male BNC crimp.....$9.95
3ft RG142/U Male SMA crimp to Female BNC crimp.....$9.95
6ft RG8 MINI(X) male BNC to PL259.....$9.95

All terminations are soldered, Hi-Pot® tested @ 5kv for one minute, & completed with UV resistant heat shrink tubing. CUSTOM CONNECTOR WORK TOO. Call for price and delivery.

CONNECTORS

Both connectors fit 9913 types and LMR400 MADE IN USA

PL 259 SILVER/*Teflon®*/GOLD TIP.....10PC $11.00.....25PC $25.00.....50PC $47.50.....100PC $90.00
"N" (2PC) SILVER *Teflon®* /GOLD TIP...10PC $32.50.....25PC $75.00.....50PC $143.75..100PC $275.00

For our other connectors and adapters see http://www.cablexperts.com

TINNED COPPER "FLAT" GROUNDING BRAID

1 INCH WIDE (equivalent to 7ga).....25FT $24.00.....50FT $47.00.....100FT $94.00
½ INCH WIDE (equivalent to 10ga)..... 25FT $14.00.....50FT $27.00.....100FT $53.00
½ INCH x 6FT Copper Plated Ground Rod w/clamp.....$7.00 each

I.C.E. PRODUCTS

180A Beverage/Longwire matching unit.....$39.00/ea
348 Rotor cable Line filter.....$44.00/ea
303U Coax impulse suppressor 8 kW 1.5-200MHz.....$44.00/ea
516R Remote RF power switch for up to 6 antennas.....$184.00/ea
Individual Band Pass Filters.....$35.00/ea

Purchase two or more ICE units and enjoy a 10% discount.
All other I.C.E.s stocked.

HELIAX® LDF series from ANDREW® Corporation.

- **Premium electrical performance.**
- **100% RF shielding.**
- **50 Ω Impedance.**
- **Very Low Loss Foam Dielectric.**
- **Use "N" and/or UHF connectors.**
- **Termination price: $15.00/each.**

CABLE PRICES

Cable	Size	Price/ft
LDF2-50A	3/8"	$1.70
LDF4-50A	1/2"	$2.10
LDF5-50A	7/8"	$5.37

CONNECTOR PRICES

Cable	"N"/Price	UHF/Price ea.
LDF2-50A	$27.00	$41.75
LDF4-50A	$30.00	$27.00
LDF5-50A	$73.00	$70.00

Prices do not include shipping. $20.00 minimum order.

For Complete Catalog Check Web Site or Mail Request

ORDERS ONLY: 800-828-3340

HOURS: M-F 9AM-12Noon, 1-5PM CST.
First Sat. of Month 8AM-12PM Walk-ins. FAX: 847-520-3444
TECH INFO: 847-520-3003 HRS: M-F 9AM-5PM CST
http://www.cablexperts.com/

416 Diens Drive, Wheeling, IL 60090

CABLE & WIRE CUT TO YOUR SPECIFIC LENGTH • WE STOCK AND INSTALL CONNECTORS TOO.

LOGic 5 for Win 95/98

because a great hobby deserves state-of-the-art

Introducing the best all around software package for your shack! New 32-bit, Windows 95/98/NT 4 application! Complete logging, online awards tracking for ***any*** award, prints QSL cards/labels, contesting, radio interfacing, antenna rotor control, digital communications for all modes, unequaled packet spotting, CW keyer, sound card support, customizable screens and reports, prints graphics and color, superb documentation, unsurpassed tech support, grayline propagation chart, interface to callbook databases, customizable for foreign languages, and much more. **Free infopak! Download the new demo from our web site today!** No gimmicks, simply the best. Specs: Pentium, 12 megs RAM, CD ROM drive, Win 95/98 or NT 4.0. $129. Foreign shipping extra. Visa/MC. GA residents add 7% tax. Also available: PDA QSL Route List, SARtek rotor interface, rig and keyer interfaces, RA Callbook.

Personal Database Applications, Dept Q, 1323 Center Dr., Auburn, GA 30011. 770-307-1511, 770-307-0760 fax. 770-307-1496 tech support. e-mail: sales.qst@hosenose.com web: http://www.hosenose.com hours: 9-6 M-Th, 9-noon Fri.

New! CD-ROM version!

TOROID CORES

Ferrite and iron powder cores. Free catalog and RFI Tip Sheet. Our RFI kit gets RFI out of TV's, telephones, stereos, etc.
Model RFI-4 ..... $25.00
+$6 S&H U.S./canada. Tax in Calif.
Use MASTERCARD or VISA

PALOMAR®
BOX 462222, ESCONDIDO, CA 92046
TEL: 760-747-3343 FAX: 760-747-3346
e-mail: Palomar @compuserve.com
www.Palomar-Engineers.com

HIGH SIERRA ANTENNAS

New mobile antennas

MODEL 1500
MODEL 1600
RV SPECIALS

$275

Price includes control panel and mounting hardware kits

For details, check out our webb pages or request a copy of our all new brochure. Call our toll free number today:

1-888-273-3415

We can solve your mounting problems. Call

High Sierra Antennas, Box 2389
Nevada City, CA 95959 USA
Tel: 530-273-3415, fax: 530-273-7561
http://www.hsantennas.com/info
e-mail: cobler@hsantennas.com

Ham Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham Ad rate for commercial firms offering products or services for sale is $1.00 per word. Individuals selling or buying personal equipment: ARRL member 50¢ per word. Non-ARRL member $1 per word. **Bolding** is available for $1.50 a word.

3) Remittance in full must accompany copy since Ham Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8½" x 11" sheet of paper.

4) Send ads to: the ARRL, 225 Main St., Newington, CT 06111 ATTN: Ham Ads. Or via fax 860-594-0259 or e-mail: hamads@arrl.org Payment must be included with ads (check or any major credit card accepted).

5) Closing date for Ham Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received March 16th through April 15th will appear in June *QST*. If the 15th falls on a weekend or holiday, the Ham Ad deadline is the previous working day. Please contact Robin Micket, N1WAL at 860-594-0231 for further information.

6) No Ham Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

7) New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The American Radio Relay League does not discriminate in its advertising on the basis of race, color, religion, age, sex, sexual orientation, marital status, or national origin.

The League reserves the right to decline or discontinue advertising for any other reason.

QST HAM ADS ON THE WEB — UPDATED MONTHLY
http://www.arrl.org/ads/ham-ads.html

SELL YOUR RADIO TODAY! Check out *RADIOS ON-LINE* on the ARRL web site: http://www.arrl.org/ads/RadiosOnline/

CLUBS/HAMFESTS/NETS

BICYCLE MOBILE HAMS OF AMERICA. We mix hamming with biking! Members in 46 states, 6 countries. Tenth annual forum at HamVention. Net: 7.042, every Wed., 0200 UTC. Details, sample newsletter: SASE to BMHA, Box 4009-Q, Boulder, CO 80306-4009.

COUNTY HUNTERS: Temple Amateur Radio Club WORKED ALL TEXAS AWARD. Details TARC, Box 616, Temple, Texas 76503 or http://www.tarc.org

FRIEND OF BILL W.?? - Join HAAM net Saturdays at 12:30 Eastern on 14.290; Sundays at 09:00 Pacific on 7.283.5; Sundays at 09:30 Pacific on 14.340/2. K6LX.

JEWISH RADIO AMATEURS - CHAVERIM INTERNATIONAL is an organization for you and your friends. For information please contact Paul Kane, WA6WGP, 5401 Sadring Ave., Woodland Hills, CA 91367 or e-mail: wa6wgp@aol.com

JOIN the **Lambda Amateur Radio Club** (LARC) since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, internet listserv and IRC, hamfest meetings, chapters, DXpeditions. Write LARC, POB 56069, Philadelphia, PA 19130-6069 or e-mail: lambda-arc@geocities.com

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information write: MARCO, Box 73, Acme, PA 15610.

QCWA— Quarter Century Wireless Association. If you were first licensed 25 years ago and currently licensed you are eligible. Be one of us! Write Dept. T, 159 E 16th Ave, Eugene, OR 97401-4017. Call 541-683-0987.

RAINBOW AMATEUR RADIO ASSOCIATION - the gay/lesbian club. Active HF nets, newsletter, uncensored listserve, web page: http://www.rara.org. Privacy respected. P.O. Box 191, Chesterland, OH 44026-0191. E-mail: RARA@EN.COM

THE ARRL LETTER — The League's news digest for active amateurs, professionally produced and edited and now available in weekly electronic edition via the World Wide Web at http://www.arrl.org/arrlletter

THE Veteran Wireless Operators Association, a 74-year old, non-profit organization of communications professionals invites your inquiries and application for membership. Write VWOA, Edward Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863. Visit our web site for activities, history, membership: http://www.vwoa.org

ANTIQUE/VINTAGE/CLASSIC

ANTIQUE RADIO CLASSIFIED. Free sample copy! Antique radio's largest-circulation monthly magazine. Old radios, TVs, ham equip., 40s & 50s radios, telegraph, books & more. Ads & articles. Free 20-word ad monthly. Subscribe today. Six-month trial: $19.95. Yearly rates: $39.49 ($57.95 by 1st Class). Foreign: write. ARC, PO Box 802-B22A, Carlisle, MA 01741. Phone: 978-371-0512, Fax: 978-371-7129, Web: www.antiqueradio.com

BROADCAST MICROPHONES and accessories (call letter plates, stands) wanted: early carbon, condenser, ribbon, dynamic models. Cash or trade. James Steele, Box 620, Kingsland, GA 31548. 912-729-6106. jsteele@ k-bay106.com; http://www.k-bay106.com/mics.htm

CLASSIC RADIOS FOR SALE: http://www.radiofinder.com Good used equipment wanted. The Radio Finder, 975 Arthur, Plymouth, MI 48170. Tel/Fax 734-454-4666. finder@radiofinder.com

COLLINS 30J-18 (circa 1938). Looks very similar to 30K/KW-1. CCA condition estimated fair-to-good. Will trade for factory SC-101 station control system for KWS-1. Serious inquiries only please. Bob, KA1ECA, 413-549-6086.

MANUALS FOR MOST OLD HAM GEAR. Best source for 20 years and now at lower prices! Most USA made ham gear. Our catalog "P" ($1 USA / $3 elsewhere) required to order or get free info via internet at www.hi-manuals.com. Hi-Manuals, Box P-802, Council Bluffs, IA 51502.

MILITARY ANTIQUE KEYS from 1940s: CMH brass, $35. Small, foreign test set "spy-type", now only $50, postpaid. Some others. TEC, Box 400, Lincoln, MA 01773.

SALE/TRADE: 25 bugs including Vibroplex, McElroy, Mecograph. SASE for list. Dave Pennes, WA3LKN, 4607-C Santa Cruz Dr., Indianapolis, IN 46268-5354. 317-471-9605.

TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre1950 Callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013, 800-840-KEYS.

TELEGRAPH KEYS/MUSEUM AT DAYTON HAMFEST: Bring your keys: free history, appraisals, pretzels! Space: 2555. Information: http://w1tp.com

TELEGRAPH MUSEUM/COLLECTOR'S INFORMATION: http://w1tp.com

TELEGRAPH: PERERA'S COLLECTOR'S GUIDE: $12 ppd. Artifax, Box 88-Q, Maynard, MA 01754. http://home.fiam.net/tfrench/artifax.htm

W7FG VINTAGE MANUALS AND LADDER LINE: Most manuals in stock. SASE for catalog or call. 600 Ohm Ladder Line. Visa/Mastercard accepted. 402731 W. 2155 Dr., Bartlesville, OK 74006. 918-333-3754 or 800-807-6146. http://www.w7fg.com

WANTED: 1926 edition *ARRL Handbook*. 805-499-1713. wb6l@aol.com

WANTED: DX-Engineering speech processor for KWM-2. WB6L, 884 Capitan, Thousand Oaks, CA 91320.

WANTED: Early TELEGRAPH sounders, relays, and apparatus. John Casale, W2NI, 3 Pickering La., Troy, NY 12180. 518-272-3631. jcsl@global2000.net

WANTED: Electronic estates purchased. Ham radio, tubes, broadcasting, Hi-Fi, transformers, military, etc. Top cash paid! 800-251-5454.

WANTED: Western Electric audio equipment. Amplifiers, pre-amps, tubes, speakers, parts, mixing boards, etc. 800-251-5454.

KITS ARE FUN AND AFFORDABLE!

FM TRANSCEIVERS FOR 2M, 6M, & 220

Building a sophisticated microprocessor-controlled rig is easy with our step-by-step assembly manual. You build in sections and then make progress tests along the way. Added benefit is the knowledge to maintainit yourself for years to come. The only essential test equipment is a VOM.

Build in 25 hrs

- 2M Version tunes 143.5 - 148.5 in 5 kHz steps (or 2.5 kHz)
- 15 memories store repeater offset and subaudible tones
- Stores non-standard split (CAP, MARS)
- Built-in subaudible tone encoder
- Instantaneous PIN diode T/R switching
- Packet-ready with rear panel DIN connector (1200 baud)
- Large LED readout
- Build it now 5 or 30 watts, or upgrade to 30 watts later (2M version)
- Complete enclosure, mike, and mobile bracket included
- 2.25" H x 6.5" W x 6.75" D or 7.75" D for 30 watts

1220....2M.....5 watts out.....$195* 1260....6M.....5 watts out.....$195*
1222....2M.....30 watt module.....$ 64* 1230....220.....20 watts out.....$295*

EXPLORE 6 METERS FOR ONLY $95

No need to buy a complete transceiver to discover the fun of 6 meters. T-Kit offers two transverters to choose from. **Model 1209** converts your 2 meter handheld or mobile rig to 6. All features and modes on your 2 meter rig immediately available on 6 (FM SSB CW). Tune 144 -148 MHz to work 50 - 54 MHz. **Model 1208** converts any modern HF rig with 20 meters to 6. Tune 14-16 MHz to work 50 - 52 MHz.

Build in 12 hrs

- 5 watts max input delivers 8 watts out
- Silent RF-sense PIN diode T/R switching

1208...20 to 6 meter, kit....$ 95* 1208A...20 to 6 meter, factory assembled....$159*
1209...2 to 6 meter, kit.....$ 95* 1209A...2 to 6 meter, factory assembled.....$159*

9-BAND SWL RECEIVER

Modernized "first radio kit" classic. Five transistor, 3 IC design, electronic bandswitch. Tune both AM broadcast and SSB/CW from 1.8 - 22 MHz. Has Main and Fine tuning, Regen, RF gain, Volume. Powerful audio to built-in speaker, your own speaker or stereo phones. Use 8 C cells or ext. 12 VDC.

1253.....$59*

2 METERS, ALL MODES, $139

Add 2 meter, all mode capability to any HF transceiver for only $139. Four to 20 watts input on 10 meters from your HF rig produces 10 watts output on 2M. All features and modes on your HF rig immediately available on 2M. Tune 28 - 30 MHz for 144 - 146 MHz coverage.

1210, kit.....$139*
1210A, factory assembled.....$239*

MONOBAND CW TRANSCEIVERS

Ten-Tec's long tradition of offering quality rigs for QRP enthusiasts continues with these single band CW transceiver kits. Features 3W RF output, QSK CW, sensitive single conversion receiver with built-in 4-pole crystal filter and RIT. Measures 2.75" H x 6" W x 6" D. Draws 35 - 80 ma on receive, 800 ma on transmit from 13.8 VDC source. Available for 20, 30, 40 meters, and now ***80 meters!***

Coming Soon - 15 and 17 meters!

1320, 1330, 1340, 1380.....$ 95*

PORTABLE SWL RECEIVER

Enjoy quality shortwave listening comparable to factory built portables. Listen to local and international AM broadcast as well as SSB/CW from around the world.

Build in 25 hrs

- Covers 100 kHz - 30 MHz
- 2.5 kHz and 100 kHz tuning steps with clarifier
- 15 programmable memories
- Dual conversion, superheterodyne
- 13.8 VDC operation; AC wall transformer included
- 2.25" H x 6.5" W x 6.5" D

1254.....$195*

CALL FOR A FREE CATALOG TODAY
423-453-7172

Includes these kits and more budget priced projects for hams and SWLs.

ASK ABOUT CLUB FUNDRAISING OR CLUB QUANTITY DISCOUNTS!

Orders only: 800-833-7373
FAX: 423-428-4483
E-Mail: sales@tentec.com
9:00 a.m. - 5:30 p.m. EST
Monday - Friday

...America's Best!
TEN-TEC

or write us at: T-Kit
a div. of TEN-TEC, Inc.
1185 Dolly Parton Pkwy.
Sevierville, TN 37862

Visit our web site at http://www.tentec.com

*Plus shipping & handling

WWII MILITARY TELEVISION WANTED, Army/Navy SCR, ATJ, ATK, ARK, ARJ, CEK, CRV receivers, cameras, monitor, transmitters, dynamotors. Maurice Schechter, 590 Willis Ave., Williston Pk., NY 11596. P/F 516-294-4416.

QSL CARDS/CALLSIGN NOVELTIES

100% CUSTOM high-quality color QSL CARDS at US$ 89 per thousand plus shipping costs. Horizonte: Maipu 420, ZIP 5152, Carlos Paz, Argentina. E-mail: horizonte@cordoba.com.ar

100 QSL Cards $8.50. We also print Eyeball and mini QSL cards. All orders postpaid. Stamp for sample. Artist, P.O. Box 148652, Nashville, TN 37214.

AFFORDABLE QSL CARDS, available in small quantities with lots of options. Parma Graphics, K2BKA, 5 Rondout Harbor, Port Ewen, NY 12466. 914-339-1996.

BROWNIES QSL CARDS. Free catalog of samples (stamps appreciated). 3035 Lehigh Street, Allentown, PA 18103.

CALL SIGN NAME BADGES. Club logos our specialty. Certified ARRL engraver. Capital Engraving, 3208 Keen Ave. N.E., Salem, OR 97303. 800-628-4985. Al, WA7UQE. capengrv@open.org. http://www.open.org/capengrv

COLORFUL QSLs, brilliant inks, polished card stock, with letterpress as done previously by C. Fritz. Send $1 for samples to: COLORFUL QSLs, Box 4027, Lafayette, IN 47903-4027. w9ye@wcic.cioe.com; http://wcic.cioe.com/~w9ye/qsl/order_form.htm

DOC'S QSL CARDS. Free custom design - SASE for samples & price list. 555 Black Fox Harbor, Knoxville, TN 37888. 423-693-8810, or docs@icx.net. http://user.icx.net/~docs

ENGRAVING: Callsign/name badges by W0LQV. Send for price list. Box 4133, Overland Park, KS 66204-0133. E-mail: lqveng@juno.com

FREE SAMPLES. QSLs by W4MPY, Box 73, Monetta, SC 29105. Phone/Fax 803-685-7117. Email: w4mpy@w4mpy.com. Starting our 20th year furnishing quality and value. Check our web site at: http://www.w4mpy.com

MARCUM'S QSLs: Call or write for info. 800-390-2220. POB 456, Forest Ranch, CA 95942. E-mail: marcumsqsl@aol.com. **www.bisonweb.com/marcumsqsls**

QSL Cards by N4EZG. Finest quality, great selection, & low prices. For FREE samples & catalog call 800-700-2224, fax 800-701-9606, e-mail: n4ezg@hotmail.com or mail to P.O. Box 1755, Ellijay, GA 30540.

QSL CARDS: Fast quality service. Samples $1 (refundable with order). WordWise Services, 107 Giles Court, Newark, DE 19702.

QSL CARDS Many styles. Top quality. Order Risk Free. Plastic cardholders, T-Shirts, Personalized caps, mugs, shirts. Other ham shack accessories. Free Call. Free samples. **Rusprint, 800-962-5783**/913-491-6689, fax 913-491-3732.

QSL SAMPLES $1 refundable, Bud Smith, Box 1948, Blaine, WA 98231.

QSLKIT U-print micro-perf QSLs, cardbox filing systems, index cards, DXCC, States and more. Laminated contester keyboard overlays. QSL envelopes and DX EDGE. HAMSTUFF by W7NN. http://members.aol.com/w7nn or 360-352-2461.

QSLs—OVER FIFTY DESIGNS! Custom cards. "Eyeball" cards. Samples $1 (refundable). Charlie Hansen, N0TT, RR1, Box 108-B, Napoleon, MO 64074.

QSLs — Quality for less is back! See our display ad in this issue of *QST*. Greg W. Eckert Printing, 7 Carlton Ave., Washington, NJ 07882.

QUALITY QSLs By WX9X from $18.95. See our display ad on this page.

QUALITY QSLs- Samples 50¢. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

SKYWARN, RACES, MARS patches, decals, caps, more. Write/fax for info. CAPS Unlimited, PO Box 460118C, Garland, TX 75046. 972-276-0413. E-mail: k5hgl@home.com

www.callstuff.com

HAM VACATION RENTALS/PROPERTY

AZ QTH? Gorgeous Sun City home, $110K. Great room, 3 br, 2+ ba, 1955 sq. ft., citrus, tower and tribander. Info free from Don Steele, VE3PFC/W7, Ken Meade Realty, 800-877-1776 or donsteele@earthlink.net

B&B WITH A HAM! Enjoy hamming from Hawaii. Join those that have chased DX from beautiful upcountry Maui! (Non smokers only, thanks). **"SEA Q MAUI,"** KH6SQ@seaqmaui.com, 808-572-7914. http://www.seaqmaui.com

Autek ADVANCED ANTENNA ANALYSTS™

NEW!

VA1 Vector RX Analyst 0.5 to 32 MHz $199.95 + S/H

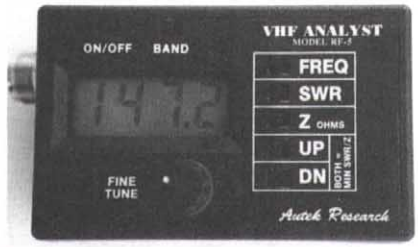
The VA1 adds phase detection to our popular RF1

Makes noise bridges obsolete & does more than network analyzers. READS:

- Frequency • SWR • True Impedance • Series R
- Series X • Sign of X • Parallel R • Parallel X
- Series Inductance (L) • Series Capacitance (C)
- Conjugate L&C for Matching • Phase Angle (deg.)

Only the VA1 calculates R/X of an antenna in the air by measuring at the transmitter end of your feedline, and is not limited to 50 ohm line - select any common line 25 to 450 ohms.

RF1 RF Analyst 1.2 to 35 MHz
Frequency SWR True Impendance. RF L & C Can't Be Beat for Basic Measurements $129.95 + S/H



RF5 VHF Analyst 35 to 75 MHz & 138 to 500 MHz
Similar to RF1 but no direct L/C. Adds Instant SWR™ $229.95 + S/H

Each Analyst has a low power "transmitter" to go anywhere in its range—even outside ham bands. Use any to measure SWR curves, feedline loss, true impedance, baluns, electrical length (e.g. 1/4 wave lines.) Take one right to the antenna or measure at the transmitter end of the line. Accurately adjust Yagis, quads, slopers, dipoles, phased arrays, matching networks, radials, and so much more. Adjust your tuner without transmitting. The RF1 measures "lumped" L and C directly, while the VA1's phase detector can separate out R and X (L/C) separately. Phase capability allows quick determination of matching methods; you're not "half blind" by knowing only SWR. The RF5 (only) adds "Instant SWR" to slew to the frequency of minimum SWR automatically. Each is palm-sized, only about 8 oz. — not much bigger than the battery pack in others. Uses a single 9 V battery. Microprocessor-based. Errors are compensated in computer tables. All values are DIGITAL. This yields a true INSTRUMENT, not just an SWR dipper. Illustrated instructions guide even a beginner through common measurements. So why use an older design? Get yours today!

Analyst details: Impedance: 0-1000 ohms (VA1), 0-2000 ohms (RF1), 0-600 ohms (RF5). 1 ohm resolution. Z accuracy to 3%. RF1/VA1: C : < 5 to 9999 pF. to 1 pF resolution. L<.04 to 300 uH. Autoranging. SWR 1.0 to 20.0 (VA1), 1.0 to 15.0 (RF1), 1.0 to 6.0 (RF5) 0.1 resolution. except 0.01 for VA1 below 4.0. VA1 reads R/X 0 to 999 ohms. All crystal-controlled 4 digit frequency readout and accuracy at all frequencies, e.g. 1.200 to 500.0 uP auto turnoff to save 9V battery (not included) Cycle between two modes (e.g. SWR/FREQ) on command. RF5 uses stripline techniques, HP diodes, and costly commercial shielded oscillators. All 5 x 2.5 x 1.5" ABS cabinet. All have standard UHF connector (SO-239). Exact specs. are subject to change w/o notice. 1 year limited parts & labor warranty on all products. MADE IN USA. See excellent reviews in QST: May 1995, and June 1998.

DELUXE SWR & WATTMETER

COMPUTING SWR
REMOTE RF HEAD
TRUE PEP & AVERAGE
2KW OR QRP
Compare at $200 +
Model WM 1 $129.95 (+$6 s/h)

The WM-1 gives you exactly what you want - **SWR ON ONE METER AND POWER ON THE OTHER.** Automatically computes SWR. SWR doesn't change with power. No more squinting at crossed needles. NO ADJUSTMENTS. It even reads SWR in PEP on SSB. 4 ft. cable to head avoids "meter pulloff". 5% FS 1-30 MHz, useable on 6M. 2KW,200, and 20 W scales with 5W center for QRP. 8-18 VDC or 115 VAC. 6-3/8x3-3/4x3"D. (See excellent review Nov 1989 QST.) Why use an inferior meter? Get yours today!

Combo offer: Cover ALL HAM BANDS 160M to 440 MHz!
RF1 + RF5 $335 plus S/H
VA1 + RF5 $400 plus S/H
MUST ORDER BOTH AT SAME TIME
sorry, no other discounts

NEW! Padded deluxe carrying case with loops and safety strap from The Pouch. Fits all analysts ever made. $16.95 + $3 S/H USA. Free shipping with any other order.

Autek Research *Quality Since 1972*

P.O. Box 8772
Madeira Beach, FL 33738
813-886-9515

MasterCard VISA

Order only direct with check, MO, MC, VISA. Add $6 S/H in 48 states Add tax in Fla. Add $11 to Canada, Ak, Hi. Add $25 elsewhere. (Shipped air elsewhere.) Add 50% to S/H if 2 units ordered. Speedy insured shipment worldwide.

Convert Your Average Reading Wattmeter To PEP Reading For Less Than $20!

The PDC-1 is a universal Peak-Hold circuit that will convert ANY wattmeter, including the Bird 43, to true PEP reading! All that is required is a DPDT switch to choose between PEP and Average readings, and 6-12 VDC or 6.3 VAC power connections.

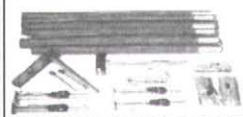
The PDC-1 measures 2" X 1.5" and fits neatly inside most wattmeters without any modification.

The PDC-1 is available for $19.99 (post paid in North America) in ready to assemble kit form.

Please add $3.00 postage for orders going outside of North America. Visa and Mastercard accepted! Don't forget to visit our new Home Page on the www!

HI-RES COMMUNICATIONS, INC.
8232 Woodview Dr., Clarkston, MI 48348-4058
(248) 391-6660 (PHONE & FAX)
E-mail: hires@rust.net • http://www.rust.net/~hires

30 FT MAST KIT



AB-1244/GRC MAST KIT, twelve aluminum alloy on steel sections form sturdy, yet lightweight 30 foot 1.7" dia mast. Kit in-cludes five each lower and upper sections, one ea lower and upper adapter sections, gin pole swivel base, four ea 36 and 42 ft guy ropes, four guy stakes, two guy rings plus 2.5 pound sledge hammer. Part of OE-254/ GRC antenna set; 30 lbs sh. NEW, $139.50

VISA, MASTERCARD or DISCOVER accepted.
Prices F.O.B. Lima, Ohio. Allow for shipping $.
Write for latest Catalog. Address Dept. QST
Phone 419/227-6573 + FAX 419/227-1313
E-mail: fairadio@wcoil.com
Home Page: http://www2.wcoil.com/~fairadio/

FAIR RADIO SALES
1016 E. Eureka P.O. Box 1105 Lima, OH 45802

Log-EQF

THE *EASY TO USE* LOGGING SOFTWARE.

Log-EQF Version 8 works with all major callsign databases, computer-ready rigs, and TNC's. DXCC, WAS, WAZ, beam headings, CW keyer, QSL labels, PacketCluster™, and more.

Log-EQF Version 8 runs in DOS, OS/2, or Windows. Just $39.95 (DX add $3 shipping).

Internet: http://www.itis.net/eqf
E-Mail: n3eqf@usaor.net

Check, Money Order, VISA or MC Orders: EQF Software
Tom Dandrea, N3EQF
547 Sautter Drive
Crescent, PA 15046
1-724-457-2584

DAYTON Booth 188

BAHAMAS RENTAL: Abaco villa w/station. N4JQQ, 901-374-0927.

BAHAMAS, Treasure Cay Resort. Beach house/contest station rental. Many world records. 3 BR/2 Bath. KC4SZE, 256-734-7300 or kennethh@airnet.net

BLUE RIDGE MT. of VA. - Build your vacation QTH on a beautiful mt. top near Blue Ridge Parkway - Floyd, VA. Info www.public.usit.net/dlarsen or www.bfrog.com/zig/land/ E-mail: kk4ww@fairs.org. Dave, KK4WW, phone 540-763-2321.

HAM VACATION: Rent 4 bedroom Chalet in spectacular Colorado Rockies. TS-930S & Alpha 91b, 40 meter beam, log periodic and 75 meter sloper. $500 weekly. 55¢ stamp for brochure. Ken, W0LSD, Box 156, Buena Vista, CO 81211. 719-395-6547. Available for fall/winter contest weekends.

MONTANA, FLATHEAD LAKE. Ham vacation at Hummingbird Haven on lake. Large dock. Radio use included. Close to Glacier National Park and Bob Marshall Wilderness. Modern hillside tri-level completely furnished. Sleeps 8 to 10. Easy access. Peter Elespuru, 101 Lakeside Bvd., Whitefish, MT 59937. 406-862-6074. E-mail: eeez@digisy.net

P49V/AI6V's ARUBA Cottage for rent; 2 bedrooms, rig and antennas. For info write: Carl Cook, 2191 Empire Ave., Brentwood, CA 94513.

SCOTTISH HIGHLANDS HAMLET. GM0VPG unique QTH. neil.thackrey@zetnet.co.uk Details: http://www.users.zetnet.co.uk/holidays/

SUN CITY CALIFORNIA QTH: 3 bedrooms, loft, great view. 1,404 s.f., Tennadyne T-6 on roof, Yaesu G-800S and Butternut HF2V. http://users.ez2.net/ pablop/house.htm or call Debra Thomas 800-700-2332.

TURKS AND CAICOS "HAM-LET" VACATION: House with station located **Providenciales** hillside above ocean. Jody Millspaugh, 649-946-4436 or Box 694800, Miami, Florida 33269 USA. **E-mail: jody@tciway.tc**

WASHINGTON, D.C. area North Potomac QTH For Sale: K9FL four bedroom, three bath, tri-level, 2500 sq. ft. living space, fenced 23,669 sq. ft. site, on non-thru street, SW-facing, beautiful landscaping, on hill. Includes 70 ft. heavy-duty crankup, TH11DX, 160 ft. inv-vee, VHF/UHF collinear, nice workbench and cabinets in large double garage, lawn tractor, snow blower. 45 minutes to NW D.C. along the Canal Rd. Bus/bike 5 minutes to highly-rated Montgomery County Schools – Wooton HS, Frost JHS, Lakewood Elementary. Drive 3 minutes to Lakewood Country Club, 5 minutes to medical facilities or I-270. Available 06/99. $350K. 301-217-9511 or ggav@msn.com

WINDWOOD, WP2Z, on St. Croix, USVI. Wonderful vacation home complete with competitive station/ antennas. Available year round for contests and vacations. Visit our web page at www.qth.com/windwood or 315-673-9586 for details.

GENERAL

#1 MORSE CODE PRACTICE AUDIO CDs - "Copy This and Pass™". Learn Morse code at 5, 13 or 20 wpm. Check/MC/Visa. $10 each, $25 all three, $5 shipping. Buckmaster, 6196 Jefferson Highway, Mineral, VA 23117. 800-282-5628 or http://www.buck.com/codedisc.html

1999 CALLBOOK CD-ROM: $36.95. QRZ! CD-ROM: $15.95. ARRL Handbook: $28.95. POSTPAID. All ARRL items discounted: aa6ee@earthlink.net, 760-789-3674. Duane Heise, AA6EE, 16832 Whirlwind, Ramona, CA 92065-7011. **http://www.radiodan.com/aa6ee/**

1999 "HamCall™" CD-ROM, U.S. and International callsign database with lat/long, grid square, e-mail addresses. Updated weekly. Check/MC/Visa. $50, $5 shipping. Buckmaster, 6196 Jefferson Highway, Mineral, VA 23117. 800-282-5628 or http://www.buck.com/haminfo.html

59(9) DX REPORT. Weekly DX and Contest bulletin. SASE for sample. P.O. Box 73, Spring Brook, NY 14140.

"A Kid with a New Kit" – HF mobile amp 300 watts plus on all bands. Worth-More Electronics, PO Box 344, Tomball, TX 77377. Model MW 300+ price $309, assembled $329, plus shipping $10. 800-819-2742 ask for Worth or e-mail: k5jli@juno.com

A-TO-Z DX GUIDE: How to find it, work it, confirm it, report it. Binder, folders, 75 pages strategies, information, systems. $19.95 plus $3.95 postage. Hanover Sales, Box 511, Flanders, NJ 07836.

AEA DSP-2232 data controller (with power supply, software and manual). Mint condition since never used. W1LYQ, call 860-652-9234 anytime.

ALUMINUM CHASSIS AND CABINET KITS. VHF-UHF antennas and parts. Catalog: callbook address. E-mail: k3iwk@herd.net, http://www.herd.net/byerschassiskits

APPLE I Microcomputer wanted for museum. KK4WW, 540-763-3311.

ICOM

IC-756 HF + 6M Multi-Info Large LCD Display, 5-100 Watts, All Mode .....***SPECIAL!*** **$1959.95**

IC-746 HF+6M+2M-SPECIAL $1589.95
IC-706MKII HF+6M+2M Transceiver FREE UT-106 DSP (From ICOM)..... .....**$995.95**
IC-2710H 2M/440MHz Mobile .....**SPECIAL $469.95**
IC-2100H NEW 2M Mobile 55 Watts, Remote Control Mic...**SPECIAL $199.95**
IC-2GXA 2M HT w/ALK, Battery Pack and BC-105 Charger **$129.95**

IC-207H Dualband Mob., 45W/35W Detach. Front Panel.....**$349.95**

IC-T8AH 6M/2M/440MHz HT ...**$309.95**
IC-T2A NEW 2M/HT 6 Watts.....**$169.95**
IC-W32A 2M/440MHz HT 3/5W..**$285.95**
BP-173 9.6v-$59.95 ***Limited Quantities!***
IC-R2 NEWAM, FM, WFM Receiver, .5-1300MHz, 400 Memories.....**$219.95**
R-10 .5MHz-1.3GHz HT Rec. **$359.95**
IC-PCR 1000 5-1300MHz **$399.95**
IC-PCR 100 .1-1.3GHz **$299.95**
R-8500 .1MHz-2GHz Receiver .**$1499.95**

KENWOOD

TS-870S HF Transceiver All Amateur Bands.....**$2269.95**
TS-60S 50MHz Transceiver, 90W Output.....**$879.95**
TS-50S 1.8-30MHz HF Transceiver Super compact.....**$799.95**

TS-570DG HF Transceiver,100W Auto Antenna Tuner, DSP.....**$1099.95**
TS-570SG HF with 6M.....**$1349.95**

$199.95
TM-261A 2M Mobile 50W
TM-G707A Dualband Mobile.....**$339.95**

TM-V7A FM,Dual Band, Detachable Front Panel

TM-V7A SPECIAL
$449.95 **list $719.95**

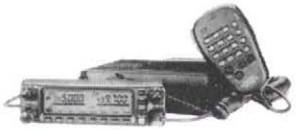
NEW!!! TH-D7A Data Communicator
TH-79AKSS Dualband HT.....$439.95
TH-G71A NEW, Dualband HT...**$269.95**
TH-22AT 2 Meter HT **$199.95**

JRC ***Call for JRC Radio***

YAESU

FT-920 NEW HF+6 Meters **$1495.95**
FT-1000D Deluxe, Allband HF.**$4199.95**
FT-1000MP HF Base, Advanced Features **$2789.95**

FT-847 HF/2M/430MHz Transceiver 100W HF/6M 50W 2M/430.....**$1699.95**
FT-100 Ultra Compact HF/VHF/UHF Transceiver.....**$1349.95**
FT-840 High Preformance Compact HF Transceiver **$729.95**



FT-8100R Compact Dual Band Mobile, Detachable Front Panel, 3 Power Levels, Wide Receive Cov..***SPECIAL!***....**$454.95**
FT-2500M 2M, FM Mobile, 50W ..... **New Low Price!**.....**$199.95**
FT-3000M 2 M, Mobile, 70W **$399.95**

FT-11RH 2M HT, 5W **SPECIAL $269.95**

VX-5R NEW 2/440 HT **$359.95**
VX-1R NEW Mini 2 M/440MHz HT**SALE** **$229.95**
FT-50RDH Ultra Compact Dualband HT .....***SPECIAL!*** **$274.95**
FT-51RH 2M/440MHz Dualband HT W/5W .....***SPECIAL!*** **$369.95**

ALINCO

AMATEUR RADIO'S VALUE LEADER™

DX-70TH Compact, 100W, HF.....**$789.95**
DR-140T 2 M Mobile .....**CALL $$**
DR-150T 2M Mobile .....**CALL $$**
DR-605T 2M/440MHz Mobile.....**CALL $$**
DR-610T 2M/440MHz Mobile.....**CALL $$**
DJ-191TH 2M HT .....**CALL $$**
DJ-C1T/C4T Credit Card size 2M or 440MHz HT ***SPECIAL!***.....**$89.95**

AOR

AR-146 50W, 2 meter Mobile **$179.95**
AT-201HP 5W, 2M, HT **$139.95**
AT-600HP 5W, 2M/440HT **$249.95**
AT-400 440MHz HT **$199.95**

BARGAIN BOX

Special Closeout! **$169.95**

Standard C168A Sub-Mini 2M HT *EXTRA FREE CNB-160!! Limited Quantities*
Features for C168A & C188A, 40+ Mem., Air band 115-175MHz, CTCSS En/Decode, DTMF Sql.

ICOM IC-3SAT 220MHz HT includes MH-BP83 1200MAH Battery **$279.95**
IC-V21AT 2M/220 HT.....**$399.95**
IC-2SRA 2M HT 50-950MHz RX!!! ***Special.....$299.95*** *Limited Quantities*

800-882-1343 / 800-564-6516
Out of State California

TIMEWAVE cushcraft hy-gain by Telex MAGELLAN DIAMOND ANTENNA TE SYSTEMS PCRIPHEX rfconcepts
MAHA MFJ COMET buttermut ASTRON CORPORATION PALOMAR GARMIN HUSTLER
VIBROPLEX
NYE & Co.
Force 12 Antennas and Systems

JUN'S ELECTRONICS
IN BUSINESS SINCE 1976

310-390-8003
FAX 310-390-4393
http://www.juns.com
E-mail:juns@dxnet.com
HRS M-F 10 - 6, SAT 10- 5
5563 SEPULVEDA BLVD.
CULVER CITY, CA 90230
2.5 miles from LAX-N. on I-405
ESPANOL • KOREAN

JUN'S

KANTRONICS DAIWA Larsen W & W MIRAGE SGC JPS M^2 Antennas KLM BENCHER, INC. GAP

AMATEUR RADIO BOOKS, software, code keys, oscillators, etc. Save on all! FREE CATALOG. ARRL, ARTSCI, RSGB, W5YI, Gordon West, CQ, etc. 1999 CALLBOOK CD-ROM (List $49.95) Only $39. QRZ! Ham Radio CD-ROM (List $29.95) Only $18. 1999 ARRL Handbook (List $32) Only $29.50. Only 40¢ handling per order plus actual shipping. MasterCard/Visa/American Express/Discover. Worldwide service. JWO SERVICES, 12 Hickory Place, Camp Hill, PA 17011; Open 3-10 p.m. Eastern. On-line catalog with secure, easy-to-use shopping cart, on Internet: www.jwoservices.com E-Mail: johnw3is@igateway.com Phone 717-731-4747; Fax 717-730-9373.

ANTENNA HARDWARE - S.S. "U" bolts, aluminum saddles, element and boom plates, S.S. hose clamps. Write for list to Harbach Electronics, WA4DRU, 2318 S. Country Club Road, Melbourne, FL 32901-5809. http://www.harbach.com

ASTRON POWER SUPPLY, Brand new w/warranty, RS-20m $99, RS-35m $145, RS-50m $209, RS-70m $249. AVT, call for other models, 626-286-0118 or aj547@lafn.org; www.aventrade.com

ATTENTION SB-200 & SB-220 OWNERS: Restore and up-grade your tired old amplifier with our parts and kits. Power supply boards, soft keys, soft starts, new fans & motors, many more items. Write for details. **Please specify the model.** Harbach Electronics, WA4DRU, 2318 S. Country Club Road, Melbourne, FL 32901-5809. http://www.harbach.com

ATTENTION **YAESU FT-102.** Expert repairs. Over 6000 hours servicing the 102. Reasonable rates. Call evenings, Mal, NC4L, 954-961-2034.

ATTN: CW OPERATORS - Still available! Super CMOS III Semi-Kit, same features as Logikey K-3. SASE for details to Idiom Press, 95441-1025.

ATV Video Test Pattern Generators with Character ID, composite and S-video outputs, audio tone. Many options. Other video products and kits also available. Tom Gould, WB6P, GEKCO Labs, Issaquah, WA. 888-435-7221. **www.gekco.com**

AVAILABLE FREE: Ten crystals for the Drake R4A receivers. Listen to international broadcast bands 49, 31, 25, 16 meters. Send five dollars for shipping. W2QHS, 732-542-9056.

AVVid is an authorized **Kenwood** and **Icom** service center for warranty and non-warranty repairs. Reasonable rates and fast turnaround. E-Mail to avvid@onramp.net or call 800-214-5779. AVVid, 222 N. Story Rd., Suite 128, Irving, TX 75061.

AZDEN PCS-3000 2 Meter VHF transceiver, TT microphone, separation cable, mobile mounting brackets, no PL, works good, $100 plus shipping. W2EKB, 348 Bortons Mill Road, Cherry Hill, NJ 08034. 609-795-0577.

BASIC QSO phrasebook: French, German, Italian, Japanese, Portuguese, Russian, Spanish. Easy phonetics, greetings, introductions, weather, numbers, etc. $8. Howard VanLoan, Box 692, Mill Valley, CA 94942.

BATTERY: Sealed lead acid/gel cell at wholesale price. 0.5AH to 100AH. 626-286-0118; www.aventrade.com

CABLE: Direct burial, copper shielded, six pair 22 gauge, 1500 feet, $150. W1MYB, 860-528-4963.

CALLSIGN HISTORY. Name and address of each holder since 1912. Will trade for displayable 1X2 ham license plate. Ron Allen, W3OR, PO Box 73, Bethel, Delaware 19931-0073. Without plate trade, $15. Call 302-875-1100.

CASH FOR COLLINS. SM-1, 2, 3; 312A-1, 2; 55G-1; 399C-1; KWM-380; 62S-1; KWM-1; 302C-3; 51S-1; 75S-3C; 32S-3A; buy any Collins equipment. Leo, KJ6HI, ph/fax 310-670-6969. radioleo@earthlink.net

COLLINS KWM-2, 312B-5, 30L-1, $1200. W4OVS, 706-283-3016.

COLLINS TO TRADE: Have beautiful 51S-1RE and excellent KWS-1. Will trade one for a TS-950SDX. SELL: 75A-3, 6.0 & 3.1 filters installed, and NBFM unit, $650 shipped. K9CSM, 303-622-9503.

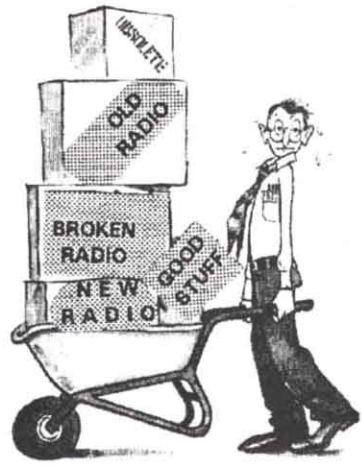
COMMODORE C-128, C-64, drives 1571, 1541(2), tape recorder, expansion module, mouse, printer, color monitor, 2 Mtr. Azden PC-2000, cables & manuals. $285 all OBO. U-ship. Ralph, KB4LLI, 256-536-6518.

COMPLETE SATELLITE STATION. Huge inventory. $2350. KE6UYP. Phone 520-615-1955, Fax 520-615-1455.

COMPUTER PRICE DROPS! Barebones: 300 MHz $245, upgrades or complete systems. Email for immediate prices or call. Free advice on upgrades! AC4OD, 561-965-7491. dataplus@flips.net

COMPUTERS - WANTED early Pre-1980 microcomputers for museum collection. Also early magazines and sales literature. KK4WW, 540-763-3311/382-2935.

CONTEST LOGGERS. EI5DI's Super-Duper. http://www.iol.ie/~okanep



CRYSTALS: FT-243's for QRP, vintage equipment made to order. 160-2 meters. 4 stamps or $1 for catalog/circuit package. C-W Crystals, 1714 N. Ash, Nevada, MO 64772.

DIGITAL FIELD strength meters: http://www.digifield.com

DP-9 MULTIBAND DIPOLE ANTENNA has 9 full size antennas for 160-10, 240' $189; DP-9S, 130' $210. DP-8 for 80-10, 124' $139; DP-8S, 70' $159. DP-7 for 40-10, 65' $110; DP160-80, 245' $85; DP16080S, 130' $105. Add $8 shipping. Other antennas in our Free Ham and Shareware Catalog. Dynamic Electronics, Box 896, Hartselle, AL 35640. 256-773-2758. Fax 256-773-7295, dei@whnt19.com, http://www.hsv.tis.net/~dei

DRAKE TV-3300 low-pass filter, $20; A&A Engineering ViewPort VGA SSTV, $50 and WSH Weatherfax, $50; Acer BG-08 tower case, $90. Buyer ships. Paul Pagel, N1FB, ppagel@arrl.org; tel. 860-594-0296, days.

DUSTCOVERS: Plastic dustcovers for the following paddles: Bencher, Vibrokeyer, Vibroplex Iambic, Jones, Kent, and MFJ-564 with your call engraved. $16 includes S&H. Larry Stamm, 28 Topton Road, Kutztown, PA 19530.

DX HEADING Maps and Lists. W2HOJ, 800-941-2252.

EASYTERM: Windows software for **AEA, Kantronics** and **HAL** modems. For info, look at: **http://www.tiac.net/users/henley/eztpage.html**, call toll free 888-336-7796 or write: M. V. Henley's Inc., Box 2154, Edgartown, MA 02539-2154.

ELECTRIC RADIO Magazine in our tenth year. Articles on vintage ham and military gear, repair/restoration, history, and AM operation. Large classified section. $3 for a sample copy, ER, 14643 County Road G, Cortez, CO 81321.

ELECTRON TUBES. Bought and sold. Large inventory equals fast delivery. Daily Electronics, 10914 NE 39th St. Ste. B-6, Vancouver, WA 98682. **800-346-6667**, fax 360-896-5476. daily@worldaccessnet.com

ESTATE SALE: SASE for listing or call 314-477-0316. L. Lamb, 1601 Lienemann, St. Peters, MO 63303.

"EVERYTHING FOR THE MORSE ENTHUSIAST." **Morse Express.** Keys, keyers, kits, books. 303-752-3382. http://www.MorseX.com

EXPERT PRINTED CIRCUIT BOARD DESIGN and schematics by Tucson PCB. Fast and accurate; guaranteed. Fifteen years experience. Reasonable rates. Small layouts accepted. W2FGV, 520-822-1712 or e-mail: w2fgv@tcsn.uswest.net

FOR SALE: Brand new, never used lowpass filter Oak Bay Technologies LP-11P. Will handle 1KW. Asking $35. W2QHS, 732-542-9056.

FOR SALE: Power cable for Kenwood TS-440. Brand new, never used, asking $20. W2QHS, 732-542-9056.

FOR SALE: TS-430S with PS-430, SP-430, AT-250, MC-60, LF-30A (1KW), TL-922A amplifier 2 kw PEP. All with manuals $1800. Also FT-101, YD-148 mic, YC-601B freq. counter with manual & repair manuals for all FT serial. Will take best offer. Contact n4jaf@bellsouth.net

FREE grid locator, send stamp. K4NBN "No Bad News". 32082-3668.

FREE Ham Gospel Tracts; youth leaders needed for national outreach. SASE, W1REZ, P.O. Box 8, Harmony, ME 04942.

FREE: Ham Radio Gospel Tracts, SASE. KW3A, 265 West Ave., Springfield, PA 19064.

FREE IBM DISK CATALOG with Ham Radio, shareware programs and CD-ROMS. Specify disk size. **MOM 'N' POP'S SOFTWARE**, P.O. Box 15003-HA, Springhill, FL 34609-0111. 352-688-9108. momnpop@gate.net

GENERATOR ALTERNATIVES for Y2K. No electricity = no gasoline. Build an EFFICIENT emergency power system now. $12 to James Flynn, KD9ZT, RR 1, Rutland, IL 61358.

GREAT CIRCLE MAPS computer generated for your exact QTH, $20 ppd. worldwide. Printouts $12 ppd. SASE for info. Bill Johnston, K5ZI, Box 640, Organ, NM 88052. 505-382-7804.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify model numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

HEATHKIT AMATEUR RADIO REPAIR by RTO Electronics, 5585 Hochberger, Eau Claire, MI 49111. 616-461-3057. E-mail: hamtech@rtoham.com. www.rtoham.com

HEATHKIT REPAIR, Ed, WA1LJY, 616-429-4295.

HEATHKITS WANTED: Top dollar paid for unassembled kits. Michael Seedman, 847-831-8823 eve., or mseedman@interaccess.com

HEATHKITS WANTED: Unassembled kits, catalogs, manuals and older gear. Bill, WA8CDU, 616-375-7978. billrobb@net-link.net

HF/6M AMP KITS, 14VDC, 500W $395, KW $719, 300W(6M) $395. SASE, Lee, KD4YBC, 197 Chickasaw Lane, Myrtle Beach, SC 29577. http://users.aol.com/rfelectron/rfelect.htm

HOBBY FACTORY, used ham & military gear on display, repairs, bought, sold, & traded. Rick, W1DEJ, 1111 North Shore Rd., Revere, MA 02151. 781-485-1414. Fax 781-289-1717. E-mail: hobfact@tiac.net; www.tiac.net/users/hobfact

HOMEBREW MBR-16, Collins KWM2/A, 30L-1 wanted. K5BCQ. talen@inetport.com

ICOM 32AT handheld wanted. Kenwood TR-851A wanted. Top dollar for top cond. & accs. Gary, KF6LRV, 619-670-7590 phone/fax.

JENNINGS WANTED: Looking for J-1003, J1004, J1005 high voltage meters, parts of meters accepted. Jim Youngson, 502-448-6228, also it's a fax number.

KENWOOD FACTORY AUTHORIZED SERVICE: Warranty, non-warranty. Repair most brands. Groton Electronics, 978-448-3322. http://www.ultranet.com/~jacques

KENWOOD R 2000 multi receiver, mint look, 30 meg multi-modes memory, 110 AC + 12 volt DC triple conversion. $385 delivers. C. Neumiller, 1273 Ivy, Reedsport, OR 97467. 541-271-5065.

KENWOOD TS-850S, PS 52. Amp supply linear LA-1000A low pass filter, mike, complete station. $1500. K2ONS, 516-334-3237.

LEARN CODE by Hypnosis, http://www.qth.com/cweasy/ or 800-425-2552.

LOG BOOK AND QSL CARD PRINTING PROGRAM for Win95, Win98 and NT. Featuring multiple logbooks, sort and search capabilities, online help, easy Navigation and automatic printing of QSL cards. Download free from www.n3jl.com or, send your call sign and ten dollars for CD-ROM to: Joe Lynn, N3JL, P.O. Box 2980, Montgomery Village, MD 20886-2980.

LOW NOISE RECEIVING LOOP ANTENNAS, 150 kHz - 30 MHz. Free catalog. RSM Communications, Box 27, LaBelle, FL 33975. 941-675-2923.

MACINTOSH ham logging program on CD-ROM. http://www.peachtree-solutions.com

MIRAGE A-1015G 50-52 MHz amplifier. Never used. $200. 808-332-8452 or kh6ch@aloha.net

MORSE 0-20 WPM 90 days guaranteed! Codemaster V for IBM compatible PC $29.95. Morse Express, 800-238-8205. **http://www.MorseX.com**

MORSE CODE MUSIC! http://home.att.net/~p.kawa/music.html. 781-331-1826.

MOTOROLA MICOR REPEATERS: 2m, 440, GMRS; $400. Complete UHF repeaters with duplexer; $600. Matt Bush, 941-694-5911.

MS-Windows software: **RAC** Callbook CD-ROM, **Ultimeter** Weather Stations and more. Info: n2ckh@cybercomm.net, http://www.QTH.com/n2ckh.bytewise.org

NEW PRODUCTS FROM S&S: Upgrade your old rigs! Digital dial (counter) has 10 Hz resolution HF, 100 Hz VHF and frequency range 50 kHz to 230 MHz; kit $99.95; assembled $149.95. NEW Digital VFO with 1 Hz resolution to 54 MHz; kit $169.95; assembled $219.95. S&H $7.00 (Continental US). GUARANTEED TO WORK. For info send SASE; Call/write to order: S&S Engineering, 14102 Brown Road, Smithsburg, MD 21783. 301-416-0661. E-mail: N3SAD@aol.com or see http://www.xmetric.com/sseng

NOW ON 40 METERS! NEW, KNOB TUNED w/DIGITAL DISPLAY, SYNTHESIZED QRP Transceiver. Complete kit only $199.95. S&H $10 (Continental US). GUARANTEED TO WORK. For info send SASE; Call/write to order: S&S Engineering, 14102 Brown Road, Smithsburg, MD 21783. 301-416-0661. E-mail: N3SAD@aol.com or see http://www.xmetric.com/sseng

"PR" CRYSTALS Peterson Radio Co. Inc., 2735 Avenue A, Council Bluffs, IA 51501, 712-323-7539.

PRINTED CIRCUIT BOARDS for Amateur Radio projects. Internet: www.cl.ais.net/farcir. E-mail: farcir@ais.net. List SASE. FAR Circuits, 18N640 Field Ct., Dundee, IL 60118.

QRP Kits. Transceivers: SP-1B 'Spider', $49.95. SP-5 $69.95. $5 shipping. Details: Lectrokit, 401 W. Bogart, Sandusky, OH 44870. lectrokit@juno.com

***QST*s FOR SALE:** December 1916 through December 1997. 70 years in ARRL binders. $1800. Will consider best offer. Ray, K5RJ, 703-938-8313 or jrjnvv@aol.com

R-389/R-390/R-390A/R-725/CV-591A SERVICE. Module repair to complete remanufacture. Info - SASE Rick Mish, P.O.B. 80041, Toledo, OH 43608. Telefax: 419-255-6220, 9-9 E.S.T.

R390A RECEIVERS. Parts and decks for sale. George, K1ANX, 413-527-4304.

BATTERIES

BUY DIRECT FROM THE U.S. MANUFACTURER!

YAESU

FNB-2	10.8v @ 600 MAH
FNB-4	12v @ 750 MAH
FNB-4A	12v @ 1000 MAH
*FNB -10(S)	7.2v @ 1200 MAH
FNB-12(S)	12v @ 600 MAH
FNB-17	7.2v @ 600 MAH
FNB-25	7.2v @ 600 MAH
FNB-26	7.2v @ 1200 MAH
**FNB-26(S)	7.2v @ 1500 MAH
FNB-27	12v @ 600 MAH
**FNB-27(S)	12v @ 800 MAH
1/4" longer than FNB27	
FNB-31	4.8v @ 600 MAH
FNB-33(S)	4.8v @ 1500 MAH
FNB-35(S)	7.2v @ 600 MAH
FNB-35(S)(S)	7.2v @ 1500 MAH
FNB-38	9.8v @ 600 MAH
*1 1/3" longer than FNB38 case	

BATTERY ELIMINATORS AVAILABLE

SPECIAL
FOR THE MONTH OF APRIL
10% OFF
on all
ICOM IC-T8A
Replacement Battery Packs
Look for May's Special of the Month
Monthly Discounts Applicable to End-Users Only

Powerpac+®
6 V for Camcorders & 12 V for 2-way

DISCOVER VISA MasterCard AMERICAN EXPRESS

W & W Manufacturing Co.

Made in U.S.A.
Send for free catalog & price list

NYS residents add 8.5% sales tax.
Add $5.00 for shipping.

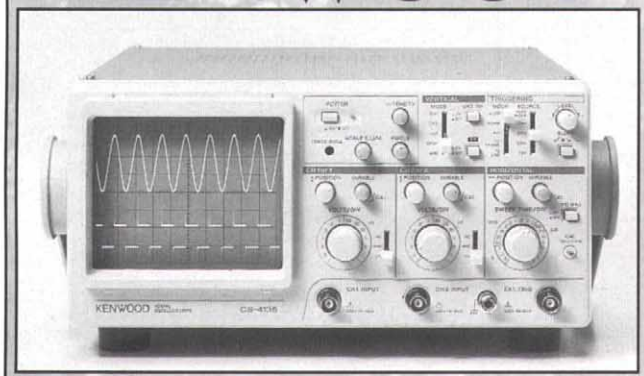
800 South Broadway, Hicksville, NY 11801-5017
E-Mail: w-wassoc@ix.netcom.com Web Site: wwassociates.com

IN U.S. & IN CANADA CALL TOLL FREE 800-221-0732 • IN N.Y.S. 516-942-0011 • FAX: 516-942-1944

MADE IN U.S.A.

Prices and Specifications subject to change without notice.

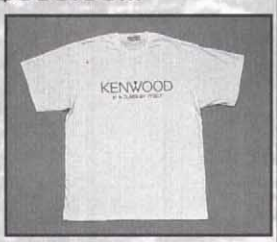
KENWOOD



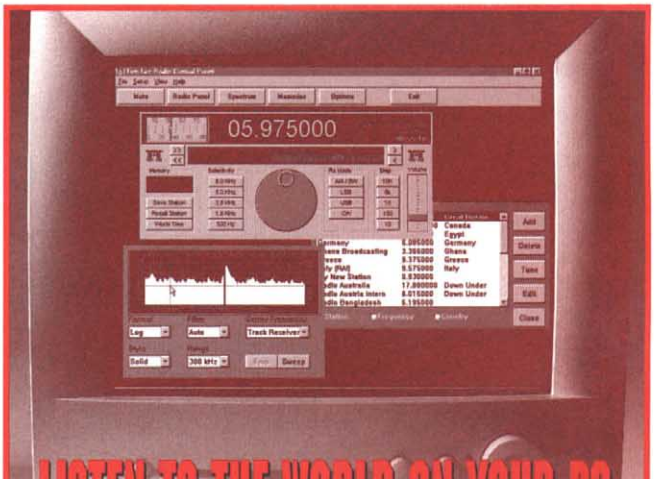
Kenwood CS-4125 Sale!

MODEL CS-4125, 20 MHz, 2 Channel, w/probes
Suggested Price $595.00
SUPER SPECIAL $389.00!!!

Free KENWOOD t-shirt with purchase of CS-4125 oscilloscope!!!



PRINT™
Products International
8931 Brookville Rd * Silver Spring, MD, 20910
800-638-2020 * Fx 800-545-0058 * www.prodintl.com



LISTEN TO THE WORLD ON YOUR PC

Worldwide listening is only a mouse click away with ***PC RADIO.*** Catch world and local news from many viewpoints plus culture, politics, and music. Hear hams, military, commercial airlines, and CB.

Tuning 100 kHz to 30 MHz, ***PC RADIO*** is a stand-alone, black box connecting to your serial port. Runs on Windows 3.1® or 95/98® and uses 1 MB of hard drive space.

Revolutionary "DSP" design provides features only dreamed of in previous receivers in this price class. Even the most experienced enthusiasts will marvel at the performance. **$295***

- No-Risk 30-day Money-Back Guarantee**
- VISA, Mastercard, and Discover

*Plus shipping and handling
**Customer pays shipping both ways.

Download the actual ***PC RADIO*** software at www.tentec.com!

800-833-7373
to order or request literature.

MADE IN TENNESSEE

TEN-TEC
1185 Dolly Parton Parkway
Sevierville, TN 37862
Office: (423) 453-7172
FAX: (423) 428-4483
e-mail: sales@tentec.com
Repair Dept.: (423) 428-0364 (8a - 4p EST)

RECOMMENDED 50 MHZ DX BAND PLAN. Must read paper of normal & expandable windows: CW DX (50.100-50.080—50.000), USB DX (50.100-50.150—50.500+), USB U.S. (50.150-50.200—50.600+). Free by SASE to WA6JRA. 714-637-3989.

REPEATER: Complete 222 MHz Icom, KLM amplifier, TX/RX duplexer, Cellwave antenna, CAT-1000 controller, power supply, rack. Best offer. Pickup at Dayton Hamvention. 920-469-1910. www.netnet.net/w9ham

RETIRED MOTOROLA Bench Technician Repairs Ham Gear, all makes new or old. Tom Miller Electronics, K6RXR, The Old Goat, 22516 S. Normandie, SP41B, Torrance, CA 90502, 800-995-8964, 310-320-8980.

RF TRANSISTORS & TUBES 2SC2879, 2SC1969, 2SC1971, 2SC1944, 2SC2166, 2SB754, MRF247, MRF317, MRF422, MRF454, MRF455, MRF448, SAV7, SAV17, 3-500ZG, 4CX250B, 572B, 3CX3000A7. WESTGATE, 800-213-4563.

ROSS $$$$ New Specials: Kenwood TM-411A $260, TR-8400 $245, BC-6 $80, TH-22AT/PB-22 $195; Yaesu SC-1 $145, SP-767 $85, SP-767P $100, FT-703RTT $215, VX-5R $338; Icom IC-245 $195, IC-2700H $420, IC-435 $245, IC-O4AT $250, IC-7072 $95, IC-UXS-92A $625; Astron, in stock; Alinco, in stock; MFJ, in stock. RG-213F, 97% PVC Jacket 500 FT roll $118; SGC SG-2000 $1275. All cash FOB Preston. Call 208-852-0830 or visit our Web page http://www.rossdist.com. Ross Distributing Company, 78 South State, Preston, Idaho 83263.

ROTOR. Ham II. Very good. $190. KK6KV, 707-961-1255.

SELLING STATION: R4B receiver, nice, $240. Yaesu FT-102 transceiver, needs service, $250. 70' Rohn tower with Hy-Gain 204BA beam, CDE45 rotor, you take down, $375. Yaesu FT-20RR, case, battery, charger, needs service, $35. W8VHY, Washington C.H., OH 43160.

SX88 HALLICRAFTERS receiver wanted. Jim, W6OU, 714-528-5652.

TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre1950 callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013. 800-840-KEYS.

TELEGRAPH KEYS/MUSEUM AT DAYTON HAMFEST: Bring your keys: free history, appraisals, pretzels! Space: 2555. Information: http://w1tp.com

TEN-TEC 600 watt HF amplifier, Centaur, QSK, mint condx, $600. N2AO, 315-446-6388.

TOWER: 50 ft. Glen Martin Hazer M-1850A, brand new, $1995. **BEAM:** Force 12 C-3 10M thru 20M and WARC, brand new, $395. K8TDK, Michigan, 616-731-2444.

TUBES for sale, all kinds. Send SASE for price-availability. K9GTK, 2932 W. 99th St., Evergreen Park, IL 60805. Phone/fax 708-423-0528. Email: tivas@xnet.com

TUBES WANTED: Highest prices paid or will trade for all types of industrial, receiving and transmitter tubes. D & C Electronics, 3089 Deltona Blvd., Spring Hill, FL 34606. 800-881-2374.

TUBES WANTED: I pay cash or trade for all types of transmitting or special purpose tubes. Mike Forman, 1472 MacArthur Blvd., Oakland, CA 94602. 510-530-8840.

VHF-UHF-ATV-Microwave. Please visit http://www.parabolic.se. 73 de sm6cku@parabolic.se

VIBROPLEX BUGS with NY address wanted for private collection. Especially want bugs with beige or brown base, 2.5" or 3" wide base, gray base with red knobs, or S/N under 100,000. Other old or unusual keys and bugs and collections from estates wanted. Randy Cole, KN6W, 4540 Fairway, Dallas, TX 75219. 214-521-7041 or cole@netcom.com

W-51 TRI-EX telescoping tower 3 section, self-supporting with HAM IV rotator. Asking $1400. Located near Fort Worth, TX. Carl, K5ROR, 817-579-9555, e-mail: k5ror@juno.com

WANT: PC Electronics TC70-10 ATV transceiver. Locastro, 315-253-2231, 252-6107 eves. after 10 p.m. est.

WANTED: book by John M. Goodman, HF Communication: Science and Technology. G4FKH QTHR, e-mail: gwyn@g4fkh.demon.co.uk

WANTED: Drake MN-2700 antenna tuner. Frank, KB0W, 916-635-4994. frankdellechaie@sprintmail.com

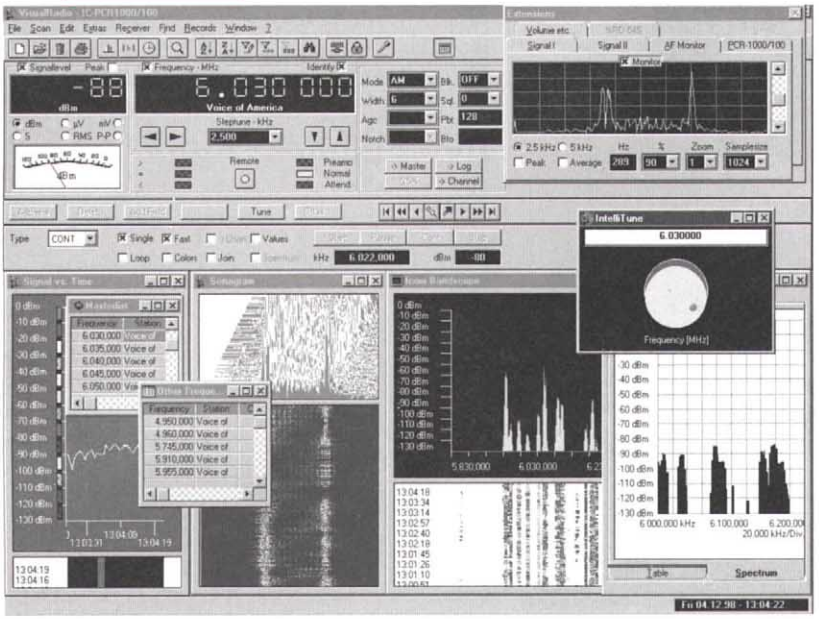
WANTED: Electronic estates, hi-fi, broadcasting. Cash paid. KB8CCY, 419-782-8591.

WANTED: Hi capacity 12 volt solar panels for repeater. kk4ww@fairs.org or 540-763-2321.

WANTED: IC-375H w/manual in good condition. Fair price paid. Reply to pwsharry@bellatlantic.net, 201-933-1727, WB2YZB.

WANTED: Icom IC-970, must be in mint condition, non-smoker. Also wanting Icom sales brochures for IC-970, IC-275, IC-475, IC-575. Randy Ballard, N5WV, 903-687-3002.

New: VisualRadio© 3.0



is the new version of the powerful control software for most radios, scanner of AOR, ICOM, JRC-NRD, KENWOOD, YAESU, WiNRADIO, and more. RF Bandscope, IntelliTune, AF Analyzer, Sonagram, timer-controlled scanning and automatic recording in WAV format. Runs in network environment. Supports two different radios or up to four ICOM radios at the same time. Free DEMO.

Protocol
ICOM® Application ICOM PCR-1000 + PCR-100

COMPUTER INTERNATIONAL
1280 Sunview Drive, # 21
St. Johns, MI 48879-2465
Tel/Fax: 1-517-224-1791
E-mail: schuette@email.mintcity.com
http://computer-international.virtualave.net

RC-1000 Repeater Controller

VOICE ID, AUTOPATCH, 96 NR AUTODIAL, REVERSE PATCH

DTMF re-encode dialing-Toll restrict - Remote Base - Control Rcvr input
Programmable CW ID, DTMF codes & timeouts - PL modes - Tail Beep
DTMF muting - Aux Outputs - Complete interface (no accessory boards)
RC-1000V w/voice ID wired & tested w/60 page manual...**$259.95**
RC-1000 w/o voice...$199.95 **19" Rack mount enclosure...$59.95**

RC-100 user programmable CW ID, tail beeps, timeout - DTMF control remote base-15Aux outputs-PL Mode-crossband...w/35 pg manual...**$129.95**

Micro Computer Concepts
8849 Gum Tree Ave, New Port Richey, FL 34653
727-376-6575 **http://home1.gte.net/k4lk/mcc**

VISA MasterCard

HamCall™ CD-ROM
U.S. and International
Over 1,524,000 Listings

HamCall has been rated one of the "Top 100" CD-ROM's by PC Magazine!

Produced and updated WEEKLY!

When you order, you will receive a CD-ROM that is less than 1 week old! Clearly, the most comprehensive and current available.

HamCall™ allows you to look up over 1,524,000 callsigns from all over the world, including nearly 300 DX call areas. Constantly updated with the latest FCC & International data.
Six month full and **FREE** access to our Internet Search Service with CD-ROM purchase. Request password when ordering.

The same CD works in DOS, Windows 3.1, and Windows 95/98. Look up hams by call, name, address, city, state, postal code, county, and country. View and print photographs (list included), edit records to add new data.

Data displayed: callsign, name, address, city, state, ZIP code, country, license issue date, expiration date, birth date (over 675,000 US still in database), previous call(s), previous class, latitude, longitude, grid square, time zone, county, QSL manager, e-mail address, WWW URL and FAX numbers.

- Displays precise latitude, longitude and grid square for almost every U.S. and DX call.
- Calculates beam heading and distance from your home QTH to every callsign you look up. Distance is measured in miles and kilometers.
- Enhanced label print capabilities for Windows.Select printer, font and print any size label. Label size, margins, columns, and rows are fully configurable. Also, supports copy and paste.
- Supported by most logging programs, packet BBS's and spotting systems.

Available directly from Buckmaster or through selected dealers. Same low price of $50.00 and $5.00 shipping U.S., $8.00 international.
Your satisfaction guaranteed!
Free 800 technical support - we won't let you fail.

MasterCard **BUCKMASTER** VISA
6196 Jefferson Highway
Mineral, VA 23117
☎ 540:894-5777 - 800:282-5628
540:894-9141(fax)
e-mail: info@buck.com

WANTED: Info-Tech M300C keyboard. E-mail: tkqr30a@prodigy.com. Phone 301-622-9513. W3QBK.

WANTED: Johnson Courier or HT-31 linears. Write W8JKS or 740-998-4518.

WANTED: OLD 70's COMPUTER MAGAZINES, Popular Electronics and Radio Electronics 1974-76 $4/issue; Interface Age etc. any pre-80's $2/issue. Steve Gabaly, 607-625-5221. old_computers@yahoo.com

WANTED: OLD 70's COMPUTERS, Altair 8800 $500-$1000+, Mark-8 $2000, Sceibi-8H $2000 or please email what you have and price. Steve Gabaly, 607-625-5221. old_computers@yahoo.com

WANTED: Palstar AT4K antenna tuner. NA6J, 209-966-2405.

WANTED: Tubes. Nobody pays more or faster than us! Mike Forman, 1472 MacArthur Blvd, Oakland, CA 94602, 510-530-8840.

WE FIX BROKEN RADIOS! 18 years experience repairing and aligning Kenwood, Icom, Yaesu, Atlas equipment. International Radio Service, 1118 Raymond Ave., Fort Pierce, FL 34950. 561-489-6302. intlradio@juno.com, www.qth.com/irsd

WWII Electronic Equipment. Send $2 for 40 page list and receive $5 credit on first order. F.J. Conway, 2217 N.E. 17th Terr., Ft. Lauderdale, FLA 33305-2415.

www.radiocom.net

YAESU FL-2100 kit for 10 meter. $480. You pickup. Landay, 215-516-9610.

JOBS

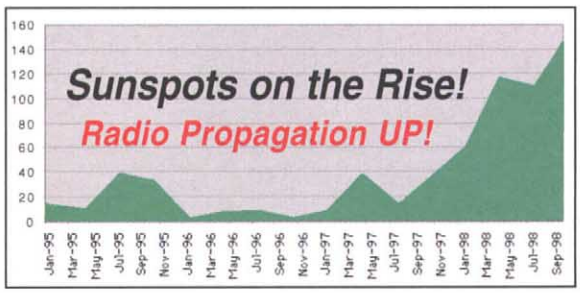
WANTED FOR SUMMER OF 1999: Instructors in electronics, ham radio, computers and all other sciences. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, Pennsylvania 18451. 570-857-1401.

ARRL Members Hold The Key to the New Millennium!

You're going to need

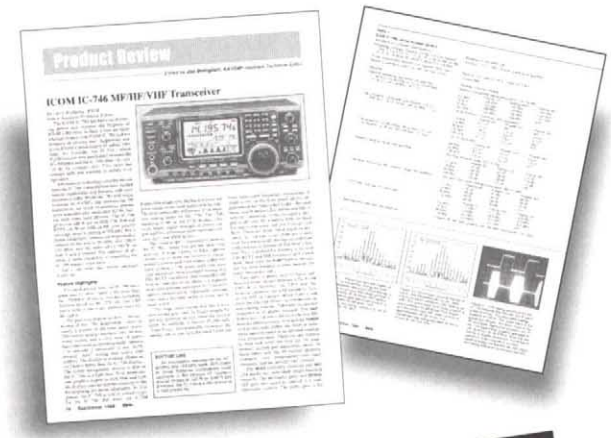
The New QST

and ARRL membership to enjoy our great new cycle!



Amateur Radio is as HOT as the new SPOTS!

The Best Ham Projects!



Product Reviews of the Hottest New Products!

The latest equipment Ads!

New Ham Radio Adventures and News!

When you join, you also get...

Members Only Services

The ARRLWeb Extra for Members Only

Exclusive features, photos, news, reviews and sounds from the world of Amateur Radio
http://www.arrl.org/members

Outgoing QSL Service

Free Technical help at your fingertips

The Fun of Contesting and Awards

Available Rig Insurance

New "Members Only" Web Site

ARRL 225 Main Street, Newington, CT 06111-1494 tel: 860-594-0355 fax: 860-594-0303
e-mail: circulation@arrl.org World Wide Web: http://www.arrl.org/

In the US call our toll-free number **1-888-277-5289** 8 AM-8 PM Eastern time Mon.-Fri. or **use the handy postpaid envelope in QST**

R&L Electronics

1315 Maple Ave HAMilton, Oh 45011 http://randl.com email sales@randl.com
(513)868-6399 Local/Tech (513)868-6574 Fax (800)221-7735


(FT-847)


(FT-100)

YAESU

HF/50/144/430 Mhz

FT-847 Features include 100 Watt output on HF / 6-Meter bands, while 2-Meter and 430 MHz bands feature a full 50 watts power output. DSP Filters (Notch, NR, BPF). With its high-tech design and revolutionary features, the FT-847 is truly the one radio that can do it all!

FT-100 Breaking new ground in the field of micro-miniature transceiver design, the FT100 is the only miniature mobile transceiver providing coverage of the 160-6 meter bands plus the 144 Mhz and 430 Mhz bands. This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the F.C.C has been obtained.

HF/6m rig w/DSP

FT-920 HF + 50 MHz with 100 Watts Output on all Bands. High Performance 33 MIPS* Digital Signal Processing (DSP) in all Modes with one touch control. New Design MOSFET PA Finals. Built-in High Speed Auto Antenna Tuner including 50 MHz.

HF w/DSP & Dual Rcvr

FT-1000MP EDSP, Dual in band receive, Selectable antenna jacks, Collins SSB Filter built-in

VHF/UHF Mobile

FT8100R Compact Dual Band Mobile. 110 Memory Channels. Enhanced Smart Search. Crossband Repeat. 1200/9600 bps Packet Compatible

2M 70W Mobile

FT3000M 2m FM mobile w/70 full watts of power. Wide band receive 110-180Mhz, 300-520Mhz, and 800-999Mhz (Cellular Blocked). 81 Memory channels.

2M 50W Mobile

FT2500M 2m FM 5/20/50 Watt Mobile. Omni-Glow LCD. Back lit DTMF Mic

Small VHF/ UHF HT

VX-1R World's smallest Dual-band Handheld. Super-wide VHF / UHF Multi-band Receive. 500mW Power Output (1W with supplied AC Adapter).


(FT-50R)

2m/70cm HT

FT-50RD 2m/440mhz HT, Wide Multi-band rx, MIL-STD 810 rated

2m HT

FT-10R 2m HT, Dual watch with dual display

KENWOOD

Dual band HT w/TNC

THD7A The new TH-D7A is equipped with a built-in AX.25 TNC for simple packet operation or to be used with a handheld GPS (NMEA-0813 compatible) as a full function APRS(TM) Automatic Packet/Position Reporting System. The TH-D7A is capable of reporting exact position, speed and heading as well as calculation of distance to destination. The TH-D7A can also be used for APRS(TM) messaging to send up to 45 character messages through APRS(TM) or APRS(TM) Internet gateways without the use of a PC.

GPSIII $289.95 GARMIN

The GPSIII - a global positioning system receiver with electronic map. It not only shows the lay of the land, but where you stand, too. We've loaded millions of miles of interstates, highways, railroads, rivers and shorelines into the GPSIII. Yet this versatile personal navigator weighs only 9 ounces and fits comfortably in your hand, on your bike or atop the dash of your car. The GPSIII's 12 parallel channel receiver will find your position fast and keep your position even in dense foliage.

UHF/VHF X-needle meter

$54.95

Model # SX144430 140-160Mhz + 400-480Mhz, 10-100-1000W scale, Tolerance: 10% full scale.

KW2000

Power cord for most all Alinco, Icom, Kenwood, Yaesu HF rigs with the 6 pin Molex connector. Also fits Ranger RCI2970

$14.95

2m/440mhz on glass antenna

Model # **JTGM270** 144-148 + 440-450 Mhz, 2.6db over 1/4 wave @ 2m, 4 db over 1/4 @ 70cm, Max power 50 watts, 26" copper plated whip with black finish.

$29.95

ICOM

PC controlled receiver

PCR1000

NEW Lower Price!!!!

USED Equipment

Icom

IC737A *HF rig* **$895.00**

Kenwood

TM255A *2m all mode mobile* **$495.00**

Yaesu

FT767GX *HF base* **$875.00**

For a complete list of used equipment send a BLANK email message to used@randl.com or look at http://randl.com/new/usedham.htm

We also carry:

ICOM

ALINCO INCORPORATED

ADI Communications

STANDARD

KENWOOD

BE Y2K PREPARED

The POWER STATION

- 12 Volt x 7 Amp/Hr Gel Cell Battery
- 12 Volt Cigarette Lighter Outlet
- 3, 6, & 9 Volt Power Jack
- Built in Voltmeter
- Car & Wall Charger w/Auto shutoff
- 2 Hidden Terminals for Hardwiring provide up to 90 Amps (short circuit)
- Only ***$49.95***+ $10.50 S&H

SOLAR CELLS

- Flexible 5.5 Watt $115*
- Rigid 11 Watt $179**
- Flexible 11 Watt $189**
- Rigid 22 Watt $219**
- Rigid 32 Watt $269***
- Flexible 32 Watt $399***
- Rigid 42 Watt $329***
- Rigid 64 Watt $449***

- Flexcharge 12Vx7 Amp Charge Controller $59.95
- All units have diodes for partial shade
- Flexible units also have reverse blocking diodes

*=$10.50 S&H **=$12.50 S&H ***=$16.50 S&H

The MEGA STATION

- 17 Amp/Hr Gel Cell w/Heavy Duty Jumper Cables provide up to 300 Amps SC
- Cigarette lighter output
- Charge Indicator meter
- Car & Wall Charger w/Auto shutoff
- Only ***$99.95***+ $16.50 S&H

CL555 Power Supply & Flashlight

- 12 Volt x 2 Amp/Hr Gel Cell Battery
- Light turns on during power failure
- 12 Volt Cigarette Lighter Power Outlet
- Shoulder Strap & Jumper Cables
- Provides 1.5, 2, 3, 4.5, 6, 7.5, 9, & 12 volts via supplied 4-way coaxial plug (used by most HT's)
- Chargers for Wall & Car with Auto Shut Off, Spare bulb
- Only ***$39.95***+ $8.50 S&H

12VDC to 110VAC INVERTERS

- Modified Sine Wave
- Great w/ The POWER, SUPER or MEGA STATION
- *=$10.50 S&H **=$12.50 S&H ***=$14.50 S&H

Model	Cont. Pwr	Peak Pwr	LxWxH	Price
PC140	140 Watts	250 Watts	5.1" x 3.5" x 1.5"	$34.95*
PC300	300 Watts	500 Watts	5.6" x 3.8" x 1.3"	$49.95*
PC500	500 Watts	800 Watts	14.2" x 6.3" x 2.6"	$99.95*
PC1000	1000 Watts	2000 Watts	12.5" x 9.5" x 3"	$219.95**
PC1500	1500 Watts	3000 Watts	16.2" x 9.5" x 3"	$324.95**
PC2500	2500 Watts	4000 Watts	17" x 8" x 6"	$549.95***

DIAMOND ANTENNA

COMET

To Order: Phone or E-Mail for Credit Card or COD, or Mail Check or Money Order with your Name, Call Sign, UPS-able Address, & S&H to:

THE HAM CONTACT

P.O. BOX 4025,
Westminster, CA 92684, Dept. Q

INFO 714-901-0573 • ORDERS 800-933-4264 E-Mail: N6YYO@SPRYNET.COM or FAX 714-901-0583
For Literature on Antennas, HT & Gel Batteries, Inverters, Power Supplies, etc., Send a large SASE with 3 stamps

VISA

VolksRTTY Interface Kits

Back by Popular Demand! Featured in April '98 QST - EZ way to get started on RTTY - Uses Any PC Compatible and HF SSB XCVR. Complete Kit (PCB, Components, Instructions & HamComm Evaluation S/W) $45
(Incl. US Shipping)

Terry Mayhan, K7SZL
4517 159th AVE NE Redmond, WA 98052
e-mail: tmayhan@accessone.com
http://www.accessone.com/~tmayhan/

Are You An ARRL Volunteer Examiner?

If you're 18 or older, and a qualified **General**, **Advanced** or **Extra** class licensee, you're invited to join us. For details call:

1-800-9-ARRL-VEC

ARRL VEC

DUPLEXERS

★ *QUALITY* ★ *SERVICE*
★ *PRICE*
WE'VE GOT IT ALL!

Our Bandpass-Reject Duplexers with our patented B_pB_r Circuit* Filters provide superior performance. . . especially at close frequency separation.

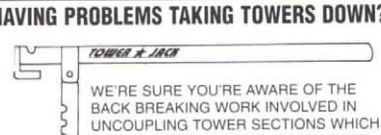
PHONE 254-848-4435
FAX 254-848-4209

WACOM
PRODUCTS, INC.
P.O. BOX 21145 • WACO, TX 76702

"KACHINA"
HF TRANSCEIVER

We sell more Kachinas than anyone!
http://www.mscomputer.com/kachina
FREE SWAP SHOP LISTINGS
ORDERS: 800-333-9041
M&S COMPUTER

HAVING PROBLEMS TAKING TOWERS DOWN??



WE'RE SURE YOU'RE AWARE OF THE BACK BREAKING WORK INVOLVED IN UNCOUPLING TOWER SECTIONS WHICH HAVE STOOD FOR ONLY A FEW YEARS.

PEOPLE FIGHTING THESE KINDS OF BATTLES HAVE USED EVERYTHING FROM 2X4s TO SCISSOR JACKS WITH A CERTAIN DEGREE OF SUCCESS AND TOO MUCH WORK, LET ALONE THE ELEVATION ABOVE GROUND WHICH IS TO BE TAKEN INTO CONSIDERATION.

NOW COMES *"TOWER JACK,"* THE GREATEST LITTLE FRIEND YOU'LL EVER NEED WITH YOU ON A TOWER. WHETHER IT BE 15 OR 150 FT. UP, YOU'LL FIND DISMANTLING TOWER SECTIONS A SNAP WITH *"TOWER JACK,"* WILL DISASSEMBLE AND ASSEMBLE ALL ROHN MODELS 20, 25, 45, and 55.

Ham Net $44.50 plus $6.50 S&H
Send $51.00 check or M.O. to:
"TOWER JACK"
P.O. BOX 1191, MT. JULIET, TN 37122
800-242-0130 order line • info line 615-758-9233
ASK ABOUT OUR OTHER PRODUCTS. DEALERS INVITED

TOWER ★ JACK®

EMPLOYMENT OPPORTUNITY WITH ARRL

Advertising Manager
Newington, CT

ARRL Headquarters has an immediate opening for an individual with proven sales ability, knowledge of the Amateur Radio industry, managerial experience, and ability to travel. Duties include management of a small in-house staff and outside sales representatives. You will also be responsible for direct customer sales and contact as well as coordination of customer and in-house advertising material for *QST*, *NCJ*, *QEX* and specialty books produced by the American Radio Relay League.

Send resume and salary expectations to: Advertising Manager Position, Robert Boucher, ARRL, 225 Main St., Newington, CT 06111;
fax 860-594-0298;
e-mail: **rboucher@arrl.org** EOE

Welcome to the **Dayton Hamvention®** *... the largest event of its kind in the world*

ELECTRONICS **HAM RADIO EQUIPMENT** **COMPUTERS**

Why do hams from 30 countries and all 50 states come to the Dayton Hamvention?

After much thought, we wondered why our visitors return to the Dayton Hamvention® year after year. So we asked them. Here's what they told us.

Meet friends! The Dayton Hamvention is **the** annual event for the ham radio operator. There is a certain "chemistry" with so many hams that just doesn't exist anywhere else.

The latest equipment! Major manufacturers introduce new products at Hamvention. Try out the equipment. Talk to the reps!

***Shop at* the World's largest Ham radio, electronics and computer flea market!** Our Flea Market is so large it is hard to imagine unless you have been here. With 2,638 outdoor spaces you can find new and used ham equipment, electrical parts, computers, tools, antique radios, microscopes and some really strange stuff that you didn't even know you needed.

Three great days to explore everything ham radio has to offer !
May 14, 15, 16, 1999

Dayton Hamvention® is something that all hams should experience!

Listen to the Forum Speakers! We have free Forums on virtually every topic, from VHF/UHF to DX, SSTV/ATV, Packet, AMSAT/SAREX, antennas, contesting and much much more. Since our visitors have diverse interests, we try to have something for everyone.

Visit the exhibits! With over 500 indoor exhibit booths you can find anything from antennas and books to computers, electrical parts, meters, software, tools, wire and weather instruments. You name it and someone probably has it for sale at the Dayton Hamvention®.

A family event!. At Hamvention®, you are among friends, other hams just like you that have come to Dayton to enjoy the show.

Enjoy the Alternate Activities. We have planned activities for those who just want to do something different. Bus tours of the area, progressive lunches and more. In addition, many clubs have Unofficial Activities at local hotels and restaurants.

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***

Need a brochure? Send us e-mail at **info@hamvention.org** or FAX us at 937-274-8369.

General Chairman Dick Miller, N8CBU • **Asst. General Chairman** Jim Graver, KB8PSO • **WEB & Internet Access** Compliments of EriNet

Sponsored by the Dayton Amateur Radio Association, Inc.

ADVANCE REGISTRATION

QST 3 4

FOR CHECK OR CREDIT CARD ORDERS:

Make checks payable to: Dayton HAMVENTION
Enclose the amount indicated in U.S. dollars. For credit card orders, please add $1.25/ticket handling charge.
A $25 service charge will be assessed on all returned checks.

Mail to: Dayton Hamvention Box 1446
Dayton, OH • 45401-1446
or
Fax to: (937) 454-5655

Please type or print your name and address clearly!

Event Dates: May 14, 15, 16, 1999

	Quantity		
Admission (valid all 3 days)	____	@ $16.00*	= $ ____
Grand Banquet	____	@ $40.00**	= $ ____
Alternate Activities			
Dine-a-Round, Friday	____	@ $17.00	= $ ____
City Tour, Friday	____	@ $7.00	= $ ____
Shop-A-Round, Saturday	____	@ $5.00	= $ ____
Cooking Class, Saturday	____	@ $20.00	= $ ____
Make It and Take It, Saturday	____	@ $5.00	= $ ____
Gardening Class, Saturday	____	@ $3.00	= $ ____
Mary Kay Make-Over, Saturday	____	@ $5.00	= $ ____
Credit Card Handling Charge	____	@ $1.25/ticket	= $ ____

* $20.00 at door **$45.00 at door, if available **Total $** ____

❑ ❑

Expiration Date: Month Year

Name _____ Call _____

Address _____

City _____ State Zip _____

Daytime Phone ( ) Evening Phone ( )

E-mail Address _____

PLEASE PRINT! THIS IS YOUR RETURN LABEL.

99 DAYTON hamvention®

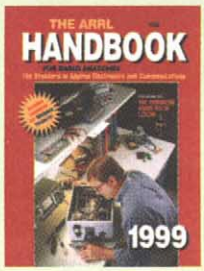
COUNTDOWN 2000!

Prepare your station for the NEXT millennium

...with help from ARRL Publications!

ORDER Toll-Free 1-888-277-5289

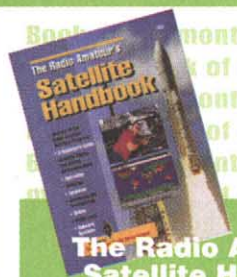
No other electronic or communications handbook measures up to it!



The 1999 ARRL Handbook for Radio Amateurs

All the reference data, project ideas and electronics theory you could ever need!

ARRL Order No. 1816—$32

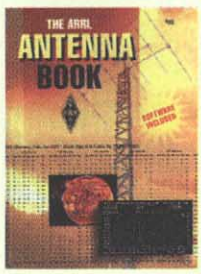


The Radio Amateur's Satellite Handbook

Turn your attention to the sky! You can operate and track the amateur satellites, regardless of your level of experience.

ARRL Order No. 6583—$22

Fun antenna projects and practical information!



The ARRL Antenna Book —18th Edition

Design, build and install almost any imaginable type of antenna. Software included!

ARRL Order No. 6133—$30

The ARRL Handbook CD 3.0

for Microsoft Windows

- Search the complete text of the **1999 ARRL Handbook.**
- Find it Fast!
- Print and Save!
- Project Templates included

ARRL Order No. 1824—$49.95

1999 Calendars!

These sharp 15-month 1999/2000 calendars will liven up any shack! Detail includes notable contests, phases of the moon (and perigees/apogees), meteor showers, and holidays.

CQ Amateur Radio Calendar color photos of stations, antennas, and hams. **ARRL #7172—$9.95**

CQ Radio Classics Calendar features vintage gear! **ARRL #7180—$9.95**

The entire book...at your command!

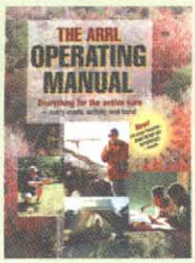
The ARRL Antenna Book CD 1.0

for Windows and Macintosh

- Easy to Use and Fully Searchable!
- Includes Yagi Analyzer and other antenna software! (DOS-based)
- Uses Adobe Acrobat Reader! (included)

PLUS 70,000 pages of band-by-band propagation tables for 140 worldwide locations!

ARRL Order No. 7229—$39.95



Your one-stop source for operating info!

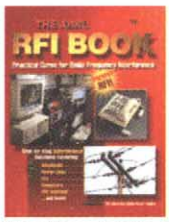
The ARRL Operating Manual

An indispensable guide for all active ham radio operators. Covers all popular activities, modes, and bands. **Bonus** booklet included—**the Ham Desktop Reference**—includes all the charts and tables most hams need every time they get on the air.

ARRL Order No. 6141—$25

The best advice available on every type of interference!

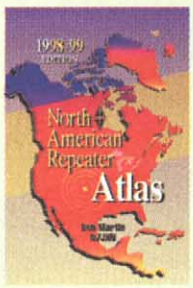
The ARRL RFI Book



Here are Real Cures to Real Interference Problems! Covers automotive, television, computers, lamps, VCRs, stereos, intermod, telephones, and interference due to powerlines. The latest RFI regulations, suppliers, and a complete bibliography!

ARRL Order No. 6834—$20

North American Repeater Atlas —1998/99 Edition



Over 175 pages of MAPS with repeater listings to help you keep-in-touch.

ARRL Order No. 6869—$12

Full Color & Fully Searchable!

QST on CD-ROM!

Search the full text of every *QST*, *QEX* (*The ARRL Experimenter's Exchange*) and *NCJ* (*The National Contest Journal*) published during an entire year! See every word, photo, drawing, table and ad! Requires Microsoft Windows.

ARRL Periodicals CD-ROM Sets:

1998 edition, coming soon!

1997 edition, Order No. 6729—$19.95

1996 edition, Order No. 6109—$19.95

1995 edition, Order No. 5579—$19.95

ARRL

225 Main Street
Newington, CT 06111-1494
tel: 860-594-0355
fax: 860-594-0303
e-mail: pubsales@arrl.org
World Wide Web:
http://www.arrl.org/

Order Toll-Free 1-888-277-5289
Mon-Fri 8 AM to 8 PM Eastern time

Shipping and Handling: In the US, add the following amounts to your order. International orders, add an additional $1.50 to the US rate. US orders shipped via UPS.

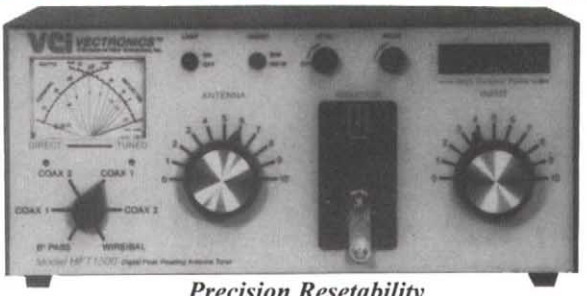
Amount of Order	Add
$10.00 or less	$3.00
10.01 - 20.00	$4.00
20.01 - 30.00	$5.00
30.01 - 40.00	$6.00
40.01 - 50.00	$7.00
50.01 - 75.00	$8.00
Over $75	$9.00
CD-ROM only	$4.00

QT 4/99

THE VECTRONICS HFT-1500 . . .
THE FINEST HIGH POWER ANTENNA TUNER MADE!

- *high current Roller Inductor*
- *SSB*Analyzer Bargraph™*
- *Cross-Needle Meter*
- *6 position Antenna Switch*
- *built-in 4:1 Balun*
- *gear driven Turns Counter*

HFT-1500
$459.95



The VECTRONICS HFT-1500 is not just an antenna tuner . . . it's a beautifully crafted work of art, using the finest components available and the highest quality construction.

Every HFT-1500 aluminum cabinet is carefully crafted with a durable baked-on paint that won't scratch or chip.

The attractive two-color Lexan front panel is scratch-proof. Take a quarter. Scratch the HFT-1500 front panel as much as you want. *You won't leave a mark!*

Arc-Free Operation

Two *heavy duty* 4.5 kV transmitting variable capacitors and a massive *high current* roller inductor gives you arc-free operation up to 2 kW PEP SSB.

Precision Resetability

A sturdy hand cranked roller inductor lets you quickly *fly* from band to band. A precision 5-digit *gear* driven turns counter lets you accurately return to your previous settings.

Large comfortable knobs and smooth vernier drives on the variable capacitors make tuning precise and easy. Bright red pointers on logging scales make accurate resetability a breeze.

Absolute Minimum SWR

***You** can tune your SWR down to absolute minimum!*

Why? Because *all* three matching network components, the roller inductor and both variable capacitors, are *fully* adjustable.

Tune any Antenna

You can tune any real antenna from 1.8 to 30 MHz, including all MARS and WARC bands. You can tune verticals, dipoles, inverted vees, yagis, quads, long-wires, whips, G5RVs, etc . . .

*SSB*Analyzer Bargraph™*

***VECTRONICS'** exclusive* 21 segment bargraph display lets you visually follow your instantaneous voice peaks. Has level and delay controls.

Accurate SWR/Power Meter

A *shielded* directional coupler and backlit Cross-Needle meter displays *accurate* SWR, forward and reflected power simultaneously. Reads both peak and average power on 300/3000 Watt scales.

6 Position Ceramic Antenna Switch

Select two coax fed antennas (tuned or bypassed), balanced line/wire or bypass.

Built-in Balun

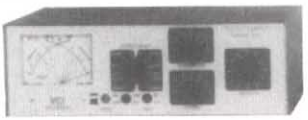
A 4:1 Ruthroff voltage balun feeds dual high voltage Delrin terminal posts for balanced lines. HFT-1500 is 5.5x12.5x12 inches.

Try any product for 30 days

Call toll-free 800-363-2922 and order any product from VECTRONICS. Try it for 30 days. If you're not completely satisfied return it for a full refund, less shipping and handling -- no hassles. All VECTRONICS products come with a one year warranty.

300 Watt Antenna Tuner

VC-300DLP
$159.95



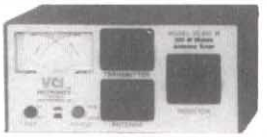
VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any antenna 1.8-30 MHz. Custom 48 position switched inductor and continuous rotation 1000 Volt capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, built-in 50 ohm dummy load, peak reading backlit cross-needle SWR Power meter, 4:1 balun for balanced line antenna. Scratch-proof Lexan front panel. 10.2x9.4x3.5 in. Weighs 3.4 lbs.

300 Watt *Mobile* Tuner

VC-300M
$109.95



The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna and *any* mobile HF transceiver and is compact enough to fit in the most compact car.

It can also be used at home with dipoles, vees, verticals, beams or quads fed by coax.

Backlit dual movement meter simultaneously monitors Power and SWR. Covers 1.8-30 MHz. Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz.). 7.25x8.75x3.6 in. Weighs 3.4 lbs.

SWR/Power Meters

PM-30
$79.95
PM-30UV
$89.95

PM-30, $79.95, for 1.8 to 60 MHz. Displays forward and reflected power and SWR simultaneously on dual movement Cross-Needle Meter. True *shielded* directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction includes scratch-proof case/front panel. 5.3x5.75x3.5 inches. SO-239 connectors.

For 144/220/440 MHz, 30/300 Watt ranges. PM-30UV, $89.95, has SO-239 connectors. PM-30UVN, $89.95, has N connectors. PM-30UVB, $89.95, has BNC connectors.

1500 Watt *dry* Dummy Load

DL-650M, $64.95. Handles 100 watts continuous, 1500 Watts for 10 seconds to 650 MHz. Ceramic resistor. SWR < 1.3. SO-239 connector. **DL-650MN, $69.95** has N connector.

Low Pass TVI Filter

LP-30, $69.95. Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1500 watts.

High Pass TVI Filter

HPF-2, $24.95. Installs between VCR/TV and cable TV or antenna lead-in cable. Eliminates or reduces interference caused by nearby HF transmitters.

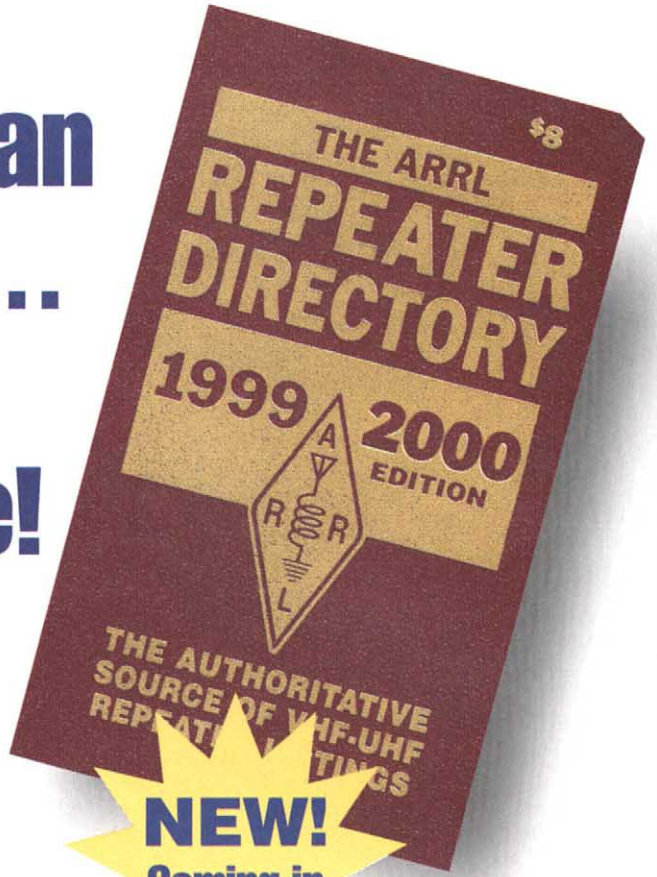
VECTRONICS®

. . . the finest amateur radio products made

VECTRONICS 1007 Hwy 25 S, Starkville, MS 39759 USA **VOICE:** (601)323-5800 **FAX:** (601)323-6551 **Web:** http://www.vectronics.com

Free catalog, nearest dealer or to order call 800-363-2922

It's Built So You Can Take It Anywhere... Because You'll Use It Everywhere!



NEW! Coming in April

You'll find nearly 21,000 FM voice and ATV repeater listings for North, South and Central America, Europe and the Middle East. The bandplan section has been revised to reflect recent ITU Region 1 changes. Information on repeater general use, locating and dealing with jammers and wilderness protocol are all addressed as well. You'll find lists of ARRL Officers and regional frequency coordinators' contact information.

Put a copy in your pocket, TODAY!

The 1999-2000 ARRL Repeater Directory. It's the pint-size book—packed with a goldmine of information—at a pint-size price. Retail $8 plus $3 for UPS Shipping. ARRL Order No. 7342

The best part is the size and format. You can easily stow ***The ARRL Repeater Directory*** in your car, bike, boat, backpack, hamshack—wherever. And the user friendly format makes it a breeze to thumb to the section you're looking for—quickly and easily.

ARRL 225 Main Street • Newington, CT 06111-1494

Extended Ordering Hours: 8 AM - 8PM Eastern time, Mon.-Fri.

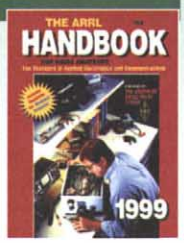
tel: 860-594-0355 fax: 860-594-0303
e-mail: pubsales@arrl.org Web: http://www.arrl.org/

Call our toll-free number **1-888-277-5289** today! We'll be happy to take your order or provide you with the location of an ARRL Publications Dealer in your area.

ARRL Publications BOOKCASE

Ordering Hours 8 AM - 8 PM Eastern time Mon.-Fri. Toll-free 1-888-277-5289

Handy References



New Edition

The 1999 ARRL Handbook for Radio Amateurs The standard in applied electronics and communications. This 76th edition includes new projects! Order No. 1816 ..... **$32**

1999 ARRL Handbook CD . Find it Fast! Search and view the complete text of the 1999 ARRL Handbook. Print and save. Project templates included. Version 3.0. Order No. 1824 ..... **$49.95**

North American Repeater Atlas—1998/99 Edition Repeater maps for every US state, Canada, Mexico, Central America, and the Caribbean. Also includes street maps showing repeater frequencies for most US metropolitan areas. Order No. 6869 ..... **$12**

The 1998-1999 ARRL Repeater Directory. Listings for nearly 21,000 FM voice and ATV repeaters located in North, Central and South America. Order No. 6702 ..... **$8**

***TravelPlus for Repeaters™ CD-ROM*—1998/99 Edition**. Use detailed maps to choose your route, and **TravelPlus** will identify all of the repeaters along the way! Includes the entire ARRL VHF/UHF Repeater DataSource. **New features** include linking to GPS units for live tracking; view grid squares and latitude/longitude; browse *ARRL Net Directory* listings. Order No. 6745 ..... **$39.95**

The Radio Amateur's World Atlas. Booklet of full-color maps showing country boundaries, call-sign prefix boundaries, CQ zones, states and provinces, and more. Order No. 5226 ..... **$9.95**

New th Edition

ARRL's FCC Rule Book. Understand the Amateur Service rules. Includes complete text of Part 97. Order No. 6966 ..... **$12**

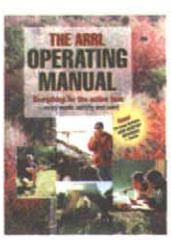
ARRL Circular Frequency Chart. Locate your frequency privileges with ease! Colorful chart includes handy operating aids. Order No. 6826 ..... **$7.95**

The ARRL Net Directory 1997-98 edition. Order. No. 6265 ..... **$4**

The ARRL VHF/UHF Radio Buyer's Sourcebook. Nearly 100 product reviews covering amplifiers, antennas and accessories, and all types of transceivers. Order No. 6184 ..... **$12**

The Best of the New Ham Companion. From the popular ***QST*** column. Order No. 6001 ..... **$12**

Operating/SWL



The ARRL Operating Manual. Make the best use of your station and operating privileges. Order No. 6141 ..... **$25**

udio CD Inside!

DXing on the Edge—The Thrill of 160 Meters Operating tips and fascinating history. Book with audio CD! Order No. 6354 ..... **$29.95**

Personal Computers in the Ham Shack. Learn how you can enhance your enjoyment of ham radio with computers. Order No. 5714 ..... **$15.95**

The ARRL RFI Book. Real Answers and Real Cures to your radio frequency interference problems. Order No. 6834 ..... **$20**

RF Exposure and You. Meet the new FCC RF exposure regulations. It's not complicated! Step-by-step worksheets and tables included. Order No. 6621 ..... **$15**

Your VHF Companion. FM and repeaters, packet, satellites, amateur TV and more. Order No. 3878 ..... **$10**

Your Mobile Companion. A practical, easy-to-digest introduction to the fun that awaits the mobile operator. Order No. 5129 ..... **$12**

Your Packet Companion will get you on the cutting edge of digital ham radio in no time. Order No. 3959 ..... **$10**

Your Ham Antenna Companion. All the antenna basics! Order No. 5110 ..... **$10**

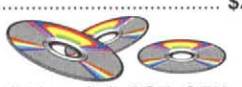
QRP Power shows just how much fun it is to operate with 5 W or less. Order No. 5617 ..... **$12**

Hints and Kinks for the Radio Amateur. Best tips, suggestions and projects from the popular ***QST*** column. Order No. 6095 ... **$12**

The ARRL DXCC List (November '98 ed.) Order No. 7067 ..... **$3**

Passport to World Band Radio (1999) is the TV Guide of shortwave listening. Order No. 7202 ..... **$20**

Computer Software Library



ARRL Periodicals CD-ROM is a compilation of all ***QST***, ***QEX*** and ***NCJ*** issues on one CD.

1997 Edition, Order No. 6729 ..... **$19.95**
1996 Edition, Order No. 6109 ..... **$19.95**
1995 Edition, Order No. 5579 ..... **$19.95**

QST View CD-ROM includes back issues of ***QST*** in convenient, space-saving CD-ROM format. ..... **$39.95 per set.**

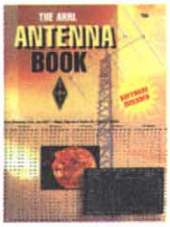
QST View Collection. Includes all 11 CD-ROM sets! Order No. QSTV ~~$439.45~~ ..... **Now $373.45**

Years 1990-94 Order No. 5749	1965-69 Order No. 6451
1985-89 Order No. 5757	1960-64 Order No. 6443
1980-84 Order No. 5765	1950-59 Order No. 6435
1975-79 Order No. 5773	1940-49 Order No. 6648
1970-74 Order No. 5781	1930-39 Order No. 6710
THE FIRST YEARS!	**1915-29 Order No. 7008**

Buckmaster's HamCall CD-ROM. Features latest US and extensive international listings. Updated regularly. Order No. 7164 ..... **$49.95**

The Radio Amateur Callbook CD-ROM. Includes more than 1.4 million listings world-wide, and prefix maps. 1999 edition. Order No. 7210 ..... **$49.95**

Antennas and Transmission Lines



NEW CD-ROM!

The ARRL Antenna Book is the definitive source for information on state-of-the-art antenna and transmission line theory and construction. Order No. 6133 ..... **$30**

The ARRL Antenna Book CD 1.0. Easy to use, fully-searchable CD-ROM for Windows and Macintosh. The entire book—every word and every page—PLUS 70,000 pages of propagation tables! Order No. 7229 ..... **$39.95**

ARRL Antenna Compendium Volume 1. Articles on multiband portable, quads and loops, baluns and the Smith Chart Order No. 0194 ..... **$10**

ARRL Antenna Compendium Volume 2. Verticals, an attic tribander, antenna modeling and propagation. Order No. 2545 ..... **$14**

ARRL Antenna Compendium Volume 3. Discover a 12-meter quad, a discone, modeling and VHF/UHF ray tracing. Order No. 4017 ..... **$14**

ARRL Antenna Compendium Volume 4. *Includes IBM-format software.* More antenna-ideas and practical projects. Order No. 4912 ..... **$20**

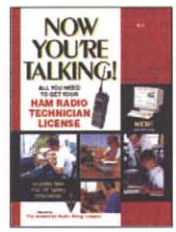
ARRL Antenna Compendium Volume 5. *Includes IBM-format software.* Baluns, HF beams and Yagis, quads, verticals, and more. Order No. 5625 ..... **$20**

ARRL Microsmith version 2.3. Smith Chart simulation program. IBM 3.5-inch diskette. Order No. 4084 ..... **$39**

Antennas and Techniques for Low Band DXing. Antennas and operating strategies you'll need to span the continents on 40, 80 and 160 meters. Order No. 4661 ..... **$20**

Vertical Antenna Classics Order No. 5218 ..... **$12**

License Study Materials



Now You're Talking!: All You Need to Get Your Ham Radio Technician License. A complete study guide for your first license. Good through 6/30/2001. Order No. 5978 ..... **$19**

The ARRL's Tech Q&A—Your Quick & Easy Path to a Technician Ham License. Question-and-answer-format study guide for the new Novice and Technician license exams. Good through 6/30/2001. Order No. 6222 ..... **$12.95**

With our exclusive **Licensing Video Courses**, you'll be on-the-air or get your upgrade in no time!

ARRL Technician Class Video Course. Good through 6/30/2001. Order No. 6192 ..... **$99**
With Computerized Exam Review Software (Windows). Order No. 6206 ..... **$129**

ARRL General Class Video Course. Includes Morse Academy software. Good through 6/30/2002. Order No. 6885 ..... **$99**
With Computerized Exam Review Software (Windows). Order No. 6877 ..... **$129**

ARRL Advanced Class Video Course. Good through 6/30/99. Order No. 5227 ..... **$99**
With Computerized Exam Review Software (Windows). Order No. 5315 ..... **$129**

General Class License Manual. Good through 6/30/2002. Order No. 6761 ..... **$14**

Advanced Class License Manual. Good through 6/30/99. Order No. 4947 ..... **$12**

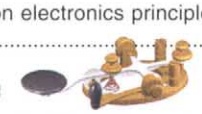
Extra Class License Manual. Good through 6/30/2000. Order No. 5390 ..... **$12**

Ham Radio Made Easy may be the only beginner-level book with "attitude." Order No. 5374 ..... **$15.95**

Understanding Basic Electronics is for beginners and those who want to brush up on electronics principles. Order No. 3983 ..... **$20**

First Steps in Radio. A tutorial on electronics principles tailored to the beginner. Order No. 2286 ..... **$6**

Learning the Morse Code



ARRL code practice tapes and audio CDs take you from 0 to 22 words per minute. Each set includes two cassette tapes or two audio CDs with nearly 2-1/2 hours of practice. Start with ***Your Introduction to Morse Code*** to learn all the characters and pass the 5 WPM exam:

	Cassettes	Audio CDs
Your Intro. to Morse Code	#5986 ..... **$12**	#5811 .... **$14**
ARRL 5-10 WPM Code	#6567 ..... **$12**	#6575 .... **$14**
ARRL 10-15 WPM Code	#6397 ..... **$12**	#6400 .... **$14**
ARRL 15-22 WPM Code	#6931 ..... **$12**	#6923 .... **$14**

Morse Tutor Gold software for IBM PCs and compatibles teaches you the code and provides plenty of practice. 3.5-inch diskettes Order No. 3258 ..... **$30**

Morse Code: The Essential Language Order No. 0356 ..... **$8**

Packet and Digital

Packet: Speed, More Speed and Applications is for packet enthusiasts interested in medium- to high-speed packet systems. Order No. 6052 ..... **$15**

Practical Packet Radio covers everything the packet-active ham needs to know: setting up a station, getting on the DX packet cluster, and much more. Order No. 5307 ..... **$15.95**

Getting on Track with APRS: A Hands-On Guide to the Automatic Packet Reporting System is your one stop for quick-and-easy instructions for installing and using this exciting new map-based tracking system. Order No. 5854 ..... **$14.95**

Practical Circuits and Design

ARRL Radio Designer 1.5 CD-ROM. Create computerized models of audio, radio and electronic circuits. See how they work before you begin building. Order No. 6796 ..... **$150**

Introduction to Radio Frequency Design presents a treatment of the fundamental methods of radio frequency design using mathematics as needed to develop intuition for RF circuits and systems. Order No. 4920 ..... **$30**

The ARRL Electronics Data Book is an aid to the radio amateur or RF design engineer. Includes valuable tables and charts for formulas and semiconductor pin-out diagrams, plus many popular circuits and building blocks. Order No. 2197 ..... **$15**

Solid State Design for the Radio Amateur. Essential for every technical library. Circuit design and applications for radios, power supplies and test equipment. Order No. 0402 ..... **$15**

W1FB's Design Notebook: Practical Circuits for Experimenters is just the book for the avid builder of Amateur Radio equipment. Order No. 3207 ..... **$10**

The ARRL Spread Spectrum Sourcebook contains reprints of most spread spectrum articles from QST and QEX and more. Order No. 3177 ..... **$20**

W1FB's QRP Notebook is packed with construction projects for QRP transmitters, receivers and accessories. Order No. 3657 ..... **$10**

Space and VHF/UHF/Microwave Communications

The Radio Amateur's Satellite Handbook. The most complete book for every satellite operator and beginner! Station setup, antennas, tracking, and operating details for active ham satellites and Phase 3D. Order No. 6583 ..... **$22**

The ARRL Satellite Anthology. *Includes Phase 3D details.* Order No. 5595 ..... **$12**

Weather Satellite Handbook. An easy-to-use reference for anyone interested in viewing our world from space. Order No. 4483 ..... **$20**

The ARRL UHF/Microwave Experimenter's Manual includes information on design and fabrication techniques, propagation, antennas and much more. Order No. 3126 ..... **$20**

The ARRL UHF/Microwave Projects Manuals. **Volume 1** has dozens of construction articles for transverters, preamplifiers, antennas, and test and measurement equipment. **Volume 2** has more practical projects, including amplifiers, antennas, using TVRO feed, and a no-tune transverter!
Vol. 1 Order No. 4491 ..... **$20**
Vol. 2 Order No. 6311 ..... **$15**

If you'd like a complete publications listing or would like to place an order, please contact us:

1. **To order or obtain the address of an ARRL Dealer near you, call toll-free (US): 1-888-277-5289 (non-US call 860-594-0355)—8 AM-8 PM Eastern time, Monday-Friday.**
2. **Fax 1-860-594-0303 24 hours a day, 7 days a week.**
3. **By mail to: ARRL, 225 Main St, Newington CT 06111-1494 or**
4. **Visit our World Wide Web site: http://www.arrl.org/**

Shipping and Handling Information

In the US, add the following amounts to your order to cover shipping and handling (S/H). Add an additional $1.50 to the US rate for shipment outside the US. US orders will be handled via UPS or comparable service where UPS delivery is not possible. International Air and other specialty forwarding methods are available. Please call or write for information. Sales Tax is required for shipments to CT 6% (including S/H), VA 4.5% (excluding S/H), CA 7.25% (excluding S/H). Canadian Provinces NS, NB and NF add 15% HST, all other Provinces add 7% GST (excluding shipping/handling).

Amount of Order	Add	Amount of Order	Add
$10.00 or less	$3.00	40.01 - 50.00	7.00
10.01 - 20.00	4.00	50.01 - 75.00	8.00
20.01 - 30.00	5.00	Over $75.00	9.00
30.01 - 40.00	6.00		

We accept the following major credit cards: American Express, MasterCard, Visa and Discover.

Prices are subject to change without notice.

Radio Society of Great Britain Products Imported by ARRL!

Communication Reference

Packed with technical information!

Radio Communication Handbook

Covers semiconductors, HF and VHF/UHF receivers, transmitters and transceivers, microwaves, propagation, HF and VHF/UHF antennas, amateur satellites and space communications, image techniques, power supplies, and much more. PCB layouts included. 760 pages. **ARRL Order No. 5234—$38**

Calling All LowFERs!

The LF Experimenter's Source Book

Food for the dedicated Low Frequency experimenter! In the US, unlicensed "Lowfers" may operate 1-watt between 160 and 190 kHz. Are you up for the challenge? Antennas, propagation, receivers, transmitters, special modes and test equipment. Plenty of detail for the LF beginner! 146 pages (comb bound). **ARRL Order No. 7148—$15**

Good radio housekeeping!

The RSGB Guide to EMC

Diagnose and cure unwanted RF interference and achieve electromagnetic compatibility (EMC). Also covers filters and braid-breakers. 204 pages. **ARRL Order No. 7350—$30**

Microwave Handbook, Volume 1

Operating techniques, system analysis and propagation, microwave antennas, transmission line and components, microwave semiconductors and tubes. 200 pages. **ARRL Order No. 2901—$35**

Microwave Handbook, Volume 2

Construction techniques, common equipment, microwave beacons and repeaters, test equipment, safety, filters and additional circuit data. 244 pages. **ARRL Order No. 3606—$35**

Microwave Handbook, Volume 3

Microwave theory and practice, reference information, practical designs, hints and tips. Covers 1.3-24 GHz. 284 pages. **ARRL Order No. 3975—$35**

RadCom 1997 on CD-ROM

All of the words, diagrams and photographs of the technical articles, news and reviews published in RadCom magazine during 1997. Includes a fully searchable keyword index covering all 12 issues; all 1200 pages including all advertisements; and Adobe® Acrobat® Reader for Windows. **ARRL Order No. 7156—$30**

VHF/UHF Handbook

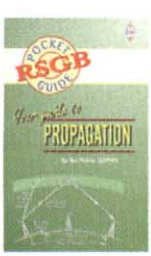
A guide to the theory and practice of VHF/UHF operating and transmission lines. Includes essential background on antennas, EMC, propagation, receivers and transmitters, together with construction details for many projects. Plus, information on specialized modes such as data and TV. 317 pages. **ARRL Order No. 6559—$35.95**

Antennas

Take the guesswork out of experimenting!

The Antenna Experimenter's Guide

Build and use simple RF equipment to measure antenna impedance, resonance and performance. General antenna construction methods, how to test theories, and using a computer to model antennas. 158 pages. **Order No. 6087—$25**



NEW! Pocket Guide!

Your Guide to Propagation

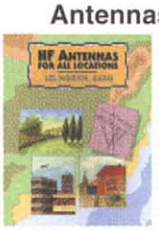
This handy, easy-to-read guide takes the mystery out of radio wave propagation. It will benefit anyone who wants to understand how to get better results from their station. **ARRL Order No. 7296—$10**

Outstanding Antennas!

HF Antenna Collection

Articles from RSGB's RadCom magazine. Single- and multi-element horizontal and vertical antennas, very small transmitting and receiving antennas, feeders, tuners and more. 240 pages. **ARRL Order No. 3770—$18**

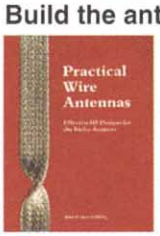
Antennas for every situation!



HF Antennas for All Locations

Design and construction details for hundreds of antennas, including some unusual designs. Don't let a lack of real estate keep you off the air! 322 pages. **ARRL Order No. 4300—$35**

Build the antenna that's right for you!



Practical Wire Antennas

Dive into the practical aspects of HF wire antennas: how the various types work, and how to buy or build one that's right for you. Marconis, Windoms, loops, dipoles and even underground antennas—they're all covered! The final chapter covers matching systems. 100 pages. **ARRL Order No. R878—$14**

Radio Auroras

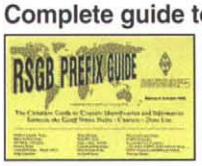
Explore the world of Amateur Radio communications via auroral propagation. What causes auroras, how they are forecast and how to best use them to work DX. You'll find an abundance of tables and charts. 96 pages. **Order No. 3568—$18**

Operating

The VHF/UHF DX Book

Assemble a VHF/UHF station, and learn about VHF/UHF propagation, operating techniques, transmitters, power amplifiers and EMC. Includes designs for VHF and UHF transverters, power supplies, test equipment and much more. 448 pages. **Order No. 5668—$28**

Complete guide to country Identification!



RSGB Prefix Guide

DXCC listings by prefix, useful data such as CQ/ITU Zones, hours +/- on UTC and latitude/longitude. Ed 4, October 1998. **Order No. 7237—$12.95**

The official IOTA award sourcebook!

RSGB IOTA Directory and Yearbook – 1998/99

Try your hand at island expeditioning! The entire IOTA (Islands on the Air) award material, much statistical information and features many national island programs. **ARRL Order No. 6079—$15**

Shipping:
US orders add $4 for one item, plus $1 for each additional item ($9 max). International orders add $1.50 to US rate ($10.50 max). US orders shipped via UPS.

ARRL 225 Main St, Newington, CT 06111-1494 tel: 860-594-0355 Order Toll Free 1-888-277-5289
fax: 860-594-0303 e-mail: pubsales@arrl.org World Wide Web: http://www.arrl.org/

Index of Advertisers

ADVERTISING DEPARTMENT STAFF

Hanan Suleiman, KB1AFX, Advertising Assistant
Robin Micket, N1WAL, Classified Coordinator

Direct Line: 860-594-0207
e-mail: ads@arrl.org

Fax: 860-594-0259
http://www.arrl.org/ads

SAVE ON ANTENNAS, TOWERS, WIRE & CABLE

TELESCOPING ALUMINUM TUBING

DRAWN 6063-T832

.375 ... $.60/ft	1.250" ... $1.40/ft
.500" ... $.70/ft	1.375" ... $1.55/ft
.625" ... $.80/ft	1.500" ... $1.75/ft
.750" ... $.90/ft	1.625" ... $2.00/ft
.875" ... $1.00/ft	1.750" ... $2.25/ft
1.000" ... $1.10/ft	1.875" ... $2.50/ft
1.125" ... $1.25/ft	2.000" ... $2.75/ft
	2.125" ... $3.00/ft

In 6' or 12' lengths, 6' lengths ship UPS. Call for 3/16"& 1/4" rod, bar stock, and extruded tubing.

CUSHCRAFT ANTENNAS

X7/X9	$489/699
XM240	$519
R6000/R7000	$269/359
A50-3S/5S/6S	$85/139/219
AR2/ARX2B	$39/59
AR270/AR270B	$65/95
ARX270U/ARX270N	$219
13B2/17B2/26B2	$99/179/289
719B/729B	$99/159
A270-6S/A270-10S	$59/69

Please call for more Cushcraft items

KLM ANTENNAS

10M4/M6	$229/369
15M4/M6	$255/599
20M4/M5/M6	$475/735/1065
40M2B/3/4	$565/759/979
KT34A/34XA	$539/749
6M5/7LB/10	$219/319/459
2M16LBXM/2M20LBX	$210/259
2M22C/435-18C	$210/219
440-6X/10X/16X	$59/69/125
432-20LBX/30/40	$159/185/249

Please call for more KLM antennas

US TOWER

MA40/MA550	$659/1055
MA770/MA850	$2359/3649
TMM433SS/HD	$1139/1379
TMM541SS	$1499
TX438/TX455	$1069/1319
TX472/TX489	$2649/4599
HDX538/HDX555	$1379/1919
HDX572	$6329

Please call for help selecting a US Tower for your needs. Shipped factory direct to save you money!

BENCHER / BUTTERNUT

Skyhawk, Triband Beam	$859
HF2V, 2 Band Vertical	$179
HF5B, 5 Band Minibeam	$399
HF6VX, 6 Band Vertical	$249
HF9VX, 9 Band Vertical	$289
A1712, 12/17m Kit	$45
CPK, Counterpoise Kit	$99
RMKII, Roof Mount Kit	$125
STRII, Roof Radial Kit	$89
TBR160S, 160m Kit	$95

More Bencher/Butternut–call

M2 VHF/UHF ANTENNAS

144–148 MHz

2M4/7/9/12	$80/99/109/145
2M5WL/2M8WL	$179/299
2M5-440XP, 2m/70cm	$149

420–450 MHz

420-450-5/420-450-11	$119/84
432-9WL/432-13WL	$159/209
440-18/440-21ATV	$109/129

Satellite Antennas

2MCP14/2MCP22	$155/209
436CP30/436CP42UG	$219/249

FORCE 12 ANTENNAS

C3/C31XR	$519/1119
C3S/C3SS	$459/449
C4/C4S	$660/569
C4SXL/C4XL	$839/929
EF240/EF240S	$539/469
EF410/EF415	$249/339
EF417/EF420	$379/499
EF510/EF610	$339/429
WARC2-2/WARC7	$379/759
ZR3, Low Profile Triband	$429

Please call for more Force 12 items

ROHN TOWER

25G/45G/55G	$79/179/229
AS25G/AS455G	$39/89
GA25GD/45/55	$68/89/115
GAR30/GAS604	$35/24
SB25G/45/55	$39/89/109
TB3/TB4	$85/99
HBX32/HBX40	$349/439
HBX48/HBX56	$589/699
HDBX40/HDBX48	$549/699
BXB5/6/7/8	$39/49/59/59

Please call for more Rohn prices

COMET ANTENNAS

GP15, 6m/2m/70cm Vertical	$149
GP6, 2m/70cm Vertical	$149
GP9, 2m/70cm Vertical	$179
QE5, 2m/70cm Mobile	$49
SBB2NMO, 2m/70cm Mobile	$39
SBB5NMO, 2m/70cm Mobile	$49
SBB7NMO, 2m/70cm Mobile	$75
Z750, 2m/70cm Mobile	$55
Z780, 2m/70cm Mobile	$69
B10NMO, 2m/70cm Mobile	$36

Much more Comet in stock–call

M2 ANTENNAS

50–54 MHz

6M5/6M7	$189/269
6M2WLC/6M2.5WLC	$399/529

220–226 MHz

222-7EZ/222-10EZ	$79/89
222-5WL/222-7WL	$145/179

900–928 MHz

902-18EZ/902-14WL	$119/179

1250–1300 MHz

23CM22EZ/23CM35EZ	$85/139

More M2 models in stock–please call

GLEN MARTIN ENGINEERING

Hazer Elevators for 25G

H2, Aluminum Hazer, 12 sq ft	$359
H3, Aluminum Hazer, 8 sq ft	$269
H4, HD Steel Hazer, 16 sq ft	$339

Aluminum Roof Towers

RT424, 4 Foot, 6 sq ft	$159
RT832, 8 Foot, 8 sq ft	$229
RT936, 9 Foot, 18 sq ft	$389
RT1832, 17 Foot, 12 sq ft	$499

Please call for Glen Martin info

UNIVERSAL ALUMINUM TOWERS

4-40'/50'/60'	$519/739/1049
7-50'/60'/70'	$939/1369/1789
9-40'/50'/60'	$729/1049/1469
12-30'/40'	$559/869
15-40'/50'	$969/1399
23-30'/40'	$859/1289
35-30'/40'	$979/1509

Bold in part number shows wind-load capacity. Please call for more Universal models. All are shipped factory direct to save you money!

DIAMOND ANTENNAS

D130J/DPGH62	$79/139
F22A/F23A	$89/119
NR72BNMO/NR73BNMO	$39/54
NR770HBNMO/NR790A	$55/75
X200A/X300A	$129/159
X500HNA/700HNA	$229/369
X510MA/510NA	$189/189
X50A/V2000A	$99/149
CR627B/SG2000	$99/69
SG7500NMO/SG7900A	$75/112

More Diamond antennas in stock

MFJ ANTENNAS

259B Antenna Analyzer	$219
1798, 80–2m Vertical	$239
1796, 40/20/15/10/6/2m Vert.	$179
1793, 80/40/20m Vertical	$159
1792, 80/40m Vertical	$145
1788, 40–15m Loop	$399
1786, 30–10m Loop	$349
1780, 14–30 MHz Loop	$229
1768, 2m/70cm Beam	$65
1762, 3 Element 6m Beam	$65

Big MFJ inventory–please call

COAX CABLE

RG-213/U, (#8267 Equiv.)	$.36/ft
RG-8X, Mini RG-8 Foam	$.19/ft
RG-213/U Jumpers	Please Call
RG-8X Jumpers	Please Call

Please call for more coax/connectors

TIMES MICROWAVE LMR COAX

LMR-400	$.59/ft
LMR-400 Ultraflex	$.89/ft
LMR-600	$1.19/ft
LMR600 Ultraflex	$1.95/ft

TOWER HARDWARE

3/8"EE / EJ Turnbuckle	$10/11
1/2"x9"EE / EJ Turnbuckle	$15/16
1/2"x12"EE / EJ Turnbuckle	$17/18
3/16" / 1/4" Preformed Grips	$4/5

Please call for more hardware items

HIGH CARBON STEEL MASTS

5 FT x .12/.18"	$35/59
10 FT x .12/.18/.25"	$65/110/149
15 FT x .12/.18"	$95/160
20 FT x .12/.18/.25"	$120/199/289

GAP ANTENNAS

Challenger DX	$259
Challenger Counterpoise	$25
Challenger Guy Kit	$14
Eagle DX	$269
Titan DX	$299
Eagle/Titan Guy Kit	$22
Voyager DX	$389
Voyager Counterpoise	$49
Voyager Guy Kit	$38

Please specify 80m capacitor when ordering Challenger DX or Titan DX.

LAKEVIEW HAMSTICKS

9106 ... 6m	9115 ... 15m	9130 ... 30m	
9110 ... 10m	9117 ... 17m	9140 ... 40m	
9112 ... 12m	9120 ... 20m	9175 ... 75m	

All handle 600W, 7' approximate length, 2:1 typical VSWR ... $19.95

HUSTLER ANTENNAS

4BTV/5BTV/6BTV	$129/169/189
G6-270R, 2m/70cm Vertical	$149
G6-144B/G7-144B	$109/159

Hustler Resonators in stock–call

ANTENNA ROTATORS

M2 OR-2800P	$1095
Yaesu G-450A	$239
Yaesu G-800S/SDX	$319/399
Yaesu G-1000SDX	$479
Yaesu G-2800SDX	$1069
Yaesu G-550/G-5500	$289/499

ROTATOR CABLE

R51(#20)/R52 (#18)	$.22/.32/ft
R61 (#20)/R62 (#18)	$.28/32/ft.
R81/82/83/84	$.25/.39/.52/.85/ft

PHILYSTRAN GUY CABLE

HPTG1200I	$.39/ft
HPTG2100I	$.52/ft
PLP2738 Big Grip (2100)	$5.50
HPTG4000I	$.79/ft
PLP2739 Big Grip (4000)	$7.65
HPTG6700I	$1.15/ft
PLP2755 Big Grip (6700)	$10.95
HPTG11200	$1.55/ft
PLP2558 Big Grip (11200)	$16.50

Please call for more info or help selecting the Phillystran size you need.

WEEKDAY HOURS:
9AM–5PM CST

SATURDAY HOURS:
9AM–1PM CST

CREDIT CARDS:
M/C, VISA, DISCOVER

TEXAS TOWERS

A Division of Texas RF Distributors, Inc.; 1108 Summit Avenue, Suite #4; Plano, TX 75074

(800) 272-3467

LOCAL CALLS:
(972) 422-7306

EMAIL ADDRESS:
sales@texastowers.com

INTERNET ADDRESS:
www.texastowers.com

HUGE YAESU DEALS!

VISIT US ON THE WEB! http://www.TexasTowers.com

YAESU DEALS

Texas Towers has Yaesu specials galore! In addition to our every day low prices, Yaesu is offering additional savings coupons for several of the radios shown on this page. So be sure to give us a call – Texas Towers really does sell for less!

FT-1000MP Please Call For Special!
FT-1000D / FT-1000 ..... Please Call!

Call for Specials!

FT-847 ..... Now In Stock, Call!

- 160–10m/6m/2m/70cm All Mode XCVR • DSP
- Satellite Ready • Optional External Auto Tuner

HF, 6M, 2M & 70CM ALL MODE XCVR!

FT-8500, 2m/70cm Mobile HUGE SPECIAL!
FT-8100, NEW 2m/70cm Mobile .... Call!

NEW LOW PRICE!

G-2800SDX: Features 34 sq. ft. capacity, 450° rotation, preset control, and more!

G-2800SDX (34 sq. ft.)* .. Call for price!
G-1000SDX (23.5 sq ft.)* .. Call for price!
G-800S / SDX (17 sq. ft.)* ... Please Call!
G-450XL (11 sq. ft.) ..... Please Call!
G-5400B Az/Elevation* .... Please Call!
G-500 Elevation Rotor* .. Call for price!

*** PLUS $25 OFF YAESU COUPON!**

FT-920 ..... Call For Price!

- 160–6m XCVR • 100 W Output • DSP
- Auto Tuner • FM Option • CW Keyer

PLUS FREE FM-1!

FT-840 ..... Call For Yaesu Special!

- 160–10m XCVR • 100 W Output • FM Option
- Compact Size • LCD Display • Much More

AFFORDABLE HF TRANSCEIVER!

FT-2500 2m Mobile XCVR ..... Call!
FT-3000 2M Mobile XCVR, 70W ..... Call!

NEW LOW PRICES!

VX-1R ..... Call!

- Super Compact 2m/70cm FM HT
- 290 Memory Channels
- Alpha Numeric Display
- AM Receive (.5–1.7 MHz)
- Autodial Memory (10 Channels)
- CTCSS Tone Encode/Decode/Scan
- AM/FM/FM Wide RX Modes
- DTS Paging & Squelch
- Yaesu's ARTS System
- DTMF Memory
- Extended RX (76–999 MHz) Cellular Blocked
- Supplied with FNB-52 Li-Ion Battery Pack, Two-Hour Plug-In Wall Charger, Belt Clip, Rubber Duck Antenna, and More!

NEW LOW PRICE!

FT-50RD ..... Please Call!

- Compact 2m/70cm HT
- Built to Mil. Spec. MIL-STD 810
- 112 Memory Channels
- CTCSS Tone Encode
- CTCSS Tone Decode
- DTMF Paging
- DTMF Squelch
- Dual Watch
- Extended RX 76–200 MHz
  300–540 MHz
  590–999 MHz
  (Cellular Blocked)
- Optional ADMS-1D Software
- Supplied with NiCad Battery Pack, Wall Charger, Belt Clip, Rubber Duck Antenna, and More!

NEW LOW PRICE!

FT-51RH ..... Call!

- Tiny 2m and 70cm FM HT
- 120 Memory Channels
- Alpha Numeric Display
- AM Receive (110–138 MHz)
- Autodial Memory (10 Channels)
- CTCSS Tone Encode
- CTCSS Tone Decode
- CTCSS Scan (Finds Tone)
- DTMF Paging & Squelch
- 5 Watts RF Output
- Direct Keypad Frequency Entry
- Extended RX (110–180 MHz)
- Extended RX (420–470 MHz)
- Supplied with FNB-31 NiCad Battery, Charger, Belt Clip, Rubber Duck, and More!

NEW LOW PRICE!

Prices, specifications, and stock quantities are subject to change without notice or obligation. Call for special Yaesu coupons!

CALL TOLL FREE

(800) 272-3467

email: sales@texastowers.com internet: http://www.texastowers.com

WEEKDAYS: CENTRAL TIME 9AM–5PM

SATURDAYS: 9AM–1PM

M/C•VISA DISCOVER

TECH LINE (972) 422-7306 FAX LINE (972) 881-0776

TEXAS TOWERS

A Division of Texas RF Distributors, Inc. • 1108 Summit Avenue, Suite #4 • Plano, TX 75074 •

HF ENTHUSIASM

Yaesu, Choice of the World's top DX'ers

Over 40 years of experience in HF transceiver design has firmly established Yaesu as the choice of the world's top DX'ers. The knowledge that produced unequaled RF technology and design that is found in the State of the Art FT-1000MP can also be found in the miniature FT-100. The FT-100 while small in size 6.3"×2.1"×8.1"(160 W×54 H×205 D mm :w/o knob) is large in features and performance. This is accomplished by using the most advanced manufacturing techniques and component mounting technology. High Dynamic range RF front-end technology and Advanced Digital technology such as DSP sets a new standard of receiver performance for miniature HF transceivers. The single piece die cast frame, dual cooling fan system and revolutionary RF high power design technique keeps the FT-100 running cool and smooth in the most adverse operating environments. (TX Power output=100W HF, 50W VHF/20W UHF) The TX Equalizer offers crisp, clear and clean TX audio reproduction that until now was only found in top of the line HF base stations. The optional ATAS-100 (active tuning antenna system) ushers in a new age of mobile and field day operation (from HF to UHF frequencies). Add the optional ATBK-100 base kit (Good for limited space, simple setup.) and you've got a base station that ranks among the best in the world.

Features

- Frequency coverage:
  RX : 100 kHz-961 MHz (cellular blocked)
  TX : 160-6 m/144-148 MHz/430-450 MHz
- Power output : 100 W (160-6 m),
  50 W (144 MHz), 20 W (430 MHz)
- DSP Bandpass Filter, Notch Filter, Noise Reduction, and Equalizer
- IF Noise Blanker
- IF Shift
- SSB, CW, AM, FM, AFSK, Packet (1200/9600 bps) operation
- Detachable Front Panel
- Two Antenna Jacks (HF/50 and 144/430)
- VOX
- Dual VFOs
- Available IF bandwidths of 6 kHz, 2.4 kHz, 500 Hz, and 300 Hz (6 kHz, 500 Hz, 300 Hz filters optional)
- Built-in Electronic Memory Keyer
- Speech Processor
- Built-in CTCSS and DCS for FM operation
- Automatic Repeater Shift and Auto-Range Transponder System
- Smart Search™ Automatic Memory Channel Loading System
- 300 memory Channels
- Quick Memory Bank (QMB)
- Bright LCD with multi-function display
- Optional FC-20 External Antenna Tuner
- Compatible with ATAS-100 Active-Tuning Antenna System. Add the optional ATBK-100 base kit

FIELD COMMANDER

FT-100

Ultra-Compact HF/VHF/UHF Transceiver

YAESU

Choice of the World's top DX'ers

For the latest news, hottest products:
Visit us on the Internet! http://www.yaesu.com

Explore the new opportunities of APRS™ with a handheld transceiver built for the future.

TH-D7A DATA COMMUNICATOR 144/440MHz FM Dual Bander

Meet Kenwood's new TH-D7A, an FM dual-band (144MHz/440MHz) handheld transceiver equipped with a TNC and all the features needed for easy amateur radio data communications — and especially APRS.

The TH-D7A offers exciting new adventures in Ham radio with a wide range of data communications options — including simple packet operation using the AX.25 protocol and the Automatic Packet/Position Reporting System (APRS), which is rapidly gaining popularity worldwide. You can also send and receive SSTV images using Kenwood's VC-H1.

APRS (Automatic Packet/Position Reporting System)

- **Position/directional data**
  Hook up to an NMEA-0183 compatible GPS receiver and you can transmit your exact position for automatic calculation of distance, current speed and heading. Manual input of latitude/longitude is also permitted.
- **Versatile messaging**
  Transmit your own alpha messages (up to 45 characters),. bulletins, comments (up to 20 characters), and fixed messages (8 patterns).
- **Station List**
  Store received APRS data in up to 40 memory channels
- **Grid square locator**
- **TX interval** (0.5/1/2/3/5/10/20/30 min.)
- **Packet path selection for Digipeat**
- **Weather station & PHG data reception**

Visual Communicator Control

- **Text superimpose function**
  Add your call sign, RSV reports, comments, etc.
- **VC-H1 shutter**
  Command a connected VC-H1 to initiate transmission
- **Fast FM**
  Send an image in just 14 secs (approx).
- **SSTV transmission mode selection (9 modes)**

- **Dual receive for voice & image transmissions (VHF only)**

FEATURES

■ Built-in 1200/9600bps TNC (1 packet, 1 frame, 256 bytes) compliant with AX.25 protocol ■ Dual receive on same band (VHF only) for both voice and data (two frequencies simultaneously) ■ Large (12 digits X 3 lines) dot-matrix LCD, multi-scroll key, menu mode & other user-friendly features ■ 200 memory channels with 8-character memory name input ■ 16 backlit keys ■ Built-in CTCSS (38 EIA-standard subtone frequencies) ■ 16-digit, 10-channel DTMF memory ■ MIL-STD 810C/D/E water resistance ■ High-gain dual band antenna ■ High-speed (9600bps) PC-based packet communications for chat, BBS, etc. ■ Kenwood Skycommand System (KSS) II for remote control of fixed HF transceiver– TS-570S/D(G) or TS-870S (requires optional PG-4R) ■ Monitoring DX cluster, TM-742A/TM-V7A remote control (DTMF remote), etc.

ISO 9001
JQA-1205
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

KENWOOD
Amateur Radio Products Group
98ARD-1837

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support/Brochures (310) 639-5300
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

INTERNET
Kenwood News & Products
http://www.kenwood.net
Kenwood Bulletins
ftp//ftp.kenwood.net