ICD 08237

CQ VHF

Ham Radio Above 50 MHz

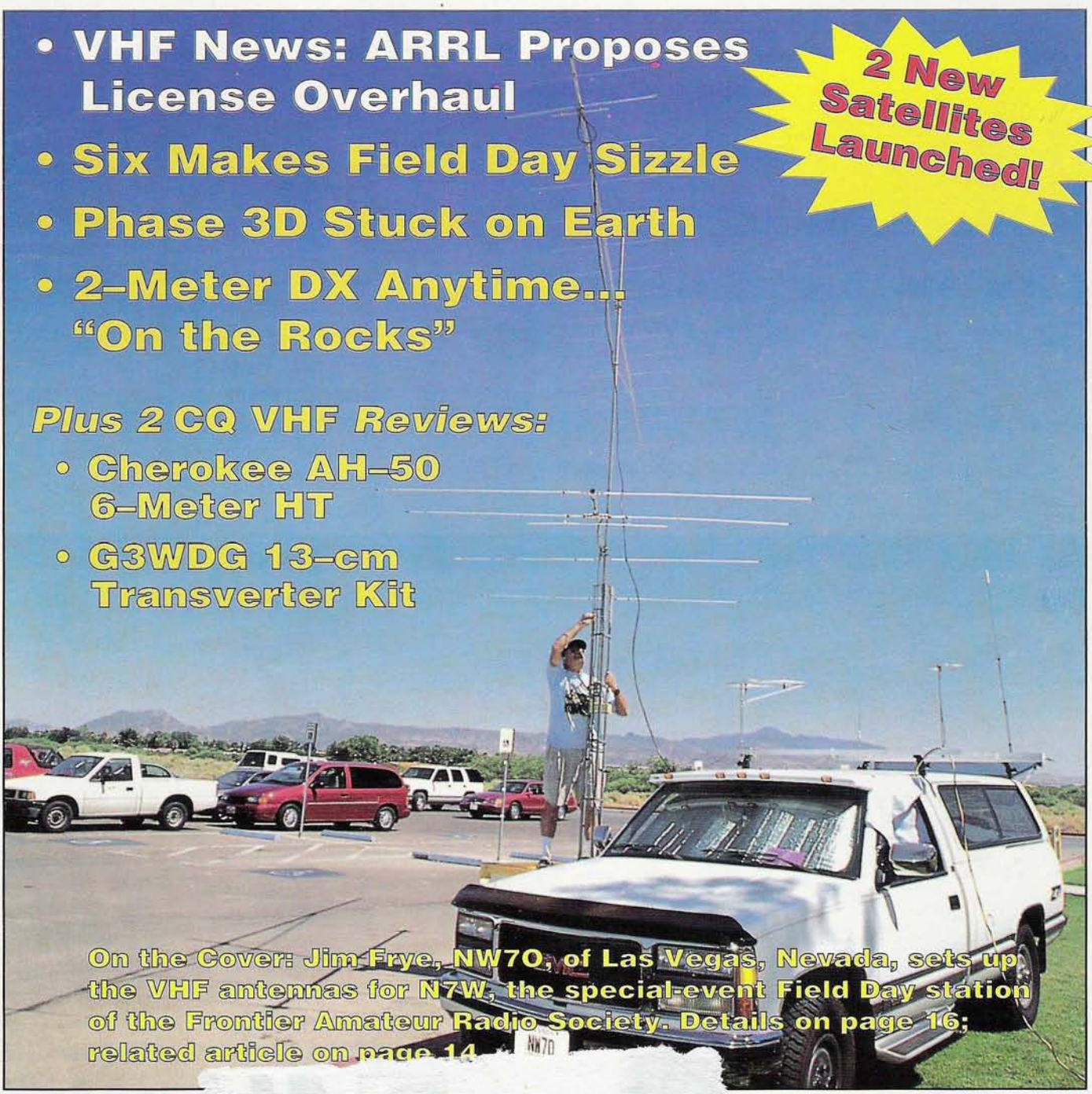
September 1998

- **VHF News: ARRL Proposes License Overhaul**
- **Six Makes Field Day Sizzle**
- **Phase 3D Stuck on Earth**
- **2–Meter DX Anytime... "On the Rocks"**

2 New Satellites Launched!

Plus 2 CQ VHF Reviews:

- **Cherokee AH–50 6–Meter HT**
- **G3WDG 13–cm Transverter Kit**



On the Cover: Jim Frye, NW7O, of Las Vegas, Nevada, sets up the VHF antennas for N7W, the special-event Field Day station of the Frontier Amateur Radio Society. Details on page 16; related article on page 14.

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B-5016-G
$299
Suggested Retail

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
MIRAGE RUGGED!

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 (50-54 MHz)

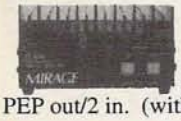
FCC Type Accepted

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

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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

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CIRCLE 114 ON READER SERVICE CARD

CQ VHF Ham Radio Above 50 MHz

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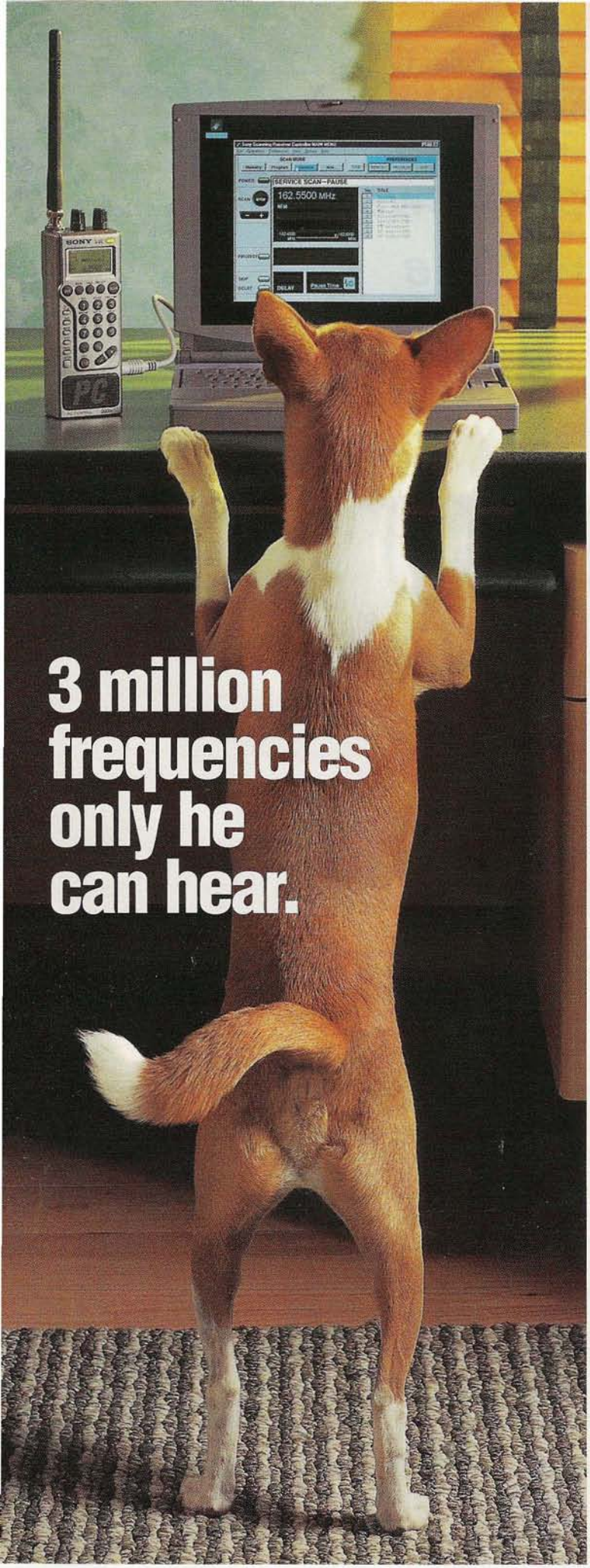
FEATURES

COLUMNS

BASICS

DEPARTMENTS

Next Month (Really!): "A Repeater-Internet Interface," by John Hansen, W2FS



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SONY

Good News, Bad News, and... DX Anytime

We all know there's no such thing as a free launch, and now it seems a million dollars' worth of promises won't fly, either. At least the sun still works the way it's supposed to...

One of the great things about ham radio satellites is that they let you work DX reliably and predictably, without worrying about the sunspot cycle, band openings, or other natural phenomena. You might say they offer "DX Anytime"—anytime, that is, that a satellite's antennas are in view of your antennas, that your antennas are pointing in the right direction, and that you happen to be in your shack at the time of a "pass," when the satellite is in range of your station.

Stuck on the ground. This photo of the AMSAT Phase 3D satellite was taken two years ago in the P3D Integration Laboratory in Orlando, Florida. The satellite is still there and, as of this writing, will be indefinitely, after being bumped in June from an anticipated flight on the fall launch of Ariane 503. Pictured with P3D are AMSAT's Stan Wood, WA4FNY (left) and Lou McFadin, W5DID (right). (File photo by Larry Mulvehill, WB2ZPI)

Statute of Limitations

Problem: the low-orbit satellites in service today offer limited range and passes of limited duration, generally along the lines of 10 to 15 minutes, three times a day. The Phase 3D (P3D) satellite will solve many of these problems, of course, with its high orbit offering lengthy passes with little change in antenna pointing required, and a "footprint" that can cover half the globe.

But from within the confines of the P3D Integration Lab in Orlando, Florida, the satellite's footprint is extremely limited...just a room or two. Yet, that's where this gargantuan effort by the international AMSAT community seems destined to stay for the foreseeable future.

In June, despite months of promises and a $1 million launch fee (which fortunately hadn't been paid yet), P3D was bumped from the manifest for Ariane 503, the third qualification (test) launch of the new Ariane 5 booster rocket. You'll find details elsewhere in this issue, in the article, "P3D: Left at the Altar Again," but for now, suffice it to say that P3D was a victim of economics and politics.

Perhaps it was also a victim of unrealistic expectations in the increasingly competitive, expensive, and profitable business of launching and operating satellites. Up until now, amateur satellites have been able to "hitchhike" (for free in the early days) with other payloads, or to fly at reduced cost on experimental launches, such as the Ariane 5 qualification flights. Hams have made significant contributions to satellite science, and giving us a break on launching our non-commercial and often innovative satellites has always been "the right thing to do." Apparently, not any more.

With commercial launch fees in the neighborhood of $70 million, our "paltry" $1 million must have been seen by launch authorities as merely symbolic, and our satellite apparently represents little more than ballast (but ballast that's expected to be launched into a specific orbit and to work when it gets there), since that appeared to be what would likely replace P3D on Ariane 503.

What Now?

What are AMSAT's options now? Apparently, they're rather limited (there's that word again) and the outlook doesn't look very bright at the moment. The number one choice, according to AMSAT-NA President Bill Tynan, W3XO, is to stick

By Rich Moseson, W2VU, Editor (e-mail: cqvhf@aol.com)

"Hams have made significant contributions to satellite science, and giving us a break on launching our non-commercial and often innovative satellites has always been 'the right thing to do.' Apparently, not any more."

with ESA (the European Space Agency) and Arianespace—the company set up by ESA to sell Ariane launches, and which tossed P3D off of Ariane 503—and begin negotiating for a new launch opportunity. There are good reasons for this:

1) AMSAT and ESA have had an excellent working relationship spanning two decades and several satellite launches; and

2) The P3D satellite—considerably larger and heavier than any other amateur satellite yet orbited—was built specifically for launch on an Ariane and, according to Tynan, "it can't just be put on any rocket that's going up...it requires a launcher with a large volume under the shroud and a launch vehicle with substantial performance."

There are also significant problems:

1) Tynan says Arianespace won't even talk with AMSAT until after Ariane 503 is launched (currently scheduled for October); and, even then, the starting price for negotiations is $10 million—about $9 million more than AMSAT's very tight P3D budget will allow; and

2) The performance of the Ariane 5 launcher has yet to be proven "substantial." The first test launch blew up seconds after liftoff, and the second launch, which was originally supposed to carry P3D, deposited its payloads in the wrong orbit. Just how badly do we want to be on an Ariane 5? Even if the price is right? In my book, if the ESA folks offer us a substitute launch on a proven-reliable Ariane 4, let's take it.

Plus, of course, there are other countries in the rocket-launching business, notably the U.S. and Russia, both of which have proven willing to orbit amateur satellites in the past. AMSAT says it is exploring those other options, as it should, despite the need to once again adapt the satellite spaceframe to fit a different launcher.

Don't Count on the Shuttle

Among the choices available, the U.S. space shuttle is almost completely out of the question. First of all, there's a very long line of payloads waiting for a ride. Second, a ride on the shuttle costs *really* big bucks. Third, the shuttle doesn't fly high enough to put P3D into the right orbit. And, fourth, virtually all shuttle missions over the next couple of years will be dedicated to building the International Space Station (ISS).

That last item not only gets in the way of a possible P3D launch, but also of SAREX (Space Amateur Radio Experiment) operations. In fact, NASA canceled plans to include SAREX on this fall's shuttle mission on which Ohio Senator (and former/new Astronaut) John Glenn will be a crew member, saying the crew will be too busy. On the good news side, SAREX will be considered "crew equipment" on the ISS, rather than a payload, and therefore a ham station should be up and running on the ISS by sometime next year, rather than sometime next century (see this month's "Beginner's Corner" for more on SAREX and the ISS).

Looking Ahead

Something else AMSAT needs to explore is figuring out a more reliable means for future launches. At last October's AMSAT Annual Meeting, much of the discussion centered on what to build after P3D. Size, scope, and function were all part of the debate, but one other element that apparently needs to be included is launchability. No matter what sort of satellite you build, it won't do anyone any good if you can't get it put in orbit.

This gives added impetus to continue down the path of collaborative satellites, part government, commercial or educational, and part amateur. Russian hams were the first to do this, and most of the RS-satellites are amateur transponders piggybacked on government or military satellites. In England, the UOSAT (University of Surrey satellites) have all been mixed use "birds," and AMRAD-OSCAR 27 (AO-27) is an amateur transponder piggybacked on a commercial satellite, EYESAT-1. There are limitations to this approach, of course, such as not having full (or any) control of the

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CIRCLE 62 ON READER SERVICE CARD

"Like clockwork, the 6-meter band turned into a DX band in June...and on Sunday morning of Field Day weekend, six was hotter than a Kansas City sidewalk in the summertime."

spacecraft, and limited transponder availability. But at least we don't have to worry about getting the bird launched or how to pay for it.

Enough Bad News...

One of the great things about natural propagation is that is lets you work DX reliably and predictably, without worrying about politics, economics, or other manmade phenomena. You might say it, too, offers "DX Anytime"—anytime, that is, that you're in the right part of the 11-year sunspot cycle, or in the shack when ionized clouds in the *E*-layer of the ionosphere produce sporadic-*E* propagation on 6 meters (it's predictable: there *will* be *E*-skip on a certain number of days each June and July...you just can't be sure exactly *which* days and at what times), or the right weather conditions allow "tropo" propagation on the higher bands. Best of all, it's free!

Reliable? Like clockwork, the 6-meter band turned into a DX band in June (even your humble editor, who has a knack for missing any band opening of note, managed to work seven grids, five states, and two Canadian provinces in one hour on June 29 on 6-meter FM), and on Sunday morning of Field Day weekend, six was hotter than a Kansas City sidewalk in the summertime. Our 6-meter guru, Ken Neubeck, WB2AMU, tells you all about it in his (expanded "Magic Band Chronicles" column,) "Six-Meter Openings Heat Up Field Day."

And Finally...DX Anytime!

I've been stealing KM5PO's line throughout this editorial...he's the one who actually has an article in this issue with "DX Anytime" in the title! It's all about making use of some of the 12 *billion* tiny meteors that enter our atmosphere each *day* to make reliable, predictable, DX contacts on 2 meters, using high-speed CW (HSCW) meteor scatter. You don't need to wait for a meteor shower to use HSCW. The mode works whenever you want it to...in fact, you might say it offers "DX Anytime"—anytime, that is, that you're willing to set up schedules in advance, and spend an average of 15 minutes to complete a contact consisting of callsigns, signal reports, "rogers" and 73s. No, it's not as easy as flipping a switch and talking as far as you want, whenever you want (although it *is* a fascinating alternative to "traditional" meteor scatter, and I heartily recommend the article).

But let's not get too carried away with this whole idea of "DX Anytime." One of the great things about ham radio is its uncertainty, its aura of mystery and magic—you can never be sure, when you flip on that switch, how far your signal will reach or who will be at the other end to talk with you. This uncertainty is central to ham radio's appeal. If it gets too reliable and too predictable, it'll become just like the telephone and the Internet, and I, for one, don't think that's really what we want. So let's keep building our satellites and improving our knowledge of the natural phenomena that make radio work, but let's not lose the *challenge* of working DX, or we'll lose the essence of amateur radio. ■

Column Notes

You may notice that "How It Works" and "Weak Signal News" aren't here this month. Both Dave Ingram and Tim Marek were ill over the summer and couldn't finish their column in time. Don't worry, though. Both have assured me that they're doing much better and expect to be able to resume their columns next month.

Also resuming next month, after a long absence is our amateur television (ATV) column, "In Focus," with Ed Manuel, N5EM, taking over that slot. We still don't have a regular "Project Corner" columnist, so keep on sending us your favorite projects to consider.

Here's Some Better Satellite News

Even though Phase 3D can't get off the ground yet, two other amateur satellites were successfully placed in orbit on July 10, 1998. The AMSAT News Service reports that TMSAT-1 and Techsat-1B were both launched atop a single Russian RESURS-01 booster from the Russian Baikonur Cosmodrome in Kazakhstan. Early indications were that both spacecraft were functioning well. At press time, they had not been given OSCAR numbers (31 and 32 should be next in line).

TMSAT-1 is Thailand's first microsatellite, built at the University of Surrey in England by a team of Thai engineers working with engineers from Surrey Satellite Technology, Ltd. It's a 9600-baud digital satellite with uplinks on 145.925 and 145.975 MHz and downlinks on 436.925, 436.900, 436.950, and 436.975 MHz. More information is available from the TMSAT Web site at <http://www.ee.surrey.ac.uk/EE/CSER/UOSAT/amateur/tmsat/>.

Techsat-1B is Israel's first amateur satellite, built at Technion Institute of Technology in Haifa. Techsat-1B has uplinks on 2 meters (145.85, .89, and .93 MHz) and 23 centimeters (1269.700, .800, and .900 MHz) and a pair of redundant downlinks on 435.225 and 435.325 MHz. For details and updates, see the Techsat Web site at <http://www.technion.ac.il/~asronen/techsat/>.

Help Wanted

If you're involved with a project or activity that you think would be of interest to your fellow *CQ VHF* readers, we'd like to hear from you. Article submissions are welcome, as are "Op-Ed" opinion pieces if you have a point of view you'd like to share about a VHF-related topic. You can contact us by mail at 25 Newbridge Rd., Hicksville, NY 11801 (send an SASE for writers' guidelines), by e-mail to <CQVHF@aol.com>, or via our Web page, <http://members.aol.com/cqvhf/>. We look forward to hearing from you.

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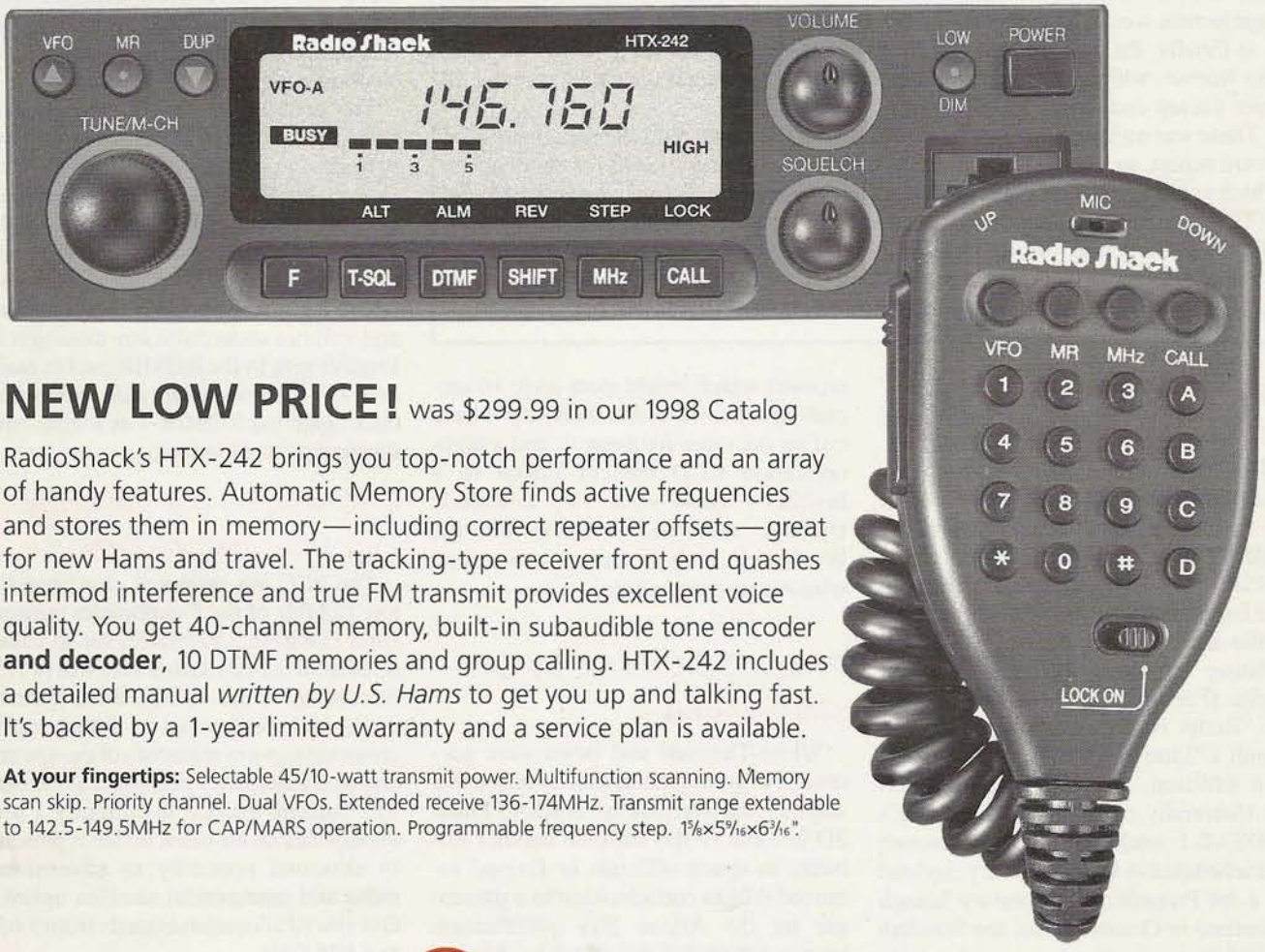

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CIRCLE 141 ON READER SERVICE CARD

VHF News

ARRL Proposes Revamped Amateur Licensing; Calls for Four License Classes; Lower Code Speeds

The ARRL—trying to pre-empt the FCC's own plans to restructure amateur licensing—has proposed replacing the current six license classes with four and reducing the code speed requirements for HF licenses from 5, 13, and 20 words per minute (wpm) to 5 and 12 wpm. Voting 9-to-6 at its July meeting, the ARRL Board of Directors proposed Class A, B, C, and D licenses, as follows:

1) Replace the current Technician class license with a "Class D" license. It would carry the same operating privileges and have the same exam requirements as the current Tech.

2) Combine the current Novice, Tech Plus, and General class licenses in a new "Class C" license, with a 5-wpm code requirement and a written exam on HF operating and technical questions. Class C licensees would have the same privileges as the current General class, but the League proposal also calls for "refarming" the current Novice CW frequencies—50 kHz each on 75 and 15 meters, and 25 kHz on 40 meters—into additional Class C phone frequencies.

3) Current Advanced class licensees would become "Class B" hams, enjoying current Advanced class privileges plus the additional phone bands proposed for the Class C license. The written exam would be virtually unchanged, and the code speed requirement would be reduced slightly, from 13 wpm to 12.

4) Finally, the current Amateur Extra license would become a "Class A" amateur license, with a tougher written exam but *no* additional code test; making 12 wpm the top code exam speed.

There was no breakdown of the 9-to-6 vote in the ARRL bulletin announcing the Board action, so it's not known at this time which directors voted for the plan and which voted against. At press time, the plan had not been formally proposed to the FCC, so no Rule Making number had been assigned or comment period opened. The League's action followed a promise by FCC staffers at the annual meeting of Volunteer Examiner Coordinators that the FCC would propose its own restructuring plan—possibly going to only three license classes—before the end of this year.

Two Ham Satellites Launched, Another Ready

Thailand and Israel both launched their first ham radio satellites July 10 on a single Russian booster rocket, reports the AMSAT News Service (ANS), making TMSAT (the Thai satellite) and Techsat (the Israeli satellite) the newest additions to the international fleet of OSCARs, Orbiting Satellites Carrying Amateur Radio. (For more on these two "birds," see "Better News on Satellites" in this month's "Line of Sight.")

In addition, the ARRL reports that the University of Alabama/Huntsville's SEDSAT-1 satellite is ready for launch and scheduled to be a secondary payload on a Jet Propulsion Laboratory launch sometime in October. Plus, the Swedish AMSAT organization is reported to be in the preliminary stages of planning its first satellite. Initial plans call for a "parrot" repeater which would store up to 10 seconds of received audio, then play it back (all on the same frequency); and a high-resolution CCD camera linked to a fax/SSTV (slow-scan TV) downlink. Updates will be available on the Worldwide Web at <http://www.users.wineasy.se/svengrahn>.

Phase 3D Can't Get Off the Ground

While Thailand and Israel were successful in getting microsats launched this summer, the international AMSAT Phase 3D satellite (P3D) suffered another setback, as space officials in Europe removed it from consideration as a passenger on the Ariane 503 qualification launch scheduled for October. It's the second time in a year that P3D has been bumped from an Ariane 5 launch. (For details, see this month's "Line of Sight" and "P3D: Left at the Altar Again," on page 18.)

Ham Radio Bumped from Manned Missions, Too

In two additional setbacks for ham radio in space, NASA officials dropped plans to include SAREX (Space Amateur Radio Experiment) and nine other "secondary" projects from this fall's scheduled shuttle trip on which Ohio Senator and astronaut John Glenn is due to fly; and Russian space officials announced that the Mir space station would be shut down six months earlier than originally planned.

Glenn was the first American to orbit Earth, but has not been back to space since his historic flight in 1962. According to the ARRL, NASA expressed regret at having to eliminate the SAREX payload, but said the crew simply would be too busy to have time for talking on ham radio.

The decision to shut down Mir next June instead of next December was purely financial, according to a Reuters report quoted by the *SpaceNews* newsletter. Meanwhile, ham radio activity aboard the Russian space station is winding down, especially for American hams. Both current crew members speak only Russian and will not understand any messages in English sent to the RØMIR packet mailbox. On the good news side, hams may once again use RØMIR-1 as a store-and-forward packet mailbox.

FCC Wants 5.9 GHz for Highway Technology

The FCC has proposed allocating the top 75 MHz of the 5-centimeter amateur band (5.850 to 5.925 GHz) for so-called intelligent transportation systems, or ITS. According to the ARRL, these systems could include devices to detect traffic congestion, warn motorists of tie-ups and dispatch emergency personnel as needed. The amateur service is currently a secondary user on the band, which is presently allocated primarily to government radar and commercial satellite uplinks. Our shared allocation extends from 5.650 to 5.925 GHz.

In FCC comments, the ARRL proposed maintaining ham radio's current

Compiled by the CQ VHF Staff

status on the band, while urging the Commission to look for more appropriate frequencies above 40 GHz. But 3M Corporation—an ITS proponent—questioned the compatibility of strong amateur signals in the same area as a highway safety system station.

Timewave Files Chapter 11

The company that bought out AEA's digital product line a year ago is now in financial trouble itself. Timewave Technology, Inc.—best known for its line of digital signal processing filters before taking on the AEA digital line—filed for reorganization in June under Chapter 11 of the federal bankruptcy laws. According to the "ARRL Letter," Timewave President Randy Gawtry, KØCBH, says the company will continue normal operations during its reorganization, and still plans to bring out its DSP-2232zx multimode TNC later this year.

There is *no* connection between Timewave Technologies and Tempo Research, which bought out the rest of AEA's product line when that company went out of business last year, including the rights to the AEA name, so Timewave's difficulties have no impact at all on AEA/Tempo or its products.

Looking Forward to Hurricanes?

The predictable threats of hurricane season may almost come as a relief to beleaguered hams in Florida, many of whom spent chunks of spring and summer responding to wildfires, tornadoes, and other unusual (for Florida) emergencies. According to the ARRL, hams were called out time and time again as wildfires rages in northern Florida in June and July. They were called on to help in evacuation shelters (at one point, an entire county was evacuated), check on people's whereabouts, and report on damage to homes and other property. We'll try to bring you details in next month's "In the Public Interest" column.

Two New ATV Distance Records

Hams in Europe have set two new distance records for amateur television (ATV) on 10 and 24 GHz. John Jaminet, W3HMS, of Amateur Television of North America (ATNA), forwards a report from HB9AFO of a new world-record ATV distance of 510 miles (821 kilometers) on 10 GHz between TM2SHF in Corsica and EA5/HB9AFO/P in Spain. The two groups of hams also set a European record on 24 GHz with a 154-mile (248 km) QSO between Corsica and Mont Caume, France. Stay tuned for details in our about-to-be-revived "In Focus" ATV column, which resumes next month.

Trans-Indian Ocean Propagation Tests

Are the conditions that cause the annual Hawaii-California duct duplicated in the Indian Ocean? The South African Radio League (SARL) reports that the ZS2VHF beacon is on the air from Port Elizabeth on the country's southern coast, running 160 watts (effective radiated power) from a five-element Yagi on 144.410 MHz, pointing northeast toward Reunion Island, some 2,100 miles away. According to SARL, a VHF group on Reunion has set up a 2-meter beacon on 144.240 MHz, with a beam pointed toward South Africa. The main goal of the project is to study summertime tropo conditions across the Indian Ocean. ■

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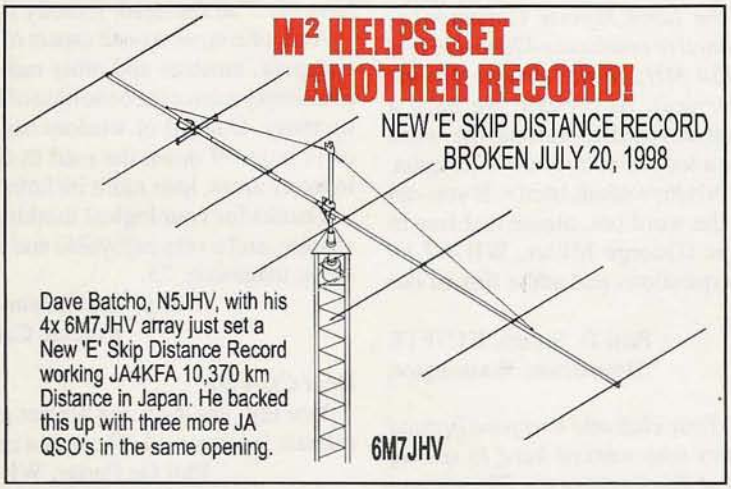
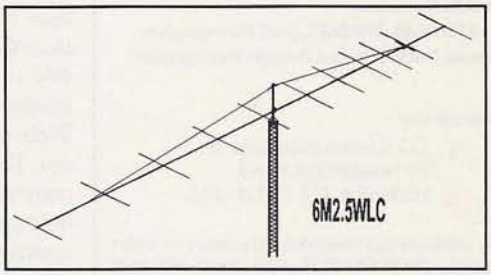
NEW 'E' SKIP DISTANCE RECORD BROKEN JULY 20, 1998



Dave Batcho, N5JHV, with his 4x 6M7JHV array just set a New 'E' Skip Distance Record working JA4KFA 10,370 km Distance in Japan. He backed this up with three more JA QSO's in the same opening.



Model #	Gain, dBd
6MSQLOOP	4.0 dBv
6M5	9.4 dBd
6M7	10.5 dBd
6M7JHV	10.9 dBd
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6M2.5WLC	12.6 dBd
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Letters

Your Spot to Speak

CQ VHF *welcomes comments and suggestions from readers. We'll print a representative sampling each month, and we reserve the right to edit letters for length or style. All letters must be signed and show a return mailing address or valid e-mail address. Writers' names will be withheld from publication upon request. Address letters to: Letters,* CQ VHF, *25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <CQVHF @aol.com>; <cqcomm@delphi.com> or <72127.745@compuserve.com>. Please specify that it is a letter for* CQ VHF *magazine.*

The Threat to 440

Dear *CQ VHF:*

I am a member of the K7PP Repeater Group in Washington State. We provide communications on the 147.200 MHz + 443.400 MHz from 80-plus miles into Canada in the north to Portland, Oregon, in the south, and throughout Washington State into northern Idaho and parts of Montana. We have satellite links with Hawaii and provide autopatch for the Seattle area and with over 100 police/fire/rescue/U.S. Coast Guard dispatchers in western Washington.

Our repeater system would go away with the passing of RM-9267 (*the petition by the Land Mobile Communications Council to reallocate 420 to 430 and 440 to 450 MHz to the Private Mobile Radio Service*). At present, we have a Web page devoted to getting the word out. Take a look at <http://www.halcyon.com/wb7vlv/newsdesk.html>. If you can help get the word out, please feel free to contact us (George Miller, WB7VLV) with any questions and add a link to our site. 73,

Paul D. Staudt, KC7FTE
Bremerton, Washington

Paul—Your club and everyone around the country who worked hard to spread the word of this threat to the 70-centimeter band are to be congratulated for your efforts. This is one example of harnessing the power of the Internet to protect ham radio. As you know, the comment period on RM-9267 is now closed and the matter rests in the hands of the FCC—will it issue a Notice of Proposed Rule Making (NPRM) providing everything that LMCC asked for? Will it issue an NPRM with something less? Will it issue an NPRM at all? At this point, all we can do is wait. When and if an NPRM is issued, by the way, there will be a longer comment period than that provided for responding to petitions for rule making.

We're a Hit in Germany

Dear *CQ VHF*:

I am a German reader of *CQ VHF*. My call is DL1AKP (U.S.: AB7VT). Your magazine is really good and I enjoy it every time I read it. There is no magazine like this available in Germany. 73,

Andy Nagel, DL1AKP/AB7VT
Blankenhain, Germany

Andy—We're glad you're enjoying CQ VHF. *And we're glad to report that we're working with our newsstand distributor to improve our distribution outside of the U.S. Of course, subscriptions are available to just about anywhere.*

Battling Band Bigotry

Dear *CQ VHF*:

Thanks very much for your incisive editorial, "Battling Band Bigotry" (June, '98). Many editorial writers have attempted to highlight the internal situation that besieges the radio hobby today, but you have hit it on the head. Exactly right.

And, of course, as one aspect of human endeavor, amateur and other radio interests simply mirror the condition of humanity today. Our gift of wisdom has caused us to head off down the road to nowhere in many areas, ham radio included.

Thanks for your logical thinking, good writing, and a very enjoyable and enlightening magazine. 73,

Harry M. Johnson, NV7K
Eureka, California

Dear *CQ VHF*:

You tell 'em Rich, we are not going to tolerate intolerance! Uh, wait a minute...

Phil De Porter, WB4KMH
Kingston, Tennessee

Faster, faster!

Dear *CQ VHF*:

I must say that I was completely distressed at all the coverage given (in "Digital Data Link") to TheNet X1J and

ROSE. You have just given the packet community another reason to stay at 1200 baud for another year while hams go fishing at flea markets for EPROM burners, and figure out which pin to bend and solder. In this day and age, we need to push flexible packages like the KA9Q variants (of TCP/IP) that support dynamic or static routing, virtually any speed, and the wide variety of hardware needed to run at the higher speeds (i.e. 56 kbps and up).

Even APRS now supports TCP/IP, and that was supposedly the "last bastion" of 1200 baud. *Please* show us active 56k links and LANs, and let 1200 baud die! Thanks and 73,

Steve Jackson, N3VZL
Fairless Hills, Pennsylvania

"Digital Data Link" Editor Don Rotolo, N2IRZ, replies:

Steve—Thanks for your comments. I couldn't agree with you more! It is my (long-term) goal to get North America out of the 1200/9600 mindset, and into better-than-ISDN data rates. It is unfortunate for me that the majority of readers don't even know how to build a 1200-baud network, much less 56k. So, I figured that we would first have a look at what's out there (ROSE and TheNET), then get into something better (FlexNet). The neat thing about FlexNet is that it implements Layer 3 (and below) much better than TCP/IP does. On the other hand, it hardly implements Layer 4 at all, and nothing higher—*this* is the realm of TCP/IP.

Take a look at the opening paragraphs of my column in this month's issue. It deals with modulation techniques (but not modems), but it starts with a brief wrap-up of the Networking series...and it was written a week before you sent your message! So we're definitely thinking along the same lines.

I guess the point is, while 56k can be about 45 times better than 1k2 (1200 baud), 1k2 is *infinitely* better than nothing. Let's get a network built, then we can go faster.

Slower, slower!

Dear *CQ VHF*:

May I please recommend that in some appropriate place in *CQ VHF* magazine you request that ham operators please slow down when presenting call letters, as well as the phonetics when used.

I do not believe that it is simply because I am a new ham that I am having this difficulty in understanding the callsign. With QRM or QRN present, it becomes impossible. I am certain that I am not alone with this difficulty, experienced or inexperienced.

The recommendation can be highlighted in some manner that it would be difficult to overlook.

Glenn E. Love, N3WPW
Carlisle, Pennsylvania

Glenn—Excellent suggestion. I'd recommend that we put it somewhere on the "Letters" page!

Licensing Proposals

Editor's Note: The FCC is rumored to be on the verge of proposing a restructuring of amateur licensing as part of a broad review of its rules and regulations. These are some reader suggestions:

Dear *CQ VHF*:

I agree with most of what you say (in your June editorial, "Battling Band Bigotry"), but you miss one important dividing factor in our ranks. I alluded to this in my past letter you published some months ago. It was in the part you edited out for publication. The problem with reducing strife in our ranks is that the entire ham licensing structure is based upon elitism.

If you want to minimize the factional infighting, it is imperative to address the cause, not the effect. In this instance, I'd recommend that the grades of licenses be reduced in number. I'll get radical in this. I would have only 2 classes. They would correspond to the two types of technician licenses presently in existence.

The No-Code Tech would give you VHF/UHF operation. The Tech Plus would have the same written exam, and 5-wpm code. This second license would give the bearer complete operational freedom on all bands. The first license would be a good entry-level item; the other would be adequate to meet any sensible requirements, foreign or domestic. I'd have a 5-year, non-renewable term for the basic license. The other could be for any number of years, and be renewable.

Most people, including those stumbling out of the American Collective School System, should be able to figure out 5 wpm of the code in 5 years. Hams would still be able to express their individual technical virtuosity. My licensing system would hardly impede this at all. People would actually have to *earn* the "right" to be snobs or victims by doing, rather than just cramming to pass an exam that is far more technical than is really necessary to ensure that they are effective radio communicators.

My reformed and progressive licensing structure provides a more realistic and less elitist approach to ensuring that hams have an adequate level of tested expertise in radio operation. I would hope that is why we have licensing in the first place.

Ironically, the vanity licensing system has helped eliminate another snobbery factor. It is now virtually impossible to tell how long a ham has been around on the bands just by looking at a call. Now, we need to address the last major hurdle in mending our faction-ridden hobby. I think my modest proposal does just that.

Sincerely yours,

Steve Berg WA9JML
DeKalb, Illinois

Steve—I'm sure your proposal is going to draw quite a bit of heat. My only question right now is why you would make the VHF/UHF license non-renewable. I thought we did away with this silliness years ago. Why should someone who is only interested in VHF/UHF operating be forced to earn HF privileges in order to remain in the hobby? Or are we back to what I talked about a few months back—that the only "real ham" is one with HF privileges? Ham radio is the only hobby I know of that has ever told people to "upgrade or get out."

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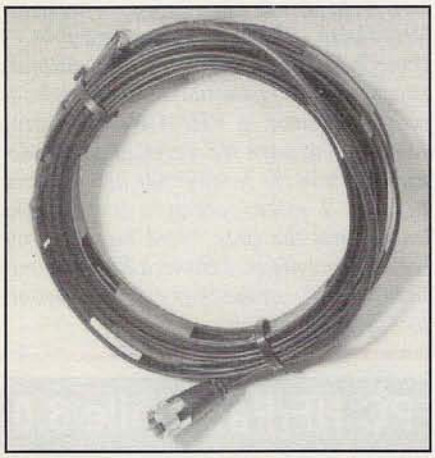
CIRCLE 74 ON READER SERVICE CARD

Product Update

MFJ 6-meter J-pole Antenna

MFJ's 6-Meter J-pole is an omnidirectional full-size halfwave antenna with a low angle of radiation that consistently outperforms quarterwave antennas. The MFJ-1736 can hang just about anywhere. It's made of 156 inches of sturdy 450-ohm ladder line and fitted with a short length of RG-58 coaxial line and a PL-259 connector. It's perfect for traveling; you can roll it up and toss it into a corner of your briefcase with your 6-meter transceiver, and be ready for instant DXing.



MFJ's 6-Meter J-pole antenna comes with MFJ's No Matter What™ one-year limited warranty. Suggested retail price for the MFJ-1736 6-meter J-pole antenna is $24.95. To order or for your nearest dealer, call (800) 647-1800; Fax: (601) 323-6551; E-mail: <mfj@mfjenterprises.com>; or check out dealer and ordering information on the Web at <http://mfjenterprises.com>.

Circle 100 on reader service card

G3SEK Tetrode Boards

The Tetrode Boards by G3SEK are a new solution to the control and protection of tetrode power amplifiers. They will work with any transmitting tetrode for amateur power levels, in any power supply grounding arrangement. Two small pc boards include regulated power supplies for the screen and control grids, screen and grid current protection, TX/RX sequencing, ALC and relay supplies—almost everything except the high-voltage supply and the tetrode!

The kit includes all the components for

the pc boards, a comprehensive 32-page manual, and full support from the designer. Experienced builders can buy the bare boards and manual. A special mains transformer is also available that connects directly to the boards and provides everything except the anode voltage.

For details, visit <http://www.ifwtech.demon.co.uk/g3sek>; or contact Down East Microwave, Inc., at (908) 996-3584. Outside the U.S., contact Ian White, G3SEK, at his *Callbook* address, or e-mail him at: <tetrode-boards@ifwtech.demon. co.uk>.

Circle 101 on reader service card

TAPR DSP Interface Board

Tucson Amateur Packet Radio (TAPR) has introduced the TAPR EVM5600 interface boards and enclosure kit to help you use Motorola's digital signal processing (DSP) unit with amateur transceivers. TAPR is taking orders until September 15th for the first round of EVM56002s. The kit includes an EVM interface board kit and enclosure for the Motorola EVM56002; all parts, including screws and standoffs; schematics and documentation (assembly and operations); and software. The Motorola EVM56002 (DSP) Interface board, however, *is not included*. The price is $135 for TAPR members ($150 for non-members) plus shipping/handling.

For more information, visit <http://www.tapr.org/tapr/html/dsp56002evm.html>. Contact Tucson Amateur Packet Radio, 8987-309 E. Tanque Verde Rd., #337, Tucson, AZ 85749-9399; Phone: (940) 383-0000; Fax: (940) 565-2544; E-mail: <tapr@tapr.org>; Web: <http://www.tapr.org/>.

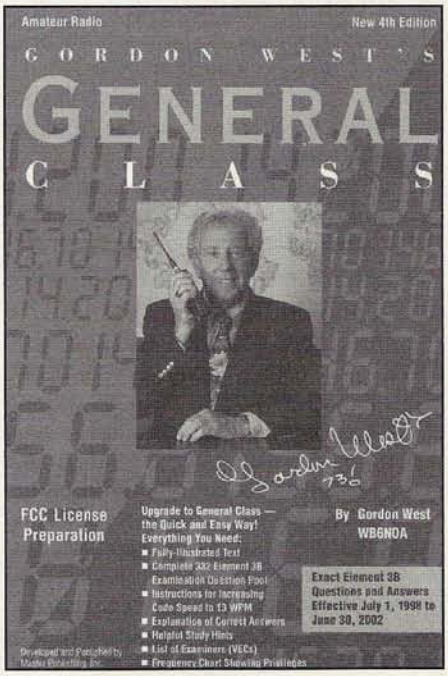
Circle 102 on reader service card

New Gordon West General License Manual

The new *Gordon West General Class Amateur Radio License Manual* is now available, covering the new question pool that went into use on July 1, 1998. The main addition is 55 new questions on RF safety. The actual General class exam now contains 30 multiple-choice questions, rather than 25.

"The number of possible examination questions has now been increased from 290 in the previous question pool to 332 questions in new 1998 Element 3B pool," comments West. The five additional test questions on RF safety are a result of the new radio frequency exposure standards that were adopted by the FCC in 1996.

The *Gordon West General Class Study Manual* retails for $11.95, and is available at most amateur radio dealers, at RadioShack stores, and by mail order from the distributor. There is also a new General upgrade software package for $34.95, including the West-written study manual, FCC rule book, and two versions of the computer program: one on DOS,



and another for Microsoft Windows, on 3-1/2-inch disks.

For a complete catalog of all Gordon West code and theory audio cassettes and training manuals, contact the W5YI Group at (800) 669-9594.

OSCAR Satellite Report Has New Publisher

Harlan Technologies is now the publisher of *OSCAR Satellite Report*, published for the last 19 years by Bob Myers, W1XT. Shari Harlan, KB9SH, is the new editor. She says she will keep the format and style the same, making few if any changes. One of the main features which will remain unchanged is the "Satellite DX" column written by Craig Mellinger, N2MNA. Harlan Technologies is also the publisher of *Amateur Television Quarterly*, and sells amateur radio software, such as Blaster SSTV, using the SoundBlaster™ computer card.

Subscription rates are $35 for the U.S., $38 for Canada, and $46 (U.S. funds) elsewhere per year (24 issues).

For more information, contact *OSCAR Satellite Report*, 5931 Alma Drive, Rockford, IL 61108-2409; Phone: (800) 557-9469 orders only, (815) 398-2683 voice; Fax: (815) 398-2688; E-mail: <OSReport@aol.com>; Web: <http://www.cris.com/~Gharlan>.

Four New Books from Prompt

Prompt Publications, an imprint of Howard W. Sams, has introduced four new titles of interest to technically minded hams.

The Complete RF Technician's Handbook (Second Edition), by Cotter W. Sayre (KJ6EB), "is the handbook for the RF or wireless communications beginner, experienced technician or ham radio operator," according to the publisher. "Although meant for people with a prior foundation in electronics, this book furnishes the reader with valuable information on the fundamental and advanced concepts important to the study and application of RF wireless communications. (ISBN # 0-7906-1147-3; List price: $29.95)

Advanced Electronic Projects (Second Edition), by Stephen Kamichik, offers a variety of projects for the experienced builder, including active filters, bipolar power supplies, and an infrared remote control. Special emphasis has been given to using readily available parts, and many projects include pc board patterns. (ISBN # 0-7906-1161-9; List price: $21.95).

Build Your Own Test Equipment, by Carl J. Bergquist, provides plans for a dozen projects, ranging from an eight-digit frequency counter to "the ultimate prototype lab," according to the publisher. All 12 projects in this book should be of interest to the active experimenter and home-brewer. Again, emphasis is placed on using parts that are easy to find and reasonably priced. (ISBN # 0-7906-1130-9; List price: $24.95).

Finally, the *IC Cross Reference Book (Third Edition)* will be an invaluable resource for anyone who enjoys designing circuits or modifying equipment. It provides replacement and substitution info for more than 35,000 integrated circuits (ICs) and modules. (ISBN # 0-7906-1141-4; List price: $24.95).

For more information, see your favorite bookstore or contact Prompt Publications, 2647 Waterfront Parkway East Drive, Indianapolis, IN 46214; Phone: (800) 428-7267 or (317) 298-5400; Fax: (317) 298-5604.

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CIRCLE 77 ON READER SERVICE CARD

Six-Meter Openings Heat Up Field Day

A combination of truly excellent propagation and high activity levels made 6 meters the place to be during Field Day '98. Looks like lots of people followed WB2AMU's advice in our June issue!

By Ken Neubeck, WB2AMU*
<kneubeck@suffolk.lib.ny.us>

Editor's Note: Ken's too modest to admit it, but apparently his article, "Operating Field Day? Don't Forget VHF!" in our June issue, got results, as VHF activity—especially on 6 meters—was stronger than at any time in recent memory. This, despite a rules change eliminating bonus points for making VHF contacts.

Six-meter operators at this year's ARRL Field Day (FD) on June 27 and June 28 were treated to one of the greatest band openings ever to occur during this annual event. Strong sporadic-*E* openings, coupled with a significant increase in the number of FD stations using the band, made for some fantastic scores for several clubs in various parts of the country.

My perspective for this activity was with the Peconic Amateur Radio Club FD group, W2AMC, from an excellent location at the Horton's Point lighthouse in Southold, New York. The location, on the north fork of eastern Long Island, was at 80 feet above sea level and overlooked Long Island Sound (see photos in the June, 1998 issue of *CQ VHF*). This location has also been particularly great for line-of-sight towards New England and eastern New York, so any skip activity is icing on the cake. This year, the club was joined by members of the Staten Island Amateur Radio Association (SIARA) to help out on the HF bands.

**Ken Neubeck, WB2AMU, is a* CQ VHF *contributing editor.*

The author operating his classic TS-670 radio on 6 meters during FD with the Peconic ARC on New York's Long Island. Ken says the band was literally smoking (good thing the rig wasn't!). Photos by Ray Neubeck, W2ZUN.

The setup that we used on 6 meters was a classic TS 670 transceiver with 10 watts out into a Mirage amplifier, which sent nearly 150 watts of power into a three-element MFJ Yagi up 20 feet. In addition, we had a double extended Zepp antenna built by Van Field, W2OQI (see "A VHF/UHF Antenna in a Pipe," *CQ VHF*, April, 1997), that would be used for monitoring in all directions when the band was quiet.

During Saturday morning set-up, there were some indications that the band would be in pretty good shape, and we heard the FP5XAB beacon on 50.035 MHz from St. Pierre and Miquelon Island (near Newfoundland) for over three hours. When FD started, we worked the usual line-of-sight areas, with a smattering of *E*-skip to Florida. A good opening developed toward the Midwest at 2020 Z and lasted over four hours. We had some good runs on the Magic Band and we worked about 60 stations via sporadic-*E* and another 40 via line-of-sight (with some relief help from Jay, K2OVS). But it was all a warm-up for Sunday.

Six Meters or 20?

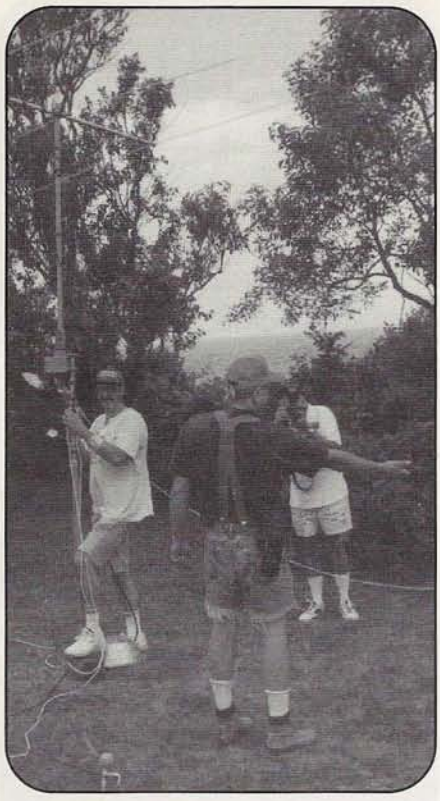
I listened to the band at 6:30 Sunday morning and heard just two local stations. When I came back from church at 8:20,

Table. Six-Meter Field Day Contacts

1220–1320 Z, 6/28

State	QSOs
Alabama	4
Arkansas	2
Florida	3
Georgia	2
Illinois	9
Indiana	7
Iowa	2
Kansas	2
Kentucky	4
Michigan	1
Minnesota	1
Missouri	9
Nebraska	1
New Jersey	1
North Carolina	3
Ohio	8
Oklahoma	2
South Dakota	1
Tennessee	2
West Virginia	1
TOTAL	**65**

Table. Summary of 6-meter contacts made between 1220 and 1320 Z June 28 at FD station W2AMC, Peconic ARC at Southold, Long Island, New York. The wide distribution shows how broad and strong the sporadic-E opening was on the Sunday morning of FD.



A three-element beam is all that was needed at W2AMC to make 270 contacts on 6 meters during FD. In this photo taken at set-up time, the author is holding the base of the monopole used to support the antenna while club FD Coordinator Don Fisher, N2QHV, and club member Warren Melhado, KG2BI, prepare to guy the "tower." Fully extended, the monopole put the Yagi 20 feet in the air.

it was wide open. I called CQ around the calling frequency and answered many calls as well. I think that hanging around near the calling frequency at the *beginning* of the opening was a good idea because many stations—including many home stations that weren't involved with a FD group—started listening there when they turned on their radios.

From 1220 to 1320 Z, I made 65 QSOs on 6 meters, a rate of better than one per minute and a new individual one-hour record for me (see the Table for a summary of states contacted during that hour). The pace slowed down only a little bit over the next few hours and the band remained "wall-to-wall" signals (did someone say it sounds like 20 meters?). The opening hung in there until the end of the FD-period at 1800 Z (the band would open again later that night, too).

There were also reports of DX, with weak openings to Europe being observed by some New England stations throughout FD and afterwards. I'm sure that Europe would have been possible from our site had we been concentrating on DX, but this would have affected our FD QSO rate and we were much too busy working the many stateside and Canadian stations that we heard. (*Under FD rules, DX contacts count for QSO points, but are worth no more than U.S./Canadian QSOs—ed.*)We observed some strong double-hop sporadic-*E* into the west from our location, and I worked six Colorado stations in a space of 30 minutes beginning at 1421 Z (KØSW, KØSU, WØTX, WØMS, NØERG, NØSMX). At 1553 Z, we worked NC7J in Utah and at 1648 Z, we worked NA7ID in Idaho, both via double-hop sporadic-*E*. I even heard Wyoming, but there was too much fade on that one (W2RC, 30 miles west of us, got him, though!).

Looking Back

It seemed our station setup was efficient enough for the opening and, being very far east, we basically left the beam facing west all morning on Sunday. Calling CQ was a good strategy for us, particularly in working the double-hop stations, as many of them came back to my CQ. Toward the end of FD, the skip was thinning out, but we still managed to work Canadian stations, VA3DR, VE4AAZ, VE4AS, and VE3JJX between 1640 and 1740 Z. I worked so many stations on Sunday that my hand started to hurt from pressing the microphone key so much.

By the way, 10 meters was also hot, but, at our station, it was getting hammered with intermod by the other HF station at the site, so 6 meters (which had no problems with intermod) had to pick up the pace! Apparently, intermod was a problem for 10- and/or 6-meter stations at other FD sites throughout the country, but even when limited to short operating periods during the peaks of the openings, many stations did well on these bands.

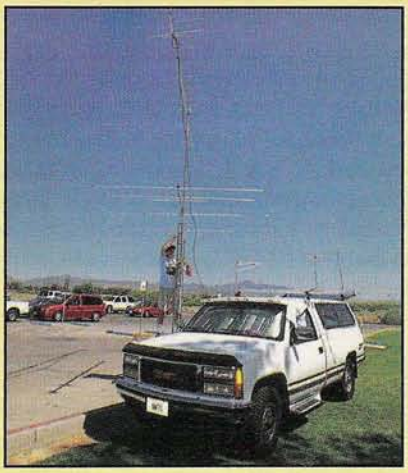
The band openings on six were so widespread that K9BGL in Illinois—one of the loudest stations we heard all weekend—said on the air that he worked all 48 contiguous states on 6 meters during the contest! Many of the other club stations near us in Long Island reported similar results on six, making over 100 QSOs each on the band. Plus, I heard similar reports from down south in Georgia from

A View from the South

Here's the brief report I received from my friend, Fuz, W4IO, about 6-meter band conditions in Georgia on FD:

The W4PVW Club in EM81 experienced mild sporadic-*E* from south Texas and the New England states on Saturday. From 1815 UTC, about 35 contacts were made before a series of strong thunderstorms halted operation at 2115.

Operations resumed at 1300 UTC on Sunday morning, with strong sporadic-*E* to W1, W2, W8, W9, VE3, and VE2. About 85 contacts were completed in a 2-1/2-hour period. Not a single local contact on six—everyone was too busy working sporadic-*E*!



On the Cover

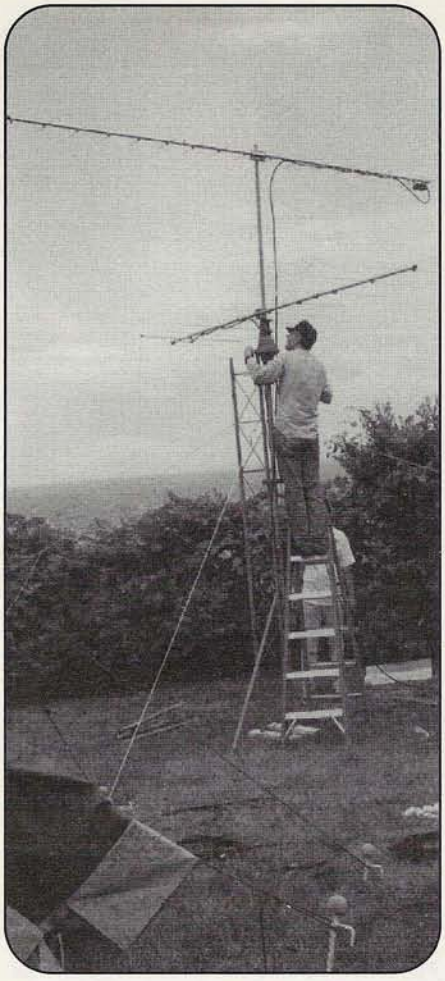
Jim Frye, NW7O, of Las Vegas, Nevada, sets up the VHF antennas—a 2-meter Cushcraft (top) and a homebrew, K7CA-designed, four-element beam for 6 meters—at the N7W Field Day site in Las Vegas's Sunset Park. Also visible in the photo is a Hustler vertical HF antenna (even though it looks like it's attached to the left rear of Jim's truck, it's actually ground-mounted several feet away). It's one of four HF antennas used at N7W, a special-event callsign.

The station, sponsored by the Frontier Amateur Radio Society, with additional participation by members of the Las Vegas ARC and Nellis Air Force Base ARC, drew over 125 people and had some 50 different operators on the major HF bands, plus 6 meters, 2 meters, and 70 centimeters.

An accomplished VHF weak-signal operator and mountaintopper, NW7O has activated each of Nevada's 17 grids at least once and operates on 50, 144, 222, 432, and 1296 MHz, plus 10 GHz.

The VHF bands, especially 6 and 2 meters, are increasingly important in the ARRL's Field Day event, which has traditionally had an HF focus. And while the folks at N7W had only two short, marginal band openings during the weekend, amateurs in other parts of the country found that the band was sizzling (see "Six-Meter Openings Heat Up Field Day," by Ken Neubeck, WB2AMU, elsewhere in this issue). But Frye says making lots of contacts isn't really what Field Day is about.

"We have fun, that's the main thing," says NW7O. "And we sit down with new people and show them how it's done. And most of them turn into real good radio operators." (Cover photo by Larry Mulvehill, WB2ZPI)



Six meters wasn't the only VHF/UHF band on the air at W2AMC. Here, Peconic ARC "Technical Maven" Charlie Burnham, K2GLP, is setting up Yagis for 2 meters and 70 centimeters, making sure the three major VHF-plus bands were available for FD contacts.

my friend Fuz, W4IO, who operated on six for club station W4PVW (see "The View From the South") And Ken Reecy, AC4TO, reports making over 400 6-meter QSOs on FD weekend from K4TLH in North Florida.

I'm sure that not every 6-meter station in the U.S. and Canada got the benefit of the great openings that were experienced in the Northeast and in the Midwest (that's the nature of sporadic-*E*), but early indications seem to show that there was some sporadic-*E* activity at least part of the time in most places.

To summarize our FD experience at W2AMC, we worked over 265 stations on 6 meters (more than 200 of them via sporadic-*E* and the rest by line-of-sight). The number of contacts made on six was nearly a quarter of our group's overall total, and six was our number-one band (including HF) during the FD period. How's that for a FD success story?

Keys to Success

The whole key to success —in addition to the excellent propagation—was that there were many stations to work during FD, including many home stations (class 1D), which weren't competing in the event but did give out points to those who were. The 270 QSOs in 1998 were a far cry from the *four* QSOs that I made from Connecticut during FD 1992, and it's good to see that six is now considered an important band for a group to have during FD.

Hopefully many clubs will realize that six can be a "money band" in the midst of the summertime sporadic-*E* season. I believe that, in the past, many clubs did not pay that much attention to setting up an efficient station for 6 meters and compounded its inefficiency by placing inexperienced operators on the band. A little bit of experience is very helpful on six, particularly when skip is going in and out. I'm fortunate that the Peconic ARC is committed to having the VHF bands running during FD and that its members enthusiastically support my efforts on 6 meters for both FD and special events.

Summing Up

In summary, the action that I saw during this year's FD was the best I've seen in the past eight years of operating FD and VHF-only contests. It almost seemed like that there were more people on six during FD this year than during the recent June VHF QSO Party. I think that after this great opening, many FD stations will be making 6 meters—as well as the other VHF bands—a regular part of their operations for years to come. It's very refreshing to see that six has made a significant turnaround from a utility band to a fun and important band during FD! ■

Oops...

Ken's article in our June issue ("Operating FD? Don't Forget VHF!" p. 22) incorrectly stated that there was a 100-point FD bonus for making an ATV (amateur television) contact. While ATV *contacts* on VHF/UHF in the past would have counted toward the now-defunct VHF bonus, there never has been an ATV *bonus* (although we think it'd be a good idea for promoting ATV activity in emergency communications). We apologize for any confusion.

Up, Up, and Away!

The SkyQuest 2 expendable "hamradiosonde" balloon was launched on May 30 during an open house at the National Weather Service's Boston Forecast Office, located in Taunton, Massachusetts. Project Coordinator Hank Riley, N1LTV, holds the ham radio payload in Photo A. After it was closed up and attached to the balloon's line, Roger Perry, N1MJN, and some of his Plymouth Community Intermediate School students (along with some "civilian kids" from the assembled crowd) inflated the balloon (Photo B) and all watched as it was launched (Photo C). The balloon's signal was heard all across New England, in New Jersey, and in Pennsylvania before it burst at approximately 100,000 feet.

Riley would like to hear from operators who have extended tapes of the balloon telemetry signal that they could loan to SkyQuest for analysis. If you can help, please e-mail Hank at <h1riley@umassd.edu>. Watch for a full-length feature article about SkyQuest in a future issue of *CQ VHF*.

(Continued on page 79)

Photo A. Hank Riley, N1LTV, holds the "hamradiosonde" launched in Massachusetts on May 30. Components, from left to right, are the altimeter, microcontroller, tone generator, and 2-meter transmitter. (Photo by Mike Riley, W1AQS, courtesy N1LTV)

Photo B. Science teacher Roger Perry, N1MJN (in center, with arm raised), and some of his students from Plymouth Community Intermediate School, inflate the balloon that would carry the "hamradiosonde" to an altitude of 100,000 feet. (Photo by Dennis Boller, N1WJI, courtesy N1LTV)

Photo C. "We have liftoff"! A crowd of onlookers at the National Weather Service's open house in Taunton, Massachusetts, looks on (as onlookers are supposed to do) as the balloon (top), parachute (center), and "hamradiosonde" (not yet visible) begin their ascent. (Photo by Dennis Boller, N1WJI, courtesy N1LTV)

P3D: Left at the Altar Again

AMSAT's Phase 3D satellite is all dressed up, with someplace to go...but no way to get there, as yet another nearly assured launch opportunity falls apart. What's next for ham radio's beleaguered "super-bird"?

By Rich Moseson, W2VU*
(<cqvhf@aol.com>)

Phase 3D, billed as ham radio's biggest, most sophisticated, *and* easiest-to-use satellite ever, literally can't get off the ground. There's no problem with the satellite itself. Rather, a combination of political and economic problems have conspired, for a second time, to leave the satellite without a launch vehicle. Despite assurances since last January from the European Space Agency (ESA), P3D was bumped in mid-June from consideration as a passenger on the October launch of Ariane 503, the third qualification flight of the European Ariane 5 booster rocket—in favor of a dummy payload.

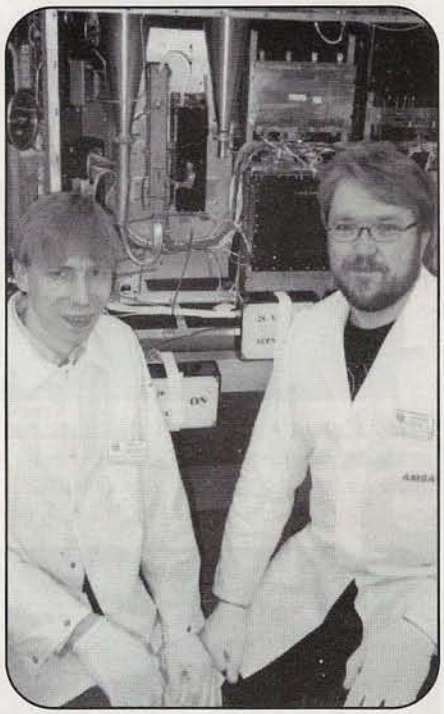
P3D was originally supposed to fly on Ariane 502, but, after Ariane 501 blew up soon after liftoff, ESA officials imposed new structural requirements on AMSAT, and the work couldn't be completed in time to meet the schedule for the 502 launch. In retrospect, this turned out to be a blessing, since 502 malfunctioned as well, and, while it did deposit its payloads in orbit, they were not the correct orbits. Had P3D been aboard, it would have had to use a significant amount of its limited fuel supply just to reach its intended orbit, thus limiting its future maneuverability. After being bumped from Ariane 502, AMSAT officials were assured by ESA that—if no paying passenger was found for the next flight (503)—P3D would fly on Ariane 503. Now, it seems, there is a "sort-of" paying passenger, meaning P3D is left launchless again.

"Despite assurances since last January from the European Space Agency (ESA), P3D was bumped in mid-June from consideration as a passenger on the October launch of Ariane 503...."

Hold On a Minute!

But wait, didn't we just say it had been replaced by a dummy payload? This is where things get interesting, not to mention a wee bit confusing.

Speaking of confusing, there's quite a bit of "alphabet soup" in the world of space launches, starting here at home with the term *AMSAT* and the fact that it has more than one meaning. AMSAT is an acronym for the Radio Amateur Satellite Corporation, the major group dedicated to the promotion, construction, launch and operation of amateur radio satellites. The North American AMSAT organization, AMSAT-NA, has affiliates in many countries around the world. P3D is a truly international satellite, with components having been designed and built all over the world, and there is a single AMSAT team, led by AMSAT-DL (Germany) President Dr. Karl Meinzer, DJ4ZC, negotiating with launch authorities to get the satellite in orbit. In general, references to AMSAT in this article are generic, referring to the international team, rather than to AMSAT-NA.



The photos accompanying this article illustrate the truly international nature of the Phase 3D project. Here, two Finnish hams, Harri Leskinen, OH2JMS (left), and Michael Fletcher, OH2AUE (right), pose with their contribution: the P3D 10-GHz transmitter and Traveling Wave Tube (TWT) amplifier. (Except as noted, photos are by Keith Baker, KB1SF, courtesy of AMSAT-NA)

Here's some additional "who's who" info in the world of space launches, courtesy of AMSAT-NA President Bill Tynan, W3XO:

1. *Arianespace* is a commercial company set up to sell Ariane launches.

2. *ESA* is the *European Space Agency*, much like the U.S. NASA (National Aero-

Rich Moseson, W2VU, is Editor of CQ VHF. *This article was prepared from material provided by AMSAT-NA, the ARRL, and the go-Ariane Web page, along with additional assistance from Bill Pasternak, WA6ITF.*

nautics and Space Administration), but a multinational organization.

3. *W1* is a commercial satellite built in Europe, which was damaged in a fire a few months ago. Reports have said that it has been refurbished and made ready for flight (*W1 appears to be a key element in the intrigue behind the "bump"—ed.*).

4. *CNES* is the French equivalent of NASA. It has been designated by ESA as the technical agency in charge of developing the Ariane 5 launch vehicle.

Signs of Trouble

The first sign of trouble, regarding the Ariane 503 launch, to reach the general ham public was a June 10 Internet posting on the *go-Ariane* Web page, which was reposted to the AMSAT-BB satellite mailing list by Eric Rosenberg, WD3Q. ("go-Ariane" is a Web site dedicated to the Ariane rockets run by French/English journalist Martin Ransom. It has no official connection to any of the agencies involved in the Ariane program...but Ransom seems to have many good contacts in all of them!)

Titled "What's Really Stopping 503 From Carrying AMSAT P3D?", the posting started with some background and then revealed for the first time ESA's intent to fly a dummy payload in place of P3D. Here are some excerpts:

The issue of the definitive payload for Ariane 503 has been dragging out for months and causing much frustration all round. The European Space Agency and CNES had been on track for a July launch and would like to see this qualification flight finished. Arianespace also, which had initially hoped to include a fully commercial flight, 504, before the end of the year. Two clients have already been lined up. But then cost of this additional qualification mission has to be met, in part by the European member states and, it has long been hoped, by a paying passenger.

We have reported how Arianespace Chairman Jean-Marie Luton had decided that he would postpone the launch—up to two months—in order to have this commercial payload. Certain industry sources have always believed that it was an illusion to think an operator would entrust one of his craft to the new launcher. That there could still be doubts after 501 and 502 is natural.

It has proved to be the case. The main contender for this cut-price ride has always been Eutelsat, one of Arianespace's most important clients, an organisation that in view of the number of craft it has to launch, could perhaps afford to take the risk. Hotbird-5, first suggested, didn't make it....Then it transpired that Eutelsat could swap its W series satellites around from their initially planned launchers. Hardly a month ago, all looked set for a W1 launch on Ariane 4 flight V109, and a W2 flight on 503. That was before the fire at W series contractor Aerospatiale facility in Cannes (France). Natural again, that Eutelsat boss Jean Grenier should then have second thoughts....

P3D Project Leader and AMSAT-DL President Dr. Karl Meinzer, DJ4ZC (left), discusses details of the satellite's systems with Dick Jansson, WD4FAB (right), AMSAT-NA's former Vice President of Engineering.

AMSAT P3D Ready But Cast Aside?

The most frustrated onlooker has been the AMSAT organisation. Its Phase IIID spacecraft was disembarked from flight 502 when it could not meet revised lateral load specifications for the second qualification flight last October. The AMSAT amateur enthusiasts who had painstakingly built their satellite to the highest standards managed to strengthen it—but not in time for the 502 launch.

After that lost opportunity, the European Space Agency and AMSAT decided in January not to squabble over the legal issues of who had not complied with the launch contract.

Instead ESA gave AMSAT P3D Project Director Dr. Karl Meinzer the assurance that if a commercial paying customer could not be found in time for 503, then P3D remained a backup solution. *go-Ariane* had confirmed that this was ESA's official policy until only very recently.

One can imagine the incredulous AMSAT team when it was revealed that, given the Eutelsat imbroglio, Arianespace was considering the eventuality of a dummy payload on 503! But why in heaven's sake, it was said, when AMSAT P3D is ready? Okay it's "only" an amateur satellite, some 600 kgs, but its project team have told ESA and Arianespace that they are willing to go into any GTO [geostationary transfer orbit] orbit to suit the qualification imperatives of the 503 mission....

What is not understood is that the January assurances from the ESA on this backup solution have not been followed up, nothing appears to have been prepared in the eventuality of a commercial "no-show." *go-Ariane* understands from several informed sources that, over recent months, AMSAT has been opposed due to the fact that a special "load analysis" for AMSAT P3D would be necessary, with certain parties such as Aerospatiale (them again!) saying that this would take 8 months! This is hotly contested. In fact, we know that environmental tests—with extra large margins—had been envisaged by AMSAT to get around this problem.

AMSAT, which has had a long and fruitful association with the European launcher, can not understand the (political?) interests that are today working behind the scenes. It is still ready to ship its satellite to Kourou [the ESA launch site in French Guiana, South America] and participate in the final qualification of the new launch vehicle. But we understand that exploratory talks have been held with other U.S. and Russian launchers. This alternative approach will be handled more vigourously if

"Arianespace may have decided to branch out from the launch business to owning and operating at least one communications satellite: the fire-damaged and now apparently repaired Eutelsat W1."

the Ariane baseline fails. It would be a shame to see such a lost opportunity—and that for the second time!

Holding Their Breaths

AMSAT officials continued holding their breaths, awaiting a final decision by the ESA Programme Board on June 11. In response to a query from *CQ VHF* about the above posting, AMSAT-NA Executive Vice President Keith Baker, KB1SF, basically asked for everyone to give Dr. Meinzer as much negotiating room as possible.

Without commenting specifically on the *go-Ariane* report, we in AMSAT-NA now understand that very sensitive negotiations regarding a Phase 3-D launch are continuing between the AMSAT-DL President, Dr. Karl Meinzer, DJ4ZC, and very high level officials within the European Space Agency (ESA) and Arianespace....

Official AMSAT Statement on New P3D Delay

The following contains the complete text of a message from Phase 3D Project Leader Dr. Karl Meinzer, DJ4ZC (President of AMSAT-DL), along with introductory remarks by AMSAT-NA President Bill Tynan, W3XO.

TO: All AMSAT-NA Members and everyone interested in Amateur Radio satellites worldwide
From: Bill Tynan W3XO President AMSAT-NA
Subject: Bad News on Phase 3D Launch

By now many of you have heard the bad news that Phase 3D will not fly on Ariane 503. This is, obviously, very disappointing news. We must, however, persevere and continue our present course to get the satellite tested and ready for a launch. And we pledge to do so.

I think the situation is best summarized by the words sent this morning by Dr. Karl Meinzer DJ4ZC the Phase 3D Project Leader.... DJ4ZC's statement follows:

Gentlemen,

First I would like to thank all of you who sent me notes of sympathy and encouragement following the recent news from ESA. Since that information was released, I have spoken with many people and the situation has become a bit clearer. First let me give a short rundown of events to put things into perspective.

1. Before the launch of AR 502, ESA terminated our launch-contract based on the fact that we "were not ready in time for the launch." This of course was due to the specification change which was imposed on us shortly before the launch following the AR 501 failure. We always maintained that the termination of the contract was on somewhat shaky legal grounds because of the unacceptable short notice we were given for the spec.-change. ESA maintained that this was a risk we had to accept because the flight was a test-flight.

2. As a consequence of the AR 501 failure, a third test-flight (AR 503) had become necessary. Because there was an uncovered hole of about $U.S. 40,000,000. in the AR 5 development budget, ESA turned to Arianespace to find a paying customer for this flight and partly delegated the responsibility for the payloads to Arianespace. For the case that such a customer could not be found, the countries developing Ariane 5 would have had to pay this missing sum.

3. In January, we accepted the termination of the contract with acceptable financial provisions and without further squabbles after ESA agreed to:

a. Carry us as a backup on AR 503 if no paying customer could be identified.

b. ESA would use "best efforts" to place us elsewhere if a flight on AR 503 did not become available due to a paying customer.

4. While we always maintained that it would be unlikely that Arianespace would find a paying customer (and in fact we were proved right by the events) and thus we would be flying on AR 503, ESA always assumed that Arianespace would come up with a paying customer. Thus ESA unfortunately did not pursue the provisions of (3.a.) in an active way. In particular, they failed to perform the necessary studies to include us on AR 503 if the option 3.a. would have to be exercised rather late in the game.

5. In the ESA Programme Board meeting last week, Arianespace surprised everybody by stating that they (the company Arianespace) would cover the missing $U.S. 40,000,000 in return for having the freedom to decide the composition of the lower payload. So, in fact, Arianespace had become the "paying customer" for this slot, and we were off.

Initially it was not clear why Arianespace would take this step. But after having spoken with many people, eventually the following picture emerged:

First of all, it is clearly in the interest of Arianespace to get AR 503 into orbit as quickly as possible. Assuming that ultimately they want to launch one AR 5 per month, each month of delay will cost them in the order of $U.S. 200,000,000 of lost revenue. This is all the more true since recently there has been some discussion about the performance of the AR 5 with regard to the market demands for launchers. So Arianespace may have some fears that they may lose the competitive edge if the AR 5 is further delayed and their customers may wander off to other launch-suppliers.

But also with AR 503 itself, Arianespace looked into optimizing the cost/profit ratio. To this end Arianespace has been negotiating with the insurance companies about the damaged W1. If the W1 can be refurbished in time for the AR 503 launch, they would launch it and then sell the communication services themselves. I had earlier indications of this, but I did not take it very seriously because I assumed that Arianespace would stay away from this option in view of the resulting conflict of interest with their customers—it turned out that I misjudged this. So, in a way, we have become the first victim of this conflict of interest. But in the light of this gamble, it is now doubtful that Arianespace would have considered us as backup even if ESA would have done their homework. Clearly they want to retain the option of switching the refurbished W1 against the W1-dummy to the last second before the launch. We simply could not compete with this by our offer of $U.S. 1,000,000 and some moral justification of not flying ballast.

So we wept some, and that done—let us now look forward:

1. For ESA, the launcher development has come to an end, and this phasing out is also reflected in the size of their staff and their commitments. So frankly, I do not expect very much from them in the future in spite of the above commitment 3.b.

2. With Arianespace, we have to start to deal seriously for a launch. In an initial contact, they stated that they would launch us for $U.S. 10,000,000. Clearly for us this is out of reach, but I hope that, once Arianespace has a better understanding of our environment and the constraints we work under, there will be room for negotiation.

3. I expect that we will get some significant help from our government [German], given that they saved quite some money, and that this saving occurred essentially at our expense.

Also all players agree that we have to finish the work on the spacecraft including the tests as soon as possible to be ready once the opportunity arises for a launch. It is clear that it will not be this year—but I think that the chances are not bad that we will find something next year on AR 5. This is all the more true given the mismatch of payloads with AR 5 performance.

But also in parallel, we should and will pursue other launch options. Although in the short term we have a problem, in the medium term I am reasonably optimistic. So keep your fingers crossed....

Dr. Karl Meinzer, DJ4ZC President AMSAT-DLe.V.

Also, as these negotiations continue, I believe it is important to remember that AMSAT-DL, and specifically, Dr. Meinzer, has again been designated by the Phase 3-D project team as AMSAT's key negotiator in this task. We are very fortunate to have Dr. Meinzer heading up our team as he has a unique knowledge and understanding of the European space business.

What's more, besides his native German, he is also fluent in French, as well as a number of other European languages. French is the language most often used in launch negotiations with ESA and Arianespace. I firmly believe Dr. Meinzer's prior track record at successfully securing not one, but several low cost launches for previous AMSAT spacecraft with ESA speaks volumes about his abilities in that regard. Right now, he again deserves our strong support as he goes about the delicate task of finding a safe and successful launch for Phase 3-D.

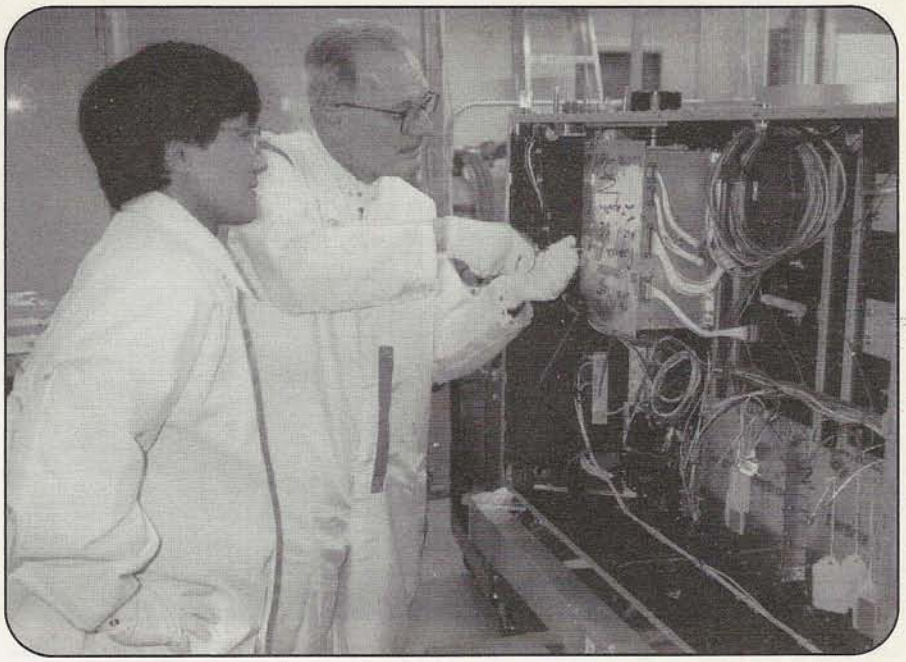
But as it turned out, negotiating room and optimism were not enough to hold back the forces of economics and politics. Less than a week after we received the above message from KB1SF, the ARRL issued a bulletin titled "Phase 3D Won't Fly This Year." It read, in part:

Phase 3D will not fly this year. AMSAT says the Phase 3D Amateur Radio satellite will not be aboard when the Ariane 503 launch vehicle goes into space this October. In addition to the Atmospheric Reentry Demonstrator, the European Space Agency will launch a dummy Eutelsat payload instead of Phase 3D, according to a joint ESA/CNES/Arianespace news release. Arianespace is a commercial company that markets Ariane launches.

"Essentially we were bought out by strategic and commercial interests," said a glum AMSAT-NA Vice President Keith Baker, KB1SF.

AMSAT-DL President Karl Meinzer, DJ4ZC, says it's clear to him that Arianespace wants to retain the option of swapping a real Eutelsat payload for the dummy right before launch. "We simply could not compete with this by our offer of 1 million dollars and some moral justification of not flying ballast," he said. "So we wept some, and, that done, let us now look forward."

Dr. Meinzer's complete statement appears elsewhere in this article. To summarize, he said it appears that Arianespace may have decided to branch out from the launch business to owning and operating at least one communications satellite: the fire-damaged and now apparently repaired Eutelsat W1. And it was willing to put up $40 million to make sure it had a "seat" on Ariane 503 in case that satellite was flight-ready by launch time. AMSAT's "paltry" $1 million couldn't hold a candle.



Japanese amateur Yoshi Takeyasu, JA6XKQ (left), works with AMSAT-NA's Dick Jansson, WD4FAB (right), on installing JAMSAT's "SCOPE" camera experiment aboard the P3D satellite. The SCOPE camera will transmit photos of Earth and space from the satellite to hams on the ground.

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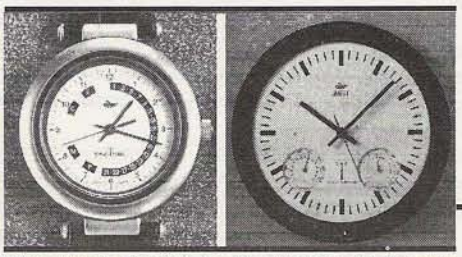

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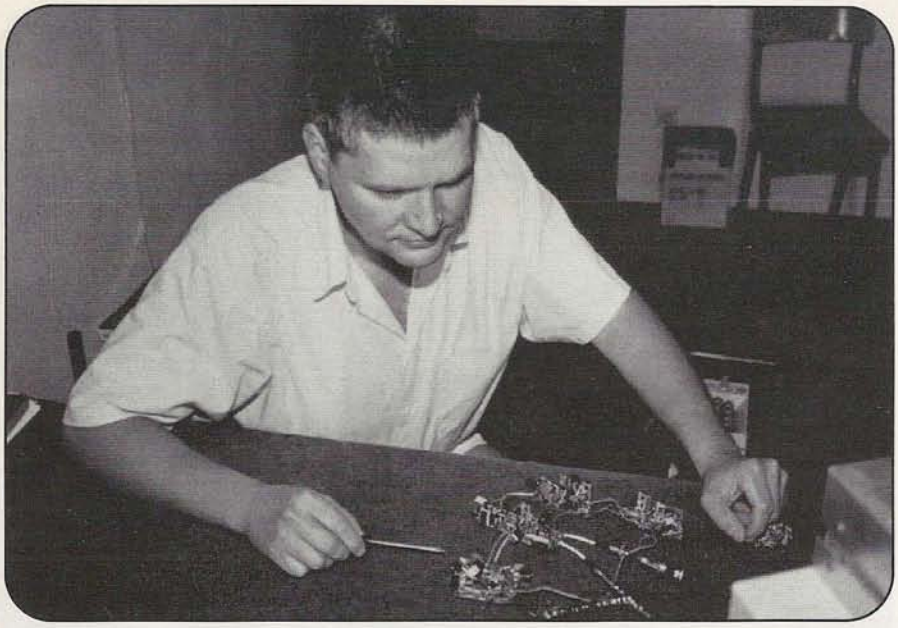

Matjas Vidmar, S53MV, of Slovenia, designed the LEILA circuit for P3D. This is a device that alerts ground station operators if they're unintentionally running too much power on the satellite uplink—then shuts them out if they don't reduce power. (AMSAT-DL photo)

Dr. Andras Gschwindt, HA4WH, holds the P3D Battery Charge Regulator (BCR), built by a team he led at the Technical University of Budapest, Hungary. The BCR will control the power to all components of the spacecraft.

It is unclear whether Arianespace intends to fly W1 *as* the dummy payload or as a functioning satellite. A later report from *go-Ariane* stated:

According to several sources, the development costs of a dummy satellite could be reduced if Aerospatiale uses the platform of the W1 satellite that was damaged at the fire in Cannes. The satellite has been declared a total loss for insurance purposes. Aerospatiale (or Eutelsat?) would thus just have to buy the satellite back from the insurance companies and fit it out to fly. To what extent it could eventually function in orbit is unclear....

A spokesman for Aerospatiale told *go-Ariane* on 19th June that nothing had been decided. "It is a question for all concerned: the insurers to which the satellite now belongs, ourselves, Arianespace and Eutelsat. For instance, how much W1 is worth if it's bought back. The satellite is at present 'drying-out' in a special chamber and we do not know at all whether part of its telecom payload would eventually work."

Extensive checks will have to be carried out—for instance on all the electrical systems, and whether the tanks are not leaking—before we ever fill it up with hydrazine to fly. We may put water. What is certain is that it would cost considerably more to build a new dummy satellite. As to when all this will be settled, well we imagine, pretty quickly!"

go-Ariane can add another motivation to the solution that has been found. It is not impossible that Arianespace might be considering eventual revenue from leasing itself transponders on the W1 satellite—should the satellite be capable of working in orbit. That would turn Arianespace into a satellite operator!

This, of course, is the same conclusion that AMSAT's Karl Meinzer reached after talking with his many contacts in the European space community.

What's Next?

The international AMSAT team is continuing to negotiate with European space officials, despite Arianespace's original demand for a minimum $10 million launch fee for P3D. In addition, while no details are yet available—and likely won't ever *be* available unless and until a deal is struck—AMSAT has begun talks with other launch agencies, presumably including NASA, the U.S. military, and Russia. According to the ARRL bulletin, everyone involved says the show must go on.

"This is obviously very disappointing news," said AMSAT-NA President Bill Tynan, W3XO. "We must, however, persevere and continue our present course to get the satellite tested and ready for a launch. And we pledge to do so."

Baker said AMSAT is continuing to look for a suitable launch opportunity and now is looking at "other agencies" instead of limiting itself to ESA's Ariane program. "We're standby passengers," he said.

Meinzer said he thinks the chances "are not bad" that Phase 3D will get aboard an Ariane 5 flight next year. "But also in parallel we should and will pursue other launch options," he advised the Phase 3D team. "Although in the short term we have a problem, in the medium term I am reasonably optimistic. So keep your fingers crossed."

The entire leadership and membership of AMSAT groups all around to world are keeping their fingers crossed, as their "jewel in their crown" sits in a Florida laboratory...waiting to be invited out to a launch. ■

Resources

This article was up to date as of the time we went to press in mid-July, and AMSAT officials considered major developments to be unlikely before the fall. For updates on developments since we went to press, we suggest that you check out any or all of the following Web pages:

AMSAT-NA:
<http://www.amsat.org>
CQ VHF:
<http://members.aol.com/cqvhf/>
go-Ariane:
<http://www.go-ariane.com>

Two-Meter DX Anytime—"On the Rocks"

Imagine being able to work 700 to 1,000 miles on 2 meters whenever you wanted and wherever you were...without waiting for band openings or satellite passes. Well, you can—with high-speed CW (HSCW) meteor scatter. And don't be scared off by "high speed"—you slow it down to listen...or even watch!

By Jim McMasters, KM5PO*
(kd5bur@gte.net)

I couldn't believe I had forgotten my jacket. The one I had borrowed was about three sizes too big, but it was better than nothing. The weather had turned out to be much colder and windier than expected and now I had the shakes, although some of it may have been from pure excitement. I tried to hold down pieces of paper from blowing away while concentrating on the computer screen and the sound in my earphones.

"By completing this contact, we would establish the first-ever North American HSCW-MS (High Speed CW via Meteor Scatter) contact from a portable station."

Would the meteor-scatter bursts that I was hunting be there? Yes! There they were. Right on time. Even with all my fumbling, it was clear that my contact with W7XU in Parker, South Dakota, was going to be a success. Arliss and his wife Holly, NØQJM, live in grid square EN13. By completing this contact, we would establish the first-ever North American HSCW-MS (High Speed CW via Meteor Scatter) contact from a portable station.

Nothing Special...

I was set up in Bossier City, Louisiana, in Grid EM32 (see Photos A and B), some

*Jim McMasters, KM5PO, was originally licensed in 1964 (at age 13) as WA1FFY and also held the calls WA5QVJ and KD5BUR. He's a two-time National Champion in Radio Controlled Precision Aerobatics, and is employed as a supervisor at the local daily newspaper. Jim is married with four children and lives in Wake Village, Texas.

Photo A. A cold blustery day set the stage for the first-ever portable HSCW operation in North America, staged from grid square EM32 at a site secured with help from Carl McNair, KB5WMY. All power is supplied by the vehicle. Rack on top is for transporting the Yagi. (Photos courtesy of the author)

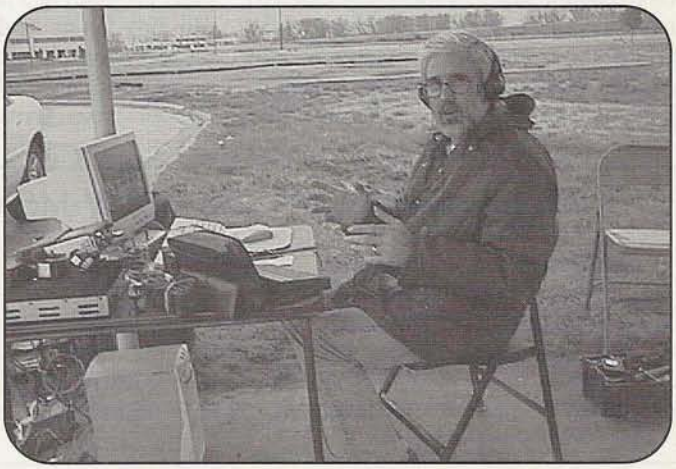

Photo B. KM5PO explains how HSCW works during a break in activity at his first-ever North American portable HSCW operation in EM32. Trees in the distance were the only things separating the antenna from the distant horizon!

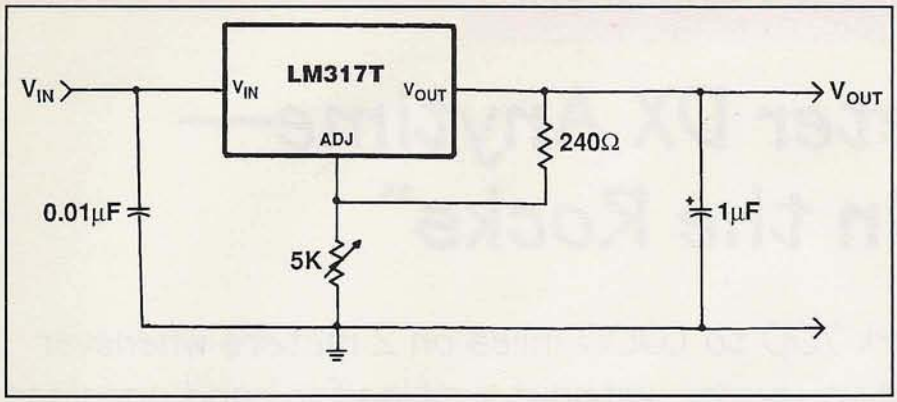

Figure 1. Schematic of a recommended speed control circuit for a modified tape recorder (MTR). Connect V_{out} directly to the tape recorder motor. Since this causes the motor to run at all times, a switch should be added between the battery supply and the speed control. I use 12 volts at V_{in}. With this setup, I can vary the tape speed from very fast down to a crawl.

700 miles south of Arliss. There was nothing special about the day. No tropo enhancement, no big meteor shower. Just a cold, breezy morning with the sun well up in the sky and the familiar sound of "white noise" filling the air. Every so often came the brief buzzing sound of a signal being reflected by the ionized trail left by a meteor. After 15 minutes of working back and forth, it was over...this history-making contact was in the logbook. We had done it! But there was little time to celebrate, as there were more contacts to be made. I worked through the list of pre-arranged schedules, getting better at it as the morning went on and finishing with five contacts in as many states, at distances ranging from 520 to 775 miles (see Table 1 for a complete list of stations worked).

I've always enjoyed working a rig out of doors and my ambitions to put together a portable HSCW-MS station were fueled by the fact that I was scheduled to make a presentation on this subject at the Southeastern VHF Society Conference in Atlanta, Georgia, and I wanted to actually demonstrate this mode on the air while I was there. HSCW-MS is very popular in Europe, but is only beginning to generate interest here in North America. With the Conference a couple of months away, I felt it was important to be well prepared by getting some real portable experience in this new and unusual mode.

After the last contact of the day was made, I took apart the portable station and reflected on the morning while loading things back into the car. No extreme DX distances were achieved, just good solid contacts made on the day *we* had picked, and at the times *we* had picked. This was the *cool* part. We had made the 2-meter band produce "DX anytime."

How Is This Possible?

We work HSCW-MS by communicating tiny bits of information via meteor trail reflections. We transmit high speed Morse code, generated by either a computer program or a programmable keyer. The tiny bursts of data are recorded by the receiving station and slowed down to a copyable speed. Stations attempting contact take turns transmitting and receiving, and hoping that a random meteor trail will form in the correct place at the correct time, causing a brief reflected signal to occur. Amazingly enough, there is a great likelihood of success!

Meteor-scatter propagation occurs when RF energy is either reflected or re-radiated by the ionized trail left behind from dust particles entering our upper atmosphere from outer space. Larger particles are seen from the Earth as they burn up and are commonly called "shooting stars." Several times each year, the Earth passes through dense concentrations of debris, generally believed to be left over from dead comets. These dense fields of debris cause increased visual sightings and RF reflections. These times are known as "meteor showers" and VHF operators have learned that using SSB or slow CW, generally coupled with prior scheduling, can yield many contacts. During peak times of a meteor shower, even random contacts can be made using SSB.

With HSCW, we are not so much interested in meteor showers as in the *routine daily influx of random meteors* into the atmosphere. Approximately 12 *billion* meteors of this type burn up daily! The commonly detected 144-MHz HSCW signal reflected via the random meteor trail just described tends to be somewhat weak and very, very short in duration. Since this type of meteor is available every hour of every day, DX contacts can, and usually do, take place on the VHF bands when and where two operators decide to schedule. Conditions vary greatly where meteor usability is concerned, and a good deal of persistence and patience may be needed when the usable meteor count is low, especially at lower ERP (effective radiated power) levels. Experience dictates that, with higher ERP, there will be more reflections heard at the receiving station. One formula indicates that a 3-dB increase in transmitted power will yield a 50-percent increase in received echoes.

I've found that the most common distance for working other HSCW stations is about 700 to 1,000 miles. Shorter and longer distances have been worked, too, of course. Using an estimated height for the meteor impact point, the math works out to a probable maximum distance of about 1,400 miles.

I've usually had better success in the early morning hours around local sunrise. This is because the speed of the Earth's rotation adds to the speed of our orbit

Table 1. KM5PO's Portable HSCW-MS Contacts

Station	Location	Grid	Distance
W7XU	Parker, SD	EN13	700 miles
WA8CLT	Columbus, OH	EN80	765 miles
NØKQY	Leoti, KS	DM98	521 miles
KØGU	Wellington, CO	DN70	775 miles
W8WN	Elizabethtown, KY	EM77	590 miles

Table 1. The first morning's worth of high-speed CW (HSCW) meteor scatter contacts made by the author this spring while operating portable from Bossier City, Louisiana, in Grid EM32. There were no atmospheric enhancements or major meteor showers in progress.

Photo C. Simple HSCW contest setup in the back seat of the author's car. CMOS Super Keyer III is behind the Modified Tape Recorder (MTR) and homemade paddles are to the right. Rig and amp are to the left, with switchbox in the middle.

around the Sun, and this, in turn, causes meteor impact speeds to be at their maximum, providing us with more usable "burns" (meteor trail reflections).

Equipment Needed to Work HSCW

A typical North American HSCW station setup will include a 2-meter all-mode rig, an amplifier capable of producing 150 to 500 watts PEP (peak envelope power), and a Yagi of at least 13-foot boom length.

For computer-assisted stations, the primary software in use is MSDSP Ver 7.0. This shareware, by Tihomir Heidelberg, 9A4GL, from Croatia, is a DOS-only program that uses the Creative Labs SoundBlaster-series sound card. The program handles both transmit and receive functions and is the best all around choice for HSCW with a computer. It allows the operator to mark and save signal bursts while continuing to record the incoming receive audio and makes data transmission easy with message "boxes" in which info is simply typed in from the keyboard. When the previously marked and saved signal is replayed, the operator has the ability to slow down the recording by a factor of -60 times. It has been found to run on many computer systems but is hardware specific regarding the sound card (you *must* use a real SoundBlaster card). Since it's written specifically for the HSCW mode and is quite easy to use, it's worth the effort to install and make functional.

A second choice of software, less extensively used, is CoolEdit. This program deals with audio files in the same way that a "paint" program works on image files. Recorded audio shows up on the screen in various colors, so the HSCW operator "sees" the actual Morse code dots and dashes. This can be helpful if the operator has little or no CW background. The shareware version of this commercial product requires Windows 95 and is fully functional for HSCW use. However, since data for transmitting must be assembled in file format prior to use, it is cumbersome where speed is of the essence, such as in random or contest work. Other HSCW software is also available, all of which run in DOS mode, some requiring sound cards, while others (which handle transmit functions only) utilize a simple serial port interface.

Table 2. Burst-Duration/Signal Strength

1st Number (Burst Duration), 2nd Number (Signal Strength)

1 - ping, not usable (not sent)
2 - burst, up to 5 seconds
3 - 5–15 seconds
4 - 15–60 seconds
5 - over 60 seconds
6 - up to S3
7 - S4 to S5
8 - S6 to S7
9 - S8 and stronger

Table 2. The Burst-Duration/Signal Strength reporting system commonly used for HSCW meteor scatter contacts. Each report consists of two digits, the first (1–5) indicating length of the meteor burst, and the second (6–9) indicating the relative strength of the received signal.

You Don't Need a Computer

The computer method of working HSCW is by far the most popular way to go here in North America. But for portable operation, it means packing up all the computer gear over and over. And not every laptop computer is compatible with HSCW software. But there is a simpler way to go.

A technique that's been popular for many years in Europe is to use an *MTR* (Modified Tape Recorder) for receive, coupled with a programmable keyer to generate high-speed code for transmit (see Photo C). I decided to check this out and, to my surprise, what I came up with worked quite well.

I took a standard cassette tape recorder and added a motor speed control (see Figure 1). By recording in the fast-forward mode (the RECORD and FAST-FORWARD buttons pressed down at the same time), and then playing back isolated signal bursts using the slower speed-controlled motor speed, the MTR could process speeds of transmission commonly used in North America (2000 to 4000 LPM, or letters per minute, equivalent to 400 to 800 wpm; see "HSCW Glossary").

Adding the CMOS Super Keyer III (see "Resources") with a 2-kHz tone oscillator (see Figure 2) completed the new simple HSCW setup. The keyer is programmable with "message banks" and can achieve CW speeds up to 5000 LPM. The tone oscillator was necessary so that the rig could be "keyed" via audio injection at the mic jack in single sideband mode. This is known as J2A mode, which is virtually equivalent to pure CW. I would rec-

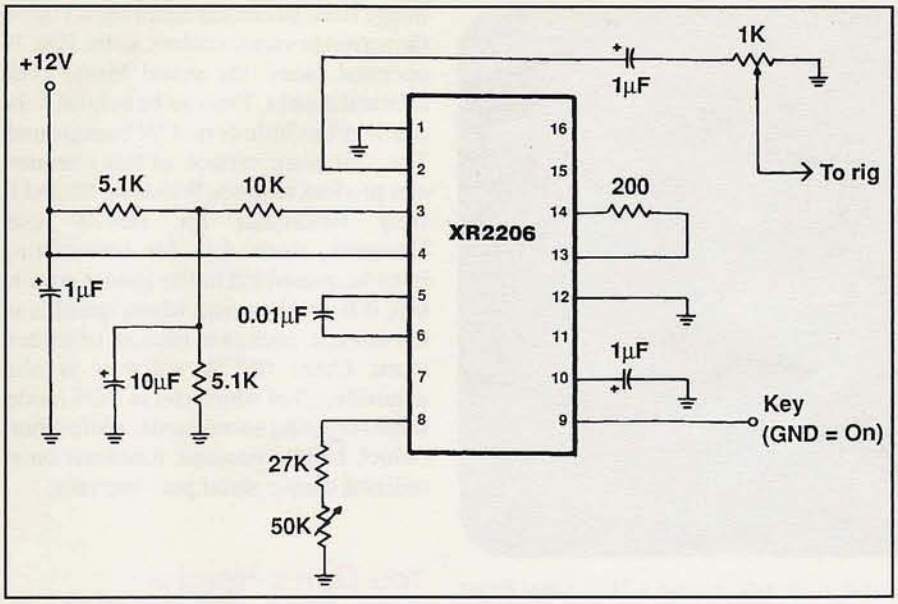

Figure 2. Schematic of an "Audio Oscillator for High Speed Keying," adapted from a circuit by DL3NCR, originally published in Funk-Telegram, *made available by PE1OGF and edited for North American use by N1BUG. Note that all capacitors except the .01-µf are electrolytic. Once built, you'll need to adjust the 50-K potentiometer (pot) for desired frequency output, usually 2000 Hz, and set the 1-K pot for proper transmitter audio drive level.*

ommend this approach as a low-cost entry level package for those who do not want to use the computer method.

Getting on the Air

Whichever way you decide to go—a computer or the MTR/programmable keyer—the hookup between devices and the rig usually consists of nothing more than shielded cables, some way to *pull* (activate) the PTT line, and possibly a .01-mfd. capacitor (specifics depend on how your rig is keyed).

The new HSCW station should then be put on the air with a local ham helper (or one within tropo range) to aid in setting the transmit audio level. Increase the HSCW audio drive into the rig until the power output shows no further increase. Then back off the audio drive a "notch." Have your friend make an audio recording of your signal. Now simply slow down the recording (with whatever system you intend to use for receive recording/playback) to check for the quality of the signal.

For receiving practice, you can download actual recordings of HSCW bursts, but the way to really "learn the ropes" is to set up some "skeds" (schedules) and actually make some contacts. Schedules can be made by any means, but most ops use e-mail. A list of stations currently operating HSCW is available on the Internet (again, see "Resources"), complete with "how-to-contact" information, including an e-mail address. Be sure to add your name to this list when your station is operational.

Photo D. A sunrise behind you will sure make it hard to see a computer monitor! Displayed on the screen is the popular HSCW software, MSDSP, by 9A4GL. To the left is a Yaesu FT290 transceiver stacked on top of a TE Systems amp. Chassis box in the middle is a simple home-brew switchbox to handle the PTT line by either a toggle switch or VOX control.

Sked Details You'll Need to Know

With HSCW, each station takes a turn transmitting for one minute and then receiving for one minute (*this is different from the standard MS practice of 15-second send/receive intervals—ed.).* During the minute that a station is transmitting, the operator works on decoding any pings received in the prior minute. For the purpose of scheduling, the westernmost station starts first. For example, if the sked starts at 1200 UTC, the station to the west starts transmitting at 1200 UTC while the station to the east receives. At 1201 UTC, the eastern station begins transmitting while the western station listens. Times are always stated in UTC to prevent confusion, and, of course, calibration to WWV or some other time standard is a must.

By the way, you might be asking, "how can I decode the signal bursts in just one minute?" The answer is practice, practice, practice. With most skeds, you may only hear one burst per minute, so, with a little experience, you'll find this no problem at all.

The speed which each station intends to use should be stated during scheduling. In North America, speeds of 2000 to 4000 LPM are most common and may depend to some extent on the equipment used and the skill of the operators. The frequency for the attempt is stated in what is called the "zero beat" format. *This is the signal's actual zero-beat frequency.* So, when using audio-tone injection (pretty much the standard now in North America), the zero-beat frequency is the *USB dial readout plus the frequency of the injected tone.* For example: for a sked

on 144.157 "zero beat" (or "144.157zb"), the transmitting station sets the VFO on 144.155 USB, with a 2000-Hz audio tone injected. The receiving station will want to hear approximately a 2000-Hz tone, so will put the receiver on 144.155 USB (the same as the transmit setting).

On the Air!

Once the station is set up and tested and a sked or two is made, it's time for the "show" to begin. Are you ready for your first HSCW QSO?

For an HSCW contact to be valid, you will need:

- An exchange of both callsigns.
- An exchange of some type of information or report.
- An exchange of confirmation of #2.

The following simple guideline has been developed:

- When a station copies both calls, he sends calls and report.
- If he gets both calls and a report, he sends his report & Roger.
- If he gets report and Roger, he sends Rogers.
- When both stations get a pair of Rogers (you must have at least two to be sure!), the QSO is officially complete. However, the other station may not know this. So it is customary to then send "73" to let the other station know that he can QRT (stop transmitting).

HSCW Glossary

LPM (Letters Per Minute): Five letters = one word.
WPM (Words Per Minute): One word = five letters.
4000 LPM: 4000 Letters Per Minute, or 800 Words Per Minute (about 4 times faster than a *fast* SSB operator.
Ping: A very short-duration meteor trail reflected signal.
Burst: Same as "ping" except usually conveys the idea that at least some HSCW data was copyable.
ERP (Effective Radiated Power): Output power delivered to the antenna driven element multiplied by antenna gain in dBd (referenced to a dipole).

Report Formats

There are two main types of "report" formats. The first is the old "Burst-length S report" (i.e. S2, S3, etc., with the number indicating the relative length of the "burn") used in North American meteor scatter work since the 1950s. The second is the two-digit "Burst duration signal-strength report," which is the standard in Europe and now common everywhere for HSCW. This second type of report consists of two numbers with the first indicating the meteor burst duration and the second number the signal strength. The most common report of this type issued is a "26" report, with the "2" representing a "burst" of up to five seconds duration, and the "6" signifying a signal strength report of up to S3. See Table 2 for the complete list of report codes.

Here's a typical exchange for a contact between Gary Krenzel, NØKQY, and KM5PO (me). NØKQY is to my west, so he sends first:

NØKQY sends: *KM5PO NØKQY KM5PO NØKQY etc.* for one minute.

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KM5PO sends: *NØKQY KM5PO NØKQY KM5PO etc.* for one minute.

NØKQY copies both calls on a short weak *ping*, and sends "calls and report": *KM5PO 26 NØKQY 2626 KM5PO 26 NØKQY 2626 etc.* Again, this goes on for a full minute. (Note that everything repeats very rapidly, *with no long runs of any one piece of information.* HSCW uses fractional-second pings. Repetition of the same information defeats its advantages).

KM5PO copies both calls and the report on a short but strong ping, then sends "Roger report": *R27 R27 R27 etc.* for a minute (*no calls*).

NØKQY copies R and report, sends "Roger": *RRRRRR* for a minute (Again, no calls are sent).

KM5PO copies Rs. QSO is complete. Tells NØKQY that he has everything by sending: *73 73 73 73.*

NØKQY copies the 73s, QRTs and completes his log sheet. If conditions are good, he may also send: *73.*

HSCW Operating Tips

You'll have better success in HSCW if you also keep in mind the following:

• Always go "forward" with your contact. Don't get confused and go backwards simply because what you receive from the other station is not what you were expecting. Example: It's possible for both stations to be transmitting the "calls and report." This is because both stations have heard full calls from each other *but have not heard anything since*, and you always send during your minute. The first station to copy the new data (calls and report), should immediately begin sending the "Roger report."

• MTR and CoolEdit users must pay close attention to the "tape counter." When a burst is received, make note of the counter position or number. This is where you must start the audio replay or visual depiction to decode the signal. CoolEdit has a "paint" function in which you highlight the area containing the signal and then zoom in to read the code visually. MTR operators will switch their motor speed to HIGH for fast rewind to reach the counter position in time to replay the burst at slow speed for decoding before starting the next minute's receive/record period. A second tape *already rewound* is good to have handy when time is tight. If you're still working on a signal burst when it comes time to begin recording again, you simply pop in the second (rewound) tape.

• Work on decoding pings and bursts received *early* in your receiving minute, especially if you're running out of sked time or if you've been receiving relatively few bursts. Unless you are running CoolEdit with a second receive recording window open, this will mean that you must stop recording the remainder of the minute to work on the data you have already received. Experience will teach you how to judge a usable burst (one that sounds like it has enough strength and duration to contain data).

• Work on decoding pings and bursts received *later* in your receiving minute or wait until you begin transmitting to analyze them if you're receiving many pings and bursts. This will enable you to see the latest data your sked partner has transmitted, *because he may have changed data during the same transmit minute* based on what he just decoded. This practice will speed up your QSO completion time.

Armed with these tips and information, you should be on your way to working "DX anytime"! All we need now is enough HSCW operators to populate the country. As of this time, there are several dozen stations on the air. Most contacts are currently made through scheduling but eventually random CQs and QSOs will become the norm as is the case now in Europe.

The Atlanta Demo

How did the Atlanta trip turn out? Well, first I had to fix some problems noted during the initial trip described earlier. There was RF coupling in the computer monitor, the antenna would not stay fixed in certain directions (especially in the wind), and I had a ground loop, which caused hum to bleed through into the receive audio. So, I immediately planned another operation into EM33 to test out a few possible solutions. This trip was also a success with five out of six stations worked and most of my problems licked.

Next came the big trip to Atlanta with the planned demonstration from the hotel parking lot. When I arrived at the site, my heart sank to see how poor a VHF location it was (but a wonderful site to hold the conference!). Situated "low" in the midst of a business park surrounded by high-rise buildings and Interstate traffic, I knew I was in for trouble. Threatening thunderstorms made for a high noise level in the receiver, and there was also the familiar computer- and appliance-generated "birdies" up and down the band. In spite of these obstacles, a nice string of contacts was made, including several into the New York and New England area and one to western Kansas (see Photos D and E). However, some contacts were lost due to the local noise masking the incoming weak signals. Many of the conference attendees visited the portable site in the

Photo E. From the KM5PO/4 portable location in Atlanta, Georgia (EM73), Bert Rollen, NS4W, works Maarten Broess, KD1DZ (now W1FIG), in FN31 (856 miles away) via HSCW! John England, K4RIG, and Cliff Segar, KF4DZV, look on.

"...this is an accepted and approved mode for VHF contesting, and with its potential for providing DX (i.e. multipliers) at any time, day or night, the serious contester will wisely give consideration to its use."

parking lot. Among them were two Europeans—Ian Melville, PA/G4EZP, and Keith, DL/G4FUF—who between them had considerable experience using HSCW in Europe where the mode has been popular for 25 years.

Contesting with HSCW?

Yes, this is an accepted and approved mode for VHF contesting, and with its potential for providing DX (i.e. multipliers) at any time, day or night, the serious contester will wisely give consideration to its use. There has also been a specific HSCW contest sponsored by the Western States Weak Signal Society, which was held this year on May 2 through 3. Contest rules required all contacts to be random, without the benefit of prearranged scheduling. This gave me a perfect opportunity not only to activate several grids as a rover, but also to try out my lightweight MTR and programmable keyer! What a joy it was to make contacts with such simple equipment. Although contest participation was somewhat low, I managed to make 10 contacts from the four grid squares I activated.

How 'bout a Sked?

HSCW work is truly a challenge and yet very rewarding at the same time. I certainly hope that if you decide to try the mode, you'll contact me for a sked and that you'll be as satisfied with "DXing anytime" as I have been. Pings to ya! ■

Resources

For additional information on High Speed CW Meteor Scatter, we recommend the following:

The North American High Speed CW-Meteor Scatter Web Site, <http://www.nitehawk.com/rasmit/ws1_15.html>. This Web site has it all when it comes to HSCW, including important news items and bulletins pertaining to HSCW activity; instructions on subscribing to free HSCW Reflector e-mail postings; download site for MSDSP ver 7.0, operating manual and usage tips; N.A. HSCW procedures and FAQ (frequently asked questions) papers; List of HSCW stations in N.A.; and a vast amount of documentation, schematics, and links pertaining to hardware and software used in HSCW, plus links to other important HSCW Web pages.

The MSROCKS page, <http://www.cybercomm.net/cgi-bin/cgiwrap/~slapshot/msrocks.sh>. Real-time HSCW skeds and action.

Practice .wav files of actual HSCW bursts: <http://www.qsl.net/kd5bur>

CoolEdit shareware software: <http://www.syntrillium.com/10/cool.htm>

CMOS Super Keyer III (originally described in *QST*, August 1995): Idiom Press, Box 1025, Geyserville, CA 95441, $55 plus $3 shipping and handling in the U.S.

Recommended Reading:

"High Speed CW and Meteor Scatter—An Exciting DX Medium," by Jim McMasters, KD5BUR, *QST*, April, 1998, pg. 34.

Beyond Line of Sight, edited by Emil Pocock, W3EP, ARRL, 225 Main St., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Internet: <http://www.arrl.org/catalog>.

Software for Hams without Internet Connection:

All of the HSCW software and documentation, HSCW Procedures, and FAQs found on the Internet are available on four diskettes for a cost of $5 from: Betty Epperson, P.O. Box 3637, Texarkana, TX 75504-3637.

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Cherokee AH-50 6-Meter Handheld

If you want to get your feet wet on the "magic band" but aren't ready to invest in an expensive multimode radio, the Cherokee AH-50 handheld might be just what you're looking for.

By Heather Hampton, KE6HEY*
(<kesixhey@aol.com>)

Recently I was bitten by a semi-serious 6-meter bug. However, when I started looking for equipment, I was disappointed to find that there was very little commercial equipment available for the band. Like most hams these days, I was on a budget, so my options were pretty limited. Most of the radios I found included 6 meters as part of a full-featured, all-mode HF radio. These radios were all very expensive and way out of my price range. That's when I came across the AH-50, a very basic (and inexpensive) 6-meter FM handheld being marketed by well-known CB radio manufacturer Cherokee.

I called a friend of mine who works for the local ham dealer and asked him about the radio. He said he'd sold a few of the HTs, but confessed that he hadn't yet gotten any feedback regarding them. It looked like I would get to be the guinea pig! When I got the radio home, I couldn't wait to get it out of the box! I had some reservations about it, but given the radio's low cost, I figured I couldn't go wrong!

Big, Solid Construction

The AH-50 is a large radio, reminiscent of the HTs of a few years ago. Still, it isn't *too* big: it fits pretty well into the palm of the hand. An added advantage is that it's big and heavy enough to remind you that it's there when you have it clipped to your belt! Many a radio has been damaged because the owner forgot about it and either sat on it or dropped it! The volume and squelch are controlled by two rubber-covered knobs on the top of the unit. Also located on top of the radio is an ICOM-compatible speaker/microphone plug, along with a rubber gasket to cover it when not in use. The radio's rubber duck antenna (see below) is about nine inches tall and attaches to the unit with a BNC plug.

While the radio lacks a keypad (and the ability to send DTMF tones), which limits your flexibility somewhat, it has plenty of other buttons if that's important to you. (*Back in my early hamming days, you could roughly judge the cost of a radio by the number of knobs and dials it had—a number that sticks in my mind is about $100/knob!—ed.*) Altogether, the Cherokee has eight buttons in addition to the Push-To-Talk (PTT). On the side of the radio, directly above the PTT key, there are **UP** and **DOWN** keys used for frequency selection. There are also six keys on the front: an **F** (Function) and a **LAMP** key directly to the left of the display, and four keys below the display, labeled **H/L** (for High/Low power selection), **RPT** (to toggle between simplex and repeater mode), **SC** (for Scan), and **CAL** (which puts you on your chosen "CALL" frequency and activates the 5-kHz step function). The front panel buttons each have additional functions, which we'll cover soon.

No micro HT, the Cherokee AH-50 is reminiscent of the bigger, "solid-feeling" handhelds of the past. Plus, it's big and heavy enough to remind you that it's there when it's clipped to your belt! The author rates it as a solid performer with a very reasonable price tag.

**Heather Hampton, KE6HEY, earned her ham license at age 15 as part of a disaster training program at her high school in Pescedaro, California. She now lives in Riverside, California, where she is active on 10-meter SSB, 2 meters, 70 centimeters, and (now) 6-meter FM.*

"The AH-50 has five memory channels, not many compared to most popular 2-meter HTs, but there are far fewer repeaters on 6 meters than on two, and most FM activity is centered around 52.525 MHz, so these memories should be more than enough for most users."

The LCD screen is clear and larger than the screens on most other HTs. Even the smaller sub-characters of the display are pretty easy to read. The radio has both momentary and constant lamp modes, and the LCD's green back lighting is adequate for most nighttime use. The AH-50 is supplied with a 12-volt, 600-milliamp NiCd battery pack, which is compatible with Standard's CNB-152. Using this pack, the radio can be operated at 5 watts output on high power (the low power setting is 1 watt).

In terms of attractiveness and "polish," I would rate the unit average. It's not bad to look at, but overall it doesn't feel quite as rugged as some other HTs that I've used.

Complex Operation

Selecting an operating frequency is straightforward enough. You simply use the **UP** and **DOWN** keys to select the frequency. Each push of the button changes the radio's operating frequency by 10 kHz. For faster frequency changes, holding down the **F** key while pressing **UP** or **DOWN** changes the frequency in 1-MHz steps. If you want to access frequencies that end in 5 kHz, such as the 6-meter FM calling frequency, 52.525 MHz, you'll also need to use the **CAL** key. Holding down the **CAL** button for a full second turns the +5 kHz function on and off. When it's turned on, a small "5" is displayed to the right of the other, larger digits of the operating frequency.

The AH-50 has five memory channels, not many compared to most popular 2-meter HTs, but there are far fewer repeaters on 6 meters than on two, and most FM activity is centered around 52.525 MHz, so these memories should be more than enough for most users. Each of the memories is associated with five of the keys on the front of the radio. The memories are accessed by first pressing and releasing **F** and then pressing the appropriate key for the memory channel you're choosing (for instance, the **LAMP** key is associated with memory number 1, the **H/L** button with memory 2, etc.).

As mentioned above, each button has more than one function. For instance, the **RPT** key (the key most folks will use most often) can be used to turn the repeater shift on and off (by pressing the button) and to turn the built-in CTCSS encode and decode features on and off (by holding the button down for 1 second). Another special key is the **SC** key. Pressing and holding this key for two full seconds allows you to enter the radio's "menu" mode. This mode allows you to set the frequency for the radio's built-in CTCSS tone encoder and decoder, set the repeater shift frequency, and turn the radio's battery saver function on and off. You can toggle between items in the menu by holding down the **F** key and pressing the **UP** or **DOWN** keys. Menu items are changed by pressing **UP** and **DOWN**, and to save the settings after you change them, just press either the **SC** key again or the **PTT**.

Nice Extras

Considering the price of the unit (a little over $200 "street price") you do also get some nice extras with the AH-50, including some that you might not normally expect. The most obvious extra is the built-in CTCSS encode and decode. This allows you not only to access toned repeaters, but also to squelch out unwanted signals on the local repeater frequency or adjacent channels. You can even set the radio to encode and decode two different CTCSS tones!

The radio also features an innovative "intelligent power save" function. Like power savers on other radios, this actually shuts off the radio's receiver for a fraction of each second, reducing the amount of power the radio draws accordingly. Unlike other radios, the amount of time that the receiver turns itself off is actually determined by the amount of channel activity: the longer it's been since the radio has heard a signal, the more deeply "asleep" the radio gets. After three minutes of inactivity, the radio's receiver with shut itself off for 2/10 of each second. After five minutes of inactivity, the radio will turn itself off for 1.8 seconds of each 2-second period. And after eight minutes or more of inactivity, the receiver will be off for 2.8 seconds of every 3 second period.

If a signal is received or any buttons are depressed during this time, the battery save will disengage and the radio will return to normal operation. Using this mode, the operating life of the battery pack can be extended by as much as 80%.

A Few Rough Spots

Although the quality and features of the radio are good, there are some things that could be improved. For instance, while operating the radio isn't terribly difficult, following the operating manual is. The 23-page manual is poorly written and rather confusing. If you look hard enough, though, it does contain all the needed programming information! Even though the manual is pretty difficult to use, the radio is more difficult to use without it, so don't throw it out. Just approach it with some patience.

Another disappointment is that there is no provision for powering the radio directly from DC "out of the box." That puts a serious damper on those who want to use the radio in fixed or mobile applications. Cherokee does offer an add-on unit for the radio, called "Mobile Com," which acts as a slide-on "battery eliminator" and allows the radio to be powered from a cigarette lighter terminal. But it's an option. Other manufacturers have similar devices, and any battery eliminator that's Standard CNB-152-compatible should work just fine with the radio.

The radio also lacks out-of-band receive coverage, a feature I would very much have liked to have. The AH-50 receives only 50 to 54 MHz. It would have been nice if the receiver also covered 45 to 47 MHz, as my local Red Cross chapter and local Highway Patrol both use this band.

You should also plan on buying an aftermarket antenna for the rig. I made

"Considering the price of the unit (a little over $200 'street price') you do also get some nice extras with the AH-50, including some that you might not normally expect. The most obvious extra is the built-in CTCSS encode and decode."

Reader FEEDBACK!

More Bands, Please

Dear *CQ VHF*:

I like the articles on antennas, like the J-Beam in the July '98 issue ("Project Corner," p. 76), and I liked the piece on the advanced J-Pole that your sister magazine *CQ* did a couple of months back ("The J-Pole Revisited," by Dan Richardson, K6MHE, March '98). But I wish the writers of these articles would put in the specs to convert these projects to other bands. I would like to build both of these projects for 6 meters, and I'm sure there's someone out there who would love to do these antennas for 222 MHz.

Yours,

Michael F. Duckett, KC7KGO
Phoenix, Arizona

J-Beam author Ed Fore, N3SDO, responds:

Michael—Glad you liked the project. I've made some calculations for elements and spacings for the other bands. The element lengths may need some adjustment depending on the material you use, but the spacing will work (see Table 1). The J-pole element itself should use standard dimensions found in the antenna handbooks. Table 2 shows recommended lengths for 6 meters and 222 MHz and is taken from an Internet posting. By the way, quarter-wave CB whips are quite good for 6-meter use. Happy building.

Table 1

Band	Director	Reflector	Element Spacing
6 meters (50 MHz)	106.5"	111.25"	35.5"
1.35 meters (222 MHz)	23.5"	26.25"	8"

Table 1. Dimensions of director and reflector elements and element spacing for 6-meter and 1.35-meter versions of N3SDO's J-Beam antenna

Table 2

Frequency	52 MHz	223.5 MHz
Pipe Diameter	1"	.50"
Stub Length	54.70"	12.65"
Overall Length	163.92"	37.94"
Separation	5"	1.25"
Connect coax at	6"	1.50"

Table 2. Recommended dimensions for J-pole element for 6 meters and 222 MHz.

several attempts to use the antenna supplied with my radio, but I couldn't even *hear* any of the local repeaters. Replacing the antenna with an aftermarket antenna did the trick, and I heartily recommend that others do the same. A number of manufacturers offer telescoping 2-meter antennas, which will work adequately on 6 meters (a 5/8-wave, 2-meter antenna is reasonably close to being a quarter wavelength on six), and these represent the most commonly available, least expensive antennas that will work well with the unit.

The Bottom Line

Signal reports using the radio have been pretty good. I've made a bunch of local contacts on 52.525 MHz and on the local repeaters (using both a Cushcraft 6-Meter Ringo Ranger and a telescoping 2-meter 5/8-wave HT antenna). Several of the stations I've worked describe the radio's audio as "bright" and "friendly." I've also found the volume from the radio's internal speaker to be adequate; a benefit of the AH-50's rather large size is that it has a decent sized speaker. Both the transmit and receive audio can be improved by using a speaker/microphone, but it certainly isn't necessary to use one.

For those who want to work DX on 6 meters but can't afford a "weak signal" radio, or who want to give "the magic band" a try before spending lots of cash on a multimode rig, the AH-50 presents a unique opportunity. Sporadic-*E* is pretty forgiving, and when the band really gets hopping, low-powered stations can usually be heard just as well as high-powered ones. While it's true that you won't be able to work quite as far as with a multimode radio, you can still have plenty of long-range fun with an AH-50 and a base-station antenna with some gain. You can also use local repeaters to dramatically increase your DX range! DXing using repeaters is common on both the 6- and 10-meter bands. Overall, I'd say the Cherokee AH-50 is a great value! ■

Resources

For more information on the Cherokee AH-50, see your dealer or contact Wireless Marketing, 1212 Remington Road, Schaumburg, IL 60173; Phone: (800) 259-0959; Fax: (847) 839-0016; Web: <http://www.wirelessmarketing.com>.

Q & A — Questions and Answers About Ham Radio Above 50 MHz

Q: Nice article on Yagi antennas this month (June's "Antennas, etc." column) in *CQ VHF*...but you didn't touch on how to properly mount an omnidirectional antenna above your beams (if it's at all possible). Specifically, I would like to mount my Cushcraft 13-element, 2-meter beam (13B2) on top of my tower (with rotor) and above that, on the same mast, I would like to put my dual-band ground plane (Comet GP 9). Can this be done without major effect on the beam? I currently have it set up with a metal mast, with the beam as high on the mast as possible. Also, the mast is on the opposite side of the boom from where the elements are mounted. Does this negate the effects that metallic masts have on a beam? Is there a fiberglass/hard plastic mast that will hold up that would work better? Thanks.

Shane, KC8IRW

A: "Antennas, etc." columnist Kent Britain, WA5VJB, replies:

NO! OK, that one was simple.

But there are other ways. My favorite is to mount a horizontal bar on the mast, so you have three or four feet of horizontal pipe/mast mounted where you want the beams. The 2-meter beam is mounted on the tip of the horizontal pipe/mast and is at least two feet away from the main mast. Now the vertical antenna is mounted to a horizontal mast. In my case, I have a 223.5-MHz beam on one side, and stacked 445-MHz beams on the other side.

Q: The *ARRL FCC Rule Book*, in the 2-meter band section has the frequencies from 144.50 to 144.60 MHz as "linear translator inputs" (with 145.10 to 145.20 as outputs). What is the purpose of this area? There is nothing in the *ARRL Handbook* about linear translators and, except for the concept of linear translators on satellites, there seems to be little description of any earthbound use. Is there any information on this topic available?

Thanks for the help.

Dennis Wilkison, KE6UZQ

A: First of all, the "repeaters" on satellites are called linear transponders, *not* translators, *but they are basically two names for one device. A linear translator/transponder retransmits signals on a relatively wide range of frequencies (a couple of hundred kHz, in the case of satellite transponders) and in whatever mode the signal originated. So, theoretically, you could have CW, SSB, packet, and FM all sharing the same transponder at the same time.*

I did find a reference to linear translators in The ARRL Handbook, *but I had to go back to my 1992 edition to find it. According to the '92* Handbook, *there's been very little commercial use of linear translators, but "Some work has been done with linear translators for terrestrial Amateur Radio communication, particularly on the West Coast of the USA. For most of us, however, the more familiar application is in the amateur communication satellites....By convention, any linear translator that is installed in a satellite is called a transponder." The chapter then goes on to talk about satellite transponders.*

The designation in the ARRL 2-meter band plan for linear translator inputs and outputs is a classic case of a) using band planning to promote a specific type of operation, as opposed to accommodating existing users and reserving space for undesignated experimental uses; and b) the band plans not keeping up with band usage. I've only been able to find (with your help) one person who actually built and operated a terrestrial linear translator—WB6JNN, who says he put a couple of them on the air in the San Francisco Bay area about 15 years ago (and wrote about them at the time in Ham Radio *magazine). Here in the metro New York area, the frequencies of 144.50-.60 and 145.10-.20 have been reallocated by the local coordinators as repeater input/output pairs. If anyone else is actively running a terrestrial linear translator, we'd love to have you write about it for* CQ VHF.

Do YOU have a question about any aspect of "Ham Radio Above 50 MHz"? We'll do our best to give you a clear, concise answer—or if it's not a question that has just one easy answer, then we'll invite readers to offer their solutions. Send your questions to: "Q & A," *CQ VHF* magazine, 25 Newbridge Road, Hicksville, NY 11801; via e-mail to <CQVHF@aol.com> or <72127.745@compuserve.com>; or via our Web page at <http://members.aol.com/cqvhf/>. Please be sure to specify that it's a question for "Q & A."

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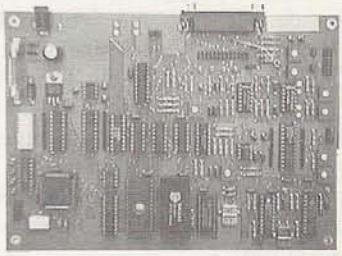
* (4) Hardware Inputs
* (4) Output Switches



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CIRCLE 64 ON READER SERVICE CARD

A Wind-Powered Repeater

Here's one way to keep your repeater on the air when the commercial power is cut off—if, that is, you live in a windy enough place.

By Cesar E. Amaro, NP3H*
Cadena el Conquistador, Inc., NP3P

What sort of backup power system does *your* repeater system use? Batteries? A generator? Have you considered...the wind?

The Cadena el Conquistador, Inc. (NP3P), a radio club based in Fajardo, Puerto Rico, keeps its repeaters on the air in the worst weather with a wind-powered generator mounted on its antenna tower. And since hurricanes are the major weather hazard in the Caribbean, wind is rarely in short supply when emergency power is needed.

"[We keep our] repeaters on the air in the worst weather with a wind-powered generator mounted on its antenna tower."

We installed an Air Wind Module 303 wind generator at our repeater site in Rio Grande, Puerto Rico (see Photo A). We utilize the system for any emergency, and were able to provide support during Hurricane Marilyn in 1995. Our Rio Grande site is home (Photo B) to a 146.990-MHz voice repeater (with a 224.700-MHz link to our 146.690-MHz repeater in Fajardo) and packet nodes on 145.03 MHz that cover any emergency by packet from the Virgin Islands, Puerto Rico, and the Dominican Republic. (See "Packet Connections" for details of our packet links.)

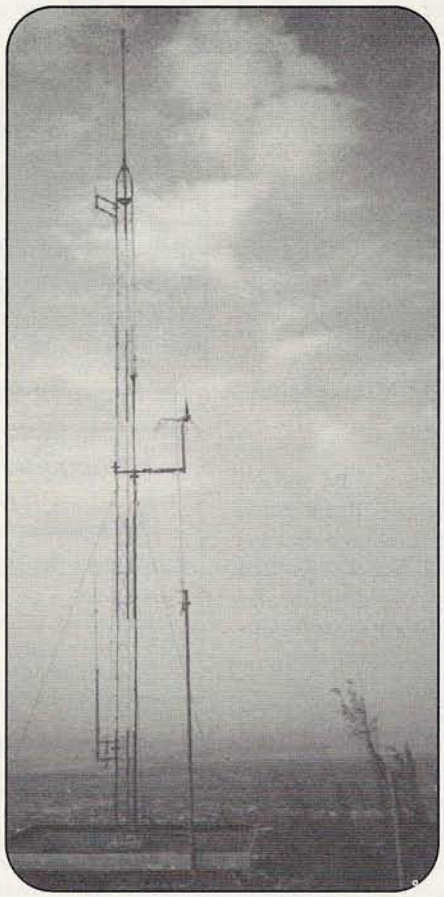

Photo A. The tower, antennas, and wind-powered generator at the Cadena el Conquistador repeater site in Rio Grande, Puerto Rico, about 20 miles west of San Juan.

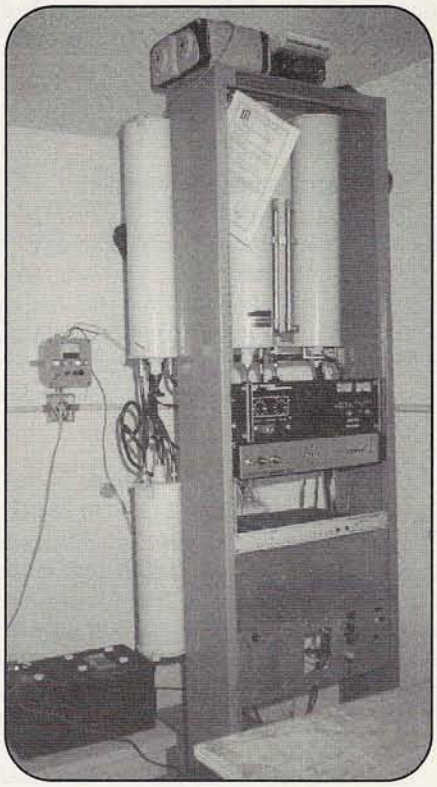

Photo B. Inside the Rio Grande repeater site. The rack contains voice repeaters on 146.990 and 224.700 MHz and the Pirata packet node on 145.030 MHz, along with cavity filters to prevent interference among the different radios. On the wall are the voltage and current meters for the Air Wind Module 303 wind generator, and the batteries that the generator charges are on the floor.

The Air Wind 303

This modular generator (Photo C) is especially engineered for high-power output, silent operation, and small size. Its three-blade design has only two moving parts to minimize maintenance, and it weighs only 13 pounds. It's made by Southwest Windpower, Inc., based in Flagstaff, Arizona.

According to the manufacturer, the 303's blades are made of carbon fiber-reinforced composite that twists as the turbine reaches its rated output. This twisting effect changes the shape of the blade and causes it to stall, limiting the speed of the alternator and preventing damage in high winds. Additionally, the blade tip is less than 3 millimeters thick, allowing for almost silent operation.

The 303's alternator is built from brushless permanent magnets made of neodymium iron boron (*in case you were wondering—ed.*) and is optimized to match as closely as possible the energy

Cesar E. Amaro, NP3H, is a member of the radio club Cadena el Conquistador, Inc., in Fajardo, Puerto Rico (see "Club Spotlight" for more about the club).

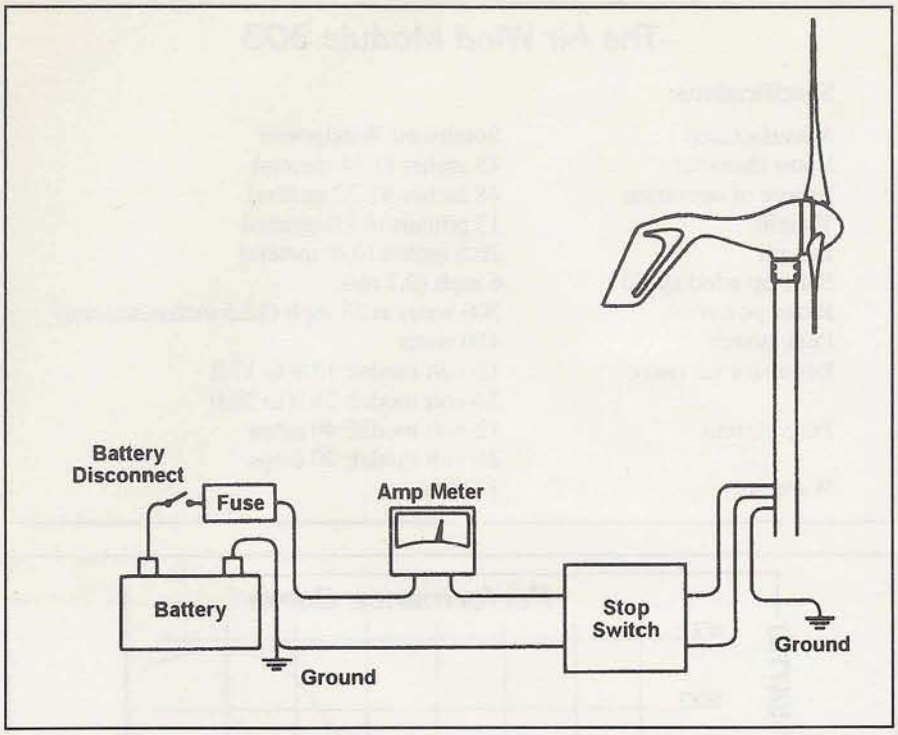

Figure 1. Block diagram of a typical wiring arrangement for the Air Wind Module wind generator. The generator is used to charge batteries, which provide voltage regulation and extended power usage, even when the wind isn't blowing. (Diagrams courtesy Southwest Windpower)

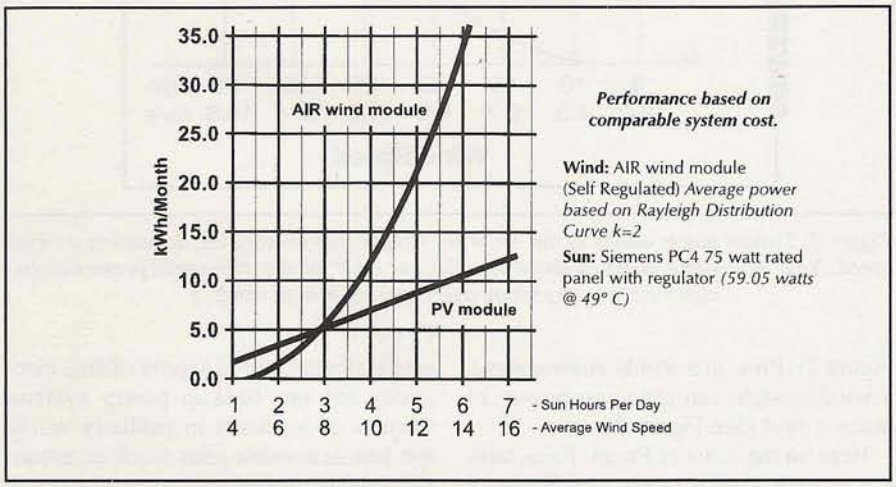

Figure 2. Comparison of average monthly power output (in kilowatt hours per month) of a 300-watt Air Wind Module and a similarly priced 75-watt photovoltaic (PV) module.

Packet Connections

Our PIRATA (NP3H) node at the 146.990 repeater site has links to node CADENA (NP3P), also in Rio Grande; node JAYUYA (WP4NHM) in Jayuya, P.R.; node PILOT (NP3P) in Sabana Grande, P.R.; node DELFIN (WP4AZT) in Salinas, P.R.; node FORTIN (NP3E) in Vieques, P.R.; and node STX (KP2BH) in St. Croix, Virgin Islands, as well as the Cadena el Conquistador, Inc./NP3P BBS (WP4MKU-1) in Fajardo. Our system is integrated to the Internet via the KP4ES AMPRnet Gateway, operated by the Puerto Rico League, Inc. (Sysop KP4TR).

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CIRCLE 79 ON READER SERVICE CARD

Photo C. Close-up view of the Air Wind Module. It is small, lightweight, and nearly silent in operation, yet produces 200 to 300 watts of power with sustained winds above 25 miles per hour. (Photo courtesy Southwest Windpower)

available from the wind. The 303's electronics provide a number of features to assure maximum output and user safety. The control electronics maintain a constant load on the alternator, regardless of the condition of the battery, to prevent turbine over-speeding. While the battery is charging, the regulator periodically checks the line, correcting for voltage loss and monitoring charge rate. Once the battery is fully charged, the regulator shuts off the current, preventing overcharging, while still maintaining a load on the alternator (as noted above) to prevent over-speeding (see block diagram in Figure 1).

Our system in Rio Grande consumes from 84 to 125 Ah (amp hours) per day, and if we have three to four windy days and nights with winds of about 15 to 25 mph, the Air Wind Module will work quite smoothly.

Price and Performance

We purchased our Air Wind Module from Sunelco (see "Resources"), which lists the 303 in its catalog for just under $550. That's about the price you'd pay for a 75-watt PV (photovoltaic) module (*better known as a solar cell—ed.*), but you get 300 watts from the Air Wind Module (see sun/wind comparison in Figure 2). Plus, in a windy environment, a wind module can give you power 24 hours a day! (See Figure 3.)

Here on the coast of Puerto Rico, having enough wind is rarely a problem, so the Air Wind generator provides us with a virtually unlimited supply of free electricity for our backup power system. Owners of repeaters in similarly windy but less-accessible sites (such as mountaintops) may even want to consider such a system as a primary power source. ■

The Air Wind Module 303

Specifications:

Manufacturer	Southwest Windpower
Rotor diameter	45 inches (1.14 meters)
Sphere of operation	48 inches 91.22 meters)
Weight	13 pounds (6 kilograms)
Length	26.5 inches (0.67meters)
Start-up wind speed	6 mph (2.7 m/s)
Rated power	300 watts at 28 mph (12.5 meters/second)
Peak power	450 watts
Regulator set range	12-volt model: 13.8 to 17.8 24-volt model: 26.0 to 36.0
Fuse current	12-volt model: 40 amps 24-volt model: 20 amps
Warranty	3 years

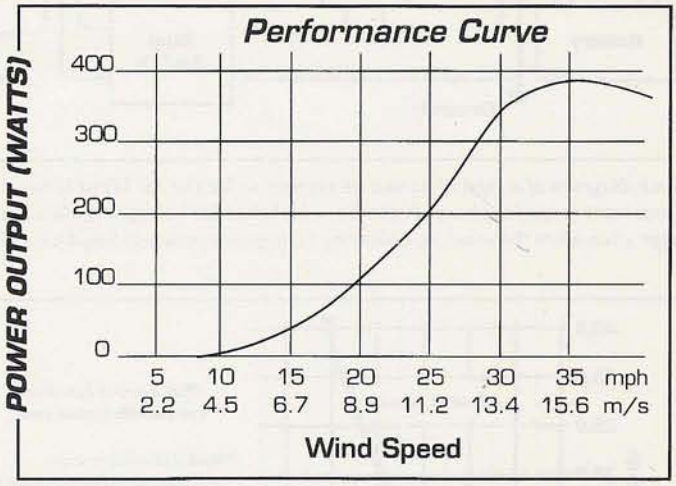

Figure 3. Typical power output of the Air Wind Module 303 at sea level, depending on wind speed. Note that output peaks at about 35 miles per hour, as the over-speed protection circuitry kicks in to prevent overcharging in high winds.

Resources

For more information on the Air Wind Module 303, contact the manufacturer at: Southwest Windpower, Inc., 2131 N. First St., Flagstaff, AZ 86004; Phone: (520) 779-9463; Fax: (520) 779-1485; e-mail: <air@windenergy.com>; Web: <http://www.windenergy.com>.

The Air Wind Module is available from any Southwest Windpower dealer, including: Sunelco, Inc., P.O. Box 787, Hamilton, MT 59840; Phone: (800) 338-6844; e-mail: <sunelco@montana.com>; Web: <http://www.sunelco.com>. Sunelco's price for the 303 is $548.

For additional information on this specific installation, contact Cadena el Conquistador, Inc., NP3P, P.O. Box 161, Fajardo, PR 00738.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—September, 1998

We'd like to know more about you...about who you are and where you live, about the kind(s) of work you do and about your ham radio interests and activities. Why? To help us serve you better.

Each month, we'll ask a few different questions, and ask you to indicate your answers by circling certain numbers on the Reader Service Card and returning it to us (we've already paid the postage).

And, as a bit of an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to CQ VHF. *This month, we continue with questions about your reactions to* CQ VHF *and its contents:*

1. Please indicate which segments of *CQ VHF* you generally read in each issue (circle all that apply):

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Feature articles	1
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2. *CQ VHF* covers a wide range of topics and activities. Please indicate whether your regularly read:

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A combination of the above	15
None of the above	16
Don't know	17

4. If you are a *CQ VHF* subscriber, please indicate how likely you are to renew your subscription when it expires:

Will definitely renew	18
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Undecided	20
Probably won't renew	21
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Thank you for your responses. We'll have more questions for you next month.

What You Told Us

Our June survey asked—for the third time in as many years—about your employment, upgrading success, on-air activities, and organizations to which you belong. The results showed that 60% of you work full-time, down 9% from 1996—and equal to the increase in the "retired" category (28% versus 19% in '96). The rest of the readership is split among part-time workers (6%), unemployed (2%), full-time students, part-time students, and full-time parent/homemakers (1% each).

There's been virtually no change in upgrading statistics. Among those who could do so, 20% have upgraded their licenses in the past two years (this excludes the 13% who have been licensed less than two years, the 9% holding Extras for more than two years, and the 2% not licensed).

More of you are more active on more modes. Numbers are up across the board for activity on ATV (9%), VHF contests (36%), FM simplex (80%), foxhunting (21%), packet (36%), repeaters (81%), SSB/CW (44%, up from 27% in 1996), and other (10%). The only decreases were in satellites (20% versus 22% in '97) and "none of the above" (4% versus 5%).

Finally, you continue to be very active in ham clubs and organizations, especially those related to emergency communications: AMSAT (12%); ARES (29%); ARRL (63%); CAP (4%); local radio club (63%); MARS (2%); NTS (3%); packet club (5%); RACES (21%); Skywarn (30%); and weak-signal club (9%).

This month's winner of a free one-year subscription is Charles Juenger of Yuma, AZ. As always, thank you for your responses.

The G3WDG010 13-Centimeter Transverter Kit

This single-board, "no-tune" kit provides an affordable entry onto the 2.3-GHz band, says GM4PLM, and it's so straightforward that even a microwave beginner can build it.

By Simon Lewis, GM4PLM*

Editor's Note: Reviewing a kit requires a little bit more than simply going over the unit's main features and telling you how well it works. Before you can operate a kit, you have to build it. So a major part of evaluating any kit has to deal with the process of putting it all together. Since many hams are relatively new to kit-building, this review will also take you through the major steps of the construction process, as well as offering tips on basic microwave construction techniques.

In addition, an inherent risk in publishing a review of equipment built from a kit is that the quality of the finished product depends as much on individual kit-building skills as on the parts and design provided by the manufacturer. A manufacturer has no control over the quality of the assembly when a piece of gear is built from a kit, and even an experienced kit-builder may accidentally make an error that will result in performance that varies from the manufacturer's specifications. This is something that you should be aware of, and take into consideration, as you read this or any other kit review.

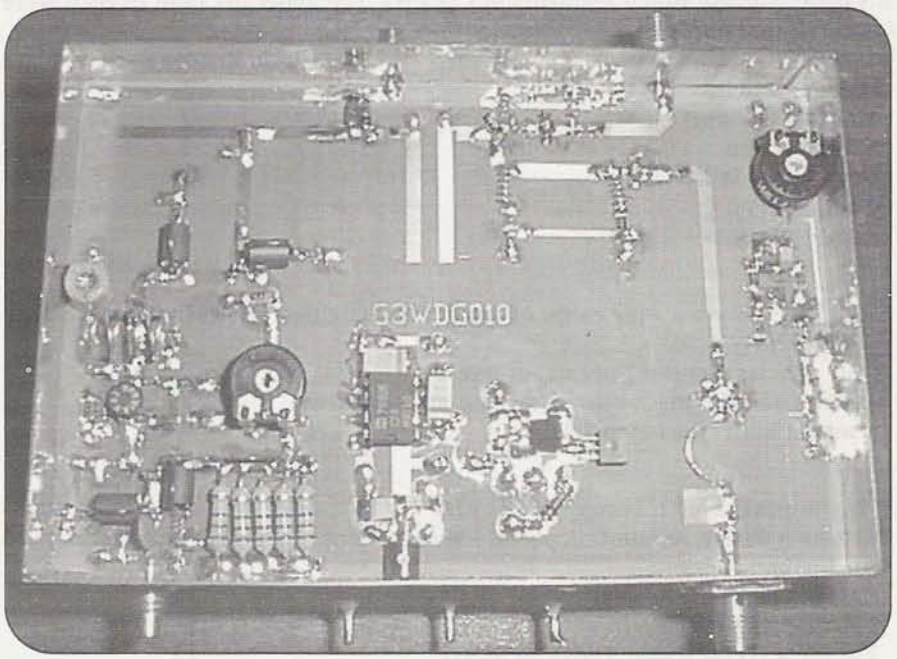


Photo A. The G3WDG 2.3-GHz transverter board. The kit comes complete with enclosure, all parts and assembly instructions. You'll need to add power and RF connectors, a local oscillator, and a 2-meter IF radio.

Recently, *CQVHF* has published a number of articles which introduce the beginner to the exciting world of microwaves. Building on those, I'd like to introduce you to a new transverter from the UK: the G3WDG010 2.3-GHz single board design (see Photo A). The 'WDG010 offers an easy introduction in amateur microwaving at an affordable price.

The 2.3-GHz band (also referred to as 13 centimeters) is an excellent introductory band, as small, low-powered equipment offers an easy and flexible way to start out in the world of microwaves. (The U.S. allocation at 13 centimeters is split, with one piece of the band at 2300 to 2310 MHz, and a second piece from 2390 to 2450 MHz. SSB and CW operation is centered around 2304.100 MHz. See Table for more band plan information.)

The G3WDG Transverter

The G3WDG010 13-centimeter transverter is a small single-board design by Charlie Suckling, G3WDG. Charlie has designed a number of transverters and matching accessories, notably the 'WDG002-005 series of 10-GHz modules, described in the March issue of *CQ VHF*. Improvements from lessons

Simon Lewis, GM4PLM, is Editor of European Microwave News *and a regular contributor to* CQ VHF.

Table. U.S. 13-Centimeter Band Plan

Band limits: 2300–2310 MHz; 2390–2450 MHz (amateur allocation is primary on 2390–2400 and 2402–2417 MHz; secondary or co–secondary on all other band segments).

2300.000–2303.800 MHz: Packet and high-speed digital communications
2303.800–2303.900 MHz: Mixed packet, RTTY, CW, and EME
2303.900–2304.100 MHz: CW and EME only
2304.100–2304.200 MHz: CW and SSB operation (2304.100 is the SSB calling frequency)
2304.200–2304.300 MHz: Mixed use (non-FM)
2304.300–2304.400 MHz: Propagation beacons and beacon networks
2304.400–2304.500 MHz: Mixed use (non-FM)
2304.500–2305.000 MHz: Linear translators & experimental beacons
2305.000–2309.000 MHz: FM Simplex and repeater inputs (2305.200 is the FM simplex calling frequency)
2309.000–2310.000 MHz: Amateur television (ATV)
(No amateur operation permitted between 2310 and 2390 MHz)
2396.000–2399.000 MHz: Control and auxiliary links
2400.000–2410.000 MHz: Worldwide amateur satellite subband
2410.000–2413.000 MHz: FM repeater outputs
2413.000–2418.000 MHz: High-speed data
2418.000–2438.000 MHz: Additional satellite subband
2438.000–2450.000 MHz: Wideband FM, ATV, experimental

The 13-centimeter band offers amateurs 70 MHz of spectrum, with a big hole in the middle. Calling frequencies are 2304.100 for SSB/CW and 2305.200 for FM simplex, with satellite operation from 2400 to 2410 MHz. Segments in bold are where you're most likely to find activity. Source: The VHF "How To" Book, *CQ Communications, Inc., 1994.*

learned from the earlier 'WDG modules have been incorporated in this new design, so the 'WDG010 should be as successful as the now-famous 3-centimeter modules.

The 'WDG010 is built on a small, double-sided PTFE (PolyTetraFluoroEthylene) printed circuit board (pcb) measuring 73 x 110 x 30 millimeters (2.9 x 4.3 x 1.2 inches) and is built into a small tin plate box which is supplied with the kit. The kit contains all components but does not include RF or DC connectors, as most builders will have their own preferences for these. Comprehensive building and alignment instructions are also supplied with the kit and should allow even a complete newcomer to microwaving to produce a working transverter.

Circuit Description

The 'WDG010 is built using "stripline" technology; that is, filtering is accomplished using etched pcb lines and not "tunable" cavity filters. These pcb filters reduce the amount of test equipment and alignment required to complete the transverter. Stripline technology has been used in a number of previous U.S. designs and should be fairly familiar to anyone who's seen the single-board designs published in *QST* and other magazines.

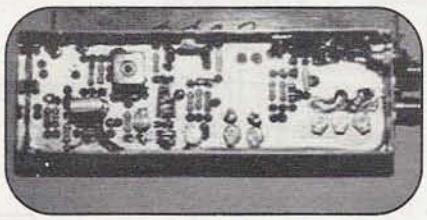


Photo B. The DDK001 local oscillator (LO) board, designed by Sam Jewell, G4DDK. This is one of several options for an LO signal needed to mix with the 2.3-GHz signals to feed the 2-meter IF rig.

The latest microwave components are used in the 'WDG010 (see Figure for schematic). The active devices used in the transverter are MAR series Monolithic Microwave ICs (MMICs), excellent high-gain, low-cost amplifiers that use 50-ohm input/output impedances. This means that simple printed stripline can be used for connections, further simplifying construction and alignment.

The 'WDG010 combines proven parts of other 'WDG modules with new circuitry for the RF sections. A look at the pcb reveals the standard 'WDG IF preamp, coupled with a G4FRE023 bias generator, which has cleverly been included on the board. The receiver preamp is PIN-diode-switched and can be driven directly from a 2-meter IF (Intermediate Frequency) rig, such as a Yaesu FT-290 or ICOM IC-202, as transmit attenuation is included on the board. PIN-diode-switching is necessary because the transverter uses a single mixer for both receive and transmit.

The LO (Local Oscillator) signal is at half frequency (1152 MHz at 2304 MHz) and drives a sub-harmonic pumped mixer. The LO input can be driven from

Photo C. Another option for a local oscillator is the G4DDK DDK004 board. This would have to be modified to produce a signal on the correct frequency for the 'WDG transverter, but the transverter manual includes instructions for making the mods.

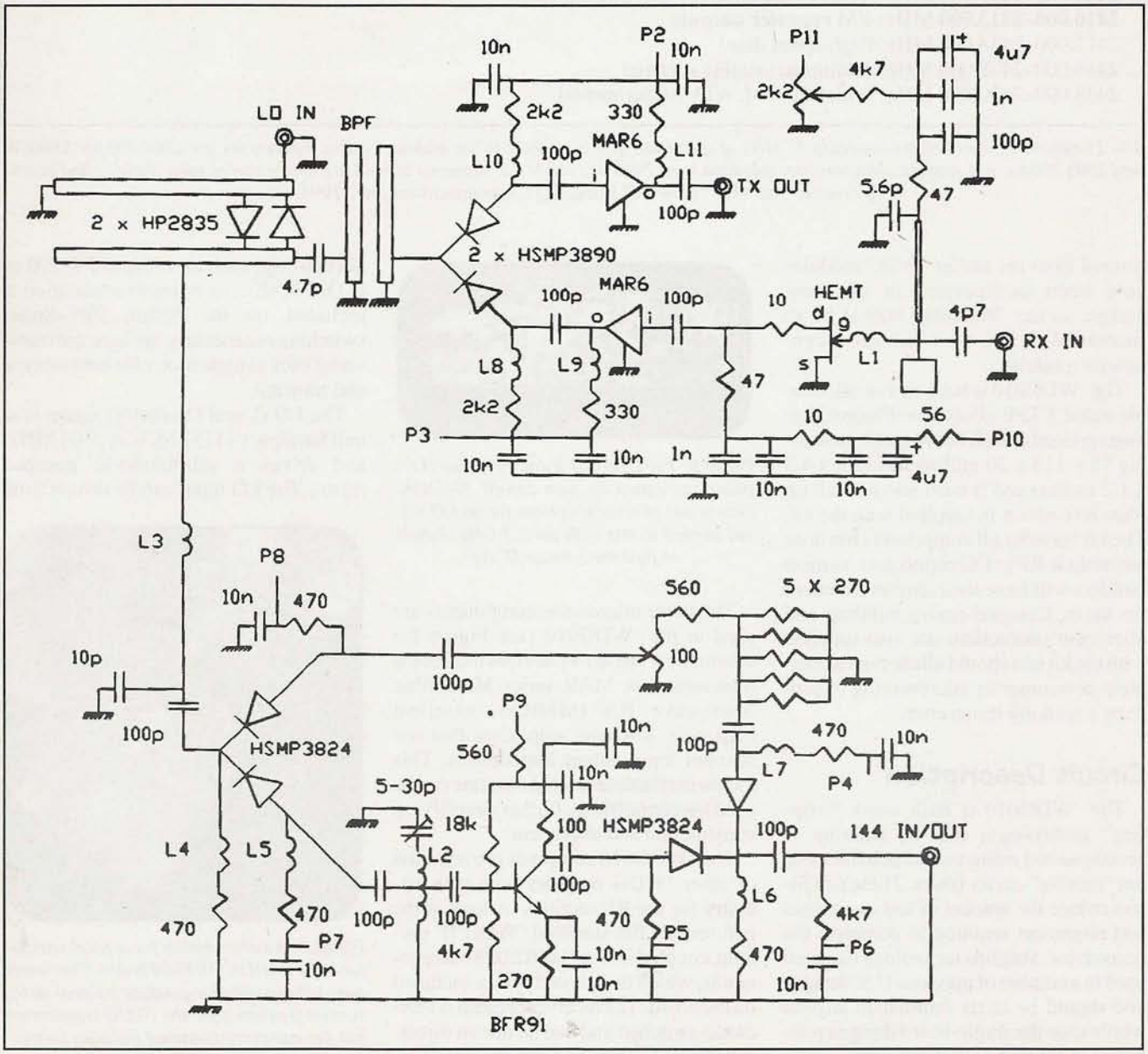
either a G4DDK001B (an 1152-MHz UK design by Sam Jewell, G4DDK, see Photo B) or from a modified G4DDK004, a very popular design which appears in much of the microwave gear designed in the UK (Photo C). Instructions for modifying the '004 are included with the transverter kit. Of course, a U.S. design that gives the same LO output, such as the "SHF-LOK" available from Down East Microwave, can also be used.

The attenuated, mixed, and filtered transmit signal is fed via a MODAMP (modulated amplifier) to the transmit RF connector, giving an output power of around 1 mW. The receiver signals are fed to an HEMT (High Electron Mobility Transistor) preamp based on a design by Rainer Bertelsmeier, DJ9BV. After the HEMT, the receive signal is sent through another MODAMP to the mixer/filtering and IF preamp stages.

"The 'WDG010 is built using 'stripline' technology; that is, filtering is accomplished using etched pcb lines and not 'tunable' cavity filters. These pcb filters reduce the amount of test equipment and alignment required to complete the transverter."

Local Oscillator Requirements

It's worth taking a closer look at the 'WDG010 local oscillator (LO) requirements. The 'WDG010 uses a half-frequency diode-pumped LO. So the LO must be run at signal frequency minus 144 MHz divided by 2. For example, to get a final output frequency of 2304 MHz, the LO must operate at (2304-144)/2 = 2160/2 = 1080 MHz. For U.S. readers, as noted earlier, Down East Microwave can supply kits, pc boards, and parts for the SHF-LOK LO source.



Schematic diagram of the G3WDG010 transverter for the 13-centimeter (2.3-GHz) band.

There are also some excellent designs from Europe, including the G4DDK series that is so popular in the UK. Since I'm most familiar with the 'DDK boards, I'll examine the two approaches you can take in using them to generate your LO signal. The first is to use a modified G4DDK004 2.4-GHz LO board, crystalled and aligned to produce a 1080-MHz output. There's a small modification to be made to the G4DDK004 board, and detailed instructions on this are included in the transverter's manual. Circuit boards and kits for the G4DDK004 are available from the Microwave Component Service (see "Resources" for contact information).

Another option is to use a G4DDK001 (A or B version), again crystalled for 1080 MHz. Circuit board layouts for this design are available in the RSGB (Radio Society of Great Britain) *Microwave Handbook (Volume 2)*, and directly from Sam Jewell, G4DDK. Both of these designs are easy to build and align, and are highly recommended for a newcomer or old hand alike.

Building and Alignment

The building sequence follows standard microwave practice (see "Microwave Construction Techniques: the Basics"). Start with the mechanical side of the project, seam-soldering the tinplate case and trimming the pcb to fit the case. Next, the mark the case where your connectors are going to go and drill the appropriate holes. Don't forget holes for DC feed-thru capacitors for power supplies, etc. Now, solder the connectors to the case and check the pc board for final physical alignment.

Once you're happy with all the alignment details, insert the pcb ground pins and solder. Then tack-solder the pcb into the case and make a quick final check that everything is in the right place and correctly aligned. Now, using a large soldering iron, seam-solder the pcb's groundplane to the box walls (your earlier seam of solder should help). The joint should be continuous, giving a good RF and DC ground to enhance stability in the final product.

Once the mechanical construction is complete, you can start on the component placement. Install the smallest components first: chip resistors, capacitors, etc. Next, install the larger components—*but* do not *install the MMICs or the front end transistor yet!*

"The kit can also be tuned to 2400 MHz for operating through the forthcoming Phase 3D satellite. Matching 1-watt and 10-watt amplifiers are also planned and should be available shortly...."

Once all the components are in place, apply power to the unit and check the bias lines to make sure that the voltages and other values match what the manual says they should be. If they don't, go back and see what you did wrong. Start by rechecking all solder joints. Only when you're totally happy that all is well with the bias supplies should active devices (the MMICs and front-end transistor) be installed. Making sure of these voltage levels before installing the active devices can prevent expensive mistakes!

Once the active devices are installed, final testing and alignment of the transceiver can begin. Connect the IF transceiver and local oscillator to the transverter and apply power. Follow the supplied instructions to set the bias voltage on the front end transistor and the IF amplifier trimmer capacitor for maximum noise in the receiver.

Then set the IF transceiver to transmit a carrier and attach a power meter and a dummy load to the transmit connector on the transverter. Set the power output to 1 mW, the optimum setting. That completes alignment of the transverter.

Conclusion

The 'WDG010 offers an excellent introduction into amateur microwaving, with its simple design and excellent performance. It's easy to build and align, and requires minimal test equipment. The transverter is also reasonably priced at around $160 for the kit. The required LO should cost around $50 to build, for a total price of $210, which is quite reasonable for a new band.

The kit can also be tuned to 2400 MHz for operating through the forthcoming

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The kit includes a geophone vibration sensor along with parts to build a basic detector that will light an LED. In addition we include a schematic that will show you how to operate a relay. The sensitivity is adjustable, so you can set it to detect elephants and other small creatures. Similar units were used by our armed forces to detect enemy troop movements...the perfect device to alert you to the pitter patter of little Leroy's feet! Unit sensitivity can be set high enough to detect a business card dropped on a table, and we've made it work with vibrations up to 40 feet away! Earthquake or Aunt Agatha...you decide! It's a fun gadget with many uses.

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Microwave Construction Techniques: the Basics

Microwave construction is well within the reach of any amateur who can solder correctly and follow simple instructions to the letter. All of the WDG kits include comprehensive instructions for their completion and will produce a working unit as long as a few simple techniques are followed carefully. *If you follow them to the letter, your kit WILL work first time.*

- If you're a beginner, use only new parts (no junk box specials here) and use only the component specified. If the component list states a "5pF Black SKY Trimmer Capacitor," use exactly that. Don't substitute unless you're absolutely sure you know what you're doing.
- Measure accurately, and measure twice before cutting. Make sure wire lengths for inductors or chokes make the dimensions and wire gauge exactly.
- Mount components as flat to the surface of the PCB as possible. Surface mount components should be mounted with the lowest possible profile. Axial-leaded components should have the smallest possible lead lengths.
- Use the right tools for the job. Don't try to solder miniature components with a soldering iron that resembles a poker! Use the smallest tip possible and fine gauge, good quality solder.
- Use connectors and cable capable of working at the frequency you're using. Don't try and compromise. That RF power is expensive to generate; don't waste it in heating poor cable and connectors.
- Build a small anti-static work station before trying to handle static-sensitive components. They're easy to build! Use a large cake board and cover it in two sheets of aluminium kitchen foil. Invest some money in an anti-static wrist strap. This will save you from "zapping" expensive components later.
- Install and check bias supplies *before* installing expensive MMICS and GaAsFETs.
- Read the instructions all the way through, and then read them again, before starting construction. Double-check component placement. Measure twice and cut once. Don't rush things; take your time and don't do difficult construction or testing when tired or after an evening out at the local bar.

Phase 3D satellite. Matching 1-watt and 10-watt amplifiers are also planned and should be available shortly—along with the transverter kit itself—from the Microwave Component Service (again, see "Resources"). Matching transverters for 23 centimeters, 3.4 and 5.7 GHz should also be available this year. Details may also be found on the Web site of the *European Microwave News*. ■

Resources

Transverter Kits and G4DDK004 LO pc boards are available from Microwave Component Service, c/o Petra Suckling, G4KGC, 314A Newton Road, Rushden, Northants, NN10 0SY UK; Phone: (from the U.S., dial 011 first) 44-01933-411446; Web: <http://www.pacsat.demon.co.uk/mcs.htm>.

Circuit board layouts for the G4DDK Local Oscillators may be found in the *RSGB Microwave Handbook (Vol. 2)*, available from RSGB Publications, Lambda House, Potters Bar, Herts UK. In the U.S., RSGB publications are available through the CQ Bookstore, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926; and from the ARRL, 225 Main St., Newington, CT 06111; Phone: (860) 594-0355; Fax: (860) 594 0303; Web: <http://www.arrl.org>.

Additional information is available from the G4DDK Homepage at <http://www.btinternet.com/~jewell/> or from the *European Microwave News* (EMN) Homepage (including the Microwave Component Service online catalogue) at <http://www.pacsat.demon.co.uk>. For an e-mail subscription to *EMN*, e-mail: <slewis@pacsat.demon.co.uk>.

In the U.S., local oscillator kits (SHF-LOK) may be ordered from Down East Microwave, 954 Rt. 519, Frenchtown, NJ 88825 USA; Phone: (908) 996-3584; Fax (908) 996 3702; WWW: <http://www.downeastmicrowave.com>.

ARRL September VHF QSO Party September 12–14, 1998

If really hot weather and lots of bugs aren't your "thing," try this "end of summer" event of the annual VHF contest schedule. The nights will be cooler, but the airwaves should be hot!

Here are the official rules for the 1998 ARRL September VHF QSO Party, courtesy of the ARRL Contest Branch:

1. Object: To work as many amateur stations in as many different 2 degrees X 1 degree grid squares as possible using authorized frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2. Date and Contest Period: The second full weekend of September. Begins 1800 UTC Saturday, ends 0300 UTC Monday (September 12–14, 1998).

3. Entry Categories:

3.1. Single Operator.

3.2. Single Operator, QRP Portable.

3.3. Rover.

3.4. Multioperator.

3.5. Limited Multioperator.

4. Exchange: Grid-square locator (see April 1994 *QST*, p 86).

4.1. Exchange of signal report is optional.

5. Scoring:

5.1. QSO points:

5.1.1. Count one point for each complete 50- or 144-MHz QSO.

5.1.2. Count two points for each 222- or 432-MHz QSO.

5.1.3. Count three points for each 902- or 1296-MHz QSO.

5.1.4. Count four points for each 2.3-GHz-or-higher QSO.

5.2. Multiplier: The total number of different grid squares worked per band. Each 2 degrees X 1 degree grid square counts as one multiplier on each band it is worked.

5.3. Final score: Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score.

5.4. Rovers only: The final score consists of the total number of QSO points from all bands times the sum of unique multipliers (grid squares) worked per band (regardless of which grid square they were made in) plus one additional multiplier for every grid square activated (made a contact from).

5.4.1. Rovers are listed in the contest score listings under the Division from which the most QSOs were made.

6. Miscellaneous:

6.1. Stations may be worked for credit only once per band from any given grid square, regardless of mode. This does not prohibit working a station from more than one grid square with the same call sign (such as a Rover).

6.2. Only one signal per band (6, 2, 1 1/4, etc) at any given time is permitted, regardless of mode.

6.3. Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station (transmitter, receiver and antenna) must exist for each QSO made under these conditions.

7. Awards:

7.1. Certificates will be awarded in the following categories.

7.1.1. Top single operator in each ARRL/RAC Section.

7.1.2. Top single operator on each band (50, 144, 222, 432, 902, 1296 and 2304-and-up categories) in each ARRL/ RAC Section where significant effort or competition is evident. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band endorsements.) For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 222-MHz scores are higher than any other Iowa single operator's, he will earn a certificate for being the single-operator Section leader and endorsements for 50 and 222 MHz.

7.1.3. Top single-operator, QRP portable in each ARRL/RAC Section where significant effort or competition is evident. (Single-operator, QRP portable entries are not eligible for single-band awards.)

7.1.4. Top rover in each ARRL Division and Canada where significant effort or competition is evident. (Rover entries are not eligible for single-band awards.)

7.1.5. Top multioperator score in each ARRL/RAC Section where significant effort or competition is evident. (Multi-operator entries are not eligible for single-band awards.)

7.1.6. Top limited multioperator in each ARRL/RAC Section where significant effort or competition is evident. (Limited multioperator entries are not eligible for single-band awards.)

7.2. Participation Pins

7.2.1. Available, while supply lasts, to all who make at least 25 contacts (any combination of bands and modes) during the contest.

7.2.1.1. This includes all operators of qualifying multioperator efforts.

7.2.2. Send order to: ARRL Contest Branch, 225 Main St, Newington, CT 06111.

7.2.2.1. Price is $5 for each pin.

7.2.2.2. Make check or money order payable to the ARRL (no cash please).

7.2.2.3. Include a return mailing label (preferably a self-adhesive type).

8. Other: See rules for All ARRL Contests and for VHF Contests (*available in the* ARRL Contest Yearbook *and on the ARRLWeb Web site at <http://www.arrl.org/contests>—ed.)*

Visiting a Real "Space Station"—Part 2

This month, we continue our visit to the Johnson Space Center Amateur Radio Club, W5RRR, and chat with the man in charge of SAREX, the Space Amateur Radio Experiment.

In part one of our visit to the Johnson Space Center Amateur Radio Club (JSCARC) last month, past President Dale Martin, KG5U, took us on a tour of the club station, W5RRR. This month, our visit continues with a conversation with Matt Bordelon, KC5BTL, JSCARC Vice-President and Principal Investigator of the Space Amateur Radio Experiment (SAREX). In "NASA-speak," the Principal Investigator is the scientist in charge of any experiment. We talked with Matt about the future of ham radio in space and the role that JSCARC plays.

Keeping in touch with Mir. Cosmonaut Vladimir Titov, U1MIR/KD5AOS (holding mic), uses the Johnson Space Center ARC station, W5RRR, to talk with colleagues aboard the Mir Space Station. Also pictured are (left to right) Mila Dmitrlev-Odiev, Astronaut Mike Foale's Russian teacher; Cosmonaut Yuri Onufriyenko; SAREX Principal Investigator (and JSCARC Vice President) Matt Bordelon, KC5BTL; and Astronaut Ellen Ochoa, KB5TZZ. (Photos courtesy KC5BTL)

More Than the Shuttle

CQVHF: *Matt, I think our readers would be interested in finding out where the ham radio manned space flight program is headed.*

KC5BTL: There is a big hint in the name change of the SAREX program (*originally the* ***Shuttle*** *Amateur Radio Experiment, recently renamed the* ***Space*** *Amateur Radio Experiment—ed.*), because we are no longer *just* doing shuttle flights and ham radio. We are doing activities on Mir, of course, and preparing for the International Space Station. We thought that we could keep the acronym and just change the first word in the title. That is more appropriate for where we are headed. You can still call it either way, but there will come a time when we don't do as much activity on the Shuttle as in the past. That's already starting to happen to a certain degree (*see this month's "VHF News"—ed.*). With more and more flights dedicated to going to Mir or assembling the Space Station, there are very few flights conducive to having a lot of amateur radio activity on board.

On the Space Station assembly flights, every second of an astronaut's time is dedicated either to assembling some other space craft or to sleep. There is just not much time for SAREX.

CQ VHF: *What types of shuttle flights* are *conducive to ham activity?*

KC5BTL: Typically, we prefer missions that are long duration—10 to 15 days—where it's more life sciences or microgravity type experiments, where there aren't a lot of maneuvers on board. We typically like to go with the higher-inclination missions, too. Most of the missions these days are around 51.6 degrees to go to Mir or the Space Station or 28.5 degrees, which is a much easier orbit to get to. The 51.6 is a reasonably good orbit, giving coverage of most populated areas of North America, but the astronauts don't have time on those flights to do much ham

By Peter O'Dell, WB2D (<success@qth.com)

Contacts with astronauts and cosmonauts in orbit also provide rare opportunities for socializing on the ground. Chatting here after a QSO are (left to right) Matt Bordelon, KC5BTL; Dave Chiquelin of NASA; Astronaut Ellen Baker, KB5SIX; Astronaut Bill Readdy; Russian teacher Mila Dmitrlev-Odiev; Astronaut Carlos Noriega, KC5WKK (partially obscured); and NASA staffers and JSCARC club members Steve Vander Ark, KC5WKH, and David Hanson, KD5AOO.

activity. The 28.5 orbits barely reach Texas, so most of the hams would miss out on the possibility of a contact, even the ones with super stations.

The Role of W5RRR

CQVHF: *What are some of the functions of W5RRR and JSCARC in supporting SAREX?*

KC5BTL: The club was started shortly after the [Johnson Space] Center opened in the '60s. Owen Garriott, W5LFL, was preparing to go to SkyLab. He had asked for permission to bring ham radio on board SkyLab. It was denied for that flight, but they said it might be possible on a later flight. That was the early '70s, just after the Apollo moon missions were terminated.

When it came time for the shuttles to start flying, it was asked again. JSCARC and various other clubs around the country got together along with ARRL and AMSAT. They put together the first hardware package to go up on STS-9 with W5LFL as the operator. At that point, it was formally known as AMRAD. Two of the prime people here at Johnson were Dick Fenner, W5AVI, and Lou MacFadin, W5DID. Shortly after the success of STS-9, the name was changed to SAREX. Since then, we have had about 24 SAREX missions. W5RRR has been one of the ground stations involved in supporting school contacts and personal contacts during SAREX flights.

JSCARC has been in the public eye, sort of a model station, very visible to the public. Early on in the SAREX program, the manufacturers banded together and donated modern top-of-the-line equipment to W5RRR to replace the old Collins equipment that we had started with. For a long time, we had a station set up in Building 2, which was then a small museum of space memorabilia. There are lots of pictures floating around of ham activity in that area.

W5RRR club members help prepare the hardware for every SAREX flight, and we operate the station to do "bridge" contacts with schools (*a bridge contact is like a dual phone patch where the phone lines are used to connect W5RRR to a station local to the school—ed.*). We also do personal contacts for the astronauts.

In addition, W5RRR has a nice test bench in the back and three HF stations that we use for special events and general operating. There is also an ATV console as well as the satellite console. We've just done a little bit of upgrading this year in preparing for Phase 3D, which should go up soon (*but not this year; see "VHF News" and other related articles elsewhere in this issue—ed.*).

"Growing" Astronaut Hams

CQ VHF: *Is JSCARC involved in helping astronauts become hams?*

KC5BTL: The club has always taken an interest in getting more astronauts licensed for SAREX flights. Gradually, the number of licensed astronauts is increasing. I think we're up to 80 past and current astronauts who are licensed in various different classes.

When it came time for Norm Thagard to go up on Mir, two of his friends who are also licensed started going out to the W5RRR ham shack to work him. They would go out a couple of times a week

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"One of [Shannon Lucid's] daughters and her husband got licensed and would regularly go out to the station and talk to Mom. As time went on, more and more people...wanted to come out and talk to their friend who is up in space. It was a way to keep in touch, a way to keep close to home."—KC5BTL

and talk to him. We would get different astronauts going in there to work him, and other club members. They shared a lot of news from home and that sort of thing. Norm was an old ham himself (ex-KB4YSY), but he let his license lapse during the Vietnam War. We had gotten permission for him to use the radio and talk to folks. The Russians have a little bit different setup as far as permission to operate goes.

Then Shannon [Lucid] went up, and we continued the use of the station out there. We had a few more folks come out to talk. And also, we got her kids interested in getting licensed. One of her daughters and her husband got licensed and would regularly go out to the station and talk to Mom. As time went on, more and more people heard about the station doing these passes. So, these folks all wanted to come out and talk to their friend who is up in space. It was a way to keep in touch, a way to keep close to home.

CQ VHF: Why isn't ham radio used for family contacts from the shuttle?

KC5BTL: When you look at the Mir Space Station, it's very different from the shuttle. It has very little com [communications] equipment, and satellite time is expensive. So, the Russians used very little of the satellite time. They used mainly ground stations. Typically, there is a lot of housekeeping and experimentation going on, so that leaves very little time for just chit chat with family or friends. That is where the station became invaluable to their state of mind.

The crew members got only one official voice link each week, an occasional piece of e-mail, and maybe one video teleconference every two weeks. A lot of times, those would get pre-empted or the equipment was down or something like that. So, there was just not a lot of com to be had.

CQ VHF: Kind of like being in Antarctica, eh?

KC5BTL: You can't really equate it to Antarctica, because Antarctica has a lot more com than the Mir space station. That prompted the U.S. to put up three more ground stations in the U.S.—Wallops [Island, Virginia], White Sands [New Mexico], and Vandenberg [Air Force Base in California]. Actually, Payload Specialist Ron Parise, WA4SIR, was very instrumental in getting their hardware set up. I think that they actually are using ICOM 820s, 821s, and 706s.

Convenient, Educational, Sometimes Essential

CQ VHF: Have all of the astronauts on Mir made similar use of the ham station there?

KC5BTL: The passes (over Houston) were a couple of times a week, and it depended on the astronaut up there whether he really wanted the com or not. Some didn't have as many passes, and some had more.

When Mike Foale, KB5UAC, got up there and they had the collision, the passes started going on a daily basis. They didn't know how much power they had, and we didn't know what was going on. One of the first passes after the collision when we had a chance to talk to him was over Houston. We were all out at the shack—I'd say a real nice percentage of the Astronaut corps, a lot of the managers and his friends, we were all out there. They were using the station in an emergency fashion to see how he was doing and what he needed. Basically, it was on a day-by-day basis. They made sure that he would get what he needed on the next Progress supply ship.

After him was David Wolfe [KC5VPF], who did not rely as much on the hams as Mike did. But he did use it quite a bit. And Andy Thomas [KD5CHF/VK5MIR] uses it on almost a daily basis, although lately he has been preoccupied with packing (*this interview was conducted a few days before Thomas returned to Earth on the Shuttle—ed.*).

CQ VHF: Has W5RRR been involved in the school contacts with Mir?

KC5BTL: We've also done schools with the astronaut while he is up there. A captive audience. We have a lot of schools waiting to do contacts with the astronauts. The program contacting the schools has been very successful.

Another thing we do is work with some of the local schools who provide pre-mission practice for the astronauts. We loan out equipment to the various schools around the Center. These schools have done contacts on past shuttle missions. Now, they do practice contacts with the astronauts in the simulators to help them get ready for on-orbit activities.

I'd be remiss in not mentioning Gil Carman, WA5NOM, who has been instrumental in keeping the station operational and fairly easy to operate. There are a lot of people who come in to operate the station. And it's a fairly sophisticated station, but he has it all automated so it's really pretty easy to use. Just hit one button, and it updates all the elements for all the satellites. It's all menu driven. About the only thing that isn't automated yet is the Doppler [frequency shifting for satellite contacts]. We do that by hand. Actually, we just purchased a [Yaesu FT-]736 with the computer control in it so that we can automate that part as well. There has always been some club member out there volunteering his time to operate the station when there were folks there who didn't know how to operate it. It just didn't seem to be that high a priority to have that aspect of it automated.

CQ VHF: *What's next for W5RRR and JSCARC?*

We're getting ready to replace [our] antennas....They've been up since the mid '80s. We're going to get some new 2-meter and 70-centimeter Yagis out there and replace the rotator. And we're going to try to put up some other bands as well.

Plus, we hope to have the ATV [amateur television] console back up and running soon. We're going to put hardware up on the International Space Station at the end of this year. We're no longer considered a payload. We're considered crew equipment.

CQVHF: *That is a big step, isn't it?*

KC5BTL: Yes. As far as payloads go for the International Space Station, they'll still be assembling things until 2002, so you don't get any payloads until about that time. But since we're now crew equipment, we'll be up there at the end of this year. We'll start out with just voice and packet. Eventually, we'll branch out into SSTV [slow-scan TV], ATV, and lots of other modes and bands. I'm sure W5RRR will play a role in that as well.

Come and Visit

CQ VHF: *Is W5RRR open to hams who visit the Johnson Space Center?*

KC5BTL: Anyone coming to visit the center can give us an e-mail and we'll set up a tour of the shack. Just give us a call, and we'll be more than happy to open the doors and let you operate.

CQ VHF: *Thank you, Matt, for this opportunity to learn more about the behind-the-scenes functioning of one of ham radio's most visible activities.* ■

Resources

If you'd like to arrange a visit to W5RRR, send Matt an e-mail message at <kc5btl@amsat.org>. You can also click on Matt's name at the bottom of the JSCARC Web page at <http://www.phoenix.net/~mbordel/>.

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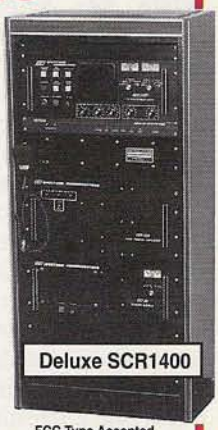

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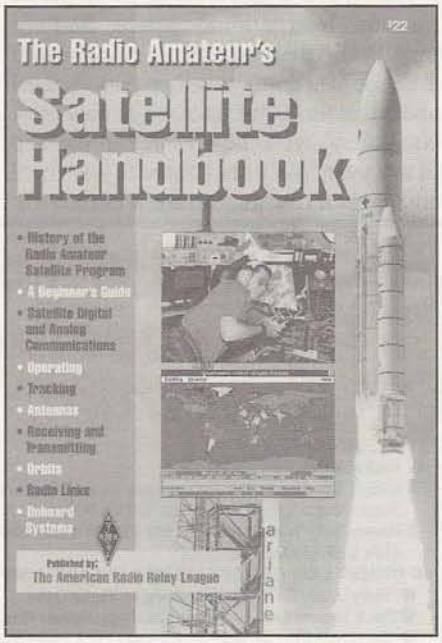
Book Review: "The Radio Amateur's Satellite Handbook"

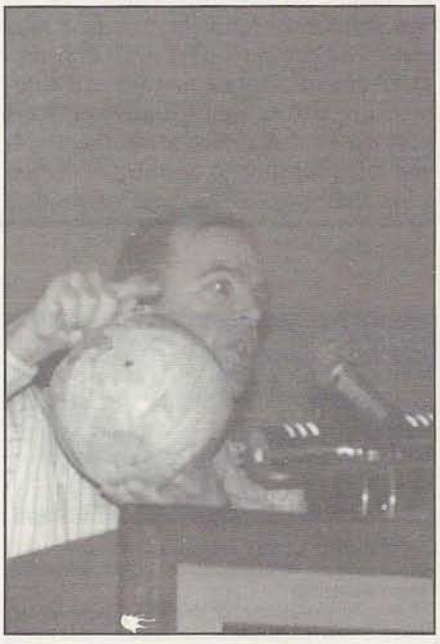
The Radio Amateur's Satellite Handbook is more than just an update to The Satellite Experimenter's Handbook. The information has been reorganized as well, making this book an outstanding resource for both the beginner and experienced satellite operator.

The Radio Amateur's Satellite Handbook, by Martin Davidoff, K2UBC, is the follow-on to Davidoff's previous work, *The Satellite Experimenter's Handbook*. When I first got the brochure from the ARRL that this book was available for purchase, I expected an update with new information and a name change to its predecessor. I was pleasantly surprised to discover that this book is also better-organized, with the material presented in a clearer form. While *The Satellite Experimenter's Handbook* was excellent in its own right, *The Radio Amateur's Satellite Handbook* is better. This is one book that I would definitely recommend for your bookshelf if you're a satellite operator or thinking about becoming one.

So let's take a look at the kind of information that's in the book, how it's organized, and how you can use it either to get on the satellites or, if you're already a satellite operator, to get more enjoyment out of it. I'll list the details in tables to make it easier to find the topics that you might find interesting



The Radio Amateur's Satellite Handbook *is the ARRL's newest satellite guide.*



Author Martin Davidoff, K2UBC, explaining orbits at a VHF conference.

What's in the Book

The Radio Amateur's Satellite Handbook is a very complete single source of information for the satellite operator. It includes satellite information (history, transponders, frequencies, operating modes), alternative choices for your ground station equipment (radios, antennas, feedlines, rotors), operating techniques (antenna tracking, Doppler, transmit power level management), and satellite tracking methods. The book is filled with facts, tables, and illustrations useful to both the beginner and advanced operator.

How the Book Is Organized

The book is divided into three basic sections: Part I is an *Introduction to the Amateur Satellite Program*; Part II is an *Introduction to Satellite Communications*; and Part III is the *Technical Reference*. There are also eight appendices (A through H) with useful reference information and a glossary of terms associated with amateur satellite communications. Table 1 lists the contents by chapter and title and tells you which kinds of satellite operators (beginners, experi-

"This is one book that I would definitely recommend for your bookshelf if you're a satellite operator or thinking about becoming one."

By Ken Ernandes, N2WWD (n2wwd@amsat.org)

Table 1. How the Radio Amateur's Satellite Handbook Is Organized

Chapter	Title	Appeals to:
Part I	**Introduction to the Amateur Satellite Program**	
1	History: ⇒ 1980	All
2	History: 1980 ⇒ Future	All
Part II	**Introduction to Satellite Communications**	
3	Getting Started	Beginners
4	Satellite Analog Communications Plus (SSB/FM/PARROT/CW/ROBOT)	Beginners
5	Satellite Digital Communications	Beginners
6	Operating Notes	Beginners
Part III	**Technical Reference**	
7	Tracking Basics	Beginners
8	Satellite Radio Links	Beginners, Experienced
9	Antennas for Space Communication: Basics	Beginners
10	Antennas for Space Communication: Practical	Home Brewers
11	Receiving and Transmitting	All
12	Satellite Orbits	All
13	Tracking Topics	All
14	OSCAR: Onboard Systems	Experienced
15	So You Want to Build a Satellite	Experimenters
Appendix A	Radio Amateur Satellite History: Dates and Frequencies	All
Appendix B	Radio Amateurs Operating in Space: Summary	All
Appendix C	Profiles of Current Amateur Satellites	All
Appendix D	BASIC Programs	Home Brewers
Appendix E	Internet Sites of Interest	All
Appendix F	Conversion Factors, Constants and Derived Quantities	Experienced
Appendix G	FCC Rules and Regulations governing the Amateur-Satellite Service	All
Appendix H	Satellite Tracking: Graphic Aids	All

"While a good 'Elmer' always helps, a beginner can use the information in this book to set up a station and begin operating on the satellites."

enced, experimenters, homebrewer, all) will be interested in that chapter.

Information for the New Satellite Operator

This book was obviously conceived and written with the beginner in mind. While a good "Elmer" always helps, a beginner can use the information in this book to set up a station and begin operating on the satellites.

I should point out that when I say a "beginner," it could be a either new amateur radio operator or a seasoned operator with little satellite experience (or little experience with a particular satellite mode). For instance, although I have extensive CW and phone experience on the satellites, I'd classify myself a beginner with the digital modes (i.e., packet) since my main digital experience with satellites has been receiving telemetry.

Table 2 lists key beginner topics covered by chapter. The information referenced in this table begins by letting you know what type of satellite operating modes are available and gives you different options to get the equipment together to assemble a station for operating your selected mode(s). The equipment choices include "homebrew" antennas and transmit and receive equipment. The topics also include the basics of satellite tracking so you can figure out when the satellite will be available for communication.

Information for the Experienced Satellite Operator

You won't outgrow *The Radio Amateur's Satellite Handbook*—this one's a keeper. Experienced satellite operators will find quite a bit of useful reference information. As I did with its predecessor, I keep this book handy in my shack as a reference.

"You won't outgrow* The Radio Amateur's Satellite Handbook—*this one's a keeper. Experienced satellite operators will find quite a bit of useful reference information."

Table 2. Key Topics for Beginning Satellite Operators

Chapter	Key Topics
3. Getting Started	• What modes of satellite communications are available • Critical decision points—building toward the operating mode and station type you want • How and why we operate full duplex on the satellites • Example case studies of beginning operators
4. Analog Communications Plus	• Operating Basics for voice and Morse code communications • Transponder types and operating characteristics • Names for different transponder modes
5. Digital Communications	• Set-up and operation of a digital satellite station • Differences between satellite and terrestrial digital equipment and operations
6. Operating Notes	• Information resources: on the air, on-line, publications, and organizations
7. Tracking Basics	• Knowing when the satellite is available (above your horizon) • Knowing which direction to point beam antennas (if you're using beams) • Basics of Doppler frequency shift • Computer-based tracking, including program names and where to get them • Non-computer tracking techniques • Basic information about orbital (Keplerian) elements
8. Satellite Radio Links	• How to compensate for Doppler frequency Shift • Familiarity with spin modulation
9. Antennas for Space Communication: Basics	• Information about gain and effective radiated power • Polarization types: vertical, horizontal, and circular
10. Antennas for Space Communication: Practical	• Simple but effective fixed antennas for satellite communications
11. Transmitting and Receiving	• Modifying equipment for satellite operation • How to optimize receiving on your satellite station • Using appropriate transmit power levels
12. Satellite Orbits	• Introduction to circular and elliptical orbits • Pictorial description of orbital (Keplerian) elements
13. Tracking	• How satellite ground coverage increases as the satellite's altitude 2 increases

Table 3. Key Topics for Experienced Satellite Operators

Chapter	Key Topics
6. Operating Notes	• On-the-satellite activities • Satellite operating schedules
7. Tracking Basics	• Summary of tracking terms • Date/time and Latitude/Longitude conversation information
8. Satellite Radio Links	• Doppler shift computation equations • Faraday rotation information • Predicting signal levels for satellite communications
9. Antennas for Space Communication: Basics	• Techniques for producing circular polarization
10. Antennas for Space Communication: Practical	• Beam antennas for satellite communications • Computing effective radiated power
11. Transmitting and Receiving	• Using the feedline to supply DC voltage to a mast-mounted pre-amp • Pre-amp weather proofing techniques
12. Satellite Orbits	• Equations for basic orbital predictions • Special orbit types
13. Tracking	• Equations for antenna pointing • Basic orbital design to optimize ground coverage

Table 4. Information for "Homebrewers"

Chapter	Construction and Software Projects
10. Antennas for Space Communication: Practical	• AZ/EL rotor • Dipole • Eggbeater • Ground plane • Helix • Lindenblad • Parabolic dish • Quad • Quadrifiliar helix • Turnstile reflector
11. Transmitting and Receiving	• 435 MHz cavity filter to remove front-end overload in full duplex • Techniques for tapping off RF from a 2-meter FM receiver • Pre-amps: 28 MHz, 144 MHz, 435 MHz, 2.3 GHz
12. Satellite Orbits Appendix D BASIC Programs	• Software source code building blocks for orbital prediction • Terrestrial distance and bearing • Ground tracks for circular and elliptical orbits • Average daily access times for circular and elliptical orbits

"This book is the most complete single source of information available today on amateur satellite communications."

Table 3 lists key topics for the experienced operator by chapter. The information referenced here builds on the practical experience gained through operating on the satellites. This includes beam antennas and how to point them and follow a satellite across the sky. The information also gives you the background technical information needed to get the most from satellite tracking software or manual tracking techniques.

Information for the "Homebrewer"

Since there are "homebrewing" projects for both the beginner and experienced operator, I'm addressing these projects as a separate topic. Table 4 lists the various "homebrew" projects in this book, which include plans for building both fixed and beam antennas as well as electronics projects for transmitting and receiving components. Since homebrewing isn't limited to just hardware, I also reference the software source code given in the book.

Summary

The Radio Amateur's Satellite Handbook is an excellent reference that provides information for all types of operators. The book is organized so the beginner can see what satellite operating is all about and learn what he or she needs to do to get started communicating via satellite. It makes a seamless transition from beginner topics, providing experienced operators with information that makes satellite operating more enjoyable. A significant number of homebrew projects and station setup tips are also provided throughout. This book is the most complete single source of information available today on amateur satellite communications. ■

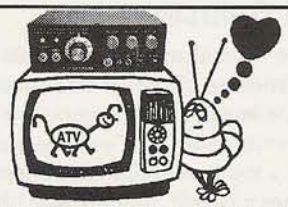
Resources

You can buy *The Radio Amateur's Satellite Handbook* for $22 (plus shipping and handling) directly from the ARRL, from AMSAT, or from the *CQ VHF* bookstore:

ARRL, 225 Main Sreet., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Internet: <http://www.arrl.org>. Order # 6583

AMSAT-NA, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703; Phone: (301) 589-6062.

CQ Communications, Inc., 25 Newbridge Road, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.



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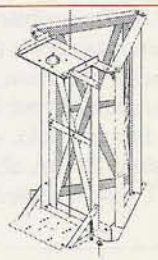

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CIRCLE 71 ON READER SERVICE CARD

Double Your Fun While QRP

Here's a way to switch between a low-voltage HT supply for long battery life and higher power when you need it to access those distant repeaters.

Sitting in this month in the "Project Corner" is Scott Farrell, KE4WMF, sharing a circuit he uses to extend his battery life while operating QRP mobile on his bicycle. But it's handy for just about any QRP activity when you need to conserve power, yet have some extra "oomph" available when you need it.—W2VU

Have you ever wondered how you can best conserve battery power while operating portable or QRP (low-power)? I know I have. I primarily operate QRP/bicycle mobile (see "Riding the Airwaves," *CQ VHF*, February, 1998), so battery conservation is a major concern for me.

Long-lasting 13.8-volt "gel cell" batteries can provide the necessary power, but many of today's newer HTs (handheld transceivers) run on 9.6 volts and are unable to directly accept 13.8 volts. Getting 9.6 volts into these HTs without the dedicated Nickel Cadmium (NiCd) battery pack means using a *DC-to-DC adapter*, a device that converts one voltage (13.8) to another, desired, voltage (9.6). The problem with even the most efficient adapters is that they consume power during operation, effectively reducing the duration of your battery's charge.

For example, my Yaesu EDC-12 consumes 20 mA all by itself, even with the HT disconnected. Given that my Yaesu FT-11R HT consumes a miserly 16mA in standby, over half of my battery's available power is being used to operate the adapter, effectively cutting my operating time in half! Even worse, if you leave the battery connected to the adapter when you are away from your rig, the adapter will slowly discharge the battery.

The battery switch can be housed in something similar to the author's Velcro® HT holder. In this photo, you can see the switch mounted below the HT, providing easy access for switching from low to high power.

Several Solutions

There are several options available to solve this problem. I'll cover three in this article. Since most HTs can operate on as little as 4 volts (*although with reduced power—ed.*), my first option is to operate directly from a 6-volt, 4-amp-hour (Ah) gel cell (one came with my high-power bicycle lighting system). With 6 volts, transmitter power is reduced to 2 watts, and maximum current is 900 mA, instead of 1.5 A. In addition, the battery-draining adapter is eliminated. Four amp-hours is enough to modestly operate most HTs for days, and I'm happy with that kind of endurance. However, I occasionally need 5 watts to use a distant repeater. For this, I need 12 volts and an adapter. This dilemma compelled me to find a way to have the best of both worlds: maximum HT power *and* battery longevity...hence the next option.

The Series/Parallel Solution

This option uses two 6-volt batteries instead of one 12-volt battery. Battery conservation begins with using the minimum power necessary to maintain communications, but continues by using the minimum voltage necessary to operate the radio. Using two 6-volt batteries is in keeping with this philosophy, but proper wiring allows 12 volts to be immediately available when needed for high power. To minimize expenses, I decided to use items already on hand: two 6-volt, 4-Ah gel cells, a Yaesu EDC-12 adapter, a handful of DC coaxial jacks/plugs, and my current homebrewed HT mount (see photo). The HT mount holds all components except the gel cells, which fit snugly in an under-seat pack.

The idea is relatively simple: Create a system that allows the operator to conveniently change the operating voltage from 6 volts to 12 volts. At first, I simply wired the batteries to have two independent 6-volt outputs and one 12-volt output (remember your series-parallel basics: two 4 Ah 6-volt batteries wired in series will give you 12 volts at 4 Ah, while wiring them in parallel will give you 6 volts at 8 Ah). At first I thought I'd solved my problem, but I decided I didn't want to be physically unplugging and plugging

*By Scott A. Farrell, KE4WMF (KE4WMF@aol.com)

**Scott Farrell, KE4WMF, is a Coast Guardsman stationed in Cape Cod, Massachusetts. Whenever possible (and when he's on land), he rides his HT-equipped bike to work. This is Scott's second article for* CQ VHF.

connectors—while I was riding my bicycle—to change the voltage supplied to the HT. Also, I needed a method for bypassing the adapter while operating on 6 volts. So I decided that a switching network would be much more convenient and safer to operate while riding.

Here's the plan. Ideally, a double-pole four-throw (DP4T) switch is needed; but, since size is important and small DP4T switches are hard to find, I opted to use two double-pole double-throw (DPDT) switches instead. The switches are mounted close to one another for simultaneous operation, and they both have a center OFF position that helps prevent accidental battery discharge or voltages where they are not wanted (12 volts to the HT, or 6 volts to adapter). Plus, the switch handles can be physically connected with plastic and epoxy for 2P4T action, further reducing the risk of accidents.

Circuit Design

Refer to the schematic as you read the following paragraphs to follow the power paths. For 5-watt/12-volt operation, both switches are placed in the "1" position. Switch S1 is used to switch the batteries from parallel to series. This is done by having the S1B contacts short battery V1's negative terminal to V2's positive terminal. V1's positive terminal, which now has 12 volts, is routed to S2B via jack J1. S2 either includes (position "1") or bypasses (position "2") the DC–DC adapter in the circuit. In the "1" position, voltage is sent to the DC–DC adapter via S2B, and V2's negative terminal is routed to the adapter via J2. The 9.6-volt output of the adapter is then sent the HT via S2A and J3.

When economic 6-volt operation is desired (most of the time for me), place both switches in the "2" position. S1 places V1 and V2 in parallel and routes their positive terminals to S2B. The negative terminals are routed directly to J3. With S2 in the "2" position, operating voltage bypasses the DC–DC Adapter and is routed straight to the HT via J3.

The system is easy and convenient to use. Fuse protection is abundant. With the vibration my connections receive while riding off road, the last thing I want is a short circuit that results in a fire under my seat! Another benefit of this setup is that switching from 12-volt series to 6-volt parallel power *doubles* my operating time (from 4 Ah to 8 Ah). With that kind of endurance available, I could operate on a bicycle tour for several days without recharging!

Going the NiMH Route

Perhaps the most efficient option is to substitute eight 1.2-volt Nickel Metal Hydride (NiMH) "AA" batteries for the 6-volt gel cells in the schematic. I'd have used this plan, but I already carry 6-volt batteries for my lighting system and I didn't want to make the $24 investment in NiMH AAs, which cost about $3 each.

But if you choose to use this option, V1 and V2 on the schematic become two banks of four AAs. The parallel-series switching of S1 makes either 4.8 or 9.6 volts available directly from the batteries...exactly the same voltages provided by the manufacturer's batteries! The DC–DC adapter can be eliminated altogether, since voltage step-down is not necessary, further increasing endurance. To make this change in the schematic, eliminate the DC-DC adapter and S2. Then wire S1A-0 to the center conductor of J3. Finally, wire S1B to J3's shield. To charge the batteries, plug the manufacturer's charger into J3 and place S1 in the position appropriate to the output of your charger (4.8-volt, use position "2"; 9.6-volt, use position "1"). *(Be sure to use a charger designed specifically for NiMH batteries. A "standard" NiCd charger may not sense a full charge and could pose a fire hazard. See "An NiMH Warning: Don't Toast Your Battery" in our March, 1998, issue.—ed.)*

Overkill? You Decide

Is this switching system overkill? Perhaps. But my goal is to make my bicycle mobile station as safe and efficient as possible. To illustrate the gains of my setup, I offer the following calculations: Using a 5-5-90 duty cycle (that's 5% transmit, 5% receive/signal, and 90% standby/squelched; the same figures used in manufacturers' ads), a 12-volt, 4-Ah gel cell would power my HT at 5 watts for 30 hours (total two-way talk time, or TT, is 3 hours, or 10% of total time). The same battery would power my HT at 1.5 watts for 40 hours. By eliminating the adapter and operating on 6 volts at 1.5 watts, that time is extended to 60 hours. But...when I switch to 6-volt parallel operation, my battery size is doubled to 8 Ah, further extending my time to 120 hours.

The key to battery conservation while operating QRP is using a dual voltage

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0510G	10	170	25	15/0.7	Standard
0550G	5-10	375	59	15/0.7	HPA
0552G	25-40	375	54	15/0.7	HPA
144 MHz					
1403G	1-5	10-50	6	15/0.7	LPA
1405G	1-2	100	14	15/0.7	Standard
1410G	5-10	160-200	28	15/0.7	Standard
1412G	25-45	160-200	22	15/0.7	Standard
1450G	5-10	350+	56	15/0.7	HPA
1452G	10-25	350+	50	15/0.7	HPA
220 MHz					
2203G	1-5	8-35	5	14/0.8	LPA
2210G	5-10	130	20	14/0.8	Standard
2212G	25-45	130	16	14/0.8	Standard
2250G	5-10	225	40	14/0.8	HPA
2252G	10-25	225	36	14/0.8	HPA
2254	75	225	32		HPA
440MHz					
4405G	1-5	15-50	9	12/1.2	LPA
4410G	10	100	19	12/1.2	Standard
4412G	15-30	100	19	12/1.2	Standard
4448G	1-5	75-100	25	12/1.2	HPA
4450G	5-10	185	35	12/1.2	HPA
4452G	25	185	30	12/1.2	HPA

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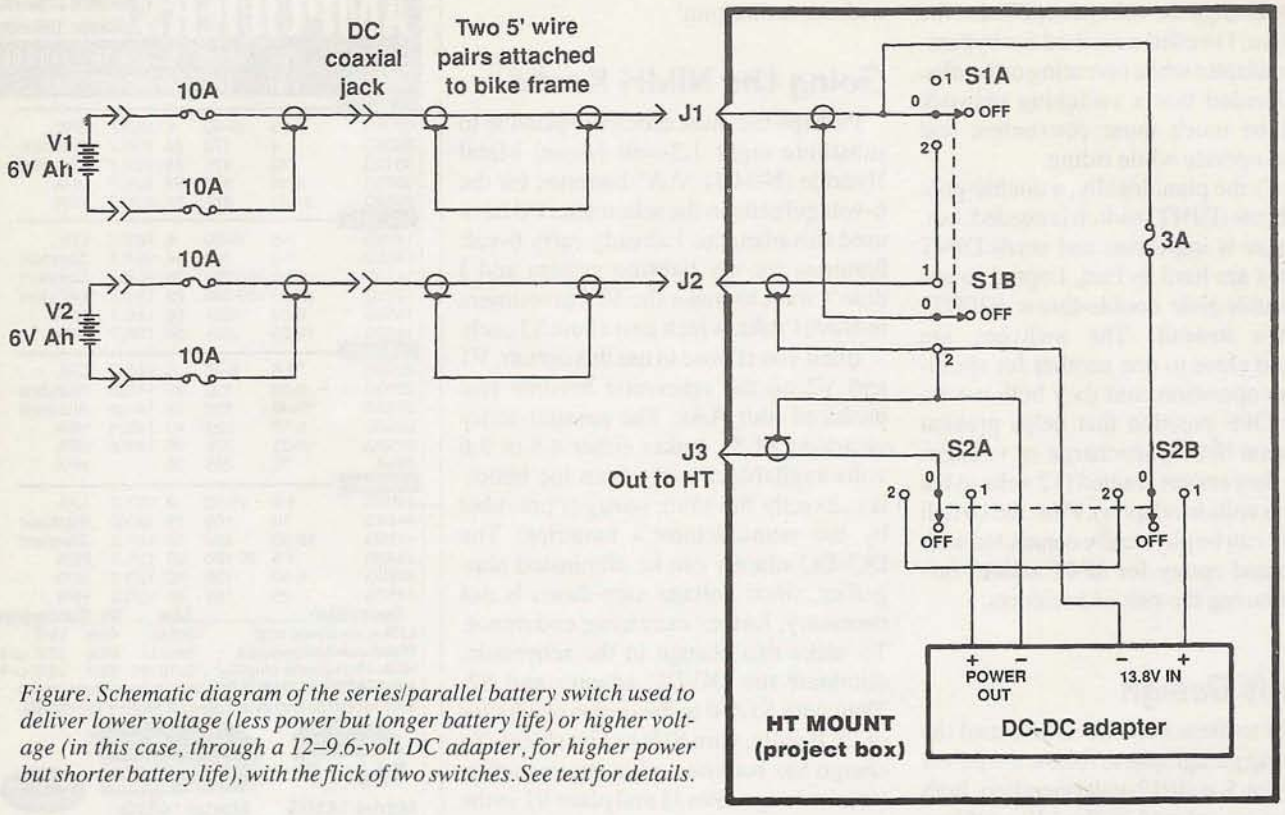

Figure. Schematic diagram of the series/parallel battery switch used to deliver lower voltage (less power but longer battery life) or higher voltage (in this case, through a 12–9.6-volt DC adapter, for higher power but shorter battery life), with the flick of two switches. See text for details.

Parts List

All parts except the gel cell batteries are available from RadioShack; all parts including the gel cells may be available from other parts dealers as well.

- 2 DPDT (double pole, double throw) center-off switches
- 1 6 x 3 x 2 inch project box
- 4 10-amp in-line blade type fuses
- 1 3-amp in-line blade type fuse
- 4 5.5 x 2.1 mm. DC coaxial plugs (two are already included if RadioShack 5-foot DC coaxial extensions are used; two more are needed for short jumpers from cables to batteries)
- 3 panel mount 5.5 x 2.1 mm DC coaxial jacks
- 2 in-line mount 5.5 x 2.1 mm DC coaxial jacks (already included if RadioShack 5-foot DC coaxial extensions are used)
- 2 5-foot DC coaxial extensions or make your own 5-foot cables
- 1 DC-DC Adapter (use whatever is appropriate for your HT's voltage needs; mine is a Yaesu EDC-12, which converts 13.6 volts to 9.6 volts)
- 2 6-volt, 4-Amp-hour rechargeable gel cell batteries, available from a variety of sources. If NiMH option is used, substitute 8 1.2-volt NiMH AA cells and two AA battery holders for the gel cells.

Resources

For an electronic copy of the full-size schematic (8-1/2 x 11 inches) with part numbers, feel free to e-mail me at <KE4WMF@aol.com>. Please try to be patient if I don't respond soon. I'm in the Coast Guard and spend over half the year at sea. (*We'll also try to post it on the* CQ VHF *Web site at <http://members.aol.com/cqvhf/>. Look under "1998 issues" for the file KE4WMF.ZIP. Be aware, though, that it's about 750 kb in size and might take quite a while to download.—ed.*)

setup. As I mentioned earlier, most HTs can operate on as little as 4.8 volts. So why operate on 9.6 volts or 12 volts if the same results can be achieved with less voltage, especially while listening? By using two lower voltage batteries (either 4.8 volts or 6 volts), the benefits of parallel longevity and series maximum power can be readily achieved with no drawbacks other than the initial labor involved to make it work. The difference in size and weight between two 6-volt, 4-Ah gel cells and one 12-volt,4-Ah gel cell is negligible, but the endurance gains are undeniable! ■

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Do you have a VHF/UHF-related project you'd like to share with your fellow readers? Send it along and if we think it'll appeal to a significant number of readers, we'll publish it. But please get a copy of our writers' guidelines first. Either download them from our Web site <http://members.aol.com/cqvhf/> or send a request with a business-sized SASE to Writers' Guidelines, CQ VHF, *25 Newbridge Road, Hicksville, NY 11801.*

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The hams of NP3P demonstrate that a club doesn't have to be real big to be real active.

Some of the more active members of Cadena el Conquistador, Inc. (NP3P), Fajardo, Puerto Rico. From left to right in the front row are Sammy, WP4NIW; Carlos, NP3E; and Mei-Ling, NP3MJ. In the rear, from left to right, are Cesar, NP3H; Fredye, WP4GPX; Carlos, NP3CB; and Roberto KP4SK. Other active club members not pictured include Jimmy, KP2BH; Mundo, WP4HNN; Melba, WP4WK; Mariam, NP3HC; Arnaldo, WP4MYI; Jose (Caché), NP4HY; Rafi, WP4NHM; Carlos WP4MKU; and Jose, WP4AZT.

The club, which was formed in 1991, has about 15 active members and is one of only three or four radio clubs in Puerto Rico that are incorporated, according to "A Wind Powered Repeater" author Cesar Amaro, NP3H. One of Cadena el Conquistador's major activities each year is the special event station that it operates on Vieques Island, off the Puerto Rican coast, in connection with the annual Vieques Cultural Festival. The Vieques Island operation is especially popular among hams seeking the Islands on the Air (IOTA) award, to whom Vieques is best known as NA-099.

For more information, contact Cadena el Conquistador, Inc., P.O. Box 161, Fajardo, PR 00738. ■

Cadena el Conquistador, Inc., NP3P, is an active radio club based in Fajardo, Puerto Rico, some 30 miles east of San Juan at the island's northeast corner. It maintains both voice and digital repeaters in Fajardo (146.690 MHz voice; 145.030 MHz digital) and about 10 miles to the west in Rio Grande (146.990 voice; 145.030 digital), with a 224.700-MHz link between the two voice repeaters. The Rio Grande site, on Puerto Rico's northern coast, has backup power provided by the wind generator described in the article, "A Wind Powered Repeater," elsewhere in this issue.

Map of Puerto Rico showing locations of Fajardo, the repeater site in Rio Grande, the capital city of San Juan, and Vieques Island, from which Cadena el Conquistador operates an annual special event station.

More Ham Help in Severe Weather

When surprise storms struck the northeast at the end of May, hams helped the National Weather Service keep tabs on "what was happening where" on a very busy weather weekend.

Severe storms struck the eastern United States on Sunday, May 30, and Monday, May 31, and hams once again were instrumental in keeping lines of communication open, both before and after the storms roared through. A fast-moving disturbance that was blamed for tornadoes in the upper Midwest early on Sunday morning caused tornadoes, hail, and heavy rain in parts of New England, New Jersey, New York, and Pennsylvania, by Monday morning leaving a path of damage and destruction in its path. Our focus this month is on ham radio's response.

Downed trees like this one were a common sight across the northeastern U.S. on the weekend of May 30 and 31, as a line of severe storms spawned tornadoes and caused significant damage in Pennsylvania, New York, and New England. (Photos courtesy of Rob Macedo, KD1CY)

"Take Cover"

Amateurs in New York's Capital District and beyond came out in force late Sunday afternoon, as a line of successive storm cells pounded Albany and surrounding counties. Severe weather nets were begun in at least six New York counties, as well as in neighboring Vermont and western Massachusetts. "Take cover" advisories were issued through the late afternoon and evening, and severe storm and tornado warnings were posted in outlying counties until as late as 2:00 a.m.

Steve Pertgen, W2FXJ, of the Albany office of the National Weather Service (NWS), operating under the Albany NWS call of WX2ALY, was heard on many area repeaters issuing warnings and gathering reports. Perhaps the busiest net was on the 146.91-MHz Mt. Greylock, Massachusetts, repeater, which covers the entire tri-state area. The net, run by Don Horton, N1ISB, was in high gear throughout most of the evening.

Other, more localized nets were being run in, Rensselaer, Greene, Columbia, Schoharie, Schenectady, and Albany counties, sometimes evolving from severe weather spotting nets into emergency response nets. One place that happened was in Mechanicville, New York, in Saratoga County, where two tornadoes touched down. April Stack, K2ZCZ, reported that one tornado was an F3, with winds over 150 mph, and a path that was a half mile wide and two miles long. Stack commented that the tornado may be "garden variety for Alabama, but not for New York."

Initial reports stated that at least 15 homes were leveled, with much property damage to both residences and local businesses. What began as volunteer coordination by Jim Pickett, N2RXP, to assist police and fire personnel in Mechanicville became an operations net for Red Cross of Northeastern New York. John Farina, WA2QCY, was grabbed up for NCS (net control station) duty and stayed with the net until its conclusion at 1:48 a.m. Red Cross shelters were opened at three sites—two in Saratoga County and one in Rensselaer County—and housed some 100 displaced residents.

Hams provided communication links to the shelters and assisted with damage assessment on Monday and Tuesday. Russ Greenman, WB2LXC, and Ken Coyne, KB2UTI, went in to survey the hardest hit area in the northern end of the community, often being detoured by downed trees and power lines. Final dam-

By Bob Josuweit, WA3PZO (bjosuweit@aol.com)

Even where trees were left standing, downed limbs and branches pulled down power and telephone lines, giving hams plenty of opportunity to provide emergency communications in the wake of the storms.

age assessments showed that at least 32 homes were destroyed by the tornado, with 50 more suffering major damage. Electric, gas, and water service to the northern portions of Mechanicville and a wide area of nearby Stillwater were not expected to be restored for several days. On the plus side, although at least two dozen people were injured, no loss of life was reported.

The Action Moves to Massachusetts

At the NWS office in Taunton, Massachusetts, Sunday, May 31, required one of the longest and most widespread Skywarn activations in many years. Damage was reported over a large area and activations spanned a 14-hour period.

Rob Macedo, KD1CY, received a 7:00 a.m. phone call from NWS meteorologists Walter Drag and Bill Simpson, asking for SKYWARN personnel to be in the office first thing in the morning. The first "threat area" warnings were issued for Connecticut and Rhode Island. KD1CY picks up the story.....

Heads up notification was given early that Sunday Morning to Len Mathieu, N1PTG, Assistant Skywarn Coordinator for Connecticut, and Harvey Broverman, K1PZS, alternate NCS for the Soapstone, Connecticut, 147.00 MHz Skywarn Net. Jeff Mitchell, N1YDU, from Rhode Island Skywarn, was also called as activity moved into the Ocean State. I called for William Dohr, KBØUYO, to go to the NWS office in Taunton for the early morning hours as I gathered data and alerted all personnel throughout the rest of NWS Taunton's Warning Area of Responsibility, which includes southern New Hampshire, all of Massachusetts except for Berkshire County, all of Rhode Island and Hartford, Tolland, and Windham Counties in northern Connecticut.

Next, I sent a heads up page of dangerous weather for the region to coordinators and spotters on our "Alpha Pager Contact" list. In that page, I asked people to refer to their e-mail (since everyone on that list has e-mail) for details on this very serious weather situation.

The e-mail messages included a Public Severe Weather Outlook bulletin for southern New England, a Convective Outlook from the Storm Prediction Center in Norman, Oklahoma, a forecast discussion from NWS Taunton and a Special Weather Statement from NWS Taunton. Next, heads up notification calls were made to western and central Massachusetts and southern New Hampshire, putting the entire network on stand-by alert.

I then went up to the NWS Taunton office, along with Dartmouth Communications Officer Tony Duarte, N1XRS, and Acushnet RACES Radio Officer Mike Leger, N1YLQ.

We arrived by 10:15 a.m. Approximately 30 minutes later, a Severe Thunderstorm Warning was issued for northern Worcester County. Dime-sized hail was reported in Gardner, Massachusetts. Severe Thunderstorm Warnings were then issued for Middlesex and Essex Counties, also in Massachusetts, as the thunderstorm intensified along the warm front. Dime-sized hail was also reported in Chelmsford Center, with three- to four-inch diameter trees down in Littleton. Next, reports of dime- to nickel-sized hail came in from Peabody, Massachusetts, verifying three of the four warnings issued that morning. The focal points for this portion of the activation were Waltham Skywarn on the 146.64 repeater, Danvers Skywarn on the 145.47 repeater, and Haverhill Skywarn on the 146.625 repeater.

The Going Gets Tough

Activity then began moving in from eastern New York. Tornado Watches were posted through New York, with an additional Tornado Watch posted for Berkshire, Hampden, Hampshire, and Franklin Counties of Massachusetts. At this time, Massachusetts Emergency Management Agency (MEMA) Director Peter LaPorte asked for RACES activation statewide. Tom Kinahan, N1CPE, State RACES Radio Officer, and Mike Baril, N1PSE, Area III East RACES Radio Officer, went to staff the MEMA Bunker in Framingham and activated RACES.

The RACES activation meant that the 146.64-MHz Waltham repeater would need to either be utilized by RACES or jointly by RACES and Skywarn. Bill Fernandez, KB1CIE, in his first stint as net control, asked Area I RACES Radio Officer Terry Stader, KA8SCP, if he should relinquish use of the repeater. Terry politely declined and had RACES utilize the MMRA linked repeater system so that Skywarn operations could continue on 146.64. Special thanks to Terry, KA8SCP, for doing this for us. Meantime, Bill, KB1CIE, did a fine job in his first stint as net control and handled weather traffic very well. Special thanks to Bill for being net control as needed.

Given the fast motion of the thunderstorms (50–70 mph), I asked for all nets from Worcester County, Massachusetts, westward to go into formal nets. Shortly after 5:00 p.m., a liaison network was established with Al Frugoli, KE1FO, and Steve Sawyer, KA1SWR, providing liaison between the repeaters on Mount Greylock, Mount Tom, and in Keene, New Hampshire. All liaison work was relayed into the Worcester County Skywarn Linked Repeater System, which operates on the 145.37 (Templeton) and 146.925 (Worcester) repeaters. In addition, the MEMA Linked Repeater System on 53.31 and 448.175 MHz provided liaison to far reaching areas of western Massachusetts, northern Connecticut, and southern New Hampshire, as well as keeping liaison with MEMA Framingham and RACES.

Reports came streaming in from the Mount Greylock net of dime- to nickel-sized hail, winds of 50–70 mph, possible tornado touchdowns in Bennington County, Vermont, a possible tornado touchdown and airport evacuation in Pittsfield, Massachusetts, and many other reports. This liaison work gave us plenty of time to warn counties in Taunton's Warning Area of Responsibility.

Activity then moved into northern Worcester, Cheshire, and Hillsborough Counties. Trees went down in the Winchendon, Massachusetts, area. One fell onto a car, causing an accident and two fatalities. This report was made via amateur radio and later confirmed by the Winchendon Police Department. Activity then streaked into Middlesex and Essex counties, which already had been hit once by severe weather activity. The Waltham, Danvers, and Haverhill repeaters were again used for this activation.

It Wasn't Over Yet

The night was not over yet. A third line of thunderstorms then made its way over Southern New England. This line covered—and spread destruction over—the widest area yet, tracking along southern Berkshire, Hampden, Hampshire, and southern Worcester Counties of Massachusetts, and on into northern Connecticut and Rhode Island.

As this line approached, activity once again increased on all the Skywarn nets. Many reports of downed trees and dime-sized hail were sent in by Al, KE1FO, and Ray, KA1JJM, from Hampden and Hampshire Counties in western Massachusetts. Brian Skalarski, N1VRK, ran net control on the Mount Tom 146.94 repeater, during the height of the event, and forwarded reports for Ray, KA1JJM, to relay to us at NWS Taunton. Numerous reports of wind damage and hail came streaming in from Brian. At the same time, more activity spread into portions of southern New Hampshire. Our New Hampshire liaison, Steve, KA1SWR, provided numerous wind damage reports, and then golf ball-sized hail damaging cars in Walpole. The Worcester County Linked Repeaters, 145.37 Templeton, and 146.925 Worcester were again used for this portion of the operation. The pinnacle of activity, however, was yet to follow.

A Storm Chaser Joins In

William Dohr, KBØUYO, a Skywarn Spotter as well as a storm chaser from South Dakota, went "in the bear's cage," as he put it. After monitoring activity along the southwest side of the storms in Amherst, Massachusetts, he proceeded south to the line of storms that slammed into southern Worcester County and where some of the worst damage was done. Will ran right into the storms, dodging knocked-down trees in the town of New Braintree.

Will's account was that the lightning lit up the sky and he saw a funnel cloud right in front of him; following that, a roaring sound and the winds increased, causing major damage. Will then reported a possible tornado on the ground in New Braintree. Immediately upon receipt of this information, NWS Taunton issued a tornado warning. After slamming into New Braintree, the storm roared on to Spencer, Worcester, Oakham, Sutton, and Oxford, with winds measured up to 104 mph, hail, heavy rain in excess of one inch per hour, and intense lightning. Several towns along the path of this storm were left without power and several local states of emergencies were declared in its wake.

Amateur Radio Month Declarations

Hams in New Jersey, New York, and North Carolina were recognized for their contributions earlier this year with "Amateur Radio Month" proclamations in those states. Following is the text of the New Jersey proclamation, which can serve as a template for requesting similar declarations in other states:

State of New Jersey
Executive Department

Proclamation

WHEREAS, since the early nineteenth century, experimenters have laid the groundwork for what is known today as the Amateur Radio Service, which comprises nearly 700,000 dedicated and federally licensed individuals nationally, almost 20,000 of whom reside in the Garden State; and

WHEREAS, through the development of communications skills and technology, these amateur radio operators promote international goodwill through contacts with foreign stations and cosmonauts on the Mir space station; and

WHEREAS, amateur radio operators provide educational opportunities for young people through the avocations of amateur communications and public service, bringing science and technology to youth service groups and into the classroom; and

WHEREAS, amateur radio operators donate their services and equipment free of charge to federal, state, and local emergency service agencies in the interest of the citizens of the State of New Jersey; and

WHEREAS, the Amateur Radio Service is on alert for any emergency, local or worldwide; and

WHEREAS, they practice their emergency communications skills annually in the month of June during the American Radio Relay League's "Field Day" exercise, which this year will take place the weekend of June 27-28, 1998; and

WHEREAS, it is fitting to give recognition to the far-reaching technological and service achievements of amateur radio operators and this important emergency preparedness exercise;

NOW, THEREFORE, I, CHRISTINE TODD WHITMAN, Governor of the State of New Jersey, do hereby proclaim JUNE 1998 as AMATEUR RADIO MONTH in New Jersey, in recognition of the contributions made by the many dedicated Amateur Radio Operators of the Garden State.

GIVEN, under my hand and the Great Seal of the State of New Jersey, this twenty-sixth day of May in the year of Our Lord one thousand nine hundred and ninety-eight and of the Independence of the United States the two hundred and twenty-first.
(Signed) Christine T Whitman, Governor

Damage in Pennsylvania, Too

Pennsylvania also experienced violent weather. Pittsburgh area residents were hit by eight tornadoes, while the Philadelphia area, 400 miles to the east, suffered devastating damage as well.

The NWS Pittsburgh office confirmed the touchdown of at least eight different tornadoes. Bob Ferrey Jr., N3DOK, a Public Information Officer with the North Hills Amateur Radio Club reported: "The amateur radio operator at the Red Cross building said they were evacuating to the basement. Another amateur radio operator in a McDonald's restaurant reported that the customers and employees were going into a freezer for cover." The funnel cloud did no damage in downtown Pittsburgh.

Ferrey continued,

> We had Skywarn nets in operation from 3:00 p.m. until after 10:00 p.m. on (June) 2nd. There were over 60 amateurs checked in, with almost 150 reports of everything from dime- to quarter-sized hail, two inches of rain in 15 minutes, urban flooding, visual sighting of the funnel cloud, and reports of damage following the storm. The Allegheny County net was in touch with the National Weather Service and also transmitted information to surrounding counties on other repeaters.

Trying to tell the story of amateur radio operators serving in the public interest, Ferrey contacted several TV stations in Pittsburgh that were providing live cov-

erage of the weather damage. Many were accepting live eyewitness report of the storm, but Ferrey never got on because his reports were second-hand. Later that evening, though, Ferrey called into KDKA Radio, and talk show host Bob Logue was very receptive to hearing how amateur radio was involved.

Meanwhile, in the Philadelphia area, numerous Skywarn nets were activated. No amateur radio assistance was need by other organizations. However, the storm damage hit home for Philadelphia's Holmesburg Amateur Radio Club. Club Board member Joel Zieger, N3JUA, reported that the club's wide-area repeater was not being heard as well as it usually is. The symptoms were very similar to a bad amplifier at its main site near Center City Philadelphia.

When Technical Chairman Ron Cardullo, WB3BDC, arrived at the site, he found the antenna hanging at about a 45-degree angle from only one mount. The repeater antenna is located on top of a 45-story building. He temporarily secured it with rope to prevent any danger to anyone below. However, a professional antenna rigger had to be brought in, in the interest of safety to the club's technical committee and the public. Cardullo said a good stiff wind could have blown the thing down! The bill for the riggers just about wiped out the club's treasury and a major fund raising effort is under way. A lesson to be learned—if your club has sponsors a hamfest or has other fund raising efforts, support it to the best of your ability.

Serving in the Public Interest

Rob Macedo, KD1CY, reported that the New England Skywarn Network was responsible for 43 out of the 73 (62%) of the severe weather reports provided that weekend by public safety and Skywarn spotters. Additional thank yous were issued by NWS offices in New York and Pennsylvania.

The last weekend in May was no ordinary one. With Pennsylvania receiving over half of its annual average number of tornadoes in a 48-hour period, it was a weekend to remember.

Have a story to tell? We're always looking for information on emergency communications and public service events. Send your information to <Bjosuweit@aol.com> or <CQVHF@aol.com>. ■

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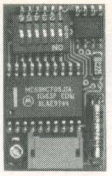

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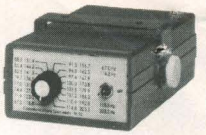

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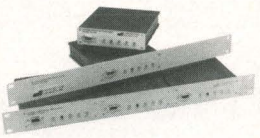

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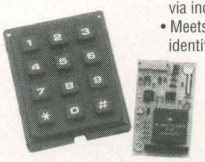

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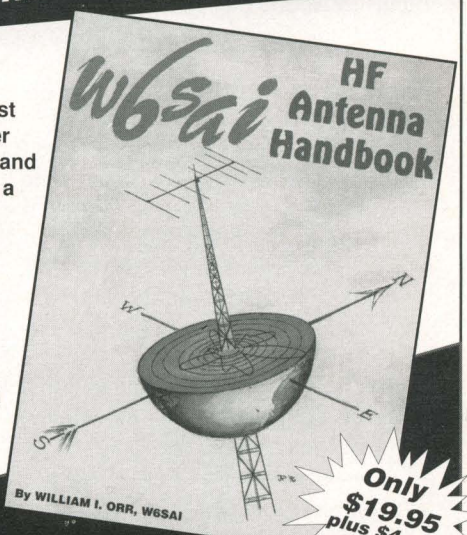

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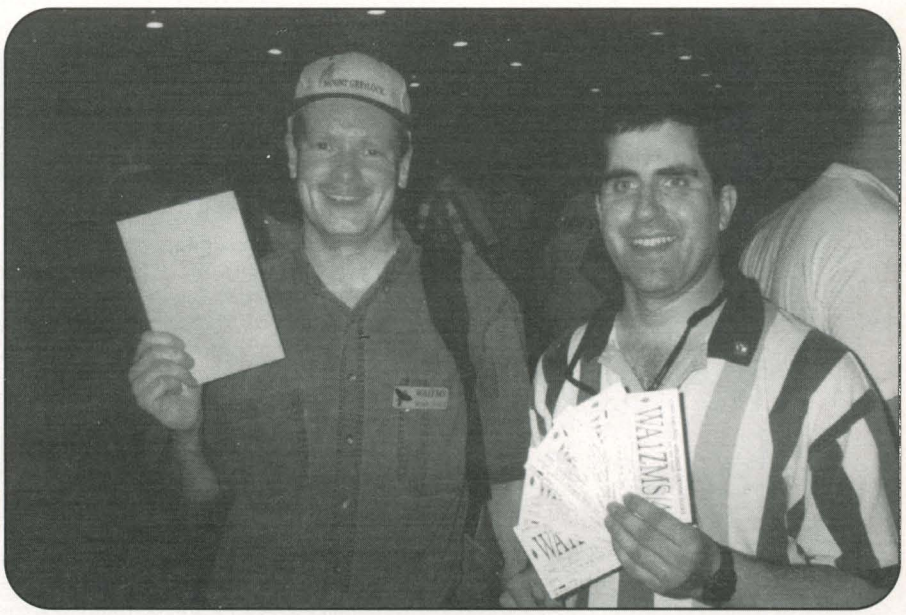
Converting Radar Detectors to 10-GHz Rigs

The guts of old radar detectors can form the basis for building your own bargain-basement rig for 10 GHz. Here's how to do it.

So you've slowed down and don't need that radar detector any more (and I'm the Queen of England), or maybe you found some used ones at a flea market and—having read my July column—snapped them up to convert to 10 GHz transceivers. OK, as promised, here's how to do it.

First, though, a word of caution: this is one project for which you'll probably need help from an "Elmer" who's well versed in microwave construction. The oscillator in the radar detector will need to be retuned from 11.5 GHz down to 10.25 GHz. A spectrum analyzer or a microwave frequency counter is very helpful here. I have retuned Gunn oscillators with a wavemeter, but they're tricky to use, so I don't recommend this unless you've had previous experience using wavemeters.

"This is one project for which you will probably need help from an 'Elmer' who's well versed in microwave construction."



Brian Justin, WA1ZMS, and Doug Sharp, K2AD, are all smiles at the Dayton Hamvention after getting certification from WA5VJB for 47-GHz VUCC Award #1.

Using AM to Make FM

A Gunn diode is controlled more by the *current* flowing *through* the diode than by the *voltage across* the diode. The PSU power supply modulator shown in Figure 1 uses a 33- to 39-ohm 2-watt resistor (R1) to drop 12 volts down to 8 volts or so. This part of the circuit is just about as simple as it gets.

The rest of the circuit in Figure 1 is the modulator. When you change the voltage slightly on a Gunn diode, its frequency changes as well. So by building an AM modulator and putting about 1% AM modulation on the Gunn diode, the voltage changes produced by the AM generate a wideband FM signal!

The microphone preamp in Figure 1 is simple, but all you need for wideband FM. I didn't include any kind of modulation limiter or compression amp since (as I'll talk about later) with Gunnplexers, you hear yourself talking. This is much like a telephone, in which audio from the mike comes out the earpiece. This is a great feedback circuit. If the audio is weak, you naturally speak up. If it's loud and distorted, you can easily tell and back off the mic. The transistor (Q1) is a simple 2N2222, but just about any general purpose NPN transistor can be used. The microphone is any general purpose dynamic mic. I used one off an old cassette recorder.

Receiver/IF

The receive mixer diode in the Gunn oscillator, which is designed for wideband (200-kHz bandwidth) FM, downconverts the received signal. The most common IF frequency for 10-GHz signals is 30.0 MHz. Just connect the receive mixer diode to a wideband FM radio through a 39-pFd capacitor, as shown in

By Kent Britain, WA5VJB (wa5vjb@cq.net)

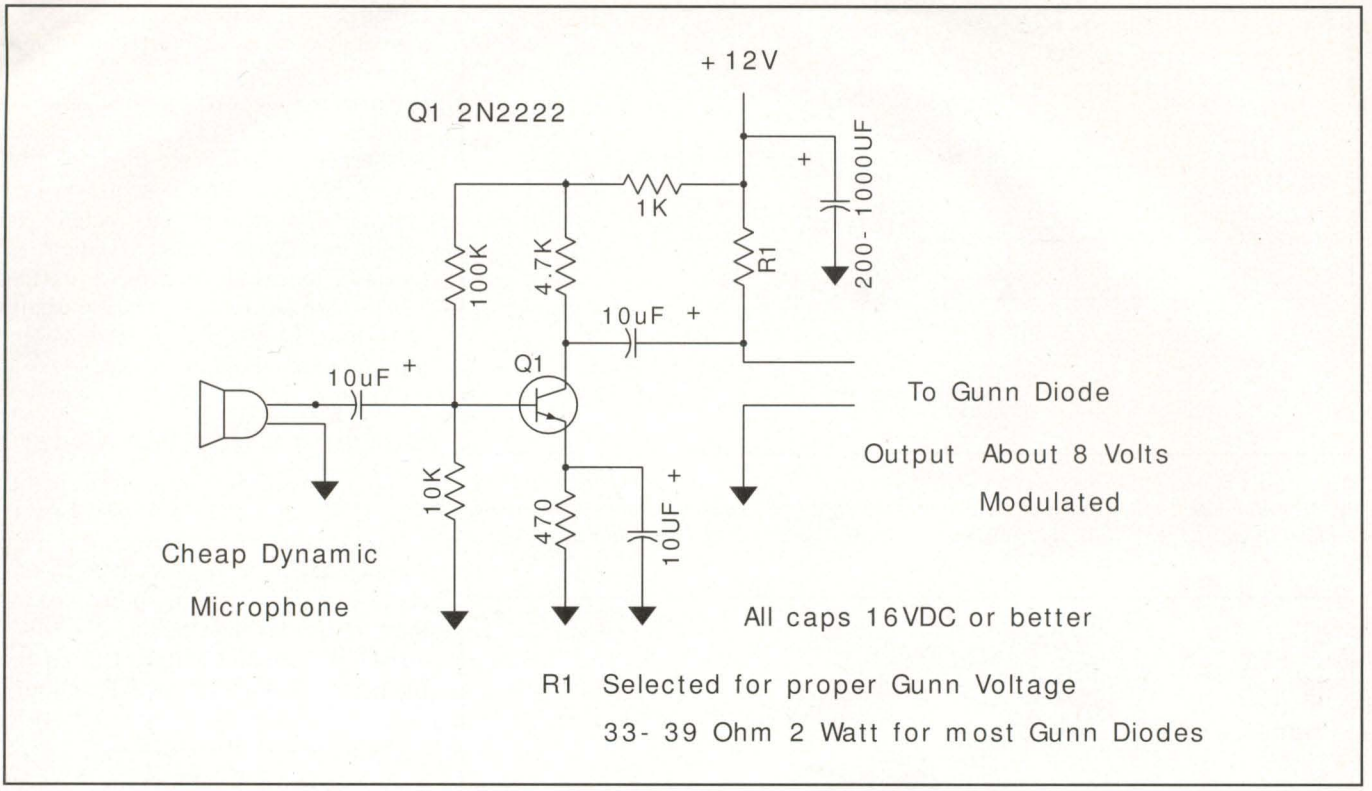


Figure 1. The PSU Power Supply Modulator, a basic power supply and modulator unit for putting the Gunn diode of a radar detector on 10-GHz wideband FM. See text for details.

Figure 2a. A typical amateur mobile setup using this equipment is shown in Figure 2b. The box labeled FR-10 is a wideband FM receiver. Suitable radios are available from many sources, and units such as the ICOM 7000, R1, and IC-706 have been used with good results. But if you really what to do this on the cheap, the most inexpensive 30-MHz receiver is the Ramsey FR10. Conversion is quite simple, especially if you make the changes as you build the kit.

FR10 Conversion

If you're using the FR-10, there are a few minor modifications you'll need to make. The first mod (see Figure 3a) is replacing filter FL2 with a .01-µFd capacitor. This makes the FR10 a wideband receiver. The .01-µFd cap goes from Pin 3 to Pin 5 of IC U2. Next, you can improve the audio by adding a 3300- or 3900-ohm resistor across the FM detector quadrature coil on U2. This replaces the FR10's R14 and is connected between Pins 4 and 8 on the IC.

The next mod is in the audio stage (Figure 3b). The FR10 is designed to drive a speaker and the audio output is far too hot for headphones. (With Gunnplexer systems, you need headphones to prevent feedback since you're operating full duplex and mic audio also comes through the speaker.) Omitting C36 (it was optional anyway!) and adding a 330-ohm resistor in series with the headphone jack works well.

Finally, Figure 3c shows my *tuning ranges* mod. Replacing C12 with a 15-pFd capacitor and adding a 15-pFd capacitor across L3 will tighten up the tuning range (12-pFd caps should also work).

Alignment is quick: just put the tuning control in the middle of its range and listen to a 30.0-MHz signal while adjusting L3. Be sure to mark where 30.0 MHz is on your tuning range. It is very important to keep the IF centered on 30.0 MHz for proper operation on 10-GHz FM.

Operation

Now you're ready to get on the air. Have your Elmer tune the Gunn oscillator to either 10,250 or 10,280 MHz, the 10-GHz FM calling frequencies. A Gunnplexer is a bit of a strange animal. Your transmitter is also the receive local oscillator (note the 30-MHz difference in frequencies), and therefore the receive local oscillator is also the transmitter.

"When you change the voltage slightly on a Gunn diode, its frequency changes as well. So by building an AM modulator and putting about 1% AM modulation on the Gunn diode, the voltage changes produced by the AM generate a wideband FM signal!"

About the best analogy I have been able to think of is to imagine a crystal-controlled 2-meter rig which uses a 600-kHz IF. Now, a 146.34-MHz transmit crystal will also serve as the 146.94-MHz receive crystal. This rig would work well though repeaters, but you could never work simplex with it.

Well, this is how the Gunnplexer operates. You tune 10,250 MHz and your buddy tunes 10,280 MHz. Your transmitter is on his receive frequency and his transmitter is on your receive frequency (see Figure 4). Now that's true duplex operation! It makes your QSOs just like a telephone call. Both sides can talk at the

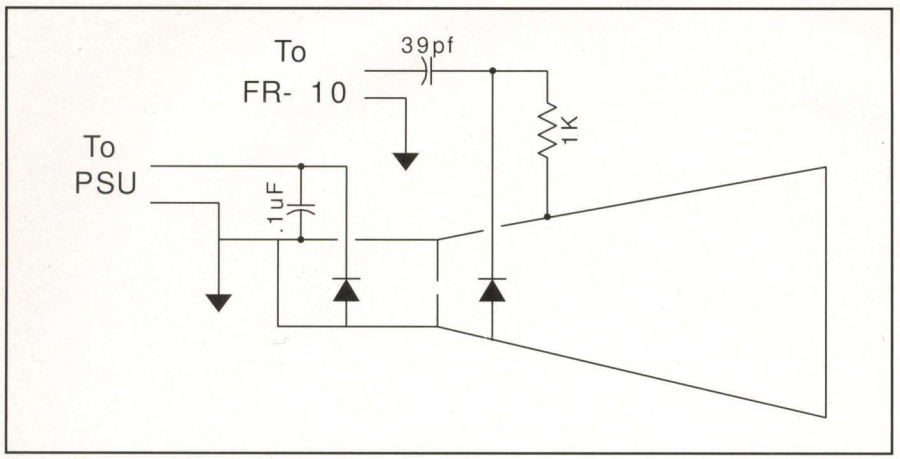


Figure 2a. Connections to the Gunn oscillator from the PSU power supply modulator and from the IF radio, labeled here as FR-10. Be sure to add the 39-pFd capacitor between the receive mixer diode and the radio, and to include the 1K resistor and .1 µFd capacitor as shown.

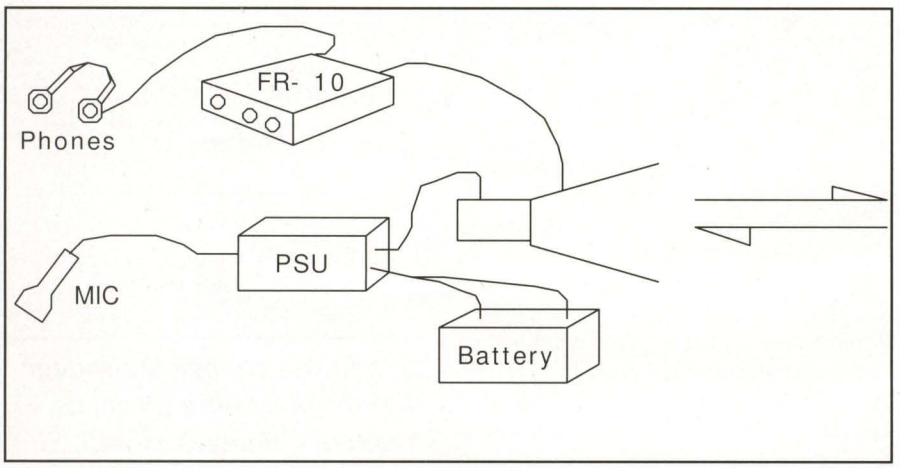


Figure 2b. Block diagram of a typical setup for portable 10-GHz operation using the equipment described here. The AM modulator in the PSU directly feeds the transmit diode in the Gunn oscillator, with voltage changes from the AM modulation causing the Gunn to transmit a wideband FM signal. The receiver, marked FR-10, needs to have a wide (200 kHz) bandwidth and be able to tune to the common Gunnplexer IF frequency of 30.0 MHz. Headphones are essential since operation is full duplex and using a speaker will cause audio feedback.

same time, you don't need a push to talk mic, and you hear your own voice coming out of your receiver. This makes for really neat QSOs.

Don't Look for DX

Basically, these units are line-of-sight, meaning that if you can't see the other guy with a good telescope, you're not going to work him. With just the horn antennas, range is about a mile. With a big horn on my rig and a commercial Gunnplexer/1-foot dish at the other end, my best DX with one of these units has been 55 miles. Still, not bad for a retired radar detector!

Plus, there are several ways of improving on the performance of this basic unit. First, you can develop a limited tuning range by varying the voltage to the Gunn. Typically, the Gunn oscillator in a radar detector can be moved about 100 MHz this way. This works out to about 25 MHz tuning per volt, so tune very carefully. It's a great place to use 10-turn pots (potentiometers) for their precision control.

"A Gunnplexer is a bit of a strange animal. Your transmitter is also the receive local oscillator...and therefore the receive local oscillator is also the transmitter."

Next, there are two ways to upgrade the antenna. I prefer to glue on a few pieces of sheet metal and make the horn a bit bigger, but this really depends on how your Gunn system is constructed. The second method is to mount the Gunn system at the focus of a small dish. I find that 12- to 18-inch diameter dishes usually work best. Larger dishes become very difficult to point out in the field.

Building a Doppler Radar

Keep looking for those old superhet detectors. Soon I'll show you how to make one into your own small private Doppler radar. Maybe we'll even talk about one of my favorite sports, making these old radar detectors into 10.495-GHz CW rigs and calling CQ on the Interstates. The truckers will hear you!

Microwave Activity

In Photo A, we have Brian Justin, WA1ZMS, and Doug Sharp, K2AD, holding their QSL cards for 47-GHz VUCC (VHF/UHF Century Club) Award #1. Brian and Doug completed the feat last April and May by working each other five grids on 47 GHz. Both stations used 100-milliwatt Gunn oscillators with a two-foot dish on one end and a one-foot dish on the other. Both antennas had rifle scopes mounted on the dishes to aid in pointing. The beams were between .5 and 1 degree wide.

As Brian explains it, he stayed in FM07 on Apple Orchard Mountain, outside Lynchburg, Virginia, operating as W2SZ/4 (both Brian and Doug are members of the Rensselaer Polytechnic Institute Amateur Radio Club, and are active W2SZ contest operators), while Doug, operating as WA1ZMS/4, traveled through FM07, 06,96,08, and FM97. The FM06-FM96 QSO established a new North American 47-GHz record of 71 miles. For additional information, see Brian's report on the record-breaking effort on page 75 of last month's issue. Future plans include station improvements and an assault on the current world record of 114 miles between HB9MIN and DK4GD, in Europe.

As a VUCC Awards Manager, I had the personal honor of verifying Brian's QSL cards. Seems they had first tried to

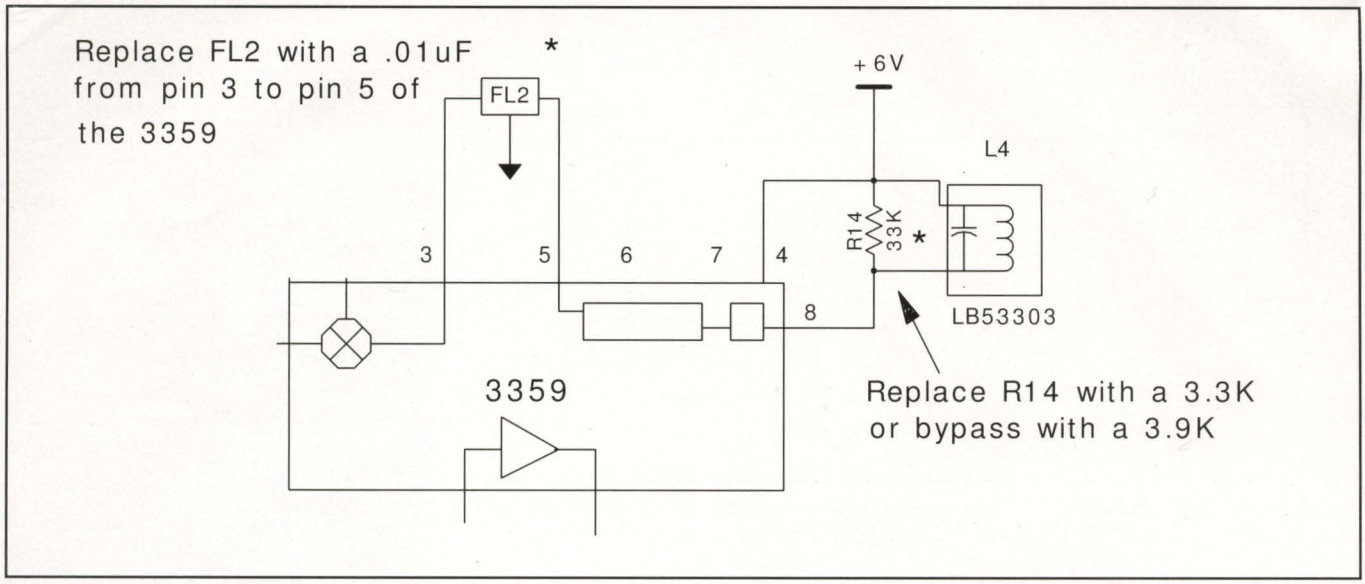
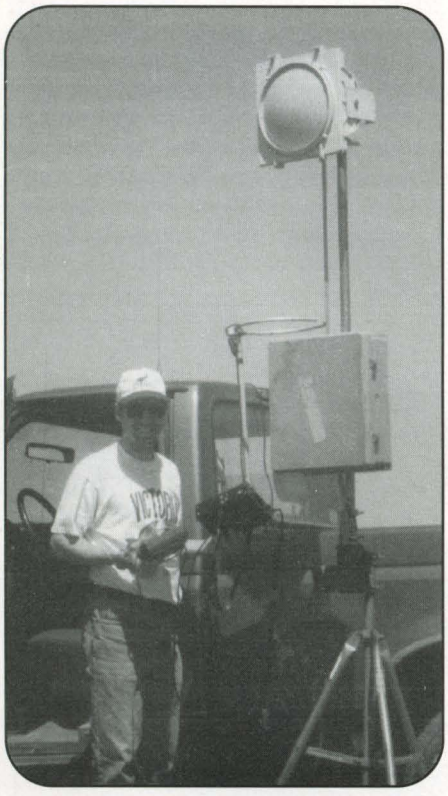


Figure 3a. Converting the Ramsey FR-10 receiver for wideband use involves a few simple modifications (mods). Replacing FL2 with a .01-µFd capacitor makes the receiver widebanded, and replacing R14 as instructed helps improve the audio.



Greg McIntyre, AA5C, poses with his 24-GHz mobile station. If the antenna on top of the mast looks like you've seen it somewhere before, STOP *and think about it. Then see the text for details.*

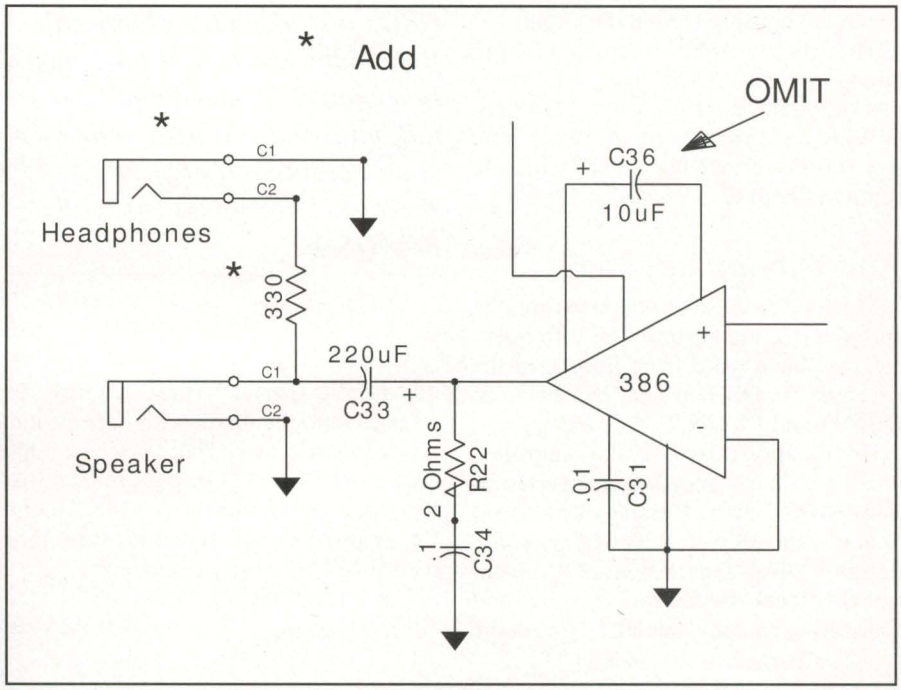


Figure 3b. The two mods shown here—omitting C36 and adding a 330-ohm resistor between the speaker and headphone jacks as shown—should bring down the audio level of the output for comfortable headphone listening. This is necessary due to full-duplex operation.

get another VUCC Manager to look at the cards, but realized there was a problem when he didn't think we had a ham band up there! They ran me down at Dayton and the rest is history.

For those who may be considering building narrowband 47-GHz equipment, the calling/center frequency is 47088.100 MHz

Moving Down to 24 GHz!

In Photo B, we have AA5C's 24-GHz SSB station. Does anything look familiar about his antenna? Hint: they usually come in sets of three, one red, one yellow, and one green! His station is built around a commercial GEM system, which, some years ago, was a popular 23.5-GHz wideband data link unit. For an antenna, the designers needed a weatherproof housing with a 12-inch parabolic reflector. The engineers found one already in production that was manufactured in large quantities and was rela-

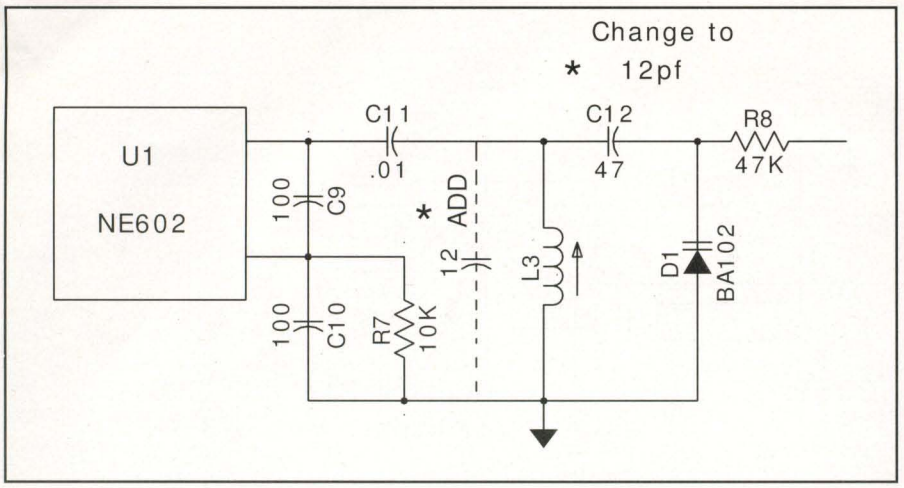


Figure 3c. The final mod to the FR-10 for use with a Gunn oscillator on 10 GHz entails tightening up the tuning range by changing C12 to a 12-pFd capacitor, and adding another 12-pFd cap in parallel with L3.

tively inexpensive. They figured, "Why reinvent the wheel?" and put their antennas in the housing from traffic lights!

This photo was taken during a 24-gig outing on which AA5C (Greg McIntyre) worked Dave Robinson, G4FRE/WW2R, in various parts of Texas. You can see Dave and his 24-GHz mobile setup in Photo C.

And Way on up There...

Finally, for those of you who think 24 and 47 GHz are absurdly high frequencies, we have word from Europe of the first amateur QSO on *411 GHz*, between DB6NT and DL1IN.

Both stations used crystal-controlled local oscillators and downconverted to 144 MHz. Two Russian beam-lead Schottky diodes were very useful in their designs. DB6NT used a more "conventional" local oscillator, mixer, and Cassegrain antenna, but DL1IN went the quasi-optic route, where energy is focused onto the mixer with mirrors and a large plastic lens. Their first test covered a distance of 50 meters (about 162 feet), but both stations have a lot of room for improvements and I'm sure this record will be greatly extended.

Until next time, 73.

—WA5VJB

"[The Gunnplexer] makes your QSOs just like a telephone call. Both sides can talk at the same time, you don't need a push to talk mic, and you hear your own voice coming out of your receiver. This makes for really neat QSOs."

Dave Robinson, G4FRE/WW2R, was on the other end of AA5C's 24-GHz QSOs on the day these photos were taken.

Resources

The Ramsey FR-10 receiver described in the text is available from many ham radio dealers or directly from Ramsey Electronics, Inc., 793 Canning Parkway, Victor, NY 14564; Phone: (716) 924-4560; Fax: (716) 924-4555; Web site: <http://www.ramseyelectronics.com>.

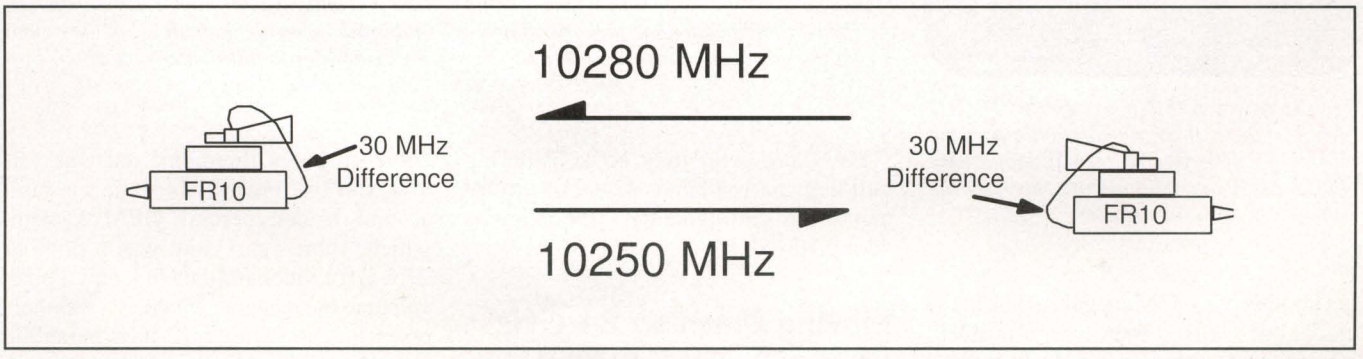
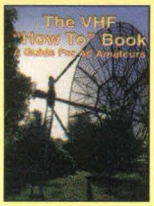


Figure 4. If you're wiring up a pair of Gunn oscillators to talk to each other, make sure one of them is tuned to 10,250 MHz and the other is on 10,280 MHz. This is the most common arrangement when using a 30-MHz IF, and it allows both the receiver and the transmitter to share circuitry for full duplex communications using channels 30 MHz apart.

Books, Calendars, Pins & Cards

The VHF "How-To" Book



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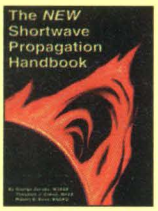

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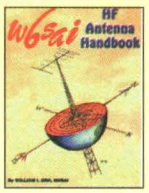

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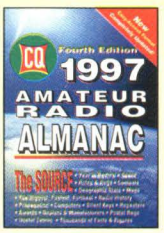

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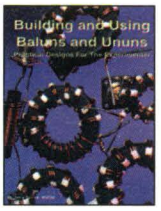

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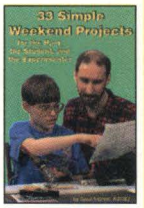

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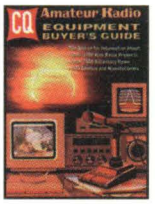

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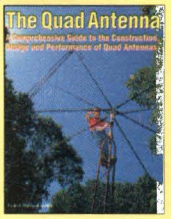

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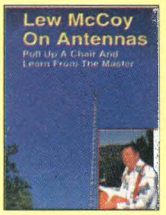

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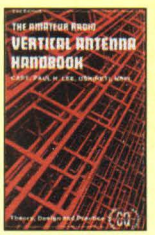

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Digital Modulation, from ASK to OQPSK

Is it QPSK or 4-QAM? Or OOK? Don't worry, just ASK Don (or is that DON?). Then get out your bowl and soup spoon; we're about to serve up a byte-size portion of the alphabet soup called digital modulation (lots of letters for a bunch of ones and zeros!).

Anyone who's read the past five months' columns should now have at least a general feel for what it takes to get a network node on the air. It was my intention to get everyone familiar with the process, to gain the courage to try it themselves. I urge you to try it. Don't be intimidated by existing networks, or by those who look down upon 1200-baud links—if there's a need for data transport services, fill it.

Once you've cut your teeth at 1200 baud, you might want greater speed. If you do, be prepared for a challenge. Trying to start a new network at 56k, for example, is a triple challenge: figuring out the network, the RF, and how to pay for it all can be discouraging if taken all at once. Instead, take it step by step. The reason I'm so enthusiastic about FlexNet (see June and July "Digital Data Link") is that it's very scalable—it will grow in size and speed with your network. Again, I also have to emphasize: FlexNet is an excellent network, but when you run TCP/IP through it, you're really getting into the powerful stuff. Try it!

Digital Modulation Techniques

This month, we'll take a (necessarily brief) look in another direction of digital data: data modulation techniques. Although it's possible to just push bits into a transmitter, a little effort and thought can make the process much more efficient.

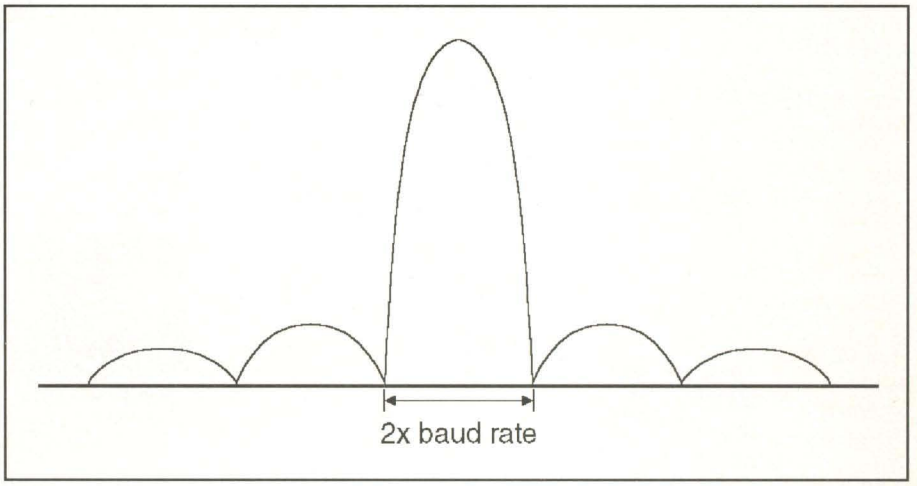


Figure 1. The spectrum bandwidth of a single-frequency transmitter that's turned on and off every so often. The bandwidth of the main carrier is equal to twice the baud rate, expressed in Hz.

There are three goals in any digital modulation scheme:

1. Minimize transmitted bandwidth;
2. Minimize the Bit Error Rate (BER) for a given power level; and
3. Maximize resistance to various forms of interference.

Data communications are considered either *power-limited* or *bandwidth-limited*. Commercial services are generally bandwidth-limited: they only can get an allocation for a small slice of spectrum (often paying millions for the privilege), so they have to maximize throughput (efficiency of data transfer) with what they've got. Compared to spectrum, RF power is cheap. In the amateur service, data communications are generally power-limited: There's plenty of spectrum to play with (for free!), especially in the microwave bands, so the costs associated with greater transmit power become a significant fraction of the total system cost.

What this means is that hams have an advantage over commercial services, namely the ability to trade power requirements for bandwidth. It should be noted that, in general, modulation schemes that use bandwidth less efficiently tend to require less power for a given BER (and the lower the BER, the higher the throughput).

Before we get into the details, I first want to acknowledge that a considerable

By Don Rotolo, N2IRZ (N2IRZ@compuserve.com)

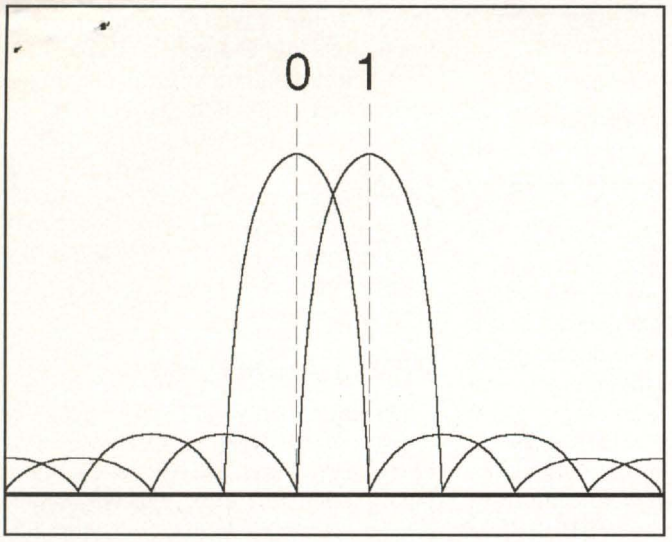


Figure 2. The spectrum view of two optimally spaced FSK carriers. No energy from the "one" carrier is detected by the "zero" receiver, and vice versa, because each signal's amplitude is always zero at the other signal's frequency.

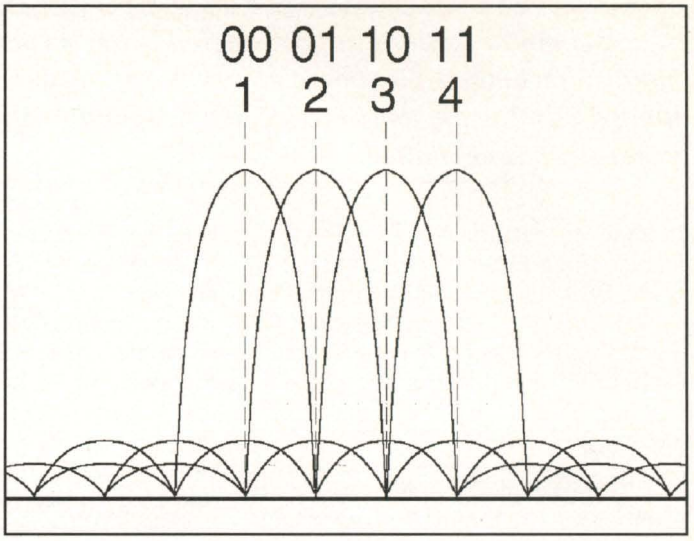


Figure 3. The output spectrum of a 4-FSK signal, which sends 2 bits per signaling period. The di-bit numbers of 00, 01, 10, and 11 correspond to carrier number 1, 2, 3, or 4 being on, with the other three being off. For OFDM (see text), the carriers are switched on and off independently, thus sending 4 bits per signaling period.

portion of the information presented here is taken from the book *Wireless Digital Communications: Design and Theory* by Tom McDermott, N5EG. This book is published by the friendly folks at the Tucson Amateur Packet Radio Corp. (TAPR), and it's available directly from them or from your local bookstore. This book is jam-packed with just what the title says. I can only dream of having the level of understanding and expertise on the topic that Tom has, and I wish I could explain such complex subjects as well as he does in this book. The writing is clear, concise, and understandable, while retaining all of the sometimes difficult content so essential to comprehension. Even if you're only mildly interested in wireless data, I heartily recommend this book.

Now, let's look at some common types of data modulation (*get ready to digest that alphabet soup!—ed.*).

FSK

One of the simplest modulation schemes is *Frequency Shift Keying (FSK)*. Basically, you transmit on one frequency to send a binary "one," and on another frequency to send a binary "zero." It is an advantage for the frequencies to be near each other, allowing a single receiver to be used, but not so near that they interfere with each other.

The ideal distance apart can be calculated (If you want to know how, buy Tom's book!). Take a look at Figure 1, which shows the spectrum bandwidth of a single-frequency transmitter that's turned on and off every so often. (Each FSK frequency is essentially a CW carrier switched on or off, which is the same as an AM transmitter with two modulation levels: 0% and 100%). The signal level drops off to zero at a certain distance from the carrier, then rises again to some lower level—this is a sideband. The distance between null points is exactly twice the baud rate, expressed in Hz (see "Bits and Bauds," elsewhere in this article).

Looking at Figure 2, we see that a good place for the second carrier frequency would be at the null in the first frequency's spectrum. This would make it easiest to tell one frequency from the other, making it an "all or nothing" decision. If the carriers were too close, we would lose some of this "all or nothing," making it necessary to have a better signal quality to ensure a given BER.

Orthogonality

In the above discussion, it was implied that, if the spacing between signals was too close, the energy of one carrier would reduce the signal margin on the other carrier, and vice-versa. While this is essentially true, one thing was left out: only one of the carriers is on at any given moment. We are sending either a one, or a zero, but never both at the same time. We can say that these two carriers are *orthogonal* with each other, that is, one cannot be mistaken for the other.

Orthogonality also comes in degrees. If the carriers were closer than ideal, they would be less than 100% orthogonal because some of the desired signal's energy would be detectable by the undesired signal's detector. If the desired frequency experienced a fade, but not the portion detected by the other detector, we might not be able to decide if it is a one or a zero. Such an occurrence would have the undesirable effect of increasing the BER. With a fully orthogonal signal, it would be much more difficult to make such an error.

Orthogonality can be accomplished at the transmitted frequency, as in this example, as well as at the baseband data level. This was discussed in greater detail in the column on Spread Spectrum in the May, 1997, issue of *CQ VHF*.

2, 4, 6, 8...

FSK using two carriers is also called *2-FSK* and sends 1 bit per signaling period (bit rate = baud rate). To increase the number of bits sent per baud, we can use more carriers (again, see "Bits and Bauds"). Figure 3 shows the spectrum of a *4-FSK* signal, which sends 2 bits per signaling period (baud rate = 1/2 bit rate, or bit rate = 2 • baud rate, or twice the baud rate). The *di-bit* (or 2-bit-long) numbers of 00, 01, 10 and 11 correspond to carrier number 1, 2, 3, or 4 being on, with the other three being off.

This can be extended to as many carrier frequencies as you like, which actual-

"Data communications are considered either power-limited or bandwidth-limited. Commercial services are generally bandwidth-limited....In the amateur service, data communications are generally power-limited...."

ly improves performance. If we were to increase the number of carriers to infinity, the BER would become very small for a given Eb/No*. However, the penalty for increasing bandwidth is increased susceptibility to interference and noise.

OFDM

A similar modulation scheme is *Orthogonal Frequency Division Multiplexing*, or *OFDM* (refer back to Figure 3). In OFDM, instead of switching on and off each carrier one at a time, each is controlled independently, meaning that more than one signal at a time may be "on." For example, with an 8-carrier OFDM system, an entire byte (8 bits) of data is sent during each signaling period. The penalty here is that the power is equally distributed among the "on" carriers. This reduces the power of any given bit, decreasing the signal-to-noise (S/N) ratio, thus increasing the BER. Also, the variability of the signal level (the power per carrier if all 8 are on is much lower than if only one is on) causes further complications.

The PSK Family

If we can detect *phase* accurately, we can use only a single carrier frequency, changing only the carrier's phase to indicate a data bit. Phase is a *time-shifting* (usually a delay) of a periodic signal (such as a sine or square wave), expressed in degrees, where 360 degrees equals one full *period*. Period is defined as the time from a point on one wave in a string of similar waves to the same point on the next wave. Detecting the phase of a carrier implies that we have available to us a reference signal to which we can compare the incoming signal. As it turns out, it's not difficult to regenerate such a reference carrier *from* the incoming signal.

This leads us to *Phase Shift Keying*, or *PSK*. The more accurately we can regenerate the reference carrier, the smaller the phase change we can detect. For example, even if our reference carrier swings wildly, varying by ±70 degrees, it is still no problem to detect a 180-degree phase change. If we can hold the reference to a few degrees, though, detecting a phase shift of, say, 10 degrees isn't difficult, either. The difficulty is that holding the reference carrier so closely requires a greater Eb/No ratio for a given BER. This means having either more signal (higher power) or less noise (a quieter channel).

Figure 4 shows the possible phase angles for a *4-PSK* system, sending 2 bits of data per signaling time. The carrier phase can take any one of the four values, each representing a di-bit data number (well, not exactly, but just accept this for now). Because of the 90-degree phase differences, this technique is also called *Quadrature Phase Shift Keying*, or *QPSK*.

One problem with QPSK is the possibility of a 180-degree phase shift. This abrupt phase reversal, when passed through a Class C amplifier (typical for FM), causes a significant widening of the transmitted bandwidth. To help reduce this problem, we can limit each phase change to ± 90 degrees if we *offset* one of the data streams by $^1/_2$ bit time. Figure 5(a) shows a regular QPSK di-bit data stream, and an *Offset QPSK (OQPSK)* data stream at 5(b).

Phase Ambiguity

One important point regarding PSK is the *absolute phase* of the reference carrier. In many cases, we can regenerate a phase-stable reference, but *we cannot always determine the constant phase offset from the transmitted carrier*. In other words, if we detect a 4-PSK signal with a 90-degree phase difference compared to our reference, we don't know which of the four possible phases the signal was transmitted with.

Looking again at Figure 4, it is completely *incorrect* to assign a di-bit number to each phase, because we can't tell which of the four phases it really is. This so-called *phase ambiguity* is resolved by only transmitting a phase change to indicate that the value of the bit has changed—from 0 to 1 or 1 to 0. So, two

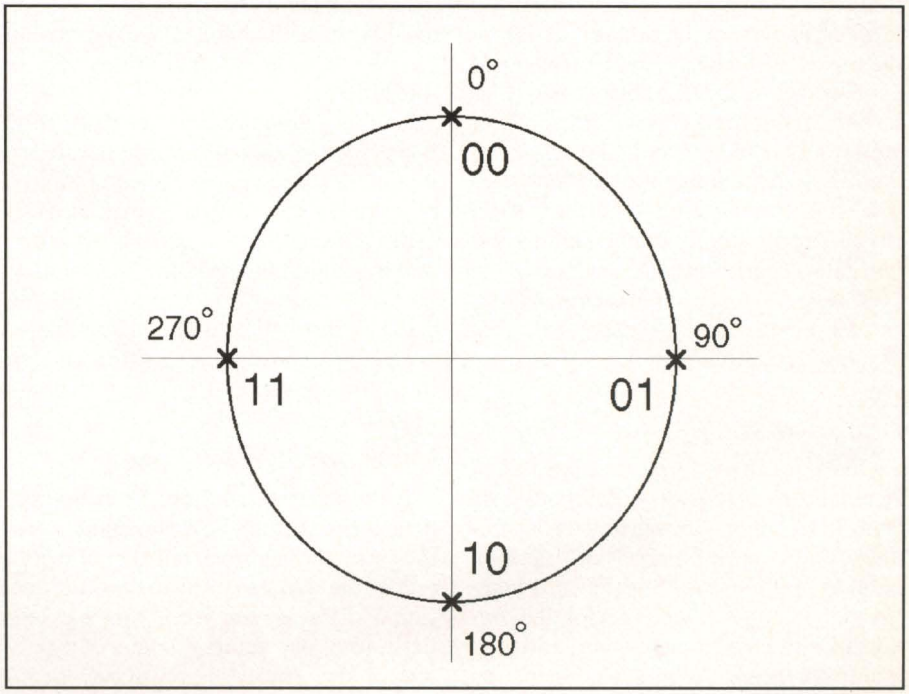


Figure 4. This phase diagram shows the four possible phase angles for a 4-PSK system. Such a system sends 2 bits of data per signaling time. Commercial modems using 64-PSK are available, but they require a very high signal-to-noise ratio for good operation. Note that, due to phase ambiguity, it's incorrect to assign a specific di-bit number to a particular phase. We did it here only to aid in explanation.

* Eb = Bit Energy, No = Noise Spectral Density. Eb/No is a more accurate measure of channel conditions than the commonly used Signal-to-Noise (S/N) ratio. Shannon's Limit states that, for an arbitrarily small BER, the smallest Eb/No >= -1.6 dB.

TABLE			
Modulation Format	Applications	Advantages	Disadvantages
FM-AFSK	VHF/UHF point-to-point, Multipoint	Simple, compatible with most equipment. Tolerant of frequency and deviation errors between multiple stations.	Poor performance, limited speed, spectrally inefficient.
FSK	VHF/UHF point-to-point, Multipoint	Simple circuitry, OK for class C amplifiers, tolerant of frequency shift errors among multiple stations.	Moderate performance, wider bandwidth than other methods.
PSK	Satellite	Modest circuitry, excellent performance for higher data rates.	Requires higher signal level and linear amplification.
OQPSK	VHF/UHF point-to-point	Excellent performance with optimum demodulator, OK for class C amplifiers	More complicated circuitry, wider bandwidth than MSK.
MSK	VHF/UHF point-to-point	Excellent performance with optimum demodulator, good performance with ordinary FSK detector, OK for class C amplifiers.	Most complicated circuitry.

Table. A summary of the advantages and disadvantages of certain modulation techniques and applications.

ones in a row wouldn't cause a phase change. You see, while we cannot determine the *absolute* phase, it's simple to see that the phase has changed, and by how much.

As I mentioned previously, the penalty for increasing the number of phases is the greater Eb/No required to hold the phase reference stable enough. For example, a certain 2-PSK system might need an Eb/No of 10 dB for a given BER, while a similar 32-PSK system would need a whopping 24 dB (nearly 25 times the signal level) for the same BER. However, for a very quiet channel (as is typical in the commercial sector), a 64-PSK system is both practical and efficient.

OOK, ASK, and QAM

The first digital modulation technique, used since radio began, and still in use today, is *On-Off Keying (OOK)*. One well-known example is Morse code. This is generally unsuitable for automatic reception because it isn't orthogonal and is susceptible to noise while in the off state. Instead, we use *Amplitude Shift Keying (ASK)*, switching between a full-power signal and a reduced-power (50%) signal. This helps combat interference in the off state since there never is a complete off state in ASK.

It's difficult to add more levels to such a 2-ASK system, as the Eb/No requirements increase dramatically. Instead, we use a little trick: We can transmit a second 2-ASK carrier 90 degrees out of phase from the first signal. Amplitude-modulated signals that are in *quadrature* (90 degrees out of phase) do not interfere with each other (they're orthogonal), so we effectively double the data rate within the same bandwidth. This is called *Quadrature Amplitude Modulation*, or *QAM*. In this case, we added two 2-ASK signals together in quadrature, so we end up with *4-QAM*.

If we examine 4-QAM carefully, we can see that it is the same as QPSK. However, if we also vary the phase of each carrier, we can squeeze even more data in there, winding up with something like 16-QAM, a technique considerably more efficient than 16-PSK. In fact, QAM is the predominant modulation scheme used in commercial data systems.

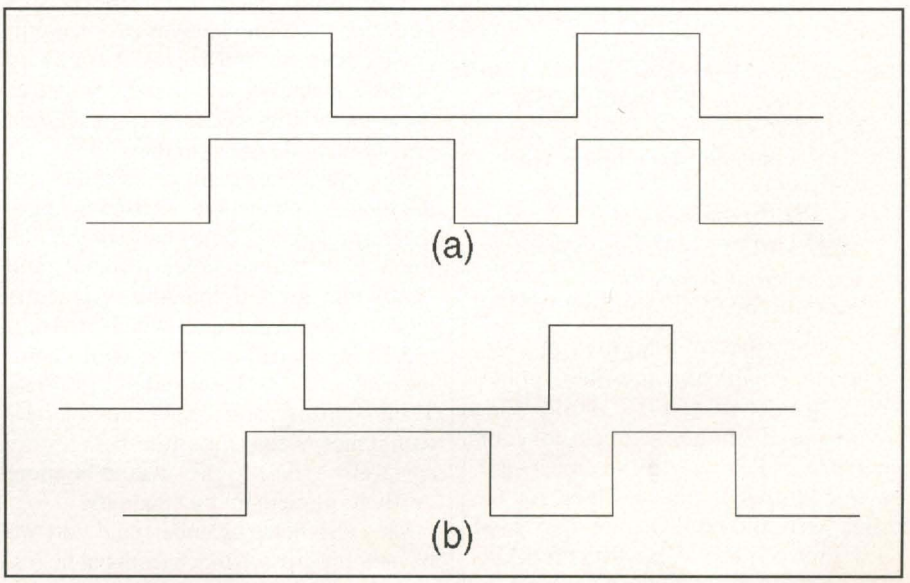


Figure 5. (a) A regular QPSK di-bit data stream without any offset between the two data streams; (b) A di-bit OQPSK data stream. Note the 1/2 bit-time offset.

If you take a look at the data transceiver chipsets offered by most manufacturers, they're nearly all set up for QAM. However, this technique is not very tolerant of noisy channels.

Getting in Shape

So far, we've been only looking at data streams of rectangular bits. If we carefully shape each bit, using a sinusoid or similar shape, we sharply reduce the high-frequency content of the data stream. This reduces the transmitted signal's bandwidth by reducing the amplitude of the sidebands. Although other, more rigorous definitions exist, this is the essence of *Minimum Shift Keying*, or *MSK*.

MSK is basically OQPSK with shaped data bits, which has the effect of making each phase transition less abrupt than the 90-degree jumps of OQPSK. Interestingly, the output spectrum looks just like an FSK signal with one-half the ideal carrier spacing. Thus, we can use either PSK or FSK techniques to generate the output signal. The basic technique of shaping the data pulses has advantages for most modulation techniques, but MSK is the nearly ideal case, thus the "Minimum" in the name. One well-known example of MSK techniques applied to FSK signaling is the G3RUH modem, commonly used for satellite work and available from most of the major TNC manufacturers.

AFSK

The last modulation system we'll look at is *Audio Frequency Shift Keying*, or *AFSK*, the system most commonly used by hams for packet and radio teletype (RTTY). Here, we use an audio tone to signify a 0 or 1 bit. In the standard 1200-baud modems we all know and love, these tones are 1200 and 2200 Hz. The advantage to this system is that virtually any voice-grade communications channel can carry these (or similar) tones, as they fall within the standard voice passband of 300 to 3000 Hz. This technique is also very forgiving of frequency and, for FM, deviation differences between multiple stations on a channel. The disadvantage is that the data rate is somewhat limited by the choice of audio tones, as well as the equipment being used.

What's the Best?

There is no ideal technique for all cases as each one has advantages over the others in certain circumstances. A summary of the advantages and disadvantages of these modulation techniques for certain applications is shown in the Table.

The main reason amateurs rarely use the modulation techniques used by commercial interests comes back to the distinction between power-limited and bandwidth-limited channels. Amateurs tend to select techniques which are technically easy to implement, while commercial systems have other priorities. There's little reason to adopt commercial techniques because, despite being more spectrally efficient, they would be more costly to implement by amateurs.

This also helps us understand why we haven't progressed much from our beginnings with 1200-baud AFSK. It is awfully simple (and cheap) to do, and 1200 baud was, until recently, quite adequate for what we were doing. The venerable G3RUH modem is still an excellent choice for most amateur work: it is reasonably efficient in its spectrum usage, it can be scaled up to hundreds of kilobytes per second, and it works well in power-limited applications. Most importantly, it's inexpensive and readily available.

Coming Up: A Melange of Modems

So there you have it—a brief introduction to some of the more common data modulation techniques. I wish I had the time to cover each of these in the detail they deserve, but that would (and did) take a book.

Next month, we'll take a look at some modems, and the APRS/Internet information I promised last month, which got preempted. After that, who knows? I've been playing with lasers lately, maybe something will come of that. Until then, get out there and build a network! 73,

—N2IRZ

Bits and Bauds

Although many people use the terms "bits per second" and "baud" interchangeably, they are not the same. "Bits per second" is fairly straightforward, but "baud" actually means "signals per second." The important difference is that *there can be more than one bit per signal*! A 28.8-kilobit per second telephone modem, for example, uses a baud rate of only 1200, but it sends 24 bits per baud...and 1200 times 24 equals... you've got it: 28,800!

Looking Ahead in CQ VHF Ham Radio Above 50 MHz

Here are some of the articles that we're working on for upcoming issues of *CQ VHF*:

- "Report on the *CQ VHF* National Foxhunting Weekend," by Joe Moell, KØOV
- "A Repeater-Internet Interface," by John Hansen, W2FS
- "The 6-Meter Calling Frequency Debate," by Bill Tynan, W3XO, and Ken Neubeck, WB2AMU

Plus...

- "Installing That New Radio in Your New Car," by Phil Salas, AD5X
- *CQ VHF* Review: Kenwood TH-G71 Handheld," by Gordon West, WB6NOA
- *CQ VHF* Book Review: WB2AMU's *Six Meters—A Guide to the Magic Band (Revised Edition)*, by Rich Moseson, W2VU

If you'd like to write for *CQ VHF*, you may download our writers' guidelines from the *CQ VHF* World Wide Web site at <http://members.aol.com/cqvhf/> or FTP to <ftp://members.aol.com/cqvhf/General> and look for the file, "writguid.txt." Or, you may send a written request along with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guidelines, 25 Newbridge Rd., Hicksville, NY 11801.

Resources

Wireless Digital Communications: Design and Theory, by Tom McDermott, N5EG, is available directly from Tucson Amateur Packet Radio, Inc., 8987-309 E. Tanque Verde Rd., #337, Tucson, AZ 85732; Phone: (940) 383-000; Fax: (940) 566-2544; E-mail: <tapr@tapr.org>; Web: <http://www.tapr.org>. You may also order it through your local bookstore. Ask for it by title and by its ISBN (International Standard Book Number), which is 0-9644707-2-1.

Spotlight on Grid Square FN32

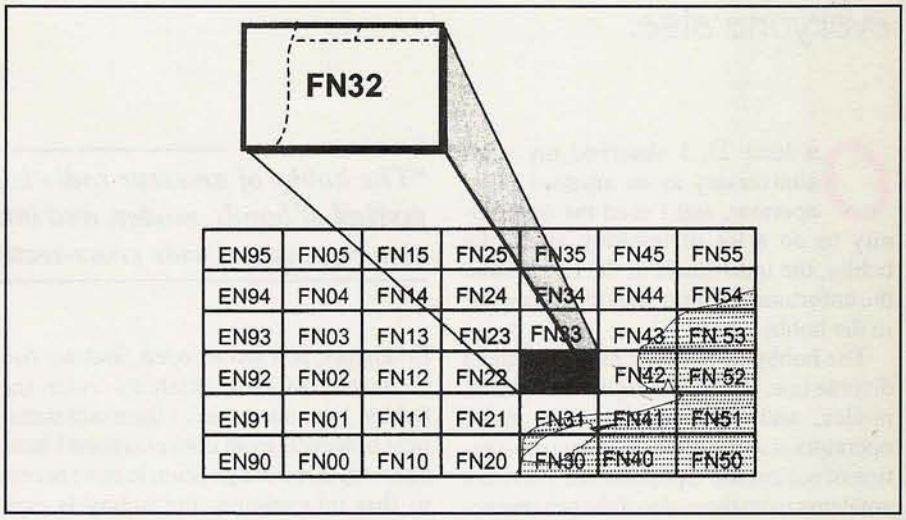
What makes one grid square different from any other? Well, this one's the home of perennial VHF contest champion W2SZ/1.

Grid Square FN32 encompasses much of Massachusetts, a little bit of eastern New York, and small slivers of lower Vermont and New Hampshire. I had the good fortune to work a number of stations—such as Joe Pietrowsky, W1BS, and the Rensselaer Polytechnic Institute ARC contest station, W2SZ/1—in this grid from my home grid of FN30 during several VHF contests. I've also had the great pleasure of visiting this grid and operating on 6 meters there.

The latter experience came in the form of two separate business trips of one week each to a lab in Pittsfield, Massachusetts, where I had to monitor lightning tests conducted on my company's aircraft equipment. These tests can be quite boring due to length of setup time, so ham radio—particularly six meters—provided a welcome diversion.

"I headed toward a nearby shopping center parking lot (mind you, I had not even checked into my hotel yet!) where I set up for 150 watts of power to a mag-mount vertical. Over the next hour, I worked a variety of stations in the Midwest...."

My first trip to Pittsfield occurred in mid-April, 1996. After completing the first day of testing (in which very little got done), I got into the rental car at 5:00 p.m. and heard some rumblings of a sporadic-*E* opening on my trusty FT-690 6-meter radio. I headed toward a nearby shopping center parking lot (mind you, I had not even checked into my hotel yet!) where I set up for 150 watts of power to a mag-mount vertical. Over the next hour, I worked a variety of stations in the Midwest, including KØGJX (EN35), WA9LWJ (EN54), KBØIKP (EN25), and KØCJ (EN34).



The Berkshire Mountains of Massachusetts make FN32 a VHF "hot spot" during contests.

At the end of the opening, I ran into Joe, W1BS, who lives in Pittsfield, and made a schedule to have an eyeball QSO (*face-to-face meeting—ed.*) with him and his XYL, Pat, during my lunch break one day that week. The next day, I tapped into another opening—this one into Florida. Two consecutive days of sporadic-*E* are pretty unusual for April...but then, I was in FN32.

Trip #2

My second trip to the same lab in Pittsfield took place in mid-September of the same year. September is just about as bad as April for sporadic-*E*, which bottoms out each year around the equinoxes. Even though I didn't expect any openings, I brought along my FT 690 anyway. One afternoon, we finished up early and I made it a point to visit Mt. Greylock, about 20 miles north of Pittsfield. This mountain—the highest point in Massachusetts at 3,491 feet—was where I worked the famous W2SZ/1 station many times during the VHF contests. It was always one of the loudest stations on 6 meters!

It took almost 45 minutes to get to the top of Mt. Greylock, and, when I got there, I started calling CQ on the SSB calling frequency using 60 watts of power. This time, the band behaved as it was supposed to in April, and I only worked two "locals" in FN32: N2SQV in eastern New York and K1JG in western Massachusetts. Back in the hotel Jacuzzi, I was treated to a beautiful sunset behind the Berkshire Mountains. Now I have those mental snapshots—the top of Greylock and the sunset—whenever I think of grid square FN32.

Do *you* have a 6-meter adventure to share? If so, we'd love to hear about it. Just contact us by mail or e-mail.

By Ken Neubeck, WB2AMU (kneubeck@suffolk.lib.ny.us)

Celebrating Ham Radio's Diversity

The multitude of interests and activities offered by amateur radio is both a blessing and a curse, says the author—becoming the latter when devotees of one interest start thinking that they're better than everyone else.

On June 23, I observed my sixth anniversary as an amateur radio operator, and I used the opportunity to do a lot of thinking about the hobby, the individuals in the hobby, and the unfortunate politics and feelings within the hobby.

The hobby of amateur radio is quite a diverse one. There is a myriad of bands, modes, and interests. Amateur radio operators also represent a wide cross-section of our culture's population. There are amateurs from the ranks of the near homeless to the heights of multinational corporate CEOs and Senators. This being the case, the amateur community offers countless possibilities and opportunities to experience all aspects of the hobby and to allow individuals to do a little bit of everything, or to specialize in one area that really appeals to them. I cannot pretend to know everything about our hobby. I can simply observe, learn a little here and there, and just pursue my interests within ham radio.

In 1991, the Federal Communications Commission (FCC) established the "No-Code," or Technician class license as an entry-level classification for amateur radio (*what the Commission actually did was remove the code requirement from the already-existing Technician class license, and limit privileges to VHF and above—ed.*). When this happened, the floodgates seemed to open, and we had thousands of new amateurs enter the hobby. I am uncertain of the exact statistics; however, from conversations I have had with those in a position to have access to that information, the hobby is now 50%-plus "No-Coders." (*It's not there yet, but it probably won't be long.—ed.*)

"The hobby of amateur radio is quite a diverse one. There is a myriad of bands, modes, and interests. Amateur radio operators also represent a wide cross-section of our culture's population."

Political Agendas

Amateur radio, like all organized groups is rife with political agendas and special interests. Because of the great diversity of the hobby, individuals tend to make their portion of the hobby more elite, or "better" than other parts of the hobby. This feeling is wrong! Pure and simple.

My interest in amateur radio is the occasional ragchew. However, my primary focus is public service/safety communications. I have structured my entire station setup and computer configuration to suit the needs of an Assistant Emergency Coordinator. That is my passion within the hobby. I spend a lot of time and devote a lot of effort to coordinating amateur radio's public service response within Fayette County, Kentucky. If I were paid $10 an hour, as is listed in the ARRL/ARES manhour reports for my efforts, I would not need to work the job I am working now. So what! Who cares? Other than myself, and a few in the ARES group who feel my contribution is helpful, all I can say is, "That's nice, Pat."

I specialize in the area of the hobby that appeals to me, and if and when something else appeals to me, I will specialize in that. So, what is your specialization? Do you like ATV, packet, one particular band, RTTY, space communications? Again, "That's nice." That is your interest. There is room for everyone as long as amateurs don't adopt an attitude regarding the "superiority" of their particular interest in the hobby.

A "Higher Class" Snub

So what sparked this expression of opinion you ask? Well, I was recently sent an e-mail by a person who was of a "higher class" than I (sarcastically speaking), stating that I needed to upgrade, and that if I didn't, I would not be worth the paper it would take to wipe me away. I took a moment or three to think before replying to that e-mail, and I decided to go to the Internet newsgroups pertaining to ama-

"I cannot pretend to know everything about our hobby. I can simply observe, learn a little here and there, and just pursue my interests within ham radio."

By Pat Spencer, KD4PWL*

*Pat Spencer, KD4PWL, lives in Lexington, Kentucky, and is ARRL Assistant Emergency Coordinator for Fayette County. A ham for just over six years, he is particularly interested in amateur radio emergency communications.

teur radio to see what people were talking about nationwide. I was shocked.

Several recognized organizations in amateur radio are trying to get their rival groups classified as "hate groups." This is garbage. And it is one time that I have to say the diversity of amateur radio is not a complimentary attribute. As I have said, there is room for all here, and we as individuals need to take a stand against those who want to promote discontent and aggravation within the hobby.

Not to overdramatize the point, but from what I have experienced, the "old timers" versus the "No-Coders" battle is much like racism. As a group, we profess acceptance and tolerance. However, there are individuals within the group who, acting on their own opinions and emotions, discriminate against those "not like them." I personally ignore those people, but many of my fellow hams are quite upset and aggravated to the point of starting battles with those people. To them, I say, "none of this worth it." Just hold fast and enjoy your part of the hobby. Live and let live.

Oh, and to the person who sent me that e-mail. You often speak of protecting our bandwidth because of the "service" end of amateur radio. But where are you when amateur radio needs your service in an emergency? I don't expect an answer from you publicly. But I will expect a reply when I send you a bill for protecting "your" bandwidth, made payable to all those amateurs, regardless of license class, who make the ARES and other emergency and public service/safety organizations work, and who do truly serve their communities. ■

"Do you like ATV, packet, one particular band, RTTY, space communications? Again, 'That's nice.' That is your interest. There is room for everyone as long as amateurs don't adopt an attitude regarding the 'superiority' of their particular interest in the hobby."

• • •

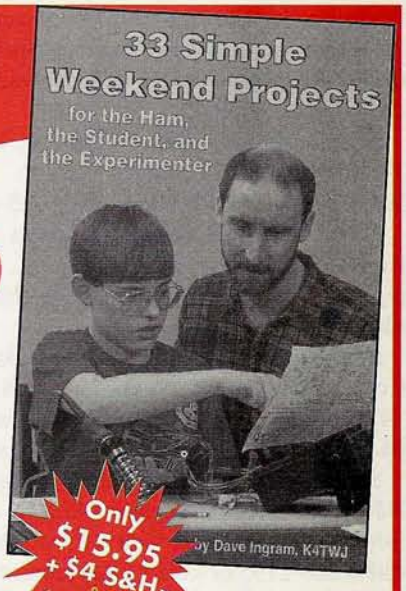
The opinions expressed in this column are those of the author and do not necessarily reflect the views of CQ VHF *or its publisher, CQ Communications, Inc.*

If you have an opinion on this issue or another matter of importance to the VHF ham community, we'd like to hear from you. Well-reasoned, well-written commentaries will be considered for our Op-Ed page. If we publish your Op-Ed article, we'll give you a complimentary one-year subscription (or extension of your current subscription) to CQ VHF. *Submissions not accepted for the Op-Ed page may also be considered for Letters to the Editor.* CQ VHF *reserves the right to edit all submissions for length and style.*

From CQ

33 Simple Weekend Projects

ALL NEW FUN FROM DAVE INGRAM, K4TWJ!



"33 Simple Weekend Projects for the Ham, the Student, and the Experimenter" gives only a hint at the fun and satisfaction to be found between the covers of this little book. Dave Ingram, K4TWJ, has pulled together a wide ranging collection of do-it-yourself electronics projects from the most basic to the fairly sophisticated, and even touching on the frivolous.

You'll find an interesting and very do-able array of useful devices: station accessories for VHF FMing, working OSCAR satellites, joining the fun on HF, trying CW, building simple antennas, even a complete working HF station you can build for $100.

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Hamfest Calendar

The following hamfests are scheduled for September, 1998:

Sept. 5, 49th Annual Gabfest, Club Grounds, **Uniontown, PA**. Talk-in: 147.045+ and 147.255+. For information, contact Carl (WA3HQK) or Joyce (KA3CUT) Chuprinko, Rt. 6 Box 231-CC Morgantown, WV 26505 (304) 594-3779.

Sept. 5, 2nd Annual Hamfest, Carp Agricultural Fair Grounds, **Carp, ONT Canada**. Talk-in: VE2CRA (146.94-). For information, call Jim Cummings, VE3XJ at (613) 446-1225; E-mail: <fleamarket@oarc.net>; Web address: <http:// oarc.net/fleamarket>.

Sept. 5, Queen Wilhelmina Hamfest, Queen Wilhelmina State Park, **De Queen, AR**. Talk-in: 145.27 (100 Hz). For information, contact QW Hamfest Association, 415 Crosstrails Rd., De Queen, AR 71832; E-mail: <blee@alltel.net>.

Sept. 12, 46th Annual W9DXCC Convention and Banquet, Holiday Inn, **Rolling Meadows, IL**. For information, contact Chairman Bill Smith, W9VA (847) 945-1564; E-mail: <w9va@aol.com>; Web: <http://www.qth.com/w9dxcc>.

Sept. 12, 21st Annual Hamfest and Computer Show, Wheeling Park, **Wheeling, WV**. Talk-in: 146.91. For information, contact TSRAC 2011 St., Hwy 250, Adena, OH 43901; Phone: (740) 546-3920; Fax: (740) 546-3685; E-mail: <k8an@aol.com>.

Sept. 12, Hamfest '98, Saratoga County Fairgrounds, **Ballston Spa, NY**. Talk-in: 146.40/147.00 and 147.84/147.24. For information or reservations, contact Darlene Lake, N2XQG, 84 Wilton Mobile Park, Saratoga Springs, NY 12866; Phone: (518) 587-2384; Packet: <n2qg@wa2umx>; E-mail: <lake@capital.net>. (exams)

Sept. 12–21, VA Beach Hamfest, VA Beach, VA. Talk-in: 146.970(-), 3.947, 7.280, 14.296. For information, call W1WTG, Charlie Chapman (207) 655-2104 or (757) 340-8812.

Sept. 13, 1998 ARRL Hudson Division Convention, Briarcliffe College, **Bethpage, NY.** Talk-in: W2VL 146.85 repeater. For information, visit the Hudson Division Web site: <http://arrlhudson.org>. (exams)

Sept. 19, Annual Hamfest & Banquet, Warroad Area Community Center, **Warroad, MN**. Talk-in: 147.090+ & 147.000-. For information, contact David Landby, KBØHAP, Rt. 3, Box 10, Warroad, MN 56763, or call (218) 386-1092.

Sept. 19, Hamfest, Mt. Holly Armory Route 38, **Mt. Holly, NJ**. Talk-in: SJRA repeater 145.290- & simplex 144.465. For information and map, visit <www.sjra.com>, or call N2XYZ (609) 268-2135 or <N2XYZ@juno.com>.

Sept. 19, Annual '76 Auction and FleaMarket, VFW Post 6342, **Forestdale (No. Smithfield), RI**. Talk-in: 146.76. for information, contact Rick Fairweather, K1KYI, 106 Chaplin Street, Pawtucket, RI 02861; E-mail: <k1kyi@juno.com> or call (401) 725-7507 between 7 and 8 p.m. only.

Sept. 19, Radio Amateurs Swapmeet, Holy Ghost Hall, **Sebastopol, CA**. Talk-in: 146.73. For information, contact Colleen Dean, KF6DHA, 5324 Huckleberry Way, Santa Rosa, CA 95403; Phone: (707) 578-4098; e-mail: <KF6DHA@cdsl.net>; <http://www.cdsl.net/scra>. (exams)

Sept. 19, Greater Louisville Hamfest/ARRL KY State Convention, Kentucky Fair & Exposition Center, **Louisville, KY**. For information, call (812) 282-7007 or (812) 948-0037; for Flea Market spaces, call (502) 935-7197 or (606) 284-9090; Web: <http://www.thepoint.net/~GLHA/>.

Sept. 19–20, ARRL Alaska State Convention, Anchorage, AK. For information, contact KL7AA, Anchorage Amateur Radio Club, P.O. Box 101987, Anchorage, AK 99510-1987.

Sept. 20, Hamfest '98, Veteran's Park, **Hazlet, NJ**. Talk-in: 145.-6, 224.96- 1.6. For information, contact G.S.A.R.A., P.O. Box 34, Fair Haven, NJ 07704; <http:www.monmouth.com/~gsara>. (exams)

(Continued on next page)

VHF Conferences

Sept. 19–20, Weinheim, Germany, The 43rd Weinheim VHF Convention. Lecture topics include new modules and aerials, types of modulation, and conduct on the air. The exhibition and flea market will be returning to the area in front of the Sepp-Herberger-Stadium. Again separated by a short walk from the forums, but in the opposite direction.

Early birds will meet at the clubhouse on Friday evening, 18th September. Martin + Martina will again be taking care of the refreshments. We will also be bringing Saturday to a close at the "Wasserhaus" (Signposted "DLØWH").

If you wish to spend the night in your tent or caravan in the meadow next to the clubhouse, please send us a postcard to this effect. Rudimentary sanitary arrangements are available. If you need electricity, please remember to bring a suitable cable.

Questions? Contact UKW-Tagung Weinheim, Birkenweg 49, D-69469 Weinhem, Germany; Phone: 0049-6201/59 20 91; Fax: 0049-6201/59 20 92; E-mail: <DFØUKW@amsat.org>; Web: <http://www.hamradio.de/weinheim>.

Sept. 25–26, Pacific Northwest VHF Conference will be in **Bend, OR**. Registration is $12. Registration blanks can be e-mailed. Contact Don Krug, K7HSJ, 1126 NE Burnside, Bend, OR 97701; E-mail: <ghcdk@teleport.com>; Phone: (541) 382-7561. Program includes 2-meter DSP, aurora, 10-GHz systems, and roving.

Operating Notes

For September, 1998:

September

5–6	IARU Region 1 (Europe/Africa) VHF Contest (2-meter)
6	Good EME conditions
12–13	ARRL Sept. VHF QSO Party (see rules this issue)
19–20	ARRL 10 GHz Cummulative Contest (2nd wknd) (see rules last month)

EME data courtesy W5LUU. More contest info is available on the CQ VHF *Web page at* <http://members.aol.com/cqvhf/navhfcon.htm>.

Sept. 20, Tailgate Electronics, Computer, and Amateur Radio Fleamarket, Albany and Main St., **Cambridge, MA.** Talk-in: 146.52 & 449.725/444.725 - pl 2A - W1XM/R. For information, call (617) 253-3776.

Sept. 20, 26th Annual Hamfest and Computer Show, Lenawee County Fairgrounds, **Adrian, MI**. For information, contact Brian J. Sarkisian, KG8CO (517) 265-1537 or <kg8co @lni.net>; AARC Web: <http://www.LNI.net/w8tqe>. (exams)

Sept. 20, Western CT Hamfest, Edmond Town Hall, **Newton, CT**. Talk-in: 147.12(+) and 146.55 simplex. For information, contact Ken, KD1DD, Box 3441, Danbury, CT 06813-3441, or call (203) 743-9181.

Sept. 20, 42nd Annual Hamfest & Computer Show, York County Area Vocational Technical School, **York, PA**. Talk-in: 146.97. For information, contact York Hamfest, P.O. Box 351, Dover, PA 17315; Phone: (717) 764-8193; E-mail: <w3sst@ juno.com>; Web: <http://www.yorkhamfest.org>. (exams)

Sept. 20, Communications Expo '98, Cincinnati, OH. For information, contact Jim Weaver, K8JE, at (513) 825-2868; Web: <http://w3.one.net/~rkuns/expo98/>. (exams)

Sept. 25–27, Moose Swappers Hamfest, Lancaster Fairgrounds, **Lancaster, NH**. Talk-in: 145.370, 145.150, 147.345. For information, contact Moose Swappers Hamfest, P.O. Box 614, Berlin, NH 03570. (exams)

Sept. 26, Amateur Electronics Swapfest, Women's Building, State Fairgrounds, **Huron, SD**. Talk-in: 147.09(+). For information, contact Lloyd Timperley, WBØULX, P.O. Box 205, Huron, SD 57350; Phone: (605) 352-7896 eves; E-mail: <wbøulx@santel.net>. (exams)

Sept. 26, 23rd Annual International Hamfest-Computerfest, Chemung County Fairgrounds, **Horseheads, NY**. Talk-in: 147.360. For information, mail SASE to Elmira Hamfest, c/o Dave Lewis, 465, CR 13, Van Etten, NY 14889, or call (607) 589-7495. (exams)

Sept. 26, Fall Fest '98 Hamfest, Tall Cedars of Lebanon Picnic Grove, **Hamilton Twp., NJ**. Talk-in: 146.67(-). For information, contact Hamcomp '98, DVRA, P.O. Box 7024, West Trenton, NJ 08628; Phone: (609) 882-2240; Web: <www.slac.com/w2zq>; or

Sept. 26, Hamfest and Computer Show, Embry Riddle Aeronautical University campus, **Daytona Beach, FL**. Talk-in: 147.150 +600 starting at 8:30 a.m. For information, contact John Munsey, KB3GK, 19 China Moon Drive, Ormond Beach, FL 32174; Phone: (904) 677-8179; E-mail: <munseyj@ worldnet.att.net>. (exams)

Sept. 26–27, W7DP Hamfest, Community Building, **Milton-Freewater, OR**. Talk-in: 147.28 (+). For information, contact Denise Hebel, KC7ORO, at (509) 527-0411, or e-mail to <dhebel@bmi.net>.

Sept. 27, Giant Electronic Flea Market, Lincoln H.S., **Yonkers, NY**. Talk-in: 440.425, PL 156.7, 146.910. For information, contact Otto Supliski, WB2SLQ, 53 Hayward St., Yonkers, NY 10704, (914) 969-1053. (exams)

Sept. 27, 8th Annual Hamfest & Computer Show, New Port Richey Recreation Center, **New Port Richey, FL**. Talk-in: 145.35 & 147.15. For information, call Chuck, KU4EV (813) 937-2540; E-mail: <cfowler995@aol.com>.

Picture This! *(from page 17)*

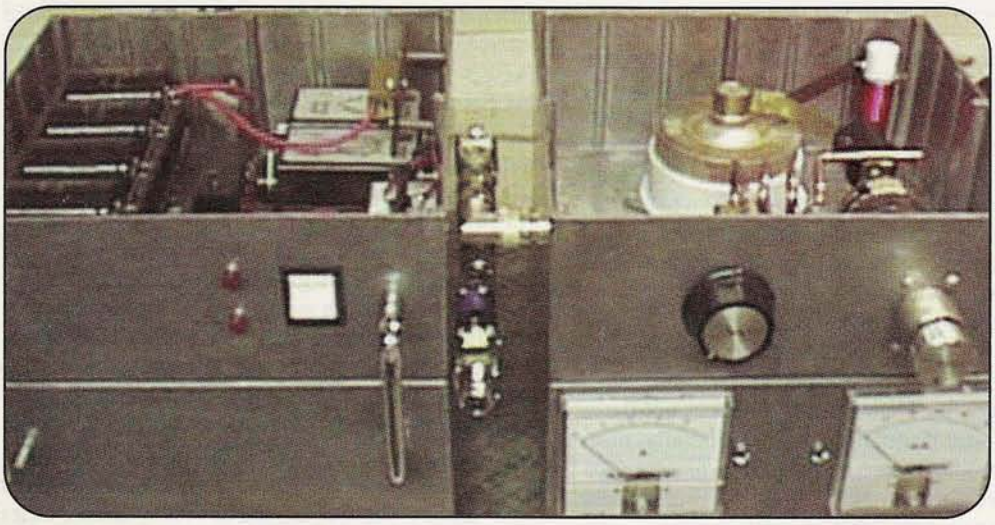

Photo D. GJ4ICD's new 1.5-kilowatt amplifier for 50 MHz. Geoff has the first British license to run high power on 6 meters, and he needs your help in his propagation research by making contacts with him on "the Magic Band." (Photo courtesy GJ4ICD)

Getting on Six in a BIG Way

Geoff Brown, GJ4ICD, has just received the first British license for operating 1 kilowatt on 50 MHz for the purpose of conducting propagation tests, specifically including FAI (Field Aligned Irregularities) and Ionoscatter. Photo D shows his new 50-MHz amplifier, which produces 1.5 kW out, using an 8877 tube and a toroidal transfomer. Both the power supply (left) and RF deck (right) are visible in the photo.

If you've got a cool snapshot to share with us, but don't have a whole article to build around it, send it in to "Picture This," along with a brief description of who and what we're seeing. If we like it, too, and have the space, we'll print it (no pay, just glory). Send your color prints to *CQ VHF*, 25 Newbridge Road, Hicksville, NY 11801. Please don't write on the front of the photos or use ballpoint pen on the back. If you'd like your photo(s) returned, please tell us so and include an SASE (self-addressed, stamped envelope) with sufficient postage. Thanks!

Basics

Emergency Communications

Staying on the air in emergencies and getting messages into and out of disaster areas is probably the single best-known aspect of amateur radio. When all else fails, ham radio gets through. But how do we stay on the air when no one else can? And how do we know what to do when the need arises? The answer is simple: preparedness and practice.

Preparedness includes knowing your equipment and its capabilities (as well as its limitations), having what you'll need for extended operation in less-than-ideal circumstances (batteries, antennas, etc.), and training in how to set up and use your equipment effectively and efficiently in an emergency. Once you've learned how to set up and operate under emergency-type conditions, you need to *practice* those skills by helping out at public service events, such as parades, walk-a-thons, bikathons, etc., and by participating in formal "nets," or on-air networks, to learn procedures.

Amateurs in Utah assist in search and rescue operations. Proper training before the emergency is vital if we are to be truly helpful. (Photo courtesy Utah County SCATeam)

Who Provides the Training?

Ham radio emergency communication is generally conducted under the umbrella of one or more emergency service organizations. These may be totally within ham radio or may be part of larger organizations. Most often, hams are trained by other amateurs who have gone through the process before and want to share their skills with others. Let's take a brief look at some of the best-known groups in the U.S.

ARRL Groups

ARES stands for the *Amateur Radio Emergency Service* and is the emergency communications arm of the American Radio Relay League (ARRL). Usually organized by county, an *Emergency Coordinator,* or *EC*, runs local ARES operations. You may register with ARES (through your EC) whether or not you are an ARRL member. Most ARES groups hold regular training nets and participate in drills and public service activities.

NTS, an abbreviation for the *National Traffic System,* is the ARRL's message-forwarding network. If you've ever been to a fair and seen a sign that says "Free Messages By Ham Radio," chances are these messages are sent through the NTS. Generally, non-emergency messages into and out of a disaster area are also routed through NTS. Most NTS nets meet daily, handling routine "traffic," or messages, giving participants plenty of opportunity to learn and practice their skills in handling written message traffic.

Off to the RACES

RACES is the *Radio Amateur Civil Emergency Service* and is actually a separate radio service established under Part 97 of the FCC's Rules and Regulations. RACES is operated on a national basis by the Federal Emergency Management Agency (FEMA) and locally by state and local Offices of Emergency Management (or whatever they happen to be called in your area). Under FCC rules, hams participating in RACES are limited to one hour of practice each week, and may speak only with other RACES-registered stations when operating in a RACES net. RACES emergency nets may be activated only at the formal request of an authorized government official and must shut down when an emergency is declared to be over.

(The ARRL recently petitioned the FCC to relax some of these restrictions. The League requested authority for RACES groups to conduct up to five hours of training each week, which would allow participation in long-term drills, and for RACES stations to communicate with any other ham "working" an emergency, even if that ham isn't a RACES member. This would enable RACES and ARES groups to exchange messages, or a RACES station at an emergency management facility to contact a ham at a Red Cross shelter without having to worry if that other ham is also a RACES member.)

CAP, MARS, and SKYWARN

Three non-amateur services in which many hams participate, and which also are active in emergency communications, are *CAP*, the *Civil Air Patrol*;

MARS, the *Military Affiliate Radio System*, and *SKYWARN*, the National Weather Service's corps of volunteer weather "spotters."

CAP is the U.S. Air Force Auxiliary and is heavily involved in search-and-rescue and other emergency operations. CAP communicators—many of whom are hams—use frequencies just outside the VHF amateur bands. Most VHF ham rigs can be modified to operate on these frequencies once you show your dealer or the manufacturer your authorization to operate there.

There are three separate MARS organizations: Army, Air Force, and Navy /Marine Corps. Hams who join MARS are issued separate MARS callsigns and also operate on frequencies immediately adjacent to both HF and VHF amateur bands. Most often, MARS members are involved in handling messages and "phone patches" to and from members of the U.S. Armed Forces, no matter where in the world they may be. (Phone patches are connections between radio and telephone, so that a serviceman or woman overseas may be hooked up with a ham back in the U.S., who then phones a family member and "patches" the two together.) MARS members may also be called on to provide emergency communications, especially if the armed service has also been called in to help deal with a disaster or other situation.

When severe weather threatens, the National Weather Service (NWS) relies on *SKYWARN* volunteers to report conditions and observations in various places. Many of these trained weather spotters are hams, and there are many SKYWARN nets in operation around the country. Hams who are SKYWARN spotters generally use amateur frequencies to report their observations, and some NWS offices have permanent ham stations installed in order to monitor SKYWARN reports.

Served Agencies

Most ham radio emergency groups don't operate in a vacuum, talking only among themselves. To be most useful, hams are sent to places where their communication skills can be put to use in keeping disaster response organized and functioning smoothly. These places typically include hospitals, Red Cross shelters, etc. Organizations such as the Red Cross, the NWS, and emergency management agencies are often referred to by hams as *served agencies*, since they're the agencies for whom we commonly provide communications services. Served agencies also include the sponsors of various non-emergency events through which we get much of our "on-the-job training," for instance, the March of Dimes, the American Diabetes Association, etc.

Most of these organizations don't operate their own communication networks (which is why they ask us for help), so ham radio participation is usually through an amateur group, such as a local radio club or ARES group. Generally, the served agencies provide us with the *opportunities* for training, while our own groups provide the actual training.

Getting Involved

Most emergency communications activity on VHF/UHF is conducted on FM and packet. The best way to get started is right in your home area. Ask for information from other hams you meet on the air. Listen on your local repeaters for NTS traffic nets, ARES training nets, etc. Try to get a feel for the net procedure. Check in if you feel comfortable doing so; otherwise, wait until after the net is over and call the Net Control Station and ask for information on participating in the net. You can expect to be welcomed and invited to join the next session. For more general information, see the "Resources" box accompanying this article.

You Must Remember This...

Hams' ability to provide emergency communication—and our record of doing so successfully time after time—is a critical reason for our continued existence and our continued access to frequencies that could easily bring billions to Uncle Sam on the auction block. It's equally critical that every ham have at least a passing understanding of how to provide useful communications during an emergency. Consider it your "rent" for the use of the frequencies. And the time to learn is *before* the tornado or hurricane hits, not *after!* ■

Resources

For more information about the various organizations described in this article, we recommend the following:

ARES—Contact your local ARRL Emergency Coordinator, Section Emergency Coordinator or Section Manager (SMs' names and addresses are listed in every issue of *QST* magazine and on the ARRL Web page, <http:www.arrl.org>, or contact ARRL Headquarters at 225 Main St., Newington, CT 06111; Phone: (860) 594-0200. Ask for field service.

CAP—Request an information package from CAP National Headquarters at 1-800-FLY-2338; write to HQ CAP/ DPM, 105 S. Hansell St., Maxwell AFB, AL 36112-6332; or connect to the CAP World Wide Web site at <http://www.cap.af.mil>.

MARS—Look for MARS tables at local hamfests, ask about it at club meetings, or visit the Army MARS Web site at <http://members.aol.com/aat6fv/>.

NTS—Contact the Net Control Station, Net Manager, Section Traffic Manager, Section Manager or ARRL Headquarters (see ARES listing for contact information).

RACES—Contact your local or county Office of Emergency Management (or whatever it's called where you live). If there's no specific listing in the phone book, call your town, city, or county clerk's office, or the police department's *non-emergency* number.

SKYWARN—Contact the National Weather Service forecast office serving your area. If there's no listing in the phone book (or the office listed in your phone book is closed!), tune in NOAA Weather Radio (162.400, 162.475 or 162.550 MHz, depending on where you live) and listen for the location of the forecast office from which your local broadcast originates. Then call directory assistance for the phone number, and ask for the meteorologist in charge of SKYWARN.

CBspeak/Hamspeak Dictionary

A translation guide for some common terms from "CB-speak" to "hamspeak."

Many new hams today come to amateur radio from CB, which is great. But they often bring with them a lot of CB jargon, which generally isn't used on the ham bands and immediately marks you as a "newbie," to borrow a term from the online world.

So here, for your convenience, is a guide for translating some of the most common CB lingo into ham lingo—along with an explanation of what it means in English. And speaking of English, there's usually no reason to use any shorthand at all, provided both parties in a QSO (oops, contact) speak the same language. There's no substitute for plain language.

"CBspeak"	"Hamspeak"	Notes or English translation
"Handle"; "personal"; "first personal"	"Name"	Some old-timers do use "handle."
"Handle" (as a station identifier)	"Callsign"	(but you already knew that one)
"10-4"	"Roger" or "QSL"	Yes; message received. *10-codes generally aren't used in ham radio.*
"10-20"; "20"	"QTH"; "location"	Location
"Good buddy"	"Old man"; "OM"	How you refer to someone when you've forgotten his name; you're expected to remember women's names, as I've never heard anyone say "Good morning, YL."
"Threes"; "73s"; "best 73s"; "all those good numbers"	"73"	"73," an old wire telegraphers' code for "best wishes." Making it plural, as in "73s," makes it "best wisheses," and "best 73s" means "best best wisheses."
"The four-lane"	"the highway"	
"Piggy bank"	"toll booth"	(but hams do sometimes pay tolls with "green stamps," dollar bills)
"Smokey"	"trooper"	"Smokey reports" are generally not done on ham radio.
"18-wheeler"	"truck"	
"4-wheeler"	"car"	
"work" (as in the place you work)	"the work QTH"; "the salt mine"	(Sometimes it's the hams who use the silly jargon.)
"rig"	"rig"	radio
"radio check"	"signal report"	"How strong is my signal?"
"Pinning the meter"	"Full quieting" (on FM); "5-9" (on SSB)	"Your signal is very strong."
"Breaker-breaker"*	"(your call) listening" (on FM); "CQ" (on SSB/CW)	

* Depending on where you are in the U.S., the term "break" may be used for joining a contact in progress or may be reserved for emergency use. Listen for local procedure. The double "break-break" is always reserved for an emergency.

CQ VHF Hamlink

CQ VHF "Hamlink" offers *free listings* of clubs, licensing classes, and exam sessions! *Plus,* for $1/month or $10/year, we also offer listings of **ham-related** *personal* Web sites (*commercial* **ham-related** Web listings are $5/month or $50/year).

Web site listings must be accompanied by payment in full in check or money order in U.S. dollars and mailed to *CQ VHF "Weblink,"* Attn: Bernadette Schimmel, 25 Newbridge Road, Hicksville, NY 11801. Credit card orders are accepted by mail, phone (516) 681-2922, or fax (516) 681-2926. Club, class, and exam listings may be submitted to *CQ VHF* "Clublink," or by e-mail to <CQVHF@aol.com>. Be sure to say what it is in the subject line (e.g., Club Listing).

Club Listings

CA, Santa Barbara Amateur Radio Club, Inc.: Meets 3rd Friday of September–May at 7:30 p.m., County Schools Auditorium, 4400 Cathedral Oaks Rd., Santa Barbara. For more information about SBARC, see the club Web site: <http://www.sbarc.org>; or call (805) 569-5700.

CO, Bicycle Mobile Hams of America: National non-profit club of bicyclists who use VHF radios for emergencies, lost riders, route information, chatting, etc. 450 members in 46 states, 6 countries. Annual Forum at HamVention. Net: 14.253, 1st & 3rd Sundays, 2000 UTC. E-mail: <hartleyal@aol.com>. For info, sample newsletter, send SASE to BMHA, Box 4009-CV, Boulder, CO 80306-4009.

FL, Highlands County Amateur Radio Club: Meetings held 3rd Monday of each month, 7 p.m. Agri-Civic Center Conference Room 3, South US 27, Sebring, FL. Visitors are welcome. Repeaters at 147.045 +.6, 442.350 +5.0, with packet on 144.970. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

FL, Metro Dade REACT 4881: One of the few **all-ham** REACT teams in the U.S., providing public service through communications. Mtgs ev. Thurs. 8 p.m., details on 147.315 MHz (+600) repeater. For info, contact: Metro Dade REACT, 3735 SW 89 Ave., Miami, FL 33165; E-mail: <react4881@juno.com>; Web: <http://www.geocities.com/Heartland/Ranch/4881>. For more information, contact Robert Cruz, KE4MCL, President, at <react4881@juno.com>.

GA, College Park REACT 4921: Training in packet, computers, radio building, space radio, FCC. Net. ev. Mon, 8:30 p.m., MatPARC Club 145.41-repeater. Contact: Thorton Williams, 2001 Godby Road, Ste. 0-6, College Park, GA 30349.

IL, Logan Area Amateur Radio Club, Logan County: Meetings held 3rd Saturday of each month, 7 p.m., American Red Cross Bldg., 125 South Kickapoo St., Lincoln, IL. Primary repeater: 147.345+. Secondary repeater: 145.390-. Contact President, Bob Rucker, KB9JSE, at (217) 735-2506; <KB9JSE@ccaonline.com>.

IL, Olney, Olney Amateur Radio Club-Richland County: Meetings 2nd Thursday of each month, 7:30 p.m., Hardees banquet room, 912 E. Main Street., Olney, IL; Repeater: 146.760-. Contact Vice President Ben Rose, KB9OTJ, at <harley@wworld.com>.

IL, Skokie, Free Live Online Hamfest: Buy, sell, trade. Instant listing of all your items for sale or wanted! No charge for this classified listing of radios, antennas, computers. Open chat room to discuss the details of your purchase or sale! Sponsored by the Tri-County Radio Group, Inc.; Web site: <http://quality-enterprises.com/tcrg/onlinefest/>.

MA, Falmouth Amateur Radio Assoc. (FARA): Meetings held last Thursday of the month at 7:30 p.m. at Falmouth Town Hall, Main Street, Falmouth, MA. ARRL exams at all levels given at 9 a.m. second Saturday of every month at the Town Hall. Primary rptr. 146.655. Contact President Lyman Mix, WA1KPE, at Box 815, W. Falmouth, MA 02574 or visit Web page: <http://www.falara.org/index.html>.

MB, Canada, Winnipeg Amateur Radio Emergency Service Inc. (WARES): Callsigns VE4YWG (Public Service Communications), VE4EOC (City Emergency Operations Centre). Meetings 3rd Tuesday of month, 1930 h Sir Wm Stephenson Library, 765 Keewatin St. Membership open to all licensed amateurs at least 18 years of age living in or near Winnipeg and interested in emergency amateur communications. E-mail Jeff Dovyak, VE4MBQ, Emergency Coordinator, at: <ve4mbq@ve4umr.ampr.org>; Web site: <http://www.geocities.com/CapeCanaveral/Hanger/1632/wares.html>.

NC, Stanley County Amateur Radio Club: Meetings held every 4th Thursday of the month at Stanly Community College. Two-meter nets held at 9 p.m., local, Wednesday (146.985) and Thursday (147.390). Six-meter ragchew each Tuesday at 8:30 p.m. (50.135). For more info, visit our Web site at <www.qsl.net/scarc>.

NY, Tonawanda, Radio Association of Western New York (RAWNY): Meets 2nd Tuesday of each month from September to May, 8 p.m., at Church of the Nativity, corner of Thorncliff and Colvin Blvd., Tonawanda, NY. Web site: <http://hamgate1.sunyerie.edu/~rawny>.

OH, Cincinnati, Weather Amateur Radio Network (WARN, W8NWS): This is the Cincinnati, Ohio, chapter of Skywarn. In addition to club details and weather-spotter training information, the Web site features a searchable southwest Ohio repeater database, and a search engine covering all known ham club sites in the Greater Cincinnati area. Membership forms and mailing list to receive club news and announcements are also available online at <http://www.warn.org>.

OH, Adena Area, Triple States Radio Amateur Club: Features an all-mode 6-meter net on 50.150 on Wednesday nights at 9 p.m. EDT (50150 FM), SSB/AM/CW. Will have a reunion of Six Meter Operators at the Wheeling Hamfest, Wheeling Park, WV Sept. 12. For info newsletter, send adr to TSRAC 2011 St. Hwy 250, Adena, OH 43901; E-mail: <k8an@aol.com>.

OH, Cleveland Area, Cuyahoga Amateur Radio Society: Meets on the third Wednesday of every month except December at 8 p.m. at the Busch Funeral Home community room, 7501 Ridge Rd., Parma, Ohio. June, July, and August, "Picnic Meetings" are held at the Cuyahoga County Metropolitan Park. Repeaters are on 146.82(-), 443.825 & 444.75 (+), 53.83 & 53.01 (+), plus digipeater at 145.07, and club simplex frequency of 146.475 MHz. For more info, contact club president, Tom Wayne, WB8N, at (440) 232-4193 or at <wb8n@en.com>.

OH, Firelands Amateur Repeater Association (FARA): Assn. of amateur radio operators and their families in North Central Ohio, dedicated to operation and maintenance of a repeater system south of Berlin Heights. Meets monthly on 4th Tuesday at Erie County Services Cntr., 2900 Columbus Ave., Sandusky at 7 p.m. in basement cafeteria. For info, write FARA, P.O. Box 442, Huron, OH 44839; E-mail: Tim Stookey, N8AHK, President: <n8ahk@amsat.org>; Web: <http://www.fara.berlin-heights.oh.us/index.htm>.

OK, Tulsa Amateur Radio Club: P.O. Box 7283, Tulsa, OK 74159-4283. Repeaters 145.11, 147.045, 442.00, 443.00, 443.45, 443.75, 444.625. Autopatches on 145.11, 443.00. Net every Thursday on 145.11 @ 8 p.m. (linked to 442.00, 443.75, 444.625). Meetings 3rd Tuesday of month at 7 p.m., West Regional Library, 2224 West 51st Street, Tulsa, OK. Breakfast Meeting, 1st Saturday of month at 8 a.m., Ollie's Restaurant, 4070 Southwest Blvd., Tulsa. For more information, call (918) 446-6451, Vince Moore, N5RFW, Public Service Liaison Officer.

ONT, Canada, Muskoka Amateur Radio Club: Meets at Huntsville Hospital Board Room at 2 p.m. on 2nd Sunday of each month. Visitors welcome. Net at 7 p.m. Monday on 146.775. Muskoka ARC, VE3MZY, 437 Aspdin Road, Huntsville, ONT P1H 1Y4, Canada.

PA, Lambda Amateur Radio Club (LARC), Philadelphia: 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. E-mail: <LARC@net-quest.com>.

TN, Cleveland Amateur Radio Club: Meetings every 2nd and 4th Tuesday of month (except December) at CARC Clubhouse, 560 Johnson Blvd., Cleveland, TN, at 7 p.m. EST, and 7:30 p.m. EDT. CARC operates a 2-meter repeater on 146.925 MHz (-600), and a UHF repeater at 444.275 MHz (+5 MHz). Contact W4GZX, P.O. Box 2683, Cleveland, TN 37320-2683; E-mail: <carc@rocketmail.com>; Web site: <http://www.geocities.com/SiliconValley/Lab/1660>.

TX, The Clear Lake Amateur Radio Club of Houston TX: Meetings are the 3rd Wednesday of every month at 7 p.m. at the Webster Volunteer Fire Dept. 17100 Texas Ave. in Webster, TX. Meetings are open to anyone interested in amateur radio. Our Web site has the info <www.clarc.org>.

WV, Plateau Amateur Radio Association, Inc. (PARA), Oak Hill, WV: Meetings held the first Tuesday of every month, 7:30 p.m. in the basement

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of the New River Pawn Shop, 328 Main Street, Oak Hill, WV. Mailing address is PARA, P.O. Box 96, Fayetteville, WV 25840. Repeaters are 146.790-; 147.075- and 443.300+. For more information, contact Juddie Burgess, KC8CON, Secretary, at <kc8con@usa.net>.

TX, No Code International: An international non-profit club of hams who are dedicated to the elimination of morse code testing as a requirement for amateur HF licenses. SASE for information to: No Code International, P.O. Box 565206, Dallas, TX 75356 or visit our Web site at: <http://www.nocode.org>.

UT, Rocky Mountain Radio Association (RMRA): Offers Utah, Wasatch Front, unique UHF to 6, UHF to 2, and UHF to HF remote gateways. Net Thursday at 9 p.m. on 447.900 PL 114.8 UHF/6-meter gateway open 24 hours on 448.700 PL 114.8. Visit the RMRA Web site: <www.inconnect.com/~rmra>; or e-mail: <rmra @inconnect.com> for more information.

Exam Sessions

CA, Los Angeles: United Radio Amateur Club, K6AA, Los Angeles Maritime Museum (6th Street, on Main Channel of the Harbor). Contact Elvin, N6DYZ (310) 325-2965. VEC: W5YI. Cost: $6.35 (or current amount allowed); Dates: 2nd Saturday every month except December; Time: 1:30 p.m.; Pre-registration: Recommended, but not required.

FL, Highlands County: Examinations held 4th Monday of each month, 7 p.m. Agri-Civic Center Conference Room 1, South US 27, Sebring, FL. Walk-ins are welcome. Web page: <http:// www.strato.net/~hamradio>; E-mail: <hamradio @strato.net>.

IL, Chicago: Ham testing session 1st Thursday every month, from 7–10 p.m. We test all levels from Novice thru Extra. Reservations are NOT required. For info, contact Dennis L. Sladek, N9OZ, 4344 W. 51 St., Chicago, IL 60632; Phone: (773) 838-8088; E-mail: <n9oz@juno.com>.

IL, Chicago: VE testing, just 4 blocks from Midway Airport, 1st Thursday of every month, 7–10 p.m. Midway VE Team-W5YI affiliated, 4344 W. 51 St. (Archer & Kostner Streets), Chicago, IL 60632. Phone: (773) 838-8088; Fax: (773) 735-8469; Web site: <www.megsinet.com/ dsladek>; E-mail: <dsladek@megsinet.net>.

IL, Lincoln (LAARC): Offers ARRL VEC exam sessions for Novice, Technician, and Tech Plus licenses on 2nd Saturday of every other month at Lincoln Public Library Annex Bldg., 725 Pekin St., Lincoln, IL. Pre-registration recommended but not necessary. For info, contact Mike Roos, N9WGT, at (217) 732-6323. Exam fee: $6.39.

NC, Wilmington: Azalea Coast Amateur Radio Club will hold a VE testing session on Oct. 10, 1998 10 a.m. at Morton Hall. University of North Carolina Wilmington Campus. Contact Jack, WD4OIN, at (910) 791-1556.

OH, Cleveland Area: Cuyahoga Amateur Radio Club holds exam sessions on the second Sunday of each odd-numbered month (except May), at the Olde Independence Town Hall, 6652 Brecksville Rd. (Rte 21), Independence, OH. Sessions start at 9 a.m. Fee is $6.95 and a valid ID and copy of your FCC license is required (if you are already licensed). For more info, contact Gary Dewey, NI8Z, at (216) 642-1399 or at <gdewey@en.com>.

OH, Colerain: The Triple States Radio Amateur Club holds exams the last Monday of every month at 6 p.m. at Citizens Bank. Courtesy call you are coming required. Phone: (740) 546-3930; Fax: (740) 546-3685; E-mail: <k8an@aol.com>.

PA, New Castle: Amateur Radio League of Lawrence County (ARLLC) and Lawrence County ARES (LCARES). Meetings every Tuesday of each month, 7:30 p.m., American Red Cross Bldg., 222 North Mercer St., New Castle, PA. Weekly informational net @ 9:30 p.m. every Thursday on 147.195(+) MHz and 146.625 (-) MHz linked repeaters. SKYWARN severe weather nets as situation requires. Contact Club Secy, ARLLC/ LCARES, P.O. Box 7931, New Castle, PA. 16107-7931 or visit our Web site: <http://pages.prodigy. com/arllc>.

SC, Columbia: ARRL/VEC testing session for all license classes will be held third Saturday of each even month (August, October, and December), at 9 a.m., at Heathwood Hall Episcopal School, 3000 South Beltline Blvd., Columbia, SC. For more information, visit the Web site at: <www.qsl.net/ ku4qn>, e-mail: <KU4QN@juno.com>, or call (803) 779-5234. Exam fee is $6.35. Elements 2 (Novice written exam), and 1A (5-wpm code) are free of charge.

TX, Houston: The Clear Lake Amateur Radio Club (CLARC) serves the SE (NASA) area of Houston, TX. We give VE exams the 2nd Saturday of each month, check in at 9 a.m. at the Clear Lake Presbyterian Church 1511 El Dorado in Clear Lake. Our Web site has all the info: <www.clarc.org>.

Personal Web Site Listings

Jim Bridge, KQ6BS, URL: <http://www.qsl. net/kq6bs>. Specialty: weak signal.

Robert Cruz, KE4MCL, Web: <www.geocities. com/Heartland/Estates/5281>. KE4MCL Swap Shop is a place for hams to advertise their old gear and place want ads. No dealer ads accepted.

James Gavlik, KF6NNX, URL: <http://member. aol.com/JGavlik/KF6NNX.html>. Specialty: Santa Barbara and Ventura, California Counties.

"The Radio Picture Archive," URL: <http:// www.e-ect.com/rpa>. Speciality collection of pictures of radios.

Commercial Web Site Listings

Communications Specialists, Inc.: Manufacturers of Tone Signaling Equipment including CTCSS encoders and decoders, Morse Station IDers, Repeater Tone Panels and much more. Please see our ad in this issue. <http://www.com-spec.com>.

KMA Antennas: VHF, UHF & HF log periodics, Yagis and unique 6-meter antennas. Please mention *CQ VHF* when you visit <www.qsl.net/w4kma>.

MS-Windows Software: RAC Callbook CD-ROM, Ultimeter Weather Stations and more, info <n2ckh@cybercomm.net>; Web: <www.QTH. com/n2ckh.bytewise.org>

Teletec: Manufactures 6, 2, 1 1/4 meter and 70 cm Linear Amplifiers as well as Receive Pre-Amplifiers. <http://www.Teletec-usa.com>.

Woodhouse Communication: Antennas and publications for weather satellite imaging: <www.view2earth.com>.

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Some accessories and/or options are standard in certainareas. Check with your local Yaesu dealer for specific details.

Seeing is Transceiving

Portable SSTV is here! Kenwood's new VC-H1 Visual Communicator combines an image-scan converter, CCD camera and LCD monitor in a compact battery-operated unit. Simply hook it up to your Kenwood transceiver to start sending and receiving color images over the air.

VC-H1 Visual Communicator

◗ Ideal for outdoor SSTV

Until now, for anyone interested in SSTV (slow-scan television), portability has not been an option. But thanks to component miniaturization the VC-H1 is not only small enough for handheld use but it runs off 4 AA batteries so you can take it anywhere. This makes it ideal for field days, special events, disaster communications and even fishing trips.

◗ Full compatibility

The VC-H1 can be connected to any transceiver with just a cable, and it offers full compatibility with all of the standard SSTV formats. Uploads/downloads are quick and easy; the images are also sharp and clear.

◗ All-in-one design

In addition to the detachable 1/4-inch CCD camera, the VC-H1 features a 1.8-inch color TFT (thin film transistor)-type display. As well as viewing incoming pictures, you can review your own prior to transmission. The built-in microphone & speaker can be used in place of a separate speaker-microphone for your transceiver.

◗ Image memory

Up to 10 pictures can be stored in memory. This allows you to compare and pick the best shot to send. You can also store incoming pictures and protect them from unintentional deletion.

◗ Computer connectivity

One of the great features of the VC-H1 is the ability to work with a personal computer. Hook it up to the RS-232C port on your laptop using the optional connection kit (includes Microsoft® Windows® 95 software) and you can save pictures (in JPEG format) that you send and receive. You can then cut and paste using standard graphics software, or even superimpose your own text. What's more, you can actually control the VC-H1 from your computer.

◗ Call sign superimpose
◗ AF mute
◗ Auto power-off

SPECIFICATIONS

- Terminals : Data I/O (for transceiver), Video in, Video out, COM (for computer),DC IN (4.8 ~ 7.0V) • Dimensions, projections not included (WxHxD): 2-5/8 x 1-3/8 x 6-3/4 in (62 x 30 x 160 mm)

Specifications are subject to change without notice.
Screen-shot photographs are simulated.
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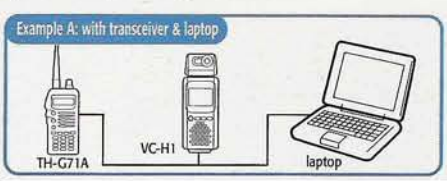
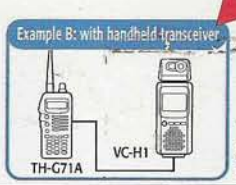
FREE PB-38 Battery Limited Time Offer See Dealer for Details.





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