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Amateur Radio

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COMMUNICATIONS & TECHNOLOGY

NOVEMBER 2001

CQ

In This Issue

On the cover: Helicopter view of lower Manhattan hours after New York City was attacked by terrorists on September 11. Details on page 51.

The Pentagon, Washington, D.C.

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T-2X, $619.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to 2 1/16 inches diameter. Rotator size is 14 1/16Hx9 1/16D in.

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AR-40, $269.95. *Lightweight antenna rotator.* Handles smaller ham antennas and large TV/FM antennas up to 3.0 square feet windload area when mounted in-tower, or 1.5 square feet when mast mounted using the supplied lower support bracket. Dual 12 ball bearing race, disc brake system. Silent, automatic control box -- just dial and touch for desired direction. Accepts mast sizes up to 2 1/8 diameter. Includes light duty mast support. Rotator size is 17 3/8Hx8D inches.

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Rotator Specifications	T2X	HAM-IV	CD-45II	AR-40
Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

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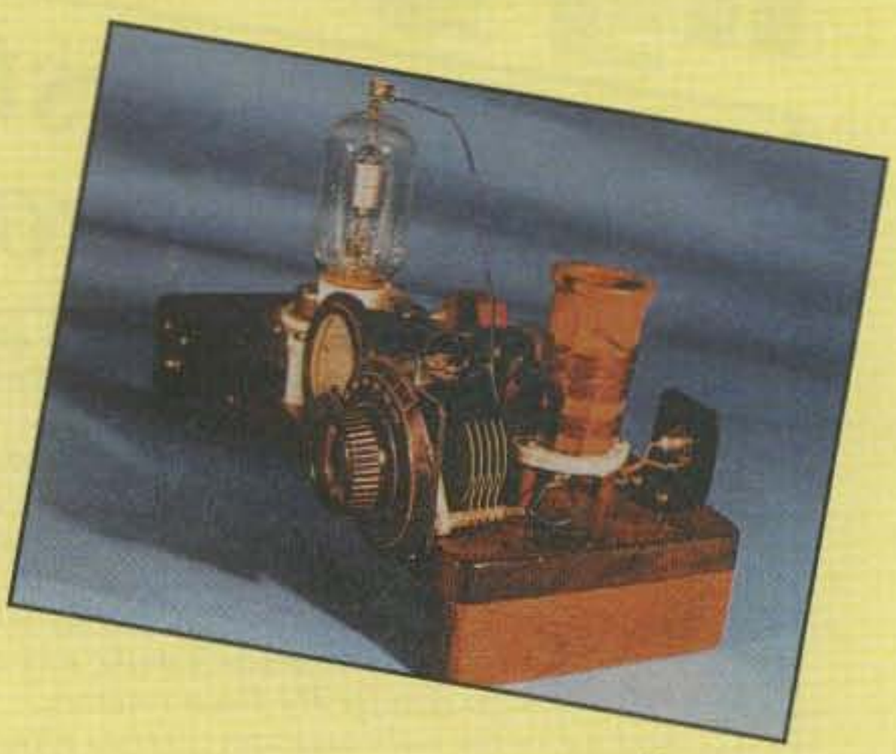
NOVEMBER 2001 VOL. 57, NO. 11

FEATURES



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DEPARTMENTS

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Experience *The G-Force;* because the *"G"* stands for *GREAT* value!

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

"Too Few Volunteers, Too Much Emergency"

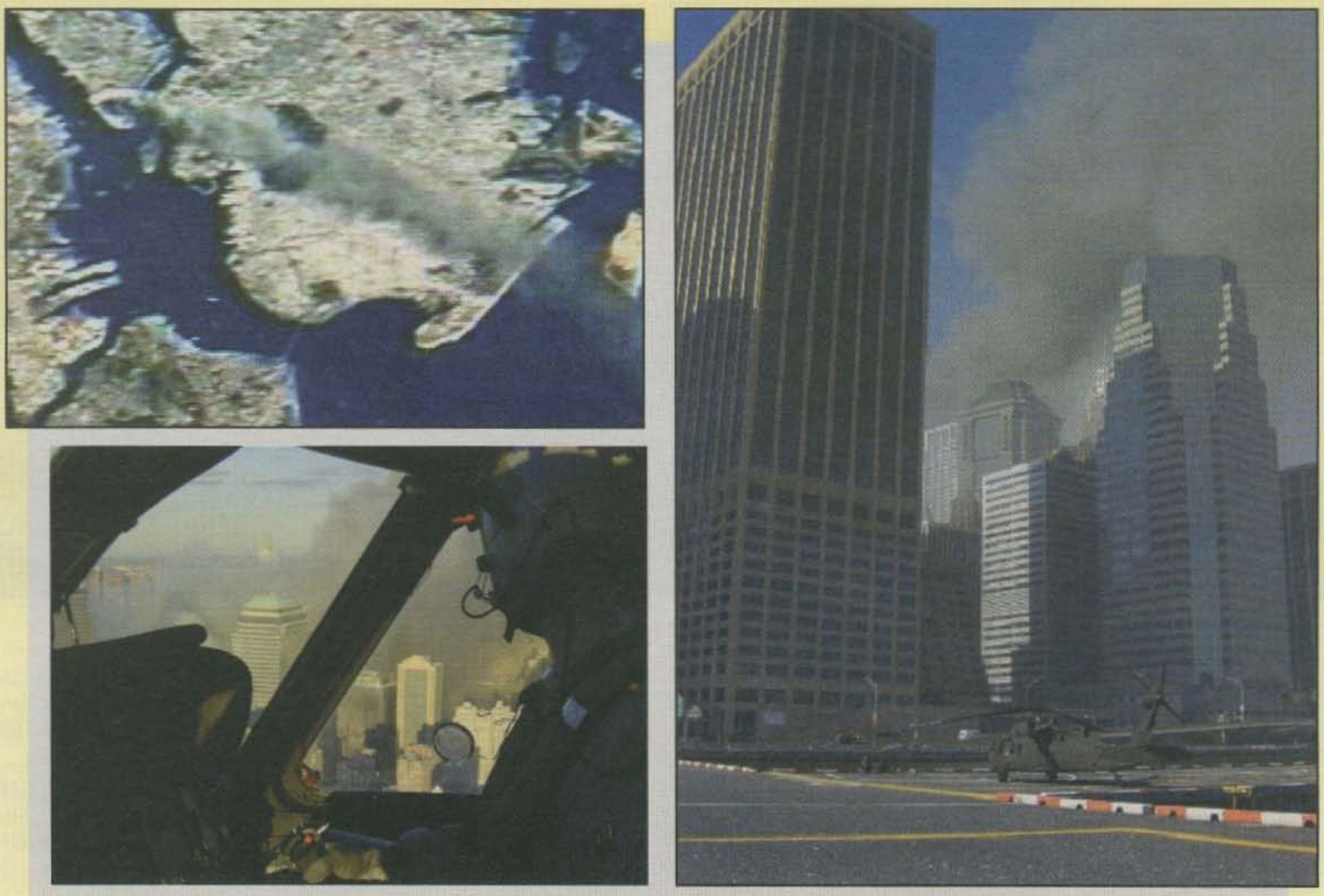
As I begin this month's editorial, it is Tuesday, September 11th, another "day which will live in infamy" in American history. From outside my house in New Jersey, I can see the smoke rising from what used to be the World Trade Center. Behind me, my 2-meter radio is on, tuned to the main New York City emergency net. All day, I've been listening to and watching the news of the terrorist attacks on New York and Washington, plus the plane crash outside Pittsburgh. I've seen the videotapes dozens of times. And I still can't believe it really happened.

But although I am shocked, angered and saddened by the day's events, my faith in human nature and in the unifying power of amateur radio cannot be stronger. Through the day, I listened to a half-dozen emergency nets gearing up for possible assignments, hearing dozens of hams volunteering to do "whatever you need, wherever you need it." And the first piece of e-mail I received about the attack came from two amateurs in Turkey—Berkin, TA3J, and his wife, Nilay, TA3YJ: "We are very sorry to hear about the terrorist attack in USA," it read. "We can't find words to explain our feelings. It is unbelievable..."

Indeed.

Yet their message served as an immediate reminder that we must be careful not to blame entire groups of people for the actions of a fanatical few. As I write this, it is not yet certain who bears the responsibility for planning and carrying out these attacks, but it is widely suspected that they originated in the Middle East. And here comes this message, expressing the same feelings that many of us are experiencing—the only message of its type today—coming *from* the Middle East, reminding us indirectly that most people in most countries want to live in peace and condemn such acts of cowardice. We hams have the opportunity to hear that firsthand. Ham radio breaks down barriers between us, and allows people from different parts of the world to relate one-on-one, human-to-human, without the interference of politics or propaganda. This is the power of amateur radio.

That sentiment was amplified in an e-mail on Wednesday from our own Antennas Editor, Arnie Coro, CO2KK, in Havana: "My thoughts were with you and all my friends that live or work in New York City when I heard the breaking news on the BBC



Various views of the destruction in New York City following the terrorists attack on the World Trade Center. At top left, a view from space of the smoke plume from lower Manhattan. The lower left photo is the view from a helicopter cockpit and photo on the right shows the smoke rising from the crash site. (Space photo courtesy NASA; others courtesy Sikorsky Aviation).

More helicopter views of the disaster scene. In photo on left, what's left of one of the Twin Towers can be seen between other buildings, along with inches of dust and ash on the ground. Right hand photo is another view of the destruction. (Photos courtesy Sikorsky Aviation; see "On the Cover" on page 51 for details).

1300 UTC News broadcast ... I extend my condolences to all the relatives of those who perished today ... May those that passed away rest in peace. Let's hope things like these tragic events will never happen again anywhere in the world."

A few days later, according to K4CY/9K2ZZ, the government of Kuwait asked all of that country's amateurs to operate for the rest of September using a single callsign— 9K2USA. It is, says Bob, "a small token of the sympathy and support for the people of the United States from the citizens of Kuwait, and ... an expression of deep condolence."

We are a worldwide hobby and a worldwide community. We grieve together in times such as these, and we respond together to help when and how we can. You'll find preliminary details of amateur response in WA3PZO's Public Service column on page 48, with a complete report in next month's issue.

I would like to take a moment here, though, to recognize the dozens of volunteers who put in countless hours of work during those first few days when, in the words of one amateur, there were "too few volunteers and too much emergency." The hams in New York who made a particular impression on me as I listened included New York City ARES/RACES Net Controls Guy Richman, KC2AYG, and Adam Fine, AB2IZ; and Red Cross HQ operators John Kiernan, KE2UN, and Charlie Hargrove, N2NOV. Their professionalism was evident throughout the ordeal. I don't know what prior training or experience these operators or all the others had, or what their preferred "hobby" aspects of amateur radio are, but whether it's traffic-handling, contesting, DXing or rag-chewing, their "hobby" uses of amateur radio have prepared them well to communicate quickly, clearly, concisely and accurately. This needs to be remembered whenever anyone—myself included—comments that amateur radio is "only a hobby." Ninety-nine per cent of the time, ham radio is "only a hobby." It's during that other 1% of the time that we earn our keep and pay our dues for the use of "our" frequencies. I've only been listening to the nets in New York, but I'm sure that similarly professional performances were turned in by amateurs in Washington, DC and western Pennsylvania. To all of you, a collective "thank you, job well done" from your fellow amateurs around the world. And *to* our fellow amateurs around the world, thank you for your spontaneous outpouring of sympathy and support. (Please see this month's DX, Contesting and VHF+ columns for more on responses from hams worldwide.)

Back to the Hobby Side

It is the hobby side of amateur radio that keeps us interested, keeps us prepared, keeps us ready to respond to any disaster or emergency for which our services are needed. To feed that hobby side, we try to bring you articles each month that will capture your interest and perhaps motivate you to try something new ... even if it involves something old! For example, author Mike Bryce, WB8VGE, is back this month with Part 2 of his "Keeping the Green Flame Burning" series on restoring old Heathkit radios, this time focusing on the famous "Hot-Water 101," which may well be the most popular HF ham rig ever sold. The response to Mike's first article, on the HW-16, was among the greatest we've received in several years in response to an article. This one should be even more popular!

As winter approaches in the Northern Hemisphere, DX conditions on the low bands of 80 and 160 meters begin to improve. Don Anderson, W7DD, wonders in his article on page 11 whether the full moon helps improve DX range on 80 meters even more! His hypothesis may sound far-fetched at first, but if you're an 80-meter DXer, you can check your logs to help see if Don's theory holds water. Also in this issue, we've got the rules for our annual CQ World-Wide 160 Meter Contest (CW weekend January 26–27, 2002; SSB weekend February 23–24, 2002). We'd hoped to bring you the results of the 2001 contest in this issue as well, but some logistical problems got in the way and we'll have them for you next month instead.

We've got a few more antenna-related articles for you (on the theory that winter is the best possible time to work on antennas), including a review by WB6NOA of Cushcraft's MA5B minibeam for 20–10 meters, designed with the real estate-challenged ham in mind. Plus, we bring you N4XX's interview with Leo Meyerson, WØGFQ, founder of both World Radio Laboratories and Galaxy Electronics. Between them, the two companies helped two generations of hams get on the air.

Looking ahead to next month, we're planning a blockbuster Nostalgia Special, with an extra-special focus on two momentous anniversaries—the centennial of the first transatlantic radio transmissions in December, 1901, and the 40th anniversary of the launch of OSCAR-1, the first amateur radio satellite, in December, 1961.

It's amazing how much our technology has progressed in the relatively short timespan of 100 years, or even just four decades. In the past century, we've gone from struggling to copy signals sent from one side of the Atlantic to another to reliable worldwide communications systems, from massive spark gaps and huge antennas to pedestrian mobile stations capable of working just about anywhere. In 40 years, we've gone from the first non-government satellite ever launched (OSCAR-1) to a satellite-based communication network that allows instantaneous transmission of audio and video from any place on the globe to any other place, and a wireless telephone network that lets you make and receive calls from virtually anywhere (take away the virtually if you're using a satellite phone).

Equally amazing, though, is the fragility of our whole telecommunications infrastructure. One side result of the World Trade Center disaster is that people in the New York area without cable TV have been reduced to watching two to three channels of over-the-air TV (instead of 10). All of the New York City TV stations had their transmitters on top of the World Trade Center, transmitters that are now just that much more rubble on the ground. In the days that followed, only one VHF station (WCBS-TV, Ch. 2) managed to get on the air from its backup transmitter on the Empire State Building. The other stations were transmitting only on their satellite uplinks, which the cable systems in turn pulled back down. But if you didn't have cable, you didn't have many choices.

In addition, the telephone network bogged down almost instantly after the crashes, making it nearly impossible to make calls into or through New York City (such as from New Jersey to Long Island) and the cellular network was overloaded as well. The Salvation Army initially thought it could rely on those combination 2-way radio/cellphones, but didn't realize that even the radio calls were routed through the cellular network. By midday Wednesday, help from hams was requested. By Thursday, the cell phones were basically working again, but busy signals were the order of the day and once again, it fell to radio— often amateur radio—to carry a great load of the non-emergency traffic (the police radio system was pretty much able to handle the emergency traffic).

Lesson #1: when the phone system breaks down, when the TV stations disappear, radio is still there and it still works. Lesson #2: Centralization of resources, such as putting all of a city's TV transmitters in one building and having them share one antenna, isn't always the best idea; neither is dropping the lease for your backup transmitter site. As noted previously in this space, one of the reasons that ham radio is able to get through when other services cannot is that our resources are decentralized, each of us with our own self-contained station, and even our repeaters are scattered geographically. That, coupled with our frequency agility and our ability to put up a station nearly anywhere and get it on the air in a short period of time, virtually guarantees that we will continue to be the service that works when others don't. Add in the personal diplomacy conducted every day by hams around the world and you have the power of amateur radio, a radio service with which we can all be proud to be associated. I know I am.

A Postscript

After listening to the emergency net in New York for four days, I decided it was time to stop being an observer and I signed up to work a 12-hour communications shift on Sunday. My family drove me into midtown Manhattan at 6 a.m., where I caught a subway to Red Cross headquarters in Brooklyn. Coming up out of the subway (carrying my gear in a backpack that weighed *nearly* as much as my son's high school backpack), the first vehicle I saw was an Army medic truck ... and very little other traffic. After registration and orientation at the Red Cross, I headed out with several other hams and Red Cross workers to shelters scattered across lower Manhattan.

Riding in a Red Cross van, we were allowed into normally closed areas. Crossing the closed Brooklyn Bridge and driving on the closed FDR Drive along the East River can only be described as surreal. These are roadways that are *never* without traffic, not even at 3:00 in the morning! Yet here they were, totally empty save for us and an occasional police vehicle. As we got off the highway, a police Bomb Squad truck roared onto it, lights flashing and siren wailing. It was the first of two bomb squad trucks we'd see during the trip, along with occasional glimpses of the smoke from the "hot zone" down streets and between buildings.

One of our stops was at the center where families came to search for word on missing loved ones. The line to get in stretched around the block. Access to the street where we stopped was controlled by Military Police, and the entire block was covered with photos and descriptions of missing people. If there was any one sight that brought home to me the depth of this tragedy, it was that block with all the photos and all the people...

Shelter operation was pretty typical and the communications were pretty routine, such things as checking on the status of food delivery, requesting special baby formula for one of the "clients," etc. If you've ever worked in a Red Cross shelter after some natural disaster or other emergency, then you've seen it and probably done it.

Net operation was as professional as any I've heard, with Net Control (W2ML for most of my stint) keeping track of who needed to talk to whom (most everybody needed to talk to Red Cross) and who had priority traffic. The operators at Red Cross handled a massive amount of traffic calmly, quickly and accurately, and somehow found a way to get all the messages delivered to the proper parties while handling traffic nonstop. I must say that this is the busiest net I have ever heard. Even six days into the "incident," traffic was virtually non-stop, with only occasional breaks of a few quiet seconds (not minutes) here and there. The volume of traffic was truly staggering. Also amazing (or maybe not; see above) was that the blend of hams who volunteered to help was as international as amateur radio itself. During my shift, there was a ham from Siberia, another from Guyana and another from England (all currently living in New York), all pitching in to do their share ... and sometimes more than their share! Oh, yes, and California, too!

Final surreal image of the day: On the way home, coming out of the Lincoln Tunnel, we looked back toward lower Manhattan. Image: Darkened buildings surrounding the highly-illuminated plume of smoke that seems as if it will be a permanent new part of New York's radically rearranged skyline. They are images that will always be with me. Rich, W2VU

Ham Radio News

From The CQ Newsroom

Hams on Both Coasts Respond to Massive Needs

Amateur radio operators on both the east and west coasts have been called into long-running emergency communication assignments, from wildfires in the west to multiple terrorist attacks in the east.

In late August and early September, hams in northern California set up 24-hour emergency networks to help deal with communication needs from a string of wildfires. According to the ARRL, the string began on August 28 with a forest fire in Trinity County, California. Just as the operations from that blaze were winding down, a second fire broke out August 31 in the town of Hayfork, prompting more evacuations and requiring a new set of amateur stations at Red Cross shelters and other locations. Then, a third fire erupted on September 6, burning more than 7500 acres and destroying 27 homes. The string of three consecutive fires "exhausted the pool of trained ARES operators," according to the *ARRL Letter*.

On the East Coast, the coordinated terrorist attacks of September 11 brought out hundreds of radio amateurs to provide emergency communications in and around New York City, Washington, DC, and Pittsburgh, Pennsylvania, where passengers aboard a hijacked plane apparently thwarted plans to fly the aircraft into yet another major target, but were killed when the plane crashed in a rural area. A week after the attacks, it was being estimated that amateurs could be needed on a round-the-clock basis in New York for a month or longer. Coverage of amateur response to these disasters will be found in this issue (primarily in "Public Service" and "Zero Bias") and in next month's issue as well.

Ironically, just a few weeks before the attacks on New York and Washington, U.S. Attorney General John Ashcroft observed an Ohio emergency drill that simulated a terrorrist attack. Radio amateurs participated in the drill. According to *Newsline*, Ashcroft told ARRL District Emergency Coordinator Ron Moorfield, W8ILC, "I have heard of amateur radio, but you people are professionals. You are not amateurs."

ITU Adopts New Amateur Licensing Standard

In what appears to be an end run by the International Amateur Radio Union (IARU) around an ongoing debate in the United States over future international licensing rules for hams, the International Telecommunication Union (ITU) has approved a new amateur licensing standard, apparently without waiting for action by the upcoming World Radiocommunication Conference in 2003 (WRC-03). That conference is scheduled, among other things, to decide whether there should continue to be an international requirement for Morse code proficiency as a condition of getting an amateur license with HF privileges. It is widely expected that the international code requirement will be dropped.

The new standards do not address the code issue, but recommend that anyone seeking an amateur license "should demonstrate theoretical knowledge of specific topics in the areas of radio regulations, methods of radiocommunication, radio system theory, radio emission safety, electromagnetic compatibility, and avoidance and resolution of radio frequency interference, " according to a news release from IARU, which adds that the changes are part of a long-term IARU effort to prepare for changes expected at WRC-03.

The new standards are "in anticipation of" those changes, according to the release, which quotes IARU Secretary (and ARRL Executive Vice President) Dave Sumner, K1ZZ, as explaining that "the new Recommendation provides additional definition to these qualifications without reducing the prerogative of an administration to set its own standards."

However, the exact wording of a new licensing standard was a matter of debate among amateurs participating in the FCC's advisory process on recommended U.S. positions for WRC-03. It appears that the IARU/ITU action may have made that debate moot.

Ed Clegg, W8LOY, SK

One of the men who put reasonably-priced VHF equipment into the hands of thousands of amateurs in the 1960s and '70s has become a Silent Key. Edward Clegg, W8LOY (and formerly W3LOY and W2LOY), passed away on September 7 at age 80 after a long illness. Clegg designed and manufactured the VHF radios that bear his name, including AM rigs such as the '66er and '99er, and early FM rigs, such as the Clegg FM-27B. He is survived by his wife, Marvis, and a daughter and son-in-law. *(Tnx W8OF and WA6ITF)*

Got Your FRN?

The FCC says that starting December 3, you'll need an FRN issued by CORES to do business with its ULS. Translated into English, that means that as of December 3, you may not any licensing business with the Federal Communications Commission unless you have a special 10-digit "FCC Registration Number," or FRN. These numbers are issued by the Commission Registration Service (CORES) and will be necessary in order to use the Universal Licensing System (ULS). Many hams who are already registered with ULS already have their FRNs.

While all the abbreviations and acronyms are firmly in place, it's not certain that the systems they describe will actually be ready to work together on December 3, according to the *ARRL Letter*, which adds that there are still a lot of questions about how ULS will be integrated into CORES.

FCC Continues Crackdown on Uncoordinated Repeaters

Trustees of five uncoordinated repeaters in five states are being told by the FCC that they must resolve interference issues with coordinated repeaters or face fines or other FCC action. One California amateur who has been warned repeatedly about interfering with the W6IER repeater has been notified that the Los Angeles Field Office will be listening for interference from his station and is prepared to issue fines if any is heard. Another ham accused of interfering with the same repeater has been warned to eliminate the interference or face the possibility of fines or other punishment.

A ham in Utah is accused of operating an uncoordinated repeater in southern California that interferes with a coordinated machine, with suggestions that the interference is intentional, such as "reports of dead carriers that last for weeks (and) a tone that lasted continuously for three weeks..." A letter from FCC Special Counsel Riley Hollingsworth, K4ZDH, warns Steven Decho to immediately stop or face enforcement action "ranging from license revocation to a monetary forfeiture."

Lower Vanity Fee in Effect

As of September 10, 2001, the fee for applying for a vanity callsign dropped from $14 to $12. If you accidentally paid $14 on an application filed after September 10, you may request a refund, according to the ARRL. (*But think first about whether the $2 is worth the time and effort – W2VU*)

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio. com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

Announcements

•Aircraft Museum Seeking Donations. The Pueblo (Colorado) Historical Aircraft Society (PHAS), manager/operator of the Pueblo Weisbrod Aircraft Museum, is seeking donations of airborne military radios and communications equipment from WW I, WW II, the Korean War, the Vietnam War, Desert Shield/ Desert Storm, and the Cold War era to complement its display of 23 WW II and post-WW II aircraft. The PHAS is a 501(c)3 nonprofit organization devoted to preserving and restoring the vintage aircraft in the museum; its membership consists of military veterans and nonveterans. All items donated are tax deductible and become the permanent property of PHAS. The museum may be contacted at telephone 719-948-9219, fax 719-948-2437, or e-mail: <pwam@iex.net>; on the web: <www.co.pueblo. co.us/pwam>.

• **Ten-Tec Dealership, Retail Store.** Ten-Tec, Inc. has announced the opening of a full-line amateur radio dealership and retail store to complement the Ten-Tec manufactured line of amateur radio equipment. Equipment from more than 20 manufacturers is in stock and available direct from Ten-Tec. The Ten-Tec manufacturing facility and retail store are located in Sevierville, Tennessee, 30 miles southeast of Knoxville. Retail store hours are 8–5 Eastern Time, Monday–Friday (sales department 1-800-833-7373; on the web: <www.tentec.com>).

•The following Special Events are scheduled for November:

N2UL, from "CQ Veteran's Day," Nutley, New Jersey; Robert D. Grant ULARA; 1200–2400Z Nov. 11 on 14.260, 21.375, 28.420 MHz (±20 kHz). For certificate send QSL to RDGU-LARA, c/o WA2VJA, 112 Prospect Street, Nutley, NJ 07110-0716.

K7YA, from Camp Fire Boys & Girls fund raiser, Gold Rock Ranch, Glamis, California; 1500Z Nov. 23 to 0100Z Nov. 24 on 7.248, 14.250, 21.350, 28.375 MHz. For certificate send QSL and 9×12 SASE to Yuma ARC – K7YA, 13329 E. 47th Street, Yuma, AZ 85367.

N8F, from commemoration of the sinking of the *Edmund Fitzgerald*, Whitefish Point, Michigan; Stu Rockafellow ARS; 1400Z Nov. 10 to 2000Z Nov. 11 on 7.270, 14.270, 21.270, 28.370 MHz. For certificate send QSL to John Ebejer, K8DSL, 15855 Winchester Drive, Northville, MI 48167.

•These hamfests, etc., are slated for the month of November:

Nov. 3, **Lake ARA Hamfest & Computer Show**, Umatilla High School Annex, **Umatilla, FL**. Contact Chuck Crittenden, KE4EXM, P.O. Box 615, Altoona, FL 32702 (352-669-2075). (Talk-in 147.255+, tone 104.5; exams walk-ins only, 10 AM)

Nov. 4, **Framingham ARA Fleamarket**, Framingham High School, **Framingham, MA**. Contact Bev Lees, N1LOO, FARA, P.O. Box 3005, Framingham, MA 01705 (508-626-2012) or reserve a table online at <http://flea.fara.org>. (Exams, info Jim Weckback, W1EQW, 508-435-6487)

Nov. 3, **NJ5S Memorial Hamfest**, Garfield County Fairgrounds, **Enid, OK**. Contact Tom Worth, N5LWT, phone 580-233-8473, e-mail: <enidhamfest@ yahoo.com>. (Talk-in 145.29 –.600, 444.400 +5.00; exams 1 PM).

Nov. 4, **Central Illinois/St. Louis Area Amateur Television Banquet**, Ariston Restaurant, **Litchfield, IL**. Contact Scott Millick, K9SM, telephone 217-532-3837; e-mail: <smillick@cillnet.com>.

Nov. 10, **Grant ARC Hamfest**, ABCAP gym, **Georgetown, OH**. Contact Dot Silman, KB8TQU, 937-446-2234, e-mail: <huggee @bright.net>. (Talk-in 146.13/ 146.73; handicapped accessible)

Nov. 10, **Montgomery Hamfest & Computer Show**, Garrett Coliseum, **Montgomery, AL**. Contact Hamfest Committee, c/o 7173 Timbermill Drive, Montgomery, AL 36117-7405; phone Phil, 334-272-7980 after 5 PM CST; e-mail: <k4ozn@arrl.net>; on the web: <http://jschool.troyst.edu/~w4ap/>. (Talk-in on 146.24/84, call W4AP; Exams 8 AM)

Nov. 17, **Interstate Repeater Society Fall Hamfest & Fleamarket**, Lions Club, **Londonderry, NH**. Fleamarket space reservations call Paul, 603-883-3308, e-mail: <k1nl@juno.com>. (Talk-in 146.850–/PL 85.4; exams 9 AM to noon, reservations suggested, call Bill, AA1OC, 603-424-2857, e-mail: <bills@aa1oc.org>)

Nov. 17, **Newtonville Amateur Radio & Electronics Auction**, Newton Masonic Hall, **Newtonville, MA**. Contact Eliot Mayer, W1MJ, 617-484-1089; e-mail: <w1mj@amsat.org>; <http://www.wara64.org/wara/auction.htm>. (Talk-in 146.640)

Nov. 17–18, **Fort Wayne Hamfest & Computer Expo**, Allen County War Memorial Coliseum, **Fort Wayne, IN**. Contact ACARTS/Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne, IN 46851; call 219-483-8163 (tables), 219-484-1314 (general information); website: <www.fortwaynehamfest.com>. (Talk-in on 146.88–; exams Saturday)

Nov. 18, **JARSFEST**, American Legion Complex, **Benson, NC**. Call 919-894-3352 or 919-894-3100 from 7–10 PM; e-mail: <blambert1@mindspring.com>; <www.jars.net>. (Talk-in 147.270 + 600; exams)

Nov. 24, **Evansville Winter Hamfest**, Vanderburgh Co. 4-H Center Fairgrounds Auditorium, **Evansville, IN**. Contact Neil Rapp, WB9VPG, 2744 Pinehurst Drive, Bloomington, IN 47403 (812-333-4116; e-mail: <ears@w9ear.org>; web: <http://w9ear.org/hamfest.htm>). (Talk-in 145.150–, 146.925–, 443.925+)

Nov. 25, **Radio Fest Electronics Fleamarket**, DuPage County Fairgrounds, **Wheaton, IL**. Call 630-826-7981; e-mail: <alf3148@megsinet.net>.

To place an item in the "Announcements" column, send the specifics about your special event or hamfest to CQ Announcements, 25 Newbridge Road, Hicksville, NY 11801; fax 516-681-2926; or e-mail: <hamfests@cq-amateur-radio.com>. Deadline is the first of the month that is two months prior to the event date (i.e., November 1st for a January event).

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Is it possible that the light of a full moon can enhance DX on 80 meters? Before you laugh, go check your logs and see if they match up with what W7DD discovered.

80 Meter DX—The Moon Effect

BY DONALD L. ANDERSON,* W7DD

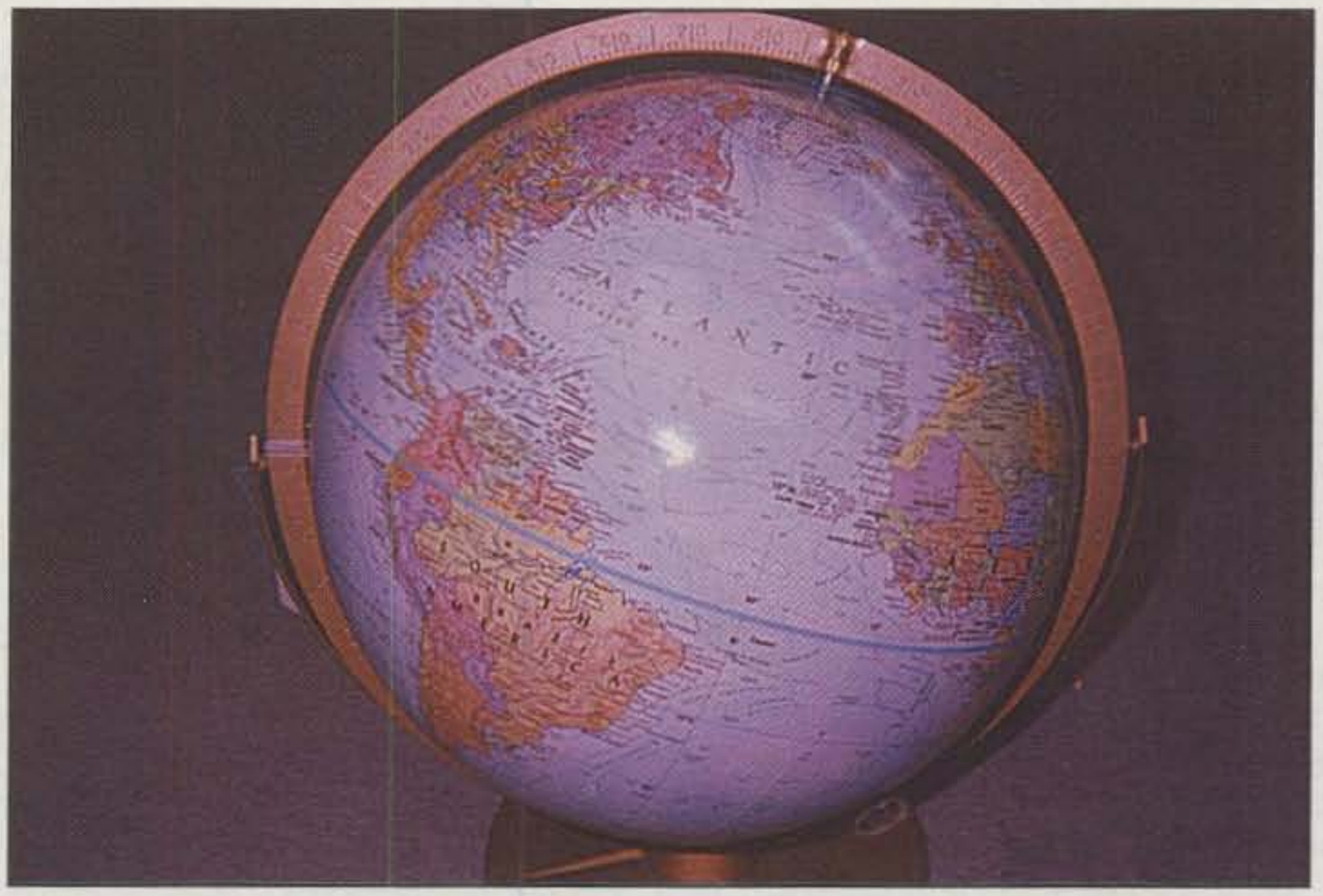
Many years ago I noticed a phenomenon on the 80 meter band when working DX. It seemed that one night each month the band would be incredibly good. From Arizona I would work 30 to 50 Europeans in one evening. A few days before and after that day would also be above average. As this time period passed, the following weeks would be back to the normal poor band conditions I had learned to expect.

I wondered for years why this was happening. It was not tied to any propagation indicator I knew of. Well, it happened again on December 11, 2000, and as usual, I wondered why. I went to bed, and at about 2 AM I awoke to find an amazing amount of light in the bedroom. I jumped up and looked out the window and was met by a giant, very bright moon. It was a full moon. I thought to myself, "I could easily walk through the desert without hitting a bush or a cactus with this light."

While thinking about the sight I had just witnessed, I began to wonder if it could have had any bearing on the wonderful evening of DX I had just finished two hours earlier. I quickly went into the ham shack and checked my logs going back several years and then got on the internet and checked the moon phases. Wow . . . They matched the full moon dates perfectly! I decided to double check this by looking at the "DX Summit" archives. I checked spots put out on me on "DX Summit" for the year 2000 from Europe using the short path. This also matched the full moon dates.

Now that I had the timing matching perfectly, I wondered why this was happening. Could this be moonbounce? No, I thought, that couldn't be, because the signals were coming from the correct direction. I have 12 Beverage receiving antennas and find directions to

*4325 W. Ironwood Hill Dr., Tucson, AZ 85745
e-mail: <w7dd@arrl.net>



Globe aligned and centered showing Europe to Arizona enhancement area. View as if seen from a full moon in winter.

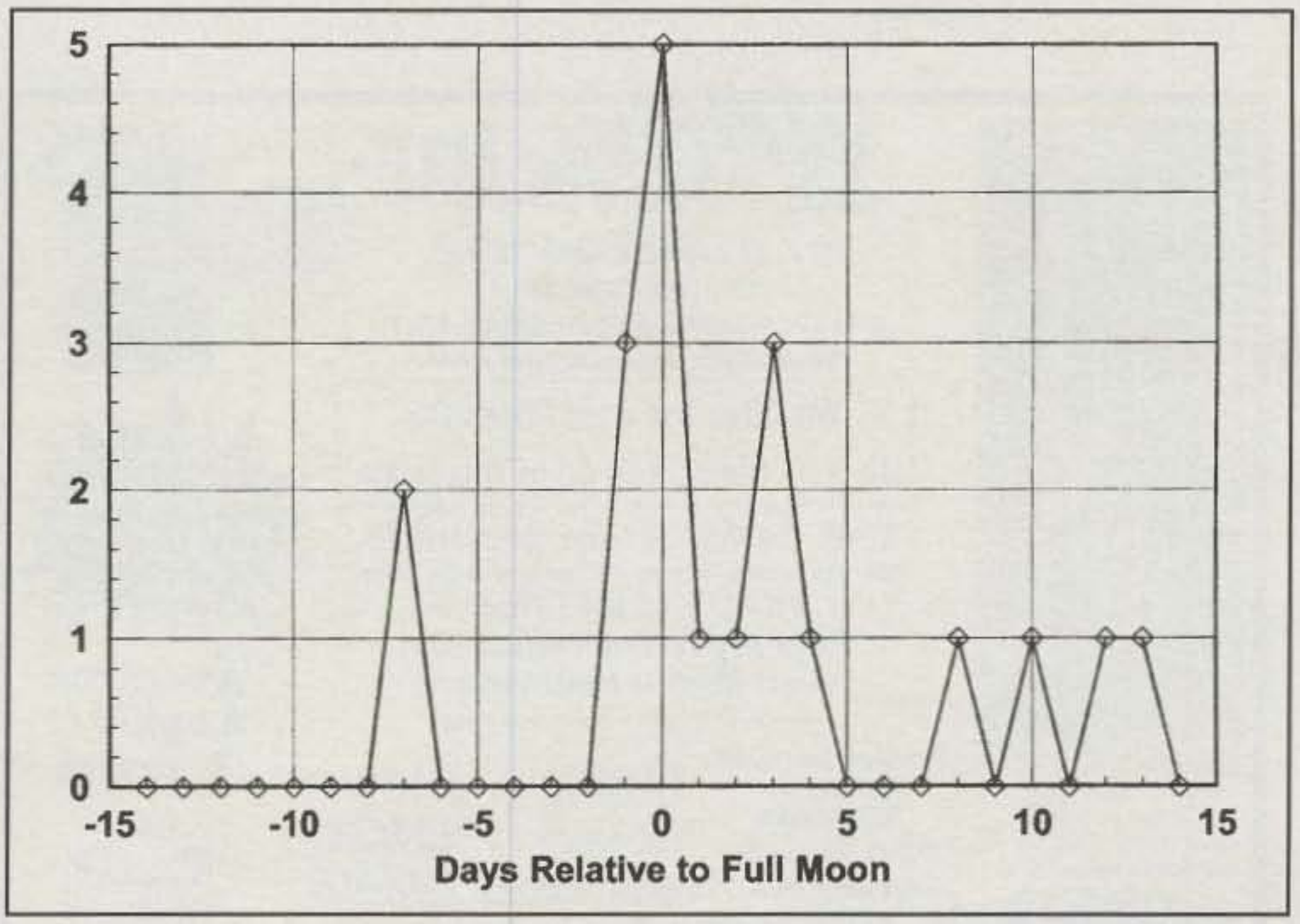


Fig. 1– DX spots from "DX Summit" archives for the year 2000. Short-path spots for W7DD posted by Europe.

You can expect to see a full moon over the next year on the following dates, give or take a day based on where you are:

November 1 & November 30, 2001
December 30, 2001
January 28, 2002
February 27, 2002
March 28, 2002
April 26, 2002
May 26, 2002
June 24, 2002
July 24, 2002
August 22, 2002
September 21, 2002
October 21, 2002
November 19, 2002
December 19, 2002

Table I– Full moon dates for 2001–02.

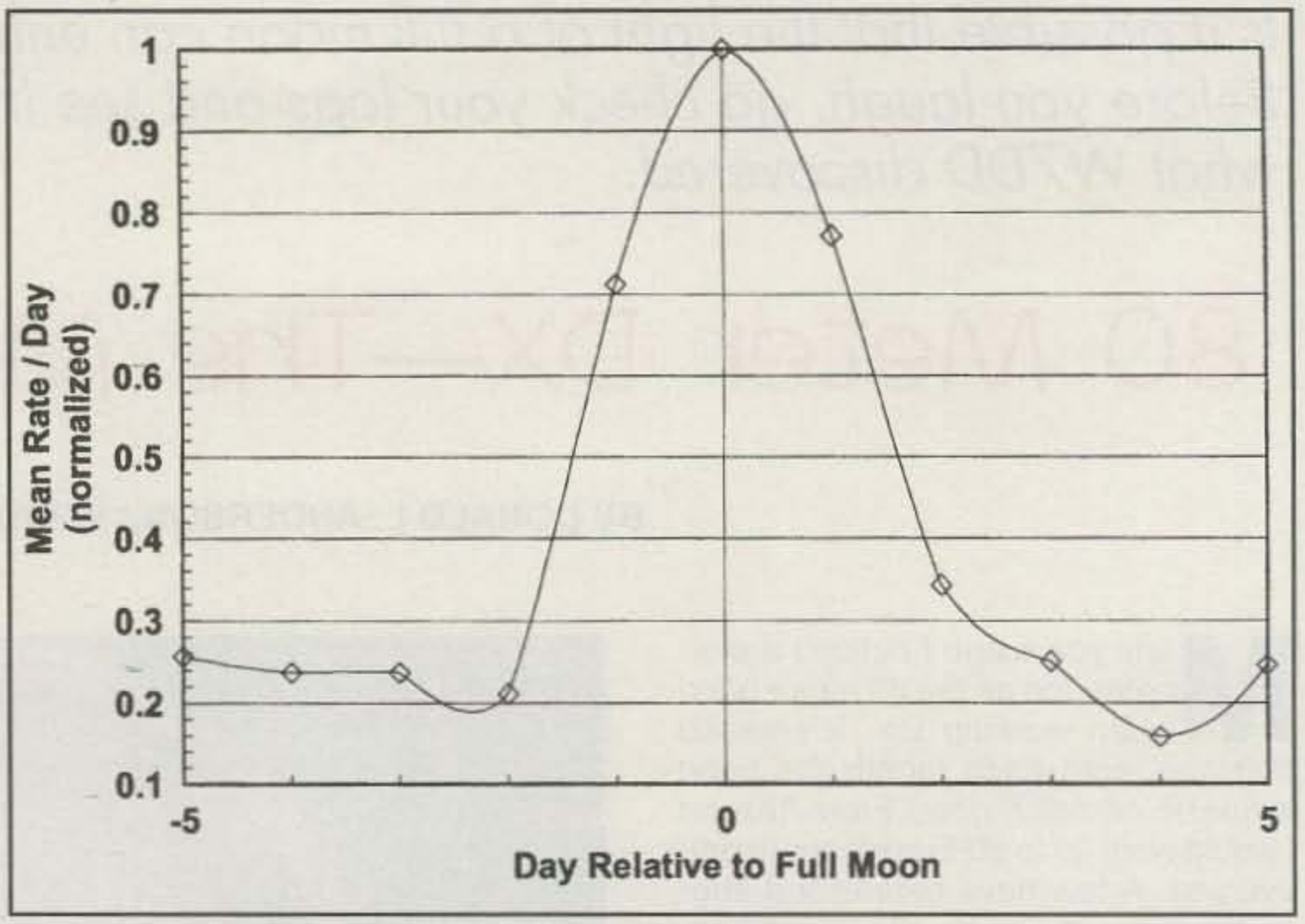


Fig. 2– Correlation chart showing QSO rate based on full moon days. Data is for one year. QSOs with Europe from Arizona on the short path.

an accuracy of about 25 degrees. Also, the *F*-layer would not allow the low-frequency signals to pass through to the moon. The *F*-layer is about 400 km above the Earth. Waves are reflected back to Earth by this layer. A single hop can be about 3000 km long.

Then it hit me: The *F*-layer was being reinforced by the sun's light reflected off the moon. There must be enough light to reinforce the *F*-layer ionization while still not activating ionization of the *D*-layer, and thus no absorption. The *D*-layer is located below the *F*-layer at a height of about 75 km. The *F*-layer itself attenuates the light getting to the *D*-layer. The *D*-layer's effect on communications is a negative one because it causes absorption of the signal.

I finally went back to bed and got a few hours of sleep. I have been told, though, that an 80 meter DXer only sleeps in the summer.

A view of Earth as seen by the moon is available on the website: <http://www.fourmilab.to/cgi-bin/uncgi/Earth/action?opt=-m> and continuously updates. (If you can't get through directly at this URL, try <http://www.fourmilab.to/earthview/> and click on view of the Earth from the moon. If you're in Europe, use fourmilab.ch instead of fourmilab.to.)

The center of the Earth, as seen on the website, is closest to the moon and would receive the most reflected light. This is the area where the *F*-layer enhancement is most pronounced. This is a moving area and must be monitored using the website's picture of the Earth. I now see that when the center of the Earth, as seen on the above website, is located between the two stations— i.e., Arizona and Europe—the maximum enhancement occurs. This is exactly when my logs show the strong signal reports and QSOs with 100 watt Europeans. Picking any two points on Earth and then checking the view from the moon will show the possibilities of propagation enhancement. This enhancement is independent of the gray line. It can affect the gray-line propagation in some oblique ways by widening the line slightly if the enhanced area is on the gray line. This can add even more strength to gray-line signals. This phenomenon is not consistent with daytime operation, as the sun's direct light is vastly greater than the reflected moon light, even the full moon light. The light given off from the full moon is just a "booster shot"—a very welcome booster shot for the low bander.

Moon information is plentiful on the internet. I typed in "moon phases" and received a wealth of information on Google.

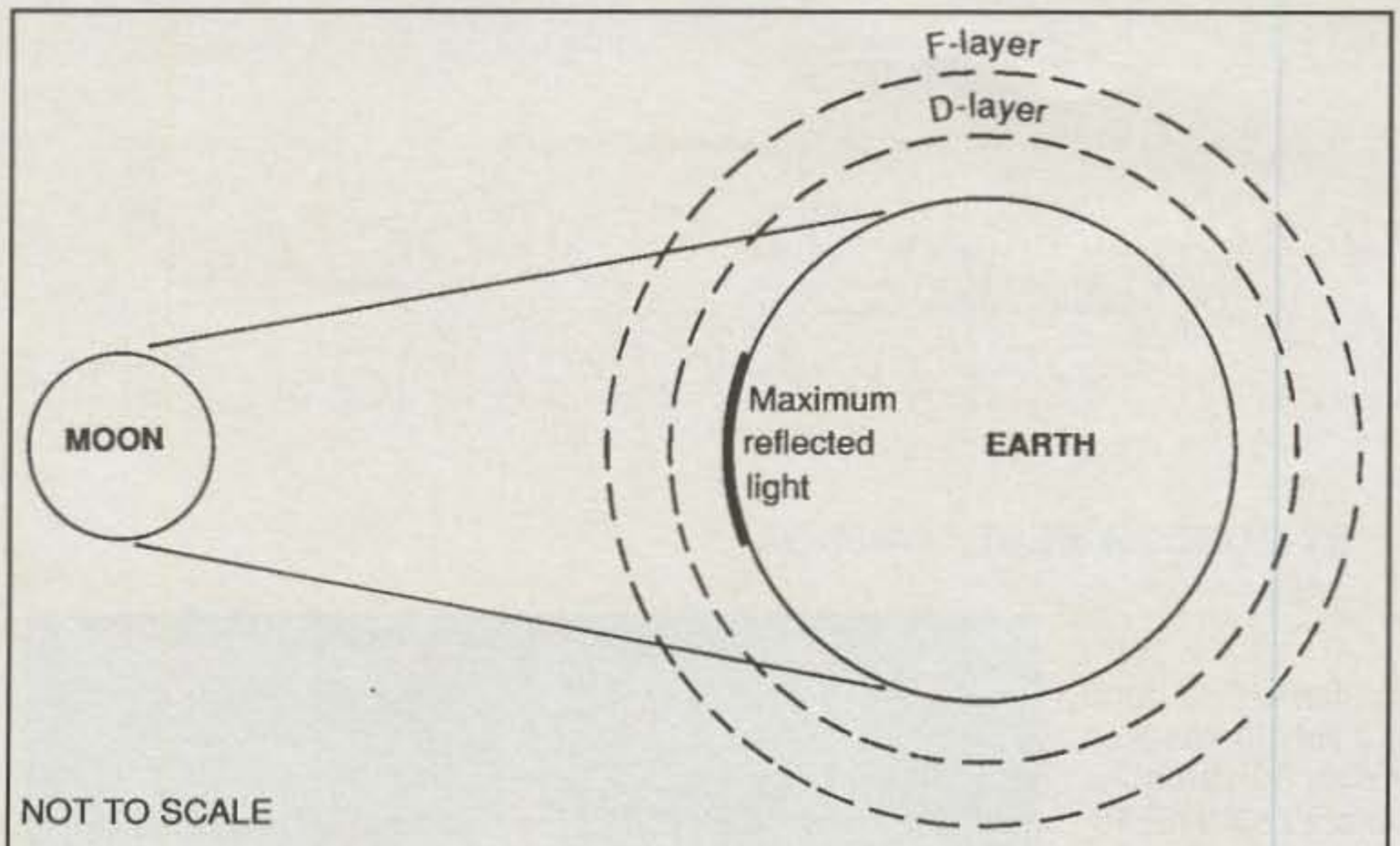


Fig. 3– F-layer and D-layer relationship, plus area of maximum reflected light on the Earth from the moon.

In conclusion, I am convinced that this phenomenon is happening, but I am only one ham. We need more input on this subject. Different places on Earth will have different relationships to the moon enhancement. I ask all low-band enthusiasts to keep this idea in mind, and maybe we can increase our database on this new tool. Bent-path propagation information should be very interesting once we hear more from hams around the world telling us of their bent-path observations with respect to the full moon enhancement. We only have a few days each month to make these observations, so we must watch the calendar. The full moon date and a few days after seem most active in Arizona.

Once in a Blue Moon...

We chose to run Don's article in this issue because November 2001 is one of those rare months which contains two full moons, the second of which is commonly (but incorrectly) known as a "blue moon." This is the first two-full-moon month since 1999 and the last until 2004. It is interesting to note that if you live in the western United States, your two full moons will actually come in October, since the precise time of the November 1 (UTC) full moon will be reached on October 31 local time. Also, if you live in eastern Europe and Asia, the November 30 (UTC) full moon will actually occur on December 1 local time, so you'll have your two full moons in December!

For more on the timings of the full moon, see <www.obliquity.com/astro/blue2001.html>. If you want to find out why calling the second full moon in one month a "blue moon" is technically incorrect, see the *Sky & Telescope* magazine website at <www.skypub. com/sights/moonplanets/9905bluemoon.html>. —*W2VU*

CQ Reviews:

The Cushcraft MA5B "Director" Compact Beam Antenna

BY GORDON WEST,* WB6NOA

Sometimes even a relatively small 3-element, 3-band beam has too big a turning radius for a tight installation on an apartment or condo roof. For over 30 years the standard in small tribanders has been Cushcraft's A3 for 10, 15, and 20 meters, with a respectable 8 dBi forward gain on the three bands, and an optional 40 meter dipole add-on kit, all on a 14 foot boom. Sometimes, however, 14 feet is too much boom for a small roof or lot, so Cushcraft has come up with a 3-element, 5-band beam on a 7 foot boom with surprising results.

The Cushcraft MA5B is a little capacity-loaded beam for 10, 15, and 20 meters, with added dipole characteristics on 12 and 17 meters. It does not take a 40 meter add-on kit, but it does offer 5-band performance in a relatively compact 26 pound package, easily assembled in less than 3 hours using only a nut driver, a screw driver, and a wrench or pliers.

The MA5B has three elements mounted on the 7.3 foot boom, with boom diameter of 1.5 inches keeping the boom absolutely flat. Each element sticks out approximately 8 feet each side of the boom, with a total turning radius of 8.8 feet to accommodate extremely small roofs or minimum-room installations. We turned our assembled antenna quite nicely with a little RadioShack antenna rotator.

Cushcraft's Ed Hammond, WN1I, describes this remarkable mini-beam as a solution for those hams who just don't have enough room or rotator power to swing the firm's popular A3.

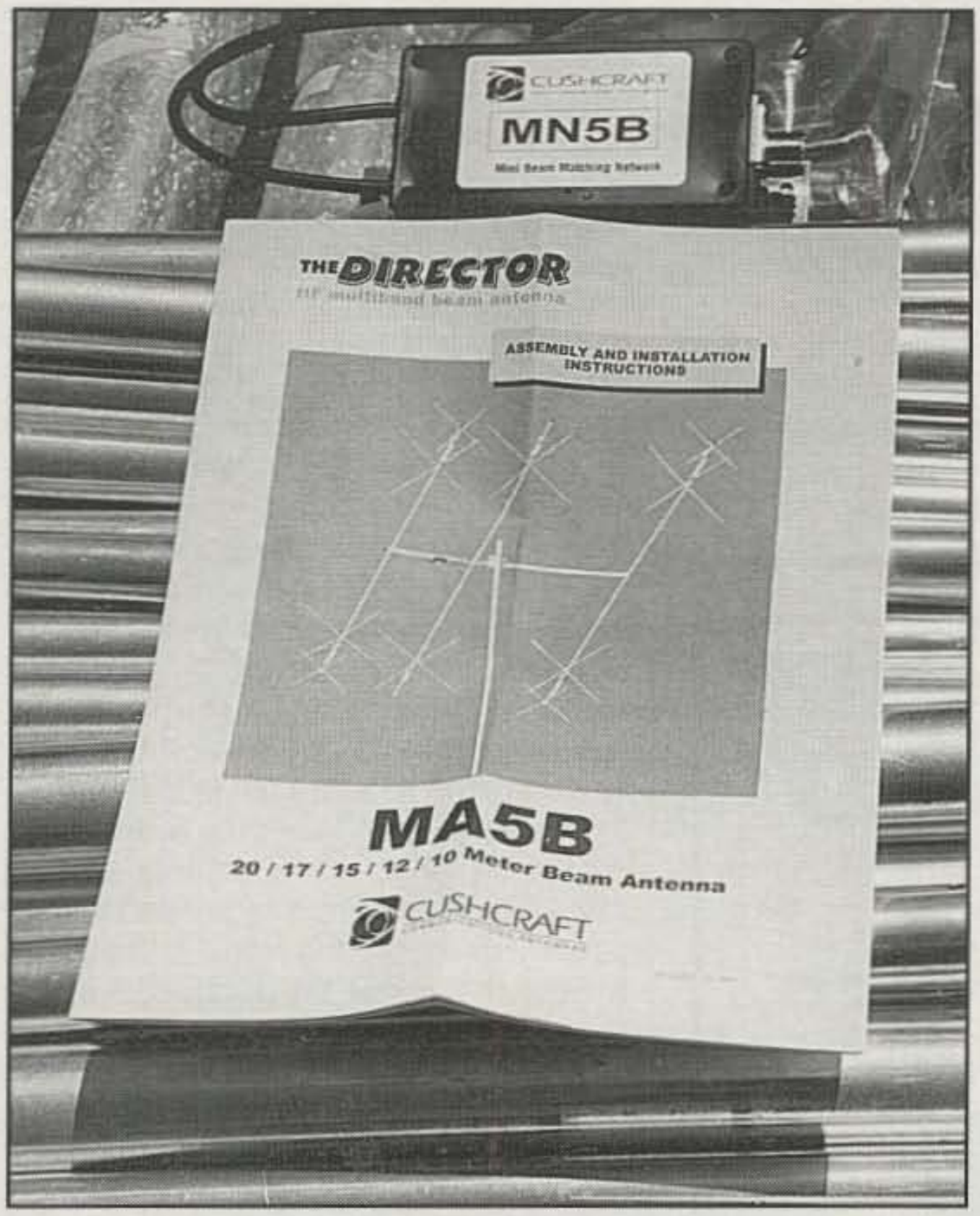
"The five bands of directivity on our relatively short 7 foot boom may only be appreciated by working the beam on the air, rather than just looking over the spec sheets," adds Hammond, referring to modest forward gain on 10, 15, and 20 meters, a good front-to-back ratio on these three bands (10 to 22 dB), and a very nice side lobe attenuation of 25 dB on all five bands with 12 and 17 meters working as dipoles.

On 10, 15, and 20 meters we anticipated and found about 5 dBi forward gain on 10 and 15 meters, and around 3+ dBi gain on 20 meters, along with a nice wide forward lobe that remained relatively strong 30 degrees each side of 0 degrees straight on. On the two WARC bands (12 and 17 meters), the antenna behaved like a dipole, with maximum signal strength achieved by pointing the beam broadside to the station being worked. On all bands there was a noticeable signal dropout when the element tips were pointed directly at the transmitting stations.

Each element contains a trap and capacity loading rods on each side of the boom. Each trap is well identified so you put it together properly, but there is not much clue on how the trap works as a high-impedance parallel circuit or a low-impedance series loading coil. The mystery of the tuning is further compounded by elements 1 and 2, insulated from the boom, both getting tied into the proprietary matching network with equal-length color-coded connecting wires. The instructions make it clear that the polarity of the wires must be matched on each element: The red wire on each element must be on the left side, and the black wire must be on the right side.

The Cushcraft MA5B "Director" mini beam is small enough to be mounted on a small rooftop or even on a (stationary) vehicle! It passed its Field Day tests with flying colors. The element at the far right in the photo is the reflector.

CQ Contributing Editor at Large, 2414 College Drive, Costa Mesa, CA 92626; e-mail: <wb6noa@cq-amateur-radio.com>



In the Cushcraft tradition, everything was well-packed and all parts were there. The instruction manual is excellent.

The third element, ostensibly the reflector, mounts directly on the boom with no insulation and also contains the X-hat capacitive loading system.

Ed told me that the design is proprietary and only a design engineer knows what is going on within the elements. This secret matching system, which seems to work well, is further mystified by the instructions, complete as they are, not saying which end of the boom is forward. After we did a little swinging of the entire MA5B, it became apparent that the driven elements are forward, and the passive element on the back is the rear reflector.

Assembly

When you get a big box filled with antenna parts, the first worry is whether or not any of the little nuts, bolts, and washers may have slipped out. Cushcraft takes away the fear by indicating the ends of the box were "factory sealed," including an indication of a precise weight, which verifies that every single nut and washer needed is included. Ed told me they can even tell if a single screw or nut accidentally was left out. If the weight doesn't add up, the package is re-opened at Cushcraft and quality-control double checks any weight discrepancy.

As it turned out, we had a few parts left over, probably on purpose knowing that any good ham on a roof is going to lose a nut or washer while putting the antenna together.

We decided *not* to put together the antenna on a hot roof, but rather chose the backyard. We don't recommend putting together the nuts, elements, screws, and washers over a lawn, however, because dropping anything into a lawn is like saying goodbye to it forever. We also suggest being careful of any sharp brass staples in the box in your eagerness to immediately jump in and pull everything out.

Like any good ham, we relied on the indicated parts list to ensure that we had all the parts. No, despite Suzy, N6GLF, wanting me to do so, I didn't inventory the parts ahead of time. We just started assembling the entire antenna, and remarkably it was fully put together 3 hours later. That included several breaks for lunch, phone calls, and an incoming call from Ed Hammond, who wanted to know my initial reaction to the assembly process. It went smoothly, and about the only thing I would recommend as an improvement to the well-illustrated instruction manual would be putting the pertinent element assembly instructions on pages facing the figures showing the overall element assembly. Having to flip back and forth, out in the wind, could be eliminated with the most important page showing the overall beam and all the measurements facing up, with more detailed instructions on the other, facing page.

I would caution assemblers to always wear protective glasses when working with this particular beam. You have $10 \times 4 = 40$ rigid rods that always pose personal danger. Because the design engineer of this antenna used efficient capacitive loading to distribute the energy out to the ends of the elements, the ten hat elements do pose some danger when working on the antenna at eye level. I also wonder why they might not have come up with a ring type of capacitive loading, like they do on the Ringo Ranger, to eliminate this potential hazard and to somewhat improve the looks of this antenna when it's up in the air. Then again, hams like to see a lot of fancy aluminum, which they will indeed get with the MA5B.

Field Day Comparisons

After our backyard assembly and test tuning with the MFJ SWR analyzer, we partially disassembled the antenna and drove it over to our weekend Field Day site. Here the anten-

Putting together the antenna took less than three hours, even with help from the (optional) antenna cat!

na was reassembled by personnel from the Mesa Emergency Service Auxiliary Communications (MESAC) team, an amateur group serving the city of Costa Mesa. We were also joined by a Huntington Beach RACES, which would be providing their own tri-band, 3-element beam on a 15 foot boom, 50 feet in the air. The MA5B Cushcraft miniature beam would mount on a telescoping flagpole and fit into the hitch receiver on our communications van.

Reassembly went well, final SWR checks showed the antenna to be absolutely resonant in the middle of each band, good quality coax was attached, and up the beam went to about 30 feet off the deck. We hooked it into several Field Day transceivers, and each one immediately came to life on 10, 12, 15, 17, and 20 meters.

We coordinated with the other group and compared the incoming signal-strength readings of their twice-as-large beam and our little Cushcraft. Every time the big beam tuned in an extremely weak signal, we could also hear that same signal. On-the-air comparisons revealed 10 meters relatively close in performance, and 15 and 20 meters slightly better on the big beam. However, the little Cushcraft was definitely holding its own.

We worked the antenna throughout Field Day, and we could work every station we heard, a sign of good design. We also tried it out informally on the 12 and 17 meter WARC bands, and again, every station we heard, we could work.

Directivity and front-to-back ratio were not nearly as sharp on the little Cushcraft beam when compared to the much larger beam. Sometimes the bigger beam could be rotated to cut QRM when turned approximately 45 degrees off the interfering station. On the little MA5B, swinging it around didn't seem to make much difference, although all stations agreed that when the beam was pointed in their general direction, the signal came up. In a way, this might be good, so no one misses any action coming in off the back or the side of the beam. In fact, we didn't even need to go out and "strong arm" the beam to work stations off to the side and the rear. I imagine our signal was not as strong, but nonetheless, we could still make the contact.

A Major Plus Discovered

For Field Day this lightweight beam played well on the mobile telescoping mast. It performed nearly as well as a 15 foot beam several hundred yards away, so our first impression of the Cushcraft MA5B was a positive one.

After Field Day one of our visually-impaired MESAC volunteers, Marvin Rohrs, KF6HVJ, asked to try out the beam on his rooftop on Balboa Island. At the time he was using a 5-band trap vertical and was plagued by nearby power-line noise. Would the little beam help squash the noise? This would be another good test.

Once again, the little Cushcraft was disassembled down to its basic elements. It was then driven down to Balboa Island, and in less than an hour, it was reassembled and mounted on a relatively lightweight TV reception mast. We planned to aim the beam due west to pick up Marvin's favorite stations on the Hawaiian OHANA net, and again we anticipated he would still have good performance which we could compare with his vertical to the east on the back of the little beam. We could quickly switch between the vertical and the beam for comparison signal reports.

We couldn't believe our ears! I used

The MA5B assembled, mounted to a telescoping flagpole mast, and ready to be raised and put on the air.

the MFJ SWR analyzer to double check that the coax was indeed plugged into the beam and to see that everything was hooked up properly. It was. *No power-line noise!*

The Hustler 5BTV with an extensive tuned ground radial system put in equal signal strengths to the little beam, but the MA5B was hearing loud and clear stations which on the vertical were absolutely buried in the power-line hash. In addition, the MA5B was actually closer to the offending power line than the vertical 30 feet away, and even pointed directly toward it. For several days we repeated the tests, and while the little beam didn't necessarily punch through with a stronger signal strength than the vertical, it could hear stations that the vertical would only yield as hash. The beam could also work stations on 12 and 17 meters that the vertical could not. The beam was easy to mount on the TV mast, but the vertical required a substantial base support plus radial systems, four per band, and four individual 20 meter radials extending out at 16 1/2 feet.

The beam could barely be seen from the street, mounted just 4 feet from the peak of the roof, yet the 15 foot vertical with its 40 meter capability stuck out like a sore thumb. As we said, the MA5B will not accept a 40 meter add-on kit, so we most likely will take down the vertical and use the first section of that vertical mast as the upper support for a simple 40 meter, no-trap dipole. Soon we probably will add a lightweight rotator to the Cushcraft beam, but quite frankly, it seems to play just about as well off the back as it does off the sides, even though the sales literature shows otherwise. We also found that the main lobe was so broad that we could work into the Alaska net just as well as the Hawaii net, and still get East Coast hams off the back. Certainly, the little miniature beam does not have near the directivity and side/rear rejection capabilities as the larger Cushcraft A3, but it's half the size and includes 12 and 17 meters with an SWR absolutely 1:1.1.

Best of all, the vertical noise floor of S7 on 20 meters drops to S2, yet stations coming in S9 on the vertical remain S9 or slightly higher on the beam.

Another good thing about the Cushcraft MA5B is how simple it is to put it together. There also was no need to fiddle around with radials or fine tune elements, as we needed to do with the original vertical. The Cushcraft miniature beam went up with no further adjustments necessary.

For hams who want to cut their noise floor dramatically, and who can use a 5-band antenna with a mere 8.8 foot turning radius in a spot on the roof or in the backyard, the Cushcraft MA5B may be just the antenna for you. Just be sure to wear protective glasses when assembling those X-hat rods, and get ready for good performance and a surprisingly low power-line noise floor.

List price of the MA5B is $430. For more information, contact Cushcraft Corporation, 48 Perimeter Road, Manchester, NH 03103 (phone 603-627-7877; fax 603-627-1764; e-mail: <sales@cushcraft.com>; on the web: <http://www.cushcraft.com>). ■

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FEATURES

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Many an old-time ham will recognize the name Leo Meyerson and associate him with World Radio Laboratories and Galaxy Electronics. But did you know he also produced the first ham radio kit and played a role in creating the magazine you're reading right now? Read on...

A* CQ *Exclusive Interview With:

Leo I. Meyerson, WØGFQ

BY DR. THEODORE J. (TED) COHEN,* N4XX

Born in Omaha, Nebraska on March 7, 1911, Leo Meyerson's interest is wireless was piqued by a classroom presentation he heard in 1920 on the subject of how radio communications were used during the Great War (World War I). Intrigued by this new technology, Leo and a friend, Harold Smith, built a one-tube (UV200) regenerative receiver just in time to hear Pittsburgh-based KDKA's first broadcast. It wasn't long after that, in 1924, that he built his first transmitter, which he used to broadcast music and news to his neighbors.

In 1928 Leo received his first amateur radio license, using the proceeds from his job as a theater organist to support his hobby. After a few years at the University of Nebraska, Leo borrowed $1000 from his father and started Wholesale Radio Laboratories (WRL) in Council Bluffs, Iowa. With the beginning of WW II, Leo and his friend Al Shideler formed another company, Scientific Radio Products, to provide crystals for the U.S. military. It wasn't until after the war that Leo again took up the reins at WRL, renaming the company World Radio Laboratories. From its headquarters at 742-744 Broadway in Council Bluffs, WRL turned out an impressive array of amateur transmitters, including the Globe Scout Models 40 and 680 and the Globe King 400 and 500.

In the early 1960s Leo formed Galaxy Electronics, which produced a line of single-sideband transceivers for the amateur community. This company was sold to Hy-Gain Antenna Company in 1969. Shortly thereafter, Leo's son, Larry, became president of WRL and Leo retired.

Leo I. Meyerson, WØGFQ.

Today, at age 90, although recently asked by his doctor to give up tennis because of a vertigo condition, Leo is actively involved in a variety of amateur radio activities, including the American Radio Relay League (ARRL) and the Quarter Century Wireless Association (QCWA). Until a few years ago, Leo and Helen, his wife of 68 years, divided their time between Omaha, Nebraska, and Cathedral City, California, where Leo often attended the meetings of the QCWA's Leo Meyerson Chapter in Palm Springs, California. Today he and Helen remain in Omaha throughout the year, enjoying the company of their children and grandchildren.

It is with great pleasure, then, that we present an exclusive CQ interview with Mr. Leo I. Meyerson, WØGFQ.—*W2VU*

CQ: Leo, tell us a little about the school presentation in 1920 and how it triggered your interest in radio?

Meyerson: I was nine years old at the time. My schoolteacher, Mrs. Mc Intosh, invited a friend who had served in WW I

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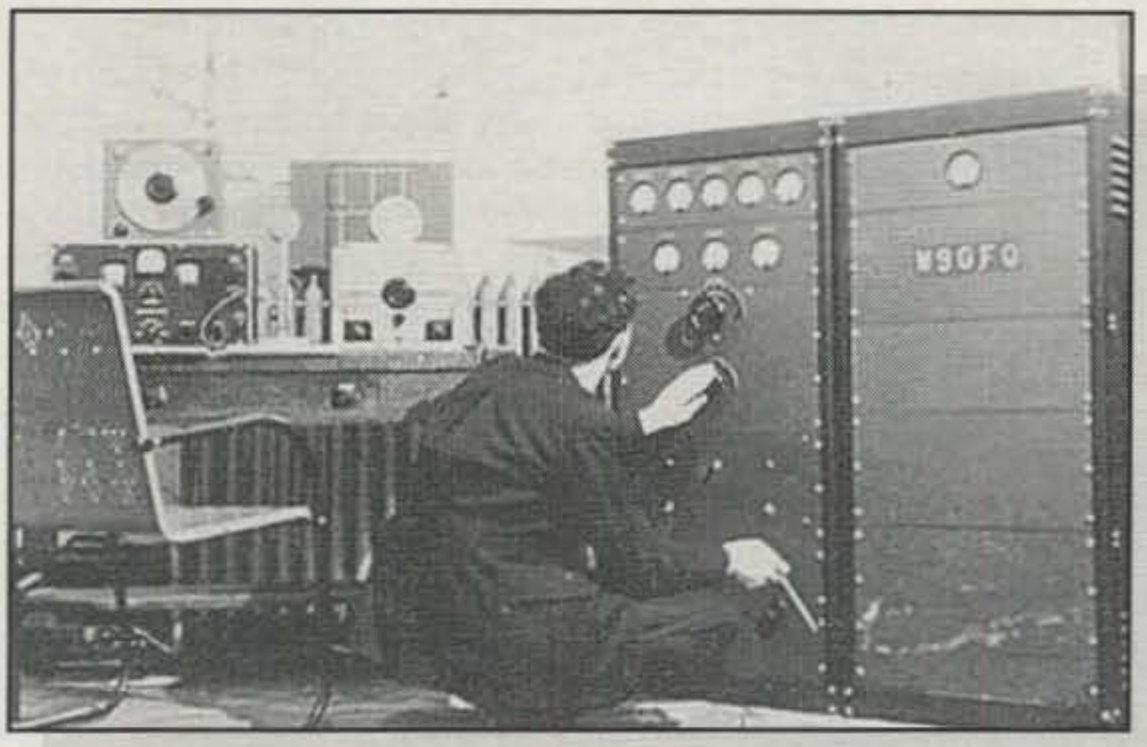


Leo Meyerson's early 1937 station included a Hammarlund HQ-120, Meissner Signal Shifter, and WRL custom-built, 500 watt transmitter. (Photo courtesy WØGFQ)

More than 800,000 of the WRL radio reference maps were distributed to amateurs worldwide. (Advertisement from The Radio Amateur's Handbook, *ARRL, 1944)* →

to tell us about how he had used radios during the Great War. I was intrigued. Afterwards, I even tried communicating with a friend using coffee cans and a string. Anyway, the man had mentioned that the Boy Scout's *Handbook for Boys* contained information on how to build radios and become a Morse code operator. It didn't take me long to get that book, believe me. In addition to the information on building radios and the Morse code, the book contained instructions on how to build crystal sets.

CQ: Did you eventually build a crystal set?

Meyerson: Yes. I knew it wouldn't be as good as the little one-tube radio my friend Harold Smith and I had built, but then I didn't have the money to buy a UV200 and the other parts I needed to build another regenerative set. So, I wound coils for a crystal set on oatmeal boxes and toilet-paper rolls. Using that little set I was able to pick up WAAW, the first broadcaster in Omaha, Nebraska. That was in 1922. About this time I found a copy of *White's Radio Log*, which listed stations all over the country. I was hooked! It wasn't long before I was picking up stations all over the country, including KFI in Los Angeles and KGO in Oakland, California.

CQ: You built your first transmitter in 1924, when you were only 13 years old. Where did you get the knowledge to do that?

Meyerson: Well, the "knowledge" came from an article in *Radio Digest*. The article, as I recall, contained detailed instructions on how to build a little transmitter using a 201A receiving tube. I can't remember how I got my hands on that tube, but I can tell you that my mother wasn't thrilled when I took her breadboard from the kitchen. My dad lent me the money I needed to purchase the other parts. Ted, I got on the air with that homemade transmitter three months before local broadcasting began in Council Bluffs, Iowa. I transmitted the first voice broadcast in the city in February 1924. From then on, nothing could stop me. I played the piano on the air, gave weather reports, aired news about the neighborhood, and even invited listeners to write to me. Once, I received a report from Crete, Nebraska, which was over 75 miles from our house. It all came to an abrupt end when two Federal agents came to the door one day and asked to see my transmitter and license. Of course, I didn't have a license, and that was the end of that!

CQ: You got your first radio license, W9GFQ, when you were 17 years old. What led you to take this step and how difficult was it to get your license?

Meyerson: This is interesting, because I had never heard of amateur radio before. After the government shut me down, I continued to listen to AM broadcasts. I built two more receivers, hoping to hear more distant stations. I also started experimenting with a Bremer Tully receiver by removing turns from one of the plug-in coils. This pushed the receiving range up in frequency, of course, to a little over 200 meters in wavelength. One night, in 1927, as I was listening just above the top of the AM broadcast band, I heard W9CHT in Missouri playing records on the air. I wrote him a letter and received a very nice reply, asking me when *I* was going to get on the air! That really piqued my interest, and then nothing could stop me. I scoured the town, looking for parts. Believe it or not, I found what I needed at Woolworth's five-and-dime and the local hardware stores. Remember, this was the 1920s. There were no radio outlets. A friend of my dad's, Victor Nelson, W9CCY—who, by the way, worked at the hardware store —took me under his wing, and together with

It was from these humble beginnings in Council Bluff, Iowa, that Leo Meyerson built WRL into one of the premier producers of amateur transmitters in the 1950s and '60s. (Photo courtesy W9WRL)

Glenn Imler, W9BTG, taught me the theory and code I needed to sit for my license.

CQ: So, armed with your newly minted ham license, you immediately got on the air.

Meyerson: Absolutely! My first transmitter was a keyed 80 meter Hartley oscillator. It used a 205A tube and a breadboard as a chassis. I tried using the code for a while, but most of the people I contacted seemed to send at speeds higher than I could read, so I built a phone rig for use on the 80, 160, and 200 meter bands. As time when on, and as I started to earn a little money playing organ in the silent-movie theaters, I was able to build a more powerful transmitter. One, I recall, used a 212D in a Heising system modulator and a pair of push-pull 302A's, each of which dissipated about 50 watts and cost $30. That was big money in those days!

CQ: Is it true that at one time you thought about a career as a musician?

Meyerson: Ted, I had *always* wanted to be a musician. Early on, I took to the piano and even learned to play the French horn. I had the ability to play by ear. As you know, I had been playing the organ in the Liberty Theater before the invention of talking pictures. This paid $15 per week, not a small bit of change in those days. I worked my way up to Head Organist while still in high school. With the advent of the "talkies" and the installation of a Vitaphone in the Liberty Theater, I was pretty much put out of a job. I graduated from high school soon thereafter and decided to attend the University of Nebraska. I took my radios with me and strung antennas from the trees outside the ZBT fraternity house. Given all the time I spent on the air, it's a wonder that I passed my classes.

CQ: You spent two years at the University of Nebraska, where you took a general course of studies. However, you left in 1930 to work in your father's grocery business. Why?

Meyerson: At college I met another fellow, Leo Skalowski, from Sioux City, Iowa, who played the piano quite well. Calling ourselves "Leo and Leo," we decided to enter a talent contest at the old Plaza Theater in Lincoln, Nebraska. We won hands down and returned to the stage four times for curtain calls. An agent in the audience thought that we were great, and he asked us to play for his boss. I showed up at the appointed time, but my partner didn't make it. He was killed in an automobile accident on the way to the audition.

CQ: You must have been devastated.

Meyerson: It was horrible. I was very depressed and felt like I just couldn't go on. I left the university in 1930. By that time, my father had started a small grocery chain, and I asked if I could try my hand at managing one of the stores. He agreed to let me try. A year or so later I met my future wife, Helen Wolinsky, from St. Joseph, Missouri. I gave her a Lafayette radio as a present and asked her dad to set the dial on a certain frequency every day at noon so that I could court her over the air! Boy, what you could get away with in those days. We eloped about 18 months later to save her parents from having to pay for a wedding. That was on March 29, 1933.

Now, getting back to the store I was managing, my dad had signed a lease on the establishment after the owners had failed to make a "go" of the business. I turned the business around and made it a going concern. Unfortunately, our lease didn't include a renewal clause, and when the owners of the building saw how successful the business had become, they decided to take it over again. Since we couldn't renew the lease, I was out of a job. But now I had a wife to think about.

CQ: So you took a big leap in 1935, and with $1000 from your dad, you started Wholesale Radio Laboratories, or WRL, as it was better known. Given that the Depression was slowly winding down and the war clouds were beginning to form in Europe, that was a risky thing to do for someone in their mid-20s, wasn't it?

Meyerson: Well, it's funny how things work out sometimes. I had always wanted to run my own business, and after we lost the lease on the grocery store, I told my dad that I wanted to get into the wholesale radio business. He said he would give me $1000 to go into that business, but I had to promise him that if I failed, I would return to work for him. We even shook hands on it. What made me want to go into the radio business was the fact that I had been building radios for many years, and I noticed how difficult it was to obtain the parts I needed for some of the more complex sets I was constructing. Other hams I knew were having the same problem. I thought that starting a business to design, fabricate, and market radio parts would work out well. That's when I started WRL. Good thing it worked out, or my family would still be in the grocery business today!

CQ: Tell us about those early years in the radio business. It couldn't have been easy.

Meyerson: No, it wasn't. To get the parts I needed for the new store, I had to travel to Chicago. There I bought up everything I could find at reasonable prices on what, then, was known as "Radio Row." I also tried to carry some of the more popular brands of tubes and parts—things such as RCA tubes and

Eveready batteries—but the other dealers in the area, primarily those in Omaha, prevented me from doing this. After a while, things finally started to ease up. I befriended a manufacturer's representative by the name of Jack Heiman, and through him and the credit extensions he arranged I finally was able to get some quality product lines. We published our first catalog in 1940 and business took off.

CQ: We should stop for a moment and talk about one of the items that put WRL "on the map," so to speak. I am talking, of course, about the famous WRL map of the United States.

Meyerson: The large, three-color map originally was the idea of a man in Rockport, Missouri. He wanted to sell a map showing the U.S. call areas and the callsigns of all U.S. amateurs at the time. That just wasn't practical, of course, because of the rapid growth in our hobby, and he finally realized that. Anyway, I traded him a receiver for the printing plates, took them to my printer, had the callsigns removed, refined the map, and had a large quantity printed. We first advertised the new map in January 1940 *QST*. The map was offered free to any customer who sent us 15 cents to cover postage. Over the years, we gave away over 800,000 maps. General "Butch" Griswold, KØDWC, of the Strategic Air Command, even posted one on the wall of the SAC operational center at Harmon AFB, Newfoundland.

CQ: From the material I was able to gather in preparing for this interview, it's my understanding that WRL produced and sold the first amateur transmitter kit ever marketed in the U.S. Is that true?

Meyerson: Yes. A fellow came to me in 1936 and wished that someone would produce such a kit. I realized immediately that the market for such an item was there, and set about developing the kit. I designed the transmitter myself. It consisted of a crystal-controlled, metal 6L6 oscillator and a pair of 6L6G output tubes running 70 watts input. The power supply used a type 83 tube. Because of its input power, I named the transmitter the "WRL-70." I then designed a matching WRL-70 Speech Amplified Modulator, which also used 6L6Gs. We sold roughly 200 of these little transmitters. Later, in 1939, I designed a 150 watt rig and speech amplifier-modulator kit, which we advertised in the November 1940 issue of *QST*. These transmitters were the forerunners of the line of WRL transmitters that would become so popular after the war.

CQ: With the outbreak of war in December 1941, you obviously were forced to scale back WRL's business between 1942 and 1945.

Meyerson: Business dropped off almost immediately after the bombing of Pearl Harbor. On December 7, 1941 amateurs were told to take down their antennas, box up their equipment, and have it ready for the government to pick up. No one could get on the air, and any and all electronic components that were available were needed for the war effort. We produced a few items for sale to communicators and experimenters, such as a slide-rule device for picking tube substitutions, but you couldn't make a living anymore in the wholesale electronics business.

CQ: What did you do?

Meyerson: There was a tremendous need for crystals during the war, so I contacted Al Shideler, W9IFI, who I knew had a large, homemade gravity saw for cutting quartz. Through the Army, we were told to contact the Galvin Manufacturing Company *(later changed to Motorola—ed.)*. To test our manufacturing capabilities, they asked us to produce crystals for five different frequencies, which we did. Then we took the Zephyr to Chicago and gave them the crystals. It took them 4 hours to test our samples, but we made the grade and received a contract for 80,000 crystals. It was the first order for the new company that we soon named Scientific Radio Products. We ended up producing between 30,000 and 40,000 crystals every month during the war, both for Galvin and Hallicrafters. As a result of our work, we received the Army-Navy "E" Award for the efficiency with which we were able to produce crystals. Our grinding process, which eventually was copied by every company in the industry, reduced the labor required to produce a batch of crystals by 12 man hours per day.

CQ: With the war over, and the demand for crystals falling rapidly, you again were able to focus on WRL. What did you do at this point?

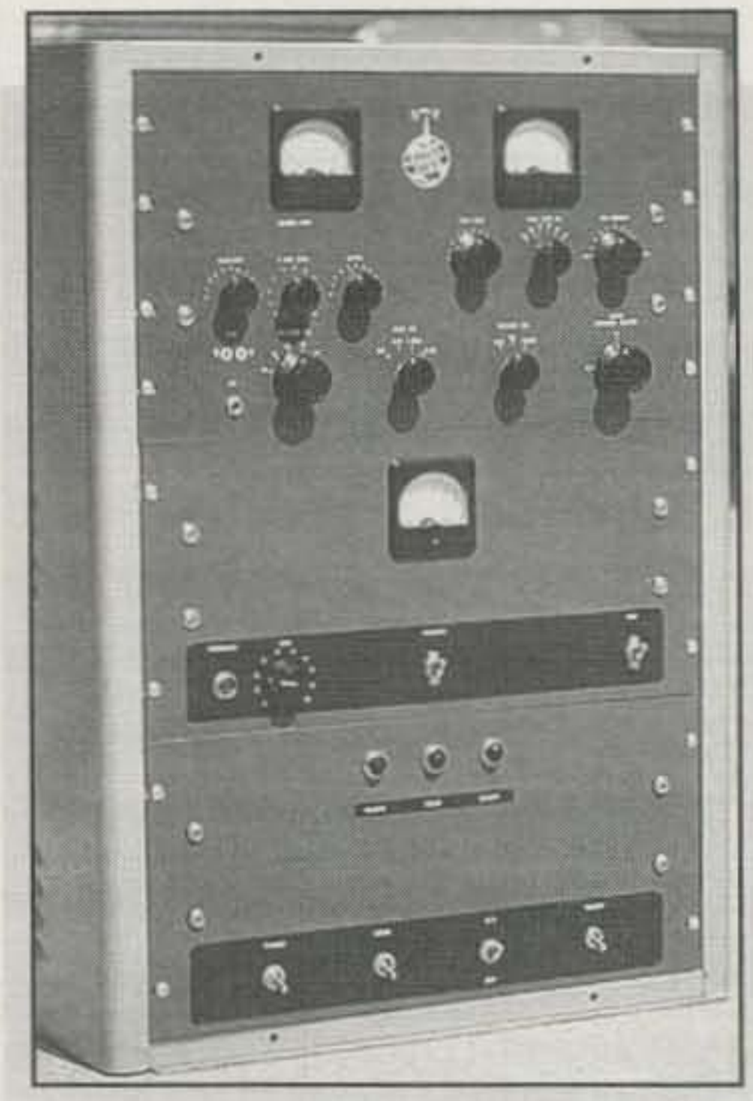
Meyerson: Once the war was over, amateurs returned to the air with a vengeance. Some even got on the various bands before the government opened them, but no one complained. Most amateurs had sold their pre-war equipment to the government or had donated it to the war effort, so they had to again start from scratch. True, a lot of military surplus equipment was available, and hams were quick to avail themselves of this source for parts and equipment. WRL, in fact, bought up a lot of surplus equipment, including BC-348 receivers for $5 apiece! We also bought BC-610 transmitters—you know, the kind as big as an industrial safe. These were Hallicrafters HT-4 transmitters. We bought them for $100 to $150 each, and were able to sell the units as fast as we could get them. Did they ever punch their way through the QRM! By the way, we sold a lot of these transmitters to businesses overseas, too, and in 1946 I decided to change the name of the corporation to World Radio Laboratories to better reflect the international nature of our business. But it was still the same old WRL to our amateur customers.

CQ: But not everyone could afford these big war surplus transmitters.

Meyerson: You're right; there was a real need for new, low-cost amateur transmitters. And while most hams built their own transmitters before the war, their increasing use of commercially manufactured receivers whetted their appetite for something a little more professional looking. Fortunately, as we were beginning to develop a new WRL transmitter, Ted McElroy, the Morse speed demon, abandoned his plan to build a small, 25 watt AM/CW transmitter. Fred Davis, one of my employees, and I quickly negotiated a deal with Ted and ended up buying enough parts to build 1500 transmitters. The little transmitter ran an 807 in the final with Heising modulation produced by a pair of 6Y6's. The unit even contained a bandswitch for the three coil forms that could be plugged into the set. We made a few changes here and there, and then released the transmitter in 1946 as the Globe Trotter.

CQ: By the 1950s you had quite a lineup of amateur transmitters on the market, didn't you?! How were these received in the marketplace?

Meyerson: After developing the Globe Trotter, we went to work on the first Globe King, a 200 watt transmitter we called the WRL-275. Next came the 150 watt Globe Champion, which was a scaled-down WRL-275. This was followed by the Globe King model 400. Introduced in 1949, the "400" ran 400 watts on CW and 350 watts on phone. Later, in late 1950, we introduced the Globe King 400A, which was rated at 425 watts CW and 400 watts phone. All of our Globe transmitters, by the way, were available wired or as kits. We continued to expand our product line throughout the 1950s, introducing the Globe King 500A, B, and C models, all of which ran 500 watts or more on CW *and* phone; the Globe Champion, a 175 watt unit when first introduced; the Globe Champion 300A; the CW7 for Novices; a wide variety of Globe Scouts; the Globe Chief 90A; a linear amplifier, the LA-1; and several other transmitters, too numerous to mention.



The Globe King 500 was considered one of WRL's finest AM/CW transmitters. (Photo courtesy WA5CMI)

With the exception of the CW7, all of our transmitters were very popular. In fact, we sold more than 50,000 Globe Scouts and almost 29,000 Globe Kings during our heyday. Believe it or not, some Globe Kings were used as AM broadcast transmitters in Central and South America, where they ran continuously for 16 hours a day, 7 days a week. I understand that even today, you still will find Globe Kings in use in some countries. These transmitters had—and still have—outstanding audio. Some AM operators say that they can recognize the audio of a Globe King just by listening to its signal. I enjoy hearing that.

CQ: Then along came "sideband."

Meyerson: Yes. Many of your readers would be surprised to know that SSB has been used on the ham bands since 1947, when Professor Oswald G. Villard, Jr., W6QYT, put W6YX, the Stanford University club station, on the air with SSB late in 1947! WRL had a prototype SSB transmitter on the bench

near the end of 1953, but we lost it in a major fire that destroyed our laboratory and manufacturing facilities in January 1954. I thought about continuing the development of an SSB transmitter, but was dissuaded by the SSB-AM feud that was intensifying by the minute. I finally put our plans aside, although I did purchase a Central Electronics 20A exciter in 1954 and used it to drive the RF amplifier of a Globe King.

CQ: But you eventually *did* address the SSB market, didn't you?

Meyerson: Yes, although a bit later than we should have. In the early 1960s I discussed the possibility of producing an SSB transceiver with Ed Schulman, a good friend of mine. It seemed like a good idea, so in 1962 I formed Galaxy Electronics. I hired Marvin Gehr, who had worked on the Collins Radio KWM-2 team, and another engineer, Clarence Huntley. Together we developed the concept for the WRL-300. The concept moved from the drawing board to production in record time, and pretty soon we had a beautiful, gold-anodized 300 watt SSB transceiver on the market for 80, 40, and 20 meters. This was 1963, near the bottom of the sunspot cycle, so we didn't include provisions for 15 and 10 meters.

A few months after introducing the WRL-300, we brought out a 2 kW amplifier, the Atlas, which used a pair of 5762B's in a grounded-grid circuit. Other transceivers and amplifiers followed, including the Galaxy III, IV, V, and GT-550. We also designed and manufactured mobile transceivers, notably the WRL Duo-Bander 84, which was very popular. But competition was killing us, especially from the Japanese. Although Regency approached us about buying Galaxy Electronics because they wanted to add a line of amateur equipment to their business, Andy Andros, WØLTE, of Hy-Gain Communications, persuaded me to sell the company to him, which I did in 1970. However, I spun off WRL as a separate consumer electronics company—to sell, for example, hi fi equipment—with my son, Larry, as president. I continued as Chairman of the Board. WRL was sold in 1988 to several of our top employees, and I finally retired from the business.

CQ: This interview, of course, is being published in *CQ* magazine. I understand that you played a role in the creation of the magazine. Tell us a little about that.

Meyerson: When Sandy Cowan and John Potts bought *Radio* magazine, they

moved it from the West Coast to New York. They wanted to create an engineering magazine. I encouraged Sandy and John to focus on amateur radio, as did others, including Robert York Chapman, W1QV. I was so convinced that the time was right for a publication such as *CQ* that I supported their new magazine with WRL advertising dollars. The rest, as they say, is history.

CQ: You semi-retired from the radio manufacturing business in 1970, after selling Galaxy Electronics to Hy-Gain. What did you do with your time?

Meyerson: I was busier than I was in the '50s and '60s! Of course, I devoted some of my time to public service. I worked with the Red Cross, YMCA, Kiwanis, The United Way of the Midlands-Council Bluffs area, Council Bluffs Chamber of Commerce, Mercy Hospital, the Opera Society Board, Mid-America Boy Scouts, among others, and I am an Honorary Citizen of Boys Town. I took up tennis in 1977, just to keep up with my wife! I also took an interest in the Quarter Century Wireless Association, or QCWA. In fact, I'm a life member of QCWA, am considered the "father" of its scholarship program, which I started in 1977, and served as its National Director from 1977 to 1987. They even named the Greater Palm Springs Area QCWA Chapter, Chapter 154, the Leo Meyerson Chapter. And always, I maintained a keen interest in amateur radio. I'll bet that over the years I have attended more than 500 ham conventions in all parts of the country.

CQ: You were elected a Fellow of the Radio Club of America in 1980. In addition, you were elected QCWA Amateur of the Year in 1991, inducted into the QCWA Hall of Fame in 1994, and selected as the 1997 Dayton Hamvention Amateur of the Year. These are quite high honors!

Meyerson: Ted, there's no greater honor than to be recognized by one's peers. I was indeed humbled by these expressions of appreciation.

CQ: As we draw this interview to a close, what do you consider to be your most significant contributions to amateur radio…the kinds of things for which you want to be remembered by generations to come?

Meyerson: That's a tough one. It's true that I've accomplished a lot in my lifetime, but I couldn't have done it without the love of my wife and family, the friendship of countless men and woman with whom I worked over the years, and frankly, a bit of luck. I guess I would just be happy to be remembered as *that guy* from Council Bluffs, Iowa, who helped bring the excitement and challenges of amateur radio to countless thousands of hams around the world.

CQ: Leo, on behalf of *CQ* and its readers, thank you for taking the time to share a remarkable lifetime of achievements in, and contributions to, the amateur service.

Meyerson: The pleasure's been all mine, Ted.

The author thanks Mike Cowart, WA5CMI, Jim Mayfield, W9WRL, Charles Milazzo, KP4MD, Barry Wiseman, N6CSW, editor and publisher of Electric Radio (14643 County Road G, Cortez, CO 81321), and the QCWA for photos and information used in preparing this interview. For more information on World Radio Laboratories (WRL) and its founder, Leo Meyerson, WØGFQ, you are invited to visit the following internet sites:

http://home.att.net/~wa5cmi/
http://www.w9wrl.com/wrl/index.html
http://www.qsl.net/kp4md/
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Here's an all-band, no-tune, no-trap antenna based on moving the feedpoint (with the flick of a switch) to achieve a perfect match on every band.

The Motorized Clothesline Antenna
An Impedance-Tuned Antenna System

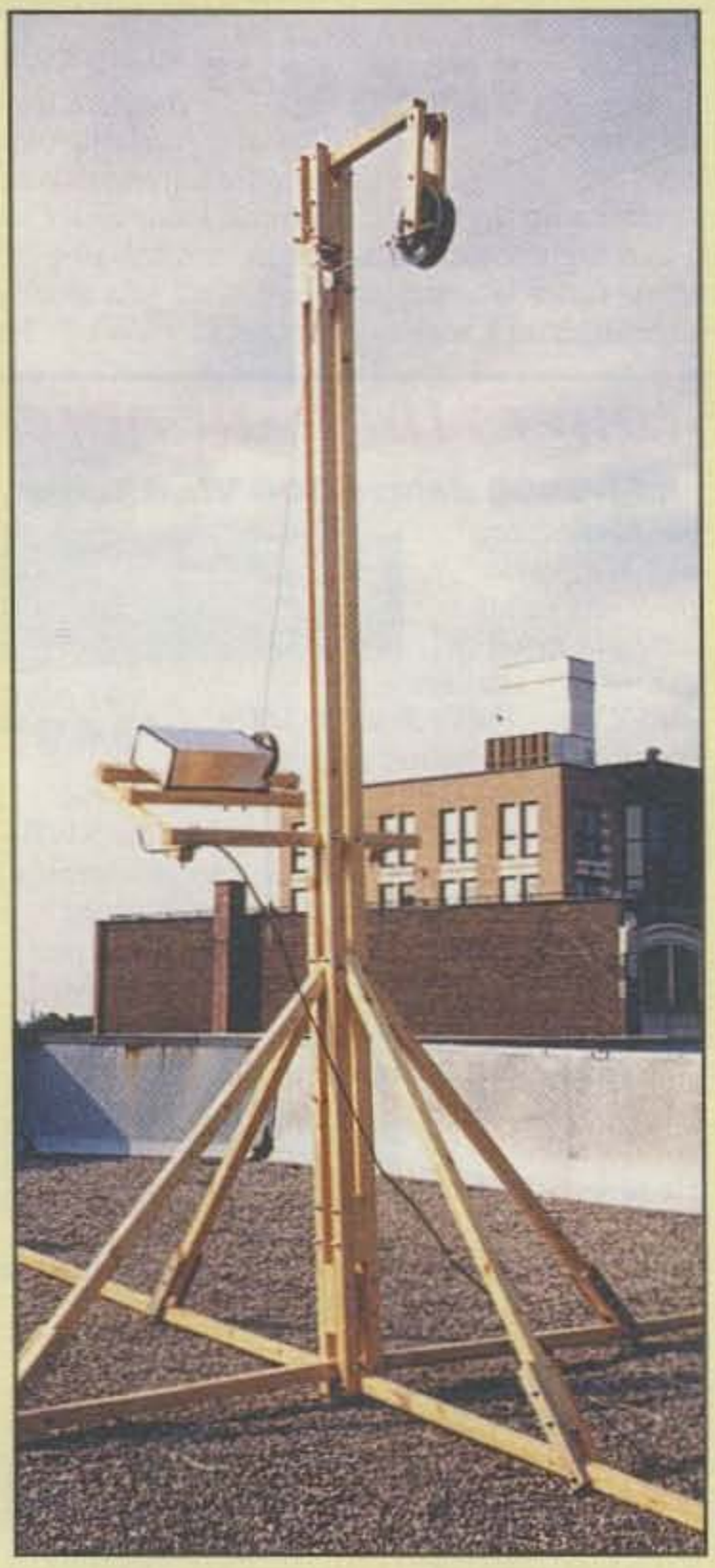
BY ROBERT VICTOR,* VA2ERY

Remember Archimedes? He was the guy who jumped up out of his bath and went running down the hallway soaking wet yelling "Eureka!" That did not mean "Where are all the bloody towels?" but rather, "I've found it!" What he'd discovered while slipping into his bath was a way to measure the volume of an object by dunking it into a tank of water, leading to the concept of specific gravity we still use today.

Archy discovered a bunch of other stuff, too: pi, the screw, and the inclined plane, to name a few. When he wasn't busy practicing science with rubber duckies, he was a philosopher and is quoted as having once said, "Give me a spot on which to stand, and I can move the entire Earth."

This brings me to impedance-tuned antenna systems, and more specifically, the Clothesline. The Clothesline is an all-band, no-tuner, no-trap, no-loading-coil HF antenna that can cost as little as twenty bucks or so to put up and will outperform almost any other multiband dipole you can name.

I developed it by finding a different angle, a different "spot" to stand on, if you will, that allowed me to see a new approach to a conventional concern: how we match an antenna to a feedline. Here's the low-down on impedance tuning and more specifically, the Clothesline antenna.



Mini-tower and drive unit at one end of the motorized clothesline antenna. The unit is self-supporting on the author's roof. (Photos by the author)

Impedance Tuning

Look at the diagram (A) in fig. 1. It shows a half-wave of radio energy distributed along a length of wire cut for a half-wave at that frequency. If this wire were 132 feet long, we would say the antenna is resonant on 80 meters. Why resonant? Because if we impose a signal of 3.5 MHz on this antenna, we wind up with the maximum voltage points at the ends. This will be the case for any resonant dipole; the voltage will be at a maximum at the free ends.

The impedance at any point along an antenna is the ratio of voltage to current at that point. At our feedpoint, in the middle, the voltage is lowest and the current is highest, so that's our point of minimum impedance—about 50 ohms in this case. (Actually, the nominal feedpoint impedance of a dipole is 72 ohms, but let's just call it 50 ohms for the sake of this discussion.)

Now look at (B) in fig. 1. Here we have the same piece of wire, only now we have voltage curves shown for not only the base frequency, but for a couple of harmonics as well. Let's say the base frequency is 80 meters and the harmonics are 40 and 20 meters. You can see that the voltage peaks for the base frequency are at the ends as before, and the minimum is still in the middle. Voltage peaks for the harmonics are also at the ends (because they're harmonics), but the minimums, which identify the 50 ohm feedpoints, are all over the place.

To run an antenna like this on more than one frequency, we have three choices: (1) live with the mismatches at different frequencies (such as by using a tuner); (2) adjust the feedline to match the different impedances at each frequency (by using multiple feedlines for instance); or (3) physically move the feedline to the right 50 ohm impedance-matching point for each frequency.

An impedance-tuned system allows you to match your feedline to your antenna by adjusting the feedline to match the antenna feedpoint. The Clothesline antenna lets you do this by using the third choice above—moving the feedline to any point you wish along the antenna.

The Clothesline

The Clothesline is a folded dipole with the ends run over pulleys. A folded dipole operates just like a conventional dipole in terms of length vs. frequency, but has a 300 ohm impedance when fed in the middle. It has some advantages over a regular dipole: It has a lower angle of radiation and it's much quieter

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e-mail: <lebloke@attcanada.ca>
†"The Clothesline Antenna," QST, July 1998, p. 56.

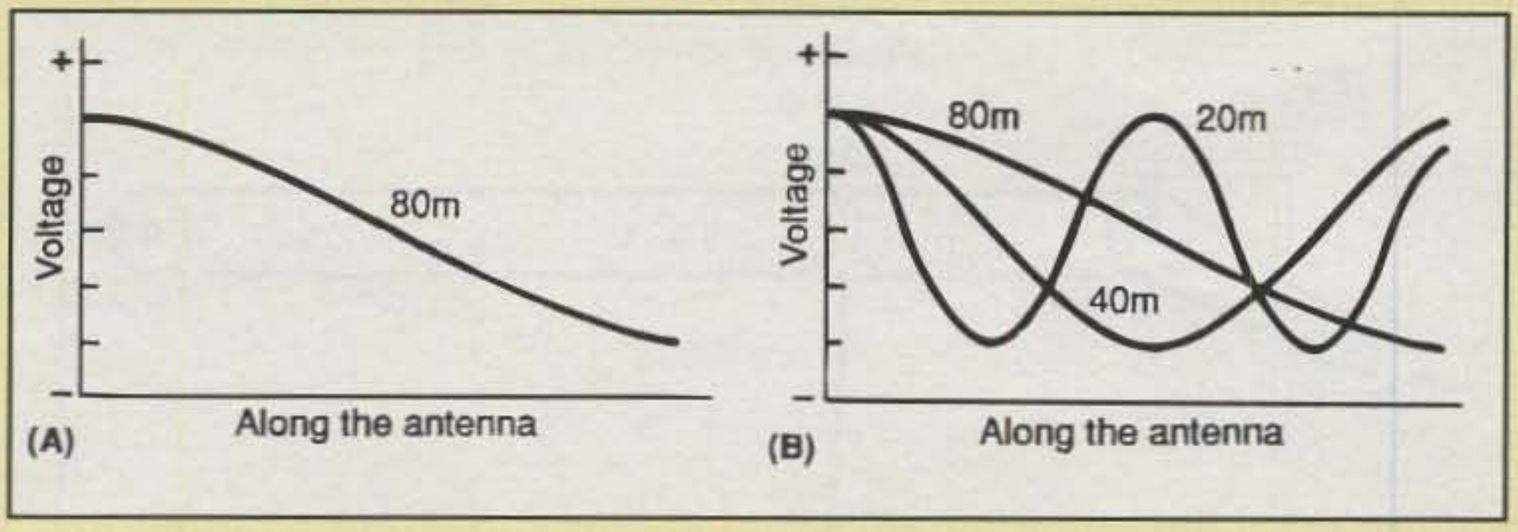


Fig. 1– (A) This graph shows the voltage distribution of an 80 meter signal on a 132 foot wire antenna. Note that the positive and negative peaks coincide with the ends of the antenna. Normally we would feed this antenna right in the middle, where the curve crosses zero. (B) Here's the same antenna with signals for 40 and 20 meters added. There are voltage peaks at the ends for each band—the antenna resonates—but the zero crossing points for 40 and 20 are nowhere near the middle.

The motor frame (lower right in photo) is hinged to permit tensioning of the drive belt. Tension is set by either shortening or lengthening the counterbalance lanyard.

on receive, both great for DX. The Clothesline uses these to advantage and more. Since we actually have a proper match on the base band and all harmonics, we have a perfect match at all times and so can dispense with the tuner or traps and the associated losses that would otherwise be the case for most multiband dipoles.

The one disadvantage of the Clothesline (and hence the motivation to create a remote drive) is that you have to go to the antenna to tune it. Since I invented the Clothesline and first described it a couple of years ago in *QST*†, I've received feedback from hundreds of hams who use it as their main antenna and don't find this a concern. It is true also that you can get one up in the air like this for about twenty dollars and get better performance than any other multiband dipole will give you, so your bang-for-the-buck is tremendous. (If you're planning on putting up *any* dipole, you should consider a Clothesline. It will only cost a couple of dollars more and open up all the other bands for the price of a yank on the feedline. Note, too, "all the other bands" includes any harmonic of 160, 80, or 40 meters, which includes 6 and 2 meters!) However, I think I felt a responsibility as the antenna's inventor: I just had to try a motor drive...

Driven to a Motor Drive

Much of what is described here applies to a non-motor-driven Clothesline, so I recommend you read this even if you're going to put up a manual version. Also keep in mind that I mention 40 meters as my base band, but you can put up one for 80 or even 160, if you have the space. If you decide to put up a motorized Clothesline, or already have one up that you want to drive remotely, you'll have some decisions to make. Here are some of the items I dealt with in executing my own installation, and the results of my experiments.

I'd already observed that the antenna seemed to peak on receive when properly adjusted for a particular band. I figured a remote drive might allow me to listen for that peak when tuning and help me position the antenna. This meant the drive had to be electrically quiet. I felt that getting a DC motor to run without generating an earful of hash would be tough, but on the other hand, an outdoor AC motor poses safety concerns and is frequently ruled out by electrical or building codes.

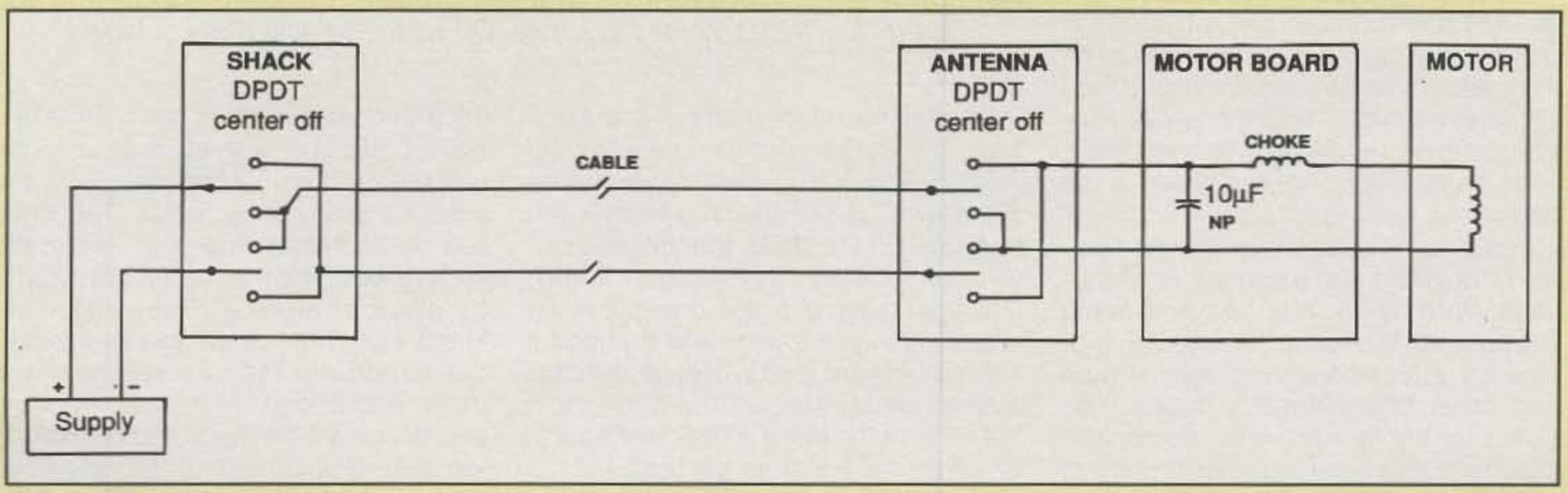


Fig. 2– Schematic of the control circuit for the motorized Clothesline antenna, providing control from either the ham shack or the antenna itself.

I thought I would need lots of torque to overcome the resistance of the pulleys and wire to shuttling in and out; my experience with the hand-driven version told me that the weight of the feedline and consequent tension on the antenna might need a little oomph to overcome. Finally, reversibility was also required.

It looked like a DC gearmotor was going to be the practical choice. They are reversible, can be had with almost any amount of torque, and have the advantage that they are built with standard-size output shafts, a consideration when shopping for pulleys and drivebelts. I'd just have to deal with the hash as best I could. I bought a new gearmotor from Dayton Gearmotors. The unit I selected offered 50 inch-pounds of torque at 28 rpm, giving me about a half-foot per second of wire travel at the pulley, which sounded just about right.

The easy way to control this motor is to use a center-off, double-pole, double-throw (DPDT) switch right in the shack, which I did. However, as I also wanted to be able to run the motor while I was right at the antenna up on the roof, I added a second switch there. The schematic (fig. 2) was the result.

This setup is simple and achieves both local and remote control. Having motor control locally on the roof made adjustment of the antenna and feed setup a breeze. When was the last time you threw a switch and the feedpoint came to you?

Construction

My apartment rooftop had no really convenient attachment points for the antenna or drive unit, so I wound up building the mast you see in the photos. It was constructed to address a few different concerns. There's lots of wind up on my apartment roof, so a free standing structure (as this had to be) needed a wide base to stay vertical. The roof itself isn't designed for any significant freestanding loads, so weight was minimized, and the long foot-pads float the whole shebang and distribute the pressure over a wide area, which I figured would avoid any stress leading to leaks.

I mounted the antenna drive-end pulley on a swing arm using a stock hardware-store hinge to permit tensioning the antenna to take up slack and to provide for counterbalancing against wind and other miscellaneous forces. The pulley for the far end went into another mounting, this one hinged to permit it to swing from side to side as well as up and down, so it would align itself automatically with the antenna.

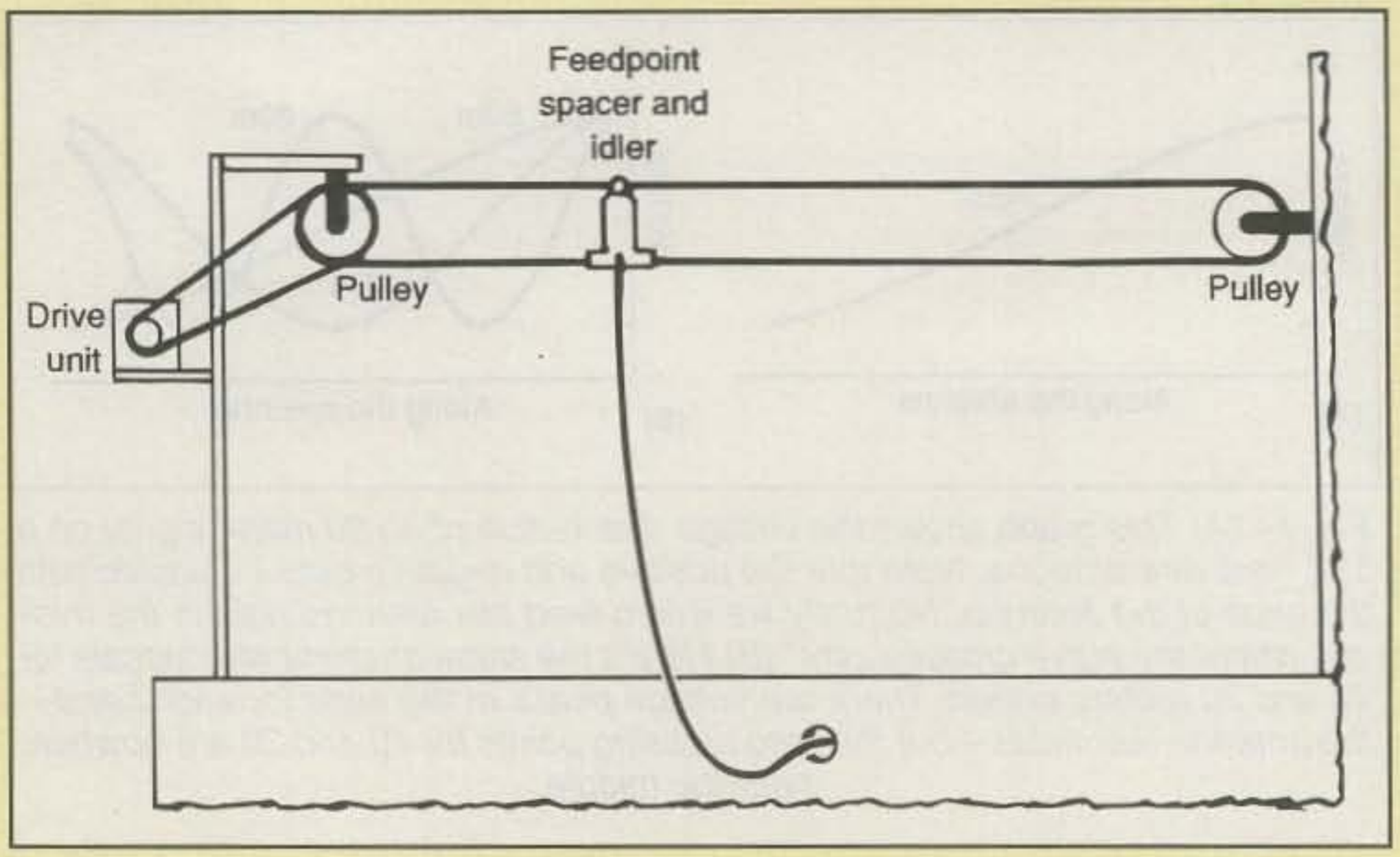
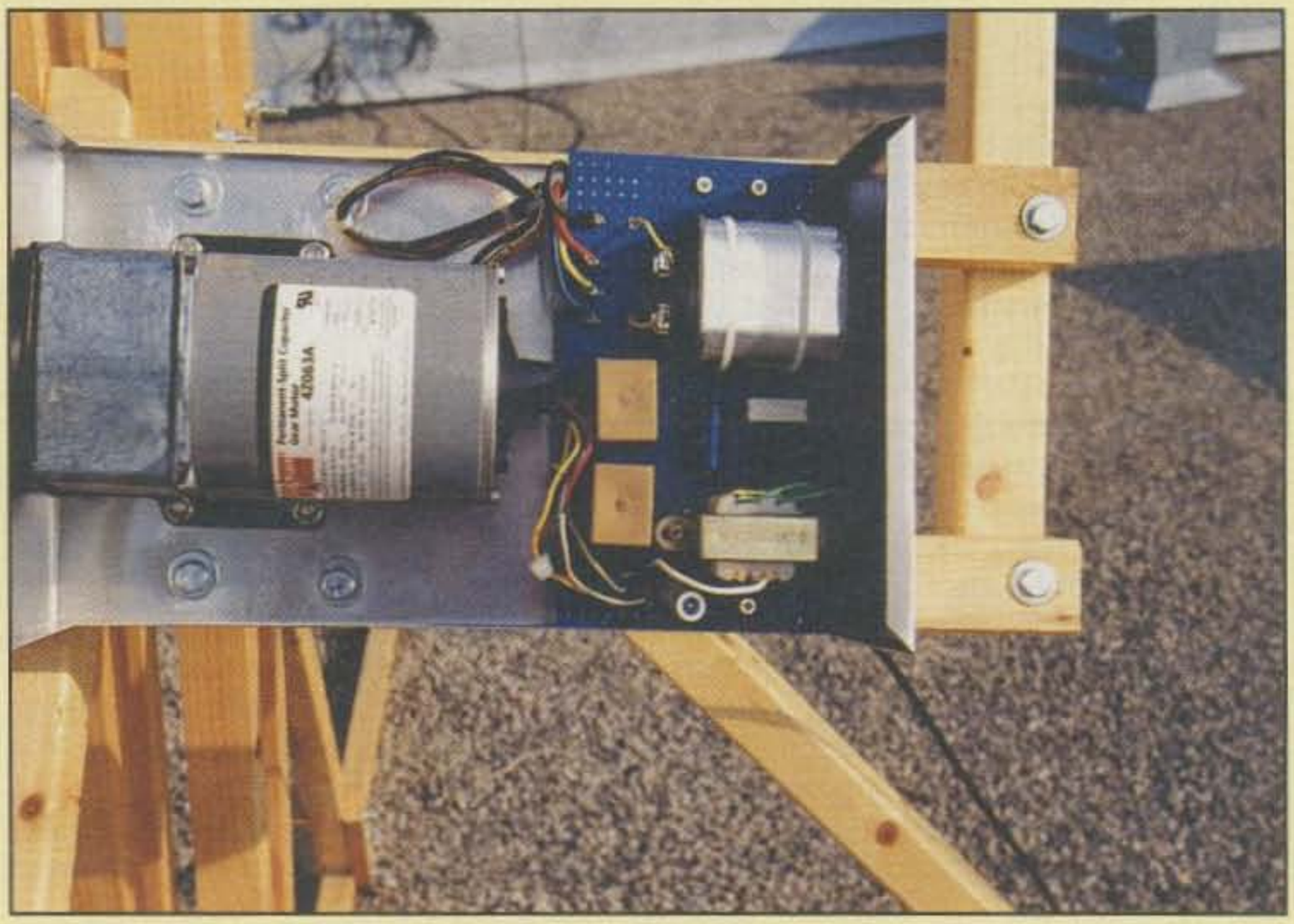


Fig. 3– Drawing of the motorized Clothesline antenna showing connections of motor and feedline. The feedline must be long enough to reach from one end of the clothesline to the other.



Here's where the work gets done! The author used a borrowed AC motor for the prototype, then switched to a safer DC motor for actual use outdoors.

I strung the antenna wire over the pulleys, and here's something you'll want to know about. You want to get any residual twist out of the wire before you hang it up. If you don't, the antenna can wind itself up like a two-element Slinky! One ham told me he tied one end of the wire to his lawn tractor and dragged it around his yard for a while; he said this worked great. Another (me) hung it in hunks over the edge of the building and shook it until his arms got tired.

I chose to mount the motor on a swinging frame bolted to the mast about four feet directly under the antenna drive-end pulley. I then ran a drive belt fashioned out of high-strength monofilament from the motor pulley up to the antenna pulley (see fig. 3). The drive belt and antenna wire both ride in the same groove in the antenna pulley; a little playing with the motor alignment keeps them from contacting each other.

It turned out that the weight of the motor and enclosure served well as a counterweight for the antenna, making for easy adjustment of the drive-belt tension. As you can see in the photo, the counterweight line is attached to the motor frame. Simply lengthening or

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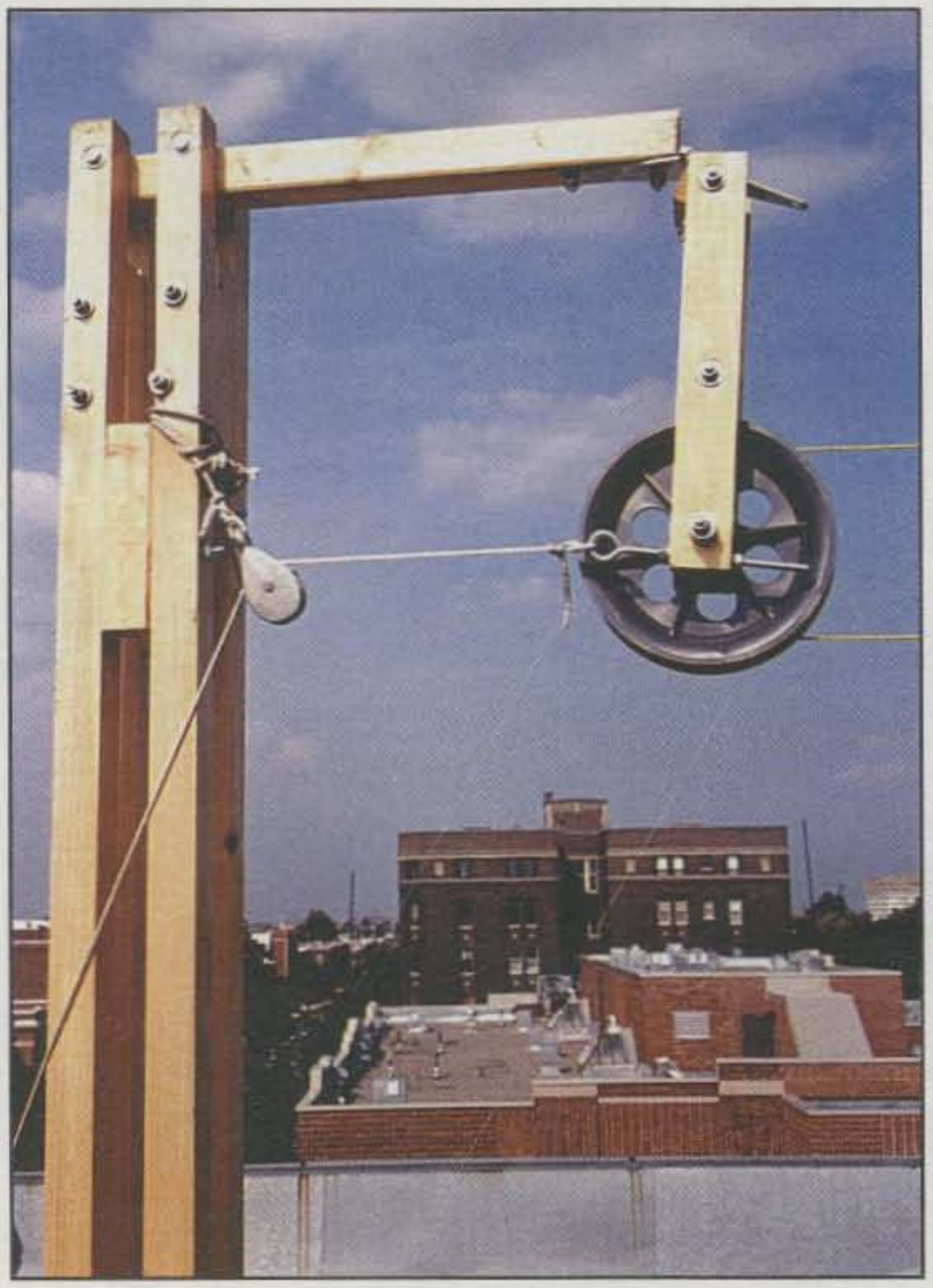
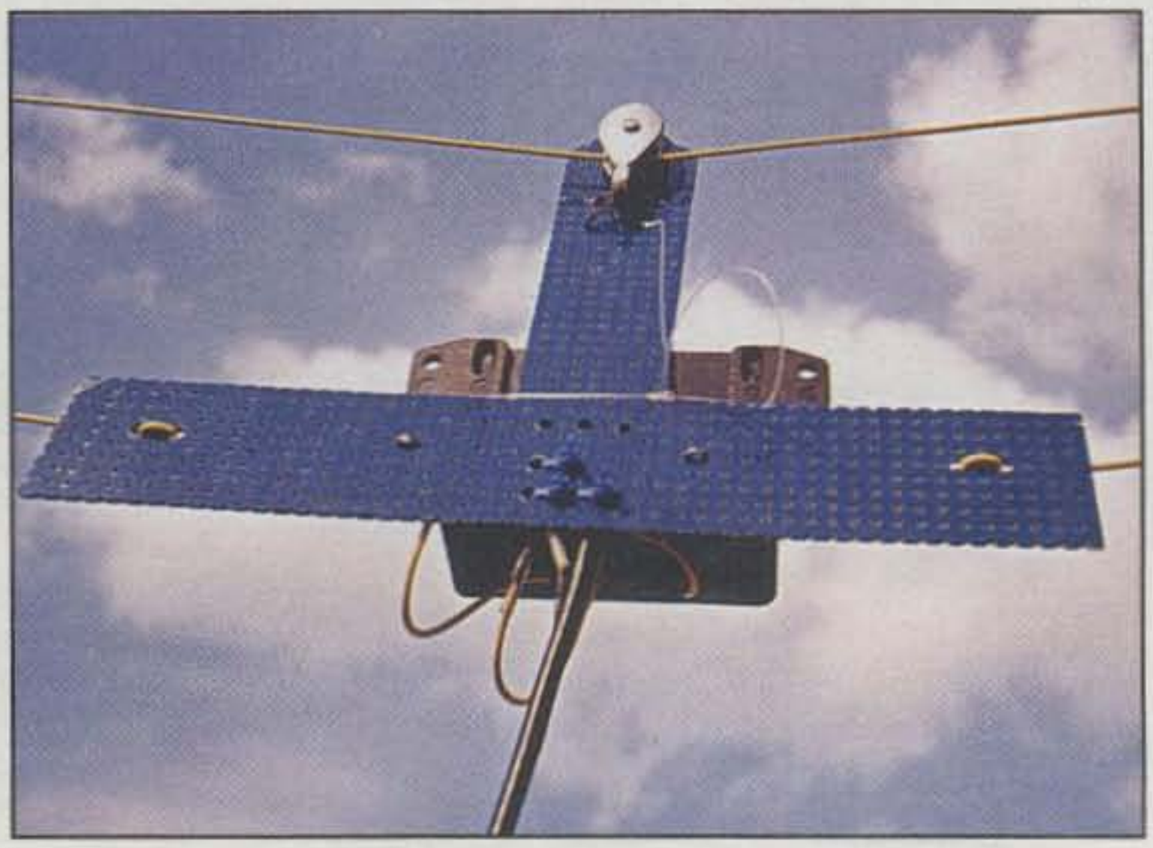


← *The drive end pulley is mounted on a swing arm. This allows tensioning of the antenna and provides a counterweight to take up slack.*

Detail of the center insulator and balun. Note that the upper section is fitted with a pulley through which the upper wire runs. This helps distribute the weight of the feedline evenly and maintains a set separation between the sections. ↓



shortening this line sets the drive tension, after which it remains relatively constant even as the motor swings up and down due to wind forces on the antenna. If needed for proper antenna tension, additional weight can be hung from the frame.

I recommend this setup, or something similar, no matter how or where you mount your own Clothesline. You're going to need some way of establishing and maintaining drive-belt tension and antenna tension, and you need to do so in a fashion such that changes in one don't affect the other. An alternative is to put the swing-arm pulley and counterweight on the far end of the antenna, while establishing drive tension to a fixed pulley at the near end.

Center Insulator and Feed-Point Attachment

The center insulator you see carries an idler pulley that rides along the top run, spaced vertically from the antenna wire tie-offs to match the diameter of the end pulleys. This spreads the weight of the insulator, balun, and feedline equally between the top and bottom runs. Because tension is constant throughout the loop, the weight is shared perfectly, and the antenna runs remain perfectly parallel, even at low tension, no matter the position or motion of the feedpoint. This is important to conserve the folded dipole shape. If you don't do this, the runs will flop around and therefore your match will vary.

Once the whole shebang was up in the air and the motor was ready to run, I made an interesting discovery. With ball-bearing pulleys and the feedline support system, the antenna, even under high tension, rolls like a breeze. A motor with a quarter the power of mine would have driven the system with ease.

The balun you see in the photos is a home-wound 6:1 and matches the 50 ohm coax to the feedpoint impedance of around 300 ohms. Here you can get away with a more common 4:1 balun, but make or buy a 6:1 if you can as it will do a somewhat better job. If you use a 4:1, consider using 75 ohm coax as feedline for a better overall match.

Operating with the Clothesline

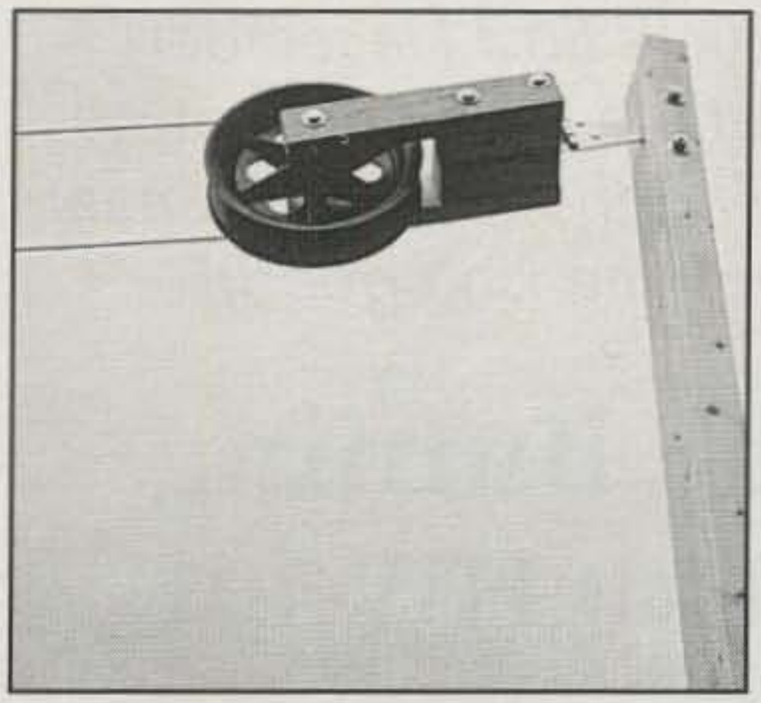
There's a word that describes operating a motorized Clothesline—*Fun!*

My first experiments involved that oh-so-desirable quality of being able to peak the antenna on receive, and sure enough this works 100%. Throwing the switch to reel the antenna this way and that, while listening to either signals or noise, produces a smooth, reliable slope and peak of activity in the phones. Hit the peak and you're tuned! I checked this over and over on all bands, and it works like a charm.

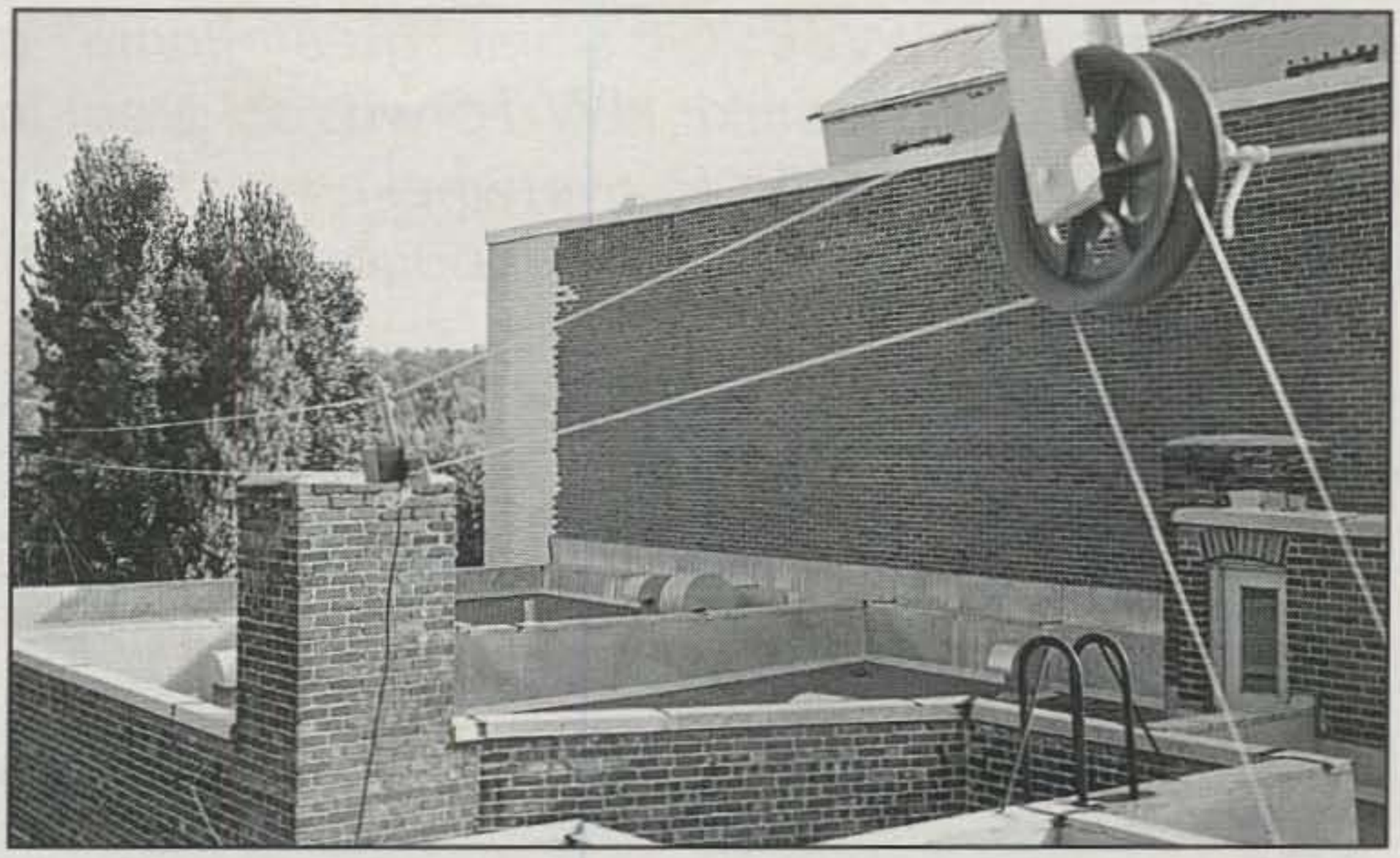
The theory says that bands higher than the base band (in my case, 40 meters) have more than one feedpoint. I had confirmed this with manual positioning of the feedpoint; now the motor drive reaffirmed it with push-button ease. I noted no difference in the tuning slope or other behavior among the multiple feedpoints on higher bands, which suggests that they're reacting just as normal dipole center-feedpoints would.

There may be some directional effects in the selection of feedpoints. Selecting an off-center point that places the long end of the antenna towards the transmitting station seems to improve performance in that direction. What with QSB and the like, it's hard to be precise, but I would say that I can improve reception (and presumably transmission) by two to four S-units with this technique when my contact lies in a direction favored in this manner.

Being able to pick the best point for



The pulley at the far end of the antenna pivots both side-to-side and up-and-down, automatically aligning itself with the antenna.



The whole shebang! Note that the runs are kept perfectly parallel. This is maintained by sharing the feedline weight between the top and bottom runs, as well as by the variable tension hinges at each end.

reception while tuning the antenna on the fly is great fun, and it has really helped with some of the iffy ones. It brings back the days when having tuning savvy was better than good looks! I feel like I'm getting these benefits on transmit as well, although I'm not sure how I'd be able to prove it.

Just like any other antenna, you likely will have to trim the Clothesline a little once it's up in the air. When you do, keep in mind that you're adjusting many bands at once. Take SWR readings for all the bands on which you want to operate, and figure out what kind of adjustments you need to make *on average* to get things in order. Being able to flip that switch and take readings makes this very easy to do.

One more note on the switches: If you look closely at the schematic, you'll notice that the motor won't work if both switches are in the "off" position. Here's how to set them up: For normal operation you leave the switch at the antenna "on" and use the switch in the shack to control the motor. When you want local control at the antenna, flip the antenna switch "off," then go back and flip the shack switch "on," and you'll have control from the switch at the antenna when you go back outside.

And So...

Motorizing my Clothesline has been worth every penny and minute of effort. I have a trap-and-tuner-free multiband antenna that tunes at the flip of a switch, replaces four other dipoles with associated feedlines, remote switches, and maintenance, is many dB quieter on receive, has a lower angle of radiation, and offers some directional and directable gain on most bands. It's rather more attractive and discrete, too, compared to all those other wires, feeds, and supports.

The tunable nature of the motorized Clothesline has permitted me to experiment with and optimize feed strategies, feed position, trim length, and noise pickup. I never really thought about this in the beginning, but this experimental facility has turned out to be one of the antenna's most valuable assets. I can't imagine how another antenna could have talked to me in such volumes, in so little time. My log book and 100 watts have smiles for miles.

Above all, the Clothesline is fun! Tuning the Clothesline has brought back those days when, as kids, we would peak preselectors, tweak trimmers, and sometimes even use a cupped palm held *just so* over a ganged capacitor to bring in the weak ones. It's so satisfying to just flip a switch and trim up the Clothesline and know that my antenna is perfectly tuned for that day, that band, and that contact. Ham heaven. ■

Another Approach

Remember back when I said that we can solve the impedance tuning issue two ways, by either moving the feedline or adjusting the feedline impedance? The Clothesline uses the first method, while a new antenna I've developed takes the second route—adjusting the actual feed impedance to match the antenna at different frequencies. This antenna, which is designed for portable HF rigs such as the Yaesu FT-817, is called the Miracle Whip, and it's being sold commercially by the company I work for, Miracle Antenna (I'm the Chief Designer). The antenna plugs into the back of the rig, covers HF and VHF, works DX off a tabletop (without a ground) and is only four feet tall! If you're interested, see our website at <http://www.miracleantenna.com>.

The response to WB8VGE's first "green flame" article (last December) on restoring the Heathkit HW-16 was so great that we didn't think it would be a good idea to overwhelm you by running the next installment too soon (too many burned-out pacemakers at one time isn't good)!

Keeping the Green Flame Burning
Part II—Restoring the Heathkit HW-101

BY MIKE BRYCE,* WB8VGE

Here's the Heathkit HW-101. Many of these are still on the air. Rugged and well behaved, it's a favorite of collectors and new hams alike.

We encounter many firsts during our lifetime. There was that first day of school, the first time you fell in love, and your very first kiss. For about 40,000[1] of us, too, there was that very first single-sideband contact made with a Heathkit HW-101. The green box called the "Hot Water 101" put sideband on the airwaves at a price everyone could afford, and it became an instant classic. You'll still find these rigs on the air today.

The HW-101 transceiver covers 80 through 10 meters. Sorry, there are no WARC bands (30, 17, or 12 meters). You get VOX operation for SSB and semi-break-in keying on CW. Using a pair of honest-to-goodness RF tubes in the final stage, the HW-101 will produce up to 100 watts of RF to the antenna. The HW-101 is simple to use and easy to tune up. All and all, it is a very well-behaved radio.

A Brief History Lesson

To properly understand the HW-101 we have to look at the entire line of SB[2] and HW series transceivers that Heathkit produced.

Heath sold several tube-based transceivers starting with the SB-100. The final result of the SB series wound up as the HW-101. Here's the time line: The SB-100 was introduced at Christmas time in 1965. It was followed by the SB-101 at about the same time in 1967. The HW-100 was introduced in March 1968, followed by the SB-102 in the spring of 1970. The HW-101 made its first appearance in the company's 1970 Christmas catalog.

All of these radios share a lot in common—so much so that the PC boards are just about identical. Other than slight changes, you could take the audio board from an SB-101 and drop it into an HW-101. In fact, from the inside, unless you look for the LMO (see below) or VFO, it's hard to tell one radio from another. All the radios share the same circuitry and the same problems.

Most of the changes among models in the SB series were slight. The SB-100 was the first of the radios to use what Heath called an "LMO," or linear master oscillator. These were pre-assembled and tested. The builder of the kit only had to bolt the LMO to the chassis and hook some wires to it. The SB-101 was the same as the SB-100 with three exceptions. The first was the option to use an external LMO, namely the SB-640. The second improvement was the addition of the optional CW filter, and the third was the use of 6HS6 tubes in the receiver front end.

When the SB-102 came along, Heath removed one tube from the radio (the tube the LMO used) and replaced it with a transistor. This improved the already excellent LMO. There were some smaller changes in the SB-102, as well.

Money Talks

The SB-line units were expensive. The curved cabinets could not be made in house; Heath had to farm them out. The LMO was very expensive to pre-assemble, too. That's where the HW series came alive.

The HW-100 started off the HW series. The HW-100 could be thought of as a stripped-down version of the SB-100. To start with, the curved cabinets were changed to cabinets that could be made in-house. Instead of the more costly LMO, the HW-100 came with a conventional VFO and this time the builder had to assemble the VFO. It's interesting to note that the HW-100 VFO is transistorized, unlike the tube-based LMO used in the SB-100.

The HW-100 came with a rather strange VFO tuning method. Heath patented the tuning drive on this radio. They called it "Harmonic Drive." Heath's

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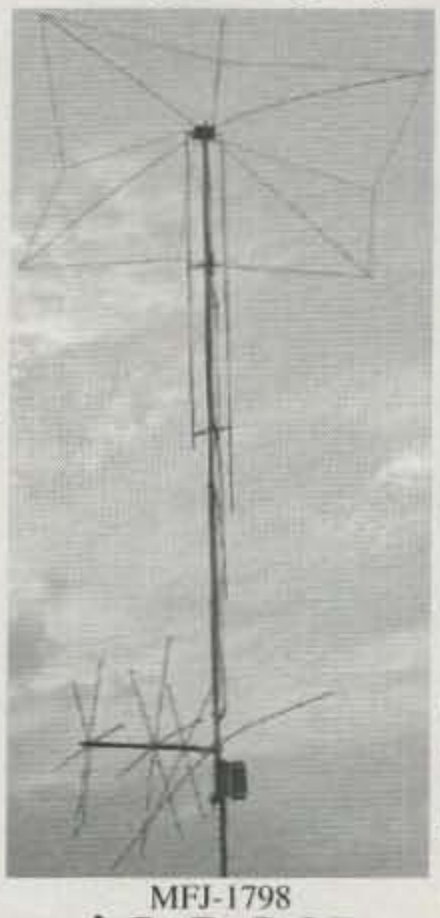

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Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning.

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Covers all bands, 160-10 Meters with antenna tuner. 102 feet long, shorter than 80 Meter dipole. Use as inverted vee or sloper to be more compact. Use on 160 Meters as Marconi with tuner and ground. Handles full legal limit power. Add coax feedline and some rope or other nonconductor and you're *on the air!*

MFJ halfwave vertical

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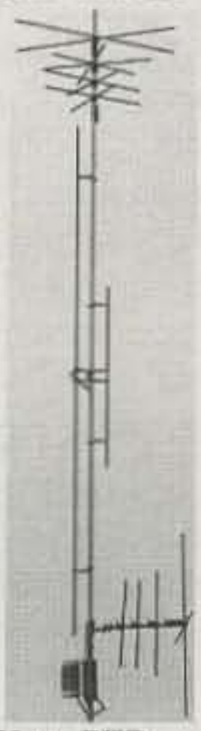

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The main tuning takes a while to get used to. It's not digital but works just fine for a casual ham band QSO.

harmonic drive was less than popular with hams and there were many complaints of backlash and wobble.

All of this brings us to the HW-101. Heath learned a lot between the SB-100 and the SB-102. They put all the things people liked into the HW-101 and then kept the price low. Heath put the 6HS6 tubes back in the front end. They removed the unpopular harmonic drive and added a front-panel selector for the optional CW filter. What they ended up with was a license to print money! The HW-101 became the most popular radio Heath ever sold, and quite possibly the most popular HF ham rig ever made.

A Closer Look at the HW-101

I consider the HW-101 the "Chevy" in the Heathkit line. To me, it is not an overly attractive radio as radios go, but it is a real workhorse. You could put an HW-101 on the air using just about any mode you want, up to and including RTTY. The only thing it will not do is AM.

The HW-101 is a well-built radio. There are five PC boards, each one hosting a specific function of the radio. The final amplifier utilizes point-to-point wiring and features a pair 6146 RF tubes. This pair of tubes will produce 100 watts of RF on 80–15 meters and about 90 watts on 10 meters.

There are 20 tubes and 19 semiconductors in the HW-101. All the works are wrapped around an aluminum chassis with a second aluminum cabinet serving as the cosmetic shell.

How Much for a HW-101?

The HW-101 is not at all hard to come by; they are everywhere. If you want to start collecting Heathkits, the HW-101 would be an ideal first choice. Start looking at fleamarkets, on swap nets, and in ads in magazines and on the internet.

If the radio comes with the optional CW filter, HP-23 power supply, and manual, plan on spending upwards of $100 to $275. I've seen bare-bones HW-101s go for about $50 to $100. Then of course there's the time I spent over $450 for one that was mint. These prices are only guidelines. I guess it all depends on how badly you want the equipment and how badly the seller wants to get rid of it. However, be sure you get the manual or a copy of the alignment instructions. You'll need them!

Visual Checks

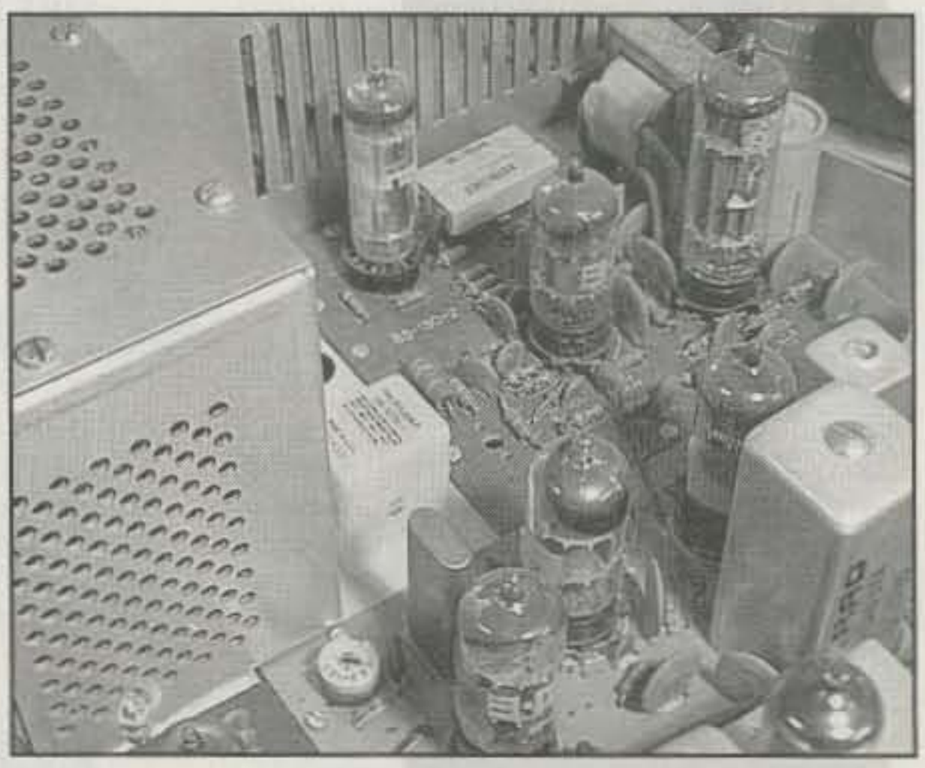
On the SB series the case has a flip top. You just open the top and you're inside the radio. With the HW-101 you will need to unscrew and remove the top and bottom halves of the exterior cabinet. Lay these aside carefully, as the paint scratches easily.

Looking inside radio, I'll bet it was a blast to assemble. On the other hand, fixing an HW-101 is no picnic! The RF driver board is the most difficult to work on. You must remove the band switch and several smaller PC boards. It's not for the weak at heart.

There's a cover that shields the several PC boards the band switch runs through. Remove this cover plate and you will see the various smaller PC boards clustered around the band switch. There is a steel comb that holds the edge of each of the boards. Make sure that these PC boards are soldered to the metal combs. There are several ground wires connected to the various PC boards. Be especially mindful of broken or cracked solder joints where these wires connect to the boards. Reinstall the metal cover and make sure it too is secured tightly.

You'll also need to check for broken solder connections between the HW-101's five main PC boards and the wiring harness. Be especially alert to the solder connections made to the PC boards. A cold solder joint can cause the radio to be inoperable. As the wires flex, they have a tendency to fracture and break the solder connections. Reheat those connections that just don't look right.

Check for burnt wires in and around the wiring harness. Check for white powder or fuzz on the electrolytic caps on the PC boards. Replace those which look bad. Check all the large-wattage resistors. Give them a good look and not a quick glance. Look for dried resin



The rubber "drive belts" of the HW-101 can be seen on the left side. Notice the loading control does not use the belt drive but has a string-and-spring setup. The last models sold had the string and spring removed, and they too have a belt drive.

"WCFT" Troubleshooting for Tube Radios

Poking around in a solid-state radio with a WCFT is a great way to locate trouble. A WCFT? Yes, a Well Calibrated FingerTip! All you need to do is poke around looking for things that are too hot or too cold. Resistors get hot; capacitors do not. That's the saying I always follow. If there is a large heat sink, then the heat sink should be hot. It's supposed to be; that's why it's there. If the heat sink is cold, then there's trouble nearby.

However, you can't really use a WCFT when working inside a radio with tubes. There's voltage inside that will bite. Sometimes there's enough voltage to kill you.

When working on these radios, you need to take a bit more care. You just don't go in poking around with a WCFT and not expect to get zapped. If you want to poke around with your WCFT, let the capacitors discharge first, check to be sure there's zero volts in the circuit, and then touch things. Also, large wattage resistors do run much hotter than the quarter watt ones in today's radios. Check for voltage first and then touch.

Make sure that your test gear is up to the challenge of high voltage. When was the last time you checked the leads on your VOM? Clip leads, jumper cables, and scope probes should all be rated for use at high voltage. A small crack in the plastic of a test probe could send you flying across the room if you are working with 900 volt circuits. "Keep one hand in a back pocket"—words to live by.

Having said that, when I was working on the HW-101 for this article I knew there was a problem in the high voltage feeding the transmit driver and final tubes. The voltage sits at about 880 volts unloaded.

I needed to measure the voltage on the driver and final tubes. I made sure the VTVM was set correctly. I looked over the test leads for cracks or bare wires. I stood up by the bench and placed my left hand in my rear pants pocket.

Besides a lot of Heathkit radios, we grow a nice bunch of cats—Maine coon cats, to be exact. Maine coon cats are known as the gentle giants. They're big! Ernie weighs in at 23 pounds. Ernie is my buddy and is always down in the shack with me. As it just so happened, when I stood up Ernie jumped up on the chair I'd been sitting in. Now there is something I should mention about Ernie. He likes to bite—not hard, just cat nibbles. My wife calls them love bites. So, there we were, Ernie on the chair. I was standing up with my left hand in the back pocket of my pants, test probe in the right hand. One quick look at the meter—yes, it was still set for voltage.

Just as I touched the plate caps of the finals, Ernie saw my little finger sticking out and he chomped down! I let out a yell that would curdle blood. Ernie jumped up and landed on my back with all claws engaged and ready for battle. Another yell from me and Ernie jumped down and ran upstairs at warp speed, passing my wife on her way down the stairs.

In the microseconds in which this all occurred, I manage to drop the test probe into the final cage of the radio. The probe got stuck between the metal cage and the plate cap. That shorted out the finals while producing a big puff of smoke. In the meantime, the power supply had shut down as small fingers of white smoke came from underneath its chassis. I was huffing and puffing, gasping for air, and thinking I had just gotten zapped by almost a thousand volts.

By this time my wife had entered the shack. The first words out of her mouth? "What did you do to the cat?!"

The bottom line? Watch where you place your fingers at all times, and move the chair away from your butt if there is a finger-eating cat sitting on the chair!

bubbles and faded color bands on the resistors. Signs such as those indicate the resistor at one time had been overheated.

On the bottom of the chassis there should be at least one crystal filter. It is mounted on the bracket beside the filter-selection switch. This is the sideband filter. If you see two, then your radio has the optional CW filter. The SSB filter is mounted closest to the chassis. The CW filter sits on top of the SSB filter. They may be the same color, or one may be black and the other silver. While looking at the filters, move the filter selector switch back and forth. You should see an aluminum bar move sideways and engage the slide switches by the filter. If these switches do not move, the radio will appear to be completely dead. The filter-selection lever may be broken off; it's a very common problem. You can move the filter switch by grabbing the green plastic piece to which the lever was attached. Apply a small amount of grease to the aluminum parts that turn the switch used to select the filters. Also, a small amount of contact cleaner applied to the slide switch is a good idea. Don't overdo the application of cleaner or grease, however.

Pull out each tube, one at a time. Check to ensure that the tube is in its correct socket. With the tube out of its socket, check for oxide and corrosion build-up in the tube socket pins. Usually plugging and unplugging the tube several times will clean off its pins.

Many times an HW-101 will become unstable for no apparent reason. This is especially true on 15 and 10 meters. Sometimes the RF output may be very low. Sometimes the receiver will howl and whistle. Usually the fix is as simple as tightening all the screws and nuts holding the five PC boards. Over time the hardware will loosen, causing all sorts of problems. Don't get carried away with the breaker bars. You want to tighten the hardware, not break it off.

Remove the screws holding the top of the PA (power amplifier) compartment. Check to see if the plate caps are tight on the tubes. With heat and time, the tube plate caps may have become unglued. Blow out any accumulated dirt and dust inside the RF compartment. Put the cover back on. There are +800 volts on the plate caps. Fingers need to be protected when dealing with that top cover! *(See sidebar "WCFT Troubleshooting for Tube Radios."—ed.)*

The HW-101 requires an HP-23 (A, B, C) high-voltage power supply. I have one on the test bench that I use with all the Heathkit tube gear. If you plan on adding to your collection, pick up several HP-23 supplies. You can always use them! If your rig came with the HP-23 supply and it has been sitting in a basement for 20 years, use a variable transformer or a light bulb in series with the primary to reform the capacitors in the power supply.

If your HP-23 supply has a voltage-select switch, set it for 300 volts. The HW-101 will not operate correctly if the switch is set to the lower voltage. This is very important and an easily overlooked problem.

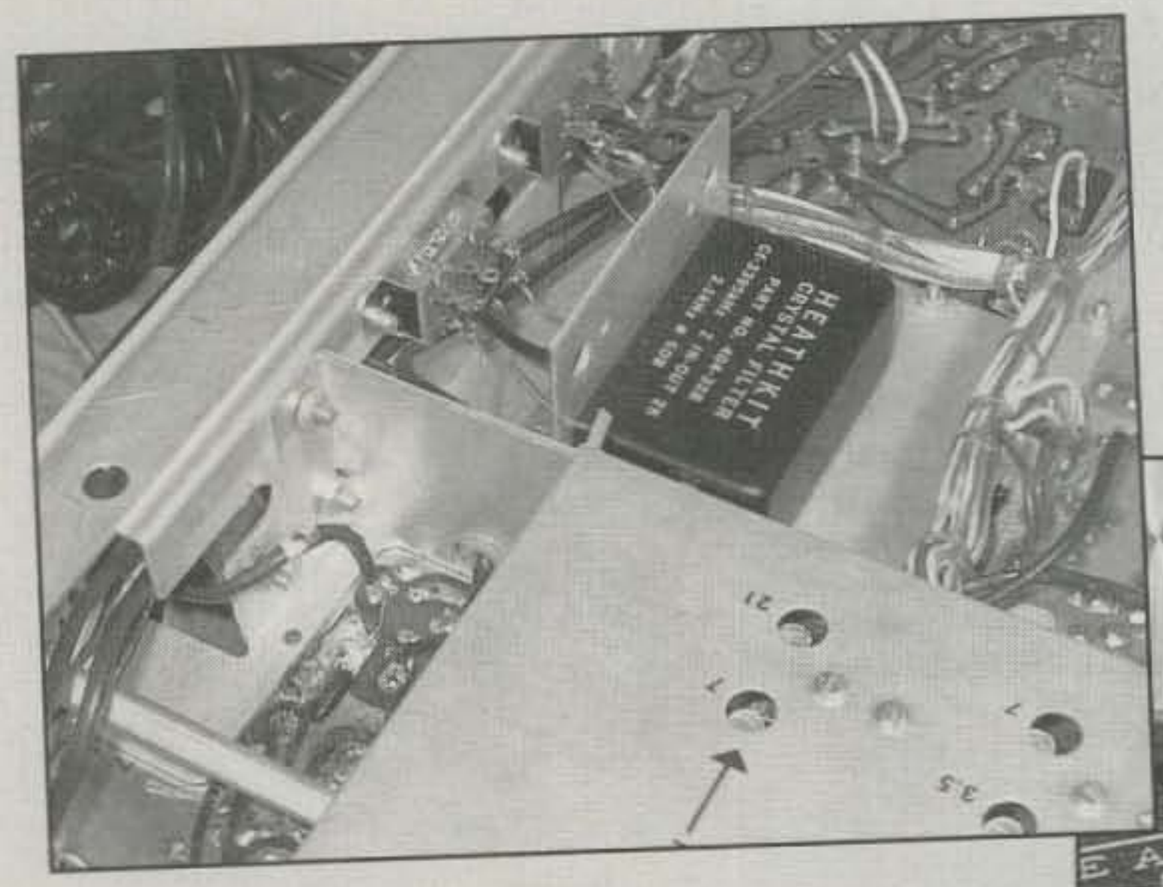
Turn-On Tips

Because the HW-101 does not have an internal speaker, be sure you have one connected. You don't want to fry the audio output stage. Also make sure you have the function control set to LSB or USB. Have the MIC gain control fully counterclockwise.

After you have checked the PC boards for obvious trouble, set the HW-101 upright and power it up. Again, be sure you have the HP-23 power supply set for 300 volts and not the lower 250 volt setting. It may have been years since this rig has seen juice, so when power is applied, check for smoke and any arcing from the components. With the audio gain up, you should hear the usual receiver noise from the speaker.

First thing you want to do is be sure the two dial lights are on. There's one light for the dial and another for the meter. These bulbs are in the series/parallel string used by the tube filaments. Never run the HW-101 with one or both of the dial lamps out. Doing so may cause one or more tube filaments to burn out. By the way, never remove a tube from the HW-101 with power applied.

The original bulbs used by Heathkit are number 44. Replace with number



In my HW-101 I only have the SSB filter installed. Here you can see the extra mounting holes to which the CW filter is bolted. Notice the slide switches between the filters. These should be cleaned now and then. Also, if you don't have the CW filter installed and the selector switch is in the CW mode, you won't get any transmitter output.

Here's a rare shot. The filter selector switch is in one piece. Usually this lever is broken off. You can't get a new one or make one.

47 bulbs. Do this even if the ones in your rig are still working. The number 47 bulbs provide a more even load to the filament string.

You'll need to dig out the manual for the next steps. Check for the proper voltages at the following test points. On point 5 of the bandpass board you should see +275 volts DC. On point 4 of the audio board you'll see –108 volts. Also, the voltage-regulator tube mounted on the audio board should be glowing a nice purple color. If it is not, then you have trouble in the power supply or connecting cable between the radio and the HP-23 supply.

If everything seems to be working, select the 40 meter band, attach an antenna, and then adjust the pre-selector for maximum noise and have at it!

Belt Your HW-101

Inside the HW-101 are two rubber belts. These drive the receiver preselector and final loading capacitors. It's a good bet that both of those belts are long gone. Now what?

Well, all is not lost. In fact, it's a simple fix. All you need to do is lug the radio down to your local hardware store, go to the plumbing department, and look for "O" rings. What you want is a ring that will fit the width of the pulleys and be long enough to fit between the capacitors and the shaft pulley. That's why you need to bring along the radio. If you get one that's too tight, the tension will pull the bearing right out of the capacitor.

My local ACE hardware store has a nice selection of "O" rings. I ended up using either a number 32 or number 30 "O" ring. I don't know if those numbers are standard in the "O" ring industry or not.

Some hams have had success with VCR belts, but for me, the easiest way is the "O" rings. Besides, you can't beat the price; they're about 20 cents a piece.

A Case Study

My first HW-101 came from a ham who told me it needed "a bit of TLC." Well, when the rig arrived, it was in sad shape. Someone at one time had drilled a hole in the front panel and added a pot. I have no idea what it does. The PC boards clearly showed signs that nearly every ham east of the Mississippi had worked on the radio. Without a question, this HW-101 was in bad shape. I almost decided to use this rig as a "part-out rig." However, at the last moment I changed my mind.

After I did some of my usual checks, the receiver seemed to be quite dead. A quick swap of tubes resulted in finding one kaput 6AU6 in the IF amplifier string. In fact, this tube controls the AGC, and thus the receiver had shut down. After the tube was replaced, the receiver came up. However, it did not seem to be as sensitive as it should. New 6HS6 tubes did not fix the sensitivity problem.

A quick check of the alignment turned up a few stages that were way out of whack. With the HW-101 you use the built-in 100 kHz calibrator as a signal source. According to the manual, on 80 meters the calibrator should produce an S-9 +60 signal on the meter. The best I could get was S-6. Clearly the receiver was not working up to snuff.

Digging Deeper

I checked the usual coupling capacitors and cathode resistors. Nothing came up as being unusual. I did, however, find one resistor between the heterodyne oscillator coils and driver coils that had been burned in two. A quick check of the schematic showed that this resistor feeds +300 volts to the plate of the 6CL6 driver. I installed a new 100 ohm resistor and powered up the rig. In an instant the resistor was history. All that was left was a lot of smoke and two wire leads. Something was shorting out the +300 volt line this resistor was supplying.

At first I saw the problem as a bad 6CL6. I figured there was an internal short from the plate to ground. I put in a new resistor and pulled the 6CL6 out of its socket. Again, the resistor was history as soon a power was applied.

The schematic shows the receiver's front end is coupled via a transformer to the first RF amplifier. Perhaps this transformer had a short that was grounding the +300 volts. This part, L801, is located on the driver PC board connected to the band switch. To get to the coil you have to remove the bandswitch rod and unsolder several wires and a few capacitors. I lifted this coil from the PC board and tried again. That was not the problem, and it's a good thing I have lots of 100 ohm resistors in my junk box.

Capacitors C801 and C412 are con-

nected to ground. If either one had an internal short, that would cause R940 to go up in smoke. I unsoldered one lead on each capacitor. A quick check with the VOM proved neither capacitor was shorted. Whatever the problem was, it was not a shorted capacitor.

After checking and double-checking, I decided that desperate means had to be taken to find the problem. Using a clip lead, I bypassed RFC 801 and R940. In effect, I took out any current limiting in the circuit. Standing back, I hit the power. The lights over my head dimmed and the power supply let out a loud groan. Several seconds passed until the circuit breaker in the power supply tripped. If nothing else, there was one hunker of a short circuit in this section of the rig.

I reset the breaker and tried it once more. Again the power supply growled, and once again the breaker tripped out. This time, however, I was able to see a small white finger of smoke coming from the PC board next to the 6CL6 driver tube. Although the tube was out of its socket, clearly I was looking in the correct area. With power off, I touched the socket for the 6CL6. It was so hot it almost burned my fingertip. I removed the socket from the PC board and installed yet another new 100 ohm resistor. This time when the power came up everything held together. I discovered that a tiny carbon trace had developed in the socket itself between the plate, (pin 6) and the +300 volts, to pin 7, the ground. In all my years of troubleshooting I had never seen this before. I guess time and heat combined to degrade the tube socket to the point where it failed.

With the + 300 volts shorted to ground in the socket, my antenna was shorted to ground as well. No wonder the receiv-

Some HW-101 Tips

After working on dozens of HW-101 radios I've found several problems to be very common. What happens most of the time with radios this old is they don't just up and quit. Part values change and the radio no longer "works quite right" until the part fails. Therefore, check out these problems and without too much trouble you should be able to get your 101 back on the air. Here are the problems I have found to be most common:

• I've found that distorted audio can be caused by several things. First, look at resistor R316 on the audio board. This resistor feeds plate voltage to the plates of V13C, the product detector, and to the plate of the audio driver, V14A. Normally this resistor is 22K. After time it increases in value to the point where the plates of V13C and V14A have very little voltage applied to them. I've tested several of the failed R316 resistors. They seem to like about 180K in the "broke" mode.

If the voltages seem okay, then check RFC101 for continuity. I found that this choke opened up in several units. Check for a broken wire at the location where the choke winding is attached to the wire lead.

• AGC in the HW-101 is generated by V13A and V13B. You can monitor this voltage at pin 1 of V11 and V10. If you don't see AGC voltage here, try adjusting the RF gain control. That should provide the required voltage. If it does, then check V13 and diode D101.

• If you notice that voltage regulator V18 is not glowing, check R304 and R305. They both should be quite hot during operation. If they are, and V18 is dark, suspect a short circuit in the 150 volt line or V18 is bad.

• Trouble with transmit audio can be traced to problems in the balanced modulator consisting of diodes CR1, CR2, CR3, and CR4. If you find one diode is bad, replace all four with matching devices.

• Being unable to balance out the modulator usually means that carrier balance trimmer R316 has opened. Replace this guy with a multi-turn trimmer. Also, while you're at it replace R117 and R115 with new parts. I've never come across any failure with carrier balance capacitor C14.

• If you still can't generate a signal on transmit, look for output coming from T1. I've found five transformers that had an open secondary winding. Apparently, the PC board takes on a slight bend and in the process pulls apart T1, breaking the wires inside the can. Usually you can repair the break. Here's a hint: Don't try to make the wire longer, but rather make the pin the wire is supposed to connect to longer.

• No carrier? Then check C16. I have found this capacitor to either open or change value.

• One of the first places I check when working on the HW-101 is the heterodyne oscillator. If this oscillator is not running, the radio will neither transmit nor receive. Tube V19A is the oscillator and V19B is the cathode follower. You can check for operation by monitoring the TP (test point) on the PC board for grid current flowing through V19. The TP is located on the long PC board just behind the VFO.

• The HW-101 has a history of flaky VOX operation. Audio from the microphone is amplified by V1A. Then the audio goes to either cathode follower tube V1B or to VOX amplifier V17A. Using your scope, check for audio on pin 7 of V17A.

• There are two relays inside the HW-101. Both are driven by V12B. The delay is generated by the value of C213, the VOX delay control, and R903. If the VOX seems to work but the drop out does not, clean the contacts on both RL2 and RL1. Spray a good-quality contact cleaner in the relays and wipe up any excess.

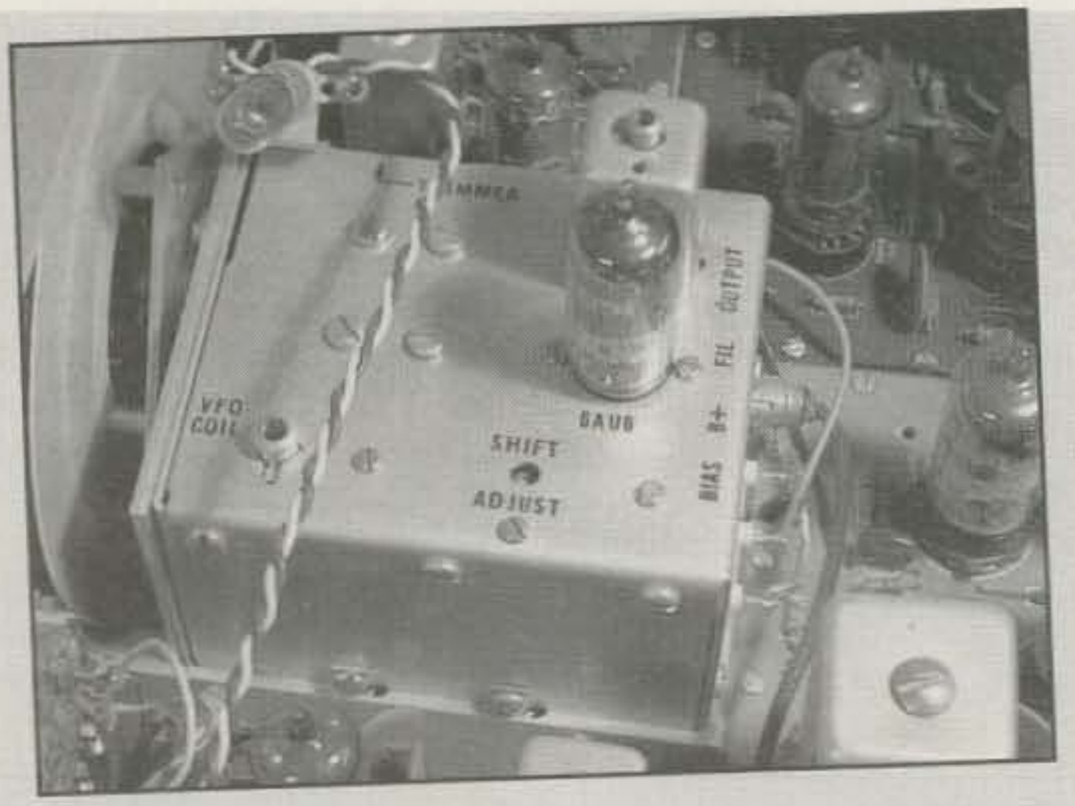
• When in the CW mode, the sidetone keys the VOX. Tubes V15 A and B form the sidetone oscillator and amplifier. Pulling the CW key line low turns on the amplifier. The tone oscillator runs all the time.

• If the S-meter won't zero, replace the 6AU6 at V3 with another brand 6AU6. Don't just swap one from another PC board in the radio; put in a new 6AU6 for V3. If the S-meter won't settle down, replace R106 with a 33K 2 watt resistor. Still can't get the S-meter stable? Replace R-107 with a 100K 1 watt resistor, too.

• Is there a chirp on CW? This problem is usually caused by the same problem that causes the S-meter not to zero—a bad 6AU6. Replace it.

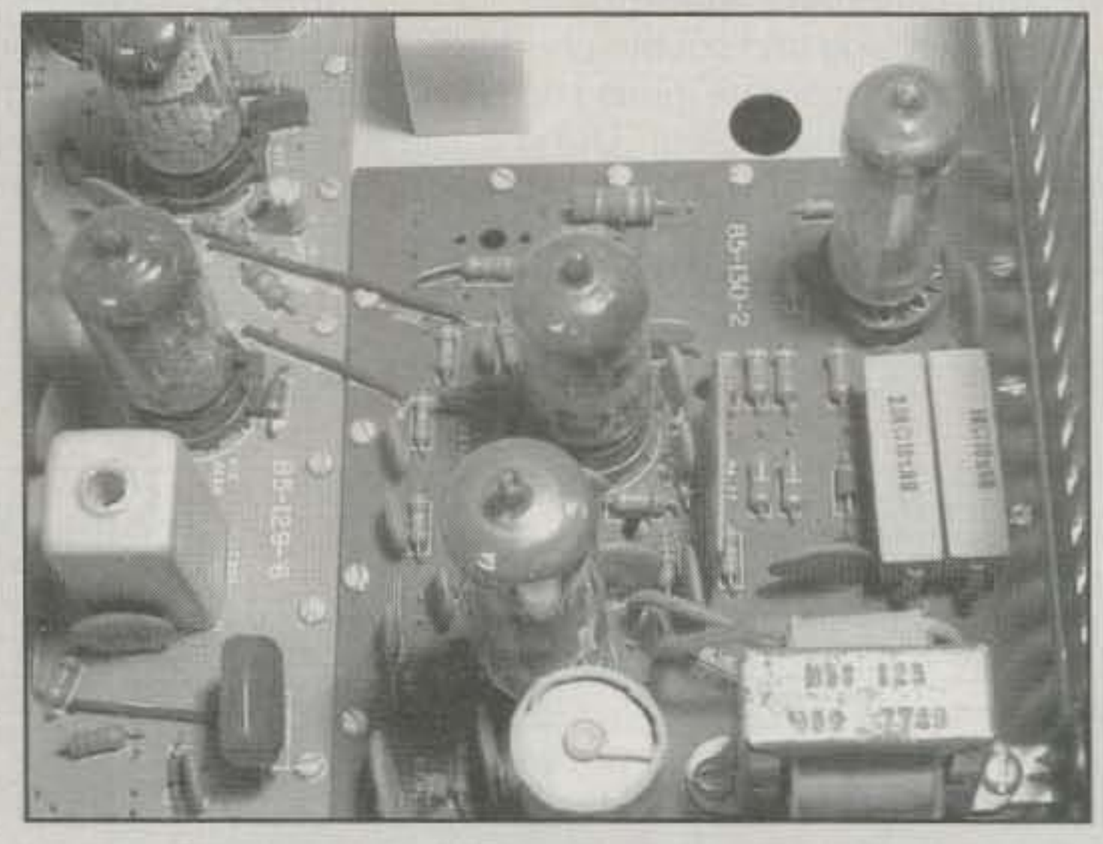
• Loss of sensitivity and/or no output from speaker or phones when going from transmit to receive: Take a piece of typing paper and clean the contacts of RL2, in particular contacts 10 and 2. The plastic covers can be removed from RL1 and RL2 by pulling straight up. Also, if the radio seems to take a long time to go from transmit back to receive, try cleaning all the contacts with a good contact cleaner.

• Complaints of RF in audio, and eventually no modulation, but a noisy carrier in USB or LSB mode. CW mode works just fine. Replace the 6EA8 at V1 with a 6CQ8. The tubes are directly interchangeable, plus you will get a lot more audio drive.



The audio board is shown here. Almost in the top center of the photo is the 22K resistor. This part usually ends up going out of spec and causing IF gain problems. As strange as it seems, the part is on the audio board, but the problem shows up on the IF board. →

The VFO inside the HW-101 is assembled by the builder, thus making the radio much less expensive.



er seemed dead. After the tube socket was replaced, the receiver popped right up to where it should be.

Thanks to All

The response from the first part of this series really was outstanding. I thank all those who took the time to either e-mail me or drop me a letter. Thanks also for the photographs some of you sent. I'll use them all. I can always use photos. If you do send photos, please make sure they are in focus with lots of contrast.

If you want to see some more photographs of the HW-101 and more trouble shooting tips, check out my website: <www.theheathkitshop.com>.

The HW-202

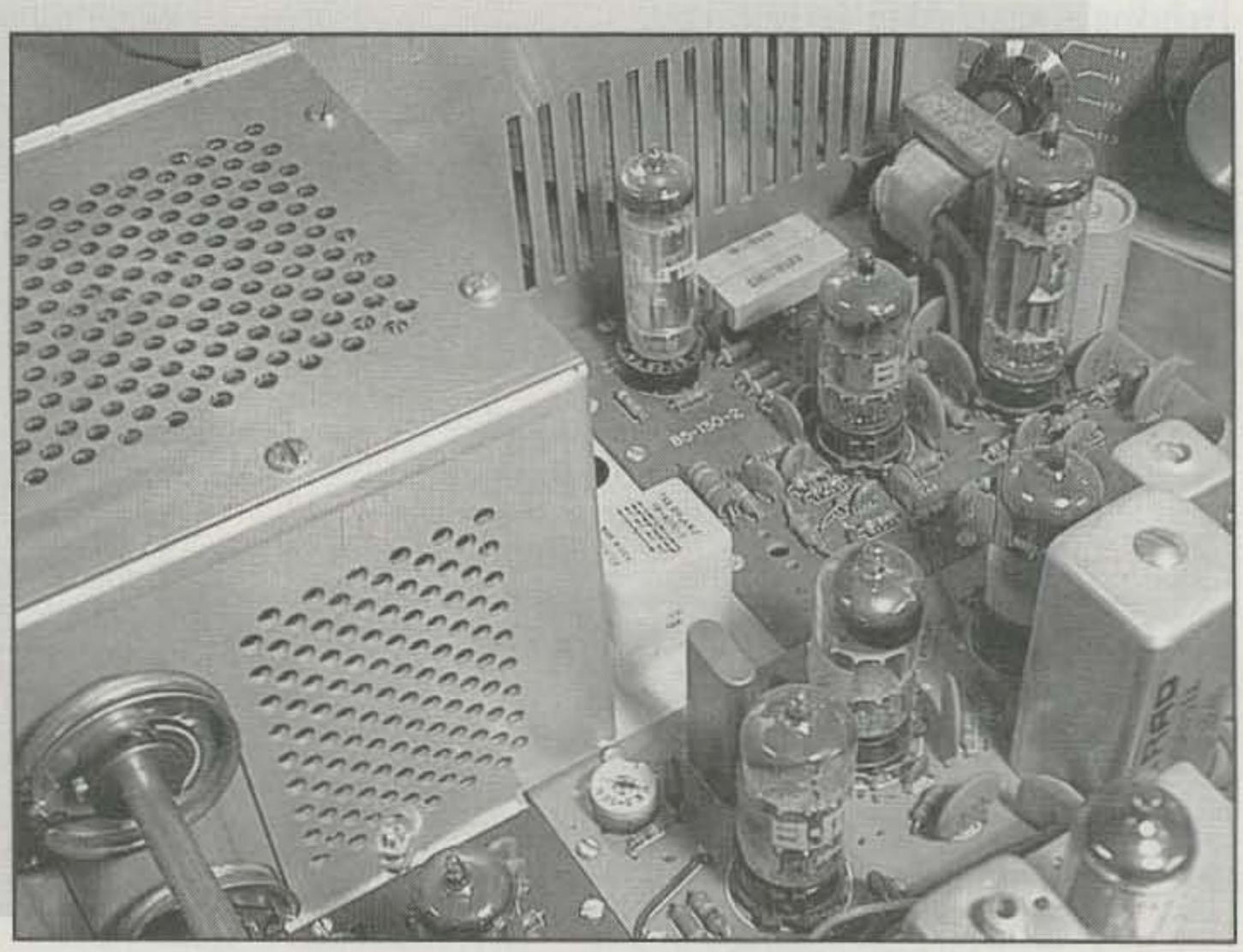
The Heathkit HW-101 put tens of thousands of us on single sideband, but Heathkit also had another radio that put thousands of hams on a much higher band and on a different mode. I am talking about the HW-202 two meter FM transceiver. That's the radio I'll be working on the next time we meet here.

Footnotes

1. Heath boasted publicly about its sales of the HW-101. The last published figure was "more than 30,000 sold," which probably included sales of the HW-100. The rig was continued in the catalog for some time, and final sales figures may have been near 40,000. If the 30,000 figure does include the HW-100, then combined sales would easily have topped 40,000.

2. I had a conversation with Heathkit collector and historian Chuck Penson, WA7ZZE, and I asked him, "What do the SB and HW stand for?" Here's his reply:

"The 'SB' came from Side Band. The tag was decided upon in 1960, a time when that mode was just beginning to gain some popularity. 'HW' is a bit trickier. No one I talked with at Heath could tell me where HW came from, but it was used to denote transceivers only. It will have to remain a mystery. However, there is a story that one night on 40 meters someone referred to their HW-22 as the Hot Water 22, and the nickname stuck. Clearly, the term 'Hot Water' did not originate within the Heath Company." ■



The white relay in the center of the photo is for the TR switching. Clean the contacts to prevent lots of problems with the radio.

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Here's what's featured this year:

Collins 75S-3 Receiver, 1961; Lakeshore Bandhopper VFO, 1957; Gonset Commander II Mobile HF Transmitter, 1955; Gonset 913A 6 meter amplifier, 1964; Technical Materiel Corporation (TMC) GPR-92 Receiver, 1964; Hammarlund HQ-170 Receiver, 1958; McElroy Model 100 Straight Key, 1941; Sonar XE-10 Modulator, 1947; National NC-300 Receiver, 1955; Hallicrafters S-85 Receiver, 1954; Heathkit SB-500 VHF Transverter, 1969; Sideband Engineers SB-34 Transceiver, 1965; Swan 400 Transceiver, 1964; Drake TR-3 Transceiver, 1963; Utah UAT-1 Transmitter, 1937.

How many do you recognize? How many did you own? How many did you wish you owned?

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Readers of W8CM's previous articles on "solid state" guys and his rotatable tower system wanted to know more about the above-ground guy anchors shown in the photos. Here's the scoop . . .

Mow the Grass, Not the Guy Lines

BY MIKE BAKER,* W8CM

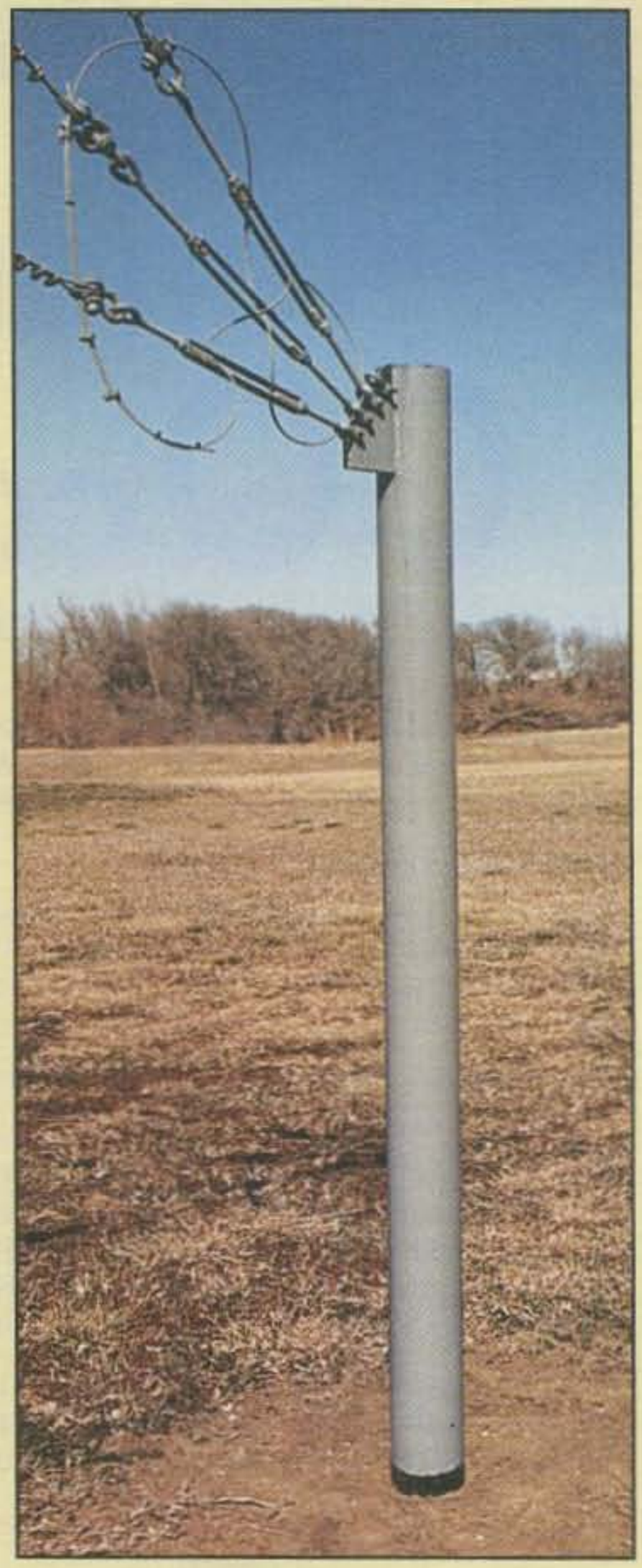

Photo A– A completed above-ground guy post with three lines attached.

Oh sure . . . when putting up that nice guyed tower you could anchor the guy lines to the standard, old ground anchors, but then you might say a few choice words for the next 10 to 20 years when you mow the grass, take a walk, ride the horse, etc. Previous articles have highlighted the Phillystran solid-state guy lines and the rotating tower system I installed, and the pictures included a view of the guys that I decided to install with above-ground anchors.[1,2] Responses from those first articles suggested that there was interest in how I constructed the above-ground guy anchors, so now I'm becoming a regular *CQ* contributor!

The above-ground guy anchors have the advantage of letting you solidly support the tower while still being able to walk around or ride a lawn tractor without having to duck those pesky guy lines coming out of the ground. Unfortunately, most hams seem to think that it is okay to make an above-ground guy anchor by just sticking some sort of steel pipe, beam, or what have you in the ground with some concrete dumped around the base for support. Well maybe, but then again maybe not.

Thanks to the advice of Dick Weber, K5IU, who is a registered professional mechanical engineer, I was able to do it the "right" way with my system. Photo A shows a completed above-ground guy post with three lines attached. I decided to build my system for 7 feet of pipe above ground (no basketball players in my family).

There are two main considerations in building a really good above-ground guy anchor. The first is how the top is built for attaching the guy lines themselves, and then the second is what is below the ground to hold the anchor in place. The easier of the two considerations is the top portion. Photo B shows a close up of the anchor plate, and fig. 1 has more information on the materials and dimensions I used. The main thing here is that the plate be angled to favor the upward-reaching guy lines.

The keen observer may wonder why there are three guy lines but four holes in this plate. The reason will appeal to Boy Scouts, who like to be prepared and plan ahead. When installing guy lines, it is best to have a way to attach a come-along ratchet line tensioning device, so the extra hole gives a place to attach that item temporarily. By the way, the entire steel assembly was sand blasted and primed inside and out, and the outside was painted with first an epoxy paint and then a layer of regular paint (your choice of a color that will please the XYL perhaps).

The underground part of the guy anchor takes a little more work and explanation. Details are shown in figs. 2 and 3. Let's first talk about how it is built, and then we'll discuss how to install it.

The difference in this design that distinguishes it from the common blob of concrete approach is that a rectangular block of concrete is used for the base. This rectangular block is oriented toward the tower in the same direction as the guy line will run, so the concrete block actually has much more holding power in the ground. Remember, it is the concrete that holds your tower down, and the pipe is just the means of attaching the guys to the concrete. As with any concrete project, some wire reinforcing mesh is required. Also, since the steel pipe is hollow, a means of drainage is required from the bottom of the pipe; you don't want water accumulating in either the pipe or the block of concrete, then freezing and breaking the pipe/concrete due to the expansion of the water as it becomes ice. As shown, sand and pea gravel are used to drain the pipe. The pipe is further anchored into the concrete block by welding some little "ears" on the bottom of the pipe. Just about anything can be used for these "ears"; I used some steel angle stock from the scrap pile.

Okay, now you have your steel pipe all welded and painted, the reinforcing wire mesh obtained, plus sand and pea gravel ready. Next comes the fun part

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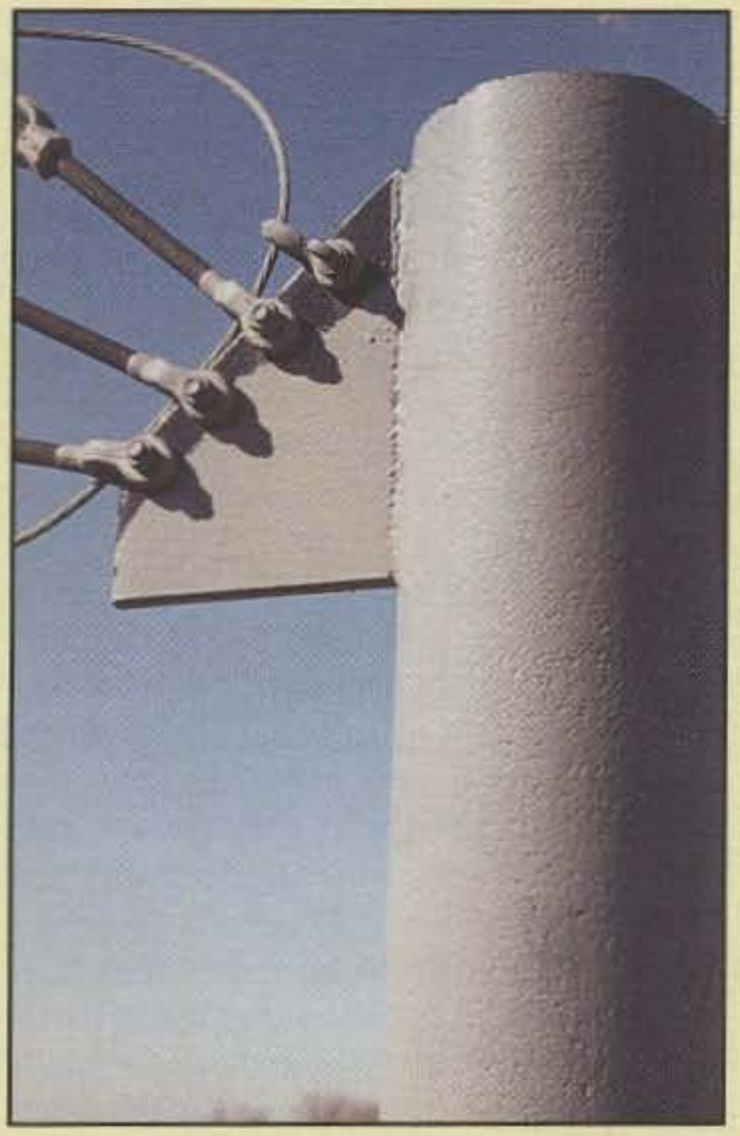

Photo B– Close-up of the anchor plate.

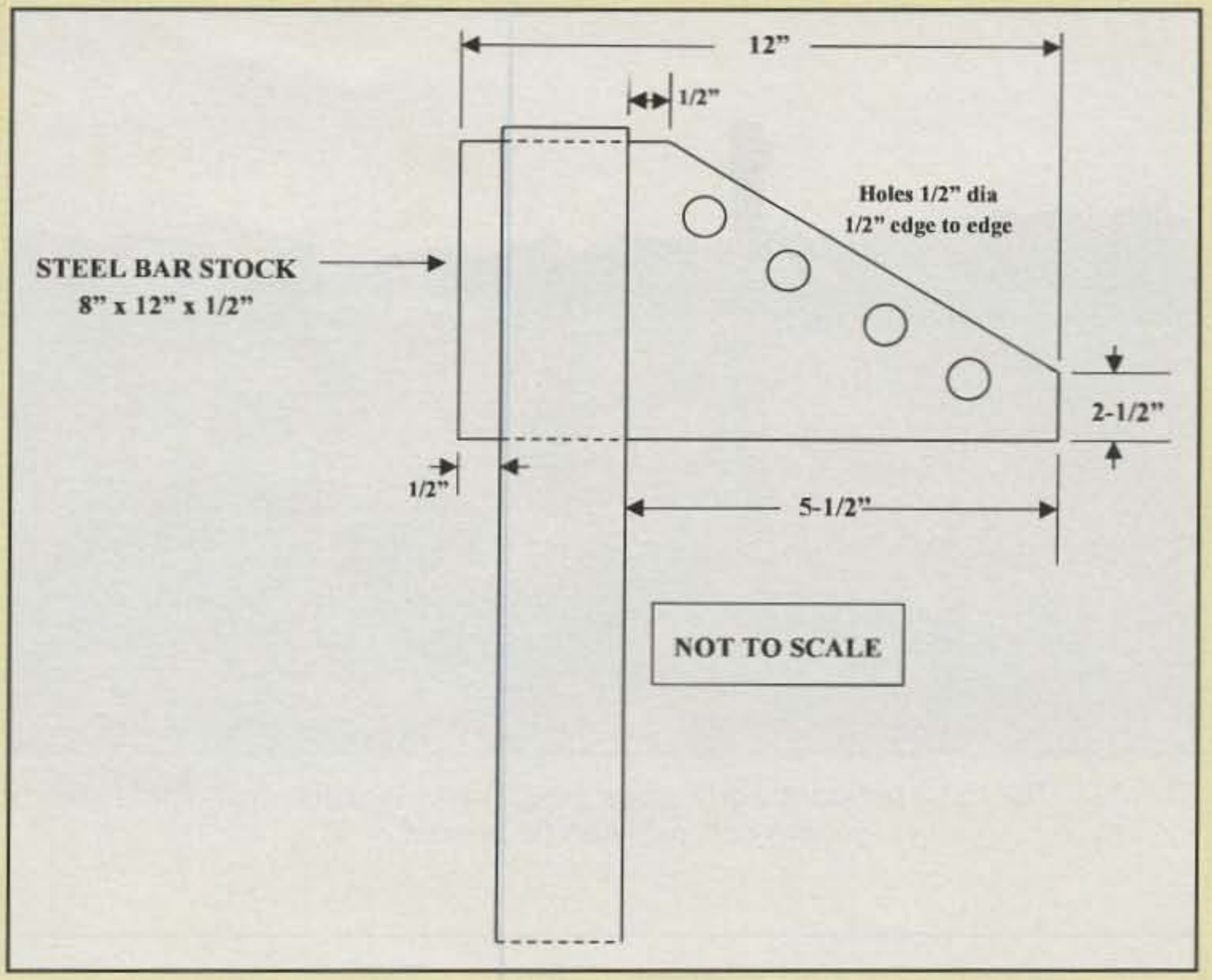

Fig. 1– The materials and dimensions used to construct the top of the above-ground guy anchor.

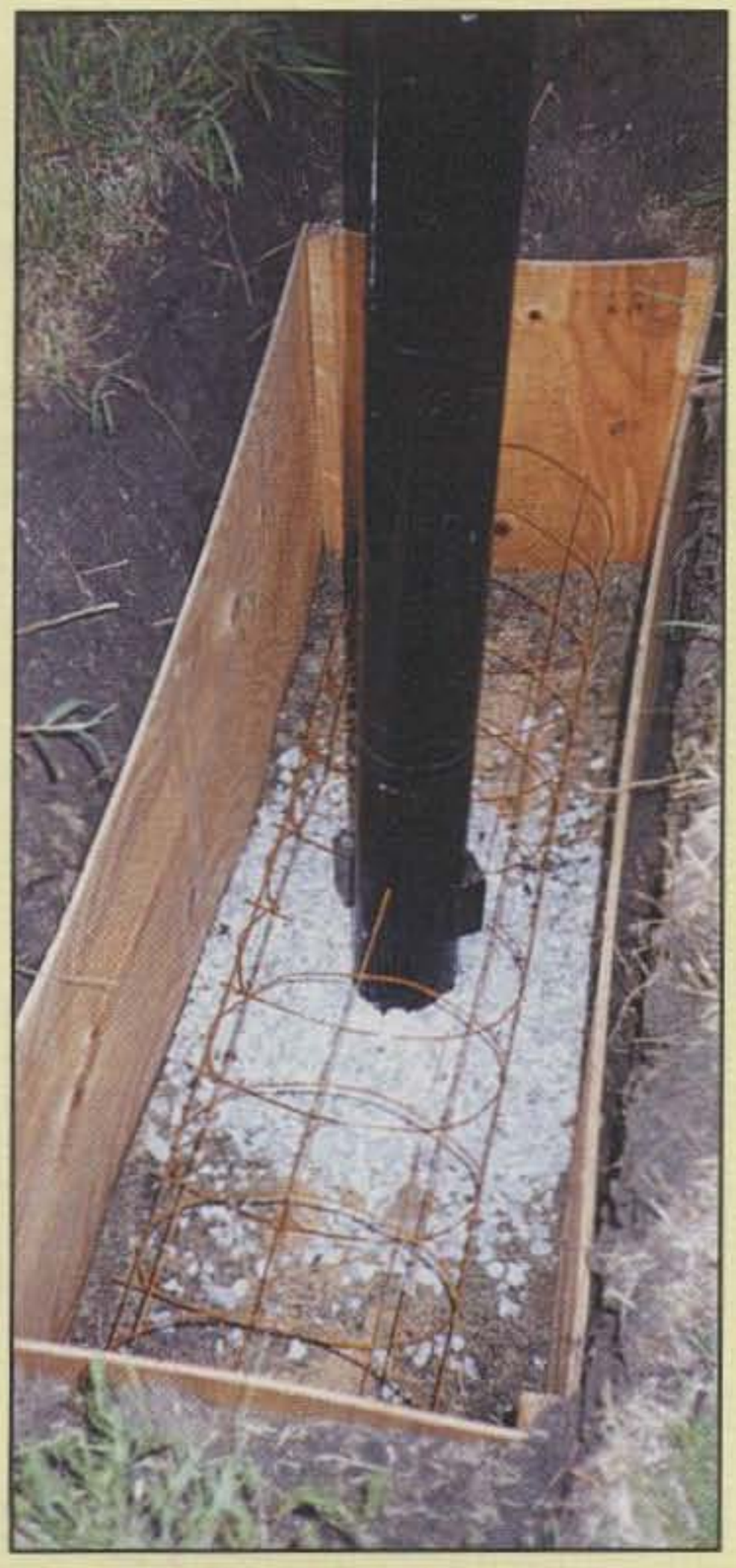

Photo C– The formed base hole with the wire mesh, sand, pea gravel, and the pole.

of digging the hole. I counted my gray hairs and then cheated and had a back hoe do it. Anyway, you need a hole that is 2' × 2' × 6' long for the concrete block, and this hole needs to be 3 ft. deep. Depending on your local soil conditions, you may need to form the hole with some plywood on the sides to keep the dirt from collapsing into the hole. Oh, don't forget to dig the hole so the center is where the guy post will be located (normally, 80% of the tower height

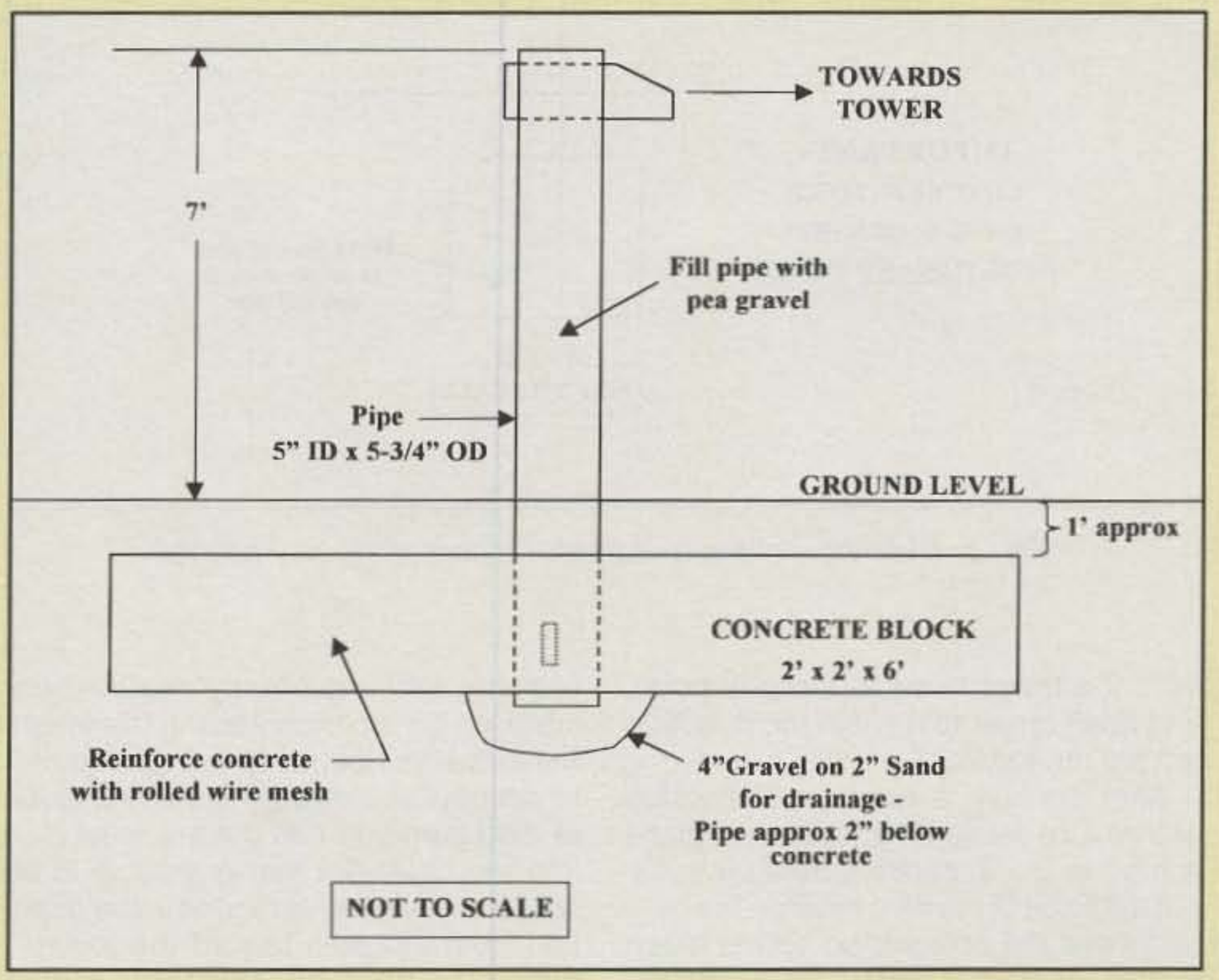

Fig. 2– Details of the underground part of the guy anchor.

Photo D– The three temporary guy ropes are shown here keeping the pole steady so the concrete can be poured.

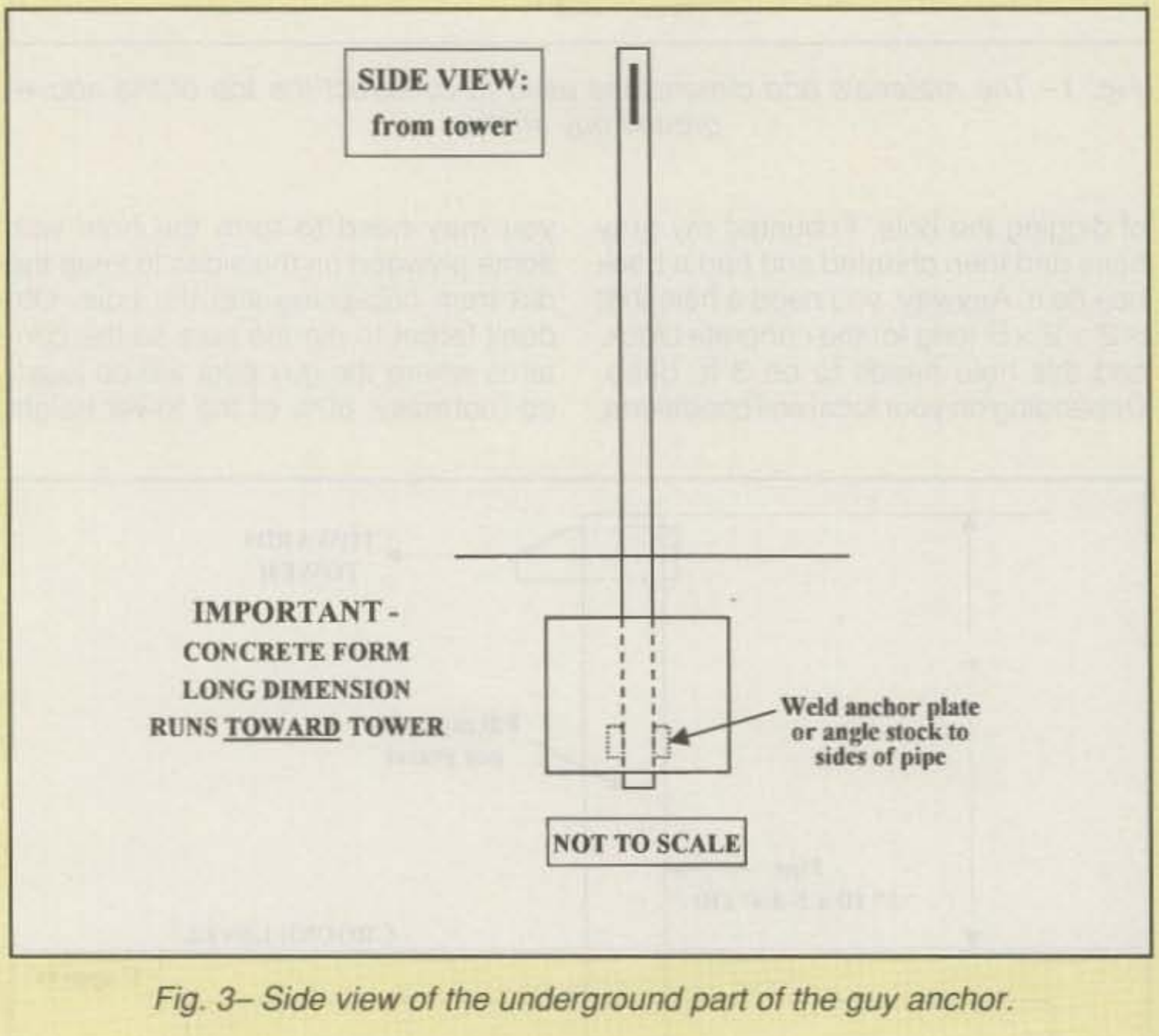

Fig. 3– Side view of the underground part of the guy anchor.

from the tower base to the guy pole), and don't forget to run it in the direction toward the tower.

After the hole is ready, roll up some of that wire reinforcing mesh and place it into the 2' × 2' section. Be sure to cut out a little bit of the wire mesh in the center where the pole will be so the mesh is at least several inches from contacting the steel pole. This is to avoid getting any lightning energy into the concrete via the pole contacting the mesh. Make a little deeper hole in the center to accept the drainage sand and gravel, and then you can put the steel pipe into the hole. Another gotcha is to be sure the guy plate also runs in the direction from the pole toward the tower; I guarantee it will be impossible to turn the pipe after the concrete is poured and you discover the plate is facing in the wrong direction. Photo C shows the formed base hole with the wire mesh, sand, pea gravel, and pole.

Following is the part I always get a kick out of. You have all three of your holes and anchor poles ready to go, and you've just discovered how much almost three cubic yards of concrete will cost. Here is where I casually mention that it probably would please the XYL, not to mention be mechanically strongest, if the pole actually were pretty close to being straight vertical after it is ready. In case you have never dumped concrete into a hole before, I can tell you that it pretty much goes where it wants to and when it wants to once that person with the concrete truck starts running the goo down the chute. You *are* putting the concrete into both the guy anchor holes and also the tower base at the same time to save time and money, right? My solution to this is to create something your neighbors will savor in their discussions for some time to come.

I guyed the guy pole. As you can see in photo D, that mighty 7 foot pole has three temporary guy ropes attached to keep the pole steady when the concrete is poured. By the way, since this concrete will be covered up with dirt after the deed is done, you can forget about all that fancy finishing, troweling, etc., since you are going to bury the block of concrete. That means you don't have to be especially neat about dumping the concrete into the hole, and if you put an extra inch or so on top, who will ever know or care?

By the way, a little humorous anecdote follows for your enjoyment. When I was getting the plywood to form the 2' × 2' × 6' concrete blocks, I bought the regular 4' × 8' plywood sheets at a local hardware store and decided to take advantage of their free cutting services to prefabricate panels that were 2' × 6" and 2' × 2'. I just happened to mention to the young lad who was making the cuts that I was building 2 × 2 × 6 coffins. The expression on his face made the entire project worthwhile. Enjoy your new elevated guy anchors, and be confident that they are well designed and sturdy for that tower holding up your prized antenna farm. ■

References

1. "Turn the Tower, Hold the Antennas," *CQ*, July 2000, p. 52.

2. "Solid-State Guy Lines," *CQ-VHF* magazine, October 1999, p. 24.

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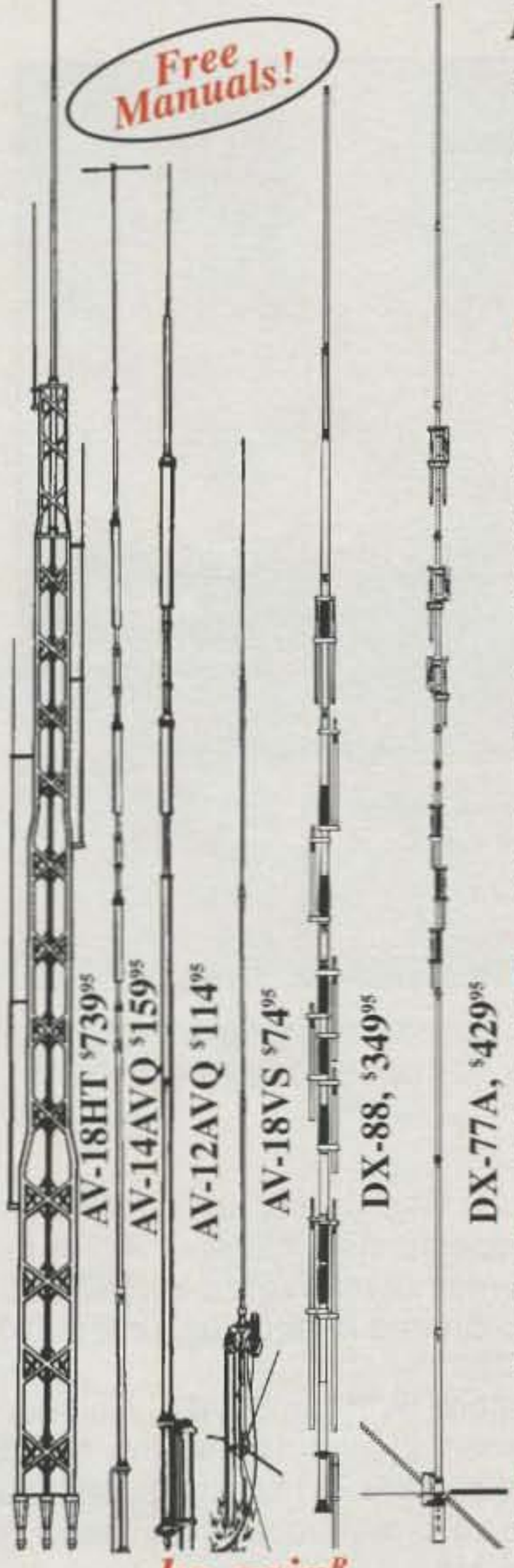

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AV-14AVQ	**$159.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$114.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$74.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$349.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$429.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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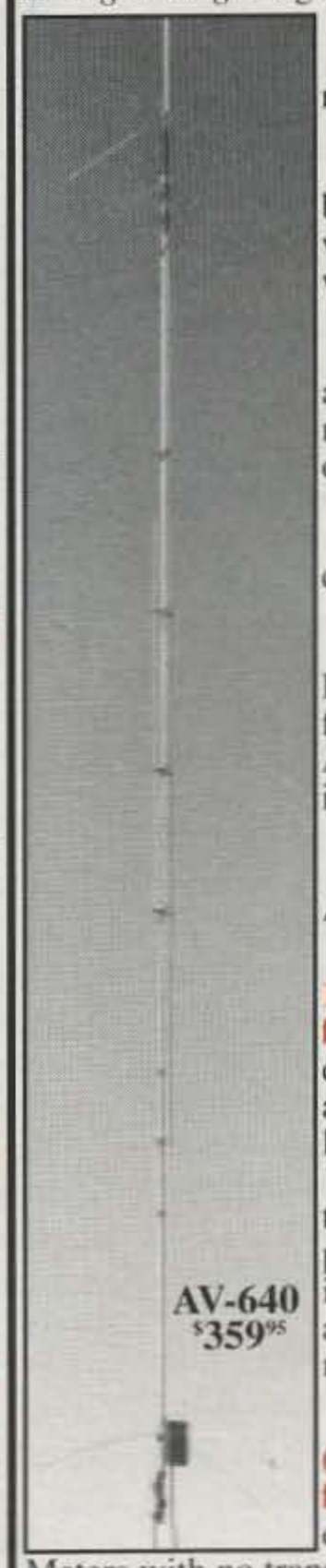

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Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Remembering 9–1-1

On September 11th America was attacked as never before as four commercial airliners were hijacked and turned into giant bombs. Two of those aircraft slammed into the towers of the World Trade Center in New York City, one ripped through the Pentagon, and one crashed into a field in Somerset County in western Pennsylvania. A nation watched in horror and disbelief as the towers crumbled to the ground, trapping thousands in the buildings as well as rescue workers on the ground. As we go to press, over 6,000 people are still missing.

Almost immediately ham radio operators mobilized at all three sites to help. As school children and workers rushed home to be with their families, many amateur radio operators were already on the air providing emergency communications.

In one of amateur radio's finest hours, hundreds of ham radio operators from five states and the District of Columbia were mobilized, all responding at a moment's notice. With cellular telephone service severely damaged and overloaded, amateurs stepped in and provided critical communication support for many emergency management agencies, the American Red Cross, the Salvation Army, and other relief agencies. ARRL Vice President Kay Craigie, WT3P, said, "Compared to the sacrifices by emergency responders in New York City and at the Pentagon, it was a small thing, yet a thing that should not go without notice."

This month we'll look at some of the initial response to this attack on America, starting with a lesser-known aspect of amateur radio participation.

Ryan Jairam, AB2MH, provided communications from an emergency shelter at a school near Battery Park City in New York. (Photo courtesy AB2MH)

MARS Members Support Federal Government

With major incidents occurring within 200 miles of each other and major cities being assaulted by terrorists, one of the federal government's many concerns was keeping in touch with all of its agencies and offices across the nation.

Within 15 minutes of the first crash, the first of many emergency information messages had been transmitted by a Military Affiliated Radio System (MARS) member to the Pentagon. Within an hour, a coast-to-coast backup net was forming. The Army MARS assignment is "Preparing for the Worst."

The initial call for assistance came from the National Communications System in the Department of Commerce. The NCS assists the President, the National Security Council, and others in the coordination and planning for national security and emergency preparedness communications for the federal government under all circumstances, including crisis or emergency, attack, and recovery. An e-mail alert just before 10 AM EDT (about one hour after the initial plane crash into the World Trade Center) ordered NCS participating stations to operational level 2, "emergency potential exists." The alert, said the NCS message, "is requested by the FBI, the National Coordinating Center for Telecommunications, and the General Services Administration."

This activated a national coordination net. By 2 PM more than 200 stations had checked in. Among the participants were FEMA outposts, FAA offices, the American Red Cross, and state emergency operations centers, as well as the MARS members enrolled in SHARES, the HF "Shared Resources" program of the NCS.

A general alert to all MARS members came soon afterward from Army MARS headquarters at Ft. Huachuca, Arizona, and then a formal request for assistance from FEMA.

Wilbur Goll, WØDEL, of Shawnee, Kansas (Air Force MARS AFA3HY) serves as central area net control for SHARES. He counted 63 Army MARS, 44 Navy-Marine Corps MARS, and 28 Air Force MARS stations in the initial operation. He also recorded 54 federal agency offices, 35 Civil Air Patrol stations, and 6 commercial carriers such as AT&T participating.

One of the first government agencies to require emergency communications was SHARES itself. Located in an office building near the Pentagon, the SHARES staff was immediately evacuated. Operations chief Ken Carpenter, KD6DBX, a retired Marine Corps communicator, quickly returned to the air with portable equipment at a secure northern Virginia location.

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Regional SHARES nets also activated across the country, bringing in many more hams. Among the busiest was the Northeast Coordination Net, which provided links from Arlington, Virginia, near the Pentagon, to Long Island, New York, immediately outside the disaster zone, to western Pennsylvania. During the first hours 29 stations, the bulk of them hams in the MARS organizations, stood by to handle traffic.

From Essex County, New Jersey, Bill Fitzsimmons, N2LMU (Army MARS call AAR2CB), was on the air within sight of the plume of smoke over the World Trade Center. Fitzsimmons not only joined the SHARES net, he also operated the MARS Region 2 digital gateway (covering NY-NJ), relaying emergency traffic to higher headquarters, including the first bulletin on the crash.

The bulletin was aired within 15 minutes from David Popkin, W2CC (AAA2NJ), the New Jersey state MARS director. He lives in Englewood, just across the George Washington Bridge from Manhattan. By the end of the operation Popkin had initiated 28 "essential elements of information" status reports. These reports included information on the incident, status of emergency medical facilities, local transportation status, general damage characteristics, area utility status, communications status, information source/time of information, and comments. Jeffrey Bixby, W4BIX (Air Force MARS call AFA2EA), of Arlington, Virginia, close by the Capitol, offered his mobile station for use when it became known government buildings were being evacuated. Army MARS Chief Bob Sutton, N7UZY (MARS call AAA9A), credited Army MARS members with initiating 49 "essential elements of information" reports for use by Pentagon planners, including early damage and transportation status reports.

While hams in MARS and SHARES supported long-distance connectivity, many other hams active in the Amateur Radio Emergency Service (ARES), the Radio Amateur Civil Emergency Service (RACES), and other organizations supported operations closer to each of the crash sites.

It Looked Like a War Zone

Shortly after the attack on the 110-story twin towers and the Pentagon, President George W. Bush announced that the U.S. military was being placed on high alert in the U.S. and abroad. The FCC's Riley Hollingsworth suggested that the amateur community remain calm but ready. He invited amateurs monitoring any suspicious radio activity to contact him, so he could relay relevant information to the FCC duty team. "You never know," he said. He advised monitors to tape such radio traffic, if possible.

Amateur radio operators quickly began to activate. New York/Long Island Section Emergency Coordinator Tom Carrubba, KA2D, began setting up a command channel on a linked repeater system that covered the New York City area. New York State RACES activated to handle emergency and governmental related traffic. Carrubba asked amateurs to be alert, prepared, and patient. In the Washington, D.C., area, Virginia SEC Tom Gregory, N4NW, said Virginia ARES was put on alert immediately following the plane crash into the Pentagon. Virginia RACES was also activated at the state emergency operations center in Richmond as a precautionary measure.

Alert Turns into Activation

Within hours, New York City District Emergency Coordinator Charles Hargrove, N2NOV, said that ARES members would be used in the search-and-

A plume of thick smoke rises from lower Manhattan in New York City the day after the attacks that destroyed at least three buildings of the World Trade Center complex, including the Twin Towers that were among the most distinctive features of the New York skyline. (Photo courtesy Sikorsky Aircraft Corporation.)

Damage to the Pentagon extended far beyond this section of the building, which collapsed after being struck by a hijacked airliner. (US Dept. of Defense photo by R.D. Ward)

rescue efforts at the World Trade Center site in lower Manhattan. Plans called for hams to be on duty 24 hours a day. Not only were cell sites, police and fire communications, and most television antennas lost when the World Trade Center collapsed, the New York City Office of Emergency Management bunker was lost when 7 World Trade Center collapsed later in the day (it had already been evacuated). Besides emergency traffic, amateurs shadowed some New York City officials and medical officials, handled medical traffic, and assisted the American Red Cross and the Salvation Army.

ARRL Hudson Division Vice Director Steve Mendelsohn, W2ML, said that all bridges and tunnels were closed to incoming traffic with heavy security on the bridges. "Jet fighters are in the air criss-crossing Manhattan," he said. "It looks like a war zone there—something out of World War II." On Long Island amateurs supplied communications for the Red Cross. ARES operators were placed on standby at the Emergency Operations Center in the towns of Babylon and Islip. In addition hams staffed two local hospitals.

Report from the Scene

NYC ARES member Ryan Jairam, AB2MH, provided communications from an emergency shelter at a school near Battery Park City. The shelter was set up to house displaced residents. He said, "Net Control on 147.000 MHz last night was done by Adam Fine, AB2IZ, and today and yesterday by Guy Richman, KC2AYG. There were many other hams, from New York metro, other areas in New York State, and tons of ham volunteers from out of New York State, from all over the U.S., many of them Red Cross volunteers."

Red Cross Headquarters was manned by John Kiernan, KE2UN, among others. Charles Hargrove, N2NOV, is on full duty from the makeshift OEM office. "It is truly a phenomenal sight to see from Red Cross headquarters all the way down to southern Manhattan below 14th Street," said Jairam. "It truly embodies our ham spirit and shows that despite all the bickering, code vs. no code, regardless of race or creed or license class, we all banded together to help out in times of tragedy."

Radio Set-up

"We hardly encountered any intermod on the repeater, since even during normal times the city is full of RF and intermod, and the repeaters were more or less prepared for that. Cell phones simply did not work. The Red Cross gave us Nextel phones, but they did not work because of the overload on the system. Some radio operators in remote sites had problems accessing the repeater. Therefore, N2NOV made it a point that we should carry a magnet-mount antenna and a dual-band mobile or base radio (at least 25 watts). I carried my ICOM 746 just in case; it had 100 watts on 2 meters. Some hams had to work double shifts, since relief was a little late getting to us. Food and supplies were delayed due to road closings. Volunteers were forced to take public transportation as non-emergency vehicles were *not* allowed into the city."

Monitoring operations from his home in northern New Jersey, *CQ* Editor Rich Moseson, W2VU, said the net was nonstop with emergency traffic. There were "reports on various bomb scares and evacuations, and requests for medical supplies for doctors at 'ground zero.'"

Northern NJ Hams Help

Amateur radio operators supported Red Cross operations at four shelters which were set up across the Hudson River in New Jersey to house New York residents who were unable to return home because of the restricted traffic into Manhattan. Many other operators relieved those on duty in New York City. Amateur radio replaced much of the Red Cross communications after its repeater was lost with the tower collapse. The nets were coordinating volunteer efforts and blood donations. In addition, they allowed hams in Red Cross emergency vehicles to keep in touch as they delivered cots, meals, and supplies.

Washington is Attacked

Within an hour after the World Trade Center towers were attacked, a third hijacked aircraft hit the Pentagon. Again amateurs were there to provide logistical support between the Salvation Army's relief and recovery effort on site and the agency's Arlington, Virginia headquarters. The Salvation Army provided food and refreshments to the crews engaged in the investigation and recovery operations.

Tom Harmon, AK1E, was at the Pentagon two days after the crash. "I did not get into the burned area, but walked through the parts of the building still functional. It was weird and abnormally quiet. *Lots* of armed folks walking around and no sense of humor. Plenty of checkpoints. There were two machine-gun nests I had to go through, just to get to the inner court." Harmon and others installed a repeater on his trailer that he left on site until the hams were released. By having the repeater on site, everyone was able to use very low power on their HTs and conserve battery power.

"There were mental health workers walking around yesterday looking into peoples' faces and eyes to see if they were past usefulness. Being tired leads to mistakes and also there is a slowly growing 'depression' on folks close in," said Harmon. "I still think it is a conflict of impressions. The awful depression from being there is offset by the incredible uplift of seeing so many volunteers and groups and their support."

The well-being of volunteers was not the only thing being taxed. "I dropped a $500 HT yesterday and someone ran over it," said Harmon. "A Red Cross worker handed me a dinner and I somehow got the soup into my shirt pocket and drowned another HT."

Impressions

While most of us were glued to the television set watching hour after hour of news, the volunteers on site did not get any news. "Somewhere around sunset last night we saw a line of trucks getting stuck behind a dirty auto wrecker up on Columbia Pike, just south of the Pentagon lot. The Pike is raised there, so everyone working there could see this. We heard a horn honk and our first impression was that he was blocking traffic. It took about a minute to realize that all the traffic was wreckers with lots of lights on and carrying American flags! It left a lasting impression in me and others to see those guys slowly circle the Pentagon as best as they could, allowing for the roads and security," said Harmon. "We were surprised to see candlelight vigils on street corners that had some grass. Lots of candles burning on the ground and people standing behind them with flags or wearing flags. Since we had no news of this, it was overpowering."

Western PA Hams Also Respond

While the television cameras focused on New York and Washington, hams in western Pennsylvania were also providing support to emergency management, the Salvation Army, and the Red Cross. There a plane crashed into an open field away from any populated area. The area was immediately declared a crime scene.

Amateurs were put on alert by local emergency management officials. Nets were activated on 2 and 75 meters. The Salvation Army's SATERN (Salvation Army Team Emergency Radio Network) team responded from Pittsburgh. By linking three repeaters together they had a direct radio connection from the Pittsburgh headquarters to the plane crash site some 80 miles away. Somerset County amateur radio operators assisted the SATERN team by shadowing key staff members. Liaison and communications were established by Salvation Army Team members with the Allegheny County (Pittsburgh) E.O.C. SATERN was the only established direct communications link from the Allegheny County EOC to the Somerset County area.

Support from amateur radio organizations around the world came into *CQ*. Andy, RW3AH, with the Russian Amateur Radio Emergency Service, who was in the Balkans wrote: "Dear AMERICAN friends: It was really terrible what happened yesterday in the USA... I believe that America will survive in this tragedy and will be stronger and solidarity! GOD BLESS YOU—AMERICA!"

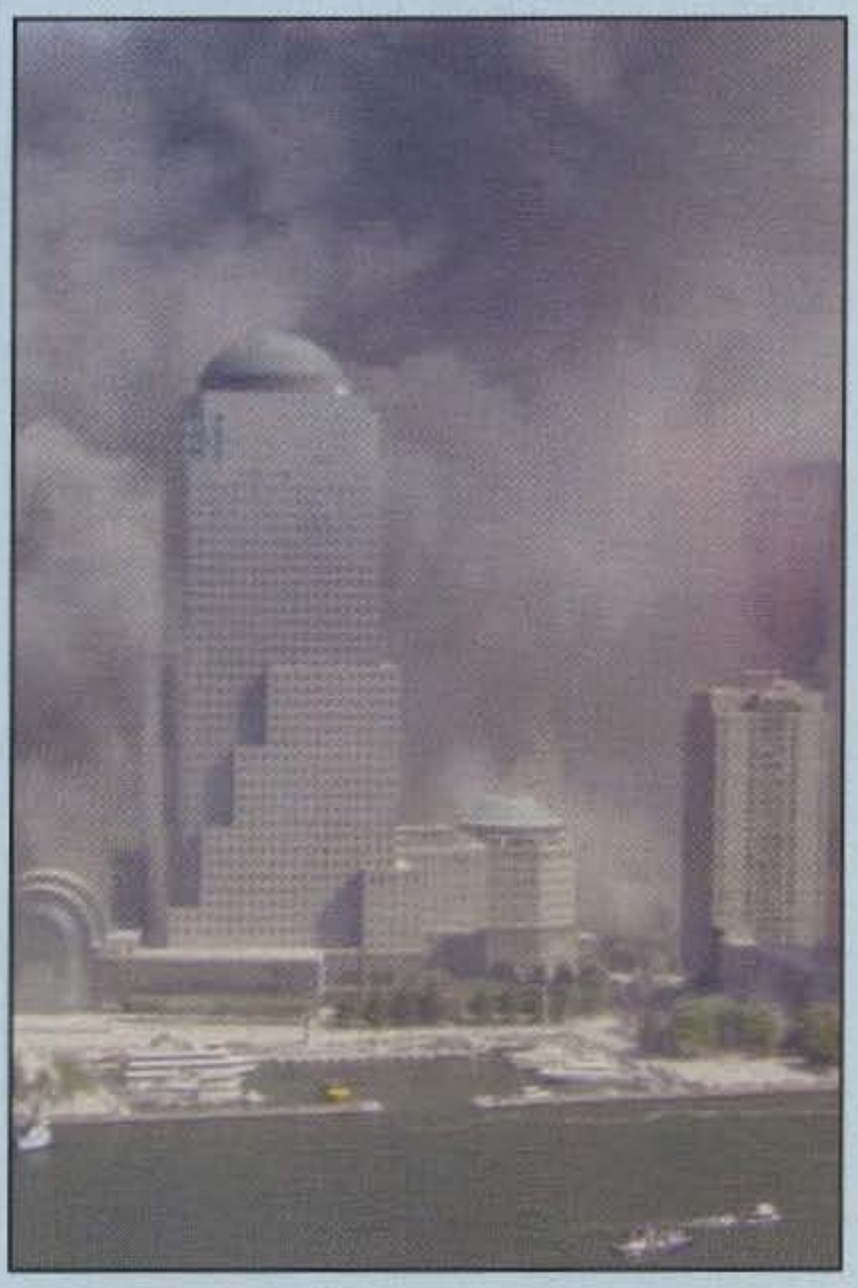
Only the Beginning

The disaster response in New York is still going on. Amateurs are still providing vital communications. We have only begun to tell the story. Amateur radio operators responded from as far away as Georgia. Next month we'll continue our report on the amateur radio response to this Attack on America. We will take a look at training and some lessons learned about working in areas described as "war zones."

I want to thank Bill Sexton, N1IN; Ryan Jairam, AB2MH; Patrick Wilson, W4PW; Tom Harmon, AK1E; SATERN, and the ARRL for supplying information for this story.

73, Bob, WA3PZO

On the Cover



A huge plume of thick smoke rises from the concrete canyons of New York City in the wake of the worst terror attack in U.S. history on September 11, 2001. This photo and several others in this issue were taken just hours after the twin towers of the World Trade Center collapsed after being struck by a pair of hijacked jetliners. The photos were taken by crew members of a fleet of seven UH-60L Black Hawk helicopters flown to the scene by manufacturer Sikorsky Aviation of Stratford, Connecticut. The choppers were used to fly in supplies and emergency personnel to help in the relief effort.

On the same morning, terrorists flew a third hijacked passenger plane into the Pentagon outside Washington, DC, causing a partial collapse of that building (see inset photo); and a fourth hijacked jetliner crashed in a wooded area of western Pennsylvania before reaching its target, apparently due to passenger action aboard the plane.

Amateur radio operators in metropolitan New York, metropolitan Washington, DC, and western Pennsylvania responded quickly to provide emergency and backup communications. As we went to press, the hams in Washington and Pennsylvania had gone home, but those in New York were still active and busy. See our coverage on pages 4 and 48 and elsewhere in this issue. (New York photos courtesy Sikorsky Aircraft Corporation; Pentagon photo by R.D. Ward, U.S. Dept. of Defense)

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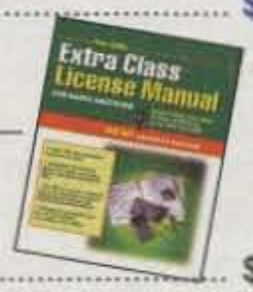

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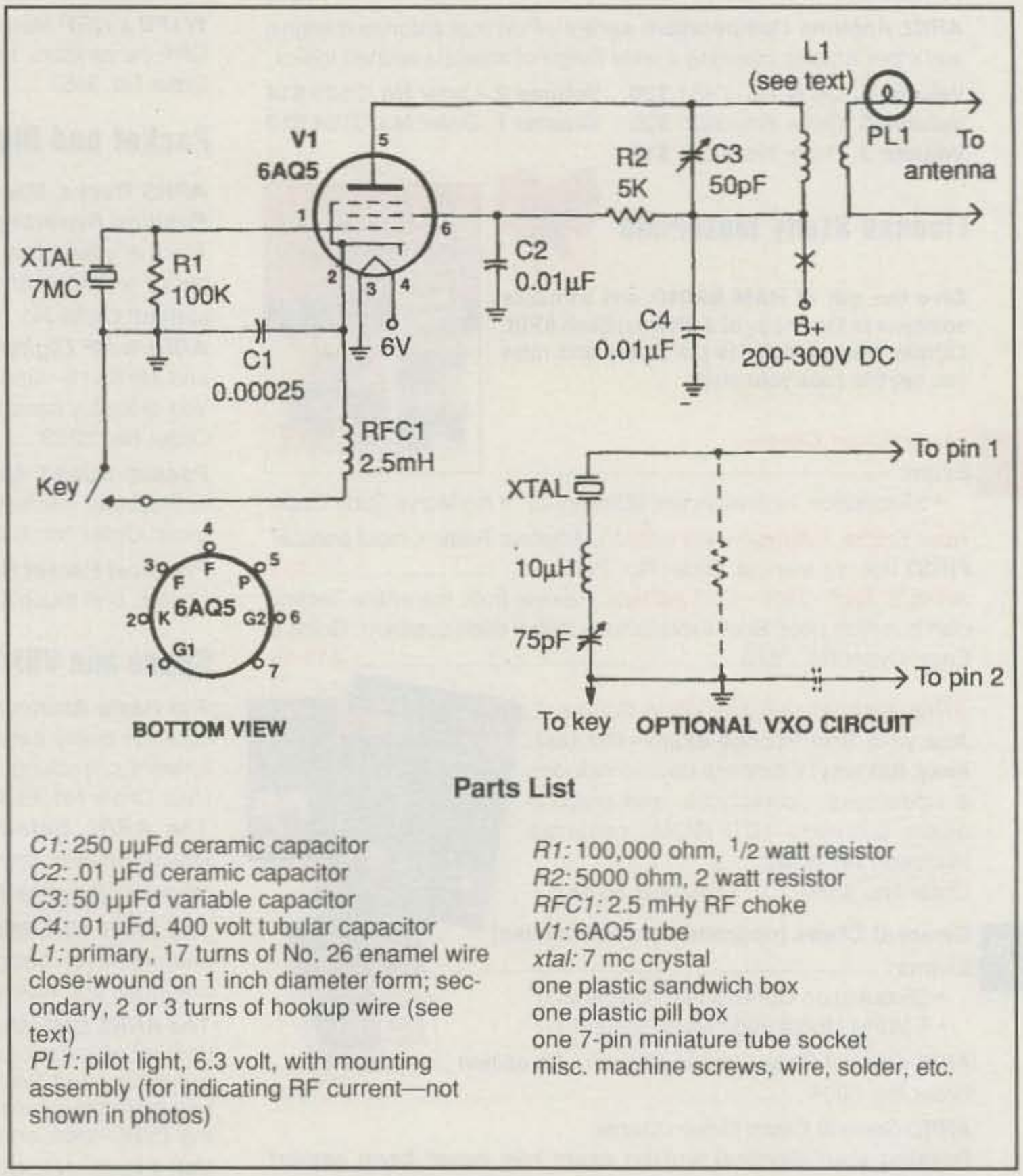
World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Romantic Retros and Dinkin' Delights—Part II

Are you ready for more good light-hearted retro-radio fun, gang? Well, two more soft-glowing delights you can quick-brew right now plus more inspirational views of mini-rigs that readers home-assembled from details in previous columns are in the spotlight again this month. Yes, and the overall combination truly moves small-time radio into the big-time league. We are on a "vintage rig roll" of the best kind, and we are not slowing pace until every amateur has at least one little vacuum-tube transmitter gracing a corner of his or her desk or an end of a bookshelf! Expensive? Not this time. In fact, our first featured transmitter is a real bargain-basement special anyone can afford. You say you do not have a high-voltage transformer to power even a small tube rig? Don't fret, as we are also including an alternate solution you will like. The good times are straight ahead, so let's get hoofin'—err . . . started!



Parts List

C1: 250 µµFd ceramic capacitor
C2: .01 µFd ceramic capacitor
C3: 50 µµFd variable capacitor
C4: .01 µFd, 400 volt tubular capacitor
L1: primary, 17 turns of No. 26 enamel wire close-wound on 1 inch diameter form; secondary, 2 or 3 turns of hookup wire (see text)
PL1: pilot light, 6.3 volt, with mounting assembly (for indicating RF current—not shown in photos)
R1: 100,000 ohm, 1/2 watt resistor
R2: 5000 ohm, 2 watt resistor
RFC1: 2.5 mHy RF choke
V1: 6AQ5 tube
xtal: 7 mc crystal
one plastic sandwich box
one plastic pill box
one 7-pin miniature tube socket
misc. machine screws, wire, solder, etc.

Fig. 1– Circuit diagram of the Dolly Jane, a neat little vintage transmitter anyone can build in a weekend. The 6AQ5 is akin to a downsized version of the ever-famous 6L6 beam power tube. (Circuit diagram compliments of Mike Zane, N6ZW)

Dolly Jane

One of the most popular miniature receiving tubes of the 1950s, '60s, and even the '70s was the dear 6AQ5. This little beauty was utilized in the audio amplifier sections of many AM broadcast radios, shortwave receivers, and SSB transceivers, and also was adapted to many homebrewed HF transmitters of the time.

As you probably recall, I have been inviting friends who used the 6AQ5 in a homebrew transmitter past or present to be troopers and share their "proven good" circuit diagrams with us. A few months ago Mike Zane, N6ZW, stepped up and accepted that invitation. His circuit is shown in fig. 1 and a diagram to guide new homebrewers through assembly is shown in fig. 2. Mike did not include a photo of his transmitter, so we will leave the choice of a support frame or chassis to your creative imagination and offer to spotlight your handiwork here in a future column.

Need some ideas? You might assemble the transmitter on a reduced-size wood frame such as the famous 6L6 Novice transmitter of the 1950s, or use a small aluminum chassis to replicate a pint-size version of Ameco's classic AC-1 Novice transmitter. As an alternative, an "elevated breadboard" layout such as the one John Karasz, WB2GMY, used with his 35T transmitter (photos A and B)—possibly including a thin wood front panel sporting dual knobs and a tiny round meter—would look terrific. Just strive to avoid hiding the tube in a fully enclosed cabinet. Why? The 6AQ5 is widely known as a gassy little critter, and in this transmitter its flickering blue tint with keying adds a special touch of class and flash you simply must see to appreciate.

Looking at the transmitter's circuit (fig. 1), we see it is a basic crystal oscillator with a series-fed tank circuit and a simple key click filter. A notable characteristic of series feed is both "sides" of plate-tuning capacitor C3 are connected to B+ or high voltage and thus should be insulated from ground or a metal chassis (if used). If desired, a plate current meter for monitoring input power can be added in series with the B+ lead (point "X"). Another possibility is a small 6.3 volt pilot lamp (PL1 in fig. 1) can be wired in series

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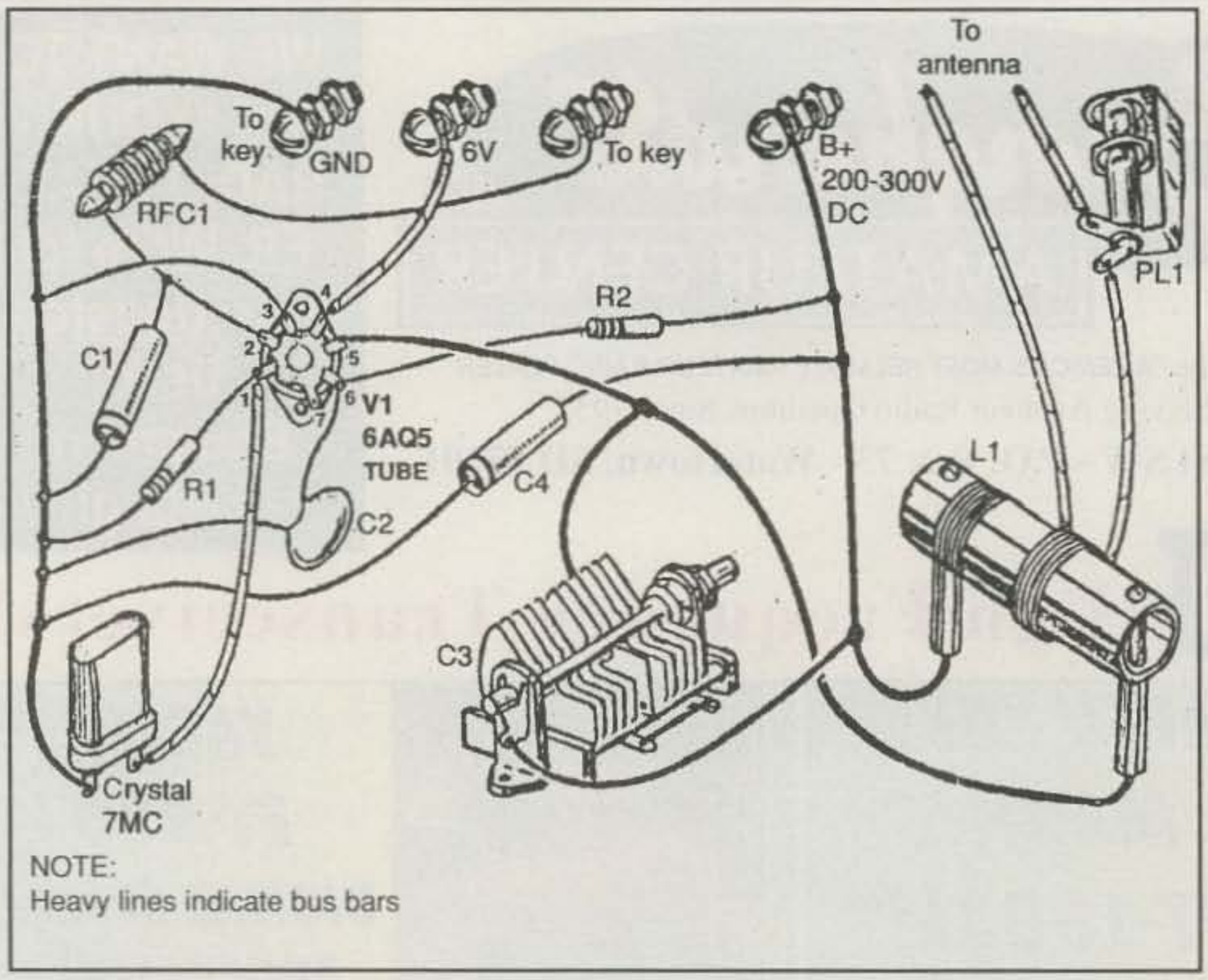

Fig. 2– Pictorial diagram of the Dolly Jane. This easy-to-assemble delight is an ideal first project for new homebrewers anxious to . . . err . . . get their hands into vacuum-tube circuits and high voltage.

with the antenna pickup coil, L2. A variable capacitor of any value between 150 and 350 pFd can also be connected in series with the antenna pickup coil for easy "Pi-type" tuning.

This little transmitter was originally designed for operation on 40 meters. Its plate coil thus consists of 17 turns of number 26 enamel-coated wire close wound on a 1 inch diameter form (like a small pill bottle). The antenna pickup coil is 4 or 5 turns of similar gauge plastic-insulated hookup wire wound beside or directly over L1. A 150 or 350 pFd "loading capacitor" can be added in series with L2, the antenna pickup coil, if desired. Feel adventurous? Decreasing the plate coil to 13 turns (while using the same 50 pFd tuning and 150 to 350 pFd loading capacitors) will shift coverage/operation to 30 meters.

Tune-up and operation of the Dolly Jane is a cinch. Just warm up the 6AQ5 a couple of minutes, add an appropriate band crystal, then close the key and adjust tuning capacitor C3 for maximum output power consistent with the cleanest sounding signal. If you included a loading capacitor, alternately adjust it and C3 for maximum "clean signal" power while ensuring plate current does not exceed 20 ma or 4 to 6 watts input (assuming 200 to 300 volts on the plate).

After smooth and clean operation has been confirmed, you can add the optional VXO circuit shown inset in fig. 1. It typically will swing the transmitter's frequency around 10 kHz. Combine that tuning range with this gem's 2 or 3 watts of output power, and you are ready to work the world in high style!

So what's the story behind this transmitter's nickname of Dolly Jane? She was a famous racehorse of eras past, and horse names are naturals for ham rigs—Hi Ho Pegasus, get-em-up Scout, etc. Doesn't that make sense?

Harass

The circuit diagram of another quick-brew one-tube transmitter, compliments of Mike Zane, N6ZW, is shown in fig. 3. I sense your first question, and yes, Harass was another famous racehorse of yesteryear. Why the name Harass for this transmitter? Truthfully speaking, it is a compliment to the horse! Our highlighted transmitters are not nicknamed in honor of just anyone or anything! A photo of Mike's 6GW8 transmitter was not available, so use your imagination in layout and build it to fit your own preference.

Referring to the circuit diagram (fig. 3), we see the 6GW8's dual sections make this little wonder comparable to a two-tube transmitter—that is, one sec-

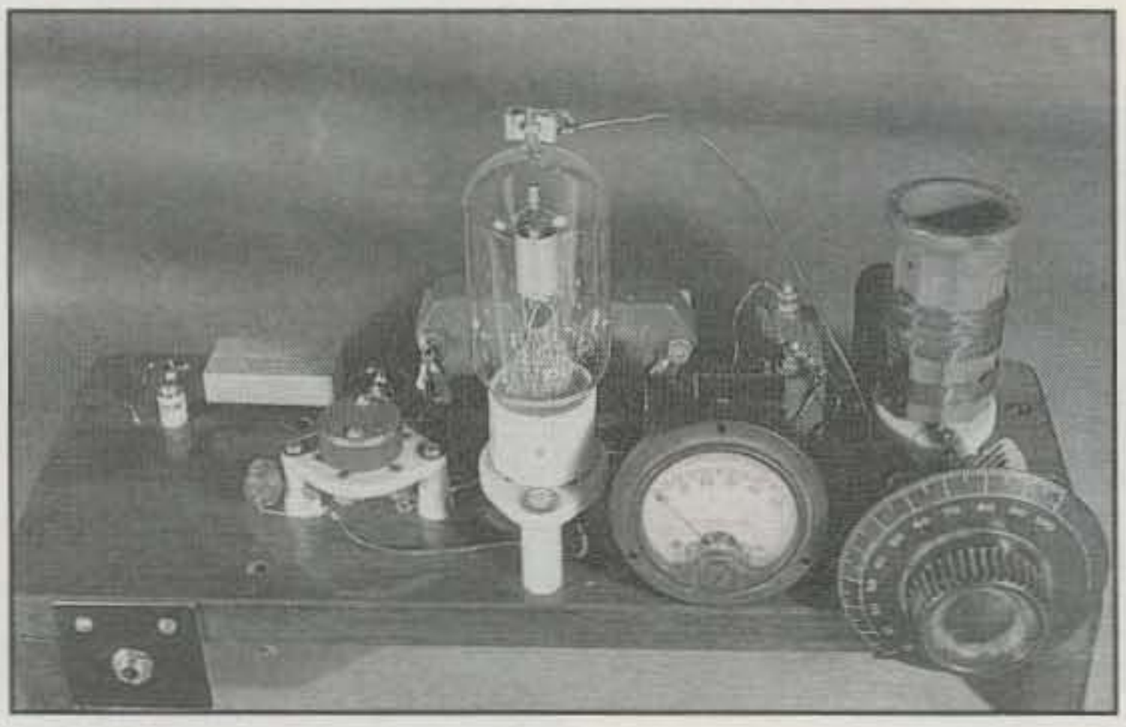

Photo A– Check out this totally awesome 35T-on-breadboard transmitter John Karasz, WB2GMY, built from details in our November 1998 "World of Ideas" column. It looks authentic '30s or '40s, pumps out a clean 7 watt signal, and steals your heart at first glance! (Photo via WB2GMY)

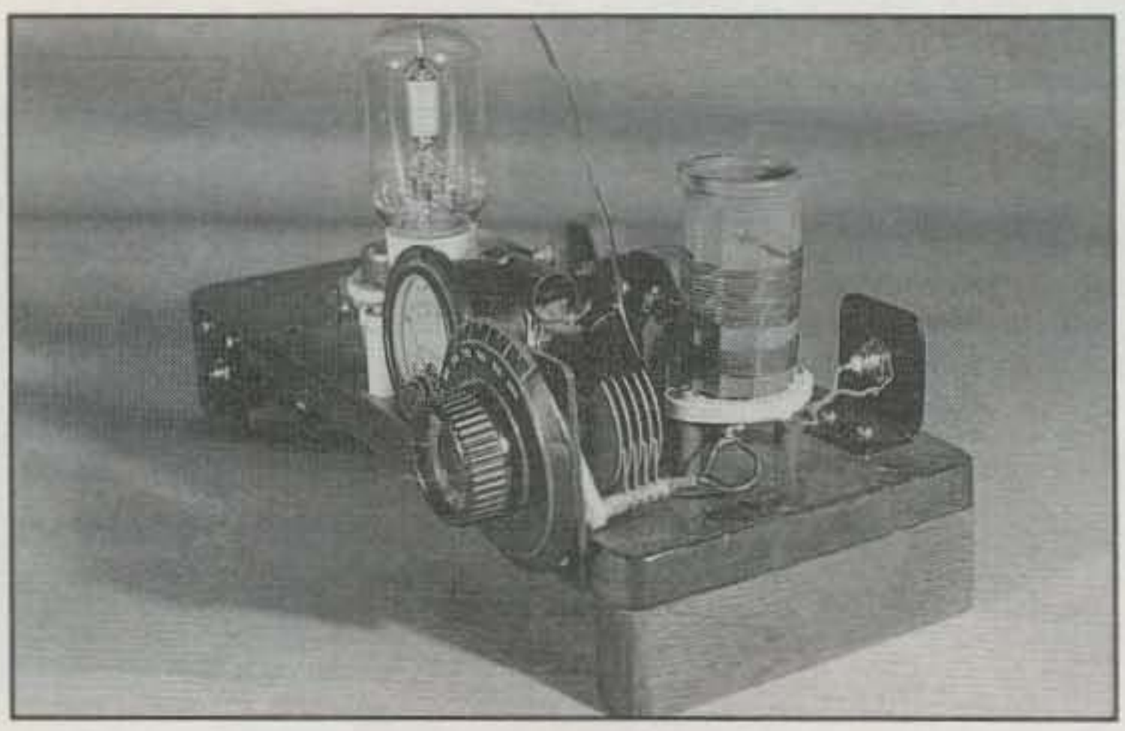

Photo B– Side view of the 35T transmitter built by John, WB2GMY. Look at that polished base, the dazzling open-air variable capacitor, that genuine Velvet Vernier dial. This thing has it all!

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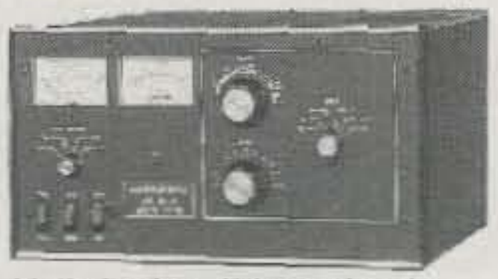

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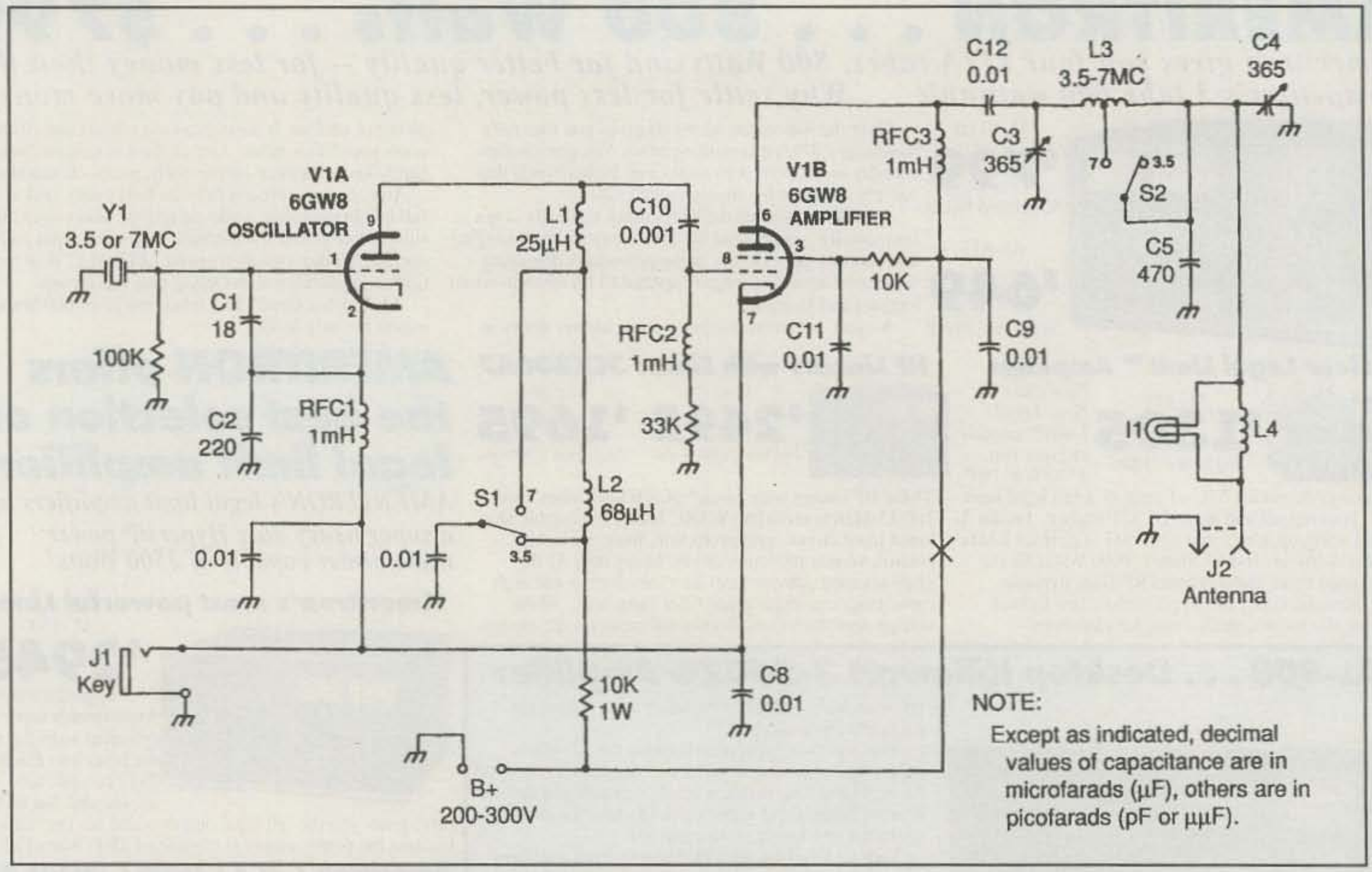

Fig. 3– Circuit diagram of the Harass, a low-cost, low-power fun rig built around a 6GW8 tube. (Circuit diagram compliments of Mike Zane, N6ZW)

tion serves as a basic crystal oscillator with a broadly resonant output circuit and the other section functions as an RF amplifier with a pi-net output circuit. In my opinion, this use of a 6GW8 is what makes Harass special. Unlike a 6AQ5 or 6L6, the 6GW8 is a sort of "sleeper" or wallflower, and letting it shine in this transmitter gives it plenty of well-deserved recognition.

This transmitter is also designed for operation on 40 meters. It can be modified for 30 meters as well, and (although I have yet to try it) the optional VXO circuit featured in the 6AQ5 rig should also work fine here. The 25 µHy choke (L1) should be broad enough for 40 and 30 meter coverage. If 30 meter output is low, change it to a 15 or 20 µHy choke. Plate coil L2 is 20 turns of No. 22 enamel-coated wire close wound on a 7/8 inch diameter form for 40 meters, or 15 turns of the same wire for 30 meters (using the same C3 and C4 capacitors for both bands). A pilot lamp or a small 50 or 100 ma meter can be inserted at point "X" for monitoring input current, which typically will register around 30 ma with 250 or 300 volts DC on the tube.

Tune-up and operation of this 6GW8 transmitter follows the classic pi-net technique. Apply filament and plate voltage, let the tube warm up a couple of minutes, and set loading capacitor C4 to minimum capacity. Next, key the transmitter and adjust plate tuning capacitor C3 for maximum output (which should coincide with minimum plate current as indicated on the meter or pilot lamp). Finally, and while monitoring the little rig's signal on a communications-grade receiver, increase loading capacitor C4 in small increments while readjusting C3 for maximum output. If/when output "levels off" or signal quality drops, decrease loading slightly. Now team the transmitter

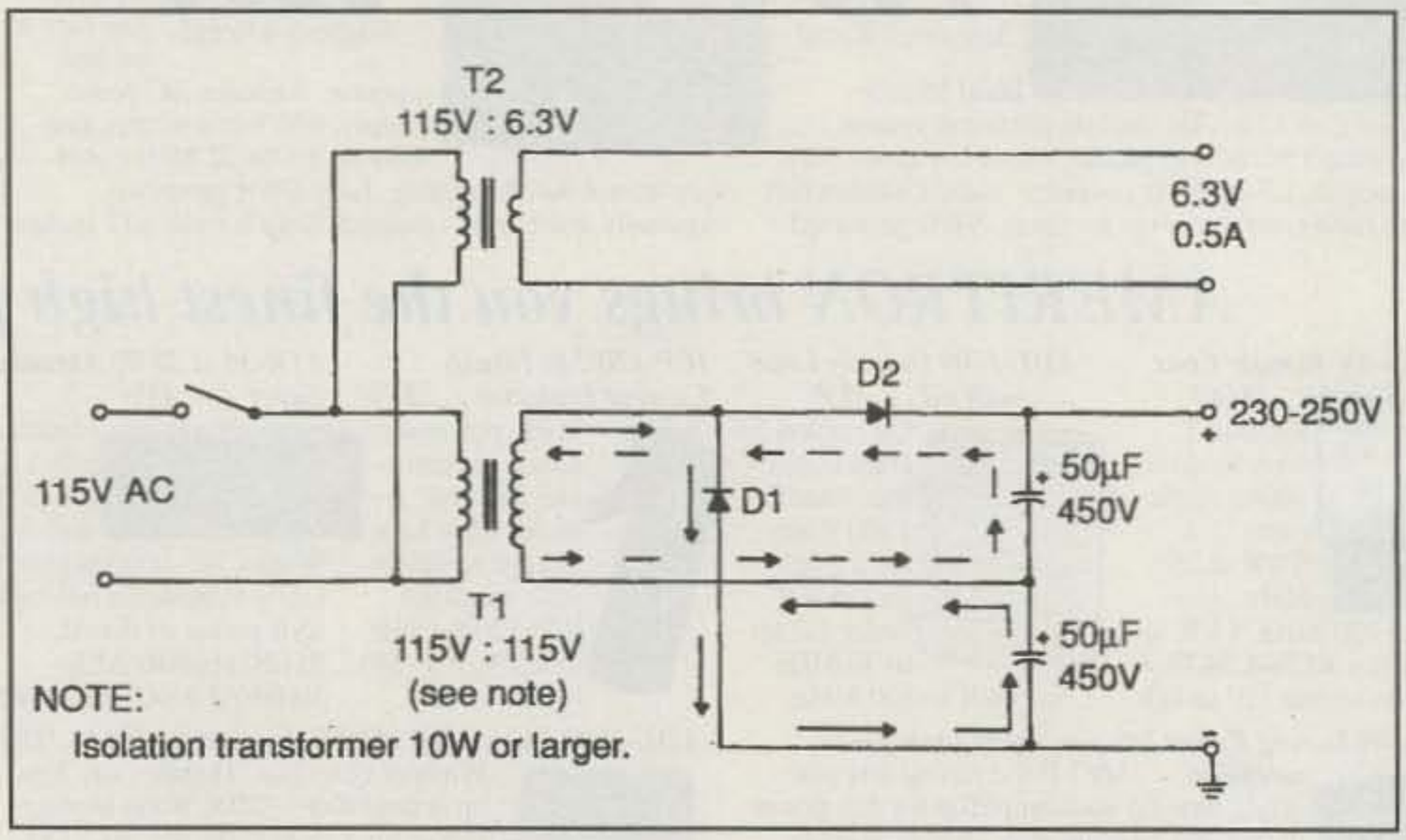

Fig. 4– A low-cost, easy-to-brew power supply for use with our featured 6AQ5 and 6GW8 transmitters. (Discussion in text.)

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With a new Fast Fourier Transform audio filter, the MMT applies DSP filtering and creates a more "natural" sound, pleasing to the listener. Line enhanced noise reduction uses new algorithms to dramatically reduce background noise. An auto-notch function can be used to reduce or eliminate annoying interference. You won't believe your ears!

"HIGH FIDELITY" SSB

This is not a conflict of terms! AOR's unique technology derives unbelievable audio from a 2.4 kHz source in simulated stereo, through the provided headphones. The results are amazing and have been compared to "FM quality" reception. You didn't know your radio could sound this good. Just about everyone who hears it says, "Wow!"

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Use the built-in microphone equalizer to enhance your transmitted audio. Contour a profile for your vocal characteristics or overcome some of the limitations that may exist in your microphone.

IMPROVED CW OPERATION

Built-in 100, 200 and 300 Hz audio band pass filters. Center frequency is adjustable from 800 Hz with 450 Hz pitch. There is also a special noise reduction circuit just for CW operation.

"STEREO" CW RECEPTION

The built-in band pass filter has independent outputs for the left and right channels, allowing independent bandwidth settings heard through the included stereo headphones.

DIGITAL MODES WITHOUT A PC

Receive and display PSK31 and RTTY (Baudot) modes without the need for a PC. AOR's MMT displays text on its easy-to-read LCD display. PSK31 formats include BPSK and QPSK. RTTY operations include 170, 425 and 850 Hz shifts.

PC INTERFACE

The MMT has a rear panel DSUB9 connector and a serial cable is provided. You can set internal parameters of the MMT and operate PSK31 and RTTY using a simple terminal program. You can also transmit and receive SSTV (56.7 kHz) through your computer (optional software needed for SSTV).

DIGITAL VOICE RECORDER (DVR)

Capture up to 102 seconds of audio, in as many as 8 memories, in the MMT's DVR. DPCM compression saves space and delivers good fidelity.

POWER MISER

The AOR MMT operates with just 4 internal AA batteries or from a regulated external supply of 9 ~ 15 VDC.

ACCESSORIES INCLUDED

With the AOR MMT, you get: input cable, stereo connectors, 8-pin mic connectors, power cable, stereo earphones and serial cable for connection to a computer. Note: some soldering of wires and connectors may be required to adapt your transceiver's mic and mic input with the MMT. No alteration to your existing equipment is necessary.

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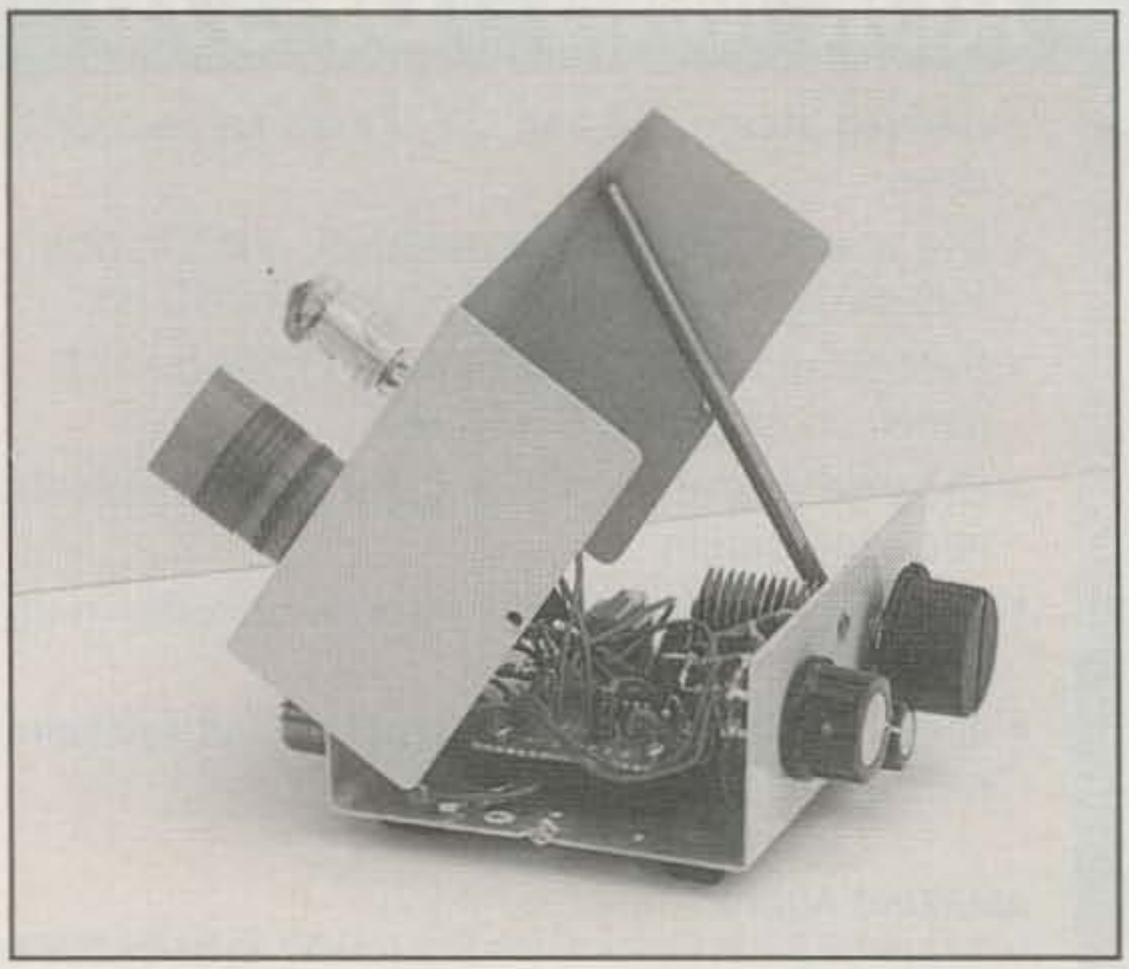

Photo C– This prim and proper little beauty is a one-tube Red Hot Radio receiver Doug McKibbens, KB9IMG, built from details in our September 1995 column, and it works as great as it looks. Doug also "hopped it up" a bit with an extra step of (integrated circuit-achieved) audio amplification. (Photo by Doug, KB9IMG)

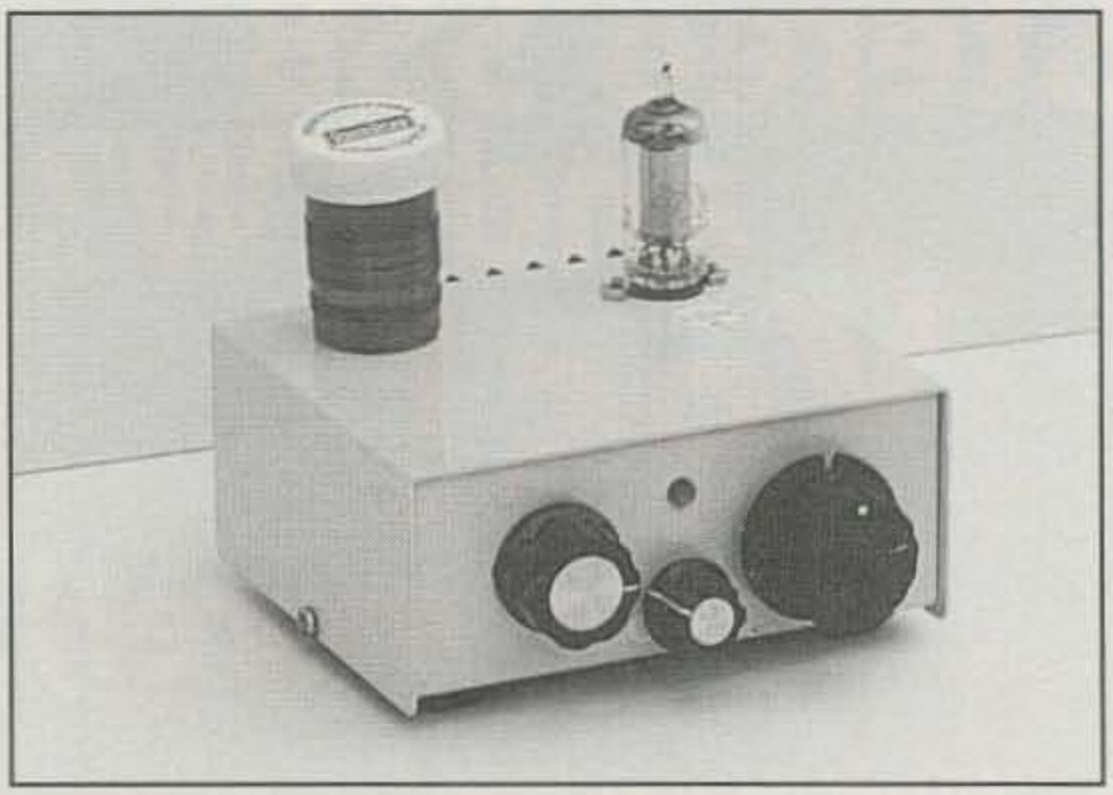

Photo D– Doug opened the lid on his Red Hot Radio to show us its innards, and they too look good. The IC-based audio amplifier section is on perf board in the left area.

with a suitable mate such as a Hammarlund HQ100 (it covers 30 meters) or our upcoming "Red Hot Receiver" and enjoy some real radio fun!

Easy-Brew Power Supply

You say you need a simple high-voltage power supply to use with Dolly Jane or Harass? No problem. Another low-cost special built around a small 115-to-115 voltage isolation transformer and a 115-to-6.3 volt filament transformer is shown in fig. 4. This one uses a basic, yet effective voltage doubler circuit that works as follows.

On alternation of AC (when the "top" of T1's secondary winding is negative and the "bottom" is positive), current flows "against the arrow" of D1, up through C1, and back to the "bottom" of T1. This charges C1 to between 115 and 140 volts. On the next alternation of AC (when the "bottom" of T1's secondary goes negative and its "top" goes positive), current flows up through C2, "against the arrow" of D2, and back to the "top" of T1. This charges C2 to between 115 and 140 volts. Since C1 and C2 are connected in series, their total charges add, and since this is a capacitor-input filter circuit, each capacitor charges to more than the input AC voltage. How much of that charge is stable usable voltage depends on the value of C1 and C2. If they are 50 mFd or greater, output will probably be 240 to 270 volts keydown with a 20 or 30 ma load, perfect for our featured transmitters.

Any small isolation transformer rated at 100 ma or 10 watts is fine for T1, and any 6.3 volt transformer rated at 1 amp is fine for T2. Any diodes rated at 300 volts and 200 ma or greater are fine for D1 and D2. If you mount the transformers on a metal chassis, position them at right angles to each other to minimize 60 Hz hum. Finally, and as you probably know, any other variety of homebrewed power supply (with stable output) can also be used in lieu of this supply to power our featured transmitters.

Survival Radio Update

Our challenge to homebrew from scratch or assemble from commercially-available gear a go-anywhere/emergency/communications package such as outlined in our August column is progressing well. As of this writing (late August), several amateurs have entered and are working on projects they plan to reveal in early December. Another company has also donated prizes to chosen winners and (at this early time) prizes outnumber contestants. When Doctor Dave and friends throw a contest, everyone wins!

Our latest prize donor is DWM Communications (headed up by Bill Lauterbach, WA8MEA), which offers one of its new "YO-YO-Tenna Deluxe" roll-up portable dipoles and a famed "Peanut Whistle Two" QRP transmitter to winners. The fold-up dipole is genuine survival-radio grade. You just roll out the length needed to produce a dipole for 40, 30, 20, 17, 15, 12, or 10 meters; hang it from any convenient support; plug it into your rig; and then rewind it after use. The Peanut Whistle Two is crystal controlled, works 40 meters (or 30 meters with a mod, and pumps out a 1.5 to 2.5 watt signal when powered from a 12 volt battery. Combined with a simple-ceiver for 40 or 30 meters, it makes a dandy survival or emergency rig.

More details on both items will be coming up in future columns, and is also available from DWM Communications, P.O. Box 87C, Hanover, MI 49241 (telephone 517-563-2613; web: <www.qth.com/dwm.com>).

Breadboard Beauty

Earlier while discussing layout of the 6AQ5 transmitter Dolly Jane, I pointed out the dazzling 35T transmitter built "elevated breadboard style" by John Karasz, WB2GMY, and shown in photos A and B. Now let's take a closer look at that heartthrob (which John built from details in our November 1998 "World of Ideas" column).

It is assembled on a beautifully stained and glazed wood base with rounded corners and end supports. "Topside" it sports a genuine National Velvet Vernier dial, round Bliley crystal (as prized as the Eimac 35T tube!), ceramic tube sockets, and authentic transmitting-grade capacitors. For compatibility with modern accessories in his shack, John added a 1/4 inch key socket and a BNC antenna connector on a right-angle bracket. He plans to team the transmitter with his National NC-173 receiver. The pair should make an incred-

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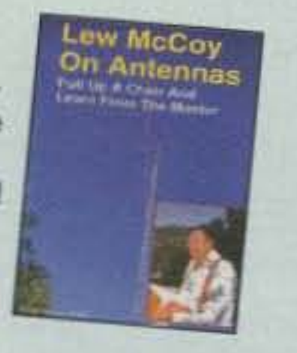

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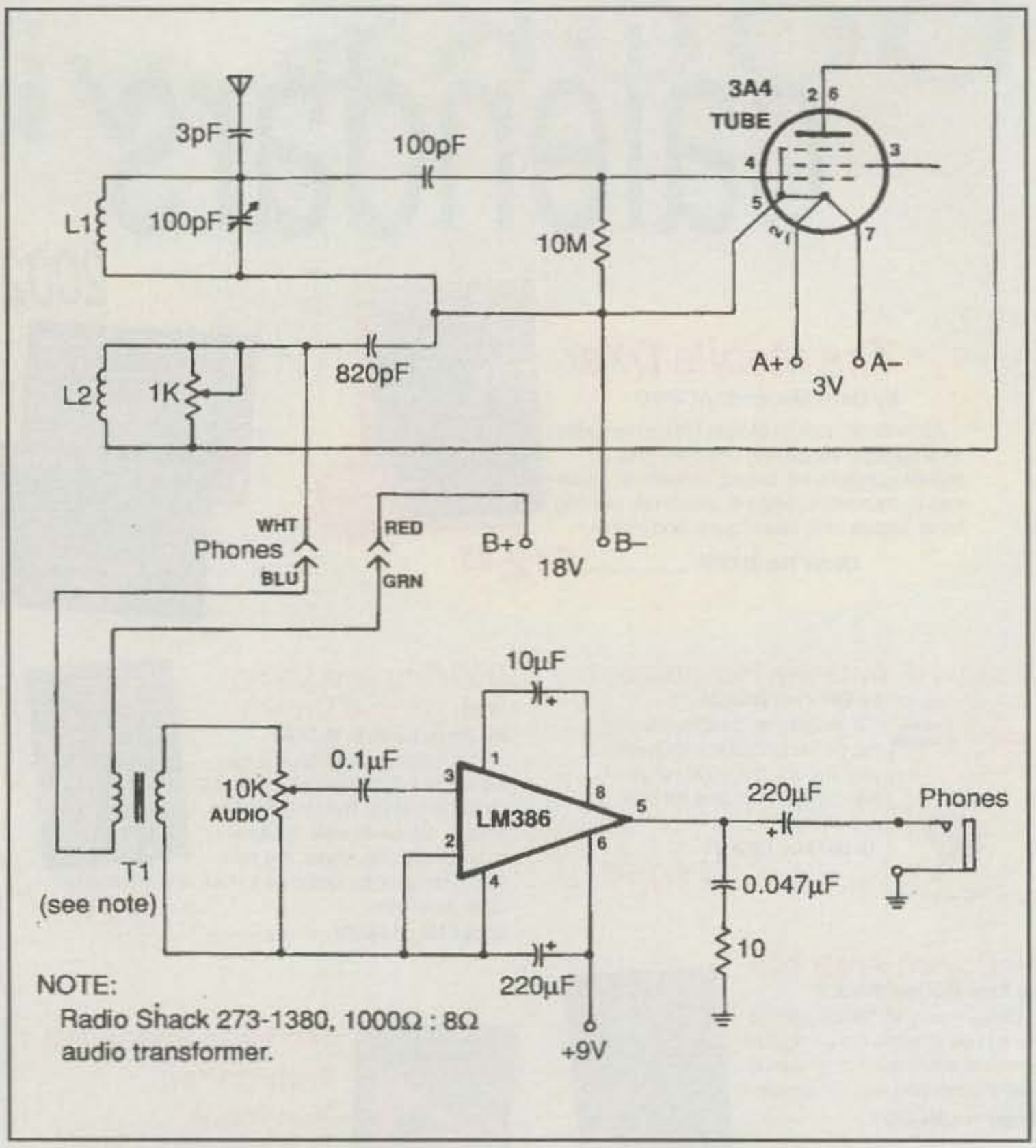

NOTE:
Radio Shack 273-1380, 1000Ω : 8Ω audio transformer.

Fig. 5– Circuit diagram of the original 1995-featured Red Hot Radio receiver and the IC-based audio amplifier section Doug, KB9IMG, added for extra performance. (Details in text.)

ible combo that leaves modern rigs cold! Congratulations, John. You have found true ham happiness!

Red-Hot Mate

Once again supporting your requests and interest in a mating receiver for our featured transmitters, we now spotlight the totally irresistible little beauty shown in photos C and D and fig. 5. Doug McKibbens, KB9IMG, built this one-tube marvel from details in our September 1995 "Red Hot Radio" column, and he says it works quite well. As I discussed in that 1995 column, L1 (which is 25 turns of No. 26 enamel wire close wound on a 1 inch diameter pill bottle form for 40 meters) can be decreased by 4 turns (down to 21 turns, in other words) for 30 meter coverage. Coil L2 remains as 7 turns of No. 26 enamel close wound and spaced 1/4 inch below L1 for both bands.

Doug took his cues for assembly of the Red Hot Receiver (which was originally built by Arnold Sayree, W8WVM) a step further and included an LM-386 audio amplifier IC "after" the tube and optional audio transformer. A separate 9 volt battery powers the IC stage, and the whole receiver is squeezed into a small Ten-Tec aluminum box with the tube and coil on top for a touch of class. You have a *real* ham rig there, Doug! Jolly good show!

Conclusion

That wraps up our visit with the classics for this time, gang. Now get busy homebrewing and/or refurbishing that special-in-your-eyes rig and hit the bands in style while sunspots are up and conditions are great. Remember to listen for me, too, especially weeknights on 30 meters. I am easy to spot. I am the weak one running QRP! May the force of good signals always be with you!

73, Dave, K4TWJ

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Radio Classics

BY JOE VERAS, N4QB

Vintage Gear and Its History

Back On The Air—The Post World War II Era

Amateurs marched back onto the airwaves following World War II with equipment differing little from that used in the late 1930s. The new gear offered by manufacturers tended to be dressed-up versions of pre-war models; the basic designs of many sets approached their tenth anniversaries.

Collins Radio Company emerged from the pack in 1946 to bring something truly new in concept to the amateur market. "Oh, No!" I can hear the groans out there. "He's going to write about Collins again." Before you start rustling pages, going off to read about "Rambling Radiators" or propagation forecasts . . . let me explain; please hear me out.

Collins *really did* make a number of landmark contributions during its time in the amateur market. This month's column contrasts some of the Cedar Rapids company's innovations with those of contemporary competitors; we'll look at a variety of gear . . . who made it, what it did, how much it cost. Candor forces the admission that this month's topic is one of convenience, as well. This is being written as I am lazing in the sun, surf, and sand at our beach getaway on the Gulf of Mexico near Ft. Morgan, Alabama. I am also preparing a presentation on the same topic for the 2001 Collins Users Conference being held in Dallas on October 19–21. *CQ*'s editor has kindly given me permission (Thanks, Rich!) to excerpt material from that presentation for use in this month's "Radio Classics" column.

The Collins 75A was introduced in October 1946. Except for minor changes introduced during production runs, the 75A-1 pictured here is the same. (All photos by Joe Veras, N4QB)

The Revolutionary Collins 75A Receiver

Collins introduced its first amateur-market receiver, the 75A, in 1946. While the overall concept and build quality made the 75A worthy of the winged emblem, two design features in particular distinguished it from its competition. Think of the 75A as having a crystal-controlled converter for each HF band ahead of a tunable IF strip operating in the 1.5–2.5 MHz range (3.5–5.5 MHz for 10 and 11 meters). That's common practice today; it was revolutionary in the early post-war years.

The VFO for that tunable IF strip is the second design feature of note. Collins developed the permeability-tuned oscillator as part of its wartime production and incorporated it into amateur gear afterward. The PTO enabled the 75A to set new standards for calibration accuracy and stability. The kilocycle dial (I use that term to remain *in period,* so to speak) was graduated with markings of one kc per division (two per division on 10 and 11 meters). What's more, the calibration and tuning rate were *exactly the same* from band to band.

An entire technical paper could be dedicated to the PTO, but it is worthwhile to briefly compare it with similar capacitor-tuned circuits. In order to change the frequency of an oscillator in which the controlling circuit elements are capacitance and inductance, either the former or the latter must be varied. In a permeability-tuned oscillator the inductance is varied, not by physically altering the coil itself, but by using an outside substance to change the characteristics of the coil's magnetic field. Iron, certain other metals, and their alloys are thousands of times more receptive, or *permeable,* to the magnetic lines of force found inside a solenoid-wound coil when an electric current flows through its windings rather than the plain air normally present there. If a core made of these permeable materials is inserted into the center of the coil, it effectively increases that coil's inductance, offering another way to vary the frequency of a tuned circuit—hence, the *Permeability Tuned Oscillator.*

In this day of all-synthesized everything, keep in mind the following comparisons are made between the PTO and the capacitor-tuned oscillators of the post-war era. Perhaps I should refer to the latter devices as condenser-tuned circuits, avoiding the seeming anachronism. Whatever the terminology, capacitor circuits offer a larger tuning range; ratios beyond 4 to 1 are possible. The practical limit with a PTO is around 3:1. As a practical matter, neither of these limits is often challenged. A ratio of around 2:1 is adequate for most general-coverage gear, while something in the 1.25 to 1.5:1 range satisfies ham-band-only requirements.

When Collins was developing its circuits, it determined the best frequency stability for an oscillator was obtained in the range of 500 kHz to 3 MHz. Coils for lower frequencies had poorer dimensional stability with temperature change. Beyond the upper end of the range, effects from variations in tube capacitance and stray circuit capacitance increased to an undesirable degree. Permeability-tuned oscillators worked very well in this frequency range and suffered little from

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SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3¼ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅝	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

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GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
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SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

After World War II and on into the 1960s, radios such as the ones pictured came upon the ham marketplace. Top row, left to right: Collins 32V-2 (a 32V-1 with TVI measures added), KWM-2A, and 75A-4. Bottom row, left to right: Hallicrafters HT-19, Drake TR-3, and National NC-300.

small changes in stray circuit capacitance because they could employ large fixed tank capacitors in their designs.

PTOs offer greater frequency stability in the face of changing humidity. Air, the tuning capacitor's dielectric, displays large changes in its dielectric properties with variations in moisture content. The PTO is generally more stable with regard to changes in temperature, too, although both types of oscillators require good design, careful construction, and painstaking compensation for best results.

Even though at first they may seem more fragile than the more familiar bread-slicer-like capacitor devices, a well-designed and manufactured PTO is the more rugged of the two. When subjected to the same amount of vibration, they can be expected to show less than ten percent of the frequency excursion exhibited by a similar capacitor circuit.

The place where the PTO really shines—especially with regard to amateur gear of the '40s, '50s, and '60s—is in calibration accuracy and linearity of tuning. With a variable-pitch winding on the coil, a well-chosen mix of materials for the tuning core, and tight tolerances on the mechanical parts, Collins put 1 kHz calibration and linear-tuning from band to band in the hands of amateurs. Using the 75A or its companion 32V transmitter, a careful ham could return to within 20 Hz or so of a previously used frequency.

Unlike its contemporary competition, the 75A is double-conversion with the second IF at 500 kHz. Transformers at that frequency are used for basic phone selectivity; a series-resonant crystal filter furnishes narrower degrees of selectivity when needed. This circuit, a communications receiver fixture for a decade-and-a-half when the 75A was introduced, was *not* one of the receiver's revolutionary features. Also included was an automatic noise limiter circuit that was quite effective on phone, but less so on CW. Some code ops of the day complained that BFO injection was too light. See? There you go; I'm quite sure many of you out there thought whining and complaining by us CW fans was relatively new. The receiver covered only the ham bands—not a first, but unusual either before or immediately after the war. The 14-tube set also occupied other sparsely populated territory, as it carried a $375 price tag.

National's *Basic Black* HROs

The National Company offered the last of its *Basic Black* HROs, the 5TA, in 1946. With plug-in coils and single-conversion, and lacking any direct frequency readout, it seems a device from another age compared to the 75A. It cost about a hundred dollars less than the Collins, but remains a good receiver. The PW dial, in conjunction with its gearbox and tuning capacitor, is a marvelous execution of the capacitor-tuned oscillator concept. I have an HRO-5 in my collection, and its previous owner tweaked the tuning cap and a coil set to use the receiver as a tunable IF at 500–1000 kHz. The ham bands are covered with separate converters. The tweaked capacitor and coil provide straight-line tuning, the same from band to band, with the 1 kHz marks about a quarter-inch apart on the big PW dial. The converters make it a double-conversion set.

Even in 1946, National could not have done all this for the $375 Collins asked for the 75A. In fact, by the time National brought out the HRO-7 a year later, that set sold for $311.

The Collins 75A/32V and Hallicrafters HT-19

When the 32V was introduced with the 75A, the pair set a trend that Collins followed during its tenure in the amateur radio business. Although Collins equipment changed from one generation to the next, gear within any particular generation displayed a family resemblance. The front panels of the 75A/32V pair are similar in appearance, and they are housed in nearly identical-size cabinets. The 32V runs 150 watts input on CW, 120 watts AM. It cost $475.

Except for minor changes introduced during production runs, the equipment advertised by Collins as the 75A/32V and the 75A-1/32V-1 are the same. Collins advertised the receiver as the 75A upon its introduction in October 1946. Ads introducing the transmitter the following month called it the 32V, despite the fact the photo of the odd-looking prototype is plainly labeled 32V-1. Collins began referring to the receiver as the 75A-1 in November 1947; the 32V acquired its -1 suffix a month later. In terms of actual production, true 75As have the noise limiter in the cir-

cuit full-time. Only a handful of receivers left the factory this way. Nearly every receiver that wound up in the hands of a customer was actually a 75A-1 and included a front-panel toggle switch to take the noise limiter out of the circuit.

In order to contrast equipment from one manufacturer with that of another, it would be nice to compare what was on dealers' shelves at a particular time. Unlike today, companies did not march in lockstep during the post-war years, matching one another feature for feature or playing a dizzying game of oneupmanship. Comparison shopping for an alternative to the 32V would have been difficult. Commercial desktop CW/AM transmitters with a self-contained VFO were scarce to non-existent when the Collins rig debuted in 1946. Hallicrafters introduced the HT-19 in 1948. It had a built-in VFO and ran 125 watts out on 80–10 meters, but the only available phone mode was narrow-band FM. AM operation required an external modulator. The price was a moderate $298.

From Collins to Hunter

Collins postwar amateur gear was not limited to the 75A/32V pair. The company made the massive 30K AM/CW transmitter, a handsome brute housed in a cabinet standing five-and-a-half feet tall. The product line also included the 310 series of exciters, units incorporating the company's PTO and multiplier circuits. Specific features vary from model to model, but all were intended to drive the 30K or similar homebrew high-power amplifiers.

The Hunter Cyclemaster 20A debuted in 1948. The heart of the unit was a PTO.

Dr. Ted Hunter, WØNTI, the man in charge of PTO development at Collins during the war years, was also one of Collins's first competitors to make use of the circuit. When he came to Collins, his résumé included advanced degrees in electronic engineering and physics, along with work as a research assistant in both obstetrics and gynecology. Hunter left Cedar Rapids to start his own company in nearby Iowa City, bringing out the Hunter Cyclemaster 20A in 1948. His transmitter/exciter was similar in concept to the Collins 310s, even bearing a strong physical resemblance. The heart of the unit was a PTO.

The 1950s

The one significant way in which the 75A had not been revolutionary—selectivity—was somewhat improved in its successor, the 75A-2, in 1950. The real selectivity revolution did not begin until that model was succeeded by the A-3 in 1952; it happened with the arrival of the mechanical filter. In simple terms, the mechanical filter works on the principle of the tuning fork. At the filter's input, electrical energy is converted to mechanical energy. This energy is transferred through a series of resonant metal disks (the tuning forks) until it reaches the output end, where it is converted back to an electronic signal. Construction of the filters requires precision in the manufacture and machining of components as well as in the assembly of the filters themselves, but once Collins mastered the process, it had a device capable of providing heretofore unknown selectivity. Unlike the crystal filters employed in the '30s and early '40s, the passband of the mechanical filter is almost ideal. Its top is flat, with little ripple, and the skirts plunge steeply down on both sides. The new 75A-3, excepting its mechanical filter, was similar to the A-2 both electrically and in appearance. The 18-tube receiver covered 160–10 meters; a 3 kHz filter was standard with an 800 Hz filter offered as an option. The price: $530.

National that same year brought out the last of its long-running HRO line, the HRO-60 (unless you count the vastly different, solid-state HRO-500/600). It, too, finally featured double-conversion, and carried a price tag of $483.50, a figure that would grow to $745 by the time the receiver was discontinued nine years later.

In 1955 National introduced a ham-band-only receiver, the NC-300. It was a clean-sheet-of-paper design aspiring to reach the technical high ground occupied by Collins without also duplicating Collins's prices. National's new set covered the 160 through 10 meter HF bands and featured a 30–35 MHz tunable IF for VHF converters, as well. Directly-calibrated scales for 6, 2, and 1¼ meters appear on the NC-300's slide-rule dial. A double-conversion set on the HF bands, the first IF is at 2215 kHz, also the frequency of the 300's crystal filter. Variable coupling in six high-Q circuits provides bandwidths of .5, 3.5, and 8 kHz in the second IF at 80 kHz. A diode detector is used on AM reception, a product detector for SSB and CW. National was successful in keeping its price point at a reasonable $349.95.

The year 1955 in Cedar Rapids found Art Collins and his team assembling the accumulation of several years' work into

The Central Electronics 100V transmitter generated sideband by the phasing method. Its master oscillator was a PTO.

what quickly became the ultimate SSB package. A stable master oscillator with a linear, slow tuning rate and a selective mechanical filter were both giant stepping stones to good sideband performance. Collins already had both of these in its inventory. Commercial sideband equipment from a number of other companies had been in use on the ham bands for several years when the 75A-4 and KWS-1 made their debut, although the Collins gear quickly set a new, higher standard in most areas.

With its pass-band tuning, front-panel selection of three mechanical filters, and 4:1 reduction main-tuning knob, the 75A-4 was every bit as revolutionary as the 75A had been in its day. The KWS-1 gave the amateur able to afford the pair a matching, full KW, SSB/CW transmitter with a limited AM capability as well. The bad news? A 75A-4, with the one standard 3.1 kHz filter, would have extracted four-hundred ninety-five 1955 dollars from your pocket; the KWS-1, one-thousand, nine-hundred ninety-five crisp bills of the same currency.

Many amateurs who tested the sideband waters in the days before (and after) Collins entered the game did so with equipment made by Central Electronics of Chicago. Its products tended to be interesting and innovative. The 100V transmitter qualifies on both accounts; it generated sideband by the phasing method, and its master oscillator was a PTO. Broad-banded circuits made it a *no-tune* transmitter . . . something we take for granted today, and unheard of when the 100V hit the market in 1958. The transmitter sold for $695 when introduced, rising a hundred dollars in the three years following. A matching receiver was prototyped but never reached the production stage.

Hallicrafters, another Chicago company, had a ham-band-only receiver on the market by 1956. The SX-101 fifteen-tube set covered 160–10 meters and sold for $395. Double conversion was achieved with a first IF at 1650 kHz and the second at 50.5 kHz. In the manner of National's NC-300, it used L/C circuits at the low IF for variable selectivity. A number of model variations followed.

As if ham radio were nothing but one long fashion parade, Collins let the next trend-setting shoe drop in 1957. The war was a dozen years behind now. America was more than back on its feet; it was becoming a country on wheels, and that included ham radio. Art Collins thought that if mobile operation were a good thing, mobile sideband must be even better. The ideal solution, of course, was a transmitter and receiver in the same package. With that idea in mind, the KWM-1 was born. The KWM-1 executed the amateur transceiver concept in a limited way; the flower fully bloomed with the introduction of the KWM-2 in 1959. The M-1 covered only the 20, 15, and 10 meter bands, and despite a wide range of accessories for both mobile and fixed-station use, it might not have been as flexible as some desired. Still, it set us on a course we follow to this day. From nearly 45 years in the past, that's powerful foresight.

While National was answering Collins's sideband twins with the NC-300 and Hallicrafters did the same with its SX-101 and HT-32 series transmitters, the company in Cedar Rapids shifted gears once again. In November of 1958, the St. James gray of the A-Line equipment disappeared in a flurry of color advertisements for a new series of gear called the S/Line. The line's main components were the 75S-1 receiver and 32S-1 transmitter, selling for $495 and $590, respectively. When cabled together, the units could be used in the transceive mode. A complete line of accessories was available, including a kilowatt amplifier which made its appearance the following year. In general, all parts of the S/Line were smaller and lighter than equipment from years gone by. They were attractively and thoughtfully designed around a common theme. In September of 1959, the S/Line's most popular, and perhaps most enduring, piece was added. The KWM-2 transceiver essentially combined the circuits of both the 75S-1 and 32S-1 into one package. It covered 80–10 meters, making up for the KWM-1's shortcoming, and cost $1150.

Introduced in 1958 by Cosmos Industries, the Cosmophone 35 was an 80 through 10 meter station-in-a-box.

Advances in amateur radio's state of the art were not limited to the state of Iowa. A couple of other companies had interesting projects under development in the late 1950s. Cosmos Industries, Long Island City, New York, announced what it termed a *bi-lateral transceiver* right at the beginning of 1958. The Cosmophone 35 was an 80 through 10 meter station-in-a-box. Two VFOs gave it the flexibility to transmit on VFO A, receive on B, and vice-versa, or transceive on either A or B. The company's ads even talked about the possibility of full duplex operation, but I don't know if a pair of Cosmophone owners ever *tried* that! Sideband generation and receive selectivity were accomplished with a 3.1 kHz mechanical filter. The Cosmophone rigs could also run CW and AM and sold for $775. The power supply cost an additional $139.50.

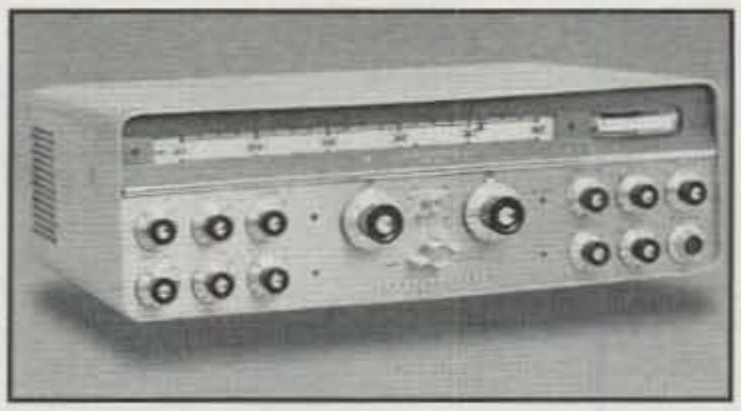
Onward into the '60s

Hallicrafters announced an advanced-concept product in 1957. The FPM-200—except for the voltage regulators, driver, and final amplifiers—was transistorized, and the company's press releases emphasized that the rig's dual VFOs made it a *transmitter–receiver* and not a *transceiver*. The operator did, however, have the option of using one of the VFOs to operate the FPM-200 as a transceiver. After a long-running soap opera of advertisements and special promotions, the rig was finally introduced in 1961. It was never truly a production-line item. Fewer than 200 units found their way into the hands of customers, none showing evidence of mass-production techniques. The FPM-200 was a very bold idea in 1957, or even 1961; not as bold as asking your dad for $2660 to buy a new ham rig . . . not in '61, anyway.

Collins played around with a transceiver mirroring some of the ideas used in the two radios above. A dual-PTO KWM-2 successor was conceived, and the project was dubbed *The Cadillac* while the idea was under development during 1961 and '62. The project died a quiet death, but an engineering model survives.

The KWM-2/KWM-2A enjoyed a long run, closing out the vacuum-tube era at Collins in 1979. More than 24,000 units of the two variants came off the company's production lines during that two-decade period.

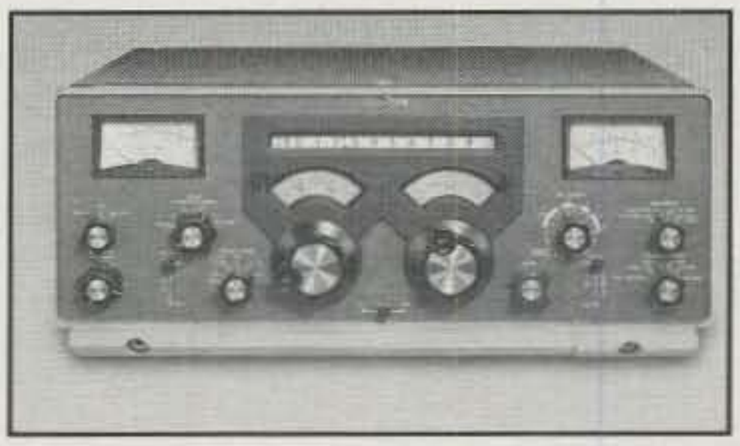
In Miamisburg, Ohio, Bob Drake took the amateur transceiver concept and molded it into the shape of the TR-3, another landmark piece of equipment. The compact SSB, CW, and AM transceiver ran 300 watts PEP on 80–10 meters; at $550, it was less than half the price of a KWM-2. When it hit the ham market in 1963, the TR-3 continued the tradition established by the Drake receivers preceding it: small size, high performance, and excellent value for the money. The new transceiver and the 4-Line equipment to follow used PTO-tuning in their master oscillators, ending our story where we began.



The Hallicrafters FPM-200's dual VFOs made it a transmitter-receiver and not a transceiver, according to the company's press releases in 1957.

In Closing . . .

Faced with the number of features available on today's radios, it is difficult to say exactly which among them is the most significant. It could depend on your favorite mode or operating style. We have just taken a look at progress in an era when a single technical development might have been a big deal. One feature alone could make a head-and-shoulders difference in performance. Finally, it was a time when the difference between price and value was more than just a semantic one.



The Cadillac was a dual-PTO KWM-2 successor under development during 1961 and '62. The project died a quiet death, but an engineering model survives.

Thanks to the following who supplied equipment for the illustrations accompanying this month's column: Brian Roberts, K9VKY, for the Collins 75A-1, 32V-2, and 75A-4; Brian Wingard, N4DKD, for the National NC-300; Herman Cone, N4CH, the Cosmophone 35, Hallicrafters FPM-200, and Central Electronics 100V; Ron Payne, WA6YOU, the Drake TR-3; Dennis Day, WØECK, the Collins "Cadillac"; and Chuck Dachis, WD5EOG, the Hallicrafters HT-19. The KWM-2A is from the collection of the late Harry Snyder, WØRN, and the Hunter Cyclemaster resided in my own collection at the time it was photographed.

Writing a column on a quarterly basis allows things to slip through the cracks occasionally. I got a book at Dayton I have been meaning to mention; sorry it has taken me this long to get around to it. *A Family Affair (The R.L. Drake Story)* is a *great* read! Please pick up a copy from Universal Radio or another ham radio bookseller, or look for one at your local hamfest. If you are interested in Drake equipment, or just vintage ham gear in general, you will enjoy this book. John Loughmiller, KB9AT, has done a superb job of documenting one of the major players in our hobby.

73, Joe, N4QB

Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

Inexpensive, Simple Low-Power Transmitters

While cleaning up the shack, I came across an article in a 1960s-era issue of *Popular Electronics* magazine (long since defunct) that described a transistorized transmitter that produced the amazing communications range of "45,000 miles per watt"! In fact, that was the title of the article. What the author really meant, however, was that based on a contact he actually had, his communications range could have been extrapolated to 45,000 miles (under the same conditions) if he had a watt of output power. That is not the point of this column, though. What all of this prompted was to see, using today's technology, just how much simpler and inexpensive an amateur transmitter could be.

Fig. 1 was the first attempt. Here a lowly TTL quad gate is connected as a crystal oscillator using a low-cost 3.58 MHz TV color burst crystal for operation in the 80 meter band. No doubt other crystals will work, and operation in the 40 meter and even the 20 meter band should be no real problem. The first two gates are connected as a crystal oscillator, the third as a "keyer," and the last as a "power amplifier." The chip used is a 74ACT00, since theoretically it is capable of driving up to 25 ma into a 50 ohm load (which under ideal conditions works out to 30 milliwatts). The fact that the transmitter employs CW adds to the simplicity of the design. You only have to turn the carrier on or off.

You will remember that TTL chips normally operate from a 5 volt supply, but this transmitter will probably operate from three fresh AAA batteries (4.5 volt) or four used AAA batteries (5 volt). Whatever you do, don't exceed 6 volts or you may not have a chip left with which to experiment. You also may have to play with the values of the 470 ohm resistors for best operation, depending on the crystal you have, but you should be able to easily get the transmitter working.

Since there are no tuned circuits in this design (and the output is essentially a square wave), there will be noticeable harmonics, so don't try to make this your primary station. We purposely left out any tuned circuit to keep costs as low as possible, but you can experiment with a series tuned network per fig. 2 in an attempt to control harmonics, but this will add to the cost. Based on small-quantity component prices, the "raw" circuit should cost less than two dollars, the most expensive component being the crystal (which can be gotten free from a discarded TV set or a junk box if you are lucky enough; then the cost will be less than a dollar).

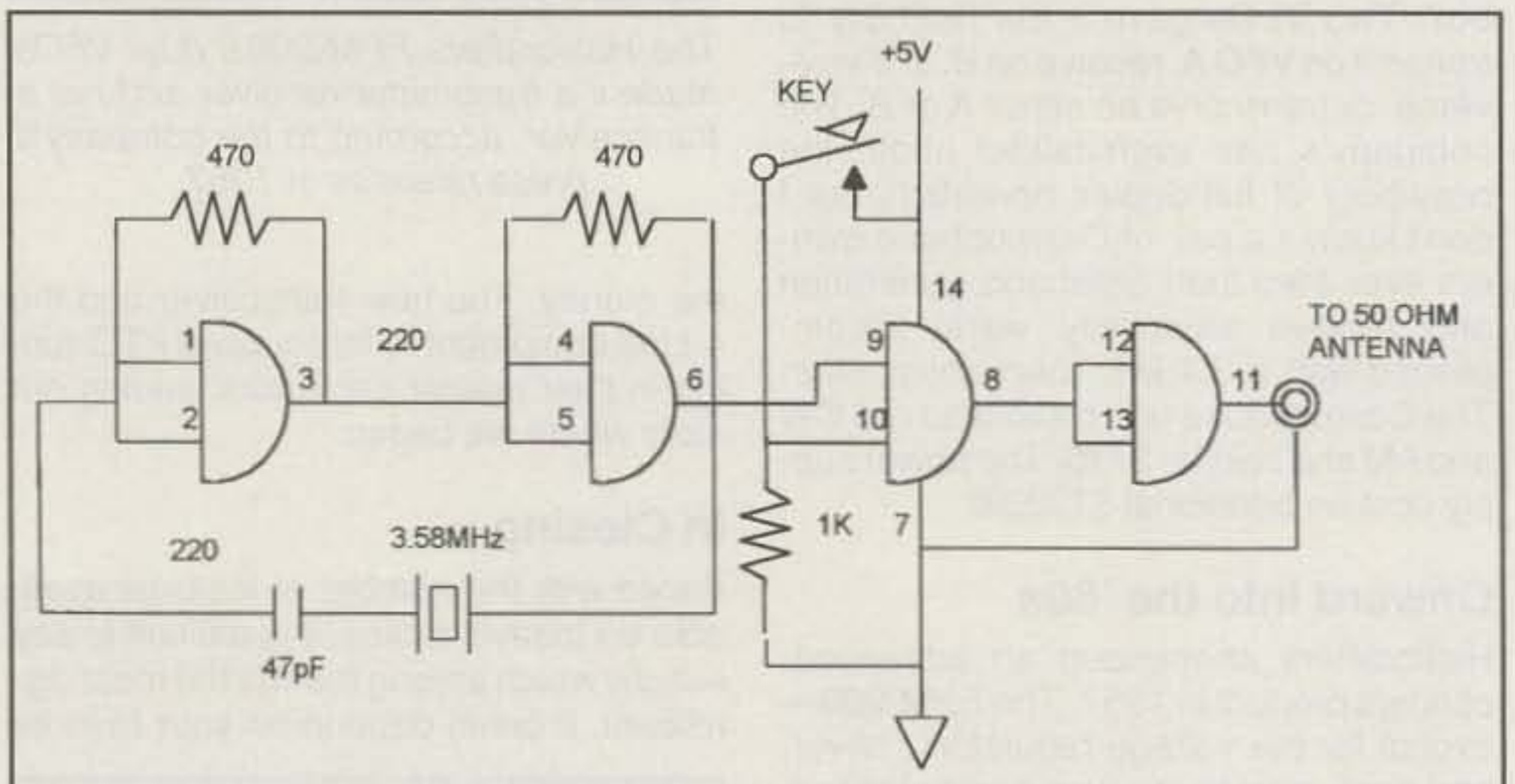


Fig. 1– TTL-based transmitter.

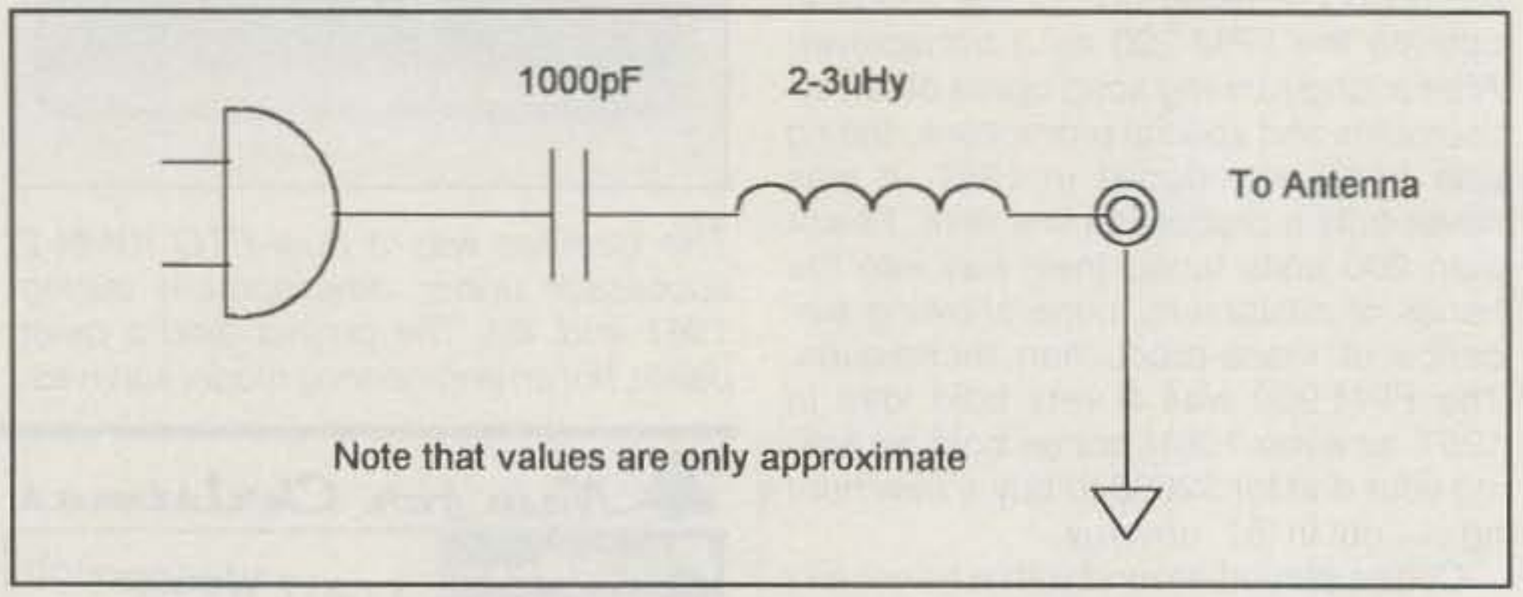


Fig. 2– Series tuned circuit for harmonic suppression.

After getting a number of snide and "are you crazy" type comments on this approach from a friend (who prefers to remain nameless), I came up with the more conventional circuit shown in fig. 3. Here a single transistor is used as the crystal oscillator and a second transistor as a "power" amplifier. In this circuit the RF produced is sinusoidal due to the tuned circuit in the amplifier stage, so undesired harmonics basically are kept under control. Power can be obtained from a 9 volt transistor radio battery or 6 volt lantern cell. Again CW is the mode for simplicity.

Our final transmitter (fig. 4) is one designed for audio, FM, and 6 or 2 meters. This time, however, an LC oscillator is used instead of a crystal to allow for proper deviation of the carrier. A high-frequency transistor is used, although you certainly can experiment with a common 2N3904. Audio is applied to the base of the transistor, and about a volt is all that is needed for 5 kHz deviation. This can be provided by a crystal microphone or an electret or dynamic mic with a one-transistor preamplifier.

Tuning the transmitter for operation

c/o CQ magazine

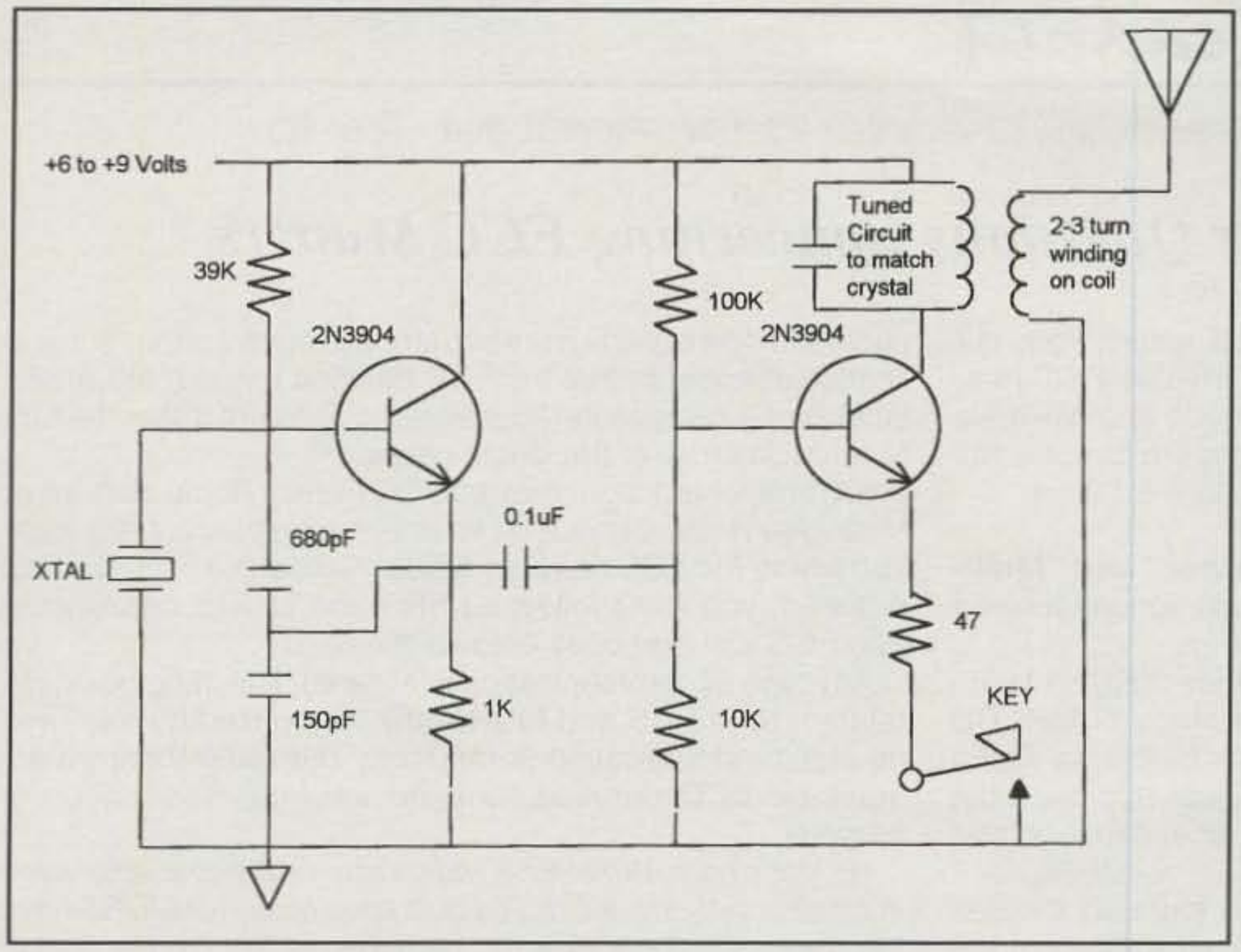


Fig. 3– Sinusoidal transmitter.

in the 6 or 2 meter band is done by compressing or stretching the coil and varying the value of the 10 pF capacitor. Stability is determined by the ruggedness of the tuned circuit coil and quality of the capacitor, so wind the coil on a ceramic or plastic form and use a mica capacitor. About a milliwatt or so is produced by this circuit, so you will need to design an additional stage for greater range.

I have tried to whet your appetite this month and am most anxious to see what circuit builders come up with. Please send me what you find and I will be glad to publish the results. Remember, the simpler the better.

73, Irwin, WA2NDM

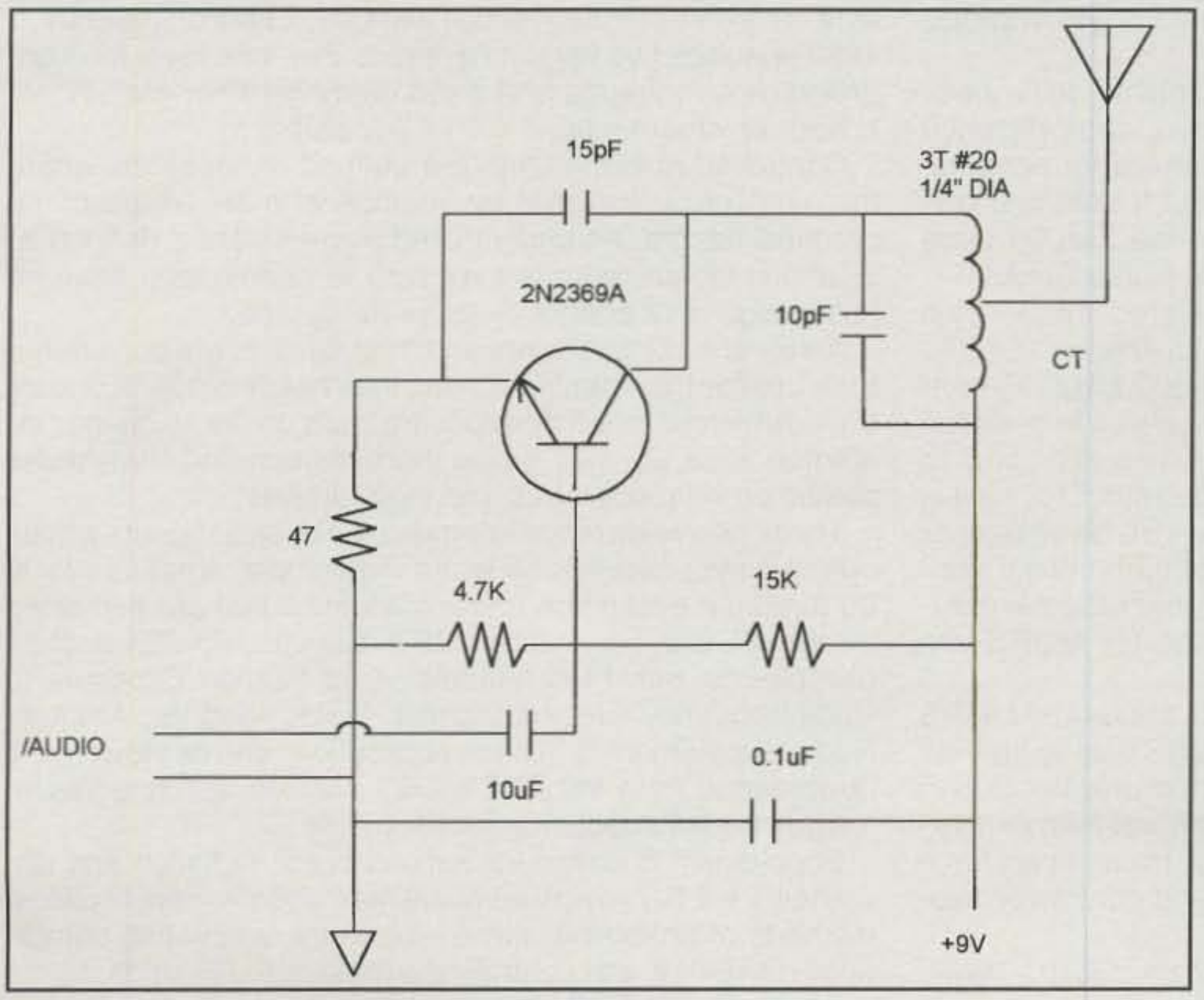


Fig. 4– Simple FM transmitter.

Washington Readout

BY FREDERICK O. MAIA, W5YI

Regulatory News In The World Of Amateur Radio

Answers to Your Questions Concerning FCC Matters

We constantly are bombarded with letters from our readers concerning issues that involve FCC matters. We save them, and every once in a while we cover some of the more general-interest ones in this column. Here goes...

Just what are the "Family Radio Service" and "Multi-Use Radio Service? Don't they amount to unlicensed ham radio?"

The FCC created the Family Radio Service (FRS) in 1996, the first new Citizens Band Radio Service since 27 MHz CB was created some five decades ago. The Multi-Use Radio Service (MURS), another new CB service, was approved just a year ago. Both may be used for hobby use, although that was not their original intention.

The Family Radio Service operates on fourteen simplex channels between the 462 and 467 MHz allocations of the General Mobile Radio Service (GMRS), CB's predecessor (*It was the original "Class A" CB—ed.*). The primary objective of the new service is to permit families and friends to communicate over short distances, such as at amusement parks, using crystal-clear FM handheld radios. Range is less than a mile.

The FRS was the culmination of more than 20 years of attempts by FCC and industry to establish a new unlicensed personal radio service at the VHF/UHF level. The service uses palm-size half-watt handheld radios with permanently affixed antennas. There are very few operating rules. Complete information, including FRS rules, can be found on the FCC's website at: <http://www.fcc.gov/wtb/prs/famrad.html>.

The Multi-Use Radio Service (MURS) is not as well known. The FCC defines it as "...a private, two-way, short-distance voice, data, or image communications service for personal or business activities of the general public." It uses five low-power VHF frequencies reassigned from the Part 90 Land Mobile (business) band to the Part 95 CB Radio Service.

The authorized bandwidth is 11.25 kHz on frequencies 151.820, 151.880, and 151.940 MHz; 12.5 kHz on 154.570 (so called "Red" dot frequency); and 154.600 MHz ("Green" dot). Power level is up to 2 watts ERP (effective radiated power) output using any type emission. There is no limit to the height of the antenna as long as the 2 watts ERP limit is not exceeded. Unlike the ham bands, there will be no restrictions on cryptography or transmission of commercial content, and the MURS rules do not expressly bar repeater operation or phone patching. The FCC rules for MURS are contained in Subpart J of Part 95.

As with FRS, you do not need a license to operate on MURS frequencies. The original objective of MURS was to provide a home for contractors to be able to communicate among themselves on the job. Many inexpensive hand-held narrowband FM commercial radios tuned to these frequencies have been sold in the past through catalogs and contractor suppliers with few of the buyers bothering to apply for the required license. It appears that the FCC decided it was more realistic to simply remove the licensing requirement rather than try to track down all of the illegal users.

Anyone, of any age, may use the Family Radio Service or Multi-Use Radio Service on an unlicensed basis at any location where the FCC has jurisdiction. Although a license is not required, you must follow all FRS and MURS regulations. The FCC can and does enforce the rules.

Any type of communication is allowed, including business related. Both FRS and MURS are "authorized by rule" and no station identification is required. The radio transceivers must be FCC certified, and no internal modification is allowed.

(*Editor's note: While FRS radios are widely available, even in office supply stores, radios built specifically for MURS have been excruciatingly slow to reach the market. To the best of our knowledge, the only current source of MURS radios is the "color-dot" equipment discussed above.*)

Can you explain exactly what the FCC's RF safety guidelines that apply to ham radio are?

Up until August 1996, amateur radio was specifically excluded from the FCC's RF radiation safety rules. Due to relatively low power and duty cycles, ham radio transmitters were found to be safe under the then-current 1982 RF protection guidelines.

The Commission adopted new and stricter RF safety guidelines in 1996, and ham radio was included for the first time! The new standard which went into effect on January 1, 1998 specifies two tiers of RF exposure—one level for "controlled" environments and a more stringent tier for "uncontrolled" environments.

Controlled environments are defined as locations where the exposure is incurred by persons who are aware of the potential hazard. An uncontrolled environment is defined as locations where there is exposure to people who have no knowledge of or control over the RF source.

Amateur radio operators and their families are considered to be in a controlled environment, their neighbors in an uncontrolled environment. The exposure limits on the adjoining residential area are five times more demanding than those placed on ham operators and their families.

These new rules require compliance by all amateurs whose output power exceeds 50 watts. To comply, amateurs must do a routine evaluation under guidelines that are explained in the FCC's RF safety OET Bulletin 65 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" and its "Amateur Radio Supplement B." These publications can be viewed and downloaded from the FCC's OET website at: <http://www.fcc.gov/oet/info/documents/bulletins/#65>.

Supplement B covers definitions of RF radiation and discusses the FCC exposure guidelines and their applications, methods of predicting human exposure, estimating compliance distances, and controlling exposure to RF fields.

Studies by the FCC and others have shown that most amateur radio transmitters would not normally expose persons

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to RF levels in excess of safety limits. This is primarily due to the relatively low operating power used by most amateurs, the intermittent transmission characteristics typically used, and the relative inaccessibility of most amateur antennas. As long as appropriate distances from amateur antennas are maintained, exposure of nearby persons should be well below safety limits.

Completing the evaluation is usually just a case of referring to a lookup table prepared by the FCC to determine if the antenna is far enough away from areas of exposure for the mode and power you are using.

The question pools for various amateur radio licenses were updated to include information on the new RF safety rules. When amateurs apply for or renew an amateur radio license, they must also certify that they have complied with the new RF safety rules.

What is GMDSS?

GMDSS (Global Maritime Distress and Safety System) is an international satellite-based maritime communications system that became mandatory in 1999 for large commercial ships on international voyages. It basically replaces radiotelegraph communications on the high seas. The biggest advantage of GMDSS is that it is not subject to HF radio-wave propagation conditions.

The 500 kHz international radiotelegraph distress frequency, established in 1906, was discontinued after GMDSS became mandatory. The U.S. Coast Guard actually stopped monitoring 500 kHz completely in 1995.

I keep hearing about the "Incentive Licensing" fiasco of the 1960s. What was that all about?

In 1967, with the support of the American Radio Relay League, the FCC phased in a three-year program known as the Incentive Licensing System. Effective November 22, 1968, amateur radio became a developmental program with operators climbing the licensing ladder by passing more difficult CW and theory examinations. The new rules also re-established the Advanced Class, which had been unavailable since 1951.

The objective was to motivate approximately 100,000 General Class ticket holders to upgrade by making additional Advanced and Extra Class frequency blocks available to them on an exclusive basis. Many General Class amateurs were furious when they lost access to frequencies which would now be restricted to the Advanced and Extra

Class. They had to pass additional examinations to get them back! They still complain about the injustice.

What do you think will be the result of the ITU's consideration of the international amateur radio regulations at WRC-2003?

Nearly 200 countries meet periodically to agree on how the radio spectrum will be divided up and used. These meetings are called World Radiocommunication Conferences and their agreements, once ratified by the Senate, have the force of law in the United States. The next one will consider (among many other topics) revamping the Amateur Service regulations, and it is widely believed that Morse code will no longer be required to access the high-frequency ham bands.

The International Telecommunications Union's (ITU's) consideration of the Amateur Service rules started at the 1995 World Radio Conference held in Geneva when the New Zealand government proposed abolishing international Radio Regulation 2735 in favor of RR2736. RR2735 (since renumbered as Article S.25.5) requires Morse code knowledge (no speed is specified) when amateur communication takes place below 30 MHz. RR2736 (renumbered as S.25.6) leaves amateur operator requirements up to the various national administrations.

The proposal became very controversial. Some administrations (including the United Kingdom) favored the change, while others opposed it or said the time was not right and the issue needed further study within the amateur community. The ultimate action was to delay further consideration until a later conference, although an initial proposal looked toward resolving the issue at WRC-97.

On July 26, 2000 a resolution was adopted at the WRC-2000 conference in Istanbul, Turkey, which finalized the agenda for WRC-2003. One of the approved agenda items is a "...possible revision of Article S.25." That conference will be held from June 9 to July 4, 2003 in Venezuela.

My guess is that New Zealand will get its wish and RR2735/S.25.5 will be abolished and RR2736/S.25.6 (or a form thereof) will be left to specify amateur radio operator requirements. The one line simply reads: "2736/S25.6 – Administrations shall take such measures as they judge necessary to verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station."

Another topic affecting amateur radio slated for discussion at WRC-2003 is a possible realignment of 40 meters to separate amateurs in the western hemisphere from broadcasters in the eastern hemisphere. It's too soon to tell what agreement, if any, will be reached.

What will happen to ham radio growth if the Morse code exam requirement is ended after the next World Radio Conference?

That's the 64 dollar question! Today the growth of amateur radio is controlled by the necessity to learn Morse code to access the high-frequency bands. My guess is that we will see an expansion in the total number of ham radio operators, but nowhere near as much as some people would have you believe.

In any event, code-free HF is probably at least five years off in the future. It will take that long for the FCC to complete rulemaking on any decision that comes out of WRC-2003. I look for a total overhauling of the Amateur Service at that time, not just the elimination of Morse code proficiency.

Japan has had a 4th Class 10 watt ham license that does not require code proficiency for decades, and its ham popularity has been decreasing—no doubt due to the internet, which allows international communications without regulations or licensing. The most popular local wireless communications service in Japan is the internet-based "I-Mode" text messaging service with more than 20 million users.

I-Mode, the creation of NTT's DoCoMo mobile phone division, allows its users to view specially formatted websites and send/receive instantaneous e-mail which has everyone in Japan constantly checking their mobile phones. With the fast-approaching new generation of voice and video capability (3G), it will be even more popular in the future.

I still believe that newcomers to ham radio will first want VHF/UHF amateur communications so they can talk on the local repeater network with their friends. The future of ham radio is digital communications, and the ARRL has a task force working on it.

I have heard one-by-one formal callsigns on the ham bands. How do I get one of them?

One-by-one callsigns (for example, W1A) are available for temporary use by any licensed radio amateur to commemorate a special event. A one-by-one callsign consists of a single prefix letter (K, N, or W), the region number (Ø to 9), and a single suffix letter (A to Z, except the letter X). You do not have to hold any specific class of license. The FCC first addressed a special event vanity callsign system in 1993, when it reserved the block of callsigns having the rarest of all formats, the 750 one-by-one (1×1) calls, for temporary use by ham radio stations during events that are of special significance to the amateur community.

In 1995 the FCC proposed that the special event callsign system would be administered by the Commission. The licensee would be required to submit a list of one-by-one format callsigns, in order of preference, four months before it would be needed. The first assignable callsign on the list would be stamped "granted," and a copy of the list would be returned to the person making the request. The applicant would certify that the "event" is of special significance to the amateur service community. The

1×1 callsign could be used for a period not to exceed that of the special event, or for 15 days, whichever was less.

On March 20, 1997 the Commission adopted an Order implementing the 1×1 Special Event Call Sign System. The system the FCC adopted, however, was a "self-administered" system with volunteers being certified to serve as "amateur station special event callsign data base coordinators." The Commission also observed that "...the amateur service community provides on-line license data base information through the internet " and that they were "...confident this experience can be used to coordinate the short-term use of special event callsigns."

Several organizations (all VECs, including the ARRL-VEC and W5YI-VEC) applied to coordinate 1×1 callsigns. The W5YI-VEC wrote an on-line computer program which was posted to the internet and permitted various coordinators to assign callsigns to a common on-line database. It can be found at: <http://ncvec.spindle.net>.

The FCC noted, "The operation of a special event station does not require additional skill. Nor does a special event callsign authorize any operating privileges. It simply allows an already-licensed station to temporarily use a different callsign in the identification announcement that helps attract greater attention to the on-air presence of the station."

Examples of the use of one-by-one callsigns by amateur stations include a wide variety of events such as conventions, festivals, dedications, and anniversaries. We also note some events of lesser importance, such as ham club or even individually sponsored events, are posted to the database.

To reserve a 1×1 callsign for your special event (and wide latitude is permitted as to just what that entails) simply contact any authorized Special Event Call Sign Coordinator. The easiest way to do that is to simply go to the website and apply online at: <http://ncvec.spindle.net> through one of the coordinators. The guidelines for using the 1×1 callsign are posted to the website.

More Questions?

That about covers this trip through our mailbag, and we hope it provided you with some useful information. If you have a question about ham radio rules or the rule-making process, drop us a line. If your question is of broad, general interest, it may show up here the next time we take up questions from readers.

73, Fred, W5YI

How It Works

BY DAVE INGRAM, K4TWJ

Theory 'n Practice

Antenna Notes and Tips for New HFers

A budding new HFer recently ordered one of my new *Guide To HF Fun* books* and also asked my opinion of using a mini-dipole strapped to his condo's balcony. As I visualized his setup I realized the new op's success in using it depended on several easily overlooked aspects, facts many seasoned amateurs often take for granted. Thinking further, I also questioned how anyone could be expected to understand even basic signal-radiation theory if it is never explained in plain-language terms. Those "Helping Elmer" notes—facts often omitted from books and magazine articles because "everyone knows that" (really?)—are the subject of this month's "How It Works" column.

When considering antenna-related questions, incidentally, I usually start by visualizing the type of antenna to be used, its planned area of installation, and the proximity of nearby objects. Then I formulate my answer. I also strive to understand that every amateur wants a strong signal such as those gained by having a big beam atop a tall tower (photo A). Physical and financial limitations, however, make dipoles and verticals the most popular and often-used antennas (fig. 1), and that is perfectly acceptable. The key is getting on the air and enjoying what you have, not fretting about what you do not have.

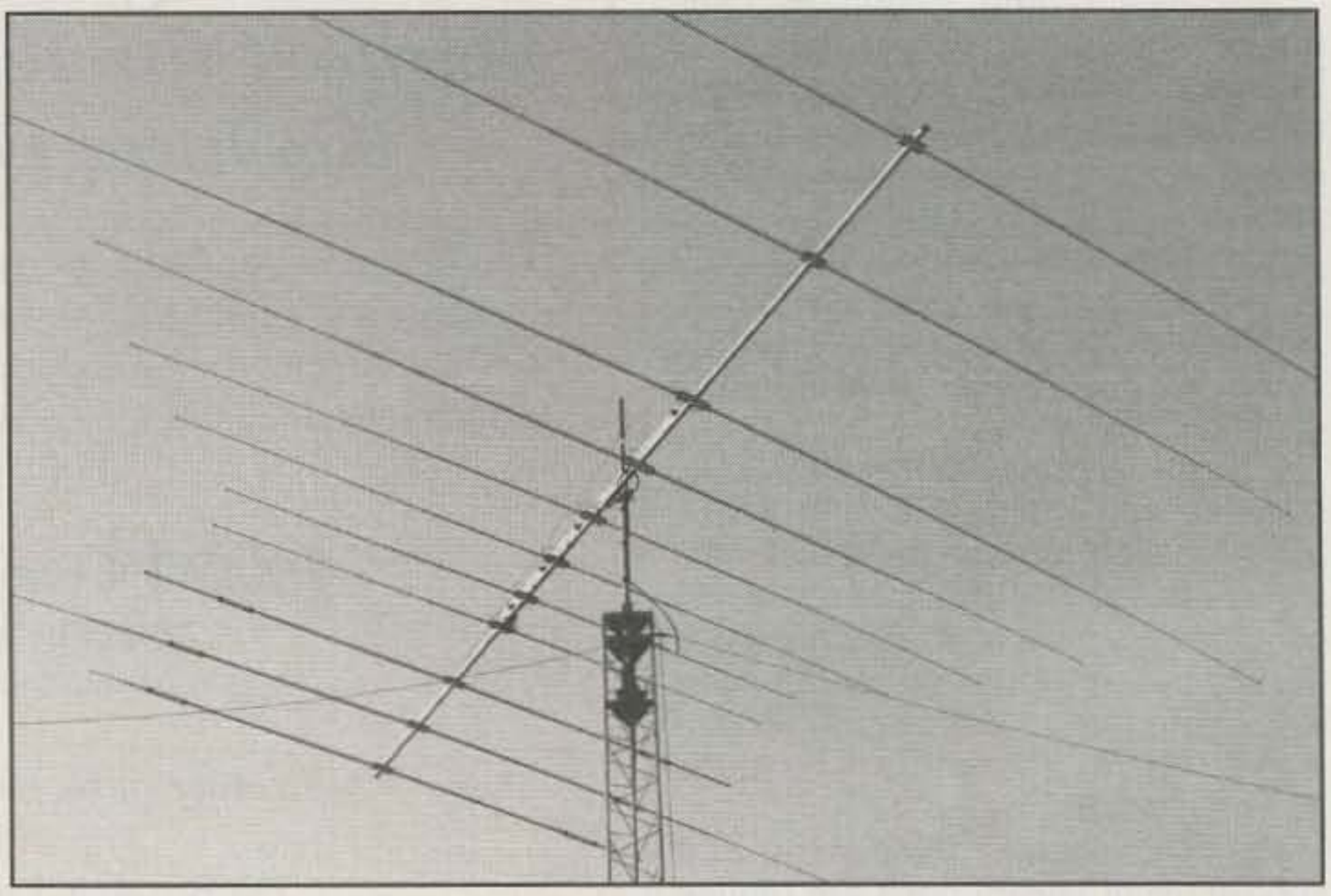

Photo A– Forget those lavish homes and big SUVs, friends. The real American ham dream is a big beam such as this Hy-Gain TH-11DX. It works 10, 12, 15, 17, and 20 meters. It has an element span of 37 feet, a boom length of 24 feet, and reaches out like a champ. (Photo courtesy Hy-Gain)

If the above-mentioned balcony-strapped dipole is oriented with its elements broadside to the condo as illustrated in fig. 2(A), the usual arrangement, a creditable amount of its signal radiating capabilities would probably be hampered by the building. Since the station's equipment and the condo's power and telephone wires are close to the antenna, RF interference and RF feedback could also prove troublesome. In other words, the antenna would work fine, but its location would send radiated energy in the wrong directions. Repositioning the antenna so its elements are at (or close to) right angles to the building would radiate more RF energy into clear space while minimizing RFI and feedback (fig. 2[B]). If the mini dipole was mounted atop the building, the clear area would improve transmission and reception of signal, but RF energy could also radiate downward into telephone, TV, and power lines. If a vertical antenna was mounted in place of the dipole atop the building, RFI and feedback in the station below would again be minimized. Confusing? Okay, let's bring in some always-helpful notes for clarification.

How Signals Radiate

A convenient and effective way to visualize how RF energy emanates from an antenna is by making an analogy between the main/driven element and a long neon tube, as illustrated in fig. 3. In the case of both neon tubes and antennas, maximum radiation emanates at right angles, or "broadside," to the element with minimum radiation off the ends or tips. That fact holds true regardless of whether the neon tube (or an antenna element) is positioned horizontally or vertically. Furthermore, the greatest amount of light, or RF energy, is closest to the radiator (actually, both RF and light are electromagnetic energy; they differ only in frequency).

Some folks refer to a neon tube's close-in light as *usable reading light*. By comparison, the intense RF energy near (and broadside to) an antenna element is often called *induction field energy*. This is because it is strong enough to induce into a nearby parallel conductor such as a telephone or power wire (assuming more than 4 or 5 watts of power). Yes, transformers also work on the principle of induction, and yes, antenna and power or telephone lines act like an open-air transformer. How far from an antenna does an induction field extend? That is a quite open-ended question, but 10 to 20 feet for 50 or 100 watts on HF is a fair estimate.

Polarization Matters

Some antennas are designed to radiate signals on a horizontal plane and some are designed to radiate signals on a vertical plane. HF signals reflected off the Earth's ionosphere may be vertically polarized, horizontally polarized, or any polarization between vertical and horizontal when received at a distant QTH. What's the significance, you ask? I have found switching between vertically and horizontally polarized antennas while working distant stations produces a difference between 5 and 10 dB on both transmitted and received

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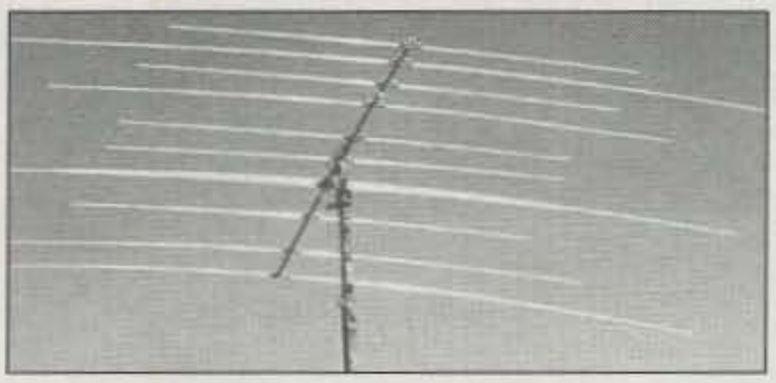

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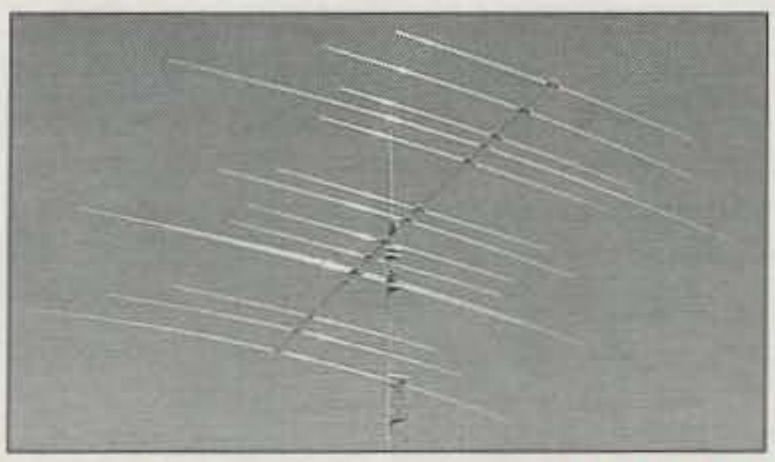

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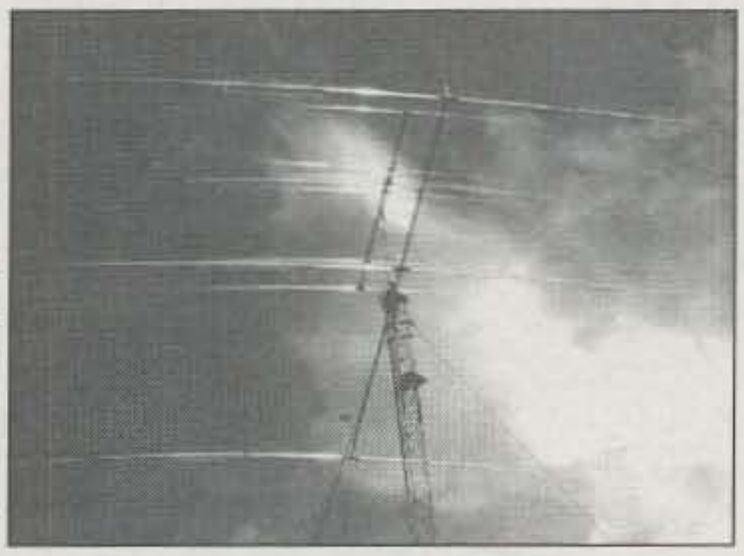

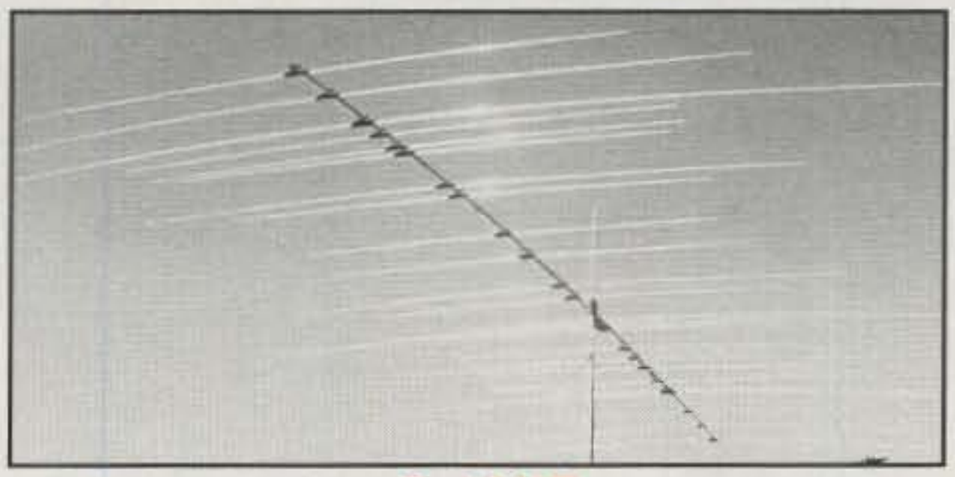

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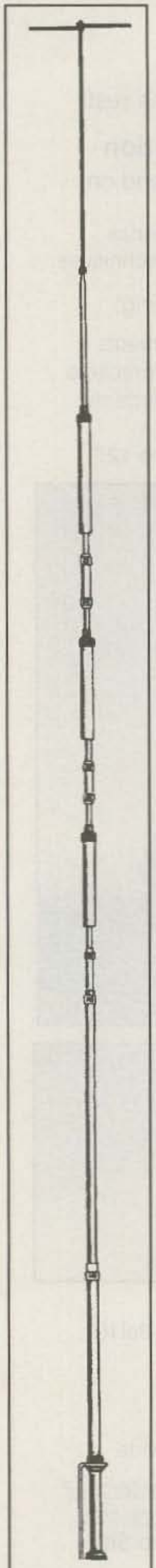

Fig. 1– When reality is factored in, the most popular and often-used antenna among average amateurs is a good vertical such as this Hy-Gain. It stands 18 feet tall and works 40, 20, 15, and 10 ←meters in fine style. (Artwork via Hy-Gain)

signals. That's right: Variations in signal polarization can produce as much difference in strength as the gain of a medium-size antenna. It also explains why operators using basic antennas (especially slopers) occasionally work out comparable to those using small beams. They have signal polarization in their favor. Relating those facts to balcony-strapped dipoles tells us tilted or sloped mounting has benefits for transmitting, receiving, and minimizing RF feedback. At the least, it's worth trying!

Short Notes on Long Wires

Single long wires of various lengths are popular "alternative antennas" among budget-conscious and portable-operation-oriented amateurs, and they usually work out quite well for their cost. In fact, a quarter-wavelength or longer length of "hook-up" wire with blue/gray insulation to blend with its sky background makes a nice stealth, or "invisible," antenna for condo use. A stand-alone, wide-range antenna tuner (plus a solid earth ground for all station gear) is required to match a long wire and transceiver, but that is no problem. Antenna tuners are quite plentiful.

There are a few pits and wrinkles in these prunes, however. RF energy radiates from a long wire's full length, and that includes the section connected to your in-shack antenna tuner (fig. 4). This arrangement obviously promotes RF feedback, and adding snap-on toroid cores to the wire is not feasible, because we want the wire to radiate RF energy. It is our antenna! The alternatives here thus centers around reorienting the long wire or using a different band to minimize in-shack RF energy. Lowering power, possibly down to the 5 or 10 watt level, should also help reduce the "stray RF" level. Unmistakable signs of stray RF "getting back into station gear," incidentally, include an on-desk lamp or rig's meter light getting brighter rather than dimmer when you tune up. Other tell-tale effects include a distorted transmit signal, an erratic operating VOX or circuit breaker, or a hot-to-the-touch rig case or key. Hopefully you will be able to recognize and sidestep those pitfalls if they occur in your own setup.

Applying Your Knowledge

How useful is the information presented in this month's discussion? Can it help you assemble a

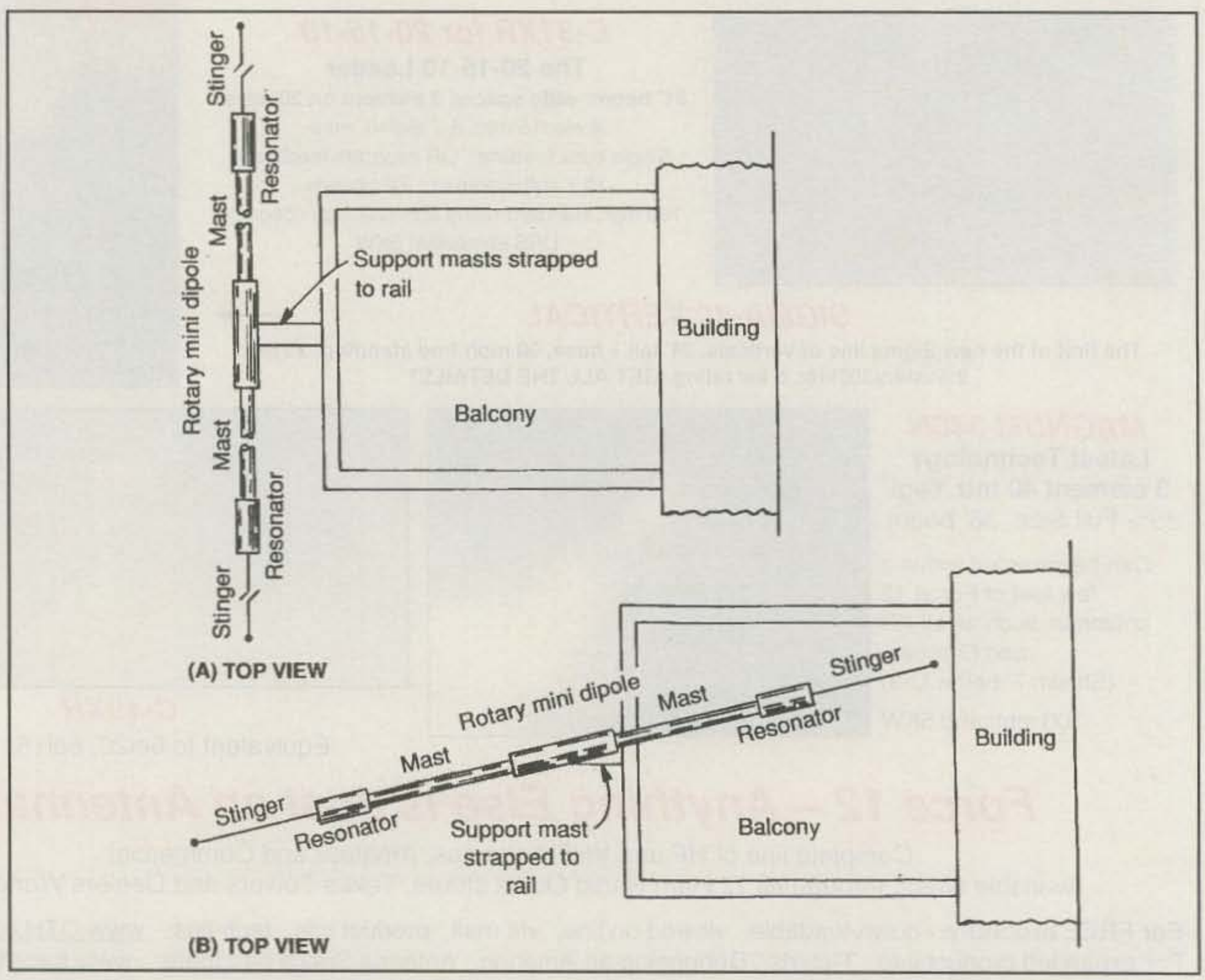

Fig. 2– As discussed in the text, mounting a dipole for best radiation in desired directions is easy with a mild amount of preplanning. In (A) one of the antenna's main lobes is blocked by the building (while causing RFI). In (B) both lobes radiate freely and RFI is also reduced.

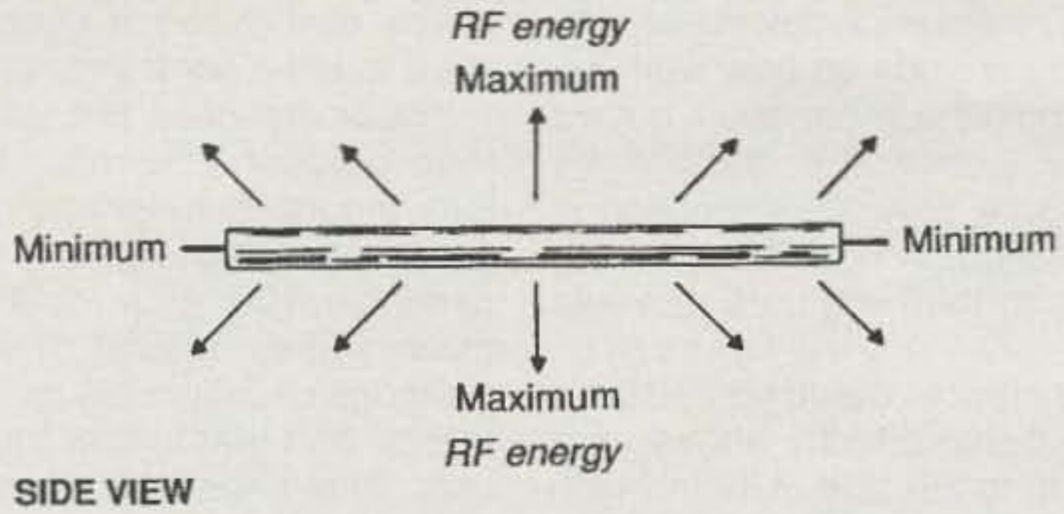

Fig. 3– RF energy radiates from an antenna element in the same manner light emanates from a long neon tube—broadside to the element, with minimum radiation off the ends. (Discussion in text.)

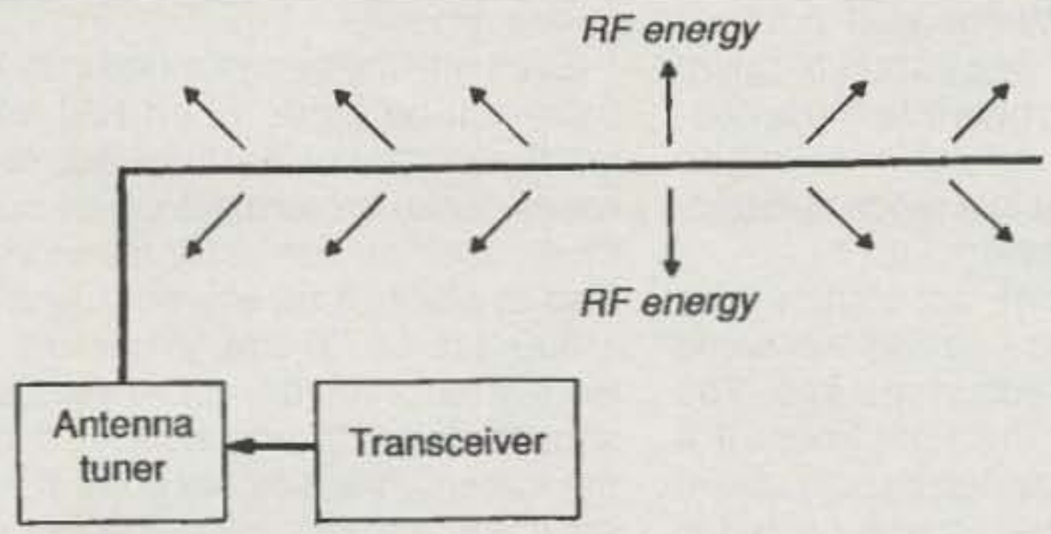

Fig. 4– Longwires are good antennas, but radiation along their full length often promotes RF feedback. (Discussion in text.)

more effective and enjoyable-to-use HF setup? That depends on how well you recall and apply the information, but we can quickly sense the answer by reviewing some previously mentioned station scenarios. Ponder the following questions, and then compare answers with us.

Given the choice, would you install a dipole or a beam directly above your radio room or to the side of it? In which direction or position would it be oriented for your usual daily (or evening) activities? If space were limited, would you mount a vertical beside your house or with the base at or near roof level? Would an indoor antenna work out best from a wood frame or a concrete building? How could you optimize the antenna's performance and minimize induction-field RFI? What is a quick and convenient "fix" for stubborn RFI?

Your answers may not match ours exactly, but if we are saying the same thing in different words, that's fine. You are thinking along the right lines. If a dipole or beam is installed directly above your station, your gear could be within the induction field (unless the antenna is mounted quite high). Installing the antenna over a less-used area such as a garage or back yard and orienting it so element tips usually point toward station gear minimizes RFI and ensures maximum radiation toward desired areas.

Verticals are good antennas, provided they are allowed "breathing room" to radiate a signal (a quarter-wave clearing in all directions is especially beneficial). Mount a vertical in a confined area so its radiation is blocked by buildings, and it can only radiate RFI into those buildings. Stand in your vertical's planned installation spot, look up 20 degrees, and turn in a full circle. If you see a clear view of the distant horizon rather than houses, cars, or foliage (and check roof views if necessary), you have found a good installation spot.

Indoor antennas are usually smaller than outdoor antennas, they usually lack mounting height, and low power (under 50 watts) is usually necessary to minimize RFI and feedback. That's three strikes against them. Concrete buildings usually have metal reinforcements, and that further attenuates signals. Wood has less attenuation if it is dry. Either way, placing an indoor antenna near or in front of a window facing your desired communications direction ensures the best possible signal, especially if the window is several floors above ground.

Even with the best planned installation there will be times when RFI and RF feedback cannot be avoided. In such cases, snap-on toroidal cores such as those used on computer monitors (and also available from Mouser Electronics, 1-800-346-6873) are lifesavers. They work great, even on mobile setups. Just snap them on DC and antenna cables at the cables' "transceiver end." If necessary, add a third core at the mobile DC cable's "battery connection end." The cores also work well on linear-amplifier cables, telephone lines, and AC power cords. Try them!

Conclusion

We are right against the closing wire, and as always there is a vast amount of information yet to be shared. I will thus bow out gracefully with a reminder to always visualize where your maximum and minimum RF energy emanates with any antenna used, be sure it fits your plans, and get on the air some every day. Also watch our upcoming "QRP" columns for details on some new and exciting miniature and portable HF antennas to fit every need. You'll love it!

73, Dave, K4TWJ

What Are Mini Dipoles?

Opinions and designs may vary, but mini dipoles usually consist of two same-band mobile whips butted together to form a reduced-size dipole. Although various types of mobile whip(s) may be used, Hustlers and Ham Sticks are the most popular.

In the case of Hustlers, two 3/8 inch diameter by 54 inch long aluminum tubes with 3/8 by 24 thread screwstock force-fit into one end are used in lieu of original Hustler masts. Each 54 inch tube is then force-fit into a 24 inch length of PVC pipe and secured with sheet-metal screws which also serve as coax-cable connection points. Resonators for your desired band of operation are screwed into the screwstock on aluminum-tube ends, and then a small boom-to-mast plate or clamp salvaged from an old beam or TV antenna completes the dipole. A micro-dipole can also be made using Hustler's new 21 inch masts (or substitute aluminum tubes) and new/longer stingers, if desired.

Double ferrule adapters with a center mast mount are available from Lakeview Company (3620-9A Whitehall Road, Anderson, SC 29626; telephone 864-226-6990), and they work great for quickly assembling a dipole. You just screw a pair of same-band Ham Stick mobile antennas into the adapter, plug in your coax feedline, tweak SWR, and enjoy. Four "sticks" could even form the basics of a 2-element mini beam. Anyone ready to pursue that dink project?

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Buying a New VHF/UHF FM Rig

Last month we looked at HF equipment. This time we are going to survey (and I do mean *survey*) FM equipment. Given enough time and permission from *CQ*, I could fill this entire issue with the different features and implementations of FM rigs. Last month I mentioned the importance of doing your homework. With FM equipment it is probably even more important. Get the detailed brochures and read the fine print. Better yet, find some way to get the equipment into your hands and use it.

This time I want to look at generic features (as opposed to the trademarked names). You'll have to translate these terms into the names the manufacturers' marketing departments give them.

FM base/mobile rigs for the VHF/UHF bands pack phenomenal features into a very small space. Digital circuitry (microprocessors) and advanced design techniques allow the manufacturers to package dual-band transceivers capable of 50 watts output in an enclosure often smaller than a hard-cover novel. With such capability, one of the biggest challenges is designing a control interface that is intuitive and convenient for the user. What's the point of having super features if the operator needs a degree in computer science just to turn on the rig and make a contact on the local repeater?

There are some features that are virtually universal at this point, but the exact method needed to activate or control these features varies from model to model and manufacturer to manufacturer. All models on the market now offer memory channels. How many memory channels do you need? If you live in a rural area or habitually hang out on the same repeater, ten channels is probably sufficient for your needs. On the other hand, if you travel for a living, visiting the same areas every few days or weeks, 100 to 200 channels might be more to your liking. This would be true particularly if the rig offers the capability of organizing and grouping the channels so that the operator can activate only one group at a time.

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Other universals (or almost universals) are "call" and "priority" memory channels. A call channel can usually be activated by touching a single button. This feature is quite useful to get you onto your "home" frequency very rapidly. A priority channel, though, usually refers to the rig's ability to momentarily check for activity on the frequency programmed into the priority channel while the receiver is tuned to another frequency. With most rigs the operator can choose whether or not the same frequency is programmed into the call and priority channels.

The norm now is for the memory channel to store more information than just the operating frequency. For instance, if CTCSS (Continuous Tone Coded Squelch System, often referred to as "PL," a Motorola trademark) is used on the repeater, it is very handy to have the CTCSS encoder/decoder automatically select the right tone each time the memory channel is activated. For dual-band or multiband models, each band often has its own set of memories.

Kenwood's TM-V7A is typical of today's dual-band FM mobile rigs. Among its features is a detachable control head that lets you mount the radio under a seat or in the trunk and attach the head to the dashboard.

ICOM's IC-2800H is a dual-band mobile with a sense of humor. Its full-color frequency readout gives you several display options, including various fruits! It also takes a video input (such as from a VCR) and displays it on the screen.

Another useful memory function for some operators is storage of DTMF (Dual Tone Multi Function, or "Touch Tone") strings. A typical use would be a telephone number frequently called via the autopatch. Perhaps, too, the repeater offers numerous "bells and whistles" that can be activated via a DTMF string. Some models now offer built-in paging and DTMF coded squelch. This is useful for those involved in emergency preparedness communications, for example. These operators may want to be available to receive a call directed to them, but may not wish to monitor a busy frequency all day.

A cross-band repeater function (dual or multiband units) can be very useful for some operators. A typical application here might be for a ham on an outing at a remote site too far away for a 144 MHz handheld to be useful. The mobile could be set up to repeat between 144 and 440 MHz. The ham could stay in contact with other operators on 144 MHz via a 440 handheld. Another use is to make HF contacts via a handheld. There are some gray areas of the FCC rules here, so take some care in thinking through what you are doing with this level of technology.

Although the internet seems to have taken some of the air out of the packet explosion (most notably in the area of

Really extended receive coverage is one of the main features of Vertex-Standard's Yaesu FT-8100. This dual-bander transmits on 2 meters and 70 cm, but receives all the way up to 1300 MHz (minus cellular), giving it receive coverage on the 222, 902, and 1296 MHz amateur bands.

DX spotting), there is still a lot of digital activity on the FM bands. Some rigs cater to this with special ports and digital-friendly functions built-in. If your interest is in packet and APRS and similar modes, you probably can find a rig that is highly compatible with those areas of interest.

One extremely useful feature that is available on some upscale models (and probably will become universal within the next few years) is the ability to program the radio via a cable connected to a computer or another radio. It would be difficult to overestimate the usefulness of this feature for a rig with a lot of memories and programmable features.

Some top-of-the-line models offer a detachable front panel, which can be very useful for some of the smaller cars with little room for mounting a unit under the dash. This feature is also desirable when the vehicle will be left unattended and there is danger of a thief making off with the radio.

Many, if not most, of the units offer extended receiver tuning ranges. On the positive side, this reduces the need for a scanner, if the operator is inclined to do some listening outside the ham bands. The downside is that some models suffer from severe intermod (interference usually caused by the mixing of strong out-of-band signals) when located in urban areas. (See the *ARRL Handbook* for a discussion of intermod and its cures.) This is because filtering that normally would block strong out-of-band signals from entering the front end of the receiver must be removed in order for the unit to be able to receive out-of-band signals. A few top-of-the-line models offer a separate out-of-band receiver. There is no standard specification for intermod susceptibility. If you live in an area with a lot of RF "pollution," you probably will want to listen carefully as other nearby operators tell of their intermod experiences.

Handhelds

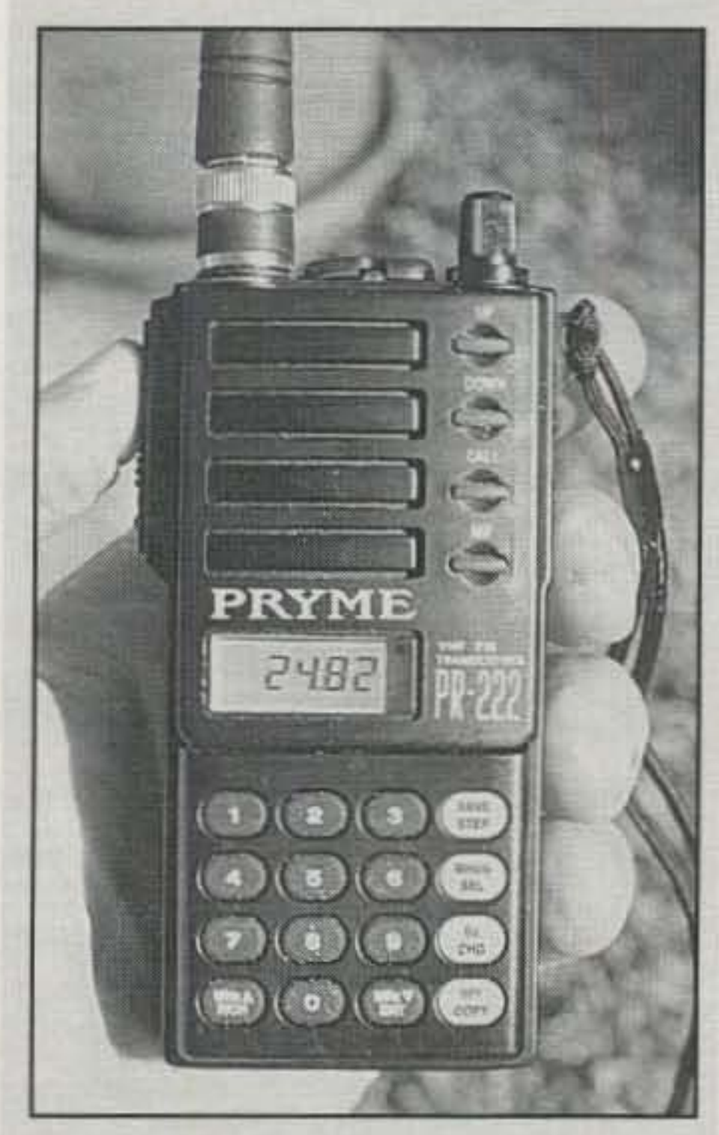
Many of the handhelds could be described as simply low-powered, battery-operated, miniaturized versions of base/mobile models. Often the features and capabilities are quite similar, excluding size and output power, obviously. There are some issues, though, that are peculiar to the handheld. For instance, a ham is much more likely to inadvertently bump the control pad of a handheld being carried on the belt or in a purse than one on the mobile unit mounted under the dash. The ability to quickly lock and unlock the control pad is a significant feature.

There seem to be two somewhat incompatible trends in handhelds these days: miniaturization and higher power. Thus, most of the manufacturers seem to be offering two different products. The first is a very small radio (roughly the size of, say, a tennis ball) with an output power on the order of 500 mW. Power typically will be provided by a rechargeable battery pack or a couple of AA cells. This unit may have loads of features and a huge number of memory channels, and it may operate on more than one band. However, it is not intended for anything more than being a shirt-pocket/purse radio.

The second line is a radio that probably has at least twice the volume of the first line. The difference is that the unit will offer a variety of battery packs of different voltages and current capacities, and perhaps a 12 VDC input jack. High power output may be 6 or more watts. You are more likely to find a connector or adapter for connecting a high-performance antenna.

Nickel cadmium (NiCd) battery packs used to be the undisputed power source

The Alinco DJ-G5 has most of the features commonly found on dual-band handhelds, including 200 memories and wide-band receive.



Pryme's PR-222 handheld is one of the few handhelds on the market that covers the 222 MHz band. It is a single-band radio and puts out 5 watts.

of choice for portable radios—true for years. They are not without problems, though. Considerable care must be taken when charging them, making sure to avoid cell "memory," among other

The new ICOM IC-V8 is a single-band, 2-meter-only handheld with 5 1/2 watts out. Built to "milspec" standards, it should be able to take quite a bit of abuse in emergency and public-service activities.

Kenwood's TH-D7A adds a digital dimension to HTs, with built-in capability to receive and display short packet messages and built-in software to send and receive APRS (Automatic Position Reporting System) messages.

things. If a cell is totally discharged, there is the danger of inadvertently "reversing" it. Thanks to the push by the cellular telephone market, NiCds are being edged out by Nickel Metal Hydride (NiMH) packs. Unfortunately, it is not happening as quickly in the ham market as it has happened in the cell phone market. Besides offering somewhat better power capacity and fewer quirks where charging is concerned, these batteries are not as big a threat to the environment as NiCd cells are. If you have a choice, go with the NiMH packs.

Although Automatic Power Off (PA) circuits are included in some base/mobile models, these features come into their own with handhelds. A simple timer circuit shuts off the radio if the transmitter is not activated or no signal breaks the squelch for a certain amount of time (usually an hour). Such a circuit can save you the annoyance of finding that you unintentionally left the unit on and ran down the battery. However, there are times when you would want to leave a rig on for an extended period of time. How easily can this feature be turned on and off?

There are some features, however, that are equally important in handhelds and base/mobile units. Adherence to the ARRL's bandplans for repeaters is spotty at best. Any radio now on the market should be able to handle oddball splits with some degree of elegance. Likewise, good design calls for the ability to change tuning steps (channel spacing) easily. Another useful feature is having the ability to instantly switch transmit and receive frequencies (T/R Reverse).

A scanning feature is useful, but because of the vagaries of the bands, particularly 144 MHz, it is highly desirable to have several different scanning schemes available or the ability to tailor the scanning to your needs. For instance, in most areas of the country you might want to scan 146.61 to 147.39 MHz in 15 kHz steps, but you probably would want to scan 145.20 to 145.50 in

Feedback

Chad E. Phillips, KGØMW, of Sioux Falls, SD: "Just wanted to let you know that I just finished reading the September column. I too use the Radio Shack foot switch. What is interesting is to not only think about how many times you have used the switch, but if you are like me, think about the times when you get a little excited and slam your foot down on the switch! It's amazing the switches last! Anyway, this is in response to your asking for newcomer stories. I don't have the time tonight to write the whole story. . .

"I have been a licensed ham for 15 years now. A year ago we moved into a new house. I decided to take the opportunity to 'start over' in ham radio. Everything was in boxes; antennas were down and cables thrown away. I gave it a lot of thought and tried to decide which direction I wanted to go with my hobby. Let me tell you in the process it has been a lot of fun! New countries, new bands, and new friends. I hope to put the story together for you (if you would like) along with pictures and send it to you during the next couple of weeks." *(Yes, do send us the pictures and story—WB2D.)*

William R. Turner, W7TI, of Landers, CA: "I enjoyed your article on using loaf pans for projects—something I hadn't thought of. You mentioned that aluminum can sometimes be hard to work with when it's thin, which I heartily agree with. There is a drill bit called a 'Unibit' which is designed just for drilling holes in thin material and it does a beautiful job. It is in the form of a stepped cone and comes in at least two sizes. Because of the steps, it can drill a number of different-size holes. It is far superior to a standard twist drill for thin stock. Your local hardware store guys will know about it. It is expensive, around $20, but one of them will replace several regular bits. Perhaps you already knew of this, but I think the beginning readers should be made aware of it. To me, it is absolutely indispensable."

20 kHz steps. Obviously, being able to scan only certain band segments is useful, too.

There are also other kinds of scanning. Some units offer the ability to scan through the CTCSS tones. This would be particularly useful for the road warrior traveling from city to city.

Both MARS (Military Affiliate Radio System) and CAP (Civil Air Patrol) have frequencies just outside the ham bands. For the ham who is also a member of one of these groups, it is most useful to be able to use regular ham equipment on these frequencies. Some designs lock out the transmitter when the unit is tuned outside the standard ham frequencies. The ability to disable this feature easily is of significance to MARS/CAP operators.

In terms of rating, receiver sensitivity is typically measured in (X) UV for 12 dB SINAD. The lower the value of X, the more sensitive the receiver. (Chapter 26 of *The ARRL Handbook 2001* details how to test SINAD.) Selectivity is usually measured at the 6 and 60 dB points. The closer these numbers are to each other, the better the selectivity of the receiver.

Summary

If there is one single message to be gained from all of the above it is this: Do your homework before you write the check. Have fun! 73, Pete, WB2D

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

More Fall Goodies

This month in your "What's New" column we'll focus on some noteworthy hamshack accessories, portable and mobile gear, software, books, and other goodies, gizmos, and info we think will be of real interest to you, so let's begin.

Accessories for the Shack

Yaesu FT-817 Tuning Made Easy. What, another accessory for the Yaesu FT-817 Multimode Transceiver? The availability of so many radio accessories certainly says something about the rig's popularity!

W4RT Electronics™ has news of a new product, One-Touch Tune (OTT), a custom add-on accessory for the Yaesu FT-817 (photo A). OTT solves the tedious and annoying tuning process that you presently must go through to produce a carrier for tuning an antenna tuner. (OTT is especially designed for use with the LDG Electronics Z-11 QRP antenna tuner, and an optional OTT/Z11 compatibility kit is available.)

With OTT all you need to do is press the TUNE button, and OTT takes control of the FT-817. Regardless of the mode used, OTT commands the FT-817 to produce a carrier having the same power as set by the FT-817 PWR function command. When you complete adjustment of the antenna tuner, you just release the TUNE button and the FT-817 returns to the prior mode. OTT is transparent to auxiliary equipment attached to the FT-817. Installation is simple, and OTT can be installed or removed in just moments. Velcro® attaches the OTT module to the rear of the FT-817, the OTT cable is plugged into the ACC jack, and the supplied OTT TUNE pushbutton switch (or your own switch) is plugged into the OTT Command jack.

The price is $59.95, and package deals are available. For more info, contact W4RT Electronics, 3077-K Leeman Ferry Road, Huntsville, AL 35801 (fax 256-880-3866; e-mail: <w4rt@oetc.com>; web: <http://www.w4rt.com>).

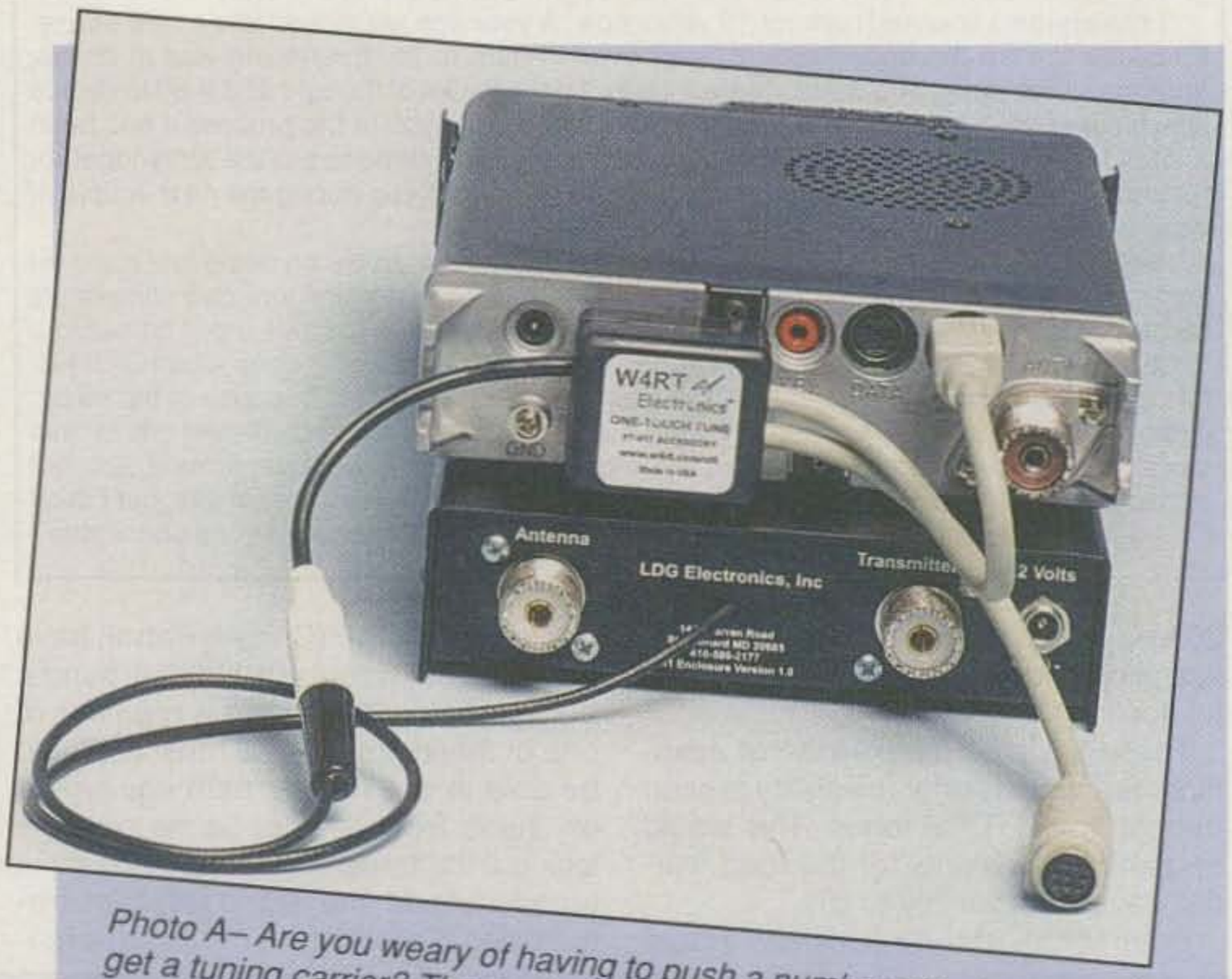


Photo A– Are you weary of having to push a number of buttons just to get a tuning carrier? The newly introduced One-Touch Tune (OTT) is a custom add-on accessory for the Yaesu FT-817 from W4RT Electronics. All you do is press the TUNE button and OTT takes control of the FT-817. (Photo courtesy W4RT Electronics)

Model 1246 Bench Model Coaxial Cable Stripper from Eraser. Do you fabricate lots of antennas and get into industrial-strength coaxial cable stripping? The Model 1246 Bench Model Coaxial Cable Stripper from The Eraser Company (photo B) is a production-type, versatile, adjustable coax stripper that can four-stage strip coax in one operation. In fact, most cables can be stripped in under five seconds.

The Model 1246 uses an all-metal cutting head designed to process a wide variety of coax from 0.030 to 0.430 inch (0.76 to 10.9 mm) OD, including semi-rigid cable. The unit's quick-change cutter head contains up to four super-thin, high-speed steel blades that are factory set to the desired strip length requirements; blade depth is adjustable. To process cables of different sizes or stripping specifications, the Model 1246 incorporates a quick-release coupling. Simply remove the guard, release the cutter head, and install another cutter head. The entire changeover takes

Photo B– The Model 1246 Bench Model Coaxial Cable Stripper from The Eraser Company is an industrial-strength, versatile, adjustable coax stripper that can four-stage strip coax cables in one quick operation. The unit uses an all-metal cutting head designed to process a wide variety of coax, including semi-rigid cable. (Photo courtesy The Eraser Company, Inc.)

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e-mail: <w8fx@cq-amateur-radio.com>

under one minute and requires no tools. For more information and pricing, contact The Eraser Company, Inc., P.O. Box 4961, Oliva Drive, Syracuse, NY 13221 (phone 315-454-3237; e-mail: <info@eraser.com>; web: <http://www.eraser.com>).

Tool Doubleheader from Jensen Tools. This month we have two new series of products distributed by Jensen Tools to share with you. The first is the PTX series of Ergonomic Wire Wrapping/Unwrapping Tools (photo C). These tools offer lightweight, well-balanced construction; dual-finger, short-throw triggers; and long handles to mitigate pressure on the palm—all features that help prevent repetitive stresses. Both the battery-operated and electrical versions have high-power motors and are capable of wrapping and unwrapping with the flick of a switch.

The second is the series of Fold-Out Pocket Tool sets (photo D). These compact tools fit in your hand comfortably and feature full-size, open-end wrenches. The individual components are constructed of high-carbon steel, tempered to a specific Rockwell hardness, and are nickel-plated. The handles are of cold rolled steel with a tough, black powder-coat finish. The sets include slotted and Phillips screwdrivers, and a 3/16 inch scratch awl. Separate fractional and metric wrench versions are available.

For more details and pricing, contact Jensen Tools, Inc., 7815 S. 46th Street, Phoenix, AZ 85044-5399 (phone 1-800-426-1194; e-mail: <Jensen@stanleyworks.com>; web: <http://www.jensentools.com>).

Photo C– The PTX series of Ergonomic Wire Wrapping/Unwrapping Tools from Jensen Tools offers lightweight, well-balanced construction; dual-finger, short-throw triggers; and long handles to mitigate pressure on the palm—all features that help prevent repetitive stresses. (Photo courtesy Jensen Tools)

Portable and Mobile Goodies

SafeTenna from CSS and AB4MT-Designs. Creative Services Software and AB4MT-Designs have announced that the "SafeTenna" is now available for 2 meters. Invented by Michael Thigpen, AB4MT, the SafeTenna was designed for use in emergency, travel, or portable operation.

According to Michael, the SafeTenna was designed to be an emergency antenna, especially for use in bad locations—such as when you have car trouble and can't hit the repeater and your cell phone is out of range. He notes that you can keep the antenna in the trunk or behind the truck seat with coax and string to put up in time of need. That's where he got the idea for the antenna's name: It's a portable antenna that can help you make a contact when other attempts likely would fail.

The SafeTenna comes in two sizes, full and compact, and is encased in a solid PVC shell. It retails for $39.95 and comes with a one-year warranty. It's available from Creative Services Software or from your favorite dealer.

Contact Creative Services Software, Inc., 503 West State Street, Suite 4, Muscle Shoals, AL 35661 (256-381-6100; e-mail: <sales@cssincorp.com>; web: <http://www.cssincorp.com>).

Mobile Multiband Antennas for the FT-817. Cutting Edge Enterprises is offering yet another accessory for the Yaesu FT817. The firm now is carrying selected English-import Waters and Stanton mobile radio antennas designed specially for the FT-817. These are ultra-light, ultra-compact antennas that reportedly boast surprisingly good performance for such small packages.

Cutting Edge considers the entire Waters and Stanton product line to be great, but says their favorite is the ATX-Walkabout Mini All-Band Antenna. Using technology similar to that of the Outbacker™, the ATX-Walkabout Mini All-Band Antenna (photo E) is a design of tapped coils with a wandering lead, but on a miniature scale. The entire coil and tap section is only 12 inches long, but the antenna nevertheless is said to work on all bands from 6 through 80 meters. Just tap into the band that you want and you're ready to go. With a removable, telescoping whip section, the entire package can fit into the palm of your hand—a backpacker's dream. An accessory antenna bag is available.

For more info and pricing details, contact Cutting Edge Enterprises, 1803 Mission Street, Suite PMB-546, Santa Cruz, CA 95060 (1-800-206-0115; e-mail: <info@powerportstore.com>; web: <http://www.powerportstore.com>).

Software and Computers

Copernic® 2001 Series Search Agents and Copernic Shopper. In the September 1999 column we took note of Copernic® and Copernic® Plus, my favorite internet search programs. These programs are highly customizable searchers you install on your PC, and they help you find what you're looking for by simultaneously using several user-selected search engines. The programs rank results by relevance, provide summaries, store the results, organize them, and remove duplicates.

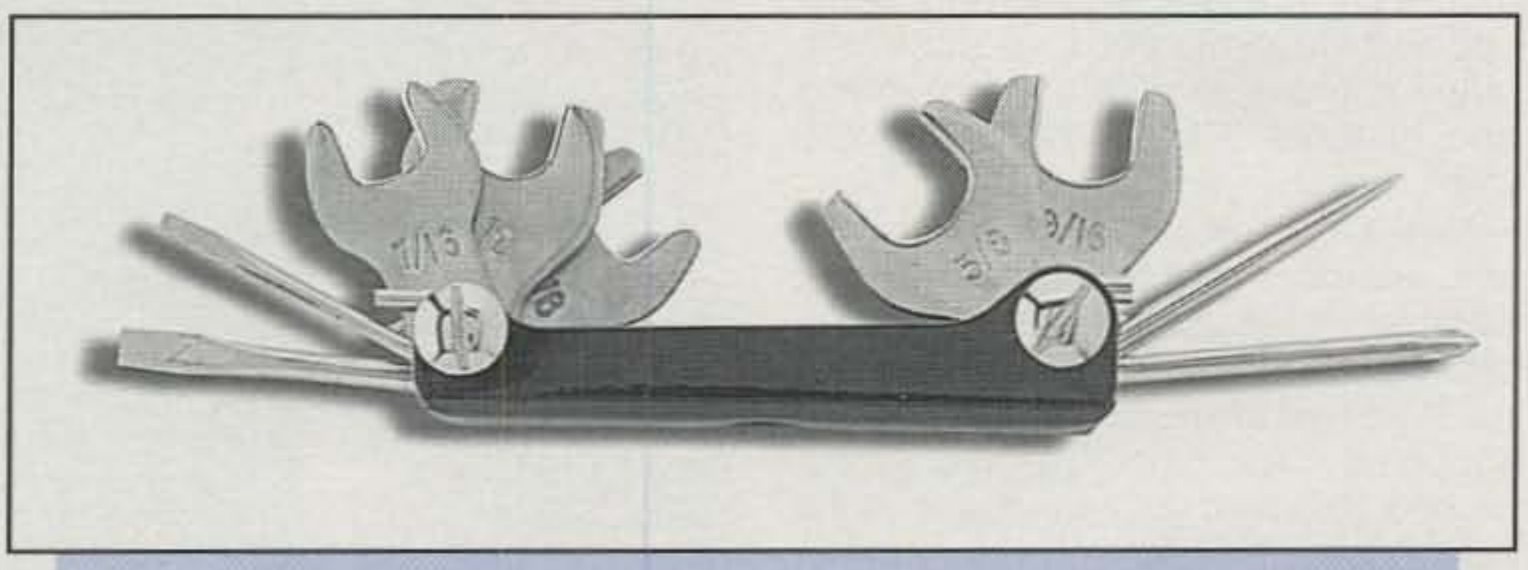

Photo D– The Fold-Out Pocket Tool sets are compact tools that fit in your hand comfortably and feature full-size, open-end wrenches. (Photo courtesy Jensen Tools)

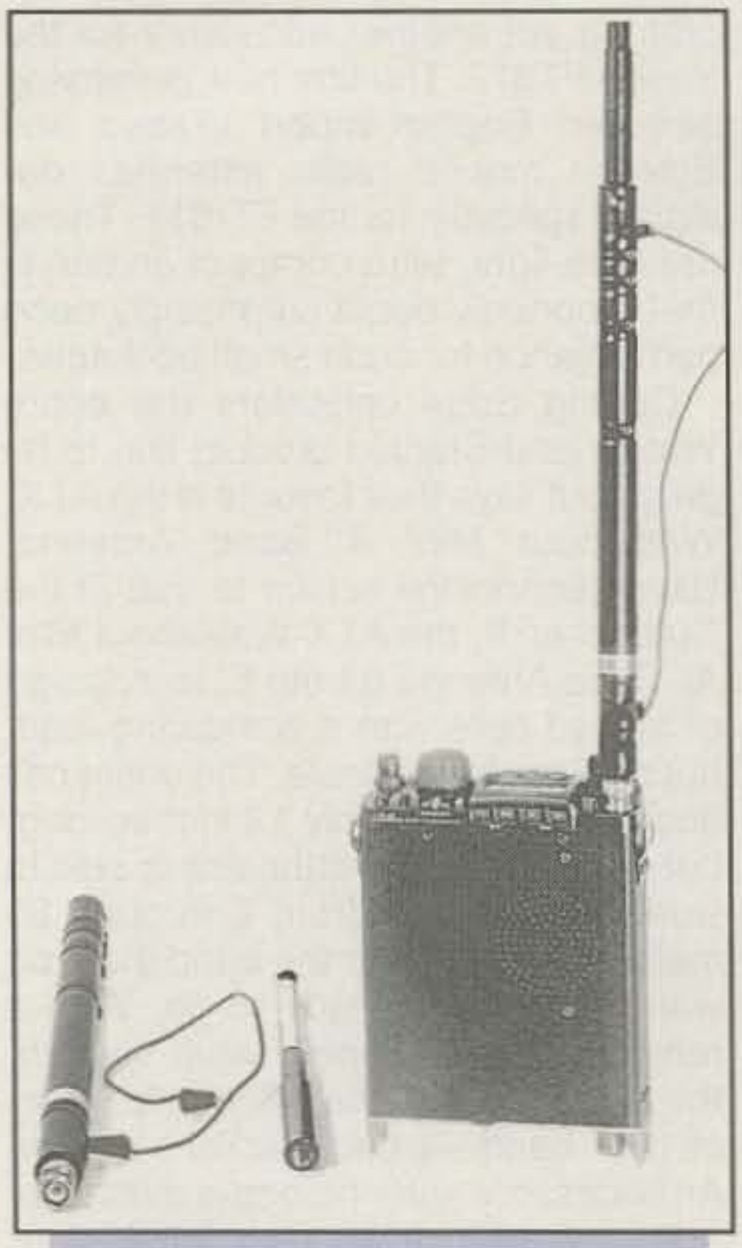

Photo E– Cutting Edge Enterprises now carries English-import Waters and Stanton mobile radio antennas designed especially for the FT-817. Shown here is the ATX-Walkabout Mini All-Band Antenna, a design of tapped coils with a wandering lead, but on a miniature scale. The entire coil and tap section is only 12 inches long, but the antenna is said to work on all bands from 6 through 80 meters. (Photo courtesy Cutting Edge Enterprises, Inc.)

Copernic® Basic is a free download, while Copernic® Plus is $39.95 and the upscale Copernic® Pro is $79.95 (U.S. funds). We'd like to mention that all the programs now are available in newly updated Copernic 2001 versions with many impressive new enhancements and features. Check them out. You won't be sorry you did!

Now Copernic.com has introduced still another new product, Copernic Shopper™. This new product is a powerful, easy-to-use shopping tool that helps you get the most out of your online shopping experience by finding the product that best fits your needs at the right price. The program offers better integration and far more sophisticated options than other online shopping tools. With it you can, for example, find product reviews and perform price comparisons by consulting over 250 information sources and online stores. Many product categories are available for searches. Copernic Shopper™ 2001 Basic is free, while Copernic Shopper™ Plus, with many added features, is priced at $29.95.

For information on any of the Copernic programs, contact Copernic.com, 360 Franquet, #60, Sainte-Foy, Quebec, Canada G1P 4N3 (418-527-0528; e-mail: <sales@copernic.com>; web: <http://www.copernic.com>).

Two Popular Mapping Software Updates from DeLorme. Over the past several years we have profiled many of the high-quality mapping and navigation software packages from DeLorme, including AAA® Map'n'Go® and Topo® USA. Now DeLorme has come up with AAA Map'n'Go 7.0, which boasts a host of new features that help take the guesswork out of traveling. We won't rehash our previous V 6.0 review (in November 2000) other than to note that Map'n'Go is a complete vacation and travel planner. We'll simply mention that the superb program has been further customized to meet the specific needs of RVers and motorcoachers, with a fuel-consumption indicator and budget planner, among other add-ons. The program also now features the locations of Wal-Marts, Sam's Clubs, Flying J Travel Plazas, and RV-friendly parking areas right on the maps. It's even compatible with Global Positioning System (GPS) receivers and users of the Palm OS®. Suggested retail price is $29.95.

DeLorme also has introduced a brand-new version of Topo USA, with Topo USA 3.0 (photo F). Mountaintoppers and hiking hams, especially, should be interested in the program, which DeLorme says redefines the way people think about topographic maps.

Topo USA 3.0 provides one-of-a-kind features, including automatic trail and road routing, shaded relief, realistic 3-D terrain map views, and the most up-to-date land-cover, elevation, and trail data available for the entire United States. The program features powerful printing and drawing options, including the ability to customize and print large mural maps from an everyday printer, and is available in CD and DVD versions that retail for a suggested price of $99, with regional editions $49. Users with a Palm OS handheld also will require the Solus Pro program, for an additional $39.95.

For more info, contact DeLorme, Two DeLorme Drive, P.O. Box 298, Yarmouth, ME 04096 (1-800-452-5931; e-mail: <info@delorme.com>; web: <http://www.delorme.com>).

From the Bookshelf

***Your Guide to HF Fun* de K4TWJ.** Recently, *CQ* columnist and colleague Dave Ingram, K4TWJ, sent us a copy of his latest how-to book, one which we found to be loaded with information. *Your Guide to HF Fun* contains a wealth of knowledge of everything from selecting "best value for you" equipment and antennas, to fine-tuning your setup and transmitting a super-sounding signal. Opening chapters discuss the numerous attractions of HF, explain rig specs and features, demystify standing wave

Photo F– DeLorme's newly updated Topo USA 3.0 software appeals to what DeLorme calls "a brand new audience of outdoor enthusiasts." Although it produces stunningly realistic 3-D views, it also lets you scout terrain in excellent 2-D views with 20 foot contour intervals and detailed shaded relief, as in this screen graphic. (Digital graphic courtesy DeLorme)

ratio (SWR), show how to install and adjust antennas, explain when and how to use a tuner, and present guides to safe and effective station assembly.

Following chapters acquaint you with signal propagation and present-day activities on each HF band, and also explain the fine art of operating, contesting, and DXing. The final chapter describes how to go HF mobile "with high class and low cash." If you want to have a ball and work the world on HF, this 84-page, eight-chapter, large-format book may be just for you.

You Guide to HF Fun is self-published and available directly from Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210 (205-951-0162). The price is $16 plus $1.75 book rate, or $3.50 Priority Mail.

Sams 2001 Annual Index. Sams Technical Publishing offers its latest index, the 2001 Annual Index, which contains over 185,000 entries, covering everything from antique TVs to CB radios to flat-screen TVs. As such, the index is an invaluable tool that provides a quick reference to repair schematics available from the publisher. The index also is quite handy in that it lists authorized parts distributors; includes a very handy "who has it?" listing; and has general, brand name, and other indexes.

The 296-page 2001 Annual Index is available in paper and CD-ROM formats. The paper format is at <http://www.samswebsite.com>, and it's $5; the CD-ROM is $12. Sams includes a coupon with purchase that's redeemable on your next order from Sams Technical Publishing. You also can obtain a free copy of the paper version by calling 1-800-428-SAMS.

For more information, contact Sams Technical Publishing, 5436 West 78th Street, Indianapolis, IN 46268-4149 (telephone 1-800-428SAMS; e-mail: <customercare1@samswebsite.com>; web: <http://www.samswebsite.com>).

Short Bursts

Update from TIC Gen and Array Solutions. We've covered both firms' innovative, high-quality products in past columns. This month we'd like to pass along word of some major marketing changes that are in the works to give several products better exposure to the marketplace.

TIC Gen Direct (TIC) and Array Solutions have announced that Array Solutions has been appointed a sales and marketing representative for TIC Gen Ringrotors (TIC Ring), controllers, and accessories. TIC continues administrative, manufacturing, and support from its facilities in Thief River Falls, Minnesota. TIC will honor existing and new warranties, from sales by Array Solutions, as well as factory direct sales. Array solutions President Jay Terleski, WXØB, notes that TIC's products fit perfectly into his firm's strategy of stacked high-performance arrays, full custom tower installations, and maximum flexibility for the customer. For more information on these marketing changes, contact Array Solutions, 350 Gloria Rd., Sunnyvale, TX 75182 (972-203-2008; e-mail: <wx0b@arraysolutions.com>; web: <http://www.arraysolutions.com>).

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: Radio "Elmers" know that they actually can learn something well themselves by teaching it to others.

73, Karl, W8FX

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

The Leonids Meteor Shower

This past August I started this column with the story of Chicken Little thinking that the sky was falling and ultimately the world was coming to an end as my way of illustrating and segueing into my discussion of the *Perseids* meteor shower. This month we turn our attention to another well-known shower, the *Leonids*. This periodic shower has displayed some major shows during its tenure, and it is because of these displays and current investigations that we have come to be aware that a storm is predicted for this year's recurrence of the *Leonids* shower in November.

First, some history: In 1833 it was the recurring *Leonids* meteor storm that caused many to worry that the end of the world was near. However, in neither the Chicken Little nor the then end-of-time prognosticators' case did a predicted end come. What did result, however, out of the latter, was a better understanding of the predictability of the recurrence of meteor showers.

As it turns out from history, the *Leonids* meteor shower seems to have been the *Rosetta Stone*, or the key to understanding how meteor showers occur. Because of its relatively predictable recurrence (every 33 or so years), astronomers have been able to study it and thereby make the tie-in with a particular comet.

The first recorded evidence of the Earth passing through the debris of a comet occurred late in the ninth century. In 868 A.D. the Earth passed through the path of the then unknown comet Tempel-Tuttle. It took approximately another 34 years before the Earth again passed through the comet's orbit. Debris from this comet caused a meteor storm, which the Chinese recorded in 902 A.D.

It would be another almost 900 years before any other major meteor storms were observed by someone connected with the western world. Germans Humboldt and Bompland, then living in Cumana, Venezuela, observed the meteor storm of 1799 and wrote about it. As a result of their investigation, they heard of contemporary reports of a similar meteor storm occurring 33 years earlier.

During the ensuing 34 years enough international investigation was done so that there was an anticipation of some sort of storm. Those observing were not disappointed when in 1833 a major storm occurred which was observed in widespread locations throughout North America. A well-known quote by Agnes Clerke aptly describes what happened the night of November 12–13:

"[A] tempest of falling stars broke over the Earth... The sky was scored on every direction with shining tracks and illuminated with majestic fireballs. At Boston, the frequency of meteors was estimated to be about half that of flakes of snow in an average snowstorm." Clerke estimated that in excess of 240,000 meteors fell during the nine-hour storm. Indeed, others reported that the lights from the fireballs of the storm were so intense that they were awakened from their sleep. The meteor storm was visible across the North American continent. Contemporary Native American writings of the time refer to the event as "the night the stars fell."

It is not surprising that so many were panicked by what they saw. During this period in religious history in the U.S. there was a fledging but growing movement that interpreted *The Bible* as indicating that Judgment Day was very near. The meteor storm of that November night lent itself as a most probable and predictable event, which was part of that doomsday fever.

However, thanks to the work of Denison Olmsted, who analyzed what had happened during that night in light of what had happened a year earlier in Europe, it was concluded that what had occurred was a meteor storm, and that the storm was caused by some sort of cloud of debris the Earth had encountered and the Earth could encounter it again the following year. Just what the cloud of debris was or what caused it Olmsted did not know.

One of the data that Olmsted discovered was the storm's approximate position in the night sky. At about the same time, A. C. Twining and W. E. Aiken independently determined a more precise location, that of being in the proximity of the constellation *Leo*. This gave rise to the naming of the storm after its associated constellation. Hence, the name *Leonid*, or *Leonids*, became associated with it.

The following year there again was a storm. However, it was nowhere near the intensity of the one in 1833.

In the ensuing years data continued to be published related to the storm of 1833. Finally, in 1837 Heinrich Olbers analyzed the data and concluded that the *Leonids* had a periodicity of approximately 33 to 34 years. From his conclusions, he predicted a return of the storm in 1867.

It was the work of Hubert Newton, however, that really solidified the periodicity of the *Leonids* meteor shower. In the years 1863–1864 Newton examined meteor shower and storm reports from around the world covering the previous 2000 years. From his examinations, he concluded that those meteor showers or storms which were observed in the years 585, 902, 931, 934, 1002, 1202, 1366, 1582, 1602, and 1698 had a periodicity relationship with the storms that occurred in 1799 and 1833. From his studies, he concluded that the *Leonids* had a period of approximately 33.25 years. Furthermore, he predicted that the next return would actually occur on November 13–14, 1866, a year earlier than Olbers.

In 1866 two important events occurred. First, Ernst Tempel in France and Horace Tuttle in the U.S. independently discovered a comet. Tempel first observed it on December 19, 1865. Tuttle spotted it on January 6, 1866. The comet was named after both of them because of their having both observed it, even though Tuttles' discovery occurred a few weeks after that of Tempel. The calculated orbit of the comet was slightly greater than 33 years. As mentioned above, it also was that year, based on the previous 33-year interval, that Newton predicted another storm would occur. Eventually, the coincidental relationship of the orbit of the Tempel-Tuttle comet and the recurrence of the *Leonids* meteor storm was studied by Dr. C. F. W. Peters, Giovanni Schiaparelli, and von Oppolzer independently of each other with their conclusions indicating that the two were related. Their

VHF Plus Calendar

Nov. 4	Poor EME conditions.
Nov. 6	Highest Moon declination.
Nov. 8	Last quarter Moon.
Nov. 10	Moon perigee.
Nov. 10-11	Second weekend of the ARRL EME contest.
Nov. 11	Good EME conditions.
Nov. 15	New Moon.
Nov. 18	Lowest Moon declination. Very poor EME conditions.
Nov. 22	First quarter Moon.
Nov. 23	Moon apogee.
Nov. 25	Moderate EME conditions.
Nov. 30	Full Moon.

• *EME conditions courtesy W5LUU*

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conclusions led to the establishment of the connection between meteor showers and comets.

It is important to note here that two other comet sightings presumably have ties to the Tempel-Tuttle comet. The first of these occurred in 1366. This observation was made by both Chinese and Japanese observers. In 1699 G. Kirch in Germany observed a comet on October 26. However, there seems to be no other observations of that comet sighting left from historical records. Even so, some of the predictors believe that these two sightings (1366 and 1699) were prior observations of the Tempel-Tuttle comet.

The second event was the recurrence of the *Leonids* meteor storm as predicted by Newton. While light from the moon interfered with good observation of the storm, enough data was acquired to indicate that the prediction was a success. From this event and analyzing the data in 1867, Theodor von Oppolzer more precisely calculated the period to be 33.17 years. Furthermore, Urbain Le Verrier calculated another period for the *Leonids*.

In 1899 another storm was anticipated and an increase in *Leonids* activity did occur. However, the activity was disappointingly low. Charles Olivier called the lack of activity "the worst blow ever suffered by astronomy in the eyes of the public." It was later determined that the stream came under the gravitational influence of both Jupiter and Saturn, in 1868 and 1870, respectively, thereby diverting its distance away from Earth in 1899 to more than double what it was in 1866. Such gravitational influence is called a *perturbation*.

The rates for the annual showers continued to increase, reaching a near storm level in 1901. The activity was most visible in the Midwest and western U.S. that year. Observers at Carlton College in Minnesota put the count to about six to seven per minute, and Mr. E. L. Larkin, perched on Echo Mountain, California, counted around five per minute at the shower's peak. *Leonids* showers occurred the following two years.

In 1902 moonlight obscured visibility of the shower. Yet in 1903, European observers John Henry in Ireland and Alphonso King in England noted levels approaching an estimated 200 per hour.

From the *Leonids* seemingly increasingly reliable predictability, in 1932 yet another storm was anticipated. However, this time in North America weather obscured prevented viewing of the storm. It was thought by some that because no observations were made here, a storm did not occur.

Even so, observations were made in other parts of the world. Data from these observations indicated that there were possibly two peaks. P. A. Curry at the Helwan observatory noted a rate approx-

Oops...

We accidentally reversed the values of the two resistors in the schematic in figure 3 on page 68 of the September issue ("Computers and Internet" column). Reader Tom Simko, WB2IVM, points out that "The 2 resistors in the drawing should be reversed in value. For non-inverting configuration, Kv = 1+ Rf/Ri (Kv = 1+ 90K/10K = 10)." So the 90k resistor should be between the minus side of the op-amp and the output, with the 10k resistor going to ground. Our apologies to anyone who blew up an op-amp or two by trying to build this circuit! *(Tnx WB2IVM)*

imating over 100 at his observed peak at around 4 AM local time. Several hours later (now in daylight), in Egypt J. P. M. Prentice observed rates approaching over 200 per hour. Nevertheless, while a storm was not observed in 1932, predictors looked forward to the years 1965–66.

In 1965 the *Leonids* count increased dramatically over the previous year. As a result, a number of amateur radio operators obtained excellent results from the *Leonids* shower of 1965. It was from these observations that predictors were fairly confident of a decent shower level the following year. However, because of the previous perturbation of the stream by Jupiter and Saturn, no one was willing to go out on a limb and predict a storm.

Continued good press prompted more interest. Encouraged by predictions in the November 1966 issues of *Sky and Telescope*, *Natural History*, and *QST* magazines, hams stood by for what they thought might be a better-than-average night for the 1966 *Leonids* shower.

Hams who were on the air at that time and visual observers in the western parts of the U.S. were not disappointed. Visual observations compared the count to that of the 1833 storm. However, there really was no way to tie together the levels of the two because of the lack of comparable data.

Nevertheless, it was far more than "better than average"! The headline for Sam Harris, W1FZJ's "World Above 50 Mc." column in January 1967 *QST* was "November Leonids—Shower of a Lifetime." Sam recounted, "Hundreds of contacts were made by calling CQ, or by breaking stations when their skeds were completed, as most were in the first minute or two of prearranged calls."

Reports of visual observations were sent to *Sky and Telescope* from all over the country. One report came from Shelby Ennis, W4WNH (now W8WN). Shelby wrote, "For us in Kentucky, the 1966 *Leonids* will be rated much better as a 'radio' shower than as a 'visual' shower due at least in part to the very sharp peak coming after dawn." Even so, in areas where dawn hadn't come, particularly in the west, the display was awesome. Reports of 2000 meteors per minute weren't uncommon. It was a night (or early morning) to remember for amateur radio operators and amateur astronomers alike.

Now, 35 years later, we are well into the next cycle of the *Leonids* storm. Reports of the 1994 *Leonids* meteor shower indicated a dramatic increase over the previous year. Some reports compared the rates to the *Perseids* shower earlier that year. Reports of 1995 and 1996 showers indicated continued increased activity.

In addition, the Dutch Meteor Society reported that a team of its observers recorded a period of increase in faint meteors riding on top of the shower during the overall peak for a period of between one and two hours. These observations put the EZHR (estimated zenith hourly rate) at about twice the number of the rest of the shower overall. Based on these observations, and the recovery of the Tempel-Tuttle comet on March 10, 1997, predictors have indicated that a storm is possible both in 1997 and 1998!

Surprisingly, reports for 1998 indicated two good peaks, one at around 0200 UTC and the other at around 2030 UTC, both on 17 November. Questions arose as to why two peaks. Could it have been a separation of the peak riding on top of the other peak that the Dutch had observed? As a result of the double peak of 1998, many diverse predictions were made for the next year.

What rolled out was a storm. The International Meteor Organization commented: "A storm of Leonid activity was observed from western Asian, European, and African locations at a solar longitude of lambda = 235.285° ±0.001°, corresponding to November 18, 1999, 2h02m ±2m UT [0202 UTC] with a peak equivalent ZHR [the number of meteors reported to have fallen in an hour] of 3700 ±100 based on 2.8-minute intervals" (<http://www.imo.net/articles/shower/leo99.html>).

By contrast, the 2000 *Leonids* did not reach storm capacity. Even so, three peaks were observed. Again, the IMO reported, "Three major activity outbursts were found: lambda = 235.28 (November 17, 8h07m UT) with ZHR = 130 ± 20, lambda = 236.09 (November 18, 3h24m UT) with ZHR = 290 ± 20, and lambda = 236.25 (November 18, 7h12m UT) with ZHR = 480± 20" (<http://www.imo.net/articles/shower/leo00.html>).

So what about this year? Again, reports of predictions of two peaks have surfaced. According to Space.com (<http://www.space.com/scienceastronomy/astronomy/leonids_2001.html>):

> The two most widely watched Leonid predictions are made by Rob McNaught of the Australian National University and David Asher of the Armagh Observatory. Even these two researchers, however, admit that prior to 1999, meteor forecast had a checkered past.
>
> 'But a new theory is able to explain the historical events and should thus be able to make sound predictions for the near future,' McNaught says. 'Prospects appear good for a moderate storm visible in dark skies from Australia and eastern Asia in 2001, and in moonlit skies over Europe, west Africa and North America in 2002.'
>
> America will not be left out this year, either.
>
> 'It seems certain that the Americas and the Far East will be treated to a grand display without interfering moonlight in 2001,' said Robert Lunsford of the American Meteor Society, shortly after reviewing last year's event and noting that predictions were on target.
>
> McNaught and Asher study these dust trails to make their predictions. They expect a peak

this year of up to 15,000 meteors per hour over Australia and East Asia and as many as 2,500 per hour over North and Central America.

The Space Operations Support Office at The Aerospace Corporation (<www.leonidstorm.com>) makes the following observations at their URL, "Observing the 2001 *Leonids*":

The 2001 Leonids are anticipated to be the best showing for meteor showers since the 1999 Leonids over Saudi Arabia. They will peak in the early morning hours of the 18th of November with rates that could exceed the 1999 event (~2500 meteors per hour).

Several models are predicting two significant peaks: one over the United States (especially towards the west) beginning about 3–4 am EST (0800–0900 UTC) and lasting until 6–7 am EST (1100–1200 UTC). The maximum, according to these models, will occur around 5 am EST (1000 UTC). The level of activity for this peak could be as much as 2000 meteors per hour.

The second significant peak will begin around 12 noon EST (1700 UTC) and last until 2 pm EST (1900 UTC) on the 18th of November. The best viewing for this peak will be over Australia and the Far East. The level of activity for this event could be anywhere from 7000 to 15000 meteors per hour!

Another model does not anticipate distinct peaks such as those just described. Instead, the prediction here is a general increase in activity for the entire night of the 18th of November beginning about 3 am EST (0800 UTC) on the 18th and lasting until 3 pm EST (2000 UTC). The highest level of activity will be around 1500 meteors per hour over Hawaii, with both the US and Australia/Far East observing anywhere from 500–1000 meteors per hour.

It is interesting to note that NASA, using the model developed by David Nugent and Peter Jenniskens (SETI Institute/ NASA Ames), has produced a software program that will predict the peak in a neighborhood close to you. This program can be found at <http://www-space.arc.nasa.gov/~leonid/estimator.html>.

The closest neighborhood for me is St. Louis, Missouri. According to the program, St. Louis will observe a sharp incline and decline in activity. The center of the narrow bell curve is around 3 AM local (0900 UTC) and the predicted peak is in excess of 2000 meteors per hour.

Working the Meteors in a Storm

The *Leonids* may or may not reach storm levels. Nevertheless, the ZHR rate may be such that sustained QSOs can take place during the one to two hours of the peak. If this is the case, then schedules are a waste of time, and using the WSJT software may be unnecessary because of the ease of completion via the CW or SSB modes. Therefore, you should concentrate entirely on random QSOs.

Now here is the dilemma: If you park on the calling frequency expecting to make random contacts by way of your being there, you can pretty much forget it. The big guns will be there in force. With all this probable QRM, it is likely that many—including the big guns—will make much headway. It is better to spread out off the calling frequency. I would suggest on 2 meters spreading out at least 50 kHz above and below 144.200 MHz. If you are a big gun, find a frequency sufficiently off the calling frequency and call and call and call. I guarantee that others will find you. Your QSO rate will be much higher and freer of QRM than if you try to compete with your fellow big guns on the calling frequency.

This year and possibly next will be those once-in-a-lifetime events you do not want to miss. If you are camped out on a calling frequency hoping to "duke it out" there, you will miss those opportunities. Furthermore, you will also keep those lesser guns from having those opportunities of working you!

Leonids URLs

The most extensive home page that I have found is the following: <http://leonid.arc.

nasa.gov/>. You may find others by going to the URL <http://www.atnf.csiro.au/asa_www/info_sheets/leonids.html>. You may also check out Sky Publishing's home page, <http://www.skypub.com/news> for their latest information.

Books on Meteors

The Heavens on Fire: The Great Leonid Meteor Storms (1999, Cambridge University Press), by Mark Littmann, plainly tells the history of meteors, especially the *Leonids* showers. Publication of this book coincided with the peak activity of the November 1999 shower, when swarms of a thousand meteors an hour were expected to be seen. The founding scientists, the history of meteors, and the dangers posed to Earth also are discussed in this book.

Observing Meteors, Comets, Supernovae and Other Transient Phenomena (Practical Astronomy, 1998, Springer Verlag), by Neil Bone, is somewhat of an update of his 1994 work, *Meteors*, released by Sky Publishing Corporation as part of their *Sky and Telescope Observer's Guides* series. For the radio amateur, these books provide a great deal of insight into what a meteor is, and how the meteor and Earth collide to create the visual (and in our case, the electronic) observations we experience. The former book devotes nearly a full chapter to the *Leonids* meteor shower. The latter book gives a brief history of meteor studies and contains a season-by-season calendar of annual meteor showers and their characteristics. A few paragraphs are devoted to the amateur radio operator's interest in meteor scatter propagation.

The International Meteor Organization's *Handbook for Visual Meteor Observations*, edited by Paul Roggemans, and also published by Sky Publishing Corporation, covers meteor showers extensively. While somewhat dated (its second edition was published in 1989), included in it are historical anecdotes of both major and minor showers.

For a copy of *The Heavens on Fire* or *Observing Meteors...*, you might try online at Amazon.com or other online book services. For a copy of *Meteors*, send $24.95 plus shipping and handling to Sky Publishing Corporation, P.O. Box 9111, Belmont, MA 02178-9918. Charge-card orders are accepted via the company's toll-free number, 800-253-0245, from 9 AM to 4:30 PM, Eastern Time, Monday through Friday. You may also order online at <http://store.skypub.com>. The *Handbook* is no longer on Sky Publishing's list, so it may be out of print. However, you might try one of the online book services.

ARRL EME Contest

The second weekend of this year's ARRL EME Contest will be November 10–11. Conditions are forecasted to be good. Complete rules were in the September issue of *QST* and are posted on the ARRL website at: <http://www.arrl.org/contests/announcements/rules-eme.html>.

From our Friends

As we went to press, the following are some of the condolence messages we received from around the world in the aftermath of the September 11th tragedy:

"Dear US EME Friends, We would like to say our deep sadness for this unbelievable attack. Our thoughts will go first to all the innocent victims and their families. We are with you by mind. F8DO family. We send the same message to US EME Friends. Gods are always with you. *F2TU family*"

"Dear US EME Friends! My deep sadness is for all victims and their families. All peoples of Ukraine are with you by mind. *Valery Loshakov and Family, UT3LL*"

"Hi EMEers, I would like to extend my sympathy to the victims and their families in the US. I (and I am sure all peoples in Russia) was horrified to see on the media the loss of so many innocent

souls. Once again I would like to extend my solidarity with the families of the innocent victims of this barbaric and criminal terror against mankind. Gods are always with you. *Dmitry, RZ1AWR, and Serge, RZ1AS.*"

"Hi Guys, I want to extend my sympathy to the victims and their families. I was horrified to see on the media the loss of so many innocent people. I would like to extend my solidarity with the families of the innocent victims of this barbaric and criminal act against mankind. *Mansueto Grech and Family, 9H1GB.*"

"Dear US EME friends, I am very sorry because this disaster that has happened to your country and your people. My deep sadness is for all victims and their families. Good bless you. *Branimir Antolic, 9A9B.*"

"I saw it from second attack to the next tower on TV and got deep sadness for all of America. I hope all you will quickly get recover from this evil's attack. Gods are always with you. *Masato, JAØBLU.*"

And Finally . . .

For some, meteor showers, and in particular meteor storms, may be considered apocalyptic. In light of the tragedy that happened to this country in September, some of our neighbors may be fearful of what they see in the sky. Here is an opportunity for us weak-signal VHFers: You can use the subject the *Leonids* as a conversation starter. You can talk with your neighbors about the ham radio hobby and how meteor showers are used for communications, and you can assure them that should there be a major shower or storm, it is a natural event and not to be feared.

Does the idea that our neighbors may experience fear when they see a meteor shower sound far-fetched? Maybe. However, having someone around who is knowledgeable can go a long way in dispelling myths and being a voice of calm.

Another possible outcome of your starting conversations with your neighbors is that you might make new friends. What has been emphasized over and over in these raw days of the early aftermath of the tragedy of September 11th is the absolute importance of community. We in Oklahoma City found this out after the Oklahoma City bombing, and now the whole country is finding out about the need for community.

If you have interesting stories of your newfound community involvement, please share them with me so that I can pass them on to our broader community and family of weak-signal operators.

Whatever news you have to share with your family of ham radio operators, I look forward to hearing from you so that I can be the vehicle for that sharing.

Until next month...

73, Joe, N6CL

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Appreciating the Camaraderie of Contesting

November's Contest Tip

The internet has a wealth of information on contesting. Two good sites to check out are <www.contesting.com> and <www.eham.com>. If you're looking for a source of information to help increase your contesting skills, these two locations are a good place to start. You'll find everything from links to other resources and clubs, to a battery of individuals ready and willing to answer your contesting questions. Check them out!

Calendar of Events

Oct. 20-21	JARTS WW RTTY Contest
Oct. 20-21	Rhode Island QSO Party
Oct. 20-21	Worked All Germany Contest
Oct. 21-22	Illinois QSO Party
Oct. 27-28	**CQ WW DX SSB Contest**
Nov. 3-4	Ukrainian DX Contest
Nov. 3-5	ARRL CW Sweepstakes
Nov. 9-11	Japan Int'l SSB DX Contest
Nov. 10-11	WAE RTTY Contest
Nov. 10-11	OK/OM DX Contest
Nov. 17-18	LZ DX Contest
Nov. 17-18	RSGB 1.8 MHz Contest
Nov. 17-19	ARRL SSB Sweepstakes
Nov. 24-25	**CQ WW DX CW Contest**
Dec. 7-9	ARRL 160M Contest
Dec. 15	OK DX RTTY Contest
Dec. 15-16	Croatian CW Contest
Dec. 15-16	ARRL 10M Contest
Dec. 29	RAC Canada Winter Contest
Dec. 29-30	Stew Perry Topband Distance Challenge

It is often said that timing is everything in life. As I was preparing to write this month's "Contesting" column, the indescribable events that took place in New York City, Washington, D.C., and Sommerset County, Pennsylvania became front and center on the same day. In a way, it completely undermined my thoughts this month. However, it also made me appreciate the fact that a small group of lunatics cannot destroy what we see in our hobby every day. That vision is one of incredible worldwide camaraderie that rises above skin color, religious affiliation, ethnic background, and so many other meaningless factors that some people use to define relationships. Contesting, in particular, is such a great example of how we can appreciate and respect our fellow man without the baggage of where we come from or who we are.

Whether it's the Dayton Hamvention™ or your local club, the socialization of contesting has been and will continue to drive interest into the future. Let's face it; as contesters we're like fishermen when we socially interact. The conversation ranges from how we bagged the big one to why the big one got away. And for me, many of my contest friends have become my lifelong friends, not just to talk about contesting and ham radio, but also to also discuss careers and life's issues in general. Without that aspect of contesting, my ham radio experience would be dramatically diminished. I'm certain you're no exception.

The notion of camaraderie can be related in a number of ways. The very first WRTC event in Seattle is a great example, as I was left with a true sense of how great our friendships can be in this hobby as Easterners and Westerners joined hands in fellowship, representing countries from around the globe. However, the most memorable example in my case comes from my earliest days of operating at the legendary station of Jim Lawson, W2PV, in Schenectady, New York. Like myself, maybe a few of you had the opportunity to operate from some of the old multi-op stations of the past. Callsigns such as W3AU, W4BVV, K2GL, and many others come to mind. When it came to joining together with the rest of the world, there simply was nothing better.

During those days as a new contester, I tried to manage the responsibilities of college while being a very avid ham. Some accused me of majoring in ham radio with a minor in Electrical Engineering. Anyone who had the pleasure of operating contests from a station such as W2PV, will relate to this month's column with a smile. For the rest of you, just imagine what the old days of contesting used to be like.

Operating at W2PV was akin to visiting NASA, especially from the perspective of a young college kid who had just recently used his Swan 270 and tribander at 35 feet. I'll never forget the first time I drove to Jim's house. He was located on a busy road in Schenectady (Route 7), and there was not a tree in sight as the QTH came into view. As you approached his house, you were struck by the staggering amount of aluminum in the sky behind the house. Jim was one of the early adopters of stacked Yagis (including 3-over-3 on 40 meters), as well as the proud owner of one of Telrex's Big Berthas. How does 10-over-10 on 10 meters grab you? Maybe you would have preferred to use the 8-over-8 on 15.

Jim lived in a modest house. He preferred to demonstrate his resources in terms of decibels rather than the number of fireplaces. As you might imagine, a multi-multi station can take up a lot of real estate in a house. At W2PV the station was spread over most of the basement as well as a separate operating room upstairs. Despite the natural opportunity for disorganization, nothing could be further from the truth when it came to station design at the Lawson QTH. Every cable, control line, interface, switch, and amplifier setting was impeccably labeled. I'll never forget the time when we had a rotator problem late one night during a CQ WW contest. Most of us would immediately start climbing the tower—not the case at W2PV. Jim's engineering discipline enabled him to develop a station technical guide. Inside this incredible piece of work was a color-coded reference manual that included site resistance readings for various conditions on all of his rotators. Jim had the problem figured out before we even had taken a climbing belt off one of the hooks in his shop!

Today's world of contesting seems to have a thyroid condition when it comes to antennas. Stacked beams are everywhere. If you don't have a 40 meter rotary, you're "not in the game." How can you think about operating without a 4-square on 80 meters (with 160 meters right behind that!). Having said all of that, there is still nothing like the experiences we used to have firing up on 20 meters with our 5/4/4 stacked Yagis.

In the days of W2PV (especially the late '70s and early '80s), there just weren't many stations like his. You stood out in the crowd, and believe me when I say it just doesn't get any better than that! Thus, operating at W2PV was a dream. It was the good old days of contesting. For you young bucks, there actually was a day in contesting when

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2000 CQ WW DX Contest Addendum

SSB

1. P3A set a NEW Multi-Single SSB record for Asia: 17,409,816.
2. N8AA should have been listed as #10 World in the Low Power All Band category table.
3. ZX2B (Op: PY2MNL) was the #1 Zone 11 score, not PW7BZ. He also ran Low Power.
4. WA3NKO/4 should have listed in the USA Top Ten QRP box as #7 with a score of 278,864.
5. K2MGA was left out of the results. He was #1 14 MHz 2nd call area with a line score of 112,398 (Final Score) 310 (Qs) 29 (Zones) 102 (Countries) and a certificate winner.
6. CV5H is Multi-Single (MS) with operators: CX2ABC, CX1ACV, CX6DAP, CX8BAE, CX8DX, CX6ACY CX3CY. Radio Grupo Sur.
7. ZY2W operated by PT2ND was Assisted Low Power (LP) 10m.
8. OH6NIO should have been listed as Assisted and a certificate winner.
9. EA6BB was not listed. His score was QRP 28 MHz 43,932 219 25 59
10 LU6HI was not listed. His score was QRP 7 MHz 109,872 349 29 80
11. EA3BES was not listed. His score was QRP 14 MHz 13,053 171 12 45
12 EA2LU was not listed. His score was 14 MHz 117,836 788 23 66
13. EA1FD was not listed. His score was 7 MHz 73,884 368 17 77
14. EA2HT was not listed. His score was LP All Band 432,372 827 60 214
15. EA1ND was not listed. His score was LP 14 MHz 50,224 333 17 56
16. The ops of MS EA6IB were: EA3AIR, EA3AJW, EA3ALV, EA3GGO, EA3KU, EA5BM, EA5ZF, EA6ACC, EA6FB, EA6FO, EB6AOK.
17. EA4DBM should have been listed as LP 28 MHz.
18. NY4W was incorrectly listed in Zone 4 in the Top Zone Box. He is in Zone 5.
19. OH7M should have been listed as Single Op (SO) All Band (AB) High Power (HP). The op was OH4JFN, club was Contest Club Finland.
20. LA7DHA should have been listed as Low Power All Band.
21. K9NW should have been listed as in Zone 4 not Zone 5 in the Top Zone table.
22. IZ5ASZ was not listed. His score was Low Power All Band 340,524.
23. EA1UU should have been listed as Low Power 14 MHz and is a certificate winner.
24. EA1BP should have been listed as QRP 21 MHz, not 21 MHz.
25. LU1VEW should have been listed as Low Power 28 MHz.
26. The score of VY2MGY/3 was L3.7 31,160 476 10 28, not 31 points!
27. KK1DX should have been AA (Assisted All Band), not A (All Band).
28. KK1H should have been AA, not A.
29. N1EU should have been AA, not A.
30. W1AO should have been A, not LA (Low Power All Band).
31. W1CC should have been MS.
32. W1ZS should have been A, not LA (150 watts).
33. W2YG should have been A, not AA.
34. WA2RF should have been AA, not LA.

CW

1. The Slovenian Contest Club listing was left out of the Club Scores. Their total score was 45,677,608, placing them #6 among DX Clubs.
2. K1ZZ #3 USA and #10 World was operated by NT1N.
3. OHØV operated by OH6LI set a NEW European 28 MHz CW record: 1,071,908.
4. The winner of the World 14 MHz trophy for CW was OH2BH operated by OH1WZ. 4M5X as listed was in error. He was Assisted.
5. N6MU is the NEW QRP 28 MHz record holder for North America.
6. The 2nd place Multi-Single Asian high score was RF9C, not UPØL. RF9C is the winner of the Asian MS trophy because P3A was the World winner.
7. N1WR/4 was really N1WR/3 and was #1 Low Power All Band 3rd call area and a certificate winner.
8. K4WI was the 3rd highest Low Power 28 MHz score in the USA.
9. S58J should have been listed in the European Top Scores bo as #3 Low Power 28 MHz.
10. 9A1AA should have been listed as Low Power 14 MHz.
11. VE2FFE should have been listed as Low Power All Band.
12. N6CW was Single Operator Assisted, not Single Operator.
13. LY1YK was left out of the CW results.
14. The OH2U operating team was not fully listed. They were: OH2BVI, OH2FT, OH2HE, OH2IW, OH2JA, OH2JQS, OH2JTE, OH2LUR, OH2XX, OH4YR, OH5JOC, OH6CT, OH6DD, OH7BX, OH7JR, OH8KXK.
15. The correct listing of W6QU should have been W6QU/4 (Op: W8QZA) QRP 1.8 MHz.
16. W9LT should have been listed as W9LT/7.
17. T94JS should have been listed as Low Power.
18. The guest operator at GW4BLE was G3WVG.
19. WA3KPP should have been listed as Assisted LP, not LP.
20. W9WI should have been listed as W9WI/4.
21. AA1ON should have been listed as Multi-Single not LP Single Op.
22. YC1ZTC should have been listed as Multi-Single, not LP All Band.

packet radio spotting didn't exist. Imagine being at one of today's multi-multi stations where you don't have six or more computers networked together. While we did have 2 meter spotting at our disposal, we certainly did not have high-tech intrastation communication between bands. At Jim's station, too, it was even a more difficult problem because the stations were in different rooms. How did we solve the problem? As it turns out, this is one of the closely held secrets of contesting. Jim, determined to work out a technical solution to allow his operators to effectively communicate with one another, developed an elaborate intercom system. The secret was that the underlying radio technology for the system was low-powered CB radios. Imagine operating in radio heaven while using a CB radio to pass a 5Z4 to 20 meters. It was just one of the many good old times of contesting.

The common thread between the days of W2PV and today is camaraderie. We had so much fun in those days. We laughed and laughed, much like today. It had to be fun; there was no other possibility. Imagine the commitment of driving four hours (each way) to operate a four out of seven weekends during the old days of two-weekend ARRL DX Contests. Imagine the motivation it took to drive eight hours to operate in a CW Sweepstakes from W2PV only to be buried below the West Coast competitors. Why did we do it? I think it's because we loved it and loved being part of a team. The team at W2PV was one of the best groups of friends I have ever had the chance to associate with, and many of us are still at it today.

I could write a book on some of the operating stories from W2PV. Most of us recall the story of King Hussein, JY1, calling in on 10 meters. Not being from the school of shy personalities, the W2PV operator simply asked His Highness to QSY to 15 meters without skipping a beat. After all, he was only a king, right? JY1 cheerfully agreed to our request and even went on to 20! He was probably thinking, why not? It's Jim Lawson's station!

When you have the use of 20 elements on a band, you tend to get the feeling that you're the loudest guy around. For the most part, that was the case on 10 meters at W2PV. Having said that, I'll never forget the time when a fellow in Vermont unintentionally fired up on my frequency and proceeded to run me off the band. Imagine the thoughts going through my head: "What could this guy possibly be running?" "I didn't know they made amplifiers that big!" When I finally got his attention, I asked him about his antenna. It turned out to be a tribander at 50 feet! If you can describe the physics behind that one, I'd like to hear from you.

My reminiscing about W2PV reminds me of just how good the old days of contesting were. Jim was a force behind my birth as a contester. In the early 1980s I had the chance to honor him (with others) as his premature death approached by presenting him with a #1 World Multi-Multi CQ WW trophy, the last contest his station ever won.

While we should always be looking forward in life, especially in light of the terrible tragedy in the U.S. we have just witnessed, so many of our previous experiences (and those of others) can be an encouragement to us all. I'm even more mindful now too of the friends I have in ham radio. They are friends who cover the globe, friends who are from every ethnic, religious, and personal walk of life, yet a group of people that truly care for one another. That's what contesting is really all about—a sport of memories and camaraderie that can't be beat!

Final Comments

Needless to say, this has been a difficult column to write this month. Had I actually been on time for a change (never-ending thanks to *CQ*!), perhaps I would have missed the timing of the horrific events in New York City and Washington, D.C. Nevertheless, as is the case with so many others around the globe, my heartfelt prayers and wishes go to everyone affected by the terrorism that took place in September.

As always, you can reach me at <K1AR@contesting.com>. Feel free to offer your comments or input. It's greatly appreciated.

73, John, K1AR

Looking Ahead in CQ

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

A Double Anniversary Special in December!
- Centennial of Transatlantic Radio
- 40 Years of Amateur Radio in Space

More Coverage of Ham Radio's Response to Terrorist Attacks

Plus:

"*CQ* Interviews: Al Kahn, K4FW," by N4XX

"Results: 2000 CQ WW DX 160 Meter Contest," by K4JRB

DX

BY CARL SMITH, N4AA

News Of Communication Around The World

DXers Send Hundreds of Condolence Messages to U.S.

Just as this column was being finished, the horrible events of September 11 were being reported. The entire civilized world was shocked beyond belief at the hijacking of four aircraft and the subsequent murder by terrorists of thousands of Americans in New York City, in Washington, D.C., and Somerset, Pennsylvania. By the time this is in print I suspect the investigation will have progressed to a conclusion and those responsible for these insane acts will at least have been identified, if not apprehended. Hundreds of messages of condolence have come from our amateur radio friends around the world over the internet and on the air. I believe I speak for all of us in America in thanking our friends for their thoughts and prayers in our nation's darkest hour.

Anticipated DXpeditions

We made it through the mid-year "crisis" of slow activity with not many DXpeditions to grab our attention. Now we can look forward to the fall and winter propagation and all of those contest weekends. There have been a number of DXpeditions announced that should generate a lot of activity for us about the time you are reading this.

3D2AG – Rotuma. Antoine is expected to operate from Rotuma again in October or November. He has made a number of trips to this spot and usually generates big pile-ups while he's there.

PYØT – Trinidade. This is not the easiest place to get to in the first place, and anyone who goes there can only stay there for a few days at a time. The site of the operation by PTØT and ZXØT from August 7–10 this year, Trindade again will be activated in October or November.

Located about 1100 km from the coast of Espirito Santo State (southeast of Brazil), the Trindade and Martim Vaz Archipelago is the most eastward point of Brazilian territory. The archipelago is administered and controlled by the Brazilian Navy, which maintains on Trindade Island (the bigger island) the POIT (Trindade Island Oceanographic Station), its purpose marking the presence of the Brazilian State and developing ecological preservation in conjunction with the IBAMA (Marine Turtles Preservation Institute). In addition, there are marines who stay on the island and operate a meteorological station (on average, 32 marines and officials).

The marines stay on the island for four months at a time, with no physical contact with the mainland. The First Naval Command of Rio de Janeiro is responsible for rotating the marines on and off the island. The journey takes two or three days, and landing on the island is only possible by helicopter. The ship stays anchored off Trindade for two or three days at a time while the marines work to resupply the POIT installation with food and other provisions, as well as prepare to "replace" the marines who have been on the island for four months.

It is during this two- to three-day period that ZWØTB and ZWØTW will be able to activate this semi-rare country for DXers around the world. For more information, see their website: <http://www.radiohaus.com.br/principalingles.htm>.

ZK1CG – North Cook. Another operation from this semi-rare Pacific island is slated to run in late October. Five members of the Western Washington DX Club will be operating all bands and will also participate in the CQ WW DX SSB Contest. This should generate huge pile-ups for that rare multiplier.

VP6?? – Ducie Island. This potential "new one" is expected to begin operation at 0000 UTC on November 16, after a vote by the IARU to accept the Pitcairn Island group as a member organization. The length of the operation was not announced at the time this information was released.

The leader of the DXpedition is well-known operator Tom Christian, VP6TC, president of the Pitcairn Island ARA. Other DXpedition members include VP6DB, JA1BK/VP6BK, JA1SLS/VP6BB, JF1IST, and three other operators to be named later. This international DXpedition will attempt to provide worldwide coverage for this rare IOTA, OC-182. Satellite log checking is planned by the team.

Ducie Island is located 360 kilometers from Henderson Island, the nearest land, and surrounded by waters of 3000 meters in depth. It is the easternmost atoll in Oceania and rarely visited. Because of its remote location, conventional transportation is not available, and an adequate-size boat is needed to make the journey. Arrangements have already been made for a charter, and landing permission has been obtained for the date selected. Because of ecological concerns, only one group at a time may be on the island.

Support for this DXpedition is being provided by Yaesu (Vertex Standard), Create Design, and Suzuki Motors. The QSL Manager will be Garth Hamilton, VE3HO, and the Pilot station will be Dr. Bill Avery, K6GNX.

Sharing in the good times at Friedrichshafen were (left to right) Gerald, K6MD; Tom, N4XP; Fernando, EA8AK; and Hiroo, JA2EZD/XW2A. (Photo courtesy Gerald, K6MD)

Two well-known DXers at the Friedrichshafen, Germany ham convention in July 2001: Franz, DJ9ZB, on the left and Abubaker, 5A1A, on the right. (Photo courtesy Gerald, K6MD)

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The WPX Program

CW

3077.....DF1TJ 3078.....AI5T

CW: 900 WA2VQV, 1000 DF1TJ. 2350 KF2O.

SSB: 400 JK7QJK. 550 N3TA. 1450 AA1KS. 1600 W2ME. 1700 JR4NUN. 2800 KF2O.

MIXED: 3350 IK2ILH, KF2O. 4200 N6JV.

10 meters: AA1KS
15 meters: JK7QJK, DF1TJ
20 meters: DF1TJ

No. America: AI5T
So. America:DF1TJ
Europe: DF1TJ

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KU0A, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM.

160 Meter Endorsement: K6JG, N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RA0FU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

Bill, VK4LC (left), coincidentally met Ami Shami, 4X4DK (right), at Friedrichshafen 2001. They have known each other on the air for more than 40 years, but had never met in person. Both are top DXers and are on the DXCC Honor Roll. (Photo courtesy Bill, VK4LC)

CQ DX Awards Program

SSB

2350.....DS3EXX 2348.....GØSWS

SSB Endorsements

320.....W6SHY/332 300.....LU5DV/315
320.....W2CC/330 250.....OK1DWC/273
320.....EA3EQT/328

CW Endorsements

320.....KA7T/330 310.....W7IIT/318
320.....YU1TR/327 310.....N7WO/312
320.....W4UW/325 275.....OK1DWC/284

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 333 active countries. Please make all checks payable to the award manager.

KH1 – Baker & Howland. Hrane, YT1AD, announced he has permission from the US Fish & Wildlife Services to visit the islands April 4 to May 16, 2002. Further details will be provided as they become available.

E29DX – Nu Island (AS-145)

I just received a report on this operation, which took place April 6–16, 2000. Nu Island is located in the Gulf of Thailand just off the coast of Songkhla Province in south Thailand. The group of islands consists of Nu, Meaw, and Kra islands. This was the last RSGB IOTA un-numbered group listed for Thailand. The purpose of the DXpedition was to obtain the IOTA designation number and give as many QSOs as possible during the operation.

A group of 28 operators from the Radio Amateur Society of Thailand and The Thailand Group 1996 participated in this event. The DXpedition leaders were HSØGBI and HS1CKC. QSL Manager is HSØGBI.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 333 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement sticker s is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 333	W2FXA 333	K2JF 331	KA7T 330	W4QB 327	W4LI 325	KUØS 322	HB9DDZ 314	F5OIU 302
K2FL 333	EA2IA 333	W1WAI 331	KZ4V 329	N4CH 327	K3JGJ 325	KE5PO 322	N1HN 313	YU7FW 301
K6JG 333	F3AT 333	N4JF 331	K9IW 329	I1JQJ 327	WA8DXA 325	K6CU 321	CT1YH 313	KH6CF 300
K9BWQ 333	DJ2PJ 333	WA4IUM 331	K7LAY 329	YU1TR 327	I5XIM 325	HA5DA 321	K9OW 313	K9HQW 299
K2ENT 333	K2JLA 333	K6LEB 331	IT9QDS 329	IT9TQH 326	K5UO 325	VE7DX 320	N7WO 312	F6HMJ 296
N7FU 333	W7CNL 333	PT2TF 331	N4AH 329	I2EOW 326	N5HB 325	W4UW 319	K9DDO 312	WG7A 295
K3UA 333	YU1HA 333	N5FG 331	WB4UBD 328	NC9T 326	YU1AB 325	HA5NK 319	W3II 312	KD8IW 288
K9MM 333	WØHZ 332	WØJLC 331	PAØXPQ 328	VE7CNE 326	W4UW 325	W7IIT 318	N4OT 311	W9IL 282
K2OWE 333	N7RO 332	VE3XN 331	K1HDO 327	NØFW 326	K8LJG 324	K1FK 318	KF8UN 308	EA3BHK 282
N4MM 333	K4CEB 332	W2UE 330	I4EAT 327	K7JS 326	DL3DXX 324	SM5HV/HK7 317	PY4WS 308	YC2OK 282
W4OEL 333	G4BWP 332	W6DN 330	DL8CM 327	N5FW 325	LA7JO 324	G3KMQ 317	IKØADY 307	XE1MD 278
W7OM 333	K6GJ 332	W8XD 330	SM6CST 327	IK2ILH 325	W6SR 323	K8JJC 315	W6YQ 305	EA2CIN 278
F3TH 333	K4CN 332	4N7ZZ 330	N4KG 327	9A2AA 325	9A2AJ 323	WG5G/QRPp 315	YT1AT 304	I3ZSX 276
WB5MTV 333	K4IQJ 332	I4LCK 330	K8PV 327	OK1MP 325	K4JLD 323	OZ5UR 315	LU3DSI 302	G3DPX 275

SSB

K4MZU 333	VK4LC 333	YV1KZ 332	W8AXI 331	VE7DX 329	I4EAT 327	LU7HJM 322	LU5DV 315	K6GFJ 299
K2TQC 333	N5FG 333	YV1AJ 332	W3AZD 331	CT1EEN 329	W9OKL 327	K5NP 322	CP2DL 314	4X6DK 297
K2FL 333	DJ9ZB 333	W2FXA 332	OE3WWB 331	W2JZK 328	DL6KG 326	NI5D 322	NØMI 313	K7ZM 292
W6EUF 333	EA2IA 333	W8ZET 332	DL9OH 331	KZ4V 328	W6SR 326	PY2DBU 322	K9YY 313	OA4EI 292
K2JLA 333	XE1L 333	WØYDB 332	N2VW 331	K1HDO 328	N4KG 326	K6CF 322	YT1AT 313	KØOZ 291
K6JG 333	W6BCQ 333	I8KCI 332	YZ7AA 331	KF8UN 328	W4QB 326	N3RX 321	KD5ZD 312	KE4SCY 291
K6GJ 333	XE1AE 333	OE2EGL 332	YV1JV 331	AE5DX 328	K8PV 326	EA8TE 321	VE3CKP 311	I3ZSX 290
K2ENT 333	4N7ZZ 333	KSØZ 332	YV1CLM 330	PAØXPQ 328	W4LI 326	XE1CI 321	CT1YH 311	YV5NWG 287
K6YRA 333	KE5PO 333	N5ZM 332	K8CSG 330	K9HQM 328	K6BZ 326	W6MFC 321	W5OXA 311	KK4TR 286
K4MQG 333	PY4OY 333	CT1EEB 332	ZL3NS 330	KD8IW 328	W4WX 326	KØFP 320	WZ3E 311	RW9SG 286
K7LAY 333	VE1YX 333	K4CN 332	W5RUK 330	KE4VU 328	W2FKF 326	N4CSF 320	HA6NF 310	VE7HAM 285
IK1GPG 333	XE1VIC 333	K9PP 332	EA3KB 330	K5UO 328	IØSGF 326	N4HK 320	LU3HBO 310	F5RRS 284
K5OVC 333	IN3DEI 333	W6SHY 332	LA7JO 330	EA3EQT 328	YV5AIP 325	DL3DXX 320	SV3AQR 310	CT1CFH 284
NØFW 333	I4LCK 333	K9OW 331	W9SS 330	KB2MY 328	K9IW 325	WØULU 320	EA3BHK 307	WØIKD 283
OZ5EV 333	VE3XN 333	W3AZD 331	W7FP 330	AA6BB 327	WA4JTI 325	EA1JG 320	N1ALR 306	EA3CYM 283
K9MM 333	OE7SEL 333	WA4WTG 331	WDØBNC 330	SM6CST 327	NI5D 325	EA7TV 320	XE1MDX 305	WN6J 281
ZL3NS 333	W2JZK 333	N4JF 331	K3UA 330	W3GG 327	KC4MJ 325	SV1RK 320	EA5OL 305	F5JSK 281
N4MM 333	EA4DO 333	EA1JG 331	VE3MRS 330	CX4HS 327	IKØIOL 325	K3LC 320	WB2AQC 305	N5WYR 281
OZ3SK 333	K5TVC 333	VE3MR 331	W6DN 330	N5ORT 327	K1EY 325	N6RJY 319	N1KC 305	YU1TR 280
N4CH 333	W4UW 332	K1UO 331	WA4IUM 330	IT9TQH 327	K3JGJ 324	WA4DAN 319	KC4FW 304	KK5UY 280
IØZV 333	K4JLD 332	YV5IVB 331	W2CC 330	IT9TGO 327	K7HG 324	CE1YI 318	YC2OK 303	KA5OER 280
YU1AB 333	WB4UBD 332	VE3XN 331	VE2GHZ 330	WD8MGQ 327	AC7DX 324	EA5GMB 317	WB2NQT 303	EA3CWT 278
W7OM 333	WB3DNA 332	KX5V 331	WS9V 329	I1EEW 327	KØHQW 324	YV4VN 317	VK3IR 303	VE2DRN 277
KZ2P 333	VE4ACY 332	VE7WJ 331	I2EOW 329	SV1ADG 327	ZL1BOQ 324	CT1AHU 316	W5GZI 302	XE2NLD 277
K7JS 333	VE4ROY 332	I8LEL 331	K2JF 329	DL8CM 327	EA3BKI 323	N5HSF 316	N5QDE 302	9A9R 277
DU9RG 333	K9BWQ 332	EA4DO 331	ZL1AGO 329	W2FGY 327	K4JDJ 323	K6RO 316	KD4YT 302	W6UPI 276
W4UNP 333	KØKG 332	PT2TF 331	N5FG 329	I1JQJ 327	W9IL 323	WA4ZZ 315	SV3AQR 302	VE2AJT 275
N7BK 333	W4NKI 332	VE2WY 331	DU1KT 329	F9RM 327	WW1N 322	K7TCL 315	YT7TY 300	Z31JA 275
N7RO 333	VE2PJ 332	W8KS 331	4Z4DX 329	XE1MD 327	F6BFI 322	WR5Y 315	SV2CWY 300	G4URW 275
IK8CNT 333								

RTTY

K2ENT 331	W2JGR 316	G4BWP 307	KE5PO 297	I2EOW 291	EA5FKI 284	W4QB 280	YC2OK 280	PAØXPQ 272
WB4UBD 325	K3UA 315	NI4H 305	W4EEU 291	I1JQJ 289				

During the ten-day operation a total of 12,495 QSOs were made. Removing the dupes from the log left a net total of 11,765 in 136 countries. See the photo of the operating location elsewhere in this column.

W9-DXCC Convention

I was ready to go and looking forward to the annual W9-DXCC Convention when disaster struck the U.S. on September 11th and all airlines were grounded. Many of us were affected by the lack of a means of transportation to reach Chicago. This is one of the oldest DX conventions around; this year was the 49th event. Always well attended, with an excellent program, I can highly recommend it to anyone looking for a great weekend of fun. If you were there, you know what I mean, and if you weren't, then think about adding it to your calendar for next year. We all can

QSL Information

3DAØWPX via ZS6WPX
3V8CB via IK8VRH
3V8MED via DL1BDF
3W2PS via HL4CYZ
4U1ET via 4W6MM
4W/CU3FT via CT1EEB
5N3NDP/6 via IK5JAN
5N4BFD via DJ9FH
5R8HA via G3SWH
5W1SA via JH7OHF
6DØZ via AC7DX
6D2X via AC7DX
6D8Z via AC7DX
6W4RK via F5NPS
8Q7QQ via HB9QQ
9AØE via DL1CC
9A5LO via OK1LO
9E1S via IV3TRK
9K11POW via 9K2RA
9M2OM via G3NOM
9M6TBT via KD3TB
9N7IG via JA3IG
A25/KG6GPA via W6DXO
A52KR via S53R
A52RK via S53R
A52UL via I7JFQ
A61AJ via N4QB
A61AO via N1DG
BI7D via BD7NI
BWØTCC via BV4CN
C4MG via 5B4KH
CN2AC via F6BEE
CN2JS via F6BEE
COØSC via IN3ZNR
CO8LF via DL1ZU
CQ2I via EA4URJ
CS5C via CT1AHU
D44TD via CT1EKF
DAØBHV via DL5EBE
E2ØRRW via E21EIC
E22DX via G3NOM
E28AM via DL8KAC
E28DX via G3NOM
EA6/SP4AOQ via EC6TK
EJ3HB via WA2YMX
EN1ØU via UY5UV
EO1ØF via URØFO
EO1ØG via UR7GG
EO1ØI via UR7IA
EO1ØJ via KG6AR
EO1ØM via UX7MA
EO1ØV via UR7VA
EO1ØY via USØYA
EO1ØZ via UYØZG
ER1ØMD via ER1BF
EU6YL via DL8KAC
EW6AC via DL8KAC
EW6MM via DL8KAC
EZ8AQ via DJ1MM
FOØCLA via F6CTL
FOØFLA via AH6HY
FR5ZU/FT via JA8FCG
GB5FI via GWØANA
H4ØDX via EA4DX
H44RD via EA4DX
HSØ/OZ1HET via OZ1ACB
HSØAC via G3NOM
HSØZCY via WB4FNH
HS6NDK via E21EIC
HS9EQY via E21EIC
IMØR via ISØAGY
J38PA via PA5ET
J43J via DJ5JH
J48SAM via SV2FPU
J6R via K3LP
J75J via KR4DA
J75WX via W4WX
J79DA via KR4DA
J79LR via W1LR
J79WB via N2OO
J88DR via G3TBK
JT1FYT via K4YT
JT1FZW via K4ZW
JW4LN via LA4LN
K2HX/KP4 via DJ9HX
K3J via AH6HN
K4T via K4PCF
K9Y via N9BOR
KA1I/NH2 via JH7BZR
KHØ/K7WD via JH7IMX
LT2D via LU2EE
LW9EOC via EA7JX
OH9A via OH1NOA
OJØ/LA6YEA via LA9VDA
P29VB via N5HHS
P29WS via W4HUT
PTØT via PY1LVF
PY1VOY/PUYØT via PY1LVF
R3DAS via UA3DJ
RAØBK via DL8KAC
RS9O via UA9OBA
S21YT via JA7KXD
SY7LH via SV7CLI
T22SC via JAØSC
TAØ/LZ1CNN via LZ1NK
TE8AT via TI3MCY
TI5KD via W3HNK
TI5U via JH8KYU
TI9CF via W3HNK
TK8T via F2YT
TL8CK via F6EWM
TM1BFA via F6KFO
TT8JE via F6FNU
TYØCDX via F5MOO
TY22DX via F5MOO
TY68F via F5MOO
UEØXYZ via RAØZD
UE3DDJ via RZ3DJ
UM8LA via RW3RN
UM9AA via UK9AA
UNØNF via DL8KAC
UN1P via DL8KAC
UN21A via DL8KAC
UN7ER via DL8KAC
UN7PCZ via DL8KAC
UPØAFG via DL8KAC
UP1ØØA via DL8KAC
UP25ØA via DL8KAC
UP53A via DL8KAC
UP54A via DL8KAC
UR6F via UXØFF
V63EC via JK1FNN
V63EK via JK1FNN
V63JT via K1KU
V63KA via JH8BKL
V63LJ via JH8DEH
V63MC via JH8BKL
V63YB via JH8MYB
V73CW via AC4G
V8AAP via N2OO
VI3ØRC via VK4RC
VKØKMT via VK4KMT
VK4BRK via N5HHS
VP5VAC via WA4JTK
VP8SGK via GMØHCQ
VP8SIG via GMØHCQ
W5B via W5OXZ
W8L via K8PT
WP4Q via EA5RD
XEØDX via AC7DX
XE2GV via AC7DX
XE2XA via AC7DX
XE2Z via AC7DX
XP1AB via OZ1ACB
XT2HB via F5RLE
XX9TFI via W5FI
YL8ØØBJ via YL2BJ
YMØKA via TA1KA
YN9HAU via EA7JX
ZS6SRL via ZS4BS

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 901-641-0109; e-mail: <golist@wk.net>.)

After the 2001 CQ WW WPX CW Contest this group gathered in Aruba. Left to right: S59AA and XYL; AI6V/P49V and XYL; S50A and XYL; P43E; N6TJ/P40T and XYL; and P43P and XYL. (Photo courtesy Jim, N6TJ, [ZD8Z])

Site of the E29DX IOTA operation on Nu Island in April 2000. (Photo courtesy Fred, K3ZO)

look forward to next year under much better circumstances.

Dayton 2002

I recently received some paperwork from the Dayton Hamvention for next year. Just to give you a preliminary look, it will be May 17–19, 2002, from9 AM to 6PM on Friday; 8 AM to 5 PM on Saturday, and 8 AM to 1 PM on Sunday. The outside vendor area will open at 8 AM on Friday; otherwise the hours are the same as for the inside exhibits.

Until next time, Good DXing . . .

73, Carl, N4AA

Postscript

Paul Blumhardt, K5RT, *CQ*'s WAZ Award Manager, was in Washington, D.C., when the tragic events of September 11th occurred. He was safe, but due to the closing of airports and flight restrictions, he could not return home in time to prepare the WAZ charts for this month's column. We will have updated WAZ input from him for the December issue.—*ed.*

Announcing:

The 2002 CQ World-Wide 160 Meter DX Contest

CW: 2200Z January 25 to 1600Z January 27
SSB: 2200Z February 22 to 1600Z February 24

The objective of these contests is for amateurs around the world to contact other amateurs in as many U.S. states, Canadian provinces, and countries as possible on the 160 meter band.

Classes: Single and multi-operator only. Use of packet, a spotting net, or logging assistance makes an entry multi-operator. Multi-operators should show the actual operator for each QSO. Under single operator there will be a designation of power level: H = power over 150 watts, L = power under 150 watts, and Q = 5 watts or less. There will continue to be only listings per state or country, but if there is sufficient activity or if a high enough score is made, then a separate certificate will be issued. Minimum score for the separate certificate is 5,000 points! Multi-operators will all be considered high power.

Exchange: RS(T) and state for USA, province for Canada, and either prefix or country abbreviation for DX. Contacts without some location indicator will be ruled invalid.

Scoring: Contacts with stations in own country, 2 points. Contacts with other countries on same continent, 5 points. Contacts with other continents, 10 points. *Maritime mobile contacts count 5 points. There is no longer any multiplier value for a maritime mobile contact.*

Multiplier: Each continental U.S. State (48), USA District of Columbia (DC), Canadian area (13), and DX country. KL7 and KH6 are considered DX and not states for this contest. DX countries are DXCC plus WAE (IT, GM Shetland Islands, et al). Canadian areas include VO1, VO2, NB, NS, PEI, VE2, VE3, VE4, VE5, VE6, VE7, NWT, and Yukon. Do not count States and Canada as separate countries. Remember that maritime mobiles no longer count as a multiplier.

Final Score: Total QSO points times the sum of all multipliers (states, VE, DX countries).

Penalties: Three additional contacts may be deleted for each unacknowledged duplicate or unverified contact removed from the log.

Disqualification: A log may be disqualified for violation of amateur radio regulations, unsportsmanlike conduct, or claiming excessive duplicate/unverified contacts or false multipliers.Logs that shrink more than 5% are subject to disqualification or warning. The calls of those warned or disqualified may be printed with the results.

Awards: Certificates will be awarded to the top scorers in each class by state, Canadian area, and DX country. Runners-up with high scores over 100,000 may also receive certificates. Low power or QRP entries may also receive certificates if there is sufficient activity or the score is outstanding. The following plaques, with donating sponsors as indicated, will be awarded for exceptional efforts.

2002 PLAQUES

SINGLE OPERATOR

	CW	SSB
World	TBA	TBA
USA	K4TEA	K4JRB
Canada	TBA	W0ETC
Zone 3 USA	N5IA	N4TMW
Zone 4 USA	K4WA	TBA
Zone 5 USA	N4XMX	K4ODL
Europe	K9UWA	N4NX
Africa	TBA	WB4ZNH
Oceania	TBA	K4IS
Asia	K4SX	NT4TT
Japan*	W4ZV	—
Pacific Rim	TBA	—
S. America	W4NU	TBA
N. America**	CQ	CQ
	N4IN Memorial	K2EEK Memorial

MULTI-OPERATOR

World	N4RJ	SE DX Club
USA	W8UVZ, W0CD, K8GG	WB9Z
Zone 3	4X4NJ	4X4NJ

TBA = to be announced

**There is no SSB operation allowed in Japan at the present.*

***North America outside USA and Canada.*

The plaque procedure is the top scorer in the indicated area wins the plaque. However, a station can only win one plaque per contest section. The plaque is then awarded to the next highest scoring station. For example, WX8ZZZ wins top World Multi-Operator. Then the next station in the USA wins the USA plaque.

Intercontinental DX Window: 1830 to 1835 kHz should be left clear for DX stations for intercontinental QSOs in both contests. This is still voluntary but essential if the contest is to continue to attract rare DX as entries. **USA, Canadian, and European stations should refrain from using the window for local contacts.** Please stay away from the window edges, too. This is a gentleman's contest and band, so let's help make intercontinental contacts happen.

Computer Logging: The preferred logging format is the Cabrillo format, which combines the log and summary into one entry. If your logging program cannot produce Cabrillo, you may send the older format log and summary (.log, .prn, .all, and .sum). E-mail is the preferred route for log submission. If you print out a computer log, you must also send a diskette. The diskette must be clearly labeled with the call of the entrant, the mode (CW or SSB), and the category. **Do not** send .bin files, database files, or other non-conforming files. Failure to follow these directions may lead to penalties or disqualification.

Manual Logs: Sample log and summary sheets may be obtained from *CQ* by sending a large SASE with sufficient postage to cover your request. You can make your own with 40 contacts per page with columns for GMT, exchanges, multiplier, and points. Paper logs with over 200 QSOs must include a dupe/check sheet with all calls in alpha-sort order.

For All Logs: If you are not submitting your log in the Cabrillo format, follow these rules:

Show the multiplier only the first time it is worked. Each page must have sub-totals for multipliers, contacts, and points. A running total below the sub-total on each page is recommended. Dupe or check sheets with every entry are requested and are required with over 200 QSOs. Include a summary sheet with your entry showing the scoring and other essential information. Include a printed name/ mailing address and a signed declaration that all rules have been observed. Please put the summary sheet at the front of the log. All logs should clearly indicate total multiplier, W/VE multiplier, and DX multiplier.

Club Competition: Any club that submits at least three logs can enter the Club Competition. The name of the club must be clearly identified under club competition on the summary sheet. Club competition is a "for fun" competition to foster more activity. There is a separate listing for the club sores.

Log Submissions: Mailing deadline for CW entries is Feb. 28, 2002; for SSB entries the deadline is March 31, 2002. *Exception:* You may send both logs in one package as long as the CW log is received by March 31, 2002. Try to mail early to assure receipt. For a return receipt enclose an SASE or SAE with postage or 1 IRC. Avoid the registered postal route, as this delays getting the log until someone can sign the receipt! For non-Cabrillo and paper logs, proofread your log before submission. Each year many errors are corrected that you should catch! Logs or sections of a log that are unreadable will be disqualified.

Send e-mail logs to: <**cq160@kkn.net**>.

Send all other logs to CQ 160 Meter Contest, 25 Newbridge Road, Hicksville, NY 11801 USA. **Indicate CW or SSB on envelope or e-mail header.**

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

A New County In Colorado

It doesn't happen very often, but effective 15 November 2001, the number of counties recognized by USA-CA will increase by one to a new total of 3077. The Colorado city of Broomfield will be removed from the other four counties in which it is located (Adams, Boulder, Jefferson, and Weld) and will become the boundaries of the city and new county of Broomfield. Accordingly, applications received on or after that date for the "All Counties" level of the USA-CA Award will require a contact with Broomfield County, CO. The change will be reflected when the *USA-CA Record Book* is reprinted in the future. There shouldn't be any difficulty in working the county due to its proximity to existing heavily populated areas of Colorado, but it should be fun on 14.336 MHz all day on 15 November!

Poland's SP5PB Awards

Piotr (Peter) Brydak, SP5PB, has been active on the Polish awards scene for several years. He offers six awards, some of which cover the popular interests of working islands and lighthouses. All of these certificates are well designed, very colorful, reasonably priced, and offer a modest but not overwhelming challenge, a winning combination these days. Peter suggests that the best way to work large numbers of rare Polish counties is during the PZK Contest, which is held during the last week of April every year.

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Phillip DePorter, WB4KMH
USA-CA All Counties #1028
July 28, 2001

USA-CA Honor Roll

500
W3BM.....3167
EI4DW.....3168
KC5DSP....3169

1000
WB4KMH...1578
KB8UUZ....1579
EI4DW.....1580

1500
WB4KMH...1318

2000
WB4KMH...1218

2500
WB4KMH...1140

3000
WB4KMH...1047
K2MHE.....1048

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

(Top) The All Baltic Islands Award is one of a series of awards sponsored by SP5PB.

(Middle) The Baltic Lighthouses Award is available to both hams and SWLs.

(Bottom) At least seven contacts with maritime mobile stations all over the world must be made to achieve the Maritime Mobile Award sponsored by SP5PB.

General requirements: GCR list of all contacts made is required with names if available and fee of US$7 (US$8 airmail) or appropriate payment in IRCs (US$1 = 2 IRCs). Apply to: Piotr Brydak, SP5PB, Okolnik 9A m 16 , 00-368 Warszawa, Poland (e-mail address of sponsor: <sp5pb@polbox.com>).

All Baltic Islands Award. Make two-way contacts (or SWL) with islands located in the Baltic Sea. The requirements are 10 for European; 5 for North American, African, and Asian; and 3 for South American and Oceanian. All islands will be taken into account, regardless the size or population. The only condition is that the area must be surrounded by the Baltic Sea.

Baltic Lighthouses Award. This award is available for all hams and SWLs who make QSOs (SWL contacts) with amateur radio stations located in Baltic Sea lighthouses. Contacts count from 1 January 1997, all bands and modes. The following Baltic entities count: SP, DL, OZ, SM, OH, OHØ, OJØ, UA, R1MV, ES, YL, LY, and UA2. There is only one class of award. European hams have to work at least 10 lighthouses; North American, African, Asian at least 5; and South American and Oceanian at least 3. One QSO with a Polish lighthouse is mandatory.

Maritime Mobile Award. Apply to the awards custodian with an application form including at least 7 contacts with Maritime Mobile amateur radio stations from all over the world.

Mazovia (Mazowsze) Award. This award is for all hams/SWLs who work SP stations in counties located in the Mazovia "R" province. Contacts count from 1 January 1999, all bands and modes. The following counties count: AC, BF, CI, ED, EN, ER, GI, GJ, GS, GT, KE, LQ, MA, MM, MZ, ND, NW, OC, OG, OM, OO, OR, PA, PD, PF, PG, PL, PN, PZ, RA, RD, UP, UT, WE, WM, WZ, WX, YD, YS, ZQ, and ZV. Each individual county abbreviation follows the province letter R, which should be indicated on the SP QSL card. There is only one class of award. European stations must work at least 10 counties; North American, African, Asian hams at least 7; and South American and Oceanian at least 5.

Vistula (Wisla) River Award. This award is for all hams/SWLs who work SP stations in provinces located along the longest Polish river, the Vistula. Contacts count from 1 January 1999, all bands and modes. The following provinces count: F, G, K, L, M, P, R, and S. There is only one class of award. European stations must work at least 7 of the 8 provinces; North American, African, Asian at least 6; South American and Oceanian at least 5.

Warszawa 2000 Award. This award is issued to commemorate the 700th anniversary of the city of Warszawa. To obtain the award, 700 points must be collected under the following rules: each station in the city of Warszawa counts 300 points; each station from the SP5 district counts 200 points. Contacts are valid between 1 January 1997 and 31 December 2003 only.

County Hunters "Bible"

The B&B Shop now has available the 26th edition of the *County Hunters Directory*. The second printing of this edition was made available beginning in mid-July, and it contains about 8000 entries of information for and about county hunting. It is much more extensive than any of the other on-line data bases and includes information not found anywhere else. If you would like to get a copy of this invaluable desk reference, send a check or money order for US$15 payable to Bill Nash, WØOWY, 13247 West Bellwood Drive, Sun City West, AZ. 85375-4517. The price includes mailing costs.

Framing a USA-CA Certificate

The USA-CA certificate is really a great conversation piece for your shack. If you want to save the cost of a custom framing job, Carl Slutter, W3BM, notes that the certificate almost fits into a "standard" 16" × 20" frame. He suggests using a paper cutter to cut about 1/2 inch from the top and bottom of the certificate, which measures 14" × 21". He suggests using a paper cutter to ensure a straight cut. If done properly, the cuts will be in the white border and outside of the flag design, so none of the design detail will be lost. Although the resulting frame is still about 2 inches wider than the certificate, it looks fine with the border showing on the sides.

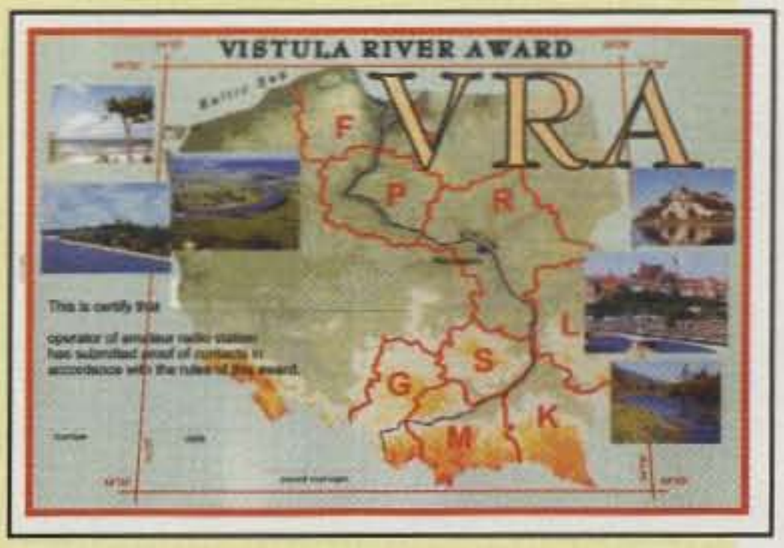
Correction

The Worked All North Carolina Counties Award listed in the September column is now free of charge. Thanks to Ed Swiderski, KU4BP, for this good news.

Internet Site of the Month

The German National Association (DARC) has provided web space for the various DOKs (clubs) to publicize their activities and awards. Literally hundreds of awards are to be found on this site. For example, a good place to start might be with the "K" district, where the URL is <http://www.darc.de/distrikte/k/index1.htm>. The site is in German, although some of the DOKs offer both German and English language translations. Note that you can use the Babelfish utility (or probably others) to translate the page for you. Results may vary.

Those who work SP stations located in the Mazovia "R" province may apply for the Mazowsze Award.

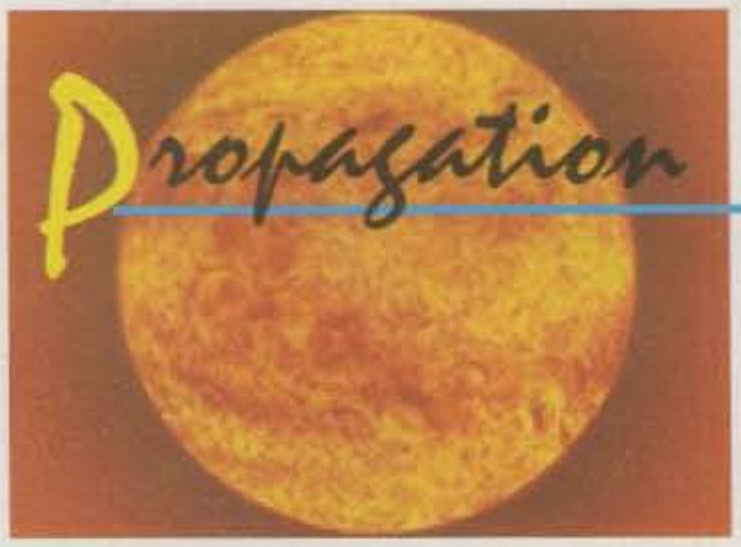


The Vistula River Award is for hams/SWLs who work SP stations in provinces located along the Vistula River in Poland.

The Warszawa 2000 Award commemorates the 700th anniversary of the city of Warszawa.

I'm still looking for samples of your club or organization's awards. Getting publicity is the key to a successful awards program. It may take a month or two to get your material into print, but awards hunters all over the world recognize that *CQ* is a great source of information for that paper chase!

73, Ted, K1BV



Propagation

BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

CQ WW DX CW Contest Weekend Mostly High Normal

CQ WW SSB Contest Bulletin

Since this issue of *CQ* should reach most subscribers prior to the start of the CQ World-Wide DX SSB Contest weekend of October 27–28, here is an updated forecast made at press time for the general propagation conditions expected during the SSB contest weekend. Based on the 27- and 54-day recurrence tendencies of solar and geomagnetic conditions, it continues to look as if there will be High Normal HF conditions during most of the contest weekend. There could be periods of Low Normal conditions on October 28th, with minor radio storminess toward the end of the contest for circuits passing through the auroral and polar regions.

Daily 10.7 cm solar flux levels are expected to climb above the 150 mark during the contest weekend, with corresponding sunspot counts likely to exceed 100. The geomagnetic planetary *A*-index is expected to drop below 10 on October 27th, but increase somewhat on the 28th.

While the conditions during this year's SSB contest weekend are not expected to be a repeat of last year's record-breaking conditions, barring any sudden solar flares or radio storms, this could be another outstanding SSB contest period. To maximize scores, be sure to check the DX Propagation Charts discussed in last month's column.

The CW weekend of the 2001 CQ World-Wide DX Contest will take place on November 24–25. This year's contest is being held during a period of slowly declining solar activity. Based on a long-range forecast made at the time of the writing of this column, we are expecting mainly High Normal conditions, with the possibility of periods of Above Normal conditions on November 25th. Solar flux levels in excess of 150 and corresponding sunspot counts in excess of 100 are expected during the CW contest weekend.

It thus looks like another outstanding CW contest weekend for 2001. We will have a more up-to-date forecast at the beginning of next month's column. Check on-the-air conditions on October 25th and 27th, which would be just one 27-day solar rotational cycle prior to the CW contest weekend, for a more probable recurrence pattern.

Check the Last-Minute Forecast on this page for day-to-day conditions expected throughout the month of November. Special DX Propagation Charts for use during the CW weekend appeared in last month's column, along with valuable tips and suggestions for increasing scores. Be sure to refer to the October column if you plan on participating in the CW contest weekend. Additional tips are discussed this month.

8701 Georgia Avenue, Suite 711, Silver Spring, MD 20910
e-mail: <george@gjainc.com>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for November 2001

Propagation Index.....	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal:2, 15, 25, 30	A	A	B	C
High Normal: 1, 3, 16, 21-22, 24, 26, 29	A	B	C	C-D
Low Normal: 4, 6-7, 10-13, 17-19, 23, 28	B	C-B	C-D	D-E
Below Normal: 5, 8, 14, 20 27	C	C-D	D-E	E
Disturbed: 9	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be good (NB) on November 1st; excellent (A) on the 2nd; good (B) on the 3rd; fair-to-good (C-B) on the 4th; fair-to-poor (C-D) on the 5th; etc. During the CQ WW DX CW weekend conditions will be good (B) on November 24th and excellent (A) on the 25th.

Sunspot Cycle Progress

The sunspot cycle took a nose-dive during July. According to Dr. Pierre Cugnon at the Royal Observatory of Belgium, the world's official keeper of sunspot indices, the monthly mean sunspot number for July 2001 was 82.2. This results in a 12-month running smoothed sunspot number, upon which the cycle is based, of 109 centered on January 2001. This is a drop of three since the previous month, as Cycle 23 begins to drop at a somewhat faster rate.

The highest daily value of sunspot count during July was recorded on the 18th with a count of 127. A low daily count of 45 was recorded on July 6th. A smoothed sunspot count of 102 is forecast for November 2001 by the National Geophysical Data Center in Boulder, Colorado.

A corresponding 10.7 cm monthly mean solar flux index of 136 was reported for July by the Dominion Radio Astrophysical Observatory at Penticton, B.C. This results in a smoothed solar flux value of 166 centered on January 2001. A smoothed level in the low 160s or high 150s is expected this November.

Updated Propagation Data

Updated propagation data is always useful to HF communicators, but it becomes invaluable during DX contests. I reviewed the major sources of updated information in last month's column, including a number of websites that provide real-time ionospheric, solar, and geomagnetic data. A single, more convenient source for updated HF propagation material can be found at my website, <http://www.gjainc.com>, where links are provided to a number of websites that can be of considerable use during the CW contest weekend.

Table I is an example of a multiband contest plan for a western USA QTH (PST) which has been devised from the DX Propagation Charts that appeared in last month's column. For each three-hour period throughout the day it shows the areas of the world and the amateur band on which propagation is expected to be optimum. Similar plans can be made for other time zones and for selected single bands.

While most likely not record breaking, look for good DX conditions on 10 meters, and excellent DX openings on both 15 and 20 meters during most of the daylight hours.

From sundown to midnight 40 meters

Time (PST)	Band (meters)	Areas To Which DX Conditions Expected To Be Optimum
00–03	20	Southeast Asia, Far East, South Pacific & New Zealand, Australasia, Caribbean, Central America, Antarctica, Africa,* South America*
03–06	20	South Pacific & New Zealand, Australasia, Caribbean, Central America, Southeast Asia,* Far East,* South America,* Antarctica*
06–09	20	Caribbean, Central America, South America, Southeast Asia, Far East, South Pacific & New Zealand, Australasia, Central & South Asia, Europe,* Eastern Mediterranean,* Middle East,* Antarctica*
09–12	15	Europe, Southeast Asia, Far East, South Pacific & New Zealand, Australasia, Caribbean, Central America, Western Africa, Eastern Mediterranean,* Middle East,* Eastern, Central & Southern Africa,* South America*
12–15	10	Africa, South Pacific & New Zealand, Australasia, Caribbean & Central America, South America
15–18	10	Central & South Asia, Southeast Asia, Far East, South Pacific & New Zealand, Australasia, Caribbean & Central America, South America
18–21	15	Southeast Asia, Far East, South Pacific & New Zealand, Caribbean & Central America, South America, Central & South Asia,* Australasia,* Antarctica*
21–00	20	Far East, South Pacific & New Zealand, Australasia, Caribbean & Central America, South America, Antarctica, Europe,* Africa,* Southeast Asia*

**Propagation index (2); all others (3) or (4).*

Table I– Sample multiband contest operating schedule, western USA.

should be the best band for openings toward the east, north, and south, and be sure to also check 80 meters. For an hour or so after sundown 20 meters should hold DX honors for openings toward the west and south. However, with shorter hours of daylight in the Northern Hemisphere, the band will close earlier than during the summer and early fall months.

Between midnight and sunrise the best DX band should be 40 meters, with 80 meters not far behind. Good DX openings on both bands are expected to most major areas of the world. Be sure to also check 160 meters for DX openings during this period. Propagation patterns should be similar to those observed on 80 meters, but with weaker signals and noticeably higher static levels.

Here is a propagation tip to remember when looking for DX on 40, 80, and 160 meters: Conditions on these bands usually peak as the sun rises at the *eastern* end of a propagation path.

VHF Ionospheric Openings

Solar activity may still be high enough to permit 6 meter DX openings during November. Conditions should peak toward Europe and in a generally easterly direction before noon. Openings should improve toward Africa shortly after noon and continue to swing in a clockwise direction during the early afternoon hours. Expect openings toward the Caribbean and Central and South American areas from late morning until shortly after noon. By late afternoon start looking for openings toward the south and southwest. For the most part, 6 meter DX openings may be errat-

ic, and the band may remain open for only short periods of time. The best days to look for 6 meter DX openings are those which are expected to be either High or Above Normal.

Some trans-equatorial (TE) type 6 meter propagation may also occur during November. The best time to check for such conditions is between approximately 8 and 11 PM local standard time. TE openings favor locations in the southern tier states, and generally take place to South American countries south of the equator. At best, TE openings are very erratic, with weak signals subject to intense flutter fading.

Two significant meteor showers are expected during November, which should result in some meteor-type ionospheric openings on the VHF bands. The *Taurids* shower, which should last for a day or two, is expected to peak on November 1st, with a peak meteor count of approximately 15 an hour. A second shower of about the same duration and intensity, the *Leonids*, should reach peak intensity on November 17th.

November is usually a month of fairly intense and widespread auroral activity, which can result in short-skip propagation on the 6 and 2 meter bands for distances of up to 1200 miles. Auroral activity is often associated with periods of radio storminess, and is most likely to occur on those days shown as Below Normal or Disturbed in the Last-Minute Forecast.

This month's column contains short-skip propagation data for use between distances of approximately 50 and 2300 miles, and between the states of Hawaii and Alaska and the continental areas of the United States.

Good luck in the CW section of the 2001 CQ WW DX Contest, and be sure to let me know how these special contest propagation forecasts work out.

73, George, W3ASK

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 kw PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

			16-17 (2-4)	20-21 (1-2)
			17-19 (1-4)	21-00 (0-1)
			19-20 (0-3)	
			20-21 (0-1)	
20	09-11 (0-1)	07-09 (0-2)	07-09 (2-3)	07-09 (3)
	11-15 (1-2)	09-11 (1-4)	09-18 (4)	09-12 (4)
	15-17 (0-1)	11-15 (2-4)	18-19 (3-4)	12-15 (4-3)
		15-17 (1-4)	19-20 (2-4)	15-21 (4)
		17-18 (0-4)	20-21 (1-4)	21-23 (3-4)
		18-19 (0-3)	21-23 (1-3)	23-02 (2-3)
		19-20 (0-2)	23-02 (1-2)	02-06 (1-2)
		20-07 (0-1)	02-07 (1)	06-07 (1)
40	07-08 (0-2)	07-08 (2-4)	07-08 (4)	06-07 (4-3)
	08-09 (1-3)	08-09 (3)	08-09 (3-2)	07-08 (4-2)
	09-19 (4)	09-15 (4-3)	09-15 (3-1)	08-09 (2-1)
	19-21 (2-3)	15-19 (4)	15-17 (4-2)	09-15 (1-0)
	21-00 (1-2)	19-21 (3-4)	17-00 (4)	15-17 (2-0)
	00-07 (0-1)	21-00 (2-4)	00-02 (3-4)	17-19 (4-3)
		00-02 (1-3)	02-06 (2-4)	19-06 (4)
		02-06 (1-2)	06-07 (3-4)	
		06-07 (1-3)		
80	08-15 (4-3)	08-09 (3-2)	08-09 (2-1)	08-09 (1-0)
	15-02 (4)	09-15 (3-1)	09-15 (1-0)	09-15 (0)
	02-04 (3-4)	15-18 (4-3)	15-18 (3-1)	15-18 (1-0)
	04-07 (2-3)	18-04 (4)	18-06 (4)	18-20 (4-1)
	07-08 (3-4)	04-07 (3-4)	06-07 (4-3)	20-05 (4)
		07-08 (4-3)	07-08 (3-1)	05-06 (4-3)
				06-07 (3-1)
				07-08 (1)
160	07-09 (3-2)	07-09 (2-1)	07-09 (1-0)	07-19 (0)
	09-11 (2-0)	09-17 (0)	09-17 (0)	19-21 (2-1)
	11-17 (1-0)	17-19 (2-1)	17-19 (1-0)	21-04 (4-3)
	17-19 (3-2)	19-04 (4)	19-21 (4-2)	04-06 (2-1)
	19-07 (4)	04-07 (3-2)	21-04 (4)	06-07 (1-0)
			04-06 (2)	
			06-07 (2-1)	

ALASKA
November & December 2001
Opening Given in GMT

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	17-18 (1)	15-16 (1)	12-16 (1)	06-12 (1)
	18-20 (2)	16-17 (2)	16-18 (2)	07-11 (1)*
	20-22 (3)	17-21 (3)	18-21 (1)	
	22-00 (2)	21-23 (4)	21-23 (2)	
	00-01 (1)	23-00 (3)	23-02 (3)	
		00-01 (2)	02-03 (2)	
			03-05 (1)	
Central USA	17-18 (1)	15-16 (1)	12-16 (1)	06-08 (1)
	18-20 (2)	16-17 (2)	16-18 (2)	08-13 (2)
	20-00 (3)	17-20 (3)	18-20 (1)	13-14 (1)
	00-01 (2)	20-23 (4)	20-22 (2)	07-12 (1)*
	01-02 (1)	23-01 (3)	22-00 (3)	
	01-02 (2)	00-02 (4)		
	02-03 (1)	02-03 (3)		
		03-04 (2)		
		04-06 (1)		
Western USA	18-19 (1)	16-17 (1)	12-16 (1)	02-03 (1)
	19-20 (2)	17-18 (2)	16-18 (2)	03-05 (2)
	20-21 (3)	18-20 (3)	18-22 (3)	05-14 (3)
	21-23 (4)	20-01 (4)	22-02 (4)	14-15 (2)
	23-00 (3)	01-02 (3)	02-04 (3)	15-16 (1)
	00-01 (2)	02-03 (2)	04-05 (2)	04-06 (1)*
	01-02 (1)	03-04 (1)	05-07 (1)	06-14 (2)*
				14-16 (1)*

HAWAII
November & December 2001
Openings Given in Hawaiian Standard Time#

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	06-07 (1)	06-07 (1)	12-14 (2)	17-18 (1)
	07-08 (2)	07-09 (4)	14-17 (4)	18-20 (2)
	08-13 (4)	09-12 (3)	17-21 (3)	20-02 (3)
	13-14 (3)	12-15 (4)	21-00 (2)	02-03 (2)
	14-15 (2)	15-16 (3)	00-06 (1)	03-04 (1)
	15-16 (1)	16-17 (2)	06-08 (3)	19-20 (1)*
		17-18 (1)	08-09 (2)	20-01 (2)*
			09-12 (1)	01-03 (1)*
Central USA	06-07 (1)	06-07 (1)	08-13 (2)	17-18 (1)
	07-08 (3)	07-09 (4)	13-14 (3)	18-20 (2)
	08-15 (4)	09-13 (3)	14-20 (4)	20-21 (3)
	15-16 (3)	13-17 (4)	20-00 (3)	21-01 (4)
	16-17 (2)	17-19 (3)	00-02 (2)	01-03 (3)
	17-18 (1)	19-20 (2)	02-05 (1)	03-04 (2)
		20-21 (1)	05-06 (2)	04-05 (1)
			06-08 (3)	19-20 (1)*
				20-22 (2)*
				22-01 (3)*
				01-03 (2)*
				03-04 (1)*
Western USA	07-08 (1)	06-07 (1)	08-10 (4)	17-18 (1)
	08-09 (2)	07-08 (2)	10-15 (3)	18-19 (2)
	09-16 (4)	08-12 (3)	15-22 (4)	19-20 (3)
	16-17 (3)	12-18 (4)	22-01 (3)	20-03 (4)
	17-18 (2)	18-20 (3)	01-04 (2)	03-05 (3)
	18-19 (1)	20-21 (2)	04-06 (1)	05-06 (2)
		21-22 (1)	06-08 (3)	06-07 (1)
				19-20 (1)*
				20-21 (2)*
				21-04 (3)*
				04-05 (2)*
				05-06 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.
*Indicates best time to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 20 and 40 meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter disatances use the preceding Short-Skip Chart

CQ Short-Skip Propagation Charts
November & December 2001
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (meters)	Distance From Transmitter (miles)			
	50-250	250-750	750-1300	1300-2300
10	*Nil*	*Nil*	07-09 (0-1)	07-08 (1)
			09-11 (0-2)	08-09 (1-2)
			11-15 (0-3)	09-11 (2-3)
			15-16 (0-2)	11-15 (3-4)
			16-18 (0-1)	15-16 (2-4)
				16-18 (1-4)
				18-19 (0-3)
				19-20 (0-2)
				20-21 (0-1)
15	*Nil*	08-10 (0-1)	07-08 (0-1)	07-08 (1)
		10-16 (0-3)	08-09 (1-3)	08-09 (3-2)
		16-17 (0-2)	09-10 (1-4)	09-19 (4)
		17-18 (0-1)	10-16 (3-4)	19-20 (3)

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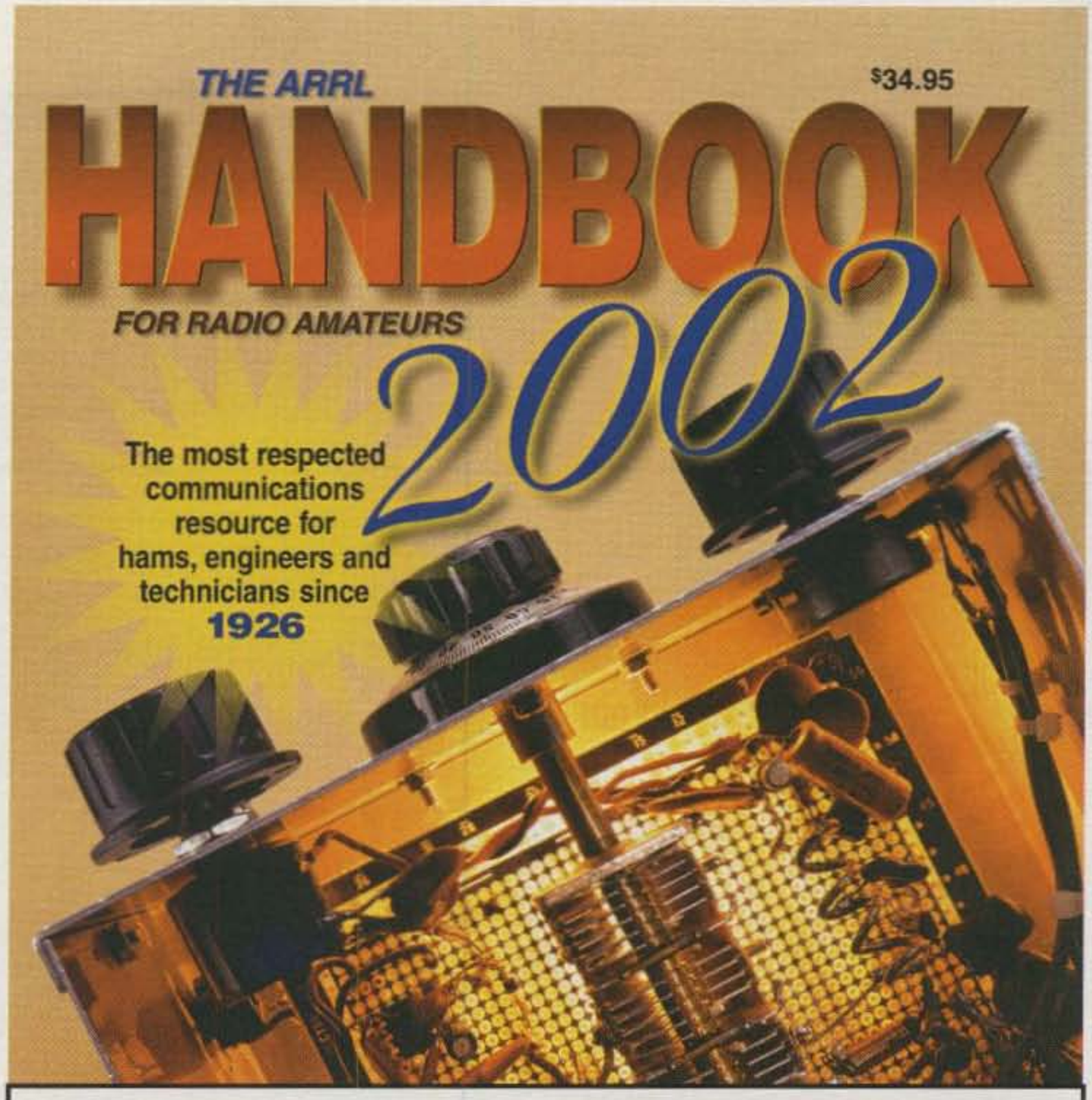

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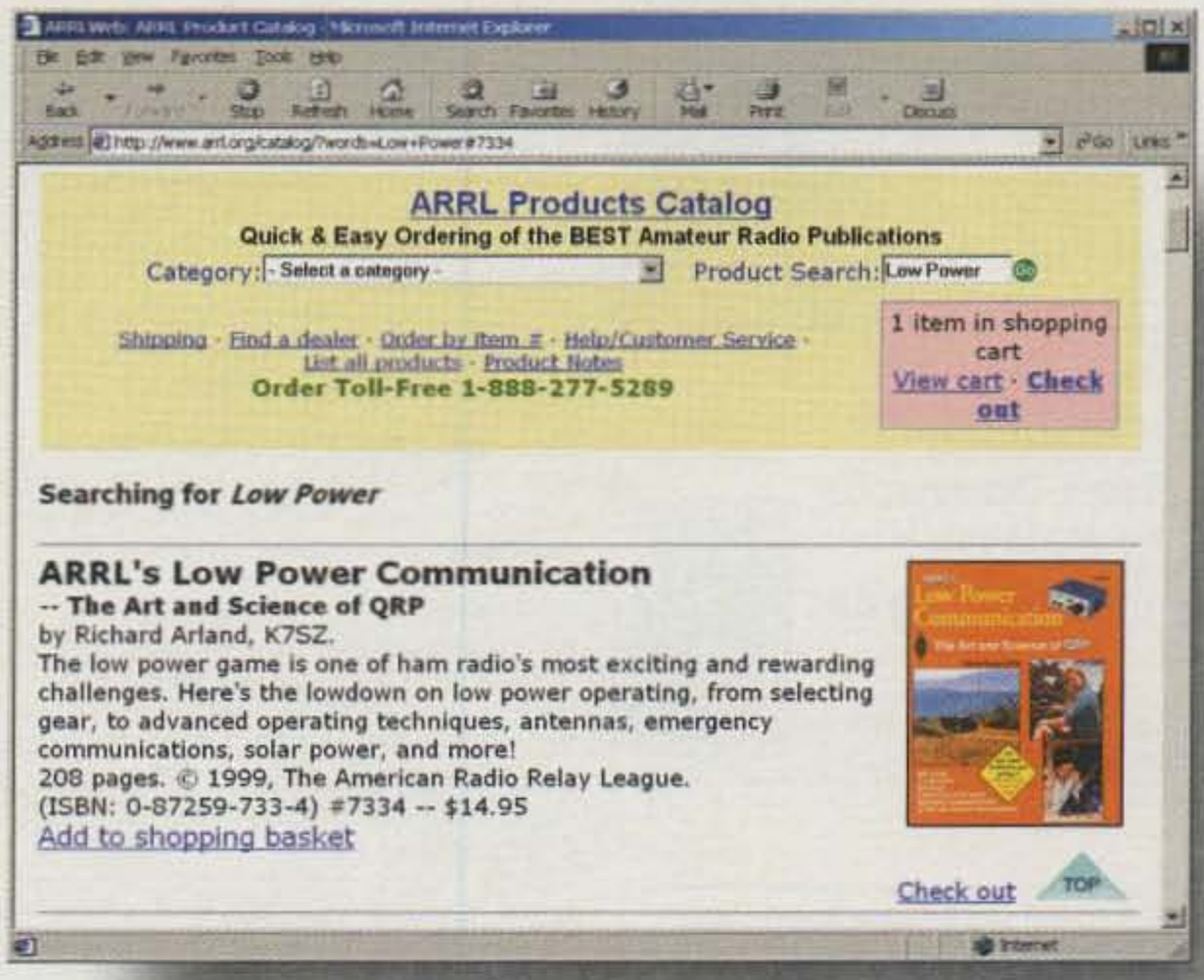

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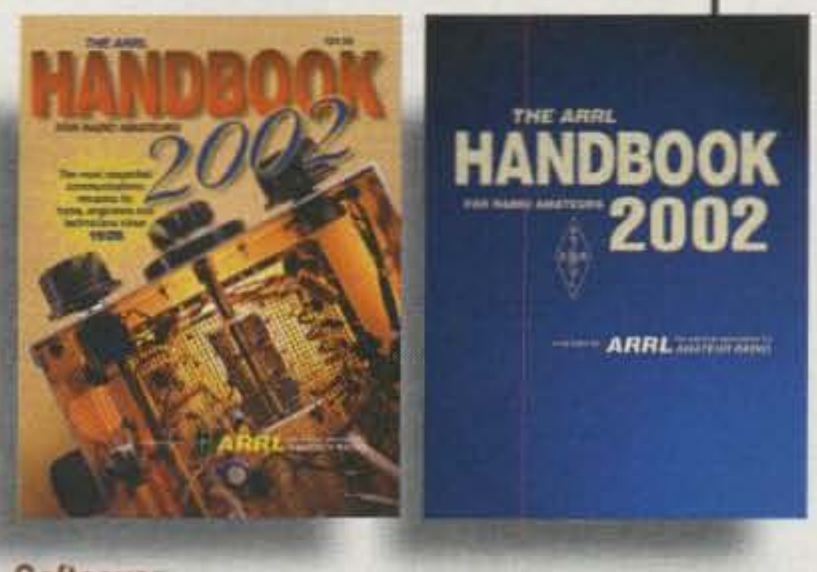

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