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Amateur Radio

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Complete Rules For The 50th Anniversary WAZ Award . . . page 56

THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in Amateur radio

NEW!

"DX-cellence!"

TS-940S

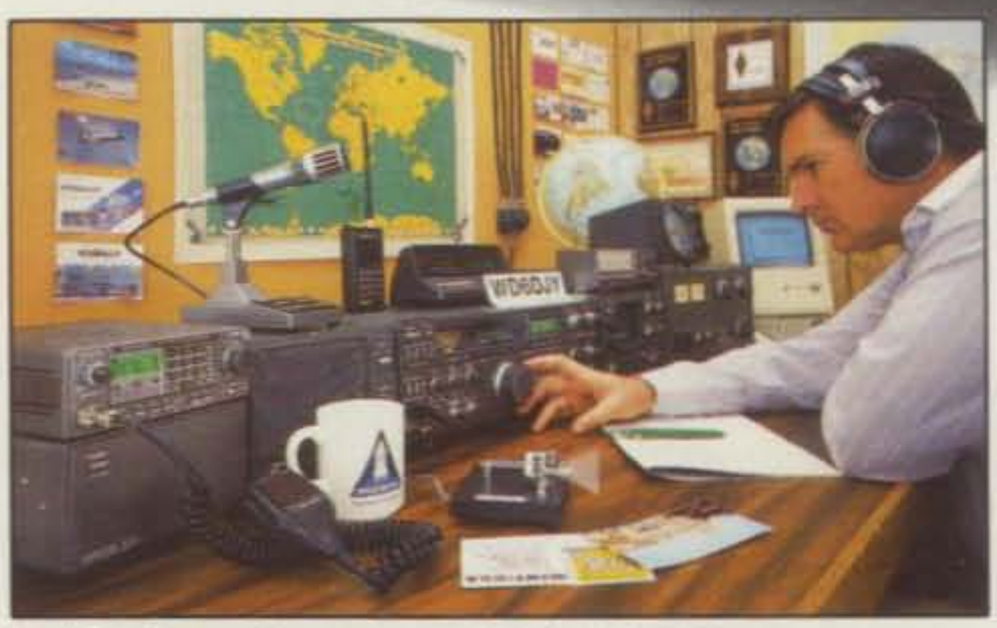
The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**

Optional accessories:

• AT-940 full range (160-10 m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First.



More TS-940S information is available from authorized Kenwood dealers.

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TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

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Dependable Duo!

TS-830S HF transceiver.

The "Pacesetter" has become a legend in DX and contest circles.

- Covers all 10 Amateur bands (50 kHz extended coverage).
- Wide receiver dynamic range, Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- Noise-blanker threshold level control.
- IF shift (passband tuning).
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- SSB monitor circuit.
- Built-in digital display, (fluorescent tube), with analog dial.
- Narrow/wide filter selection on CW.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner/SWR/power meter.
- SP-230 external speaker.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

TS-530SP HF transceiver.

This "Cents-ational" HF transceiver is recognized worldwide for superior and dependable performance.

- 160-10 meters, LSB, USB, CW, all Amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- IF shift tunes out interfering signals.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220 W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone.
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

More information on the TS-830S and TS-530SP is available from authorized Kenwood dealers.

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WAIT! 220 MHz Coming soon!

Power-Full...70 Watts!

TM-2570A/2550A/2530A

Sophisticated FM transceivers

Kenwood sets the pace again! The all-new "25-Series" brings the industry's *first* compact 70-watt 2-meter FM mobile transceiver. There is even an *auto dialer* which stores 15 telephone numbers! There are three power versions to choose from: The TM-2570A 70-watt model, the TM-2550A for 45-watts, and the 25-watt TM-2530A.

- **First** 70-watt FM mobile (TM-2570A)
- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 telephone numbers)
- Direct keyboard entry of frequency
- Automatic repeater offset selection according to the ARRL 2-meter band plan —**a Kenwood exclusive!**
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- 23 channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz** (optional)
- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- Frequency lock switch
- **New** 5-way adjustable mounting system
- **Unique** offset microphone connector —relieves stress on microphone cord
- HI/LOW Power switch (adjustable LOW power)
- Compact DIN size

Large heatsink with built-in cooling fan (TM-2570A)

DCL Introducing... Digital Channel Link

Compatible with Kenwood's DCS (Digital Code Squelch), the DCL system enables your rig to **automatically** QSY to an open channel. Now you can automatically switch over to a simplex channel after repeater contact! Here's how it works:

The DCL system searches for an open channel, remembers it, returns to the original frequency and transmits control information to another DCL-equipped station that switches **both** radios to the open channel. Microprocessor control assures fast and reliable operation. The whole process happens in an instant!

Actual size front panel

Optional Accessories

- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply for TM-2550A/2530A
- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DWN switch
- **MC-42S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna turner

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The Radio Amateur's Journal

ON THE COVER: Larry Koenig, WA2YNH, looks pretty happy operating his well equipped amateur television station. If you want to get in on some of the fun, check The World Of Ideas column this month. Photo by Larry Mulvehill, WB2ZPI.

FEBRUARY 1986 **VOL. 42, NO. 2**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

A lot of folks have taken up the standard in the last year and written about the need for younger blood in amateur radio. I've read about it (and written about it) in other amateur publications and countless club bulletins. In the ensuing months I've read (and received) the retorts and seen what passes for backlash to these writings.

There's one faction that says we should be concentrating on appeals to the senior citizen and retiree. The older folks *obviously* have more time and have less demands on that time. The thought, of course, is benevolent, but it does have some merit. For while to my knowledge no one ever tried to discourage older people from amateur radio, a sudden influx (if it were possible) of senior citizens would change a few statistics. There would be a corresponding increase, if not a healthy jump, in the ever-popular median age, thereby giving us present median-agers a new mark to shoot for while feeling young again. There might even be a more conservative bent than we have now, and that too might have a positive effect in making some of us look more liberal by comparison.

There's another faction that says that this entire effort is a conspiratorial hype designed to line the pockets of avaricious amateur radio manufacturers and publishers. They feel that things are fine the way they are, and that any increase in the amateur population will only take away from what they have. This loss, of course, is accompanied by sudden phenomenal wealth for the amateur radio industry. On that note, I am reminded of a letter I received recently from a long-time reader of *CQ* and *QST* (to quote him) who stated that he hadn't added anything new to his AM station since 1948. When he tried to check out his local sources of amateur radio equipment (I guess where he bought the last rig), he found to his surprise that they no longer existed. He wanted some suggestions as to a source closer than several hundred miles away where he could go and look at some of the newer gear. I'm not at all trying to make fun of this individual, but his sincere letter with a sincere request typifies the reality of the situation. Go through the amateur magazines of 15 or 20 years ago and count the number of distributors; then count the number today. You might even want to count the number of equipment manufacturers as well. We certainly have more amateurs today than we did then. I don't think that all of those missing names represent people sipping drinks and sunning themselves on tropical island paradises with all their amateur radio money sitting snuggly in Swiss banks.

There's a third faction that is interested in "maintaining" quality over quantity. Keeping ourselves to a hardcore of highly technical, CW proficient, service-oriented operators and experimenters is the only ideal worth having. Although contesting, award chasing, and DX-ing are childish pursuits, they might be sort of therapeutic in letting off steam after a hard day of designing new rigs. These folks can also be found at beaches gathering sand to make their own silicon.

Sprinkled liberally among these groups are other factions that want to make the amateur radio exams harder, easier, more meaningful, less meaningful, or none of the above. There are people who want special dispensation because of their age or psychological profile. You've got pro-CW, anti-CW, and data enthusiasts. Whatever variation you can think of is represented as the answer to the future of amateur radio, save one. There is apparently little interest among veteran amateurs in attracting young people. Notice I didn't say none, for there are groups trying to figure out approaches for younger people.

So what seems to be shaping up is that we are a big bunch of people who want a lot of things, basically for ourselves. The collective "we" sees amateur radio from at least 100 different perspectives, but in terms of now and what it's going to do for me. In spite of what is defined in Part 97, it is nearly impossible to define a ham. Normally we try to explain in terms of what we do rather than what we are. We do hundreds of things under the overall title of amateur radio. Each of us does a few things to the exclusion of the other possibilities that are done by others. Whatever our special interests are, we take them very personally and emotionally, far beyond any formal description of a service. We passed the concept of amateur radio service a long time ago, if it ever truly existed. Whether people like it or not, what we are all involved with is a heavily egocentric hobby. A service is a service, and a postal service employee doesn't normally get emotionally involved with mail. Some of us do service-type things which do shower down a halo effect on the rest of us, but they're not our principal products. Our principal product, as hard as it may seem to be, is satisfaction and enjoyment. Whatever aspect of amateur radio we do, we seem to like it and want to do it again.

The collective "we" is protective of our own individual slice of the pie. About 1% of all licensed amateurs wrote negative comments and helped to kill a code-free license. What about the other 99%? Did they care? Did they personalize it or feel threatened by a code-free license? We'll never know what their reasons were and are, but we do know that a miniscule minority told a large majority what was good for them.

Over thirty years ago when the Novice license was created, the curmudgeons of that day were also up in arms. Crowded bands, lowered standards, little or almost no CW proficiency, and cries of anarchy were heard (and printed). Well, most of us, according to statistics, came from that concept, the Novice class of license. We became the "quality" that must be protected over quantity. We grew with the hobby. However, the ever-popular "they" did get even with the next generation. We upstarts who were licensed in the early 50s under the new Novice license had 2 meter phone privileges. At that time, 2 meters was a vast wasteland that no one wanted, much like Oklahoma during the last century. The Novices were moved there much like the American Indian was moved to Oklahoma. Oh, sure, you could get a 522 to work there, but it really had no value until Gonsett, Harvey Wells, and Lettine started making equipment readily available. When Motorola equipment started to become available and the little HTs started to show up, it was as if oil had been discovered in Oklahoma again. This territory was too valuable for Novices or Indians—get them off. Today's concept of giving phone privileges to Novices is nothing new. It's not a frightening thing. They had it before. Most of us around today came from that tradition. Although unpopular at first, the idea worked in spite of a vocal miniscule minority.

So, while it's all well and good to add as many older people to amateur radio as possible, how many of them or of us median-age amateurs will be waving the banner for amateur radio 35 years from now? Maintaining "quality" is really up to who defines "quality." For as long as I can remember there has been one group of amateurs or another complaining about the other. Technical proficiency changes so rapidly these days that it's hard to say just what information is really meaningful or indicative of what is required to be an amateur. Some of us operate very sophisticated equipment with complex antenna systems, and others string some wire and try to get a few more miles out of an old clunker. A few of us are on the keen cutting edge of technology, and the rest of us are sort of using a butter knife. We're all amateurs, though, each and every one of us, no matter how we derive our enjoyment and satisfaction. We share that feeling in common and that is our bond.

We need a shot of youth today, just as we did in the early 50s—perhaps more. Whether it's a new form of license or an active, sincere selling job, something has to be done, and done by all of us. Our prejudices and fears are groundless in the light of history. We either share and grow or get buried piecemeal as band segments are cut away for "better" use. Getting any new group of people into amateur radio is a positive thing. However, the goal is not necessarily to provide a pleasant bit of diversion for an aging population. The goal is to provide that "service" or hobby to many generations to come. And that means time, and time means youth. They have the 35 and 40 years that many of us don't. They have the same excitement and potential that most of us had in the 50s and hopefully realized by today. They are the promise of an amateur radio for tomorrow, an amateur radio industry for tomorrow, and an amateur radio technology for tomorrow.

73, Alan, K2EEK

TOO GOOD TO BE TRUE?

PAKRATT™ Model PK-64

shown with enhanced
HFM-64 option installed

★ MORSE ★ BAUDOT ★ ASCII ★ AMTOR ★ PACKET ★

FIRST FIVE MODE DATA CONTROLLER

The Pakratt model PK-64 by AEA is the world's first computer interface that offers Morse, Baudot, ASCII, AMTOR *and* Packet all in one box (hardware *and* software included) at a price many competitors charge for Packet alone (from $219.95 Amateur net). Do not let the low price fool you; coming from any other company but AEA it WOULD be too good to be true. The PK-64 works with virtually any voice transceiver. The Pakratt is the easiest of any to hook up and have operating in just a few minutes.

In Packet mode, the PK-64 offers virtually all the features of every other Packet controller on the market, plus many important features left out by others due to cost constraints. For example, we have included a hardware HDLC, true Data Carrier Detect (DCD), multiple connect with up to ten stations simultaneously and full implementation of version 2.0 of the AX.25 protocol.

Because the PK-64 was designed specifically for the Commodore 64 (or C-128 and SX-64) computer, we have been able to do many things not economically feasible with general RS-232 interface controllers. For example, the Pakratt includes true split screen operation with on-screen status indicators and an on-screen tuning indicator.

ENHANCED HFM-64 MODEM OPTION

The standard PK-64 will operate all modes with a phase-lock-loop (PLL) detector roughly equivalent to all popular packet modems in the marketplace (except we have included extra filtering). The enhanced HFM-64 modem option offers true independent dual channel filtering with A.M. detection (like the famous CP-100 Computer Patch™). The enhanced HFM-64 option also offers a hardware LED tuning indicator (like the CP-100) and a front panel variable threshold control for setting maximum sensitivity under various band conditions. We recommend the HFM-64 option for anyone keenly interested in weak-signal heavy-QRM HF operation. For anyone desiring to operate FM RTTY with the standard North American tone pair or CW receive, the HFM-64 is required. The HFM-64 is field installable with no soldering or test equipment required.

WORKS WITH THE POPULAR C-64 COMPUTER

AEA designed the PK-64 around the low-cost C-64 because of the special architecture features making it especially suited to Amateur Radio applications. The C-64 should not be viewed as a mainframe, but rather a very economical accessory to your data communications system. Many owners of expensive computers such as IBM, TANDY, APPLE, KAYPRO, ATARI, etc., are now buying the low cost C-64 and dedicating it to their operating position. They simply cannot find software for their machine that even approaches the power and user friendliness of the PK-64. Plus, think of the convenience of having only one controller and keyboard to go from one mode to another without having to redo cabling!

The PK-64 is so complete that all you need to do is wire up a microphone connector to the end of a cable (provided) and you are ready to go. There is no need to track down special terminal software, cabling or even a power supply. It all comes with the PK-64. So do not be the last on your block to own the most exciting new product in years. See the PK-64 at your favorite dealer or write for our specification sheet now.

Prices And Specifications Subject To Change Without Notice Or Obligation

Advanced Electronic Applications, Inc.
P.O. Box C-2160, Lynnwood, WA 98036-0918
(206) 775-7373 Telex 6972496 AEA INTL UW

AEA Brings you the Breakthrough!

Announcing

• **Contact 10 Members Contest** - To commemorate the 50th anniversary of the York Radio Club, the club will hold a Contact 10 Members Contest. Starting on January 1, 1986 and ending on December 31, 1986, members of the YRC will be working all the HF bands at all class levels. Members will be using their own call signs, but will be adding York Radio Club to all CQ's and contacts. Those individuals submitting proof of confirmation of contact will be sent a certificate. One dollar and an SASE are requested. The YRC will also issue a special QSL card on Field Day 1986 for those stations willing to exchange information and cards. For further information and certificates, send requests to Dan Levit, 50th Anniversary Chairman, York Radio Club, 861 Fairfield, Elmhurst, IL 60126 (include an SASE).

• **W4ABR From Carter County, TN** - The ARC's of Johnson City, East Tennessee State University, and Carter County, TN will operate W4ABR February 1–2 in celebration of Homecoming '86 for the state of Tennessee. Frequencies will be the lower portion of all bands as conditions permit as well as Novice bands. Send an SASE to W4ABR, P.O. Box 3682 CRS, Johnson City, TN 37602.

• **Hamfest '86** - The Wheaton Community Radio Amateurs will hold Hamfest '86 on February 2 at the Odeum Exposition Center in Villa Park, Illinois. Tickets $3.00 in advance, $4.00 at the door. For more information, send an SASE to Wheaton Community Radio Amateurs, P.O. Box QSL, Wheaton, IL 60189, or call 312-629-8006.

• **Cherryland ARC Swap N Shop** - The Cherryland ARC's 13th Annual Swap N Shop to be held on February 8 at the Immaculate Conception Middle School Gymnasium, 218 Vine Street, Traverse City, MI 49684. Doors open from 9:00 a.m. through 2:30 p.m. General Admission is $2.50; single tables $3.00. Talk-in on 146.85 and 146.52 simplex.

• **Niagara Peninsula ARC Hamfest** - This club will hold its Hamfest and Fleamarket at the U.A.W. Hall, Bunting Rd., St. Catharines, on February 8 commencing at 0800 hours local time. Talk-in service will be provided on VE3 NRS, the club repeater, 147.240 MHz out, +600 in.

• **Mansfield Mid*Winter Hamfest** - This hamfest/auction will be held on February 16 at the Richland County Fairgrounds, Mansfield, Ohio. Doors open to the public at 7:00 a.m. Tickets $3.00 in advance, $4.00 at the door. Tables $5.00 in advance and $6.00 at the door. Half tables available. Talk-in, call W8WE on 146.34/94. Advanced ticket/table orders must be received and paid by Feb. 10. For more information or advanced tickets/tables send SASE to Dean Wrasse, KB8MG, 1094 Beal Road, Mansfield, OH 44905, or phone (419) 589-2415 after 3 p.m. EST.

• **Wild Rivers ARC Swapfest** - The Wild Rivers ARC will hold their mid-winter swapfest from 10:00 a.m. to 3:00 p.m. February 16 at the Spooner Experimental farm east of Spooner, WI on highway 70. Talk-in on 147.81/21. VE exams will be given, advance registration only. Tables available. For more information, contact Tom Young, KD9FC, Route 5 Box 5239, Hayward, WI 54843.

• **Algonquin ARC Annual Hamfest/Swapfest** - This event will be held on February 16. For details, contact AARC. P.O.B. #258, Marlboro, MA 01752, telephone 617-393-9920.

• **MIT Volunteer Exams** - The MIT UHF Repeater Association and the MIT Radio Society offer monthly amateur exams, all classes Novice to Extra. The next two will be given on Wednesday, February 19 and March 19 at 7 p.m., MIT Room 1-134, 77 Mass Ave., Cambridge, MA. Reservations are requested two days in advance. Contact Ron Hoffmann at 617-253-5820/646-1641, or Craige Rodgers at 225-6616. Exam fee is $4.00. Bring a copy of your current license (if any), two forms of picture ID, and a completed form 610 available from the FCC in Boston (223-6609).

• **Robbinsdale ARC "Midwinter Madness"** - On February 22 the Fifth Annual "Midwinter Madness" Hobby Electronics Show will be held at Totino-Grace High School at 1350 Gardena Ave. in Fridley, a northern suburb of Minneapolis, Minnesota. For more information, contact the Robbinsdale ARC, P.O. Box 22613, Robbinsdale, MN 55422.

• **Glasgow, Kentucky Swapfest** - This event will be held on February 22 from 8:00 a.m. at the Glasgow Flea Market Building 2 miles south of Glasgow off highway 31E. Admissions is $2, no extra charge for exhibitors. One free table per exhibitor with extra tables available at $3 each. Talk-in on 146.34/94. Additional information from N4HCO, Rt# 4 Box 354, Glasgow, KY 42141.

• **Vienna, Virginia Winterfest™** - Organized by the Vienna Wireless Society, this hamfest will be held at the Vienna Community Center, 120 Cherry St., Vienna, VA, on February 23, beginning at 8:00 a.m. Admission is $4.00 per person at the gate. For further information, call 1986 Winterfest Chairman John Arnold, N4IXD, at 255-2076.

• **La Porte ARC Hamfest** - The La Porte ARC's winter hamfest will be held on February 23 at the La Porte Civic Auditorium. Table charge $2.00 in advance, $2.50 at the door. Talk-in on .52 simplex. Donation $3.00 at the gate. For more information and reservations: LARC, P.O. Box 30, La Porte, IN 46350. For table reservations: Att: KA9PHA. Include an SASE.

• **Davenport, Iowa Hamfest** - The Davenport Radio Amateur Club will hold their 15th annual hamfest at the Davenport Masonic Temple on February 23 from 8:00 a.m. to 4:00 p.m. Admission: $2.00 in advance, $3.00 at the door. Tables available, reserved, for $7.00. Talk-in on 146.28/88 WØBXR. For table reservations and advanced tickets contact Dave Johannsen, WBØFBP, 2131 Myrtle Street, Davenport, IA 52804.

• **Cuyahoga Falls ARC Auction** - This electronics equipment auction and hamfest will be held at the Tallmadge High School, Cuyahoga Falls, Ohio (new location) from 8 a.m. to 3 p.m. on February 23. Admission $3.00 in advance, $4.00 at the door. Send SASE for tables ($5.00 reserved by Feb. 9), tickets, and info. Talk-in on 87/27. Details from Bill Sovinsky, K8JSL, 2305 24th St., Cuyahoga Falls, OH 44223, telephone 216-923-3830.

• **Charleston, WV Amateur Exams** - The Charleston Area VE Group will conduct examinations for all classes of amateur radio licenses on March 1, 1986. Cutoff date for applications is February 15 (send form 610). They will be held at the George Washington High School in Charleston at 8:30 a.m. For information, contact Jim Lingan, AC8K, 1528 Hampton Rd., Charleston, WV 25314 (304-343-7251). Applicants should submit the following to AC8K: completed form 610, check for $4.00 payable to ARRL-VEC, copy of current license, and SASE.

• **Southeastern Virginia Exam Schedule** - To apply for the following exams send form 610, copy of current license, $4.00 check payable to ARRL/VEC, and SASE. Cutoff date for applications is 30 days prior to test. April 5: Williamsburg Area ARC, contact Andrew G. Swanson, WJ4X, 259 Nottingham Rd., Williamsburg, VA 23185. May 3: South Peninsula ARC, contact Al Evans, N4IIC, P.O Box 4128, Hampton, VA 23664.

• **Orlando Hamcation** - March 8–10, for information call 305-422-ARRL.

• **Charlotte Hamfest** - March 22–23, for information call 704-596-2168.

• **Dayton Hamfest** - April 25–27, for information call 513-433-7720.

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Frequency Range	142.000 to 150.995 MHz	440 MHz to 449.975 MHz
Type of Emition	F3	F3
Memory Channels	10 Channels	10 Channels
Antenna Impedance	50 ohms	50 ohms
Power Source	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V
Transmitter		
RF Output Power	5.0 Watts (H), nominal at 12V 3.5 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V	3.0 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V
Modulation	Frequency modulation	Frequency modulation
Maximum Deviation	± 5 KHz	± 5 KHz
Transmit Spurious	– 60 dB	– 60 dB
Microphone	Electret Condenser Microphone	Electret Condenser Microphone
Receiver		
Receiving Methods	Double superheterodyne	Double superheterodyne
I.F.	1st 16.9MHz 2nd 455KHz	1st 21.4MHz 2nd 455KHz
Sensitivity	Less than – 0.25uV at 12dB SINAD	Less than – 0.25uV at 12 dB SINAD
Band Width	± 7.5 KHz at 6dB down	± 7.5 KHz at 6dB down
Selectivity	± 15 KHz at 60dB down	± 15 KHz at 60dB down
Audio Output Power	400mW at 8 ohm	400mW at 8 ohm

Note: See Accessory List for ST-200 for Compatible Accessories.

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SPECIFICATIONS	KR-500	KR400/KR-400RC	KR-600/KR-600RC	KR-2000/KR-2000RC	KR-250
Input Voltage	117/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	117/230 VAC
Power Consumption	30 VA	40 VA	40 VA	100 VA	37 VA
Motor Voltage	24 Volts 2Ø	24 Volts 2Ø	24 Volts 2Ø	24 Volts 2Ø	24 Volts 2Ø
Rotation Time	61 Sec @ 60 Hz	50 Sec @ 60 Hz	53 Sec @ 60 Hz	67 Sec @ 60 Hz	43 Sec @ 60 Hz
End Stop Type	Mechanical	Mechanical	Electrical and Mech.	Electrical and Mech.	Mechanical
Rotational Torque	350 in lbs	340 in lbs	520 in lbs	1736 in lbs	170 in lbs
Stationary Brake Torque	1750 in lbs	1500 in lbs	3470 in lbs	8680 in lbs (brake on)	520 in lbs
Vertical Load Max	N/A	440 lbs	440 lbs	550 lbs	
Capacity In Sq. Ft. Ant.	11 sq. ft.	11 sq. ft.	19 sq. ft.	27 sq. ft.	4 sq. ft.
Maximum Mast Size	1.5-2.5 in. dia.	1.5-2.5 in dia.	1.5-2.5 in. dia.	2-2.5 in.	1-1.5 in. dia.
Maximum Mounting Size	1.25-1.625" dia.	1.5-2.5 in. dia.	1.5-2.5 in. dia.	Tower Mount	1-1.5 in. dia.
Cable Type	6 - #22	6 - #22 or larger	6 - #22 or larger	8 - 2@#18 6@#20	6 - #22
Control	4.33" x 6" x 7.5"	4.33" x 6" x 7.5" aprx	4.33" x 6" x 7.5" aprx	4.33" x 6" x 7.5" aprx	7" x 3.35" x 12.4"
Rotator	12.4" x 5.6" dia.	10.63" x 7" dia.	10.63" x 7" dia.	13.6" x 8.9" dia.	12.4" x 5.6" dia.
Weight	5.5 lbs	9.9 lbs	10 lbs Rotor/5.5 lbs Control	20 lbs Rotor/5.5 lbs Control	6.4 lbs
Suggested Retail	$179.95	$139.95/$169.95	$229.95/$239.95	$439.95/$459.00	$79.95

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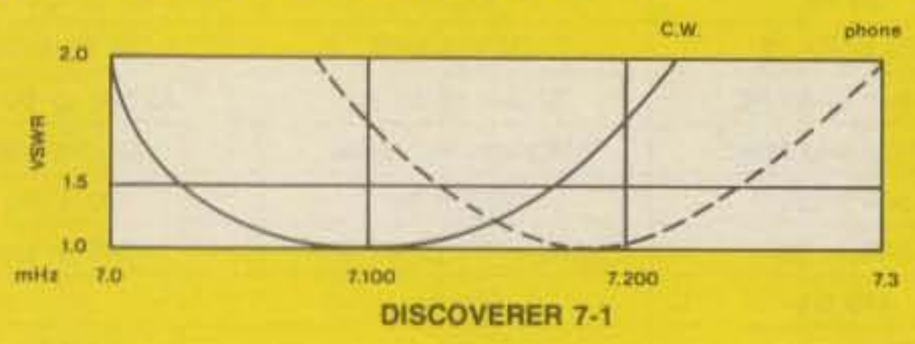

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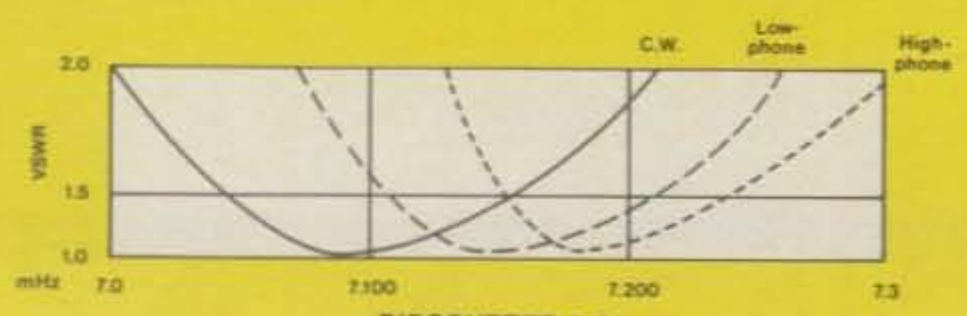
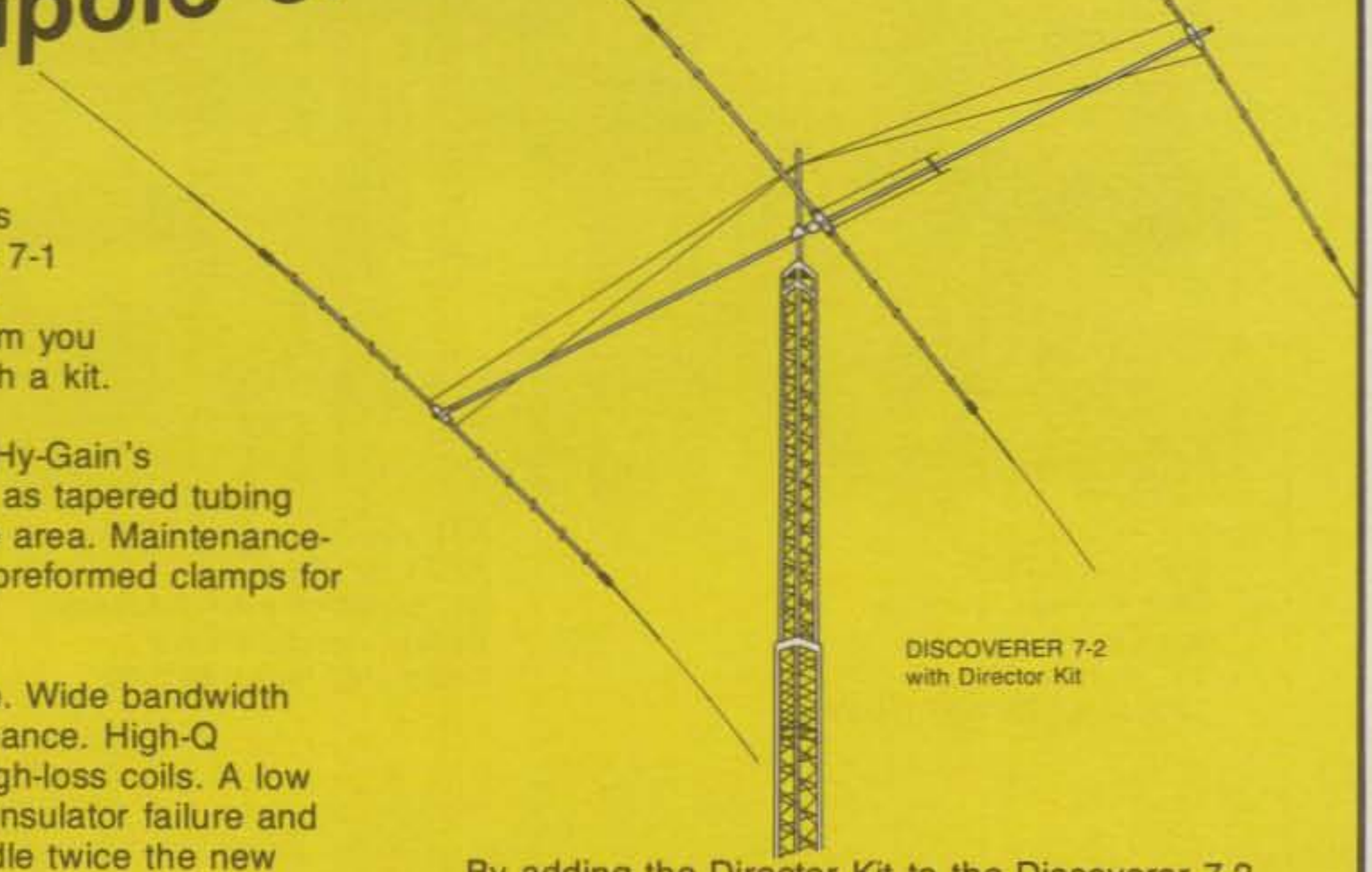


DISCOVERER 7-2



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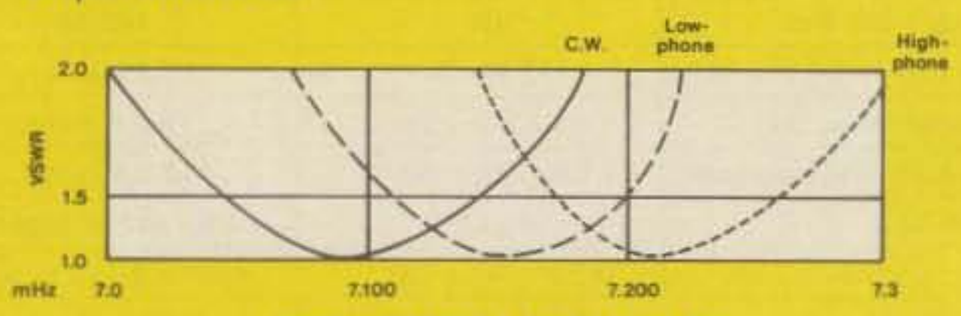
with Director Kit

By adding the Director Kit to the Discoverer 7-2 you create a three-element beam on a boom of only 35 ft. (10.7 m), that outperforms many of the heavy-weight giants with much longer booms. In fact, the kit doubles the effective radiated power of the Discoverer 7-2, and nearly doubles the front-to-back ratio. And, because the antenna is still more compact than a "giant", you only need a medium-duty tower such as the HG52SS. All of which saves you money and space without compromising safety or performance.



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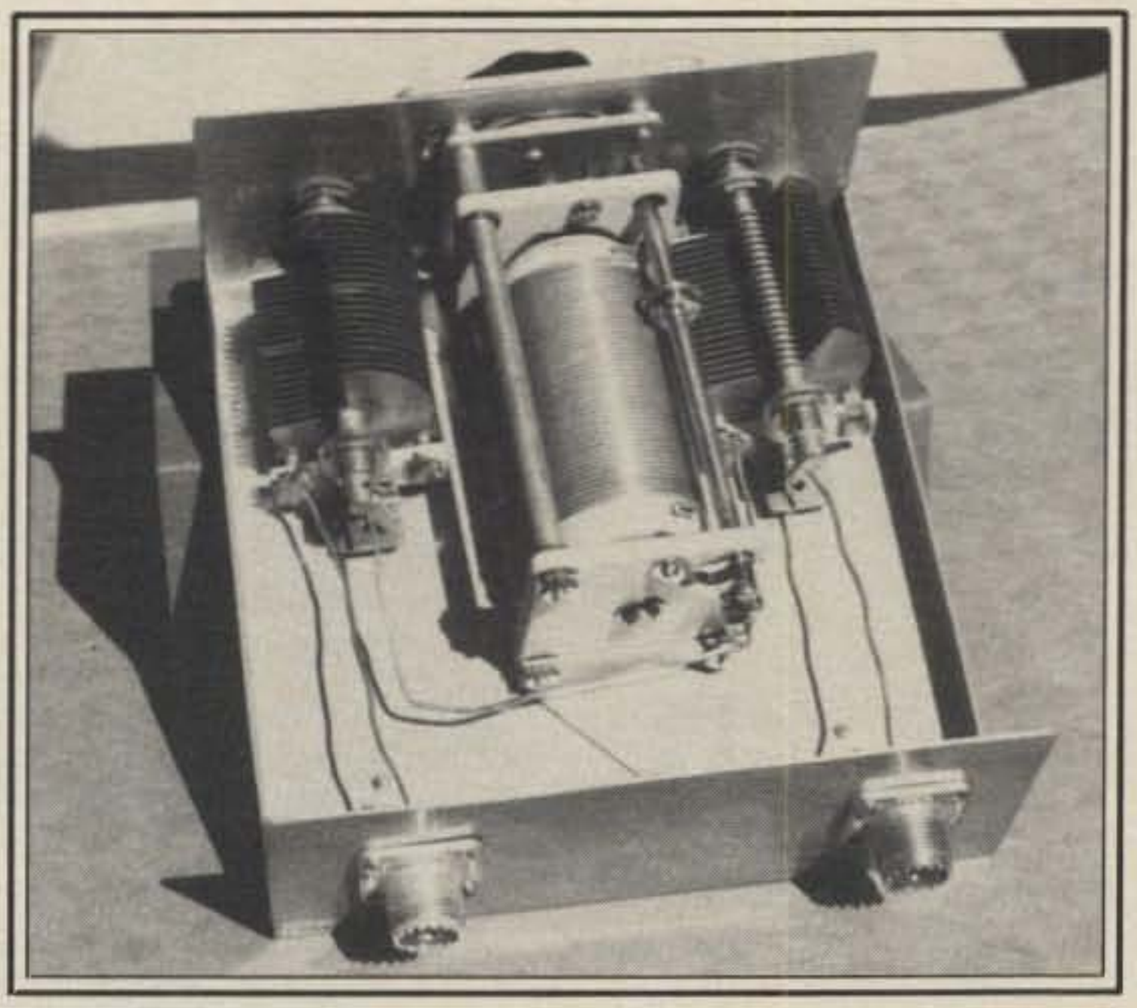
W1ICP offers us some straight talk on antennas and the use of a Transmatch.

To Use Or Not To Use A Transmatch

One More Discussion of a Popular Subject

BY LEW MCCOY*, W1ICP



Here is a junk-box Transmatch. Refer to fig. 1(B). C1 is 150 pF, as is C2. Any value from 150 pF to 350 pF can be used. The roller inductor is about 25 uH and was picked up at a fleamarket. Any inductance value over 15 uH will work for 80 through 10 meters. The capacitors have receiver-type spacing and will handle about 200 watts when the Transmatch is perfectly matched. For this reason, be sure to use low power when tuning up, and by low, I mean just a few watts. Not shown is a toroid balun that provides balanced output. Details for making such a balun can be found in antenna chapters of any recent handbooks.

Certainly one of the most frequently asked questions I get at lectures and in the mail concerns the use or non-use of Transmatches. And I might add that these same questions have been asked for the last 20 years—at least! The reason for the questions is certainly understandable. Antennas, feedlines, and coupling antenna systems to the transmitter is a complex subject—one not thoroughly understood by many amateurs. So let's see if we can clear the air a little more.

What Is A Transmatch?

In the early days of amateur radio any device used to couple an antenna system to a transmitter was called an "antenna tuner," and many amateurs still use this term. Back in 1961 in July *QST* I wrote an article describing "The 50-Ohmer Transmatch." In that article the word "Transmatch" was used for the first time, and here is what was said: "A generic name coined by the editors to apply to any type of matching network inserted between a transmitter and a transmission line. There has been an obvious need for such a word, since 'antenna coupler' is inadequate both technically and psychologically." So if any modern-day amateur is interested in why the term *Transmatch* is used, it stems from that 1961 article by this author.

Stated as simply as possible, a Transmatch is a combination of coils and capacitors that make up an adjustable RF transformer. The function of a good Transmatch is to take the unknown load of the antenna **system** (note I say "system") and convert that load to a usable one for the transmitter. In addition, when an antenna or antenna system is nonresonant, there is always reactance present, and a good Transmatch should be capable of tuning out such reactances. Briefly, then, a Transmatch is simply a circuit consisting of coils and capacitors best described as an RF transformer and reactance "tuner-outer."

Modern-Day Problems

After WW II several things happened to change amateur radio forever. First, coaxial feedline became cheap enough so that any amateur could afford it. Coaxial lines were preferred, because it was easier to run coaxial line rather than the more commonly used open-wire feeders. Using coax meant working with 50 or 70 ohm loads, which happened to be the characteristic impedance of coax. Second, television came along and gave us TVI to contend with, and that led to completely shielded transmitters. This, in turn, led to the use of pi-network tank circuits, because such circuits offered simplified bandswitching. Because of the use of coaxial lines, amateurs started thinking in terms of multiband 50 ohm impedence antennas. Gradually, antenna manufacturers started to work towards antennas that would be 50 ohms impedance no matter on what frequency they were used. (I might say that outside

*Technical Editor, CQ, 200 Idaho St., Silver City, NM 88061

of a dummy-load antenna, such a condition really only exists in ham heaven!) The result of all these changes was that transmitter manufacturers started eliminating all adjustable final-stage transmitter components. (They were more expensive than fixed-value components.) They designed their equipment to work into 50 ohm loads. When solid-state came along, this only emphasized the problem, so now if one doesn't have a 50 ohm load, the transceiver will actually shut itself down!

For those of you who entered amateur radio in the last 20 years or so, the 50 ohm antenna is now a way of life. Believe it or not, the transmitters before 10 or 15 years ago had built-in Transmatches! As an example, the old Johnson Ranger transmitter had a tank circuit that would actually match any antenna load used, no matter what the SWR or impedance happened to be. So all a Transmatch really is, is the adjustable tank circuit those manufacturers took away from us years ago. How about that!

What Kind of Transmatch To Use?

I am putting the cart before the horse in this article in telling you what kind of Transmatch to use before actually telling you if you need one, hi! However, there are certain circuits I prefer, and I'll tell you why. Historically, as far as present-day circuits for Transmatches are concerned, they all are derived from the "50-Ohmer Transmatch" mentioned above. I described another circuit in July 1970 *QST* called "The Ultimate Transmatch," which was very popular, because with that circuit it was possible to match any load of any impedance or reactance. Fig. 1(A) is that basic circuit. A few years after the original article appeared, Walt Maxwell, W2DU, correctly pointed out that a dual capacitor was not needed at C1, and he suggested the circuit shown in fig. 1(B). A few years back an argument erupted over the Ultimate and W2DU circuits in that neither was purported to be good for harmonic suppression, second or third harmonics, that is. To be very honest, I considered the argument ridiculous for a very simple reason. The FCC had long ago passed a rule that *all* transmitters must have 40 dB harmonic attenuation of all harmonics in the final amplifier stage (that amplifier stage attached to the antenna system). That is the case today, so harmonic attenuation arguments as far as Transmatches are concerned are ridiculous.

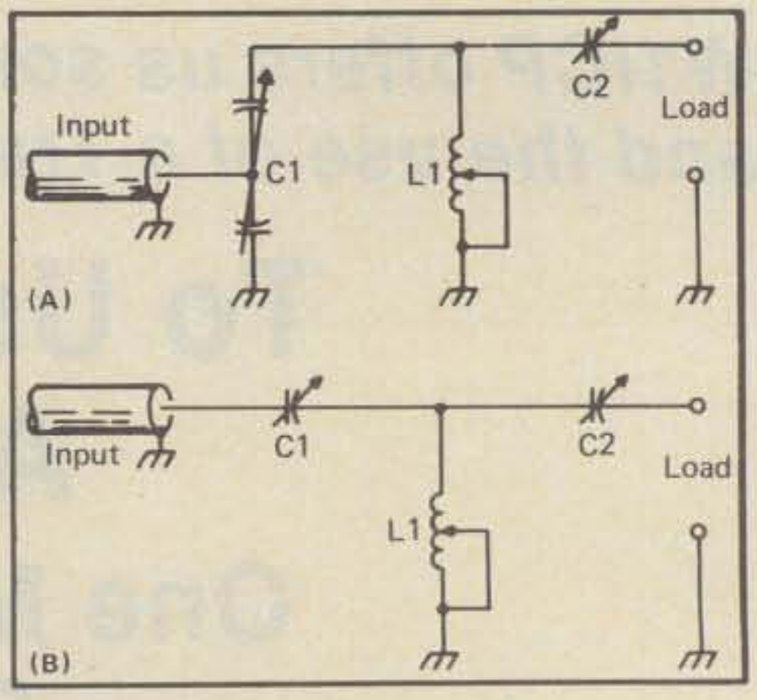


Fig. 1– Circuit diagram of Transmatches. (A) is the basic Ultimate circuit and (B) is the Walt Maxwell version. L1 can be a tapped coil, but does not provide the flexibility of a rotor inductor. If you use a tapped coil and find you cannot get a perfect match, you might try adding a short length, 5 to 10 feet or so, of feedline. This will change the overall impedance and may put you in a matching range of the tapped coil.

Getting back to the choice of circuits, Maxwell's simple T-circuit is just about as good as one can use. I would prefer a variable inductor for L1 because there are many antenna system loads that can be extremely critical to match. A switched, tapped coil can create some matching problems with such loads simply because the inductance range is fixed. In order to match any impedance, the inductance should be continuously variable.

The Meat—Transmatch or Not?

For those readers who have become tired reading up to this point, I can make it short. If you wish to always have a 50 ohm

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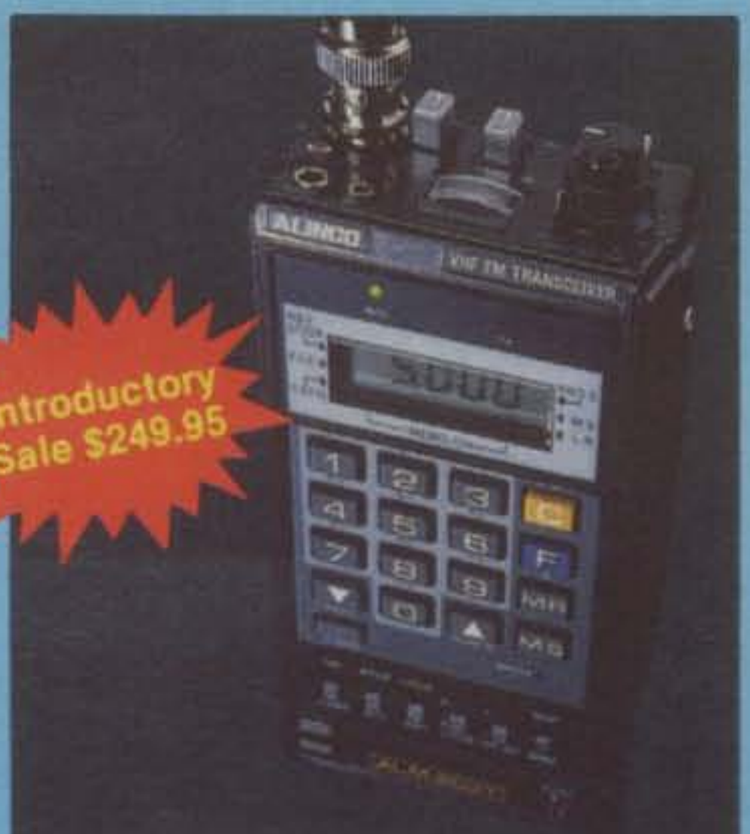

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load for your transceiver and have maximum transfer of power, plus keep your transceiver running cool, then use a Transmatch. For those of you who wish to continue, I have more to say. In fact, I could write five articles on just subject!

Let's first talk a little about losses. Any circuit will have some losses, so adding a Transmatch to your antenna system will introduce some losses. I have made many tests using Transmatches, so I can give you some figures. A well-constructed Transmatch—one using good electrical connections and good components—doesn't introduce any great losses. The *T* configuration with a roller or variable inductor can introduce as much as 7% loss. In other words, 100 watts out of the rig, you could lose as much as 7 watts in the Transmatch. However, and there are several "howevers," that 7% loss only takes place under a very badly mismatched load, with standing-wave ratios on the order of 15 or 20 to 1 and a high value of reactance! The minimum loss through a Transmatch is on the order of only 3%. My method of checking was putting identical wattmeters on both sides of the Transmatch, input and output, and then measuring the differences into a wide variety of mismatched loads. One of those "howevers" we mustn't overlook is what we gain, not what we lose. I have no way of giving exact figures, but you would actually pick up power from your rig simply because its load would be exactly for what it was designed. The rig would run cooler—no doubt about that.

Still another advantage is that a Transmatch is certain to improve reception. Your receiver will always be looking at a resonant antenna system and will profit accordingly. In addition, the Transmatch will provide a certain amount of selectivity.

Resonant Antennas—Eh?

There is another important consideration that should be brought in at this point: a discussion about resonant antennas. For some reason that is obscure to me, many amateurs insist that a resonant antenna is much better than a nonresonant one. Let's first define a resonant antenna as simply as possible (and without offending any antenna experts). A resonant antenna is one where only ohmic and radiation resistance exists in the feed point—no reactance is present. Keep in mind that you cannot get power through a reactance; you must cancel out the reactance. It is probably best to use an example. Let's say your favorite frequency is 3600 kHz, so you cut a dipole using the formula 468 divided by 3.6 to get a resonant antenna. Look at that! The SWR is 1.1. to 1 and you have a full 100 watts going out! So comes the day and you decide to operate phone up on 3900 kHz. The question then arises, what about the resonant 3600 kHz dipole? It isn't resonant anymore. Even worse, when you used the antenna on 3600, the SWR was just about 1 to 1, but up here on 3900 it looks like 8 to 1! And added to that, the rig won't load at all! Gosh, I guess you need another resonant antenna for 3900. Hogwash!

Let's suppose we attach the transmitter end of the 50 ohm feedline cable, RG-8/U, to a Transmatch and the rig to it. We next adjust the Transmatch so we have a 1 to 1 SWR on the piece of coax between the Transmatch and the rig, which indicates the transmitter is seeing a 50 ohm load. What we have done is taken the complex load that appears at the Transmatch end of the 50 ohm line and done some interesting things. However, it is at this point that many amateurs have a hard time understanding what is happening. Keep in mind, if you will, that the actual impedance of the load at this end of the coaxial line is not 50 ohms, the impedance of the line. Rather, it could be a much higher or lower value and have lots of reactance present. And, going back to the beginning of this article, we are now looking at what I like to call the "antenna system," and that is what we are going to tune. By adjusting the coil and the capacitors in our Transmatch, we tune out the reactance present in the load and also step up or down the necessary transformation required for the transmitter to "see" a 50 ohm load. Also bear in mind that the antenna system load has not changed, nor will it.

We load up our transmitter so that we have 100 watts output, just as we had with our 3600 kHz resonant dipole. So where is the 100 watts going to go? It is true that coaxial line has some losses as the SWR increases. We do have an SWR of 7 or 8 to 1 up here on 3900, so we may lose a few watts on the way. However, for all practical purposes we now have just about 100 watts in our "nonresonant" antenna. Actually, it isn't really nonresonant anymore. At least the antenna *system* isn't nonresonant. Don't forget that we tuned out the reactance by using the Transmatch, so all we have left is radiation and ohmic resistance.

Some things do change with our antenna, but certainly not its efficiency. A resonant half-wavelength dipole has the characteristic figure-eight radiation pattern. As an antenna gets longer or shorter other lobes are developed, and if the antenna is longer than a half-wavelength, it actually exhibits gain in some directions. Remember, resonant antennas are strictly a state of mind. In the real world we want resonant antenna *systems*.

Matched Antennas and Transmatches

The real crux of the article is whether to use a Transmatch with a matched antenna—one that has a low SWR. In my

own case I have a seven-band beam, and while on some frequencies the SWR is 1 to 1 or close to that, it goes well over to 2 to 1 on others. Therefore, I keep a Transmatch in the line at all times. It means making a few extra adjustments each time I switch bands, but those adjustments are easy and fast. However, most important to me, my equipment is always working into the design load.

If you find that your equipment loads easily and you don't have antenna problems when QSYing, then you probably don't need a Transmatch. However, if any of your antennas show an SWR of much more than 1.5 to 1, then I would recommend using a Transmatch. I have already discussed the 3% power loss in a Transmatch, but as I also said, I find that insignificant given the other advantages.

For years I tried to convince the amateur fraternity to use what I thought (and still think) is the best multiband antenna system. This is an antenna that has no traps or resistors and uses a practically lossless transmission line. But it does require the use of a Transmatch. Now that we have all the new bands, we need an antenna system for the average amateur who cannot afford numerous towers and beams. So here goes at reviving that outstanding system.

A Really Good Multiband Antenna

The formula for making the antenna is quite simple. You first find out how you plan to support the antenna and what is the maximum possible length of wire you can use. It may be that the antenna must be an inverted-V type with a single high support at the center and the ends as high as possible off the ground. If you have two widely separated supports, such as trees, then the antenna can be horizontal (horizontal is nearly always better than vertical or an inverted V). In any case, the antenna is made long enough to reach between the two farthest supports. If that happens to be 100 feet overall, fine! If it is 200 feet, even better. (Always make the antenna as long as possible.) Next cut a wire that long.

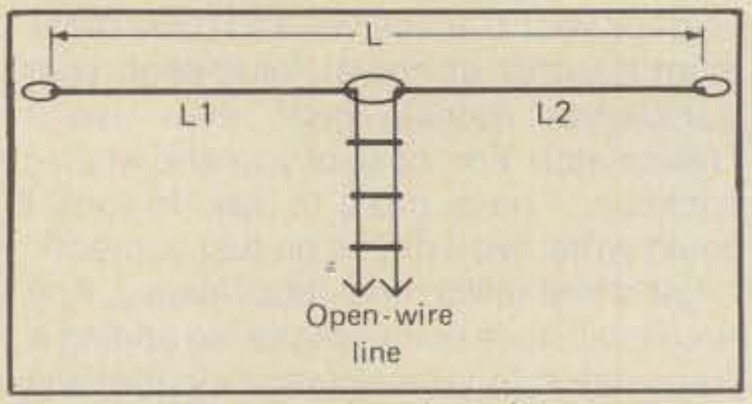
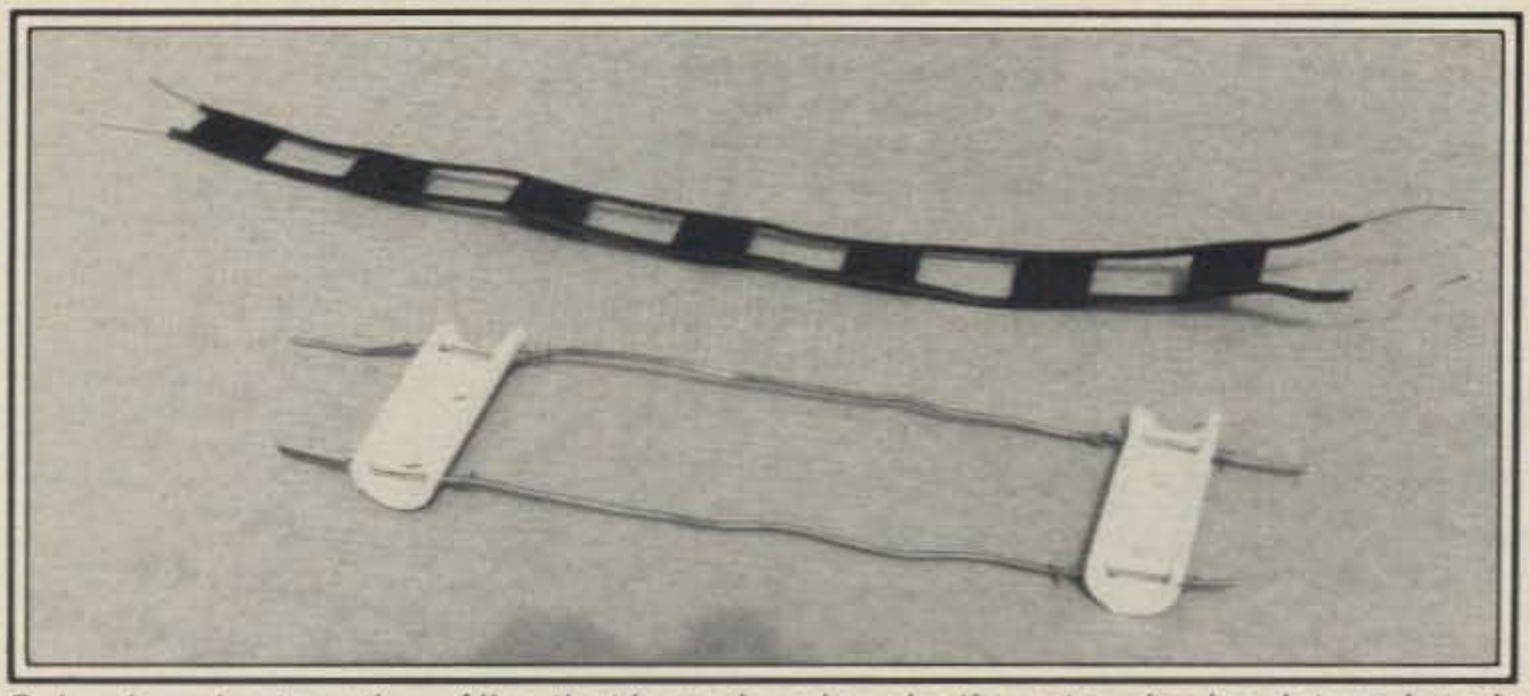


Fig. 2– This is the drawing of the antenna described in the text. The length L can be any convenient length, but one should try to make it at least one-quarter wavelength long on the lowest operating band. L1 and L2 should be equal lengths. Also, the antenna can be mounted as an inverted V. If you like slopers, this same antenna can be installed as a sloper.

What Kind of Wire?

A frequent question is, "What kind of wire can I use for a wire antenna?" Almost any kind of wire that is copper or copper-clad steel that is strong enough to support itself is usable. Nearly any electrical supply house has single wire, No. 12 or 14 copper wire. Farm supply houses usually have electric fence wire, which is customarily No. 18 copper-clad steel.

Getting back to our antenna, find the center of the wire and cut it again. You now have two wires to make a dipole. Note I didn't say half-wavelength dipole because it would be only chance if it were. Because we are going to use this antenna on a multitude of frequencies and bands, it would be expected that the SWR will be quite high in some instances. For this reason we will need a relatively low-loss feedline—certainly not coax. If you don't care to make your own line, then you can use a good grade of 300 ohm TV-type twinlead. Even better is a heavy-duty-type twinlead that has sections cut out and approximates open-wire feeders. It is easy to make your own feeders by using two wires separated 2 or more inches. The insulators between wires can be made from almost any poly or phenolic material. One-half inch plastic plumbing pipe can be cut and drilled to make insulators. (Hair curlers of plastic



Below is a short section of line that is made using plastic water pipe insulators. I made these from a piece of tubing 3 inches long that was sawed in half, providing two insulators. Holes are drilled in the ends of the insulators and the wire for the feeders and then fed through the holes. The other holes are put in to eliminate any moisture accumulation. The wire spacing is not critical; any spacing up to 6 inches is suitable. One 10 foot length of PVC tubing should provide more than enough spacers. Above is the heavy-duty "open-wire" type twinlead. This line will handle the amateur legal limits, but it is more lossy than the homemade line at the left.

are suitable.) Even wooden dowel rod can be cut and drilled, but in this case it might be wise to dip the wooden spreaders in hot paraffin.

Make the line long enough to reach from the center of the antenna to your shack. Many amateurs insist that the length of the feedline must be a half-wavelength or multiples of same. The only time that such lengths are of any importance is if we are going to attempt to measure the feedpoint impedance of the antenna. To be brief, make the feedline long enough to reach the shack; that is what is important. Do try to bring the feeders away from the antenna at right angles. This is done to avoid feeder coupling to the antenna itself, causing parallel standing waves and feeder radiation. However, this isn't as important as some amateurs think when using open-wire line. Such coupled power is radiated, not lost.

Some amateurs balk at bringing open-wire feeders through the wall or windows. An easy out here is to mount the end of the feeders near a shack window, and at that point attach a length of the commercial twinlead to come into the Transmatch. There may be an impedance mismatch between the values of open-wire line and twinlead, but both lines are balanced, so again this isn't important.

Connect the end of the feeders to the station Transmatch using the balanced configuration output of the Transmatch. Use as low a power as possible to get an SWR indication on your matching indicator. Be sure to keep notes of the different settings of the Transmatch that provide a match. Go through the various bands and note all settings. This will probably take a few hours, but when you are finished, you will be able to quickly change bands and frequencies. Assuming you are using one of the Transmatch circuits described earlier, I can guarantee that you will obtain a 1 to 1 match on all bands.

What you now have is just about the best multiband antenna system you can find. In my case, I have about 170 feet, center fed, with the heavy-duty twin-lead type feeders. I keep a coax switch in the feedlines, and I am sometimes surprised to find that the wire antenna will provide better signals than the beam! This is, of course, because of the gain on certain lobes from the wire antenna plus a better angle of radiation for a given signal. Remember that you now have a tuned resonant system—not necessarily a resonant antenna.

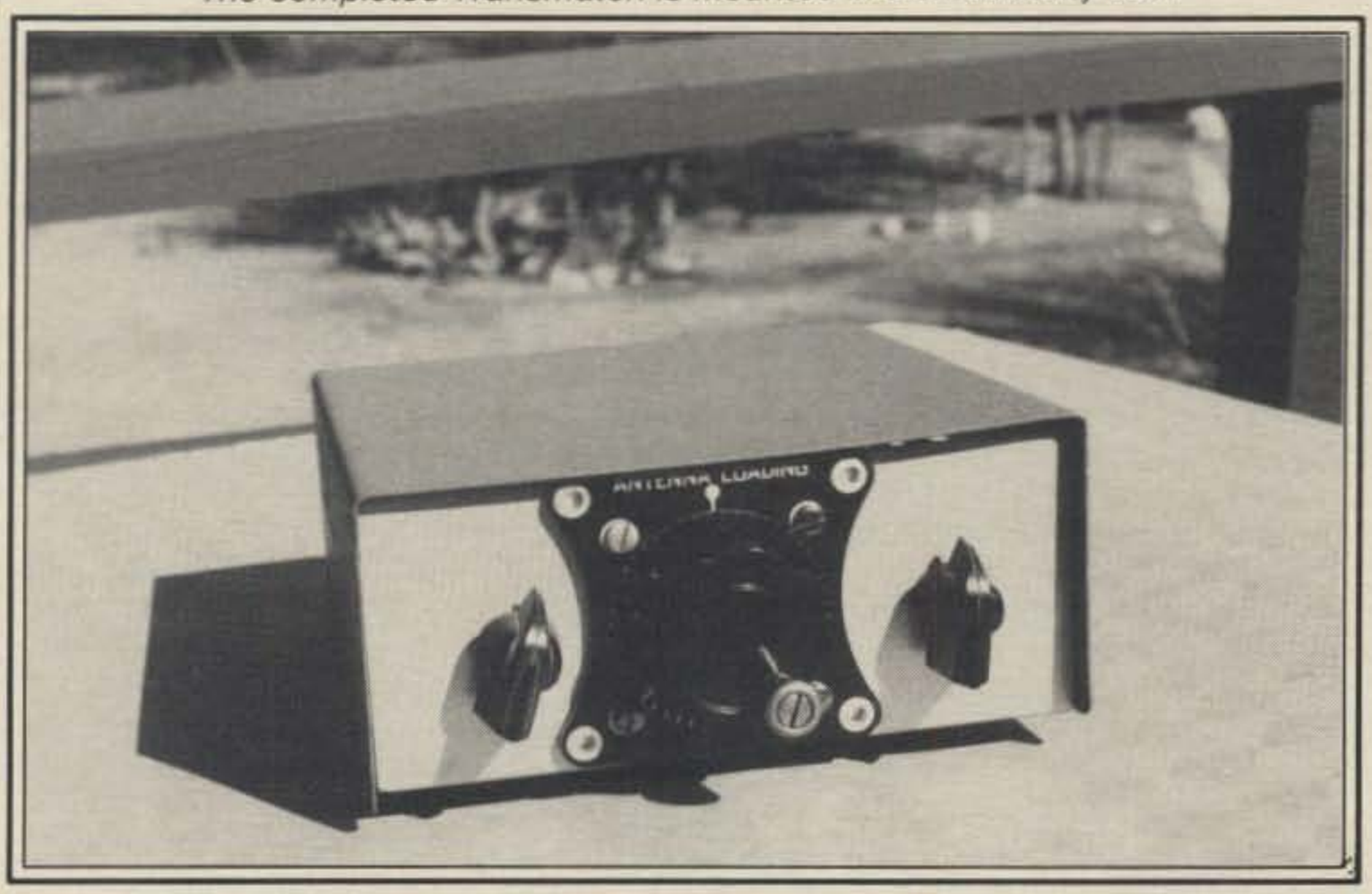
I don't like to downgrade other multiband antennas. However, there has been much written lately about the off-center-fed Windom and the G5RV. Before making remarks about these antennas let me make something clear. Many years ago I came up with what is known as McCoy's Law. Simply stated, McCoy's Law says, "If the damned thing works, leave it alone!" In any case, I have some comments about these and other multiband antenna systems that I don't think anyone will argue about.

Generally speaking, trap multiband antennas always will suffer when compared to the multiband dipole described above. So will multiband verticals. The off-center-fed Windom will suffer from feedline radiation. This isn't really bad, but the antenna is inherently unbalanced. Also, to cover 80 meters you will need a Transmatch anyway. From all I have read and heard about the G5RV antenna, plus testing several, a Transmatch is needed to keep the SWR within reason. If so, it becomes slightly ridiculous to attempt to hold to fixed antenna and feedline lengths.

No antenna expert will argue about the efficiency of a decent-size dipole with open-wire feeders. And as to decent size, a good rule of thumb is to try to make the antenna at least one-quarter wavelength long on its lowest operating frequency—in other words, at least 60 feet long if your lowest band is 80 meters, but the longer the better. The antenna will work with shorter lengths, but no where near as well. It is just an unbeatable antenna for 80 through 10 (it will also work on 160), and the beauty of it is that the antenna and feeders are cheap.

So that's the scoop. I hope you've read this far. If so, you'll know a little bit more about Transmatches and good multiband antennas. There is a lot more to say, but by now you must be bored, right? CQ

The completed Transmatch is mounted in a small utility box.



This little one-evening project will go a long way to improve your mobile operating pleasure and still keep you in touch.

EASY LISTENING

BY JIM BURTOFT*, KC3HW

Operating mobile is fun, but it can be plagued with problems. Many of these problems fall under the general classification of "noise." We're all familiar with electrical noise, engine noise, and road noise, but there's more. The mobile operator must deal with two other "noises."

The first "noise" emanates from the other passengers. It's commonly referred to as "conversation." However, to the mobile operator it's just more "noise" to overcome.

The second "noise" is everyone else's opinion of what comes out of the transceiver's speaker.

Now these two noises tend to have a regenerative effect. As the general noise level rises, the passengers unconsciously raise their voices in order to be heard. The mobile operator attempts to compensate by raising the radio's volume. After an undeterminable number of rounds, someone runs out of patience and in disgust turns off the radio. No one is happy, and amateur radio suffers one more minor public-relations disaster.

Is there some way to circumvent this "noise" problem? Sure. One obvious way is to wear headphones. That will reduce the noise, but it creates a worse problem. Headphones tend to isolate the operator from his surroundings. If the operator is also the driver, the situation could be hazardous. It may also be undesirable; if your wife is talking and you're not listening, you could be in trouble!

Okay, then let's pass on the headphones idea. Now, what's left? Well, how about borrowing an idea from the private aviation industry. Most current light aircraft are designed so that the pilot doesn't wear headphones. Instead the manufacturer mounts the radio speaker just above the cabin door. Mounted there it's less than a foot from the pilot's ear and pointed directly at it.

This system allows the pilot complete freedom of movement, total awareness of his environment, and the ability to hear everything coming over the radio. As a side benefit, the passengers don't find it annoying, since the volume is comparatively low.

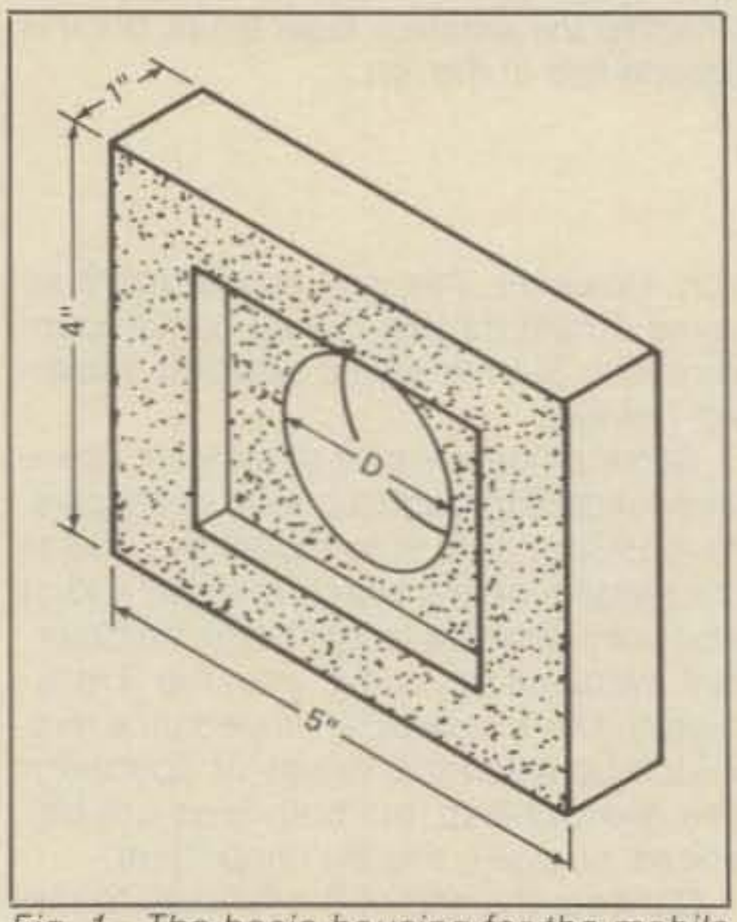


Fig. 1– The basic housing for the mobile speaker is a block of wood 5" × 4" × 1". The diameter of the hole (D) is determined by the size of the available speaker. The area of the hole is undercut so that the speaker fits flush with the face of the board.

Now let's see if we can adapt this concept to mobile amateur use. Mounting the speaker on a car ceiling places limitations on what we can use. What we can't use is the average commercial unit. It's just too big. To make the concept work we need an extremely thin speaker enclosure with good audio quality. Oh yes, one more thing. Since this is for amateur use, we want it to be quick, cheap, and easy.

Construction

The small size and demand for simplicity dictate the use of something other than traditional materials. So instead of heading for your local electronics emporium, head for your local home-center store. Look over the store's supply of 1 × 4 boards. You're looking for a piece that contains a knot-free section at least 5 inches long. From the knot-free section cut a 5 inch long block. Make sure that your cuts are reasonably neat and square.

Now you must locate a suitable speaker. Sources for these speakers are legion. Discarded portable radios and cassette players all contain small, shallow speakers. My speaker was salvaged from a defunct cassette tape recorder.

In the center of the wooden block cut a hole slightly smaller in diameter than the speaker. If you don't have a hole saw large enough to do the job, then drill a series of overlapping small holes around the perimeter of your desired hole. Once you've completely circled the perimeter, the core will fall out. The job isn't the world's neatest, but don't worry, as it won't be seen.

The next step is to fit the speaker into the hole. Begin whittling the edge of your hole, enlarging it so that it's cone shaped along the edges. Continue whittling until the speaker fits flush into the hole. Mount the speaker permanently by gluing it into the hole using panel or construction adhesive (also available at your home-center store).

The speaker and wood block are transformed into a professional-looking enclosure by wrapping the front and sides with a small piece of double-knit cloth. A piece less than a foot square is all you'll need. If you wife doesn't sew and no one in the neighborhood can supply a free piece of cloth, then check out a local fabric store's bargain bin (you can usually find a fabric store in the larger shopping malls). Choose a solid color piece if possible.

The photo shows my method of attaching the fabric. Since we're using a wood enclosure, thumbtacks work quite nicely. I simply drew the fabric around to the back and thumbtacked it into place.

The final step is to attach a reasonably long cable to the speaker. Make sure that

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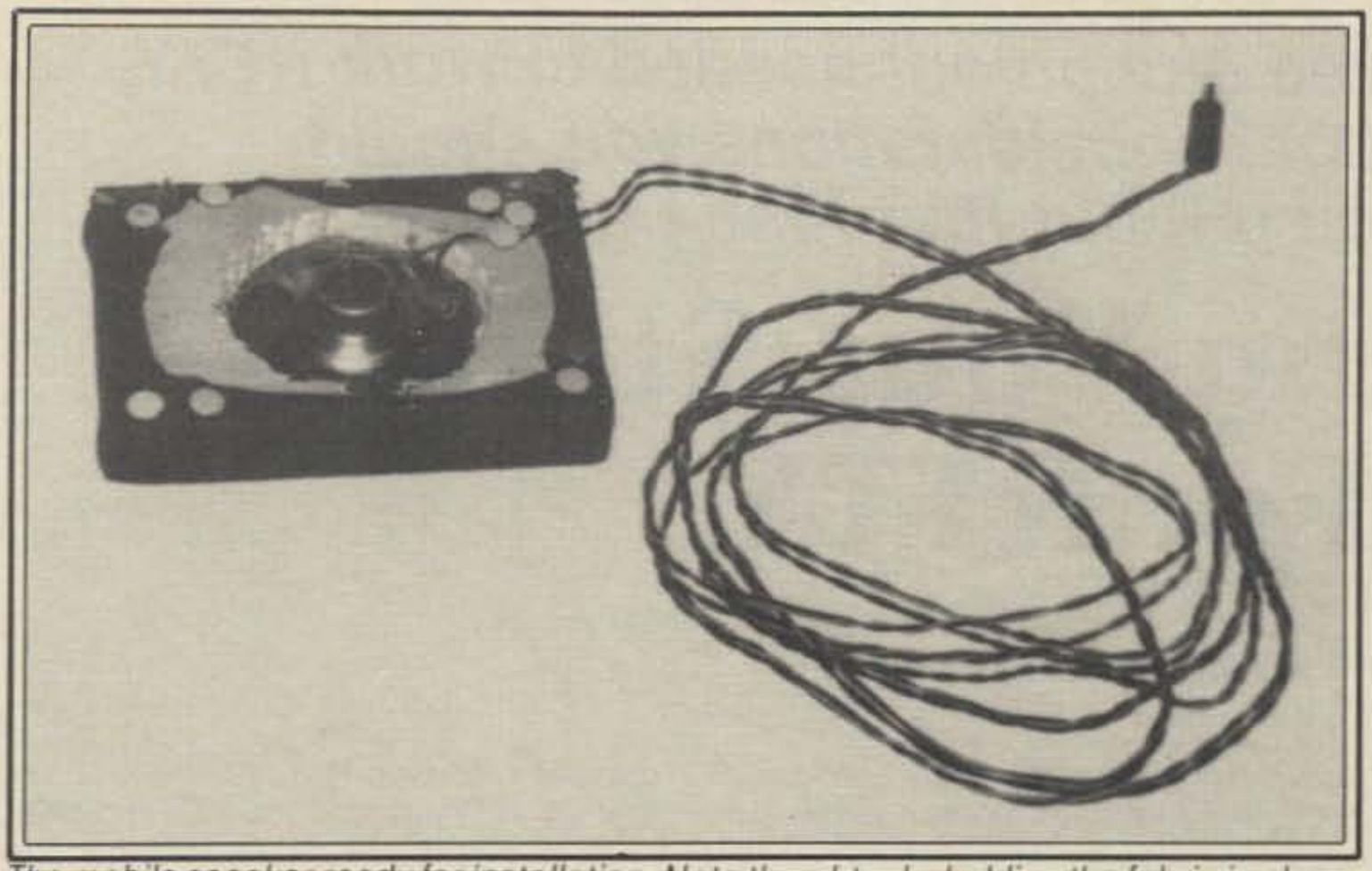
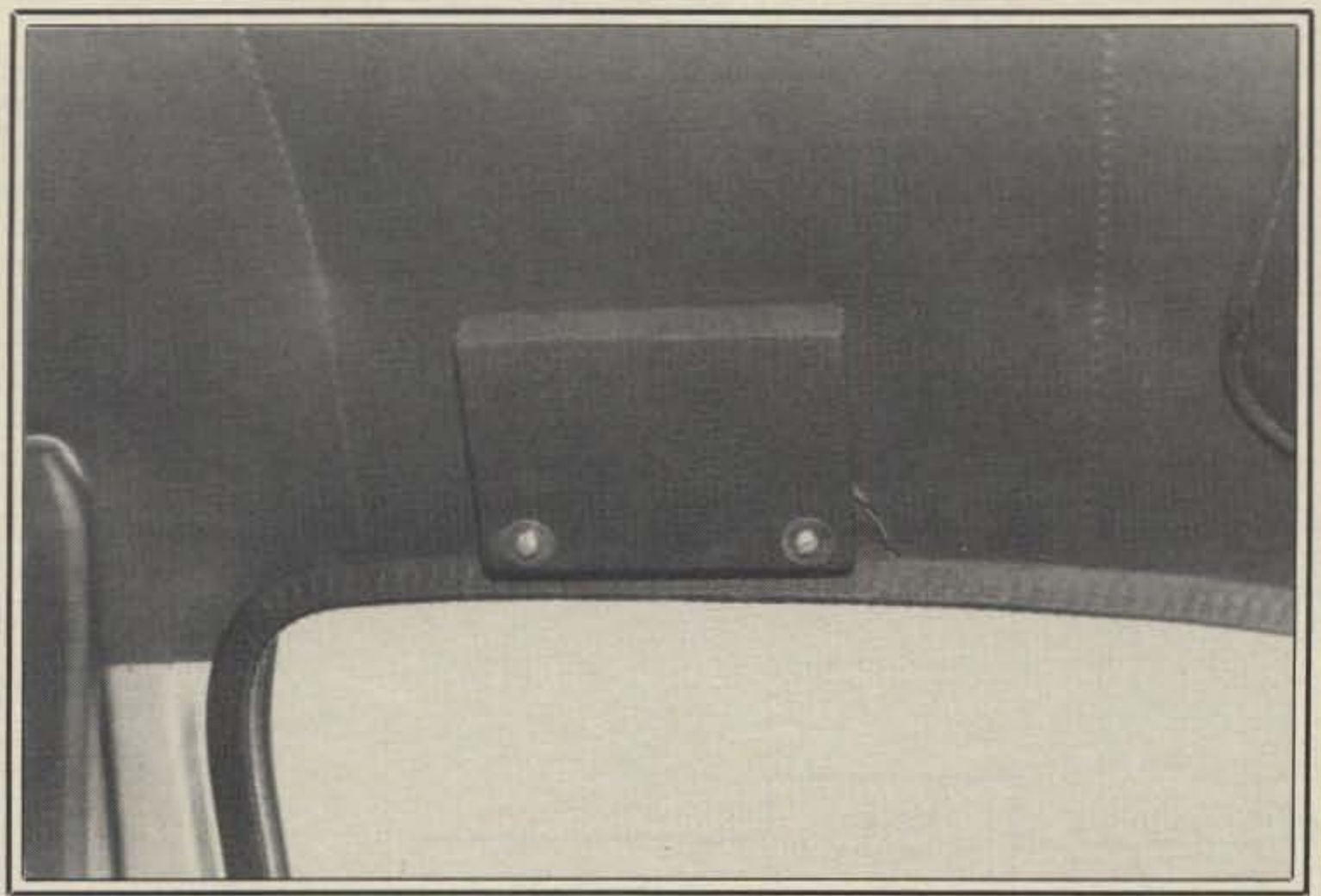


The mobile speaker ready for installation. Note thumbtacks holding the fabric in place.



The mobile speaker installed in my Chevette. The unit measures 5" × 3½" × ¾" and doesn't interfere with the head room. Note the speaker cable tucked in behind the door trim.

it's long enough to follow the route you'll have to take to get it from the speaker to the transceiver and still be hidden.

Mounting the speaker is relatively simple. The method I chose was to attach the speaker to the car using two sheet-metal screws. Lay the speaker into position and note where a roof support channel runs behind it. Most likely it will be just above the door. Mark on the front of the enclosure the location where the two screws could go through the wood enclosure and into the channel behind it. Drop a couple of drops of Elmer's Glue onto these points and let it dry. This will keep the fabric from unraveling as you drill through the cloth.

Now once again set the enclosure into position and drill through the enclosure and into the channel behind using an ⅛ inch or smaller drill bit. Using two 1½ inch sheet-metal screws, mount the speaker onto the car as in the other photo.

The final step is to route the speaker cable to the transceiver. In most cars this should pose no problem. Most of the time there will be plastic trim that will conceal the cable.

Conclusion

By following this nontraditional approach you can have a speaker that's made to order for mobile operations. It's small and shallow, and being made of wood, it has better acoustical qualities than a comparable metal enclosure.

Best of all, it requires no special metalworking skills or tools. CQ

Besides the specialized equipment needed to work RTTY, there are some practical considerations you should think about before you put out that first signal.

Adapting Your Station For RTTY

BY BILL HENRY*, K9GWT

RTTY is a new mode for a lot of us in amateur radio. Much has been written about how to choose the best terminal, RTTY demodulator, computer program, etc. Some of these articles also mention that any transceiver or antenna may also be used for RTTY **if certain precautions are observed.** What certain precautions? Scares me!

The following article will attempt to point out some of the special things about equipment that become important when you operate RTTY modes. Some of the information is based on practical experience—other on personal opinion. I hope the examples given will provide some insight to the newcomer to RTTY.

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What Is A RTTY Station?

A RTTY station is somewhat different from a CW or voice station. More equipment is required, we "talk" with a keyboard and "listen" on a printer or screen, and different requirements are placed on the technical capabilities of the transmitter and receiver. RTTY is a radio mode, but it is definitely different!

A lot has already been written about the different pieces of equipment required for RTTY, and the reader should consult November issues of *CQ* magazine, *RTTY Journal*, and other articles for detailed discussions. For now, let's say that *all* RTTY stations must have a minimum of a keyboard, RTTY tone generator, transmitter, antenna, receiver, RTTY demodulator, and a printer or CRT screen. A basic RTTY station is diagrammed in fig. 1A. Often, some of these separate functions are combined into just two or three pieces of equipment as shown in fig. 1B. The RTTY station diagram applies equally to HF or VHF stations. If AMTOR or Packet Radio is used, two additional functions are required—a code/protocol converter for transmit and receive information. Again, the code/protocol converter is usually a single piece of equipment that does both transmit and receive conversion as shown in fig. 2. Re-

Fig. 1– A typical RTTY station. (A) The basic RTTY station. (B) The "combined" RTTY station.

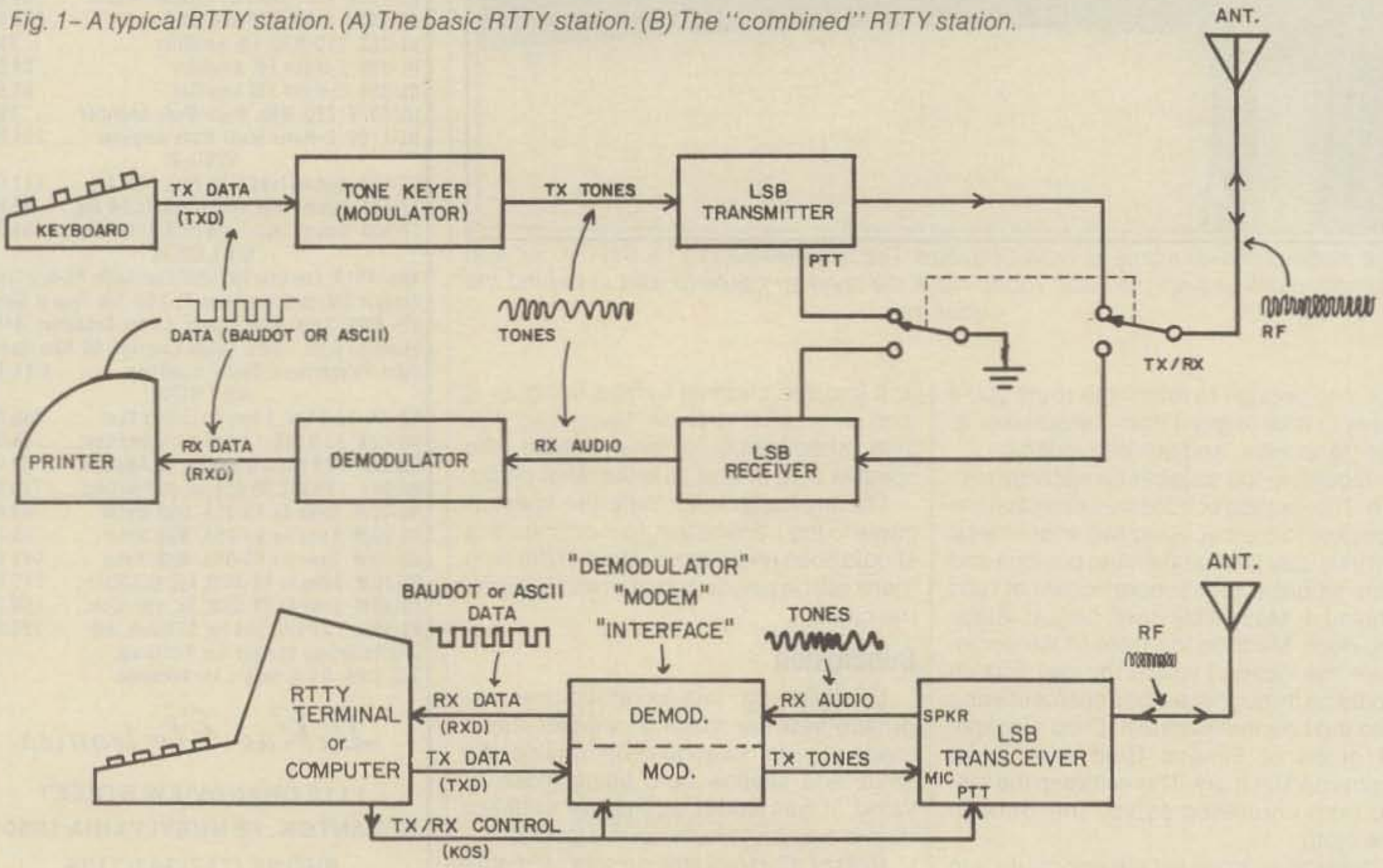
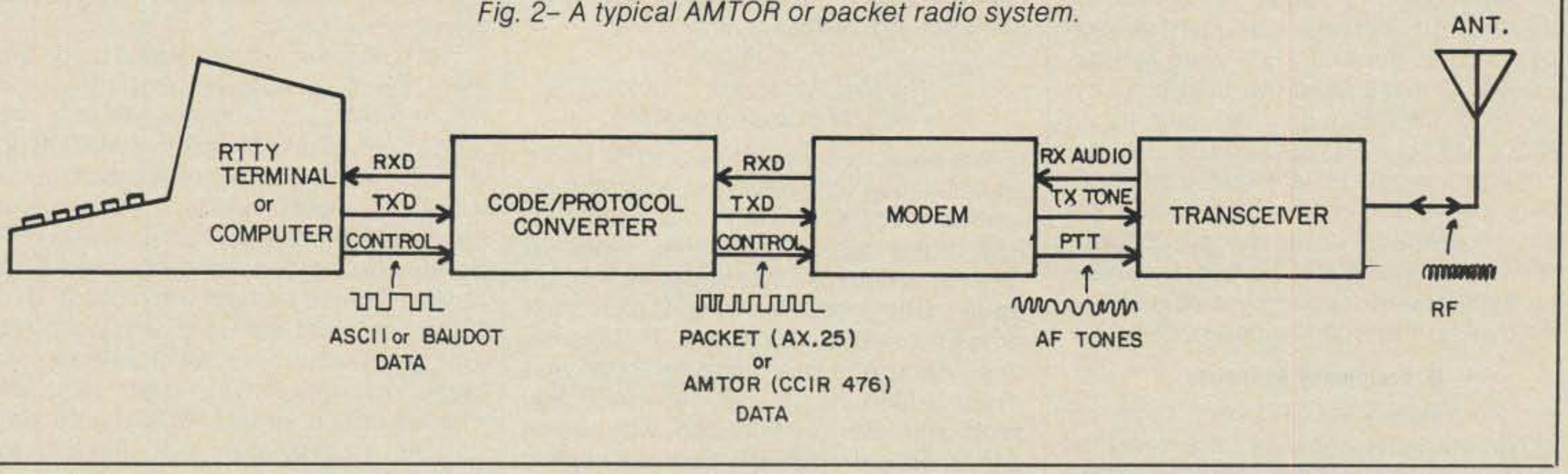


Fig. 2– A typical AMTOR or packet radio system.



gardless of how you build the RTTY system, some of the necessary RTTY operating practices are forced by the way the system is constructed.

What Special Concerns Are There For RTTY Station Equipment?

First of all, the transmitter, receiver, and antenna must be adjusted to work at your desired frequency. This is just like phone or CW. Choose the frequency and antenna, tune the transmitter and antenna tuner, and set the proper modes. That's easy! There are, however, some special considerations for RTTY as follows:

A. Frequency

HF RTTY is confined to *non-voice* segments of each band, further restricted by privileges of your particular license class. So-called "gentlemen's agreements" place RTTY in the following subbands:

80 meters: 3600–3650 kHz
40 meters: 7050–7100 kHz
20 meters: 14070–14110 kHz
15 meters: 21075–21100 kHz
10 meters: 28075–28100 kHz
160, 25, and 13 meters: RTTY permitted in CW segments; no popularly defined RTTY subbands at present.

B. Duty Cycle

When sending RTTY, the transmitter is on the air for the entire time you are typing. When using voice or CW, the transmitter actually develops full power only half of the time. Therefore, for the same power output, **TWICE** the heat is developed in the transmitter for RTTY as for voice or CW. For this reason, it is usually advisable to use lower transmitter powers in RTTY. The power problem is one of heat dissipation, and blowers help, as well as do husky power supplies and transmitting components. The following are rough guidelines based upon experience.

SSB Transmitters:

6146 tube in final (TS520, TS820, SB101, etc.): Load to 180–200 ma maximum plate current—less if power supply or final compartment shows excessive heating.

"Sweep" tube in final (FT101, T4X, etc.): Load to 125–150 ma maximum plate current—less if heat is excessive.

Solid-state finals (TR7, TS430, TS930, FT-One, Corsair, KWM-380, IC-751): Read manual *carefully*! Most solid-state finals may be operated at full output for a *limited* time. Adjusting for 50–75% of maximum output is generally safe if equipment is well ventilated.

Linear Amplifiers:

1. *The bigger the box the better!* Most amateur linear amplifiers are 50% efficient at best. This means that there is a lot of heat to be dissipated—1000 watts for 2000 watts input! There is **NO** substitute for free-air around the tube and good air-flow, usually requiring a blower.

2. *Use rugged transmitter tubes.* Linears using the 3-500Z tube or similar have a greater lifetime in RTTY service than amplifiers constructed of parallel sweep-tubes or even those using 572B tubes. External anode tubes such as the 4CX1000, 4CX250, etc., work well if the blower is adequate ("loud blower" is usually "adequate"!). These tubes are also more expensive to replace.

3. *Use only the power you need!* This has been preached to amateurs since the hobby began and is certainly applicable to RTTY. Increasing transmitter power output from 250 to 1000 watts will produce only 1 S-unit of gain in the other guy's receiver. Tube lifetime may be 10 to 100 times greater at 250 watts than at 1000 watts output. Save that capacity for the few times you need it to work that rare DX station!

4. *Use 220V mains power rather than 120V.* Linear amplifiers produce high power output only by drawing it from the AC mains. You might get by with 120V supply for CW or voice, but line-voltage drop and "breaker-popping" may be a serious problem when operating high-power RTTY.

Antenna System:

1. *Use an adequate antenna tuner.* The antenna tuner *must* be capable of handling the full power output of the transmitter and/or linear. It makes no sense to have a monster amplifier drive a miniature antenna tuner, regardless of "claimed" power ratings. The antenna tuner is only needed to provide impedance matching to the transmitter or linear amplifier. When the feedline impedance to be matched is noticeably different from 50 ohms, very high currents or voltages may develop in the antenna tuner. This can produce spectacular arcs or dramatic melting of parts. No doubt this impresses visitors, but the repair bill may also be spectacular!

2. *Be sure the antenna will handle the power.* If you operate high-power RTTY, try to avoid trap-type antennas. Traps are by nature lossy devices, and the heat build-up due to RTTY's 100% duty cycle may cause melting. Trap dipoles and trap beams come with instructions for CW and voice dimensions. They rarely operate at lowest SWR in the RTTY subbands! Monitor the SWR to the antenna. If it changes while transmitting, something in the feedline or antenna system is changing—usually melting!

3. *Use RG-8 type coax.* The smaller RG-58 coax is cheaper, easier to install, and may well work at 1000 watts for voice or CW. However, the 100% duty cycle of RTTY may produce enough heat to melt it, particularly at 15 and 10 meters if the SWR in the line is not low.

C. Stability

Modern technology has greatly reduced a previous big problem for RTTY operators—frequency stability. However, RTTY still requires frequency stability that is five to ten times better than that required for voice or CW, particularly if net or Mailbox (MSO) operation is desired. Medium-term (30 minutes after warm-up) stability of ±100 Hz is quite adequate for voice and CW, and such a variation is rarely noticed by the operator. However, the **SHIFT** used in RTTY (difference between Mark and Space frequencies) is only 170 Hz—a drift of 100 Hz will mean you can no longer print the RTTY signal without adjusting the receiver dial. For RTTY, a medium *and* long-term (over several hours) stability of 10 or 20 Hz is very desirable, particularly if you participate in a Net or Mailbox system. Transceivers with ±100 Hz stability can

be used for RTTY rag-chewing and DX chasing, but will require frequent dial adjustment. In general, rigs using synthesized VFO's will have the best stability, and rigs with capacitor-inductor tuned VFO's will not be as stable. The less-stable rigs are used quite successfully in Nets if crystals are installed for the frequency desired. Newer models of transceivers are usually most stable, and external synthesized frequency stable VFO's are available for many older models.

D. Frequency Response

Unfortunately for RTTYers, most HF transmitters and receivers are designed for voice and CW modes. We have to take what there is and adapt it to our needs. The problems for the RTTY operator show up in terms of power (duty cycle—discussed above) and frequency response. As receivers and transmitters have become more and more selective and stable, the required voice bandwidth has been narrowed to the point that the currently accepted range of audio frequencies is 300 to 2400 Hz, a bandwidth of 2100 Hz—thus the common 2.1 kHz SSB filter in most rigs. Moreover, this is not a flat bandpass by any means and signals at 300 or 2400 Hz are usually attenuated by *at least* 3 dB, if not more, from a mid-band signal at, say, 1500 Hz. All this is very good practice for voice signals and gives us moderately pleasing SSB to listen to. It isn't quite what we would have done if we had started designing an RTTY system, however!

RTTY reception uses a radio receiver with an audio tone demodulator connected to the receiver's audio output terminals (600 ohms if available, speaker if not). For historical reasons based upon telephone-company practice, the U.S. standard for RTTY tone filters is to use 2125 Hz as the Mark filter and set the Space filter frequency higher by the amount of the RTTY shift. For 170 Hz shift, Space is 2295 Hz; 2550 Hz for 425 shift; 2975 Hz for 850 shift. When compared to the 300 to 2400 Hz SSB audio passband, it becomes obvious that only 170 Hz is compatible with the SSB equipment, and that neither 425 nor 850 shift Space tone frequencies will be passed through the receiver.

If we were *only* interested in receiving RTTY, there is a "way out." Most of the higher quality (and unfortunately more expensive) receivers also include a **Passband Tuning control.** This little knob is a godsend to the RTTYer! You only need to shift the knob to favor the higher audio frequencies (LSB side, if you please), and all standard RTTY shifts are available. Since amateurs use *only* 170 shift, we can make do with a receiver without passband tuning, at the expense of not copying wide-shift RTTY signals. However, if you want to do some RTTY Shortwave Listening (SWL), you should have a receiver with passband tuning. Commercial shortwave stations rarely use anything *but* 425 or 850 shift.

Receive Passband Tuning Is Very Important For RTTY

We have two ways to transmit RTTY signals—use tones into the microphone input of an LSB transmitter, or use direct FSK of the transmitter carrier if the feature is available. As explained in an earlier article, both techniques have their problems. However, since our *transmitting* concern is *only* amateur radio and since amateurs all use 170 shift, few problems are experienced with using either tones or FSK. We may see slightly lower power for Space than for Mark, but rarely as much as 3 dB, an insignificant amount to a good demodulator at the receiving station. So, even if your wattmeter does bounce up and down when transmitting, chances are that it does little or no harm to your RTTY signal. Don't try 425 or 850 shift, however! The other guy will need a demodulator with Mark-only capability to copy you!

There is another cure for the frequency response problem that is widely used outside of the U.S. That is to use lower frequency RTTY tones that are compatible with SSB transmitters and receivers. These are the so-called "low-tones," which are defined by the CCIR and in use everywhere *except* the United States. Why doesn't the U.S. convert? It's a question of compatibility with a large inventory of previously built equipment and continued compatibility with amateur VHF operations. There are literally thousands of high-tone demodulators in the possession of U.S amateurs. Because we use FSK on HF and detect it with SSB receivers, either a high- or low-tone demodulator may be used, the only difference being an 850 Hz offset in dial calibration. However, most of us also operate RTTY on VHF where we use high tones and do *not* have the convenience of choosing tone frequency at will. The only tones you get out of the VHF FM receiver are those the other guy sent. By staying with the high-tone standard in the U.S., we are able to use the *same* demodulator on HF and VHF. Therefore, the U.S demodulator standard has been and will continue to be high tones.

E. Switching Speed

The last major item of concern applies *only* to AMTOR and packet radio stations. Both AMTOR and packet radio are "burst" types of RTTY. A group of characters is sent and then the transmitter turns off and waits for the receiving station to send either an acknowledgement or request a repeat. SSB and VHF voice radios were definitely *not* designed for this mode! Some have purposely slow switching times to prevent annoying speaker pops or clicks when going from transmit to receive. Others slow the receive to transmit time to prevent creating key clicks.

AMTOR is the most exacting mode and little has been known about transmitter/receiver switching speeds until this mode came along. The active AMTOR operators now have a pretty good list of which items of current amateur gear can be used or modified for use with AMTOR. Some rigs may be used for limited distances (limited on both the close and far distances), and others switch quite rapidly. A transmitter-receiver with several layers of sequential relays has little chance of successful AMTOR communications! Packet radio is a little less exacting, but still cannot be used with very slowly switched radios. Both AMTOR and packet radio equipment include programmable delays that may be set to compensate for equipment delays. However, particularly in the case of AMTOR, the compensation may also considerably reduce the near and far distances you may use AMTOR for communications. The random nature of packet transmissions reduces this problem for packet radio.

Conclusions

Building an RTTY station requires not only the "special" boxes of keyboard, printer, demodulator, etc. We also need to be aware of the special requirements RTTY places on our transmitter, receiver, and antenna system. A good station for CW or voice may or may not be well adapted for RTTY. Fortunately, as RTTY interest grows, more and more RTTY features such as 100% duty cycle, high stability, FSK keying, passband tuning, and rapid transmit/receive switching are being included in new commercial equipment. Even with such nice features and especially with older equipment, the RTTYer has to use some common sense and experience to keep his equipment in top condition.

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K8PYD spent four weeks touring the orient. Part of that time was spent operating and the rest was spent seeing sites that few westerners will ever see other than as pictures in a magazine.

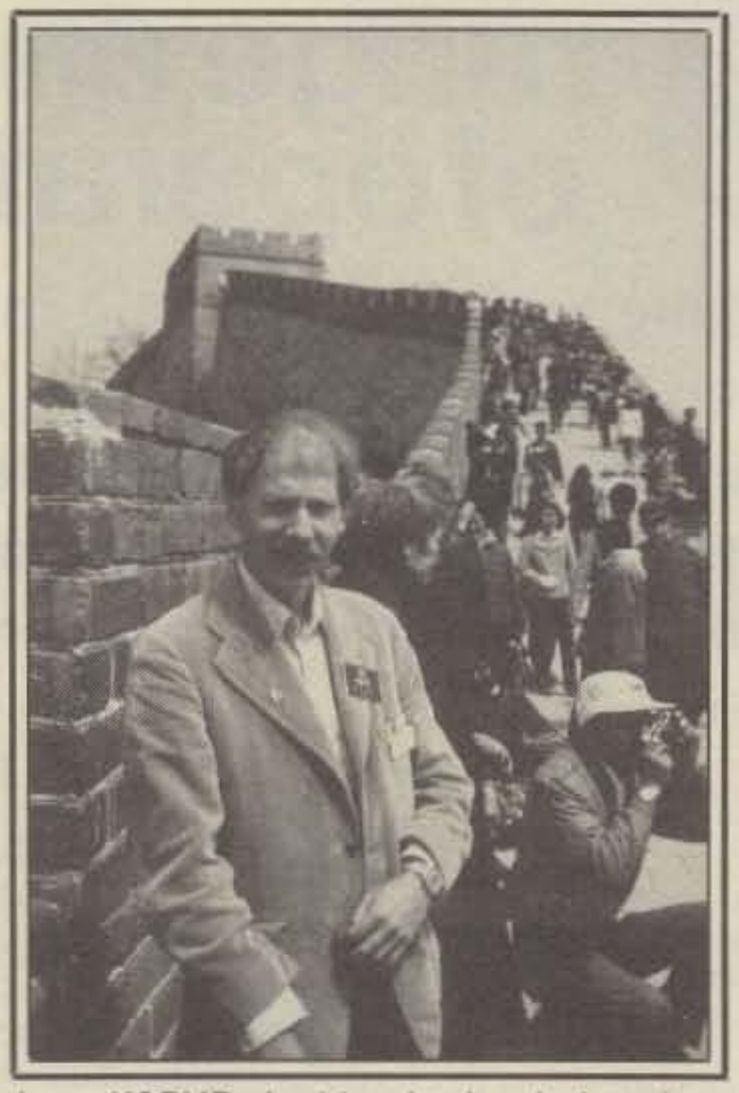
DXing The Far East
A Brief Encounter

BY LEO W. FRY*, K8PYD

After having the pleasure of operating an amateur radio station in the Mideast, it was clear that wherever I would travel, I would again have to be "on the air." The Peoples Republic of China was my goal as the next place to visit. However, the chances of operating there were slim to none at all. Talk was that one could operate from Hong Kong with relative ease. In addition, most tours of the Peoples Republic of China either began or ended in Hong Kong. An additional week to operate would be just about right. The added expense would be minimal, since most of the total cost would be the required airfare to visit the Far East. I decided to give it a go.

My local travel agent began helping me find the best tour group for a tour through the Peoples Republic of China. Meanwhile, I contacted several radio amateurs in Hong Kong, namely Phil Weaver, VS6CT, and Paul Bailey, VS6DO. The suggestion was made that I might spend several days in Hong Kong and then proceed to Macau for a week, where I might also be able to operate. After consulting the local travel agent, I decided to spend four weeks abroad. The air tickets were written and the tour of the Peoples Republic of China was booked. Accommodations in both Hong Kong and Macau were left open.

My tour of the Peoples Republic started from Hong Kong, included stops in six cities, and ended at Beijing, the capital. Letters were written to both BY1PK and BY4AA in hopes of visiting the stations. Meanwhile, Phil, VS6CT, responded, stating the possibility of borrowing a station from a Hong Kong source to take to Macau. Also, he said that Jose, XX9WW, would probably be able to help me when I got to Macau.



Leo, K8PYD, looking bedazzled and exhausted, takes in China's Great Wall.

After arriving in Hong Kong, I checked into a hotel some distance from where I would be staying with the tour group which was going to the Peoples Republic in two weeks. This would allow me to become better acquainted with several parts of Hong Kong during my visit. The local amateurs suggested I leave for Macau in two days, stay for a week, and return to join the tour group. Meanwhile, they said I should apply for a reciprocal amateur radio license at the main post office on Hong Kong Island.

Walter Chen, VS6DW, Head of Operations: Communications and Navigation for Hong Kong.

This worked out well, since Paul, VS6DO, was working across the street from the post office. I hadn't yet had the pleasure of meeting Paul. I visited him first, made plans for a later meeting, and then followed his instructions to get to the proper room at the post office. As usual in public buildings, construction or renovation was taking place. One had to go around to the side of the building, go up one level outside, enter the building, go up two floors on the elevator, and after getting off, walk down one adjacent flight of stairs to the floor below.

I entered the office and expressed my desire to obtain a reciprocal license. I completed the forms I received with the understanding that I could use a local amateur's station and operate with the call-

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Chen, the YL operator of BY4AA. She speaks fluent English and is a most gracious hostess.

From left to right are Tong, of BY1PK, Leo, K8PYD, and Xuru of BY4AA.

sign K8PYD/VS6. As it turned out, the head of operations there was Walter Chen, VS6DW, who had been into radio for many years. A brief meeting with him was quite informative about amateur radio and maritime navigation, since his department also had this responsibility for the Hong Kong area.

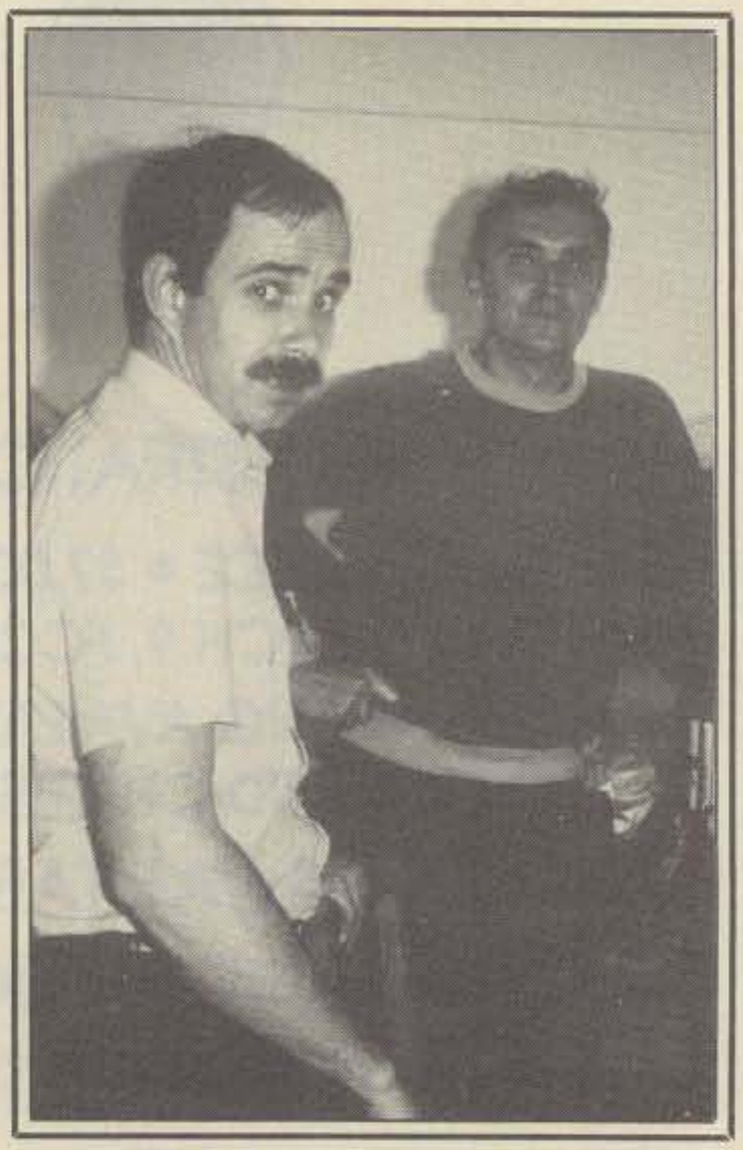
I was able to operate for several days from local amateur stations before leaving for Macau. The actual trip was one hour on the hydrofoil ship. However, things were a little more complicated by the fact that I was carrying a complete radio station inside my luggage. I thought customs at Macau would be the problem, but it wasn't. It was trying to carry all of the luggage from the point of exit in Hong Kong to the ship. No porters were allowed, and it had to be done in one trip. I managed to make it in two multi-step trips. I believe my arms are still stretched longer than they were when I left the States. Arrival in Macau was easier. I happened to see the ship's captain, who was leaving the dock area. At my request he sent back two porters. Although smaller than myself, each was quite capable of carrying the gear on top of his head.

When I reached the hotel, I found Jose, XX9WW, waiting with all arrangements made. Then together we went to the post office to apply for the license. My copy of the license would be issued shortly and operation could begin immediately using the callsign XX9YD.

Assembly of the station was easy, with the exception of finding a base mounting plate for the vertical antenna I had carried to Macau. After a half hour, though, the antenna was up and coupled to the station in my top-floor suite.

My first few log sheets were full of contacts with Japan, but then out of nowhere a stateside friend, Jim Profitt, WA8EUK, from my home town, was calling me. I had expected to be swamped for sure with calls from the East Coast when skip started to reach into the US. However, the Midwest region was first. After working Jim, I enjoyed several hours of Stateside contacts before the skip changed. As it turned out, I only had two good days for working Stateside. Hardly anything from the other continents outside of Asia ever came through. But it was a real pleasure to work Asian stations, since normally in the Midwest region of the USA they are either too weak to be heard or just too busy working pile-ups to give more than a signal report.

Halfway through the week I managed to return to Hong Kong and attend the Hong Kong Radio Transmitting Society meeting. The ride back in the hydrofoil without carrying any luggage was very relaxing. The meeting was short, but I was able to meet a few more of the local amateurs, some for the first time, including Bob Frost, VS6BQ, Hal Malcolm, VS6HI, Roger Clark, VS6CL, and Michael Yorke, VS6CP. A few of the group had already contacted me in Macau while I was operating my station, XX9YD. The real surprise, though, was when I went back to the pier to return to Macau. The ticket windows were closed, and the last ships were leaving in an hour. I had completely forgotten that the next day was a local holiday. Not having purchased a ticket ahead of time, it was the world of the hawker, who had purposely bought extra tickets just for the chance to make a few dollars. The tickets were available to the highest bidder. Fortunately, though, I was able to size up the situation correctly.



On the left is Bob Frost, VS6BQ, an active CW operator. On the right is Paul Bailey, VS6DO, an active DXer, contester, and the only individual licensed to operate on 160 meter SSB.

Ticket prices were above my daily room rate at the hotel where I had previously stayed in Hong Kong. I headed there and took a room for the night. The next day, wide awake and the ticket windows again open for business, I bought a ticket and headed back to Macau.

Upon arrival at Macau, I found a breeze blowing. The bands still sounded good in spite of my not having spent the previous night on the air. I proceeded to work Chris Roberts, T2ADE, on Tuvalu, Allan Dodson, ZK1DA, on Cook, and a

few others in the Pacific area. But even though they had 5-9 signals, I only received very weak reports in return. I remembered that upon arrival at the hotel I couldn't see the antenna from ground level. Was it sitting too far back from the edge of the roof to be seen from below, or should it have even been visible? Had there been a problem overnight due to the strong breeze outside? Going to the roof I found the vertical antenna lying on its side. It had worked, as I had just made several contacts on the air, but things should improve. This time when putting up the antenna in the vertical position I secured it against the breeze that Macau was experiencing.

Scanning the band I soon found a pile-up. Maybe it was someone Stateside or an expedition. Instead it was Chen, the YL operator at BY4AA. After calling several times, I made contact. She mentioned that she had received my last letter the day before and had hoped to work me at Macau for a new country. I mentioned that I would be in Shanghai in a week and would be happy to confirm the contact. She said the group at the station would be awaiting my visit.

The rest of the week allowed me to log many more Asian contacts, as well as tour Macau and enjoy the delicious Oriental-Portugese food. Then it was back to Hong Kong to join the tour heading to the Peoples Republic of China. Along with the group, I would be visiting Guangzhow, previously known to the western world as Canton. Following that I would visit Guilen, where the surrounding hills as high as 1200 feet were uniquely sculptured ornaments of nature which are highly revered in this vast republic of the Far East.

From the beginning our group's national guide had taken the names and addresses I had in order to contact BY4AA. On the second day in Shanghai he mentioned things were at a standstill with no results in finding a way to visit BY4AA. However, after spending the whole morning of our last day on the land-line, he managed to contact Xuru, the head operator of the station. A meeting was arranged for that afternoon, since I was to leave the next day for Xian.

It must have taken an hour to reach the station location of BY4AA. The taxi and bicycle traffic was heavy, although the flow of traffic was steady. When I arrived, Xuru was waiting at the doorway with a YL who spoke excellent English. She was acting as interpreter, but did not introduce herself until we were inside and having tea. What a surprise! She was Chen, the YL operator I had talked with from both Stateside and Macau. All of us must have talked for an hour, along with exchanging QSL cards, viewing photographs, etc. Another individual entered the room. This was a second surprise! The visitor was Tong, the operator of BY1PK, whose letter I had received just prior to my departure from the States saying he would not be in Beijing when I arrived there. Now I knew why; he had to be in Shanghai. I only wish I had been able to spend more time visiting with these wonderful hosts. However, most pleasant encounters are brief when traveling abroad.

The next day I flew to Xian, where the famous terra-cotta warriors were unearthed several years ago at the burial site of Qin Shi Huangdi, ancient China's first unifier in 221 BC. From there I flew to Beijing. The sites I visited were fabulous! These included the Forbidden City, the Summer Palace, and the Great Wall. My visit to the Far East had been wonderful. I had had the pleasure of meeting some of the operators I had talked with from Stateside and also had been able to operate from both Hong Kong and Macau.

I can honestly say that these trips abroad were well rounded because of amateur radio. It provided me with the opportunity of meeting many people in lands that were strange and new to me. This has allowed me to see another facet of the daily life of the local inhabitants not normally seen by a tourist. In a small way I feel I have become a part of these countries. Hopefully, others will be able to do likewise. CQ

Our Readers Say:

"Build Your Own Versatile RTTY Converter" Correction

Editor, *CQ:*

As with most projects, after you have looked and looked, being very familiar with them, Murphy's Law strikes. I discovered with horror that I had made several errors in the schematic on page 22 in my article in the November 1985 issue. They are as follows. The unlabeled pin on the 2206 is pin 10 and ties to a 1 mFd capacitor. The resistor on pin 4 (2206) is 4.7k. The resistor on pin 6 (DG301) is 10k. Capacitors C1 through C8 are .005 mFd. Also, C1, C3, C5, and C7 tie respectively to pins 2 or 6 of the 1458 (U1 and U2). Pins 3 and 5 (1458) go to ground. The connection between U1A and U1B is the 36k resistor identical to the circuit between U2A and U2B. The transistor input to the 567 CW chip has a 100K resistor tied from the base to the collector and a 12K resistor from the collector to pin 4 (567) and then a 1K resistor to +12 volts. The only error to the parts placement is that the two 390 ohm resistors should be 390K (360K resistors will work well, also), and the capacitor on pin 10 (2206) should be 1.0 mFd, not 10 mFd.

I must apologize for these errors that were sent in to *CQ*. They were caused by having several copies of the preparation work on hand. Needless to say, the wrong one was submitted. Most of the errors can be resolved by using the parts placement, as it is proper.

C.L. Houghton, WB6IGP
San Diego, CA

Use It Or Lose It

Editor, *CQ:*

In the spirit of "use it or lose it," I believe that there should be a national calling frequency for CW on 10 meters. Even though I hold an Extra class license, my choice would be 28.150 MHz, which is the center of the Novice band. For those who do not object, let's consider this to be.

Henry J. Hampel, KA0TUP
St. Louis, MO

The Best Yet

Editor, *CQ:*

I think your editorial in November 1985 *CQ* is the best editorial I have ever seen in any ham radio magazine (I get *CQ*, *Ham Radio*, *QST*, and sometimes *73*) and I have been a ham since 1954 (KN2JZS, K5BSD, KH6FIM, KX6AS, ZD8WR, and now WB2VAT).

Dick Duane, WB2VAT
Long Valley, NJ

Keep It Simple, Stupid!

Editor, *CQ:*

First of all, I want to compliment you and your staff on a fine editorial and cover for the November 1985 issue of *CQ* magazine. It was just what I wanted to see. I have wanted to get involved with RTTY for years now, and you have given me the encouragement I needed to finally go out and do it. But that is not the main point of this letter. It is something much bigger and of more interest to you and your staff than my new-found interest in RTTY.

By the smile on the face of Douglas Sharp, you have finally found someone who really *enjoys* amateur radio. You see, for months I have been searching amateur radio magazines for a single smiling face. Doug's was the first I found. Instead of smiles I found frowns, scowls, and *many* "killing" stares. Is this representative of a person enjoying what he is doing? It would seem to this observer anyone enjoying what he is doing would smile occasionally while doing it! Besides the fact that, for the most part, these people are posing for the pictures!

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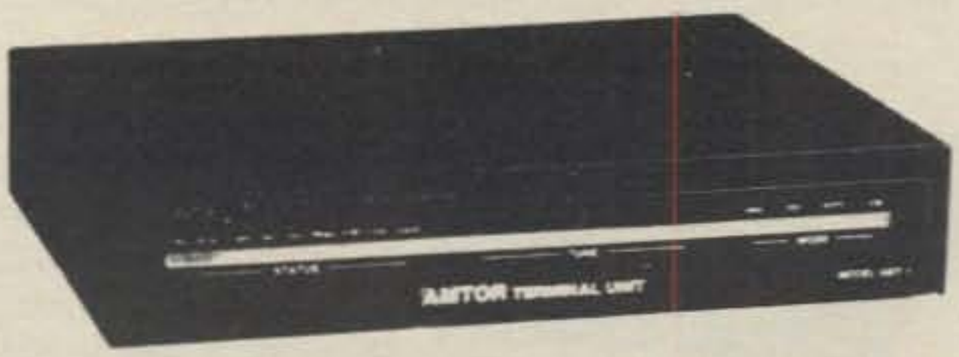

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Many of your recent editorials have been directed toward the "Destiny of Amateur Radio" and our questionable future. Your point is well taken. By the expressions of the people in our magazines we do indeed have bleek times ahead. I believe some of these people were actually angry that their pictures were taken!

Perhaps we don't need more clubs, more sophisticated equipment, more contests, or even more younger people. Perhaps all we need is the people already involved to become committed to having fun. Right now you're saying here's a man who has his antenna permanently disconnected. A man who has coax for brains and has been locked up in his shack too long with his linear at legal limit. Let me explain. Enjoyment at the simplest level creates an environment which nurtures all the rest of the other events many of us enjoy about amateur radio. Just having fun triggers the other feelings of enthusiasm, excitement, and sharing. What happens next? All those "special" things you have been writing about for months begin occurring, like people telling other people about the fun they're having with amateur radio. New people become involved and long-standing amateurs regain the enthusiasm they had years ago.

There may not be any easy answers. It is a difficult problem to point a finger at because, if amateur radio dies, all fingers will point at us. It is because of this apparent complexity that I now offer a principle that has helped solve many problems throughout my lifetime. Many people know about it without ever attaching a name to it. Maybe it could apply here. It's called the K.I.S.S. principle. This stands for "Keep It Simple, Stupid." I believe amateur radio, in its simplest terms, is a lot of fun. The fun of making new friends all over the world. The fun of making that first contact. The fun of chasing DX or countries. The fun of contesting and certificate collecting. I could go on for pages and pages. But, most importantly, the people who are having the most *fun* are those who are sharing amateur radio with others. Remember, a candle can light thousands of other candles and not shed any less light.

Craig S. Rockwell, KD8LU
Jenison, MI

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8/M	75%	26 pF	16-ga. / 19 × 29
58/U	66%	28 pF	20-ga. / solid
59/U	75%	15.5 pF	22-ga. / solid
6/U	75%	18.6 pF	18-ga. / solid

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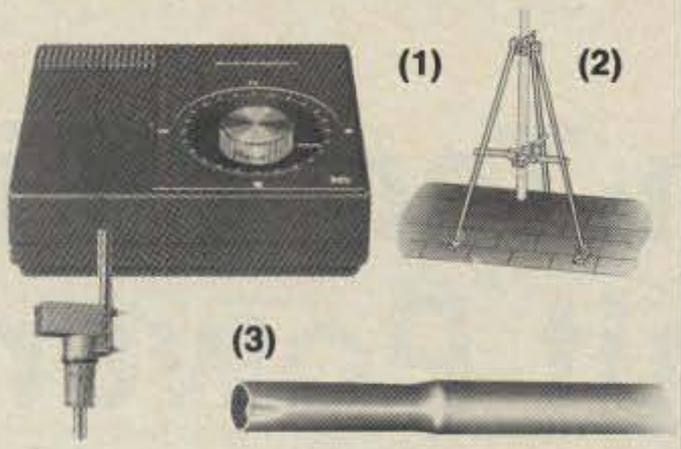

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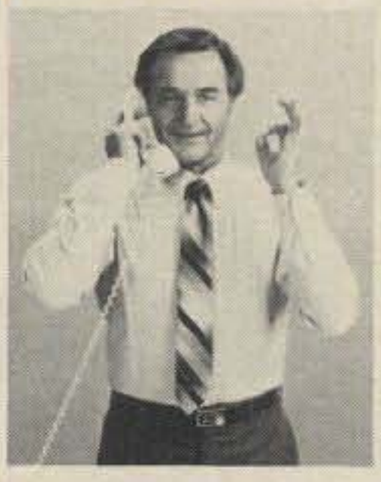

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4049 Hex Buffer	276-2449	1.19
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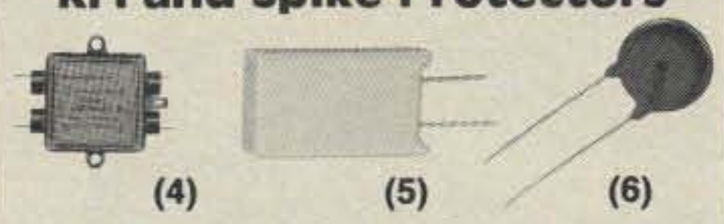

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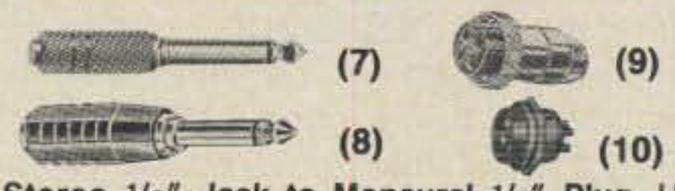

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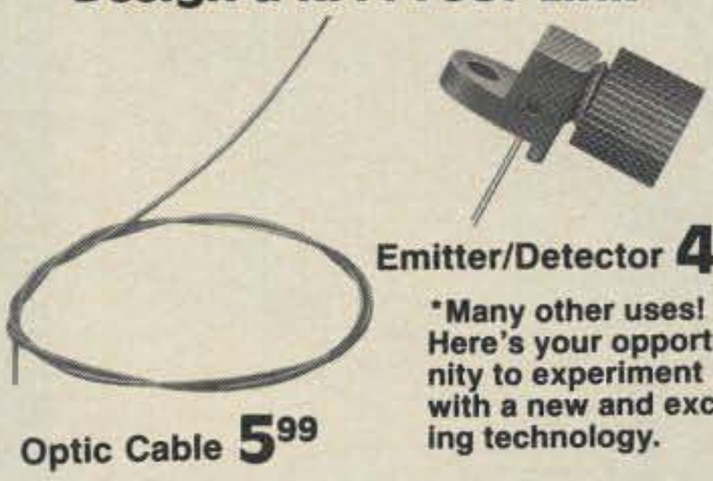

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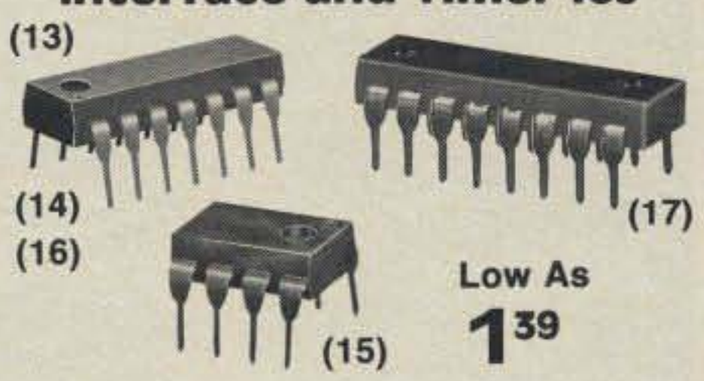

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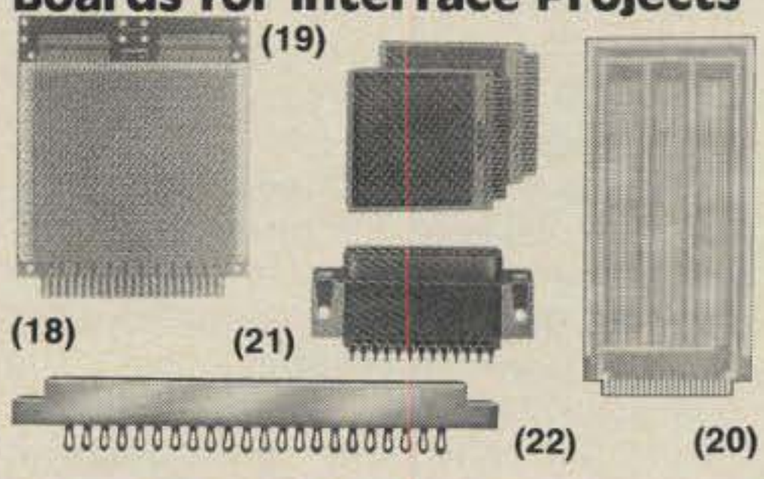

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CIRCLE 16 ON READER SERVICE CARD

CQ REVIEWS:

Ten-Tec's Titan Legal-Limit Power Amplifier

BY JOHN J. SCHULTZ*, W4FA

The increase in the linear amplifier legal power limit to 1500 watts *output* has resulted in a number of new linears coming on the amateur market. However, since the hefty 1500 watt output level is far beyond what can be handled by simple linears using sweep tubes, 811's, 572B's, etc., manufacturers of the new "super" power level linears have generally turned to ceramic/metal power tubes, notably those from the Varian/Eimac company. That has unveiled a rather quiet, but extremely significant revolution in modern-day power-tube design. Ceramic/metal power tubes now can combine very high power dissipation in a physically small package and yet have good power gain, low distortion, high efficiency, and very low filament power requirements. Anyone remember the 750TH?

Anyway, the reason for this prologue is not really to reminisce, but to indirectly introduce the Ten-Tec's Titan linear. It is a full legal power linear which utilizes two of the very newest Eimac ceramic/metal power tubes and is an excellent example of modern, compact, high-power linear-amplifier design.

The Titan comes in three shipping containers—one each for the linear-amplifier compartment, the power-supply compartment (minus the power transformer), and the power transformer itself. The only assembly work one has to do is to mount the hefty power transformer (it weighs almost 45 lbs.) in the power-supply compartment. The latter procedure involves unscrewing and rescrewing some 24 screws and/or nuts and bolts both to remove and replace the cover on the power supply and to bolt down the transformer. However, no wiring is required since the transformer has plug-in wiring connections. Two cables, both about 6 feet long, interconnect the power

*c/o CQ Magazine

Photo 1. The Titan in operation next to a Corsair transceiver. It's hard to imagine a 3 kw linear almost the same size as its matching transceiver.

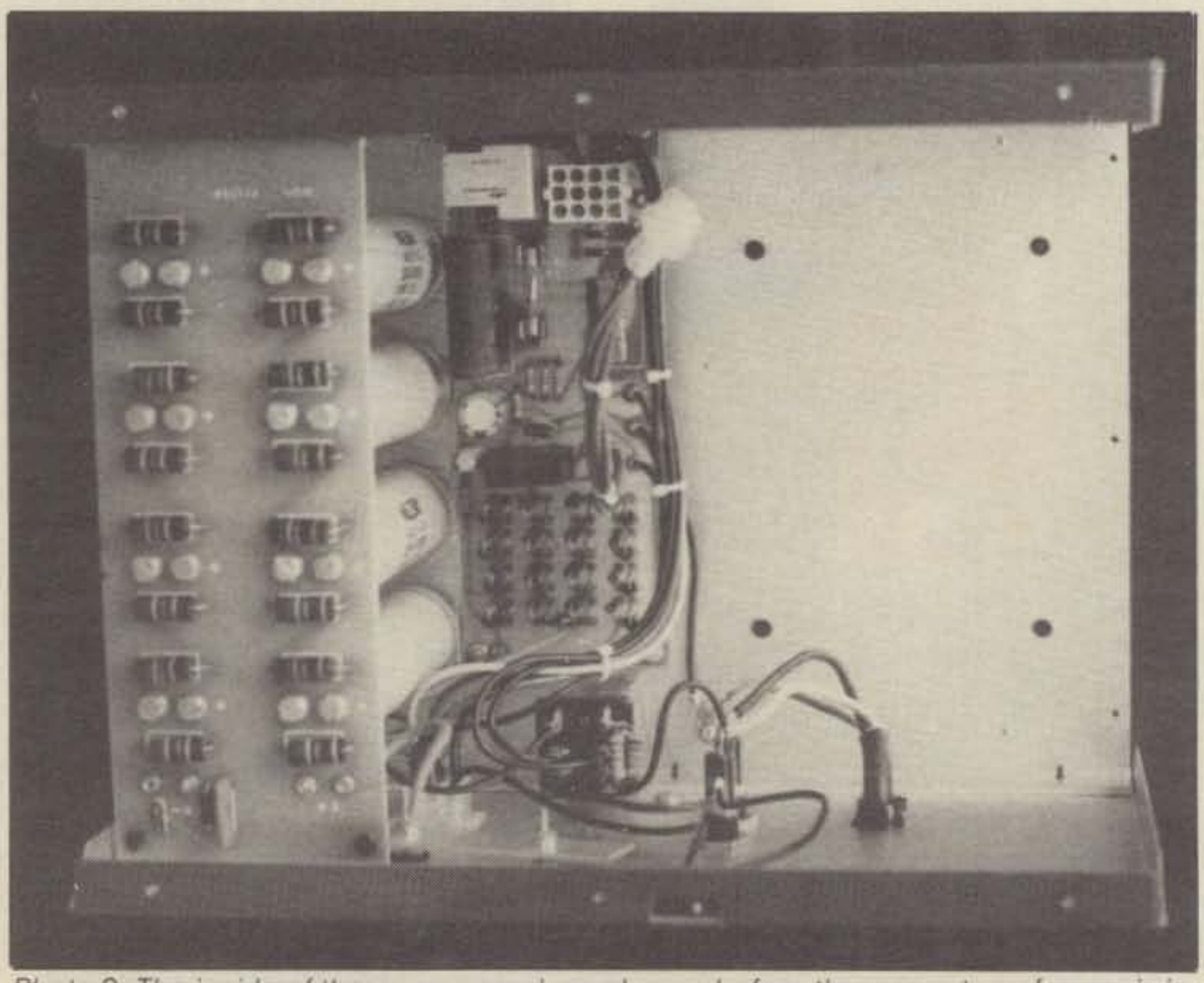
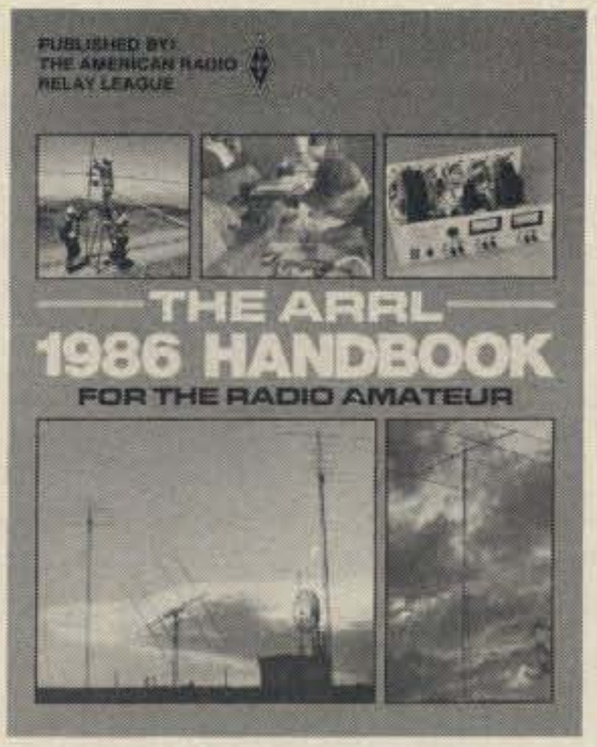


Photo 2. The inside of the power-supply enclosure before the power transformer is installed (a simple procedure).



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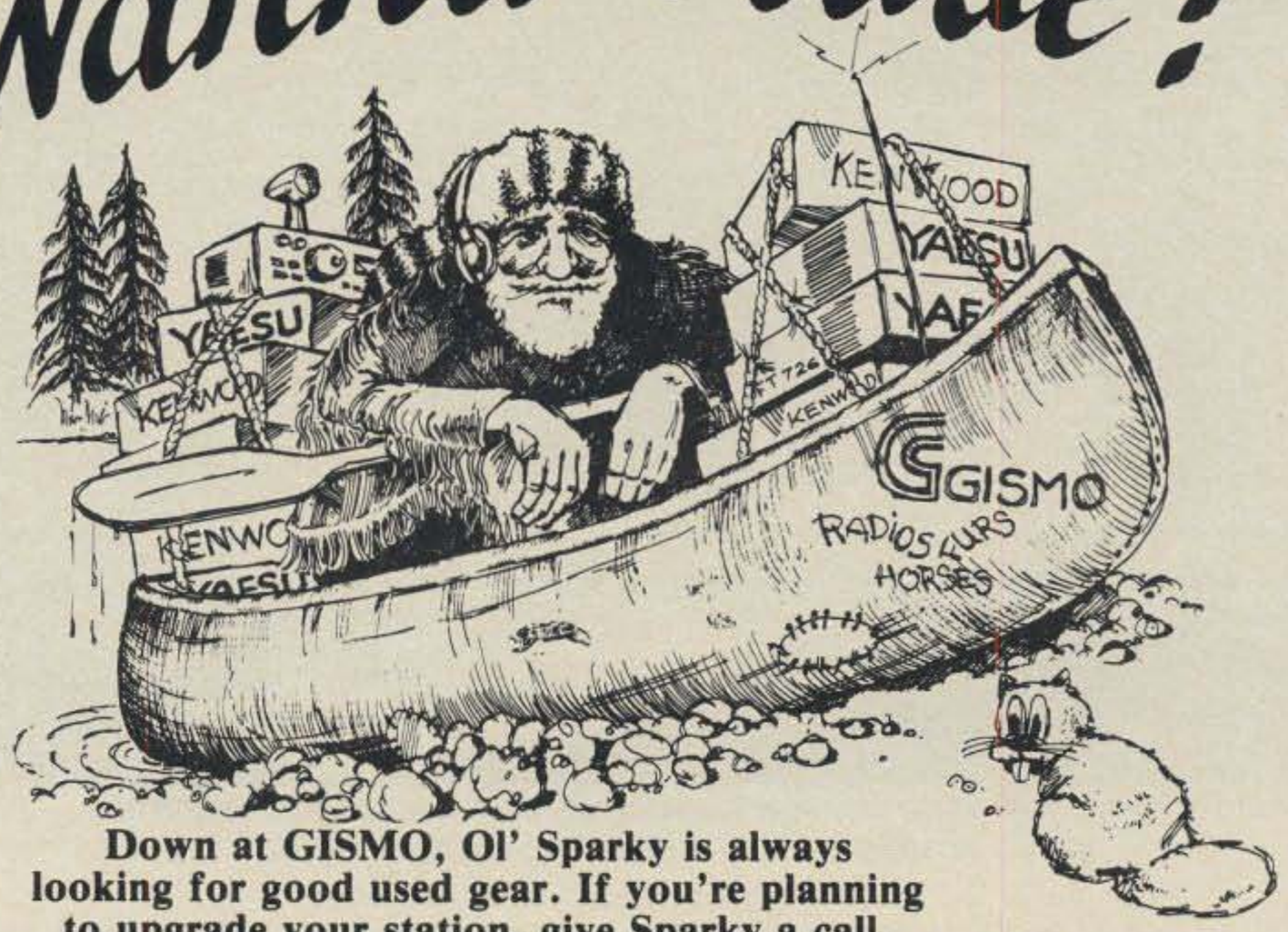

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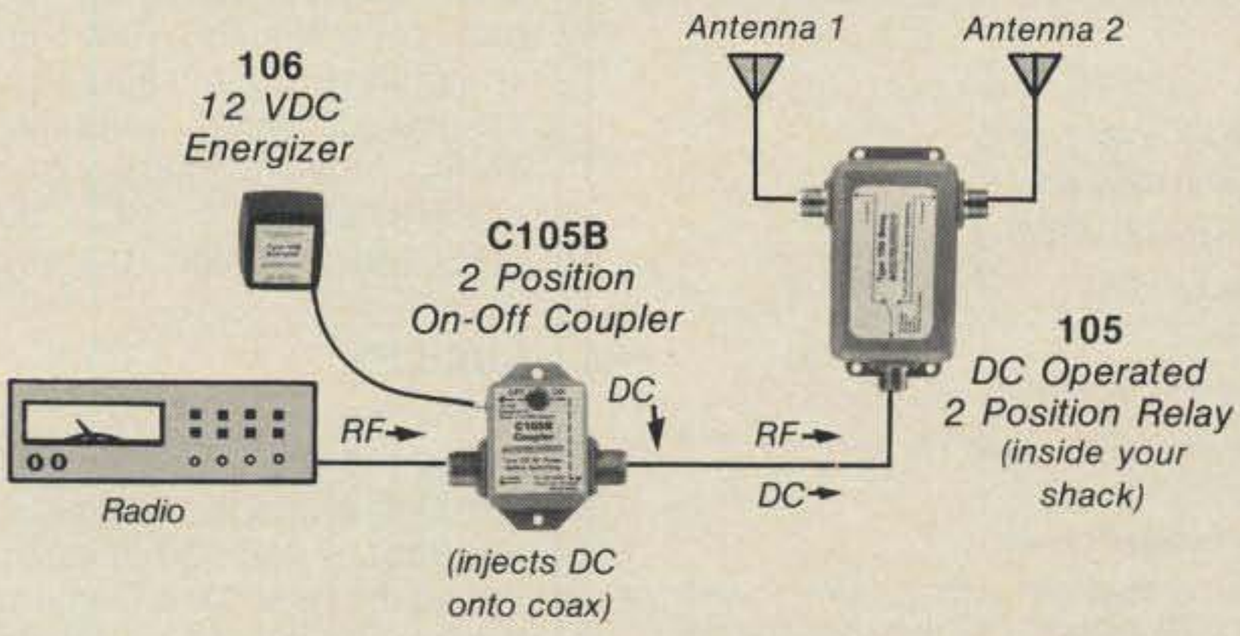

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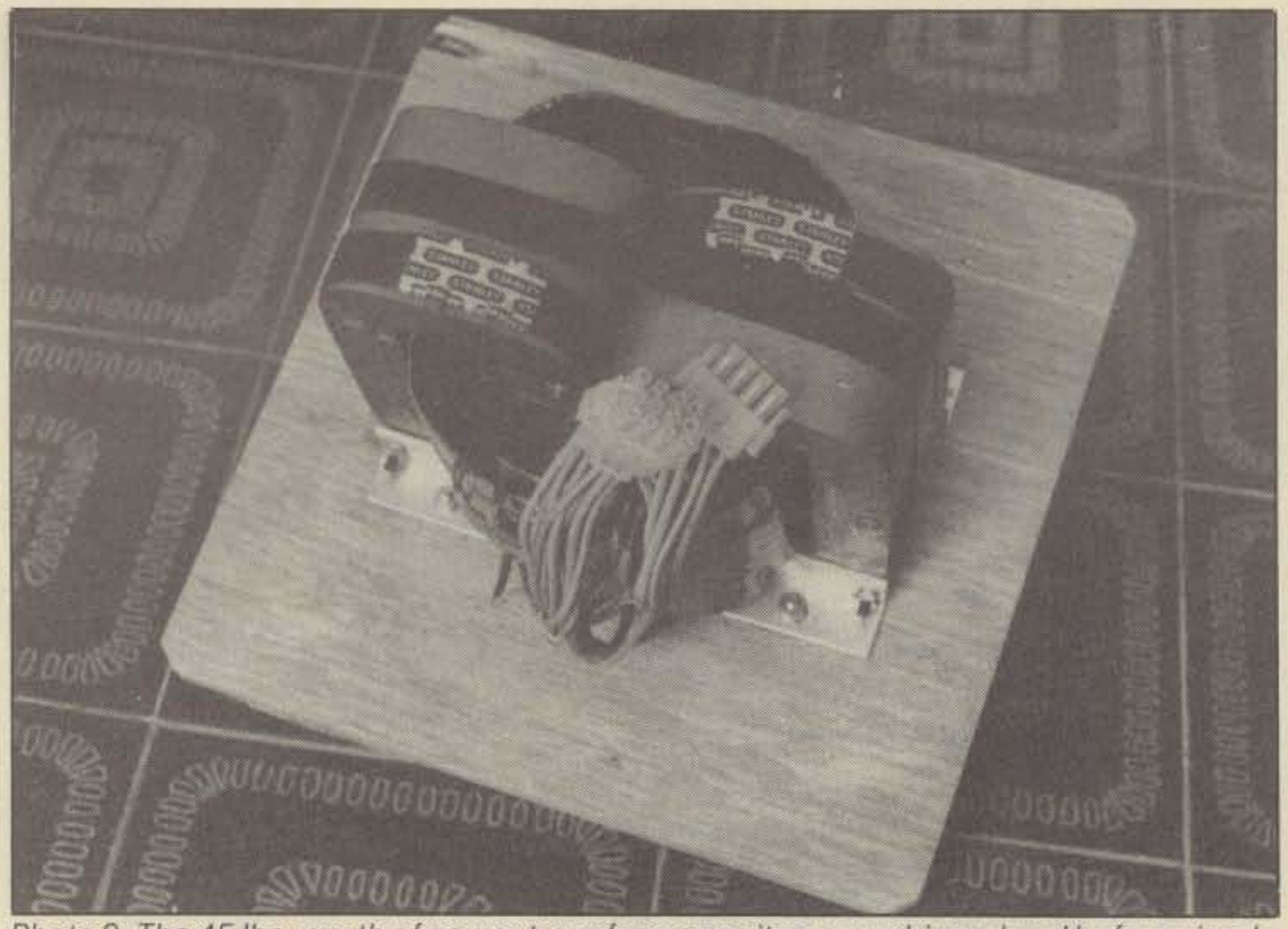

Photo 3. The 45 lbs. worth of power transformer as it comes shipped and before simple installation in the power-supply enclosure.

supply and amplifier so the latter can be conveniently located in a station setup. All operating controls and indicators, by the way, are on the amplifier so the power supply can be placed out of view. The power supply is wired for a 220 VAC line since it can draw as much as 4 kw of line power; 120 VAC operation is not recommended, but possible.

General

Table I shows the specifications for the Titan. Before going into an overview of its features, one might note the power input figures *vis-a-vis* the sizes and weights for the power supply and amplifier. The Titan packs a lot of RF power into small, relatively light-weight enclosures. The amplifier enclosure, for instance, weighs less than many transceivers. The reason this can be done is due primarily to the usage of the modern Eimac power tubes and, to a lesser degree, to a modern power transformer and compact filter capacitors in the power supply.

The Titan has a maximum SSB/CW power input of 3 kw (2 kw in continuous service) and requires less than 100 watts drive over its operating range. The latter encompasses all of the presently available bands authorized high-power operation, including 160 meters, although a 10 meter modification has to be installed to allow operation on that band. Ten-Tec has stated that it will make information available on use of the Titan on the 10, 18, and 24 MHz bands when linears are allowed on those bands. Full QSK (break-in) operation is possible at keying speeds up to at least 50 wpm. With an efficiency of 50–65%, the Titan will develop the full, legal 1500 watt output level in any mode. The input and output impedances are the standard 50 ohms. IMD products are rated at −35 dB, and harmonic rejection is rated a very respectable −50 dB.

In order to monitor various electrical parameters, the Titan uses an interesting combination of conventional metering and LED indicators. One meter is dedicated to reading plate current only. The other meter can be switched to read plate voltage, grid current, forward power, or reflected power. There are LED indicators for "overdrive," "operate," "stand by," or "wait." A 10-element LED bargraph display indicates peak power output continuously. The controls are straightforward and simple and, besides the meter switch, comprise the bandswitch, tune and load controls, and rocker switches for "on/off," "standby/operate," and "low/high" plate voltage.

SPECIFICATIONS
MODEL 425 TITAN AMPLIFIER

BAND COVERAGE: 1.8-2.0, 3.5-4.7, 5.0-8.0, 9.0-15, 19-23 MHz. (Export model provides coverage to 29.7 MHz.)
MAXIMUM POWER INPUT: 3 KW, 2 KW CCS.
DRIVING POWER REQUIRED: 100 watts, maximum, 65 watts typical.
EFFICIENCY: 50-65%, depending on load, frequency and drive level.
INPUT AND OUTPUT IMPEDANCES: 50 ohms unbalanced, VSWR 2:1 or less.
DISTORTION: −35 dB from 1 KW PEP rf output level.
HARMONICS: −50 dB, typical.
CW BREAK-IN: High speed QSK capability when using a QSK exciter.
TUBE COMPLEMENT: Two Eimac 3CX800A7 ceramic air-cooled triodes in grounded grid.
TUBE PLATE DISSIPATION: 1600 watts.
COOLING: Ducted forced air, vertical exhaust, using centrifugal blower.
METERING: Full time plate current. Switch selected plate voltage, grid current, forward power or reflected power. Peak power indicated on a 10 element LED bar graph display.
AUTOMATIC LEVEL CONTROL: Negative-going, adjustable threshold.
STATUS INDICATORS: Overdrive, Standby, Operate, Wait.
PRIMARY POWER: 220-250 volts @ 20 amperes, maximum.
TRANSFORMER RATING: 2.0 KVA CCS.
PROTECTION: Primary line fuses. Plate current fuse. Ac and high voltage interlocks engaged when cover is removed.
FRONT PANEL CONTROLS: Power ON-OFF; Mode (Standby-Operate); HV (High-Low); Plate Tune; Loading; Band Switch; Meter Switch.
SIZE: Amplifier: 5¼" H x 15¼" W x 15" D. (13.5 x 39 x 38 cm.)
Power Supply: 8¼" H x 13⅜" W x 10¼" D. (21 x 34 x 26 cm.)
WEIGHT: Amplifier: 17 lbs. (7.7 kg.)
Power Supply: 45 lbs. (20 kg.)

Table I– Specifications of the Ten-Tec Titan.

Circuitry

The basic circuitry of the Titan is shown in fig. 1. Two 3CX800A7 tubes are used in a grounded grid circuit. The tubes are directly cathode driven, hence eliminating the need for a filament choke, and have a tuned input circuit for each band. The plate output circuit is a double section P-L configuration which has two advantages—it increases harmonic reduction compared to a simple Pi-circuit and reduces the need for very large value loading capacitance values on the lower frequency bands. On the other hand, it does raise the voltage rating required for the variable loading capacitor in the Pi-L network and that is why, as one might note from some of the photographs, the loading capacitor has almost as wide plate spacing as the plate tuning capacitor. The plate voltage can be selected to

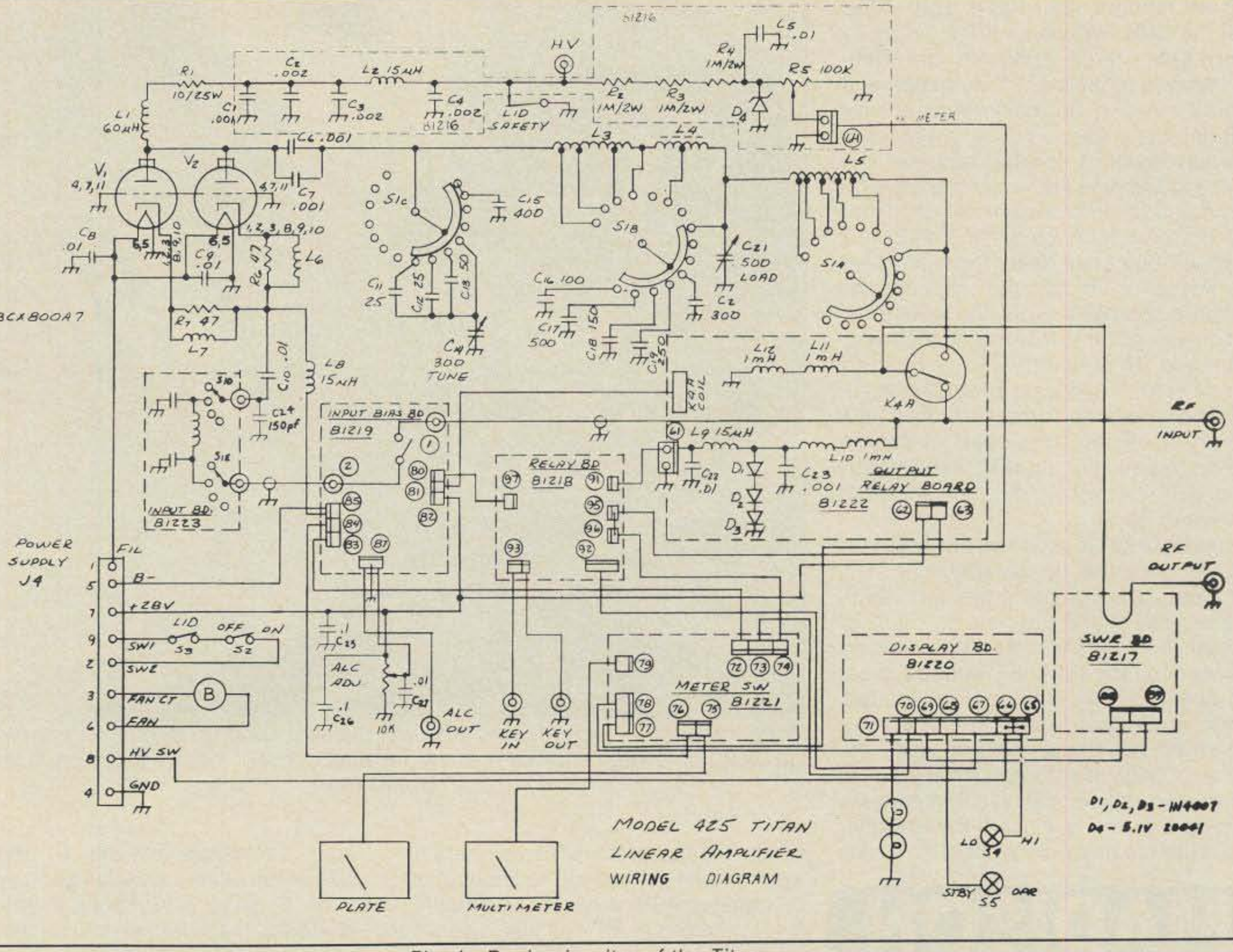

Fig. 1– Basic circuitry of the Titan.

be about 1700 volts (600 ma plate current) for 1 kw input or 2500 volts (1.2 ampere plate current) for 3 kw input. Two relays are used for antenna switchover in order to provide full QSK operation. Relay K4A is a special high-speed (2 ms switching time) vacuum relay which controls the main RF path while a smaller relay in the input bias board disconnects the tuned input circuits from the antenna line on receive so the circuits do not desensitize a transceiver's front end. The grids of the power tubes are biased with +8.5 volts during operation and with +28 volts during receive periods for cut-off. The rest of the circuitry—which provides for various control, status monitoring, and safety features—is spread out on a number of small PC boards. All of the design is really quite interesting and sophisticated, but just a few highlights concerning the ancillary circuitry will be covered.

The full QSK capability of the Titan requires that very fast transmit/receive relay switching be done while preventing the relays from "hot" switching (switching while RF energy is present). The speed with which the relays operate is largely a function of the relays' own physical and electrical characteristics. The vacuum relay used in the Titan will switch

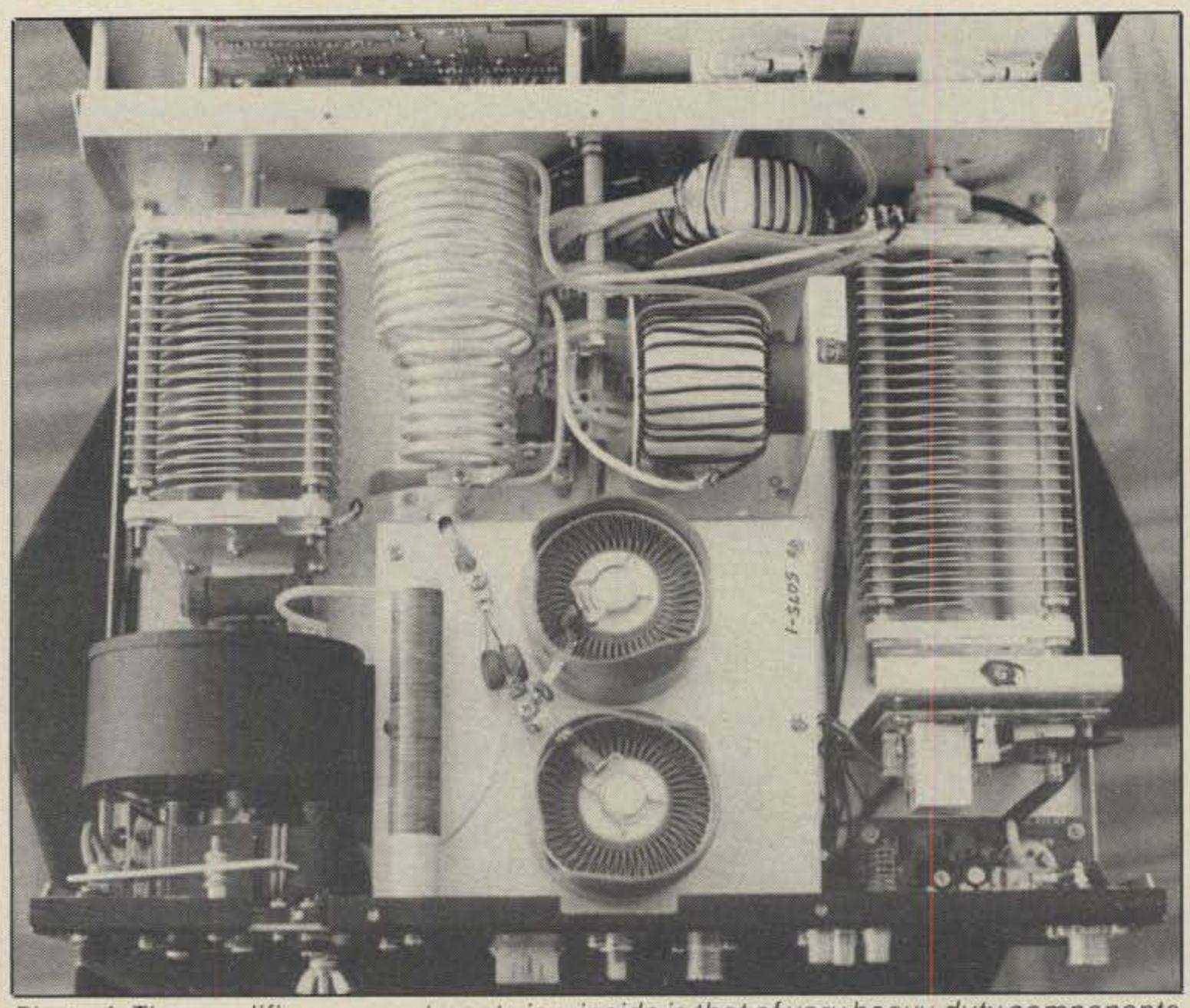

Photo 4. The amplifier compartment view inside is that of very heavy-duty components all centered around the elevated chassis for the two 3CX800A7 power tubes.

in 2 ms, and the other relays associated with the QSK feature switch in no more than 0.5 ms. The prevention of hot switching involves a chain of RF detection and control circuits. Basically, the circuitry first detects if there is drive present *before* key down. If not, the amplifier will switch to transmit and wait for excitation (keying). If drive is present, the amplifier will not switch to transmit. The circuit secondly detects if drive is present *after* the key is up. If not, the amplifier will switch to receive. If excitation is still present, the amplifier will remain in the transmit mode. The circuitry involves a number of steps in which several transistor switches are turned on or off or inhibited. However, much of the heart of the circuitry centers around the circuitry connected to the "input RF" jack shown to the left in fig. 2.

The base of Q4 receives control information from the RF detector (C4, D7, D10, etc.) and from a control line which has sensed if the key line is open or closed. If RF drive is sensed as being present, but the key line is sensed as being open, Q4 will clamp Q5 to ground, which in turn will prevent the closing of the transmit/receive relays. (K4, the vacuum relay, in fig. 1 and K3 in fig. 2). If RF drive is not sensed as being present, and the key line is closed, the amplifier will switch to transmit. When the key line is opened after transmitting a character, a second RF detector (C5, D8, D9, etc.) determines if RF drive is still present. If so, it clamps Q3, in a similar manner to which Q5 was clamped before, and the rest of the circuitry prevents the transmit/receive relays from opening. If RF drive is sensed as not being present, the transmit/receive relays are allowed to open. Incidental, but still an important part of the overall switching action, is Q1 in fig. 2, which in turn controls the zener diode D2. In the transmit mode this diode establishes the operating bias for the amplifier tubes while in the receive mode Q1 opens and +28 volts cutoff bias is applied to the tubes.

The foregoing is a very simplified ex-

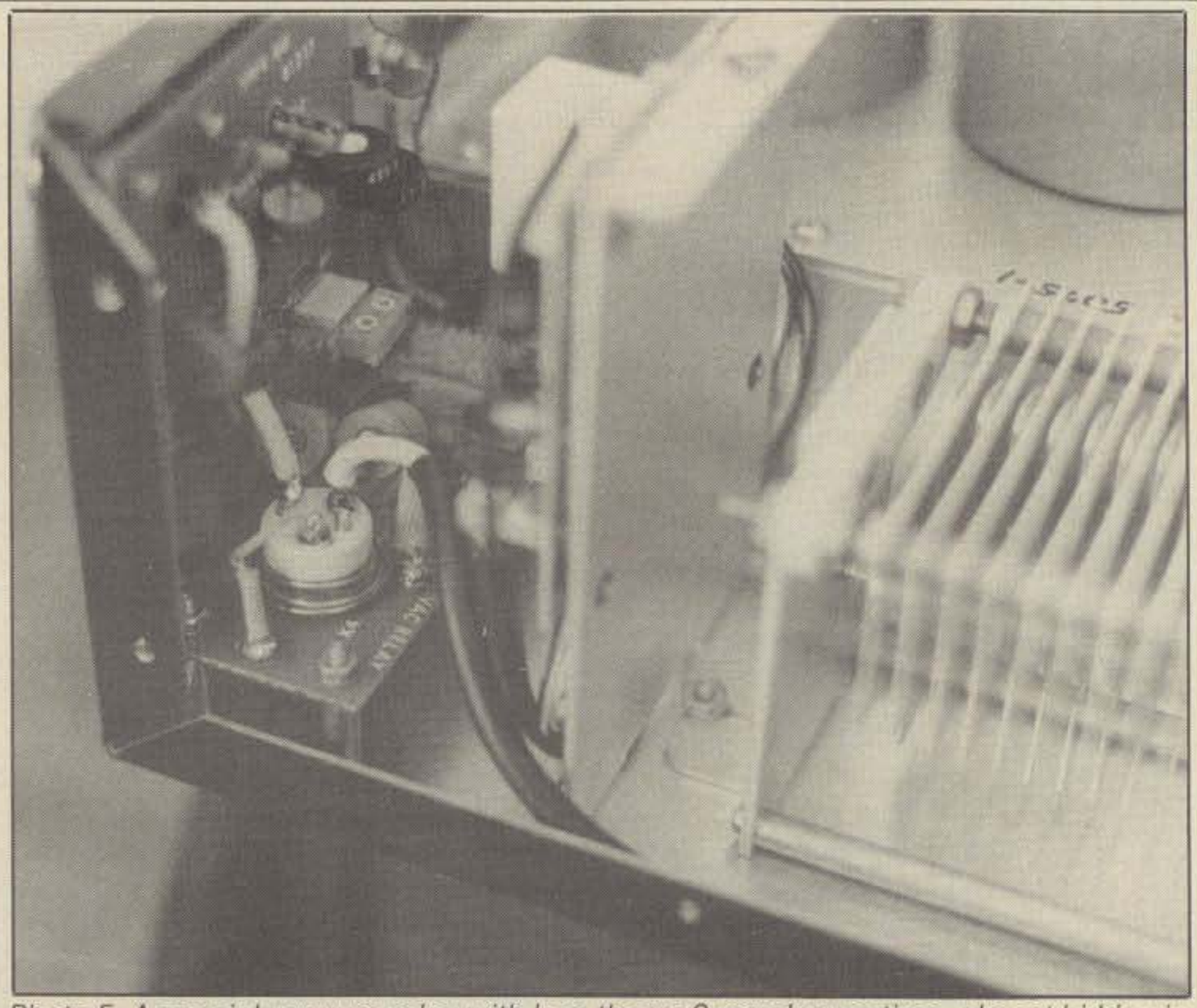

Photo 5. A special vacuum relay with less than a 2 ms closure time, almost hidden in the back of the Titan enclosure, is a main component of the full QSK system featured by the Titan.

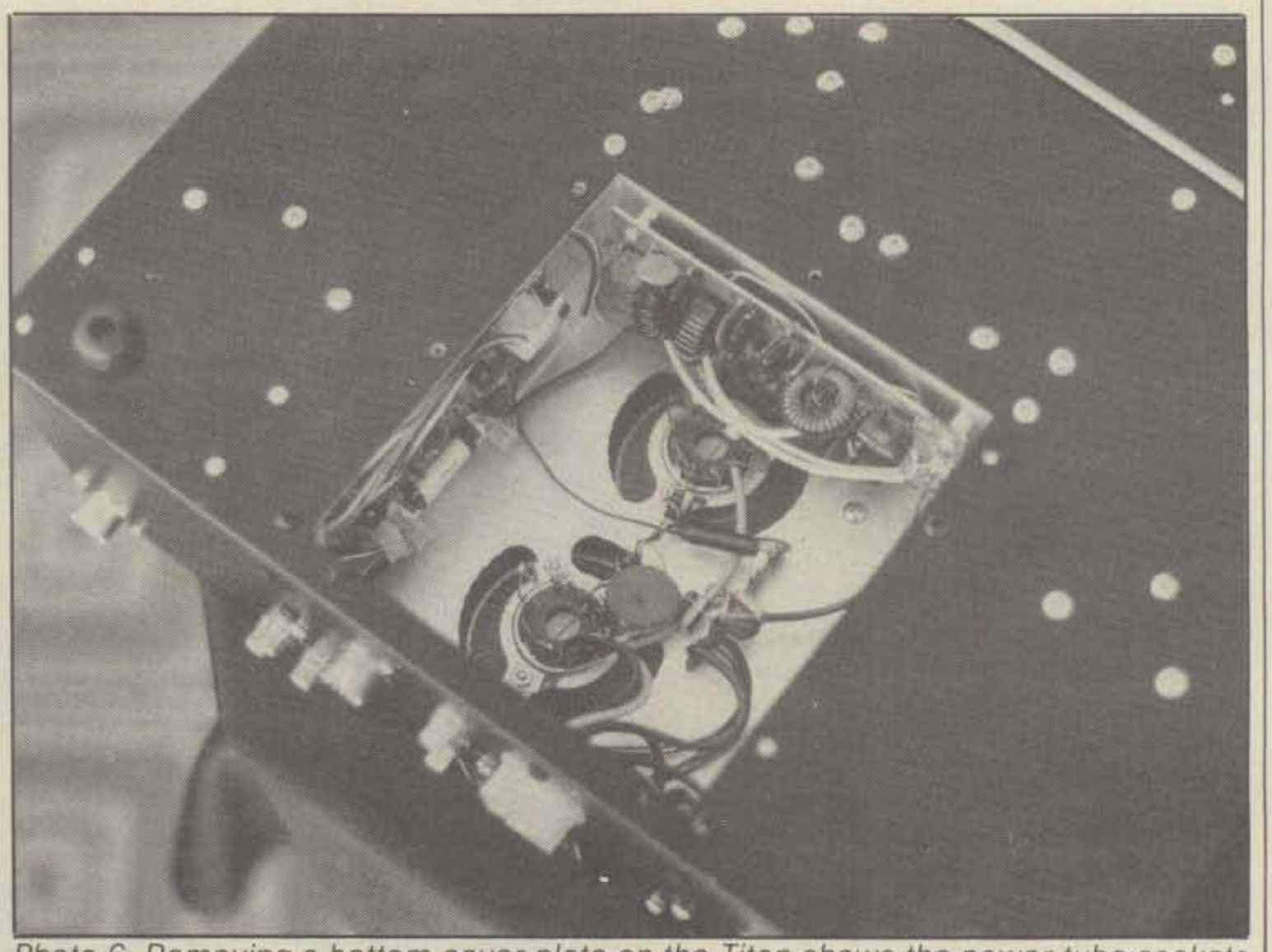

Photo 6. Removing a bottom cover plate on the Titan shows the power-tube sockets and the low-pass tuned input circuits. Air-pressure input from the fan shown in photo 4 would be from the right.

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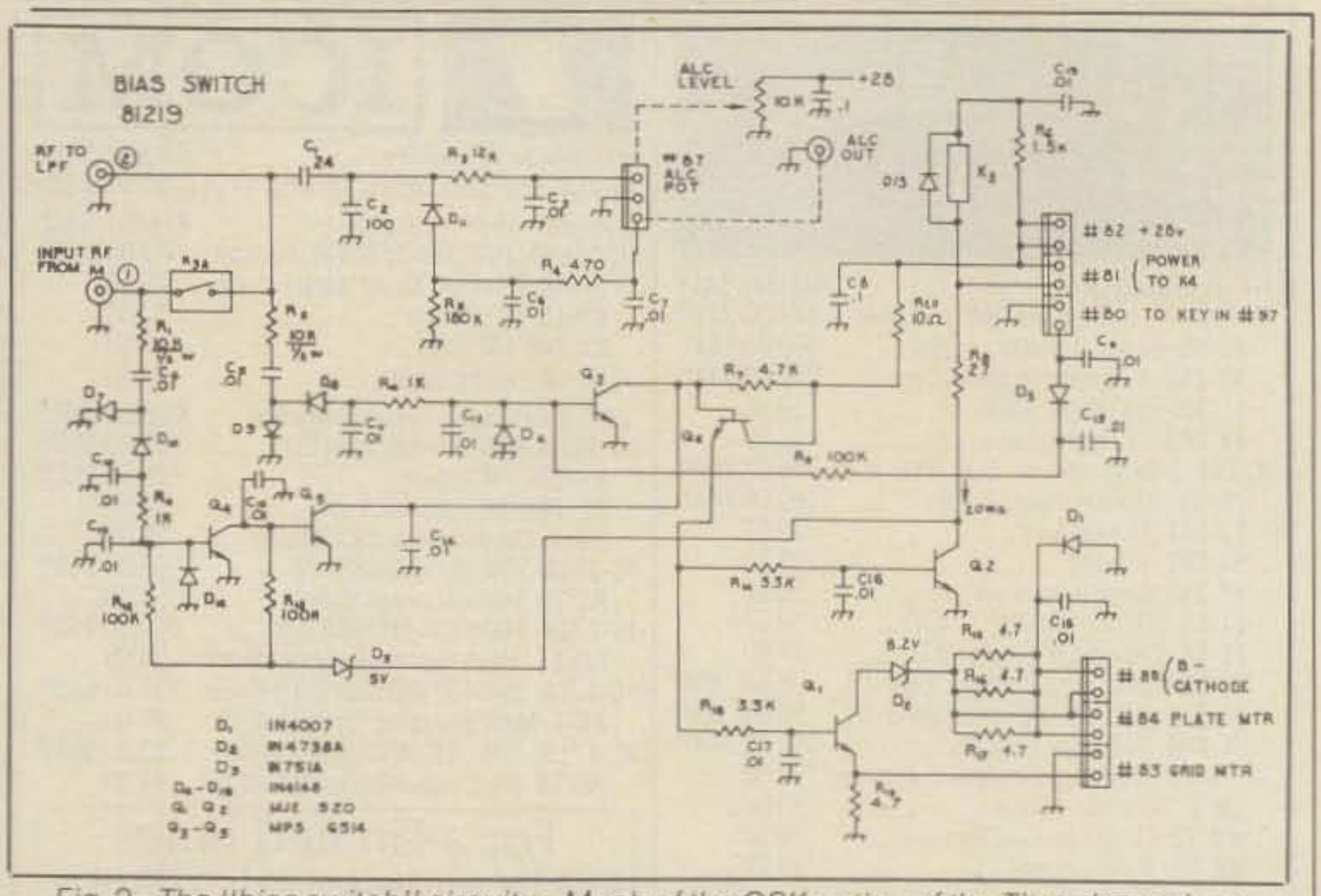

Fig. 2– The "bias switch" circuitry. Much of the QSK action of the Titan depends on circuitry on this board.

planation of some circuitry which Ten-Tec takes a page and a half in the Titan manual to explain. Nonetheless, it gives one some idea of the switching actions involved. The great trick, of course, is to arrange the switching circuitry and choose components so no unnecessary time delays are introduced by the QSK system. As far as the Titan is concerned, the limiting factor seems to be the closing time of K4 (about 2 ms). The limiting factor in a real station setup will most likely be the keying characteristics of the excitation source (Ten-Tec Triton, Delta, Omni, and Corsair transceivers match the QSK speed of the Titan).

Two other small circuits are of interest. Fig. 3 shows the SWR circuitry. It is of straightforward design, but uses a relatively small number of parts to drive a wattmeter with 2.5 kw forward and 250 watt reverse power scales. Because of the 10:1 ratio of the power scales, a quick check that the SWR is at least below 1:2 is always possible, since for that condition the overall meter deflection in the reflected position must only be less than the deflection in the forward position (once the scales on the meter have been calibrated). The outputs **FWD MTR** and **REV MTR** shown in fig. 3 go directly to the meter's forward/reverse selector switch. The outputs are not used to trip the amplifier off in case of high SWR. The output shown as **PEAK M** in fig. 3 goes to the input shown as **FWD** in fig. 4. This input drives the LED peak power bargraph (D5 to D14) via the LM3914 bargraph driver IC. Again, the circuitry is basically simple but very effective. The bargraph display has nine green segments and one red segment. R1 is calibrated such that the *red* segment, D14, lights when the peak output power sensed is 1500 watts.

Although a panel meter reads the grid current directly, an LED indicator marked

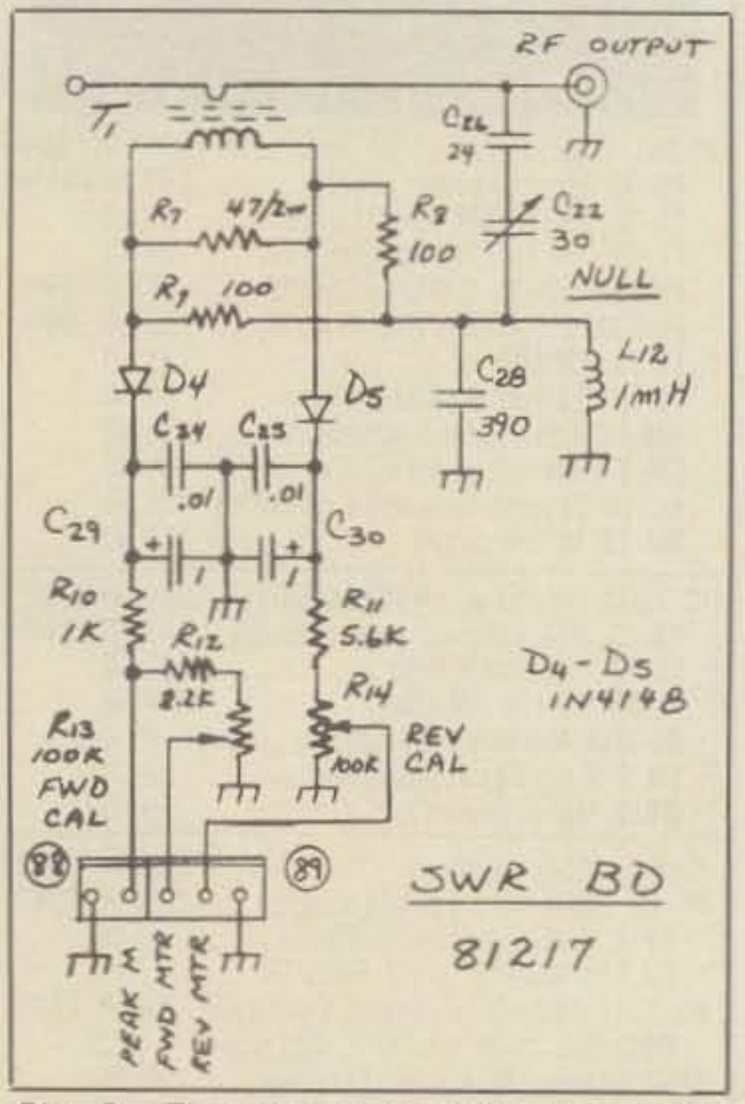

Fig. 3– The simple but effective SWR/power detection circuitry. T1 can be seen a bit next to a vacuum relay in one of the photographs. It's a simple toroid core transformer.

"overdrive" warns of excessive peak grid current. The circuitry is not shown, but basically it uses a comparator IC which senses the voltage across a 4.7 ohm resistor in the grid bias return line to ground. The comparator is biased to drive the LED when the grid current reaches 120 ma.

The diagram of the power supply is shown in fig. 5. The high voltage supply utilizes a Hipersil core transformer rated at 1.8 KVA CCS. The primary has two separate 120 volt windings but it is prewired only for the standard U.S. 117-neutral-117 system or overseas 230 volt operation.

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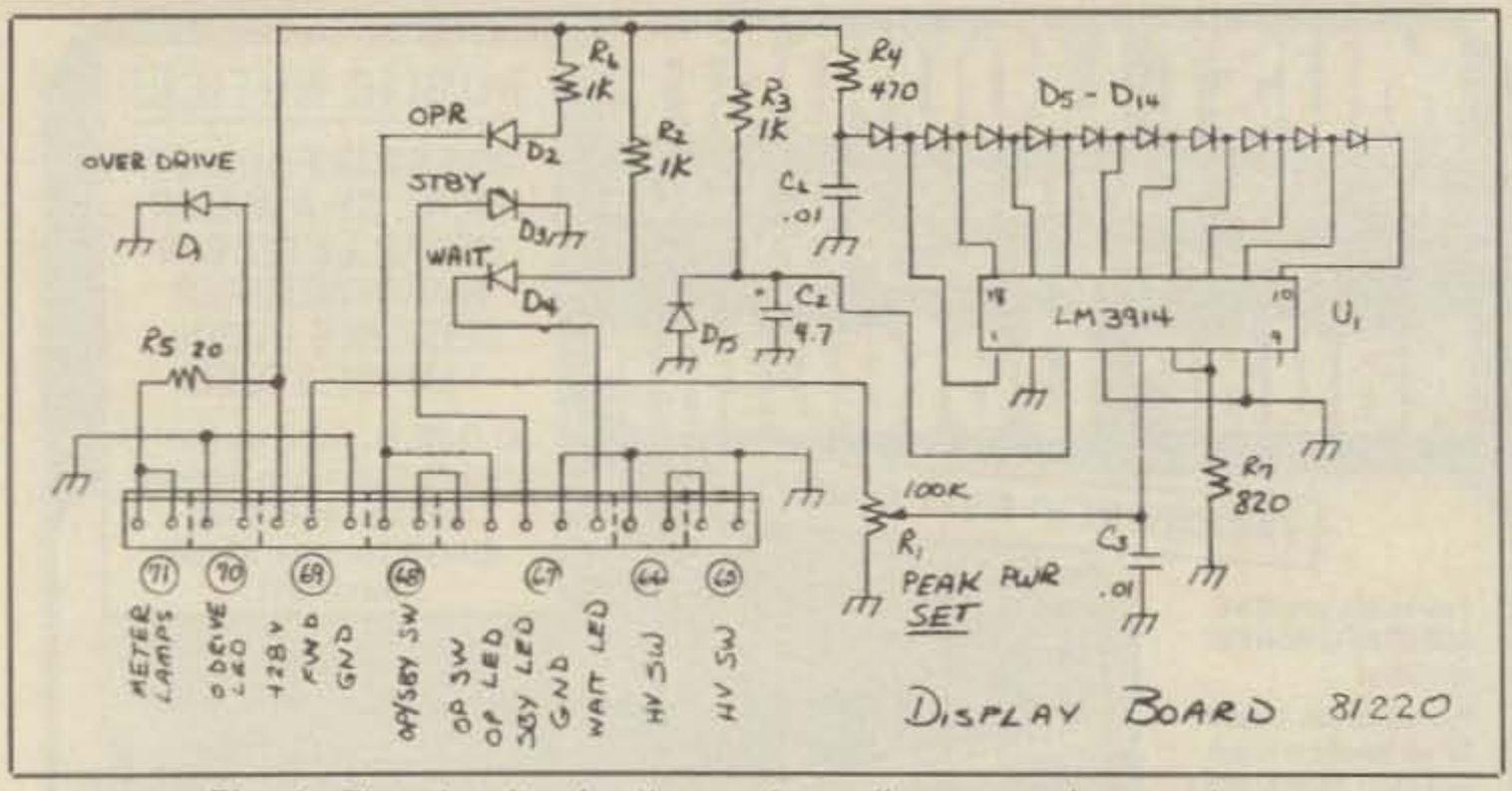

Fig. 4– The circuitry for the peak-reading power bargraph.

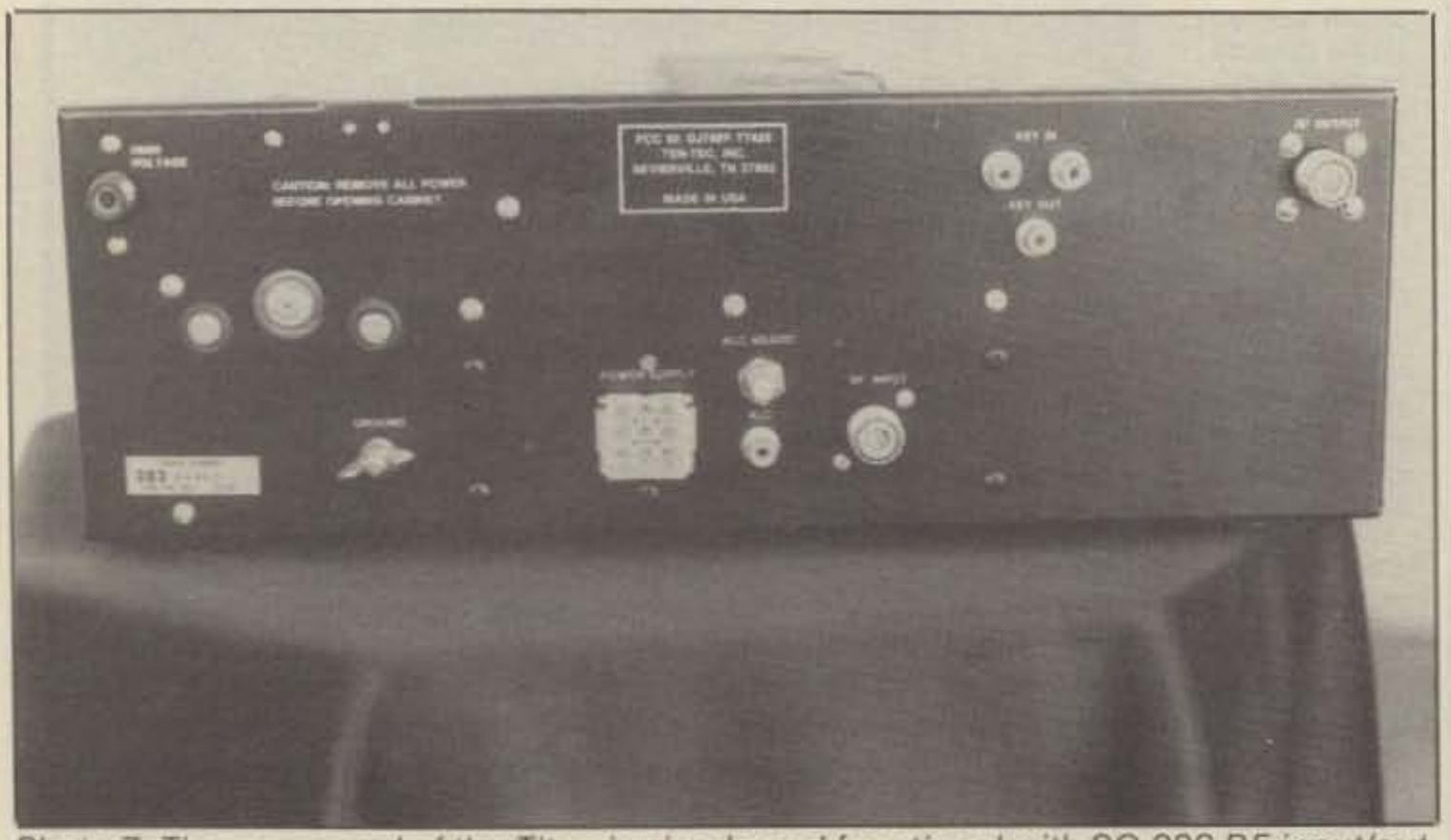

Photo 7. The rear panel of the Titan is simple and functional with SO-239 RF input/output connectors.

The high-voltage winding is connected to a full-wave bridge rectifier, not a voltage doubler, and the series bank of 400 mF capacitors provide for an effective 50 mF of output filtering. A low-voltage tap on the high-voltage winding is relay selected, and separate 20 volt and 13.5 volt windings provide power for the control circuitry and relays and the amplifier tube filaments. There is an interlock switch and crowbar shorting switch, as on the amplifier unit itself. The former acts to disable the turn-on of AC power to the supply when its cover is removed, while the latter just plain shorts the high voltage to ground both to discharge the capacitor bank and to act as a double protection in case the interlock circuitry fails. In case of a "crowbar" operation, D13 and R1 in fig. 1 limit the surge current so no power supply components are damaged.

Construction

The photographs tell most of the story about the construction of the Titan.

The power supply is housed in a separate enclosure and has no controls. The filter capacitor bank is associated with one main PC board, while the rectifier components are located on another PC board. The construction is very neat and standard, and heavy-duty components are used throughout.

Looking inside the amplifier compartment, one can see the general layout used with the tuning and loading capacitors towards the outside edges, the coils for the Pi-L output network in the center, and the two power tubes on a separate, raised chassis assembly. The latter is pressurized by a squirrel-cage fan which forces air into the side of the chassis enclosure and which exhausts upward through the tube anode fins. Insulated chimneys around the anode of each tube channel the air flow. The air intake is from the sides, not the bottom, of the amplifier enclosure. A small PC board located near the output coaxial connector contains the vacuum relay for antenna transfer. Looking at the bottom of the amplifier, with the cover plate of the tube compartment removed, one can see the tuned input circuitry. The back panel of the amplifier contains regular SO-239 connectors for RF in/out, phono-type connectors for key line functions, and a special high-voltage power-supply connector. The construction appears to be very sturdy, and there is a generous use of machine screws where some manufacturers might have used rivet fastenings, plenty of teflon insulation around coil tap wires, etc. The bandswitch is a heavy-duty, ceramic insulated type.

PTT and CW operation are about as simple as can be imagined and are shown in

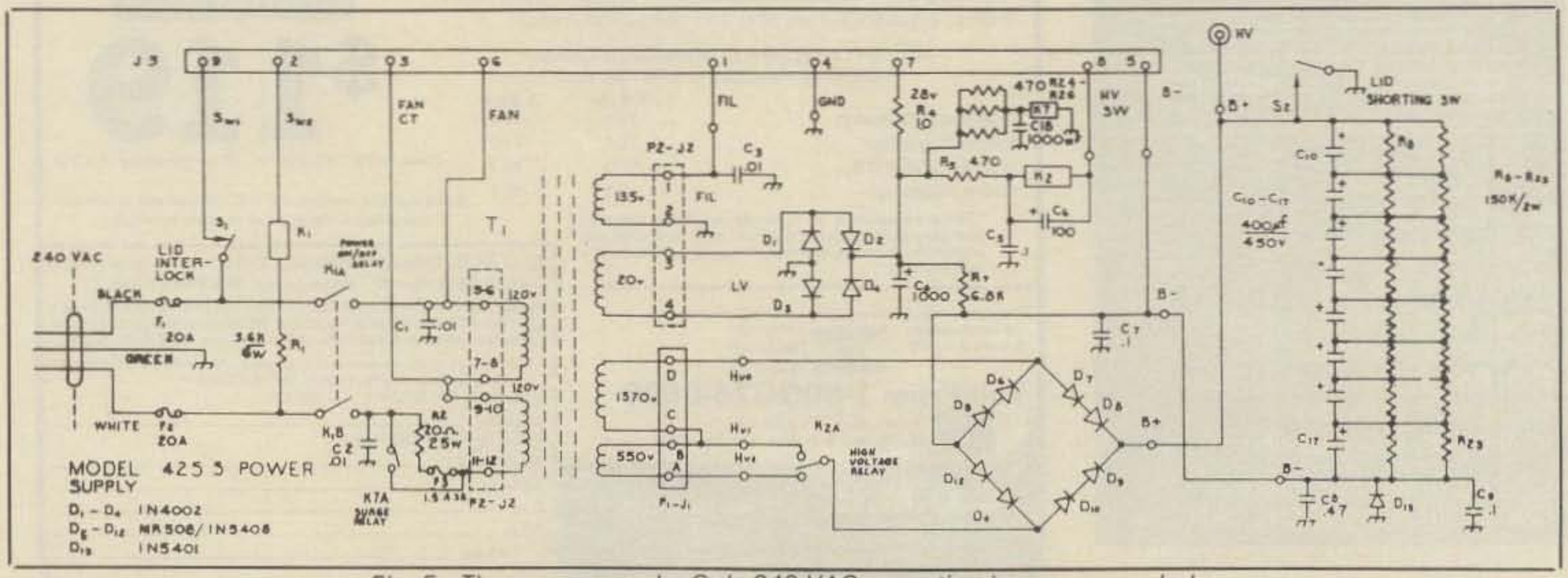

Fig. 5– The power supply. Only 240 VAC operation is recommended.

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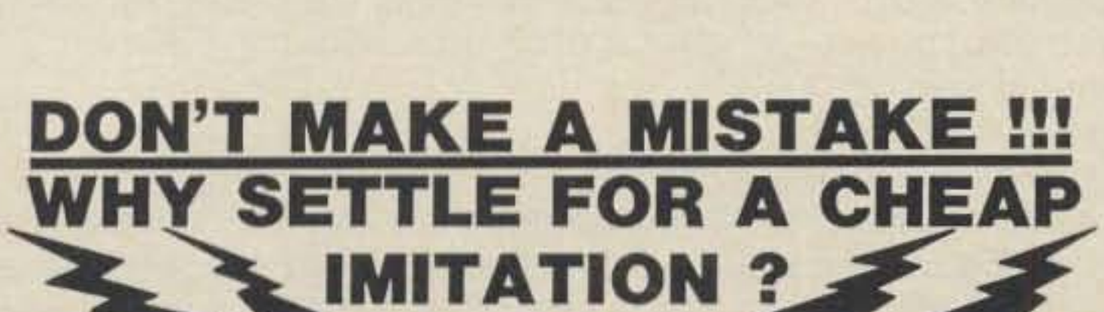

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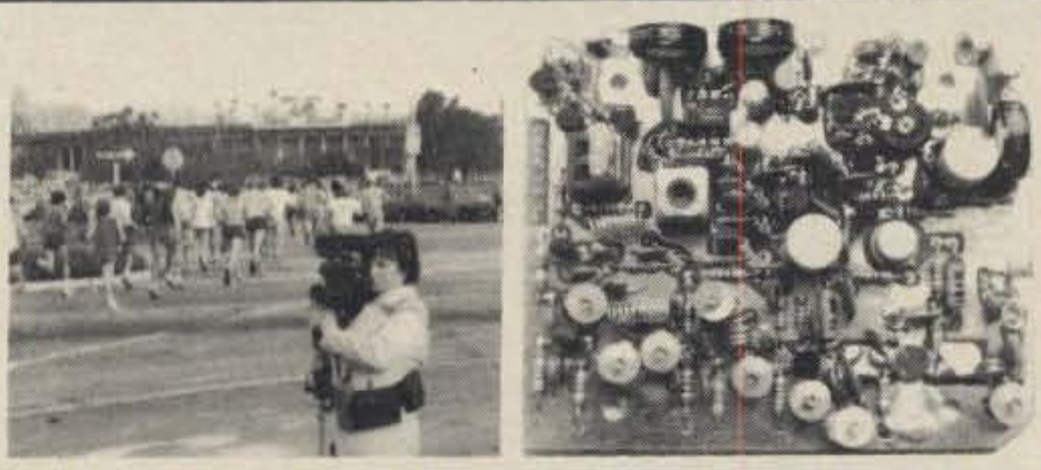

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fig. 6. The dotted line showing ALC interconnections is **not** necessary in the case of solid state transceivers. The ALC interconnection may only be necessary with tube-type transceivers. In this case the Titan is designed to supply a negative-going control voltage to the ALC **input** on such a transceiver. For QSK operation, the interconnection scheme of fig. 7 is used. In this mode the amplifier itself, not the exciter, is actually keyed. The amplifier QSK system keys the exciter after ensuring that the amplifier's relays cannot be hot switched. The Titan manual supplies full information on the interconnections, but it is just interesting to note how simple it is to accomplish.

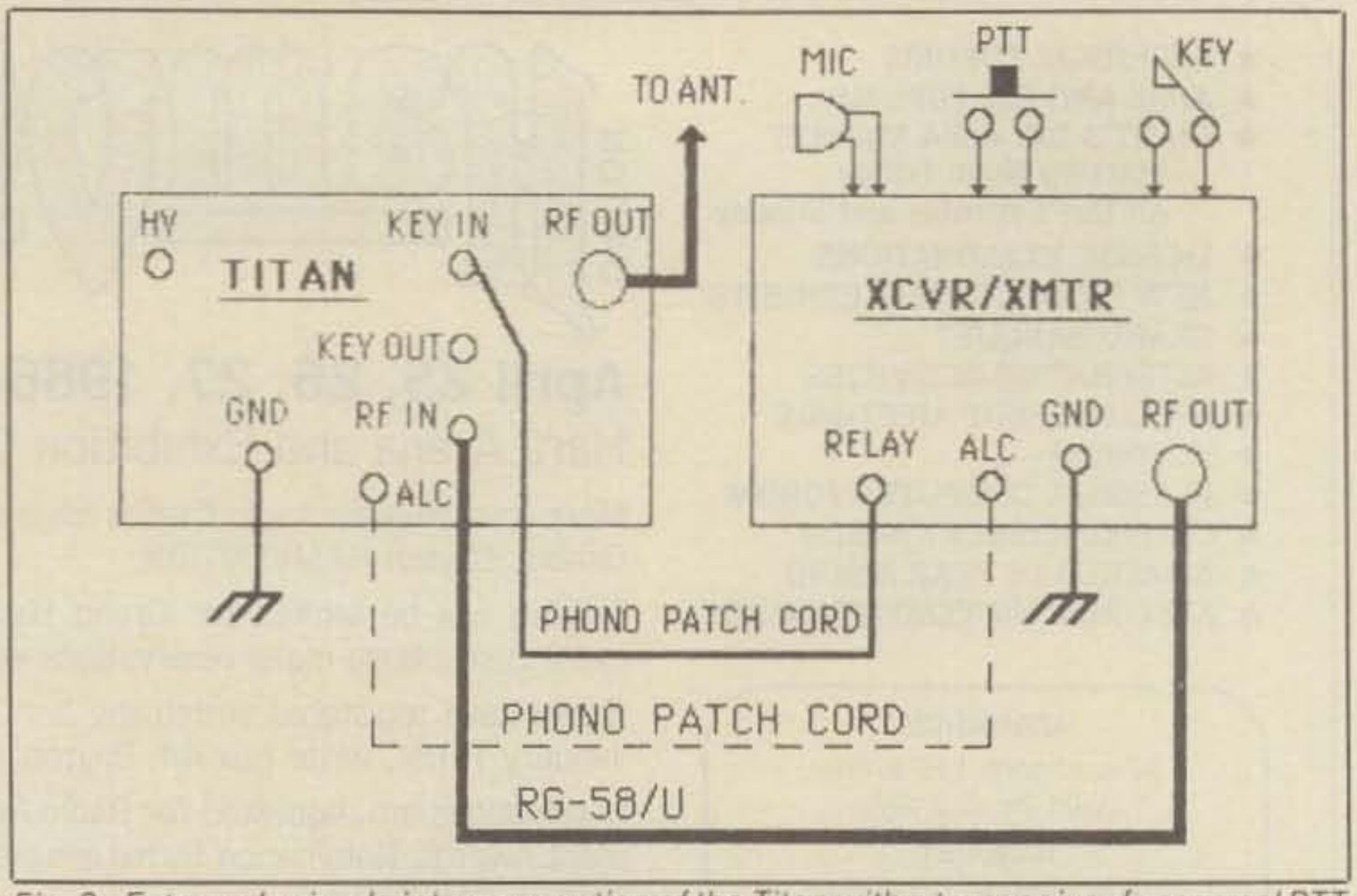

Fig. 6– Extremely simple interconnection of the Titan with a transceiver for normal PTT SSB/CW operation. The ALC connection is not required with solid state transceivers.

Tuning and Operation

Tuning of the Titan is greatly facilitated by the vernier drives employed on the loading and tuning controls and the combination of the analog meters and the LED bargraph power display. One doesn't go through the usual "tune for plate current dip and adjust the load control" routine. With the high-voltage switch in the low position, drive is applied, and the load and tune controls alternately adjusted so the power output peaks as viewed either on the analog meter (set to forward power) or on the LED display. After a bit of practice it becomes extremely easy to tune the amplifier just watching the LED display, because it is so responsive to changes in the control settings. In fact, I would rate the Titan as the easiest tube-type linear to tune of all the manually tunable linears available.

One can operate the amplifier in the low power mode (750 watts output) continuously (the maximum time tested was 30 minutes) for RTTY/SSTV or switch the high-voltage switch to high, repeak the controls, and operate any mode in intermittent service at 1500 watts peak output. The amplifier was operated many hours at a time in SSB and casual CW at its maximum rated power output level, and there never was any sign of overheating. The last, red-colored segment on the LED bargraph display lights when one just reaches 1.5 kw output and is a very handy indicator. The same is true of the handy red LED indicator for "overdrive." One doesn't always remember to check the grid current when making a quick QSY or band change, and the LED gives a very quick warning in case of overdrive. As Ten-Tec emphasizes, if any operating fault is likely to be responsible for destruction of the power tubes, it will be excessive grid dissipation, although avoidance is easy by proper drive and loading adjustments.

The power output versus drive requirement for the Titan was found to be remarkably uniform over the 160–15 meter bands with only 60–70 watts for drive required for 1.5 kw output. The input SWR never exceeded 1:1.6. The analog meter wattmeter checked to be very closely calibrated. The LED bargraph peak wattmeter was a bit generous around the 500 watt output level, indicating more like 600 watts, but then checked out fine again at the 1.0 and 1.5 kw levels. The IMD products measured about −37 dB from 1.0 kw peak at 14 MHz. The harmonic output was not completely measured, but the claimed value of −50 dB appeared to be, if anything, conservative. As is true with almost any tube-type linear, the Titan is reasonably tolerant of small load SWR variations. It would work perfectly into a slightly changing antenna load at full power (e.g., SWR changing from 1:1.0 to 1:1.7 or so) under conditions where a solid state, high-power linear would shut down. The forced-air cooling system is very good but not perfect. There is some slight mechanical vibration to be heard besides the sound of pure rushing air. But, I do admit to being somewhat of a nit-picker on that sort of thing. I really think the blower motor should be separated from the amplifier enclosure, but that would necessitate another unbilical cord coming out of the amplifier, which most amateurs would not accept. In any case, the blower noise from the Titan is not objectionable for any sort of normal station operation including the use of high audio gain speech processors on SSB.

On-the-Air Results

When actually using an amplifier like the Titan, one does have to realize that one is dealing with **real** RF power. In the

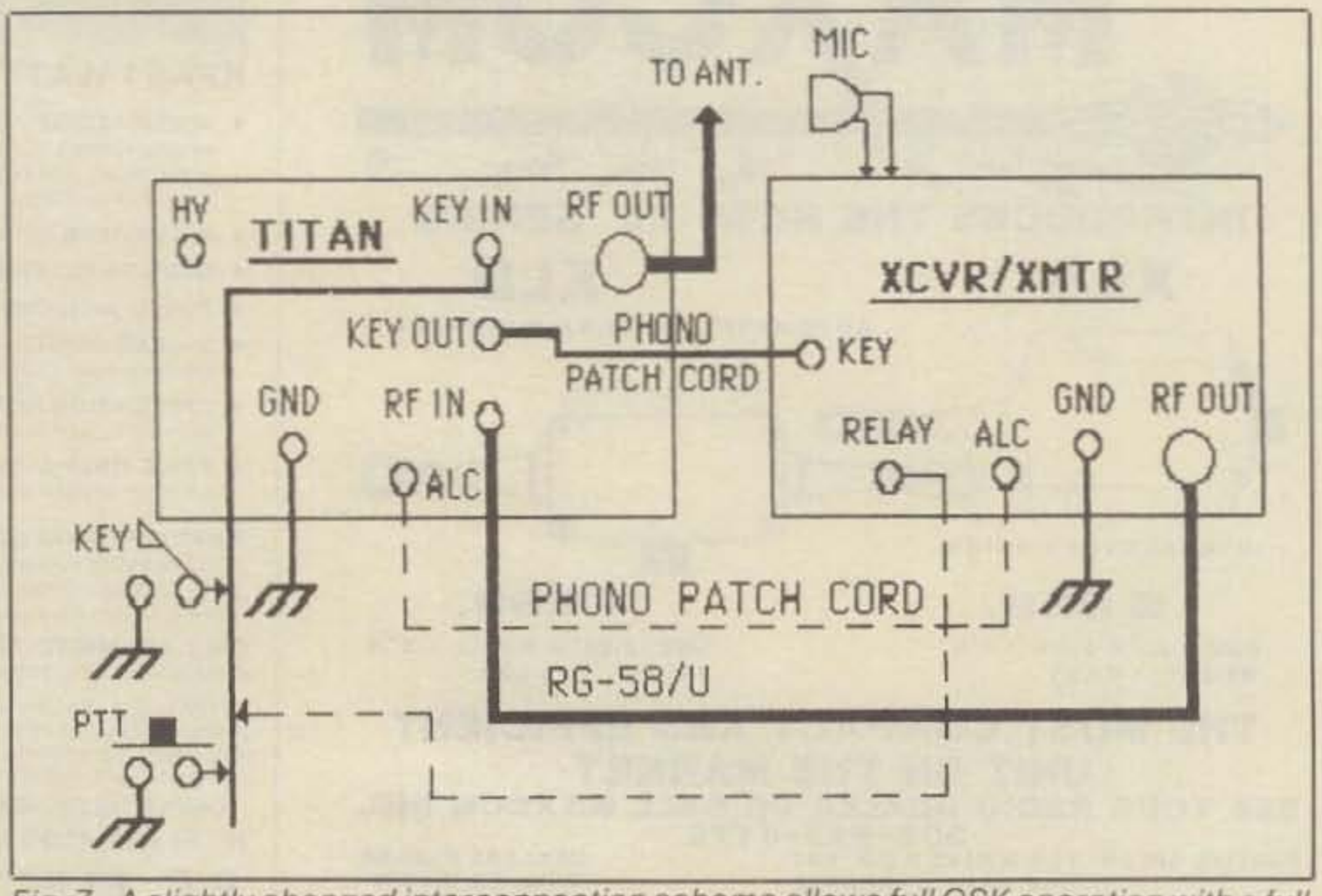

Fig. 7– A slightly changed interconnection scheme allows full QSK operation with a full QSK transceiver.

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No - 45 - 46

course of testing and using the Titan, the oil was heated and bubbled out of a dummy load rated at a nominal 1 kw, and a balun rated to handle 1 kw was ruined. Also, one end of a 40 meter dipole was allowed to come too close to a concrete roof surface and RF burned a hole into the concrete. So, one does have to have an antenna system that complements the power level of the Titan if one is going to operate the linear at full power! If one does have such a complementary system, the on-the-air results can be most gratifying. Compliments like a "beautifully clean" signal and signal reports of S9 + 20 dB or even S9 + 30 dB were not uncommon. Stations could be worked through pile-ups under conditions that otherwise would have been hopeless. Of course, brute RF power is one thing, but real RF power that also delivers a clean signal is something else again.

The Titan delivers both a powerful and clean on-the-air signal to judge by all the reports received, and the reports, of course, confirm the various measurements made on the Titan. The full QSK capability of the Titan was not tested. It was used up to about 20 wpm QSK, and stations reported clean keying while received CW was not truncated in any way. Considering Ten-Tec's devotion to producing properly performing full QSK equipment, there is no reason to believe that the Titan could not operate QSK up to 50 wpm as specified.

The Titan is the sort of amplifier that one gets used to using and tends to leave on even when full power is not required. The latter is, of course, quite poor amateur radio practice, but the almost inevitable result of using a linear which one feels confident will loaf along for hour after hour at its full rated power.

Manuals and Warranty

The manual supplied with the Titan is very complete. It contains a full description of how to interconnect the amplifier, how to tune and use the amplifier, detailed discussions of circuit theory (particularly pertaining to the metering and QSK circuits), and complete circuit diagrams. A chart gives approximate control settings for each band. A particularly detailed "Maintenance and Troubleshooting" section goes through some 21 detailed symptoms of malfunction and, if encountered, what to do about it. It's hard to imagine that any user would encounter a problem that is not covered. The Titan comes complete with all the necessary interconnecting cables appropriate to most transceivers and even, as a nice touch, extra fuses and a set of hex wrenches so one can retighten the front-panel control knobs (presumably after a few years of vigorous use).

Ten-Tec provides a basic one-year warranty for the Titan which includes workmanship and material except for the power tubes. The latter are warranted directly by Eimac/Varian for 3,000 hours of filament "on" time with a prorated adjustment, in case of failure, from 300 to 3,000 hours. Ten-Tec supplies Eimac warranty forms for the tubes and offers to assist in any claim. It should be noted that the 3,000 hour warranty means that even if the amplifier is used for several hours of operation each day, the tubes are covered for almost three years of operation.

Summary

The Ten-Tec Titan is certainly not an inexpensive piece of equipment (amateur net $2685.00). However, it is good, honest value for the money if one really desires a full-featured, legal power amplifier of conservative design that should provide reliable service for a number of years with the guarantee that if something should go wrong, Ten-Tec is available to take care of the problem. The latter, by the way, is not just an empty suggestion. Ten-Tec's service and information people are readily available, very responsive, and quite knowledgeable. That has certainly been my personal experience over the past few years every time I have had contact with them. CQ

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

International Reply Coupons

International Reply Coupons (IRC's) enable the person sending a letter to a foreign country to prepay the postage of the anticipated response by enclosing an IRC. The foreign correspondent can exchange one IRC for postage to cover the first weight unit (usually 20 grams) for an unregistered international letter sent by surface mail. The exchange is accomplished at the foreigner's local post office. Amateurs frequently use IRC's to pay the mailing costs of QSL (confirmation) cards they want to receive from foreign (DX) amateurs they have contacted on the air. This article provides an introduction to these reply coupons, which are of great importance to the worldwide amateur radio fraternity.

History

The IRC was created at the 1906 Rome Congress of the Universal Postal Union (UPU), an international organization of the world's postal administrations, which is headquartered in Bern, Switzerland. IRC management responsibility was assigned to the International Bureau (IB) of UPU from the beginning of the IRC program, and the IB continues to oversee this program. The 1969 Tokyo Congress of the UPU decided that IRC accounting should be simplified and centralized between the UPU/IB and the participating countries, and this was accomplished at the 1974 Lausanne Congress. The changes adopted by the 1974 Congress resulted in a standardized IRC that superseded the reply coupons which existed prior to 1 January 1975.

Prior to 2 May 1959 IRC's cost 13¢ each. The price increased to 15¢ as of 2 May 1959, and it became 22¢ each as of 1 January 1971. The next cost increase occurred 5 January 1974, when the price became 26¢ each. As of 3 January 1976 the cost of a single IRC rose to 42¢. The price of an IRC has been 65¢ since 1 January 1981.

Previous IRC's

The name of the country of origin is printed on the old style (pre-1975) reply coupons, which were printed using green ink. The old coupons are no longer redeemable at U.S. post offices, which is probably the case in all post offices throughout the world. There is no time limit on the exchange of pre-1975 coupons; anyone who has them should return them to their correspondents for replacement or redemption at the foreign post offices which sold them.

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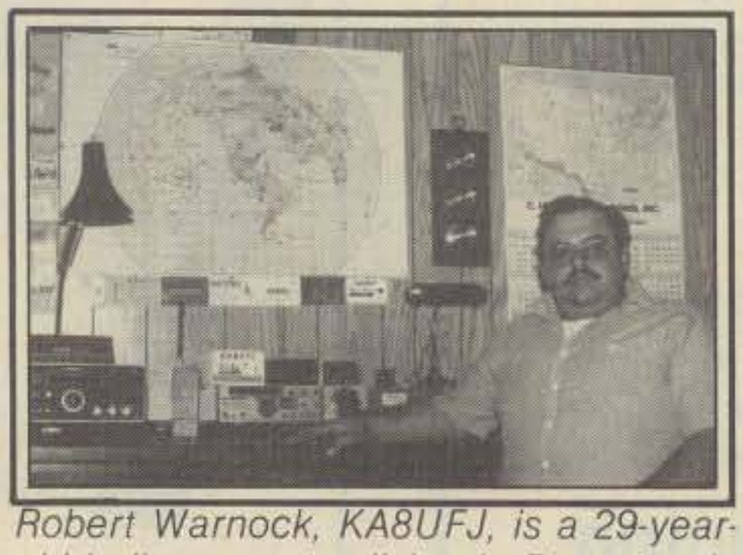


Robert Warnock, KA8UFJ, is a 29-year-old boiler operator living in Portsmouth, Ohio. He has been licensed since March 1984, and his contacts include amateurs in more than 40 states. He has also worked about 30 DX (foreign) contacts, with most of his operation on 15 meters. His station includes a Kenwood TS-430-S transceiver with a matching AC power supply and speaker, MFJ electronic keyer with a Bencher paddle, Tokyo Hy-Power antenna tuner, Barker and Williamson AV-25 vertical, 10 meter vertical, and a 40 meter dipole. Robert is a member of the Portsmouth Amateur Radio Club, and he enjoyed working their Novice position during the June 1984 ARRL Field Day Contest. He is also an ARRL member.

Similarly, reply coupons that used to be issued by the Postal Union of the Americas and Spain are no longer valid. These coupons are captioned "Cupon Respuesta America-Espanol," and they were printed using green ink. Such coupons should be returned to correspondents in their countries of origin for redemption through the foreign post offices which sold them.

Current IRC's

Since 1 January 1975 IRC's have been printed using blue ink. They are printed on paper that has the letters "UPU" in the watermark. The front side of the IRC tells its use in French; the reverse side provides the same information in Arabic, Chinese, English, German, Russian, and Spanish. There is no time limit within which post-1974 (current) IRC's must be exchanged.

The UPU IB receives IRC orders from UPU member countries. Such orders may include special data that is requested by the ordering country, such as the selling price. However, all IRC's are almost identical in appearance. Countries are allowed to add printing and distribution costs to the minimum fee established by the UPU. Consequently, IRC's do not cost the same in all countries; however, one IRC can be exchanged for the single-rate surface letter mail postage.

As of 1 September 1985 there are 168 member countries in the UPU. All of these countries redeem IRC's; however, postal services in several countries (including territories and possessions) do not sell IRC's. The postal services that do not sell IRC's are Anguilla, Antigua and Barbuda, Bahrain, Bhutan, Bolivia, Bulgaria, Cambodia, Cayman Islands, China, Cuba, Czechoslovakia, Dominica, Dominican Republic, Falkland Islands, German Democratic Republic, Grenada, Hungary, Iceland, Kiribati, Democratic People's Republic of Korea (North), Mongolia, Montserrat, Mozambique, Nepal, Pitcairn Islands, Qatar, Saint Christopher and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Solomon Islands, South Africa[1], Syria, Taiwan[1], Tonga, Turks and Caicos Islands, Tuvalu, Union of Soviet Socialist Republics, Vatican City State, Socialist Republic of Viet Nam, Virgin Islands (British), People's Democratic Republic of Yemen, Zaire, and Zimbabwe.

U.S. Postal Service and IRC's

Here in the United States the current selling price of an IRC is 65¢. IRC's can be requisitioned by all U.S. post offices, just as stamps are requisitioned. If you use IRC's, but your local post office does not stock them, let the postmaster know about your need for IRC's. U.S. post offices postmark IRC's in the lower left circle; this is done at the time they are sold. Post offices in some foreign countries do not add this postmark showing date and location of sale. The selling price is printed on each IRC that is sold in this country; some countries do not print the price on the IRC's they sell.

IRC Redemption

Regardless of purchase cost, each IRC is now redeemable in U.S. post offices at the rate of 37¢, which is the single-unit surface-mail rate required to mail

[1]*These countries neither sell nor redeem IRC's.*

George Beckley, KA8UEW, is a 37-year-old carpenter who operates from Hale, Michigan. He has been a Novice a little more than one year. George has made more than 1500 code contacts. He has worked amateurs in 49 states and 23 countries. He made 219 contacts during the 1985 ARRL Novice Roundup Contest. George has received five operating awards, one of which is the Ten American Districts certificate which I handle. His station includes a Kenwood TS-520S transceiver, Dentron RT-3000 antenna tuner, Heath HD-1410 electronic keyer, MFJ Signal II Code Filter, 15 meter Yagi-Uda, 40 meter dipole, and 80 meter dipole. George holds a 15 wpm ARRL code proficiency certificate and has probably upgraded to General by now.

a letter to any foreign country. U.S. post offices will issue stamps, metered postage, and/or embossed envelopes (including aerogrammes) in exchange for IRC's issued by foreign governments. Several IRC's may be exchanged to obtain the amount of postage needed to prepay for international airmail letter service. When a U.S. post office redeems an IRC, it must be postmarked in the unpostmarked (lower right) circle, regardless of which country sold it (including this country). U.S. post offices must not accept foreign-sold IRC's already bearing a USPS postmark.

The original purchaser (only) may exchange unused IRC's, bought from U.S. post offices, for postage stamps. This exchange rate is 1¢ below the purchase price printed on the IRC.

Usage

During 1975 through 1980 all participating countries obtained a total of more than 57 million IRC's, and exchanged a total of less than 32 million IRC's. With just 55% of these IRC's redeemed to buy postage, 45% of them remained in stock, were purchased without being redeemed, were lost, or were destroyed. The least number of IRC's ordered from UPU/IB (according to the figures I have) was just over one million (1910), whereas

almost 22 million IRC's were ordered during 1971.

Amateurs sometimes use IRC's as a form of international money. As an example, they may include several IRC's in a letter used to mail their QSL to a foreign amateur, intending that the extra IRC's be used to defray the DX operator's QSL printing costs or DXpedition costs. This practice has been known to cost foreign amateurs their licenses, since government officials understand what is happening and they sometimes decide to stop it. Be careful with regard to your use of IRC's; they serve us well, but we should not misuse them. The comments in this paragraph reflect my personal observations. It would be dishonest to ignore this practice of using IRC's as a form of international money. The U.S. Postal Service advises that amateurs should understand that IRC's are not a form of international money.

Except for comments regarding amateur radio uses of IRC's, the information in this article reflects data provided by the Public and Employee Communications Department of the United States Postal Service. I greatly appreciate their cooperation in producing this article, and it is hoped that you now know more about the IRC, which has long been an integral part of amateur radio.

U.S. QSL Service Ends

The following announcement has been received from USQS: "It is with deep regret that I must inform you that USQS will no longer accept QSLs or SASE's for processing. This decision has not been made lightly nor easily. We have tried to provide a needed service for the past five years, but the lack of volunteers and donations makes it impossible to continue. We are proud of the fact we received no compensation of any kind for our efforts, but it is impossible for one or sometimes two people to handle the workload and we cannot forward unclaimed cards without adequate donations. Too many hams expected us to handle 2–300 QSLs with no donation whatever nor even an SASE for returns! We are in the long, tedious process of returning all unused SASEs to their owners. Thank you for your support over the past five years.—73, KM7Z"

It is unfortunate that this service to our amateur radio fraternity has ended due to lack of support. I have receive domestic cards via USQS. They should be proud of the excellent job they did during the past five years.

FCC General/Technician Sample Written Examinations

If you have been studying the FCC element three material you must know to upgrade to Technician or General, you may want to test yourself to find out whether or not you are ready to take the Technician/General written test. I have a set of ten typical element three tests reflecting the current questions and answers, with the exact wording that is used throughout this series of exams.

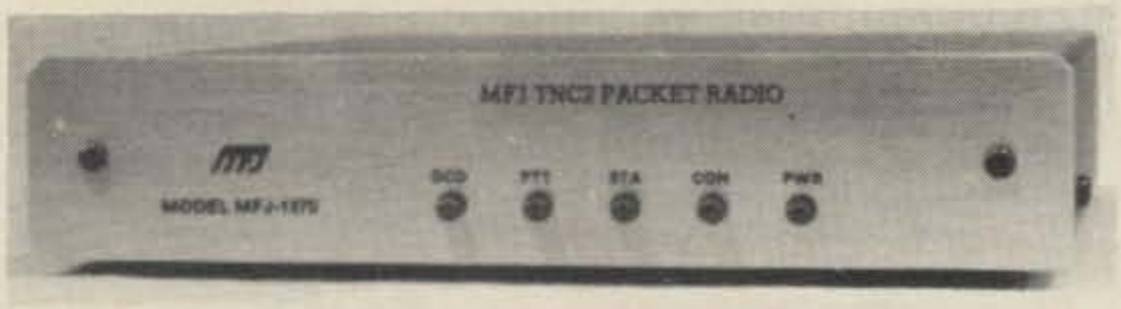
A single set of these ten tests is available at three dollars, which covers all costs, including postage.

These tests enable one to quickly determine the subjects they need to study to make sure they will pass the upgrade test. I use these tests to wrap up the Technician/General licensing courses I instruct. Many of the questions and answers are changed during the yearly review, making this type of material temporary in its usefulness. However, this set of tests is correct at this time. They are an aid to my students, so I have decided to offer them to readers of this column. The number of questions in each category is the same as you will get in your upgrade test.

Please use the address shown on the first sheet of this column, and remember to state what you want. I receive several requests each week for printed aids, and I am sometimes forced to guess what is wanted.

AFFORDABLE PACKET RADIO FROM MFJ

An identical TAPR TNC 2 clone with a new cabinet and added features ... for an incredible $129.95!



MFJ-1270
$129.95

Join the exciting packet radio revolution and enjoy error-free communications ... for an incredible $129.95!

MFJ brings together efficient manufacturing and TAPR's (Tucson Amateur Packet Radio) leading edge technology to bring you affordable packet radio. You get a nearly identical clone of the widely acclaimed TAPR TNC 2 with identical software and hardware. It's in a new cabinet and includes a TTL serial port for extra versatility.

All you need is your rig, home computer with a RS-232 serial port and a terminal program. If you have a Commodore 64, 128 or VIC-20 you can use MFJ's optional Starter Pack to get on the air immediately. You get interfacing cable, terminal software on tape or disk and complete instructions ... everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95 each.

Unlike machine specific TNCs, you never have to worry about your MFJ-1270 being obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port and an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them. Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use. You can also use the MFJ-1270 as an inexpensive digipeater.

It features the latest AX.25 Version 2.0 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, 16K RAM, simple operation plus more.

Join the packet radio revolution now and help make history. Order the MFJ-1270 today.

Here are MFJ's latest and hottest products for improving your station's performance.

SUPER KEYBOARD

MFJ-496
$169.95

Price slashed 50% to $169.95! Get a full feature Super Keyboard that sends CW/RTTY/ASCII for the price of a good memory keyer.

You get the convenience of a dedicated keyboard —no program to load—no interface to connect—just turn it on and it's ready to use.

This 5 mode Super Keyboard lets you send CW, Baudot, ASCII, use it as a memory keyer and for Morse Code practice. You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold.

TRIPLE OUTPUT LAB POWER SUPPLY MFJ-4002 $149.95

Lab quality power supply gives you plenty of voltage and current for all your analog and digital circuits. **3 completely isolated outputs**: 2 variable 1.5-20 VDC at 0.5 amp and a fixed 5 VDC at 1 amp. Connect in series or parallel for higher voltage and current. It's short circuit protected, has excellent line (typ.0.01%/V) and load regulation (typ.0.1%). **Lighted meters** monitor volt./cur. 12x3x6 in. 110 VAC.

CROSS-NEEDLE SWR/WATT METER MFJ-815 $59.95

MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power —all at a single glance! SWR is automatically computed —no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702 $19.95

$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1½ x 3 in.

ANTENNA CURRENT PROBE MFJ-206 $79.95

This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

MFJ's Best VERSA TUNER

MFJ-949C $149.95

MFJ's best 300 watt tuner is now even better!

The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale.

Run up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Tune out SWR on dipoles, vees, long wires, verticals, whips, beams/quads. 10x3x7 in.

DIGITAL SWR/WATTMETER

MFJ-818
$89.95

Fully automatic Digital SWR/Wattmeter reads SWR 1:1 to 1:9.9 directly and instantaneously—no SWR knob to set. Huge 0.6 inch bright orange digits make across-the-room reading easy. 12 segment LED bar graph wattmeter gives instantaneous PEP readings up to 200 watt RF output.

Good, bad. mismatch tri-color LEDs indicate SWR conditions. Small size (5½ x 4¼ x 1 in.) and easy-to-read digital display makes it ideal for mobile use. For 50 ohm systems. 1.8-30 MHz. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MOBILE ANTENNA MATCHER

MFJ-910 $19.95

Lower your SWR and Get more power into your mobile whip for solid signals and more QSOs. Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions. Fits anywhere, 2½x2½in.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).
• One year **unconditional** guarantee • Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

MFJ

MFJ ENTERPRISES, INC.
Box 494, Mississippi State, MS 39762

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE

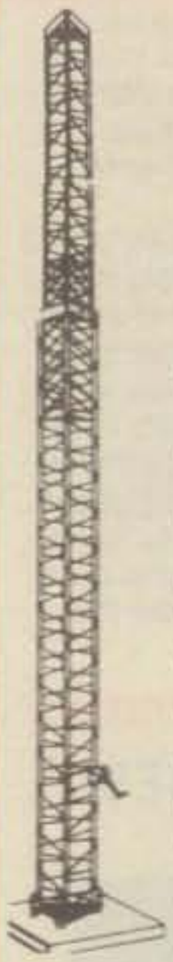
800-647-1800

Call 601-323-5869 in Miss. and outside continental USA Telex 53-4590 MFJ STKV

VISA
MasterCard

CIRCLE 80 ON READER SERVICE CARD

ANTENNA/TOWER SALE!



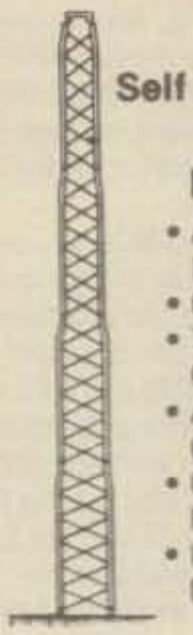
hy-gain CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq. ft.	$CALL
HG52SS	52 ft	9 sq. ft.	$CALL
HG54HD	54 ft	16 sq. ft.	$CALL
HG70HD	70 ft	16 sq. ft.	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



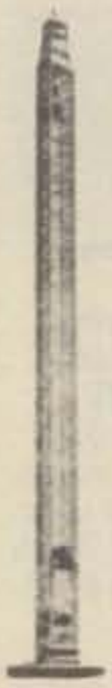
ROHN Self Supporting Towers On SALE!

FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant. Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.



Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:
- **All steel construction**
- **Hot dip galvanized after fabrication**
- **Complete with base and rotor plate**
- **Totally self-supporting—no guys needed**

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

US TOWER CORPORATION

Formerly Tristao Tower Co.

MA-40
40' tubular
Regular $745
SALE! $549

MA-550
55' tubular
Will handle 10 sq. ft. antennas at 50 MPH winds.
Regular $1245
SALE! $899

IN STOCK FOR IMMEDIATE DELIVERY

CALL FOR INFORMATION ON ALL OTHER MODELS

RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket $.79/ft
½" LDF4-50 Andrew Heliax ™ $1.79/ft
⅞" LDF5-50 Andrew Heliax ™ $3.99/ft
select connectors below.

HARDLINE & HELIAX ™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$25	$25	$25	$25
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 $1.25
UG21B N Male $2.95 UG230 N Female $2.95

Antenna Wire & Accessories

Solid Copperweld 12 ga. $.12/ft 14 ga. $.10/ft
Stranded Copper 14 ga. $.10/ft 16 ga. $.09/ft
Stranded 14 ga. $.10/ft 16 ga. $.09/ft
¼ mile 18 ga copper-clad steel wire $30
6 inch heavy-duty end insulator $2.00/ea
Dog-bone insulator $.79 Coax seal $2.50

Van Gorden

1:1 Balun $11 Center Insulator $6
Dipole Kits D80 $31/D40 $28
Short Dipole Kits SD80 $35/SD40 $33
All-band Dipole w/ ladder line $29
G5RV $49.00

ALPHA DELTA

DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander Beam	$209
A743 30/40mtr Kit for the A3	$75
A4 4-el Tribander Beam	$269
A744 30/40mtr Kit for the A4	$75
R3 20, 15, 10mtr Vertical	$259
AV5 80-10mtr Vertical	$99
D40 40mtr Dipole	$149
40-2CD 2-el 40mtr Beam	$279
A50-5 5-el 6mtr Beam	$79
215 WB NEW 15-el 2mtr Beam	$75
3219 19-el 2mtr Beam	$89
220B 17-el 220MHz Beam	$89
424B 24-el 432MHz Beam	$75
ARX2B 2mtr Vertical	$39

hy-gain

Discoverer 2-el 40-mtr Beam	
Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER SPECIAL	
QK710 30/40 mtr. Add-On-Kit	
V2S 2-mtr Base Vertical	
V4S 440MHz Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam	
TH7DXS 7-el Triband Beam	
TH3JRS 3-el Triband Beam	
205BAS 5-el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
64BS 4-el 6-mtr Beam	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2mtr Beam	
25BS 5-el 2mtr Beam	
28BS 8-el 2mtr Beam	
214BS 14-el 2-mtr Beam	
2BDQ 80/40 mtr Trap Dipole	
5BDQ 80-10 mtr Trap Dipole	
BN86 80-10 mtr KW Balun W/Coax Seal	

Limited Quantities purchased at old prices. Call for current prices.

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
4BTV 40-10 mtr Vert $89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

NEW HF4B "Butterfly" Compact Beam $189 delivered (cont. USA)

HF6V $129 Delivered (Cont. USA)
- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF2V 80/40 Meter Vertical Antenna $129 Delivered (Continental USA)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

Free Shipping On Butternut Accessories Also When Purchased With Antenna

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
435-40CX 435 MHz Satellite Antenna w. CS-2	$159

MOSLEY

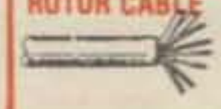
TA-33 3-el Tribander	$239
TA-33JR 3-el Tribander	$189
PRO 37 7-el Tribander Beam	$469
S 403 3-el 40-mtr Beam	$699

MINI-PRODUCTS HQ-1 $159

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call
KLM EL-3000 Moon Tracker Elevation Rotator	$369
Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg.	$329

ROTOR CABLE



Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50 45G $112.50
25G $49.50 55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$899
FK2558	58 ft	13.3 sq ft	$949
FK2568	68 ft	11.7 sq ft	$999
FK4544	44 ft	34.8 sq ft	$1199
FK4554	54 ft	29.1 sq ft	$1299
FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit $249
45G Foldover Double Guy Kit $269
*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2" × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" × 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LB Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

VISA MasterCard

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

TEXAS TOWERS

ORDER TOLL FREE 1-800-272-3467
Texas, Alaska & for information 1 (214) 422-7306

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(Prices & Availability Subject To Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)

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KENWOOD

TS-940S LIST $1999
NEW Top-of-the-Line
HF Transceiver
- 100% Duty Cycle
- 40 Memory Channels

CALL FOR SPECIAL PRICES!!

TS-930S LIST PRICE $1649
CALL FOR SPECIAL SALE PRICE!

TS-430S LIST PRICE $899.95
CALL FOR SPECIAL SALE PRICE!

TS-711A LIST $799.95
TS-811A LIST $899.95
CALL FOR SPECIAL PRICE!

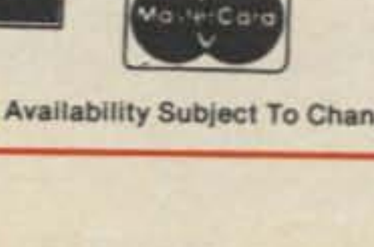
TW-4000A LIST $599.95
CALL FOR SPECIAL PRICE!

TR2600A - 2mtr
TR3600A - 70cm
High Tech
HT XCVRS

NEW
Ultra-
Compact
HT XCVRS
TH21AT 2mtr
TH31AT 220 MHz
TH41AT 440 MHz

CALL FOR SPECIAL PRICES—
SAVE $$$!!

MIRAGE AMPLIFIER SALE!



B3016
ONLY $199!

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$249
B23	2M	No	2W	30W	$ 79
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
C22	220	No	2W	20W	$ 79
C106	220	Yes	10W	60W	$179
C1012	220	Yes	10W	120W	$259
D24	440	No	2W	40W	$179
D1010N	440	No	10W	100W	$289

ICOM

IC735 NEW General Coverage
HF Transceiver Full Featured
-Ultra Compact - Economical
List Price $849
CALL FOR SPECIAL PRICE!

IC745 General Coverage
HF Transceiver List $999
IC751 Full Featured
HF Transceiver List $1399
CALL TODAY FOR LOW
TEXAS TOWERS/ICOM PRICES!

IC271A List $699 **IC271H List $899**
IC471A List $799 **IC471H List $1099**

CALL TODAY FOR SPECIAL
LOW ICOM PRICES!!

IC27A List $369 **IC27H List $409**
IC37A List $449 **IC47A List $469**

CALL TODAY FOR SPECIAL
ICOM PRICES!

IC3200 NEW 2m/70cm
Dual Band Xcvr List $549
CALL FOR SPECIAL PRICE !

IC02AT - 2mtr
IC04AT - 70cm
High Tech
HT XCVRS

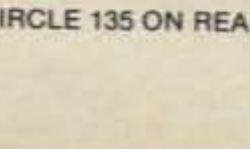
IC2AT - 2mtr
IC3AT 220 MHz
IC4AT 440 MHz

ALL IN STOCK—
CALL FOR SPECIAL PRICES!

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105–125 VAC Output: 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—
  A-Series Without Meter



Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

YAESU

FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-726R LIST PRICE $899
CALL FOR SPECIAL SALE PRICE!

FT2700RH NEW 2m/70cm
Dual Band Transceiver
Full Duplex — Cross Band
Operation! List $579
CALL FOR PRICE—SAVE $$!

FT-209RH
NEW High Tech
2mtr HT
5 Watt Output
NOW IN STOCK

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SPECIAL PRICE!

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95

CP1-1 Computer Patch	$189.95
CP-1/20 Computer Patch W/VIC20 MBATEXT	$219.95
CP-1/64 Computer Patch W/C64 MBATEXT	$219.95
CP-100 Deluxe Computer Patch	$299.95
PK64 C64 Packet System	$219.00
ATU-1000 Advanced Terminal Unit	$1049.95
MBATOR Software C64 or VIC20 (Specify)	$89.95
Doctor DX CW Band Simulator Software	$99.95
Doctor QSO Morse Code Trainer Software	$79.95
PKT-1 Packet Controller	$469.95

Isopole 144MHz, 220MHz & 440MHz Antennas
In Stock — CALL FOR SPECIAL PRICES!

NEW
PACKRATT
PACKET
CONTROLLER
ONLY $219.95

Kantronics

The Interface	List $169.95	SALE $129.95
Interface II	List $269.95	SALE $239.95
Challenger	List $99.95	SALE $89.95
Universal Term Unit	List $199.95	SALE $189.95
Packet Communicator	List $219.00	SALE $199.95
UTU Terminal Software (IBM/CPM/TRS80)		$19.95
Hamsoft/Amtorsoft (Atari/C64/VIC/TRS80C)		$79.95
Apple Hamsoft $29.95 Atari/VIC Hamsoft		$49.95
TRS80C Hamsoft $59.95 TI994A Hamsoft		$99.95
Hamtext (Apple/Atari/C64/VIC20)		$99.95
Amtorsoft (C64/VIC20)		$89.95
Amtorsoft (Apple)		$139.95

AMERITRON

AL80A NEW 1000W 3-500Z Amplifier $689

AI-84 600W PEP Output (4-6MJ6 Tubes)	$379
AL-1200 1500W Output (3CX-1200 Tube)	$1399
RCS-8 5 Pos Remote Antenna Switch	$119
ATR-15 1500W Antenna Tuner	$289

TEN-TEC SALE!

NEW CORSAIR II
CALL FOR PRICE AND DELIVERY INFORMATION

425 Titan New 3KW amplifier
in stock-only $2195!

ALINCO

ELH-230D
LIST $89.95

30 Watt 2M Amp w/ Preamp
Special $79.00
Other Alinco Amps in Stock
Call For Special Price

POWER SUPPLIES

EP-3030 LIST $208.00
SPECIAL $189.00

KDK

FM-240
NEW COMPACT
2M-25W FM
Transceiver

- 16 memory channels
- 2 VFOs
- Programmable sub audible tone unit included no extra charge
- Optional voice synthesizer available

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THL CORP.

Power amps and receive preamps in stock.
CALL FOR SPECIAL PRICES!

FREE SHIPPING-UPS SURFACE
(continental USA) (most items, except towers/antennas)

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Texas, Alaska & for information call 1-(214)-422-7306

VISA MasterCard

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Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

(Prices & Availability Subject To Change Without Notice)

CIRCLE 135 ON READER SERVICE CARD

Complete Rules For The 50th Anniversary WAZ Award

To commemorate the 50th anniversary of the WAZ award, *CQ* is offering a special certificate, the WAZ-50 Award, for those presenting proof of contact with the 40 zones of the world between January 1 and December 31, 1986. This proof of contact shall consist of proper QSL cards submitted directly to our WAZ Award Manager, Leo Haijsman, W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904. Sequential numbers beginning with one (1) will be assigned to the WAZ-50 certificates in the order in which the applications are received by W4KA. A handsome plaque will be awarded to the first winner. In the event of a tie, the winner of the plaque will be determined by the earliest postmark.

The following rules apply to the WAZ-50 award:

1. The official CQ WAZ Zone Map and the printed zone list which follows these rules will be used to determine the zone in which a station is located.

2. QSL cards must be accompanied by a list of claimed zones showing the call letters of the station contacted within each zone. The list should also clearly show the applicant's name, call letters, and complete mailing address. It is strongly preferred that this list be submitted using *CQ* Form 1479. A zone map and application form may be obtained by sending a self-addresed, stamped envelope to W4KA.

3. All contacts must be made with licensed, *land-based*, amateur stations operating in the 80, 40, 20, 15, and 10 meter bands. Contacts made in the WARC bands, 30, 17, and 12 meters will *not* be accepted for this award.

4. WAZ-50 is a mixed mode award. Applicants may use a combination of CW, SSB, RTTY, AM, or other legal types of emission.

5. All contacts submitted by the applicant must be made from within the same country. When the applicant submits cards for multiple callsigns, evidence must be submitted to show that the applicant also held those call letters.

6. Any altered or forged confirmations will result in permanent disqualification of the applicant.

7. A processing fee of $5.00 for all award applicants should be included with the application and a self-addressed envelope with sufficient postage or international reply coupons (IRC's) to return the QSL cards by the class of mail specified by the applicant. IRC's equal in redemption value to the processing fee are acceptable. The 1985 redemption value of IRC's is 37 cents each. Checks should be made out to Leo Haijsman, WAZ Award Manager.

8. Applications may be made at any future date, but all contacts must have taken place between January 1, 1986 and December 31, 1986.

9. Decisions of the *CQ* DX Awards Advisory Committee on any matter pertaining to the administration of the award will be final.

The following list of zones is presented as a guide. Any questions will be decided by the *CQ* Zone Map. For rulings on borderline areas, consult the WAZ Award Manager.

Zone 1. Northwestern Zone of North America: KL7, VE8 Yukon, the VE8 Northwest Territories Districts of Mackensie and Franklin, and the islands west of 102° including Victoria, Banks, Melville, and Prince Patrick.

Zone 2. Northeastern Zone of North America: VO2 Labrador, that portion of VE2 Quebec north of the 50th parallel, and a portion of the Northwest Territories *VE8 east of longitude 102°. The latter includes part of the District of Franklin and the islands of King William, Prince of Wales, Somerset, Bathurst, Devon, Ellesmere, Baffin, and the Melville and Boothia Peninsulas.

Zone 3. Western Zone of North America: VE7, W6, and W7 states of Arizona, Idaho, Nevada, Oregon, Utah, and Washington.

Zone 4. Central Zone of North America: VE3, VE4, VE5, VE6, and W7 states of Montana and Wyoming. W0, W9, W8 (except W. Va.), W5, and the W4 states of Alabama, Tennessee, and Kentucky.

Zone 5. Eastern Zone of North America: FP8, VE1, VO1, that portion of VE Quebec south of the 50th parallel, VP9, W1, W2, W3, the W4 states of Florida, Georgia, South Carolina, North Carolina, and Virginia, and the W8 state of West Virginia.

Zone 6. Southern Zone of North America: XE, XF, and 6D4 (Revilla Gigedo).

Zone 7. Central American Zone: FO8 Clipperton, HK0 (San Andres), HP, HR, KS4, KZ5, TG, TI, T19, VP1, YN, and YS.

Zone 8. West Indies Zone: C6A, CM/CO, FG7, FM7, FS7, HH, HI, HK0 (Bajo Nuevo), J3, J6, J7, KC4 (Navassa Is.), KG4, KP2, KP4, KV4, PJ6, PJ7, PJ8, VP2, VP5, YV0 (Aves Is.), ZF, 6Y5, 8L2 (St. Lucia), and 8P6.

Zone 9. Northern Zone of South America: FY7, HK, PJ1, PJ2, PJ3, PJ4, PJ9, PZ, YV, 8R, and 9Y4.

Zone 10. Western Zone of South America: CP, HC, HC8, and OA.

Zone 11. Central Zone of South America: PY, PY0 (St. Peter and Paul Rock), PY0 (Trinidade), and ZP.

Zone 12. Southwest Zone of South America: CE and some antarctic prefixes.*

Zone 13: Southeast Zone of South America: CX, LU, VP8, and some antarctic prefixes.*

Zone 14. Western Zone of Europe: C31, CT1, CT2, DA, DF, DJ, DK, DL, DM, EA, EA6, EI, F, G, GB, GD, DI, GJ, GM, GU, GW, HB, LA, LG, LX, ON, OY, OZ, PA, PI, SK, SL, SM, ZB2, 3A, and 4U1ITU.

Zone 15. Central European Zone: FC, HA, HB0, HV, I, IT, IS, MI, OE, OH, OH0, OJ0, OK, SP, UA2, UP, UQ, UR, YU, ZA, 9A, and 9H.

Zone 16: Eastern Zone of Europe: UA1, UA3, UA4, UA6, UA9, (S,W) Bashkir and Chkalov, UB5, UC2, UN1, and UO5.

Zone 17. Western Zone of Siberia: UA9 (A,C,F,G,J,K,L,Q,S,X) Sverdlovsk, Chelyabinsk, Komi, Jurgan, Molotav, Omsk, Tyumen; and UH8, UI8, UL7, and UM8.

Zone 18. Central Siberian Zone: UA9 (H,I,O,P,U,V,W,Y,Z) Novosibirsk, Tomsk, Kamerov, Alta; UA0 (A,B,H,O,S,T,U,V,W) Krasnovarsk, Irkutsk, Chita, Bruyate Mongolia, and Dickson Island.

Zone 19. Eastern Siberian Zone: UA0 (C,E,F,G,I,J,K,L,M,Q,R,Z) Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island, Wrangel Island, and the Soviet Kuriles.

Zone 20. Balkan Zone: JY, LZ, OD5, SV, TA, YK, YO, ZC4/5B4, and 4X4.

Zone 21. Southwestern Zone of Asia: A4, A6, A7, A9, AP, EP, HZ/7Z, UD6, UF6, UG6, YA, YI, 4W1, 70, and 9K2.

Zone 22. Southern Zone of Asia: A51, S2, VU, VU5 (Laccadive Is.), 4S7, 8Q6 (Maldive Is.) and 9N1.

Zone 23. Central Zone of Asia: BY provinces of Tibet, Sinkiang, Kansu, and Hinghai, JT1, and UAOY Tanna Tuva.

Zone 24. Eastern Zone of Asia: BV, BY (except the provinces in Zone 23), CR9, and VS6.

Zone 25. Japanese Zone: HL/HM and JA/KA.

Zone 26. Southeastern Zone of Asia: HS, XV, XU, XW, XZ, VU2 (Andaman and Nicobar Islands), and 1S (Spratly Is.).

Zone 27. Philippine Zone: DU, JD1 (Minami Torishima), JD1 (Ogasawara), KA1 (Bonin Is.), KC6 (Eastern Caroline Is.), KC6 (Western Caroline Is.), AH2/KH2/NH2/WH2/KG6 (Guam), KG6 (R,S,T), and 7J (Okino Torishima).

Zone 28. Indonesian Zone: H4, P2, T2, VS5, YB, 9M2 (West Malaysia), 9M6 (Sabah), 9M8 (Sarawak), and 9V1.

Zone 29. Western Zone of Australia: VK6, VK8, VK9X (Christmas Is.), VK9Y (Cocos-Keeling Is.), and some antarctic prefixes.*

Zone 30. Eastern Zone of Australia: VK1, VK2, VK3, VK4, VK5, VK7, VK2 (Lord Howe Is.), VK9Z (Willis Is.), VK9 (Mellish Reef), VK9 (Willis Is.), VK0 (Macquarie Is.), and some antarctic prefixes.*

Zone 31. Central Pacific Zone: C2, F0 (Marquises Is.), AH1/KH1/NH1/WH1/KB6 (Canton, Baker, Enderbury, and Howland Is.), AH6/KH6/NH6/WH6 (Hawaii), AH3/KH3/NH3/WH3/KJ6 (Johnson Is.), AH4/KH4/NH4/WH4/KM6 (Midway Is.), AH5/KH5/NH5/WH5/KP6 (Palmyra and Jarvis Is.), AH5K/KH5K/NH5K/WH5K/KP6 (Kingman Reef), KH7 (Kure Is.), AH9/KH9/NH9/WH9/KH6 (Wake Is.), KX6 (Marshall Is.), T2 (Tuvalu Is.), T3 (Kiribati Rep.), VR1 (British Phoenix Is.), VR3 (Northern Line Is. or Christmas Is.), VR7 (Central and Southern Line Is.), and ZM7 (Tokelaus).

Zone 32. New Zealand Zone: A3, FK8, F0 (Society Is.), FW8, KS6/KH8 (American Samoa), VK9 (Norfolk Is.), VR6 (Pitcairn Is.), YJ, ZK1 (Coor Is.), ZK1 (Manihiki Is.), ZK2, ZL (inc.

Aukland, Campbell, Chatham and Kermadec Is.), 3D2, 5W1, and some antarctic prefixes.*

Zone 33. Northwestern Zone of Africa: CN2, CN8, CT3, EA8, EA9, 3V8, and 7X.

Zone 34. Northeastern Zone of Africa: ST, SU, and 5A.

Zone 35. Central Zone of Africa: C5, D4, EL, J5, TU, TY, TZ, XT, 3X, 5N, 5T, 5U, 5V, 6W8, 9G, and 9L.

Zone 36. Equatorial Zone of Africa: D2, TJ, TL, TN, S9, TR, TT, ZD7, ZD8, 3C, 9J, 9Q, 9U, and 9X.

Zone 37. Eastern Zone of Africa: C9, ET, J28, 5H, 5X5, 5Z4, 60, 70, and 7Q7.

Zone 38. South African Zone: A2, H5, S8, ZD9, ZE, ZS1,2,4,5,6, ZS2 (Prince Edward and Marion Is.), ZS3, 3D6, 3Y, 7P8, and some antarctic prefixes.*

Zone 39. Madagascar Zone: D6, FB8W, FB8X, FB8Z, FH8, FR7 (Reunion Is.), FR7 (Glorioso Is.), FR7 (Juan de Nova Is.), FR7 (Tromelin Is.), S79, VKØ (Heard Is.), VQ9, 3B6, 3B7, 3B8, 3B9, 5R8, and some antarctic prefixes.*

Zone 40. North Atlantic Zone: JW, JX, OX, TF, and UA1 (Franz Joseph Land).

**Considerable exploration has taken place in Antarctica in recent years in areas such as Wilkes Land, Victoria Land, Marie Byrd Land, and others. In recognition, we are no longer assigning all antarctic prefixes to Zone 13. The boundaries of CQ zones 12, 13, 29, 30, 32, 38, and 39 are being extended to converge at the South Pole. Station 8J1RL is now in Zone 39 and VKØGM and VKØGW are in Zone 29. Station KC4AAA is at the pole itself and will count for any one of the above zones. Zone 13 will continue to embrace the Falkland, South Shetland, South Orkney, South Georgia, and South Sandwich Islands, as well as stations located in the Palmer Peninsula. Questions regarding the zone location of a particular antarctic station should be directed to the WAZ Award Manager.*

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Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

We continue to receive announcements past the deadline of the month for which that activity was scheduled. One of these was the TASYLS Michigan YL QSO Party scheduled for the weekend of January 25–26. Just in case you got involved in this activity, you have until February 28th to submit your entry. Send it to Verline Ferris, KI8V, 308 E. Harry, Hazel Park, MI 48030. The TASYLS (The Auto State YLs) also have a certificate that can be earned for contacts made during the party. Send an SASE to Elaine Matyjaszek, KA8KAK, 1127 Hillcrest Dr., Boon, MI 49618 for details.

Most state QSO parties still refer to the Canadian multiplier as provinces. Taken literally, that would only add up to a multiplier of 10, where in fact a multiplier of 13 is available. VE8 and VY1 are territories, and VO2 is part of the province of Newfoundland but counts as a separate multiplier, therefore making a total multiplier of 13. If Canadian areas are to be used as multipliers, their identity should be more clearly defined (provinces plus VE8, VY1, and VO2, or provinces and call areas).

Final arrangements for the Tom Peruzzi, W4BVV Memorial Plaque (World-Wide Contest, European All Band Phone) have been completed. Yours truly, W1WY, is donating the 1984 award. The 1985 and future awards will be donated by the Potomac Valley Radio Club.

Rather late but to set the record straight, the operation of OH1RY in the 1984 World-Wide CW Contest was by guest operator OH2KI.

Deadline for announcements of May activities is February 15th, and March 15th for the June issue. Please send all information to my home address.

73 for this time, Frank, W1WY

Calendar of Events

*	**Jan.**	**24-26**	**CQ WW 160M CW Contest**
*	Jan.	25-26	French CW Contest
	Jan.	25-26	UBA CW Trophy Contest
	Feb.	1-2	Vermont QSO Party
	Feb.	1-2	RSGB 7 MHz Phone Contest
*	Feb.	1-3	New Hampshire QSO Party
	Feb.	2	ARCI QRP Winter SSB Sprint
	Feb.	8-9	QCWA CW QSO Party
	Feb.	8-9	YL-OM Phone Contest
	Feb.	8-9	YL-ISSB Phone Contest
	Feb.	8-9	Dutch "PACC" Contest
	Feb.	15-16	ARRL DX CW Contest
	Feb.	**21-23**	**CQ WW 160M SSB Contest**
	Feb.	22	RTTY Journal Contest
	Feb.	22-23	French Phone Contest
	Feb.	22-23	RSGB 7 MHz CW Contest
	Feb.	22-23	YL-OM CW Contest
	Feb.	22-23	UBA SSB Trophy Contest
	Feb.	22-23	Alabama QSO Party
	Mar.	1-2	ARRL DX Phone Contest
	Mar.	8-9	QCWA Phone QSO Party
	Mar.	8-9	RSGB Commonwealth
	Mar.	9-10	Wisconsin QSO Party
	Mar.	15-16	Bermuda Contest
	Mar.	15-16	YL-ISSB CW Contest
	Mar.	22-24	BARTG Spring RTTY
	Mar.	**29-30**	**CQ WW WPX SSB Contest**

* *Covered last month.*

UBA Trophy Contest

CW: Jan. 25–26 SSB: Feb. 22–23
0600Z Saturday to 1800Z Sunday

This is an annual affair sponsored by the Union of Belgian Amateurs. Participation is dominated by the Europeans. There were no stateside entries in the 1985 contest.

All five bands, 10–80, can be used, but are divided into the following classes:

A. Single operator, 40 and 80 meters only, 6 hours—2 hours on Sunday, 0900 to 1100Z, other 4 hours free choice.

B. Single operator, 40 and 80, only 12 hours.

C. Single operator, all bands, only 24 hours.

D. Multi-operator, all bands, full 36 hours.

SWL's—A, B, and C as above.

Exchange: RS(T) and QSO serial number. Belgian stations will include their province abbreviation.

Points: ON and ON Forces in Germany, 10 points per contact. QSO's with one of French countries, 1 point.

Multiplier: Each Belgian province plus a BSD/FBA worked on each band (maximum of 10 per band).

Final Score: Total QSO points times the sum of multipliers from each band.

Awards: Certificates to the top scorers in each class for each country.

Use a separate sheet for each band and a summary sheet showing the scoring and other essential information, including the usual signed declaration.

Mailing deadline for CW entries is March 1st, and April 1st for SSB.

They go to: UBA HF Contest Committee, Att: Galicia Jan, ON6JG, Oude Gendarmeriestratt 62, B-3100 Heist op den Berg, Belgium.

RSGB 7 MHz Contest

Phone: Feb. 1–2 CW: Feb. 22–23
1200Z Sat. to 0900Z Sun.

Rules are the same as those used last year. Only single operator entries will be recognized. The following rules are for stations other than the British Isles.

Bands: Phone—7.04 to 7.10. C.W.—7.00 to 7.03. (B.I. stations please note that this will require split frequency on phone for U.S. stations.)

Exchange: RS(T) plus a three digit QSO number starting with 001.

Scoring: Stations in Europe score 5 points for each B.I. contact. Those outside Europe score 15 points per contact.

Multiplier: One for each different British Isle country prefix worked (G2, GC3, GD4, GI6, GJ8, GM3, GU5, GW8, etc.), maximum of 49 possible. No credit for GB prefix.

Final Score: Total QSO points times the country prefix multiplier worked.

Awards: Certificates will be awarded to the first, second, and third place winners in the British Isles, Europe, and non-Europe in each section of the contest.

Include a summary sheet showing the scoring and a list of the country prefixes worked, and the usual signed declaration that all rules and regulations have been observed.

There is also an SWL section with the scoring same as above. Overseas listeners log B.I. stations only. Record the call as well as the serial number sent. The call sign of the station being worked may only be repeated once in every three contacts logged unless it's a new multiplier.

Unmarked duplicate contacts will be penalized at ten times the number claimed. Logs containing in excess of five unmarked duplicates will be automatically disqualified.

Phone entries must be received by March 31st and CW by April 21st. This year they go to: RSGB HF Contests Committee, P.O. Box 73, Lichfield, Staff. WS13 6UJ England.

Vermont QSO Party

0001Z Sat. to 2400Z Sun., Feb. 1–2

This event is again being sponsored by the Central Vermont ARC. The same station may be worked three times per band—once each on phone, CW, and RTTY—for QSO points.

Exchange: RS(T) and QTH. County for VT; state, province, or DX country for others.

Scoring: One point per phone QSO; 5 points if on CW or RTTY. VT stations multiply total by (VT counties + states + VE provinces + DX countries) worked. All others use VT counties for their multiplier (maximum of 14). Work the club station W1BD and add 20 bonus points to your

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RS-20A, RS-20M, RS-20S, VS-20M	16	20	5 × 9 × 10½	18
RS-12A, RS-12M, RS-12S	9	12	4½ × 8 × 9	13
RS-10A	7.5	11	4 × 7½ × 10¼	11
RS-7A, RS-7B	5	7	3¼ × 6½ × 9 4 × 7½ × 10¾	9
RS-4A	3	4	3¼ × 6½ × 9	5

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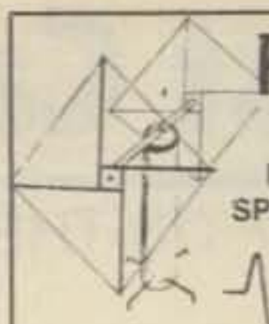

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CIRCLE 22 ON READER SERVICE CARD

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Frequencies: Phone—3910, 7230, 14260, 14320, 21360, 28570, 50110, 144.2 (no repeaters). CW—3540, 3720, 7040, 7120, 14040, 21040, 21140, 28040. RTTY—3620 and 90 kHz from lower edge of other bands.

Awards: Certificates to the top-scoring station in each state, VE province, and DX country, and each Vermont station submitting a log. There is an annual plaque to the highest scoring Vermont station.

The W/VT Award is available to stations working 13 of the 14 Vermont counties.

Official log forms are available by sending a large SASE to WA1PDN.

Mailing deadline for party entries is March 1st to: D. Loverin, WA1PDN, 50 Liberty Street, Montpelier, VT 05602.

ARCI QRP Winter SSB Sprint

2000Z to 2400Z Sun., Feb. 2

Rules are exactly the same as for the SSB September 7th Sprint. Rules were in the September 1985 issue. Logs go to: Eugene Smity, KA5NLY, P.O Box 55010, Little Rock, AR 72225.

YL-OM Contest

Phone: Feb. 8–9 CW: Feb. 22–23
1800Z Sat. to 1800Z Sun.

It's the YL's working the OM's in this annual activity organized by the YLRL. All bands may be used, but cross-band contacts or contacts with stations on net frequencies do not count.

Phone and CW are separate contests and require separate logs. The same station may be worked once only regardless of band.

Exchange: QSO no., RS(T), and ARRL section or DX country. (See *QST* for sections list.)

Scoring: Each QSO is worth 1 point. Multiply total by number of ARRL sections and DX countries worked for final score.

There is also a power multiplier of 1.25 for stations running 150 watts or less on CW, and 300 watts PEP on SSB. Multiply your final score by the above factor if you qualify.

There is a penalty of three contacts for each duplicate contact removed from the log by the contest committee.

Frequencies: CW—3555, 7055, 14055, 21195, 28195. SSB—3955, 7255, 14295, 21395, 28595. Plus or minus 15 kHz.

Awards: First-place cups to both YL and OM winners in each contest. Second and third place winners will receive certificates. The top scorers in each U.S. and VE call district and each DX country will also receive certificates.

All entries must be mailed by March 10th. This year they go to: Mary Lou Brown, NM7N, 504 Channel View Drive, Anacortes, WA 98221.

QCWA QSO Party

C.W.: Feb. 8–9 S.S.B.: March 8–9
0001Z Sat. to 2400Z Sun.

This is the 29th annual QSO Party for the Quarter Century Wireless Association. It's a fun party to renew old friendships and to meet new friends.

Rules are the same as those used last year. CW and SSB are separate activities and require separate log entries. The same member may be contacted on each band for QSO points, but the chapter and "AL" multiplier are counted once only.

Exchange: QSO number, name, chapter (name or number), and state. If no chapter affiliation use "at large," or "AL."

Points: One point for each QCWA member worked on each band.

Multiplier: Each new chapter and one "AL" contacted, counted once only.

Score: Total number of QSOs multiplied by the total number of chapters plus one "AL" contact worked (well over 150 at last count).

Frequencies: CW—3545, 7045, 14045, 21055, 28055. SSB—3915, 7245, 14295, 21365, 28615. Plus or minus 15 kHz. Also 160 meters and 6 and 2 meters simplex.

Awards: Plaques to the top scorer in each party. Party QSO's can be applied to the many QCWA awards. Make your request on the summary sheet of your entry.

The standard QCWA log forms have 20 contacts to the page. If you prepare your own, have columns for the time in UTC, station worked, QSO number sent and received, name, chapter, and state. *(A column indicating the band and the multiplier the first time it is worked would be helpful. Using a separate log sheet for each band would also be helpful.—ed.)*

Submit your entry right after each party, but no later than March 24th. CW logs go to: Edward Everett, W1ALE, 162 Centre St., Concord, NH 03301. SSB logs go to: Carl Breuning, N1CB, 54 Myrtle St., Newport, NH 03773.

YL ISSB QSO Party

Phone: Feb. 8–9 CW: March 15–16
0001Z Saturday to 2359Z Sunday

The party is open to all, but the emphasis is on membership participation.

Categories: Single operator, DX-W/K partners, and YL-OM teams.

Exchange: Signal report; state, province, or country; and name. Members will include their ISSB number and DX-W/K partner.

Points: Three points for two-way member contacts within the same continent, 6 points if in different continents. One point for non-member contacts.

Multiplier: Only member stations count as multipliers. One for each of the following: DX-W/K partners, YL-OM team, each US state, VE province, and DX country. And two for contacts between DX-W/K partners using input power under 250 watts throughout party.

Frequencies: The General portions of the phone and CW bands. *Note:* Avoid net frequencies, 14313, 14332, and 14336, etc. Check 40 and 80 meters on the hour. VHF and UHF simplex only.

Awards: Special certificates to overall winners in each category. Regular certificates to winners in each US state, VE province, and DX country.

Logs should be set up as outlined in the exchange. A summary sheet with the scoring and other essential information is desirable.

Mailing deadline is April 30th and logs go to: Bill Early, WA9AEA, P.O Box 401, McHenry, IL 60050-0401.

Dutch "PACC" Contest

1200Z Sat. to 1200Z Sun., Feb. 8–9

It's the world working The Netherlands on all six bands, 1.8 through 29.7 MHz, in the band sections recommended for contest operation by the IARU. The same station may be worked on each band, but on one mode only, phone or CW, for QSO and multiplier credit.

Categories: Single operator, multi-operator, and SWL.

Exchange: RS(T) plus a QSO number starting with 001. Dutch stations will add two letters to identify their province. There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, and ZL.

Scoring: Each QSO with a PA/PB/PI station counts one point. DX stations determine their multiplier by the number of provinces worked on each band (maximum of 72).

Final Score: Total number of QSO's times the number of provinces worked on each band.

Awards: Certificates to the top scoring station in each category in each country and call areas of JA, LU, PY, UA9/Ø, VE/VO, VK, W/K, ZL, and ZS. Also second and third place awards if returns justify.

SWL's must log the call of the Dutch station as well as the station being worked and both serial numbers. Scoring same as above.

Indicate the multiplier in a separate column in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration.

Mailing deadline is March 31st to: PACC Contest, Att: F. Th. Oosthoek, PA@INA, P.O. Box 499, 4600 AL Bergen Zoom, The Netherlands.

ARRL International DX Contest

C.W.: Feb. 15–16 Phone: March 1–2
0000Z Saturday to 2400Z Sunday

Rules are the same as last year. However, I strongly recommend that you study the announcement in the December issue of *QST* for more details. Also send a large SASE (2 IRC's for DX) for sample log and entry forms.

All bands may be used, 1.8 through 28 MHz, but not 10 MHz. Aeronautical or maritime mobile stations cannot be worked for contest credit. Following is a brief outline.

Categories: Single operator, both single and all band. Multi-operator, one transmitter and two transmitters. Also multi-operator, multi-transmitter. Also QRP, all band only. Multi one and two transmitter stations must remain on a band at least 10 minutes once a contact is made. Multi-transmitter stations no limit, but only one signal per band.

Exchange: RS(T) and state or province for W/VE; RS(T) and power input for DX stations (three-digit number).

QSO points: W/VE stations earn three points for each DX contact. DX get three points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VE's. DX stations use US states (48) and VE districts VE1–8, plus VO and VY1 for their multiplier (10). (Maximum multiplier of 58 per band.)

Final Score: Total QSO points times the sum of the multiplier from each band. Entries with 500 or more QSO's must include a QSO check sheet.

Awards: Certificates given in each category, in each country, and in each ARRL section, plus a wide selection of plaques. Also certificates to DX stations making over 500 QSO's.

Disqualification regulations will be strictly enforced and are listed in the official rules. Mailing deadline for all entries is April 1st, and they go to: ARRL DX Contest, 225 Main Street, Newington, CT 06111.

RTTY Journal Contest

0000Z to 2400Z Sun., Feb. 22

This is the fifth RTTY contest sponsored by the RTTY Journal in conjunction with *73 Magazine*.

The same station may be worked once on each band. Single operator stations are limited to 16 hours of operation. Multi-operators may operate the full 24 hours. Off times must be at least 30 minutes each and must be indicated in your log.

Classes: Single operator and multi-operator, single transmitter. Single and all band, 10–80 meters.

Exchange: RST and state or province for the U.S. and Canada. Others RST and a consecutive QSO number.

Scoring: Five points for contacts with Ws and VEs; 10 points for all other contacts.

One (1) multiplier point for each U.S. state (48), VE prov./terr., and DX country worked on each band.

Final Score: Total QSO points times the sum of the multipliers from each band.

Awards: Will be issued in each class to the winners in each U.S. call area, VE prov./terr., and DX country (minimum of 25 QSOs to be eligible).

Disqualification: Taking credit for duplicate contacts in excess of 2% of the total, and other discrepancies will be deemed grounds for disqualification.

Use a separate log sheet for each band, a dupe and summary sheet, and a multiplier check sheet. Indicate equipment and power used.

Contestants are requested to send a large SASE for official forms and final results. Mailing deadline for all entries is March 22nd to: The RTTY Journal, 1155 Arden Drive, Encinitas, CA 92024.

CQ WW 160 Meter SSB Contest

2200Z Fri. to 1600Z Sun., Feb. 21–23

Just a reminder that our 160 Meter S.S.B. Contest will be coming up the last weekend of this month. Extensive coverage has been given to this event with complete rules appearing in the October 1985 issue. There are no changes from last year's format.

Exchange: Signal report and QTH (no QSO serial number).

Scoring: Contacts with stations within own country count two points; with stations in other countries but the same continent, five points; with stations in other continents, ten points.

The multiplier remains the same: each US state (48), Canadian areas (13), and DX country. (US and Canada are not country multipliers.)

It is strongly requested that the "DX Window," 1825–1830, be kept free from W/K and VE/VO activity. Work the DX split frequency. (KP4 and KV4 should also observe this request.)

Mailing deadline for last month's CW Contest is February 28th. This month's SSB Contest's deadline is March 31st. Send them to: Don McClenon, N4IN, 3075 Florida Ave., Melbourne, FL 32904. Of course, you can always use the *CQ* address: 76 N. Broadway, Hicksville, NY 11801. (Please indicate CW or SSB on the envelope.)

Alabama QSO Party

1600Z Sat. to 2300Z Sun., Feb. 22–23

The Birmingham ARC has picked up this party after a year's absence and plans to generate activity from all 67 Alabama counties.

The same station can be worked on each band and mode, and mobiles and portables from each county change.

Exchange: RS(T) and QTH. County for Alabama; state, province, or country for others.

Scoring: Two points for phone contacts, 3 points for CW. Alabama stations multiply total QSO points by sum of US states, VE provinces, AL counties, and DX countries worked. Others use AL counties for their multiplier (maximum of 67).

There is a bonus multiplier of 1.5 for stations using 200 watts or less, and also 1.5 for stations using noncommercial power (mobiles excluded).

Mobiles can add 500 bonus points for each county from which 10 or more QSOs are made.

Frequencies: CW—1810 and 50 kHz from the bottom of each band. Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.20, 146.52. Novice—10 kHz from low end of each Novice band.

Awards: Certificates to top scorers in each Alabama county, and each US state, VE province, and DX country. Also to top Novice and Tech scorers both in and out of state. Trophies to the overall out-of-state, Alabama fixed/portable, and mobile winners.

Mailing deadline is March 30th to: Bill Levey, WA4FAT, 3629 Dabney Drive, Birmingham, AL 35243. Include an SASE for a copy of the results.

No-63-64

Antennas & Accessories

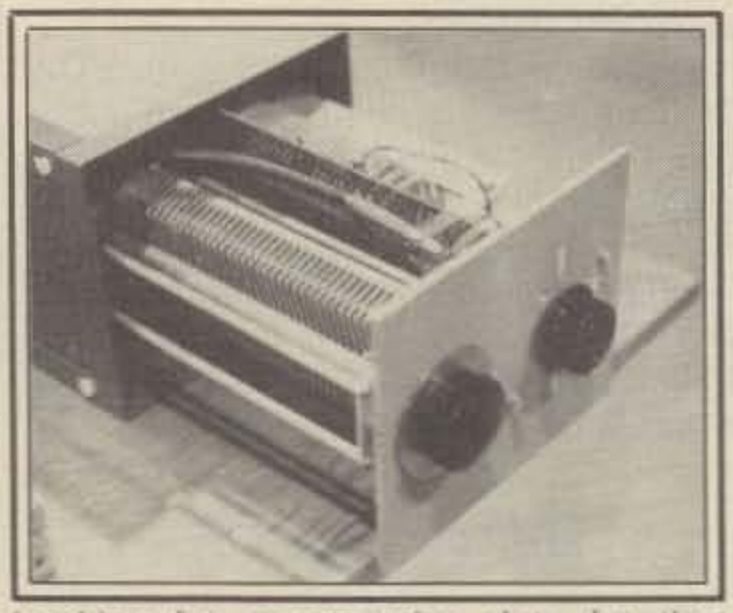
a monthly feature by
KARL T. THURBER, JR., W8FX

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

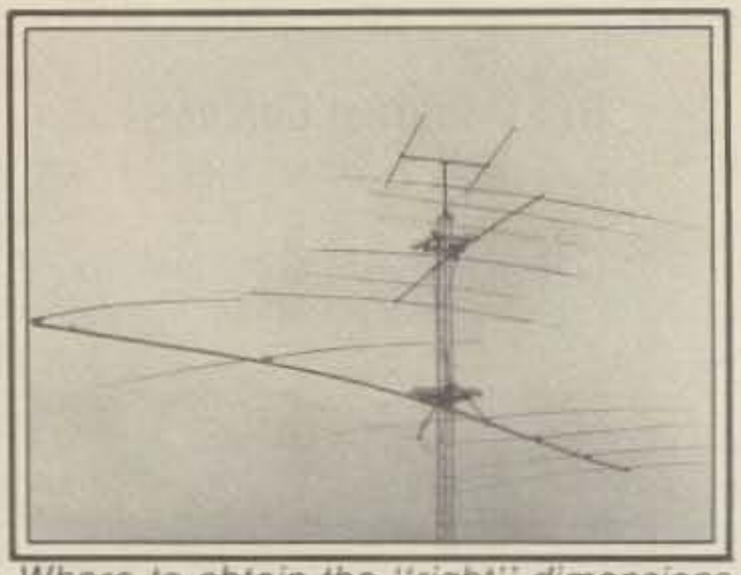
Ham Radio Information Sources

Are you 'tuned in' to all of the sources of technical and operating information that are available to you? Our columnist provides a number of useful suggestions on information sources you can tap.

—K2EEK



Looking for construction data for that new antenna tuner, linear amplifier, or transmitter? Many of the ARRL publications have what you need, in addition to a wide range of reference books carried by CQ's own Book Shop.



Where to obtain the "right" dimensions for the new HF or VHF beam and necessary feedline matching data? W8FX leads the way to several reference books and manuals that will have the information you require. (Photo courtesy Polar Research, Inc.)

In last month's Antennas & Accessories column we concluded a two-part series that placed the spotlight on hamshack software. We perused several commercial software packages, including the Xantek Computerized DX EDGE™, David Eagle's Science Software series, and AC3L's Morse Code software. We also discussed KH6CTQ's *Quad Reference Book* and several other publications, antenna products, and software packages.

This month we've cooked up a recipe that constitutes a review of the many available sources of hamshack information—magazines, reference books, newsletters, and other publications. We'll also highlight some hamshack reading material that's recently come to our attention, and introduce several new software offerings. Finally, we'll close the log with a list of antenna and antenna parts suppliers that you should find helpful. First, though, a look at information sources.

Ham Radio Information Sources

Many of the letters that I receive contain requests for information that is readily available in the several amateur magazines, reference publications, newsletters, etc. I respond to the "where do I find that" requests to the best of my ability. Often the answer to one's question is a lot closer to home, if one only knew where to look for information. One needs some idea of just what "information source" might contain the answer to a perplexing question. This month we'll provide a broad overview of some of the sources we have found to be useful to us in general amateur radio, antenna, and hamshack software information quests.

In this short column we can't possibly list all of the myriad information sources which might be uncovered, but we will at least categorize them, list some of the major sources by name, and provide some ideas on where and how to find these sources. Let's look at some of the sources we've identified.

317 Poplar Drive, Millbrook, AL 36054

mean magazines such as *CQ*, *73*, *Ham Radio*, and *QST*. For most stateside amateurs these four magazines represent the most important, general-purpose sources of technical and operating news; the lively competition between them is a healthy phenomenon. Though similar in many respects, each publication carries a different editorial theme and serves a slightly different client base. For example, *CQ* is oriented to a middle-ground in amateur radio, serving amateurs who are perhaps more operating-oriented than technically inclined. On the other hand, *Ham Radio* is firmly focused on advanced communications technology. Each publication has a stable of specialized columns, and many amateurs make their subscription selections based on the specialized interests served by the particular magazine—operating, contesting, RTTY, DX, Novice and beginner, antennas, etc.

Outside the United States the major amateur radio periodicals include the Radio Society of Great Britain's (RSGB's) *Radio Communication;* the German Amateur Radio Club's (DARC's) *CQ-DL;* and Japan's *CQ Ham Radio* and *Ham Journal*. Our own *CQ* has an affiliated Spanish-language edition, *CQ Radio Amateur*, which is published in Spain and distributed throughout the Spanish-speaking world. While the magazine is independent and carries material mostly of Hispanic origin, several of the stateside *CQ* columns are frequently reprinted in the Spanish edition.

We should also mention two other publications in the *CQ* stable, *Popular Communications* and *Modern Electronics*. Neither magazine is specifically targeted to amateurs, but most amateurs will find many of the articles in both publications relevant. The latter magazine, incidentally, is something of a reincarnated *Popular Electronics*. Those of us who received much of our early electronic upbringing on that now-defunct publication will almost certainly enjoy *ME*.

Specialized Periodicals. Into this category fall a grab-bag of special- and hybrid-interest magazines such as *Computer Trader Magazine*, published right here in Alabama; *Spec-Com*, formerly *A5 ATV Magazine*, which supports most of the new-technology communications modes; and *ORBIT*, published by AMSAT and serving OSCAR satellite enthusiasts. Also included in this category might be *Computer Smyth Magazine*, a computer hardware magazine that is popular among hams; and *Run* magazine, a Commodore-specific computer monthly that frequently publishes amateur radio and communications applications articles relating to the Commodore line of computers.

Professional and Technical Publications. Several professional/technical electronics periodicals may be of interest to amateurs, particularly those whose technical interests and needs run deep. Some of these publications include *Radio-Electronics; IEEE Spectrum; IEEE Transactions on Antennas and Propagation; Microwave Journal; Microwave Systems News;* and *RF Design*. Technically oriented computer magazines include publications such as *Byte*, *Dr. Dobb's Journal*, *The Transactor*, and others too specialized and numerous to mention here.

There's a sort of "new frontier" in amateur radio on the lower frequencies, as well as the upper reaches of the spectrum. One easy way to tune into VLF (very low frequencies) is through use of a VLF up-converter, such as this one from Palomar Engineers. Such devices up-convert a sizable chunk of the VLF spectrum to a more easily received range, such as 3500–4000 kHz. (Photo courtesy Palomar Engineers)

Newsletters. These serve a wide range of interests, often quite specialized. Most of these are published either weekly, monthly, or quarterly. Needless to say, such publications come and go with the trends and tides, but some have remarkable power and serve needs not easily served by the slick monthly publications.

Some of the more popular general-interest newsletters include *The ARRL Letter*, whose primary purpose is to keep the amateur radio fraternity informed of recent news in a timely manner; the Sacramento-based *World Radio* (2120 28th St., Sacramento, CA 95813), a lively, general-interest ham newspaper; and the biweekly newsletters *Westlink Report* (11119 Allegheny St., Sun Valley, CA 91352), and *W5YI Report* (Box 10101, Dallas, TX 75207). This group of publications focuses on legislative and FCC matters, organizational issues, upcoming events, and the like.

More specialized newsletters also abound. One of the better-known among these is *QEX*, the ARRL experimenters' exchange publication, a monthly ARRL-sponsored newsletter focusing on articles that may be too technical for big brother *QST*. There's also AMRAD, the Amateur Radio Research and Development Corporation, an organization of experimenters in packet radio, spread spectrum, and digital communications; AMRAD publishes a monthly newsletter for the membership. Into this category may be placed VHF/UHF newsletters and club publications such as *220 Notes* (WD9GCR); *VHF/UHF and Above Information Exchange* (KA0HPK); *Sidewinders on Two Bulletin* (K1PLR); *Six Shooter* (K5ZMS); *Radiosporting* (VE3BMV); and the *Northeast VHF News* (W1GXT), to name but a few.

Also to be included here are the many regularly published DX bulletins and propagation newsletters. Some of the more popular pubs in this group include *The DX'ers Magazine* (W4BPD); *The DX Bulletin* (K1TN); *LIDXA Bulletin* (W2IYX); and *QRZ DX* (W5KNE).

Reference Books and Manuals. When in doubt, look it up. In many cases the best source for project information is a thick reference manual. We surely can't cover them all, but let's look at some of the most useful ones to amateurs.

General amateur radio standard reference sources include well-known publications such as *The ARRL Handbook;* Bill Orr's *Radio Handbook;* the *RSGB Radio Communications Handbook;* and the RSGB's *Amateur Radio Operating Manual.* Many publications serve special interests, mainly from the ARRL, such as the various *License Manuals; Hint and Kinks; FM and Repeaters for the Radio Amateur; the FCC Rule Book; The Satellite Experimenter's Handbook;* and other publications too numerous to detail here.

Individuals and organizations other than the ARRL have, in recent years, published definitive reference books for the hamshack. Some of the more useful of these are George Jacobs, W3ASK, and Ted Cohen, N4XX's *The Shortwave Propagation Handbook;* Bob Locher, W9KNI's *The Complete DX'er;* Dave Ingram, K4TWJ's *RTTY Today;* and Adrian Weiss, K8EEG/W0RSP's *The Joy of QRP.* There is also Rich Rosen, K2RR's *From Beverages Thru OSCAR—A Bibliography,* in two volumes.

The antenna buff has no lack of information. In addition to the highly technical, nonamateur oriented standard texts, excellent ARRL sources include the *ARRL Antenna Book, ARRL Antenna Anthology,* and *ARRL Antenna Compendium,* while the RSGB publishes *HF Antennas for All Locations.* A recently reprinted "antenna classic" is Paul H. Lee, N6PL's *Vertical Antenna Handbook.*

Another set of classics belongs in the library of any active amateur operator. These, of course, are the "Bill Orr Series" of antenna publications. They include *Simple Low-Cost Wire Antennas, Beam Antenna Handbook, The Radio Amateur Antenna Handbook,* and *All About Cubical Quad Antennas.*

In the bits-and-bytes domain we're seeing the available source books go from virtually "nothing available" just a year or two ago, to a nearly full shelf today. A particularly useful publication is Hayden Books' *Computer Programs for the Radio Amateur,* by Wayne Overbeck, N6NB, and Jim Steffen, KC6A. This is probably the first complete source book of computer programs for the radio amateur, and one which can be purchased complete with program disks for most of the popular home and personal computers. Another amateur radio computer book is that by Joe Gasser, G3ZCZ, entitled *Software for Amateur Radio,* which is published by TAB Books.

A new book by Jim Grubbs, K9EI, *The Commodore Ham's Companion,* provides a wealth of solid information on practically all aspects of Commodore computing in the hamshack. More on Jim's book later on in this column.

Also, while not specifically written with the amateur radio operator in mind, three books by Alfred Glossbrenner deserve special mention as excellent building blocks for the intelligent use of the computer in the hamshack and home. These are the St. Martin's Press volumes *How to Buy Software, How to Get Free Software,* and *The Complete Book of Personal Computer Communications.* Each of these constitutes invaluable computer and communications source books.

Ads, Catalogs, and Product Reviews. These should not be overlooked for both general technical information and specific, product-related information. Most catalogs can be obtained free of charge simply by requesting them using magazine's reader-service coupons. Often catalogs will contain tutorial information on the products' use and their technical background, as well as data on new components and applications that may be of use to you. New product reports and reviews, though often not as objective and critical as they should be, may be helpful, too, in building an information base.

To this point we've covered most of the main amateur radio information sources. But where to obtain or "hook onto" these sources?

Many of the magazines we've listed are available on newsstands or can be seen at the larger libraries. Especially good sources for the general and technical electronics publications are college and university libraries and bookstores, especially those schools which have engineering departments. Many of the amateur radio newsletters advertise in *CQ* and other amateur publications, and we've included a ham callsign as a point of contact with each newsletter entry in this column.

As for the reference books we've cited, there are several convenient sources. The *CQ* Book Shop (see the advertisers' index) stocks a wide variety of electronics and amateur radio books, including the Bill Orr series previously mentioned, and the Book Shop is only as far away as your mailbox. The Ham Radio Magazine Bookstore is another publisher-operated venture that carries an extensive line of publications for the amateur, and one which also stocks computer books and software.

There is also the ARRL, which of course stocks all of the ARRL publications and manuals, nam and membership supplies, and a limited number of non-ARRL publications, such as those from the RSGB. The major amateur radio equipment dealers and some local stores, many of those whose ads can be found in the pages of *CQ,* also sell manuals and books.

To softly toot our own horn, don't forget

the wealth of information contained in the magazine which you are reading! In addition to printing a wide range of technical, construction, and operating articles, *CQ* regularly devotes whole issues to subjects such as antennas, RTTY, and DX, and each month carries columns devoted to propagation, DX, several categories of contests, VHF, QRP, Novice, specialized operating modes, and, of course, antennas and accessories. Newcomers to amateur radio will find Bill Welsh, W6DDB's Novice column a treasure trove of useful information; in fact, any given year's collection of Bill's columns represents a mini-handbook of amateur radio from the beginner's viewpoint. Moderately experienced amateurs looking to try out the new operating modes will find much of interest in Dave Ingram, K4TWJ's monthly World of Ideas column.

Ham radio information? It's all around us, and yours for the taking!

Good Reading

We've surveyed several sources of amateur radio information to this point. Right now I'd like to highlight and review some specific publications which you should find informative. Let's start with a new book from K9EI.

The Commodore Ham's Companion. If there is (or may be in the future) a Commodore computer in your hamshack, you'll be interested to learn of Jim Grubbs, K9EI's new book. This new book provides a considerable body of information on hamshack computing with the Commodore series of computers. The book discusses Commodore computer selection and system upgrading; tells where and how to find specialized programs for applications such as slow-scan television, packet radio, and Message Storage Operations (MSOs); lists over 80 sources for Commodore amateur radio software and hardware; and includes a bibliography of over 60 magazine articles and reviews concerning the use of Commodore machines in the shack.

Jim Grubbs has a good, solid product in the *Commodore Ham's Companion*. Reflecting a genuine enthusiasm for finding new ways to do things in amateur radio using the home computer, Jim does an excellent job of orienting the reader to Commodore computers in the hamshack. This publication fills a real need.

The book can be obtained for $15.95 plus $2.50 for shipping and handling from QSKY Publishing, P.O. Box 3042, Springfield, IL 62708. The front cover of Jim's book is shown in fig. 1.

We should also note that Jim was editor of the Command Post column in *Commander* magazine from September 1983 to June 1984, when the magazine ceased publication. For those who remember it, his column was the only Commodore-specific amateur radio column to appear in a major computer magazine. Reprints of the entire Command Post series are also available from his publishing house for $9.95, plus shipping and handling.

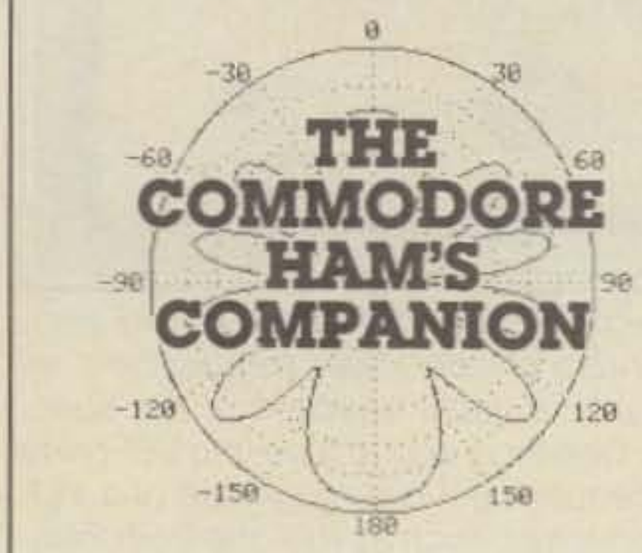


Fig. 1– The Commodore Ham's Companion by Jim Grubbs, K9EI.

We wish Jim good luck in his new publishing venture!

Commodore 64 Case History. Those who own a Commodore 64 should find interesting an article which appeared in the March 1985 issue of the *IEEE Spectrum*, "Design Case History: the Commodore 64." This article describes in fascinating detail the engineering history of the Commodore 64—a computer which, along with its custom chips, was created in a single year, from concept to production. It's a story of rapid development and almost complete engineering autonomy that is almost unknown in the computer industry.

Included in this fascinating story is far more than just the engineering details: the several strong management personalities involved, the myriad cost-cutting production techniques, and more. For those with 64s gracing the shack, this article makes for great reading.

Lowdown on the Lowdown. Have an urge to return to radio's "root frequencies"? In a sense, the Longwave Club of America (LWCA) caters to this need, and it counts among its members many hams. The LWCA was organized in 1974 to promote DXing and experimenting on frequencies below 550 kHz and activity on the so-called 1750 meter experimenters' band. These frequencies include radio navigational aids; emergency, news, marine, and aeronautical services; standard time and frequency stations; and longwave broadcasters outside the Western Hemisphere.

The Lowdown is the LWCA's monthly journal, and it contains information on

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COPPER ELECTRONICS	4200 PRODUCE RD.	LOUISVILLE KY 40218	800-626-6343
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HENRY RADIO	931 N. EUCLID	ANAHEIM CA 92801	714-772-9200
HILL RADIO	2503 S. E. ROAD - BOX 1405	BLOOMINGTON IL 61701-0887	309-663-2141
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QUAD ELECTRONICS COMPANY	1420 N. PACE BLVD.	PENSACOLA FL 32505	904-438-3319
RADIO WAREHOUSE	5635 EAST ROSEDALE	FT. WORTH TX 76112	800-433-3203
RADIO WEST	3417 PURER RD.	ESCONDIDO CA 92025	619-741-2891
RADIO WORLD	ORISKANY ARPT. TERMINAL BLDG.	ORISKANY NY 13424	800-448-9338
RF ENTERPRISES INC.	RT #7	ST. CLOUD MN 56301	612-255-0855
RIVENDELL	68 WARNER HILL ROAD	DERRY NH 03038	603-434-5371
ROSS DISTRIBUTING COMPANY	78 SOUTH STATE	PRESTON ID 83263	208-852-0830
SHAVER RADIO INC.	1775A S. WINCHESTER BLVD.	CAMPBELL CA 95008	408-370-6665
SLEP ELECTRONICS COMPANY	HIGHWAY 441	OTTO NC 28763	704-524-7519
SPECTRONICS INC.	1009 GARFIELD ST.	OAK PARK IL 60304	312-848-6777
SULTRONICS AMATEUR RADIO	15 SEXTON DRIVE	XENIA OH 45385	513-376-2700
TEL-COM	675 GREAT ROAD (RTE. 119)	LITTLETON MA 01460	617-486-3400
TEXAS TOWERS	1108 SUMMIT AVE. SUITE 4	PLANO TX 75074	214-422-7306
THE ANTENNA BANK	516 MILL ST. N. E.	VIENNA VA 22180	800-336-8473
THE HAM STATION	220 N. FULTON AVE.	EVANSVILLE IN 47710	800-523-7731
THE VHF SHOP	BOX 349 RD 4	MOUNTAINTOP PA 18707	717-868-6565
TNT RADIO SALES INC.	4124 WEST BROADWAY	ROBBINSDALE MN 55422	800-328-0250
UNADILLA/REYCO/INLINE	6743 KINNE ST.	E. SYRACUSE NY 13057	800-448-1666
UNIVERSAL AMATEUR RADIO INC.	1280 AIDA DRIVE	REYNOLDSBURG OH 43068	614-866-4267
UNIVERSAL ELECTRONICS	4555 GROVES ROAD SUITE 3	COLUMBUS OH 43232	614-866-4605
VHF COMMUNICATIONS	915 NORTH MAIN STREET	JAMESTOWN NY 14701	716-664-6345
WESTECH ELECTRONICS	ROUTE 286 - PRESQUE ISLE PLAZA	PITTSBURGH PA 15239	412-733-1555

Fig. 2– Antenna and antenna parts suppliers directory.

1750 meter band operations, loggings, technical equipment and antenna articles, help with station IDs, members' letters and want ads, and the like. The journal is included as part of the LWCA membership, which is presently $10 per year. Information can be obtained by writing to the LWCA, 45 Wildflower Rd., Levittown, PA 19057.

Incidentally, for those who may not be aware of the fact, unlicensed transmitters of 1 watt power may be operated in the US on the 1750 meter wavelength. FCC restrictions are severe, however. In addition to the power input being restricted to 1 watt, and the need to suppress all emissions outside the 160–190 kHz band by 20 dB, the total length of the transmission line(s) plus the antenna may not exceed 50 feet!

In the same vein, we should mention an LWCA-promoted publication, Ken Cornell's *The Low and Medium Frequency Scrap Book*. Ken's book, which is now into at least the fourth edition, is an all solid-state collection chock full of simple circuits and data on the lower reaches of the radio spectrum; much of the book's information is also applicable to the lower frequency amateur bands, such as 80 and 160 meters. Active antennas, loops, converters, preamps, coils and coil-winders, FCC rules, and the like are all covered. The book is available for $10 directly from Ken Cornell, W2IMB, 225 Baltimore Avenue, Point Pleasant, NJ 08742.

Software of Note

N6ESV Hamdisk. Jim Pearce, N6ESV, has assembled a useful collection of Commodore 64 software on a single disk, and has made it available to other amateurs at no charge, other than to send him a blank disk and SASE mailer.

Jim's Hamdisk package contains several programs that he has either written or converted for the 64. These include five program sets, for contest logging and duping; DXCC callsign and awards-tracking; WAS award tracking; propagation predictions; and contest following on a "perpetual calendar" basis. Documentation for the programs is contained on the disk and may be printed out in hardcopy form.

For a copy of N6ESV's Hamdisk, send a blank diskette and SASE mailer to Jim at 4104 Earnscliff Avenue, Fair Oaks, CA 95628.

Public Brand Software. Most of us like things that come to us "free," or nearly so. In this light, the concept of public-domain software appeals to us. At a southeastern hamfest last summer we encountered Donald Schlensker, whose Public Brand Software firm had recently issued a catalog of highly affordable programs for the IBM-PC and IBM compatible computers ("clones"), priced at $5 a disk.

A perusal of the Public Brand catalog only showed one strictly amateur radio

disk (Disk No. HR 1.1), though this disk included a wide range of programs such as Morse code practice, SSTV reception, satellite finding, RTTY, QSL card management, etc. Most of the disks in the Public Brand collection are DOS utilities; screen editors and graphics packages; communications programs; languages; word processors and databases; and even games—each disk a veritable "candy store on a floppy."

Recognizing that the quality of public-domain programs varies all over the lot, the catalog rates each program, and the overall disk, with from one to four stars—a one-star program or disk being "interesting at least," and a four-star being "invaluable, superb, a masterpiece." The disks, in double-sided DOS 2.x (360K) format, are available for $5 each from Public Brand Software, P.O. Box 51477, Indianapolis, IN 46251.

Donald welcomes program contributions to the PBS library, if you wish to processor. A sample wiring diagram for hooking the computer to the transmitter for the Morse code keyboard feature is included in the package.

For more information, contact KOH Software, P.O. Box 18517, Charlotte, NC 28218.

Ampro IBM-PC Software. Also for the IBM-PC is a series of awards-handling software for the PC, compatibles, and other MS-DOS machines, from E.B. Rough, KB3GX.

Ampro offers four packages: DXCC; 5-band DXCC; WAZ/5-band WAZ; and WAS/5-band WAS. Each package is intended not for use as a logbook, but rather as a means of keeping an organized record of progress toward the acquisition of one or more of the awards, and a means of listing selected information on them. Each program contains complete databases and a data editor.

Each of the four packages includes complete documentation, though the software is "friendly" in that minimal instruction is needed. All the program features are selected from option menus; each entry displays the entire record when performing file maintenance, thus allowing verification of entries before being returned to the file.

The Ampro programs require the use of one disk drive and 256K RAM; a printer is optional, but is preferred. The disks are non-copy protected; for hard-disk owners, a batch file is provided for automatic installation of the programs. The cost of each program in the series is $29.95 plus $2.00 shipping and handling. For further information contact AMPRO Software, 101 Maple Lane, Annapolis, MD 21403.

New from KOH Software. Jack Davis, WB4KOH, advises us that he is still in there plugging with the TI 99-4/A home computer. Jack sells a variety of software packages for the computer, including those for electronics and electrical engineering; home and office; printer enhancement; programming aids; and amateur radio.

A new offering is a menu-driven program package for the TI that performs the multiple functions of a Morse code programmable keyboard, dupe checker, and logging program. The package is self-documenting, and the instructions may be printed out by an internal program routine, or by the popular TI-Writer word-processor. A sample wiring diagram for hooking the computer to the transmitter for the Morse code keyboard feature is included in the package.

For more information, contact KOH Software, P.O. Box 18517, Charlotte, NC 28218.

Antenna and Antenna Parts Suppliers Directory

It's generally not all that simple to walk down to the local franchised consumer electronics store and purchase 300 feet of openwire line or hardline. In fact, it's not easy to find just what you need when purchasing antennas, antenna construction supplies and repair parts, transmission lines and cables, and the like. Recognizing this fact, in the October 1984 issue we collected and presented an "antenna parts sources sampler" listing in that month's column, with emphasis on the firms that specialized in mail-order sales. This listing, though small and incomplete, was well received.

We've now broken out our list into two distinct listings: one for dealers and another for manufacturers. This month we will present the Antenna and Antenna Parts Suppliers Directory (fig. 2)—a dealer list organized alphabetically. In an upcoming column we will present the manufacturers directory.

As with the Software Sources Listing which we presented in a recent column, please consider the listings as a *guide* in shopping. We suggest that you check out the stores listed in your area, seeing if they can meet your needs, but also send for the catalogs and sales flyers of those of interest outside of your local area. Recognize that it's too big a task for us to keep up with the details of what each firm or individual offers; you'll have to check each firm's offerings yourself. Also, realize that the listing was prepared several months prior to actual publication in the column, so some new sources may have been inadvertently left out (our apologies!).

There is nothing hard and fast about this directory, and so we would welcome input from those who would like to be added, as well as from those who would like to be deleted from it. We hope to keep the directory as current and useful as we can, and we expect to update it in future columns.

Wrapping It Up

That wraps up the column for this month. This time we've surveyed a number of amateur radio information sources, perused the bookstores for some good hamshack reading matter, and taken notes of some new amateur software. We also presented our updated Antenna and Antenna Parts Suppliers Directory (with manufacturers to be featured in a future column.

Next month more Antennas & Accessories topics of timely interest. See you then.

73, Karl, W8FX

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month is:

Charles Loftis, WDX4KEF
All Counties #496, 7-10-85

"My shortwave listening began in 1965 when I was with the United States Air Force in Iceland. I bought a portable SW radio shortly after arriving there because there were only Islandic language broadcasts on the local radio stations. I tried to see how many counties I could hear. I think, as an SWL station, I logged every country in Europe from that location. I could really use cards from some of those countries.

"It was in 1969 that I began serious SWLing. I bought a communications receiver and I also found out about QSL cards. I started trying to confirm as many countries as I could, as well as all states and Canadian provinces.

"In September 1970 one state I needed to confirm all states was Missouri. I happened upon the County Hunters Net, where I heard WØSJE in Missouri. I sent Jack a card and requested his QSL. He sent me his QSL as well as a Mobile Reply Card for the county he was in. He enclosed a long letter explaining everything about county hunting and mentioned that the award was available to shortwave listeners as well as to licensed operators. I was amazed at this kindness, since I had sent many cards to hams and never heard from them.

"So, with the help of WØSJE, I began my county hunting in September 1970 and ended nearly 15 years later in June 1985, when I confirmed my last county.

"Through the years I found that most of the county hunters were just as thoughtful as Jack. I have not experienced such a helpful attitude anywhere else on the amateur bands.

"It was a great loss to county hunting and amateur radio in general when WØSJE became a Silent Key. It was in his honor that MARAC initiated the WØSJE Memorial Award. I received Number 5 certificate for the WØSJE Award, which is very special to me.

"There are too many mobilers to thank personally for helping me to complete USA-CA. When I got under 100 to finish, there were quite a few who made special trips to operate from the counties I needed. It was a big help, of course, when the 75 Meter Net was revived and I was able to hear the counties I needed to finish here in the southeast.

Charles Loftis, WDX4KEF, USA-CA All Counties #496, 7-10-85.

"Finally I was down to three counties to finish All Counties. They were Power County, Idaho; Dawson County, Texas; and Northumberland County, Virginia.

"I knew WA7UQE drove an 18 wheeler and ran counties all over the United States, so I wrote him a letter about the three counties I needed to finish. I also told him that Thursday was my day off.

"The following Thursday I learned that Mel, W5AWT, was on a trip and had decided to go up to Dawson County, Texas. I heard Mel make a contact from Dawson County, Texas. Now I had only two to go.

"The next Thursday Al, WA7UQE, was on a trip from Texas to Oregon. He made a side trip over to Power County, Idaho. I heard him operating from there and now I had only one county to go.

"I got the County Hunters Directory to see who was near Northumberland County, Virginia. I discovered that Bill, WA3ZMY, lived near there, so I wrote to him. Bill received my letter on Monday and telephoned me that same evening to discuss the best time for propagation from Virginia to South Carolina. We agreed upon June 30 at about 0100, when I could hear stations in Virginia fairly well.

"As planned trips often go, Bill did not make it to Northumberland County by 0100, and it was after 0200 when he arrived. By the time he started his run, I could no longer hear him. Then at 0219 I did hear him work three stations. I later found out that he was in a farmer's driveway, and he turned his vehicle around in a position where he could hear stations in my area.

"I now had county number 3076—my last for all! From September 1970 to June 1985 I had finally confirmed all 3076 counties, and on July 10, 1985 I was awarded USA-CA All Counties #496.

"Now, nearly four months after winning the USA-CA All Counties Award, I am working the counties the second time around and have heard and logged nearly 2000 counties.

Besides shortwave listening, I am active in Masonic Lodge and Shriners. I am a Past Master of my Lodge and have been Secretary for eight years. I am a member of both the Scottish and York Rite of Masonry. I am also a member of Hijaz Temple and a member of the American Legion. This year I was inducted into S.C. Council No. 20 of Knight Masons. This chapter is now the largest in the world of Knight Masons.

"My next goal is to finish All Counties second time around. I do not plan to take 15 years to finish them this time!

"Very best wishes and many thanks to all of you, especially to those who have been so very helpful to me during the years while I was working for USA-CA All Counties. 73, Charles, WDX4KEF"

333 South Lincoln Ave., Mundelein, IL 60060

USA-CA Honor Roll

3000
N6QA 532

2500
KA4SAX 594
W9HQW 595
HB9AFI 596

2000
W9HQW 651
HB9AFI 652
VE3-9094 654

1500
W9HQW 728
HB9AFI 729
ZL2BCX 730
PP2ZDD 731

1000
WA1UDH 897
KF5AT 898
W9HQW 899
HB9AFI 900
ZL2BCX 901
PP2ZDD 902

500
KJ4EJ 2061
W9HQW 2062
HB9AFI 2063
ZL2BCX 2064
PP2ZDD 2065
I2DMK 2066

Awards Issued

Jerry Burkhead, N6QA, advanced to one more plateau and claimed USA-CA 3000 #532, endorsed all CW, 10-4-85.

Ira L. Bell, KA4SAX, now has USA-CA 2500 #594, all mobile, all SSB, 9-28-85.

George A. Van De Boe, W9HQW, qualified for USA-CA 500 #2062, USA-CA 1000 #899, USA-CA 1500 #729, USA-CA 2000 #651, and USA-CA 2500 #595, all 20 M SSB, Mobile, 10-9-85.

Kurt Wetter, HB9AFI, sent for USA-CA 500 #2063 (#5 to HB), USA-CA 1000 #900 (#2 to HB), USA-CA 1500 #729 (#1 to HB), USA-CA 2000 #652 (#1 to HB), and USA-CA 2500 #596 (#1 to HB), mixed band and mode, 10-9-85.

Basil M. Gould, SWL-VE3-9094, was awarded USA-CA 2000 #654, All CW, 10-21-85.

John Luxford, ZL2ZDD, claimed USA-CA 500 #2064, USA-CA 1000 #901, and

Al Garrett, KG5J, this year's winner of the "Manchester Trophy." The Manchester Trophy is a traveling trophy which is awarded each year to an outstanding County Hunter.

USA-CA 1500 #730, all 20 M, SSB, 10-16-85.

Dick Dorrence, PP2ZDD, qualified for USA-CA 500 #2065, USA-CA 1000 #902, and USA-CA 1500 #731, all SSB, 10-22-85.

Stephen E. Press, WA1UDH, added the gold seal for USA-CA 1000 #897, mixed, to his certificate, 9-23-85.

Joe M. Chambers, KF5AT, received the seal for USA-CA 1000 #898, mixed, 9-26-85.

Certificates for USA-CA 500 went to:

Clarence A. Willis, KJ4EJ, #2061, all 20 M, SSB, 9-30-85.

George Van De Boe, W9HQW, #2062, all 20 M, SSB, mobile.

Kurt Wetter, HB9AFI, #2063 (#5 to HB), mixed, 10-9-85.

John W. Luxford, ZL2BCX, all 20 M, SSB, 10-16-85.

Dick Dorrance, PP2ZDD, all SSB, 10-22-85.

Massimo De Marco, I2DMK, all CW, 10-23-85.

Armadillo 1986

On October 24, 1985, Governor Mark White of Texas issued the following proclamation:

"Amateur radio operators have long provided a service to the citizens of Texas by providing emergency communications during disasters.

"Many amateur radio operators around the world enjoy trying to contact other amateur radio operators in every county in the United States.

The Diploma FRACAP.

"The members of the Texas DX Society Amateur Radio Club want to celebrate Texas's Sesquicentennial with amateur radio operators around the world by designating a special 'Armadillo County' along the Texas Independence Trail in honor of Texas's unofficial mascot.

Therefore, I, Mark White, Governor of Texas, do hereby proclaim that from March 2, 1986, the 150th anniversary of the signing of the Texas Declaration of Independence, through December 31, 1986, the end of the Sesquicentennial Year, any licensed amateur radio operator operating from, or on the land or on the land fronting on, the Texas Independence trail may broadcast that he is operating from 'Armadillo County, Texas.'

"In official recognition whereof, I hereby affix my signature this 24th day of October, 1985." (signed) Mark White.

In cooperation with the Texas DX Society, which is making this special effort, the USA-CA Custodian will recognize Armadillo County, Texas for credit toward the award. However, it is **not required** for any level of the award.

The following rules and conditions apply:

1. The county must be worked in the period March 2 through December 31, 1986.

2. The usual confirmation procedures are required.

3. Credit for Armadillo County may be claimed along with the "regular" county or counties (county line) in which the mobile is operating.

4. To claim credit, simply add Armadillo County and the usual QSO information to the Texas counties in your record book, or list, for submission to the custodian.

For purposes of the USA-CA Award, Armadillo County is considered to be an optional, additional county. It may not be used instead of any other county. It may be used to round out the count for intermediate endorsement levels.

The Texas Independence Trail is a series of state and US highways that stretch from just east of Houston to just east of San Antonio and down to the Gulf Coast. This trail marks the fight for independence from its beginning through the final battle at the San Jacinto Battleground near Houston.

Armadillo County is open to all amateurs. The Texas DX Society is planning an all-band special events station, K5DX/A, for opening day. On December 31, 1986 Armadillo County will become a deleted county.

For further information, contact Tom Taormina, K5RC, 3940 Bahler Avenue, Manvel, TX 77578. Tom's telephone number is 713-489-1152.

Awards Available

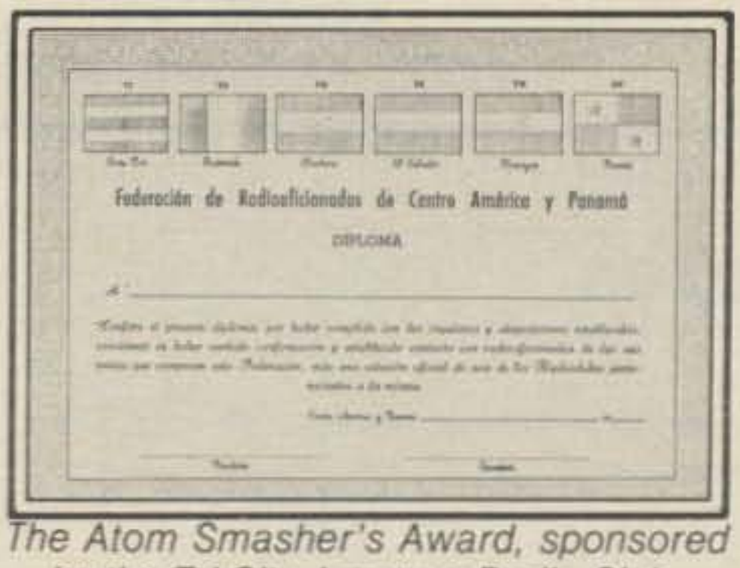
Diploma FRACAP. The principal reasons for the creation of this diploma are, aside from increasing the international awareness of the FRACAP existence, to raise the interest and knowledge of the geographical location of its member countries, namely Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

The requirements are two-way confirmed contact, any mode, any band, with each one of the six different countries forming the FRACAP. To be counted as valid, each contact must be made with a radio amateur affiliated with the club, member of the FRACAP. Contacts are valid after August 16, 1985.

The application must be accompanied by the QSL cards, or a GCR list verified by the radio club of which the applicant is a member. The cost of the diploma is 10 IRC's, or $5 US. Send application and fee to Awards Manager of R.C.C.R., Bengt Hallden, TI4BGA, Box 999, 3000 Heredia, Costa Rica.

Halley's Comet Award. WB6FNI will operate from the Jet Propulsion Laboratory's Table Mountain Observatory, where he is a resident astronomer, to commemorate astronomical observations of Halley's Comet during the International Halley Watch. Operation will be limited to 40 meters during the months of February and March 1986 on a noninterference basis with normal observatory activities. Frequencies and times: CW—7.120 ± 5 kHz (Novice) 0400–0500 UT; Phone—7.228/ 7.077 (DX to EU and AF) 0500–0600 UT; 7.249 (stateside/ Western Hemisphere) 0600–0700 UT; 7.249 (Triple HHH Net) 0700–0800 UT; 7.228 (South Pacific/Australia/NZ) 0800– 0900 UT; 7.228/7.084 (DX to Asia/Far East) 0900–1000 UT. Certificate plus an original 1986 Halley's Comet photo taken at the observatory are available for #10 SASE (39¢) stateside or 5 IRC's DX requests. QSL via operator at P.O. Box 576, Wrightwood, CA 92397 U.S.A.

Atom Smasher's Award. This award is sponsored by the Tri-City Amateur Radio Club station, W7VPA. The requirements are as follows. For DX stations—one contact with W7VPA or 3 contacts with club members. For stateside stations outside tri-city area—one contact with W7VPA and 10 contacts with club members. For stations in tri-city area—one contact with W7VPA and contacts with 10 club



The Atom Smasher's Award, sponsored by the Tri-City Amateur Radio Club.

The Krebshilfe Diploma, the German Cancer Foundation Award.

members or contacts with 15 club members.

Cost: DX station no cost, but 2 IRC's if airmail is required. All stateside stations $1.00. The award will be mailed folded in a first-class envelope. Log data will be accepted for verification but must be in GMT or UTC only. No QSL card is required.

German Cancer Foundation Diploma. Early in 1982 a group of six OM's in Koenigstein/Ts. near Eschborn near Frankfurt/Main decided to use an amateur radio diploma to gain support for the German Cancer Foundation "Krebshilfe." The diploma was designed and officially recognized by the DARC (German Amateur Radio Club) in November 1982 and was made public in "CQ-DL" in 1983.

Dr. Mildred Scheel (co-founder and patron of the "Krebshilfe" and wife of former president of Germany, Mr. Walter Scheel) promised her support of the "Krebshilfe" diploma effort. Since then about 800 diplomas have been issued, and on October 20, 1983, in connection with the 10th anniversary of the local radio club F43 in Eschborn, a check for 2.000 DM from the first proceeds was presented to Dr. Mildred Scheel and the "Krebshilfe" during ceremonies in Cologne.

The German Cancer Foundation diploma may be awarded to all SWL's and licensed OM's operating on VHF or HF in any mode on any recognized band. The diploma is 25 × 35 cm in size and is printed in brown, red, and gold on heavy paper of parchment-like quality.

Spell the word "Krebshilfe" using only the last callsign letter from each of ten confirmed QSO's with DL stations. The order of the QSO's is immaterial. Each QSO, confirmed with a QSL card, may be used only once. All QSO's must take place on or after the first of January 1983.

The application for this award together with a confirmed list of the received QSL cards and 10 DM or 13 IRC's should be sent to: Kari Minola (DL2FBC), P.O. Box 1348, D-6240 Konigstein/Ts, Federal Republic of Germany.

Notes:

There have been several serious and unresolved questions about the acceptability of contacts with W0RLM/Mobile. The distances claimed were inconsistent with elapsed times, claim to have been operating air-mobile from a county line, traveling at a speed of 330–350 knots, and use of a repeater in making the contacts. Under these circumstances, and based on documentation in my possession, it appears that I have no choice but to deny credit for counties worked based on contacts with W0RLM. If you have these contacts in your application, please rework the county.

I hope your New Year is off to a good start and that things are going well where you are. 73, Dorothy, WB9RCY

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

A Mighty Big Antenna In Texas

I first heard W5UN's amazing moonbounce signal in mid-October 1985. On a weekday evening at moonset (the time when the moon is about to dip below our western horizon) on a date that I cannot precisely recall, I eagerly awaited reception of W5UN's EME signal on 144.008 MHz, having been alerted earlier of his possible presence. Sure enough, with the moon still about six degrees above my southwestern horizon, the signal was detectable: W5UN . . . CQ . . . CQ . . . de W5UN. I was not just impressed, but somewhat amazed by the relative strength of the signal—about 3 dB above the noise—considering how obstructed my southwestern horizon is. There is a cluster of 60 to 70 foot tall trees to my southwest forming a barrier between my 45 foot high 2 meter antennas and the sky.

Contacting Dave Blaschke, W5UN, shortly after hearing him that fateful evening brought in return a detailed and rather hilarious story entitled "The Evolution of a Mighty Big Antenna (MBA) in Texas." I had heard that Dave was using a unique antenna system on 2 meters, but I wasn't sure of exactly what it was. His story and accompanying photographs enlightened me. Dave has installed the largest amateur 144 MHz moonbounce array I've ever seen or heard of: 544 elements in total, occupying a volume of about 115,000 cubic feet!

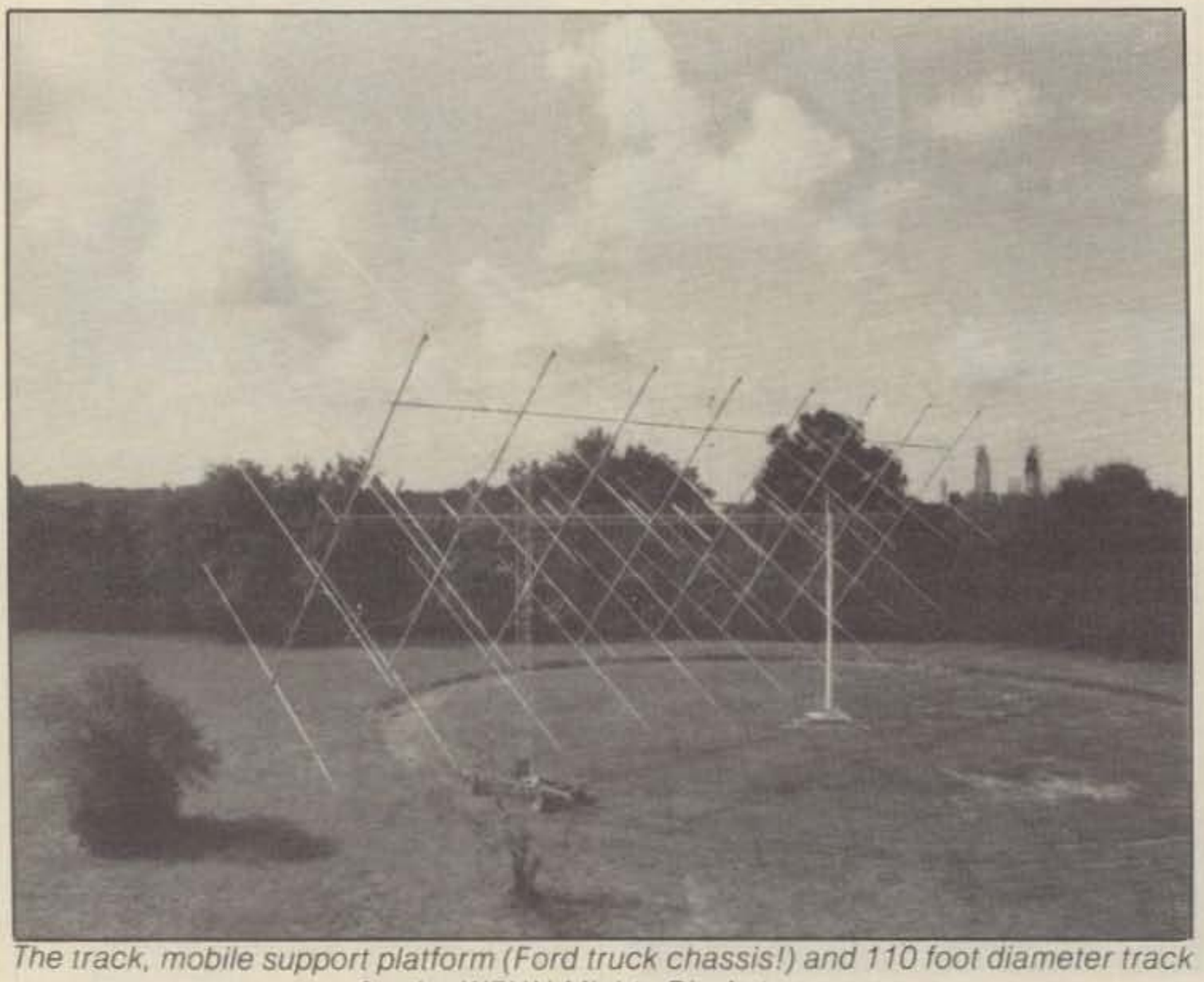
Dave's story is too long to reproduce here (although I'd love to), so I'll include pertinent details. W5UN first conceived his "MBA" while driving to the Dayton Hamvention with WA1JXN in April 1984. Lance is also an avid EME enthusiast, and the two fellows found themselves dreaming aloud about a truly ideal 2 meter moonbounce system. Dave learned in June 1984 that he was to be transferred to a new job assignment in Houston in early 1985, and this was the perfect opportunity for him to hand-pick a QTH for the installation of his "dream" antenna, thirty-two 17-element Yagis on 31 foot booms, assembled on a 97 foot long cross-boom made of tower sections and rotating on a track occupying a half-acre of real estate.

W5UN contacted Mike Stahl, K6MYC of the KLM antenna company, who was contracted to custom manufacture the special 17-element Yagis with 70 ohm feeds. The modified feed system was to accommodate CATV "hardline" to be used as the antenna interconnects. Dave points out that Lance, WA1JXN, was instrumental in the development and plans for the Mighty Big Antenna.

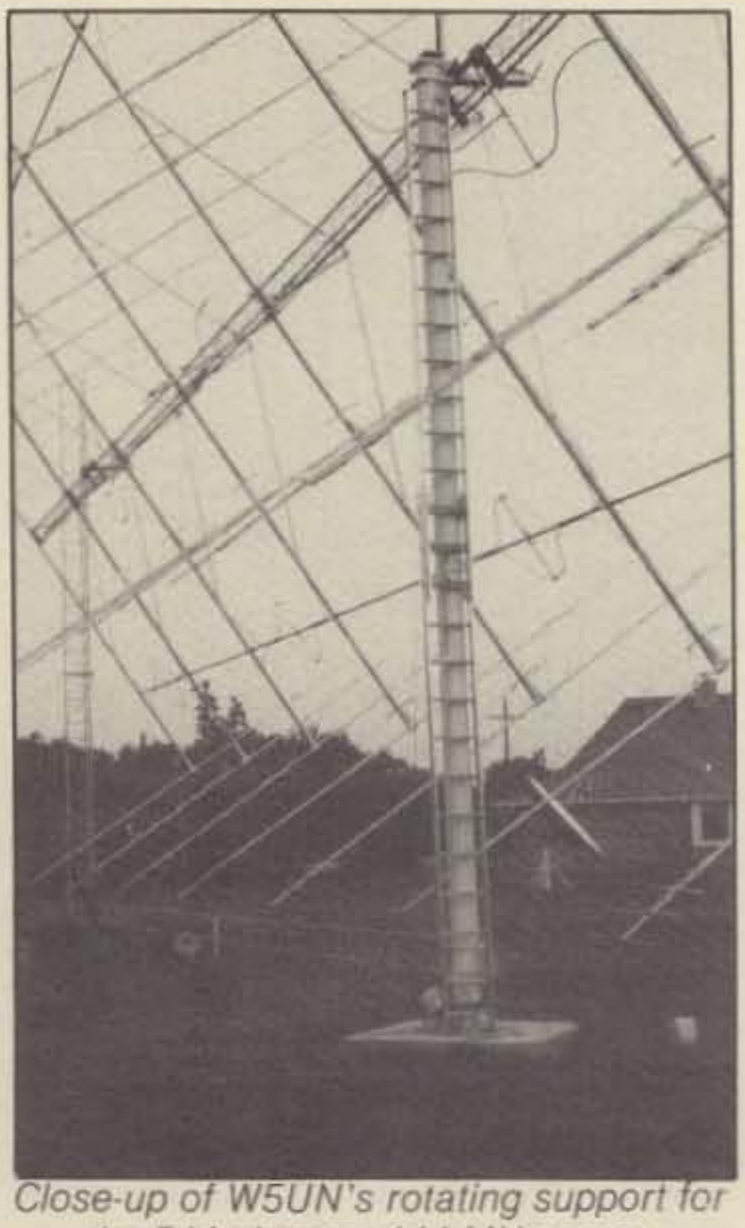
Dave and his XYL located a suitable property in rural Manvel, TX, about 25 miles south of Houston, for the construction of their home and the ultimate moonbounce antenna. House construction was completed in April 1985, and concrete foundations, totalling 20 cubic yards, were poured for planned antennas. Assembly of the huge 2 meter system occupied the months of May through July, and the antenna had its on the air debut August 5, 1985. I won't go into the mechanical details of construction, fascinating as they are, but the photographs tell much of the story: the 97 foot cross-boom supports the 32 antennas in 8 groups of 4, and is supported by a 33 foot length of 8 inch (ID) pipe, which acts as the rotatable fixed support, and a similar length of Rohn #45 tower attached to the chassis of a Ford pickup truck acting as a mobile support platform.

The track on which the mobile platform rides is a circular, leveled, 110 foot diameter dirt pathway centered on the rotating mast. The truck chassis is powered by a 400 in.-lb. reversible gearmotor which

24 Louis Dr., Budd Lake, NJ 07828



The track, mobile support platform (Ford truck chassis!) and 110 foot diameter track for the W5UN Mighty Big Antenna.



Close-up of W5UN's rotating support for the 544-element 144 MHz array.

drives the pickup's rear axle differential. The pickup chassis is held to a rigid radius about the rotatable fixed support by a 56 foot length of Rohn #25 tower and associated strut cables. In case you're wondering, each bay of four 17-element Yagis is supported by a 40 foot length of 3 inch irrigation tubing, and each such crossarm is double strutted to provide extra rigidity. The turning radius for the entire array is approximately 83 feet, and the array requires 6½ minutes for one complete rotation—less than one degree of angular movement per second. Positioning accuracy is about ½ degree.

Dave didn't tell me what kind of motor is used for elevation of this monster array, but he did discuss the problems encountered with elevating a 97 foot long array. He settled on using two hinge mechanisms 56 feet apart and driven in tandem by a single winch. W5UN uses precision potentiometers for measuring azimuth and elevation, and he can resolve azimuth direction to less than one degree. The potentiometers are connected to 3½ digit A/D (analog-to-digital) converters and LED readouts in the shack; the readout system is interfaced to Dave's HP-41 calculator, which computes the moon's position and turns the antenna positioning motors on and off.

Do You Still Want To Build One?

No story is complete without a results summary, so here goes. W5UN made 251 EME QSO's during the period August 5 to October 14, 1985, averaging 25 moonbounce QSO's per week! As of October 23, when Dave wrote to me, his moonbounce totals were 388 different stations worked, WAS, WAC, and 50 DXCC countries. Blaschke estimates his system gain to be 30.5 dB and says he should be able to work any 2 meter station running 500 watts to a single antenna aimed toward the moon while it is "visible" to W5UN. He has already worked at least one station running 200 watts to a single 13-element beam fed with RG8/U. Dave's ERP (effective radiated power) is about 1.5 megawatts, and he's using a low-noise amplifier mounted at his antenna, so don't worry about being "moonbounce ready" to work him. Let his station do the work. Read up on standard EME operating practices (the *ARRL Handbook* has a section on this), set your clock to WWV, aim your antenna at the moon (even if that means moonrise for west-coast stations and moonset for east-coast stations), listen on 144.008 MHz, and be prepared to work W5UN! Thanks, Dave, for a terrific story.

Equipment Review: The muTek gfba144e and The SSB Electronic MV144S Low-Noise Masthead Preamplifiers

With more stations turning to weak-signal work and higher powered transmitters, there is a growing need for very sensitive receiver "front ends" capable of finding that .01 uV signal amidst the noise and stronger local signals. As reported in previous columns, the unaltered receiver sections of the popular multimode transceivers dominating our current market are pretty poor, having rather high noise figures and offering mediocre dynamic performance. While many have installed low-noise preamplifiers ahead of their "stock" receivers or converters in an attempt to improve sensitivity, such action can create as many problems as it solves for those in populated areas.

Typically, the neophyte VHFer buys a commercially manufactured GaAsFET preamplifier having 20 dB or more gain and installs it ahead of his IC271A, TR9130, FT726R, Microwave Modules unit, or whatever. The problem is, he's now decreased his receiver's dynamic range by the amount of gain the preamp exhibits—in our scenario, 20 dB. For an operator who lives in Timbuktu and has no locals to contend with, this degradation in dynamic performance may be of no matter. However, for those of us living in populated areas with locals running kilowatts and all kinds of other RF pollution, it's another story. The first RF stage in most commercially made VHF gear is easily saturated by strong signals, and this problem is compounded when the signals reaching it are 20 dB stronger. Such overload creates all kinds of deplorable effects: the creation of spurious mixing products, intermodulation distortion, cross-modulation, and desensitization are common maladies resulting from signal saturation of otherwise linear stages.

So, one thing we surely do *not* want in a preamp is *too much* gain. There is nothing good about having a lot of preamplifier gain for small-signal RF work.

Then the neophyte VHFer might be using lossy transmission line such as RG-8/U or its derivatives to feed his antenna. While a preamp in the shack will help fix a very poor receiver, remember that signals lost in the feedline are lost forever and cannot be recovered with a preamp. The most effective place, then, to install a receive preamp is at the antenna, ahead of the feedline losses. Of course, this is the most effective place to install a transmitting amplifier, too, but that is often out of the question. A masthead receiving preamplifier should have enough gain to overcome feedline losses and the input noise figure of the first stage which follows. In most cases, 10 dB of gain is enough for such a preamplifier. The more important parameters are noise figure, saturation point, and bandwidth.

The noise figure of any receiver need only be as low as atmospheric noise present at the frequency of operation. While this noise is usually expressed as a "sky temperature" for microwave work, it is significant enough to be expressed in dB at 144 MHz. It's been my observation that

a noise figure of < 2 dB offers no additional enhancement in received minimum detectable signal at 144 MHz, so I'd say we should all strive for a maximum noise figure of 2 dB on this band. Atmospheric noise lessens as we work our way up the spectrum, and is apparently < .5 dB at 23 cm, but at 2 meters there doesn't seem to be any valid reason to strive for a noise figure this low.

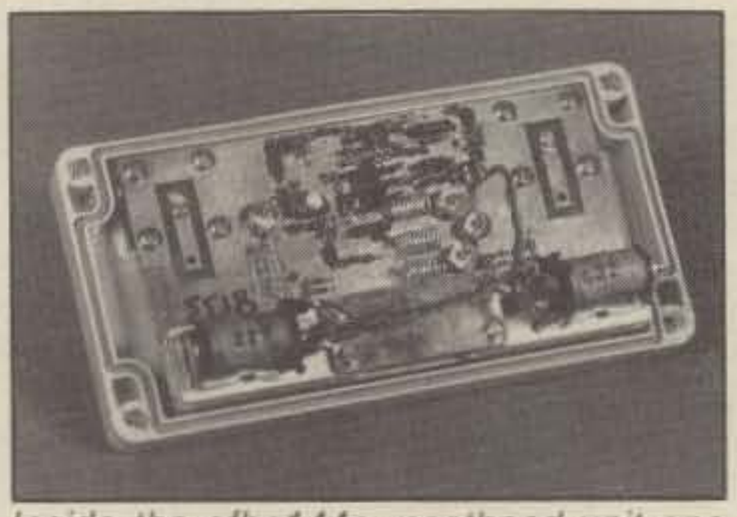
As stated earlier, saturation, or overload characteristic, is important to those of us in areas of high-level RF exposure. As such, this dynamic parameter is very significant. Often expressed as the "third order IMD intercept point" or some such information which is not easily derived in the average hamshack, a just as useful figure of merit for overload characteristic is the 1 dB compression point. This is the point at which the amplifier becomes notably nonlinear, compressing the output signal by 1 dB with respect to the input signal. At this point the amplifier under test will invariably produce considerable harmonic distortion and become, in effect, a rather useless tool. We are well advised to operate any linear amplifier, including receive preamps, well below this level.

Bandwidth can be an important consideration for amateur receive preamps as well. While a preamp may not overload from in-band signals, it may be quite saturated by out-of-band signals not readily detectable by the receiver but whose presence is surely felt. Again, this may not be very important in all installations, and antenna characteristics will lend a bandpass effect to most any preamplifier, but I think gain:bandwidth product is an important enough parameter to warrant a measurement and judgment.

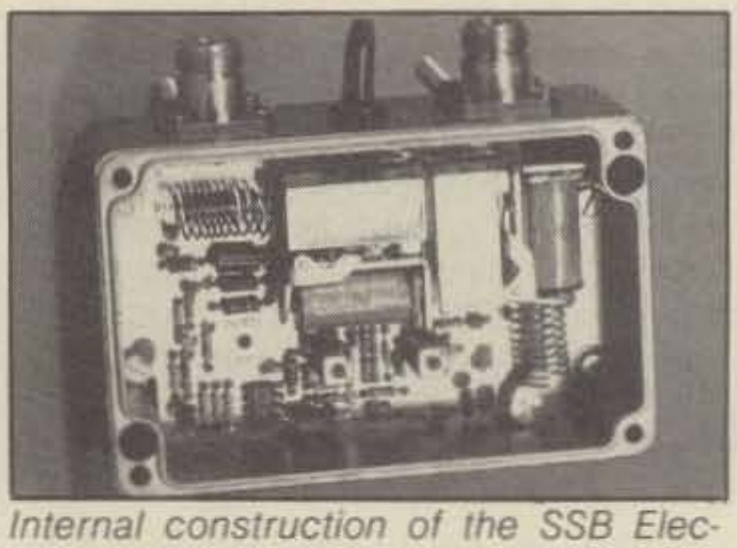
It was with these things in mind that I pursued evaluating the muTek ltd. gfba144e and SSB Electronic MV144S masthead (antenna-mounted) preamplifiers. The gfba144e is manufactured in Devon, England by muTek limited. It is housed in a polycarbonate (plastic) case and is intended for antenna mast or tower leg mounting. Programmed by its companion "sequencer," muTek model ATCS-144S, the preamplifier is installed directly in the main antenna feedline and is switched in and out of the line as required during TX/RX cycles. The MV144S is manufactured by SSB Electronic of Iserlohn, West Germany. It is housed in a cast aluminum case and is also intended for antenna mast or tower leg mounting. Programmed by its companion "sequencer," SSB Electronic model DCW15A, the preamplifier is installed directly in the main antenna feedline and is switched in and out of line as required. The DCW15A requires no additional conductors be run from controller to preamp, as it uses the coaxial cable's center conductor for the transmission of DC power and sequencing information, while the ATCS144S requires a two-conductor cable be run from controller to preamp.

The muTek limited masthead preamp, model gfba144e, is enclosed in a polycarbonate weatherproof box. This surface, with type N connectors and three-terminal jack for DC power and control, is normally mounted facing "down," away from rain, snow, etc. Photo by KT2B.

The SSB Electronic MV144S masthead preamp. RF connections are type N receptacles, and no additional connections are required. Photo by KT2B.



Inside the gfba144e masthead unit one finds a professional layout and excellent workmanship. RF transfer relays are toward the bottom of this photo (relay coils can be seen). Photo by KT2B.



Internal construction of the SSB Electronic MV144S is clean and professional. The RF transfer relays are contained in the shiny metal boxes (relay coils can be seen). Photo by KT2B.

A word may be in order regarding "sequencing" control of masthead preamplifiers. GaAsFETs, and some other sensitive microwave components, are notoriously susceptible to catastrophic failure from instantaneous voltage transients and as such must be specially protected from exposure to damaging signal levels. To assure that any masthead preamplifier is fully switched "out" of the transmission line during transmit periods, and then switched "in" line only after the transmitter is fully off, electronic "sequencing" is generally employed. Such sequencing can be arranged by various means, but always with the goal of unconditionally protecting sensitive components. The most foolproof system is one where the "normal" condition is for the preamp to be **out** of the line, and then intentionally switch it **in** line only when it is impossible to inadvertently transmit. This means the "normal," unkeyed mode for the preamplifier transfer relay(s) is one in which the transmission line is connected directly to the antenna; if the sequencing unit or the preamplifier itself were to fail, the station could then still be put to use (without the preamp). The sequencer is a mechanism which monitors transmitter activity and keys the preamplifier's internal transfer relay(s) to allow the preamp to be placed on line only when there is absolute assurance of safety. Using an electronic timer, the sequencer keys the preamp some time *after* the station transmitter is unkeyed, and allows the transmitter to key some time *after* the preamp is unkeyed. This time delay is typically 50 ms (milliseconds) or more, to allow for time lag in mechanical mechanisms like relays.

Other than the obvious difference in the electronic sequencers, the two review units are remarkably similar. Based on my laboratory evaluation, I'd say that either unit would make a valuable addition to most 2 meter SSB/CW stations. I set out to measure the following parameters on each preamplifier:

1. DC current drain, preamp switched "in."
2. Gain at 144 MHz.
3. Bandwidth characteristics.
4. Noise figure.
5. 1 dB compression point.
6. Through loss in "xmit" mode.

One characteristic I probably should have measured, but neglected to, was VSWR in the "xmit" mode. I personally

never care very much what my VSWR is, and worry only when it begins to cause transmission-line heating or breakdown, since I use a tube-type power amplifier capable of generating a great deal of power into a wide range of load impedances. Based on the fact that both masthead preamps exhibited very low through loss in the "xmit" mode, and all measurements were made into a "pure" 50 ohm load, I'd have to say that the VSWR must be quite low. Another rating I could not fully evaluate was maximum power handling. Both the gfba144e and the MV144S are rated at 1 kw transmit power (assuming termination VSWR <1.1:1), and I applied 1 kw continuously through both units without any system failures, but this does not guarantee reliability nor lead us to any conclusion about relay operation life.

To clearly summarize the results of my laboratory testing, I've tabulated the data as follows:

Measured Parameter	gfba144e	MV144S
Operating current @ 14 VDC	250 mAdc	165 mAdc
Gain @ 144 MHz	13 dB	21 dB
3 dB bandwidth	7.2 MHz	10.3 MHz
10 dB bandwidth	10.9 MHz	18.6 MHz
20 dB bandwidth	15.7 MHz	34.2 MHz
"Q" of input circuit	20.0	13.8
Noise figure	1.5 dB	1.0 dB
1 dB compression	+7.8 dBm	+4.0 dBm
Through loss in xmit	<0.2 dB	<0.1 dB

The gain:bandwidth frequency response for both preamps is plotted in fig. 1. As you can see, the muTek product is quite a bit "sharper," but the SSB Electronic unit is no slouch, offering excellent out-of-band rejection. Neither product had its gain peaked at 144 MHz, but this is common with low-noise amplifiers (which are adjusted for minimum noise figure, not maximum gain).

The MV144S installs easier because it requires no control cable; the sequencing unit (controller) is placed directly in the transmission line at the shack, and the preamp is similarly installed at the antenna. A 13.8 VDC source, along with a keying line to the station power amplifier and a PTT line from the station exciter, is applied to the DCW15A sequencer via a 4-pin connector and that completes the station hookup. You couldn't ask a piece of high-tech equipment to be easier to interface.

The gfba144e connects to its sequencing unit (controller) via a 2-conductor cable which provides 13.8 VDC (12.5 VDC minimum) on receive. This voltage drops to zero on transmit. The ATCS144S sequencer then connects to the station equipment via coaxial cables which place the controller between the station exciter and power amplifier, and PTT line (either "high" or "low" sense), power amplifier keying lines, and a +13.8 VDC power source are connected to feedthrough terminations. The photograph of

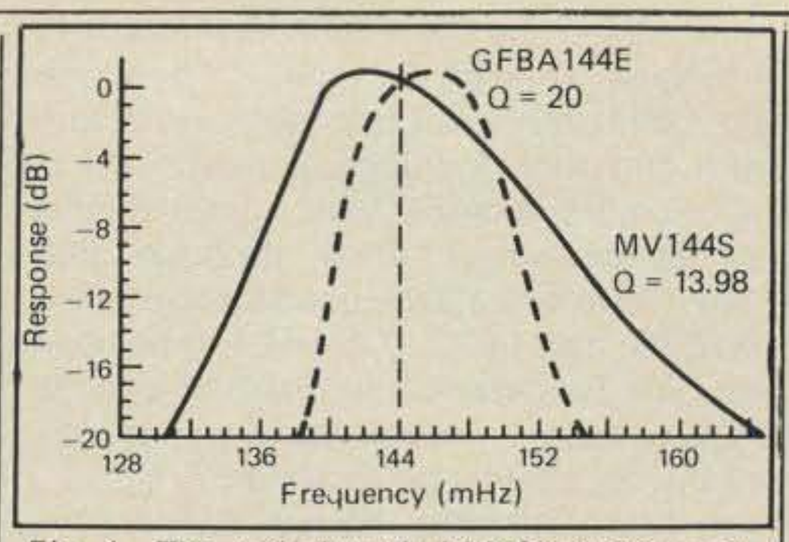


Fig. 1– The gain:bandwidth frequency response for the muTek gfba144e and SSB Electronic MV144S.

The muTek ATCS144S sequencing controller. DC and keying lines connect to feedthroughs while the exciter RF path is routed through the unit. Photo by KT2B.

The sequencing controller model DCW15A by SSB Electronic is a handsome unit with rubber feet and panel LED status indicators. The RF transmission line is routed directly through this box, as well as through the masthead unit. Photo by KT2B.

the ATCS144S shows the connection points.

Which unit do I prefer? Tough choice, because each excels in a different area. The muTek is a "tighter" front end, and may be more recommendable in harsh RF environments. The SSB Electronic unit is a bit more sensitive and had slightly lower transmission loss. The muTek product had what appeared to be superior internal RF relays, specially manufactured with printed circuit microstrip lines. The SSB Electronic product had cheaper-looking relays which I'd suspect won't last forever. The muTek requires a separate control cable. The SSB Electronic doesn't. And so it goes.

Structurally, both products appear very sound. I didn't perform any exhaustive environmental tests, but I'm confident that both the gfba144e and the MV144S can withstand severe weather without degradation. Whether they continue to perform "to spec" at all temperature extremes, I cannot say. Both masthead units feature Type N coaxial receptacles, which should be weatherproof if mating fittings are correctly installed, and both units have a "breathe" hole to prevent internal condensation. They both seem rugged, but I wouldn't want to drop either off my tower.

The MV144S features adjustable gain, in the form of a variable output attenuator following the active stages. This control allows gain adjustment over a range of 15 to 25 dB, and I used the factory pre-set for the gain data shown elsewhere. The muTek may not seem to have much gain (13 dB), but this is its specified rating and it should be sufficient for the majority of applications. Assuming a station receiver with a noise figure of 3 dB and a feedline with 3 dB loss, the muTek has more than enough gain to overcome feedline loss and improve system noise figure to <1.6 dB.

These and other specialty VHF/UHF products are available from The VHF Shop, 16 S. Mountain Blvd., Mountaintop, PA 18707. The gfba144e and sequencer are priced at approximately $290; the MV144S and sequencer are priced at approximately $310.

What Else Is New?

Well, there's a new U.S. dealer in exotic European VHF/UHF gear, for one thing. Ivars Lauzums, KC2PX, whose famous face has graced these pages in previous months, has established The "PX" Shack, 52 Stonewyck Dr., Belle Mead, NJ 08502. Ivars is a franchised distributor of Microwave Modules products, including those ever-popular "black box" transverters, preamps, power amplifiers, and the brand-new "R" series 25 watt VHF transverter. He's also franchised to distribute products made by EME (Elektromechanic Elektronic UHF/SHF Technik) of W. Germany and the new ON5FF high-powered VHF/UHF amplifiers popularized by *DUBUS* magazine and elsewhere. Ivars promises to bring over a couple of the new ON5FF amplifiers on his next return trip from Europe. The 2 meter amp features a pair of 3CX800A7's and runs 1.5 kw output, while the 70 cm unit uses a single 3CX800A7 at 750 watts output. EME makes some pretty nice amplifiers, too, including a dual-tube 7289 power amplifier for 23 cm, which is stocked by The "PX" Shack. EME also makes some nifty power meters good to 2.3 GHz, filters, directional couplers, etc. We'll be reviewing some of the new stuff in this column before long.

"Butch" Miller, WA2JSW, and Roy

Soifer, W2RS, are promoting a new idea for the 2 meter band plan: restructuring the "calling frequency" format. In a recent correspondence, these fellows accurately describe what has become a problem in populated areas. The "national calling frequency" of 144.200 no longer serves its purpose, getting so jammed up during good band conditions that it becomes unusable. Also, many weak-signal enthusiasts (DXers) call "CQ" on 144.200, hoping for a new grid square or whatever, and are answered by the station across town who talks so long that he wipes out any chance for the DXer hearing anything weak.

Clearly, one calling frequency for a popular band such as 2 meters just isn't enough. WA2JSW and W2RS recommend maintaining 144.200 as a calling frequency for general operating, but moving serious DX activity elsewhere in the band. They go on to say, "To reduce the QRM problem during meteor showers and marginal openings, a range of frequencies should be used rather than a single channel." They propose that 144.100 to 144.120 be used for DX calling on SSB, and 144.090 to 144.100 be used for CW. This approach, which I'll call the "DX window" system, works well on other bands, so why not 2 meters?

Traditionally, the HF DX bands have established "DX windows" at the very bottom edge of each phone band (except on 40 meters, where most DX operation is split-frequency, and 160 meters, where the DX window is 25 kHz into the band). This "window" for DX calling works well, and I can't think of any reason not to popularize the approach for the 144 MHz band. As Butch and Ray pointed out in their letter, placing the SSB DX band adjacent to the CW band might encourage the increased use of CW for DX work, which is a good idea in itself. There's really no reason, with modern equipment, why our "calling frequency" has to be up 100 kHz into our phone band. Let's start using 144.100 to 144.120 for SSB DX work, and by use alone this will become part of the new "plan." Thanks to WA2JSW and W2RS for this suggestion.

American VHFers who wish to know more about European VHF/UHF developments, projects, and activities might want to subscribe to *VHF Communications*, a German publication translated into English and available from U.V. COMMS, P.O. Box 432, Lanham, MD 20706. A one-year subscription for 1986 costs $19.00—quite a bargain. This is a very high-quality magazine dedicated to homebrewers and experimenters the world over. U.V. COMMS' proprietor, K3BRS, says that back issues from 1979 to present are also available. We're glad to see this publication available once again in the U.S.

UHF homebrewers in general, and 23 cm or 13 cm enthusiasts, will be pleased to know of two good sources for materials. Down East Microwave, Box 1655A, RFD #1, Burnham, ME 04922, is a manufacturer of 23 cm and 13 cm loop Yagis, power dividers, stacking frames, and linear power amplifiers. Down East's proprietor, W3HQT, is an active UHFer and a relocated "Packrat" from the Philadelphia area who now lives "Down East" (in Maine, that's about anything south of Bangor). Microwave Components of Michigan, 11216 Cape Cod, Taylor, MI 48180, sells a variety of microwave components including chip capacitors, Schottky diodes, GaAsFETs, high-Q trimmer capacitors, gold-plated connectors, etc. They also offer a preamp measuring service, using an H-P 8970A/346A automatic noise figure meter, and will adjust your preamp for minimum noise figure for $7.50 including shipping. MCM proprietor WA8EUU also makes some nice low-noise preamps, one of which we reviewed in this column.

Speaking of UHF, the German publication *UHF Compendium*, by Karl Weiner *et al*, is now available to American amateurs via Gerd Schrick, WB8IFM, 4741 Harlou Dr., Dayton, OH 45432. *Compendium* spans the UHF region from 300 to 3000 MHz and includes "more than 400 pages of Theory and Practical German/European Know How," according to WB8IFM. Parts 1 and 2 of *Compendium* are available for $20 postpaid, while parts 3 and 4 are being translated and will be available shortly. The table of contents looks fascinating, and I've ordered my copy.

I've some terrific correspondence from readers, a review of the brand-new Microwave Modules MMT144/28R, and all kinds of interesting stuff planned for the March column. Don't miss it!

73, Steve, WB2WIK

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

WW DX Contest Critique

Nature cooperated magnificently during the *CQ* World-Wide DX Phone section weekend of October 26–27, producing two days of High to Above Normal conditions right in the middle of the bottom of the sunspot cycle!

While solar flux levels were mainly in the 60s and low 70s during most of October, they began to rise above 80 on the 20th and remained at an elevated level through the 27th. The 2.8 GHz solar flux observatory at Ottawa, Canada reported a level of 84 on the 26th and 80 on the 27th. A period of exceptionally quiet geomagnetic conditions coincided with the temporary rise in solar flux. Observatories at mid and low latitudes reported an A-index of 3 on both days. More importantly, polar region measurements reported an index of 7 on the 26th and 8 on the 27th. This combination of solar flux and geomagnetic indices produced High to Above Normal ionospheric conditions during the Phone Contest weekend. Early reports received from contest participants bear out the unusually good conditions that existed. *Ten* and *15* meters came to life, *20* meters became a worldwide DX band again, and *40, 80,* and *160* meters sounded better than they have for many years.

If the editor of this column can be permitted a moment of immodesty, the exceptionally good conditions experienced during the Phone Contest weekend should have come as no surprise to readers of *CQ*. The updated contest forecast, appearing on page 84 of the November issue, called for "Low Normal during the contest weekend, but the chances are good that they will rise to High Normal, particularly on Saturday, October 26th. It looks like a good weekend for the Phone Section."

Initial data available at press time indicate that there may have been a 27-day cycle recurrence of the October 26th and 27th conditions during the CW Contest weekend of November 23rd and 24th. We will have a more complete report in next month's column.

Declining Sunspots

The Royal Observatory of Belgium reports a monthly mean sunspot number of 18 for October 1985. The sun was completely spotless for the first 12 days of the month, and again on the 30th and 31st. The highest daily level recorded was 72 on October 22nd. This mean level of activity results in a 12-month running smoothed sunpot number, upon which the cycle is based, of 18 centered on April 1985. The present cycle continues to decline towards its minimum as charted on pages 114 and 115 in the December 1985 issue of *CQ*. A smoothed sunspot number of approximately 11 is forecast for February 1986.

11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for February 1986

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 7, 10, 23	**A**	**A**	**B**	**C**
High Normal: 4-6, 8, 11, 16, 23	**A**	**B**	**C**	**C-D**
Low Normal: 2-3, 9, 12, 15, 20-21, 24-25, 28	**A-B**	**B-C**	**C-D**	**D-E**
Below Normal: 1, 13-14, 17, 19, 26	**B-C**	**C-D**	**D-E**	**E**
Disturbed: 18, 27	**C-E**	**D-E**	**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 S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from 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 band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-poor (C-D) on the 1st, fair-to-good (B-C) on the 2nd and 3rd, good (B) from the 4th through the 6th, excellent (A) on the 7th, etc.

February Conditions

Low solar activity coupled with normal seasonal changes in HF propagation conditions is expected to result in very few *10 meter* DX openings during February. The band may occasionally open towards southern and tropical areas during the daytime when conditions are High Normal or better. There's a somewhat better chance for *15 meter* DX openings to many parts of the world during the daylight hours, especially when conditions are High Normal or better.

Twenty meters should continue to be the best band for DX propagation during February. Look for a DX window of an hour or two duration, beginning just after sunrise, during which the band should open to most areas of the world. DX should be possible throughout the day, with another peak in conditions expected during the early afternoon. When conditions are High Normal or better, *20 meters* should stay open to some areas of the world well into the hours of darkness, and possibly as late as midnight.

Good nighttime DX propagation conditions are expected on *40 meters* during February. The band should open towards Europe and the east an hour or so before sundown, peaking during the early evening. South America should be within range from about 7 p.m. and until sunrise. Look for openings towards the South Pacific, Asia, and the Far East from about an hour or two before to about an hour after local sunrise. Good *80 meter* openings are also forecast to most areas of the world during the hours of darkness. Be sure to also check *160 meters* between sundown and sunrise for fairly good DX openings to many areas of the world.

A seasonal increase in static levels may begin to be noticeable on the HF bands during February.

Short-Skip Conditions

On *160 meters* no significant skip is expected during the daylight hours, but up to 1300 miles and beyond should be possible on a regular basis during most of the hours of darkness. On *80 meters* expect openings up to about 250 miles during most of the daylight hours, with the skip lengthening to between 400 and 1300 miles just after sundown, and between 800 and 2300 miles by midnight. On *40 meters* daytime skip should be possible between approximately 250 and 750 miles, extending to between 750 and 2300 miles during the early evening. During the hours of darkness expect to work *40 meter* stations within a range of between 1500 and 2300 miles. Daytime skip on *20 meters* should range between 750 and 2300 miles through the late afternoon. During the late afternoon and until just after sundown it should lengthen to between 1500 and 2300, with the band out for short-skip by 8 p.m. on most nights. On *15 meters* skip should range

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas, the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left-hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. 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.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength 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.

6. 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.

February 15-April 15, 1986
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe & North Africa	10-12 (1)** 08-10 (1) 10-12 (2) 12-13 (1)	06-08 (1) 08-11 (2) 11-12 (3) 12-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	16-17 (1) 17-19 (2) 19-20 (3) 20-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-21 (2) 21-01 (3) 01-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2)* 01-02 (1)*
Northern Europe & European USSR	09-12 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-14 (2) 14-16 (1)	17-19 (1) 19-02 (2) 02-03 (1)	20-22 (1) 22-00 (2) 00-02 (1) 20-00 (1)*
Eastern Mediter-anean & Middle East	09-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-17 (1)	18-20 (1) 20-23 (2) 23-01 (1)	19-23 (1) 20-22 (1)*
Western Africa	10-13 (1)** 09-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	18-19 (1) 19-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-01 (1) 21-01 (1)*
Eastern & Central Africa	11-13 (1)** 09-11 (1) 11-14 (2) 14-15 (1)	13-15 (1) 15-18 (2) 18-19 (1)	19-22 (1) 22-00 (2) 00-01 (1)	20-00 (1)
Southern Africa	10-13 (1)** 09-10 (1) 10-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	07-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-20 (1)	18-20 (1) 20-22 (2) 22-00 (1)	21-23 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	04-07 (1) 17-21 (1)	04-07 (1) 18-20 (1)
Southeast Asia	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-08 (1) 19-21 (1)	06-07 (1) 19-21 (1)
Far East	16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-20 (1)	05-08 (1) 17-19 (1)	06-07 (1) 17-18 (1) 06-07 (1)*
South Pacific & New Zealand	14-16 (1) 12-15 (1) 15-18 (2) 18-19 (1)	15-19 (1) 19-22 (2) 22-07 (1) 07-09 (2) 09-11 (1)	00-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 02-07 (1)*
Australasia	15-17 (1)** 09-11 (1) 22-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-08 (1)	04-05 (1) 05-06 (2) 06-07 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-16 (1)** 07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1)	19-21 (1) 21-04 (2) 04-06 (1) 20-02 (1)* 02-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-15 (1)** 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-23 (2) 23-00 (1)	19-21 (1) 21-04 (2) 04-07 (1)	21-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-17 (1)	17-19 (1) 19-22 (2) 22-00 (1) 07-09 (1)	22-00 (1) 00-04 (2) 04-06 (1)	00-04 (1)

February 15-April 15, 1986
Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Southern Europe & North Africa	08-09 (1) 09-12 (2) 12-13 (1)	06-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	16-18 (1) 18-21 (2) 21-00 (1) 00-02 (2) 02-03 (1)	18-20 (1) 20-00 (2) 00-01 (1) 20-00 (1)*
Northern & Central Europe & European USSR	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-15 (1)	19-22 (1) 22-00 (2) 00-02 (1)	20-01 (1) 21-01 (1)*
Eastern Mediterranean & Middle East	08-11 (1)	07-11 (1) 11-14 (2) 14-16 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
Western Africa	09-12 (1)** 08-10 (1) 10-13 (2) 13-15 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-22 (2) 22-01 (1)	21-00 (1) 21-23 (1)*
Eastern & Central Africa	08-11 (1) 11-13 (2) 13-14 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-16 (2) 16-18 (1)	19-23 (1)	19-22 (1)
Southern Africa	10-12 (1)** 08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-19 (1) 22-00 (1)	18-20 (1) 20-23 (2) 23-00 (1)	19-22 (1) 20-22 (1)*
Central & South Asia	09-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	04-08 (1) 17-21 (1)	05-07 (1) 17-19 (1)
Southeast Asia	10-13 (1) 17-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-21 (1)	04-08 (1) 17-19 (1)	05-07 (1) 17-18 (1)
Far East	16-18 (1)** 16-17 (1) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	02-04 (1) 04-07 (2) 07-08 (1)	04-07 (1) 05-07 (1)*

South Pacific & New Zealand	14-17 (1)** 11-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-10 (2) 10-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-02 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1)	00-02 (1) 02-06 (2) 06-07 (1) 03-07 (1)*
Austral-asia	14-17 (1)** 12-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-00 (1)	01-04 (1) 04-06 (3) 06-07 (2) 07-08 (1)	04-05 (1) 05-06 (2) 06-07 (1) 05-07 (1)*
Carib-bean, Central America & North-ern Coun-tries of South America	11-15 (1)** 07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-05 (2) 05-07 (1)	19-21 (1) 21-04 (2) 04-06 (1) 20-02 (1)* 02-04 (2)* 04-05 (1)*
Peru, Bolivia, Para-guay, Brazil, Chile, Argen-tina & Uruguay	12-14 (1)** 07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	19-20 (1) 20-04 (2) 04-06 (1)	21-05 (1) 01-04 (1)*
McMurdo Sound, Antarc-tica	15-17 (1)	16-19 (1) 19-22 (2) 22-00 (1) 07-10 (1)	22-01 (1) 01-04 (2) 04-06 (1)	01-04 (1)

February 15-April 15, 1986
Time Zones: PST
(24-Hour Time)
WESTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & South-ern Eu-rope & North Africa	08-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (1) 22-00 (1)	19-22 (1) 22-00 (2) 00-01 (1)	19-22 (1) 20-22 (1)*
Northern & Central Europe & European USSR	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-13 (1) 22-00 (1)	19-21 (1) 21-22 (2) 22-23 (1)	19-22 (1) 20-22 (1)*
Eastern Mediter-anean & Middle East	08-10 (1)	07-10 (1) 10-11 (2) 11-13 (1) 22-00 (1)	18-21 (1)	18-20 (1)
Western Africa	09-10 (1)** 08-09 (1) 09-12 (2) 12-14 (1)	05-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	18-22 (1)	19-21 (1) 19-21 (1)*
Eastern & Central Africa	09-11 (1)	06-08 (1) 11-13 (1) 13-15 (2) 15-16 (1)	18-21 (1)	18-20 (1)
Southern Africa	09-11 (1)** 08-10 (1) 10-13 (2) 13-14 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-17 (2) 17-18 (1) 23-01 (1)	18-22 (1)	19-21 (1) 19-21 (1)*
Central & South Asia	08-10 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 17-19 (1)	05-07 (1) 17-18 (1)
South-east Asia	16-18 (1)** 08-10 (1) 16-17 (1) 17-18 (2) 18-19 (1)	02-07 (1) 07-09 (2) 09-11 (1) 16-17 (1) 17-19 (2) 19-20 (1)	02-04 (1) 04-06 (2) 06-08 (1)	05-07 (1)
Far East	14-16 (1) 16-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*
South Pacific & New Zealand	15-17 (1)** 11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	06-09 (1) 09-11 (2) 11-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-04 (1)	21-22 (1) 22-06 (3) 06-08 (2) 08-09 (1)	22-00 (1) 00-06 (2) 06-07 (1) 22-00 (1)* 00-06 (2)* 06-07 (1)*
Austral-asia	15-17 (1)* 14-16 (1) 16-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	00-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*
Carib-bean, Central America & North-ern Coun-tries of South America	10-14 (1)** 07-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-02 (1)	18-19 (1) 19-20 (2) 20-01 (3) 01-04 (2) 04-06 (1)	19-20 (1) 20-03 (2) 03-04 (1) 20-01 (1)* 01-03 (2)* 03-04 (1)*
Peru, Bolivia, Para-guay, Brazil, Chile, Argen-tina & Uruguay	10-15 (1)** 07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-20 (1) 20-03 (2) 03-05 (1)	21-04 (1) 22-03 (1)*
McMurdo Sound, Antarc-tica	13-15 (1) 15-17 (2) 17-18 (1)	16-19 (1) 19-22 (2) 22-02 (1) 06-07 (1) 07-09 (2) 09-11 (1)	22-02 (1) 02-05 (2) 05-06 (1)	02-05 (1)

* Indicates Best Time For 160 Meter Openings
** Indicates Best Time For 10 Meter Openings.

between 1300 and 2300 miles during most of the daylight hours, with the band going dead for short-skip about an hour or so after local sundown. Occasional short-skip openings may also be possible on *10 meters.*

VHF Ionospheric Openings

Best chances for unusual ionospheric openings should be during periods of radio storminess on the HF bands. Check the "Last Minute Forecast" at the beginning of this column for days during February that are expected to be Below Normal or Disturbed. Check the VHF bands on these days for auroral-type and sporadic-*E* short-skip openings.

No significant meteor showers are expected during February.

There is a slight change in the format of the DX Propagation Charts appearing in this month's column. For the duration of the low period of solar activity, the band headings will be for *15, 20, 40,* and *80* meters, with *10 meter* opening shown in the *15 meter* column with a double asterisk (**) and *160 meter* openings in the *80 meter* column by a single asterisk (*). Short-Skip Propagation Charts for February—valid for distances between approximately 50 and 2400 miles and between Alaska, Hawaii, and the mainland—appeared in last month's column.

73, George, W3ASK

dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

Electronic Privacy Act: Lunacy In The Making!

It can't be the heat. So there's little to explain certain positions being taken on the Electronic Privacy Act (proposed in House Resolution H.R. 3378 and Senate Bill S. 1667) except for the phase of the Moon!

Intended to extend "wiretap" laws to all forms of electronic communications, the bills, if passed into law, would make it illegal to eavesdrop on communications such as those involving data transmission and radio telephone calls. As presently written, certain communications would be exempted. These include distress calls, police and fire communications, communications involving "walkie-talkies," CB communications, and communications in the Amateur service. Fair enough.

But here's the problem. **The cellular telephone industry is proposing that it be made illegal to monitor amateur autopatch calls.** It argues that these calls represent private communications, and as such, must be protected. Further, the industry wants autopatch calls to be constrained to certain specially assigned subbands. As an alternative, the industry is suggesting that these communications be encrypted (this cannot be done, currently, under the Commission's rules governing the Amateur service).

Needless to say, amateurs everywhere are up in arms! For while communications by an amateur operator are exempted "up front" in the bills, there is a question as to whether this exemption would apply if another device that is covered (e.g., a telephone or a computer) is attached to the radio.

The League has initiated discussions in the matter with legislative assistants in both the House and the Senate. In the long run, however, amendments will have to be prepared that would exempt *all* amateur communications, regardless of type or mode used (e.g., autopatch, simpatch, packet, etc.).

New Radio Service Proposed For 52–54 MHz

Donald L. Stoner, W6TNS, has petitioned the Commission to create a new telecommunications service dedicated to the encouragement of digital communications. In his 22-page petition to the Office of Science and Technology (OST), Stoner proposes that the service be called the "Public Digital Radio service," and that it be made available to computer users who wish to develop local area networks (LANs). One of the reasons given for proposing the new service, says Stoner, is that the development of LANs by means of telephone hookups is generally too expensive for many users.

Although the new service would not be a part of the Amateur service, Stoner suggests that operations be conducted in the band 52–54 MHz. This band is lightly used by amateurs, he argues, and it would be ideal for the type of local communications envisioned. Under the terms of the petition, only a technical exam would be required to obtain a license (i.e., there would be no requirement to demonstrate an ability to send or receive Morse code). Further, in keeping with the concept of "local communications," and mindful of potential TVI problems, Stoner proposes that power input to the final amplifier be limited to 1 watt.

The Commission left the door open for the creation of a non-amateur, computer-oriented communications service when it rejected proposals to create a no-code amateur license last year. Thus, according to Ray Kowalski, Chief, Special Services Division, Private Radio Bureau (PRB), both the OST and the PRB consider Stoner's petition as a "serious, non-trivial" matter. At this writing, however, it is not known whether the Commission will carry the petition forward to the point where public comment is sought.

Commission Reviews Tapes of Amateur Communications Following Mexican Earthquake

The press has rightly sung the praises of those amateurs who gave of their time and energy to help survivors of last year's Mexican earthquake. But as noted in this column of last December, reports quickly surfaced in the days following the earthquake that the major radio and television networks in the U.S. grossly misused amateur communications in their attempt to cover the event. Specifically, concerned amateurs cited the networks with using amateur communications to conduct routine business with their employees and others in Mexico City. In many cases these communications were reported as centering on subjects such as crew makeup, wages, hotel accommodations, meals, and overtime pay. In response to these complaints, the Commission initiated an inquiry into the situation and requested amateurs to foward audio tapes, or descriptions of what they heard, for use in the inquiry.

According to Ray Kowalski, PRB, FCC, some of the tapes received do indeed contain exchanges that might constitute violations of Part 97 of the Commission's Rules. In some cases, for example, there is no question that the communications recorded constitute a "business use" of the amateur bands. However, said Kowalski, many operators were apparently confused by recent FCC actions regarding "rebroadcast" issues. As such, the Private Radio Bureau is *not* going to treat the tapes as evidence leading to fines or revocations for the amateurs involved. Nor will the Commission use the evidence to take legal action against the media. Instead, the PRB intends to use the incident as an opportunity to educate both amateurs and the media alike to the proper use of stations in the Amateur service. In this regard, the Radio and Television News Directors Association has already issued a notice to its members, clarifying the relationship between radio and television commentators and amateur operators.

Amateurs are reminded that they are ultimately responsible for the use of their stations. If violations similar to those observed following the Mexican earthquake occur in the future, warns Kowalski, "sanctions would be imposed on the hams, not the broadcasters!"

Reports of RFI Down Slightly From Last Year

Jeffrey Young, Enforcement Division, Field Operations Bureau (FOB), FCC, reports that during the last quarter of FY85 (July, August, September 1985), RFI complaints to the Commission totaled 13,408, down from the 15,516 complaints received during the same period last year.

Of the 13,408 complaints received, 9,596 involved a television receiver as the victim device. CBers are alleged to have been responsible for 5,808 of the TVI cases reported, while amateurs were cited in 571 of the TVI complaints. In all,

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complaints involving CBers totaled 6,727, about the same as the 6,992 cases reported in the last quarter of FY84. Amateurs accounted for 787 of all complaints filed in the quarter.

As in the past, the number of complaints by amateurs against other amateurs remaind high, with 241 reports filed with the Commission in the quarter.

Finally, the total number of RFI complaints reported during FY85 was 66,794, about the same as the 67,760 complaints filed in FY84 and the 67,803 complaints filed in FY83. The large number of complaints filed each year, together with the changing nature of the problems cited (see below), explains why the Commission continues to view radio-frequency interference as an area of major concern.

FCC Begins New Initiative on RFI

A steady stream of RFI reports (see above), together with the changing face of the RFI problem, is behind the FCC's latest move to work more closely with industry and the consumer in an attempt to identify and resolve "true" interference problems.

According to Sue Earlewine, Chief, Public Contact Branch, Public Service Division, FOB, the Commission is now in the process of developing an Automated Case Management System that will be used to store, process, and retrieve a broader range of RFI data than is now possible. When the system becomes operational and the data collection process is fully automated, the FOB will not only have the capability to acquire more detailed information regarding each RFI complaint, but will also be able to better analyze these complaints.

The need for an automated system is two-fold, explains Earlewine. First, the Commission needs additional data on each complaint filed so that it will be able to identify those complaints that result from the susceptibility of a consumer's device to strong RF fields (these are the so-called "true" RFI complaints, as opposed to RFI complaints caused by transmitter malfunction, harmonic radiation, etc.). Second, the number of RF sources is increasing at a rapid pace. Today, says Earlewine, the Commission not only has to deal with emissions from stations in a wide range of radio services, but it also has to consider the emissions of touch control lamps, ultrasonic pest controls, illegal video transmitters, and other devices found in the home and office.

The new Automated Case Management System is currently scheduled to be placed into operation during the summer, 1986. Complete automation of the FCC's RFI data collection and analysis process is scheduled for 1 October 1986.

Crackdown Begins on High-Powered CB Operations

As this issue reaches you, the Commission is mustering its forces for a move on high-powered CB stations. And for consumers and amateurs alike, the crackdown comes none too soon. Why? Because, as noted above, CBers were implicated in almost half of all RFI complaints filed with the Commission in FY85 (32,712 complaints against CBers, out of a total of 66,794 RFI cases). Further, CB-related TVI cases totaled 28,215 for the year, almost 60% of the total number of TVI complaints (48,177). These are pretty high numbers, considering that CB stations should run no more than 12 watts PEP!

According to Richard Engelman, Chief, Inspections and Investigations Branch, FOB, Bureau personnel began the crackdown in mid-January. In addition to going after users of CB amplifiers, Engelman told your Washington Editor that his people will also target those who market these illegal devices. Enforcement activities will be nationwide in scope, with the intent being to reduce significantly the volume of TVI complaints received each year by the Commission. Any reduction in such complaints would benefit operators in the Amateur service, who, more often than not, are blamed by both their neighbors and the press for the interference caused by CBers.

Applications For Use of 1900-2000 kHz By Radiolocation Must Be Delayed Until At Least 1 July 1987

Errata concerning the footnotes in the matter of PR Docket 84-874 (Radiolocation in the band 1900–2000 kHz; Report and Order released 31 October 1985) yielded some pleasant surprises for amateurs, especially those who use the 160 meter band. Among other things, the Commission corrected its Report and Order to read that licensees of existing conventional systems may not seek authorization to use the 1900–2000 kHz band before 1 July 1987. Operators of new conventional systems who seek to use the band must wait until 1 July 1988 before submitting their requests. Opera-

tors of new spread-spectrum radiolocation systems were permitted to apply for access to 1900–2000 kHz in December 1985. However, permitted field strengths are so low that these systems are not expected to cause interference to, nor to receive interference from, amateur stations using the same frequencies.

With the release of the Report and Order, non-government radiolocation was given Primary status between 1900 and 2000 kHz. Thus, amateur stations in this band are cautioned against causing harmful interference to users in the Radiolocation service. By the same token, amateurs are given no protection from interference that results from radiolocation operations. For all intents and purposes, however, the FCC noted that amateurs still have "virtually exclusive non-government use of 1900–2000 kHz until private radiolocation transmitters become operational.

CATA Develops "White Paper" on Satellite Home Earth Terminals

Responding to the ever increasing amount of misinformation on satellite home earth terminals and signal scrambling, the Community Antenna Television Association, in its newsletter "CATA-CABLE," late last year attempted to clarify its position on these issues. Using a "question and answer" format, the association explored questions such as "How did the home terminal users get the right to take the programming off the satellite in the first place?" and "Some (people) are arguing that what (cable television operators) are really doing is trying to lock up the market for yourself, and keep out competition. Aren't (the operators) violating the antitrust laws?"

In a nutshell, the Association's position can be stated as follows:

"The development of the home terminal market was and remains predicated on the idea that a home dish owner can 'get something for nothing.' The advertising, particularly in cabled areas, is very specific. It says, 'Why pay for cable when you can get it for free?' This is how the market has developed to date.

"To be sure, there are legitimate areas for home earth terminal sales. The rural areas where there is no cable television and no other option for the reception of video programming is a good example. The cable industry does not oppose the sale and use of home earth terminals even within franchised areas. What we do oppose is the sale of that technology predicated on the idea that the programming we have developed, and our subscribers pay for, should somehow be either given for free, or rate-regulated to assure an artificially low price to home users."

Interested readers may contact the Association at: Community Television Television Association, P.O. Box 1005, Fairfax, VA 22030-1005 (703-691-8875).

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

When first we met
We did not guess
That DX would prove
so hard a master . . .

Here on the far western edge of the country, spring always arrives in the last two weeks of February. Winter may not yet be gone, but spring has come. And so, usually a DXer wanders up the hill to ask some questions. Last week one came burdened with a mixed bag of troubles.

"It's this way," the Local started in with his explanation, making himself so comfortable that we began to expect a long stay. "It all started last summer down at the marina where I keep my boat. There was this fellow preparing for an ocean race to Honolulu, and he knew hardly anything at all about radios—maybe even less about his 12 volt power system. However, he must be smart in other ways, as he had enough money for one of those high-tech, ultra-light racing boats and things like that. The problem was that he had installed a satellite navigation unit on the boat in getting ready for the race, and the thing was not working right. So knowing that I was an amateur and a DXer, he came asking my help. You get the picture?"

Of course we did. We were just sitting there, nodding our heads at most everything he said, and so far everything had been understandable. We also understood that most people tend to believe that every radio amateur is a minor electronic prodigy, regardless of his age, and always worthy of wearing the mantle that old Marchese Guglielmo fashioned. We could even understand why DXers are considered to know most everything better than anyone else. It has been long years since we came across a DXer who would even think of admitting otherwise. But we had to know more about this one's troubles. "We get the picture," we advised, "but what's the problem anyhow?" We were quick to learn.

The Local shrugged his shoulders. "If you got the picture, you should know the problem," he said and continued. "When this fellow kept having trouble, he came and asked me to look at his nonfunctioning satellite navigation device. Sometimes I may rush into things, but when he mentioned what he had and how much he'd paid for it, I did some quick thinking. This one might best be avoided, and I told this fellow that I probably couldn't do anything without a service manual. Perhaps

77 Coleman Dr., San Rafael, CA 94901

Making another of his regular appearances at V3 Belize during contest season, Joe Hypnarowski, WA6VNR, shows the operating position for his V3CQ effort. At the QTH on an island 60 miles offshore Joe found excellent conditions especially on 75 meters, where there was low noise level. QSL V3CQ to WA6VNR.

that was a mistake, because he said he had one. I was stuck and the manual was almost 2 inches thick.

"So there we were, down in the cabin of the boat, the fellow showing me how things worked while I flipped through the service manual trying to give the impression that I understood the pages of schematics and things like that. Anyhow, the fellow showed how the device was supposed to work, how it told when a satellite was supposed to pass, how the digital readout would show your longitude and latitude, and how the readings he was getting were obviously wrong. He even went and showed me how you crank in your local longitude and latitude, and as we were waiting for the next satellite pass to get above the horizon, he showed it on the digital display. Suddenly I struck paydirt. Or I thought I had."

We have to admit that we were getting interested. We have an unflagging faith in the sagacity of DXers. This one was possibly worthy of our faith. We continued to think so as we felt the inner satisfaction that comes in sharing another's triumph.

"I took a look at the readouts on the device," the Local continued, "and then asked this fellow why it had 122°29'E showing when everyone knew we were in west longitude." The Local leaned close to make sure we got the point. "The fellow had never noticed that he had the wrong data cranked into the instrument —east longitude when it should have been west longitude. For weeks he had been hasseling the store where he made the purchase, the distributor of the gear and anyone in between, telling them the darn thing just would not work. Get it?"

Of course we did. Any DXer who ever tuned up on the wrong band will easily understand. Things look right but nothing works. We were reading the scenario but not understanding the problem. "But how does that make life miserable for you?" we had to ask. The Local shaking his head was not yet telling the whole story, we were thinking.

"This long-haul ocean racer," the Local continued, "was so happy to get things working that he went around the marina telling everyone how sharp I was. Then a lot were asking my opinion on anything that has volts in it, even down to digital watches. Heck! I don't know all the answers to the questions they ask. Some are easy, but some I would not touch with a 10-foot pole. I know my limitations, and now I am afraid that they will find out that I don't know everything. Then where will I be?"

Actually, we could not hazard a guess. "So what do you do?" we asked, and the Local, we had to admit, was a quick thinker as well as innovative. "Why," he explained, "when I run into something complicated I just say I have to look it up in the books, then get on a phone and call WB6NOA. Gordon is real sharp about marine electronics and takes care of most of my questions. If this does not work, I give the advice that the problem looks like a shop job and point them at someone who does that line of work. Maybe someone like Rich Wilde, who used to be a big DXer. Remember him?"

Sure we did. The youngest, at least up to that time, ever to attain the Honor Roll. But all of this did not seem to be on the level. "But those people think that it is you who is helping them," we protested. "Is that quite honest?" We had some doubts, but apparently the Local did not.

"Look," he said, and a note of exasperation was almost detectable in his voice, "the back of my amateur license is strong in repeating the word "operate" in outlining things. There is nothing that says I have to be able to troubleshoot complex gear turned out by a commercial factory. Isn't it an operating license that the FCC issues me?"

We had to think about this. Well, maybe, but . . . The Local wasn't going to let things get very far afield. "And how many DXers, or other amateurs," he continued, "work on their own gear these days? When you pay around a thousand dollars, maybe sometimes more, for the latest model of a Whammy transceiver, you get a bit cautious, don't you? When I look inside my rig and see all those circuit boards and mini-circuits and things like that, I tell myself that I am an amateur—an amateur, but a smart amateur—and when something goes wrong, it's down to

The WPX Program

Mixed

1185	TF5BW	1187	PY1QQ
1186	N9BMS	1188	NF9S

S.S.B.

1767	YB4FW	1770	WD6L
1768	TI2KD	1771	I8IXO
1769	W4UW	1772	NKØS

CW

2338	JA1OJZ	2339	I2IWM

Endorsements

Mixed: 450 PY1QQ, NF9S. 500 PY1QQ, NF9S. 550 PY1QQ, WA3FWA. 600 PU1QQ, WA3FWA. 650 PY1QQ. 700 PY1QQ. 750 KC2RS, PY1QQ. 800 KC2RS. 850 DK9MC, KC2RS. 900 DK9MC, KC2RS, KSØZ. 950 3A2LF, DK9MC. 1000 DK9MC, W5PWG. 1050 DK9MC, KC8CC. 1100 DK9MC, K2POF. 1450 KF2O. 1500 KF2O. 1550 KF2O. 1600 IN3ANE, KF2O. 1650 N7TT.

S.S.B.: 350 YB4FW, TI2KD, W4UW. 400 EA3AAY, TF5BW, TI2FD, W4UW. 450 I8WYD, TI2KD, W4UW. 500 XF4MDX, I8WYD, TI2KD, W4UW. 550 XF4MDX, I8WYD, TI2KD, W4UW, WA8KMK. 600 XF4MDX, I8WYD, TI2KD, W4UW, WA8KMK. 650 XF4MDX, I8WYD, W4UW. 700 XF4MDX, I8WYD, W4UW. 850 NP4CC. 900 NP4CC. 950 NP4CC. 1000 NP4CC, KC8CC. 1300 KF2O. 1350 KF2O.

C.W.: 350 I2IWM. 400 I2IWM. 450 I2IWM. 500 I2IWM, PA3BEJ. 550 KT2C, I2IWm. 600 I2IWM. 650 I2IWM. 750 DL3DD, JA5SIX. 800 JA5SIX. 900 K2POF. 1150 OK1TA. 1200 OK1TA. 1250 N7TT, OK1TA. 1300 W4WJ, OK1TA. 1350 OK1TA. 1400 OK1TA. 1450 OK1TA. 1650 VE7CNE. 1950 N6JV.

20 meters: TF5BW, JA2KVD, W4UW, JA7AZJ.
40 meters: K2POF.
80 meters: TI2KD.
160 meters: W4UW, KF2O.

Asia: JA1OJZ.
Africa: DK9MC, W4UW.
No. America: W4UW, PY2DBU, WD6L.
Europe: PY2DBU, TF5BW, W4UW.

Award of Excellence . . . SMØAJU with 160 meter endorsement.

Award of Excellence Holders: K5UR, K6XP, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YZ/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SMØAJU.

Award of Excellence Holders with 160 Meter Endorsement: K5UR, OK1MP, W8CNL, W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SMØAJU.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

During the last CQ WW DX Phone Test Lloyd and Iris Colvin were on their current African tour and signed W6KG/ZS, running up a big total. Just before the test they dropped into ZS6AF's radio store in Johannesburg and found George Collins, VE3FXT, twisting the dials on the displays. In the photo from the left is George Collins, VE3FXT, Iris Colvin, W6QL, and Lloyd Colvin, W6KG. George operated in the DX test as H5FXT. The Colvins should be back in the states before long, and should they show at a DX convention near your QTH, be there! These two are legendary DXers, and their DX activities over the years have been remarkable for the number of countries and the number of DXpeditions they have been on. (YASME photo)

the factory outlet. You get to be cautious about who works on such gear and sometimes the number-one suspect is yourself. Understand?"

Understand? What we understood sounded like blatant heresy! We almost had to cover our ears. "But what about Part 97. How about that?"

We quickly learned that this was one publication that the Local might understand. "Doesn't Part 97 refer to modern amateur techniques?" he demanded. "And doesn't the gear they sell these days need a shop with a lot of test equipment to do any troubleshooting? You probably need some equipment just to figure out how to get to a solder connection deep inside some of those rigs. And the circuit boards and all other miniature components. Isn't it the modern technique to take the family jewel to someone who really understands how to fix it?"

What could we say? This one apparently had answers ready for all our questions. "But . . ." we started to say. We never finished.

"As I read Part 97, we are supposed to understand the theory and the regulations and know how to operate our gear. I think I do that. When it comes to experimenting, I stick with my antennas and my feedlines. That's something I think I do understand, and I can make things work. I know when things are operating right, and I know when they are not. But long ago someone told me that I was an amateur, not an engineer. And furthermore . . ." By this time we were reeling and we held up our hands. Things needed a different direction.

"I think I understand your problem," we said, and the Local stopped dead in his tracks. "Problem?" he echoed. "I haven't even gotten around to mentioning it yet. My problem is with the XYL, and I thought you might have some advice that would help.

Son of a gun! We were confused, but maybe things would improve. "Tell us about it," we said, smiling encouragingly. Anything to change the subject. It worked, and the Local continued.

"The XYL has been made at me for about a week now, and I don't really know why," the Local said. "You know that the

The WAZ Program

20 Meter Phone

545	VK2PU	547	SM5CRW
546	WA4CTA	548	SM5LZ

15 Meter Phone

225	KD5ZM	226	SM5CRW

80 Meter Phone

34	SM5CRW

20 Meter CW

235	WA4CTA

All Band WAZ

S.S.B.

2988	W8CZN	2991	IK8BQE
2989	OZ4ZT	2992	SM5CCH
2990	W3YMB	2993	GW4OFQ

C.W. and Phone

5915	WB2PCF	5920	—
5916	JE1ZSK	5921	JA4BAP
5917	DK1YT	5922	F6HMJ
5918	WA4CTA	5923	EA8NI
5919	I0TIC	5924	JA7MF

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

WPX Test will be here before long, and I'm thinking I'll be in real trouble unless she mellows, and I have to find out why she's in a snit. If I don't get things straightened out, I might have trouble running the full WPX test. You know how it is, don't you? What do I do?"

Really, we did not know. "Tell us more," we suggested, and possibly that will not be the last mistake we will ever make.

"I just don't understand what's bothering the XYL," the Local explained, "but a week or so back I decided to start my campaign to ensure that the WPX weekend would be free. You know, what I've done for years, and it always works. So I was helping the XYL wash the dinner dishes, and when we finished I thought I'd really cement things and make the WPX a sure thing. So I slipped my arms around her and gave a hug. And honestly, all I said was 'Hey! I think my arms are getting shorter,' and she immediately was as made as a wet hen. But that was all I said, and I cannot understand why she's mad. Do you?"

We thought we did, but how does one explain what is not readily understood. We understood and no doubt you understand, but this Local apparently did not. So what could we say?

"Have you ever thought of concentrating on CW?" we asked, and again the Local did not understand. "Speak only in 20 wpm CW" we advised, "and the XYL will never misunderstand you. Never!"

Maybe she would not understand the CW either, but it would certainly save the Local from jeopardizing the WPX weekend. Maybe the Local did not understand what his phone techniques had done, but it was evident that someone had gotten the message, intended or not. One might eventually realize why so many "old" DXers like the CW mode. There are good reasons.

Here is Juan, EA9IE, relaxing in front of his operating position. The awards on the wall tell their own story. Juan works a lot of DX. A lot of DXers work EA9IE, Juan. (W4KA photo)

South Orkneys

During the winter months here, the summer months there, Juan Carlos Parra, LU8DTQ, will be signing AZ1A from South Orkney and will be doing a lot of RTTY work. He planned to be in the January and February RTTY tests plus a bit of CW and SSB other times. Juan is an electronic engineer, and you might look for him around 14090 or 21090 kHz. QSL to CBA —Box 5, 1636-Olivos, Buenos Aires. Grupo Argentino de CW forwards this information; their bulletin is a good aid in improving your command of the Spanish language. Also contains some good DX news.

Grenada

Bill O'Kain, K4LTA, will lead a group from the hills of Tennessee to offer a lot of J3 action during the upcoming DX Tests. Actually, they will be in Grenada across both portions of the ARRL DX Test, the CW test the third weekend in February and the phone test the first weekend in March. In both tests they will operate a multi-single effort. They plan to start operating in the middle of the month, around February 13th, and action outside the contest periods will be mostly on CW.

Besides K4LTA on the effort, there will also be N4FKO, WA8FSX, N4MMV, NF5Z, K0OSN, N4KOV, W5PWG, and N6LHN. The first three are YLs. A special callsign has been requested, but nothing had come through at the time of this writing. If nothing shapes up, they will be signing their home calls /J3.

Generally they will be operating about 25 or 30 kHz above the lower band edges. On the lower frequencies look for them around 7005, 3505, 1823, or 1833 kHz. On phone listen around 14195 and 14257 kHz. Generally they will be trying to fill out cards for needy DX types such as JAs, Europeans, or other long-haul DX. On week days they will listen for Novices at 21123 kHz and will run slow-speed CW at this frequency from 2230Z.

K4LTA is taking a linear on this trip in hopes of improving the score on 160. This may help those trying to fill out a 5- to 6-band DXCC. J37AH on Grenada is helping facilitate the project. Listen for QSL information during the operation. The group plans to be on Grenada from February 12th to March 5th.

CU-Azores

Some of the older and somnolent DX types may find it difficult to keep up with prefix changes, more than one surfacing to ask what they had worked on completing a QSO. CT2-Azores became CU a month or so back. The number after the prefix will identify one of the nine islands in the group; 0 will be used for repeaters. The change will affect all the amateurs in the Azores, and they will all show, or have already shown, with new callsigns.

The new address for the QSL bureau for the Azores is Associacao de Radiomadores dos Acores, POB 211, 9 503 Ponta Delgada, Azores Islands.

DX Archives

Possibly one has to accumulate a good layer of the years to easily distinguish between that which is now and that which was. Old DXers are adept in making these fine distinc-

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5 Band WAZ

Standings as of November 1, 1985

All 200 zones worked:

1. ON4UN	37. OK1AWZ	73. VK9NS
2. K4MQG	38. IV3PRK	74. N4KG
3. SM4CAN	39. DJ6RX	75. YU7DX
4. AA6AA	40. OH3YI	76. DL8MAG
5. W8AH	41. I4RYC	77. OK3DG
6. W6KUT	42. ZL1BIL	78. ZL1BOQ
7. EA8AK	43. I4EAT	79. EA9IE
8. LA7JO	44. ZL1BQD	80. DL7HZ
9. EA3SF	45. TG9NX	81. DJ9RQ
10. OH1XX	46. XE1J	82. EA5SP
11. EA8OZ	47. F5VU	83. EA2IA
12. W0SD	48. W3AP	84. SP3BQD
13. K0ZZ	49. YO3AC	85. LZ1NG
14. ON6OS	50. K3TW	86. N4JF
15. OK3TCA	51. XE1OX	87. CT2AK
16. K6SSS	52. VE7IG	88. HB9CIP
17. ZL3GQ	53. OK1ADM	89. OK1MG
18. OK3CGP	54. CT1FL	90. CT4BD
19. SM0AJU	55. WA1AER	91. VK6HD
20. OZ3PZ	56. N4RR	92. EA6ET
21. I3MAU	57. UW0MF	93. VK3QI
22. I2ZGC	58. W4DR	94. LZ2DF
23. 4Z4DX	59. OK1MP	95. ON4QX
24. N4KE	60. W1NW	96. SM0DJC
25. K5UR	61. OE1ZJ	97. CT3BM
26. K9AJ	62. HB9AHL	98. K2TQC
27. SM3EVR	63. HB9AMO	99. EA8XS
28. LA5YJ	64. LA6OT	100. HA9RE
29. DL3RK	65. UR2QD	101. SM4CTT
30. N4WJ	66. UK2RDX	102. A71AD
31. G3MCS	67. ZS5LB	103. LZ2CC
32. SM5AQD	68. F6DZU	104. SM4CLE
33. W0MLY	69. DL4YAH	105. LZ1HA
34. I0RIZ	70. LA7ZO	106. SM5AKT
35. ON5NT	71. W9ZR	107. CT4NH
36. OH6JW	72. W1NG	108. ZL4BO

The top 12 contenders for 5 Band WAZ are:

1. DK5AD, 199	7. LA9GV, 198
2. JA1BWA, 199	8. W6GO, 198
3. JA3EMU, 199	9. K4CEB, 198
4. N4WW, 199	10. W2YY, 198
5. K6YRA, 199	11. G3GIQ, 198
6. W8UVZ, 199	12. K7UR, 198

343 Stations have attained the 150 zone level

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FT-2/709R/H	ICO2AT
FT-1903/1123	IC-04AT
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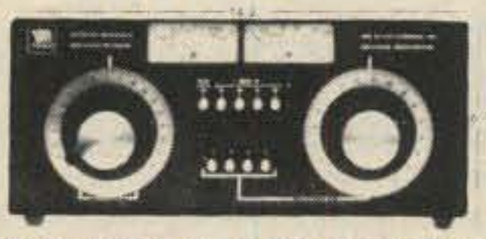

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kHz around 1700Z and a bit later on their weekend—Friday and Saturday. All this via the "DX Incorporated Bulletin," which also notes S92LB shows on Snooky's Net at 14183 kHz from 1900Z. This usually is a list operation, no call on list, no contact. However, the pressure is down a bit. If you want more information on this group, drop a line to Richard Breckinridge, WA9BXB.

At the end of last year the FCC was moving towards "self-rule" in handling the matter of repeater frequencies. The stature of the various repeater councils across the country would be bolstered with the FCC ready to back their coordinating decisions. Initially the FCC was determining what should be the qualifications for such frequency coordinators, caution being used to weed out "front" groups seeking only to establish their own rights to frequencies.

At the turn of the year the FO@XX Clipperton group was getting the demand for QSLs answered, some 14,000 incoming QSLs received for that effort. The desire by the operators to select really outstanding color slides that would express the "real them" for their QSLs delayed the printing, but they figured things would be cleaned up around the end of the year. Some may wonder what 14K incoming QSLs might look like. If the envelopes were stacked on edge, the row of letters would run about 47 feet in length. Anyhow, they all should be out by now.

Dave Siddall, K3ZJ, of the Capitol Hill Radio Club, notes that fees for amateur licenses were not included in the legislation which proposed fees for FCC services. Neither the House nor the Senate version had any language that would reestablish fees for the amateurs.

Clubs looking for an in-house DX competition might study the "NAANY" Award of the Western Washington DX Club. It aims at a lot of the available DX, runs for one year at a time, and after three years only K7WA and NR7F of the local group have managed to qualify. Drop a note to Jack Bock, K7ZR, if you need the full details. With most of the the heavy-duty contest season getting behind us, some DX clubs are looking to this fall and wondering if they want to gird up their linears and challenge another, sometimes neighboring DX club to a duel to the end.

WWV continues to be an excellent source for propagation information, right after the 18 minutes after the hour time check. You get the solar flux and A index for the previous day plus the "K" index as they note it at Boulder. This is updated every three hours, plus the state of solar activity and the earth's magnetic field for the preceding 24 hours. You will also get a prediction of what to expect in solar factors and the magnetic field for the coming 24 hours.

There is a report that Taiwan now has eight amateur stations with more to follow. The *Totem Tabloid* recently listed BV1 Yilan/Kuelung; BV2 Taipei; BV3 Taoyuan/Miaoli; BV4 Taichung; BV5 Changhua/Chiayi; BV6 Tainan; BV7 Kaohsiun; BV8 Taitung/Hualien, and BV9 Adjacent Islands. Also, BV2RA is often found around 7005 kHz at west coast morning time.

A final item that you may have noted previously, we write three months in advance of the date on the cover of *CQ* and would like allowances made, when possible, when information is sent. We are always looking for word on future action, pictures of DXers, and especially overseas DXers. Looking beyond all of this ending stuff, remember that things are going to get better in this year—or the next—and as the Hero of Mafeking would often say, "Be Prepared!"

73, Cass, WA6AUD

DX Ten Years Back

PY@PO and PY@BXC started February 1976 with action from Fernando de . . . . WA6AHF was in the Western Carolines. LU2XR was planning a brief South Sandwich operation and VP8MS was headed for South Georgia. LU1ZA was active from the South Orkneys and VR3AH was waiting for gear to arrive so he could put Christmas Island on the air. FL8OM *et cie* were headed for Abu Ail and WB6OOL was headed for Tuvalu. The Colvins were headed for Fiji and EA8CR had just wound up a Spanish Sahara effort. Word was received that Dr. Hidetsugu Yagi had passed away in late January. 5T5CJ was due on for a DX test at the end of the month and PJ8KI was on from Sint Maarten. Operating from VR1Z, the Colvins worked a WAC in 92 minutes—FB8ZF, VK3LV, JH2QXS, LZ1KPM, LU3DJX, and W4BBP. There were rumors of a possible "new country" to show on the 50th anniversary of the JARL. FR7ZL was on from Europe. The sunspot cycle was headed up!

Dr. Fernando M. Fernandez, EA8AK, is the winnter of 5B WAZ #7, and over the years he has been the winner or top scorer in many contests. Fernando has also been on DXpeditions to Spanish Sahara, Equatorial Guinea, and Annobon, as well as joining some record-scoring efforts in the CQ WW DX Tests. Here Fernando relaxes in the shack at La Laguna on Tenerife Island. One of the world's top Dxers, you will usually hear the EA8AK call in CQ's fall DX Tests.

5B WAZ #7

We are reaching back a bit for this one, but any DXer who has been around for a contest or two will quickly recognize the call EA8AK and its holder, Dr. Fernando M. Fernandez Martin. A former president of the Union de Radioaficionades de Espana, a recipient of a Communications Gold Medal awarded by the Spanish P.T.T., Fernando has been active in a lot of DX and DX contests, winner in many, holder of world-record scores in several, and a contester always in there when the action is booming. In other times and other places Fernando has teamed up with other well-known DXers to operate from places such as EA9-Spanish Sahara, 3C1AA/3C@AB, Equatorial Guinea, and Annobon and C31 Andorra. In the 1980 *CQ* WW DX Test Fernando racked up over 9 million points in the single operator/all-band category. In 1977 Fernando was part of the operation that ran up over 21 million points in the *CQ* WW DX Test. Always close to the DX scene, Fernando served as the DX Editor for the URE publication from 1977 to 1980.

EA8AK was first licensed in 1956 at the age of 13. At that time he was the second operator to EA8CR. Fernando holds the Spanish Class A license and has been signing EA8AK since 1977. His XYL is Elena, and they have two children, Fernando and Maria.

Fernando won 80 meter WAZ #1 and 40 meter #1 in 1975, both in the same year. On other bands he picked up 20 meter WAZ #13, 15 meter WAZ #2, and finally the 10 meter WAZ. Fernando has won awards in the *CQ* WW DX since 1974.

The equipment in the shack at EA8AK is a Drake 4C line with a Drake L4B linear. Fernando also has the Collins S-line, a Drake TR-7, and an Alpha 77. Though you might find Fernando on all bands, he prefers 80/160 meters plus a continuing interest in the 144 MHz and 432 MHz bands. On 2 meters he made the first EA8/YU contact, the first EA8/DL contact, and established a tropo record in IARU Region I with action from EA8 to G-land. He has worked into Spain from the Canaries on 432 MHz, another first.

So what does Fernando do when he is not DXing? He is an M.D. with a specialty in neurosurgery as well as being the Professor of Neurology at the University of the Canary Islands.

In the Canaries there is no local radio club in downtown La Laguna, so Fernando usually has to get on the air to talk with other DXers. He does belong to LINX, a Spanish radio club, as well as being a member and past-president of URE, the Spanish radio society.

The antennas are a forest of monobanders. There are 5 elements for 10 meters, 5 elements on 15, 4 elements on 20, and 3 elements on 40. For 80 there is a 2-element Delta loop plus three sloper dipoles (NE/NW/SW), and 160 has a top-loaded vertical with 20 quarter-wave radials. There is also a beverage antenna for receiving on 80 and 160.

Considering the recent years of DXing, Fernando must be acknowledged as being among the world premier DXers. The winning 5B WAZ #7 certainly adds a bit to an already imposing image. When you work EA8AK in a contest, you know you are working one of the best.

QSL Information

Often the biggest file in a low-total DXer's shack is the QSL file. Radio magazines have markers to show the monthly QSL information. Clippings are stored for possible future need. The W6GO/K6HHD QSL Manager List (Box 700, Rio Linda, CA 95376) or the QSL Report (JH1WHN) gathers all the information into a format that is published at frequent intervals. Some say a QSO is not completed until you have the QSL in hand. The way to a needed one is always valued—sometimes more so.

FG/K3VW/FS to K3VW
DJ9ON/S9 to DJ9ON
DK9KX/S9 to DK9KX
EL8AU/mm to VS6GP
FT8XA to F6FYD
HI8JR to HI3JR
K3EST/PJ4 to CBA
LX1JAS to LX1DA
N7ZZ/PJ4 to CBA
P44B to N2MM
P44RX to W4PPT
P48K to I8MPO
PY4WAS/PS8 to PY4AG
WA3LRO/PJ4 to CBA
TZ6FE to DL4BC
VI4IYY to VK4SS
VP2MW to WA6AHF
V44KAC to WB2LCH
XX9SP to KS7P
W9GW/EA9 to W9GW
4U1ITU (Oct. 26-27) W4KA
4U48UN to W2MQV
8P9AG to K6ZM
CX2AAL to Carlos Carrara, Box 4, Montevideo, Uruguay
FG/K3VW/FS to Pete Carter, Rt 2, Box 266 Hillside Dr., Quakertown, PA 18951
FT8XC to C. Alemani, 3 rue Victor Boucher, 76440 Forge les Eaux, France
KB6DAW/KH2 to Ed Campbell, 300A Rendova, APO San Francisco 96337
PZ2AC to POB 86, Nickerie, Surinam
P42J to W1AX, 60 Warwick Dr., Westwood, MA 02090
W1BIH/PJ2 to W1AX, 60 Warwick Dr., Westwood, MA 02090
XX9SP to Herb Davidson, KS7P, 11944 SE Brookside Dr., Portland, OR 97266
9L3MW to J. Droge, 7138 Wilkinson Rd., Rockford, MI 48341

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FT-726R, FRG-9600, FT-270RH, FT-2700RH

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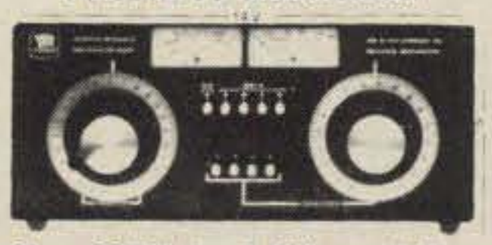

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tions. Everything good happened in the past—like Cycle 19. But the Northern California DX Foundation long ago realized that the DX past should not be forgotten and that, unfortunately, some of the DX records and reports have been lost because no one sought to gather and care for them.

Some may recall this being announced in the past. The intervening years have brought a number of valuable reports, and currently the NCDXF has the following slide shows:

1974 Kingman Reef/Palmyra Island DXpedition (148 slides).

1978 African DXing by K5YY (62 slides).

1984 Easter Island, Galapagos, San Andreas, and Juan Fernandez by the Colvins W6KG/W6QL (140 slides).

1984 Kermandec DXpedition by ZL1AMO and W6REC (58 slides).

1983 Saipan operation in *CQ* WW Test by AH0C (82 slides).

1985 Clipperton DXpedition (192 slides).

Also available if you have capability for VHS video are:

XU1SS, this includes a BV0YL and BV0JA operation (35 minutes).

1976 and 1978 7J1RL DXpedition; this includes the VK9ZR Mellish Reef effort.

1978 VK9ZR DXpedition plus the JD1YAH/JD1YAK Ogasawara effort of 1978.

Frankford Radio Club ARRL Phone parody plus JH7YHL WW CW 1982 effort.

Okino Torishima DXpedition of 1979 by JF1IST/7J1.

These are available for club or group showing. If you are interested, drop a line to the Northern California DX Foundation, Box 2368, Stanford, CA 94305-0015.

Also, the NCDXF continues to seek records, logs, or other jetsam from DXpeditions or other notable operations. The Foundation wants to preserve the past for the information of future DXers. It may be junk to some, but it could be a treasure a couple of decades hence. If you have anything, write and tell them what you have to donate. They would like to hear from anyone.

P29JS

Jim Smith in the bulletin from the Heard Island DX Association notes that he thinks Heard Island might be a bit more available in the future as the Australian government moves towards reestablishing a base on the island. The recent visit permit included a clean-up clause in the paperwork. Jim believes that it will take a bit of work to have a base whose buildings can cope with the bad and worse weather generally encountered at Heard.

A couple of months back Jim was in Konedobu up in Papua/New Guinea with wife Kristi, P29KJ, enroute to join him. You might check the net frequency of 14220 kHz from 0600Z.

Band Edges

How close can you work to the edge? Some with new receivers and digital readouts are fond of announcing frequencies in tenths. K5WG, an Official Observer Coordinator down in Oklahoma country, notes that a violation notice out of the Livermore Monitoring station in California cautioned against operating within 3 kHz of the upper edge on 20 and 15 meters.

As the issuing officer at Livermore put it: "For an upper sideband emission, a carrier frequency greater than 14347.2 kHz should not be used." Some have commented that with the characteristics of the human voice, any operation above 14347.0 on 20 or 21447.0 kHz on 15 should not be attempted. Note that in these instances they are talking upper sideband. On those bands where lower sideband prevails, it is the lower edge where caution must be used. Whether you are up or down, 3 kHz seems to be the minimum safety margin.

Pribilofs

The Alaska DX Assn. has advised DXers not to throw their Pribilofs QSL away. The group says that they are not through trying and will be back. The support given by various DX groups and meetings has been cited, the Alaska DX Association noting that they got the support of an overwhelming majority of the DXers.

So far the group has shown endurance and can be expected to keep the topic alive. It might be noted that the group also raises a question as to the continued longevity of some current DXCC countries under the new Section 5 criteria. Before you start to worry, keep in mind that you never lose what you already have. Work 'em now and you will probably never have to worry later.

Some are quick to note inconsistencies in the country criteria, and there are some. But the criteria have been developing for about 40 years, and while some changes sought to plug obvious loop-holes, no attempt was made to go back and tidy up everything that had happened up to the time of the change.

Years back we heard a noted DXer propound the idea that the mileages mentioned in Section 2 of the country criteria, the 225 miles and the 500 mile separation, should be reduced by 25 miles, or some other good figure, every 5 years or so. As we recalled it, the idea was even proposed years back to the ARRL Board. Seems that back then when it rolled off the table it did not even bounce when it hit the floor.

But before you scorn the idea, stop and think of the potential. New countries would bring increased activity. Increased activity would attract new readers and new membership to organizations. There would be increased equipment sales, more licenses. And amateur radio would be saved! Even Chairman Volcker would approve such a planning concept, we have heard some say. DX and DXCC countries may, in many instances, be but a state of mind. So "Think Shrink!" Shrink the mileage in Section 2 of the criteria.

Then again, some suggest that DXCC

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

2819	YU2DX	1789	SM7TV	1424	WA8YTM	1156	W7CB	884	WI4K
2777	F9RM	1758	N2AC	1391	PY4OD	1154	G4FAM	876	VE2PD
2540	W2NC	1683	I2PHN	1350	K8LJG	1134	YU2CQ	858	K7CU
2507	K2VV	1657	I8YRK	1338	SM6DHU	1126	YU4YA	856	DF6EX
2439	K6JG	1649	YU7AW	1300	N5TV	1115	SM7AJU	851	JH8NYK
2354	K6XP	1640	W8CNL	1268	IS0LYN	1094	N4IB	841	I0AOF
2284	VE3XN	1633	K9BG	1258	DK5AD	1075	K2POF	828	NE6I
2160	N4MM	1589	I3ZKD	1250	N4NX	1048	WD9IIC	827	PY1DFF
2149	W9DWQ	1584	W0SFU	1240	KL7AF	1028	KC8CC	807	KX1A
2135	W4BQY	1581	I6SF	1234	W6OUL	1018	N2AIF	802	SV1PL
2048	N4NO	1536	W1NG	1232	PY1APS	1012	N8BJQ	800	KO2Q
2025	YU7BCD	1529	K7NN	1230	N6AW	952	W6YMH	787	K9BQL
1942	N6JV	1524	IN3ANE	1229	I2MQP	947	WD4RAF	752	JH4UVU
1897	N9AF	1521	WA1JMP	1224	LA7JO	926	VE5ADA	722	K8HF
1889	YU2TW	1511	W9NUF	1194	YU7AJD	914	AI8S	678	PY2DBU
1889	N6CW	1500	KF2O	1192	JH1VRQ	913	AI6Z	634	N3KR
1868	N4UU	1480	YU7KV	1185	K2QF	910	YU1SZ	611	JO1BMV
1825	K5UR	1479	K6ZDL	1171	WB8ZRL	905	W0JIE	607	KL7VZ
1798	YU7BPQ	1464	EA2IA	1164	CT1LN	904	W3GXK		

S.S.B.

2710	F9RM	1600	WD8MGQ	1160	W2NC	1028	JH1VRQ	810	CT1BY
2273	I0ZV	1577	W9DWQ	1150	G4CHP	1017	KC8YM	768	K3IXD
2130	K6JG	1558	K5UR	1133	W9NUF	999	WB8ZRL	761	WB6SRK
2093	K6XP	1557	PA0SNG	1126	W2CC	993	HI8GB	755	WO4L
2060	ZL3NS	1532	W4BQY	1103	W3ARK	980	KC8CC	746	EA5BCX
2029	I0AMU	1528	N4NO	1100	N5TV	948	XE1XF	717	I8WYD
2015	K2POA	1376	N2SS	1094	KC4OV	948	KK0L	714	SM0AJU
1966	K2VV	1374	WA4OMQ	1088	AC2J	937	K8LJG	710	W4UW
1944	N4MM	1340	VE1YX	1085	ZP5JCY	933	K5RPC	706	K8ZZU
1798	YU1DZ	1310	CT4NH	1082	N6FX	911	I0SGF	688	W6YMH
1764	I8YRK	1292	WF4V	1081	ZP5RS	902	N4IB	683	K9BOL
1759	I4ZSQ	1269	I6NOA	1081	XE1OX	901	PY4VX	655	EA8KN
1740	W0YDB	1257	CT1FL	1080	TG9GI	895	WA2FKF	649	KK5P
1739	CT1UA	1249	KF2O	1049	KL7AF	883	CT4UW	621	AG2K
1690	OZ5EV	1230	I2MQP	1033	N2AC	879	WI4K	619	CT1BWY
1664	YU7BCD	1223	PY3BXW	1030	I8KCI	868	PY4OD	617	N2AIF
1605	I6ZJC	1175	WA4OIB	1029	I4LCK	858	VE2PD	600	W7KWI
1605	I8KDB	1167	W1NG	1029	EA2IA	838	W0ULU	600	KC2FC

C.W.

2313	W2NC	1600	VE7CNE	1148	EA2IA	919	AK9Z	724	SM5DAC
1927	N6JV	1557	N2AC	1133	JE1JKL	897	KL7AF	717	F6HKD
1911	WA2HZR	1492	N4MM	1133	I2DMK	888	DJ1YH	661	VE4AEX
1854	K6JG	1442	K5UR	1123	I1YRL	852	I7PXV	654	W0JIE
1833	K2VV	1383	VO1AW	1111	PY4OD	827	NNR1	649	W9PWM
1809	W8KPL	1355	I6SF	1107	JA1KRU	813	N2AIF	644	N4IB
1785	N4NO	1334	W4WJ	1043	KA7T	803	JH1VRQ	633	ZS6BCR
1776	W9DWQ	1294	K9QVB	1013	IT9VDQ	797	AK2H	629	W6YMH
1745	K6XP	1286	YU3NP	1011	W1NG	790	YU2CQ	616	VE1ACK
1739	W3ARK	1244	N4YB	1000	N5TV	771	G4FAM	615	KQ8J
1710	W4BQY	1182	K6ZDL	999	KF2O	767	WD9IIC	608	JA2GCW
1657	G2GM	1163	N6FX	963	K8LJG	755	N4NX	605	LA7JO
1635	DL1QT	1161	W9NUF	926	K2POF	725	SM0AJU	603	I8YRK
1619	YU7BCD								

CQ DX Awards Program

S.S.B.

1440	NE8Q	1443	GW4OFQ
1441	I2ZGC	1444	CX2AAL
1442	N9BMS		

C.W.

649 WP4F

S.S.B. Endorsements

310	TI2HP/316	275	KC8EU/296
310	OE2EGL/312	275	KB3KV/296
310	DL6KG/310	275	I1POR/293
310	WA4JTI/310	275	KD5ZM/290
310	W7FP/310	275	N8BJQ/286
300	KB9OC/307	275	VE6PW/280
300	KP4EQF/302	28 MHz	I2ZGC
300	W8IMZ/301	1.8 MHz	I2ZGC
300	I2ZGC/300	3.5/7 MHz	I2ZGC
300	KZ2P/300	Mobile	K2JF
3.5/7 MHz	W8IMZ	QRPp	K2JF

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

should be started all over, that it is time to develop a new criteria, and begin right from Country 1 again. If you want to test the idea, and your popularity, bring up the idea at the next meeting of the local DX club.

Will the Pribilofs be back with the demand that the bar sinister be erased? You can expect it. Will it be a DXCC country? Probably. But just don't ask when.

IARU

Ask a passing DXer what the IARU is and the most probable reply will be that it is where you get the WAC certificate. The IARU does cover other matters, some dear to the hearts of the Deserving, and a run down on the items in a recent list shows the wide scope of IARU actions.

These actions include: admission of Gabon as the 124th IARU member; note that IARU sent observers to WARC meeting in Geneva on matters concerning geostationary satellites; notice that the EI-Radio Society will not be bound by provisions on the acceptance of QSL cards addressed to non-EI Society amateurs; Japan signed a reciprocal agreement with the U.S., the first such JA agreement; that New Zealand, Austria, the Dominican Republic, and Japanese amateur radio societies will celebrate their 60th anniversary in 1986 and that the address of the QSL Bureau has been changed from Box 111 to Box 111, St. John's.

Years back an old timer up on the Blithedale Ridge above the Pacific just south of here advised that DXers have to read everything to keep up in front of the pack. Later we came to a parallel conclusion—that true-blue DXers never tire of reading about DX and DXing. Sometimes the IARU report has some interesting information.

The Sunspot Cycle

Should you be watching for the sun to warm you up this month, you might also remember that you are looking at the bottom of the cycle, or a reasonable facsimile. The good Dr. Koeckelenbergh of the Sunspot Index Data Center in Brussels was looking for a smoothed sunspot number of 7 in December and 6 in January. That's low.

Here are a couple of the operators at BY1QH resting in front of the operating position. On the right is Yuan Bo, the Chief Operator for BY1QH.

In October the flux got down to a level of 66, which has been called a record low. The 12-month running smoothed sunspot number for August was 10.4, and in September it was 3.9. The bottom probably is being touched right now, but unfortunately sometimes it is not easily identified as to just what the bottom is until sometime later. But when the new cycle starts up, it usually moves up a bit faster than it came down, and life will again be worth living for DXers.

Actually, all you can do is patient and wait for developments. But this should be the bottom. Things should show signs of improving before too many contests pass, and the Deserving can look forward to tomorrow being a brighter day. Live in anticipation!

Some Short DX Notes

That third-party agreement with Great Britain has a few restrictions. Any such communications must be with a GB prefix, none other, and it does not include GB3 prefixes. The conversations must be on casual technical or personal levels too unimportant for commercial facilities.

If you recall the disappointment expressed by some European DXers last spring after the Clipperton effort, the comments by W6OAT at the Atlanta DXPO may bring some understanding. The game plan was to have each operator in charge during the times of the expected best propagation to his home area. The decision was made by the European operators, and especially by the French, to operate RTTY on 20 during the prime time to Europe, this utilizing the 20 meter SSB rig for 3 hours each day during the peak propagation periods for that area. Apparently this pre-empted any possibility of CW or SSB on the 20 meter band during these times. Some 18 hours of prime time was used during these best European periods, some 81 RTTY contacts being accomplished.

HZ1AB has been off the air in Saudi Arabia. Improvements going on at the Dhahran Airport resulted in the removal of the building that housed the station. All the equipment was put in storage, and the operators are looking for a new building so that HZ1AB can be back on the air. If you worked HZ1AB and thirst yet for the HZ1 QSL, all available station logs have been shipped to the station's QSL manager, Leo Fry, K8PYD.

The ARRL DXCC Desk is advising that it has been taking about 12 weeks to process cards. They are hoping to speed the process, but if you are waiting, it might help to know why. TL8HM runs a weekly schedule with a W9. You might watch 14230 kHz at 2000Z on Wednesdays. SU1ER often found at 14175 or 14275

kHz around 1700Z and a bit later on their weekend—Friday and Saturday. All this via the "DX Incorporated Bulletin," which also notes S92LB shows on Snooky's Net at 14183 kHz from 1900Z. This usually is a list operation, no call on list, no contact. However, the pressure is down a bit. If you want more information on this group, drop a line to Richard Breckinridge, WA9BXB.

At the end of last year the FCC was moving towards "self-rule" in handling the matter of repeater frequencies. The stature of the various repeater councils across the country would be bolstered with the FCC ready to back their coordinating decisions. Initially the FCC was determining what should be the qualifications for such frequency coordinators, caution being used to weed out "front" groups seeking only to establish their own rights to frequencies.

At the turn of the year the FO0XX Clipperton group was getting the demand for QSLs answered, some 14,000 incoming QSLs received for that effort. The desire by the operators to select really outstanding color slides that would express the "real them" for their QSLs delayed the printing, but they figured things would be cleaned up around the end of the year. Some may wonder what 14K incoming QSLs might look like. If the envelopes were stacked on edge, the row of letters would run about 47 feet in length. Anyhow, they all should be out by now.

Dave Siddall, K3ZJ, of the Capitol Hill Radio Club, notes that fees for amateur licenses were not included in the legislation which proposed fees for FCC services. Neither the House nor the Senate version had any language that would reestablish fees for the amateurs.

Clubs looking for an in-house DX competition might study the "NAANY" Award of the Western Washington DX Club. It aims at a lot of the available DX, runs for one year at a time, and after three years only K7WA and NR7F of the local group have managed to qualify. Drop a note to Jack Bock, K7ZR, if you need the full details. With most of the the heavy-duty contest season getting behind us, some DX clubs are looking to this fall and wondering if they want to gird up their linears and challenge another, sometimes neighboring DX club to a duel to the end.

WWV continues to be an excellent source for propagation information, right after the 18 minutes after the hour time check. You get the solar flux and A index for the previous day plus the "K" index as they note it at Boulder. This is updated every three hours, plus the state of solar activity and the earth's magnetic field for the preceding 24 hours. You will also get a prediction of what to expect in solar factors and the magnetic field for the coming 24 hours.

There is a report that Taiwan now has eight amateur stations with more to follow. The *Totem Tabloid* recently listed BV1 Yilan/Kuelung; BV2 Taipei; BV3 Taoyuan/Miaoli; BV4 Taichung; BV5 Changhua/Chiayi; BV6 Tainan; BV7 Kaohsiun; BV8 Taitung/Hualien, and BV9 Adjacent Islands. Also, BV2RA is often found around 7005 kHz at west coast morning time.

A final item that you may have noted previously, we write three months in advance of the date on the cover of *CQ* and would like allowances made, when possible, when information is sent. We are always looking for word on future action, pictures of DXers, and especially overseas DXers. Looking beyond all of this ending stuff, remember that things are going to get better in this year—or the next—and as the Hero of Mafeking would often say, "Be Prepared!"

73, Cass, WA6AUD

DX Ten Years Back

PY0PO and PY0BXC started February 1976 with action from Fernando de . . . . WA6AHF was in the Western Carolines. LU2XR was planning a brief South Sandwich operation and VP8MS was headed for South Georgia. LU1ZA was active from the South Orkneys and VR3AH was waiting for gear to arrive so he could put Christmas Island on the air. FL8OM *et cie* were headed for Abu Ail and WB6OOL was headed for Tuvalu. The Colvins were headed for Fiji and EA8CR had just wound up a Spanish Sahara effort. Word was received that Dr. Hidetsugu Yagi had passed away in late January. 5T5CJ was due on for a DX test at the end of the month and PJ8KI was on from Sint Maarten. Operating from VR1Z, the Colvins worked a WAC in 92 minutes—FB8ZF, VK3LV, JH2QXS, LZ1KPM, LU3DJX, and W4BBP. There were rumors of a possible "new country" to show on the 50th anniversary of the JARL. FR7ZL was on from Europe. The sunspot cycle was headed up!

Dr. Fernando M. Fernandez, EA8AK, is the winnter of 5B WAZ #7, and over the years he has been the winner or top scorer in many contests. Fernando has also been on DXpeditions to Spanish Sahara, Equatorial Guinea, and Annobon, as well as joining some record-scoring efforts in the CQ WW DX Tests. Here Fernando relaxes in the shack at La Laguna on Tenerife Island. One of the world's top Dxers, you will usually hear the EA8AK call in CQ's fall DX Tests.

5B WAZ #7

We are reaching back a bit for this one, but any DXer who has been around for a contest or two will quickly recognize the call EA8AK and its holder, Dr. Fernando M. Fernandez Martin. A former president of the Union de Radioaficionades de Espana, a recipient of a Communications Gold Medal awarded by the Spanish P.T.T., Fernando has been active in a lot of DX and DX contests, winner in many, holder of world-record scores in several, and a contester always in there when the action is booming. In other times and other places Fernando has teamed up with other well-known DXers to operate from places such as EA9-Spanish Sahara, 3C1AA/3C0AB, Equatorial Guinea, and Annobon and C31 Andorra. In the 1980 *CQ* WW DX Test Fernando racked up over 9 million points in the single operator/all-band category. In 1977 Fernando was part of the operation that ran up over 21 million points in the *CQ* WW DX Test. Always close to the DX scene, Fernando served as the DX Editor for the URE publication from 1977 to 1980.

EA8AK was first licensed in 1956 at the age of 13. At that time he was the second operator to EA8CR. Fernando holds the Spanish Class A license and has been signing EA8AK since 1977. His XYL is Elena, and they have two children, Fernando and Maria.

Fernando won 80 meter WAZ #1 and 40 meter #1 in 1975, both in the same year. On other bands he picked up 20 meter WAZ #13, 15 meter WAZ #2, and finally the 10 meter WAZ. Fernando has won awards in the *CQ* WW DX since 1974.

The equipment in the shack at EA8AK is a Drake 4C line with a Drake L4B linear. Fernando also has the Collins S-line, a Drake TR-7, and an Alpha 77. Though you might find Fernando on all bands, he prefers 80/160 meters plus a continuing interest in the 144 MHz and 432 MHz bands. On 2 meters he made the first EA8/YU contact, the first EA8/DL contact, and established a tropo record in IARU Region I with action from EA8 to G-land. He has worked into Spain from the Canaries on 432 MHz, another first.

So what does Fernando do when he is not DXing? He is an M.D. with a specialty in neurosurgery as well as being the Professor of Neurology at the University of the Canary Islands.

In the Canaries there is no local radio club in downtown La Laguna, so Fernando usually has to get on the air to talk with other DXers. He does belong to LINX, a Spanish radio club, as well as being a member and past-president of URE, the Spanish radio society.

The antennas are a forest of monobanders. There are 5 elements for 10 meters, 5 elements on 15, 4 elements on 20, and 3 elements on 40. For 80 there is a 2-element Delta loop plus three sloper dipoles (NE/NW/SW), and 160 has a top-loaded vertical with 20 quarter-wave radials. There is also a beverage antenna for receiving on 80 and 160.

Considering the recent years of DXing, Fernando must be acknowledged as being among the world premier DXers. The winning 5B WAZ #7 certainly adds a bit to an already imposing image. When you work EA8AK in a contest, you know you are working one of the best.

QSL Information

Often the biggest file in a low-total DXer's shack is the QSL file. Radio magazines have markers to show the monthly QSL information. Clippings are stored for possible future need. The W6GO/K6HHD QSL Manager List (Box 700, Rio Linda, CA 95376) or the QSL Report (JH1WHN) gathers all the information into a format that is published at frequent intervals. Some say a QSO is not completed until you have the QSL in hand. The way to a needed one is always valued—sometimes more so.

FG/K3VW/FS to K3VW
DJ9ON/S9 to DJ9ON
DK9KX/S9 to DK9KX
EL8AU/mm to VS6GP
FT8XA to F6FYD
HI8JR to HI3JR
K3EST/PJ4 to CBA
LX1JAS to LX1DA
N7ZZ/PJ4 to CBA
P44B to N2MM
P44RX to W4PPT
P48K to I8MPO
PY4WAS/PS8 to PY4AG
WA3LRO/PJ4 to CBA
TZ6FE to DL4BC
VI4IYY to VK4SS
VP2MW to WA6AHF
V44KAC to WB2LCH
XX9SP to KS7P
W9GW/EA9 to W9GW
4U11TU (Oct. 26-27) W4KA
4U4BUN to W2MQV
8P9AG to K6ZM
CX2AAL to Carlos Carrara, Box 4, Montevideo, Uruguay
FG/K3VW/FS to Pete Carter, Rt 2, Box 266 Hillside Dr., Quakertown, PA 18951
FT8XC to C. Alemani, 3 rue Victor Boucher, 76440 Forge les Eaux, France
KB6DAW/KH2 to Ed Campbell, 300A Rendova, APO San Francisco 96337
PZ2AC to POB 86, Nickerie, Surinam
P42J to W1AX, 60 Warwick Dr., Westwood, MA 02090
W1BIH/PJ2 to W1AX, 60 Warwick Dr., Westwood, MA 02090
XX9SP to Herb Davidson, KS7P, 11944 SE Brookside Dr., Portland, OR 97266
9L3MW to J. Droge, 7138 Wilkinson Rd., Rockford, MI 48341

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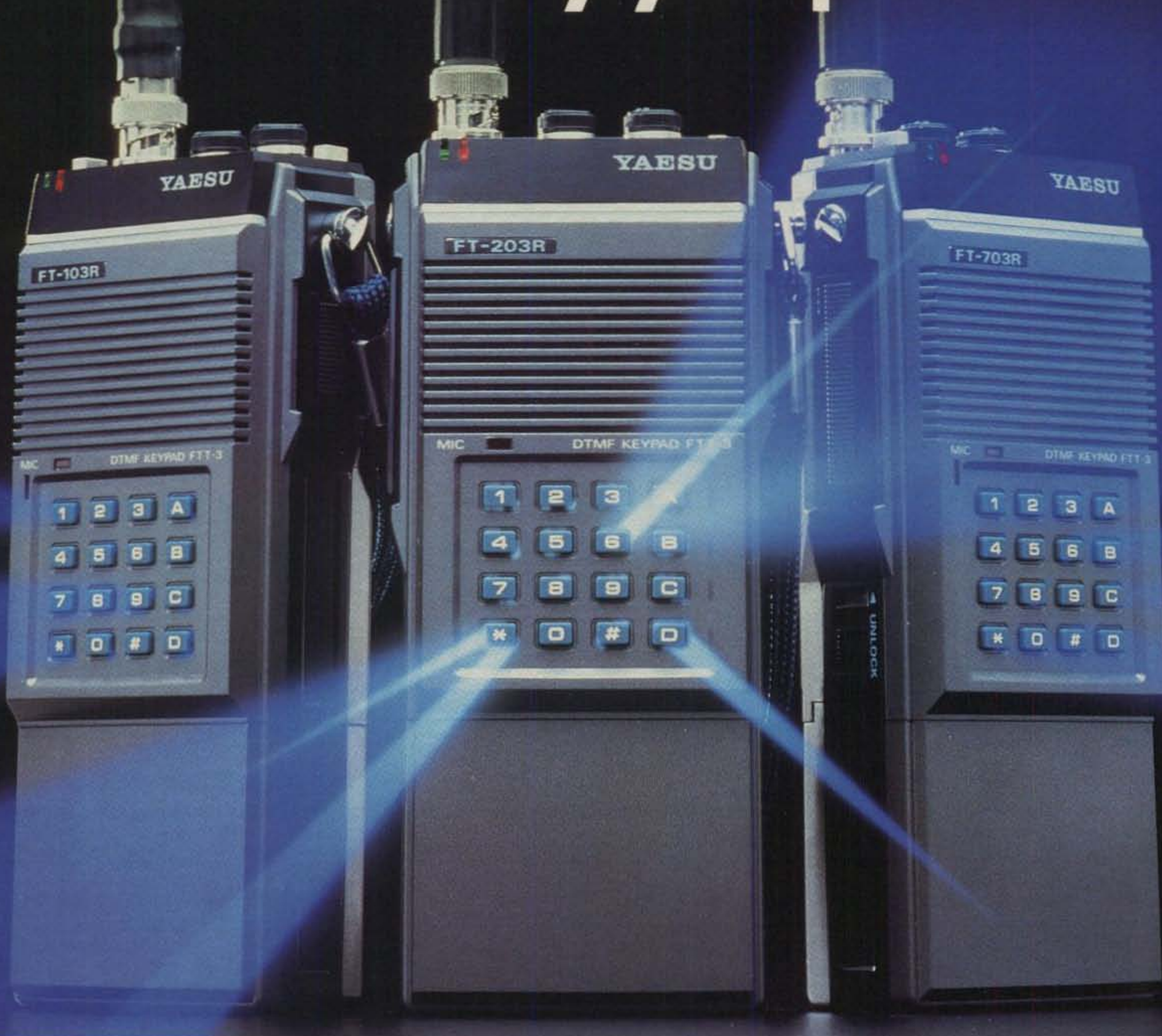

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Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

Amateur Radio Growth Is Important

The FCC's new Amateur Radio Service volunteer examining (VE) system has been in place for some two years now. The Technician class and higher VE program actually came "on line" during fiscal year 1984, but it wasn't until fiscal 1985 that it really got going. The government's fiscal year is actually from October 1 through September 30th of the following year.

Amateur Radio Service growth is very important if we are to maintain the valuable frequencies that we have. We probably wouldn't have them at all if we didn't have them first. Many other well-funded radio services continue to eye them for their own needs! The transition from FCC to volunteer amateur self-testing is a radical change indeed, and one with the potential to greatly affect the health of the service. Let's take a look this month at what has happened.

Actually there are now two volunteer amateur testing programs. Novice tests have always been given on a volunteer basis, although not in the present form. It used to be that an applicant was first given a VE-designed 5 word-per-minute code test. A 20-question written test was later administered after receipt from the FCC. No more.

Now the VE designs both the Novice code *and written test.* The written test is based on an approved set of questions which the examiner selects according to a specified formula. Who ever thought that this is the way it would someday be for the higher class licenses, too. But here we are and *the program is working!* The entire VE system is conducting more amateur exams than the FCC ever did in its most productive year—in fact, 50% more! (See Table I.)

FISCAL - 1985 - AMATEUR RADIO SERVICE
VOLUNTEER EXAMINING PROGRAM STATISTICS

Fiscal-85 Month	No. of VEC's (*)	No. of Testing Sessions:	No. of Test Elements Admin.	No. of Persons Tested:	Pass Rate:	No. of Persons per Session:	No. of Elements per Person:	No. of Test Sessions per VEC
Oct 84	50	75	2,465	1,643	46.69%	21.91	1.50	1.50
Nov 84	50	89	2,240	1,493	47.86%	16.78	1.50	1.78
Dec 84	51	130	2,741	1,827	49.73%	14.05	1.50	2.55
Jan 85	52	219	5,290	3,664	51.30%	16.73	1.44	4.21
Feb 85	53	168	3,428	2,053	54.64%	12.22	1.67	3.17
Mar 85	64	252	6,178	4,177	56.30%	16.58	1.48	3.94
Apr 85	64	261	6,202	3,620	59.32%	13.87	1.71	4.08
May 85	64	328	7,436	4,925	57.88%	15.02	1.51	5.13
Jun 85	64	322	6,221	4,217	58.16%	13.10	1.48	5.03
Jul 85	65	279	4,639	3,173	57.88%	11.37	1.46	4.29
Aug 85	65	280	4,894	3,299	61.03%	11.78	1.48	4.31
Sep 85	65	241	4,247	2,846	61.27%	11.81	1.49	3.71
Total:		**2,644**	**55,981**	**36,937**				
Average:	**59**	**220**	**4,665**	**3,078**	**55.17%**	**14.60**	**1.52**	**3.64**

(* Many VEC's handle multiple regions. FCC considers each call sign region as a different VEC. Only 27 different VEC's.)

Source: FCC, Personal Radio Branch; Washington, DC

Table I– Fiscal 1985 Amateur Radio Service, volunteer examining program statistics.

The VE Program Is Off and Running

With constant government agency budgets and manpower cut-backs, turning over amateur testing to the amateur became a fiscal necessity. The FCC should be congratulated for pulling this off to the extent they did! It was a massive undertaking. Pools of questions had to be developed. A VE/VEC program had to be put together. Instructions had to be written. VEC's had to be trained. It took them two years to do it!

The FCC said in 1983 that 1984 would be the last year that they would administer amateur examinations, and then only on a quarterly basis. It was either do it yourself or nothing! It almost became nothing, as amateur self-testing got off to a very slow start. Everyone thought the ARRL would immediately jump in, but they didn't. They really didn't get going until early 1985. Individual amateurs (like myself) and amateur radio clubs tried to take up the slack. The FCC authorized many VEC's before the League submitted its proposal to be a coordinator.

Now there are over 50 amateur radio operator testing sessions going on in the U.S. every week, and this figure is increasing! Nearly 37,000 amateurs took over 55,000 test elements last year trying to upgrade at 2,644 test sessions. *Over 20,000 of them did.* The sessions were cordinated by 27 VEC's who acted as the link between the government and the testing community. We are proud to be one of them! Our program ranks number two behind the ARRL's in popularity. We applied to be a VEC when it appeared that testing opportunities would be nonexistent in the future.

Pass Rate Remains the Same

You would expect that the pass rate for the volunteer program would be higher than that of the FCC since the system is dramatically different. Rather than being administered unknown questions, today's amateurs study known multiple-choice questions and answers. The pass rate for 1985 averaged 55%, although it inched up to over 60% by year end from a mid-40's beginning. The obvious reason is that good license preparation materials are now more widely available. Even so, the pass rate is pretty much what the FCC experienced when they had the program.

Another interesting VE program statistic is that while the pass rates are increasing slightly, the number of persons who attend a testing session steadily decreases. The typical test session during 1985 administered amateur examinations to an average of 15 applicants. At the beginning of the year the average session had 20 applicants. By year end this fell to about 10. Amateurs have found that it is easy to hold test sessions. While hamfests conduct massive test sessions, most sessions consist of only three VE's giving tests to a handful of candidates. Most VE's find that administering Technician and higher class tests is no different

P.O. Box #10101, Dallas, TX 75207

AMATEUR RADIO SERVICE

LICENSING ACTIVITY - FISCAL 1985

Fiscal 1985 - Month:	New 1st Time Amateurs	Novice Class Upgrading	Technic. Class Upgrading	General Class. Upgrading	Advanced Class Upgrading	Total Amateurs Upgrading	Amateurs Letting License Expire:	Increase in Amateur Census:
Oct 84	961	390	217	158	58	823	510	+ 451
Nov 84	1,281	690	277	338	200	1,505	627	+ 654
Dec 84	1,552	949	299	461	190	1,899	343	+1,209
Jan 85	1,343	647	257	116	77	1,097	405	+ 938
Feb 85	1,242	747	357	224	126	1,454	554	+ 688
Mar 85	2,001	933	418	376	196	1,923	518	+1,483
Apr 85	2,043	726	251	273	184	1,434	389	+1,654
May 85	2,174	1,437	497	563	297	2,794	1,364	+ 810
Jun 85	1,186	1,167	344	386	223	2,120	513	+ 673
Jul 85	1,431	1,125	283	369	273	2,050	2,416	- 985
Aug 85	1,297	1,002	382	333	235	1,952	2,817	-1,520
Sep 85	862	609	251	232	155	1,247	2,156	-1,294
Total:	**17,373**	**10,422**	**3,833**	**3,829**	**2,214**	**20,298**	**12,612**	**+4,761**
Average:	**1,448**	**869**	**319**	**319**	**185**	**1,692**	**1,051**	**+ 397**

Source: FCC Licensing Facility, Gettysburg, PA

Table II– Amateur Radio Service licensing activity fiscal 1985.

than giving a Novice exam. One thing hasn't changed, however. The average applicant takes 1.5 tests per session.

Table I shows that there were 65 VEC's at year end. Actually, there were only 27 *different* coordinators, since the FCC assigns VEC's by call-sign region. Our own W5YI-VEC program is actually 13 VEC's according to the FCC, since we have been approved to accredit VE's and coordinate amateur testing worldwide (call sign regions 1 through 0 plus the Pacific, Alaskan, and Caribbean insular areas). There are now four national VEC's: us, the ARRL, DeVry Amateur Radio Society (Chicago), and a new one, Metroplex-VEC in New Jersey. We were the first and remain the only VEC that is an individual.

There doesn't seem to be any serious cheating or problems at VE-administered examinations. This is not to say there have not been some, but probably no more than the FCC experienced when they gave the tests. The perceived credibility of amateur self-testing still remains high.

Licensing Activity During 1985

Table II has some good news and some bad news. The good news is that 17,373 candidates joined the amateur ranks for the first time during 1985, and over 20,000 amateurs upgraded! The bad news is that over 12,000 amateurs failed to renew their tickets and were purged from the FCC's active record file.

FISCAL - 1985 - AMATEUR RADIO SERVICE

AMATEUR CENSUS BY CLASS AND CALL SIGN FORMAT

Amateur Call Sign Format:	Extra Class:	Advanced Class:	General Class:	Technician:	Novice Class:	Total by Format:	Percent of Total
Group "A" (1x2, 2x1)	23,268	925	362	8		24,563	5.95%
Group "B" (2x2)	1,060	18,656	56	9	3	19,784	4.80%
Group "C" (1X3)	8,937	42,032	60,755	27,258	58	139,040	33.70%
Group "D" (2X3)	4,453	36,071	56,040	55,753	76,271	228,588	55.40%
Other Formats	250	141	127	89	5	612	.15%
Total:	**37,968**	**97,825**	**117,340**	**83,117**	**76,337**	**412,587 (*)**	
% of Total:	**9.20%**	**23.71%**	**28.44%**	**20.15%**	**18.50%**		**100.00%**

(* Excluded are: 2,262 Club, 165 Military, and 354 RACES stations.
Actual total active stations is: 415,368)

Source: FCC, Private Radio Bureau database; Washington, DC

Table III– Fiscal 1985 Amateur Radio Service census by class and call sign format.

Most were Novices who became disinterested or disillusioned with the hobby.

A way has got to be found to maintain Novice interest. The answer may be on the horizon! The Commission appears to be on the verge of approving voice privileges for Novices. If that occurs, watch the "failure to renew" rate go down or disappear!

We have listed the fiscal 1985 amateur radio operator licensing activity by month. Note that there appears to be a "licensing season." The months of March through July are historically the peak period.

Amateur radio did show growth during 1985. Although the growth wasn't what it should have been, it is a step in the right direction. That it came at a time when the amateur community was assuming the responsibility for testing its own is particularly gratifying. The service grew at the rate of about 400 a month last year. I look for greater growth next year—in fact, *substantial growth*. All the signs are there. We all will have to do our part.

Table III shows the fiscal 1985 year-end amateur census by license class and call-sign format. It is interesting to note that fewer than 50% of all amateurs upgrading chose to change their call sign. They apparently become attached to it and are reluctant to "change their name" I guess.

From the Mailbag

The mail that is generated from readers continues to pile up. I try to answer some, but can't answer all. I will try to cover questions of universal interest whenever I can.

"I lost my license. How do I get another?"

Write to the Consumer Assistance Branch at the FCC, General Radio Branch, P.O. Box #1020, Gettysburg, PA 17325. You can also call them at (717) 337-1212. Explain what you think happened to the original. They have a special form and replacement is very fast.

"Does the Novice written examination, Element 2, have to be written?"

No it does not. It can be given orally in "interview" fashion. The answers do not have to be multiple choice. While the questions must be given as stated in the question pool, the answers can be in any form—even discussion. It will shortly be this way for the Technician through Extra class written examinations also, since the FCC is in the process of approving the VE to determine the correct answer rather than the VEC!

All Morse code tests, whether 5, 13, or 20 wpm, are the responsibility of the VE. They can be in any format: one minute solid copy, fill in the blanks, answer ten questions, or multiple choice. Most VE's make up their own test tape.

"Does a Novice applicant have to take his test through a VE accredited by a VEC?"

Absolutely not! Any General class (or higher) amateur can give a Novice test provided the VE is 18 years of age, not related to the applicant, and not "significantly" engaged in the amateur-equipment or license-preparation business. Only one examiner is required, although the ARRL has a proposal (at this writing) to increase this to two.

"Where do I get the test to give to a Novice candidate?"

We have one available (with answers) for $1.00 (P.O. Box #10101, Dallas, TX 75207), but you can make up your own. Write to the FCC (Personal Radio Branch, Washington, DC 20554) and ask for PR Bulletin #1035A. This is the 200 Novice question pool. There is no charge.

The instructions tell you how many questions to ask from each topic. Be aware, however, that the FCC only furnishes the questions, not the answers. You have to come up with those yourself. We have a Novice manual and instructions available for $2.95 which lists all 200 questions *and their answers* in multiple-choice form. It is handy for candidates to study and for examiners to select questions/answers. We include an FCC Form 610 with either the test or the manual.

"How does 'instant upgrade' and 'code credit' work?"

The same Certificate of Successful Completion issued at test sessions covers both functions. It is provided by the VE when a code element is passed or the amateur upgrades. In the case of a successful code test, it serves as evidence for credit for the required telegraphy examination at a subsequent testing session held within one year of the date of issue of the certificate.

A candidate who has an FCC-issued amateur radio license and who has passed the requirements for a higher class amateur operator license may operate immediately on a temporary basis up to one year with the rights and privileges of the higher operator class. The certificate is evidence or proof of having passed the additional test element(s) and is not a permit or license, although it does authorize immediate upgrade privileges. Only the FCC can issue a permit or license.

"Will the FCC issue me a specific call sign?"

No, not at present. FCC rules require that amateur call signs be issued "systematically" with no exceptions. But the FCC is working on a program with the ARRL that may change that. It might be a year off, but the Commission is aware that many amateurs want specific call signs—call signs issued to a deceased relative; special club, commemorative, memorial, special event call signs; and the like. A program is being discussed whereby the League will be able to issue these in the future. The FCC does not have the staff nor the resources to handle specific requests. While no decision has been made, the ARRL will probably be allowed to charge a fee for their services.

"Must I wait the full 30 days before retaking a failed amateur test?"

No, the rule was changed last November. The previous so-called "30-day rule" was based on the FCC's staffing requirements. They simply didn't have the examiners to test candidates more often. Now that amateur testing has been turned over to the amateur community, the VEC can determine his own waiting period. In our own case, we now allow applicants to retake failed amateur tests on successive days, but not on the same day. Each VEC has their own waiting period, and the FCC does not interfere. No VEC or VE is required to give tests to anyone, or on demand.

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Getting Started in SSTV

Winter months are an ideal time for investigating new areas of communications and expanding one's interest in amateur radio. Inclement weather during this season tends to discourage outdoor antenna experimenting, for example, and propagation on HF bands play havoc with the ever-classic pursuit of DXing. As a spinoff of these temporary limitations, amateurs spend more time reading and pursuing special projects or venturing into some personally attractive area of specialized activity. Such ideas are quite logical and gratifying, and it's the perfect way to rekindle amateur radio's original excitement during an otherwise bland winter. Joining a new area of amateur radio activity doesn't necessarily mean being intimidated by "unknowns" or investing large sums of money. In fact, most amateurs start such ventures rather slowly and pick up speed as on-the-air operations guide their directions.

Specialized modes such as QRP, RTTY, or SSTV are quite popular areas of interest because they can utilize many items in one's existing setup (such as antennas, transceivers, variable filters, etc.) rather than starting from scratch with a complete new layout. The "add on" concept has its advantages! Since slow scan TV adds the complete new dimension of sight to amateur communications, its enjoyable "returns to initial investment ratio" is favorably encouraging. Likewise, that investment can be moderate or massive according to one's available funds.

Possibly the best way to explain that statement is to compare it to RTTY. Most of us have seen and/or used at least one of the classic mechanical teleprinters of past decades. We homebrewed a TU and copied RTTY in style, later adding transmit capabilities. The SSTV equivalents here are the (old) P-7 type monitor and SSTV camera. A number of these low-cost units continue appearing in hamfest fleamarkets and used-gear want ads. Naturally, you could begin by "looking in" and maybe transmitting your own prerecorded tapes made by a new SSTV friend. Computerized RTTY systems are quite popular, and SSTV is similarly following that trend. Naturally, SSTV software and hardware interfacing are necessary for assembling that video system. Which home computers are the most popular for SSTV operation? The ones used by SSTVers with inclinations in programming—usually Radio Shack and Commodore's 64. This area varies, so check with the SSTV nets for latest trends. They're quite friendly and enthusiastic about helping newcomers.

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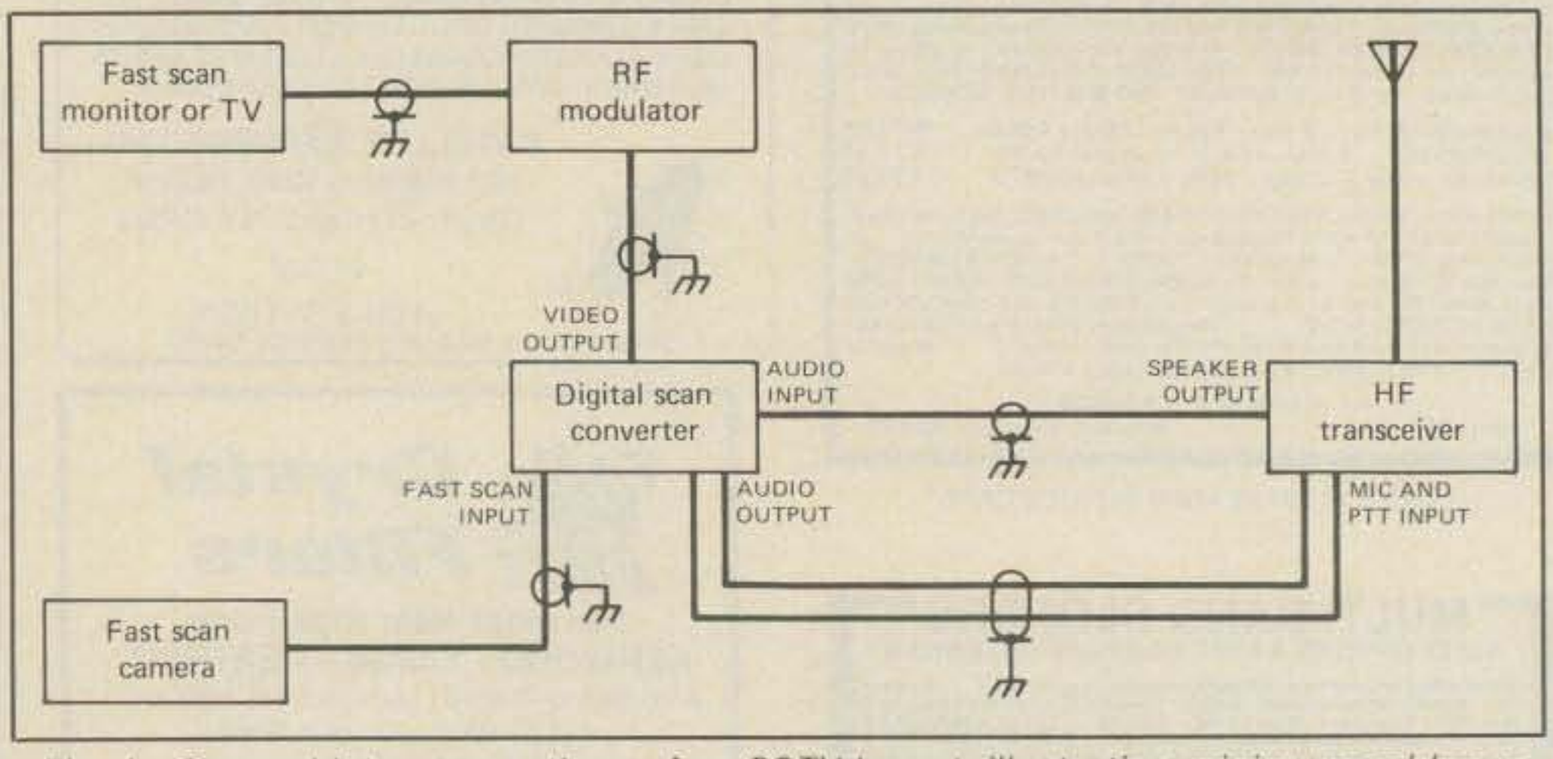

Fig. 1– General interconnections of an SSTV layout, illustrating minimum cables required. If older SSTV gear is used (P-7 monitor and sampling camera), monitor input connects to rig speaker output and camera output connects to rig input.

Basic Concepts of SSTV

Explained in the simplest of terms, slow scan TV is a very narrow bandwidth means of visual communication (it's comprised of audio tones between 1200 and 2300 Hz). When received over the air, SSTV signals sound like a "musical form" of RTTY with noticeable "bleeps" at the beginning of each picture. Interconnecting SSTV gear to an HF SSB transceiver, VHF FM rig, or inexpensive cassette recorder can thus be accomplished within a few minutes using a minimum number of cables (see fig. 1). The results are a complete new dimension in amateur communications on both a local and long-distance basis.

Since many uninformed investigators tend to confuse the operational capabilities of fast and slow scan TV, let's briefly compare differences of the two modes in a side-by-side analysis. FSTV, or conventional ATV, is quite broad in bandwidth (approximately 4 MHz), thus its operations are confined to amateur bands of 70 cm and higher. The range of these activities is limited to line of sight between stations and/or ATV repeaters (approximately 50 to 300 miles, depending on terrain). The overall definition of these moving pictures (approximately 480 horizontal lines and 30 pictures/frames per second) results in almost "commercial" quality. This mode is best known and recognized by amateurs during the annual Rose Bowl Parade, California Yacht races, etc. Comparatively, SSTV exhibits slightly lower definition (128 or 256 lines per picture), and each SSTV picture requires 8 to 12 seconds for transmission. This format produces a group of "stills" rather than "full motion" displays, but the trade-offs are more than justified by SSTV's worldwide capabilities via HF bands. A further clarification of SSTV's operating parameters is shown in fig. 2.

Many amateurs get started in fast scan TV by adding an RF-amplified frequency converter "in front" of a regular television. Since SSTV's parameters are completely different, however, digital scan conversion techniques have become extremely popular. Essentially, these clever units input and store a fast or slow scan picture, accelerate or decelerate it according to which conversion is taking place at that time, then output the results to a regular TV monitor or HF rig's mike input as required for reception or transmission of SSTV. Using this method, all in-shack gear may be FSTV related with SSTV tones seldom heard except via the airwaves. Prior to digital scan conversion, SSTV signals were generated by (rather complex) homebrew cameras and P-7 type homebrew monitors. Many amateurs still get started in SSTV via this inexpensive route, and although SSTV today is roughly a 50/50 mixture of color and black and white, older P-7 gear is quite attractive for most general on-the-air use.

Since SSTV attracts a large number of technically oriented amateurs, innovations and expansions in this area are con-

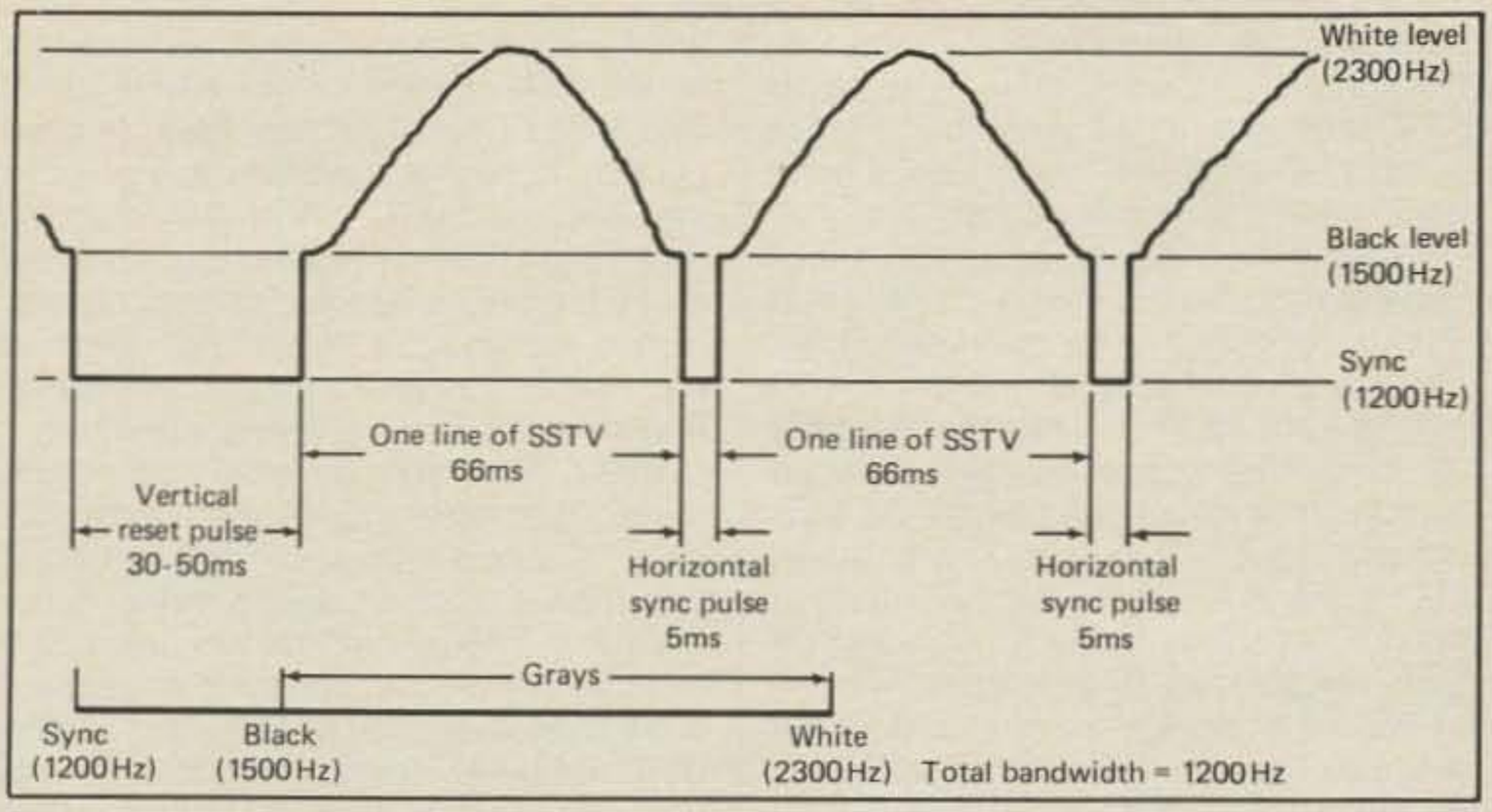

Fig. 2– Operating parameters of basic SSTV using black-and-white format. Approximately 128 lines are included in each full picture (only first two lines illustrated here).

tinuous and endless. The ever-common mode of 128-line pictures in an 8 second period accounts for roughly 50 percent of activity; the other 50 percent is intermixed in various speeds, lines, and color formats as shown in Table I. If you enjoy experimenting with various concepts and circuit designs, SSTV is an unlimited haven. We should also emphasize that the areas of creative applications and uses of SSTV are wide open and begging for development by nontechnical-minded operators. This mode needs more sheer use to expand its popularity. "Show and tell" programs on everything from gardening to circuit troubleshooting are two expandable ideas. Emergency or crisis communications are other areas that need developing. You probably have some other worthwhile ideas.

	128 lines			256 lines		
Black-and-white formats	8	12	17	24	34	36
Color SSTV formats	12		24	36		72
	Normal resolution			High resolution		

Table I– Summary of various speeds, lines, and color formats presently used in SSTV. Black-and-white 8 second pictures reflect nearly 50 percent of activity. Rest is split according to specialized pursuits.

SSTV Equipment

As mentioned previously in this article, there are three categories of SSTV gear available for mating with one's budget and levels of interest. Early analog or P-7 monitors and "sampling" cameras are no longer produced, but they still receive/generate standard 128-line/8-second pictures and can be acquired quite inexpensively. Received pictures are somewhat dimmer than (scan converted) fast scan views, but you can at least *see* what's behind those tones being *heard* on HF bands. Sampling-type SSTV cameras can prove slightly tricky to adjust, and patience is required for setup (8 seconds per adjustment, typical). Once beyond that point, however, a sampling camera performs very well.

A formidable amount of hardware and software is required when interfacing a home computer for SSTV scan conversions, and at least 64K of memory is desirable for best resolution. Assuming you're game for some homebrewing and have a computer on hand, this area warrants investigation. The largest amount of late-breaking news on software, hardware, and interfaced computers usually surfaces on the weekly SSTV nets. The International Visual Communications Association Net (IVCA) meets on 14,230 kHz at 1500 GMT Saturdays. The "original old-time SSTV Net" follows on 14,230 kHz at 1800 GMT Saturdays. Check-ins are on a first-call basis using SSB. The net control then sequentially calls each station with requests for status/information desired or pictures to transmit.

Setting Up An SSTV Station

Assuming you've collected the basic gear needed for SSTV operation, the next logical step involves laying out those items for convenient and successful utilization. Worthy considerations here involve positioning the monitor at a comfortable viewing distance (not so close that you see individual scan lines, but far enough to "eyeball integrate" a full picture) and avoiding bright reflections from camera lights. Some slow scanners rig a mini studio with a pull-down shade or backdrop during "live operations," while others merely place their camera on an inexpensive photographic tripod and move it around as required. Let your own station's room be your guide! Camera light bars are quite useful for SSTV operations, and they can usually be attached to that camera's tripod. An AC light dimmer can be added to each floodlight for maximizing picture contrast and clarity. If you plan to pursue color SSTV either imme-

diately or during the near future, I heartily recommend using the popular quartz lights rather than ordinary incandescents (which are high in orange output). I also suggest using at least two "side lights" (one on each side of the camera, and spaced 1 to 2 feet from the camera) rather than a single spotlight directly above the camera to avoid "hot spots" on televised pictures. If camera lighting situations become somewhat troublesome, try using inexpensively produced 35 mm slides projected onto a small backdrop or sheet and train the TV camera onto that "screen." Alternately, you might purchase a battery-powered slide viewer, drop your own home photos onto the viewer, and train the TV camera's lens into the viewer. That arrangement can yield perfect pictures even in a dark room!

Since few SSTVers care to "fire up" a station's camera and lights every time a video transmission is desired, prerecorded programs and station ID's are attractive accessories. Such views can be taped during periods of low on-the-air activity, end labeled according to content, and loaded into a wall rack for quick access. Avoid recording more than five or six views on a single tape, record the same material on "both sides" to minimize rewinding, add a cassette tape player on the station's desk, and you're always ready for instant SSTV action.

Two additional points worthy of mention are station grounds and avoidance of unnecessary RF fields. The most logical grounding idea I've found involves adding a large copper strap to the station's desk rear, then running coax braid-type straps from the copper to each and every piece of station gear. A heavy wire is then connected from the copper strap to a solid outdoor ground, producing a common, definite, and low-resistance ground for the complete setup. Finally, try to locate SSTV gear as far as possible from the setup's RF amplifier. The previous notes minimize RF feedback and/or hum.

When initially adjusting the fully set-up SSTV layout, set the monitor for best off-the-air reception and then adjust the camera for similar quality *without* readjusting your "point of reference" monitor. If you're unsure about sufficient contrast, wire a small speaker to the scan converter's SSTV output and compare the "musical tones" with those heard on the air. Alternately, an SSTV spectrum analyzer such as HAL's "spectra-tune" or Timekit's "Blinky" can be used for that evaluation (check *CQ*'s advertisers for info and prices).

Operating SSTV

Initial activities in the world of SSTV bear a surprising resemblance to one's first days as a radio amateur. There's a newfound excitement and a challenge to delve further, and there's the usual awkward moments which most of us overcome through on-the-air operations. Newcomers are advised to spend time "looking in" on SSTV views from others. Notice how they switch from SSB to SSTV, how pretransmission descriptions of complex pictures aid understanding, the best ways of intermixing SSTV and SSB when calling CQ, how multiple views of the same picture can become boring, and how describing color SSTV frame sequences aid others receiving those pictures. Notice, also, the subjects and type of pictures transmitted by others; this aspect can inspire your own creativity.

During on-the-air SSTV operations remember to keep transmissions reasonably short, and check to ensure your pictures are being successfully received by others. Propagation can be a mite tricky during SSTV's popular evening hours, especially during our present low point in the sunspot cycle. Short transmission times also provide a welcome breather for final amplifier stages, and encourage higher viewing-to-transmitting ratios in roundtable QSOs—an attractive trend that's once again rising in popularity.

SSTV is a 100 percent duty cycle mode. Thus, one must remember to cut back RF output to less than one-half usual "full power" output during video transmissions. This should be accomplished by lowering the transceiver's mike gain/SSTV tone levels, not by reducing loading of RF amplifier stages. The idea here is ensuring cool overall operation rather than abusing final amplifier stages. I, personally, hold SSTV output levels to one-sixth normal output, and S-meter readings at receiving stations usually indicate nearly equal voice/video levels. My RF amplifier, transformers, and antenna traps seem to appreciate that.

Tuning off-the-air SSTV signals is occasionally tricky for SSTV newcomers. Until you develop an ear for those tones, try tuning for the most natural sounding audio before picture transmissions. If SSTV transmissions are already in progress, try slowly tuning the signal from its highest tones downward while watching the monitor display. Views will "tear" slightly, then "sync in" and roll smoothly down the monitor screen. There are a few rare times when perfectly normal sounding SSTV signals simply won't produce readable pictures due to multipath propagation. This DX-type phenomena is usually confined to brief times on 20 meters, and 1200 Hz sync is lost. Listen to each station's SSB flutter to confirm multipath. Armed with the previous information, your involvement with SSTV should be thoroughly enjoyable and your awkwardness as a newcomer should be miniscule.

Conclusion

Slow scan TV is a fascinating special-interest area of amateur radio, and its worldwide popularity is growing at a phenomenal rate. There are over 150 countries presently active on SSTV, and the brunt of this activity is usually within 10 kHz of (in order of popularity) 14,230 kHz, 3,845 kHz, 7,171 kHz, 21,340 kHz, 28,680 kHz, and any SSB frequency of 12 meters. The areas of technical expansions and sheer operating applications openly invite each and every radio amateur. The mode is tremendous fun, and its use during emergencies offers unlimited possibilities. Most important, however, is the fact that SSTV is now one of the easiest "specialized" modes to pursue. All SSTV operators are cheerful, friendly, and anxious to help newcomers join the action. Come on in and enjoy the views. It's great!

73, Dave, K4TWJ

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ROSS'$ USED February SPECIALS: KENWOOD TS-520 $359.90, TS-520SE $399.90, TS-180SDFC $389.90, VFO-230 $195.90, TS-820S $449.90, TS-700SP $365.90, YAESU FV-101Z $89.90, FT-901DM $539.90, FT-620B $269.90, ICOM IC-280 $189.90, IC-730/FL30 $469.90, IC-701 $295.90. Send SASE, Call letters, name & phone # for used list. Over 200 used, also 7,500 NEW ham-related items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 (208-852-0830).

ROSS $$$$ NEW SPECIALS (February only): COLLINS HF-380 Make Offer. KWM-380 $5500.00, ICOM IC-701 $529.90, IC-45A $279.90, IC-745 $768.90, IC-490A $509.90, IC-751 $1099.90. KENWOOD TS-940S/WAT $1689.90, R-1000 $334.90, TR-3500A $249.90, TM-2550A $384.90, TS-430S $688.50, TM-211A $309.90, TR-8400 $349.90, TS-180SDFC $579.90, VFO-120 $139.90. YAESU FT-209RH $294.90, FT-757GX $698.50, FRG-7700 $369.90, FV-901DM $309.90, FC-102 $259.90, FT-203R $169.90. Over 7500 ham-related items in stock. Send Call letters, name & phone # for personal price quote. All major lines stocked. L.T.O. MENTION AD. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 (208-852-0830).

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SALE: HEATH HW101, HP23, $250. Moving, must sell. N3BHD 215-459-0119.

HEATHKIT HW8, power supply, headfones, manual, ext. spkr.; all $110. I ship. KA9NCC, 3008 Fairoak, Fort Wayne, IN 46809.

FOR SALE: YAESU FRG-7700 w/memory unit, active antenna, and antenna tuner, $400. I pay UPS shipping. Call 203-372-2026 after 6pm EDT.

WANTED: Martin Autoplex or Hulitt keys, other early or unusual bugs, telegraph, or wireless keys. Buy or trade. Bill Holly, K1BH, 324U Haley Rd., Kittery Pt., ME 03905.

TELEGRAPH KEY collector looking for pre-1935 bugs, spark keys, and pre-1900 landline keys. Visitors welcome. K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081.

BRITISH CB (FM) moved to 10M by factory. 100 kHz offset. Brand new, $85. K1LEC, Box 73, N. Springfield, VT 05150 (802-886-8121).

NCL-2000 PRODUCTION PARTS: SASE for special price list and/or list of National Radio manuals. Max J. Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

WANTED: Like-new HW-7 reasonably priced and unmodified. KT1H, RR 9 Box 223, Concord, NH 03301 (603-224-5737).

TRADE for HT-Infotech 75 keyboard, Infotech 150 converter. Will also sell for $200. Joseph Schwartz, 11 Windham Loop, Staten Island, NY 10314 (1-718-698-8069).

FOR SALE: All new unused Hy-Gain 2BDQ dipole $55. U-100 rotators (2) $40 each. Belden 8214 coax 100 feet $39. Cushcraft A144-10T $45. G. Skloot, KE2N, 2923 Mandalay Beach Road, Wantagh, NY 11793 (516-221-3535).

FOR SALE: Heath HW101, HP23 $250. Moving must sell. N3BHD 215-459-0119.

FOR SALE: Old Call Books. SASE or postcard to John Matazel, 15931 Null Road, Three Rivers, MI 49093.

WANTED: 40 and/or 30M, 12V or 24V portable rec. 3–30 MHz, 5–100W amp. Martin, 1450 Hotel Circle North, San Diego, CA 92108 (619-456-8414).

HIGH VOLTAGE CONNECTORS, Millen #37001, red or black, $3.30 each postpaid. Ralph Jannini, KA1FAA, 16 Hansom Rd., Andover, MA 01810.

WANTED: Old bugs and keys for my collection, any condition. Send price and condition to: Joe Bowerman, WA4LXP, Rt. 2 Box 72, Blountsville, AL 35031.

SALE: Collins xmtr., ser. #1401, 32V-2, 75A-1 Rcvr., Ser #114 w/sideband slicer ser. #6029. All manuals, all work well. $300 for all, U ship. KA7JOJ, 1-503-363-1853.

WANTED: Hallicrafters S-20R, SX25, SX-28 A, or Echophone EC 1 in good condition. Clive Beckwith, 13305 S.W. 109 Place, Kendall, FL 33176.

NEW ANTENNA MATCHING PREAMPLIFIER: MILLEN R9'R #92109. 30–60 dB gain without rear cabinet, 6AKs tube. $35.00 postpaid. Ralph Jannini, 16 Hansom Road, Andover, MA 01810.

WANTED: HALLICRAFTERS SX-62. WA9VLK, 895 Park Drive, Kankakee, IL 60901.

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WANTED: BC-348 receiver, state price and condx. Bob Tate, WB6EYN, 6425 Reseda Blvd. #219, Reseda, CA 91335.

FOR SALE: Yaesu FT-101 with Fox-Tango Corp. WARC band modification, CW filter, DC cable, and noise-cancelling mic, mint condx, $350 + shipping. Test Equipment: HP-606A, $225; HP-608D, $140; HP-5245L, $300; Tektronix 506 Dual-Trace scope, $225. Collins 32S-1, 75S-1, 516F-2, and accessories, very good condx, $550 for complete package. Ted Ayres, KAØFXH, (303) 779-8553.

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FOR SALE: Kenwood TS820 digital, CW filter $425, VFO820 $80, TV502 converter 2 meter $135, Dentron GLA-1000C 160–15 meters $250. Package $775, U ship. Call Rick (302) 737-7966, or write KB3PD Callbook Ad.

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NEED manual or copy for MFJ 941-B 300 watts Versa Tuner II. Please contact me: CE5NA, R. Claramunt, Casilla 1305 Concepcion, Chile.

H*A*R*K: Radio Archives "Novice" newsletter. Experimenters' emphasis. $1/$6 yr. TIMM, 2308 Garfield #304, Minneapolis, MN 55405.

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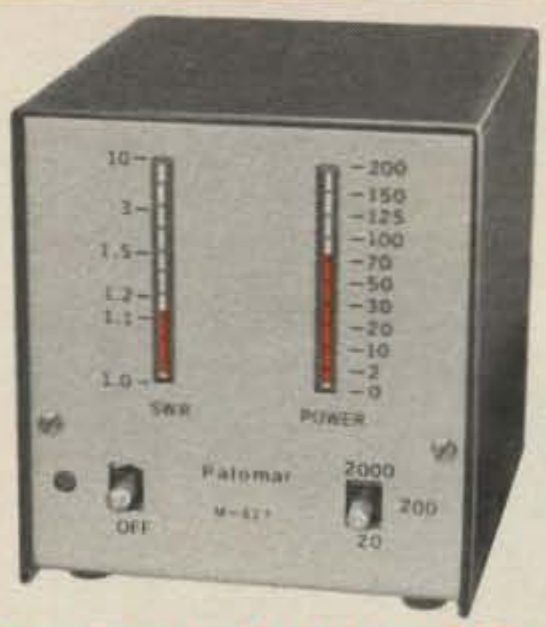

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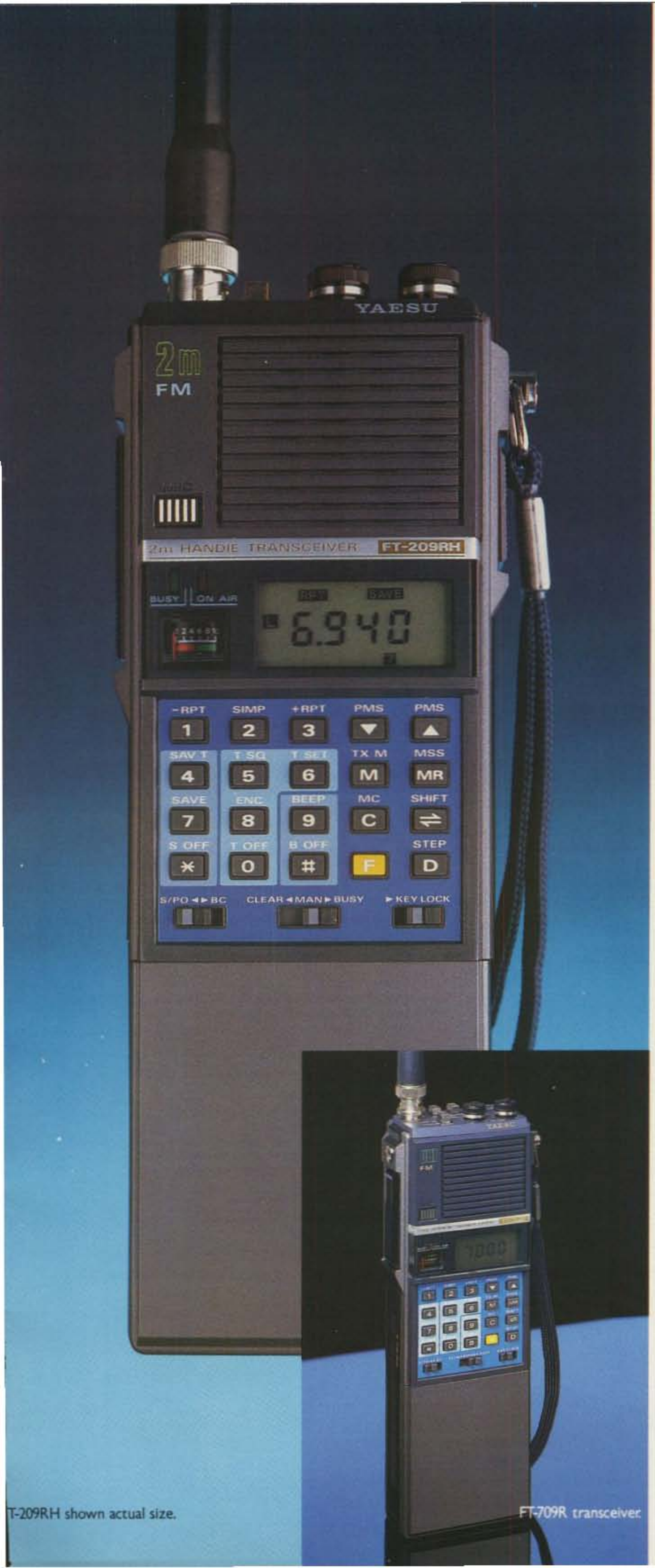

T-209RH shown actual size.

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High power to get you out. Battery saver to keep you there.

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