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Amateur Radio

CQ

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CQ Reviews:
The Kenwood Model TS-940S
The AEA PK-64 Pakratt

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THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in Amateur radio

NEW! Computer Interface!

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

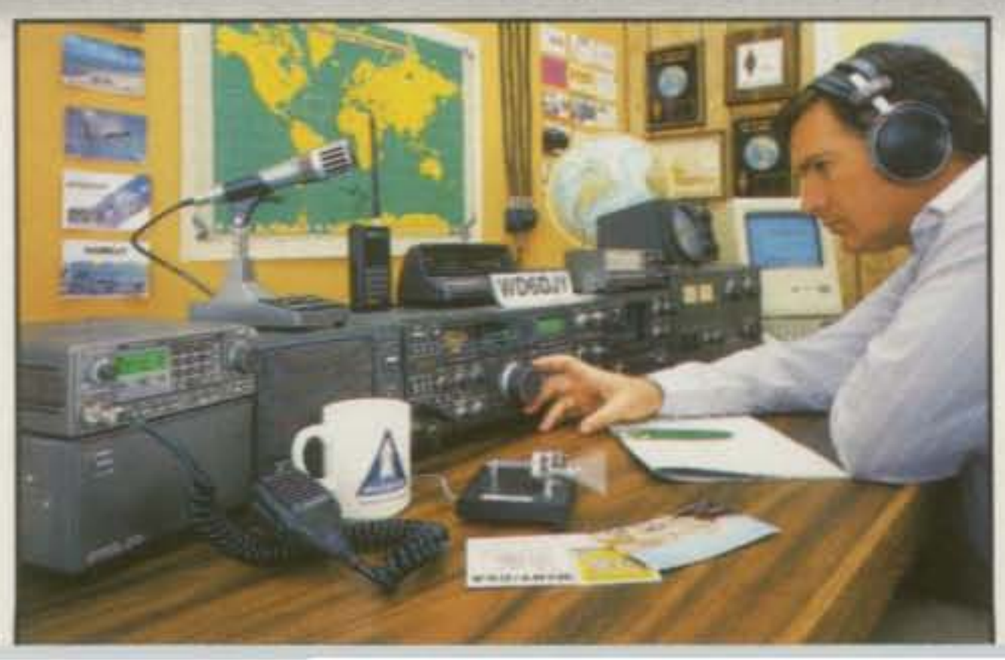
Optional accessories:

• AT-940 full range (160-10m) 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.

Interface IF-232C/IF-10B

25th Anniversary

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



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

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1111 West Walnut Street
Compton, California 90220

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All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)

- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
  Subtone is memorized when TU-8 is installed.
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-42S UP/DOWN mic. included**
- **Computer interface port**
- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW; AMTOR compatible.**

Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S-88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-4/5/6/7 headphones
- SP-40/50 mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2C extra DC cable.

Kenwood takes you from HF to OSCAR!

25th Anniversary

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Here Now 220 MHz

220: Kenwood Style!

TM-3530A

The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz**
- Frequency lock switch
- Digital Channel Link (DCL) option
- **Unique** offset microphone connector—relieves stress on microphone cord

- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- **New** 5-way adjustable mounting system
- High performance GaAs FET front end receiver
- HI/LOW power switch (adjustable LOW power)

TM-3530A optional accessories:

- **PS-430** DC power supply
- **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
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DOWN switch
- **MC-42S** UP/DOWN mic.
- **MC-55** (8 pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200B** SWR/power meter
- **SW-100** compact SWR/power meter

TH-31AT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery and wrist strap
- Quick change, locking battery case
- Rugged, high-impact case

TH-31AT/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook

TH-31AT with DTMF pad shown. Optional RA-9A attached.

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1111 West Walnut Street
Compton, California 90220

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The Radio Amateur's Journal

ON THE COVER: It's spring and time to get out of the shack once again to see what's happening in the world of hamfests and fleamarkets. Here's a shot of the world's biggest amateur radio fleamarket, a small part of it that is, at Dayton. Photo by Larry Mulvehill, WB2ZPI

MAY 1986 **VOL. 42, NO. 5**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

DXing and contesting are measures of what someone is doing. They are quantitative expressions of achievement. A few new countries and a couple of new certificates symbolize the result of hours of effort—the reward, if you will, or the rationalization of why we do what we do. If someone asks what you do as an amateur, you can always point to exotic QSL cards and achievement certificates to substantiate just what it is that you do.

If you're the technical type, you can probably take an interested party down to the shop and let him see your latest brainchild taking shape on the workbench. The test equipment, as well as the explanation of how the project works and why you or anyone needs it, should dazzle him a bit. Even if the visitor happens to be another amateur, be prepared to see glazed-over eyes at this point. Most likely, he hasn't the slightest idea of what you're talking about.

Most amateurs fall somewhere in between the avid competitor and the technical type and would classify themselves as operators. It's hard to pinpoint just exactly what "operator" implies and means, let alone define what an operator does. Operators communicate with no real specific purpose other than a one-on-one exchange of commentary. Sometimes it's just time spent listening in on other exchanges.

This oversimplified view is the raw material or "stuff" from which we have to sell and build amateur radio. When one tries to recruit a new amateur, the prospective member is going to ask what it is that one does as an amateur. This internally translates into the following questions: "Can I see myself doing this? Do I want to do this? Does the possible enjoyment outweigh what I may have to do to accomplish this?" So before you even get to the stage where you have to hem and haw about a code test and theory exam, you have to have a nuts-and-bolts approach to what will turn on this prospective amateur. What turns on a person is what he can do or what he thinks he can do. So besides the intrinsic amateur radio part, do you yourself look interested, excited, happy, and fulfilled with what you are doing? You are the role model.

Some people, for whatever reason, may lean towards the technical side of amateur radio. They see possibilities that can extend their reach and create challenges. Most of us are utilitarian, however. We use what others develop. An amateur radio license, whatever the class, is more a rite of passage than an electronic education. Having a high degree of license does not necessarily make a person electronically omniscient. An example that comes to mind is a story that I heard recently from a manufacturer. A customer bought one of their products which required a 12 VDC source. They supply a battery cord with the unit. The customer has an Advanced class license and is a highly educated professional. The unit was damaged in use because the amateur didn't know that the red lead is positive and the black lead is negative. It is possible that he is a good operator and he probably is good in his profession, and with a little bit of effort he may even take and pass his Extra exam. The only bit of electronic knowledge he will have gained in the interim is that red is positive and black is ground. At that rate, think of what would have to be destroyed in order for him to build and service his own rig.

The purpose of this editorial is not to poke fun at any of us or at what we do. It is to try to focus on just what we do. If we're all having fun, then we must be doing something right. If a prospective amateur doesn't see the fun or see himself doing what we do, then obviously he is no longer a prospective amateur. We are the role models—the heroes and heroines who are doing these wonderful things, having fun, and performing worthwhile services. Most of us would like to see the number of amateurs grow. The quality, type, and age of these new amateurs may still be a point of discussion, depending on our individual bias, but the need for growth as a universal concept is apparent. While we try for a consensus of the right quality, type, and age for our future amateur, let us keep in mind that this perfect person may not want to emulate us.

One of the anomalies of our hobby lies in what we *say* we do and what we *actually* do. We say we are a technical service, not a hobby, but I wonder how many of us are running homebrew stations. In fact, when we look at our respective shacks, what percentage of what we see could have been designed and built (and serviced) by us? How many of us even order the service manual for the newer rigs on the market? I bet secretly hidden in most of our attics are countless shipping cartons saved for that day when something happens and the rig goes south. We can still tell our friends that we could have fixed it ourselves, but we just didn't have the time. When we talk about technical proficiency, we really mean operating savvy and know-how built up from experience. It's a feat in itself these days to learn how to operate some of these 70 and 80 control transceivers, let alone design one. Perish the thought that we would take this electronic marvel apart to check it out. It certainly would void the warranty, and we probably could get in as much trouble as by removing the warning labels from the bottom of mattresses.

Regardless of which of the five amateur radio licenses we may have, the ease or difficulty of the questions asked in those five different exams bears little if any relationship to what is actually being done by most of us. We operate, and we hopefully communicate, using various modes to exchange information. Each higher grade gives us more spectrum space in which to operate and perhaps additional modes. That is what we do, and the rationale for the five grades of license is a series of carrots dangling before us to be able to gain more space to operate and communicate. It doesn't really relate to technical proficiency, although that may be the ideal.

The ARRL Novice Enhancement program is a definite step in the right direction. As long as we have this five-tiered system, we really have to begin the incentives earlier to let people start doing what we do. It doesn't detract at all from the higher classes of license, and in fact, it makes them more attractive once the Novice gets a taste of amateur radio. You can look at a bag of potato chips, read about potato chips, and even see ads for them, but is doesn't mean anything until you've tasted a couple. Like the ad says, you can't eat just one; you want more.

Staunch traditionalists may not want to change the five-tiered system or its requirements, but change will come. The reality is that it is occurring now. The need has been expressed, but the form hasn't been defined. If we do nothing to encourage growth in meaningful numbers, amateur radio becomes a self-consuming routine. I am reminded of an admonition which I learned my first week in the army and which did become a truism: "You don't have to do this, but you may wish you had." As time went by, those words developed a meaning and character all too clear.

If we are to remain viable, we must have change in order to attract and cultivate new amateurs. The changes required do not mean an automatic lowering of standards; they mean *different* standards. What we use as a yardstick today doesn't truly measure what we do or need to know in order to operate our rigs. It might be useful to exclude people from amateur radio, but I don't think that's our problem at the moment.

We can't go back to the good old days, whenever they were. Sure, people built more of their own gear and were more technically involved with amateur radio, but how much of that was desire and how much was a result of little commercial equipment being available? We all know what happened when commercial gear became widely available. People (including us) bought it. The relative price for commercial gear was always high for the times, yet we all found ways of paying for it. In relation to that, today's gear is infinitely more sophisticated and does considerably more for proportionally less dollars. People still want and are able to buy commerical gear. The price of amateur radio didn't scare off people 20 or 30 years ago, and it still doesn't, providing they see something of value in return. That simply is the fun in doing what we do.

Things are different now and people are different now. Our growth today will come from today's people, whatever their ages may be. There are plenty of things competing for a person's free time, amateur radio being just one of them. Altruism and sacrifice up front for a later goal properly belong in a seminary or the Peace Corps rather than in amateur radio. The fun and enjoyment have to be seen a lot closer in for someone to want to trade his free time and dollars for it. Even the staunch amateur radio traditionalist of today buys a new rig with the anticipation of having more fun with it rather than having the ability to provide greater public service.

Perhaps to the outside world we as amateurs don't look like we're having a good time. Maybe we take ourselves and what we do far too seriously to be able to admit we're having fun and enjoying ourselves. After all, that strange, happy feeling could become infectious and more people might want to partake of it, too. Don't worry. Ease up. There's more than enough for everybody.

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

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(206) 775-7373 Telex 6972496 AEA INTL UW

AEA Brings you the Breakthrough!

Our Readers Say:

Propagation Column Appreciated

Editor, *CQ:*

Just got my March issue of *CQ*, saw the heading of the Propagation column, "Thirty-Fifth Anniversary," and had to send you a short note. I, for one, certainly have appreciated all the time and effort that has gone into these continuing propagation forecasts.

Not only appreciated, but I have used them. I used them while living in Europe in the late 50's and early 60's. I've used them in Iran, Russia, China, and other strange places to know when and where to listen for the BBC and/or VOA. More recently, I've used them in my operation as 5W1EX and A35ZH. And as of the mail delivery yesterday, I'm only one card away from my 5BDXCC—a task that was made much simpler through the use of the Propagation column. Finally, when I leave for BY-land this year (third visit in as many years), I will once again take a copy of your column. Thanks again to George Jacobs, W3ASK.

Herbert Hoover III, W6ZH
San Marino, CA

Let's Hear It For The Workhorses

Editor, *CQ*:

I am not a writer, and it may take years to commend on some. First I would like to thank *CQ* for your excellent articles. Great, in one word. Have been changing subscriptions many times for the last 35 years, but always return to *CQ*. Enjoyed the article of K9ARZ about the Boat Anchors Away (September 1985 issue). I agree with Lawrence 100%. I just purchased a old Hammarlund receiver SP-200, made in 1936—yes, 50 years old—and it works like a good old horse.

CQ, keep those articles about the good old American-made equipment rolling. If I cannot repair my own equipment anymore, then I turn in my amateur license.

George J. Heeringa, PA0FM
Beek, Holland

Reciprocal Licensing Article Clears Up Questions

Editor, *CQ:*

I am an amateur from Panama who has been licensed now for about four months. I traveled to the United States last summer and I'm planning to do so again early next year.

In the June 1985 issue of *CQ* the "Reciprocal Operating Agreement" article in the Novice column was published at just the right time and it cleared up many questions. It sure was good to know I didn't have to go through the trouble of taking a test and the paperwork and expense of requesting a license all over again. Keep up the good work.

Jonathan Wattley, HP2BMQ
APO Miami, FL

"Easy Listening" Correction

Editor, *CQ:*

I am writing you regarding my article "Easy Listening," which you published in the February 1986 issue of *CQ*. I happened to pull out my copy and noticed that on the schematic I reversed the polarities of the LED, zenner, and all the diodes. This was a copying error from when I laid out the schematic so that the ground buss would be at the bottom. My apologies.

Jim Burtoft, KC3HW
Washington, PA

Why I Do Not Have 300 Countries Confirmed

Editor, *CQ:*

I did contact EP2ST (Sam Thompson), but somehow I sent his QSL card to the wrong address. I do not know his stateside call. Sooooo . . . no QSL confirmation.

I heard J5WAD, "Vlad," but he had QRM from a "W2" portable in Arizona calling "CQ-DX for a propagation report," so I lost Vlad.

The JX5BAA, Jan Mayan, that I missed completely, was due to a "K6" station calling "CQ" from "Beautiful Downtown Los Angeles." He seemed to be playing a tape recording, because he called CQ for 15 minutes and did not work anyone.

The problem here in Oklahoma is that we are surrounded by an electronic wall. It is equally as difficult to penetrate the west coast "Big-Guns" as it is to work DX in the East Coast electronic wall.

My location is in the big middle of the "Tornado-Alley," and when the wind blows at 50 knots-per-hour day after day, the antenna beam heading "windmills," and that is the direction that I contact the DX.

I missed the YL operator at XU1SS by only a few minutes. I was on the "list" and hearing the DX louder than the net control. Before a turn came there was an argument among the "police" on the frequency, and I never had a chance for a contact.

The most horrible was a J28 in rare (for me) "Djibuti" and a "W8" came on the DX frequency calling a long "CQ-DX." I told the W8 he was calling on top of a "J28," and guess what? He worked him and I still need a J28.

I am going to take down my "DXer" sign.

Allen A. Watson, W5ERY
Edmond, OK

KENWOOD

...pacesetter in Amateur radio

Just arrived!

All-Mode Mobility!

TR-751A

Compact 2-m all mode transceiver

It's the "New Sound" on the 2 meter band—Kenwood's TR-751A! Automatic mode selection, versatile scanning functions, illuminated multi-function LCD and status lights all contribute to the rig's ease-of-operation. All this and more in a compact package for VHF stations on-the-go!

- Automatic mode selection, plus LSB

144.0 144.1 144.5 145.8 146.0 148.0 MHz

CW	USB	FM	USB	FM

- Optional front panel-selectable 38-tone CTCSS encoder
- Frequency range 142-149 MHz (modifiable to cover 141-151 MHz)
- High performance receiver with GaAs FET front end
- VS-1 voice synthesizer option
- 25 watts high/5 watts adjustable low
- Programmable scanning—memory, band, or mode scan with "COM" channel and priority alert
- 10 memory channels for frequency, mode, CTCSS tone, offset. Two channels for odd splits.
- All mode squelch, noise blanker, and RIT
- Easy-to-read analog S & RF meter
- Dual digital VFOs
- Semi break-in CW with side tone
- MC-48 16-key DTMF hand microphone included
- Frequency lock, offset, reverse switches
- Digitial Channel Link (DCL) option

Optional accessories:

- **CD-10** call sign display
- **PS-430, PS-30** DC power supplies
- **SW-100A/B** SWR/power meter
- **SW-200A/B** SWR/power meter
- **SWT-1** 2-m antenna tuner
- **TU-7** 38-tone CTCSS encoder
- **MU-1** modem unit for DCL system
- **VS-1** voice synthesizer
- **MB-10** extra mobile mount
- **SP-40, SP-50** mobile speakers
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MC-60A, MC-80, MC-85** deluxe base station mics.
- **MC-42S** UP/DOWN mic.
- **MC-55** (8-pin) mobile mic.

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Announcing

• **Trip to Israel Planned** - The Chaverim is planning a trip to Israel with a tour of the Holy Land for October 27th to November 10th 1986. Amateur radio operators will have the opportunity to operate their equipment throughout the country. For more information contact Bill Soble, W3QXT, 9357 Hoff St., Philadelphia, PA 19115, or call 215-676-6769.

• **Southeastern Virginia Amateur Radio Exam Schedule** - July 12, Virginia Beach ARC, contact KA4UNC, 433 W. Farmington Rd., Virginia Beach, VA 23454. Aug. 2, Hampton Roads Radio Assoc., contact AA4MB, 1900 Athens Ct., Chesapeake, VA 23323. To apply send form 610 and a copy of current license with $4.25 check, payable to ARRL/VEC, to contact person (SASE). Cutoff date for application is 30 days prior to test date.

• **Fairfield, CT Special Event** - The Greater Fairfield ARA will operate WB1CQO during the 51st annual Dogwood Festival from 1300–2200Z Saturday May 10. Frequencies are 3.975, 7.235, 14.330, and 21.420. Send SASE for certificate to FARA, P.O. Box 1364 SM, Fairfield, CT 06430.

• **Ship Island, Mississippi** - The Pearl River ARC will operate WE5Y on May 10 from 1500–0200Z from Ft. Massachusetts off the coast of Mississippi. Suggested frequencies are 14.295 and 7.280. Certificate for SASE to Rt. 6 Box 326A, Picayune, MS 39466.

• **Armed Forces Day** - The U.S. Naval Reserve Readiness Command will operate Special Event station W4NUS from the Battleship *U.S.S. North Carolina* at Wilmington, NC, on May 17 from 1400–0200Z. Frequencies: SSB 7230, 14230; CW 7030, 7130, 10110, 14030. QSL to *U.S.S. North Carolina*, Box 417, Wilmington, NC 28406.

• **Zilwaukee Bridge Special Event** - The Saginaw Valley ARA and the Bay Area ARC will operate special event stations from both ends of the bridge. Operation will be from 0000Z Saturday, May 17 to 2400Z Sunday, May 18. Modes will be SSB and CW. Frequencies: 1.820, 1.860, 3.545, 3.910, 7.120, 7.045, 7.245, 14.045, and 14.270. A certificate can be earned by contact with a SVARA *plus* a BAARC station. A QSL card can be earned by contacting either SVARA *or* BAARC station. Exchange is RS + State + QSO number. QSL to POB 1783, Saginaw, MI 48605-1783 with #10 business SASE envelope.

• **WB@HSI From St. Charles, MO** - The St. Charles ARC will operate WB@HSI from the annual Lewis and Clark Days Festival 1300–2100Z on 17–18 May. The station will work close to the lower edges of the General SSB portions of 40, 20, 15, and 10 meters. For certificate, send large SASE to St. Charles ARC, P.O. Box 1429, St. Charles, MO 63302.

• **KA1YP From Hold Land, USA** - The Waterbury, CT ARC will operate Special Events station KA1YP from Holy Land, U.S.A. on 17–18 May. Holy Land, U.S.A. sits atop Pine Hill overlooking the city of Waterbury, and is a miniaturized replica of the Holy Land at the time of Christ. Operation will be during daylight hours on the 40, 20, and 15 meter bands, SSB. QSL (SASE only) to Callbook address.

• **Abegweit Award Contest** - On May 18, the Prince Edward Island ARA is sponsoring an Abegweit Award Contest. VE1 and VO1 stations must confirm contacts in all three counties (Prince, Queens, and Kings County). All other VE's and U.S. amateurs must confirm contact with any three P.E.I. stations, regardless of the county. All amateurs, other than continental U.S. and Canada, must confirm contacts with any two P.E.I. stations, regardless of the county. Any Island contacts after Jan. 1, 1960 are also valid for the award. Operation will be on SSB and CW only (CW 21.100, 14.050, 7.100, 3.700; SSB 21.300, 14.250, 7.200, 3.800) from 1200 to 0000 UTC. Send a copy of the log (certified by two other amateurs) and $2.00 or 10 IRC's to P.O. Box 1232, Charlottetown, Prince Edward Island, C1A 7M8, to claim your award. For more information contact: David A. Smith, VE1CIK, Box 529, Kensington, Prince Edward Island, C@B 1M@, or call 902-836-4246 after 2200 UTC.

• **Special Event Station KA@AWS** - The Union Electric Ham Radio Club will operate KA@AWS on May 18 from 1800–2300 UTC 25 kHz up from the lower edges of the General band on 80, 40, and 20 meters, a 10 meter FM repeater on 29.620/.520 and a 2 meter repeater on 147.06/.66. Send your contact number and large SASE (39 cents) for certificate to: Henry G. Schaper, Sr., KA@AWS, 241 Tapestry Dr., St. Louis, MO 63129.

• **W8ZQ From Wheeling, WV** - The NPAR Club will operate W8ZQ on May 23 to celebrate the Elby's Distance Race. Frequencies 7.235 and 14235 ± QRM. Special QSL for SASE to Joe McCready, WB8CTC, 111 Chase Ave., Bridgeport, OH 43912.

• **N4EE From Charleston, SC** - The Trident ARC will operate N4EE on SSB 7.249, 14.240, 21.340, 28.540; CW 7.120, 21.120. Times and dates: 1400–2400Z on 24–25 May, 31 May to 1 June, and 7 June. Certificate for QSL and large SASE to TARC, P.O. Box 73, Summerville, SC 29484-0073.

• **The following hamfests, etc., are slated for May:**

May 2–4, **Cochise ARA Hamfest**, Sierra Vista, AZ. Contact Don Morgan, W7ACI, at 602-458-5293.

May2–4, **Fresno ARC Hamfest**, Fresno, CA. Contact Harry H. Billings, Fresno ARC, P.O. Box 783, Fresno, CA 93712 (209-268-6314).

May 3, **Cedarburg Swapfest**, Cedarburg, WI. Contact 1986 ORC Swapfest, 101 E. Clay St., Saukville, WI 53080 (SASE).

May 3, **Southern Tier ARC Hamfest**, Owego, NY. Contact STARC, P.O. Box 7082, Endicott, NY 13760 (SASE).

May 3, **Northwest Arkansas ARC Hamfest**, Rogers, AR. Contact Roy Milliren, AF5W, 2014 S. 16th St., Rogers, AR 72756.

May 3, **Bemidji Hamfest**, Bemidji, MN. Contact Bemidji ARC, P.O. Box 524, Bemidji, MN 56601.

May3–4, **BRARC Hamfest**, Baton Rouge, LA. Contact Rick Pourciau, NV5A, 879 Castle Kirk, Baton Rouge, LA. 70808 (SASE).

May 3–4, **Greenville Hamfest**, Greenville, SC. Contact Blue Ridge ARS, P.O. Box 6751, Greenville, SC 29606.

May 4, **Suffolk County Radio Club Electronic Fleamarket**, Melville, LI, NY. Contact Bill Sullivan, N2ETG, 516-689-9871 evenings.

May 4, **TCRA Hamfest**, Stirling, NJ. Contact Dick Franklin, W2EUF, Box 182, Westfield, NJ 07090 (201-232-5955).

May 4, **DeKalb Hamfest**, DeKalb, IL. Contct KARC, Box 21, Genoa, IL 60135.

May 4, **Kankakee Hamfest**, Kankakee, IL. Contact Don Kerouac, K9NR, 1377 Circle Dr., Kankakee, IL 60901.

May 4, **Hamswap 86**, Carmichael, CA. Contact Hamswap 86, c/o NHRC, P.O. Box 41635, Sacramento, CA 95841.

May 4, **Hampden County Radio Assoc. Fleamarket**, West Springfield, MA. Contact Steve Nelson, WA1EYF, at 413-596-8216.

May 4, **Ham Radio & Computer Swapfest**, Boulder, CO. Contact Dave McClune, WB@ZID, 5338 Spotted Horse Trail, Boulder, CO 80301 (303-530-1872).

May 10, **Spring Tailgate Swapfest**, Deerfield, NH. Contact WA1IVB, RFD Box 57, West Baldwin, ME 04091.

May 10, **Swapfest 86**, Duluth, MN. Contact Bill Cossette, N@BKL, 15 Manitou St., Duluth, MN 55808 (218-624-7188).

May 10, **Western Slope Amateur Radio & Computer Swapfest**, Grand Junction, CO. Contact Larry Brooks, WB@ECV, 3185 Bunting Ave., Grand Junction, CO 81504 (303-434-5603).

May 10, **Microcomputer Show & Fleamarket**, Woburn, MA. Contact Ken Gordon Productions at 800-631-0062 (in NJ 201-297-2526).

May 11, **Medina County Hamfest**, Medina, OH. Contact Medina Two Meter Group, P.O. Box 452, Medina, OH 44258 (216-725-4492).

May 16–18, **12th Annual Eastern VHF/UHF/SHF Conference**, Nashua, NH. Contact Lewis D. Collins, W1GXT, 10 Marshall Terrace, Wayland, MA 01778 (617-358-2854, 6–10 p.m. EST).

(continued on p. 51)

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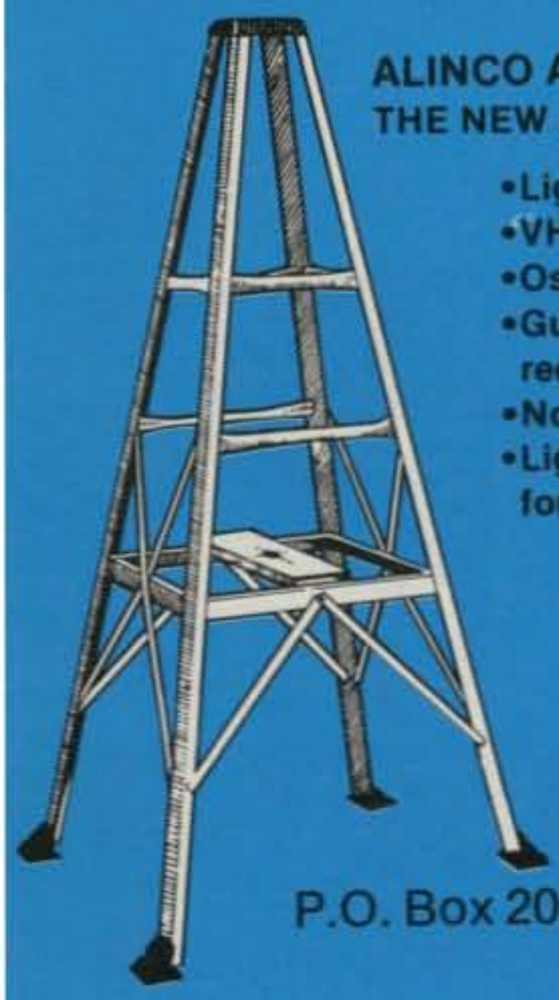

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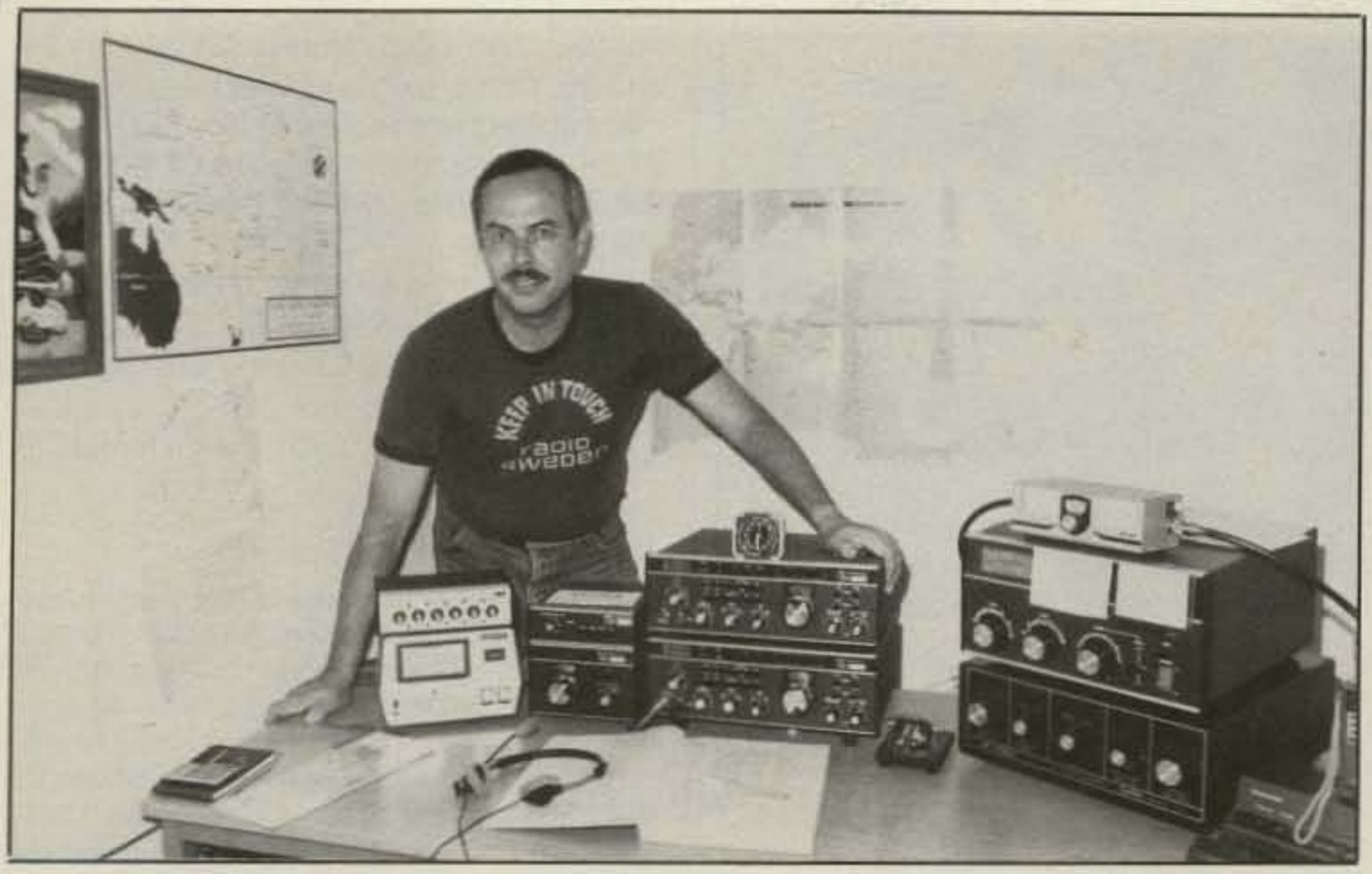

Rolf, 5Z4MX, in his last WPX CW Contest from Kenya. Rolf has now moved back to Sweden.

The operators of Italian multi-single station IO2UIY. Left to right: Paul, I2UIY; George, I2VXJ; and Jim, WA2JNN.

RESULTS OF THE 1985 CQ WORLD-WIDE WPX CW CONTEST

BY STEVE BOLIA*, N8BJQ

Four new world records and a host of new U.S.A. and continental records highlighted the 1985 WPX CW Contest. With band conditions generally good throughout most of the world, scores rose on most bands and records fell. It did pay to read the last-minute propagation forecasts and pick operating times, and bands, carefully, with conditions deteriorating on Sunday in many areas.

Leading the way among the single ops was Rajko, YZ4GD, with an outstanding 3,554,460 points, edging out Felipe, NP4Z, who used NP4CC's station to take second place in the world and number one in North America. Four single ops topped 3 million points in '85, compared to only one in '84. In the monoband categories records fell on 1.8 through 14 MHz. On 20 meters Jose, YV5ANT, used his special contest call (YX5A) to easily outdistance the rest of the field. Setting new continental standards were second-place finisher YT3A and number three UA9YE for Europe and Asia. The big signal on 40 meters was DF9ZP operated by DL6FBL with a new record score of 1,998,372 points. Three stations bettered the previous record with YZ9A taking second place and N5RZ third in the world. On 3.5 MHz Algis, UP2NK, operated from Georgia and claimed top spot with a new record score of 701,904 points. Number two I4IND and number three RB5IM also topped EA8RL's 1984 record. On top band another Lithuanian station operating in Georgia came away the winner. Albertas, UP3BP/UF, provided many a new country on 160, along with a new prefix (UF0). Last year's record holder, LZ2CJ, finished second with a new European record score of 93,800 points. While not setting records, YO3KWJ was number one on 28 MHz, and YT3L led the world on 21 MHz.

LZ2KTS is the 1985 multi-operator single transmitter champion and new European record holder, with HH2WW second and Lithuanian club station UP1BZZ finishing third. In the multi-multi class, SSB winner KH6XX just edged out OK7AA for the top spot. Finishing third with a new North American record was KL7Y.

Another dual-mode champion is Ralph, 4X6IF, who captured both SSB and CW QRPp all band sections, and is the winner of the new QRPp trophy sponsored by the QRP ARCI. The QRP race was extremely close with only 3,000 points separating the top three finishers. The QRP category is among the most competitive each year, with a great deal of effort going into antenna design and operating techniques. Many of the scores turned in are remarkable considering band conditions at this stage in the sunspot cycle.

In the U.S.A., 1983 champion KC1F emerged as number one in 1985, with a narrow victory over Phil, KT3Y, with Bob, KQ2M, finishing third. U.S. stations fared very well in '85, with six stations finishing among the top ten in the world.

Single banders fared very well also, with new U.S. records on 20 through 160 meters. Gene, N2AA, is the new U.S. record holder with an outstanding 1,658,469 points. K2TW, AI7B, N1CQ, and W5WMU round out the top five on 20. On 40 meters Ralph, N5RZ, set out to finish high, and that he did, with a new record 1,754,664 points, good enough for third in the world. Number two finisher KR2Q was ahead of

*c/o CQ Magazine

Ralph (QSO #2 to #1), but the lead was short lived. Also challenging were K1MM, KZ2S, and NI6W. On 3.5 MHz Art, N2AU, strained through the QRN to finish with 119,232 points and another U.S. record. On 160 Rick, K5UR, now owns both SSB and CW records. Rick spent the weekend listening to static crashes, but did find enough stations to work to triple AE6U's 1980 record. Conditions on 10 meters were much quieter, but not totally dead. KE5CV, NU4Y, and W8AKS/6 all found activity there. QSO rates were not too high; however, some interesting DX was reported on 10. Fifteen meters is also suffering from the effects of the sunspot cycle, but there are still stations to be worked. KA5W spent the weekend on 15 and captured a North American championship for his efforts. The top QRPp entry was KA2AEV, whose 228,144 points was good enough for third in the world. Excellent scores were also turned in by KB7G (14 MHz) and KU7Y (7 MHz).

Number one among U.S. multi-single stations is NA5R, followed by AI6V and KN6M/5. The top multi-multi entry belongs to NM5M with 4,302,972 points, good for number 6 in the world.

On the club scene the Northern California Contest Club is the winner of the world club aggregate trophy, with the North Texas Contest Club sneaking by the Yankee Clipper Contest Club for the U.S.A. trophy. North American multi-single leader HH2WW is the winner of the 1985 K4IA contest expedition trophy.

Some new and unusual prefixes along with interesting DX helped to make the '85 contest another success. Special recognition goes to CQ8CQ, UP2NK/UF, UP3BP/UF, UP3BI/UF, 6Y6A, HI0A, TI0RC, DL7AFQ/OH0, OH2BCI/OH0, LX/DJ0BC, AZ8DQ, DX1N, 4U1UN, YX5A, and HB0/DK1II for adding something extra to the contest.

While checking the logs, my computers found several stations who didn't do a very good job of duping. Those scores were reduced accordingly and resulted in a couple of position changes. Dupes are illegal, and while I don't have time to dupe every log, I manage to get to quite a few. Operating is only part of contesting. Doing the paperwork is as important, and a sloppy job can ruin a fine effort.

Rule VII spells out what constitutes a prefix for contest purposes. You may not pick your own prefix to use during the weekend. It is not permissible for me to sign N8BJQ/NQ6 or something similar for the contest. If everyone were to do this, the contest would become unmanageable.

If you have checked the 1986 rules, you will notice several new trophies have been added, along with a few deletions. There are still several categories open for clubs or individuals desiring to sponsor a trophy for either mode. For further information, contact me through *CQ*.

I have been asked several times if there is an approved prefix check sheet available. At this time none is available through *CQ*. However, I have seen several good ones come with logs. I would be interested in seeing a good prefix check list that is easy to use and won't become obsolete each time a new block of calls is issued.

According to I2UIY, George, I2VXJ likes his Italian "pizza" much more than CW, which makes it impossible to have a good contest score.

Congratulations to the '85 winners and thanks to everyone who took part in the contest. The 1986 contest will be May 24 and 25. Complete rules and log and summary sheets are available from *CQ* for an SASE. Please mail all logs to **CQ WPX Contest, CQ Magazine, 76 North Broadway, Hicksville, NY 11801.**

Again, thanks to all who helped make the contest a success and *fun*, and I'm looking forward to working everyone in the '86 contest.

73, Steve, N8BJQ/6

Random Comments

Fifteen meter condx best this year—unbelievable over the pole openings . . . *NA5R*. VK's, ZL's on 15 meters Sunday 0330–0400Z. We never expected that! Tnx Sol . . . *NI8V*. We knew it was tired time when Scot tried to work himself . . . *KM9W*. Thoroughly enjoyed contest despite appalling propagation conditions; as you can see the number of stations worked was very low (including our own continent). It was a very difficult situation trying to break into the Northern Hemisphere crowded bands with a poor signal, but we did enjoy trying . . . *ZS1CT*. Fun!! . . . *JE2YRD*. Who switched off the propagation on Sunday? . . . EA3VY. Excellent activity, big powers. Thanks for the excellent CW contest . . . HG7B. Thirty year anniversary of our club OH3AA celebrated with special callsign . . . OG3AA. Poor propagation, a few stations from S. America and Africa. Thanks for beautiful contest. We hope see you again next year . . .

TROPHY WINNERS

SINGLE OPERATOR - ALL BAND

***WORLD** - Canadian DX Assn. Trophy. Won by: **Rajko Mackic, YZ4GD.**
U.S.A. - Steven Bolia, N8BJQ Trophy. Won by: **Stu Santelmann, KC1F.**
***CANADA** - Canadian A.R.F. Trophy. Won by: **Station VE3CRG. Op. Dave Goodwin-Hill, VE2ZP.**
***JAPAN** - Palm Gardens Contest Club Trophy. Won by: **Kazuo Yuyama, JH1OGC.**
OCEANIA - Tom Morton, KT6V Trophy. Won by: **Joel E. Chalmers, KG6DX.**
WORLD QRPp - QRP ARCI Trophy. Won by: **Ralph Rosenbaum, 4X6IF.**

SINGLE OPERATOR SINGLE BAND

WORLD - Pedro Piza, Jr., NP4A (Pedro Piza, Sr., KP4ES Memorial Trophy). Won by: **Station YX5A. Op: Jose Castejon, YV5ANT.**
U.S.A. - Kansas City DX Club Trophy. Won by: **Ralph E. Bowen, N5RZ (7 MHz).**
U.S.A. 7 MHz - Dennis Younker, NE6I Trophy. Won by: **Douglas Zwiebel, KR2Q.**
ASIA - Bruce Frahm, K0BJ Trophy. Won by: **Yuri Retin, UA9YE (14 MHz).**
WORLD 3.5 MHz - Lance Johnson Eng. Trophy. Won by: **Algis Kregzde, UP2NK/UF.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD - Ron Blake, N4KE Trophy. Won by: **Station LZ2KTS, Oprs.: LZ2DF, LZ2CC, LZ2HE, LZ2PO & LZ1-A310/2.**
U.S.A. - Austin Regal, N4WW Trophy. Won by: **Station NA5R, Oprs.: K5GN, KG5U & KN5H.**
***CANADA** - Tehrahedral Contest Circle Trophy. **No Entry.**
***EUROPE** - Jonas Bjarnason, TF3JB Trophy. Won by: **Station UP1BZZ, Oprs.: UP2PAJ, UP2BIG & UP2BIL.**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD - North Florida DX Assn. Trophy. won by: **Station KH6XX, Oprs.: KH6XX, KH6ND & N6VI.**
NORTH AMERICA - Dick Weber, K5IU Trophy. Won by: **Station KL7Y, Oprs.: KL7Y, NL7G, NL7P, WL7E, KL7RA & AL7CQ.**

CONTEST EXPEDITION

WORLD - Ed Roller, K4IA Trophy. Won by: **Station HH2WW, Oprs.: N4WW, NX4N & N4SA.**

CLUB (SSB & CW)

***WORLD** - Canadian DX Assn. (Bud Abraham, VE1VR Memorial Trophy). Won by: **Northern California Contest Club.**
U.S.A. - Northern Ohio ARS Trophy. Won by: **North Texas Contest Club.**

* *Donor is responsible for this trophy.*

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OK7AA. New contest record!! Most amps destroyed per hour . . . KL7Y. Amazed at what 5 watts and a modest antenna can accomplish. Next year may try 1 watt! . . . VE7YU. Can't believe how well my 5 watts gets into Asia on 40 . . . W9SE/7.

AH6EK worked his best DX while I fixed my Argo VFO . . . KH6CP. Moved to Texas weekend before the contest. Biggest thrill was getting on at all. Thank God for pine trees and transmatches . . . KI9A/5. Signals were so strong I actually tried to answer NP4CC while I was still on my dummy load . . . KN1H. Propagation forecasts said Sunday would be lousy. Why didn't I listen? . . . VE3CRG (op. VE2ZP). Just wondered where all the 9's were. Didn't even hear them on 40 or 80. Had counted on them for a bunch of multipliers . . . VE3CWE. My first contest after being licensed three months. A great way to increase code speed on callsigns and numbers. With the fun I had during the contest I'm sure I will participate in many more . . . VE3OZB. I guess I should have stayed on 40 this year. Nice to work ZL7OY and TR8IG on this 80m "boring band" . . . VE3BMV. Lots of fun going single op all bands in the WPX. CQ has the best contests by far . . . NP4CC (op. NP4Z). I got a transmitter—all I need is a receiver . . . 6Y6A (op. 6Y5HN). Delighted to have had the opportunity to participate in my 3rd WPX CW contest. In spite of very poor conditions "Down Under" was pleased to have made contact with old friends in USA and Europe. Your 18 hours "restriction" is greatly appreciated . . . VK5AGX.

One of the things I like about this contest is that you don't have to know what country the strange prefixes are in . . . KG6DX. Condx were so good, I knew my 930 would have to blow up again. It couldn't handle hearing the East Coast! . . . AH2U. Regret lose more than half of contest period. Had to work (unscheduled) Saturday. Can you believe such bad luck? . . . PY2RLQ. No new countries, but earned some new prefixes. Hope to do better next year . . . JO1BMV. The worst condx I have ever had in a WPX contest. Hpe condx will be better next year . . . HZ1HZ. My first WPX contest, and what a great fight it turned out to be! Tnx to everyone who worked me. It'll be hard to stay away next year . . . OH2BH (op. OH6UM). My first long contest. Will be back next year with more experience . . . OH6LI. Tnx for nice contest. I made a few new countries in this test . . . SP4EEZ. We have only 5 hours (2000–0100 GNT) condx on 80 meters/day in summer because we have no dark . . . OH2BCI/OHØ. During first day of contest 15 meters was wide open—very rare thing here on Svalbard, so I decided to compete single band. Unfortunately on second day I wasted plenty of time calling stations with no luck . . . JWØEQ (op. SP5EXA).

Very amusing contest because the rare prefix you can work . . . *ED1CI*. QRN was 7 to 9 on S meter all weekend, but that's 160. Top band best monoband because at 73 yrs. young, I need my beauty sleep (during the day) . . . *SVØAA*. One day for antenna installation, 2 days for contest, 3 days to rewrite the logs. Very good contest . . . *I4IND*. You don't imagine what is working a CW contest with CQ8CQ call. It was fun and hope it was worthwhile . . . *CQ8CQ (op. CT2CQ)*. First contest from new area. Condx very different. Learned a lot. Miss the JA's . . . *K1GQ (op. K5ZD)*. Worked 3 months on wire antennas for 80 and 40. Nice to hear T32AF on one of them. Hard work pays off . . . *WA2CNF/1*. Condx were great. Even had time to play 18 holes of golf on Sunday . . . *N1CQ (op. KC1Q)*. Fifteen open really well 2 hours before contest to Europe. After that it was a real struggle without heavy-duty aluminum . . . *KQ2M*. New px/new amp sure made a difference . . . *NI2P*. I couldn't work my own prefix—WA2—Hi . . . *WA2HZR*. Finally got a good computer program for logging, etc., now to develop some better operating strategy! . . . *W2FTY*.

Most consistent signal during the contest: KL7Y . . . *W2LPV*. I don't understand how N5RZ beat me. When I worked him, I had double his QSO's (my #2, his #1) . . . *KR2Q*. Guess all the big guys decided to do 7 MHz this year, hi! Would liked to have wkd RL8PYL but he couldn't hear me . . . *KM3T/2*. No Alpha, no Q's. Being the world's only NV2 (at present) of no help . . . *NV6O/2*. Wish I had some real antennas! . . . *W3SOH*. Thunderstorm wiped out Sunday. This is my favorite DX Contest. Thanks to all who gave me a call . . . *KMØL*. XCVR went up in smoke after 5½ hours—fun while it lasted . . . *KBØG*. Not much DX here on 21 MHz. My condolences to anyone who might have done 10 meter single band . . . *NØBSH*. Thanks to all USA operators who gave me prefix contacts . . . *WØRXL*. Murphy blew the amplifier fuse just as the JA's started coming thru on 40m—comme

Phone Results Correction

In the March issue the call DL7AX/3X was listed in the contest results. The call should have been DL7AH/3X.

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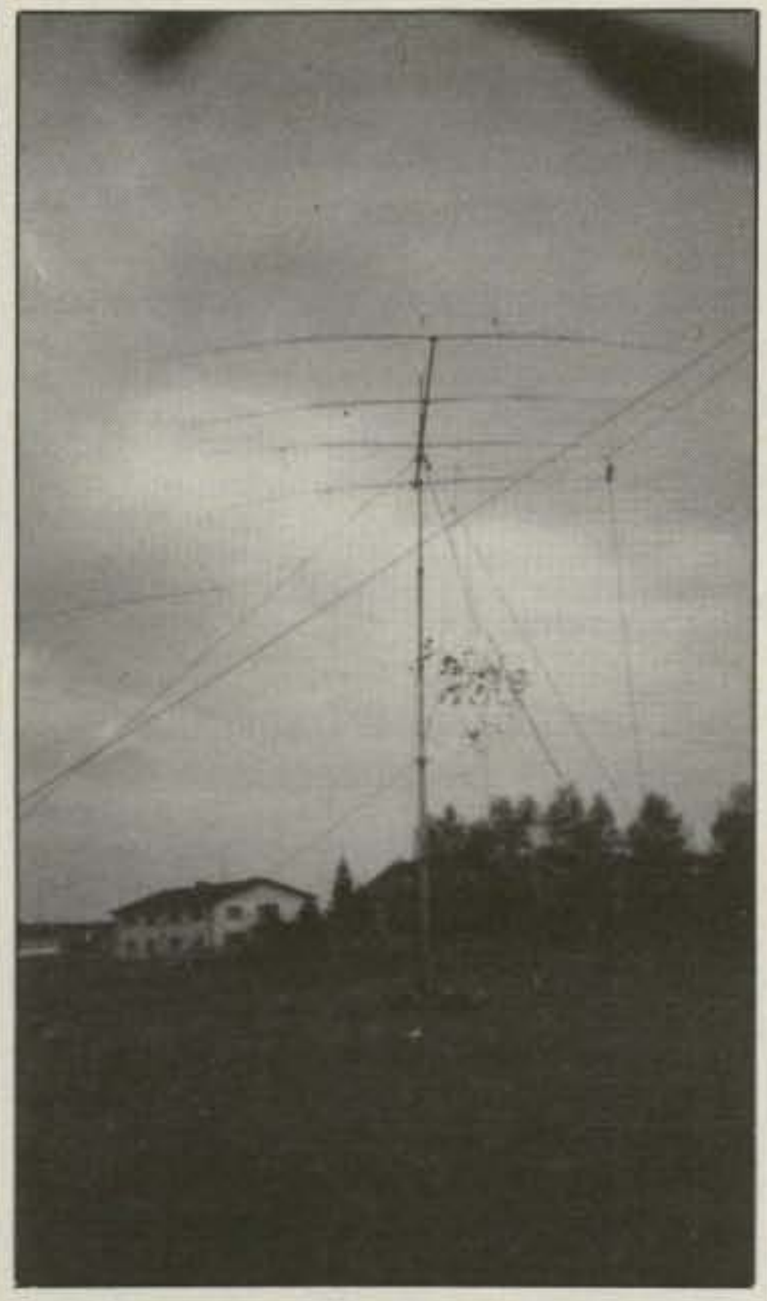
Northern California Contest Club	**38,647,861**
P.A.C.R.A.T.S. (Hawaii)	33,449,638
YU DX Club (Yugoslavia)	24,462,004
North Texas Contest Club	**23,095,607**
Yankee Clipper Contest Club	22,565,340
Kaunas Polytechnic Institute (USSR)	16,116,151
Ontario Contest Club	13,432,551
Northern Lithuania DX Group (USSR)	12,452,307
Frankford Radio Club	12,048,011
Texas DX Society	12,008,527
Southern California Contest Club	8,383,596
Marianas ARC (Guam)	7,963,030
Potomac Valley Radio Club	7,271,161
East Anglian Contest Club (England)	6,848,424
Rubber Circle Contest Club	5,601,678
Berlenga DX Group (Portugal)	5,286,120
Lithuanian Contest Group (USSR)	4,851,099
Lichfield ARS (England)	4,511,430
Northern Ohio ARS	4,502,352
Moscow Radio Club (USSR)	4,155,252
Sevilla Contest Club (Spain)	3,950,793
Ashtabula ARC	3,661,486
Mad River Contest Club	3,204,002
Willamette Valley DX Club	2,985,675
Morton Area DX Association	2,770,213
South German DX Group (FRG)	2,770,065
Kansas City DX Club	2,233,034
Rhein Ruhr DX Association (FRG)	2,232,428
Pig House Contest Team (Sweden)	2,215,292
Dixie DX'ers	2,144,097
Bavarian Contest Club (FRG)	2,126,432
New Mexico Big River Contesters	1,761,984
High Power Contest Club	1,705,738
Murphy's Marauders	1,542,840
Central Indiana Contesters	1,300,336
SP DX Club (Poland)	1,246,928
Grand Mesa Contesters	1,179,755
Latvian Radio Club (USSR)	1,101,352
South Jersey DX Club	1,040,479
Southeastern DX Club	986,892
Southern California DX Club	913,672
Reading Radio Club	737,660
Down Under DX'ers (Australia)	644,083
Northern Illinois DX Association	605,324
St. Louis ARC	601,480
Lincoln (Neb.) ARC	546,362
Northern Ohio DX Association	519,492
Fraser Valley DX Club	501,508
Mississippi Valley DX & Contest Club	442,526
Central Arizona DX Group	438,271
Four Lakes ARC (Wisc.)	414,656
Danish DX Group	411,348
Royal Navy ARS (England)	321,126
Alaska DX Association	234,040
Western Washington DX Club	225,527
Maxwelltown ARC (Scotland)	222,807
South West Ohio DX Association	222,741
Eastern Iowa DX Association	219,776
Dayton Amateur Radio Association	184,775
IBM ARC of Boca Raton	148,333
Kiev Radio Club (USSR)	141,482
Troyan DX & Contest Club (Bulgaria)	129,294
Northern California DX Club	110,662
Halifax ARC (Canada)	92,964
Dade Radio Club	91,980
Armavir Radio Club (USSR)	77,149
Kaw Valley ARC	50,008
Steel City ARC	47,790
Rip Van Winkle ARS	47,520
Poway ARS	40,599
Trio Kenwood Employees Radio Club	34,226
Hoosier Contesters	26,460
Trondheim DX Club (Norway)	25,272
River City Contesters	21,090
Eastern Michigan ARC	12,604
Minsk Radio Club (USSR)	11,050
Tallin Radio Club	5,106



Four elements on 40 helped DL6FBL operate DF9ZP to a new world record.

One of the ops of European multi-multi champion OK7AA, Tina, OK3TMF, keeping the dupe sheet.

d'ordinaire!!! . . . *KM9L (op. WB9JKI)*. Worked station down the block then duped him an hour later. Hi! Hi! . . . *WB8MRU*. My first—didn't realize how much fun I'd been missing all these years. Low band strategy worked—3.8 points/QSO. Gain antennas on 80 and 40 necessary to do well in this one . . . *K7LXC*. I've never been set up better—rig and ant system perking on all bands. So what happens? Lightning hits a power pole Sat. 2300Z. Blackout til 1200Z. The longest power outage here in years . . . *KS7T*.

New prefix (NN7) received a month before contest. Enjoyed being a bit rarer than the WA7 I held for 16 years . . . *NN7A*. Who would have believed a JA opening from 0549 to 1000Z plus on Saturday night. Eat your heart out East Coasters . . . *W7FGT*. Most confusing call award goes to CQ8CQ, who at times was as loud as the east coast but never would answer me . . . *W7KJI*. Contest is great fun; paperwork afterward is pure torture . . . *WA6AUE*. Biggest thrill: finding myself the object of a pileup of Japanese hams on 80 meters in the wee hours of Sunday morning . . . *WA6AGD*. Sixteen hours of straight key operation—ouch! . . . *W8AKS/6*. Couldn't sleep Sat. morning—ran out of gas Sat. night . . . *NE6I*. Listening to 80m QRN all night sure makes you miss 10m . . . *WB6JMS*. Nice contest. Boy you drop your pencil and you have lost your frequency . . . *KG4W*. City lot and triband don't cut it. Next year monobanders will replace tribander, but city lot limitation remains awhile longer . . . *K5RX*. Worked 3 or 4 CB'ers, but don't know how to log "Kingfisher" . . . *KE5CV*. What a great bunch of CW operators! Who says CW is dead? . . . *W5MW*. Condx on 40m were outstanding! Could not believe EU and JA activity. If someone had told me I could have made this score, I would have told them they were crazy . . . *N5RZ*.

Station Operators

Multi-Operator Single Transmitter

NA5R: K5GN, KG5U, KN5H. **AI6V** & W6SZN. **KN6M/5** & AF5K, KY5N, KM5X. **WC4E** & K4XS. **N7TT** & KE7V. **KU2C** & K2NJ, W2GD. **AK6A** & N6ADI, AD6C, WA6FGV, N6HK, KY6L, AC6T, N6VR, NS6X. **NU6S** & N6CQ, W6RGG, WB6KBZ. **NI8V** & K3JT, NZ4K, KD8NS, WB8PHI, WD8IXE, Walt. **WC6I** &

The contest room of world champion multi-single station LZ2KTS.

VE6CB, was the top Canadian on 14 MHz.

N6AUV. **AK6T** & K4UVT, K6ZM. **AC8W** & K8DD, KJ8A, N8CQA, NJ8M, WA8BSF, WB8EMV. **KS9O** & K9LJN, NA9J, KA9LTR, KA9DVY, AK9N. **KJØG** & W7XG, KD7EY, KØGAS. **KJ6V** & NCDXC Net. **KM9W** & NB9C, N9EJL, KC9XF. **N3BNA** & KA3MUH. **HH2WW:** N4WW, NX4N, N4SA. **4U1UN:** W1NG, K1EFI, AF1U, HB9RS, SP5GOL. **ZS1CT:** ZS1VP & ZS1D. **JA3YBF:** JG3LZG, JR4AGT, JE6BXJ, JA9TOZ, JH9GRM, JR4IZK. **JE2YRD:** JA1KFX, JA2EZD, JA2IVK, JA2MGE, JE1JKL, JR2BGE, JF2XJE. **JA9YBA:** JM1NFG, JO1NLP, JH7UJR, JA9LNJ, JA9QCE, JA9QWJ, JA9VDA. **8J7ITU:** JF7GQK, JF7TDN, JH7XKI, JH7XMO, JA7YFB, JN1RON, JE7JWB, JE7MOY, JR7GYC, JR7JLU, JR7JVO, JR7LCI, JR7OEF, JR7QYW, JR7RLB, JHØQNT. **JA1YBK:** JHØLFE & JL1IEO. **JA1YFG:** JL1BLW, JO1RUR, JR7SUV. **JH7YJF:** JA7SN, JA7RHJ, JH7DNO, JH7VEP.

JA1YAD: JP1DMX, JH5GHM, JH5MXM, JR6JOE, JG6AFD, JH7UCC, JH8XTP, JA9UFS, JH9ADA, JH9AMJ, JHØDRT. **JA1YXP:** JI2DLF, JN1OTG, JL1ROT, JM1AQU, JJ1OHJ, JR4HCV. **JA7YCQ:** JR7MZC & JE7WVX. **JA7YAF:** JE7MHM, JE7PPC, JF7MEV. **JA1YAL/1:** JRØALC, JH9CAU, JRØGUM, JQ1LKT. **LZ2KTS:** LZ2DF, LZ2HE, LZ2PO, LZ2CC, LZ1-A310/2. **EA3VY** & EA3AIR, EA3AVV, EA3DXD, EA3FER, EA3KU, EA3LL. **HG5A:** HA5OM, HA5WE, HA5UA, HA5GF, HA5MK, HA7RY, HA7SU, HA5ML, HA5NQ. **HG7B:** HA5MY, HA7UG, HA7UL, HA7SH, HA5WA, HA7UO. **GB2MM:** G4DSE, G3RZL, C. Chambers. **HG9R:** HA9RU, HA9RB, HA9PP, HA9PV, HA9RX, HA9RP. **HG6N:** HA6ND, HA6ON, HA6OQ, HA6NN, HA6NY, HA6NQ, HA6NF. **IO3FIY:** I3FIY & I3JSS. **OH1AF:** OH1EH, OH1HS, OH1HX, OH1TW, OH1XM. **OG3AA:** OH3IQ, OH3VT, OH3TQ, OH3RF. **IO2UIY:** I2UIY, I2VXJ, WA2JNN. **HG6V:** Simon, Suszter, Varga, Vingender, Bocsi, Dienes. **HA7KLG:** HA7MY, HA7LD, HA7LM, HA7MQ. **7S7SSA:** SM7NJJ, SM7IDF, SM7FDO, SM7OHG, SM7NDX.

HBØ/DK1II: DJ7MG, DK1II, DC8OC. **HA5KKC:** Lajos, Erno, Viktor, Pal, Laszlo, Rudolf. **SP5PBE:** SP5ELA, SP5ANJ, SP5JTM, SP5FKW. **YT2O:** YU2OB & YU2OU. **SP2ZFJ:** SP2FAP, SP2ASJ, SP2LNW. **GB4OPE:** G4OTU & G4XFB. **HA1KRR:** Jozsef, Sandor, Janos, Zsolt, Joszef, Janos. **DKØXA:** DF4XG, DL1HBT, DL2HAA, DL3HAH. **HA8KVK:** HA8VK, HA8UP, Laszlo, Jeno. **SP7KTE:** SP7AW, SP7IFM, SP7IIT, SP-0046-KI. **SK6EI:** SM6LPF, SM6LPG, SM6LJU, SM6CST, SM6MCW. **OK5SSM:** Club Group. **HA6KNX:** Jozsef & Gyula. **OH9AB:** OH9PH & OH9UW. **HA5KDB/2:** HA5MY & Csaba. **OZ8JYL:** OZ1KUM, OZ1KII, OK1KHZ. **IV3IQY:** IV3AMK, I3BLF, IV3BNS, IV3EAD, IV3ZCZ. **PA3DQW** & PA3DGM. **OK2KMR:** OK2SSS & OK2BQZ. **HA3KNA:** HA3NS & HA3NU. **OK3KGQ:** Club Group. **SP1KIZ:** Club Group. **LZ1KOZ:** Miroslav & Marian. **YU4JLM:** YU4RS-2150, YU4RS-2105, YU4RS-2106. **OK1KQJ:** Club Group. **OK3KSQ:** Club Group. **YU2CAH:** Branko, Vlatko, Zoki, Drasko. **OK1KAY:** Club Group. **OK1OXP:** Club Group. **OH2AQ/OHØ:** OH2BUQ, OH2BQW, OH2LQ. **OK2KZC:** Club Group. **OK1KPZ:** Club Group. **OK1ORA:** Club Group.

SP2KAE: Club Group. **RL8PYL:** UL7PAE, UL7PAZ, UL7PCZ, UL7PEZ, RL8PY, RL8PA, UL7-023-158, UL7-023-502. **UZ9FWR:** UV9FB, UA9FM, UA4WA, UA9FAL. **UL8LWO:** UL7LCZ, UL7LBI, UL7LFB, UL7-026-389. **UZØCWA:** UAØCB, UWØCA, UAØCGN, UWØCM, UAØCCD, UAØCZ, UAØ-110-300, UAØ-110-298. **UZ9XWW:** Sorokin, Saulich, Skryaga, Budanov. **UZØLWX:** Club Station. **UZØFWD:** UAØFER, UAØFAY, UAØFFI, UAØ-153-285. **UP1BZZ:** UP2PAJ, UP2BIG, UP2BIL. **UR1RWX:** UR2RRJ, UR2RNA, UR2-083-166, UR2-083-167, UR2-083-165. **UQ1GWW:** UQ2-037-116, UQ2GDW, RQ2GG, UQ2OI, UQ2GLK. **UP1BZO:** UP2BMX, UP2BOA, UP2BFN, UP2BMQ, UP2BJK. **UP1BZG:** UP2BCO, UP2BCW, UP2BCT, UP2BOC, UP2QA, UP2-038-439.

UB4XWB: UB5-062-240, UB5-062-647, UB5-062-56. **UP1BZR:** UP2BDW, UP2BOQ, UP2-038-346, UP2-038-728. **UB4CWW:** RB5CB, UB5CCN, Lila. **UT4JWB:** RT5JA, UT5JAB, RT5JD, RB5GW. **UZ1AWT:** RA1CA & UA1ALZ. **UB4IZA:** UB5-073-1619, UB5-073-342, UB5-073-264, UB5-073-468. **UZ1AWW:** UA1-169-2210, EZ6ADZ, UA1-169-1113. **UZ3QYN:** UA3QGN, UA3-121-5, UJ8JZ. **UZ1AWO:** UA1AAF, UA1ARL, UA1AKC, UA1AIL. **UP1BWW:** UP2BIJ & UP2PAX. **UB4JWT:** Shalya, Glazunov, Yavorskey. **UZ3DZA:** V. Subbotin, S. Subbotin, A, Egorshin. **UZ3AWP:** UA3-170-563, UA3-170-567, UA3AKR. **UB4IWI:** UB5IQW, UB4IUK, UB5-073-4002. **UQ1GWX:** Baltin, Sevastijanov, Sakhov. **UZ3DXW:** Kirollov, Kovalevsky, Suvorov. **UZ3TWJ:** UA3-122-1051 & UA3-122-1440. **UZ4HWS:** UA4HSV & UA4HQB. **UZ3DWX:** UA3-170-998 & UA3-142-363. **UB4IWB:** Club Group. **UZ3TWT:** Andrei, Serge, Alex.

Multi-Operator Multi-Transmitter

KH6XX & KH6ND, N6VI. **OK7AA:** OK3CLA, OK3CIW, ex-OL8CMY, ex-OL8CPY, OK3DG, OK3CAW, OK3CGP, OK3TPV, OK3YX, OK3LZ, OK3YL, OK3TAO, OK3TMF, OK3CUM, OK3CQW, OK3CAP, OK3YCE, OK3EA, OK3LU, OK3CEM, OK3JW. **KL7Y** & NL7G, NL7P, WL7E, KL7RA, AL7CQ. **YU1ELM:** YU1DW, YU1SA, YU1SZ, YU1OP, YU1OYW, YU1MAT, YU1RS-369, YU1OOW. **JA2YKA:** JJ1BTC, JE2JCV, JE2VYM, JF2DQJ, JF2LTH, JF2UTL, JG2BFR, JG2MTC, JG2VTD, JI2DQC, JI2JXR, JI2NPL, JI2WYI, JJ2JNF, JG3OET, JA9SSY, JA9XXS. **NM5M** & WA5CAC, KA5UPB, KA5SBS, KE5IV, K5LZO, NT5D, AK5B, WB5RUS, NR5M, NM5L, K2TNO. **JA7YAB:** JE2DQC, JF7SVH, JG3ENB, JH7CUU, JH7MAJ, JH7WDX, JJ1NNJ, JM1LRA, JR7CDI, JR7IQS, JR7MPR, JR7VMF, SWL's Awano & Endoh. **YU4EZC:** Adjijaj, Gagic & Zukic. **K6XO** & K. Brubaker, 2 Meter Net. **JA4YJA:** JR4IHK, JG6PAF, JE4DNQ. **JA2YEF:** JR2PVI, JR2TPD, JE2KEA, JF2NFC, JF2QHC, JG2OAJ, JI2LPD, JI2QVF, JI2SIC, K. Hirai, T. Honda.

WORLD TOP SCORES

SINGLE OPERATOR

ALL BAND

YZ4GD	**3,554,460**	K1GQ	2,766,726
NP4CC	3,163,455	KI6P	2,676,297
KC1F	**3,140,592**	OK1RI	2,660,690
KT3Y	3,104,192	K3ZO	2,398,870
KQ2M	2,961,855	G3FXB	2,357,043
5Z4MX	2,922,318	NR5M	2,329,077
KRØY	2,814,336	UH8EAA	2,255,680

SINGLE BAND

28 MHz

YO3KWJ	96,882
YT3P	58,259
LZ1KIC	57,120
RB4IRO	21,423
4M7QP	15,972
SP8EMO	15,520
OH2EJ	12,610

21 MHz

YT3L	514,150
UW3UO	395,843
G4CNY	343,226
JF2EZA	272,750
UA3PDW	226,032
UL7CM	197,253
RC2AM	182,880

14 MHz

YX5A	**3,016,155**
YT3A	1,850,320
UA9YE	**1,711,080**
YU7AV	1,670,032
N2AA	1,658,469
AZ8DQ	1,434,630
7S2SSA	1,380,480

7 MHz

DF9ZP	1,998,372
YZ9A	1,920,960
N5RZ	**1,754,664**
KR2Q	**1,555,048**
YT7W	1,541,980
K1MM	1,390,720
4N3E	1,389,647

3.5 MHz

UP2NK/UF	**701,012**
I4IND	526,812
RB5IM	488,557
VE3BMV	311,080
RB5BA	305,970
UA9CBM	277,764
YU1ZZ	261,870

1.8 MHz

UP3BP/UF	125,240
LZ2CJ	93,800
UA2FF	84,420
UB5ZAL	41,600
OK1DXS	34,980
LA7JO	25,272
Y37XJ	24,464

QRP/p

4X6IF	**A**	**231,210**	JA2DN	14	133,254
YU7RU	A	228,150	G3VMY	7	96,036
KA2AEV	A	228,144	HA3GZ	3.5	45,344
EA3EGV	28	13,689	UA3AQP	1.8	10,950
EA8ACL	21	168,873			

MULTI-OPERATOR SINGLE TRANSMITTER

LZ2KTS	**6,658,796**	GB2MM	3,542,175
HH2WW	**5,050,032**	RL8PYL	3,504,039
UP1BZZ	**4,998,336**	HG9R	3,488,772
EA3VY	4,342,005	HG6N	3,445,542
HG5A	4,051,974	UZ9FWR	3,273,210
NA5R	**3,907,730**	IO3FIY	2,928,360
HG7B	3,568,866	AI6V	2,761,048

MULTI-OPERATOR MULTI-TRANSMITTER

KH6XX	**8,551,399**	NM5M	4,302,972
OK7AA	8,440,839	JA7YAB	1,976,316
KL7Y	**6,462,747**	YU4EZC	1,077,234
YU1ELM	4,619,202	K6XO	502,588
JA2YKA	4,573,585	JA4YJA	172,634

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. Certificate winners are listed in Bold Face.

QRPp SECTION WORLDWIDE

4X6IF	**A**	**231,210**	**415**	**210**
YU7RU	**A**	**228,150**	**419**	**234**
KA2AEV	**A**	**228,144**	**406**	**291**
UB5UKH	**A**	**171,644**	**402**	**188**
W8VSK	**A**	**162,150**	**341**	**235**
UT5UGR	"	157,368	432	166
UB5MPD	"	147,378	298	242
VE7YU	**A**	**119,354**	**270**	**166**
Y25QE	**A**	**114,840**	**404**	**165**
K1CGJ	**A**	**107,950**	**223**	**170**
SP9IGY	**A**	**79,128**	**302**	**157**
DL4FN	**A**	**64,240**	**212**	**146**
W9SE/7	**A**	**61,851**	**208**	**159**
W9PNE	**A**	**53,246**	**191**	**158**
PAØPUR	**A**	**48,600**	**225**	**135**
WB9HRO	"	45,188	176	143
KH6CP	**A**	**45,100**	**163**	**82**
KFØT	**A**	**36,400**	**202**	**175**
YO5KLE	**A**	**34,854**	**160**	**74**
OK1DNM	**A**	**33,878**	**198**	**116**
YU1OWN	"	32,079	176	111
PAØADT	"	32,060	121	102
OK2PAW	"	31,302	161	94
DF5SF	"	29,720	184	120
KV7X	"	28,944	174	134
Y26JD	"	28,800	138	96
VE3OOL	**A**	**24,376**	**110**	**88**
OK1DKW	"	22,764	98	84
KZ1L	"	17,479	94	77
N1AFC	"	17,473	111	101
OK1DZD	"	17,248	196	88
Y24TG	"	16,517	132	83
KI9A/5	**A**	**14,880**	**129**	**96**
DL2HCB	"	9,394	74	61
KK7C	"	7,638	81	57
SM7CZC	**A**	**5,406**	**69**	**51**
PAØATG/LX	**A**	**4,374**	**66**	**54**
W2JEK	"	1,530	33	30
OK2SBJ	"	1,145	57	46
OH2BLU	**A**	**447**	**21**	**21**
WB8MWR	"	234	29	26
PA3AFF	"	225	15	15
Y24DG	"	126	9	9
EA3EGV	**28**	**13,689**	**147**	**81**
EA3FHC	"	6,136	97	59
JH9HXF/1	**28**	**168**	**26**	**21**
EA5AJZ	"	135	10	9
JI3BFG	"	8	8	8
EA8ACL	**21**	**168,873**	**311**	**181**
RB5WW	**21**	**162,864**	**333**	**216**
4X6NM	**21**	**89,080**	**230**	**136**
UR2CR	**21**	**42,585**	**228**	**145**
UB5FDM	"	12,533	115	83
OH3GD	**21**	**9,288**	**111**	**86**
JP1FZA	**21**	**9,152**	**71**	**64**
JH7LRS	"	2,550	35	34
JHØXUP	"	1,200	26	25
JA2DN	**14**	**133,254**	**270**	**198**
OK2BMA	**14**	**90,152**	**292**	**191**
KB7G	**14**	**54,284**	**188**	**164**
OK8ACW	"	52,640	185	140
AH6EK	**14**	**43,488**	**154**	**96**
KB7NV	"	26,335	131	115
OK1AYQ	"	23,870	167	110
KB9S	**14**	**23,862**	**143**	**123**
PA3DKZ	**14**	**18,584**	**121**	**101**
KN1H	**14**	**15,750**	**113**	**105**
OK1DMP	"	14,774	100	83
WA9FWO/5	**14**	**11,875**	**106**	**95**
I4KRF	**14**	**11,169**	**94**	**73**
UP2DT	**14**	**4,674**	**62**	**57**
G3CWL/A	**14**	**4,455**	**61**	**55**
K7DBV	"	4,125	93	75
NU4B	**14**	**2,550**	**81**	**75**
PAØTA	"	1,512	36	36
G3VMY	**7**	**96,036**	**216**	**159**
UT4UB	**7**	**95,140**	**154**	**142**
OK1DCP	**7**	**80,460**	**237**	**149**
KU7Y	**7**	**70,824**	**220**	**156**
YU3MJ	**7**	**64,106**	**208**	**62**
AA2U	**7**	**57,814**	**166**	**137**
YO4DCF	**7**	**34,592**	**120**	**94**
UA3VLZ	**7**	**27,416**	**120**	**92**
UA1ZFT	"	21,580	260	114
YO3MS	"	12,970	82	63
JA9MJR	**7**	**8,536**	**47**	**44**
WD8IXE	**7**	**192**	**20**	**16**
HA3GZ	**3.5**	**45,344**	**252**	**104**
OK3BRK	**3.5**	**42,532**	**209**	**98**
HA6IAM	"	37,054	204	97
YO2AQO	**3.5**	**24,492**	**148**	**78**
Y26WM	**3.5**	**20,910**	**114**	**85**
SP9GKM	**3.5**	**17,956**	**131**	**67**
YV3AGT	**3.5**	**15,040**	**56**	**47**
SP6EIY	"	13,248	103	69
RB5GD	**3.5**	**4,472**	**55**	**43**
OK3CUG	"	3,528	68	40
UA3AQP	**1.8**	**10,950**	**81**	**50**
OK1DRO	**1.8**	**10,920**	**105**	**70**
UB5REN	**1.8**	**9,396**	**82**	**54**
RP2BIH	**1.8**	**8,160**	**83**	**48**
UA3ATV	"	8,100	83	50
OL1BIP	"	7,904	76	52
OL8COJ	"	7,410	82	57
OK3CXS	"	7,076	88	58
Y27KL	**1.8**	**5,002**	**62**	**41**
Y64ZF	"	448	19	14

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

KC1F	**A**	**3,140,592**	**1782**	**546**
K1GQ	**A**	**2,766,726**	**1467**	**547**
				(Op. K5ZD)
K1XA	**A**	**1,542,840**	**1133**	**460**
K1VUT	"	1,397,300	994	445
K8HVT/1	"	470,418	544	326
K1XM	"	305,418	356	218
WA2CNF/1	"	272,448	383	264
K5MA/1	"	188,552	284	196
KZ1O	"	187,016	371	241
KS1J	"	117,216	244	176
WA1LBG	"	74,305	262	193
KQ1F	"	58,016	157	112
W1CNU	"	40,096	136	112
W1OPJ	"	6,095	62	53
W1BET	"	2,989	59	49
N1CO	**14**	**1,077,945**	**998**	**417**
				(Op. KC1O)
W1LOQ	"	114,456	284	228
WB1AOD	"	65,404	203	166
K1TR	"	35,316	131	108
W1DA/1	"	31,772	114	94
KT1O	"	9,639	74	63
K1MM	**7**	**1,390,720**	**819**	**410**
KA1SR	**1.8**	**884**	**32**	**26**
KQ2M	**A**	**2,961,855**	**1592**	**585**
WA2OOS	**A**	**887,698**	**856**	**389**
K5NA/2	"	617,638	521	314
NI2P	"	254,282	478	287
KF2O	"	208,465	319	241
WA2HZR	"	204,180	374	246
K2SX	"	196,420	326	230
KW2J	"	184,194	372	243
W2FTY	"	181,779	323	237
KD2HE	"	156,140	318	185
W2DW	"	105,298	211	163
KT2D	"	69,960	206	159
NJ2L	"	48,360	196	155
AA2Y	"	45,402	188	141
KC2QR	"	38,688	137	124
W2LPV	"	31,414	135	113
NJ2D	"	2,584	35	34
N2AA	**14**	**1,658,469**	**1386**	**527**
K2TW	**14**	**1,319,004**	**1252**	**486**
K2JF	"	6,783	58	57
NJ2C	"	1,664	30	26
KR2Q	**7**	**1,555,048**	**901**	**431**
KZ2S	**7**	**1,173,940**	**778**	**395**
KM3T/2	"	920,205	700	363
NC2V	"	141,750	226	150
N2AU	**3.5**	**119,232**	**250**	**184**
NV6O/2	"	2,184	47	42
KT3Y	**A**	**3,104,192**	**1677**	**574**
K3ZO	**A**	**2,398,870**	**1350**	**515**
W3GM	**A**	**1,807,200**	**1121**	**450**
W3ARK	"	335,880	446	311
KJ7K/3	"	216,736	587	338
AA3B	"	166,192	321	221
W3SOH	"	105,138	217	177
K3DTD	"	95,000	245	190
WB3BRF	"	55,224	216	177
W3FQE	"	45,600	137	114
WA3VPL	"	3,157	44	41
N3BJ	**14**	**852,202**	**876**	**449**
K3HPG	**14**	**730,944**	**778**	**432**
W3UM	"	722,959	790	391
AI3Q	"	391,257	619	337
WA3JXW	"	7,938	73	63
NN3SI	"	416	38	32
W3BGN	**7**	**66,144**	**140**	**106**
K4JLD/3	"	61,250	151	125
K3TW	**3.5**	**19,680**	**100**	**80**
K4JPD	**A**	**1,429,233**	**1217**	**507**
				(Op. W8ZF)
N4KMY	**A**	**716,800**	**744**	**400**
K4OD	"	263,266	400	278
W4BV	"	230,125	366	263
W4YN	"	91,980	214	146
KB4GID	"	17,700	117	100
NU4Y	**28**	**5,467**	**133**	**77**
WB4QNX	**14**	**758,490**	**910**	**393**
				(Op. W1IHN)
WB4TDH	**14**	**587,560**	**678**	**370**
WY4T	"	299,840	546	320
NQ4I	"	281,908	539	298
W4WKQ	"	68,076	245	186
K4FPF	"	55,419	177	147
NA4D	"	19,208	110	98
W4KM	"	9,588	80	68
SMØMLL/AJ4	"	1,320	52	44
KG4W	**7**	**443,840**	**477**	**292**
WZ4Z	"	405,350	444	275
W4KMS	"	2,800	40	40
NR5M	**A**	**2,329,077**	**1659**	**551**
				(Op. N5JJ)
K5RX	**A**	**1,477,020**	**1042**	**478**
KC5DX	"	572,355	708	345
K5LP	"	542,067	597	303
KA5KWX	"	101,376	257	192
W5OB	"	61,457	207	151
W5EIJ	"	20,548	149	113
KA5PVB/N	"	204	17	17
KE5CV	**28**	**5,544**	**182**	**99**
KA5W	**21**	**64,750**	**245**	**185**
W5WMU	**14**	**1,035,826**	**1065**	**478**
W5FO	"	850,560	1066	480
AD5Q	"	453,245	717	367
W5MW	"	27,280	134	110
N5RZ	**7**	**1,754,664**	**1003**	**452**
AF5M	"	206,336	383	256
K5UR	**1.8**	**13,668**	**174**	**102**
KI6P	**A**	**2,676,297**	**1677**	**489**
N6ICV	**A**	**1,131,348**	**919**	**348**
AJ6V	"	979,668	1010	386
WA6AUE	"	795,872	738	308
NC6T	"	493,353	671	369
				(Op. NF6H)
W6CF	"	228,375	362	225
WA6AGD	"	184,836	360	211
N8BJQ/6	"	174,724	374	242
K6EID	"	147,278	286	211
KA6W	"	133,620	290	170
N6EK	"	98,230	259	190
K6ZUR	"	79,605	176	145
K6CSL	"	35,904	161	132
N6IBP	"	24,743	176	135
K6LRN	"	17,955	107	95
WE6G	"	7,866	83	69
W8AKS/6	**28**	**288**	**27**	**18**
KØEJ/6	**14**	**202,826**	**406**	**269**
WA6TKT	"	73,569	215	179
AA6EE	"	37,632	165	128
W6DNY	"	9,455	77	61
N6JM	"	6,885	52	45
NI6W	**7**	**1,048,775**	**834**	**325**
AA6XX	"	451,200	527	240
NE6I	**3.5**	**52,628**	**190**	**118**
WB6JMS	"	25,020	116	90
K7LXC	**A**	**917,182**	**792**	**343**
KS7T	**A**	**343,350**	**597**	**351**
KX7J	"	64,617	237	181
NN7A	"	48,622	205	161
W7QN	"	46,781	210	163
N7GWF	"	22,848	155	119
KA7FEF	"	12,152	109	98
AI7B	**14**	**1,229,500**	**1227**	**500**
NN7L	**14**	**451,110**	**705**	**330**
KG7D	"	443,325	782	345
KS7L	"	230,184	460	278
W7FGT	"	160,696	341	212
W7AYY	"	136,983	295	231
K7RIE	"	52,598	217	182
KS7P	"	42,560	144	140
KC7V	"	11,877	120	107
K7UU	"	11,041	76	61
W7KJI	**7**	**405,536**	**449**	**232**
W7YS	"	6,018	51	51
N8BC	**A**	**326,522**	**419**	**281**
W8GOC	**A**	**92,588**	**218**	**158**
K8MR	"	69,037	182	131
N8CXX	"	52,394	160	134
KC8UR	"	35,192	187	166
W8UPH	"	28,152	160	136
WA8YTM	**14**	**95,832**	**260**	**198**
KV8Q	**7**	**447,580**	**539**	**322**
WA8DXB	"	297,264	329	264
K8CW	"	185,320	300	226
WB8MRU	"	108,852	267	193

U.S.A. TOP SCORES SINGLE OPERATOR

ALL BAND

KC1F	**3,140,592**	NR5M	2,329,077
KT3Y	3,104,192	W3GM	1,807,200
KQ2M	2,961,855	K1XA	1,542,840
KRØY	2,814,336	K5RX	1,477,020
K1GQ	2,766,726	K4JPD	1,429,233
KI6P	2,676,297	K1VUT	1,397,300
K3ZO	2,398,870	KM9L	1,358,048

SINGLE BAND

28 MHz

KE5CV	5,544
NU4Y	5,467
W8AKS/6	288

21 MHz

KA5W	64,750
KS9J	11,616
NØBSH	8,094

14 MHz

N2AA	1,658,469
K2TW	1,319,004
AI7B	1,229,500
N1CQ	1,077,945
W5WMU	1,035,826
N3BJ	852,202
W5FO	850,560

7 MHz

N5RZ	**1,754,664**
KR2Q	**1,555,048**
K1MM	1,390,720
KZ2S	1,173,940
NI6W	1,048,775
KM3T/2	920,205
AA6XX	451,200

3.5 MHz

N2AU	119,232
NE6I	52,628
KJ9D	26,460
WB6JMS	25,020
K3TW	19,680
NV6O/2	2,184

1.8 MHz

K5UR	13,668
KA1SR	884

QRPp

KA2AEV	A	228,144	KB7NV	14	26,335
W8VSK	A	162,150	KB9S	14	23,862
K1CGJ	A	107,950	KU7Y	7	70,824
KB7G	14	54,284	AA2U	7	57,814

MULTI-OPERATOR SINGLE TRANSMITTER

NA5R	**3,907,730**	WC4E	2,503,656
AI6V	2,761,048	N7TT	2,353,176
KN6M/5	2,628,540	KU2C	2,172,942

MULTI-OPERATOR MULTI-TRANSMITTER

NM5M	4,302,972	K6XO	502,588

KM9L	**A**	**1,358,048**	**1059**	**496**	
					(Op. WB9JKI)
W9XT	**A**	**579,700**	**683**	**374**	
W9QWM	"	91,000	252	200	
W9GMV	"	30,660	154	140	
KY9P	"	9,888	105	103	
KS9J	**21**	**11,616**	**110**	**96**	
K9QVB	**14**	**698,326**	**823**	**437**	
K9ZO	**7**	**278,460**	**369**	**255**	
KV9S	"	55,390	197	145	
KJ9D	**3.5**	**26,460**	**184**	**126**	
					(Op. KK9V)
KRØY	**A**	**2,814,336**	**1573**	**576**	
KMØL	**A**	**751,996**	**927**	**428**	
KVØI	"	378,652	812	362	
WØHBH	"	370,386	614	342	
KSØT	"	207,480	379	273	
KBØG	"	91,740	274	165	
KCØSV	"	18,810	138	114	
WDØAVV	"	16,958	219	139	
AKØM	"	5,076	65	57	
NØBSH	**21**	**8,094**	**160**	**114**	
KØRWL	**14**	**678,824**	**836**	**424**	
NJØM	"	200,855	672	289	
WØRXL	"	31,548	161	132	
WØIZV	"	19,836	130	116	
KAØIKD	"	2,184	43	42	

ALASKA

KL7UR	**14**	**232,650**	**389**	**235**
NL7DQ	"	122,521	297	161
KL7AF	"	67,932	174	153

BERMUDA

VP9LB	**7**	**104,482**	**204**	**119**

CANADA

VE3CRG	**A**	**1,633,775**	**1171**	**457**
				(Op. VE2ZP)
VE3DZV	"	813,120	736	363
VE7QO	**A**	**401,180**	**536**	**260**
VO1AW	**A**	**228,028**	**292**	**218**
VE3CWE	"	174,660	274	213
VE3NYT	"	19,995	93	93
VE3MCL	"	12,985	66	49
VE2AEJ/3	**28**	**792**	**22**	**18**
VE6CB	**14**	**1,031,658**	**1012**	**417**
VE4ALO	**14**	**358,248**	**665**	**264**
VE3NBE	**14**	**171,808**	**315**	**224**
VE6VW	"	16,274	88	79
VE3DQB	"	987	22	21
VE3OZB	**7**	**172,140**	**283**	**151**
VE3CRD	"	113,696	197	136
VE3BMV	**3.5**	**311,080**	**364**	**202**
CF7SK	**3.5**	**226,080**	**304**	**157**
VE1AIH	**3.5**	**92,964**	**147**	**122**
VE3MFA	**1.8**	**23,302**	**100**	**61**
VE3INQ	"	22,272	105	58
VE3OME	"	19,872	100	54

COSTA RICA

TIØRC	**A**	**414,540**	**494**	**252**
				(Op. TI4BGA)

DOMINICAN REPUBLIC

HI8WRE	**A**	**5,640**	**45**	**40**
HIØA	**3.5**	**24,790**	**84**	**67**

GREENLAND

OX3OA	**A**	**212,175**	**384**	**205**

JAMAICA

6Y6A	**A**	**1,755,000**	**1305**	**450**
				(Op. 6Y5HN)

PANAMA

HP1XKR	**A**	**704,245**	**735**	**305**
HP1AC	A	111,834	238	171

PUERTO RICO

NP4CC	**A**	**3,163,455**	**1925**	**535**
				(Op. NP4Z)
KP4EKG	**21**	**5,546**	**58**	**47**
WP4D	**3.5**	**21,780**	**79**	**66**

AFRICA

CANARY ISLANDS

EA5YU/EA8	**A**	**763,530**	**653**	**310**
EA8BIE	**21**	**40,735**	**133**	**103**

DJIBOUTI

J28EI	**A**	**558,552**	**714**	**274**

KENYA

5Z4MX	**A**	**2,922,318**	**1706**	**486**

MADEIRA IS.

CT3ET	**7**	**260,192**	**252**	**173**

SOUTH AFRICA

ZS6BCR	1.8	20	8	5

ASIA

JAPAN

JH1OGC	**A**	**1,085,416**	**898**	**391**
JA7DLE	**A**	**974,832**	**977**	**368**
JE6MQW	**A**	**910,316**	**878**	**374**
JF3CCN	"	449,400	578	280
JA6BIF	"	364,392	518	252
JE1ARQ	"	211,358	309	217
JA1BNW	"	150,282	256	207
JHØNVX	"	148,368	280	176
JH7XGN	"	131,376	242	168
JJ1VRO	"	102,982	208	151
JA1LDJ	"	72,226	207	134
JAØUMV	"	71,168	195	128
JA7KM	"	63,175	171	133
JH1MTR	"	62,270	178	130
JA4YPE	"	60,568	157	134
		(Op. JF3MOK)		
JJ3JJL	"	23,068	115	79
JE1KDM/8	"	21,096	102	72
JJ3QJI	"	16,575	76	65
JG2THA	"	13,969	72	61
JA1JPM	"	12,980	62	59
JF2YFY	"	7,992	80	37
		(Op. JA2KSA)		
JJ3SRU	"	5,985	60	45
JN1ENK/3	"	5,712	65	56
JH3DEJ	"	5,184	44	36
JI2NQS	"	3,605	45	35
JR4ISK	"	42	6	6
JM1TUY	**28**	**702**	**49**	**39**
JO1NZT	"	544	45	32
JM1SMY	"	350	31	25
JF2EZA	**21**	**272,750**	**443**	**250**
JA1ZLO	**21**	**107,334**	**301**	**178**
		(Op. JI3DMA)		
JE1GPX	"	42,568	170	136
JM1WZP	"	15,810	94	85
JA1YAG	"	14,212	85	76
JA1AAT	"	5,264	52	47
JR3WXA	"	5,096	65	56
JAØNCE	"	1,050	24	21
JA6IP	"	860	20	20
JA3YKC	**14**	**1,212,685**	**1070**	**409**
		(Op. JH4PAM)		
JAØDAI	**14**	**1,020,519**	**966**	**387**
JA7YAL	"	**725,424**	**809**	**336**
		(Op. JH7MEV)		
JH1AEP	"	709,198	775	358
JE4VVM	"	449,600	627	281
JM1LRQ	"	397,440	600	288
JH8JYV	"	377,454	489	301
JH7WKQ	"	356,166	500	282
JR3BOT	"	344,080	521	253
JAØCGJ	"	279,112	412	251
JF1SEK	"	261,426	413	233
JA1GTF	"	132,800	259	200
JH9GGH	"	81,472	202	152
JA3ARM	"	80,359	215	163
JG1GGF	"	67,184	188	152
JA1OHP	"	52,576	156	124
JA2XI	"	46,585	152	121
JA7PFC/3	"	36,108	137	118
JA5COE	"	26,304	116	96
JG3EHD	"	26,077	101	89
JA2KPV	"	18,881	96	79
JH1BYE	"	17,862	87	78
JO1BMV	"	17,020	86	74
JO1QZI	"	12,159	72	63
JA4FMS	"	10,132	76	68
JA1SAP/1	"	7,056	50	48
JR2AQP	"	5,754	53	42
JHØQIG	"	5,460	50	47
JH7AJD	"	2,997	39	37
JR2BNF	"	1,568	29	28
JAØGTM	"	1,380	23	23
JA1AJA	"	690	16	15
JG1UOT	"	192	8	8
JH6NBW/1	"	3	1	1
JA5BJC	**7**	**736,764**	**516**	**294**
JA3YKC	**7**	**258,630**	**291**	**185**
		(Op. JE3MAS)		
JAØYAK	"	236,544	295	192
		(Op. JHØUSD)		
JH7LVK	"	221,782	284	187
JA8DWR	"	110,952	166	134
JK1RJQ	"	33,024	106	86
JF3ZAH	"	30,832	97	82
		(Op. JH3DJA)		
JR6GHN	"	29,568	98	84
JA2BNN	"	27,000	91	75
JE8EKG	"	23,562	93	77
JN1AIF	"	18,648	87	63
JR3XEX	"	15,456	60	56
JG2LGM	"	14,986	72	59
JA1THL	"	5,904	45	41
JA8EJO	"	5,301	34	31
JR4SRW	"	3,150	27	25
JAØGZ	"	1,440	19	18
JL1EJO	"	1,364	25	22
JA1OND	**3.5**	**17,688**	**76**	**66**
JA1QZC	"	3,306	33	29
JA1CMD	"	3,248	36	29
JF1NZW	**1.8**	**162**	**11**	**9**

KOREA

HL2XP	**21**	**29,532**	**235**	**92**
HL1CG	**14**	**352,080**	**560**	**270**

MONGOLIA

JTØAPE	**3.5**	**6,513**	**61**	**39**

SAUDI ARABIA

HZ1HZ	**A**	**607,545**	**600**	**345**

U.S.S.R.

ARMENIA

UG6JJ	**A**	**145,376**	**280**	**176**

ASIATIC

UA9SF	**A**	**343,273**	**500**	**203**
UA9URF	**A**	**264,936**	**443**	**249**
UA9AJM	"	246,132	329	212
UA9AU	"	86,864	196	178
UA9ALD	"	81,144	201	147
UA9YE	**14**	**1,711,080**	**1241**	**504**
UA9AIA	"	304,587	445	261
UA9WDM	"	1,460	25	20
UZ9WXH	"	169	13	13
UA9CI	**7**	**826,512**	**650**	**268**
RA9SUV	"	412,726	381	199
UA9YEW	"	202,500	260	162
UA9XHT	"	4,160	29	26
UA9CBM	**3.5**	**277,764**	**314**	**158**
RA9YD	"	81,792	173	93
UA9FXJ	"	1,116	43	12
UA9AOV	**1.8**	**21,244**	**81**	**47**
UA9MR	"	3,174	36	23
RAØJD	**A**	**81,055**	**297**	**145**
UAØLJ	"	10,680	100	60
UWØCM	"	6,201	80	53
UAØLT	**21**	**9,664**	**165**	**64**
UAØSAU	**14**	**945,314**	**941**	**386**
UAØBCV	**14**	**454,476**	**593**	**313**
UAØBCK	"	236,028	426	221
UAØBDZ	"	50,310	175	117
UAØCS	"	11,286	82	66
UAØUBZ	"	5,687	73	47
RAØFA	**7**	**185,328**	**367**	**156**
UAØZBP	"	20,624	86	68

AZERBAIJAN

UD6CN	**A**	**727,380**	**701**	**324**

GEORGIA

UP3BI/UF	**7**	**1,106,222**	**710**	**271**
UP2NK/UF	**3.5**	**701,012**	**561**	**221**
UP3BP/UF	**1.8**	**125,240**	**220**	**101**

KAZACH

UL7CM	**21**	**197,253**	**391**	**217**
RL7AB	"	2,970	34	33
RL8PY	"	1,216	22	19
UL7LER	**14**	**629,432**	**701**	**328**
UL7CAA	**14**	**611,156**	**710**	**322**
UL7CAZ	"	85,840	226	148
UL7IBZ	"	35,298	129	106
UL7CAD	**7**	**137,780**	**228**	**130**
UL7BX	**3.5**	**248,358**	**304**	**159**

KIRGHIZ

UM8MBA	**21**	**60,325**	**190**	**127**
UM8MGM	"	102	13	6

TADZHIK

UJ8JA	**7**	**102,582**	**160**	**123**

TURKOMAN

UH8EAA	**A**	**2,255,680**	**1559**	**424**

UZBEK

RI8BP	**21**	**40,567**	**164**	**113**
UI8LBB	**14**	**26,560**	**215**	**80**

EUROPE

ALAND IS.

DL7AFQ/OHØ	**A**	**145,755**	**461**	**205**
OH2BCI/OHØ	**3.5**	**77,616**	**243**	**132**

AUSTRIA

OE9SLH	**A**	**55,800**	**154**	**120**
OE1XA	**14**	**376,068**	**629**	**308**
OE3DSA	**3.5**	**244,824**	**502**	**202**

AZORES

CQ8CQ	**7**	**1,161,922**	**819**	**367**
				(Op. CT2CQ)

BELGIUM

ON4XG	**A**	**204,963**	**520**	**263**
ON7BX	"	14,532	101	84
ON5WL	**3.5**	**59,236**	**212**	**118**

BULGARIA

LZ1BJ	**A**	**177,636**	**312**	**262**
LZ1KAA	"	**46,683**	**195**	**91**
				(Op. Zlatko)
LZ1WY	"	32,152	194	110
LZ1BG	"	1,058	24	23
LZ1KIC	**28**	**57,120**	**326**	**160**
				(Op. Anton)

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4" Extension Speaker

For Home or Mobile Rigs **12.95**

Superior to most built-in speakers. Has adjustable bracket, 10-ft. cord with 1/8" plug. Rated 5 watts, 8 ohms. #21-549

Monophonic Headset

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Modern lightweight design with fully adjustable band and foam cushions for real comfort. 16 ohms. 1/4" plug. #20-210

Outdoor Antenna Kit

Includes 75-ft. of strong, stranded antenna wire, 50-ft. of insulated lead-in, support and standoff insulators, and a window feedthrough strip. #278-758 ..... **8.49**

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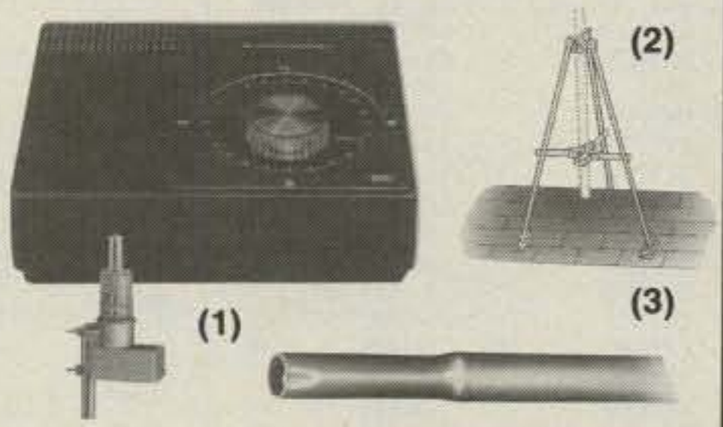

(1) Archerotor®. Just right for many VHF beams, small loaded HF beams and rotatable dipoles. Includes indoor control unit with direction indicator light, weatherized rotator and hardware. UL listed AC. Requires 3-wire cable, extra. #15-1225, **59.95**

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(3) 10-Ft. Steel Mast. 1 1/4" diameter, strong 16-gauge steel with gold enamel finish and one swaged end. #15-843 ..... **9.49**

LCD Anywhere® Alarm Clock

Selectable 12 or 24-Hour Display Only **12.95**

- **Mountable Almost Anywere With Included Bracket and Tape**
- **Quartz Accuracy and Dependability**

Easy-to-read liquid crystal display features AM/PM and alarm "on" indicators, plus a pushbutton backlight for night viewing. You can mount the bracket on equipment, the wall or a car dash. The clock will slide out and do double duty as a travel alarm! Snooze function. Operates up to one year on one low-cost "button" battery, included. 1 5/8 × 3 1/4 × 1/2". #63-838

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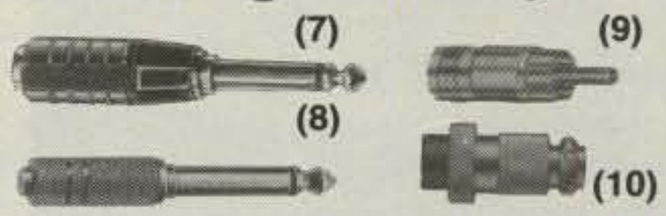

(7) Headphone Adapter. 1/4" mono plug to 1/8" stereo jack. Allows you to use comfortable "mini" stereo headphones with Ham rigs, shortwave receivers and scanners. Really handy! #274-348 ..... **1.49**
(8) Mono 1/4" Plug to Stereo 1/4" Jack. #274-360 .. **1.49**
(9) Pkg. of 2 Shielded Phono Plugs. #274-339 .. **1.29**
(10) 4-Pin Mike Plug. #274-001 ..... **1.59**

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42% Off

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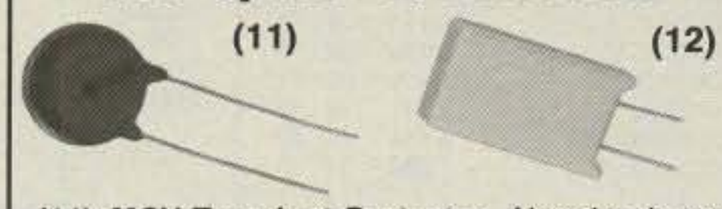

(11) MOV Transient Protector. Absorbs damaging line surges before they can damage your equipment. #276-568 ..... **1.69**

(12) Gas Discharge Tube. Fast-response spike protector for use when repetitive surges are expected. #270-811 ..... **2.49**

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SPDT. #275-326 ..... **1.99**
SPDT Center-Off. #275-325 ..... **2.19**

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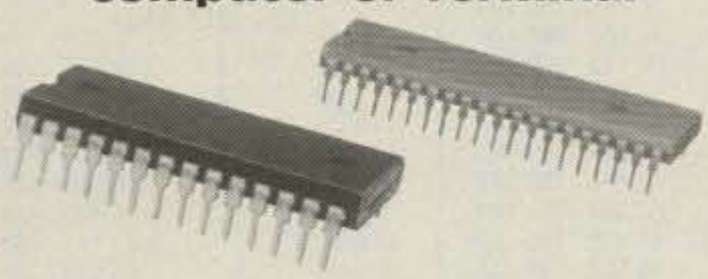

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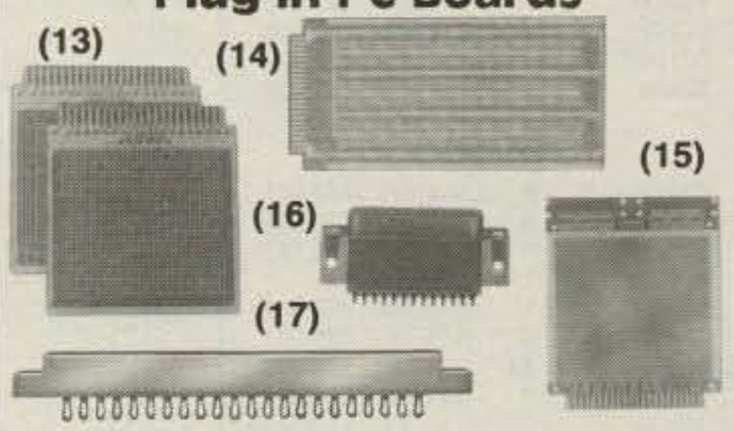
Plug-In PC Boards



(13) Multipurpose Two-Bus Board. Predrilled DIP pattern. 4 1/2 × 4". #276-152 ..... **2.99**
3-Bus Version of Above. #276-154 ..... **2.99**
(14) Jumbo Two-Bus Board. Accepts up to 24 sixteen-pin DIPS. 4 1/2 × 9 9/16". #276-190 ..... **5.95**
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(15) Board With RS-232 Ports. Accepts two 90° RS-232 connectors. 4 5/16 × 5 5/16". #276-187 ..... **3.99**
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LZ2OV	**14**	**25,725**	**151**	**105**
LZ1KSF	"	1,660	40	32
			(Op. Alex)	
LZ2CJ	**1.8**	**93,800**	**278**	**134**

CZECHOSLOVAKIA

OK1RI	**A**	**2,660,690**	**1734**	**545**
OK1VD	**A**	**895,520**	**1025**	**386**
OK3ZMV	**A**	**888,336**	**1233**	**372**
OK2TBC	"	826,440	1055	388
OK1DBM	"	589,152	860	323
OK3FON	"	347,072	500	272
OK1KZ	"	229,216	565	232
OK2RU	"	153,264	304	206
OK3YCA	"	134,106	364	186
OK1ZTW	"	111,010	359	170
OK2PCF	"	105,504	321	168
OK3CEI	"	95,589	232	171
OK1EP	"	90,954	235	186
OK1MKU	"	84,546	215	154
OK1DCF	"	74,700	356	166
OK3UG	"	59,478	236	138
OK1MZO	"	39,135	159	117
OK3CCC	"	26,860	161	85
OK3CDZ	"	7,242	60	51
OK2BBQ	"	6,560	122	40
OK3CQD	"	2,268	28	28
OK2PO	**28**	**11,832**	**132**	**87**
OK1AXK	"	8,925	118	75
OK1AJN	"	7,245	113	63
OK1AES	"	4,125	79	75
OK1MAW	**21**	**5,600**	**41**	**28**
OK2BGR	**14**	**217,056**	**419**	**266**
OK1XJ	**14**	**216,456**	**424**	**232**
OK2BNX	"	123,548	333	214
OK1MKI	"	88,352	315	176
OK2BPU	"	35,520	153	111
OK1MAW	"	27,345	197	73
OK2ABU	"	25,668	139	92
OK2BFX	"	19,040	104	80
OK2BHJ	"	9,450	108	70
OK1ARJ	"	5,668	64	52
OK1JDJ	"	935	19	17
OK1MGW	**7**	**258,552**	**371**	**228**
OK3TAY	**7**	**96,432**	**203**	**147**
OK3CAL	"	64,106	190	133
OK1HCG	"	26,508	120	94
OK1AII	"	15,250	64	61
OK2HI	**3.5**	**91,242**	**287**	**137**
OK2PLH	**3.5**	**79,460**	**274**	**137**
OK3CEL	"	67,440	260	120
OK2PIO	"	39,402	186	99
OK3CND	"	36,888	179	106
OK1DRQ/P	"	12,198	104	57
OK2BCZ	"	5,358	61	47
OK2PFX	"	5,110	45	35
OK1DXS	**1.8**	**34,980**	**173**	**106**
OL8COB	**1.8**	**13,720**	**114**	**70**
OL7BLO	"	11,152	106	68
OK1DRU/P	"	6,768	104	36
OK1DYL	"	5,916	66	51
OK2BQU	"	5,782	74	49
OL6BNB	"	3,744	48	39
OK3KEU	"	1,288	35	23

DENMARK

OZ5KU	**A**	**205,920**	**449**	**234**
OZ7BW	**A**	**44,744**	**156**	**119**
OZ9MM	"	32,079	164	111
OZ3Q	"	20,570	102	85
OZ4RT	"	3,034	42	41
OZ2NU	"	560	25	20
OZ1JJR	**28**	**6,386**	**101**	**62**
OZ8CT	**14**	**312,000**	**582**	**300**
OZ1HET	"	88,920	326	190
OZ4CG	**3.5**	**6,674**	**61**	**47**

ENGLAND

G3FXB	**A**	**2,357,043**	**1482**	**507**
G3ESF	**A**	**456,000**	**702**	**304**
G4OKN	"	87,341	312	167
G4BWP	"	24,360	106	84
G4CNY	**21**	**343,226**	**657**	**307**
G6QQ	"	1,798	32	31
G6NK	**14**	**21,105**	**127**	**105**
G3LZQ	**7**	**181,864**	**258**	**179**
G3XTM	"	45,980	163	121
G3XWZ/A	**1.8**	**8,736**	**156**	**56**

FINLAND

OH6LI	**A**	**1,423,800**	**1334**	**452**
OH5BM	**A**	**1,382,080**	**1416**	**448**
OH2PM	**A**	**1,107,447**	**1263**	**407**
OH4RH	"	600,240	1006	328
OH2BJG	"	438,592	847	308
OH7SQ	"	173,159	455	203
OH2VZ	"	112,112	295	176
OH8OB	"	99,992	290	232
OH7NW	"	87,538	302	173
OH7YF	"	78,776	241	172
OH9PN	"	41,363	186	133
OH5QY	"	37,835	199	115
OH9KA	"	35,746	158	122
OH6MM	"	11,775	121	75
OH2BXT	"	9,983	85	57
OH5PT	"	9,308	64	52
OH2DN	"	3,350	50	50
OH2EJ	**28**	**12,610**	**125**	**97**
OH7EU	"	6,188	93	68
OH6DH	**21**	**31,611**	**190**	**123**
OH5MX	"	9,159	98	71
OH3KM	**14**	**807,311**	**955**	**353**
OH6NU	**14**	**665,392**	**1028**	**364**
			(Op. OH6MW)	
OH2BVE	"	475,800	778	325
OH8LQ	"	473,340	826	345
OH6YF	"	408,947	682	329
OH3BU	"	395,675	715	323
OH8YL	"	329,476	671	287
OH2BYS	"	183,458	361	269
OH6KY	"	84,875	300	175
OH3NM	"	82,320	228	196
OH5OZ	"	37,083	143	141
OH8EP	"	24,200	117	100
OH2BFS	"	112	10	8
OH2BH	**7**	**1,248,072**	**916**	**399**
			(Op. OH6UM)	
OH6EI	**7**	**1,116,120**	**786**	**393**
OH2BJJ	"	82,656	213	144
OH6CD	"	68,310	233	135
OI8AX	"	12,212	100	71

FRANCE

F6HWM	**A**	**81,346**	**243**	**178**
F6HWU	"	70,980	195	169
F6HNX	"	38,664	272	108
F9DK	**14**	**165,189**	**419**	**237**
F6BEE	**7**	**43,008**	**106**	**84**

GERMANY (FRG)

DL6RAI	**A**	**1,524,125**	**1348**	**445**
DF1LX	**A**	**486,366**	**786**	**309**
DK7QB	"	269,916	580	249
DL0NR	"	255,250	520	250
DL6FBL/P	"	246,928	594	244
DL1BDE	"	204,045	448	223
DJ1OJ	"	197,570	438	230
DL8KJ	"	181,841	314	271
DL1TH	"	129,285	397	195
DL1AM	"	63,632	170	164
DL3SAI	"	50,553	205	137
DF3QN	"	40,832	200	116
DL4YCZ	"	37,288	201	118
DL2MDB	"	34,047	134	97
DJ3TI	"	31,350	130	114
DL0ZC	"	9,576	99	76
			(Op. DF9OW)	
DJ2BV	**28**	**7,400**	**98**	**74**
DL7MAE	"	2,145	55	39
DL1RB	**21**	**63,666**	**247**	**162**
DL9VDQ	"	21,109	117	101
DL0IU	**14**	**575,586**	**820**	**342**
			(Op. DL4AAE)	
DJ0YI	**14**	**252,590**	**492**	**290**
DL6BBT	"	91,020	281	185
DK8FD	"	48,910	276	146
DF5BM	"	46,125	166	125
DF9ZP	**7**	**1,998,372**	**1118**	**482**
			(Op. DL6FBL)	
DK2OY	"	600,320	612	320

GERMANY (GDR)

Y51UE	**A**	**1,337,764**	**1359**	**412**
Y54PL	**A**	**791,352**	**1113**	**348**
Y25FF/A	**A**	**376,443**	**800**	**277**
Y39SH	"	292,354	601	254
Y23FK	"	173,352	332	186
Y25TG	"	157,920	400	224
Y22DK/A	"	149,955	398	195
Y42YG	"	102,960	390	176
Y55VJ	"	95,205	261	165
Y34SE	"	77,265	200	153
Y52TL	"	74,168	238	146
Y22LE	"	73,112	299	152
Y36SG	"	70,334	191	139
Y41WM	"	67,952	212	137
Y23CM	"	66,030	199	155
Y43VL	"	62,431	261	149
Y36TG	"	50,959	155	131
Y24SK/A	"	41,860	166	115
Y44WF	"	33,633	138	111
Y37ZM	"	32,184	150	108
Y31XN	"	22,154	121	106
Y32OC	"	21,216	133	96
Y37ZK/P	"	17,402	108	77
Y78VL	"	12,006	100	69
Y31ON	"	8,586	60	54
Y71ZH	"	7,832	96	44
Y26MH/A	"	4,480	67	56
Y31TF	"	4,290	43	39
Y54YD	"	2,840	47	40
Y31NJ/P	"	2,464	32	32
Y68WG	"	1,452	38	33
Y23RJ	**28**	**3,736**	**64**	**39**
Y33VL	"	805	34	23
Y23HE/A	"	725	29	25
Y66ZN	"	180	15	12
Y26DM/A	**21**	**19,392**	**150**	**96**
Y37ZE	"	11,088	96	77
Y22UB	"	3,266	59	46
Y22HF	"	2,960	43	40
Y36UE	**14**	**256,768**	**566**	**256**
Y43VF	**14**	**106,232**	**378**	**196**
Y41ZF/P	"	12,069	95	81
Y31ZE	"	7,784	61	56
Y66ZF	"	5,665	67	55
Y23JA	"	4,268	50	44
Y27BN	"	3,960	50	45
Y31PA	"	2,220	36	30
Y63YF	"	1,872	26	26
Y75XH/P	"	1,148	31	28
Y64YG	"	770	23	22
Y24YH	**7**	**193,772**	**348**	**193**
Y21NE	"	113,488	318	164
Y64ZL	"	22,720	93	80
Y41UF/P	"	1,508	30	26
Y25PE	**3.5**	**5,336**	**60**	**46**
Y21HI/P	"	1,100	24	22
Y37XJ	**1.8**	**24,464**	**140**	**88**

GREECE

SV1RP	**14**	**246,441**	**563**	**267**
SV8AA	**1.8**	**6,816**	**63**	**48**

HUNGARY

HA8UB	**A**	**771,680**	**892**	**371**
HA5LZ	**A**	**507,092**	**720**	**331**
HA1XY	"	458,724	756	301
HA4XX	"	196,787	307	168
HA8UN	"	190,483	425	239
HA8XX	"	52,578	236	138
HA5CW	**28**	**8,740**	**112**	**76**
HA5KKN	**21**	**43,155**	**210**	**137**
HA7RO	**21**	**42,624**	**215**	**148**
HA3GJ	"	1,134	34	27
HA3GO	"	888	27	26
HA3KGJ	"	380	20	19
HA8KWG	**14**	**399,464**	**541**	**334**
HA4ZX	"	112,560	320	201
HA8AT	"	23,754	137	107
HA9RE	**7**	**1,018,878**	**871**	**357**
HA8KQX	**3.5**	**247,192**	**541**	**212**
HA6NL	**3.5**	**155,050**	**401**	**175**
HA3PT	"	71,832	283	123
HA5UA	"	28,050	155	85
HA3JB	"	12,412	136	58
HA9MAT	"	11,186	116	47

IRELAND

EI3DP	**21**	**80,029**	**328**	**191**

ITALY

IK2DVG	**A**	**2,010,279**	**1537**	**489**
I7PXV	**14**	**310,992**	**587**	**304**
I2JIN	"	70,700	225	140
I4IND	**3.5**	**526,812**	**639**	**286**

LUXEMBOURG

LX/DJ8BC	**A**	**30,130**	**201**	**115**

THE NETHERLANDS

PA8XPQ	**A**	**92,880**	**315**	**172**
PA3JCG	"	7,140	70	60
PA3CNI	"	48	4	4
PA3BNT	**14**	**17,869**	**167**	**107**
PA8DIN	**3.5**	**920**	**21**	**20**
PA3BFM	**1.8**	**6,912**	**62**	**48**

NORWAY

LA4YW	**A**	**566,130**	**884**	**339**
LA5RBA	"	119,756	358	196
LA1XDA	**28**	**2,161**	**53**	**37**
LA2EG	"	812	29	28
LA1PBA	"	110	11	10
LA3YA	**14**	**346,092**	**659**	**302**
LA2QM	**7**	**142,760**	**297**	**172**
LA7JO	**1.8**	**25,272**	**135**	**81**

POLAND

SP5CJQ	**A**	**405,270**	**664**	**270**
SP2BKF	**A**	**300,599**	**585**	**247**
SP6FER	"	269,535	532	255
SP3HC	"	256,802	583	238
SP7NJX	"	249,216	458	264
SP9NLS	"	154,400	423	193
SP6BAA	"	82,164	283	164
SP3AZO	"	40,810	151	110
SP3IOE	"	26,299	133	91
SP6EQZ	"	17,600	160	88
SP2BLC	"	1,495	24	23
SP8EMO	**28**	**15,520**	**156**	**97**
SP6BFK	"	45	9	5
SP3LPR	"	36	6	6
SP4EEZ	**21**	**71,736**	**289**	**183**
SP6GIK	"	66,566	272	166
SP6NXP	"	432	21	18
SP4JWR	**14**	**532,014**	**750**	**371**
SP5LKM	**14**	**272,525**	**438**	**275**
SP6PDT	"	161,694	434	234
		(Op. SP-07018-OP)		
SP6CDP	"	107,226	307	207
SP7EJS	"	14,325	85	75
SP2IHG	"	3,120	47	40
SP8NR	**7**	**312,912**	**453**	**246**
SP4GFG	**7**	**78,628**	**194**	**133**
SP8TQ	"	65,660	195	134
SP5JTR	"	57,334	137	109
SP9CVY	"	43,152	147	116
SP9MZH	"	28,644	121	93
SP9EMI	"	27,270	105	101

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SP1DTG	"	19,520	103	80
SP1JUN/3	"	14,544	105	72
SP2KSK	**3.5**	**42,244**	**198**	**118**
		(Op. Adam)		
SP5GH	1.8	154	7	7

ROMANIA

YO8DDP	**A**	**609,564**	**884**	**316**
YO8FR	**A**	**415,492**	**780**	**308**
YO3CFF	"	193,158	395	219
YO5AAT	"	135,090	383	171
YO3KWJ	**28**	**96,882**	**454**	**201**
YO6DOF	"	2,615	59	45
YO8GF	**21**	**39,339**	**211**	**141**
YO2CMI	"	285	15	15
YO6UX	**14**	**103,935**	**342**	**205**
YO6EZ	"	56,832	256	148
YO8BDQ	"	54,870	226	155
YO8DOH	**7**	**68,770**	**20**	**130**
YO2CJX	**7**	**50,380**	**150**	**110**
YO6VZ	"	**25,440**	**146**	**80**
YO3BWK	"	**25,347**	**81**	**71**
YO7BGA	"	**17,850**	**100**	**75**
YO3BFJ	"	**3,128**	**40**	**34**

SPAIN

EA3FAA	**A**	**1,274,208**	**1166**	**416**
EG7TH	**A**	**953,530**	**1351**	**355**
ED1CI	"	603,840	868	370
EA1NZ	"	28,424	102	88
EA1CVY	**28**	**3,139**	**76**	**43**
EA5EXI	**14**	**90,356**	**331**	**196**
EA3BOW	"	29,370	141	110
EA2CR	"	6,887	80	71
EA3GF	"	5,824	59	52
EG1BRX	**7**	**4,914**	**46**	**39**
EA5AR	"	4,788	50	42
EA1JO	**3.5**	**3,096**	**41**	**36**
EA5TX	1.8	96	4	4

SVALBARD

JW5VAA	**A**	**14,931**	**118**	**79**
JW8EQ	**21**	**63,525**	**320**	**165**
		(Op. SP5EXA)		
JW5NM	**14**	**27,588**	**123**	**76**

SWEDEN

SM7LSU	**A**	**275,655**	**415**	**345**
7S6SSA	**A**	**260,602**	**503**	**229**
		(Op. SM6DED)		
SM7LAZ/6	"	151,011	502	189
SM2OJR	"	100,657	288	191
SM8COP	**28**	**10,191**	**131**	**79**
SM5DUT	"	8,988	105	84
SM6NJK	"	8,850	119	75
SM6AWA	**21**	**17,952**	**138**	**102**
7S2SSA	**14**	**1,380,480**	**1376**	**480**
SM8TW	**14**	**314,514**	**579**	**303**
SM8BVQ	"	188,500	415	250
SM7KIL	"	55,624	196	136
SM6CST	"	51,408	207	144
SM2LCI	"	36,408	200	123
SM5CSS	"	14,457	84	79
SM7TV	"	10,126	98	83
SM6JY	"	1,760	39	32
SM7NSX	**40**	**188,160**	**416**	**196**
SM5ARR	"	780	16	15

SWITZERLAND

HB9CSA	**A**	**1,159,640**	**1247**	**424**
HB9AGA	"	240,570	494	243
HB9BPP	"	31,236	274	114
HB9CWA	**3.5**	**35,020**	**147**	**103**

WALES

GW3JI	**A**	**333,960**	**597**	**276**
GW3OKA	"	205,821	574	237

YUGOSLAVIA

YZ4GD	**A**	**3,554,460**	**1844**	**651**
YU3EA	**A**	**1,067,193**	**1059**	**419**
YU7DR	"	567,854	806	329
YU3DAS	"	375,532	412	176
		(Op. YU3SB)		
YU7AF	"	306,032	621	248
YU7ORQ	"	100,213	255	197
YU1NZW	"	57,270	190	156
YT3P	**28**	**58,259**	**363**	**149**
		(Op. YU3MA)		
YU1RA	"	5,893	85	71
YT3L	**21**	**514,150**	**811**	**350**
		(Op. YU3OH)		
YU2AKL	"	83,356	290	182
YU7MGU	"	33,396	174	132
YT3A	**14**	**1,850,320**	**1500**	**505**
		(Op. YU3BO		
YU7AV	**14**	**1,670,032**	**1456**	**496**
YU7BJ	"	966,336	1056	448
YU7PXT	"	163,300	394	230
YU7NHT	"	20,800	190	80
YU2WJ	"	15,810	107	85
YZ9A	**7**	**1,920,960**	**1074**	**464**
YT7W	**7**	**1,541,980**	**980**	**430**
		(Op. YU7AD)		
4N3E	**7**	**1,389,647**	**1313**	**469**
		(Op. YU3HAM)		
YT3M	"	1,360,590	891	399
		(Op. YU3EW)		
YT3T	"	823,170	716	345
		(Op. YU3BQ)		
YU4FRS	"	810,509	759	343
		(Op. Edin)		
YU2CQ	"	489,072	522	276
YU7SF	"	361,560	463	262
YU1ZZ	**3.5**	**261,870**	**511**	**215**
4N6N/2	"	254,660	504	214
		(Op. YU6AD)		

U.S.S.R.
EUROPEAN

UW3AA	**A**	**1,869,120**	**1745**	**495**
RZ3DM	**A**	**391,870**	**602**	**298**
UA3TU	"	322,953	610	249
RA1AL	"	258,400	610	272
UA4ALI	"	166,465	400	197
UA4CK	"	162,495	439	207
UA3AGX	"	121,632	336	181
RW3DR	"	97,152	283	184
UA4ANZ	"	81,216	252	144
UA3DMJ	"	80,580	335	170
RV6AF	"	77,149	200	179
UA3LAR	"	74,727	192	171
RZ3DZ	"	56,064	195	148
UA3XDS	"	47,970	250	130
RV6AB	"	27,348	111	106
UA3ZFT	"	11,819	74	53
UA3TCJ	"	10,192	110	104
UA6ABG	"	390	10	9
UA3XBB	**28**	**3,312**	**69**	**48**
UW3UO	**21**	**395,843**	**573**	**293**
UA3PDW	"	226,032	495	277
UW3GL	"	27,724	148	116
UA4AHT	"	22,680	126	105
RA3VJ	**14**	**1,098,554**	**1253**	**426**
UA1ODR	**14**	**862,823**	**1128**	**403**
RA4FA	"	832,905	1037	415
UA3XDM	"	756,952	902	392
RA4PC	"	395,910	686	318
RZ3DF	"	394,671	617	293
RZ3AM	"	212,415	541	245
RA3VA	"	126,630	318	210
UA4WCE	"	72,900	225	162
RV4LA	"	68,554	246	168
UV3DN	"	34,047	201	117
UA4CHH	"	30,972	145	116
UA6LLI	"	23,326	176	109
UA1DF	"	13,612	87	83
RZ6AWP	"	968	25	22
UA4HNP	**7**	**302,220**	**432**	**230**
UA1AJH	"	28,512	111	88
UA3YAO	"	12,400	125	80
RA1QBF	"	5,734	122	47
UA3GGQ	"	3,894	40	33
UA3XBY	**3.5**	**116,432**	**314**	**152**
UA3QBX	"	79,650	253	135
UA3TBM	"	34,544	223	127
UA3PFN	**1.8**	**23,652**	**133**	**81**
UA3PLS	"	1,856	54	29

FRANZ JOSEF LAND

UW3HY/1	**A**	**170,528**	**379**	**202**

KALININGRAD

UA2FJ	**7**	**1,132,148**	**859**	**384**
UA2EC	"	126,000	269	175
UA2FF	**1.8**	**84,420**	**250**	**124**

UKRAINE

RB5II	**A**	**881,474**	**1003**	**389**
RT4UA	**A**	**762,864**	**933**	**368**
RB5IA	"	376,908	728	294
UY5TE	"	305,216	669	251
UB5EF	"	199,290	519	210
RB5GM	"	149,730	374	230
UB5DW	"	141,482	322	218
UB5IAN	"	126,072	258	153
UB5IJZ	"	101,790	276	195
RB5AL	"	73,346	253	182
UB5ENI	"	48,670	201	155
UY5VA	"	48,442	171	106
UB5CCP	"	34,254	121	99
UT5UCM	"	1,222	26	26
RB4IRO	**28**	**21,423**	**185**	**111**
RT5UO	"	11,070	129	90
UB5VDO	"	9,744	108	84
RT5UY	"	8,494	72	62
UB5TAU	"	3,600	73	72
UB5INO	**21**	**141,132**	**395**	**228**
RB5QL	"	23,443	177	119
RB5IZ	**14**	**1,081,262**	**1100**	**457**
UB4DXX	**14**	**823,860**	**980**	**414**
UB5LAJ	"	787,572	1011	393
UB5IRM	"	642,060	921	348
UT5XW	"	316,920	530	278
UB5JS	"	157,586	344	247
UB5VK	"	139,380	314	230
UB5CN	"	138,212	334	218
UB5LAL	"	138,195	295	249
UB5MMR	"	121,975	361	205
UB5CBA	"	83,424	234	158
RB5JI	"	9,928	81	68
UB5WBS	"	8,330	99	70
UB5IIA	"	7,590	60	55

CONTINENTAL LEADERS

ASIA

1.8	UP3BP/UF	125,240
3.5	**UP2NK/UF**	**701,012**
7.0	UP3BI/UF	1,106,222
14	**UA9YE**	**1,711,080**
21	JF2EZA	272,750
28	JM1TUY	702
AB	UH8EAA	2,255,680

AFRICA

1.8	ZS6BCR	20
3.5	No Entry	
7.0	CT3ET	260,192
14	No Entry	
21	EA8BIE	40,735
28	No Entry	
AB	5Z4MX	2,922,318

NORTH AMERICA

1.8	VE3MFA	23,302
3.5	VE3BMV	311,080
7.0	**N5RZ**	**1,754,664**
14	N2AA	1,658,469
21	KA5W	64,750
28	KE5CV	5,544
AB	NP4CC	3,163,455

SOUTH AMERICA

1.8	No Entry	
3.5	No Entry	
7.0	PY2DP	181,412
14	**YX5A**	**3,016,155**
21	PY1CRP	44,100
28	4M7QP	15,972
AB	CE3DNP	1,492,705

EUROPE

1.8	LZ2CJ	93,800
3.5	I4IND	526,812
7.0	DF9ZP	1,998,372
14	YT3A	1,850,320
21	YT3L	514,150
28	YO3KWJ	96,882
AB	**YZ4GD**	**3,554,460**

OCEANIA

1.8	No Entry	
3.5	No Entry	
7.0	T32AF	1,249,176
14	AH2U	387,985
21	WH6W	57,939
28	No Entry	
AB	**KG6DX**	**1,556,640**

MULTI-SINGLE

AS	RL8PYL	3,504,039
AF	ZS1CT	453,645
NA	**HH2WW**	**5,050,032**
SA	No Entry	
EU	**LZ2KTS**	**6,658,796**
OC	No Entry	

MULTI-MULTI

AS	JA2YKA	4,573,585
AF	No Entry	
NA	**KL7Y**	**6,462,747**
SA	No Entry	
EU	OK7AA	8,440,839
OC	**KH6XX**	**8,551,399**

RB5VW	"	1,725	27	23
UB5WE	**7**	**756,658**	**700**	**343**
UB5INT	"	190,080	330	198
UB5WCG	"	174,048	325	196
UT5EH	"	110,842	260	157
UB5VAA	"	18,885	146	95
RB5IM	**3.5**	**488,557**	**795**	**257**
RB5BA	**3.5**	**305,970**	**530**	**235**
UB5WF	"	179,552	428	181
UB5FAN	"	88,404	295	139
UB5MLP	"	48,760	188	106
UB5EEP	"	42,436	372	103
UB5IHQ	"	36,260	169	98
HB5XBD	"	1,456	36	26
UB5ZAL	**1.8**	**41,600**	**178**	**100**
UB5LCV	"	18,620	112	70
UB5WCQ	"	18,224	117	67
UB5IJA	"	7,462	66	41

BYELORUSSIA

UC2OR	**A**	**1,223,684**	**1153**	**548**
UC2OM	"	105,651	301	189
UC2ACZ	"	71,133	213	181
RC2AM	**21**	**182,880**	**563**	**254**
UC2AIU	**14**	**676,984**	**829**	**392**
UC2OBB	**3.5**	**98,908**	**312**	**136**
UC2WO	"	17,040	132	60

MOLDAVIA

UO5OO	**A**	**161,856**	**424**	**192**
UO5ODA	"	116,580	307	201

LITHUANIA

UP2BR	**A**	**758,461**	**1029**	**361**
UP3BU	**A**	**570,418**	**1005**	**323**
UP2PAQ	"	352,420	693	263
UP2BZ	"	268,073	612	221
UP2BN	"	251,845	479	241
UP2OQ	"	170,361	449	207
UP3BA	"	113,088	260	152
UP2BNY	"	94,080	265	140
UP2BOS	"	64,680	248	110
UP2BLV	"	63,788	293	148
RP2BIT	"	46,592	202	104
UP2BBF	**28**	**2,398**	**56**	**43**
UP2BIC	**21**	**53,956**	**268**	**164**
UP2ND	"	8,932	106	77
UP2PBM	"	187	13	11
UP2BO	**14**	**195,546**	**411**	**218**
UP2BNC	"	92,664	296	198
UP2BIM	"	73,920	247	176
UP2BLF	"	42,957	211	129
UP3BE	"	28,272	190	114
UP2BON	**7**	**147,600**	**301**	**180**
UP2BOW	"	19,760	94	76
UP3BX	**3.5**	**240,352**	**535**	**203**
UP2BHN	"	174,600	413	180
RP2BID	**1.8**	**680**	**22**	**17**

LATVIA

UQ2PQ	**A**	**849,505**	**1292**	**367**
UQ2GIP	**A**	**223,720**	**432**	**238**
UQ2GLW	"	57,120	226	140
UQ2GBJ	"	19,610	130	74
UQ2GP	**28**	**1,470**	**42**	**35**
UQ2GN	**3.5**	**235,170**	**501**	**201**
UQ2GGP	"	99,360	319	138
UQ2GNL	**1.8**	**6,348**	**70**	**46**

ESTONIA

UR2RNG	**A**	**40,519**	**259**	**217**
RR2RW	**14**	**335,800**	**621**	**292**
RR2RU	"	105	7	7
UR2RLR	**7**	**1,428**	**19**	**17**

OCEANIA

AUSTRALIA

VK2APK	**A**	**902,589**	**739**	**309**
VK4XA	**A**	**442,962**	**599**	**234**
VK6DU	**A**	**305,218**	**415**	**191**
VK3DNC	**A**	**115,800**	**212**	**150**
VK5ATU	**A**	**15,561**	**92**	**63**
VK5AGX	**14**	**42,401**	**141**	**109**
VK4TT	**14**	**36,955**	**139**	**95**
VK3JI	**14**	**24,444**	**101**	**84**
VK2BQQ	**7**	**1,040**	**14**	**13**

GUAM

KG6DX	**A**	**1,556,640**	**1234**	**345**
AH2U	**14**	**387,985**	**569**	**235**

HAWAII

AH6AZ	**A**	**1,268,179**	**1065**	**341**
AH6J	"	2,507	23	23
WH6W	**21**	**57,939**	**215**	**93**
KH6WT	"	45,240	155	104

KIRIBATI

T32AF	**7**	**1,249,176**	**780**	**276**

NEW ZEALAND

ZL1AIZ	**A**	**90,675**	**130**	**117**

PHILIPPINES

K1BAZ/DV1	**A**	**354,552**	**571**	**187**
DX1N	A	231,380	503	230
DV1TV	**14**	**53,393**	**173**	**107**

SOUTH AMERICA

ARGENTINA

LU6EF/D	**A**	**553,773**	**575**	**291**
LU1EWL	"	269,952	358	222
AZ8DQ	**14**	**1,434,630**	**1132**	**435**
LU1HUC	"	430,900	543	278

BRAZIL

PY1AJK	**A**	**225,185**	**434**	**287**
PT2KT	**A**	**119,360**	**215**	**160**
ZV2ACZ	"	73,190	192	130
PY3BC	"	24,412	91	68
PY1CRP	**21**	**44,100**	**146**	**105**
		(Op. PY1APS)		
PY2OHJ	"	1,656	25	23
ZW4OD	**14**	**1,101,447**	**948**	**391**
PY2RLQ	"	24,882	100	87
PY2DP	**7**	**181,412**	**207**	**154**

CHILE

CE3DNP	**A**	**1,492,705**	**1082**	**395**

NETHERLANDS ANTILLES

PA0JLS/PJ2	**A**	**555,840**	**598**	**288**

VENEZUELA

4M7QP	**28**	**15,972**	**82**	**66**
YX5A	**14**	**3,016,155**	**1819**	**557**
		(Op. YV5ANT)		
YV4ABR	"	219,145	365	205

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

NA5R	**3,907,730**	**1972**	**655**
AI6V	**2,761,048**	**1776**	**568**
KN6M/5	2,628,540	1739	612
WC4E	**2,503,656**	**1561**	**603**
N7TT	**2,353,176**	**1502**	**522**
KU2C	**2,172,942**	**1467**	**549**
AK6A	1,872,570	1343	482
NU6S	1,728,650	1288	449
NI8V	**1,705,546**	**1409**	**547**
WC6I	1,471,269	1141	401
AK6T	1,007,216	917	368
AC8W	855,800	897	440
KS9O	**740,625**	**592**	**395**
KJ8G	**692,730**	**865**	**387**
KJ6V	654,126	740	374
KM9W	285,820	517	310
N3BNA	**206,118**	**357**	**297**

NORTH AMERICA

HH2WW	**5,050,032**	**2552**	**624**
4U1UN	**857,493**	**837**	**351**

AFRICA

ZS1CT	**453,645**	**573**	**255**

ASIA

JA3YBF	**2,559,987**	**1583**	**549**
JE2YRD	**2,161,072**	**1462**	**496**
JA9YBA	1,926,348	1458	458
8J7ITU	1,592,481	1683	451
JA1YBK	1,541,320	1199	440
JA1YFG	1,394,155	1135	427
JH7YJF	1,356,583	1223	401
JA1YAD	1,048,590	934	382
JA1YXP	648,600	798	376
JA7YCQ	386,974	533	262
JA7YAF	200,304	377	208
JA1YAL/1	3,293	38	37

EUROPE

LZ2KTS	**6,658,796**	**3268**	**745**
EA3VY	**4,342,005**	**2618**	**639**
HG5A	**4,051,974**	**2719**	**619**
HG7B	3,568,866	2522	597
GB2MM	**3,542,175**	**2249**	**585**
HG9R	3,488,772	2513	574
HG6N	3,445,542	2527	603
IO3FIY	**2,928,360**	**1969**	**552**
OH1AF	**2,507,490**	**2021**	**555**
OG3AA	2,454,031	2197	529
IO2UIY	2,445,232	1962	536
HG6V	2,213,640	1814	559
HA7KLG	2,155,500	1793	500
7S7SSA	**2,023,287**	**1899**	**497**
HB0/DK1II	**1,762,050**	**1999**	**425**
HA5KKC	1,638,686	1658	469
SP5PBE	**1,567,980**	**1514**	**465**
YT2O	**1,515,980**	**1378**	**458**
SP2ZFJ	1,502,549	1571	421
GB4OPE	1,412,218	1157	654
HA1KRR	1,337,300	1461	430
DK8XA	**1,214,488**	**1495**	**407**
HA8KVK	1,202,243	1335	413
SP7KTE	964,712	1310	392
SK6EI	905,795	1248	383
OK5SSM	**841,616**	**1179**	**368**
HA6KNX	712,602	954	366
OH9AB	537,550	1015	325
HA5KDB/2	528,668	858	316
OZ8JYL	**477,680**	**1007**	**280**
IV3IQY	405,099	666	309
PA3DQW	**380,948**	**670**	**262**
OK2KMR	288,288	532	264
PA3BDK/LX	**251,082**	**616**	**234**
HA3KNA	223,863	414	213
OK3KGO	141,024	461	208
SP1KIZ	112,093	343	197
LZ1KOZ	76,258	307	182
YU4JLM	74,572	446	103
OK1KQJ	54,627	146	131
OK3KSO	51,729	202	129
YU2CAH	48,816	151	108
OK1KAY	42,368	168	128
OK1OXP	31,185	137	105
OH2AQ/OH8	**29,800**	**200**	**100**
OK2KZC	11,625	98	75
OK1KPZ	7,988	54	52
OK1ORA	2,380	31	28
SP2KAE	1,428	34	28

U.S.S.R. CLUB STATIONS

ASIA

RL8PYL	**3,504,039**	**2138**	**539**
UZ9FWR	**3,273,210**	**2000**	**486**
UL8LWO	2,473,790	1645	430
UZ8CWA	**1,728,969**	**1598**	**433**
UZ9XWW	1,109,479	975	353
UZ0LWX	525,748	834	376
UZ0FWD	295,431	781	219

EUROPE

UP1BZZ	**4,998,336**	**2875**	**672**
UR1RWX	**2,359,215**	**2189**	**509**
UQ1GWW	**2,343,470**	**2075**	**529**
UP1BZO	2,129,986	1868	502
UP1BZG	1,814,332	1720	481
UB4XWB	**1,594,768**	**1436**	**491**
UP1BZR	1,435,570	1419	445
UB4CWW	1,419,552	1490	432
UT4JWB	1,107,239	1569	431
UZ1AWT	**1,078,484**	**1002**	**386**
UB4IZA	1,057,128	1232	408
UZ1AWW	877,680	1226	368
UZ3QYN	861,488	1310	368
UZ1AWO	649,642	1065	343
UP1BWW	568,242	955	306
UB4JWT	517,080	860	278
UZ3DZA	455,886	853	279
UZ3AWP	453,176	900	296
UB4IWI	346,299	698	267
UQ1GWX	186,806	335	262
UZ3DXW	139,778	552	162
UZ3TWJ	77,586	311	201
UZ4HWS	39,093	157	95
UZ3DWX	27,913	118	103
UB4IWB	11,946	73	66
UZ3TWT	663	17	17

MULTI-OPERATOR MULTI-TRANSMITTER

KH6XX	**8,551,399**	**3607**	**647**
OK7AA	**8,440,839**	**4649**	**759**
KL7Y	**6,462,747**	**3101**	**621**
YU1ELM	**4,619,202**	**3348**	**654**
JA2YKA	**4,573,585**	**2524**	**589**
NM5M	**4,302,972**	**2669**	**711**
JA7YAB	1,976,316	1369	471
YU4EZC	1,077,234	1225	453
K6XO	**502,588**	**595**	**323**
JA4YJA	172,634	323	209
JA2YEF	37,628	133	92

CHECK LOGS: The following logs were used for cross-checking. Check logs and SWL logs are always appreciated. Thank you.
4N0D, 7S4SSA, 7SL5ZYB, DL1JF, EA8AGH, HA5CW, HA7KNT, JT1AO, K0SW/M, KH6JOI, LA0EH, LA3BX, LA4NE, LA8CE, LA9XG, LZ1EO, LZ1IA, LZ1KAU, LZ1KAZ, LZ1KSN, LZ1TR, LZ2KAF, LZ2KOZ, LZ2KSB, N4PN/WW4, N6UW, N7CEE, OH5FA, OH6ZH, OH7EU, OH8ZX/2, OK1DRQ, OK1DWJ, OK1US, OK2IL/P, OK3-28011, OZ1FFG, OZ1JNR, OZ1NF, OZ2JZ, OZ5MJ, OZ5PA, OZ7JLX, PA0UV, PY10L, PY1RN, PY2OO, PY2WR, RA0SS, RA1AO, RA1ASK, RA2FA, RA3AR, RA3EA, RA3EF, RA3IG, RA3VO, RA3VR, RA3VV, RA4AG, RA6AF, RA6AHA, RA9HA, RA9YG, RB5HB, RB5LM, RB5UA, RL7GC, RL7GE, RW3AL, SM2NTU, SM5APS, SM6CDN, SM7KWE, SP2GUV, SP2ZT, SP3BYZ, SP3FDD, SP4DGN, SP4ZHX, SP6CYX, SP6HEK, SP6LK, SP7DTP, SP8FNA, SP8GSC, SP8JMA, SP8KAF, SP9ADY, UA0AAB, UA0IDF, UA0KAV, UA0KCL, UA0QO, UA0SBQ, UA0ZC, UA0ZDK, UA1AUA, UA1OB, UA1OGA, UA1QBV, UA2FM, UA3AAJ, UA3DAT, UA3DFV, UA3DMY, UA3DQS, UA3DRC, UA3DTT, UA3IAK, UA3ICX, UA3IDT, UA3LCC, UA3MBE, UA3MDX, UA3MED, UA3PB, UA3RAO, UA3RDG, UA3TAM, UA3UAR, UA3VAN, UA4ANZ, UA4CDX, UA4CGZ, UA4CLT, UA4CM, UA4HDV, UA4HKJ, UA4HLD, UA4LDJ, UA4NBD, UA4QK, UA4SDA, UA4SSS, UA4WAP, UA4YA, UA4YZ, UA6ADM, UA6LKC, UA6PCH, UA6YCI, UA6YW, UA9AGY, UA9FKZ, UA9SIO, UA9TS, UA9XAB, UA9XR, UA9YAR, UB4SWM, UB5FDG, UB5GJP, UB5IS, UB5KBV, UB5SBR, UC1AWD, UC2LB, UF6FIB, UL7BB, UL7GAV, UM8MFA, UM8MM, UM8MU, UO5OJM, UQ1GXX, UQ2GCV, UQ2GLQ, UR2ZN, UV3ABC, UV9CJ, UV9DO, UW4HL, UW9YI, UY5GG, UY5YY, UZ0AWB, UZ0IWO, UZ0QWE, UZ0QWN, UZ2FWA, UZ3DWH, UZ4SWN, UZ9AXT, UZ9XWA, VE1ACK, VE7AHB, Y21DC, Y21XH/A, Y22DD, Y22TD, Y22TO, Y23BF, Y23OJ, Y24EA, Y25GH/A, Y25MG, Y25SM, Y26KI/A, Y26ML, Y38YE, Y42WB, Y43HM, Y51XG, Y51XJ, Y73WH, Y75ZH/A, YB4FNN, YO3ABL, YO8RL, YU7BJ.

Here's how to build an inexpensive endless tape loop that will let you extend your recording and listening time.

A Cheap and Easy Endless Tape Loop

BY ARIC KECK*, KN8P, AND CHUCK SENATORE**, KN8R/3

Do you hate showing up at work on Mondays with laryngitis, or at least a scratchy sore throat from the past weekend's contest? What you need to cure your problems is not a gallon of chicken soup, it's an endless tape loop.

The endless tape loop is a recording of your voice used for sending CQ's or passing along required exchange information. Just as its name implies, it is a loop of tape; thus there is no need for tedious rewinding, hence the name endless. Conventional tape loops are usually played on reel-to-reel tape decks, but the idea here is convenience and ease. This article will try to show how the cassette tape player can be utilized, and what advantages it has over a reel-to-reel deck.

The standard reel-to-reel deck is cumbersome and expensive compared to a cassette, which is relatively cheap, and best of all small, where space in today's contester's shack is a rare commodity. Also, the actual type of tape required for the cassette is less expensive and easier to work with.

For our cassette, a cheap 15 minute cassette will suffice. These can be obtained from Radio Shack and work very well for our purposes. If you get a different type of cassette, that will be fine also, as long as the tape is capable of voice reproduction. Some types of cassettes are held together by small screws; others are held together by a special manufacturing glue. Either tape will work, but when reassembling the glue-type cassette, it will have to be held together by some form of adhesive tape.

Now that we have our cassette picked out and laying in front of us, what next?

First, take the cassette housing apart, either by unscrewing the small screws or by carefully prying the glue cassette apart. Now that we have the housings apart, we will want to determine the length of tape required to record our message. The formular for this is: $1\frac{7}{8} \times$ Time (seconds) = tape length (in inches). As cassette speed of the tape is $1\frac{7}{8}$ inches per second and time is the length of our recorded message, you should try for a message time of 8 seconds or less, as the cassette housing will not hold much more than 15 inches of tape. Although 8 seconds does not sound like much, you would be surprised how much information can actually be exchanged in that period, and certainly a time period of 8 seconds is more than enough CQ time in a contest situation. If you find all of your information cannot be recorded in the allotted time period, you might try talking a bit faster or altering your message to cut out unnecessary information.

After we have our desired length calculated, we will want to pull out that length from the take-up spool in the cassette and cut to desired length. Take a small piece of adhesive tape and secure the remaining tape on the cassette to its take-up spool. This will be used later for adjusting the tension on the loop itself.

Splice the two loose ends on the loop together with either a special splicing or plain ordinary adhesive tape. Make sure to trim off the excess splicing tape that may be hanging over the side of spliced ends. When splicing, make sure that there are no twists in the loop and that the dull side of the tapes are facing outwards; this will be the side used for recording.

Feed the loop around the two roller guide wheels located on either side of the housing, and up and around both take-up wheels. This is illustrated in fig. 1. Now, check the tension on the loop. If the loop will not fit around both take-up spools, unwind some tape off of one take-up spool an cut. Be sure to refasten the loose end back to its take-up spool. The tape should not have very much tension on it, and it must be allowed to run smoothly around all corners. Keep altering the take-up spool's diameter until this tension is obtained. The reason the tape loop should not be too taut is that on some of today's cassette players there is a device called automatic shut-off, where the player will automatically shut the play button off when the end of the cassette is reached. The automatic shut-off determines this by tape tension.

If the cassette is unable to move, check tape tension. On the other hand, there must be some amount of tension to cause the recording head to pick up any record-

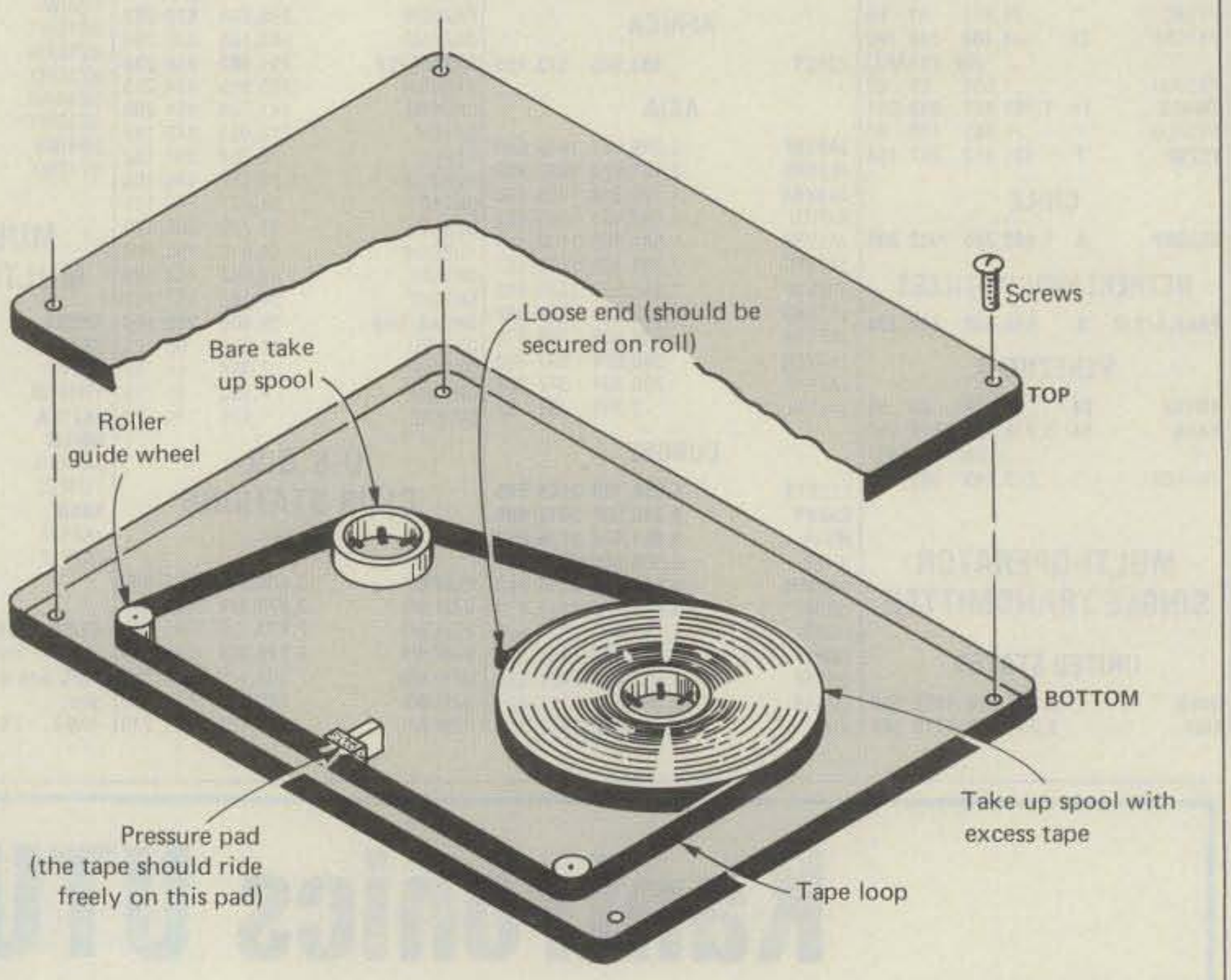

Fig. 1– As shown, feed the loop around the two roller guide wheels located on either side of the housing, and up and around both take-up wheels.

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

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- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
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CIRCLE 42 ON READER SERVICE CARD

ed information and play it. Try experimenting until the happy medium is obtained, as different recorders require different amounts of tension for the automatic shut-off feature to be activated. To check desired tension, the tape will have to be put in the recorder, so by temporarily taping the housings together, the cassette will stay assembled. If still more tape needs to be taken off, simply remove the housing tape and cut off more tape from the take-up spool. It should be noted that the loop tension is not that critical; as long as the loop works for your particular cassette recorder, it will not damage the recorder.

Now that the loop works in the recorder without any problems, we can reassemble the cassette housings totally, either by replacing all screws or, in the case of a factory-glued cassette, simply by securing both sides of the cassette housings with adhesive tape.

Try recording your desired message. The two take-up spools may not both turn, or both may turn; it does not affect the performance of the loop, as it is now totally independent of both take-up spools. After recording, and if playback sounds acceptable, we are ready to hook up the unit to our radio equipment. If you encounter problems, you may want to go back and check loop tension and make sure the loop is running around wheel guides, etc.

Your radio should have a phone-patch jack or something similar in order to activate your endless loop system. If you do not have a phone-patch jack, you will have to run the output from the recorder into the microphone jack through means of a "Y"-type connector, or you will have to fasten the wires directly to the microphone-jack terminals. For those with phone-patch jacks, we will want to make a patch cord from shielded cable. RG-58/U works great for this purpose, but any two-conductor cable can be used. Fasten a connector to one end of the patch cord so it can be plugged into the phone-patch "IN" jack on your radio. Second, cut the earpiece off an earphone jack. Attach the two wires from the earphone plug to the two wires on the patch cord. Polarity will not affect the performance in connecting the earphone wires to the patch cord. Now plug the ends of the patch cord into the phone-patch jack and the earphone jack. Press the "PLAY" button on the recorder. No output will be observed. To engage the loop to give output, the mic will have to be activated into the transmit mode. VOX can also be used. Adjust the recorder output so there is no appreciable audio output difference from the cassette recorder and your normal audio out. This is so your CQ audio and your normal "talk" audio will have virtually the same strength on the receive end. You can also adjust your VOX control for the recorder output so it will trip the VOX automatically whenever the cassette is being used.

If feedback seems to be getting in the recorder, you can wrap both ends of the patch cord around separate torroid coils.

You probably will want a remote switch for "hands off" operation during a contest. Some recorders have a REMOTE jack on them, which is set up for this purpose. A remote foot switch can be obtained at Radio Shack for a minimal charge to allow on-off switching by a foot pedal. This will come in handy particularly to allow the hands to be used for logging or other similar duties.

There can be many derivations from this basic design. In a particular case in which a processor such as the Ten-Tec type which has two different types of microphone plugs available is used, you can run a patch cord to one mic connector, allowing processing of both audio outputs.

This is obviously more inexpensive than a reel-to-reel system and requires only basic parts. It took approximately 20 minutes to construct, and it should more than make up for the meager effort to build it. The prototype model was constructed out of an old, dusty broken tape, and it is still going strong. You will find this will be a real asset to have in your contesting shack, especially if you do a lot of CQ'ing. Aside from all of the obvious advantages listed, it gives a ham an extended period of time to listen to himself talk, and I haven't met a ham who doesn't like to do that! CQ

CIRCLE 20 ON READER SERVICE CARD

North is an illusive direction, and reference point. To really orient your antenna, it is important to know how to find North.

Which Way Is North?

BY WILLIAM A. BORCHERS*, K1WB

To the amateur using a beam antenna or any antenna with directivity it is important to know the antenna pattern relative to true North. True north is the direction of the earth's geographic North Pole from any location of earth. It is the point of reference for globes, maps and beam heading charts. A number of methods for finding the direction of true North are available[1] [2]. These are:

1. Maps
2. Compass
3. Pole Star (Polaris)
4. Meridian Passage

The use of these methods and their advantages and disadvantages in practice will be discussed in this article. In the author's opinion the most satisfactory method is the meridian passage and a computer program to assist in its use is presented.

Before discussing the individual methods in detail some consideration of the practice of establishing direction is in order. Amateurs are generally interested in determining either true North for calibrating a rotator or finding the direction of lobes or nulls of a fixed antenna. While either of these directions can be established by any of the methods listed above, the best method to use is the one which provides a direct measurement taken at the point of interest and requiring no further correction. Unfortunately this ideal situation only occurs with the establishment of true North by Polaris or meridian passage or in rare instances when sighting mapped objects which just happen to be located in the desired direction. All other situations involve corrections, transferral or further angular measurement form the reference direction with a protractor or other device. For this reason, the author believes that the best method of establishing direction is the meridian passage of the sun.

Maps

Maps are used in two ways to find direction. In one instance a map establishes a reference direction (such as from a street) and that direction is then used as a reference to establish true North or another desired direction. In the second instance a map is used to establish the direction of a distant object for a sighting. The sighted direction in turn is used as the reference to establish true North or another direction.

Three types of maps can be used. **Geological Survey maps** published by the U.S. government are useful for either determing a reference direction or for establishing the direction of a sighting. In the former case the direction of a street or highway is often useful. In the later case the direction of distant objects visible from your location can be determined. Geological Survey maps show houses, buildings, and other prominent objects upon which a sighting can be made.

Local street maps may also be useful for either determining a reference direction (that of the street you're on) or a sighting if sufficient distance is involved.

Surveyor maps of your property almost always show the direction of your property line indicated from an established mark. In addition, the direction of the walls of your foundation are frequently indicated. Often directions are expressed on these maps in terms of North (or South)— so many degrees— East (or West). For example N45°E means 045° whereas N45°W means 315°.

The advantage of using a map is that reference directions, your location and that of objects to be sighted have been professionally determined. The disadvantage is that directions that can be established from a map suffer loss of accuracy when transferred to your antenna farm. In the case of a reference direction shown on a map it is first necessary to physically establish that direction in or near your antenna farm. The reference direction must then be moved (translated) to the point of interest. The point of interest may be the base of a tower or the axis of an antenna array. Moving the reference direction to the point of interest, a protractor is then used to establish true North or another desired direction.

Obviously a sighting from the point of interest is preferrable to translating a reference direction. Even a homemade sighting device can have less error than would be involved with translating a reference direction. After marking the sighted direction it is then necessary to employ a protractor to establish true North or any other direction.

Compass

A compass is used by taking it to the point at which you wish to determine a direction and reading the compass. While this seems a simple thing to do there are a number of considerations that offset it's convenience. First, for accuracy a reasonable size (and priced) compass is required. A small inexpensive compass is usually not satisfactory for two reasons. Only larger compasses have sufficient (every two degrees) scale graduations. Further, a small compass often has sufficient friction in its mounting such that it will come to rest a few degrees off in an unpredictable manner. Second, a compass points to the earths magnetic North Pole which is not the same as the geographic North Pole (the basis for true North). This difference is called **variation** and is a function of your location. Variation can be determined from Geological Survey maps on which it is expressed in degrees east or west. If the variation is east then the compass points to the east of true North. Or, true North is the number of degrees of variation west of the magnetic North to which your compass points. Third a magnetic compass is affected by the presence of ferro-magnetic materials, primarily iron and carbon steel. The resulting error is called **deviation** and its size is a function of the mass of the ferro-magnetic material and the distance of the compass from it. This error may not be significant in the middle of a field, but can be quite large in the proximity of a steel tower. Thus while the primary advantage of a compass is that it can be taken to the point of interest,this is not so if the point of interest is the base of a steel tower. To obtain a true North

*460 Hale St., Suffield, CT 06078

```
10 REM      APASS
12 REM      COPYRIGHT 1984
14 REM      W.A.BORCHERS
100 CLS
135 PRINT @ 104,"INPUT LONGITUDE"
140 PRINT @ 172,"DEGREES"
145 PRINT @ 204,"MINUTES"
150 PRINT @ 236,"SECONDS"
155 INPUT L1,L2,L3
160 L=L1+L2/60+L3/3600
165 CLS
170 PRINT @ 104,"INPUT TIME ZONE"
175 PRINT @ 173,"A. AST"
180 PRINT @ 205,"B. EST"
185 PRINT @ 237,"C. CST"
190 PRINT @ 269,"D. MST"
195 PRINT @ 301,"E. PST"
200 INPUT AN$
205 A=ASC(AN$)-64
210 IF A<1 THEN 200
215 IF A>5 THEN 200
220 ON A GOTO 225,230,235,240,245
225 Z$="AST":GOTO 250
230 Z$="EST":GOTO 250
235 Z$="CST":GOTO 250
240 Z$="MST":GOTO 250
245 Z$="PST":GOTO 250
250 CLS
255 PRINT @ 4,"INPUT CALCULATION MONTH"
260 PRINT @ 66,"(INPUT FIRST THREE LETTERS)"
265 INPUT N$
270 CLS
300 C=15*(A+3)
305 LC=(L-C)*4
310 M$="JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC"
315 FOR I=1 TO 36 STEP 3
320 Y$=MID$(M$,I,3)
325 G=(I+2)/3
330 ON G GOTO 335,345,335,340,335,340,335,335,340,335,340,335
335 F=31:GOTO 350
340 F=30:GOTO 350
345 F=28:GOTO 350
350 FF=FF+F
355 IF Y$=N$ THEN 365
360 NEXT
365 GG=FF-F
370 FOR J=1 TO GG:READ D:NEXT
375 PRINT "LONG.-";L1;"DEG";L2;"MIN";L3;"SEC"
380 PRINT "TIME ZONE-";Z$
385 FOR K=1 TO F
390 READ D
395 E=LC+D
400 IF E>60 THEN 425
405 IF E<-60 THEN 430
410 IF E>0 THEN 435
415 T=1160-ABS(E)
420 GOTO 440
425 E=E-60:T=1300+E:GOTO 440
430 E=E+60:T=1060-ABS(E):GOTO 440
435 T=1200+E
440 IF T-INT(T)>.5 THEN 455
445 T=INT(T)+1
450 GOTO 460
455 T=INT(T)+1
460 IF T=1260 THEN T=1300:GOTO 475
465 IF T=1160 THEN T=1200:GOTO 475
470 IF T=1060 THEN T=1100:GOTO 475
475 PRINT Y$;K,T
480 IF K>12 THEN 485 ELSE 490
485 BN$=INKEY$:IF BN$="" THEN 485
490 NEXT
900 DATA 4.4,4.8,5.2,5.4,5.6,6.0,6.6,7.0,7.6,8.0,8.2,8.8,9.4,9.7,10.0,10.3,10.5,
10.8,11.0,11.1,11.3,11.4,11.7,11.8,12.0,12.2,12.5,12.7,12.8,13.0,13.1
905 DATA 13.2,13.4,13.6,13.7,13.8,13.9,14.0,14.0,14.0,14.0,14.0,14.0,14.0,14.0,1
4.0,14.0,14.0,14.0,14.0,14.0,13.9,13.7,13.6,13.4,13.4,13.2,13.1,13.0
910 DATA 12.8,12.7,12.5,12.3,12.2,12.0,11.7,11.4,11.2,10.9,10.6,10.2,10.0,9.7,9.
4,9.0,8.7,8.4,8.0,7.8,7.5,7.2,7.0,6.7,6.4,6.0,5.8,5.4,5.1,4.9,4.6
915 DATA 4.3,4.05,3.8,3.5,3.2,2.9,2.6,2.3,2.0,1.7,1.4,1.2,.8,.4,0.0,-.3,-.4,-.5,
-.7,-.8,-.9,-1.0,-1.2,-1.3,-1.5,-1.7,-1.9,-2.1,-2.3,-2.4
920 DATA -2.6,-2.7,-2.8,-2.9,-3.2,-3.3,-3.5,-3.6,-3.7,-3.8,-3.9,-3.9,-3.9,-3.9,-
4.0,-4.0,-4.0,-3.9,-3.9,-3.8,-3.7,-3.6,-3.6,-3.5,-3.5,-3.4,-3.3,-3.2,-3.1,-3.0,-
2.9
925 DATA -2.8,-2.7,-2.5,-2.4,-2.3,-2.2,-2.0,-1.7,-1.5,-1.3,-1.0,-.8,-.6,-.4,-.1,
.1,.3,.5,.8,1.0,1.2,1.4,1.6,1.8,2.1,2.3,2.5,2.7,2.9,3.1
930 DATA 3.4,3.5,3.7,3.9,4.1,4.3,4.5,4.7,4.9,5.0,5.2,5.4,5.6,5.7,5.9,6.0,6.1,6.1
,6.1,6.1,6.1,6.2,6.2,6.2,6.2,6.2,6.2,6.2,6.2,6.2,6.2,6.2,6.2935 DATA 6.1,6.1,6.1,6.1,6.1,6.0
,5.9,5.7,5.5,5.3,5.0,4.8,4.6,4.4,4.2,4.0,3.8,3.6,3.4,3.2,3.0,2.8,2.5,2.2,2.0,1.7
,1.5,1.2,.9,.6,.4,.2
940 DATA .1,-.3,-.6,-1.0,-1.2,-1.7,-2.0,-2.4,-2.7,-3.0,-3.2,-3.8,-4.3,-4.6,-5.0,
-5.4,-5.8,-6.2,-6.6,-7.0,-7.4,-7.6,-8.0,-8.4,-8.7,-9.0,-9.4,-9.6,-10.0,-10.2,-10
.5
945 DATA -10.6,-10.8,-11.2,-11.4,-11.7,-12.0,-12.3,-12.5,-12.7,-13.0,-13.2,-13.4
,-13.6,-13.8,-14.0,-14.2,-14.4,-14.6,-14.8,-14.9,-15.1,-15.2,-15.3,-15.4,-15.5,-
15.6,-15.7,-15.8,-15.9,-15.9,-15.9
950 DATA -16.0,-16.0,-16.0,-16.0,-16.0,-16.0,-15.9,-15.9,-15.9,-15.8,-15.7,-15.6
,-15.5,-15.4,-15.2,-14.9,-14.7,-14.4,-14.1,-13.8,-13.6,-13.3,-12.6,-12.4,-12.0,-
11.7,-11.4,-11.1,-10.7
955 DATA -10.4,-10.1,-9.8,-9.4,-9.2,-8.8,-8.4,-7.8,-7.4,-6.9,-6.6,-6.2,-5.8,-5.4
,-5.0,-4.4,-3.9,-3.2,-2.8,-2.4,-1.9,-1.3,-.8,-.2,.3,.8,1.4,2.0,2.5,3.0,3.6
```

Table I - Program listing.

reference for a tower using a compass requires taking the compass to a point where it is not influenced by the tower. The tower is then sighted using the compass. The sighting is extended to the tower by means of a taut string and the reference direction is marked at the base of the tower. The marked reference direction is then corrected for variation to obtain a true reference direction. This, of course, neglects deviation which is assumed to be small at a distance from the tower.

Pole Star (Polaris)

The pole star (Polaris) is always located within 1 degree of the geographic North Pole. As such, an accurate sighting on it provides an accurate true North reference. There are, however, practical problems with this method. First, Polaris is sometimes difficult to locate since it is not a particularly bright star. Second, its altitude above the horizon makes obtaining a bearing in the plane of your antenna farm difficult. Third, you must work at night to obtain your true North reference line and often you're left with transferring it the next day to the point of interest.

Meridian Passage

When the sun crosses your meridian of longitude it is due south of you. Hence, the shadow cast by a vertical object will bear true North. The method therefore is to be at the place you wish to establish a true North reference line with a vertical object such as a pole or plumb line at the time the sun crosses your meridian. If you wish to establish a true North reference for your tower it can serve as the vertical object. To determine the time of meridian passage requires only a simple calculation. The calculation involves two corrections to your local standard time (the time to which most people in your time zone set their watch). First you must correct for the difference between your actual longitude and that of the standard meridian for your time zone. This amounts to 4 minutes of time per degree or longitude and is added to your standard time if you are west of the standard meridian and subtracted if you are east of the standard meridian. Second you must apply a correction which accounts for the fact that the earths orbit about the sun is elliptical and not circular. This correction is tabulated in the references and can also be found in the *Farmers Almanac* entitled "Sun on Meridian- Civil Time." This correction varies between plus and minus 15 minutes during the year. The calculation is explained in more detail in the following section.

The advantage of the meridian passage method is that it can be used anywhere the sun shines to get a direct true North reference. And, only a protractor or other angular measurement device is required to go from the reference to any

```
LONG.- 72 DEG 40 MIN 0 SEC
TIME ZONE - EST

DEC 1     1141
DEC 2     1141
DEC 3     1141
DEC 4     1142
DEC 5     1142
DEC 6     1142
DEC 7     1143
DEC 8     1143
DEC 9     1144
DEC 10    1144
DEC 11    1145
DEC 12    1145
DEC 13    1145
```

Table II - Sample output.

other desired direction. The disadvantages are that the sun doesn't shine every day and that meridian passage occurs only one per day.

Computer Program

Feeling that it would be handy to have a tabulation of the time of meridian passage for a full year, a computer program was written to do it. The program was written for the Radio Shack® Color Computer in BASIC. With some modification it will no doubt run on other computers.

As originally conceived and written the program provided a printed tabulation of the time of meridian passage for a full year. The tabulation was printed on one and a half pages. Since a considerable amount of coding was associated with producing the compact printout and input error checking, the resulting listing was rather long. To make the listing a more reasonable length for publication, the printer control and input error statements were eliminated and the output changed to one months worth per run printed on the screen. If anyone is interested in the full program and/or a printout for their QTH it can be supplied by the author[3].

A listing of the program which is entitled APASS is provided in Table I. Referring to the listing, statements 100 thru 270 accept the input longitude, time zone and month for which output is desired. Statements 300 thru 490 perform the calculation and display the output. The day by day correction to account for the earths elliptic orbit is tabulated in DATA statements 900 thru 955. Each DATA statement contains a months worth of corrections. The correction values contained in the DATA statements were obtained graphically by connecting the points for which values were supplied in the references and the *Farmers Almanac*. A more accurate method would be to use the *American Nautical Almanac*.

There are no input error checking statements in the program. This is not a serious ommision since only a minimum of input is required and the input is completely repeated in the output. One caution of importance is that the input month must be the same three letter abbreviation used in the program. This is emphasized on the input screen. Table II provides a sample output. The output is presented in Standard Time. The output must be corrected by the user if Daylight Savings Time is in effect. In most places this amounts to adding one hour.

Running the program is simple. After loading it and typing RUN, you are prompted for input. After inputting the month of interest the program calculates and displays the time of meridian passage for the first 13 days of the selected month. Each time you want to see an additional day you merely tap any key and the next day will appear on the bottom line as the output scrolls up.

References

[1] ARRL Antenna Book.

[2] "Amateur Antenna Tests and Measurements," Harry D. Hooton, W6TYG, Howard W. Sams, 1977.

[3] A computer listing and/or printout for your QTH can be supplied by the author. One dollar for postage and handling is required. Please specify if you want the listing, printout or both. If a printout is requested please provide your call letters, longitude and time zone. Send to William A. Borchers, 460 Hale St., Suffield, CT 06078.

CQ REVIEWS:

The Kenwood Model TS-940S HF Transceiver

BY JOHN J. SCHULTZ*, W4FA/SV0DV

Kenwood advertises the TS-940S as a "serious radio for the serious operator." Well, after putting a TS-940S through various bench checks and a lot of on-the-air operating, I would completely agree with Kenwood's description. But, I would also hasten to lighten the slightly somber tone of that quote. Besides being a "serious" radio, the TS-940S is also a delightful radio to operate. I would suggest two perspectives if you might be interested in a TS-940S:

1. If you are a really experienced amateur and are looking for the "ultimate" transceiver in the less than $2,000 price range, the TS-940S deserves immediate, serious consideration. This article will try to describe the transceiver as fully as possible and highlight its strong and weak points, although some of those points are bound to be subjective.

2. If you are not yet a really experienced operator but would like to avoid several station setup changes as you progress and, of course, if the price tag is acceptable, the TS-940S deserves real consideration. The basic radio is very easy to operate and you can initially forget all the "bells and whistles" built into the radio ("versatility" is, I'm sure, the word Kenwood would prefer to see in print) until you progress a bit. Then you'll find that what appears to be "bells and whistles" are really fine operating features.

General

The TS-940S is what I would call a "full size" transceiver. It weighs in at about 44 lbs. (the power supply is built-in); measures about 40 cm wide, 15½ cm high, and 35 cm deep; and the knobs, switches, etc., on the front panel are very comfortably spaced.

Table I gives the manufacturer's specifications for the TS-940S. I realize that some readers feel that the presentation of such data is academic. However, I would suggest otherwise. Manufacturer's advertisements often don't have the space to present such data, and by studying the specifications one can really learn quite a bit about a transceiver and what

*c/o CQ Magazine

The TS-940S here is almost overshadowed by the microphones in the foreground. Although it has plenty of controls and switches, the TS-940S is basically simple to operate. The Kenwood microphones tested with the TS-940S are the MC-80, MC-60, and MC-85. The MC-80 and MC-85 have been modified slightly in that their microphones were removed and mounted on a separate boom.

standard performance is claimed for it without special options.

In general, the specifications for the TS-940S present it as a full-coverage 160–10 meter transceiver with general-coverage receive (150 kHz to 30 MHz), 250 watts input on SSB, CW, FSK, and FM (140 watts on AM), excellent transmit IMD at −37 dB, excellent SSB/CW sensitivity, variable bandwidth tuning on SSB and CW, variable notch filter, etc.

Although I think the specifications are worth reading, as I just mentioned, they really have to be supplemented by some more information if one is going to get some idea of the features contained in the TS-940S. Some special features of the transceiver are as follows (most will be elaborated upon later):

1. A digital frequency readout displaying to the nearest 100 or 10 Hz (selectable) supplemented by a quasi-analog display displaying a spread of 100 or 1000 kHz (selectable) and a separate digital display for RIT or XIT ranging from −9.9 kHz to +9.9 kHz.

2. Completely separately selectable dual VFO's with provisions to transfer data between them.

3. A total of 40 memory channels (frequency plus mode) with very easy provisions to transfer data to and/or from them to one of the VFO's.

4. Keyboard entry of frequencies into either VFO.

5. Memory and other scanning functions.

6. Dual noise blankers with threshold adjustment.

7. Squelch active on all modes.

8. A unique LCD sub-display which can be switched to display real time, programmable transceiver on/off times, frequencies and modes stored in the VFO's, and memories or the relative setting of the SSB or CW variable bandwidth controls.

9. Semi or full break-in on CW.

10. Extremely easy tune-up, especially if the optional AT-940 automatic antenna tuner is installed.

11. A very effective, true RF-type speech processor.

12. An efficient cooling system with a truly quiet fan.

13. Separate "pitch" and "AF Tune" controls on CW, which I think one can safely translate as old-fashioned "BFO" and "audio peaking" controls.

14. A full array of rear-panel conectors for any possible interconnection to linear amplifiers, transverters, phone-patches, remote-control devices, etc.

15. Rugged mechanical construction.

Besides all of that, the TS-940S will interface with a variety of optional accessories ranging from an internal automatic antenna tuning unit to various CW/AM filters to various base station microphones. Many of the optional accessories were tested and will be described.

Circuitry

Fig. 1 shows a block diagram of the unit. In general terms one can see that the transceiver circuitry is divided into various functional blocks. The RF Unit processes both the receive and transmit signals. The receive signal is routed through any one of nine diode switched bandpass filters (the bandpass range

[GENERAL]	
Transmitter Frequency Range:	160 m Band 1.8 ~ 2.0 MHz 80 m Band 3.5 ~ 4.0 MHz 40 m Band 7.0 ~ 7.3 MHz 30 m Band 10.1 ~ 10.15 MHz 20 m Band 14.0 ~ 14.35 MHz 17 m Band 18.068 ~ 18.168 MHz 15 m Band 21.0 ~ 21.45 MHz 12 m Band 24.89 ~ 24.99 MHz 10 m Band 28.0 ~ 29.7 MHz
Receiver Frequency Range:	150 kHz ~ 30 MHz
Mode:	A3J (USB, LSB), A1 (CW), F1 (FSK), A3 (AM), F3 (FM)
Frequency Stability	$\pm 10 \times 10^{-6}$ (–10°C ~ +50°C)
Frequency Accuracy	$\pm 10 \times 10^{-6}$ (Room temperature)
Antenna Impedance	50 ohms
With AT-940 Antenna Tuner	20 ~ 150 ohms (Transmission only)
Power Requirement:	120/220/240 VAC, 50/60 Hz
Power Dissipation:	Max. 510 W during transmission, 80 W during reception
Dimensions	W 401 × H 141 × D 350 mm (Projections Inc.) W 409 × H 154 × D 420 mm W 160.4 × H 56.4 × D 140 inch (Projections Inc.) W 163.6 × H 61.6 × D 168 inch
Weight	With antenna tuner: Approx. 20 kg (44.0 lbs) Without antenna tuner: Approx. 18.5 kg (41.0 lbs)
[TRANSMITTER]	
Rated Final Power Input	250W PEP (160 ~ 10 m bands in SSB, CW, FSK, FM) 140W (in AM)
Modulation	SSB: Balanced modulation FM: Reactance modulation AM: Low level modulation
Maximum Frequency Deviation	± 5 kHz
RTTY Shift	170 Hz
Harmonic Content	–40 dB or less (in CW)
Carrier Suppression	40 dB or more (with 1.5 kHz modulation)
Unwanted Sideband Suppression	Better than 50 dB (with 1.5 kHz modulation)
3rd order intermodulation	–37 dB or less (based on Single tone output)
Microphone Impedance	500Ω ~ 50kΩ
Frequency Response	400 ~ 2600 Hz at –6 dB in SSB
[RECEIVER]	
Circuitry	Quadruple conversion for SSB, CW, AM, FSK Triple conversion for FM
Intermediate Frequencies	1st IF: 45.05 MHz 3rd IF: 455 kHz 2nd IF: 8.83 MHz 4th IF: 100 kHz
Sensitivity	
150 kHz ~ 500 kHz	10 dB S/N 0 dBμ (1μV) or less in SSB, CW and FSK 10 dB S/N 20 dBμ (10μV) or less in AM
500 kHz ~ 1.8 MHz	10 dB S/N 12 dBμ (4μV) or less in SSB, CW and FSK 10 dB S/N 30 dBμ (32μV) or less in FM
1.8 MHz ~ 30 MHz	10 dB S/N –14 dBμ (0.2μV) or less in SSB, CW and FSK 10 dB S/N 6 dBμ (2μV) or less in AM 12 dB SINAD –6 dBμ (0.5μ) or less in FM
Squelch Sensitivity	–10 dBμ (0.32μV) or less
Image Ratio	80 dB or more in 1.8 – 30 MHz
IF Rejection	70 dB or more in 1.8 – 30 MHz
Selectivity:	
N: Denotes the filter setting is NARROW.	**W: Denotes the filter setting is WIDE.**
(SSB, CW, AM(N), FSK)	2.4 kHz/–6 dB 3.6 kHz/–60 dB
(AM (W))	6 kHz/–6 dB 15 kHz/–50 dB
(FM)	12 kHz/–6 dB 22 kHz/–60 dB
Variable Range	With SSB Filter
(SSB Slope Tune)	High-cut: 1500 Hz or more Low-cut: 700 Hz or more Without SSB filter
(CW VBT)	600 Hz ~ 2.4 kHz continuously variable
RIT/XIT Variable range	± 9.99 kHz
Notch Filter Antenuation	40 dB or more
Audio Output	1.5 W (at 8 ohm load/10% distortion)
Audio Load Impedance	8 ohms

Table I– Specifications for the TS-940S.

is noted above each filter). The IF Unit likewise processes both the receive and transmit signals. A great deal of diode switching is used so advantage can be taken of using the various IF filters for both receive and transmit. More or less in the middle of fig. 1 one can see three stages in line: Q40, IC4, and Q43. They form the RF speech processor. If one traces the transmit signal around, it will be seen that it goes through one set of SSB filters both before and after the processor stages so the processing is of a true RF clipping type. The Control Unit contains the noise blanker stages, audio stages, VOX and QSK stages, and various regulators. The PLL, Carrier, and Digital Units are self-explanatory. The Final Unit contains, of course, the transmit power amplifier stages, the output of which is routed through the Low Pass Filter Unit where one of seven relay switched filters is placed in the output line. A high-speed relay completes the RF path to the RF Unit during receive periods.

Fig. 2 shows the receive and transmit frequency paths in the TS-940S. It also shows where the standard and optional IF filters would be placed. Considering an incoming SSB signal (upper left side of fig. 2), it is amplified and then translated down to a 45.05 MHz IF and goes through a broad IF filter. The 45.05 MHz signal is then translated to 8.83 MHz where it encounters its first real selectivity in the form of a crystal filter. A 2.4 kHz filter is standard, while optional 500 Hz wide and 6 kHz wide filters are available for CW and AM, respectively. The 8.83 MHz signal is then translated to a 455 kHz IF and goes through a ceramic filter at that IF. A 2.4 kHz filter for SSB and a 6.0 kHz one for AM are standard. Optional 500 Hz and 250 Hz wide ones are available for CW, although Kenwood does recommend that if the 500 Hz wide 455 kHz filter is installed that it be done in conjunction with installing the 500 Hz wide filter at the 8.83 MHz IF. The 455 kHz IF is further translated to a 100 kHz IF where it passes through an RF-type notch filter and is then demodulated. Essentially the same signal flow takes place on transmit, but in reverse and the 100 kHz IF is not used. One can trace the transmit signal flow starting with the "Mic Input" in fig. 2 (lower right). The signal-flow paths differ a bit for FSK and FM, but they are noted in fig. 2. The variable bandwidth (or slope) tuning feature operates by varying slightly the carrier oscillator frequency to two of the mixer stages. The effect is to reduce the apparent IF filter bandwidth as the side skirts of two filters move so their passbands shadow each other with the resultant unshadowed area between them having an apparent bandwidth less than that of either filter alone. Fig. 3 shows what happens to the IF bandwidth and variable bandwidth tuning when either just the standard IF filters are used or various of the optional filters.

The heart of most modern-day transceivers is really their frequency generation and microprocessor control circuits. They are also probably the most expensive circuits to engineer and usually involve custom IC's. The control unit in the TS-940S has various IC blocks marked CPU, ROM, RAM, etc., but that's about it. The PLL functions are shown in fig. 4. One can see how the various frequencies from the PLL unit match the oscillator frequency block in fig. 2. Basically, the PLL unit is a digital VFO that covers 45.08 to 75.05 MHz in 10 Hz steps. Three PLL loops, each crystal controlled, exist to generate the various carrier insertion frequencies required. Each loop is phase com-

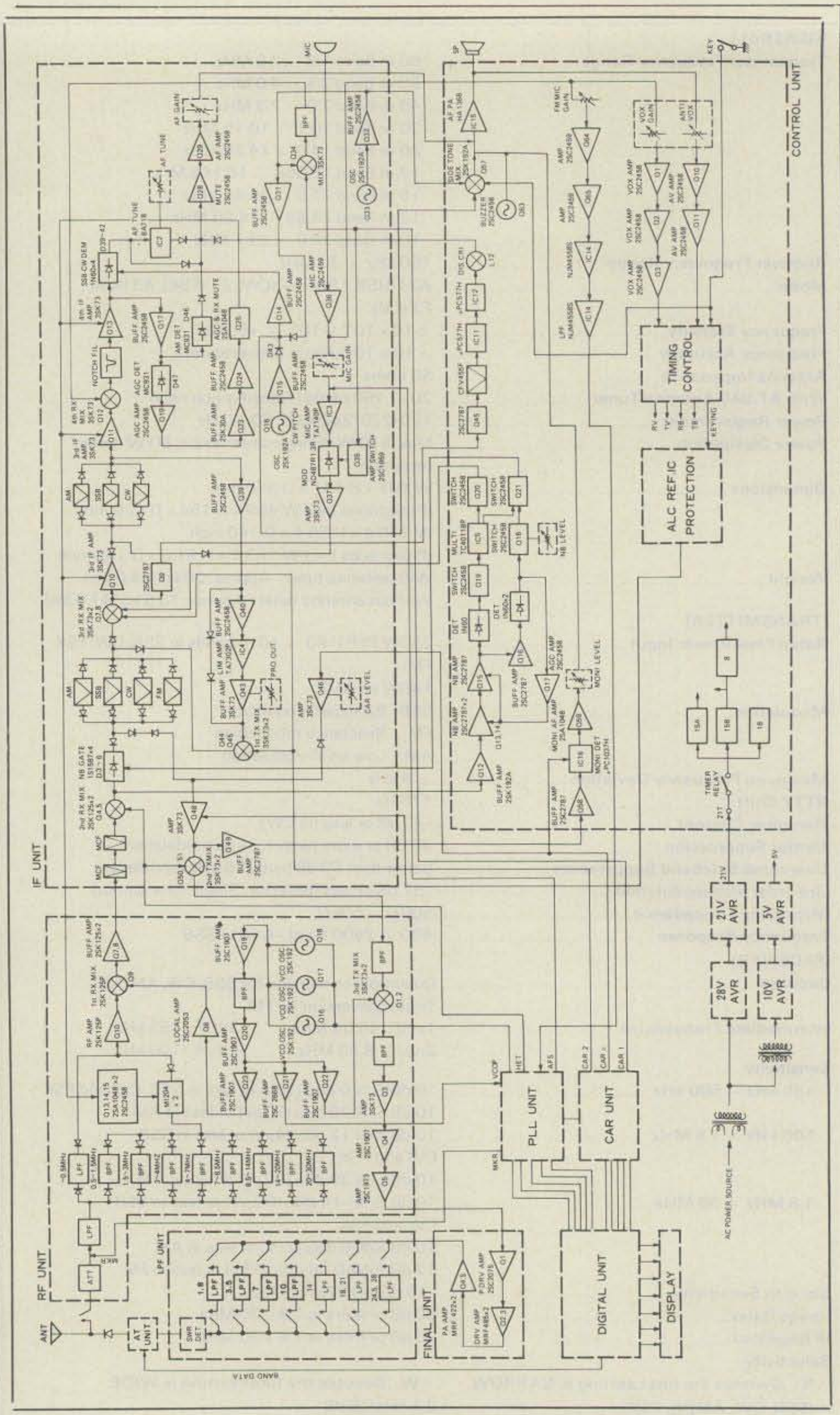
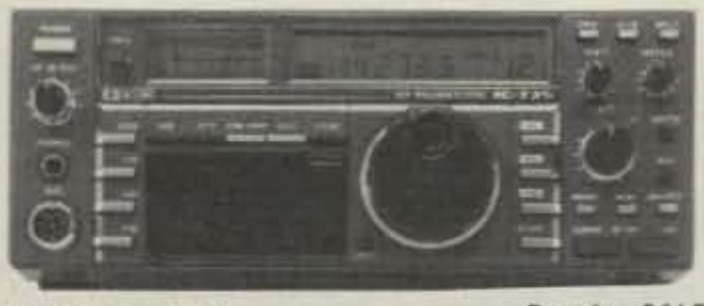


Fig. 1– Complete block diagram of the TS-940S.

pared to the master 20 MHz crystal oscillator shown in the lower left-hand corner of fig. 4. So in effect, the stability of that oscillator determines the stability of the entire transceiver. The basic stability of the TS-940S (see Table I) is certainly adequate for any normal mode of operation or environment. But, Kenwood does make available an optional, temperature-compensated crystal oscillator (type SO-1) for those who might have special stability requirements of what Kenwood refers to as "commercial standards."

To say the least, the TS-940S contains all sorts of interesting, detailed circuitry. Double balanced mixers, for instance, abound throughout the transceiver. Unfortunately, it would take too much space to start presenting detailed circuitry. As far as I could tell, however, by closely looking at the circuitry, the design is *first-class!* I couldn't find any "head



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AT-150 Automatic antenna tuner	399.00	359.95
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
UT-30 Tone encoder	TBA	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	799.95
PS-35 Internal power supply	169.00	149.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-44A SSB filter (2nd IF)	159.00	144.95
SM-6 Desk microphone	40.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	21.99	

IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	999.00
PS-35 Internal power supply	160.00	149.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 kHz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	40.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	21.99	

IC-720A 9-band xcvr • (CLOSEOUT) •	1349.00	689.95
PS-15 20A external power supply	149.00	134.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
SM-5 8-pin electret desk mic	40.00	
MB-5 Mobile mount	21.99	

Other Accessories:	Regular	SALE
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CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234.95
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
SP-3 External speaker	54.50	
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CR-64 High stab. ref. xtal (745/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	129.95
SM-8 Desk mic - two cables, Scan	69.95	
SM-10 Compressor/graph EQ, 8 pin mic	119.00	109.95
AT-100 100W 8-band auto. antenna tuner	399.00	359.95
AT-500 500W 9-band auto. antenna tuner	499.00	449.95

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BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	735.00	649.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
IC-271A 25W 2m FM/SSB/CW	735.00	649.95
AG-20 Internal preamplifier	56.95	
IC-271H 100W 2m FM/SSB/CW	944.00	789.95
AG-25 Mast mounted preamplifier	84.95	
IC-471A 25W 430-450 SSB/CW/FM xcvr	839.00	729.95
AG-1 Mast mounted preamplifier	89.00	
IC-471H 75W 430-450 SSB/CW/FM	1149.00	989.95
AG-35 Mast mounted preamplifier	84.95	

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	99.00	89.95
PS-35 Internal power supply for (H)	169.00	149.95
PS-15 External power supply	149.00	134.95
SM-6 Desk microphone	40.00	
EX-310 Voice synthesizer	41.25	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	549.00	479.95
IC-490A 10W 430-440 SSB/FM/CW	649.00	569.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	389.00	349.95
IC-27H Compact 45W 2m FM w/TTP mic	429.00	379.95
IC-37A Compact 25W 220 FM, TTP mic	449.00	349.95
IC-47A Compact 25W 440 FM, TTP mic	489.00	429.95
PS-45 Compact 8A power supply	112.95	99.95
UT-16/EX-388 Voice synthesizer, 47A	31.00	
SP-10 Slim-line external speaker	31.95	
IC-3200A 25W 2m/440 FM w/TTP	569.00	499.95
UT-23 Voice synthesizer	31.00	
AH-32 2m/440 Dual Band antenna	32.95	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	

IC-1271A 10W 1.2 GHz SSB/CW Base	1049.00	929.95
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	41.25	
TV-1200 ATV interface unit	115.00	106.95
UT-15S CTCSS encoder/decoder	79.95	
IC-120 1W 1.2 GHz FM Mobile	499.00	449.95
ML-12 1.2 GHz 10W amplifier	339.00	299.95

Repeaters	Regular	SALE
RP-3010 440 MHz, 10W FM, xtal cont.	1049.00	949.95
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1259.00	1129
Cabinet for RP-1210 or 3010	269.00	

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BC-35 Drop in desk charger for all batteries	74.95
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LC-14 Vinyl case for Dlx using BP-7/8	18.49
LC-02AT Leather case for Dlx models w/BP-7/8	39 95

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	42.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	31.25
BP-4 Alkaline battery case	13.75
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	10.75
CP-10 Battery separation cable w/clip	19.99
DC-1 DC operation pak for standard models	18.75
EX-390 Bottom slide cap	4.95
MB-16D Mobile mtg. bkt for all HTs	21.99
LC-2AT Leather case for standard models	39.95
RB-1 Vinyl waterproof radio bag	30.00
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HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE 89.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$849.00	689.95
RC-11 Infrared remote controller	59.95	49.95
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	41.25	
CR-64 High stability oscillator xtal	56.00	
SP-3 External speaker	54.50	
CK-70 (EX-299) 12V DC option	10.95	
MB-12 Mobile mount	21.99	
R-7000 25 MHz-2 gHz scanning rcvr	969.00	849.95
RC-12 Infrared remote controller	TBA	
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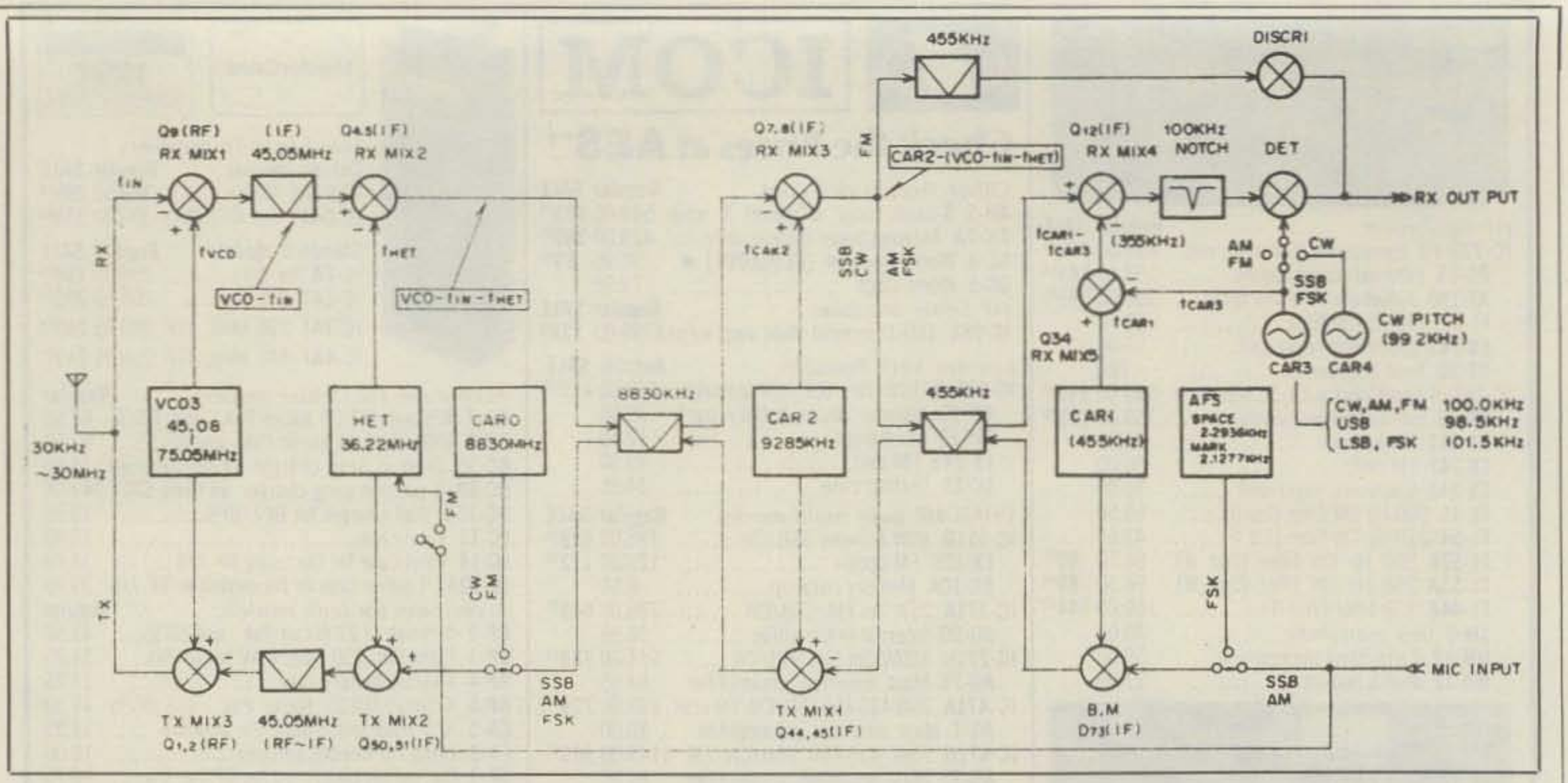


Fig. 2– Basic signal-flow paths and frequency relationships within the transceiver.

count" for all the transistors and IC's contained in the TS-940S, but there surely must be several hundred of the devices.

Bench Checks

My bench checks using lab-quality test equipment easily confirmed the claimed specifications for the TS-940S. As might be expected, my measurements varied a few dB, plus or minus, from those specified by Kenwood, but that is totally to be expected considering that only one TS-940S was evaluated. For those who take interest in the "numbers game," here are some of my results:

1. MDS (noise floor): an outstanding −136 dB.
2. Dynamic Range (500 Hz bandwidth): 100 dB.
3. Third-Order Intermod: +14 dB (Receive).
4. Transmit Third Order IMD: −41 dB.
5. SSB Filter Bandwidth (−6/60 dB): 2.44 kHz/3.5 kHz.
6. Optional CW Filter Pair Bandwidth (−6/60 dB): 480 Hz/800 Hz.
7. Optional AM Filter Bandwidth (−6/60 dB): 6.0 kHz/11.4 kHz.

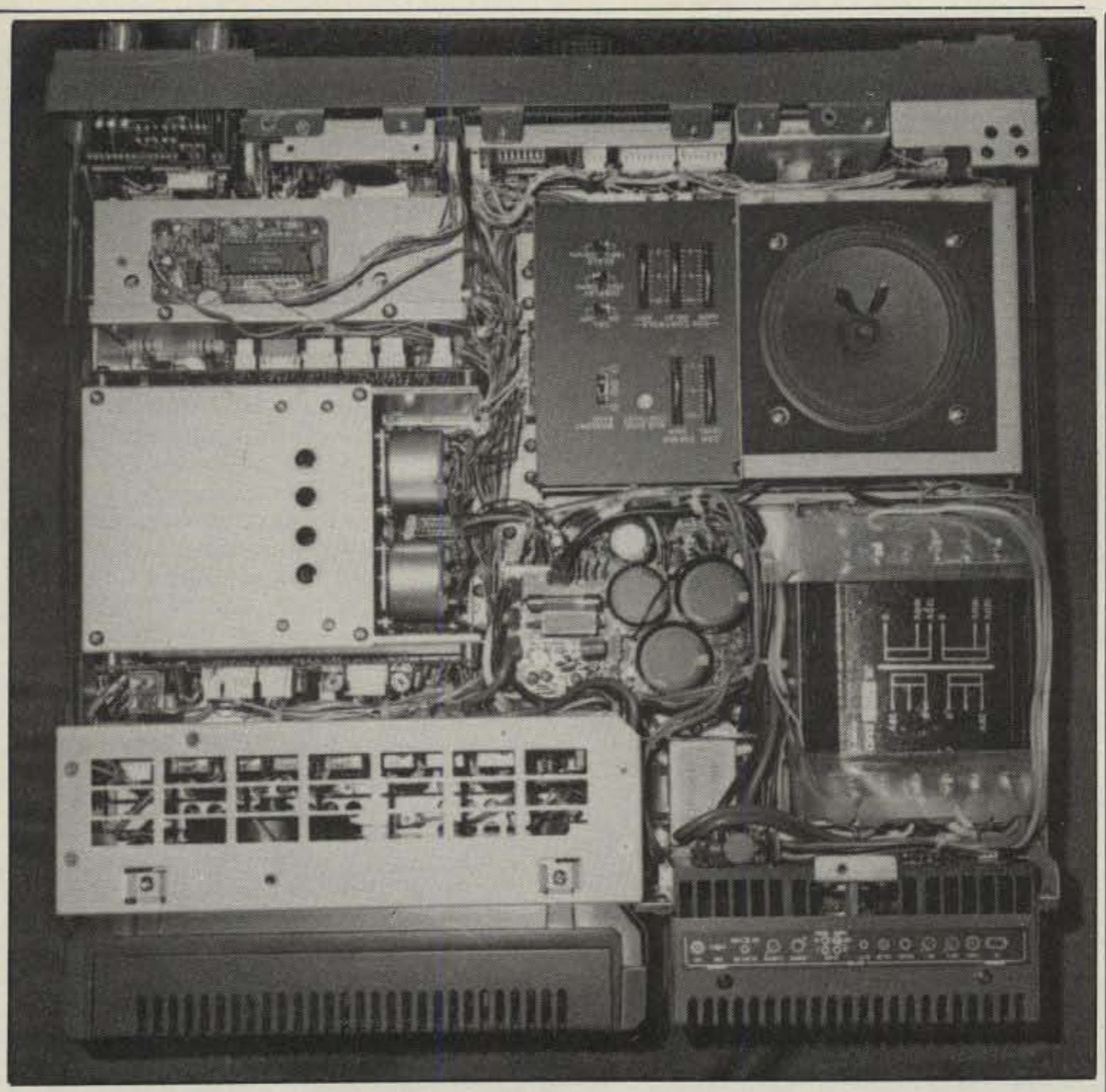
The first four measurements are averaged ones for 40, 20, and 15 meters. Kenwood guarantees an ultimate attenuation for the various IF filters of more than 80 dB. I found a range of 85–92 dB to be typical. The claimed sensitivity, image ratio, and IF rejection figures were only spot checked and found to be quite in order.

Fig. 3– This chart presents an overview of the selectivity possibilities using either just the stock filters or various of the optional IF filters.

COMBINATION OF IF FILTERS

MODE switch	NAR-WIDE switch	883 MHz IF	455 kHz IF	Overall pass-bandwidth	SSB SLOPE TUNE	CW VBT	AF TUNE *2	NOTCH	Note
SSB *4	WIDE or NARROW	2.4 kHz (Stock)	2.4 kHz (Stock)	2.4 kHz	HI-CUT to 1500 Hz LOW-CUT to 700 Hz	–	–	Yes	
CW/FSK *2	WIDE	2.4 kHz	2.4 kHz	2.4 kHz	–	600 Hz ~ 2.4 kHz	Yes	Yes	
	NARROW *1	(YK-88C-1 500 Hz)	(YG-455C-1 500 Hz)	500 Hz	–	150 Hz ~ 500 Hz	Yes	Yes	Filter combination recommended for CW VBT
		2.4 kHz	(YG-455CN-1 250 Hz	250 Hz	–	*3	Yes	Yes	For narrower
AM	WIDE	– (YK-88A-1 6 kHz)	6 kHz 6 kHz	6 kHz 6 kHz	– –	– 4 ~ 6 kHz	–	Yes	
	NARROW	2.4 kHz (YK-88A-1 6 kHz)	2.4 kHz 2.4 kHz	2.4 kHz 2.4 kHz	– –	600 Hz 2.4 kHz* *3	–	Yes	

Note:
( ) = Optional filter installed.
*1 Shows recommended optional filter combination for CW.
*2 AF TUNE in FSK mode does not work.
*3 Although VBT circuit operates, not recommended.
*4 No optional SSB filters.



Taking off the top cover one sees the very well-organized interior. The power transformer is to the lower right. The VOX and other controls accessible via a slide cover on the top cover are shown to the left of the speaker. The AT-940 antenna tuner (with two motors on its right side) is towards the middle left side. The large IC in the upper left-hand corner is the optional VS-1 voice synthesizer.

The reason for this cursory check is that in a modern class of transceiver, which the TS-940S represents, those parameters have become universally good and consistent.

The power output on various bands is presented in Table II along with the range of frequencies on each band over which the full power output took place. The latter are a bit broader than those specified by Kenwood in some cases and might be of interest to those concerned with MARS or similar activities. The power output of the TS-940S was amazingly consistent, as Table II shows. A simulated SWR of 1:2 reduced the power output to only 80 watts, while a simulated SWR of 1:3 reduced the output to 50 watts.

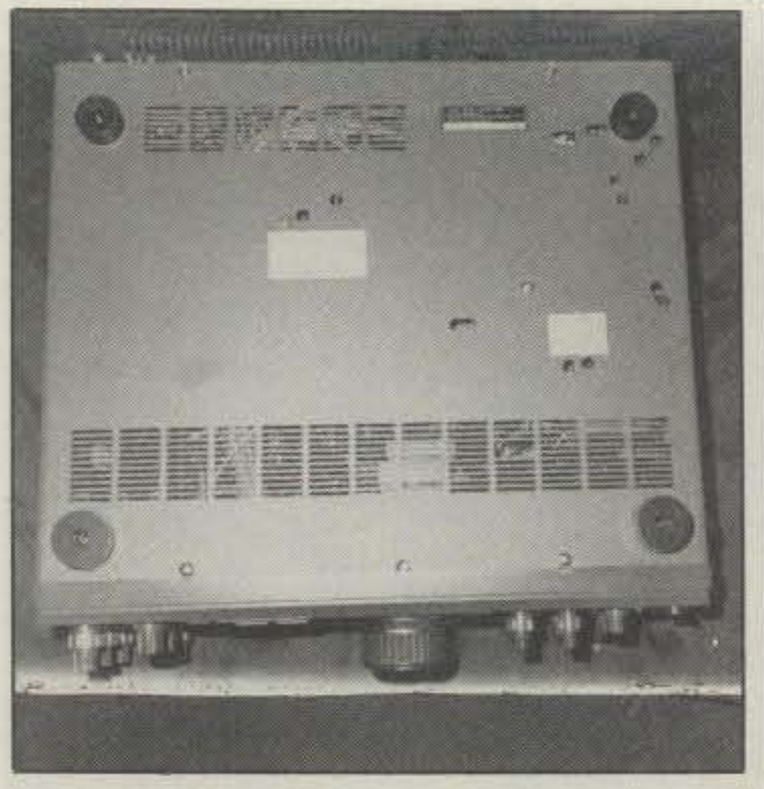
The main tuning knob has a subtle, interesting feature. At slow tuning speeds it covers a constant 10 kHz/revolution, but if one turns the knob rather fast, the coverage in terms of kHz/revolution increases proportionally. It's a rather clever alternative to having to push buttons to change the tuning rate. For instance, turning the main tuning knob at about 1 second/revolution, the basic 10 kHz is covered. If one speeds up to about 3 revolutions/second, about 250 kHz is covered. In the AM and FM modes the basic tuning rate is automatically changed from 10 kHz/revolution to 100 kHz/revolution. There is a sub-display below the main digital display which is a quasi-analog display. There is a fixed scale going from 0 to 1000 with calibration marks at every 20 units, each of the units being associated with a

Operational Range (kHz)	Power Output (watts)
1500–2000	100
3500–4000	100
7000–7500	100
10,000–10,500	100
14,000–14,500	100
18,000–18,500	99
21,000–21,500	100
24,500–25,000	100
28,000–30,000	100

Table II– Measured power output. For MARS or other out-of-band operation, Kenwood requires specific documentation as to authorization in order to supply the information.

miniature LED. The 0 to 1000 scale can be switch selected to represent either 1000 kHz or 100 kHz. In any case, as one rotates the main tuning knob, the LED markers illuminate in turn to represent either 20 kHz or 2 kHz steps. The effect is just like having a red marker move across the 0 to 1000 scale. It works beautifully, and one can use the scale to see one's relative position in an amateur band (when set for 1000 kHz coverage) or one can "magnify" any 100 kHz range. It's extremely useful, if, for instance, one often operates within a 100 kHz range (e.g., 14.000 to 14.100 for CW).

The sensitivity of the TS-940S is somewhat reduced on the long- and medium-wave fre-



The bottom side of othe TS-9430S. Several access holes are provided here, as well as on one side, so various infrequently made or one-time-only adjustments (e.g., side tone level) can be done without removing any covers.

quencies, but it is still very much "alive and useful" on those frequency ranges as compared to some general-coverage transceivers which seem to exhibit millivolt instead of microvolt sensitivities.

Overall, the TS-940S bench checks out as an outstanding performer for its price class, and if anything, later on-the-air checks at least confirmed and often exceeded the expectations generated by the bench checks.

Operating Impressions/Results

The TS-940S has 72 front-panel controls, switches, indicators, display elements, and two connectors! The rear panel has 14 connectors, jacks, accessory terminals, fuse holders, etc.!

However, to use the transceiver on SSB, for instance, all that is basically necessary is to connect the AC power, an antenna, a microphone, set the mode (USB or LSB) by means of pushbuttons, set the desired band by means of pushbuttons, and set the microphone gain control to an ALC "red zone" meter reading while transmitting and the AF gain control to a desired speaker volume while receiving. This presumes one has set all other controls to their normal, on/off or minimum or maximum settings as specified in the TS-940S instruction manual. That is all that is necessary for simply getting the transceiver on the air. The same is true for basic CW operation, except that a key is connected to a back-panel key jack and a "carrier level" control, instead of a microphone gain control, is adjusted for meter deflection within an ALC "red zone." Going along in this manner one can use the transceiver for many hours of enjoyable operation.

One will surely want to soon learn how to use some of the sophisticated features contained in the transceiver. The QRM-fighting features are certainly the most useful to start to learn first. For SSB reception they revolve around the dual SSB Slope Tune control, the Notch control, and the RIT control. The dual SSB Slope Tune (Variable Bandwidth) control is the most interesting feature. As was mentioned before, it can be used to reduce the apparent SSB IF bandwidth from its nominal wide, or normal, value to down to about 800 Hz by "pulling in" the low- and/or high-frequency skirt responses of the SSB passband *independently*. The basic idea is shown in fig. 5 where just one skirt response is "pulled in" to reduce an undesired signal. The "real world" is, of course, always a bit different when one encounters QRM from both sides of a desired signal. In that "real world" situation I found the

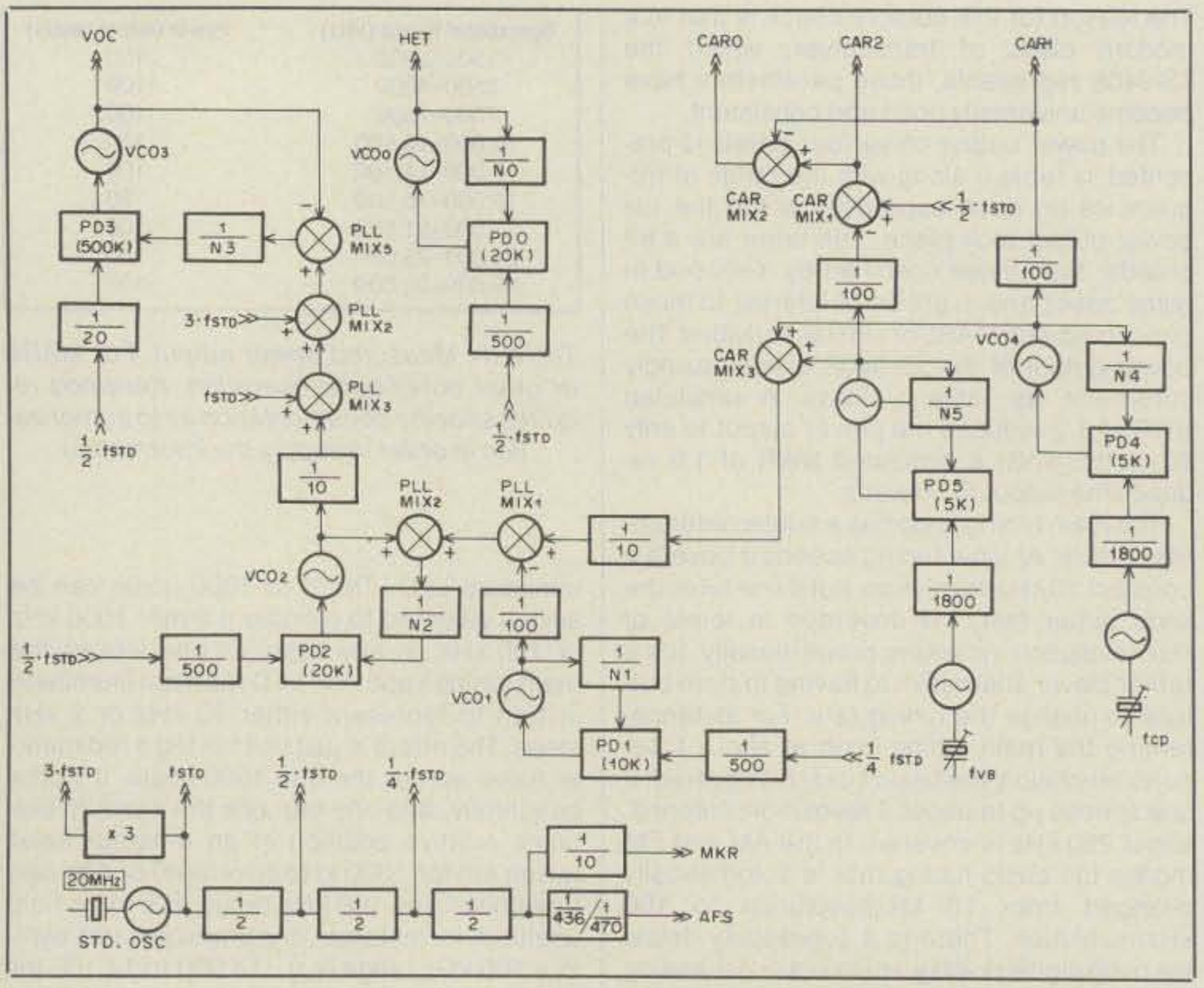
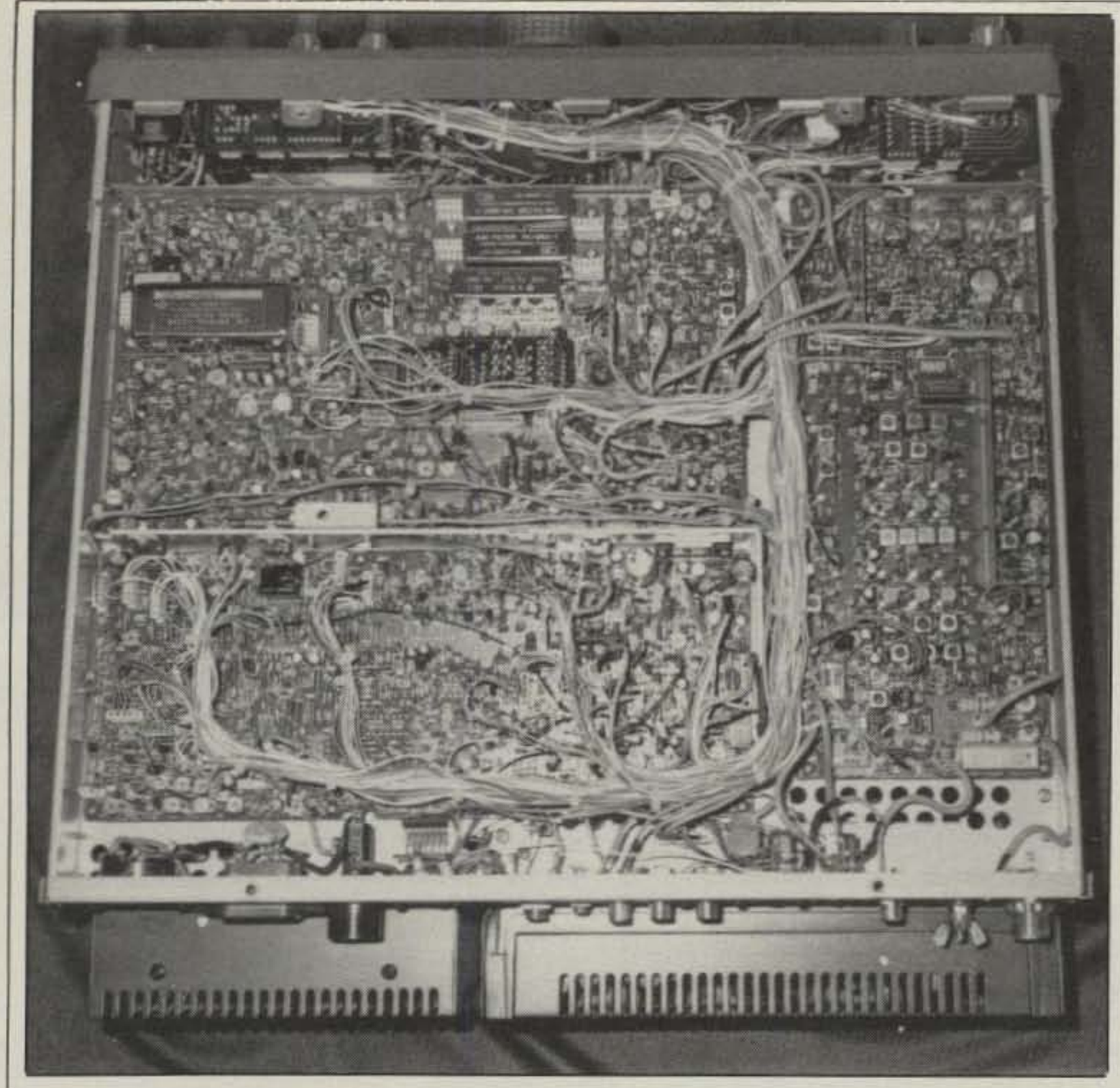


Fig. 4– An overview of the PLL loops within the TS-940S. It can be used in conjunction with fig. 2 to see where various of the injection frequencies (top of diagram) are used.



Taking off the bottom cover one sees a jungle of parts and wires. However, it is a very well-organized and well-labeled "jungle" in case you need to trace around it. Various of the optional IF filters are shown installed on the IF Unit board (upper left).

SSB Slope Tune feature to be very effective. One cannot possibly reduce an SSB receive bandwith to 800 Hz and understand a transmission, but I did find that by modestly, independently using the high or low tune controls on the SSB Slope Tune feature, many SSB signals could be pulled out of very difficult QRM situations. In fact, I don't know of any other SSB filter tuning action that will provide equivalent results using just a single control. Besides the filtering action under QRM conditions, the Slope Tuning feature allows one to sort of "tailor" a received SSB signal to the response that one prefers to hear for extended QSO's. One can make the received audio sound "crisp" or "mellow," as one likes, within the confines of the established SSB IF bandwidth.

The Notch control operated very smoothly and was extremely useful in nulling out "tune-up" or other interfering tones. The RIT (also XIT) control covers a range of ±9.9 kHz and a digital sub-display indicates the RIT (XIT) setting. Both the main digital display and the quasi-analog display change in accordance with the RIT setting, so there is absolutely no question as to what frequency one is receiving or transmitting. A simple "clear" pushbutton restores the RIT (or XIT) function to 0.0 kHz, so there is no need to actually rotate the RIT (XIT) control knob to reset it.

For CW there is a separate Variable Bandwidth Tuning control. If the optional 500 Hz IF CW filters are installed, the control will vary the bandwidth from about 150 Hz to 500 Hz. If the optional filters are not installed, the normal SSB bandwidth used on CW can be varied down to about 600 Hz. I can't imagine any serious CW fan not wanting the optional CW filters, while, on the other hand, I doubt if a casual CW operator will ever need them considering the standard variable bandwidth feature. The notch filter can be used on CW, but the so-called "pitch" and "AF Tune" controls are of more interest. The "pitch" control is what would have been called a BFO control years ago, but it is very effective even when the bandwidth control is set at its narrowest position (even when using the optional CW filters). The "AF Tune" control is really an audio peaking control with, I estimate, a range of 400 to 1500 Hz. All of the CW "anti-QRM" controls are very effective, and I couldn't find any situation where they would not allow good CW copy unless two stations were essentially on the same frequency. The semi-break-in feature of the TS-940S worked absolutely fine at any keying speed. The full QSK feature seemed to work absolutely fine at least into the upper 20 WPM range, which represented the highest speed range I could handle.

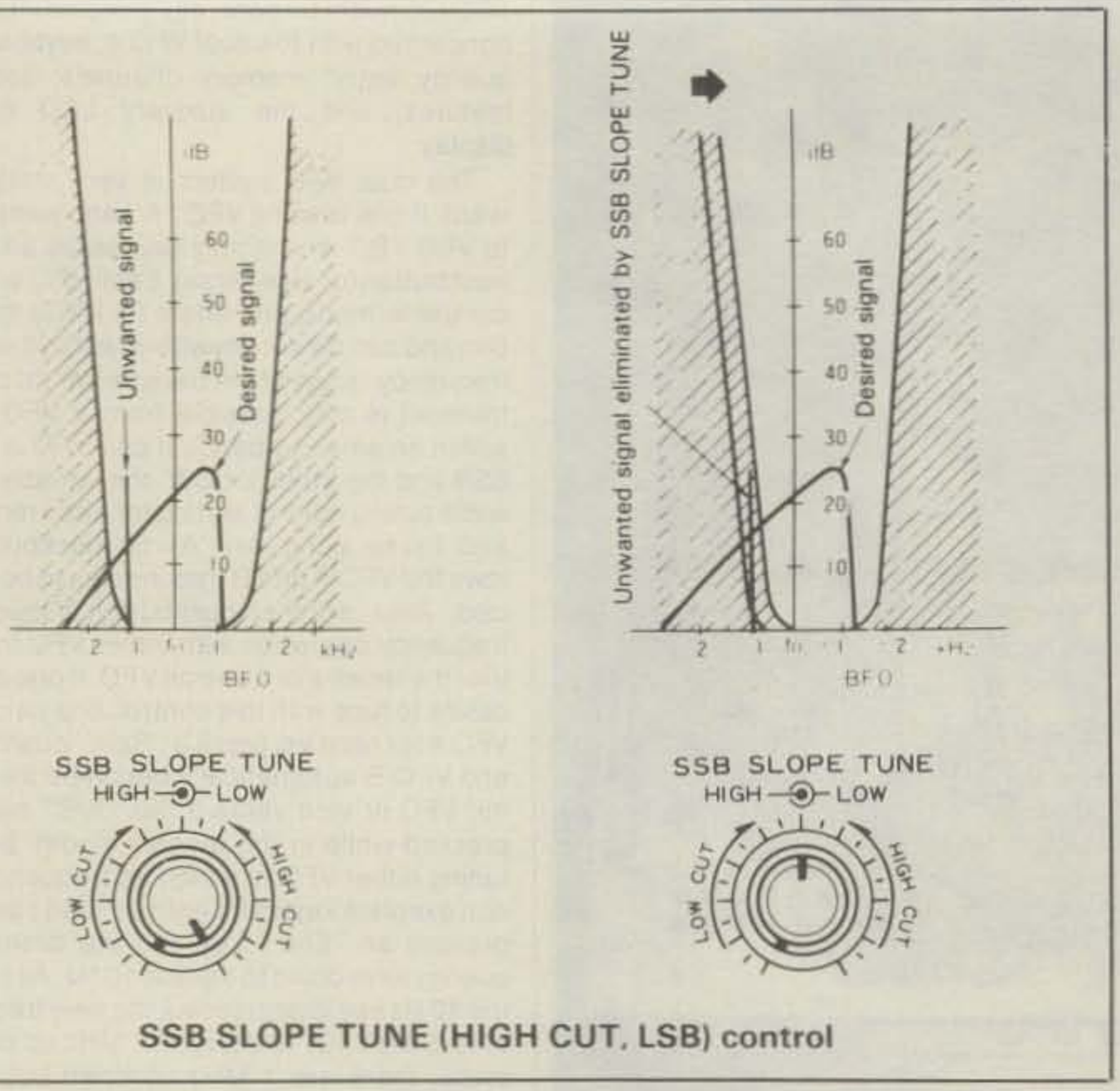
The noise blanker in the TS-940S works extremely well. It takes out ignition noise and the "woodpecker" type noise with ease. It did not eliminate some rather weird electrical power line noise peculiar to my QTH, but neither did any other noise-blanker circuit I have tried. Of all the noise-blanker circuits I have tried, however, I would rate the one in the TS-940S as 9 on a scale of 1 to 10. And, I'm an extreme conservative!

The "bells and whistles" features on the TS-940S might be generally grouped into those concerned with the dual VFO's, keyboard frequency entry, memory channels, scanning features, and the auxiliary LCD graphic display.

The dual VFO system is very straightforward. If one is using VFO "A" and wants to go to VFO "B," one simply depresses an "A/B" pushbutton (or vice versa). Each VFO contains complete mode and offset (RIT/XIT) information and can be set anywhere within the entire frequency range of the transceiver (of course, transmit is only possible from a VFO set to within an amateur band). If one VFO is set for SSB and the other for CW, the variable bandwidth tuning control setting for each mode will also follow along. An "A=B" pushbutton allows the VFO A and B frequencies to be equalized. Also, another pushbutton allows split-frequency operation with either VFO to be either the receive or transmit VFO. If one doesn't desire to fuss with this control, one can set up VFO A for receive, press a "Split" pushbutton, and VFO B automatically becomes the transmit VFO (ir vice versa if the "A/B" switch is pressed while in the receive mode). Besides tuning either VFO to a desired frequency, one can exercise keyboard entry. In that case, one presses an "ENT" key and the desired frequency keys down to the last 10 Hz. As soon as the 10 Hz key is depressed, the new frequency enters the VFO. To assist in 1 MHz up or down steps, there are 1 MHz up/down buttons to move the VFO frequency.

If one keeps in mind that either one of the two VFO's controls the transceiver at any given time, the memory functions are easy to understand. Any frequency displayed on the active VFO can be entered into a memory channel by depressing a "Memory In" key and the number key for the memory channel. One can continue tuning with the VFO and enter as many memory frequencies as desired. To recall a memory frequency, a "VFO/M" key is used and the number key for the memory channel. The chosen memory channel appears on the main display, and the mode switches, selectivity controls, and RIT feature can be used but without changing the data stored in the chosen memory channel. Other memory channels are chosen by pressing their number key. If it's desired to return to the original VFO frequency, the "VFO/M" key is again depressed. If one wants to transfer any recalled memory channel into the VFO, a "M/VFO" key is depressed. All of the operations just described can be used using either VFO A or B.

The TS-940S has both memory scan and program scan functions. To explain them, one has to first mention that although the transceiver has 40 memory channels, they are divided into four groups of 10 channels each. The front-panel keys can select any channel in a group but a memory bank group switch, located inside a slide panel on top of the transceiver, has to be used to select the desired group. In the memory scan mode, each memory channel with data entered is scanned at four second intervals. The scanning speed is very convenient since it provides ample time to press a "HOLD" switch in case a busy channel is found. The program scan will scan between the frequencies set in memory channels 9 and 0 of any given memory bank. In the AM mode 100 kHz is scanned in about 23 seconds. In the CW/SSB modes 50 kHz is scanned in about 180 seconds. One can stop the scan at any point and use a VFO to "take control."



SSB SLOPE TUNE (HIGH CUT, LSB) control

Fig. 5– Example of the slope or variable-bandwidth feature. On SSB both sides of the passband can be made to "move in" independently. On CW there is one control and both sides of the passband "move in" equally.

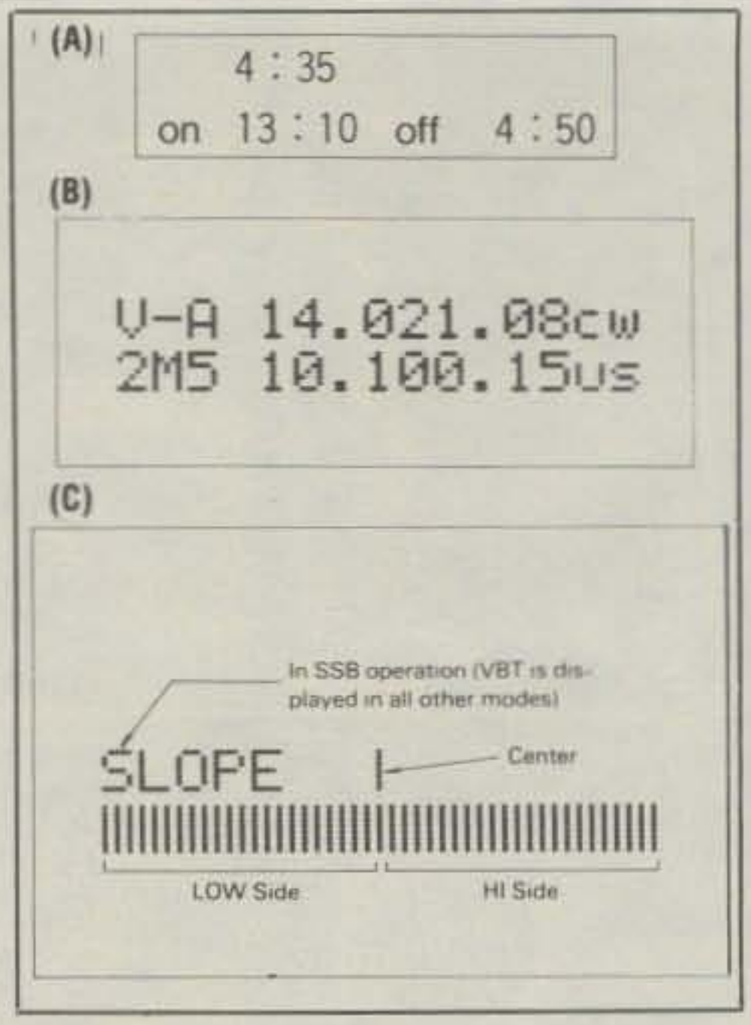


Fig. 6– Examples of what can be seen on the graphic display. (A) is a straightforward time and timer display. (B) shows one possible frequency display; in this case VFO A frequency and mode is displayed and the frequency and mode stored in channel 5 of the second memory bank. (C) shows the relative setting of the bandwidth controls. On SSB either the "LOW" or "HI" display, or both, can be made to shrink in towards the center.

The scanning functions work very well. The awkward location of the memory bank selector switch is unfortunate.

The LCD graphic display on the TS-940S is a unique feature. Depending upon how one uses a few simple pushbuttons, it can be used to display real time and timer on/off settings; the status of the variable bandwidth tuning controls for CW or SSB; the frequencies stored in the VFO's and memories; or the status of the optional AT-940 antenna tuner when installed. The time display is straightforward, and one can easily set the clock and on/off times from front-panel switches. The frequency status display for the VFO's and memories is very well done and the most useful feature of the graphic display in my opinion. One can display simultaneously the frequency and mode setting of each VFO, or one can display simultaneously the frequency and mode setting of the *inactive* VFO and that of any memory channel (or "scroll" through the settings of each memory channel in a selected memory bank while the display of the inactive VFO remains steady). It's a form of electronic notebook. The frequencies displayed on the graphic display and the main display match exactly to the nearest 10 Hz and there is not the slightest sign of any display flicker.

The graphic display of the selectivity settings and antenna tuner status is partly useful and partly entertainment. The graphic display of the selectivity control settings can indeed remind one that a control has been advanced to a narrow position when one tunes around after a QSO or after one turns the transceiver on and wonders why stations sound "strange." Possibly, it can remind one to use the bandwidth control features in the TS-940S. But, the graphic display indications while the AT-940 automatic tuner operates can only be regarded as a "fun" thing to observe with the one rare exception (explained later) when it comes up with a dramatic "NO MATCH" display.

Overall, on receive the TS-940S delivers excellent performance. It has features galore but is easy to operate. The main tuning is extremely smooth. It's full of little subtleties that one only appreciates after using the transceiver for some time. For instance, the main tuning rate has the proportional speed feature on SSB mentioned before. One can also, by a single finger motion, with the hand that is used for manipulation of the main tuning knob, instantly change between 10 kHz and 100 kHz tuning rates by alternately depressing the SSB/CW and AM mode buttons.

In the transmit mode no tuning of any sort is necessary unless one has to adjust an external, manual antenna tuner. If the optional AT-940 tuner is installed, tune-up becomes ultra-simple in any mode. An in/out switch is pressed to place the AT-940 in the antenna line. When automatic tuning on any frequency to which the active VFO is set is desired, an "antenna tune" button is momentarily depressed and then the PTT switch on the microphone. The motor controls on the AT-940 are heard to rotate while the graphic display scrolls the indication: "TUNING !". Finally, when tuning is complete, the graphic display indicates "TUNING FINISHED, TX READY" unless the antenna mismatch is so bad that the graphic display comes up with the "NO MATCH" display. Since other automatic antenna tuners I have used have taken up to 45 seconds to find a matched condition, I was astounded to time the AT-940 as taking no more than 6 seconds to match simulated resistive loads on any band which represented 1:3 SWR's. When one considers also that no mode or power level controls have to be touched while the AT-940 is tuning, it is truly an outstanding tuning system.

Audio reports on transmit were excellent, and the built-in audio monitor system allows one to hear precisely the effect when one adjusts the various microphone gain, ALC, or RF processor controls. The RF processor is very effective since it is a true RF type. It will add a "clean" one "S" unit increase to the transmitted SSB signal *when* properly adjusted. If one is to achieve that "clean" increase, however, one does have to watch the processor control settings and the meter indications—the same as with any high-performance type of processor. Full VOX operation is available and it performs very smoothly.

Various controls for the VOX function, CW and SSB monitor level adjustments, switches for memory-bank selection, quasi-analog tuning-scale display modes, etc., are not front-panel mounted. And yet the front-panel controls are very well dimensioned and spaced. So, I suppose one could debate for hours how "readily accessible" and "effort accessible" controls and switches should be distributed. I'd rate the TS-940S, after hundreds of hours of using it, as achieving 95% success. Its clean front-panel layout is outstanding and is particularly suited for those of us who do not have thin, "finger-stick" fingers which cannot distinguish between controls set a few millimeters apart. On the other hand, I would only criticize the TS-940S on three cosmetic points:

1. A finger-tip insert on the main tuning knob would have been very convenient for fast QSY.

2. A dual metering function would be useful but not absolutely necessary. Somehow I have the feeling that especially in the transmit mode more usefulness could have been gotten out of the LCD graphic display.

3. Non-front-panel mounting of the four bank memory bank selector switch. So much of the versatility of the transceiver is involved here, and yet only a simple 1P4T switch is necessary to implement the function on the front panel. Perhaps Kenwood can come up with a modification kit?

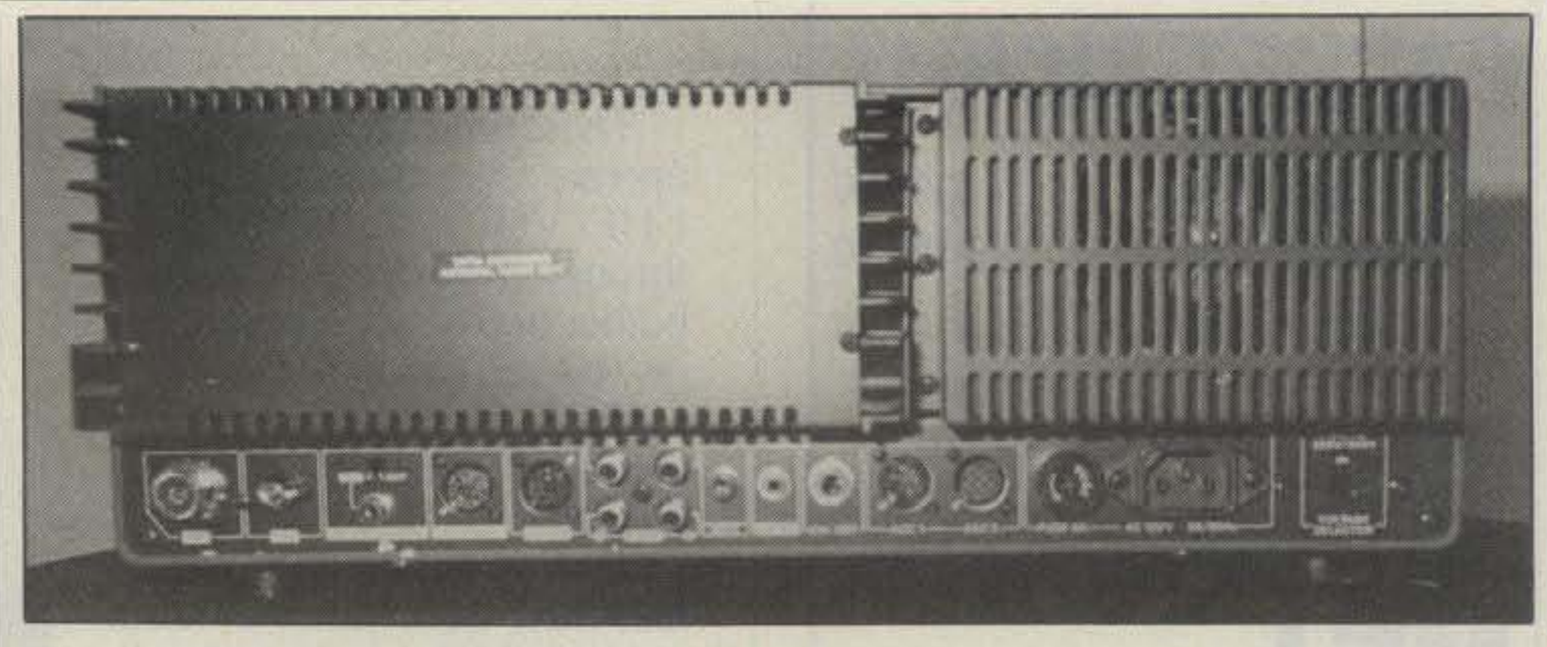
The built-in cooling is very quiet. During normal operation one will never notice when it switches on or off.

Accessories

The optional AM and CW filters are very useful and recommended if one is a CW buff or does much monitoring of international broadcasting stations.

The voice-synthesizer option is more of a fun thing than a serious operating aid. By pressing a "VOICE" button a female voice will announce the frequency displayed on the main readout down to 10 Hz. The synthesized voice is quite clear and understandable. A switch on the PC board for the synthesizer allows one to select announcements in either English or Japanese!

The AT-940 automatic antenna tuner was mentioned before and is a star performer. A block diagram of the unit is shown in fig. 7. It's basically a T-network tuner, but the electronics associated with it are quite sophisticated. An automatic SWR computer associated with it apparently senses not simply the SWR, but whether the reactance presented by the antenna load is inductive or capacitive so the tuner can immediately start its automatic tuning in the right "direction." Fig. 7 only indicates three tap positions on the T-network coil. In fact, the coil really consists of four separate coils in series, and there are a total of eight relay-selected tap positions on the coils. The unit fits snugly inside a corner of the TS-940S as shown in one of the photographs.



The rear panel provides enough interconnection possibilities for any possible accessory items (e.g., linears, transverters, patches, RTTY gear, SSTV, data communications, etc.). Two massive heatsinks are used, one for the power amplifier module (left) and one for the power-supply components (right).

The TS-940S was tried with not just one, but with three different Kenwood microphones—the MC-60, MC-80, and MC-85. The first one is a dynamic unit, while the latter two use electret condenser microphone elements. All three have switches for PTT and PTT HOLD and up/down scanning. Aside from that, their features differ. The MC-60 can be used either as a desk microphone or hand-held. It is very robustedly and handsomely constructed as though it had come out of a broadcast studio. The MC-80 is a console-type microphone with a built-in, adjustable output level preamplifier. The MC-85 is an extension of the MC-80 in that it has a preamplifier, AF compressor, and a "lo-cut" feature to reduce low-frequency response. It also has three switched outputs so it can be used to control up to three transceivers. All of the microphones worked quite well with the TS-940S, easily providing full modulation. All three of the microphones also have a good "communications"-type frequency response which avoids excessive, dull low-frequency response, yet does not go so far as to have a very peaked "DX" response *a la* the Heil HC-4 microphone cartridge. They are all quite good microphones, but if I were forced to opt for one, it would be the MC-85. It has more versatility and I feel electret microphones somehow have a cleaner, crisper voice response than most dynamics, although their static frequency response curves may look the same.

Instruction Manual

As modern-day transceivers become more sophisticated with an array of controls resembling an airplane cockpit, it becomes more important than ever that instruction manuals be complete and well illustrated. The TS-940S manual is excellent. In fact, it's the best I've seen. It is full of information but not laborious to use. It starts out with the usual steps to observe to connect up the transceiver to an antenna, power, station ground, etc. Then there are a series of two-page illustrated spreads, each devoted to how to get the transceiver operating on a particular mode (e.g., SSB). The spreads concern themselves only with the *basic* control usages and settings for each mode. A very simple step-by-step procedure is given for both receive and transmit. By looking at the SSB setup procedure, for instance, one should have the TS-940S operating in a simplex, two-way mode in a matter of minutes.

Following sections of the manual then go into a detailed description of exactly what function is performed by each control, how the memory operations are used, and how the graphic sub-display operates. The text is very amply illustrated by large, clear diagrams.

Finally, there are two sections to the manual devoted to a circuit description and maintenance and adjustment. These sections are complimented by various block diagrams and a separate schematic diagram set. This material does not constitute a service manual, but it would allow any experienced amateur to do a

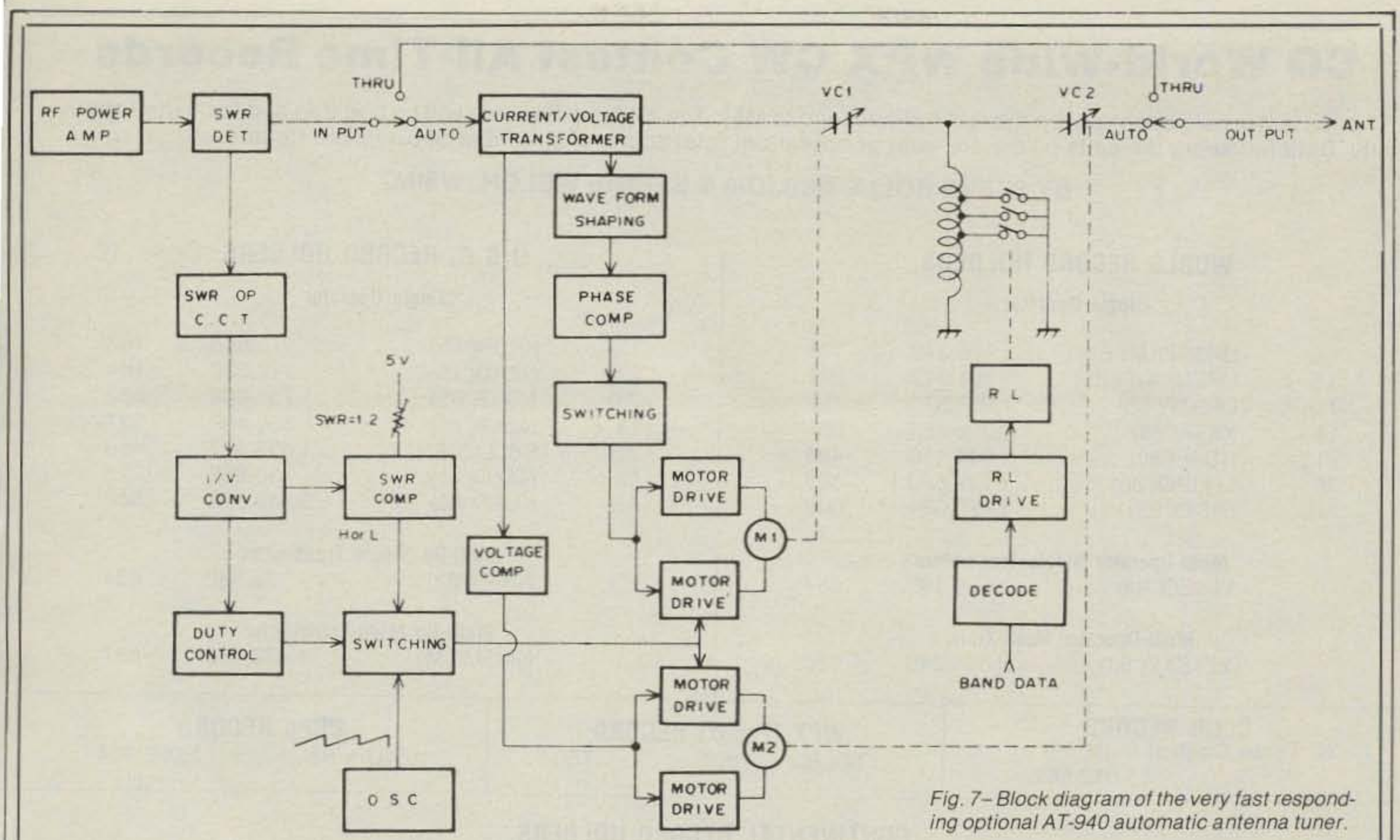


Fig. 7– Block diagram of the very fast responding optional AT-940 automatic antenna tuner.

lot of basic troubleshooting and it certainly provides great insight into what makes the TS-940S "tick." Quite a few simple adjustments can be made without really "getting inside" the transceiver, such as digital display calibration, carrier balance adjustment, sidetone level adjustment, S-meter calibration, etc. All of the steps necessary are clearly explained. The only fault I could find with the maintenance section of the manual is that it mentions that there are two back-up batteries used—one for the memory which lasts 5 years and one for the timer which lasts 3 years. However, no information is given as to where they are located nor how to replace them.

Reliability

Reliability seems to be a big question these days with a lot of imported equipment. I certainly treated the TS-940S with care, but I did not hesitate to use every feature and worked it into grossly mismatched loads for short periods to check its SWR protective circuitry. It was left on for several 24-hour continuous periods to check for overheating. Also, it must have endured a "shake-table" test far worse than that to which "Mil-Spec" equipment is subjected as it made its way to SV land via several transshipment points. The "bottom line" statement I can easily make is that I found the TS-940S totally reliable from the time it was turned on. To date absolutely no flaw nor even the slightest degradation in performance has been detected. Obviously, Kenwood feels comfortable with the reliability of the unit since it carries a one-year warranty.

Summary

Is the TS-940S the world's best transceiver? Well, I think even the engineering team at Kenwood responsible for the TS-940S would have to say "no." But, I rather suspect they would say "no" with, actually, a bit of pride! I certainly would if I were the engineering team leader. One cannot escape cost factors when working on transceiver design. For instance, steep filter skirts (IF) down to –120 dB would be great on any transceiver, and one might be able to achieve them at the price of the filter section being more than several times the cost of the rest of the transceiver. Therefore, any transceiver design has to optimize a careful balance of performance features versus price if the latter is to remain realistic. On that basis, I would rate the TS-940S as an outstandingly well-designed transceiver. Its "cosmetic" faults are relatively minor compared to its significantly superior operational capability. CQ

No-43-44

CQ World-Wide WPX CW Contest All-Time Records

The contest is held each year on the last full weekend of May. The All-Time Records will be updated and published annually. Data following the calls below are: year of operation, total score, and number of prefix multipliers.

BY STEVE BOLIA, N8BJQ/6 & BERNIE WELCH, W8IMZ

WORLD RECORD HOLDERS

Single Operator

1.8	UP3BP/UF('85)	125,240	101
3.5	UP2NK/UF('85)	701,012	221
7.0	DF9ZP('85)	1,998,372	482
14	YX5A('85)	3,016,155	557
21	HDØE('80)	3,544,416	496
28	LU8DQ('80)	1,627,660	388
AB	L8DQ('83)	4,128,084	548

Multi-Operator Single Transmitter

	VP2EC('84)	7,599,480	664

Multi-Operator Multi-Xmtr.

	YZ1EXY('83)	9,858,240	756

U.S.A. RECORD HOLDERS

Single Operator

1.8	K5UR('85)	13,668	102
3.5	N2AU('85)	119,232	184
7.0	N5RZ('85)	1,754,664	452
14	N2AA('85)	1,658,469	527
21	K6LL/7('81)	1,433,457	459
28	N4ZC('81)	136,086	222
AB	KC1F('85)	3,140,592	546

Multi-Op Single Transmitter

	NA5R('83)	3,986,592	634

Multi-Op Multi-Transmitter

	NM5M('84)	4,432,883	637

CLUB RECORD

N. Texas Contest Club('84) 53,012,561

WPX (Prefix) RECORD

YT4I('83) 760

QRPp RECORD

4Z4UH('82) 1,028,904

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	No Entrant		
3.5	EA8RL('84)	453,456	201
7.0	EA9GT('81)	579,824	217
14	EL2AV('82)	906,840	330
21	5Z4CS('82)	2,104,245	429
28	ZS6BUX('81)	8,850	50
AB	5Z4MX('85)	2,922,318	486

ASIA

1.8	UP3PB/UF('85)	125,240	101
3.5	UP2NK/UF('85)	701,012	221
7.0	UP3BI/UF('85)	1,106,222	271
14	UA9YE('85)	1,711,080	504
21	UL7QF('83)	1,220,083	373
28	4X4UH('81)	1,081,262	338
AB	UF6CR('84)	3,084,480	540

EUROPE

1.8	LZ2CJ('85)	93,800	134
3.5	I4IND('85)	521,812	286
7.0	DF9ZP('85)	1,998,372	482
14	YU4GD('84)	2,147,148	564
21	YU3BO('81)	1,550,390	394
28	9H1CH('81)	307,433	259
AB	YZ4GD('85)	3,554,460	651

Multi-Op Single Transmitter

AF	ZS6CT('84)	3,129,216	464
AS	UZ9A('80)	5,500,135	511
EU	LZ2KTS('85)	6,658,796	745
NA	VP2EC('84)	7,599,480	664
OC	KH6XX('84)	4,646,859	553
SA	L8DQ('84)	5,952,111	627

NORTH AMERICA

1.8	VE3MFA('85)	23,302	61
3.5	VE3BMV('85)	311,680	202
7.0	N5RZ('85)	1,754,664	452
14	CY3BMV('83)	2,341,680	528
21	KP4EQF('83)	1,816,416	476
28	KP4EQF('81)	577,500	300
AB	KP2A('80)	3,463,593	483

OCEANIA

1.8	No Entrant		
3.5	T32AF('83)	93,480	95
7.0	T32AF('85)	1,249,176	276
14	VK4QK('80)	1,276,584	344
21	N6HR/NH6('83)	1,203,552	378
28	KG6DX('81)	1,238,806	334
AB	KG6SW('79)	2,848,320	345

SOUTH AMERICA

1.8	PY5AAX('81)	96	6
3.5	4M3AZC('83)	142,780	121
7.0	OA4AWD('82)	1,752,254	329
14	YX5A('85)	3,016,155	557
21	HDØE('80)	3,544,416	496
28	LU8DQ('80)	1,627,660	388
AB	L8DQ('83)	4,128,084	548

Multi-Op Multi-Transmitter

AF	EA9CE('84)	4,383,308	482
AS	JA2YKA('83)	5,895,628	614
EU	YZ1EXY('83)	9,858,240	756
NA	KL7Y('85)	6,462,747	621
OC	KH6XX('85)	8,551,399	647
SA	HD1A('79)	6,052,032	474

QRPp

AF	EA8ACL('82)	139,965	155
AS	4X4UH('82)	1,028,904	344
EU	YU3BC('84)	345,950	275
NA	N3RS('83)	494,884	307
OC	KH6CP('84)	125,820	135
SA	OA8V('81)	444,768	246

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Future Views—Part II

It's happening. Slowly but surely the future views I described in May 1984 *CQ*, that WA2LQQ discussed at Dayton 1984, that K6FO related in August 1985 *Worldradio* are moving closer to reality. Those particular views highlighted tomorrow's migrations to VHF, UHF, and microwaves, plus smaller-sized gear and the integration of several "fixed position in sky," or geostationary, amateur satellites. The satellites will be capable of global interlinking to provide worldwide communications on a daily basis, totally independent of sunspot cycles or propagation fadeouts. Visualize the overall concepts and possibilities of that arrangement for a couple of minutes. A full communications system small enough to fit in one or two pockets will soon yield worldwide range almost anytime it's needed. Printed words or packet-type activities complete with electronic mailboxing plus store and forward operations can be intermixed with voice communications. Indeed, today's voice synthesizer and "recognition" concepts can be system integrated to provide aural message centers or voice mailboxing right in one's own auto or briefcase.

Our previews of coming attractions are not pipe dreams, nor are they a limited, specialized area available only to technically inclined individuals. They stand an 80 to 90 percent chance of implementation and operation within the next four to five years—possibly sooner. Such visions are a mere tip of the proverbial iceburg; tomorrow's world of amateur radio promises to be a kaleidoscope of exciting activities and new area development opportunities. Several months ago I remember someone insinuating that today's amateurs were losing their creative clout and amateur radio's frontiers were declining. Indeed not! Our interests and means of pursuit are merely changing with the times. We continue to reflect the leading edge of communications technology. The erà of homebrewing hasn't faded; it has merely shifted into our specialized areas and assembling commercially manufactured "pieces" to create full systems. Yesterday we debated coil and capacitor types. Today we compare interfacing units, home computers, software, GaAsFET preamps, and helical antennas. Our world is still young in opportunities, and it's definitely expanding!

Eastwood Village No. 1201 So., Rt. 11, Box 499, Birmingham, AL 35210

Amateur Satellite Developments

During early 1987, amateur radio's first data relaying satellite, or "flying mailbox," is due to be launched into orbit (the PACSAT program). This Japanese-built spacecraft will be capable of accepting, storing, and forwarding packet-radio-type messages worldwide. You transmit a group of preaddressed messages into it, the satellite orbits to its distant destination, the message(s) is delivered, a reply is sent back to the satellite, and its next in-range orbit delivers your reply. Assuming you've left for work or turned in for the evening, your own packet/satellite terminal stores the reply in your own mailbox for later reviewing and answering. This satellite will operate within our 2 meter and 70 cm bands. The arrangement is super convenient; you could be typing out messages on your setup at 2 a.m. or 3 p.m. A band doesn't need to be open or a satellite within range.

During mid to late 1987 our second Phase III OSCAR satellite is scheduled for launch into a highly elliptical orbit approximately over the North Pole. It will be able to "see" and relay both aural and data communications throughout roughly the world's northern hemisphere. Its operations and capabilities will thus be similar to our present OSCAR 10, except it will "fill in" the blank areas and times not included in OSCAR 10's equatorial-type orbits. Think of that as two OSCAR 10 type satellites, each providing relays for different world areas, and then remember OSCAR 10 is still young and strong hearted. Its second on-board nickel-cadmium battery hasn't yet been called into daily use. Double fun, and there's more due yet.

A triple launch of geostationary amateur satellites is being planned for 1988. This Phase IV concept will place each spacecraft over a strategic earth area—namely, the Atlantic, Pacific, and Indian Oceans. The satellites will operate within our 2 meter, 70 cm, and 23 cm amateur bands. Through earth-based interlinks and specific uplink frequency selection, one can direct a signal east or west of his/her location as desired. Want to "join in" on the ground floor of this action right now? Latch onto all-mode transceivers for 2 meters, 70 cm, and 23 cm, plus mating antennas and get cracking on OSCAR 10. It's an absolute blast of operating fun!

Personal Communications Systems

There are some exciting developments taking place in hand-held talkies that warrant watching during coming times. At least one presently popular 2 meter talkie (Santec) includes both FM and SSB operating capabilities at this time. Assuming a similar 70 cm unit also soon evolves, a ready-to-use OSCAR 10 and Phase IV setup could be carried in a small tote bag or two pockets. Roll-up wire antennas and small RF amplifiers would complete the system.

Smaller and smaller VHF and UHF FM talkies are another modern reality with a promising future. A quick scan through advertisement sections of this month's amateur magazines gives a prime example of that statement. Now if Casio or T.I. develops a similar cigarette-pack-size computer terminal, we can assemble a strictly pocket packet system. Personally, I'm still expecting wrist rigs to become reality so I can interface one with a wrist TV and calculator. Isn't modern technology grand!

Video Evolutions

Video activities, both amateur and commercial, are also on the brink of some exciting developments. ATV transmitters small enough to fit on radio-controlled model airplanes and thumb-size cameras again open new areas in personal communications systems. UHF ATV repeaters continue to gain mass popularity while providing impressive range for those setups. Quite possibly, however, today's forms of television may soon be superceded by the screenless concept of holographic video. Fixed-image-type holograms are typically produced by firing a split-beam laser into a fogged or cloud area where their resultant interference patterns are used to reproduce a three-dimensional image. You can view the image's top, front, or sides; it seems to actually "be there," but you can move a hand right through it. Holographic displays of this nature are often seen at exhibitions such as Disney World or NASA's Space Museum.

Through inclusion of mechanical/electrical scanning and laser-beam modulation, holographic video can expand the previous concept into complete moving displays (see fig. 1). The term "display" is

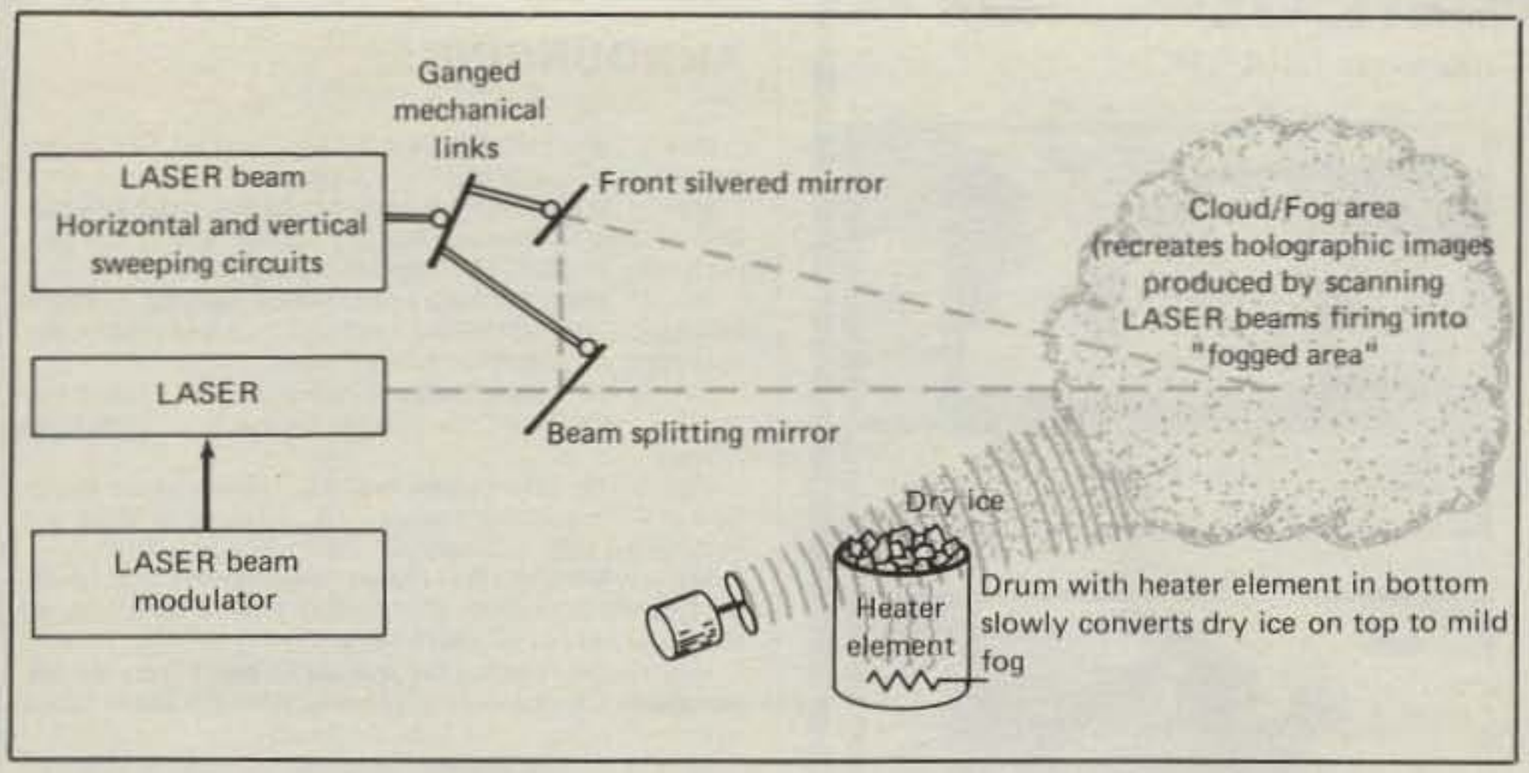


Fig. 1– Hypothetical setup for use in holographic video. The concepts are discussed in the text.

slightly misleading, however, since complete scenes would bear a close resemblance to plays rather than screen-type movies. Their viewing area would also be adjustable to suit available space. In many ways that initial system setup might be compared to equipping a room with a Boze speaker system. Exact positioning of the beam sweeping reflectors and the cloud display area determine overall holographic areas. Interesting concept. Maybe we'll soon have a working model to show.

Assuming you're still thinking along with us regarding holographic video, additional expansions may also seem feasible. The next logical refinement, for example, might involve eliminating the use of a fogged "reproduction area." A consequent step instigating full duplex sight and sound with such holographic displays would closely synthesize electronic transportation. Visualizing the technological capabilities of our century, expansion of synthetic electronic transportation again seems like a natural evolution. Today really is a golden age. We still physically travel in enclosed vehicles, many of which are powered by old-time internal combustion engines, we watch movies on a flat-screen display, and we talk to our worldwide friends via desk-top transceivers using mainly a nature-controlled reflector called the ionosphere. I'm not sure which is more exciting, the golden present or the fascinating future!

Future Assurance

While the previous views are both exciting and encouraging, we must remember the old proverb "There's no such thing as a free lunch." Our amateur radio ranks will continue into future generations only if we—each and every one of us—nurture, encourage, and promote its appeal and growth. If we continue leaving that campaign to the other person or to curious investigators' unguided abilities to learn on their own, we're promoting, if not guaranteeing, our own extinction. We must continually strive for favorable exposure to the general public while offering continuing guidance to those reflecting any spark of curious interest. As our own Editor Alan, K2EEK, pointed out, maybe we need—and can conjure—our own unicorn or "gimmick." Sometimes amateur radio is a unicorn itself. A packet setup demonstrated to a class of computer students, or an on-the-air mail display during a special event (with separate "promoters" explaining activities to curious investigators) is an idea whetter. That could be expanded to include local TV news coverage and later interviews with amateurs. Newspapers often follow leads of television—another vehicle for public exposure. A surprising number of newspapers welcome guest editorials from "involved parties," and a weekly piece on amateur radio reaches thousands of homes.

Looking inward, there are several additional unicorns which we can use to our advantage for glamorizing amateur radio to newcomers. Some of those attractions presently exist but need promoting for recognition; others need development and instigation. Worldwide communications via Phase III and Phase IV OSCAR satellites is available to all Technician and higher class licensees, for example, but that fact isn't necessarily in the front of everyone's mind. Ditto Fast Scan ATV and video repeater activities. In the development and instigation category, we might (should?) seriously consider some "promotional reallocations" within our HF spectrum. Arrangements such as expanding Novice bands an extra 50 kHz and allowing SSB operations (including Novice SSB) within that range can have multiple rewards. That approach is more appealing than a code-free license, it generates mass enthusiasm, encourages growth, and stimulates our economy. Many old timers surely remember when 2 meter phone privileges were available to Novices and that favorable impact on "going further" into amateur radio involvement. Today we can surely spare a few kHz of HF spectrum as a measure to retain any spectrum tomorrow. Let's just hope the idea works.

Those are the views as we see them at this time, and your opinions/ideas are heartily solicited. Write to me directly, and let's all begin moving toward the exciting times of tomorrow. The fun and enjoyment may just be beginning!

73, Dave, K4TWJ

ANNOUNCING:

May 17, **Wexaukee ARA Swap & Shop**, Cadillac, MI. Contact Wexaukee ARA, P.O. Box 163, Cadillac, MI 49601.

May 17, **RI Amateur FM Repeater Service Fleamarket & Auction**, Woonsocket, RI. Contact Rick Fairweather, K1KYI, Box 591, Harrisville, RI 02830 (401-568-3468, 7–9 p.m.).

May 17, **Pikes Peak Radio Amateur Assoc. Swapfest**, Colorado Springs, CO. Contact PPRAA Swapfest, P.O. Box 16521, Colorado Springs, CO 80935 (303-473-1660).

May 17–18, **BirmingHamfest**, Birmingham, AL. Contact Roy Johnson, NO4D, at 205-321-4863 (office) or 205-681-0855 (home).

May 17–18, **Lake Hartwell Hamfest**, Hartwell Group Camp, East of Anderson, SC. Contact M.A. Counsell, W1BNS, 215 Nottingham Way, Anderson, SC 29621 (803-261-7018).

May 18, **Willingboro Area Repeater Group Hamfest**, Willingboro, NJ. Contact Jack Engel, K2KLM, P.O. Box 31, Rancocas, NJ 08073 (609-877-5249 after 6 p.m.).

May 18, **San Francisco Bay Area OSCAR User's Group Meeting**, San Mateo, CA. Contact Ross Forbes, WB6GFJ, AMSAT Coordinator, P.O. Box 1, Los Altos, CA 94023-0001.

May 18, **Tri-State Swapfest,** Taylor, MO. Contact Western Illinois ARC, P.O. Box 3132, Quincy, IL 62301.

May 18, **Tamaqua Hamboree**, Tamaqua, PA. Contact A. Breiner, Jr., K3NYX, 127 Market St., Tamaqua, PA 18252 (SASE).

May 18, **Ak-Sar-Ben ARC Auction**, Omaha, NE. Contact Greg Zimmerman, N0BTN at 402-895-5219.

May 18, **Sandusky Valley ARC Hamfest**, Fremont, OH. Contact Pat D. Keating, WB8KWD, 615 Lime St., Fremont, OH 43420 (SASE).

May 18, **LIMARC ARRL Hamfest**, Old Westbury, LI, NY. Contact LIMARC Infoline 516-796-2366.

May 18, **Knox County ARC Hamfest**, Knox County Fairgrounds, IL. Contact Timothy Smith, KA9XLB, 1004 West Girard Ave., Monmouth, IL 61462-1066.

May 18, **Portage Hamfair**, Randolph, OH. Contact KJ30 at 216-274-8240.

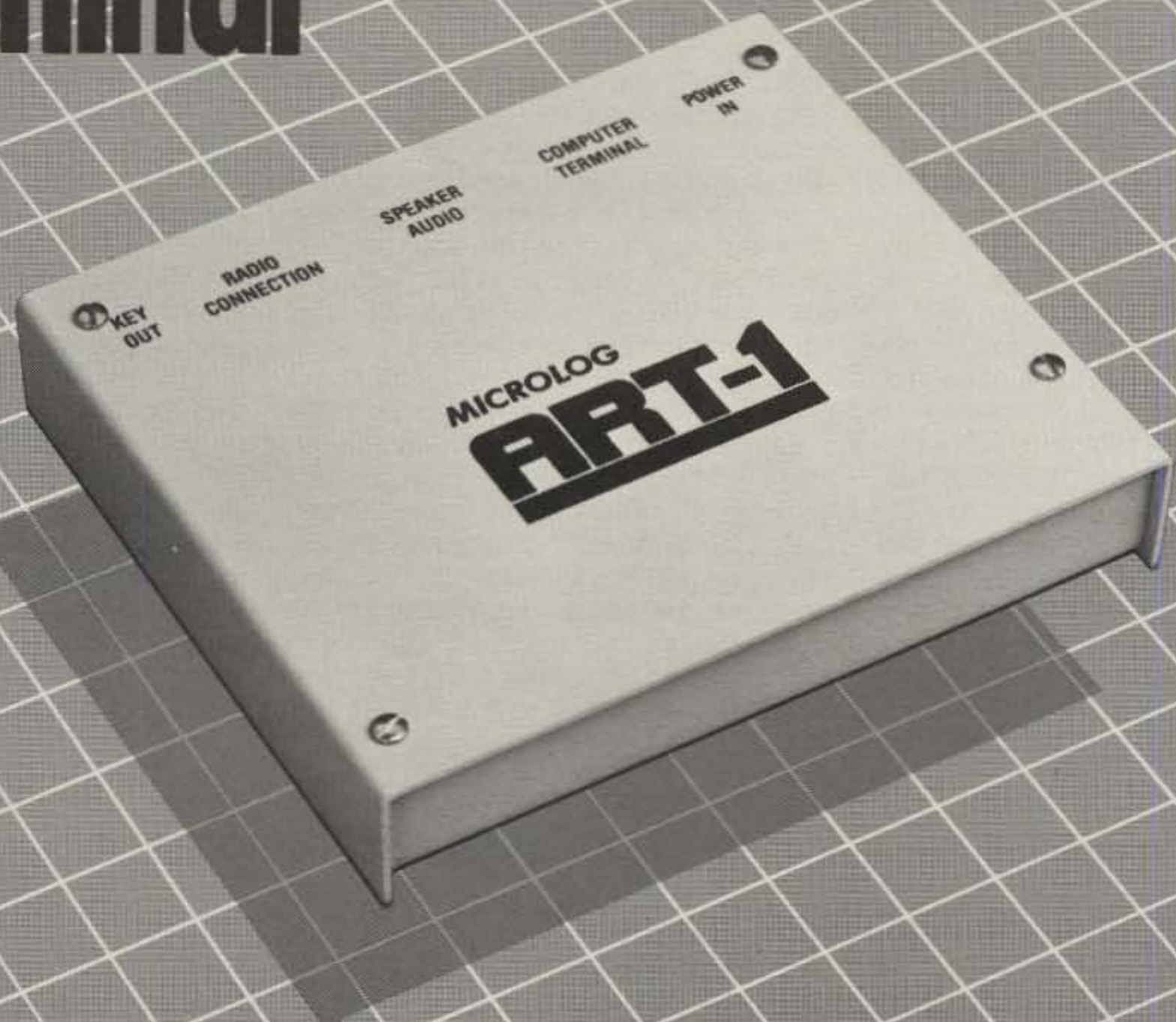
May 18, **Northern Berkshire ARC Fleamarket**, Dalton American Legion, Route 9, Dalton, MA. No contact given.

May 18, **900 MHz User's Group Hamfest,** Cicero, IL. No contact given.

May 25, **Quebec Hamfest 1986**, Tracy, Quebec, Canada. Contact Sorel-Tracy ARC, P.O. Box 533, Sorel, Quebec, Canada J3P 5N6.

July 19–20, **Atlanta Hamfestival**, Atlanta, GA. Contact Atlanta Hamfestival, Inc., P.O. Box 77171, Atlanta, GA 30357 (SASE).

All Mode Communication Terminal



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Here are a few of its many features:

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CIRCLE 112 ON READER SERVICE CARD

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

Aurora!

By the time this reaches print it will have been ten weeks since the most amazing Aurora conditions I've ever heard created the need for operators to spread themselves out all over the VHF/UHF bands in hopes of finding reasonably clear frequency. Of course, the HF bands were absolutely drowned by the intensity of the geomagnetic storm that occurred February 8, and many of our HF band DXing brethren probably cursed the lousy conditions; but that date produced the most intense Aurora VHF propagation I've heard in 20 years on the bands.

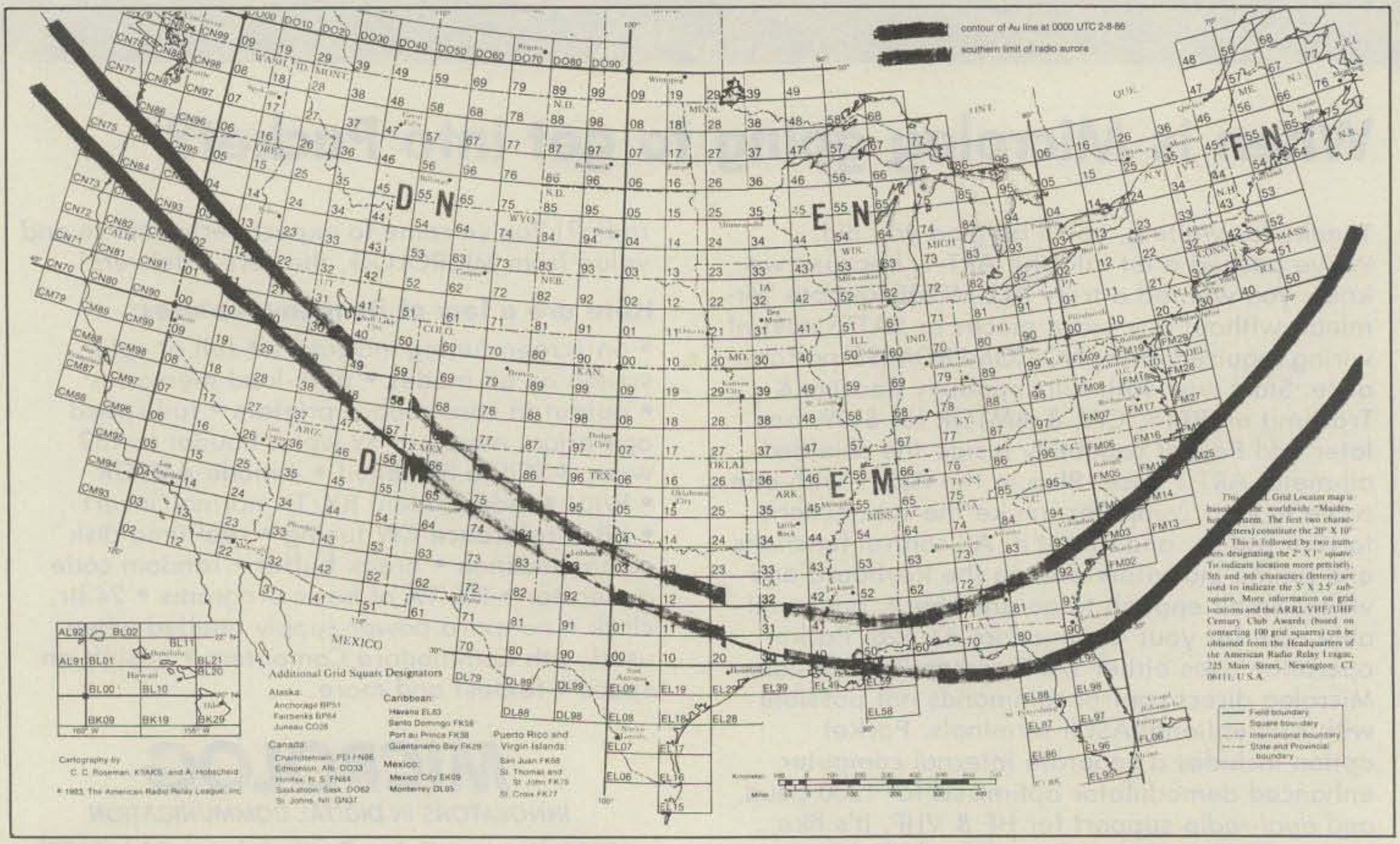
For me, it started with a telephone call from WA2FXB at about noon local time (1700 UTC). Sid informed me of the Au and advised that I get on the air as quickly as possible. I had company visiting and didn't wish to be rude, so I stole just a few minutes to tune around on 2 meters. Hearing only the "usual" Au stations at their normal signal levels, I thought this was just another wintertime Aurora. I was very wrong. Having listened during a lull in the conditions, I wasn't immediately aware of how intense this geomagnetic storm was, or what it was about to produce for VHF enthusiasts all over our continent (and possibly the world).

Later in the day, about 1745 EST (2245 UTC), I had a bit more time to spend at the station equipment. Six meters was bursting with activity, midwestern Au stations showing 40 dB/S9 signal levels. "Now *that* is an Aurora," I thought to myself, warming up the kilowatt final. Tuning across 2 meters, I found more of the same: intensely strong Au signals coming from points so far south I could barely believe it. Warming up the 2 meter kilowatt final, I rushed to the 135 cm station and tuned the receiver to 220.100. Holy mackerel! This band was open, too! With the 220 MHz kw filaments warming, I practically raced over to the 70 cm station in anticipation of hearing my first genuine (workable) Aurora signals on 432 MHz. Sure enough, there were some buzzy signals on the band, but they weren't as strong as on the "lower" three bands.

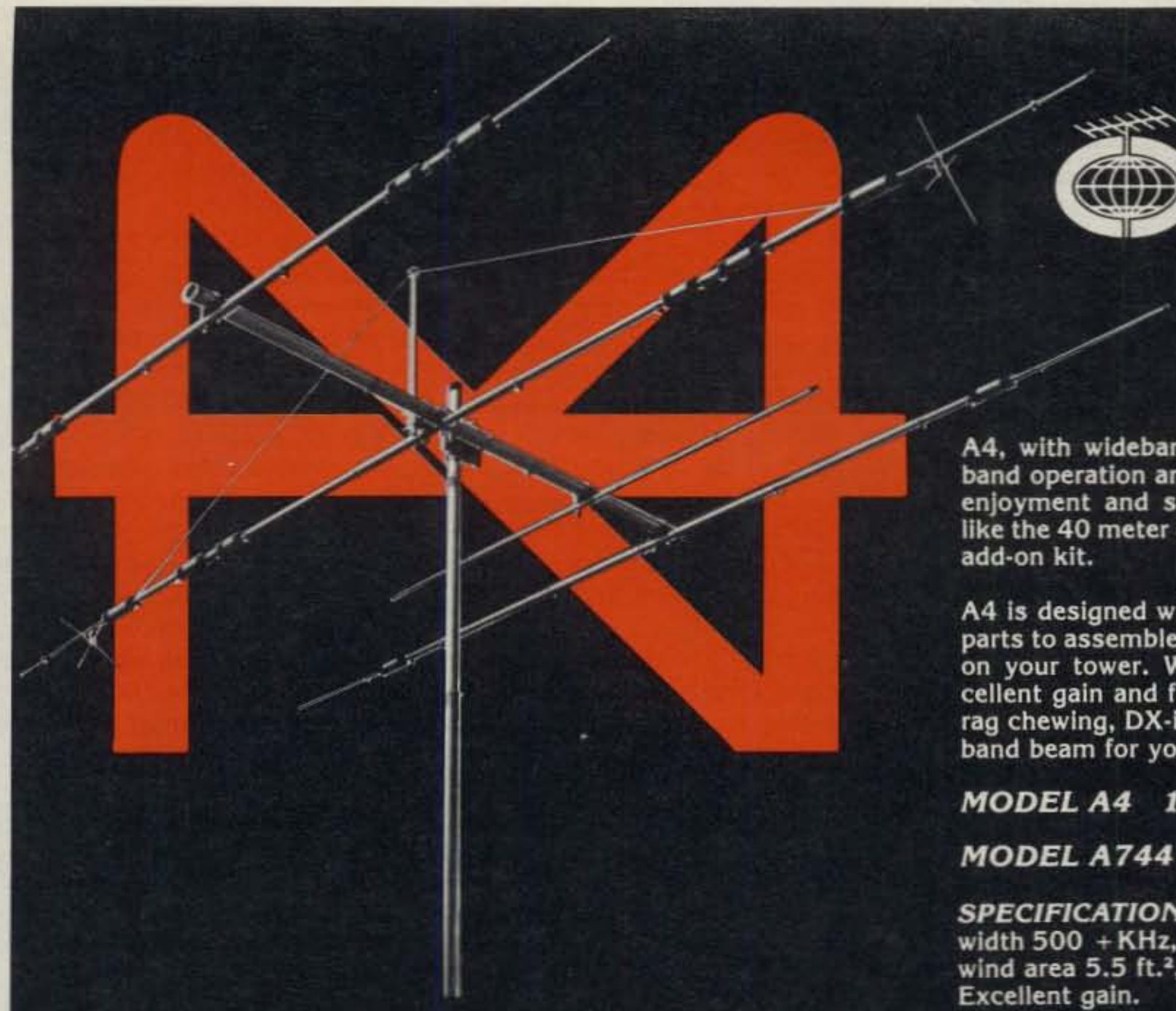
What to do? I knew I only had perhaps 90 minutes to operate, as we were expecting company for dinner and a movie and it would have been impolite to ignore this social obligation. I had to make the most of those 90 minutes. By 1800 local time I found myself calling CQ on 144 and 220 MHz with memory keyers while I worked phone (SSB) on 50 MHz in a valiant attempt to make at least 3 Au QSO's per minute. Things didn't work out exactly as I had hoped, and my QSO rate averaged only about 1.7 per minute on the three bands, but I sure had a lot of fun working new stations, grids, and even a new state (on 135 cm). I never did get on 70 cm, and I understand I missed a great opportunity there.

24 Louis Dr., Budd Lake, NJ 07828

The ARRL Grid Locator map showing the mean contour of AU line at 0000 UTC on February 8, 1986, and the southern limit of radio aurora.



A4



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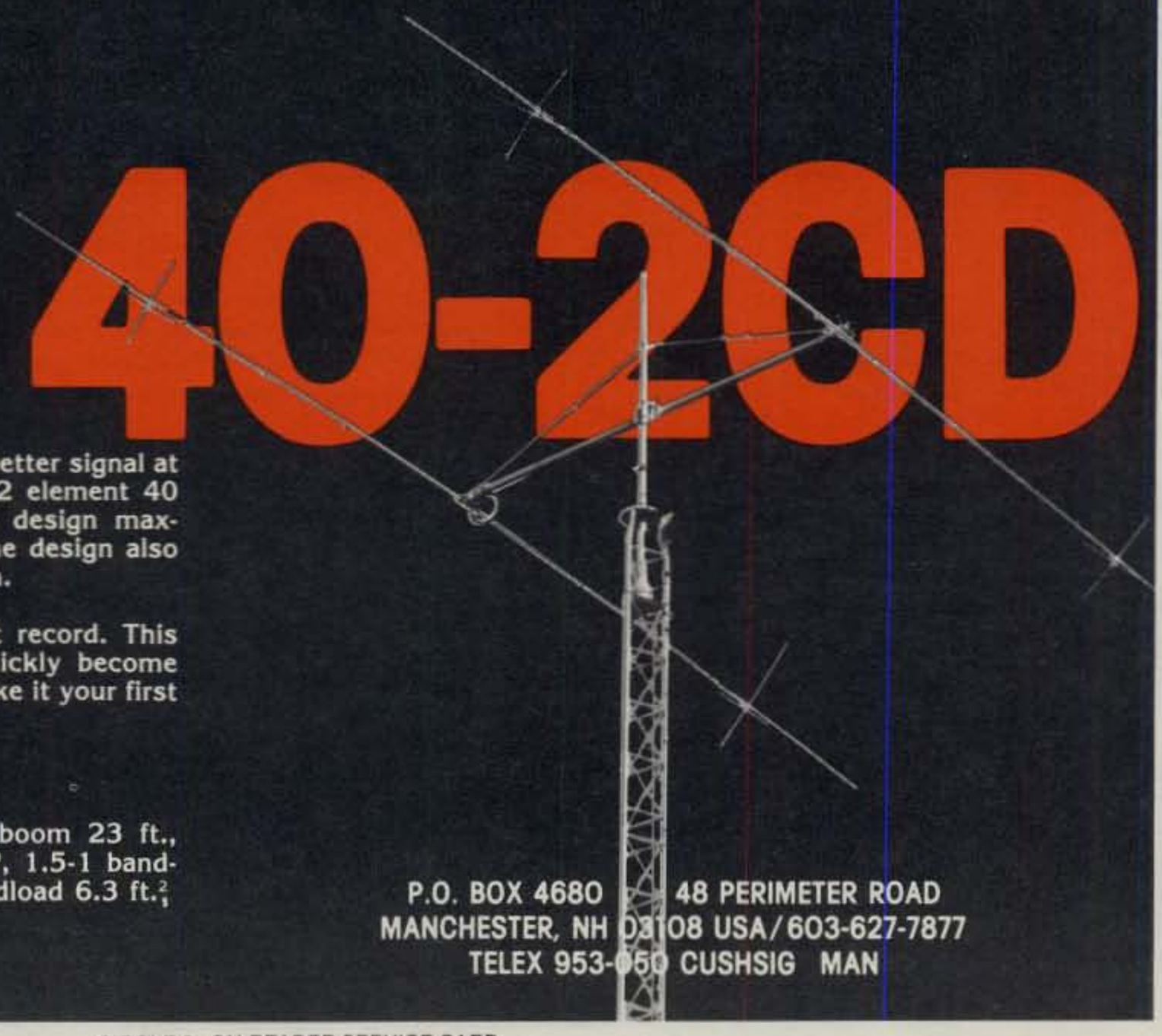

More contacts, less interference and a better signal at the receiving end are yours with this 2 element 40 meter Skywalker Yagi. The computer design maximizes gain and reduces side lobes. The design also gives low SWR with excellent bandwidth.

Holder of the North American contact record. This compact two element antenna has quickly become "the most wanted" 40 meter beam. Make it your first choice.

MODEL 40-2CD 40 METERS

SPECIFICATIONS F/B ratio 20 dB, boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², weight 40.7 lbs. Excellent gain.

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Now it's all over but the shouting, and reports from everywhere indicate that many Au DX records were shattered on February 8, 1986. "The Midwest VHF Report" for February tells of 2 meter contacts between WAØTKJ and KA1ZE (1348 miles) and K5SW and W1VD (1270 miles). The same report details numerous Au contacts made on 220 and 432 MHz by midwestern stations, and that KH6IAA was working mainland stations as far east as MN on 50 MHz! Dan Vanderplough, NA9N (IN), wrote to tell of his success working the February 8 Au with an FT221R and 7-element beam. NA9N is a newcomer to weak-signal mode 144 MHz work, and got on just in time to work NY, NC, IA, MO, KS, IL, and AR within one hour, and he's only running the 10 watt Yaesu rig barefoot.

What could possibly have produced such wonderful Au conditions? I asked Sid Lieberman, WA2FXB, one of our local propagation moguls, for his interpretation of the February 8 Aurora. Sid replied with some "brief notes" (about 5 pages long) reproduced here in part:

"The Aurora which occurred on 6 meters through 70 cm (was caused by what) can be classified as one of the greatest geomagnetic storms of the century. It is very rare to have a Boulder 'K' index of 9 + during a three hour reporting period (per WWV).

"This geomagnetic storm was the result of a pair of solar flares on the Sun's disk. There was a steady buildup of geomagnetic activity until the index reached the top reading on the 'K' index (9 +) at approximately 0000 UTC. At this time, the 'A' index reached a value of 110 out of a possible 400 flux units. The 'A' index is a cumulative value of the 'K' index for the preceding 24 hour period.

For many years scientists have known there is a form of sporadic-*E* skip associated with the Aurora and its Auroral Electrojet known as 'Auroral E.' This *E*-skip condition has been known to rise up to the 6 meter band and yield contacts with paths that follow the direction of the Auroral Electrojet stream. Under a normal Aurora (K index Ca 5 units) the possibility of Auroral *E* should be limited to the higher latitudes (42 degrees and north), but due to the severity of the February 8 storm the Auroral line dipped down into the middle latitudes.

"Using the F2 formula by K. Davies and modified by S. Lieberman for *E*-skip latitude tracking, we can now apply this to the southern limits of the radio Aurora and see if it fits the geographical profile for stations participating in the opening. The modified formula is this:

78 − (2 × K-index) − 31 degrees = Southernmost latitude line

"This is derived as follows:

78 degrees = geomagnetic latitude (the normal resting point of the Auroral zone under a 'K' index of zero).

(2 × K-index) = F2 formula for geomagnetic latitude per K. Davies.

− 11 degrees = conversion from geomagnetic to geographic latitude.

− 20 degrees = the 'FXB constant' to derive the southernmost limit of the *E*-skip and Aurora line.

(Ed. note: Evidently, there is some "black magic" to all this.)

This formula seems to fit the opening of February 8, since around 0000 UTC, with the 'K' index at 9 + , stations in the northeastern U.S. were making Au contacts into GA, AL, AR (latitude 32–35 degrees), and as the index dropped the paths drifted farther north in latitude, closing out the paths to the deep south. At one point, when the southern limit line was about as far south as it could go and the east-west window was in proper position, K9MRI worked into New Mexico on 2 meters. It is very rare to work Au from NM, since the aurora's center footing is at the geomagnetic north pole (over Greenland).

"There are reports of 1000 mile Au contacts on 70 cm; this can be attributed to the intensity and duration of this geomagnetic storm. Here in W2-land, the 2 meter band was open to W9-land at 0900 local, then closed at 1330 local, only to reopen in the late afternoon as we lost the direct effect of the sun on our part of the planet; the band remained open until about midnight local time (geomagnetic midnight).

"Bouncing signals off the Aurora line is like playing pool with bank shots. This is why, when the line was below us, we had to look west 270–280 degrees to get the long path west and southwest. Looking north-northeast gave us the bounce back to W4-land as well as to VE1."

These words are Sid's, not mine, so if you feel differently you might want to take it up with him. The reference to K. Davies' work is from "Studies of Ionospheric Storms Using a Simple Model," Volume 79, No. 1, *Journal of Geophysical Research* (2/1/74).

I'm sure we'll be hearing much more about who worked whom and what records were broken as the reports continue to arrive. Meanwhile, keep your eyes and ears open for signs of unusual geomagnetic activity which might create enhanced VHF/UHF conditions! Remember, when the HF bands are simply "wiped out," get up on VHF and look for Aurora signals. A few brief tips might be in order for those who have not yet worked VHF Au:

- **Point north,** or toward the geomagnetic north pole, to begin with. Au can peak in other directions, but generally it peaks toward geomagnetic north ±30 degrees.
- **Use CW** for best results, especially when running low power. If you *must* use SSB, speak slowly and distinctly, taking care to articulate to your best ability. Do *not* speak at your normal conversational pace.
- **Spread out,** avoiding popular "calling frequencies." Au signals occupy greater bandwidth than signals of the same mode which are propagated without Auroral reflection. Very sharp CW filters may prove a hindrance, rather than a help.
- **Keep your antenna moving,** to peak the Au signals as the reflection angle continues to change. Often signals will peak toward geomagnetic north but will be influenced by the geographic location of the other station(s). It's a real help to have a rotator which stops at south, not north, for Au work!
- **Start out on 6 meters,** if you are so equipped for this band, then follow the Au up the spectrum to see how far it goes. Au, like meteor scatter, is easiest to work on 50 MHz and becomes increasingly difficult as we jump up the bands. Seventy cm Au, while possible (and terrific on February 8, 1986!), is rare.
- **Use clear and simple phonetics** on SSB. Unlike m.s. work, where time is of the essence and phonetics are generally wasteful, easily- understood phonetics can be a real help for Au work. Avoid single-syllable phonetics which might be confused for similar-sounding words ("CALIFORNIA" is a better phonetic that "CAT").
- **Stick with it a while,** even after the Au signals have apparently taken their final fade. There is often a lull in Au propagation, only to be followed by another peak which allows contacts over entirely different paths.

Dayton

The world-famous Dayton Hamvention is April 25–27 and this issue will be out before then, so I consider it our Dayton issue. Maybe I'm alone in this, but last year the April *CQ* was barely a memory at Hamvention time, while the May issue was on the newsstands. Please, if you live within any reasonable distance of Dayton, OH and have a keen interest in VHF/UHF work, make an effort to attend. I've been making the annual pilgrimage to Dayton for some 13 years (for me, it's only 600 miles) and I've never been disappointed. The VHF forum is excellent, as are most of the other scheduled activities. There are bargains galore at the mammoth fleamarket, and new equipment vendors will keep you busy eyeballing their newest wares. Since so many of our amateur equipment manufacturers are located in Japan, where there is more VHF/UHF activity than anywhere else, we can always expect exciting things from the land of the Rising Sun. The ICOM IC1271A multimode 23 cm transceiver, only a rumor at Dayton '85, will be available for sale this year.

Lots of goodies for VHFers come from Europe, as well, and a couple of our favorite specialized equipment dealers

ANTENNA/TOWER SALE!

hy-gain

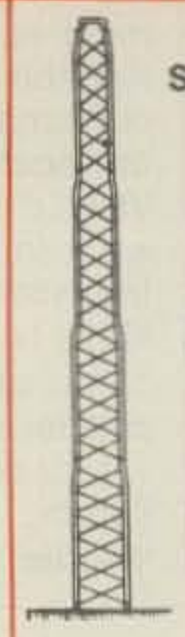
CRANKUP SALE!

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
HG77SS	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.!



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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.**

ROHN

Guyed Tower Packages

- **World Famous Rohn Quality and Dependability**
- **Rugged high wind survival-provides safe installation**
- **Multi purpose towers satisfy a wide range of needs**
- **Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.**

You can save freight costs on optional thrust bearing & antenna mast by ordering with tower packages. See lower right for most prices. Packages shown are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	Model 45G	Model 55G		Model 25G	Model 45G	Model 55G
40'	$ 509	$ 919	$1,249	90'	909	1,689	2,049
50'	569	1,039	1,399	100'	989	1,809	2,219
60'	629	1,169	1,579	110'	1,189	2,069	2,609
70'	689	1,289	1,729	120'	1,249	2,179	2,769

US TOWER CORPORATION

Formerly Tristao Tower Co.

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

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55' tubular

Will handle 10 sq. ft. antennas at 50 MPH winds.

Regular $1245
SALE! $899
IN STOCK FOR IMMEDIATE DELIVERY

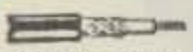
CALL FOR INFORMATION ON ALL OTHER MODELS

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



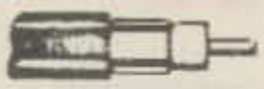
$.19/ft $179/1000 ft

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

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10 MHz	30 MHz	150 MHz	450 MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
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 UG23D 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
Standed 14 ga.	$.10/ft	16 ga.	$.09/ft

¼ mile 18 ga copper-clad steel wire ... $30
6 inch heavy-duty end insulator ... $3.00/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 all band antenna ... $49

ALPHA DELTA

DX-A 160-80-40 Sloper ... $49

CUSHCRAFT

A3 3-el Tribander Beam	$209
A743 30/40 mtr 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 40 mtr Beam	$279
A50-5 5-el 6 mtr Beam	$79
215 WB NEW 15-el 2 mtr Beam	$75
4218 XL 18-el 2 mtr Beam	$95
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	
12 AVQ 20-10 mtr vertical	
14 AVQ 40-10 mtr vertical	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2 mtr Beam	
25BS 5-el 2 mtr Beam	
28BS 8-el 2 mtr 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

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

HF4B "Butterfly" $189. (del. cont. USA)
- Covers 10, 12, 15, 20M
- Compact Beam Design
- Max. Element Length of 12.5'
- Light Weight, Only 17 lbs.
- Use with TV Rotor

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

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 HDR3000 Heavy Duty (25 sq ft rating)	$Call
Kenpro KR500 Heavy Duty Elevator Rotator	$189
Kenpro KR5400 AZ/EL Rotor Package	$319

ROTOR CABLE

Standard 8 cord cables $.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
9901LD 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

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NEW Top-of-the-Line HF Transceiver
- 100% Duty Cycle
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TM 2570A	(70W)	LIST $549.95
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High Tech HT XCVRS

NEW Ultra-Compact HT XCVRS
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List Price $849
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IC-751A New Full Featured HF Transceiver. Top of The Line. Warranty
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IC02AT - 2mtr
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High Tech HT XCVRS

IC2AT - 2mtr
IC3AT 220 MHz
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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
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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
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FT2700RH NEW 2m/70cm Dual Band Transceiver
Full Duplex — Cross Band Operation! List $579
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NEW High Tech 2mtr HT
5 Watt Output
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Isopole 144MHz, 220MHz & 440MHz Antennas In Stock — CALL FOR SPECIAL PRICES!

MIRAGE AMPLIFIER SALE!

B3016 ONLY $199!

Model	Band	Pre-amp	Input	Output	Sale Price
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B23S	2M	No	2W	30W	$ 79
B23A	2M	Yes	2W	30W	$ 89
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
D24	440	No	2W	40W	$179
D1010N	440	No	10W	100W	$289

AMERITRON

AL80A NEW 1000W 3-500Z Amplifier $689

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

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NEW KPC-2 Packet Controller
List $219.00 ONLY $199.95

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TRS80C Hamsoft $59.95 TI994A Hamsoft		$99.95
Hamtext (Apple/Atari/C64/VIC20)		$99.95
Amtorsoft (C64/VIC20)		$89.95
Amtorsoft (Apple)		$139.95

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CIRCLE 22 ON READER SERVICE CARD

will be manning inside booths at Dayton. Look for The PX Shack, who will be selling Microwave Modules, E.M.E., Transverters Unlimited, and other imported products; and the VHF Shop, who will be offering Mutek Ltd., S.S.B. Electronic, F9FT (Tonna), and other European wares. Speaking of The VHF Shop, its proprietor, KQ3R, submitted a few photos showing his VHF/UHF antenna farm in northeastern PA (FN10). Tom has a total of 1064 elements, spread over 4 towers, for 50 through 2304 MHz!

Tom O'Hara, W6ORG, of P.C. Electronics, will be moderating the ATV Forum at Dayton and he'll also be displaying his products at an indoor booth. Tom has an interesting writeup entitled "What Kind of DX Can I Expect with ATV?" and I hope he brings copies of this along for distribution from his booth. Tom and others have been trying to get me on ATV for a couple of years now, and I think this will be the year that I finally bite the bullet and join in the fun on 439.25 MHz. Hope to see you there (literally).

I'll spend a bit of time at the *CQ* booths, but shall mostly occupy myself out at the fleamarket picking up parts for new homebrew projects. Four of these projects are 8877 amplifiers for 50 through 432 MHz, a joint effort with WA2VUN to provide Mike with some horsepower to complement his new 106 foot tall rotating antenna farm. I'll also be involved with a presentation at the Contest Forum, where we are giving a multiprojector audiovisual show on Field Day '85. What does this have to do with VHF? Well, one of our full-time FD stations (out of 3) was a VHF station which switched between 50 and 144 MHz to provide us with hundreds of QSO's from our mountaintop perch in northwestern NJ. If you enjoy FD and haven't given VHF a serious try, you're missing out on a lot of fun!

The Second Annual *CQ* Worldwide VHF WPX Contest, now scheduled for July 19–20, will be promoted at Dayton. We intend to have a display set up at the *CQ* booths and should have contest rules, logs, and entry sheets available at the booths. There were 500 entrants in the 1985 VHF WPX Contest, and we expect this number to grow in 1986. More VHF WPX info to come.

AA4FQ (left) and KA4BCM inspect their handywork at the K4HY (Owensboro ARC) site from which WØORE/5 was contacted.

Activities

WA1JXN, reknowned VHFer and moonbouncer from Montana (and previously, VT and PA) spent a couple of weeks operating /C6A (Bahamas) in late February and raised quite a ruckus with his overwhelming signal up and down the east coast. I don't know at this juncture exactly what Lance was able to work off the moon, but he surely made a lot of tropo/scatter contacts on 144.200. I listened to his S1, bursting to S9, signal for several hours on February 18 and 19. Nobody seemed to have any trouble working Lance, if they were willing to plough through the intense QRM on 144.200 to do so. I thought this a rather foolish frequency for a "DXpedition," and would have much preferred to hear WA1JXN/C6A operating below 144.120 in the "DX window." In any case, I'm certain Lance's expedition was an enormous success and was hoping to drop in on his operation; it seemed that we had a vacation in the Bahamas planned for February 21–26 anyway, so we would be "in the neighborhood." Unfortunately, Lance's operation on Abaco Island was pretty far away from our vacation site at Cable Beach (on New Providence Island, near the capital city of Nassau), so we never did get to surprise WA1JXN with a visit. Maybe next year.

Ross Forbes, WB6GFJ, AMSAT Coordinator for North Central California, would like us to announce that the San Francisco Bay Area OSCAR User's Group will be meeting on Sunday, May 18 in San Mateo. They also intend a second meeting in October as part of the ARRL Pacific Division convention. For more information, contact Ross at P.O. Box 1, Los Altos, CA 94023-0001. How's that Ross?

Dale Coy, WA7TUX, wrote an interesting letter about his 6 meter activities from Utah. Dale's been using an NCG triband transceiver (who makes these things, anyway?) which covers 6-15-40 meters and runs 10 watts output to his G5RV multiband dipole antenna (!) installed as an inverted vee. Despite his modest station, Coy has made contacts with 15 states and 2 VE's in 34 grid squares, with his best DX being MN. WA7TUX says, "I'm coming to believe skip is there when we aren't. I believe if more hams really knew how little it really takes for some real 6 meter excitement we'd have more on. Ten watts and even a 6 meter dipole can provide some very interesting experiences." You're right, Dale. But, thanks to an excellent network of 50 MHz beacons I believe that word of enhanced conditions spreads pretty rapidly. Read on for more about how we can improve our chances for new grids, states, and countries on 6.

Harry Schools, KA3B, of Philadelphia, is compiling a 6 meter activity listing for North America. "It is my aim to prepare an activity listing that would include stations active on the band with their respective grid squares and a nationwide listing of 6 meter nets....I think that anyone who spends any amount of time on 6 meters would like to have this type of information in the shack for reference," says Harry. Sounds like a good idea to me. Please write to KA3B with station and QRA information; his address is 1606 South Newkirk St., Philadelphia, PA 19145.

Having worked W3HQT/1 (ME) in the January VHF SS and again during the February 8 Aurora, I received a letter from Bill telling of his "Down East Microwave" products and his plans to be at Dayton. I'm glad to hear you'll be with us, Bill, and hope to see you there! W3HQT points out that his 45-element loop Yagi for 23 cm should show gain just slightly lower than the 55-element F9FT array reviewed in this column for January, but the "looper" should prove a better performer when wet. Bill says conventional 1296 MHz Yagis detune terribly in the rain, because the water droplets tend to hang from the tip ends of the elements (the high-impedance points). On a loop Yagi the water runs around to the low-impedance point. Perhaps we can run a "garden-hose test" on the two antennas sometime this summer to demonstrate relative performance dry versus wet; this would be an interesting test. Bill's company, Down East Microwave, will be selling loop Yagis and other specialized UHF products at Dayton.

Don Baldwin, WA7VHW, of Sprague,

The Microwave Modules MML432/100 amplifier will be featured next month.

WA wrote to tell about his meteor-scatter work from DNØ7. He's interested in learning more about the trigonometry involved in signal reflections and the technique of offsetting antennas (from the great-circle path) to catch more useful meteors. Don, I'd be glad to make this the subject of a future column, so keep reading! Don is running a barefoot TS600 to a 3-element NBS Yagi on 6, and an IC211 plus 80 watt T.H.L. (Tokyo High-power labs) amplifier to an 11-element W5UN Quagi on 2. Baldwin says he's determined to get a 4CX250R amp and a bigger antenna going on 6, plus a pair of 4.2 wavelength NBS Yagis on 2, in time for the next meteor-scatter season. He's also putting together a KB7Q 8877 amplifier for 2 meters and should have it on the air by now. Good luck, Don, and let us know how your m.s. work is going.

Jeff Harris, AA4FQ sent along a photograph of the helix antenna he and KA4BCM used to contact WØORE aboard the space shuttle Challenger in August 1985. Their 5-turn helix, pictured elsewhere in this column, was made of wood ("What a mistake"—AA4FQ) and was remotely rotated with a pan/tilt camera positioner. These folks at the Owensboro, KY ARC, K4HY, ran an IC27H transceiver and Mirage B1016 amplifier to the helix and had an estimated ERP of 3500 watts. Jeff has modified a surplus AM-6155 amplifier for use in his home station and has it running at about 375 watts output. His original report advised he was getting 650 watts from the AM-6155, and I didn't print that because I didn't believe it; sure enough, Jeff's follow-up letter says his Daiwa 720 power meter was in error, and he's confirmed the output to be 375 watts using a borrowed Bird instrument. That's more like it, Jeff!

I'm not surprised the Daiwa 720 was so far off. I own some of these pretty cross-needle meters, and while they seem to work okay on the HF bands, they're inaccurate at VHF. In fact, when I put 1 kw output power at 144 MHz through a Daiwa (which was rated at 1 kw from 1.8 through 150 MHz), it melted the dielectric material in one of the SO239 receptacles and began to burn the printed circuit board coupler (smoke and all). I subsequently measured the meter's input VSWR at 144 MHz with its output terminated in a 50 ohm microwave (resistive) load and found it to be 1.7:1—not too great. I also measured the through loss at 144 MHz and found it to be 1.0 dB. No wonder it got so hot at a kilowatt! The meter's coupler was dissipating over 100 watts of power.

For such reasons I've decided to use only microwave-type traveling-wave RF couplers for power monitoring in m · station. I have several Bird-type 43 me rs, but these aren't the only good ones around. I'll be reporting on a few VHF/UHF power-measuring instruments and comparing their characterisitics in a future column.

Next Month

The June *CQ* will contain the results of the First Annual Worldwide VHF WPX Contest (finally!) and other feature articles of interest for VHFers. In this column we'll review the Microwave Modules MML432/100 power amplifier, a product of increasing popularity in the U.S. I've had the chance to use the MML432/100 for a couple of months now, and it's a winner! And we'll have some operating tips for the summer months, so don't miss it.

73, Steve, WB2WIK

CQ REVIEWS:

The AEA PK-64 Pakratt And HFM-64 Modem

BY LEW MCCOY*, W1ICP

In this day and age one hears a wealth of expressions such as "right on!", "go for it!", "sexy, man!", and so on. It really boils down to what "turns" you on. In my case, there is no doubt that I am old (70) and jaded—I still think that the greatest singer (female) was Judy Garland with Streisand a close second. Sinatra, with all apologies to Crosby, was number one, and without a doubt Duke Ellington was first as a band leader and composer. This in a way has nothing to do with amateur radio, but to me is a good introduction to a product review. Incidentally, if any readers want to argue my choices, write to me. I promise to answer —one day.

The Pakratt is designed to work with the Commodore C-64, SX-64, and C-128 computers. I have said this in many previous reviews and it sounds like I am a salesman for Commodore, but the C-64 is the one very popular computer for amateur radio. There is more software and hardware available for amateur radio for the Commodore than for any other computer. I find that a C-64 can be purchased used for under $100 at hamfests.

The PK-64 comes in a small package. The case measures 10 inches deep, 5 inches wide, and 2 inches high. There is a shielded cable with appropriate plug to go into the computer. Basically, the PK-64 permits you to operate (send and receive) Morse, Baudot, ASCII, AMTOR, and AX.25-V2 Packet. To operate Morse you do need the addition of the HFM-64 (High Frequency Module). Without the module, you can operate Packet on VHF and UHF. However, for high-frequency work the HFM-64 is a must. This unit includes an LED bargraph tuning indicator, which I found necessary for tuning in 20 meter and other HF packets. It does provide for weak signal copy. In addition to the bargraph, a **Threshold** control is also made available, permitting you to maintain "close" adjustments on incoming signals. The HFM-64 is mounted inside the PK-64 case.

I have always been critical of new products that fail to provide adequate operating instructions or "weak" manuals. At the outset I would like to state that the manual that comes with the PK-64 is absolutely outstanding. In fact, it is almost a complete operating manual for both Packet and AMTOR. There are 10 chapters in the manual including one that is a complete hand-holding procedure for getting the Pakratt on the air and working. In fact, there is a section in the front of the book that tells you how to use the manual! Also, there are complete schematics, block diagrams, and parts lists—well over 100 pages of solid information.

This is the Pakratt PK-64.

I don't intend to go into a lengthy discussion of Packet Radio because by now there have been reams of information printed about the mode. Check W5PFG's article in the November 1985 issue of *CQ*. However, a few words are in order to understand what is being described in this review.

One of the newest forms of communications, Amateur Packet Radio, has been developed by amateurs in North America. It represents a major improvement in the reliability of text communications—the elimination of receiving errors in amateur text transmissions. With the advent of radio teletype, amateurs were relieved of the responsibility of decoding the teletype tones. Mechanical equipment was used to decipher the tones and transfer them to a printer. With the advent of home computers and video displays conditions improved immeasurably. However, accuracy of the received text still suffered because of the vagaries of the signal path. Packet Radio solved the problem of accuracy by using a system of error checking. The packet controller provides the receiving station with information that can ensure that the text it receives is 100 percent accurate.

To accomplish this a Terminal Node Controller (TNC) is needed. Its task is formidable in that it must take the text that you send and package it into packets. These packets include additional information specifically related to how the text will get to its destination and be received in sequence with other data. While this is going on the TNC listens for other packets sent by other stations, checking to see if they are intended for you or if someone else is sharing the frequency and using your TNC as a digipeater. All this is "transparent" to you, as you will see only the text sent to you. (Although with the PK-64 it is possible to copy all the traffic on the frequency. More about that in a moment.)

There are many different TNCs being used in the USA and Canada (and some DX stations), but though they are different, they are all capable of communicating with each other because they all use the same "protocol." This protocol is known as AX.25 Version 2.0. I won't go into details about AX.25 as

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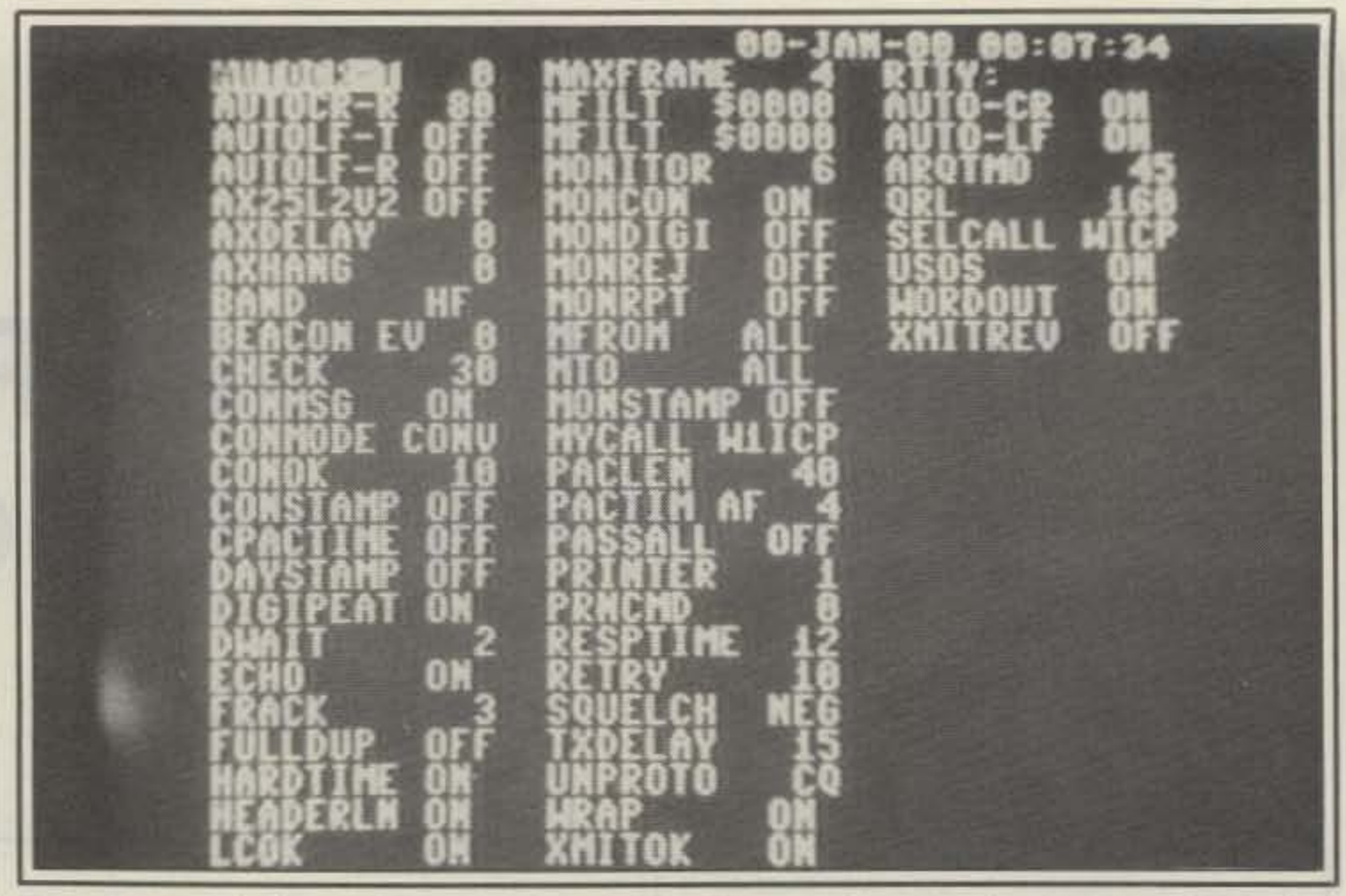


This photograph shows the parameter screen. One merely moves the cursor to the desired number to be changed and types in the change. (The changes can be filed top disk and brought up automatically.)

there have been many articles written on the subject.

The PK-64 comes with a very extensive list of settable parameters. When one first brings up the parameter screen on the video display it looks overwhelming. However, AEA has preset each parameter to a default value that should be close to what you actually want. As you use the system, there may be things you want to change (in fact I know you will). These changes can be saved to disk and then when the unit is first turned on, the disk file will change the parameters to your presets. The instruction manual takes you on a step-by-step course on each parameter and what each does. Also, I have photographed the parameter screen and it is shown in this review. As I said before, the manual does an excellent job. However, one feature that I considered outstanding is in the **MONITOR** modes.

In the **MONITOR 2** mode the following setups are available:

0 No packets are monitored.

1 Only unnumbered information (UI) frames are displayed. These are frames resulting from an unconnected transmission. This mode is handy for an UNPROTO, roundtable-type QSO. If other stations are connected and using the frequency, their packets are not displayed.

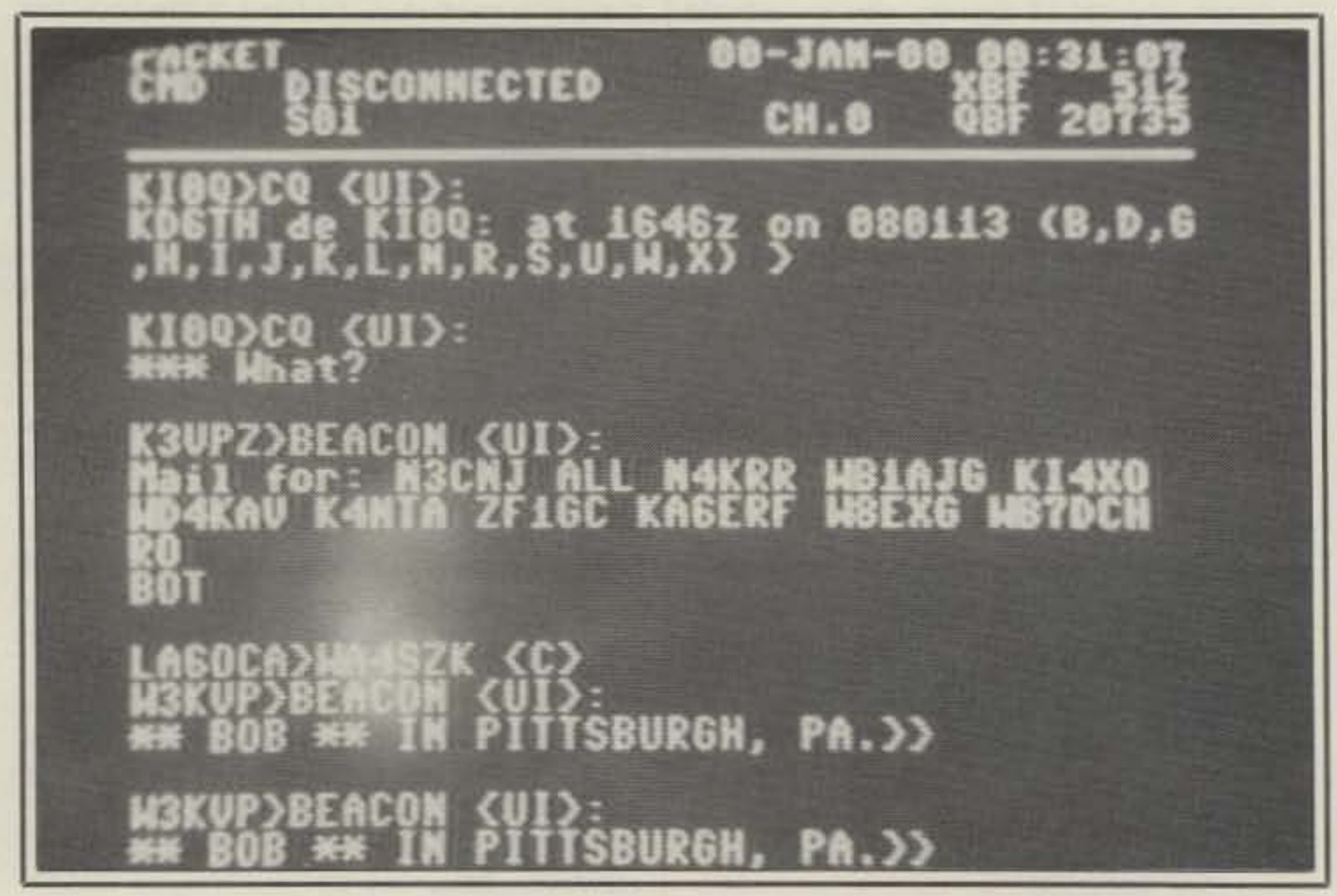
2 As in number 1 but numbered information (I) frames also are displayed.

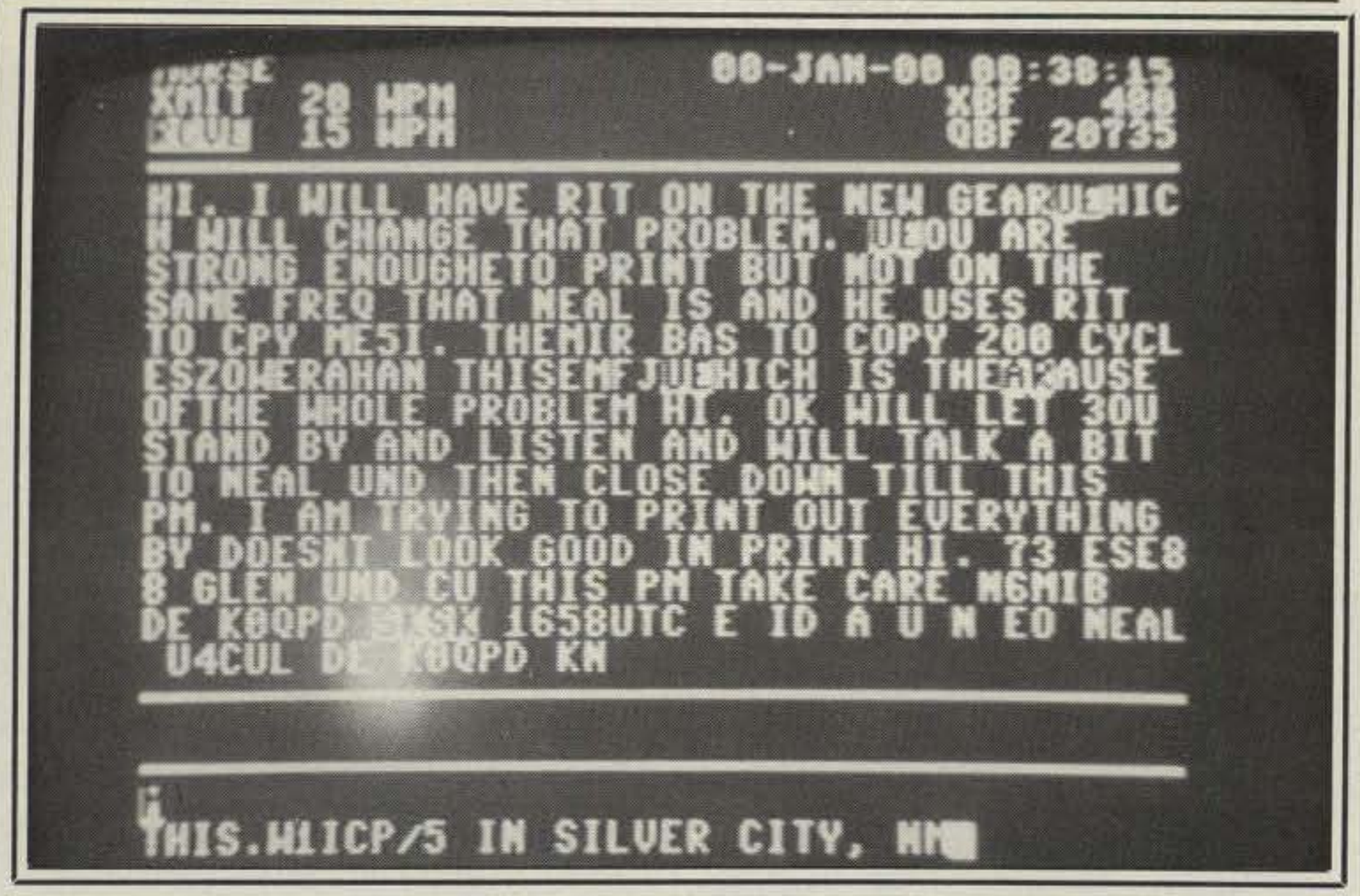
3 As in 2, but connect request frames (SABM) and disconnect frames (DISC) are displayed with header and either the characters (UA) or (DM).

4 As in 3, but unnumbered acknowledgement of connect and disconnect state frames are displayed with a header.

5 As in 4, but receive ready, receive not

This shot shows the PACKET screen and typical information that appears. This was done on 20 meters, 14,103.





Here is the video screen of a portion of a CW QSO. The upper portion, above the banner line near the bottom, is the information being transmitted by an amateur. The bottom of the screen holds the information to be transmitted, and it will flow across the banner line.

ready, reject, and frame reject are displayed.

6 Shows internal states of the line and the three timers.

In MONITOR level 6 there is another feature of the PK-64 worth mentioning. The internal link state is shown in the Packet screen status panel and is numbered according to the ARRL AX.25. For example if S01 appears, it means a disconnected state exists. Or, if S05 appears, it means that there was a transfer of information. And S07 shows you are awaiting acknowledgement. To put it mildly, this is a big feature when operating packet because you always know the state of link.

I tested the Pakratt on both VHF and low frequencies—20 and 80 meters to be exact. There is a wealth of activity on 14103—in fact, so much so that you have to wait for replies to the packets and QSOs tend to become tedious. I am coming to the conclusion, at least as of now, that packet radio is much better on VHF than low frequencies for exchanging information. This is my own opinion and I am probably wrong, and there well may be a future for packet on the lower bands. However, and this is important at least to me, the Pakratt also works Morse, Baudot, ASCII, and AMTOR, so for the amateur who wants all modes available, this is the device for him.

Morse

As I have said in other articles and reviews I am very fascinated with programs that permit you to copy CW. The PK-64 is very good in this respect. Using the high-frequency module I found that very weak CW signals could be copied. Of course, like any device tied to a computer, and the computer having a good program in it, the ability to copy depends primarily on the fist of the person sending the code. I found that while most amateurs are far from perfect in forming characters and timing, all the amateurs I checked provided at least 90-percent copy with this device. Also, shown in this article is a photo of the video screen in the monitor mode for CW. The amateur sending had a good fist, but like all of us, goofed once in a while on spacing.

When you set up the PK-64 for Morse, the top of your video display shows that you are on Morse, and just below that the transmit and receiving speeds are set. If you are using the keyboard for sending, the transmitting speed can be set in by using the F5 function key and the speed can be set from any speed 5 to 99 wpm. The receiving speed is determined by the incoming speed and is shown on the top display. On the top right of the display is the date and time of day. Just below that is **XBF**, which is the transmit buffer, and it shows the amount of transmit buffer space set aside. Just below that is **QBF**, the amount of QSO buffer space available. When you go to the transmit mode, you will have 12 lines of received text showing, just below the header information, plus one line of the text being transmitted—this flows across the screen in banner style—and then 5 lines of text to be transmitted. Both the 12 lines of received and 5 lines of transmitting text are scrolled up and off the screen as they are used. Also, inverse video is used on the **XMIT** and **RCVE** at the top of the video display as one goes to transmit or receive to show in which mode you are.

The PK-64 program provides the most frequently used Morse "prosigns" by having them coded into the keyboard. These are the prosigns such as SK, AS, AR, and so on. To go to transmit with the system you press the F3 function key, and to receive, F1.

Baudot and ASCII RTTY Operation

The Baudot or Murray Code, also known as International Telegraph Alphabet Number 2, is a five-bit asynchronous text transmission code used for text or message transmission, when the user does not need the more sophisticated character set found in ASCII. The Baudot/Murray code is the RTTY code most widely used in amateur service. The PK-64 provides RTTY operation at 45, 50, 57, 75, and 100 bauds, corresponding to approximately 60, 67, 75, 100, and 132 words per minute.

For ASCII (American Standard Code for Information Interchange) code, the PK-64 provides RTTY in ASCII code at 110, 150, and 300 words per minute.

In addition, the PK-64 provides for RTTY Maildrop. To use the RTTY maildrop function one sets up a WRU (**W**ho a**R**e yo**U**) keyword and its response in Message buffer 7. Each time the program receives **(YOURCALL) DE**, your system can reply with a personalized message.

AMTOR

AMTOR operation is an adaptation of the internationally-standardized SITOR system, and it uses a unique seven-bit synchronous text transmission code which provides built-in error-correction capabilities. The PK-64 provides CCIR-compatible AMTOR ARQ and FEC operation.

The AMTOR display at the left top of the video display is first set to show AMTOR Mode B (FEC—Forward Error Correction).

This is the correct transmission mode for calling CQ and initiating a general transmission. The display shows:

AMTOR
RCVE S S
LOCK

The "RCVE" indicates the system is in the receive state. The first "S" indicates "Standby" mode and the second "S" indicates the system is in the standby status.

As one progresses through a transmission and QSO, the display will change to show you what is happening. For example, you would press CTRL-B on your keyboard to begin a Mode B transmission. The transmitter would be turned on, and invisible synchronous idle control characters would be transmitted in a continuous stream. The screen would then show:

AMTOR
XMIT B I
LOCK

The "XMIT" shows the transmitter is on the air, the "B" indicates mode B operation, and the "I" indicates the idle condition of the data. The screen display changes as the transmit buffer is opened and data flows through the transmitter.

In AMTOR there are many control key functions. They are much too detailed to cover in this review, but again the manual is excellent in covering the operation.

Opening Menu

I suppose this section could have been at the beginning of the review, but I consider this one of the better features of the PK-64 system, so best for last! There is an opening menu available which does a jillion things. It is brought up by pressing the **Run/Stop** key and is as follows:

P. PACKET
A. AMTOR
R. RTTY
I. ASCII
W. MORSE
K. CALIBRATE
L. LOAD
B. BROWSE
E. EDIT
M. MOVE
S. SAVE
T. SET TIME
C. SET COLOR
D. DISK
B. Back To Basic

Of course, some of the commands are obvious. Pressing "P," for example, brings up the PACKET Mode. The CALIBRATE command permits you to adjust the AFSK transmit choices, Q. The QSO Buffer, M. is Message Buffers, and P. is PACKET Parameters.

I have both disk and cassette operations for my C-64 and both (or either) can be used with the PK-64. In fact, the PK-64 has extensive capabilities when it comes to saving, storing, or transmitting messages, text, or QSO information. Ten messages can be stored. These and the QSO buffer can be edited via the **E.** EDIT command. Individual messages can be sent by merely pressing the control key and the message number. The messages are stored via regular file names but can be recalled by number.

Earlier it was mentioned that the screen is divided into three sections for a QSO: first the 12 lines of received text, next the banner line for the transmitted data, and last the lines of the data to be transmitted. The incoming data can be stored in the QSO buffer and saved (to disk if desired), and if you are in the **ECHO ON** mode, your transmitted data is saved as well. As I have said, the PK-64 has extremely versatile software.

The **BROWSE** command permits you to view the contents of your QSO buffer. This buffer (and the message buffers) can be edited with the **EDIT** command. The **MOVE** command permits you to replace and append material to the various buffers. Going back to the **SAVE** command, it is of course possible to save the QSO buffer to a printer. I don't have a printer attached to my Commodore, but I am very confident that the PK-64 will work with a printer as described in their manual.

Considering the cost of the PK-64, slightly over $200 and about $75 for the HFM add-on, this is an outstanding device for getting an amateur on just about all the modes he or she could want. And it does it without depriving the operator of any seriously desired features. I had a ball operating Packet one day, RTTY the next, and then keyboard/computer Morse. I found that it is necessary to spend some time on CW in order to become really familiar with the system. After a few days I found it very easy to tune-in signals correctly for excellent copy. After getting experience, I found that even the weakest DX signal could be copied solid with the unit (assuming the sender had a good fist!).

There is a point or two I would like to make about Packet for those of you who have not operated the mode. However, while this is a criticism, it has nothing to do with the operation of the PK-64. As far as I can see, the PK-64 has no faults worth mentioning, at least not to me.

After considerable operating time, with the PK-64 and other units, I find that Packet leaves much to be desired when operating the high-frequency bands. On VHF and UHF the mode is ideal for exchanging files and information that must be accurate. The error-checking methods built into Packet AX.25 make the accuracy possible. But to me, this same required accuracy makes high-frequency operation a real drag. Unless the signal path between two 20 meter stations, for example, is ideal, a simple QSO becomes a long, dragged out affair, simply because of the ionosphere skip and QRN/QRM creating too many problems. I have completed several QSOs on 20, but a simple exchange of name and QTH plus weather conditions can take a ridiculous amount of time.

Please don't misunderstand me. Packet is a wonderful mode on VHF or any "line-of-sight band" where a lot of skip doesn't get into the picture. I operated, for example, on 10 meters where the other amateur was about 20 miles away (10 was not open to skip) and we had good, solid communications without any repeats. It is just that I don't want my enthusiasm to trigger readers into running out to buy Packet devices and then becoming unhappy when they try to operate the low bands. Anyone who operates Packet knows about the HF problems, but the neophyte doesn't.

Conclusions

Now that I got that out of my system, I would like to again say that the Pakratt PK-64 is an exceptionally fine piece of equipment. If one wants to add all the modes I have discussed to his or her station, certainly the PK-64 should be considered. The PK-64 and HFM module are manufactured by Advanced Electronics Applications (AEA), P.O. Box C-2160, Lynwood, WA 98036-0918 (206-775-7373).

Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

The Regulation of Radio, A Short History

In the United States and its possessions, all interstate wire, radio, or other electronic communications are regulated by the Federal Communications Commission. We used to think that only wire or radio communications means existed, but intelligence can also be transmitted other ways, such as on thin strands of glass—fiber optics.

The Commission, as they are known, is an independent Federal agency created by Congress and as such reports directly to Congress. It wasn't always that way. At various times, communications were regulated by the Department of Commerce, the Interstate Commerce Department (ICC), the Federal Radio Commission.... Even the post office at one time had jurisdiction over communications

Radio licensing came about in 1912 after an international conference in London felt that wireless radio standards were needed. The *Radio Act of 1912* was the first law for domestic control of radio communication in general.

The Radio Act of 1912 did not provide for (or even anticipate) broadcasting. In 1919 broadcasters were classified as "limited commercial stations." Amateurs were ordered off the air during World War I and were almost not allowed back on!

In 1922 the "wavelength" of 360 meters (830 kHz) was assigned for the transmission of "important news items, entertainment, lectures, sermons, and similar matter." The first broadcast station was an amateur transmitting music from his garage! Later on, 750 kHz was assigned for program transmission. Everybody got in each other's way as more and more broadcasters went on the air!

The *Radio Act of 1927* was really enacted to deal with the bedlam that existed. It created a five member *Federal Radio Commission* with regulatory powers over radio, including the issuance of licenses, the allocation of frequency bands to various services, assignment of specified frequencies to individual stations, and control of station power.

Callsign assignment and station inspection were delegated to the Secretary of Commerce. Much of the activity of the Federal Radio Commission dealt with resolving the problem of too many broadcast stations on too few frequencies. New rules caused about 150 of the over 700 AM broadcasters to surrender their licenses!

The Radio Act of 1927 dealt only with radio. It did not give the Federal Radio Commission jurisdiction over the telegraph and telephone. This remained with the ICC. Congress felt that *all* communication regulation should be under a single body. Senate bill S.3285 passed both houses, and the Communications Act was signed by President Franklin D. Roosevelt on June 19, 1934.

The *Communications Act* created the *Federal Communications Commission*, which began to function on July 11, 1934. The FCC consisted of seven Commissioners appointed by the President with the approval of the Senate. This was reduced to five on July 1, 1983. One of the Commissioners is designated as the Chairman and his tenure is at the pleasure of the President.

To ensure that their decisions are not biased by business or political interests, no Commissioner can have a financial position in any Commission-regulated business—nor can more than three Commissioners be members of the same party. Unless filling out an unexpired term, appointments are for seven years. Not only does the Communications Act govern FCC activities, but so does the Administrative Procedures Act, which details the steps the government must go through in making rules. The public is allowed to have its say, which must be considered before new rules are adopted.

The FCC allocates bands of frequencies to nongovernment communications services and licenses, issues callsigns, and regulates stations and operators. Only transmitting stations are licensed. The Commission does not license sets used for reception only. Some countries do!

The FCC is mandated to "encourage the more effective and widespread use of radio." Their staff is organized on a functional basis with various bureaus and staff offices. The Amateur Radio Service is one of the Private Radio Services in the Private Radio Bureau. The PRB, as it is known, used to be called the Safety and Special Radio Services.

The Private Radio Services differ from Broadcast Services in the same way that letter writing differs from newspaper publishing. They include all the different uses of two-way radio by people at work and play.

The various FCC offices around the country are part of the Field Operations Bureau (FOB). It is the FOB's responsibility to monitor the radio spectrum to ensure that stations meet various technical requirements, to furnish radio bearings for aircraft or ships in distress, and to inspect stations. It is the FOB that used to conduct amateur radio operator examinations, but this is now handled by volunteers in the amateur service itself.

The FCC does not charge for its services, although it does allow volunteer examiners to recoup expenses associated with the amateur testing function. Legislation passed in 1984 allowed up to a $4.00 fee limit with annual increases based on inflation. This limit was increased to $4.16 for 1985 and to $4.29 for 1986. Most test coordinators authorize either a $4.00 or $4.25 test fee.

As a general rule the FCC does not license aliens. The amateur service is an exception. Under reciprocal agreements with a number of nations, alien radio amateurs may be authorized to operate their stations while visiting the United States, or they can apply and, if qualified, obtain a regular U.S. amateur radio license.

The Amateur Radio Service is one of the largest, oldest, and most active of the Private Radio Services. Being *amateur*, ham stations—as they are commonly called—they may not be used to transmit or receive messages for hire or be used in connection with any commercial enterprise. There are no age limits for becoming a radio amateur.

Government Rules (they are not called regulations) for the Private Radio Services may be found in Title 47 of the *Code of Federal Regulations* (47 CFR), Parts 81 through 99. Part 97 covers the Amateur Radio Service. You can order Part 97 from us at a cost of $3.00 plus $1.50 postage (W5YI Report, P.O. Box #10101, Dallas, TX 75207). You can also order *Title 47CFR Parts 80-99* from the U.S. Government Printing Office, Washington, DC 20402 (Stock Number 022-003-95444-9, $14.00)

From The Mailbag

We continue to get mail from readers and will try to cover as many of general interest as space allows.

"How do I know which amateur radio operator test is being given by a volunteer examiner?" This is a very frequent question—maybe the most frequent! In a sen-

P.O. Box #10101, Dallas, TX 75207

tence, I would ask the volunteer examineer or better yet the VEC. The VEC is the volunteer examiner coordinator who acts as the link between the testing community and the FCC.

At this writing (and it *could* change), the FCC determines the question topics and questions. The FCC is considering a rulemaking that will allow the *VEC to determine the questions* and the VE the answers! If that happens, then the questions could be different, depending upon with which VEC program you take your test. At present, however, the coordinator determines the answers and designs his test around the questions and "recipe" that the FCC specifies. A VEC is required to select a certain amount of questions from each topic.

While our program (and most VEC's) uses the answers supplied by the ARRL in the interest of test standardization, not every VEC program does. Further complicating the issue is the fact that the FCC issues new revised questions annually on a staggered basis. For example, the latest Technician/General (Element 3) question pool was issued November 1985. The FCC allows a six month "implementation period."

Our program and the ARRL's are the two biggest amateur testing programs. Together we account for two-thirds of all amateur testing. The W5YI program is in second place, with the League's program being the largest by far. We try to use the same implementation dates as the ARRL does in their testing.

Both the League and W5YI program Technician/General tests changed in April. At this writing we anticipate that the Advanced class will change in August and the Extra class in October 1986. The changes will range from minimal (for the Advanced and Extra class) to many (in the Technician/General class).

If you are buying license preparation material ask for the *1986–1987 questions* if you are talking the examinations *after* these dates. Before these dates you need the 1985–1986 questions—that is, if you are taking ARRL or W5YI examinations. If you are taking examinations coordinated by other VEC's then I would ask them if they have license preparation material available. Some do and some don't.

We were authorized by the FCC to distribute license preparation material so that applicants would be able to get the appropriate study guides. Our manuals are current and appropriate for both the ARRL and W5YI examinations. Be sure to state *when* you are taking the test if you mail order license preparation material.

You can also get license preparation manuals from many amateur radio stores, but a word to the wise. Be careful to get the right information. We know of no manuals available today that state for how long they are current.

"I haven't received my upgrade license yet. Can I upgrade further without it?" In most cases you can. Again it depends on the VEC. Show the volunteer examiner your *Certificate of Successful Completion* substantiating that you indeed did upgrade. Most VE's allow further testing and will attach a note to the FCC Form 610 application when forwarding to the VEC. This alerts the VEC to write to the applicant for a copy of his license when received. The application is held at the VEC office until the license is received. We put all such applications in a "hold" file while awaiting receipt of the applicant's license.

"Is it true that amateur examinations can't be given at hamfests?" Absolutely not. Volunteer examinations are given at most amateur conventions, but a candidate must not be charged a hamfest admission fee in order to take the examination. The only fee that can be charged is the regular test fee that the VEC assigns. The current maximum is $4.29. Some hamfests have examinations off site or accompany applicants to and from the examination room so that they don't pay an admission charge.

"How is testing of the handicapped handled?" In much the same way it is handled for any other applicant, except a VE will take the handicap into consideration when administering the test. For example, blind applicants aren't given tests that contain diagrams. Applicants who can't write can dictate what the code transmission said, etc. Any needed special equipment must be supplied by the handicapped applicant. No waivers of the rules are granted due to a handicap.

A test session can be held for a single handicapped applicant. While a public announcement is still required before the test can be given, this announcement can specify that the test is not open to the public.

"I find that different examiners give the code test in different ways. Why?" The FCC rules call for the code test to be the *sole* responsibility of the volunteer examiner. While many VEC's provide test tapes for code administration, the VE has the *option* to use them or not. Many VE's make up their own code test tape generated by a personal computer. Even machine- or hand-sent code is allowed.

The code test can involve solid copy for one minute, answering questions about what was sent, fill-in-the-blank, multiple choice. Even a true/false format is acceptable. Some VE's ask ten questions (seven is the passing mark) if an applicant doesn't copy for one minute solid. This gives the applicant two chances to pass. A sending test is usually not required, since the FCC has found that code copying ability usually indicates code sending proficiency. Again, it is pretty much up to the examiner.

"I would like to offer my services as a volunteer examiner. Where do I apply?" You apply to the VEC, who will accredit you based on their (and FCC) requirements. Some VEC's require open-book tests or other prerequisites. Our program accredits only Extra class amateurs as VE's. Write to us for an application. Accreditation is quick—within a week. It takes three VE's to hold a test session.

"Doesn't it take a lot longer now to get an upgraded amateur license?" Yes, but not that much more time. Add a week or two to what it took when the government was administering tests. A volunteer examiner (and VEC) must forward applications within ten days of administration or receipt from the VE. Upgraded licenses are usually issued by the FCC within a six to eight week period after test administration.

"How does the current pass rate compare to the rate when the FCC gave amateur tests?" The new volunteer examination program pass rate started out at less than 50% when the program was in its infancy and little license preparation material was available. It has been steadily inching up and is now over 60%. It really isn't that much different from FCC results. The system seems to be working! Over 20,000 amateurs upgraded last year!

Antennas & Accessories

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

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Mail Call

This month: a look into W8FX's mailbag, an examination of some new antenna products, a peek at hamshack software and reading matter, and an updated Antenna Manufacturers Directory. Stay with us! —*K2EEK*

Last time we got together we discussed packet radio. That single topic took most of the column, but with the remaining space we noted some new books and other publications and also surveyed the software scene.

This time we would like to focus our attention on several interesting and informative letters we've received over the past several months with respect to antennas and software subjects. Following that, we'll highlight some new antenna products and software, look at some interesting reading matter, and present our Antenna Manufacturers Directory, which supplements the dealers list which appeared recently in the column.

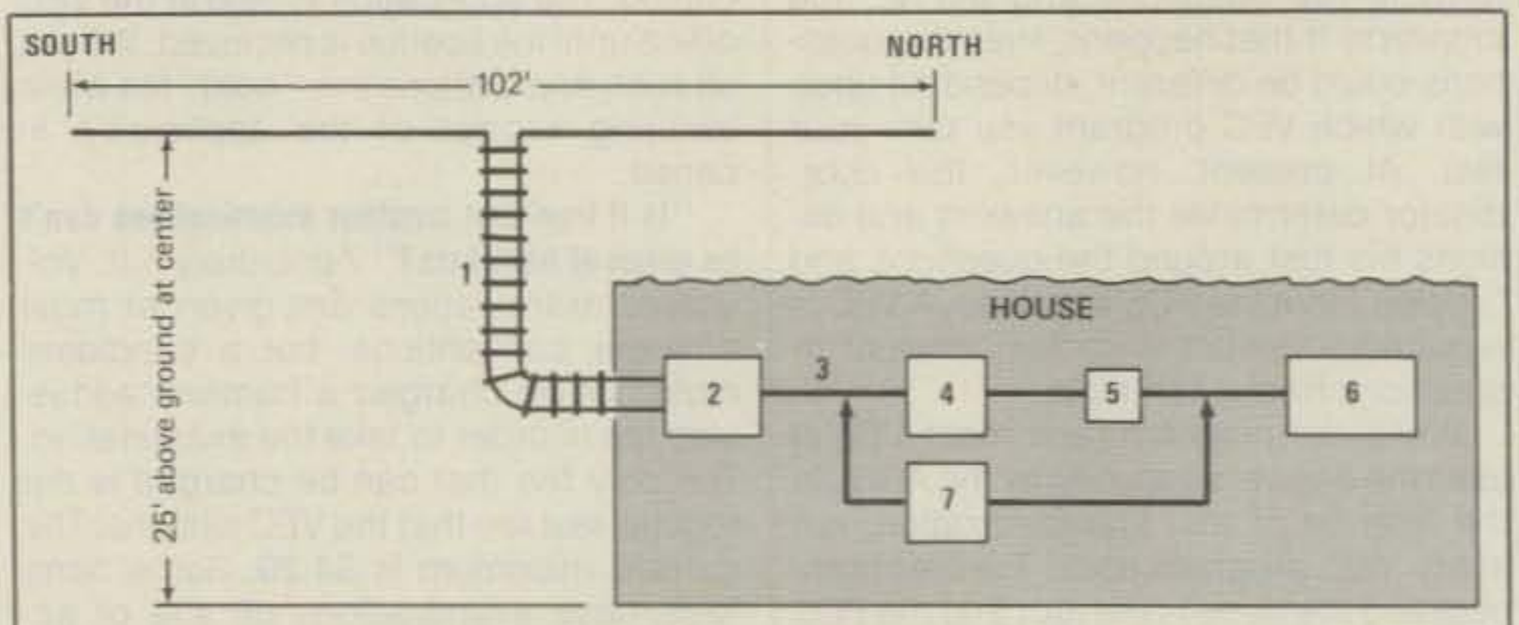
Before getting into this month's material, as a postscript to last month's column on packet radio I would like to call to your attention W. Max Adams, W5PFG's excellent "plain ole English" packet tutorial which appeared in last November's *CQ* RTTY Special issue. Hopefully, Max's primer, which appeared on page 13 of that issue, coupled with last month's column will stimulate your interest in packet radio.

From the Mailbag

Rarely does a day go by without a letter from a reader. Of those received over the past several months, I've selected four to present here—three on antenna subjects and one on computer topics. First, another letter on an antenna which is becoming increasingly popular—the G5RV.

G5RV Notes. We've run material on the G5RV antenna in several columns over the past year or so. This multiband HF antenna, which essentially makes use of a 102 foot flattop and a specially chosen length of feedline (either parallel line or a combination of parallel line and coaxial cable), seems to work quite well for those looking for a simple, easily fed multiband radiator. In fact, we have received more correspondence on the G5RV—almost all of it favorable—than on any other antenna in our six years of stewardship of the column.

L.B. Cebik, W4RNL, took the time to share some of his G5RV experiences with us. Having moved to a new QTH, he was looking for a simple, unobtrusive wire antenna. What attracted him was the combination of ladder line or twinlead, and coaxial cable feed, and so he constructed the system as shown in fig. 1. W4RNL's letter is a very lengthy one, but the information it contains is most valuable, so we'll quote it almost in its entirety. Writes he:



Antenna system components, adapted from G5RV system:
1. 34 feet 450 ohm, polyvinyl covered, semi-open feedline (Note 1)
2. Balun (Note 2)
3. 50 ohm coax (RG213)
4. MFJ Model 989 transmatch
5. B&W low-pass filter
6. Yaesu FT-757GX transceiver
7. MFJ Noise Bridge (in place of components 4 and 5 for tests)

Note 1. Not yet adjusted for velocity factor due to variability of figures given.
Note 2. See text of letter for balun experiments.
Note 3. Antenna slopes downward with the land toward the south. South end will be further elevated.

Fig. 1– W4RNL Multiband Antenna System.

"The G5RV simply eliminated a lot of cut and try...The most interesting aspect of my system is the part marked 'balun' [in fig. 1]. I had the opportunity to ground the coax at the point where it joined the 450 ohm polyvinyl semi-open twinlead. Without grounding at this point [operation was erratic]. Thus, I experimented with baluns:

"A single [ferrite core T-200 4:1 ratio] balun, as specified in kits with the addition of glass tape to the core, provided poor results at the HF extremes (3.5 and 30 MHz). I believe the balun might be responsible for feeding RF back to the rig on the outside of the outer conductor. Even with the coax (RG213) grounded at the balun (along with 6 turns of the coax forming an RF choke at the feedline end), SWRs were higher even than the 4:1 ratio should have allowed. A triple-core 4:1 balun was installed, with improvements showing up especially in the upper bands [though with significant disparity between noise bridge and SWR meter readings].

"A W2DU-type balun or ferrite bead choke in the outer conductor of RG142 coax (1 foot) yielded the final results that are close to G5RV's predictions, adjusted for the length of the coax lead. Interestingly, with this device, grounding the coax outer conductor and coiling the RG213 seems to make no difference to the RF return along the coax shield—it is nil...Performance on 80 and 40 meters is far superior to either [T-200 ferrite core] balun configuration. I believe that on both these bands, the baluns were creating losses even with only modest reactive components to the impedance."

W4RNL offers the following conclusions as the result of experimentation with his G5RV system:

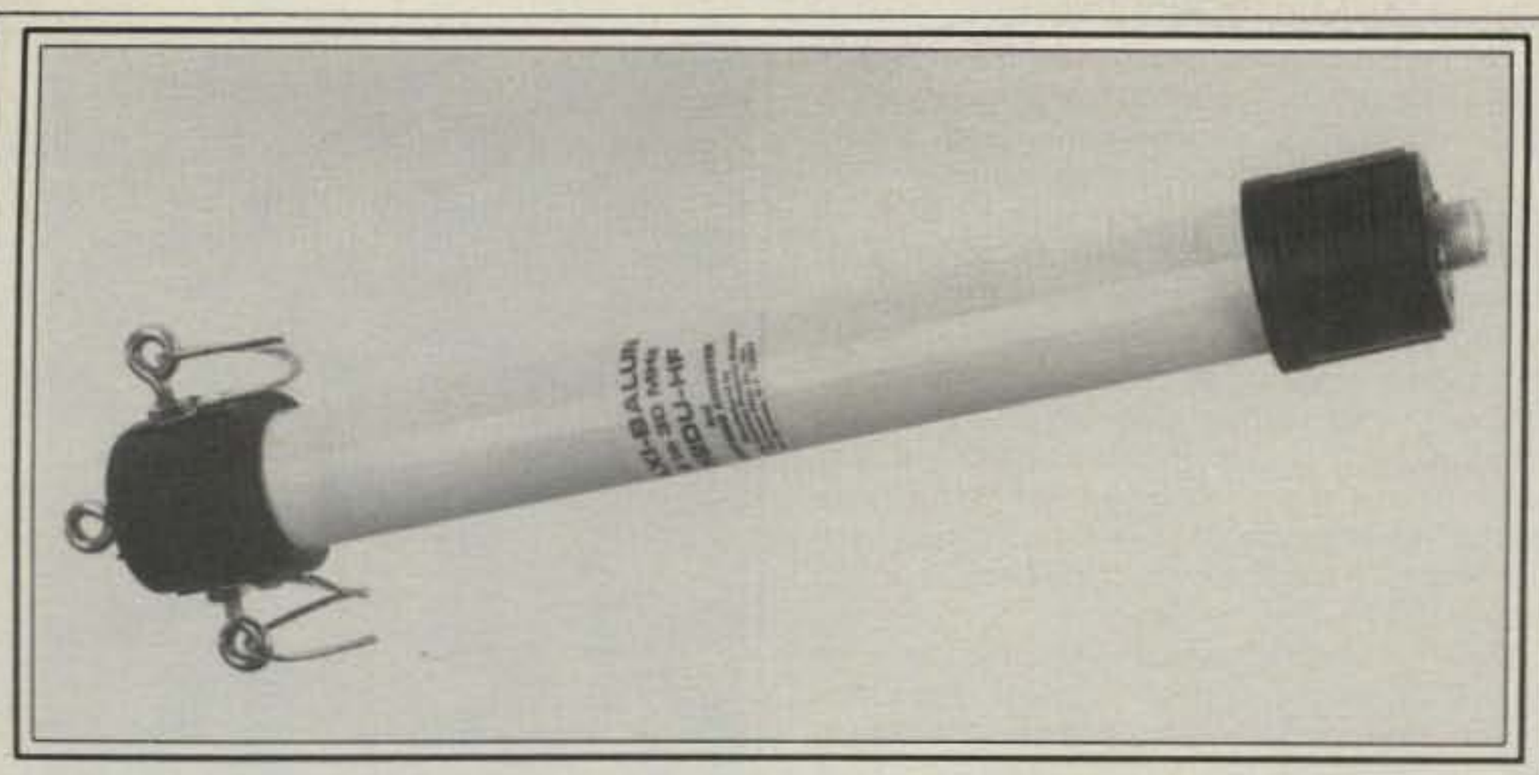
"1. A short indoor run of coax to the G5RV will not create significant losses. Nor will it degrade performance or the antenna pattern if a W2DU-type balun is used. This configuration may permit the installation of an all-band antenna and transmatch in circumstances that do not favor twinlead or ladder line indoors. The exact length of coax used, however, will determine the size of the reactive component presented to the transmatch. This can make a difference in performance on the upper bands, where very small inductive values may be required with high inductively reactive components. [For me], 20 feet of 0.66 velocity factor cable gave reasonable results with acceptably low losses.

"2. A noise bridge and SWR meter, even at minimum power, may give widely divergent readings, especially when the impedance is low and especially when the resistive component is very low. The correspondence between noise bridge reactive component readings and transmatch settings suggests that at least some SWR meter designs are susceptible to high error when reactive components are high and when resistive components are very low.

"3. Toroidal baluns should probably be avoided except with purely resistive impedances. I would even question their use in T-circuit transmatches with balanced feeders, given the apparent losses I experienced and the suspicion that they introduced inductively reactive components into the system."

Our thanks to W4RNL for his astute comments. His G5RV experiences are quite interesting, and his balun observations seem to confirm a growing body of literature on results

317 Poplar Drive, Millbrook, AL 36054



The W2DU "Maxi-Baluns" are increasingly popular for use in situations where other than purely resistive components may be encountered on the transmission line. Conventional toroidal baluns have a ferrite core which tends to saturate at high power levels, with resultant losses in the balun. These baluns—designed by noted antenna and transmission-line expert Walt Maxwell, W2DU—tend to minimize such problems. (Photo courtesy Unadilla/Reyco/Inline)

obtained with different types of baluns. Indeed, ferrite-core baluns tend to saturate at high power levels with high SWR. Use of non-toroidal-core baluns may enable an antenna tuner to make much wider frequency excursions from the antenna's resonant frequency when running high power than with ferrite-core baluns. The W2DU-type baluns which W4RNL mentions are suitable for use in multi-band systems. These baluns are available from Unadilla/Reyco/Inline, 6743 Kinne St., East Syracuse, NY 13057.

Back to the Zepp. Drayton Cooper, N4LBJ, wrote to express his wonder as to why more hams don't fall back to basics in their antennas and stick with designs such as the plain old centerfed Zepp, as it is sometimes called. He points out that the centerfed balanced antenna is simple, easy to erect, efficient, and inexpensive. Further, pattern plots are predictable, both those for the double and the extended double Zepp, and they are readily available in the various ARRL antenna publications. Thus, anyone can orient their antenna to place the major lobes on any part of the globe.

N4LBJ writes that he has had very good success with a pair of Zepps cut for 3930 kHz that are 120 feet in overall length. One reason he chose this frequency is that it is also the right length to be an extended double Zepp (each leg 0.64 wavelength) on 30 meters. He feeds each antenna with 450 ohm ladder line through a small T-network tuner, which enables him to run them on all bands, 80 through 10 meters. His Zepps are oriented broadside NE-SW and NW-SE so that he gets into most any global area simply by switching from one to the other antenna. He reports:

"On 80 CW the antennas are a bit short, but they load and radiate well enough to work transatlantic DX. They come into their own as good DX antennas on 40 and 30, however, and really perform admirably on those two bands. On 40 the antennas act as two halfwaves in phase, and on 30, as extended double Zepps.

"The antennas are configured so that they cross each other right at the feedpoint, and are as close to 90 degrees apart as I could get them. The two feedlines come away from the antennas together and are terminated at a knife switch on the desk, allowing me to choose which antenna I want, according to the pattern I need. On 40 the full-wave pattern is quite pronounced, as there are no minor lobes to confuse the issue. On 30 meters the major lobes are broadside to the antenna, as on 40, but minor lobes come into play on this band."

N4LBJ further reports that although the antennas are only about 24 inches apart where they cross each other, there is no noticeably adverse interaction. Using the T-match he can achieve a 1:1 SWR condition at the transceiver across the major portion of the CW band on 40, and most of the 30 meter band. At the top end of 30 the SWR climbs to just under 1.5:1.

He especially likes the fact that often the QRM can be reduced to minimal levels by switching the antennas so that he gets a different directional pattern. Often switching antennas drops the stateside QRM down by a couple of S-units while bringing up the DX signal of interest. Admittedly, this is all rudimentary stuff, but (and we would agree) he points out that beginners in antenna experimentation tend to forget the receiving advantages to directional antennas, bringing to mind the old saw that "you can't work 'em if you can't hear 'em."

N4LBJ does both work and hear them, and has worked 41 countries on 30 meters in his first 6 months in using the antenna. All continents except Asia have been worked on 40, all using a Ten-Tec Omni-D barefoot. He credits a good deal of the favorable results with these antennas to their height: 55 feet. With the antennas strung between conveniently located trees, he uses nylon line, 520 pound test, available locally for 5–7 cents per foot, as halyards.

George Shira, WD4BUM. We've reported the doings of antenna manufacturer George Shira, WD4BUM, in past columns. George has had a small but thriving antenna business, Mobile Antennas & Accessories, in Anderson, South Carolina for a number of years. George specialized in the manufacture of inexpensive but high-quality amateur mobile antennas, selling them primarily by mail and at hamfests throughout the southeast.

George sent us a letter indicating that he was retiring from the business, but that his product line would be continued under the stewardship of Larry Councilman at AC/DC Electronics. Larry plans to continue the business and will continue to sell at hamfests, through dealers, and by mail, with no major changes in the operation other than to add additional products to the line and establish additional dealerships.

Interestingly, the growth fo George's firm has been remarkable, as there is practically no advertising. Promotion is primarily by word-of-mouth, plus George's promise that "If you can find a better performing antenna at any price, we will refund your money."

The new address is AC/DC Electronics, Rt.#1 Box 406-C, Pond Road, Burlington, NC 27215.

Ham Radio on the Z-100. H. Alan Harp, K4PB, is enthusiastic about the Zenith Z-100 personal computer and amateur radio applications, though he reports that there aren't many such programs available for the "Z."

In response to a question we posed to him concerning compatibility with the IBM-PC, K4PB advises that the Z-100 is not completely compatible with the IBM, though it arranges files on disk in the same way, and so the machines can read each other's disks. Microsoft wrote the operating system for both computers, and thus the BASIC languages are similar. A BASIC file can be written to disk in ASCII format, and can be used by the other machine directly, with few if any changes. He

A VHF (30–300 MHz) version of the popular W2DU balun is shown here. (Photo courtesy Unadilla/Reyco/Inline)

No-69-70

also advises that both the Z-100 and the IBM-PC have basic compilers that can compile these programs from the ASCII files.

Alan has written a number of amateur radio BASIC programs for the Z-100, ones that might easily be converted for use on the IBM-PC, PCjr, or PC compatibles. His programs are in ZBASIC, and he can offer the files in ASCII format, so that they can be used on both computers. Program instructions are contained in text files and can be directly printed out or manipulated by a wordprocessor. Alan mentions that he considers his programs public domain and will share the cost of handling. Contact H. Alan Harp, K4PB, 8113 Belgium Drive, Raleigh, NC 27606.

New Products

Portable VHF Antennas. We received a small but interesting catalog from The Radio Engineers Company, 3941 Mt. Brundage Ave., San Diego, CA 92111. In it the firm features several 2 meter portable antennas. These include the 2MQ Portaquad, the 2GP and 2GPS Ground-Planes, and the 2JV J-Vertical. A solid-state low-frequency receiver, which covers 160 to 380 kHz (primarily for marine and aircraft use), is also offered.

Probably the most unusual antenna of the group is the Portaquad, a high-gain full-size 2 meter cubical Quad antenna designed for portable or semi-fixed operation. The antenna, which somewhat resembles a portable Quad which Palomar Engineers produced several years ago, is of a mechanical design that allows it to fold up for storage or transportation in a container. Interestingly, the container also doubles as the antenna's support base when the antenna is installed. The assembly is designed to be erected or collapsed in about one minute.

Hazer Tower Accessory. This is a unique tower accessory which raises and lowers antennas with the turning of a winch. The Hazer was developed by Glen Martin Engineering as a safety-first, convenient alternative to tower climbing, or the use of foldover and telescoping towers.

The Hazer brings antennas and other tower equipment down to ground level, keeping the equipment in an upright position for maintenance, tuning, and calibration. The Hazer is assembled around the tower at ground level. If it is installed at the same time the tower is erected, climbing is completely eliminated. On existing towers a top plate and pulley assembly must be installed at the tower top, but this is a one-time operation.

Once it is installed, the Hazer travels smoothly past tower braces and bolts. There is a spring-loaded safety latch, which prevents accidental lowering by catching on the tower cross braces. When lowering the Hazer, a control cable is used to disengage the safety latch as the winch is turned. When fully elevated, the safety latch transfers the load from the Hazer to the tower; full 360-degree antenna rotation is now possible.

The firm recommends that installation be guyed if possible, depending on the adequacy of the tower and the wind load of the antenna, mast, rotor, etc. Guy wires attached at the apex of the tower may have to be temporarily draped away to accommodate large systems when lowering. Guys can also be installed on the Hazer and raised into position with the device, though guys on the center of the tower must be temporarily removed when the Hazer passes their position.

At least five different versions are offered, for Rohn and Martin towers, to handle wind loadings from 8 to 16 square feet. Included in the Hazer literature is a useful wind loading map, showing wind loading zones. For more information on the Hazer, contact Glen Martin Engineering, P.O. Box 253, Boonville, MO 65233.

Western Radio Catalog. Filling in one of those handy reader-service coupons brought me a thick catalog and packet of antenna material from Western Radio Electronics, Box 400, Kearney, NE 68847. The materials describe Western's wide range of inexpensive single- and multi-band dipole, trap, sloper, and vertical antennas. Of interest to SWLs looking for low-cost starter antennas, I noted two multi-band trap antennas intended for coverage of the 49, 31, 25, 19, 16, and 13 meter shortwave bands; also available were single-band dipoles to cover the 49 through 16 meter bands.

While I have not used any of Western's antennas and cannot attest to their performance, I note that the firm offers a 10-day, money-back trial period and a one-year guarantee against material and workmanship defects. In any case, the ad material in Western's package is informative and interesting, especially for beginners.

Main menu screen for the AMSAT AMS-2064 Tracking Program, one of the many satellite tracking programs that are offered by AMSAT. (W8FX photo)

Good Reading

The DX'ers Magazine. This is Gus Browning, W4BPD's semi-monthly newsletter which is crammed with DX news and tidbits from various sources around the world. Carrying a cover motto of "DX news and info for the serious DX'er," columns include DX tidbits, news bulletins, DX worked/heard, and operator handles. There are also appropriate reprints and synopses from other DX publications. The style is very "folksy."

A one-year domestic sub is $14.00. For further information, contact *The DX'ers Magazine*, P.O. Drawer "DX," Cordova, SC 29039. I'm sure that if you ask nicely, Gus will send you a sample!

The DX'ers Directory. Compiled by Fred Osterman, this is an SWL-oriented reference guidebook which lists nearly 1,000 DX enthusiasts, including addresses, telephone numbers, radio club affiliations, special interests, and the like. Fred's book also includes names and addresses of a large number of DX clubs. The book includes forms which you can fill out if you would like to be included in any future edition of the directory.

The book is $4.95 plus $1.05 postage. It is available directly from Universal Shortwave Radio, 1280 Aida Drive, Reynoldsburg, OH 43068.

Tesla's Autobiography. A note in our sister publication *Popular Communications* brought to my attention an interesting autobiography. This was on one of the more colorful electrical inventors and science pioneers, Nicola Tesla, inventor of the Tesla coil and designer of the great power system at Niagara. The book is entitled, simply, *My Inventions*, said to be long out of print. The book is solid, basic reading for anyone seeking to penetrate Tesla's mysterious life and his complex personality.

The book is available in hardback ($12.95) and paperback ($7.95) from Liberty Library, 300 Independence Ave. SE, Washington, DC 20003.

Software Notes

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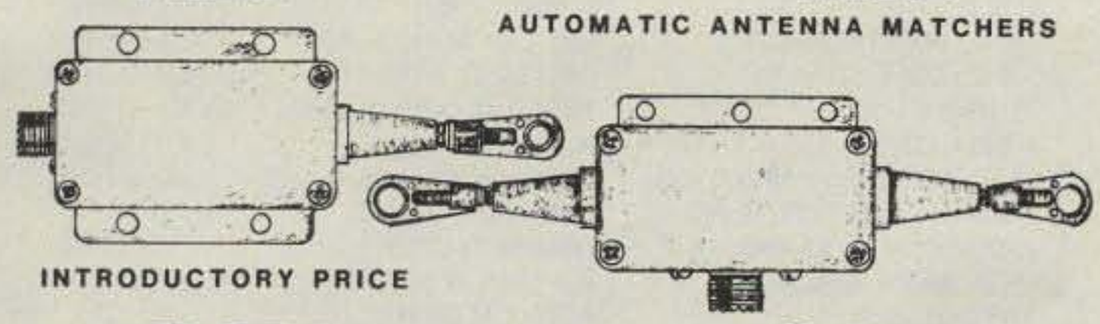

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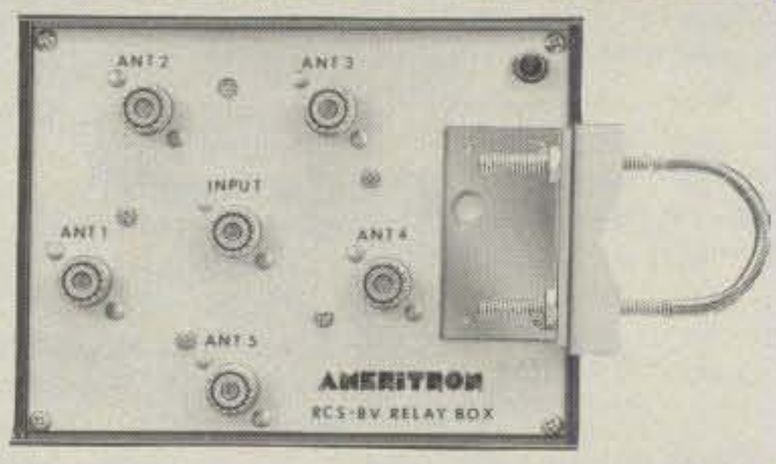
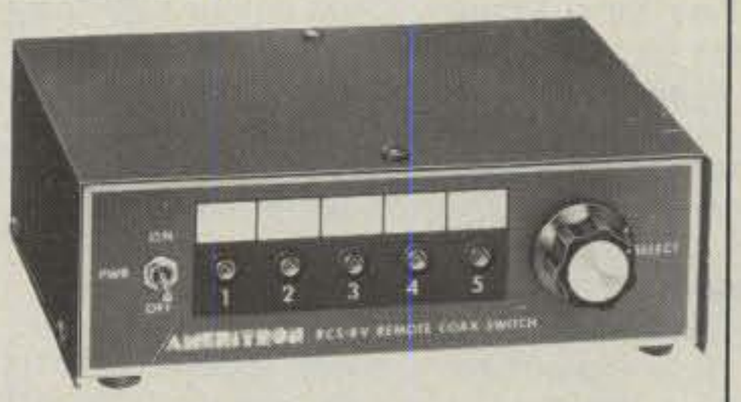


RCS-8V High Performance From DC Through UHF



The Ameritron RCS-8V is a remote controlled coaxial switch that selects up to five coax ports. Unused coax ports can be grounded or floated. Any number of ports can be engaged at the same time. Applications include stacking of antennas, cross-switching of coaxial lines or independent selection of five separate lines to a common port. The RCS-8V operates from 120 VAC 220/240 VAC export model available.
Specifications: Loss at 150 MHz: less than .1 dB. VSWR:under 1.2 to 1 from DC to 250 MHz. Impedance 50 ohms. Power capability: 5KW below 30 MHz , 1KW at 150 MHz.

RCS-4 Simple Installation For 1.8 Through 30 MHz

The Ameritron RCS-4 is a remote controlled coax switch that selects one of four antennas by supplying all control voltages through the coax feed line. The elimination of a control cable results in a neat and inexpensive installation. The indoor control console has bright LED antenna selection indicators. The remote relay box is tower or mast mounted with a single clamp.
Specifications: VSWR: Under 1.1 to 1 from 1.8 to 30 MHz. Loss at 30 MHz. Less than .05 dB. Power Capability: 1500 watts average, 2500 watts pep max.

Send for catalog of other quality Ameritron Products.

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CIRCLE 71 ON READER SERVICE CARD

the AMSAT Software Exchange's growing library of inexpensive orbital prediction programs. Recent notices from AMSAT show an expanded range of offerings, with good support shown for many computers, including the TRS-80 series, IBM-PC and IBM-PCjr, Heath H-89, and others. Of special note are several IBM programs by WØSL and N4HY, and two new Commodore 64 programs (VR85 and Quicktrak-2064). Prices on the programs mostly range from $15 to $30, and somewhat less if you're an AMSAT member.

For a program flyer, contact the AMSAT Software Exchange, P.O. Box 27, Washington, DC 20044.

Busy Signal Software. CP/M enthusiasts will likely be interested in the offerings from this firm located at 2566 Mammoth Drive, San Diego, CA 92123. A recent flyer shows only one ham-oriented program (HAMLOG), but several useful utilities. These include a magazine indexing program, two home inventory programs, and a purchase-order program for small business use.

Busy Signal's menu-driven HAMLOG program is designed to assist in keeping contact logs, and it will instantly recall contacts by band, callsign, city, date, name, or mode. With IBM-type computers (using CP/M-86) with 256K memory, 750 contacts may be held, while other CP/M computers will hold 385 contacts. Hardcopy printout of contacts is available.

A look at Busy Signal's flyer shows that about 30 CP/M capable computers are supported. All programs are $29.95.

Bob Rosen, KA2HKL. Bob wrote to us and enclosed some literature on his Radio Shack CoCo software and an *80 Micro* writeup on his success in developing sophisticated bulletin board (BBS) software, known as CONNECTION 80, for the CoCo machine.

I didn't see any specifically amateur-oriented software in Bob's package, but I did notice what looks like a very capable color graphics program known as CoCo MAX, which has all the trappings of the bigger systems: icons, pull-down menus, graphics editing, font style selection, mouse or touch-pad input, and the like. Such a system could be very handy for the SSTV user owning a CoCo.

For further information, contact Bob at Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421.

Winner's Edge Contester Software. Pete Smith, N4ZR, offers a novel, fully-integrated, real-time contest program for the TRS-80 Model 100 and the Commodore 64 known as THE CONTESTER™. Bob's BASIC program logs and dupes each contest contact and generates CW from the computer via a small interface. Morse may be sent at between 5 and 50 wpm. Fifteen preprogrammed contest exchanges may be sent on keystroke command.

The program can log and dupe 3000 contacts for contests in which you can work a station but once, or 1000 contacts per band for as many as 6 bands in contests in which you can work the same station on each band. "Paperwork" functions supported include automatic entry of date, time, and contact data in a complete log; maintenance and storage of dupe sheets on disk; sorting of dupe sheets; and post-contest dupe-sheet printout.

The program, available on disk, requires connection to the transmitter through a simple one-IC, one-transistor interface. A schematic is provided, though kits and finished units are available. For more details, contact Bob at Winner's Edge Software, 2003 Sarazen Place, Reston, VA 22091.

Commodore Speedup. In last November's column we alluded to the bittersweet popularity of the Commodore 64 in the hamshack: a great computer on a per-dollar basis, but a computer that's hamstrung by a super-slow disk drive system. As any C-64 owner is aware, 1541 disk drive access (loading and saving of programs) proceeds at a snail's pace.

We pointed out that several software and hardware speedup approaches have been taken. For many users the most practical for the typical C-64 user is an outboard plug-in speedup cartridge that increases the loading of programs by several times. We noted that the popular Epyx Fast Load™ cartridge is very popular for this purpose.

Since the article appeared, we've become aware of several other plug-in speedup devices. One of these is the GT4™ Hi-Productivity Cartridge offered by Pro-Line Software Ltd., 755 The Queensway East, Unit 8, Mississauga, Ontario, Canada L4Y 4C5. We even had the opportunity to get our hands on this one.

The GT4 is similar to the Epyx cartridge, but it also speeds up the SAVEing of programs (datafiles are not noticeably speeded up) and disk formatting, which takes under 20 seconds. The cartridge also builds in a very enhanced set of DOS commands adapted from the more powerful Commodore BASIC 4.0 used on the firm's business-oriented PET and CBM machines. Thankfully, two 1541 disk drives are supported by the cartridge, and single- as well as dual-drive disk backup commands are included.

I found the GT4 to be a very useful product. My only real criticism is that it was not as "transparent" to software as I would have liked it to be, as it prevented the loading and running of some programs, especially those which used special loaders and certain machine-language routines. I would also like to see both a reset button and an on/off switch included. The GT4 is priced at about $40 (US) or $50 (Canadian).

Special Note

We believe that when highlighting products in the column, whether antennas, software, or anything else, we perform a useful service for our readers. In some cases we're able to do a hands-on evaluation. Often, however, we must simply pass along information that comes to us from a number of different sources, per-

Antenna Manufacturers Directory

NAME OF INDIVIDUAL OR FIRM	STREET ADDRESS	CITY - STATE -ZIP	TELEPHONE
AC/DC ELECTRONICS	RT. 1 BOX 406-C - POND RD.	BURLINGTON NC 27215	
ADVANCED ELECTRONIC APPL. INC.	PO BOX C-2160	LYNNWOOD WA 98036	206-775-7373
ALLGON ANTENNA CORP.	20 WATERSIDE PLAZA	NEW YORK NY 10010	212-683-6783
ALPHA DELTA COMM. INC.	PO BOX 571	CENTERVILLE OH 45459	513-376-4180
ALUMA TOWER COMPANY	BOX 2806	VERO BEACH FL 32960-2806	305-567-3423
AMP SUPPLY COMPANY	2071 MIDWAY AVE. BOX 421	TWINSBURG OH 44087	216-425-2010
AMPRUSS CO.	PO BOX 551	AIEA HI 96701	808-487-1252
ANTECK INC.	ROUTE 1 BOX 415	HANSEN ID 83334	208-423-4100
ANTENNA CO. OF AMERICA (ACOA)	P O BOX 794	MOUNTAIN VIEW CA 94042-0794	
ANTENNA SPECIALISTS CO.	12435 EUCLID AVENUE	CLEVELAND OH 44106-4386	216-791-7878
ANTENNAS ETC.	16 HANSOM ROAD	ANDOVER MA 01810	617-475-7831
ARCOMM	24 VALLEY STREET	LEWISTOWN PA 17044	717-248-7739
AUSTIN CUSTOM ANTENNA	P O BOX 357	SANDOWN NH 03873	603-887-2926
BAILEYTECH	304 WEST S. COLLEGE ST.	YELLOW SPRINGS OH 45387	
BARKER AND WILLIAMSON	10 CANAL ST.	BRISTOL PA 19007	215-788-5581
BENCHER	333 W. LAKE ST.	CHICAGO IL 60606	312-263-1808
BHC INC.	1716 WOODHEAD	HOUSTON TX 77019	713-522-5755
BILAL COMPANY	S. R. 2 - BOX 62	EUCHA OK 74342	918-253-4094
BILL OLSON - W3HQT	BOX 1655A RFD 1	BURNHAM ME 04922	207-948-3741
BLACKSBURG GROUP	BOX 242 - SUITE 100	BLACKSBURG VA 24060	703-951-9030
BUDWIG MFG. CO.	PO BOX 829	RAMONA CA 92065	
BULLSEYE PRODUCTS INC.	28506 HAYES	ROSEVILLE MI 48066	313-776-2587
BUTTERNUT ELECTRONICS	405 EAST MARKET STREET	LOCKHART TX 78644	512-398-9019
CADDELL COIL CORP.	35 MAIN ST.	POULTNEY VT 05764	802-287-4055
CAPRI ELECTRONICS	ROUTE 16	CANON GA 30520	404-376-3712
CENTURION	P O BOX 82846	LINCOLN NE 68501	402-467-4491
CERTIFIED COMMUNICATIONS	4138 SOUTH FERRIS	FREMONT MI 49412	800-433-9473
COAXIAL DYNAMICS INC.	15210 INDUSTRIAL PARKWAY	CLEVELAND OH 44135	216-267-2233
COLATCHCO	P O BOX 230	CARLISLE MA 01741	617-371-1242
COM-RAD INDUSTRIES	25 IMSON ST.	BUFFALO NY 14210	716-823-0331
CUBEX COMPANY	P O BOX 732	ALTADENA CA 91001	818-798-8106
CUSHCRAFT	48 PERIMETER RD. -- PO BOX 4680	MANCHESTER NH 03108	603-627-7877
CX LABS	P O BOX 95 - 55 RAILROAD AVE.	GARNERVILLE NY 10923	
DC SALES	1602 CHESTNUT RIDGE ROAD	KINGWOOD TX 77339	713-358-0051
DYNETIC SYSTEMS	19128 INDUSTRIAL BLVD.	ELK RIVER MN 55330	612-441-4303
FIRESTIK ANTENNA COMPANY	2614 EAST ADAMS	PHOENIX AZ 85034	
GEM QUAD PRODUCTS	BOX 53	TRANSCONA MANITOBA R2C 2Z5	204-866-3338
GENE HANSEN CO.	1000 HANSEN ROAD	CORRALES NM 87048-0419	505-898-3251
GLEN MARTIN ENGINEERING INC.	BOX 253	BOONVILLE MO 65233	816-882-2734
GROVE ENTERPRISES	P O BOX 98	BRASSTOWN NC 28902	704-837-9200
H. J. THEILER CORP.	PO BOX 5369	SPARTANBURG SC 29304	803-576-5566
H. STEWART DESIGNS	P O BOX 643	OREGON CITY OR 97045	
HAMTRONICS INC.	65-B MOUL RD.	HILTON NY 14468-9535	716-392-9430
HART EASTERN COMMUNICATIONS	1444 DARLINGTON DRIVE	DERBY NY 14047	716-947-4840
HUSTLER	3275 NORTH B AVENUE	KISSIMMEE FL 32758	
IIX EQUIPMENT LTD.	P O BOX 9	OAK LAWN IL 60454	312-423-0605
J & R ENTERPRISES	RT. 3 BOX 389	CHAPIN SC 29036	

Table I– Antenna Manufacturers Directory.

forming a sort of "filter-out" of those products which don't look like they cut the mustard. Hopefully, we make the right decisions in electing to highlight something in the column. So please bear with us, and realize ultimately it's you who must evaluate all of the available information, decide to contact a firm we've mentioned, and possibly make a purchase decision.

To that end we suggest that you consider what we (or anyone else) says about a firm and its products as but one of several inputs you need for complete evaluation. Check out other articles, look for product reviews, and write to those who offer the product for complete information before plunking down hard cash. Especially bear in mind that the column is written several months before publication, so product specifications, availability, and prices may have changed during this period. Do not, therefore, send a firm a remittance unless you check with that firm first for confirmation.

Antenna Manufacturers Directory

Several months ago we presented an Antennas and Antenna Parts Suppliers Directory—a dealers list, organized alphabetically. This month we're pleased to present the companion Manufacturers Directory in Table I.

As with the previous listing, please consider this listing as a *guide*. Recognize that it's just too big a job for us to keep up with the details of what each firm or individual offers, so you will have to check specific offerings yourself. Bear in mind that the listing was prepared several months prior to publication, so some new sources may have inadvertently been left out. Note that some firms appear on both the Suppliers and Manufacturers Directories, since they function in both areas.

We would welcome input from those who would like to be added to the listings. We hope to keep the listings as current as we can, so we expect to update them in future columns.

Wrapping It Up

That's the column for this go-around. This month we have focused on reader feedback. We've also looked at some good hamshack reading material, highlighting some new antenna products, and opened the software notebook. We also presented our updated Antenna Manufacturers Directory, supplementing the Suppliers Directory presented in a previous column.

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

73, Karl, W8FX

NAME OF INDIVIDUAL OR FIRM	STREET ADDRESS	CITY - STATE -ZIP	TELEPHONE
J. L. INDUSTRIES	P O BOX 547	HALLANDALE FL 33009	
KILO-TEC	P O BOX 1001	OAK VIEW CA 93022	805-646-9645
KLM ELECTRONICS INC.	P O BOX 816	MORGAN HILL CA 95037	408-779-7363
LANCE JOHNSON ENGINEERING	P O BOX 7363	KANSAS CITY MO 64116	
LARSEN ELECTRONICS INC.	11611 N. E. 50TH AVENUE BOX 1686	VANCOUVER WA 98668	206-573-2722
LATTIN RADIO LABORATORIES	BOX 44	OWENSBORO KY 42302	
MAGNUM DISTRIBUTORS INC.	1000 S. DIXIE HY. W. #3	POMPANO BEACH FL 33060	305-785-2002
METZ COMMUNICATIONS CORP.	COR. RTE. 11 & 11C	LACONIA NH 03246	603-528-2590
MFJ ELECTRONICS	BOX 494	MISSISSIPPI STATE MS 39762	800-647-1800
MINI-PRODUCTS INC.	1001 W. 18TH ST.	ERIE PA 16502	
MOBILE MARK INC.	9001 EXCHANGE AVE.	FRANKLIN PARK IL 60131	800-648-2800
MOR-GAIN	P O BOX 329A	LEAVENWORTH KS 66048	913-682-3142
MOSLEY ELECTRONICS INC.	1344 BAUR BOULEVARD	ST. LOUIS MO 63132	800-325-4016
MULTI-BAND ANTENNAS	7131 OWENSMOUTH AVENUE SUITE 263C	CANOGA PARK CA 91303	818-341-5460
N.C.G. CO.	1275 N. GROVE ST.	ANAHEIM CA 92806	714-630-4541
NATIONAL TOWER CO.	P O BOX 12286	SHAWNEE MISSION KS 66212	913-888-8864
PALOMAR ENGINEERS	1924-F W. MISSION ROAD	ESCONDIDO CA 92025	619-747-3343
POLAR RESEARCH INC.	P O BOX 781	THIEF RIVER FALLS MN 56701	218-681-7413
PRO-SEARCH ELECTRONICS CO. INC.	1344 BAUR BOULEVARD	ST. LOUIS MO 63132	314-994-7872
QUANTUM COMMUNICATIONS CORP.	5319 SW WESTGATE DR. - SUITE 113	PORTLAND OR 97221	503-690-1108
QUATRON	485 EAST MILL ST.	LIBERTY MO 64068	816-587-5300
RADIO ENGINEERS	3941 MT. BRUNDAGE AVE.	SAN DIEGO CA 92111	
RF ENTERPRISES INC.	RT #7	ST. CLOUD MN 56301	612-255-0855
RF PRODUCTS	PO BOX 33	ROCKLEDGE FL 32955	305-631-0775
ROHN	BOX 2000	PEORIA IL 61656	309-697-4400
RUDY PLAK - W6TIK	P O BOX 966	SAN MARCOS CA 92069	
SIGNAL ENGINEERING	2624 FAYETTE DRIVE	MOUNTAIN VIEW CA 94040	415-948-3833
SKYLANE PRODUCTS	359 GLENWOOD AVENUE	SATELLITE BEACH FL 32937	305-773-1342
SOMMER GMBH	KANDELSTR. 35	7803 DENZLINGEN - W. GERMANY	
SPECTRUM INTERNATIONAL INC.	P O BOX 1084	CONCORD MA 01742	617-263-2145
SPI-PRO DISTRIBUTORS	ROOM 103 - P O BOX 1538	HENDERSONVILLE NC 28793	
SULTRONICS AMATEUR RADIO	15 SEXTON DRIVE	XENIA OH 45385	513-376-2700
SVM ELECTRONICS	64 BURNING TREE	CHESTERFIELD MO 63017	
TELEX/HY GAIN	9600 ALDRICH AVE. SO.	MINNEAPOLIS MN 55420	612-884-1371
TELREX LABORATORIES	P O BOX 879	ASBURY PARK NJ 07712	201-775-7252
TEN-TEC INC.		SEVIERVILLE TN 37862	
TENNATEST - WBURR	1025 WILDWOOD ROAD	QUINCY MI 49082	
TOM EVANS - W1JC	113 STRATTON BROOK	SIMSBURY CT 06070	
UNADILLA/REYCO/INLINE	6743 KINNE ST.	E. SYRACUSE NY 13057	800-448-1666
UNIVERSAL MANUFACTURING CO.	12357 E. 8 MILE RD.	WARREN MI 48089	313-774-4140
UNIVERSAL RADIO CO.	P O BOX 26041	EL PASO TX 79926	915-592-1910
VAN GORDEN ENGINEERING	P O BOX 21305	SOUTH EUCLID OH 44121	
VECTOR RADIO COMPANY	P O BOX 1166	CARDIFF CA 92007	619-944-1063
W9INN ANTENNAS	P O BOX 393	MT PROSPECT IL 60056	312-394-3414
WACOM PRODUCTS INC.	PO BOX 21145	WACO TX 76702	817-848-4435
WAYNE RES. & DEV. CO.	P O BOX 75144	HOUSTON TX 77234	
WESTERN ELECTRONICS	DEPT C	KEARNEY NE 68847	308-236-5333
WM. M. NYE COMPANY	1614-130TH AVENUE N. E.	BELLEVUE WA 98005	206-454-4524

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

MARS—Conclusion

This is the last half of the MARS article that began in the April issue. Part I covered introduction, history, objectives, call signs, modes, frequencies, nets, repeaters/VHF, gateway stations, and messages. Both parts of this article should be read to achieve maximum understanding of the overall MARS program.

Benefits

The following benefits can be derived from participation in the MARS program:

1. Additional experience operating all modes while using military call signs on military frequencies in local through international nets.

2. Learning the correct method to handle military communications, plus the subsequent satisfaction of providing this important service.

3. Increased communication opportunities.

4. Opportunities to expand one's knowledge of electronic and communication subjects by completing free correspondence courses offered to Army and Navy-Marine Corps MARS members. MARS members are eligible to take all such courses available to active-duty military personnel. Such courses require a minimum of six months active participation prior to enrollment. This program is not presently available to Air Force MARS members.

5. Association with the military service branch of one's preference, participating in structured nets conducted under military communication rules. This training could benefit anyone who later enters a military service.

6. Participation in the surplus (excess) equipment program after six months of active membership. This opportunity can be important to new amateurs who need equipment and/or accessories to improve their stations. Such property is excess to DoD and civilian federal agencies' needs. It is issued to MARS members for experimental and operational purposes as long as they remain active in MARS. It remains U.S. property that is subject to recall at any time. The variety of surplus items is very slim, and most items have to be repaired before they can be used.

Eligibility

Amateurs who are at least 14 years old are eligible for acceptance in the MARS program. MARS membership is not restricted to U.S. citizens. Amateurs who have been legally admitted to the United States for permanent residence (per Chapter 12 of Title 8, U.S. Code) are also eligible to join MARS. Physical handicaps do not disqualify people from being accepted as MARS members. Each applicant must possess a valid amateur radio license, which is usually issued by the FCC. MARS operates from many parts of the world. In some cases a Status of Forces Agreement dictates that the U.S. Military issues amateur radio licenses on behalf of host nations. Naturally, MARS recognizes and accepts applications from such licensees.

Each applicant must also possess a station that can be operated on at least two MARS high frequencies (actually, 2 to 30 MHz).

Navy-Marine Corps MARS accepts applications from Coast Guard Auxiliary members who have the "RADIO" endorsement on their licenses. These people are required to participate as regular MARS members.

Navy-Marine Corps MARS accepts membership applications from clubs. A MARS club station trustee must be designated to be responsible for proper operation and administration of such a MARS station. Also, the club station trustee and at least two more club members must be members of Navy-Marine Corps MARS for such an application to be acceptable.

Craig Williams, KB6DRW, of Weaverville, California, is the 35-year-old father of five children. Craig has been interested in becoming an amateur since about 1970. He finally took the big step and became a licensed Novice in January 1984. Craig won first place for the Sacramento Valley Section during the 1985 ARRL Novice Roundup Contest. His station includes a Swan 750CW transceiver, 15 meter inverted-Vee antenna, and a 40 meter dipole antenna. Craig has contacted amateurs in 46 states and 12 countries. He likes to chase DX (foreign amateurs) on the 15 meter band when it is open.

Novice Eligibility

DoD regulations require MARS members, who joined MARS while holding Novice licenses, to upgrade their class of license within 18 months of joining the MARS program; if they fail to meet this requirement, they are dropped from MARS. All three MARS groups meet this DoD requirement, but their time spans differ. The Navy-Marine Corps, Air Force, and Army MARS programs allow 6, 12, and 18 months, respectively, for Novices to upgrade.

Joining MARS

Applicants may request membership in the organization of their choice. Veterans tend to join the MARS group of the military branch in which they served. One is not allowed to be a member of more than one service group at the same time. In other words, if you are a Navy-Marine Corps MARS member (as an example), you cannot also be a member of either Air Force MARS or Army MARS. However, one can resign from one MARS group and then join another MARS group.

Any local MARS member or military installation MARS station should be able to provide an appropriate data sheet and MARS application. The area/region coordinator or the state director of MARS is the logical first contact for potential MARS members.

When one's application has been accepted, the applicant is issued an appropriate MARS (military) call sign and she/he is assigned to a training net.

Air Force MARS

An Air Force MARS application can be obtained from almost any local person or group associated with USAF MARS. If you do not know a local contact, material (data sheet and application) can be requested by writing to (or calling) the Air Force MARS Chief, Headquarters AFCC/SIMR, Scott AFB, IL 62225-6001 (telephone 618-256-4177).

Air Force MARS is divided into ten geographical regions. Each stateside region is run by a Regional Communications Manager (RCM), an affiliated MARS member appointed by the USAF MARS Chief. Each state in the first six (stateside) regions has a State MARS Director (SMD), another af-

2814 Empire Ave., Burbank, CA 91504

Gary L. Cooper, KA7UIK, operates from Boise, the capitol of Idaho. Gary has been a shortwave listener a long time. He has 6 Canadian provinces, 29 American states, 20 zones, and 90 countries confirmed as an SWL. His shack's walls are used to display about 130 SWL awards he has earned. Gary recently obtained a Novice license, and I hope he will put his ICOM 745 transceiver to use on the Novice bands. His amateur radio station also includes a Drake R-4B receiver and a 65 foot random wire antenna.

filiated MARS member appointed by the USAF MARS Chief. Each SMD is responsible to her/his associated RCM.

The USAF MARS regional breakdowns are as follows:

The first region consists of CT, DE, IN, MA, MD (including DC), ME, MI, NH, NJ, NY, OH, PA, RI, and VT.

The second region consists of AL, FL, GA, KY, NC, SC, TN, VA, and WV.

The third region consists of IA, IL, KS, MN, MO, ND, NE, SD, and WI.

The fourth region consists of AR, LA, MS, OK, and TX.

The fifth region consists of CO, ID, MT, OR, UT, WA, and WY.

The sixth region consists of AZ, CA, NM, and NV.

The seventh region is Europe.

The eighth region is the Pacific, including Hawaii.

The ninth region is Alaska.

The tenth (Ø) region is Central and South Americas.

Each overseas region (7–0) is managed by an overseas military headquarters.

Army MARS

An Army MARS application can be obtained from almost any local person or group associated with Army MARS. If you do not know a local contact, the desired material can be requested by writing to (or calling) the Director serving your area. The four Army MARS Directors in the continental U.S. (CONUS) and Hawaii, plus the areas they serve, are listed in the following paragraphs.

The Central Area Army MARS Director serves AR, IA, IL, IN, KS, LA, MI, MN, MO, NE, NM, OH, OK, TX, and WI. The mail address is Director, Central Area Army MARS, Fort Sam Houston, TX 78234-5000, Attention ASN-OPS-OX-SHN. The telephone number is 512-221-5061.

The Eastern Area Army MARS Director serves AL, CT, DE, FL, GA, KY, MA, MD, ME, MS, NC, NH, NJ, NY, PA, RI, SC, TN, VA, VT, and WV, plus Puerto Rico and the U.S. Virgin Islands. The mail address is Director, Eastern Area Army MARS, Fort Meade, MD 20775-5365, Attention ASN-OPS-OX-MDE. The telephone number is 301-677-5718.

The Western Area Army MARS Director serves AK, AZ, CA, CO, ID, MT, ND, NV, OR, SD, UT, WA, and WY. The mail address is Director, Western Area Army MARS, Presidio of San Francisco, CA 94129-5000, Attention ASN-OPS-OX-PSF. The telephone number is 415-561-2123.

The Pacific Basin area Army MARS Director serves the Hawaiian Islands, plus the U.S. Trust Territories, Guam, and the Philippines. The mail address is Commander, USAISC Signal Battalion, Fort Shafter, HI 96858-5415, Attention ASPH-PO-MARS. The telephone number is 808-655-4934.

Overseas Command Army MARS Directors are located in Germany, Japan, and Korea. The mail address for the Command Army MARS Director-Germany is Commander 5th Signal Command, Attention ASE-OP-MARS, APO New York 09056. The mail address for the Command Army MARS Director-Japan/Okinawa is Commander USAISC-Japan, Attention ASJ-PO-OD, APO San Francisco 96343-0059. The mail address for the Command Army MARS Director-Korea is Commander USFK/EUSA, Attention SJ-OMS, APO San Francisco 96301. MARS members intending to operate from an overseas command must first meet the licensing requirements of the host country, as well as the requirements of the USA's FCC.

An Army MARS data sheet and application can also be requested by writing to the Chief, Army MARS, Headquarters U.S. Army Information Systems Command, Fort Huachuca, AZ 85613-5000, Attention AS-OPS-OA. The telephone number is 602-538-6277.

Navy-Marine Corps MARS

A Navy-Marine Corps MARS application can be obtained from almost any local person or group associated with Navy-Marine

Corps MARS. If you do not know a local contact, the desired material can be requested by writing to Chief, Navy-Marine Corps MARS Naval Communications Unit, Washington, DC 20390-5161.

Participation

Continued MARS membership requires continued active participation. The minimum acceptable activity requirements are low, but members are expected to put in more than these required minimum operating times.

Air Force and Army MARS members are required to participate at least 12 hours per calendar quarter (3-month segment). At least 6 of the 12 hours must be operation in one's high-frequency net assignment.

Navy-Marine Corps MARS members are required to participate at least 18 hours per calendar quarter. At least 12 of the 18 hours must be operation in one's area or region high-frequency net.

Resigning

If you decide that you do not have the time and/or desire to remain active in MARS, you can resign at any time. One does not have to state a reason for resigning, but such information could be useful. Our commitments change with shifts in family status, job responsibilites, and physical condition. Previous MARS members are welcome to return to the MARS program when they can again be active.

Summary

MARS has something to offer to all amateurs, and it can be particularly beneficial to new amateurs. MARS provides excellent training in message word count, message handling, net operation, and military communications. Technical nets and correspondence courses enable members to upgrade their technical knowledge. On-the-air operating experience is a confidence builder for relatively inexperienced amateurs.

If a national emergency arises, only MARS and RACES (Radio Amateur Civil Emergency Service) stations would be allowed to continue operating; amateur radio operation would be halted.

The Navy Headquarters Station (NAV/K4NAA) is located in Building 13 of NAVCOMMU, which is 15 miles southeast of Washington, DC. NAVCOMMU is on Route 5, and it is near Andrews Air Force Base. Visitors are welcome at K4NAA/NAV. The station's telephone number is 202-238-2266/2267.

I appreciate the assistance I received from H.R. (Ray) Collins, AGA3C, Arthur R. Delperdang, K4KBI/NNN0ASB), and R. Larry Warren, KA7TPV/AAA9A, in preparing this article; respectively, they are the Chiefs of the Air Force, Navy-Marine Corps, and Army MARS Programs.

73, Bill, W6DDB

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Yaesu Reps on Saturday 5/17

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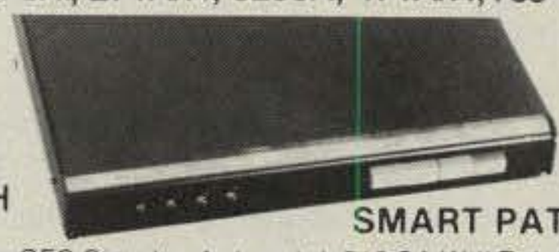
ICOM

IC—R71A, 751, 745, 27A/H, 37A, 47A, R-7000, 1271A., 271A/H, 3200A, 471A/H, 735

YAESU

FT-ONE, FT-980, FT-757GX, FRG-8800
FT-726R, FRG-9600, FT-270RH, FT-2700RH



SMART PATCH

CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone Great For Telephone Calls From Mobile To Base. Simple To Use - $319.95.

PRIVATE PATCH III in stock

KENWOOD

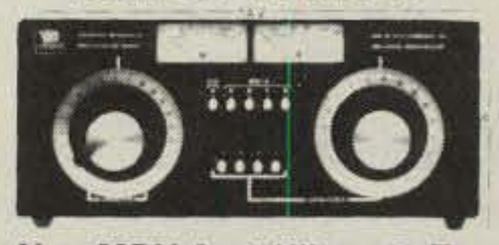
TS440S/AT, R-1000, R-2000, TS-940 S/AT
TM-201B, TR26/3600A, TM2570A/50A/30A
TW-4000A. Kenwood Service/Repair.
TH21/31/41AT, TM-211A/411A & TS-711A/811A

Antennas
A-S
Cushcraft
Hy-Gain
Hustler
KLM
METZ
Mini-Products
Mosley

YAESU	ICOM
FT-1/2/703R	IC2AT
FT-2/709R/H	ICO2AT
FT-1903/1123	IC-04AT
	IC-A2/U16

Land-Mobile H/T
Midland/Standard
Wilson Maxon
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine) M700
Tempo M-1

FLUKE 77 Multimeter



Nye MBV-A 3 Kilowatt Tuner

COMPU-FIRE EXTINGUISHERS
EXL-5000E RTTY/AMTOR TERMINAL

Alinco Power Supplies

VoCom/Mirage/Daiwa
Tokyo Hy-Power Amplifiers &
5/8λ HT Gain Antennas IN STOCK

AMERITRON AMPLIFIER AUTHORIZED DEALER

Yaesu FTR-2410, Wilson
ICOM IC-RP 3010 (440 MHz)
ICOM IC-RP 1210 (1.2 GHz)

SANTEC
ST-222/UP
ST-20T
ST-442/UP
HT-7

Soldering Station,
48 Watts, $68
JBC soldering line in stock.

Computer Interfaces stocked: MFJ-1224
AEA CP-1, PK-80, DR.DX
CP-100, PK-64, Dr. QSO,
Morse University

ETO

ALPHA AMPLIFIERS

MFJ Models
422, 313, 989, & 941D

MURCH Model 2000 A, A-LS, B in stock

Complete Butternut Antenna Inventory In Stock!

MICROLOG-AIR I. Air Disk, SWL, Morse Coach
KANTRONICS
UTU, Interface II, UTU-XT, Challenger, Packet Comm.

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
4-400A

BIRD
Wattmeters &
Elements
In Stock

DIGITAL FREQUENCY COUNTERS

Trionyx-	Pro-Com Engineering	
Model TR-1000	0–1 GHz	1200HH
0–600 MHz	0–1.3 GHz	1296HH

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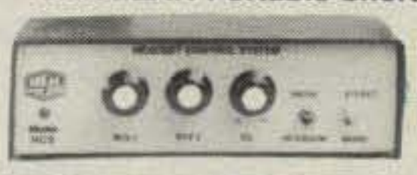

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Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The steady decline of the present solar cycle towards its demise continues to make news. The Royal Observatory of Belgium, the world's official keeper of solar records, reports a monthly mean sunspot number of 2.3 for January 1986. This is the lowest monthly mean observed since July 1976, shortly after the present cycle began.

January's mean sunspot number results in a 12-month smoothed sunspot number of 17 centered on July 1985. The solar cycle is measured by the level of smoothed sunspot number. A smoothed sunspot number of 9 is predicted for May 1986.

Cycle 21 continues to decline much as predicted. From present solar observations it appears very likely that the cycle will end, and Cycle 22 will begin, towards the end of 1986.

May Propagation

The following is an overall picture of HF amateur band conditions expected during this month. For specific times of DX openings refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts valid for May and June, as well as charts centered on Alaska and Hawaii. The Short-Skip Charts contain propagation forecasts for openings varying in distance between 50 and 2300 miles. For day-to-day propagation conditions expected during May, see the Last Minute Forecast which appears at the beginning of this column.

10 Meters: Very few DX opportunities expected on this band during the present period of very low solar activity. An occasional opening may be possible towards South America during the afternoon hours, when conditions are High Normal or better. Frequent short-skip openings between distances of approximately 750 and 1400 miles, however, should be possible on many days.

15 Meters: A decrease in DX openings on this band is normal for May and the summer months. Some fairly good openings should still be possible towards South America when conditions are at least Low Normal, and towards southern Africa and the South Pacific occasionally when conditions are High Normal or better. Best time to check the band for DX is during the afternoon hours. Numerous short-skip openings between approximately 600 and 2300 miles should be possible on most days.

20 Meters: This is expected to be the best band for DX propagation during May. Opening shortly after sunrise, good DX conditions are expected to one area of the world or another throughout most of the day and well into the evening hours. Conditions should peak for an hour or two after sunrise and again during the late afternoon hours, with openings possible to most areas of the world. When propagation conditions are at least High Normal, the band may remain open to many areas of the world through the early evening and well into the hours of darkness. Very frequent short-skip openings are also expected throughout the day, ranging between approximately 350 and 2300 miles. Quite often, especially during the afternoon hours, optimum conditions may exist for both short and long skip, with stations a few hundred miles away QRMing DX stations.

40 Meters: Shorter hours of darkness and seasonally higher static will mean somewhat fewer DX openings on this band during May. Some fairly good ones, however, should still be possible. Check from about an hour before sundown, through the hours of darkness, and until shortly after sunrise for openings to many areas of the world. Good daytime short-skip openings can be expected over distances between 150 and 750 miles, with nighttime openings extending up to the one-hop limit of 2300 miles.

80 Meters: Fewer DX openings are also expected on this band during the month. It's worth checking, however, during the hours of darkness and the sunrise period for what could often be some fairly good openings to several areas of the world. Excellent short-skip openings are expected throughout the daylight hours over distances ranging between approximately 50 and 250 miles. During the hours of darkness the short-skip

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for May 1986

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 21	A	A	B	C
High Normal: 3, 6, 18-20, 22-23, 27, 30	A	B	C	C-D
Low Normal: 1-2, 4, 7-10, 14, 15, 17, 28-29, 31	A-B	B-C	C-D	D-E
Below Normal: 11, 13, 16, 24, 26	B-C	C-D	D-E	E
Disturbed: 12, 25	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 good (B-C) on May 1st and 2nd, good (B) on the 3rd, fair to good (B-C) on the 4th, excellent (A) on the 5th, etc.

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10db loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

CQ Short-Skip Propagation Chart
May & June, 1986
Local Daylight Savings Time At Path Mid-Point (24-Hour Time)

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	08-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	08-09 (1) 09-13 (2) 13-17 (1-2) 17-21 (2) 21-23 (1) 23-07 (0-1)	08-09 (1-0) 09-21 (2-0) 21-23 (1-0) 23-07 (1-0)
15	Nil	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-00 (0-1)	07-09 (1-2) 09-13 (2-3) 13-17 (1-2) 17-19 (2-3) 19-21 (2) 21-00 (1) 00-07 (0-1)	07-09 (2-0) 09-13 (3-1) 13-17 (2-1) 17-19 (3-1) 19-21 (2-0) 21-07 (1-0)
20	Nil	07-09 (0-2) 09-12 (0-3) 12-17 (0-4) 17-19 (0-3) 19-23 (0-2) 23-07 (0-1)	07-08 (2) 08-09 (2-3) 09-12 (3-4) 12-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-23 (2) 23-07 (1)	07-08 (2) 08-09 (3-2) 09-15 (4-2) 15-17 (4-3) 17-20 (4) 20-21 (3) 21-23 (2) 23-07 (1)
40	08-10 (0-2) 10-16 (1-4) 16-18 (2-4) 18-20 (1-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2-4) 10-15 (4-2) 15-16 (4-3) 16-19 (4) 19-20 (3-4) 20-22 (2-3) 22-08 (1-2)	08-09 (4-3) 09-10 (4-2) 10-15 (2-1) 15-16 (3-1) 16-19 (4-2) 19-20 (4) 20-22 (3-4) 22-01 (2-4) 01-03 (2-3) 03-08 (2)	08-09 (3-1) 09-10 (2-1) 10-16 (1-0) 16-19 (2-1) 19-20 (4-3) 20-01 (4) 01-03 (3) 03-06 (2) 06-08 (2-1)
80	08-10 (4) 10-18 (4-3) 18-20 (4) 20-22 (3-4) 22-00 (2-4) 00-06 (2-3) 06-08 (3-4)	08-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-00 (4) 00-06 (3-4) 06-08 (4-3)	08-09 (1) 09-10 (1-0) 10-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-02 (4) 02-06 (4-3) 06-08 (3-2)	08-09 (1-0) 09-18 (0) 18-20 (1-0) 20-22 (3-2) 22-02 (4-3) 02-06 (3-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-07 (2) 07-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

See explanation in "How To Use Short-Skip Charts" which appears in the box at the beginning of this column.

range will increase out to about 1800 miles, and considerably further when static levels are low.

160 Meters: Propagation conditions on this band have passed their seasonal peak and will be on the decline until early fall. Openings up to distances of at least 1000 miles should still be possible during the hours of darkness, and over considerably greater distances at times when static levels are low.

VHF Ionospheric Openings

Sporadic-*E* ionization usually increases considerably during May, and some fairly frequent *6 meter* short-skip openings should be possible. Openings are most likely to occur over distances between approximately 1000 and 1400 miles. Best times to check are between 10 a.m. and 2 p.m. and between 6 and 10 p.m., local daylight time, although sporadic-*E* ionization can occur at other times as well. When ionization is very widespread and intense, two-hop openings considerably beyond 1400 miles may be possible for brief periods on *6 meters*, and short-skip openings between approximately 1200 and 1400 miles may also be possible on *2 meters.*

By checking short-skip conditions on *10 meters* you can often get a good idea about possible openings on *6 meters.* When the shortest skip you hear on *10 meters* is down to 500 miles or less, be sure to check *6 meters* for openings in the same general direction. The same rule applies to *6* and *2 meter* openings. When sporadic-*E* openings are down to about 500 miles on *6 meters,* check *2 meters* fast for possible skip openings as well.

The *Eta Aquarids* meteor shower should intersect the earth's atmosphere between May 3 and 5. This is usually a major shower, and it should reach maximum intensity during the evening of May 4, with a predicted hourly meteor count in excess of 20. Chances are good for meteor-burst short-skip openings during the period of the shower.

Not much auroral activity is expected during May, although some may occur during periods of radio storminess.

73, George, W3ASK

ALASKA
Openings Given In GMT

To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	Nil	00-02 (1) 02-04 (2) 04-05 (1) 12-14 (1)	07-10 (1)	Nil
Central USA	00-02 (1)	01-03 (1) 03-05 (2) 05-06 (1) 13-15 (1)	08-12 (1)	Nil
Western USA	00-03 (1)	00-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 14-15 (1) 15-18 (2) 18-20 (1)	08-09 (1) 09-14 (2) 14-15 (1)	10-14 (1)

HAWAII
Openings Given In HST

To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	12-15 (1)	06-08 (1) 10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	19-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1)	21-00 (1)
Central USA	12-14 (1) 14-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-17 (3) 17-18 (4) 18-19 (3) 19-21 (2) 21-22 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-02 (2) 02-04 (1)	21-21 (1) 21-00 (2) 00-02 (1) 22-01 (1)*
Western USA	13-17 (1)** 09-14 (1) 14-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-16 (3) 16-18 (4) 18-20 (3) 20-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-07 (1)	19-20 (1) 20-22 (2) 22-03 (3) 03-04 (2) 04-05 (1) 22-03 (1)*

* Indicates best time for 160 Meter openings.
** Indicates best time for 10 Meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances use the preceding Short-Skip Propagation Chart.

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the month is:

Junior High School 22m ARC Education Through Communications

Joseph J. Fairclough, WB2JKJ, is a junior high school English teacher and has been since 1968. He has been an amateur radio operator since 1962. After several years of using the conventional methods of teaching English and finding they simply would not work on the youngsters with whom he was dealing, Joe decided it was time for a change. He thought there must be a way to make the children interested enough to *want* to learn.

With the idea of creating interest and excitement, Joe decided to combine the English curriculum with ham radio as follows:

1. Teach the children Morse in the beginning of the term and get them to a point where they can copy their spelling and vocabulary in CW.

2. Use the Novice handbook as the class text. Diagram the sentences, examine the parts of speech, etc.

3. Make reading assignments from the various ham publications.

Obviously, there is a great deal more, such as QSLing, letter writing, geography, math, speech, and so on.

In 1979 Joe wrote his proposal to the New York City Board of Education. He wanted to try his new approach. The board approved his proposal to institute the course called "English Through Ham Radio." They backed their approval with a grant of $600 so Joe could buy equipment and put his theory to a test.

Joe purchased a transceiver and a dipole, and in September 1980 he went on the air from the school with 120 eager students. Attendance in Joe's classes increased dramatically, and kids began to learn English in a way never before thought possible. Within this framework they are learning the basic skills of reading, spelling, composition, and some geography. With Joe as the control operator, the students talk with many people, ask questions, and then study the maps and mark locations of the contacts. This has added a completely new dimension to their knowledge.

A regular participant in Joe's classroom is retired Air Force Lt. Col. Roger Wells, W4IPM, a man whose love for amateur radio has led him into the New York City classroom. When Col. Wells came in con-

333 South Lincoln Ave., Mundelein, IL 60060

Bill, WB2JKJ, with some of his students at Junior High School 22m in New York City.

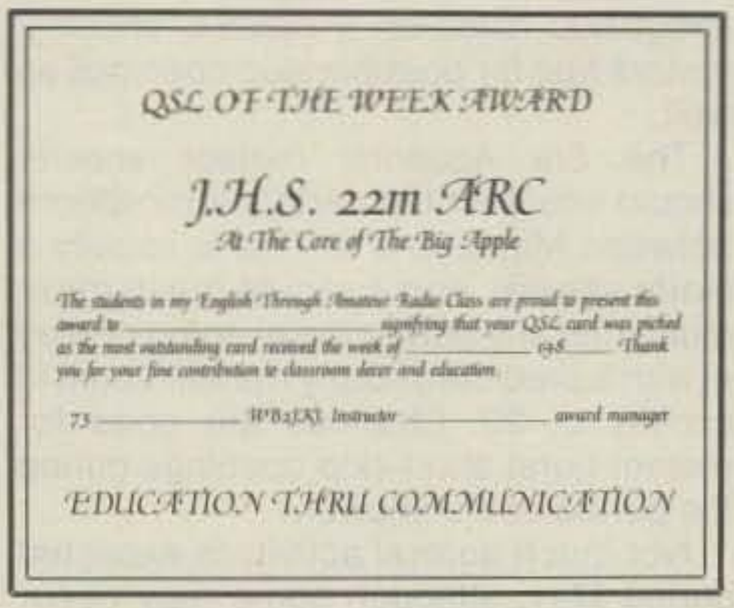
tact with Joe several years ago over the radio, he learned of the unique teaching methods. To assist with the project Colonel Wells began sending small bags of white sand and seashells to the class. An occasional foreign coin would be buried in the sand, and the first student able to identify the shells and coins was allowed to keep them. Now the colonel asks the students questions about the country from which the coin comes, along with questions about science, history, English, the arts, the radio itself, or anything else that comes to mind. The project became so popular that Colonel Wells has long since depleted his supply of coins collected during his years with the Air Force. Others believe in the program as well, and the colonel has received help from churches, schools, amateur radio operators, and the governor of Florida.

Among the letters Joe and his students have received, especially treasured are those from President Ronald Reagan, Senator Barry Goldwater of Arizona, and Mayor Edward Koch of New York City. All express enthusiasm for the program.

We all salute Joseph J. Fairclough, WB2JKJ, the visionary English teacher who has opened the windows of the world for his students.

A QSL of the Week Award is sent by the students of Junior High School 22 in New York City. The 180 students examine each card received during the week and issue the award to the winner.

For those who desire to submit their cards for judging, send them to: WB2JKJ, Junior High School 22 Amateur Radio Club, 111 Columbia Street, New York, NY 10002.



QSL OF THE WEEK AWARD

J.H.S. 22m ARC

At The Core of The Big Apple

The students in my English Through Amateur Radio Class are proud to present this award to _____ signifying that your QSL card was picked as the most outstanding card received the week of _____ 19__. Thank you for your fine contribution to classroom decor and education.

73 _____ WB2JKJ Instructor _____ award manager

EDUCATION THRU COMMUNICATION

The QSL of the Week Award offered by J.H.S. 22m ARC.

USA-CA Special Honor Roll
Donald C. Walters, WB3IQJ
All Counties #502, 1-15-86
All SSB

G. Pauline Parker, N9CLZ
All Counties #503, 1-28-86
All SSB

Awards Issued

Donald C. Walters, WB3IQJ, completed them all and sent for USA-CA 500 #2080, USA-CA 1000 #913, USA-CA 1500 #736, USA-CA 2000 #657, USA-CA 2500 #600, USA-CA 3000 #535, and All Counties #502. All awards were dated 1-15-86 and endorsed All SSB.

G. Pauline Parker, N9CLZ, stopped long enough from her travels to claim USA-CA 500 #2085, USA-CA 1000 #915, USA-CA 1500 #737, USA-CA 2000 #658, USA-CA 2500 #601, USA-CA 3000 #536, and All Counties #503. All awards were dated 1-28-86 and endorsed All SSB. Pauline's OM, George W. Parker, K9CSL, holds All Counties #329, 5-26-81.

John P. Levo, WA8KIW, added four seals to his certificates for USA-CA 1000 #912, USA-CA 1500 #735, USA-CA 2000 #656, and USA-CA 2500 #599, all dated 1-8-86.

Jack Cole, N8FEB, qualified for USA-CA 500 #2079 and USA-CA 1000 #910, All SSB, 1-2-86.

George A. Dessert, W3IJT, claimed USA-CA 1000 #911, All SSB, 1-6-86.

USA-CA 1000 #914 was issued to Hugh P. Dickinson, KK2J, All A-1, 1-17-86.

USA-CA 500 certificates went to:

Jack D. Cole, N8FEB, USA-CA 500 #2079, All SSb, 1-2-86.

Donald C. Walters, WB3IQJ, USA-CA 500 #2080, All SSB, 1-15-86.

Urban Kjellberg, SM6CST, USA-CA 500 #2081, Mixed, 1-18-86.

Mats Gunnarsson, HC1SK, USA-CA 500 #2082, Mixed, #2 to Ecuador.

Jacques Danis, F6HKD, USA-CA 500 #2083, All CW.

USA-CA Honor Roll

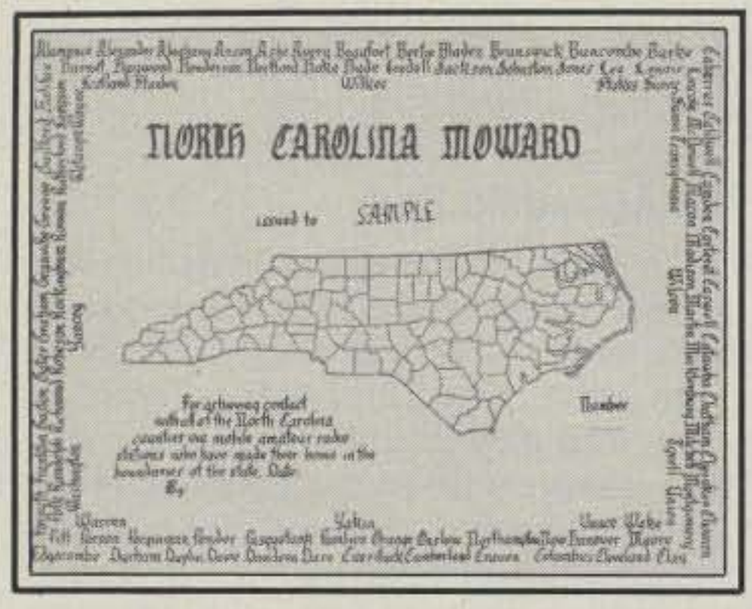
3000		1500		500	
WB3IQJ	535	WA8KIW	735	N8FEB	2079
N9CLZ	536	WB3IQJ	736	WB3IQJ	2080
		N9CLZ	737	SM6CST	2081
2500				HC1SK	2082
WA8KIW	599	**1000**		F6HKD	2083
WB3IQJ	600	N8FEB	910	KE5KC	2084
N9CLZ	601	W3IJT	911	N9CLZ	2085
		WA8KIW	912		
2000		WB3IQJ	913		
WA8KIW	656	KK2J	914		
WB3IQJ	657	N9CLZ	915		
N9CLZ	658				

Dave C. Rachier, KE5KC, USA-CA 500 #2084, All 20 M, Mobile, SSB, 1-27-86.

G. Pauline Parker, N9CLZ, USA-CA 500 #2085, All SSB.

Awards Available

The North Carolina Moward. To qualify contact all 100 counties of North Carolina via mobile radio stations operated by amateurs who reside in the state. Contacts after January 1, 1984 will count toward this award. Any band or mode will be valid, but any repeater-assisted contacts will be invalid.



The North Carolina Moward for contacting mobile stations in S. Carolina counties.

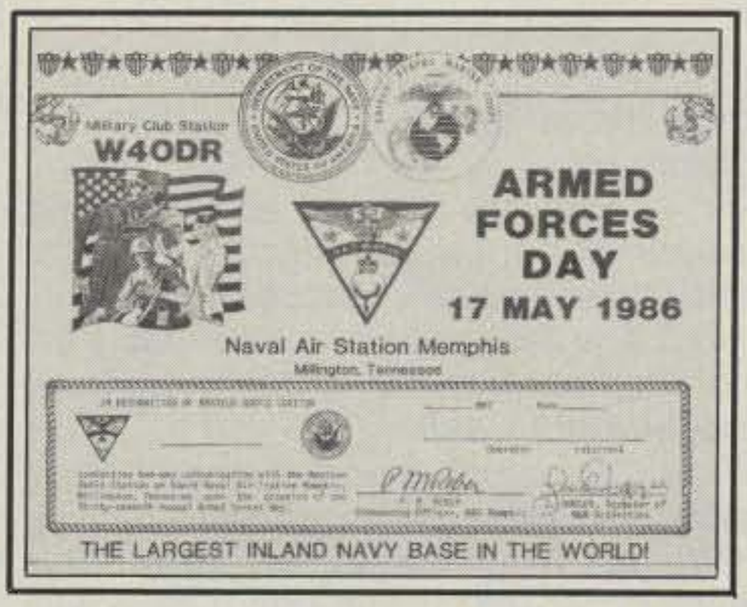
The award is 8½" × 11" bordered in red with the names of all the North Carolina counties surrounding a yellow outline map of the state with county outlines and is printed on blue stock.

Applicants must have confirmations "in hand," but need only supply log information in alphabetical order by county along with a large SASE. One or more cards may be requested for verification. Send application to Coy Terry, KD4ON, 2827 Meade Avenue, Gastonia, NC 28052.

Armed Forces Day Award. In recognition of the 37th Annual Armed Forces Day celebration, amateur radio station W4ODR, located Northside aboard the Naval Air Station Memphis, Millington, Tennessee, will be operated by sailors and Marines on Saturday, 17 May from 1400Z to 2200Z. Active duty, reserve, and retired military personnel will combine efforts for this exciting event for Armed Forces Day recognition.

Plans call for operation on SSB at 7.230 MHz, 14.280 MHz, and 21.370 MHz (+ 10 kHz). CW frequencies will be 21.145 and 28.145 MHz. Two meter frequency will be 146.52 simplex. It is hoped that operation will be continuous on all bands, but check all frequencies to be sure.

Special red, white, and blue certificates will be available to those who work "Whiskey Four Old Dusty Rebel." No self-addressed stamped envelope required! Certificates will be mailed the same day! Calls not in the Callbook should QSL to Military Club Station W4ODR, P.O. Box 54278, Naval Air Station Memphis, Millington, TN 38054. Special attention will be paid to those hams who have been stationed at Millington over the years.



Armed Forces Day Award from the Naval Air Station Memphis.

Zurich 2000 Award. In 1986 the town of Zurich is having its 2000th anniversary. To celebrate the event and in the spirit of developing friendly relations among nations, the Zurich division of the USKA (USKA Sektion Zurich) is sponsoring the Zurich 2000 Award. Requirements are as follows:

HB9: 10 stations in the canton of Zurich, including at least 4 stations in the town of Zurich.

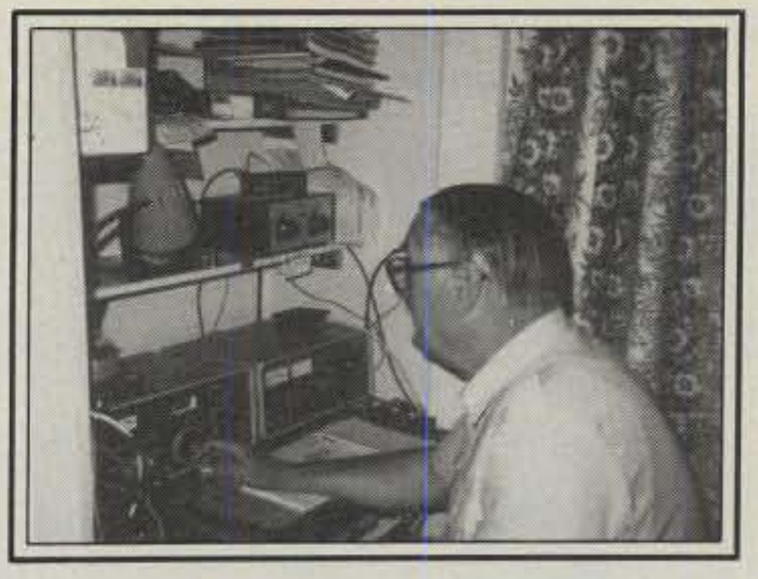
EU: 5 stations in the canton of Zurich, including at least 3 stations in the town of Zurich.

DX: 4 stations in the canton of Zurich, including at least 2 stations in the town of Zurich.

Every station counts only once, but the club station (HB9Z) of the Zurich division of USKA counts as two stations. HB9Z also counts for the town of Zurich. The award is available for all bands or modes.

Please send your application (no QSL's, log data only) verified by two licensed radio amateurs or a national award manager with the fee of 5 Swiss francs or 4 IRCs or 3 US dollars to: USKA Sektion Zurich, Awards Manager, Fritz Zwingli, HB9CSA, Eugen-Huberstr. 25, CH-8048, Zurich, Switzerland.

International Diploma Commemorative "Puebla 455." This award is to commemorate the 455th anniversary of the founding of the City of Puebla de los Angeles (Puebla of the Angels), now Heroica Puebla de Zaragoza (Heroic Puebla of Zaragoza) on the valley of Cuetlaxcoapan (place where snakes are skinned), Mexico. The Honorable Council of the City and Municipality of Puebla acting upon a proposal of the radio clubs of the city has instituted the International Diploma Commemorative "Puebla 455" as part of the festivities. The diploma is fine linen cardboard, 36 × 51.5 cm, in color and signed by the mayor of the city. The following requirements apply:



Ellis, GW3CDH, looking for counties at his QTH in Risca, Wales.

1. The diploma is free except for the postage costs, according to international use of the IRC (see rules 10, 11, and 12).

2. All radio amateur stations with a license given by the authorities of their respective countries may apply.

3. The diploma will be given for bilateral contacts among amateurs beginning January 1, 1986 at 00:00 hours XE (Mexico's Central Time) up to October 12, 1986 at 24:00 hours XE.

4. Contacts will be made exclusively with stations in the city of Puebla in the international amateur bands (according to the definition of IARU) from 10 to 80 meters.

5. On April 16, May 5, and October 12 the largest number of stations will be operated for the maximum amount of time to facilitate contacts celebrating the 16th of April (founding of the city), the 5th of May (the Battle of Pueblas), and the 12th of October (day of the Spanish race).

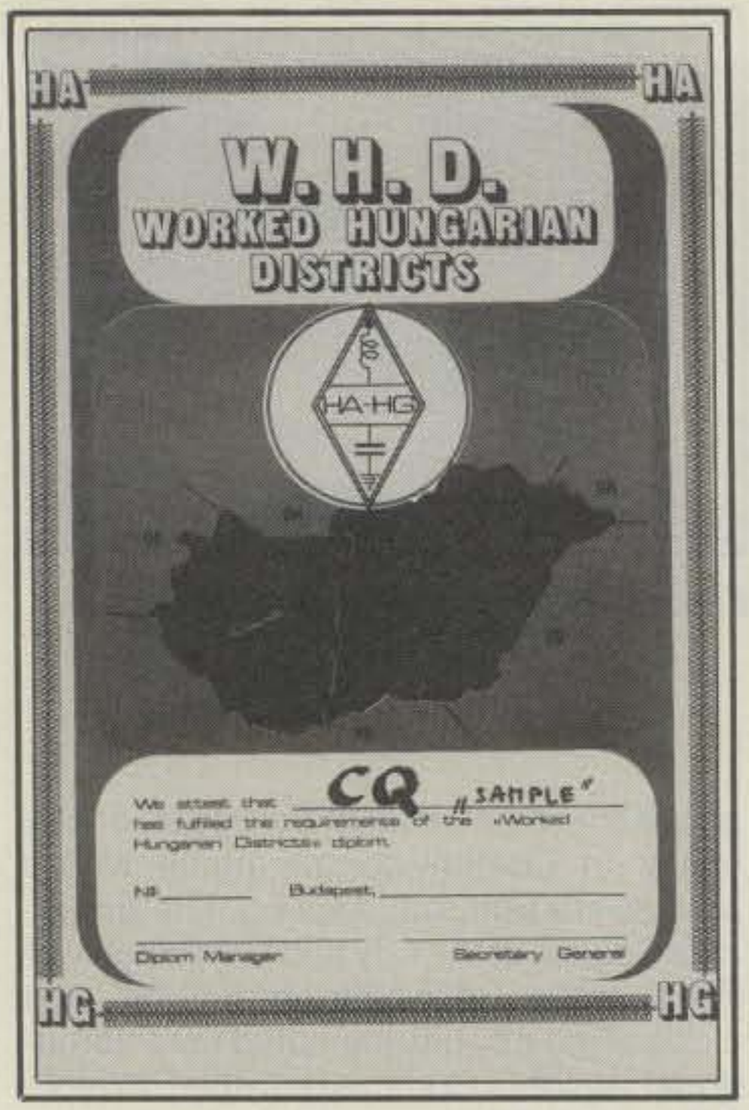
Contacts made with radio clubs will not be valid. Only contacts with radio amateurs will be valid.

7. Contacts that involve two or more bands (links) simultaneously will not be valid. That is, it will not be allowed to link two bands in order to achieve contact, but it is valid to make contact with the same station on two or more bands on different dates.

8. Contacts made with one station on one band may not be repeated at a later date. That is, one contact with a station for one band (the maximum that a Puebla station can give to one correspondent).

9. QSL cards must be sent to: Apparatado Postal No. 587 in Puebla, Mexico, In Care of Commission del Diplima.

10. Stations in the Republic of Mexico



The W.H.D. Award for working Hungarian Districts.

must make 10 contacts with Puebla stations. Include 1 IRC with each card to cover return postage for cards and diploma.

11. The rest of continental America will send 2 IRC's with each card for return of the cards and diploma.

12. All countries not included in paragraphs 10 and 11 send 3 IRC's with each card to cover return postage of cards and diploma.

Diploma Cuba is offered by the Federacion de Radioaficionados de Cuba.

13. The diploma can be endorsed two or more times (seals to be glued to the diploma).

14. After the second endorsement, paragraph no. 8 will be cancelled. That is, one can begin again to repeat stations.

15. The date limit to receive QSL's according to cancelling in Mexico will be December 11, 1986.

16. The commission will answer questions, and its decisions are final.

Worked Hungarian Districts Award. This award is issued for confirmed QSO's with HA/HG stations after 1-1-58. The applicant must confirm: EU station 2 QSO's with at least 8 different districts; DX stations 2 QSO's with at least 5 different districts. Fee for the award is 5 IRC's. The award manager is Janos Retkes, HA8UB.

All award applications should be sent to Hungarian Radioamateur Society, Award Committee, P.O. Box 22, Tiszakecske, Hungary H-6061.

The Cuba Award. Work the eight districts of Cuba CM-CO1 to CM-CO8. Radio club stations (three letters in the suffix) may be substituted for missed districts (no more than three). No QSL's to be sent, only log with contacts certified by a radio club official or two active amateurs. Stations may be worked in any band or mode. The fee is 10 IRC's or $2 U.S. It is free of charge for "Cuba DX Group" members or any other radio club or amateur radio organization. Send application to Federacion de Radioaficionados e Cuba F.R.C., P.O. Box 1, Havana 1, Cuba.

Of Special Interest To County Hunters

The new edition of the *County Hunter Handbook* is available. This handbook contains much helpful information for county hunters. It is available from the B & B Shop, 1348 Pinewood Drive, Woodbury, MN 55125. The cost is $4.00 U.S. postpaid.

There will be a County Hunters Forum at the Dayton Hamvention. Check your program for details or call Les Shockey, WB8SNO, at 304-273-3525.

The Armadillo Run

The dates for the Great Armadillo Run contest have been set to correspond with the County Hunters Contest. The phone event will be May 3 and 4. The CW weekend will be July 26 and 27. During these two weekends all of the counties in the United States, as well as the special Armadillo County, will be on the air. For further information contact Armadillo Activities Coordinator Tom Taormina, K5RC, 12610 Barbizon, Houston, TX 77089 (tel. 713-481-3816). For information on the Armadillo Run Contest, contact Galen Graff, KB5FU, 350 Magnolia Bend, New Caney, TX 77357 (tel. 713-689-6362). Armadillo County QSL's (K5DX/A) contact is C.E. Sharp, K5DX, 216 Myers Road, Highlands, TX 77562. Armadillo County souvenirs contact is Bob Walworth, AK5B, 3210 Chaparral Way, Spring, TX 77380.

The TDXS has slides and a VHS tape presentation on the Armadillo Run and can make speakers available for your club group. Contact K5RC for details.

Armadillo County is recognized for credit toward the USA-CA Awards. Details and conditions are in the *CQ* Awards Column for February 1986.

Notes

There was an error in the "Awards Issued" section of this column for February 1986. The correct call for John Luxford is ZL2BCX *not* ZL2ZDD! Sorry, John! That's all for this month. See you at Dayton!

73, Dorothy, WB9RCY

Work VHF or HF Packet On Any Computer With Kantronics Complete Packet Communicator

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From IBM to C-64, or any computer with an asynchronous serial port, you can now work packet on VHF or HF with one TNC, the KPC-2! Extra cost options are unnecessary. KCP-2 is packed full of features and backed by our full-time customer support departments. KPC-2 has totally new hardware and software, Kantronics designed. For more information contact Kantronics or a Kantronics dealer.

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- Supports multiple connects, up to 26
- RS232 or TTL compatible (C-64 too!)
- HF modem included! (both U.S. and European tones)
- Carrier Detect, and software squelch operation
- FCC Part 15 Certified
- Kantronics industry standard extruded aluminum case
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- All EPROM software is Kantronics sourced and copyrighted
- 128K EPROM, 16K RAM — expandable to 32K, 4K EEPROM.
- Advanced software HDLC routines, eliminating costly out-of-date chips

Customer Support

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- In-house service representatives
- Periodic software updates (like 2.0!)

Want more information on Packet?
Contact us about our new **PACKET VIDEO.**
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Kantronics
RF Data Communications Specialists
1202 E. 23 Street Lawrence, Kansas 66046 (913) 842-7745

CQ SHOWCASE

Crowston Distributors Of Grosvenor Software

Crowston Enterprises, the North American distributor of Grosvenor Software, has available amateur-oriented software for CW, RTTY, and AMTOR for use on the Radio Shack Tandy CoCo 2 and color computers (software has also been converted for use on several other computers). Programs are sold separately for those who want only one mode, or at combination prices for those who purchase two or more modes at one time. Each one is custom made and includes the user's call installed in the program. Interfacing information is supplied, including complete plans for a CW TU.

For more information, contact Crowston Enterprises, P.O. Box 1064, Shellbrook, Sask. S0J 2E0 Canada, or circle number 102 on the reader service card.

Fox Tango Newsletter Cumulative Index

After serving the owners of Yaesu equipment for 14 years, publication of the FT Newsletter has ceased. Fox Tango has, however, announced the publication of a comprehensive cumulative index covering the years 1976–1985, and a summary of 1972–1975. Most of the articles are grouped by model number, and within the groupings articles are listed by year and page, by topic, and by title and author's call letters.

Price of the newsletter index is $4.00 in the U.S. and Canada and $5.00 elsewhere. For more information, contact Milton Lowens, 248 Lake Dora Drive, West Palm Beach, FL 33411 or circle number 103 on the reader service card.

Coaxial Dynamics Wattmeter

Coaxial Dynamics, Inc. has announced the Model 83000A Peak Reading Wattmeter designed to measure both forward and reflected power in CW and FM systems. In addition, the 83000A will instantly measure peak power in most AM, SSB, or pulse systems.

The Model 83000A comes with a two-year warranty and lists a retail price of $375. For more information, contact Co-

axial Dynamics, Inc., 15210 Industrial Parkway, Cleveland, OH 44135, or circle number 101 on the reader service card.

ICOM IC-751A HF Transceiver

ICOM has announced the IC-751A 100 watt HF base station transceiver with general-coverage receiver (100 kHz to 30 MHz). The IC-751A incorporates features of the IC-751, plus has new features. Included are: all modes built in; 100% duty cycle transmitter; 105 dB dynamic range; electronic keyer included; QSK up to 40 wpm; FL-32A 9 MHz at 500 Hz CW factory-installed filter; CW sidetone for code practice; LED annunciator; and more.

For more information, contact ICOM

America, Inc., 2380 116th Ave. NE, Bellevue, WA 98009-9029, or circle number 105 on the reader service card.

Etron RF Enterprises RF Design Aid Programs

Etron RF Enterprises has made available a series of RF Notes program disks which aid in the solving of frequently encountered RF design problems. The programs are written in IBM BASICA and are intended for use on the IBM PC series computers. Arranged in a simple to use fashion, the disks start with basic subject matter and advance to more sophisticated topics as the series progresses.

At the time this is being written, three RF Notes are available. RF Notes No. 2 sells for $60 color or monochrome, for IBM 128K (graphics card required). No. 3 Vol. 1 is $85 for IBM DOS 2.1, 128 K min., color or monochrome (graphics card required). For more information, contact Etron RF Enterprises, P.O. Box 4042, Diamond Bar, CA 91765, or circle number 104 on the reader service card.

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

DXers that pass in the night,
And speak to each other in passing,
Only a signal heard
And a distant voice in the darkness. . . .

Most DXers have heard that everything comes to him who waits—long enough. And they generally have also heard that when things look good to be wary. Last week one of the Locals came trudging up the hill with an idea for which some may have been waiting. Possibly it would have been better to have waited some years longer.

"I have this great idea," the Local rushed to tell us, and we immediately were braced. "You know how the club often makes a big effort in DX tests. Well, we've figured out how we'll run up a big score this year, big enough to swamp most every club who tries a group effort in the DX Test. I just hope that no one else thinks of this idea before the next test. This is one that will really work!"

Our attention immediately went to full alert at these words. Clubs always like to point with pride to winning efforts in the big tests. And though summer is almost at hand, it will not be many months before the great CQ WW DX Tests, these always marking the return of football and the new DX season. We were well aware that this was the time to plan and prepare. "Tell us about it," we suggested. We did not have to live long to regret our quick words.

The Local leaned close, his voice low and guarded. We also were leaning close so we would miss nothing. Already we could detect the air about this whole thing that said "secret." We listened and the Local spoke.

"You know how in DX Tests you will find someone with a loud signal sitting on one frequency calling CQ DX non-stop," the Local said, and we nodded. We could almost see the secret knowledge back deep in his eyes. We were attentive.

"Well," the Local continued, the tone still conspiratorial, "a couple of us contest types got to talking things over after the last DX club meeting, and we decided that this year we are going to do things right. We talked over certain possibilities and finally someone suggested something which is simply brilliant. One has to wonder why it has not been thought of before now. It is simple but brilliant. Absolutely brilliant!"

A note of triumph was showing in this

77 Coleman Dr., San Rafael, CA 94901

Luigi Gavdino, I2KKL, is a Deserving DXer in Mantova, Italy. The gear and wall plaques should tell their own story of his operating. He has a Kenwood TS-930 going to a 3-element Yagi . . . plus other easily recognized gear. Luigi works CW, his bug being homebrew.

one's guarded whispers and he had all our attention. If it was so brilliant, yet so simple, we also were asking ourselves why it had not been thought of before. Certainly we knew a number of club members who considered themselves brilliant, perhaps more than an expected share. And there were some that we considered simple. We just has to know more about this plan.

"Keep in mind," the Local continued, "that the basis of any sure-fire winning strategy is in the planning. And we are well along with our planning. The plans are simple. The biggest problem will be to get the needed participants. As you know, DX contests usually run only 48 hours, and we are aiming to have no gaps in our planning. We will be active every possible moment and work every possible DX station. Absolutely!" The Local leaned even closer to bring more emphasis to his words. "And we will, we will! That is, if you'll do your part. Will you?"

What could we say? Of course we would. Every DXer has to fully support his club. "We will, we will!" we shouted, leaping to our feet. "Just tell us what we will have to do. You can count on us."

The Local smiled. "We were sure that we could," he said. "Your name was mentioned by several as a good worker in club activities, one who enjoyed doing the simple things. 'You can depend on him' was what a lot of the fellows were saying. And that's why I'm here. I'm here to help you!"

Maybe we were getting a bit anxious at this point. It sounded good and we were eager to be in on all the action. But we needed more information. What were we going to do? What were all of us going to do? We were even thinking just how big a score we could run up with the sunspot showing some signs of a new life. We had to know. The Local pressed on with his orientation speech.

"You do understand," he continued, "that our objective is to not miss any possible DX that shows and is workable during any contest period. There are some members in our group who are strong in their beliefs that they can work more DX at any time and especially more so during contests by calling 'CQ DX.' As there are so many of these in our group, really a good majority, everyone went along with their ideas. I am sure that when you learn about it you will certainly agree with us that the plan is both brilliant yet simple. Maybe I'd better explain to you what your duties will be, now that you are one of us."

We were ready. The Local was ready. But is the DX World ready? We are still wondering.

"You know how DX is most often found in the lower 25 or 50 kHz of a band," the Local said, leading us on with his explanation, and we quickly nodded our heads at his words. We knew that while you might expand the phone bands, move it down 25 or 50 or so, DX still will mostly be found in the lower portion just above the subband edge. There was nothing new yet in his words we were thinking. We continue to find DX occupying the same lower part of a phone band. Only the CW section seems to shrink a little. Possibly we were furrowing our brows with the effort of thinking but there was no sign that the Local had noticed or given this any attention.

"Our plan is to cover the DX portions of any subband," the Local continued, "and we plan to cover any band where there might possibly be DX and which will count for points in a contest. We call it our Blanket Contest Strategy, and what we hear will be what we get. We will blanket the bands, or at least at a minimum, the lower hundred kHz of every subband. Everything—160 to 10 meters—maybe even 6 meters, though some don't think we should worry about that one. But definitely 160 through 10. Understand?"

We were thinking of asking just what we were supposed to understand, maybe even asking why there should be any concern over 10 meters at the bottom of a cycle. But then we told ourselves that the more we talked the less we would learn. We later would have time to review that vagrant thought.

"We are going to organize into contest brigades," the Local continued, "one brigade for each band, three platoons to every brigade. Real solid formations. And depending on the band in question, we wil

The WPX Program

Mixed

1198	W3KWH	1201	HA8UB
1199	NK2W	1202	OA4AWD
1200	AB5G		

S.S.B.

1781	WA9AEA	1783	AB5G
1782	EA5JC	1784	OA4AWD

CW

2348	PY2DBU	2352	JA3UCO
2349	DL1YB	2353	PY2MT
2350	DF2PI	2354	OA4AWD
2351	IK6CGO		

VPX

244 YU7-RS-772

Endorsements

Mixed: 450 W3KWH, HA8UB, OA4AWD. 500 W3KWH, W9IAL, HA8UB, OA4AWD. 550 W3KWH, K7LJ, HA8UB, OA4WD. 600 W3KWH, HA8UB, OA4AWD. 650 N3KR, HA8UB, OA4AWD. 700 I2EAY, HA8UB, OA4AWD. 750 I2EAY, DF1SD, HA8UB, OA4AWD. 800 DF1SD, HA8UB, OA4AWD. 850 KX1A, DF1SD, HA8UB, OA4AWD. 900 VE2PD, DF1SD, HA8UB, OA4AWD. 950 HB9BYZ, I5HOR, IT9KMU, HA8UB, OA4AWD. 1000 HB8BYZ, JA6GWU, IT9KMU, IS0MVE, HA8UB, OA4AWD. 1050 OA4AWD. 1150 K2POF.

S.S.B.: 350 WA9AEA, EA5JC, EA2SN, AB5G, OA4AWD. 400 WA9AEA, EA5JC, HC2IX, OA4AWD. 450 WA9AEA, EA5JC, G3UKH, OA4AWD. 500 WA9AEA, EA5JC, KM1I, G3UKH, OA4AWD. 550 WA9AEA, EA5JC, KX1A, OA4AWD. 600 WA9AEA, KX1A, KE6KT, K79C, OA4AWD. 650 ON6IT, KX1A, K2POF, OA4AWD. 700 ON6IT, K9BQL, I2EOW, OA4AWD. 750 ON6IT, OA4AWD. 800 ON6IT, OA4AWD. 850 W4UW, OA4AWD. 900 VE2PD, DF7QD. 1000 KZ2P. 1050 PY4VX. 1100 PY4VX. 1250 LA7JO. 1500 I2JSB. 2200 ZL3NS.

C.W.: 350 PY2DBU, JA1OJZ, K9BQL, OA4AWD. 400 PY2DBU, OA4AWD. 450 PY2DBU, KX1A, OA4AWD. 500 PY2DBU, KX1A, OA4AWD. 550 N3KR, OA4AWD. 600 JA3ARM, PY2RRG, I2EAY, W4RHZ, OA4AWD. 650 I2EAY, LA7JO, OA4AWD. 700 OA4AWD. 750 OA4AWD. 800 SM5DAC, IS0MVE. 950 K2POF, DJ1YH. 1100 IT9VDQ. 1200 IS0FPH. 1300 W3TVB. 1700 N2AC.

10 meters: KC2RS, SV1PL, DJ1YH, HA8UB, OA4AWD.
15 meters: NJ0C, VE2PD, WA8YTM, SV1PL, DF1SD, HA8UB, OA4AWD.
20 meters: WA9AEA, WA8YTM, SV1PL, PA3BFH, HA8UB, OA4AWD.
40 meters: WA8YTM, SV1PL, W4UW, HA8UB, OA4AWD.
80 meters: NJ0C, KC2RS, WA8YTM, DF7QD, SV1PL, DF1SD, KU9C, HA8UB, OA4AWD.
160 meters: SV1PL, YU2TW, OA4AWD.

Asia: KA7T, AC2J, KC2RS, N5TV, WA8YTM, IK5ACO, JA3UCO, HA8UB.
Africa: N5TV, WA8YTM.
No. America: WA9AEA, KC2RS, N5TV, K7LJ, WA8YTM, KQ8J, IK5ACO, DF1SD, HA8UB.
So. America: W0ULU, N5TV, WA8YTM.
Europe: WA9AEA, KC2RS, N5TV, WA8YTM, KQ8J, IK6CGO, IK5ACO, PA3BFH, HA8UB.
Oceania: NJ0C, N5TV, K7LJ, WA8YTM, DF7QD.

Award of Excellence: N5TV with 160 meter endorsement.
Award of Excellence Holders: VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV.
Award of Excellence Holders with 160 Meter Endorsement: W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SM0DJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SM0AJU, KF2O, K5UR, OK1MP, N5TV, W8CNL.

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.

Here is HB9CSA, Fritz Cwingli, from downtown Zurich. First licensed in 1983, Fri has concentrated on DX and contests, also doing some operating at 4U1ITU and as G0/HB9CSA. Born in 1963, Fri works in the dietary department at a major hospital.

have a minimum of one operator for every 5 kHz of DX territory. If we get enough signed up, we might even cut that to one every four, or even three, kHz. We are out to cover the bands around the clock, wall to wall, top to bottom, inside and out. Where any DX is, we'll be there . . . or within a kHz or so. We just can't miss!"

We could feel a fear starting to work within us as we learned more of the plan for which we had so enthusiastically volunteered. From years back came again the words of First Sergeant Willie Sapp in our training company at Ft. Knox. "Never volunteer," he had said. But then he was a regular and all of us were volunteers. Maybe we did not exactly understand him then. Now we were understanding, but now was too late. Before we could voice any doubts, the Local was again plunging onward.

"We will really blanket things," he continued. "Every one of us will have an assigned frequency and a tour of operation. Four hours on, eight hours off. That way no one will get tired and lose this enthusiasm. And the clincher will be that five minutes before a contest is due to start, everyone on duty will fire up and start calling 'CQ DX.' One club member every 5 kHz in the DX band, and maybe even closer if we can find enough operators. And though we will start calling five minutes early, we won't answer any DX stations until the contest starts. But we will have established our claim to the frequencies, see? How can we miss? Simple, isn't it? Yet it is also brilliant, right?"

We could not find the words to answer. Within us confusion was wrestling with indignation. "Brilliant? Simple?" we managed to blurt out. "Isn't all of what you say getting to be a bit ridiculous? If you are calling 'CQ DX' every 5 kHz, how is any DX going to get through? Any why bother with those dead bands like 10 meters? And what makes you think that other clubs won't get the same crazy idea and also line up their members shoulder to shoulder across the DX bands, and they also will be calling 'CQ DX'? What will happen then?"

All the Local did was shrug. "You haven't taken time to think things through," he calmly advised us. "First, keep in mind we are establishing what will be our operating frequencies. They will be ours because we will use them in every contest. Any good DXer will respect our efforts and avoid any interference. Inasmuch as we will be using the frequencies before a contest starts, we naturally will be on frequency first. No good DXer will do anything but look for a clear spot, if there is any. Only a recidivist DXer would think of trying to operate in our portion of the band. And it will be ours because of use, custom, and DX tradition. We will have things covered for now and future needs, everything. As for 10 meters, keep in mind that cycles come and cycles go and with them things like 10 meters. But when it opens again, we will already be there and possibly will have been for some years. As for DX stations, if we are the only game in town, what else can they do but work us. All of us! What a score we are going to run up!"

This was getting to be ridiculous. We had convinced ourselves that it was, but what could we do with this Local on our hands. Then we thought we might try a flank attack. "You know, of course," we said, "that there has been talk at some DX conventions of either banning the calling of 'CQ DX' in contests, especially by the W's and K's, or even having contests where calling 'CQ DX' would be flatly prohibited." We paused to let these thoughts sink in. Then we challenged, "What about that? And how are you going to keep other clubs from working up the same madness? What will happen then?"

If we had thought to bring the clouds of worry to the Local, we were wrong. In reply we got the smile of serenity. "What will we do?" he asked. "Maybe nothing at

How does one recognize a DXer? Well, they are happy, genial, well fed, unwrinkled by the years of DXing, shoeless, and relaxed. They are found in rooms filled with amateur gear, the walls covered by DX QSLs and certificates. Come to think of it, that sounds like Doc Hollatz, VP2MF at Woodlands on Montserrat. Know the signs and you'll recognize a DXer anywhere! Study Doc's photo and learn DXer identification. (KG6IP photo)

The WAZ Program

20 Meter Phone

552	W6SN	553	N8DBI

40 Meter Phone

35	I8QLI

80 Meter Phone

36	NW5K

40 Meter CW

53	I4EAT

80 Meter CW

6	I4EAT

All Band WAZ

S.S.B.

3002	W0JMZ	3004	IK1ATG
3003	WA2MID	3005	F6CFT

C.W. and Phone

5933	IK5DEY	5937	N5TP
5934	FD6HSI	5938	HB9TE
5935	NN2G	5939	W1GNR
5936	WD4MDW	5940	G4EDG

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.

all. If any club thinks it can work in between our spacing without deliberate interference, let them try. Just so they don't bother our rapid QSOing of DX stations. If they can filter things out and maintain a signal very narrow, let them go," we said. "Let them go as far as they can, which should not be very far. As for banning 'CQ DX,' that's been talked about at conventions over the years, but have you seen any action? Anything at all? By the time they even get around to starting to think seriously about this or anything else, we probably will have so many contesters following our simple yet brilliant game plan that we will easily outnumber any vociferous and dissident group. We will be in the saddle, don't forget, and everyone loves a winner. That will be us!"

Frankly, we were having trouble finding any reason to believe that they might not be. Certainly the plan was taking things to extremes, but what if they did get enough operators to cover the bands in a contest? And we had volunteered. While we tried to think of an escape route, the thought was growing that in some recent DX Tests it did seem as though those calling "CQ DX" were shoulder to shoulder, calling long but working little. Were these already staking a claim to a frequency, or were they looking to next year and a big total? While we were wishing that we might know the answer, we were feeling a dread of what it might turn out to be. We could not rid ourselves of the feeling that some might try to see if this would work, if they had not already done so.

Finally we got enough wit and strength to ask, "What made you fellows turn in this direction? I thought that all you fellows ever argued over was DX nets without any agreement ever showing at all. What got you started on contests?"

It was obvious that the Local was feeling a bit expansive. "You are right," he said, "but that is what we used to argue about in other years. Along the way, however, someone pointed out that while we might never agree on DX lists and nets, maybe would agree on some actions which are badly needed in the club's contest activity. And naturally being DXers of strong opinions and even stronger drives, a decision was reached, and reached unanimously I might add, that the club would in the future be out to sweep the DX tests." The Local was again leaning close, the strong eye contact almost unbearable. "And we will, we will! You can count on that for sure. We will triumph!" And with that he was gone—finally.

All we could do was wonder why we had been in such a hurry to volunteer and how we might escape without putting the bar sinister on our callsign. Hopefully we ran some possibilities through our minds: maybe our tower would fall down, maybe we would manage to blow the linear again, it vanishing in a blast of smoke and flame and noise. Or we could blow the traps on the beam. Maybe we might even get ill. Something had to happen or we were in trouble. And all we could say was, "Willie Sapp, why didn't we listen to you back then?" Having to listen to a solid phalanx calling "CQ DX" all across the DX bands in a contest was a terrible thing to contemplate, but knowing that we had volunteered to join with them was a worry we could not shake. We had to think of something. We would. But what if there were a dozen willing volunteers to take our places? It was hard to think that even if we escaped from our rash volunteering, could we escape what we might find when the next big contest opened?

Rudolf Mueller, DJ5CQ, on Lord Howe

Hans Rueckert on Lord Howe Island has forwarded through the Southern California DX Club some of the problems encountered by Rudi Mueller, VK9NM/LH, on his trip there a few months back. While at times the feeling is that all DXpeditions are warm winds, cool nights, and sparkling conditions, they sometimes turn out to be otherwise. In fact, at times things can be downright miserable.

Rudi arrived on Lord Howe last fall, set up business, and worked a lot of DX in spite of the current conditions. He made over 12K contacts, including a good number on 80 meters. In November he started not feeling well but resisted seeing a doctor. SWLer Hans Rueckert on Lord Howe finally insisted on Rudi seeing the local MD who diagnosed the problem as critical and requiring emergency treatment. The local doctor there is VK9LK.

A call for assistnace brought the Royal Australian Air Force in a Hercules four-engine aircraft with a full medical staff and a

5 Band WAZ

Standings as of February 1, 1986

All 200 zones worked:

1. ON4UN	38. IV3PRK	75. YU7DX
2. K4MQG	39. DJ6RX	76. DL8MAG
3. SM4CAN	40. OH3YI	77. OK3DG
4. AA6AA	41. I4RYC	78. ZL1BOQ
5. W8AH	42. ZL1BIL	79. EA9IE
6. W6KUT	43. I4EAT	80. DL7HZ
7. EA8AK	44. ZL1BQD	81. DJ9RQ
8. LA7JO	45. TG9NX	82. EA5SP
9. EA3SF	46. XE1J	83. EA2IA
10. OH1XX	47. F5VU	84. SP3BQD
11. EA8OZ	48. W3AP	85. LZ1NG
12. W0SD	49. YO3AC	86. N4JF
13. K0ZZ	50. K3TW	87. CT2AK
14. ON6OS	51. XE1OX	88. HB9CIP
15. OK3TCA	52. VE7IG	89. OK1MG
16. K6SSS	53. OK1ADM	90. CT4BD
17. ZL3GQ	54. CT1FL	91. VK6HD
18. OK3CGP	55. WA1AER	92. EA6ET
19. SM0AJU	56. N4RR	93. VK3QI
20. OZ3PZ	57. UW0MF	94. LZ2DF
21. I3MAU	58. W4DR	95. ON4QX
22. I2ZGC	59. OK1MP	96. SM0DJC
23. 4Z4DX	60. W1NW	97. CT3BM
24. N4KE	61. OE1ZJ	98. K2TQC
25. K5UR	62. HB9AHL	99. EA8XS
26. K9AJ	63. HB9AMO	100. HA9RE
27. SM3EVR	64. LA6OT	101. SM4CTT
28. LA5YJ	65. UR2QD	102. A71AD
29. DL3RK	66. UK2RDX	103. LZ2CC
30. N4WJ	67. ZS5LB	104. SM4CLE
31. G3MCS	68. F6DZU	105. LZ1HA
32. SM5AQD	69. DL4YAH	106. SM5AKT
33. W0MLY	70. LA7ZO	107. CT4NH
34. I0RIZ	71. W9ZR	108. ZL4BO
35. ON5NT	72. W1NG	109. I1BSN
36. OH6JW	73. VK9NS	110. DF6CY
37. OK1AWZ	74. N4KG	111. DK5AD

The top 14 contenders for 5 Band WAZ are:

1. JA1BWA, 199	8. W6GO, 198
2. JA3EMU, 199	9. K4CEB, 198
3. N4WW, 199	10. W2YY, 198
4. K6YRA, 199	11. G3GIQ, 198
5. W8UVZ, 199	12. K7UR, 198
6. LU8DPM, 199	13. W3GG, 198
7. LU9GV, 198	

356 Stations have attained the 150 zone level.

portable operating theater. The aircraft made a night landing on a short airstrip in heavy rain and strong cross winds. The operating room was immediately set up, a life-saving operation performed, and the following morning Rudi was evacuated by the aircraft to Sydney.

After a four-week recuperation, much of it spent at VK2BZW's QTH, Rudi returned to Lord Howe. A few weeks later Rudi got word that his mother was hastily hospitalized with an undiagnosed illness which might possibly be serious. Rudi's XYL was in a traffic accident enroute home after taking the mother to a hospital. That same night the mother was hospitalized, Rudi's home in Bamberg was completely destroyed by fire. All the family's possessions, Rudi's Drake gear, everything went in the blaze. Investigation indicated that the fire probably started in the area of the ham station.

Russ Mason KG6IP, of the Southern California DX Club, has passed on the difficulties encountered by this DXer on his trip to Lord Howe. Russ notes that any QSLing for the recent operation of VK9NM/LH can be sent to Rudolf Mueller, Alter Main 23, D8601 Ebing-Bamberg, West Germany. Also, any DXer who may wish to help Rudi get back on his feet can use the same route.

Teoman Basarin, TA2C, was a visitor in Atlanta earlier this year. WI4K shot this photo when he was checking some of the local SE DX club stations. TA2C was only recently licensed and was due to return to his home in Ankara this spring. Listen for him in the fall CQ WW DX Tests. (WI4K photo)

Youngest Hall of Famer?

In the June 1967 QST there is a listing of the DXCC Honor Roll and K6VVA, Rich Hilding, is right in there at the bottom at 313. W6CF says that this may possibly be the youngest DXer to ever attain the Honor Roll, Rich being 23 years old at the time.

Actually, K6VVA attained the necessary number of countries while he was 22 years old, the listing in *QST* not showing until he had celebrated his 23rd birthday. If there is anyone out there who attained the DXCC Hall of Fame listing at an earlier age we would like to hear of it. Considering that some operate 23 years and a good deal more and never make it, it is notable when someone as young as Rich attains it.

Admittedly, digging around in this ancient trivia is interesting to many DXers, some more so. Back then the top of the Honor Roll was at 322 and 7 worthy DXers were balanced atop the DX pole: G3FKM, W5ABY, W6AM, W8EWS, W8JBI, and W0QVZ. W6AM had the highest combined total of current and deleted countries—346.

Should you wonder why that G3FKM callsign might be a bit familiar, that is Dr. E.J. Allaway of Birmingham, a long-time stalwart in the RSGB and at least twice the president. Twenty years or so after the listing of the top DXers as noted above, G3FKM is still at the top with 315/358 listing. The listing last year had close to 250 DXers crowded there at the top. W8JBI is the only other DXer still at the top from that list of 20 years back.

CQ DX Hall of Fame

Possibly there will be some new nominees to the DX Hall of Fame by the time you read this, and it might be a good time to briefly review the honor which over the years has gone to the top DXers and those who will leave a lasting mark on the DX scene.

First, anyone can nominate for consideration a DXer for the *CQ* DX Hall of Fame. The nominations are independently reviewed by each of the *CQ* Awards Advisory Committee, each balloting independently, each commenting independently. And often each comes with a different perspective. A big total of countries worked is not necessarily a decisive factor. It is what the individual as a DXer has contributed over the years. Often DXCC countries are worked for one's own benefit. It is the work or efforts beyond the country total and done for the benefit of DX and DXers that can be significant factors.

Many well-remembered DXers are on the *CQ* Hall of Fame roster: W4BPD, W1BB, KV4AA, W4DQS, OH2BH, RAEM, W6AM to name a few. There is also one who is not an amateur, Geoff Watts, the long-time publisher of the *DX New Sheet* in England, he being a instance of effort on the behalf of DX generally.

If you know of a DXer whom you consider to have made a significant and enduring contribution to DXing, write the whole qualification story and send it to John Attaway, K4IIF. The selection process is deliberate, slow, and complete. Possibly next month you will find word from K4IIF on the latest selections. The list is not long, but it does honor those whose efforts should endure.

N7DF/TT8 Chad

Larry Strain, N7DF, is back in downtown Holton, Kansas, after his operation last fall from Chad. There was a delay in getting the QSLs out because of problems in getting the logs to his brother, K0HGW. It was then decided to hold up the mailings until his return to the states, QSL information being fed onto a computer disc and mailing labels prepared for each contact. Then as the cards showed, the returns were expedited. When the demand slackens, Larry figures to prepare QSLs for those not yet requested, these to be sent to the various bureaus to complete the goal of QSLing 100%.

Larry does not mince words on what is often an irritant to the DX stations, that of unnecessary QSOing. When the available time for operating by the DX station is severely limited, repetitive QSOs will only ensure that the station might not be worked by a needy DXer running low power or with a modest antenna system. While "insurance" calls are understandable, too much insurance can be a burden. Possibly a practice of giving the call first, then the report, can be some protection against "tail-enders," Larry believes. Of the first 1200 QSLs received, 21 had erroneous information, this usually being one character incorrect or the use of local time rather than universal time. Also with this group there are some 22 contacts on September 21st and 22nd when Larry was not on the air. The feeling is that Tchad Slim was filling in the need for action.

Larry was in Tchad for 14 weeks, traveled some 3300 miles on the mission he was on to that country, was put in jail three times, and managed to get but 72 hours operating time while there. His jail visits were twice for taking pictures of the wrong things and once for protective custody. A good many hours were spent just waiting to talk with some of the local government officials.

Larry took a good number of photos as well as video tape, and the Kansas City DX Club is working with him in getting together a slide and tape show of his trip. If you are in Dayton you

may be familiar with the show at the Kansas City DX Club hospitality suite—Room 525 at Stouffers.

DXpeditions!

The national society of New Zealand, NZART, was the host for the 6th IARU Region III conference in Auckland a few months back. One of the papers at the meeting was presented by NZART and it blasted DXing and DXpeditions. Perhaps you may have already read of this elsewhere. If you have not, here are some of the highlights:

. . . contenders for the DXCC type awards are tending to bring the Amateur Service into disrepute . . .

. . . the "big guns" of the DX world resort to very high and in most cases illegal power to blast others off the air and operate without regard for their fellow amateurs . . .

. . . Such activities . . . encourage the use of excessive and illegal power . . . to the inconvenience of the majority.

. . . make a mockery of the Amateur Code.

. . . provide valuable evidence to be used against Amateur Service by hostile administrations.

. . . deny amateurs in the smaller (rarer) countries their right to normal operation.

All DXpeditions inevitably contribute to the problem . . .

. . . there are a number of professional or semi-professional "amateur" operators who openly ask for payment for QSL cards.

There is an elegant solution . . . offer a DXCC-type award for proof of contacts with 100 countries, no more, no less. An alternative is to stop the farce of amateur radio "countries" and restrict the status of "country" to members of the ITU only.

. . . there is little point in IARU actively promoting amateur radio and at the same time condoning activities detremental to it.

Accordingly, the NZART proposes: That this conference recognizes the problem caused by DXpeditions and urges the Administration Council to make recommendations to members to help minimize its effects on Amateur Radio.

The Administrative Council to whom this plea was directed has nine members: W1RU, W0BWJ, K1ZZ, PA0LOU, G3FKM, YB5BPG, HK3DEU, 9V1RH, and VK3KI, these being responsible for the policy and management of the IARU.

This IARU meeting was at Auckland last November. As far as can be determined no action was taken at the meeting. But before you get too overwrought, remember that such ideas crop up from time to time by well-meaning officials who almost always are not DXers. They stumble onto a pile-up, they recoil in horror, and immediately don their shining armor and charge out to save the world and amateur radio. The thoughts expressed have been heard before and undoubtedly they will be heard again.

The IARU at this meeting also moved to improve the IARU Radiosport Championship competition. They even added headquarters station of the IARU member societies as multipliers. They also improved the WAC Award.

As the Old Timer has often been heard to say, "Only DXers understand DXing; only a DXer understands another DXer." But one has to watch that strange concepts do not develop, and a continued association and activity by a DXer with his national society will keep things as they should be. One should not be surprised when such proposals are heard; one should always remember where the decisions will be made. Also, if you look at the calls on the Administrative Council, you might recognize a handful whose callsigns are also found in the DXCC listings and even on the DXCC Honor Roll. But don't relax. These proposals will be

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 316. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

C.W.

ON4QX	316	K6EC	312	SM6CST	304	W9RY	293	K7ZR	280
W9DWQ	316	W6ID	311	W0IZ	303	N5DX	291	I5XIM	280
W6PT	316	K4XO	311	WA8DXA	302	I3OBO	290	W2LZX	280
K4CEB	316	W4BQY	310	YU2TW	301	WA4JTI	290	W9NUF	280
N4JF	316	DL3RK	310	SM3EVR	300	W1WLW	289	W6YQ	280
K9MM	315	AA6AA	309	W6SN	300	W4BV	289	HB9AFI	279
N4PN	315	N4MM	308	WB4RUA	300	N8MC	288	WA4DAN	278
DL7AA	315	W9BW	308	W0SR	299	WA2HZR	286	DL1QT	277
N6AV	315	K1MEM	308	K3FN	298	K8LJG	284	G2GM	276
W3GRS	314	OK1MP	308	W7CNL	298	WD9IIC	284	NN4Q	276
W8KPL	314	W4OEL	307	DJ7CX	297	K4CXY	283	KA3R	276
K6LEB	314	W1NG	306	EA2IA	297	W0HZ	283	I8WY	276
K6JG	314	K9QVB	306	K3UA	295	K8PYD	281	K4SE	275
N6CW	313	N4KG	305	K9IW	294	K1VHS	281	N4AH	275
K9AB	313	AB4H	304	WD9IIX	294	JH1VRQ	281		

SSB

K2FL	316	F2MO	312	WA0DCQ	306	JH4PRU	298	VE3CYX	285
W4EEE	316	W3GG	312	VE3MRS	306	K8VFV	298	KE4HX	285
K6WR	316	I8YRK	312	VK3JF	306	EA9IE	298	WA2FKF	284
W4UG	316	W0SD	312	WA4TWG	306	XE1NI	298	KB5RF	284
W6EUF	316	K9RF	312	KB5FU	306	HP1JC	297	N8BKF	284
VE3MR	316	K8LJG	312	EA1QF	305	K5DUT	297	VE3DLR	284
DL9OH	316	K4MQG	312	NA5W	305	KB3OQ	297	AG9S	284
N4JF	316	N4MM	312	KZ8Y	305	YU7KV	296	KD8V	284
I0ZV	316	I2LLD	312	KB8KW	305	KE3A	296	WB3HAZ	283
KD8VM	316	VE7WJ	312	XE1OX	305	WB3GPR	296	VE3MV	283
I0AMU	316	W9SS	312	XE1J	304	KC8EU	296	IN3ANE	283
F9RM	316	N2SS	312	WB1DQC	304	KQ9W	296	KI3L	283
TI2HP	316	LA7JO	312	W6SN	304	KB3KV	296	AE5B	282
KS2I	316	OE2EGL	312	VE7HP	304	I8ACB	295	CT1UA	282
W3GRS	315	K4XO	312	W4UNP	304	I3OBO	295	KC8YM	282
VE3MJ	315	K6EC	311	W6NLG	304	K7LAY	295	AI9R	282
I8AA	315	W4SSU	311	XE1KS	303	W0IYR	295	TG9EP	282
4Z4DX	315	I4LCK	311	W2LZX	303	KK0C	295	N1ALR	282
W9DWQ	315	LU3YL	311	KR9O	303	W4BQY	295	W5LLU	281
W9JT	315	W8PCA	311	I0MBX	303	I8ZTE	294	K9TI	280
ZL1AGO	315	K9BWQ	311	K1MEM	302	NN4Q	294	N5FW	280
W4NKI	315	K6XP	311	N5FG	302	WD0BNC	294	ZL1BOQ	280
VE2WY	315	K9AB	311	W6FET	302	I5BDE	294	G4FAM	280
K6YRA	315	W1LQQ	311	W2FGY	302	I0SGF	294	VE6PW	280
W3AZD	315	W7FP	311	K9HQM	302	WD8PUG	294	KA8T	279
XE1AE	315	DK2BL	310	WA4DAN	302	K4SE	293	KB5DN	279
VE3GMT	315	IV3YRN	310	K9IW	302	KC8JH	293	EA3KW	279
ZL3NS	315	AA6AA	310	K9UAA	302	AI5I	293	EA6DE	279
YV1KZ	315	W8JXM	310	NJ2C	302	I1POR	293	W9OKL	279
DJ9ZB	315	N6OC	310	KP4EQF	302	W9NUF	293	JH8NYK	279
W4DPS	315	DL6KG	310	VE3FJE	301	WA4LOF	292	KX5V	279
I4ZSQ	315	WA4JTI	310	WB4NDX	301	AC0A	292	AI8M	278
OK1MP	315	N4PN	309	WA3HUP	301	I2MOP	292	K4BYK	278
I8KDB	314	K1UO	309	K8CMO	301	VE3FEA	292	I5EFO	278
N4WF	314	9H4G	309	W8ILC/QRPp	301	VP9CP	292	VE3IUE	278
OZ3SK	314	W6DN	309	W9RY	301	W8LKG	292	K3LUE	278
K9MM	314	W7OM	309	YU2TW	301	XE1OW	292	KB8O	277
YV5DFI	314	ZL1BIL	309	N4CRU	301	W6BCQ	292	WB0UFL	277
K6JG	314	W1NG	308	W8IMZ	301	K1VHS	292	W4PTT	277
CT1FL	314	VK4VC	308	W4OHZ	300	W0ULU	292	KB0SY	277
OZ5EV	314	YV5AIP	308	I5EFO	300	VE3IPR	291	I8XTX	277
W2SUA	314	N6AV	308	K9QVB	300	N5AWS	291	K2JF	277
W0SFU	314	W2CC	308	KB9KD	300	WB6GFJ	291	N7ASL	276
W0YDB	314	AI8S	308	K3UA	300	W4JFE	291	WA6DTG	276
ZS6LW	314	N4KG	308	VE4AT	300	W6MFC	291	WA4OPW	276
OE3WWB	314	K8NA	308	I8KCI	300	KB0U	291	AI9U	276
W9BW	314	VE4SK	307	WZ4I	300	K2JLA	291	KC2RS	276
K9LKA	313	K8PYD	307	WB3DNA	300	VE3CKP	290	WA9IVU	276
ON5KL	313	I0MBX	307	I2ZGC	300	KD5ZM	290	K0HQW	276
EA2IA	313	W0SR	307	WB4UBD	300	JA5PUL	289	I8INW	275
VE3XN	313	WD9IIX	307	KZ2P	300	W9TA	289	WB3CQN	275
VE1YX	313	SM4CTT	307	K4CXY	300	K8ZZU	289	WB1EAZ	275
W8ILC	313	KV2S	307	WA0TKJ	299	K0GT	288	VE7BSM	275
EA4LH	313	WD8MGQ	307	I6PLN	299	OK1AWZ	288	K8NWD	275
OZ8BZ	313	G4CHP	307	JH1VRQ	299	I8KCI	288	KA9ABC	275
N6AW	313	KB9OC	307	DJ7CX	298	AB9E	287	G3XTT	275
K5OVC	313	KB8DB	307	K9SM	298	N3ARK	286	G4GED	275
N7RO	313	KU9I	307	I8LEL	298	K4LR	286	VE5FX	275
YU1DZ	313	N4KE	306	K8NA	298	N8BJQ	286	KS0Z	275

heard again. Just be ready to knock them down.

Some Short DX Notes

If you are saving your 4U1VIC QSL card, do not give up hope. There may be more action in that direction. The Pribilof matter was again run past the ARRL Board a couple of months back. The report is that it was again tabled. "Tabled" is not a final action. The presumed intention is always that such motions mean a future consideration. "Tabled" is not quite as good as "adopted," but a lot better than "rejected." On Aruba, keep in mind that final independence will not come for about ten years. When it does, Aruba very likely will be another country for the deserving. All you have to do is wait.

The FCC antenna preemption was upheld at the appellate level in Cincinnati when the court there vacated a lower court ruling against WM4T, sending the matter back for reconsideration and final disposition. The rulings do seem to favor reasonable amateur antennas, but it may be some time before the dust settles and everyone has the word.

If you are interested in high-speed CW operation, the Radio Telegraph Very High Speed Club may be your dish. All it takes to qualify is to have four 30 minute contacts with existing members of the club at a minimum speed of 40 wpm. PAØDIN will furnish you with all the details.

On the club scene, the Kansas City DX Club has Larry Wilson, KØRWL, as the new president, Mike Bellinger, KØUAA, vice-president; and Steve Gecewicz, KØCS, secretary-treasurer. Mike Crabtree, ABØX, continues as editor of the club paper. Down in southern California Dan Davitt, N6CGB, is the new president for this year, Steve Locks, W6FRZ, vice-president, Edgar Brown, N6OU, secretary, and Russ Mason, KG6IP, treasurer. At the Madison Radio Club in lower Wisconsin, Frank Holliday, WB9NOV, is the new president, while Dick Burton, N9BAF, is the vice-president. Bernie Albright, N9EJL, has won the post of the club's hardest worker, being the new secretary-treasurer.

Some have asked just what is an "Old Timer." One would wonder why such a question would be asked. "Old Timer" is a relative term, relative to, first, is he licensed longer than you, or, two, is he smarter with the answers than you are. But then again, there are some real Old Timers and there are a couple right close by. Frank Anzalone, W1WY, certainly merits being in the Old Timer class. Frank has been handling the contest chores since 1955. That's a long time, yet you will still find W1WY in there in contests. Frank notes that he worked WAC in the last 160 test but is still amazed what some others can do on that band. You might also note how long George Jacobs, W3ASK, has been pointing out the promise and the vagaries of propagation. Some say that George was doing this back during sunspot Cycle 18, and with Cycle 22 almost at hand, that's been a long time. Both are real Old Timers.

Mady M. Langdon notes that back in October of last year she became 7J6AAB under the new reciprocal agreement with Japan, and the new prefix drew a lot of attention. Mady also operated as 7J6AAB/6 and 7J6AAB/1 and among those working her were XU1SS, BY1QH, and JT1KAA. QSL either via JARL or direct to KA6ZYF.

CQ DX Awards Program

SSB

1455	I8QLI		
1456	YCØTG	1461	DU1KT
1457	G4SZD	1462	WP4K
1458	YCØDNK	1463	WA4SAC
1459	WB4FLB	1464	SV1JG

CW

653	N4AH	656	PA3BEJ
654	IK5DEY	657	HA8UB
655	F6HKD		

SSB Endorsements

310	OE3WWB/314	275	KB3OQ/297
310	N7RO/313	275	WØULU/292
310	EA2IA/313	275	KSØZ/275
310	VE3XN/313	250	I8QLI/265
310	W1LQQ/311	250	N9CPW/262
310	W7FP/311	200	PY2DBU/237
300	ZL1BIL/309	150	WP4K/166
300	AI8S/308	150	DU1KT/157
300	KB5FU/306	28 MHz	I1POR
300	NA5W/305	3.5/7 MHz	I8QLI
300	XE1OX/305	3.5/7 MHz	KB5FU
300	W4UNP/304		

CW Endorsements

310	K6JG/314	275	N4AH/275
275	EA2IA/297	150	F6HKD/156
275	W6YQ/280	150	K6UXO/152
275	I8WY/276		

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.

KG9N/V4 will be heard the last half of July from St. Kitts looking for pile-ups, both CW and SSB, 10 through 80 meters. Don't disappoint Chuck! He'll be listening for you.

The DXCC Advisory Committee is working on a 50th Anniversary DXCC award. Prepare! At the last board meeting there was consideration of the content in *QST*, note being that operating news has dropped from 1.7% in 1979 to 0.1% last year, that DXCC listings are up to 1.9% from 1.2% during the same period, and contest reports have dropped 25%. You may find that some monthly columns will not be seen monthly in the future.

DXers? Monthly is not fast enough with the news. Daily, maybe even hourly, would be better. But until we get to that point, check out a couple of the new DX news sources: *Inside DX* (Arthur Hubert, N2AU, 436 N. Geneva St., Ithaca, NY 14850) or *Inc Spots* (DX Incorporated, Box 1082, La Grange, IL 60525). Maybe you should check them both. DX Inc. recently ran an updated list of DX Nets.

Some are believing that we are at the bottom of Cycle 21. Their irrefutable logic is that when you reach bottom, where else can you go? Keeping in mind that all our thinking is embodied in six-month smoothed numbers, it is obvious that when we look back we will know for sure where we were six months ago. The difficulty is in figuring where we are right now. But there are a lot of days now showing with no activity. Definitely, tomorrow will be a brighter day. Just wait! The sunspots will return again. They always have! 73, Cass, WA6AUD

QSL Information

All of the following comes with a lot of assistance, especially from W9LNQ and N9ALC.

A35WZ to ND7W
A71BK to N5GAP
EL2AY to N5GAP
HC1BW to KT1N
HC5KA to KT1N
FM5CT to N7RO
KG9N/V4 to KG9N
KQ2M/P4 to KQ2M
K8PYM/HC1 to K8PYM
LU2BC to SM0KCR
N9AG/V2A to W8UMD
OA1A/KP2 to K5TVC
OA4SS to KB6J
PA0VDV/PJ2 to PA0VDV
PJ8DFS to SM0AQD
S90AS to IT9AZS
TU2NG to N5GAP
VK3MO to WA9BXB
VK4KA to KA5RGE
VK9LM to OE1ZL
WB9CIF/V2A to W8UMD
VP2MPD to KN3P
VP5DG to KA5RGE
VQ9QM to W4QM
W1BIH/PJ2 to W1BIH
YV6BXN to KA3GEA
ZF2JB to WB0PNA
ZS1OU to KA3FIB
ZS3BI to DF2AL
ZS6BKK/6 to ZS6CDJ
3Y9WT to LA9WT
4K1J to UA1BJ
4X6KF to K3STM
5H3CE to IK6BOB
5H3ZR to OH6IQ
5V7AS to IT9AZS
6W6NJ to N5GAP
7J6AAB to KA6ZYF
AH6GJ to Bill Early, WA9AEA, 501 No. Hill Rd., McHenry, IL 60050
AH6GQ to WA9AEA, 501 No. Hill Rd., McHenry, IL 60050
EI8EK to WA9AEA, Bill Early, 501 No. Hill Rd., McHenry, IL 60050
EL2ED to B.P. 2176, Monrovia, Liberia
HC1ATG to George Brumley, Apartado 8512, Quito, Ecuador
ON7ZM/EA8 to Box 258, LaLaguna, Canary Islands
TJ1CH to Box 1169, Yaounde, Cameroun
VE8YQ to WA9AEA, 501 No. Hill Rd., McHenry, IL 60050
ZS6JCF to Bx 2327, Johannesburg, 2000 South Africa
5Z4MR to Box 898, Kisumu, Kenya

DX Ten Years Back

In May 1976 the DX world was agitated over the 7J1RL upcoming Okino-Tori Shima effort. This new country marked the 50th Anniversary of JARL. WB7ABK could not make things jell for a Cocos-Keeling effort and moved on to Nepal. SM0ACD was headed for Baja Nuevo, and the Colvins were winding down their FK0KG effort. Abu Ail was rumored for mid-May. Plans for Iraq by DL7FT fell through, YI not having then been heard from many years and needed by the Deserving. W4PUZ/XZ2 was heard along with a 3X2M, QSL information still needed.

5 Band WAZ No. 52

Who works the DX is always a good question to ask. Most DXers think it is everyone else but themselves. A look at the 5 Band WAZ certainly should give a good clue as to what parts of the world work the DX. Here we have Reg Beck, who is the first VE to gain the 5 Band WAZ award. Though he signs the VE7IG call at home, he has also operated on DXpeditions and as guest operators in PJ5, VP2V, VP2K, CR9, VS5, 9V1, HS0, VU2, 9N1, EP2, and YA1. That last prefix will give you an idea of how many years Reg has been in distant spots.

Reg Beck, VE7IG, is the 5 Band WAZ #52 winner. A teacher in the Williams Lake area of British Columbia, Reg has been active from a number of DX spots. A lot of the gear is homebrew. Those racks on the left hold three linears, one 5-bander, and two single-banders for 40 and 80 meters. A contester from way back, Reg has held some VE contest records and still holds the 20 meter record in the CQ SSB test that comes every spring.

First licensed in 1956, Reg holds the Canadian Advanced Amateur license. He is 44 years old and a high school teacher. He has two daughters and the XYL to complete the home front. He is on the DXCC Honor Roll and holds the 5BDXCC.

Reg works both SSB and CW using ¾-wave slopers and a vertical for 80 meters, a quarter-wave sloper with gp for 40, a 4-element monobander on a 37 foot boom for 20 with elements for 15 and 10 meters interlaced to give three elements on each band. All the attennas are homebrew.

The station lineup has a Yaesu FT-101 transceiver, a Drake R4 receiver, a homebrew 80 meter exciter, a homebrew 5-band linear, plus separate homebrew linears for 80 and 40 meters.

Zone 40 was the tough QSL to get. The last QSL always is and it took some time for Zone 23. Reg notes that there is nothing unusual about his antennas . . . maybe. He uses a 62 foot length of RG11 hung in a tree with 12 radials. He also recalls visiting the shack of AC3PT but not being able to operate.

Reg likes contests. Until a few years ago he held the Canadian record for 20 meters in the *CQ* WW DX Test. He still holds the VE record for the *CQ* Spring SSB Test. He also avoids the DX nets. A teacher, Reg hgolds degrees in Physics.

Here we always find it interesting to review the 5BWAZ award winners. They are a unique group of DXers and always bring some unusual factors to DX. The first VE 5 Band WAZ certainly brings something extra to DXing.

Some things never change. Other things drift off into faded memories. But certainly there was a best of times for everyone.

REMINISCENCES

BY JOHN J. NAGLE*, K4KJ

Remember those cold, clear winter nights with a slight breeze blowing in from the northwest? Every star in the sky looked so close you could reach out and touch it.

Inside the shack you were cozy and warm. The light over the operating table was just bright enough to read your copy. The warm, soft glow from the filaments in the ol' inhalor gave a feeling of satisfaction and comfort.

In the headphones the background level was nil. DX stations you seldom heard were rolling through loud and clear. Those were the nights for which radio was made.

Now, sitting alone in the shack with an all solid-state rig and the cold, green, silent stare of the CRT in the word processor, the bright fluorescent lights overhead and more than one gray hair, I can't help but look back and wonder how I got here.

It seems like only yesterday in some ways, but so much has happened in the passing years that it seems long ago and far away in other ways.

In the junior high school library I had seen a circuit for a crystal set in an issue of *Popular Mechanics*. Allied Radio advertised a complete set of parts: masonite breadboard, tuning condenser (capacitor today), coil, fahenstock clips, headphones, and, most important of all, a crystal detector with a cat's whisker—all for $3.49. And Allied appeared happy to have my business then!

I put the set together the night it arrived in less time than it usually took me to do my English homework, and when it was finished, I could hear two broadcast stations, one at the low end of the band and one at the high end. After that, I often fell asleep at night listening to one or the other. My mother would gently take off the headphones when she came up to make sure I was tucked in. I could always tell when she had, as she never moved the cat's whisker off the crystal the way I always did; I was afraid the crystal would wear out like a light bulb if I didn't turn it off.

Next came greater things—the two-tube regenerative receiver from the 1939 *Handbook*. This considerably widened my horizons because it included the 160 meter band. Listening one night I heard Marshall Ensor, W9BSP, teaching his famous code class, now long forgotten, but once very popular. I didn't realize the significance of it then. My mother had been sending me Morse code with a buzzer and had gotten me up to 6 or 7 wpm, which was about as fast as she could go. The ARRL hadn't started their code proficiency program yet. W9BSP's 1 kw on 160 from Olathe, Kansas, covered the midwest like the dew. Whenever Marshall was unable to be there, his sister, Loretta, took over for him. After listening to Ensor every night, I was able to bring my code speed up to about 15 wpm. A month after finishing his course, the Radio Inspector came to St. Louis to give operator exams and I passed! A few years later Ensor received the William S. Paley Amateur Radio Public Service Award for his work. Shortly thereafter we moved back east and I lost track of Ensor. I understand he became a Silent Key in the 1950s, and the more publicized ARRL code proficiency program largely met the need which Ensor's work had filled in its day. Wherever he is now, I hope he can share in the joy he brought to one 13-year-old boy and probably to thousands more like me.

Construction Practices

One thing that's entirely different today is construction techniques. Everything now is laid out with photographic precision, nice and neat on a printed circuit board. It wasn't always that way! Remember the days of haywire? Today haywire is a lost art!

The hottest soldering irons around—and I do mean hottest—were the 69¢ specials from the five-and-dime stores. You put a drop of solder on the tip of the iron and you had not more than 10 seconds to complete the solder joint. After that, the solder vaporized. This assumed, of course, that you bothered to solder your connections at all.

Home projects required only a minimum of tools: two sizes of drill bits—a big one and a little one. Some builders only used one drill bit—medium size. However, usually builders who had only one drill bit also had a rat-tail file to make little holes into bigger ones, and this amounted to having more than one drill bit anyway, so what the heck. Every builder needed a tool to hold things—round, square, oblong, hot or cold, smooth or rough. This called for a pair of gas-pipe pliers. Another widely used tool was a persuader, like in "Don't use force—get a bigger hammer!" "Persuaders" were very helpful in making things fit—except vacuum tubes!

Finally, if the above tools couldn't be adapted to the problem at hand, there was always access to whatever was in the odds-and-ends drawer of the kitchen cabinet. As these items varied from one household to another, they cannot be described in detail. In fact, many of these items defy description altogether!

Today the tool situation is even more complicated by the large amount of imported equipment, making it necessary to add to one's tool collection metric sizes of a hammer, a metric-size pair of pliers, adjustable wrench, and even a metric-size rat-tail file.

Very few transmitters in those days used meters. Tuning was done for minimum redness of the anode. In the case of metal tubes, if the paint started to wrinkle, you probably had excessive plate current.

How did you tune if the anodes didn't turn red? Well, if the anode didn't run red, you obviously weren't running as much power as the tube could handle, so that problem had to be corrected first. How many amateurs today can recall seeing a transistor running red? Having to use expensive meters in transistorized circuits is one reason why today's transmitters cost so much.

Construction techniques of the day required everything to be wide open. Transmitters had more exposed high-voltage

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points than a burlesque queen. Safety rules were equally simple, but effective: "Keep your cotton-pickin' fingers off things!" I had this law drummed into me very early.

I was a high school student during World War II, and as I had obtained a first-class commercial radio telephone operator's license, I was able to get a job at a local broadcast station working the sign-off shift, 7 PM to midnight. At sign-off it was standard practice to record all meter readings just before turning off the carrier, which was done by tripping the high-voltage circuit breaker. Filaments and blowers were left on for five to ten minutes so the transmitter would cool down, and then the main power breaker was turned off completely, shutting down the transmitter.

On Wednesday nights we were also scheduled to test the stand-by transmitter after sign-off. I would turn on its filaments about 15 minutes before sign-off to let the transmitter warm up, and then perform the test while the main transmitter was cooling down.

To change over from the main transmitter to the stand-by transmitter, it was only necessary to switch over the audio and manually change a link on the antenna lead. This was done by standing on a metal chair at the back of the transmitter and moving a piece of flexible braid with a banana plug in each end from one set of insulated jacks to another.

On the night I will never forget, I was just finishing recording the meter readings when the phone rang. I recorded the last reading and answered the phone—wrong number. I then went around to the back to change over the antenna lead so I could bring up the stand-by transmitter.

I placed the chair beside the transmitter, climbed up on it, and was about to reach for the antenna lead when I suddenly remembered that I had not opened the back doors of the transmitter; this was a standard safety procedure, as opening either door tripped the interlock circuit and ensured that the high voltage was off. I remember pausing a minute to ask myself. "Is this trip really necessary?" but in the end I did get down off the chair and opened the rear doors. Then I went on with the changeover without further complications.

At the conclusion of the test I restored the transmitters to their original configuration and then went over to shut down filaments and blowers on the main transmitters. To my real surprise and horror, the high voltage breaker was still ON! I had *not* turned off the carrier in the usual way.

The full impact of what had happened did not hit me until I was walking home. It was well after midnight and the streets were dark and quiet, so I had time to reflect. The phone call had interrupted my normal routine, and I had neglected to turn off the high voltage. I had been in the control room alone; the announcer had

disappeared out the door long before the national anthem was over. The sign-on operator would not be in until about 5:30 AM, almost 5½ hours later. Had I gotten down off the chair and opened the back doors of the transmitter, the carrier would still have been on when I grabbed the antenna lead. The voltage at this point was about 800 volts RF. I wondered if I would have been paralyzed, or thrown to the floor, or what. The part that scared me the most was that there would have been no one to help me for 5½ hours. My guardian angel again!

The memory of that experience has made me very safety conscious, whether working professionally on the design and testing of multi-megawatt radar transmitters or as a hobby on my 150 watt amateur rig. Safety first pays!

Radio Propagation, First Law of

I had not been listening on my crystal set very long before I learned one of the most fundamental laws of radio propagation. This law says that at the location of the listener, there will be a dramatic improvement in radio propagation immediately after bedtime. I learned this law from experience as a 13-year-old school boy.

After I built my first regenerative receiver, the effect became even more pronounced. This receiver was set up at my desk by the window, and I soon learned that my mother could see the desk light turned on. It didn't take me long to discover that radio propagation improved even more dramatically when it was dark inside as well as outside. I heard some of my best DX under these conditions.

The "after bedtime improvement in radio propagation" law is unusual in another way: it seems to pass from one generation to the next without any instruction. When our son was about 13, he built an Allied Radio shortwave receiver kit that he set up on his bedside table, which happened to be just under his window. Sometimes when I went upstairs after his bedtime, I'd look in his room. He'd be breathing quietly, the headphones hung up beside his bed, the dial lights on the receiver out, and everything quiet. But the warm, soft glow of the filaments would be reflected from the darkened window. I would walk over and put my hand on the receiver cabinet. Yes, my hypothesis was verified: The cabinet was warm and the pilot lamps were lying beside the radio. I never said anything, just walked away smiling, remembering the times that used to be. The after-bedtime law does pass from one generation to another by instinct.

In my 30-plus years of professional experience as a communications engineer, I have never been able to find a physical or mathematical basis for the existence of this law. Terman does not even mention it in his books, but I *know* it's true! I think the appropriate government laboratory should carefully study the law. Maybe even the CIA. Who knows; a solid scientific basis for its existence might be worth a Nobel prize.

These, and many other memories, flash by much too fast to write down as I sit here looking at the word processor which only looks back with the cold, green, emotionless stare of a monster. These things happened many, many years ago, but they are indelibly embossed in my memory.

My own children have long since gone out on their own; we only see them occasionally now. Just their childhood possessions remain, stuffed into closets and other spare spaces where I would like to keep my antique radio collection.

I pass up the after-bedtime DX, as I am too tired to stay up and listen. Besides, most of it is buried under Radio Moscow.

The shack is filled with memorabilia from another era. National, Hammarlund, Hallicrafters, RME, Bliley, Guthman—all once household names on 75 meters—are heard no more. When a newtimer stops by and looks at my collection, I hear something like, "I've heard of those things, but this is the first one I've actually seen." Or when the occasional oldtimer stops in, he says, "I always wanted one of those, but could never afford one." It's been a long time since anyone came by who actually used one.

One last thought comes to mind that makes me stop and wonder: If my high school English teacher had ever found out that I would be writing for publication, I'm sure her comments would have been something like, "NO, it's absolutely impossible!" And it wouldn't be her fault either. She did try hard; at the time, I thought she tried too hard! Had I not married a Wellesley graduate, a former teacher, who spells and edits for me, my former English teacher would be right. Bless both their hearts.

The more I look back, the more I realize some things were meant to be. CQ

May - 1986

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Accessories

TL-922A 160-15 m 2 KW PEP/1 KW DC Input Linear Amplifier. Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.

PC-1A Phone Patch (FCC Part 68 registered).

VB-2530 25 W RF Power Amplifier (for TR-2600A). BNC-BNC cable, and mounting bracket supplied.

MC-85 (8-pin) Multi-function desk-top microphone (8-pin) 700 Ω unidirectional electret condenser mic. Built-in audio level compensation with output and tone control, meter, and UP/DOWN switch. Selector switch for up to three transceivers. (Additional 4, 6, or 8-pin cables optional.)

MC-60A (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.

SM-220 Station monitor/10 MHz oscilloscope Pan display capability with optional BS-8 (for TS-940S, TS-830S). Monitor transmitted waveforms and/or received signal waveforms. Built-in 2-tone generator.

HS-5 Deluxe headphones.
HS-6 Lightweight headphones.

LF-30A Low pass filter. 1 kW, 50 Ω. Insertion loss: less than 0.5dB at 30 MHz.

MA-4000 2 m/70 cm dual band mobile gain antenna. Duplexer supplied. Ideal for use with the TW-4000A "Dual Bander" and TM-211A/TM-411A. (Mount not supplied.)

AL-2 Lightning and static arrester. 1 kW, 50 Ω.

MA-5 80/40/20/15/10 meter mobile antenna. All resonators supplied. 200 W PEP max., VSWR 1.5:1 or less. Easily adjustable for center frequencies.

VP-1 Bumper mount for above.

SP-40 Compact mobile speaker.
SP-50 Mobile speaker.

Not Shown:

MC-50 Desk-top microphone. Hi/Lo Z. 4-pin connector.

MC-80 Desk-top microphone. 700 Ω unidirectional electret element with flexible boom. Built-in mic. pre-amp and UP/DOWN switch, with lock. (8-pin).

MC-48 Hand microphone with 16-key DTMF pad and UP/DOWN switches. (8-pin).

MC-46 As above, but with 6-pin connector.

MC-42S Hand microphone with UP/DOWN switches. (8-pin).

MC-35S Noise cancelling hand microphone, 50 k Ω (4-pin).

MC-30S As above, but 500 Ω.

PG-4A Microphone cable for MC-60A. Converts MC-60A to 4-pin connector.

PG-4B As above, but 6-pin.

PG-4C As above, but 8-pin, as supplied with MC-60A.

PG-4D Extra 4-pin cable for MC-85.

PG-4E As above, but 6-pin.

PG-4F As above, but 8-pin.

HS-7 Micro-headphones.

KPS-7A 13.8 V DC, 7.5 A intermittent DC power supply.

RA-3 2 m, ⅜ λ telescoping antenna with BNC connector.

RA-5 2 m ¼ λ /70 cm ⅝ λ telescoping antenna with BNC connector.

RA-8B 2 m StubbyDuk® with BNC connector.

RA-9B As above, for 220 MHz.

RA-10B As above, for 440 MHz.

RD-20 Dummy load, 50 Ω DC-500 MHz 20 W continuous, 50 W intermittent.

PG-3A DC line filter for mobile use.

Service manuals are available for all Kenwood transceivers and most accessories.

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1111 West Walnut Street
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Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

As reported in last month's calendar, the *National Contest Journal* is sponsoring a North American QSO Party in April. This is a new event to fill the void caused by the ARRL dropping its annual QSO Party. Arrangements had not been completed, and unfortunately I did not have the full details in time to include them in last month's announcement. I was only able to indicate that there would be a CW Party scheduled for April 12–13.

Final rules in the January/February issue of the *Journal* also included an SSB Party the following weekend, April 19–20. This was not received until after the April issue deadline.

The scoring, etc., is the same as reported for the CW Party—total QSOs times the sum of states, VE call areas, and N.A. countries worked on all bands. Use that as a guide to score your log and be sure to submit it and show your approval of what could develop into a very popular event.

Entries must be postmarked no later than 30 days after each Party. They go to: Dave Pruett, K8CC, 2727 N. Harris Road, Ypsilanti, MI 48198.

No word from LABRE regarding their World Telecomm. Day Contest held in May to commemorate Telecommunications Day, May 17th. It's usually held the week following that date, but past experience has proved unreliable, so I will not show any definite date. They do issue attractive certificates and badges, so if you should get involved send your logs to: LABRE, ITU Contest Committee, P.O. Box 07-0004, 70000 Brasilia (DF) Brazil.

Deadline for material for the August issue is May 15th and June 15th for the September issue. Sending it to my home address will give you a few more days leeway.

73 for this time, Frank, W1WY

Calendar of Events

*	May	3-4	County Hunters SSB
*	May	3-4	"Armadillo Run" (SSB)
*	May	3-4	Florida QSO Party
*	May	4	DARC "Corona" 10M RTTY
	May	10-11	USSR "CQ-M" Contest
	May	10-11	NY State QSO Party
	May	17-18	ARI International Contest
	May	17-18	Michigan QSO Party
	May	**24-25**	**CQ WW WPX CW Contest**
	May	27-28	CLARA AC/DC "Mystery"
	My31	Jn-1	National 6M Contest
	June	7-8	ARRL VHF QSO Party
	June	14-15	All Asian Phone Contest
	June	28-29	ARRL Field Day
	July	5-6	Venezuelan SSB Contest
	July	12-13	IARU Radiosport Contest
	July	**19-20**	**CQ VHF WPX Contest**
	July	26-27	County Hunters CW Contest
	July	26-27	"Armadillo Run" (CW)
	Aug.	9-10	European CW Contest
	Sep.	13-14	European Phone Contest
	Oct.	4-5	IRSA World Championship
	Oct.	**25-26**	**CQ WW DX Phone Contest**
	Nov.	8-9	European RTTY Contest
	Nov.	**29-30**	**CQ WW DX CW Contest**

** Covered last month.*

USSR CQ-M Contest

2100Z Sat. to 2100Z Sun., May 10–11

Keep in mind that this is a world-wide-type contest, so do not limit your operation to the USSR only. Contacts may be made on CW or SSB, 3.5 through 28 MHz. The same station may be worked on each band, but not both modes for QSO and multiplier credit. Contacts via Oscar count as an extra band if made on UHF.

Classes: (A) Single operator, single band. (B) Single operator, all band. (C) Multi-operator, single transmitter, all band only. (D) SWL.

Exchange: RS(T) plus a three-figure QSO number. USSR stations add the number of their region (oblast) to their report.

Points: Contacts between stations on the same continent one point; different continents three points. Own country may be worked for multiplier credit but no QSO points.

Multiplier: Is determined by the number of countries worked on each band. The USSR "R-150-S" list is the standard, which essentially is the same as our DXCC, plus the following oblasts: 002, 013, 014, 056, 084-5-6-7-8-9, 090-1-2-3-4-5-6-7-8, 159, and UA1 Novaya Zemlya, UA0Kuril Is., UA0New Siberian Is.

Final Score: Total QSO points from all bands times the country/oblast multiplier from each band.

The SWL's get one point for reporting one station in the exchange, and three points if both stations are reported.

Awards: A large selection of trophies, medals, and badges in all classes for overseas winners. Badges to all entries contacting at least 10 USSR stations.

Contest contacts may be credited for USSR awards in lieu of QSL cards if request is made with entry (R-150-S, R-100-0, W-100-U, R-15-R, R-6-K, R-10-R).

Mailing deadline is July 1st to: Krenkel Central Radio Club, CQ-M Contest Committee, P.O. Box 88, Moscow, USSR.

1985 USSR "CQ-M" Contest North America Results

U.S.A.

3.5 MHz

W1KM	3,638

7 MHz

K5NA	38,745
AA6XX	4,448
K1XM	3,718
NC2V	3,485
W7KJI	520

14 MHz

N2AA	97,960
WB4TDH	52,965
WC6I	38,958
AD5O	38,563
K3ZJ/1	31,812
K8CW	21,436
KZ2I	19,720
WC4E	17,316
W2FCR	17,220
K4PI	16,974
WA4QMO	14,190
WA8YTM	14,124
W6TFO	8,910
K9RHY	8,760
AI3Q	8,642
N8EFG	6,583
W@GOR	6,576
W1LQQ	5,544
W4BAA	4,920
N8BNE	4,825
K2QF	4,761
WA3DMH	4,410
W7NG	4,224
N6IC	3,667
AA6EE	3,320
KA6ZYF	2,880
G3MHV/W6	2,771
KM9L	2,755
W9NTU	2,336
K7RIE	2,278
NE6I	2,028
W5ZR	2,016
W1XN	1,989
WB3DNA	1,980
K@BJ	1,845
KE5PA	1,600
NG6W	1,599
WA5VGI	1,358
W1OPJ	975
W9QWM	910
KC8YW	759
N4MM/m	726
W8VEN	576
KA7FEF	513
W4KM	480
W4MOM	441
KA8OUT	408
KI@G	378
KB1JZ	368
WA4SAC	248
K8OOK	198
W5EIJ	175
K2OVS	120

All Band

K1KI	438,048
K3EST	411,312
K3ZO	192,280
K5LZO	185,934
W3XU	177,760
KA2MXO	107,520
K3WW	57,834
K5KLA	54,242
W6OKX	18,447
W3BGN	16,638
W4YN	9,728
W1OO	6,720
WD8IXE	6,021
K9DDO	3,366
W3CV	1,938
N8LL	1,728
N6JM	1,620
KJ4BK	900

Alaska
All Band

AL7FG	46,244

Bermuda
All Band

K8PYD/VP9	6,800

Canada
14 MHz

VE1EP	9,246
VE1NG	1,242
VE3NYT	189

All Band

VO1AW	40,920
VE3XN	31,066
VE7BS	2,088
VE3IR	2,058

Costa Rica
All Band

TI4BGA	10,450

Dom. Rep.
All Band

HI@A	1,216

Panama
All Band

HP1AC	9,400
HP1XKR	1,728

World

K5NA #6 on 7 MHz	
N2AA #6 on 14 MHz	
K1KI #10 on All Band	

ARI International Contest

1600Z Sat. to 1600Z Sun., May 17–18

It's the world working the Italian stations in this one, including San Marino, Vatican City, and SMOM.

Classes: Single operator, one mode—CW, SSB—or mixed modes. Multi-operator, single transmitter, all modes and SWL.

14 Sherwood Road, Stamford, CT 06905

Bands: All six bands 1.8–28 MHz; 1830–1850 kHz on 160, and 3613–3627, 3647–3667 kHz on 80 for Italian stations.

Exchange: RS(T) plus a QSO no. starting with 001. Italian stations will include two letters identifying their province.

Scoring: Europeans earn 2 points per QSO; others 4 points.

Multiplier: Each province, T7, HV, SMOM, worked on each band.

Final Score: Total QSO points times the sum of the multipliers from each band. A declared score exceeding more than 5% of the actual score means disqualification.

Awards: Certificates to the top-scoring stations in each country for each category. Special awards to the five leading stations in each class.

Use a separate log sheet for each band, and a summary sheet showing the scoring from each band and other essential information is a must. Include your name and address in block letters.

The Worked All Italian Provinces award is issued to stations working 60 different provinces. Application can be made by including a separate list of provinces worked during the contest with your log. QSL cards are not required. Include 10 IRCs to cover cost.

Mailing deadline for your logs is June 30th to: Contest Manager, c/o A.R.I., via Scarlatti 31, 20124 Milano, Italy; or Giorgio Beretta, I2VXJ, via Sciesa 24, 20135 Milano, Italy.

New York State QSO Party

1600Z Sat. to 0400Z Sun., May 10–11

These are new dates for the third annual New York State QSO Party sponsored by the Salt City DX Assn. It's only 12 hours long, Saturday afternoon and night local EDST.

The same station may be worked on each band and each mode, and NY stations can make in-state contacts for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for NY stations; state, VE provinces, or DX countries for others.

Scoring: One point for SSB contacts, 2 points for CW, and 5 points for Novice/Tech.

New York stations multiply total QSO points by (NY counties + states + DX countries) worked for their final score.

Others multiply total NY QSO points by number of NY counties worked (maximum of 62).

Frequencies: CW—3550, 7050, 14050, 21050 kHz. SSB—3900, 7250, 14250, 21350. Novice/Tech.—3710, 7110, 21110 kHz.

Awards: Certificates to top scorers in NY state counties and to all stations outside of the state.

Mailing deadline for all entries is June 15th, and they go to: John Carioti, K2ZJ, 3720 Dutchman Drive, Baldwinsville, NY 13027. Include a large SASE for a copy of the results and awards.

Michigan QSO Party

1800Z Sat. to 0300Z Sun., May 17–18
1100Z Sun. to 0200Z Mon., May 18–19

This year's party is again being sponsored by the Oak Park ARC. The same station may be worked on each band and mode, portable/mobile in each county change. Contacts between Mich. counties are permitted for multiplier credit.

Exchange: RS(T), QSO no., and QTH. County for Mich.; state or country for all others.

Scoring: *For Mich.*—One point for phone contacts, 2 points if on CW, and 5 points if with W8MB. Multiply total by (states + countries + Mich. counties) worked for final score. KH6 and KL7 count as states, VE as a country (maximum of 85 possible).

Out-of-state—One point for each Mich. phone QSO, 2 points if on CW, and 5 points if it's with club station W8MB. Multiply total by Mich. counties worked (maximum of 85).

VHF scoring same as above except multipliers from each band are added together for total multiplier. Repeater contacts are not permitted.

Frequencies: CW—1810, 3540, 3725,

7035, 7125, 14035, 21035, 21125, 28035, 28125. SSB—1815, 3905, 7280, 14280, 21380, 28580. VHF—50.125, 145.025, 146.52.

Awards: Certificates to winners in each state, country, and Mich. county (mini mum of 50 QSO's). Seven plaques to top winners: single operator, upper peninsula, multi-operator, VHF, mobile, and aggregate club score, and out-of-state and Mich.

Party contacts do not count toward the Michigan Achievement Award unless one fact about Mich. is exchanged.

A summary sheet is requested with your entry showing the scoring and other pertinent information, plus a signed declaration that rules and regulations have been observed. Include a large SASE for a copy of the results.

Mailing deadline is June 30th to: Mark Shaw, K8ED, 3810 Woodman, Troy, MI 48084.

Michigan Achievement Week

May 17–24, 1986

All contacts with Michigan stations made during Michigan Week, May 17–24, as well as Party QSO's, may be used for this award if the following requirements are fulfilled.

1. Mich. stations—Submit a log with information, name and address of station worked if possible, of 15 or more QSO's with out-of-state or DX stations with information about Mich.

2. Out-of-state stations including Canada—Submit a log with information, name and address if possible, of at least 5 Mich. stations worked who related facts about Mich.

3. DX stations—Work at least one Mich. station, with log information, name, and address, and relate fact about Mich. given by the station worked.

4. Only contacts made during Michigan Week, May 17–24, are valid for this award.

Applications for certificates must be postmarked no later than July 1, 1986, and mailed to: Governor James Blanchard, Lansing, MI 48902.

(Facts about Michigan: State Bird, Robin; Fish, Trout; Flower, Apple Blossom; Tree, White Pine; Stone, Petoskey; or any local facts.)

CQ WW WPX CW Contest

0000Z Sat. to 2400Z Sun., May 24–25

This is a reminder of our *CQ* WPX CW Contest coming up at the end of this month. Results of last year's contest in this issue may be used as a guide to choose the best class for your operation.

Rules and scoring are exactly the same as for the SSB section in March, and these rules were given in detail in the January issue, with a follow-up in the March Calendar. A few items to keep in mind are as follows:

Par. I—Only 30 hours out of the 48-hour contest period may be used by single operator stations. The off times may be taken in up to five periods.

Par. IV—Multi-operator, single transmitter. Only one transmitter and one band permitted during the same time period (defined as 10 minutes). No QSYing to another band to pick up a new multiplier.

Par. VI—QSO points on the three lower bands—7, 3.5, and 1.8 MHz—are worth double those for contacts on 28, 21, and 14 MHz. Own country may be worked, but for multiplier credit only (making U.S. QSO's very attractive).

Par. VII—The prefix multiplier is counted once only, not once on each band. Definition of a prefix is clearly spelled out in the rules, and was again reviewed in the March Calendar. The WPX Awards list can no longer be used as a guide for contest operation.

Stations operating in a call area other than that of the call sign are required to indicate the area of operation. The portable prefix is the multiplier (i.e., W8IMZ/4 counts as W4; N8BJQ/KV4 counts as KV4).

Par. IX—There will be 19 plaques awarded in this year's contest. Eligibility remains at 2 years except for areas in categories as indicated.

Mailing deadline is July 10th, but will be extended for rare isolated areas. Be sure to indicate CW on the envelope.

All logs go to: *CQ* Magazine, WPX Contest, 76 N. Broadway, Hicksville, NY 11801 U.S.A. Questiuons pertaining to the WPX Contest can be sent to: WPX Contest Director, Steve Bolia, N8BJQ, via *CQ*.

CLARA AC/DC "Mystery" Contest

1800Z Tues. to 1800Z Wed., May 27–28

This one organized by the Canadian Ladies ARA. It's open to YL's as well as OM's. Each CLARA station may be contacted twice, once on phone and again on CW, or on the same mode on two different bands.

Exchange: Name, QSO no., RS(T), QTH, and if a CLARA member. There will be three "mystery" unidentified stations operating.

Scoring: CLARA members score 1 point for each QSO with a non-member (YL or OM), 2 points if it's with another member, and 3 points if it's on CW.

Non-members, 2 points for each CLARA contact, and 3 points if it's on CW.

Multiply above by number of VE provinces/territories worked for the total score.

The contest manager will add 10 points to the base score for each "mystery" station worked.

Frequencies: Phone—3773, 3900, 7150, 14160, 14280, 21300, 28488, 28588. CW—3690, 7035, 14035, 21035, 28035. (No net, list, or 10 or 2 meter repeaters.)

Awards: CLARA members, first-place cup and certificate, second-place certificate. Non-members, first-place plaque, second-place certificate. And a certificate to DX station winners. All entries are eligible for a mini prize drawing.

All logs must be received no later than July 15th by the Contest Manager, Muriel Foisy, VE7LQH, RR #1, Pender Island, B.C., Canada V0N 2M0.

National 6 Meter Contest

1400Z May 31 to 2400Z June 1

The National 6 Meter Invitational Net (SIN) invites all 6 meter stations to participate in this activity.

Exchange: Call, SIN no., and grid squares.

Scoring: Contacts with SIN members are worth 3 points, with non-members 2 points. Multiply grid squares by total QSO points for your final score.

Awards: Certificates to the highest scorers, and a certificate to the lowest score (?).

Deadline for mailing your log is July 1st to: Lisa Lowell, KA0NNO, P.O. Box 249, Ft. Lupton, CO 80621.

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Advertising Rates : Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are 60 cents per word. Minimum charge $2.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Non-commercial ads free to CQ subscribers, as space permits, maximum 3 lines each. All ads must be typewritten double spaced. Recent CQ mailing label must accompany ad.

Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 76 N. Broadway, Hicksville, NY 11801.

WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, Rt. 11, Box 499 #1201 South, Birmingham, AL 35210.

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HAVE AM CAPABILITY? Join SPAM (Society for Promotion AM). Membership is free. For free info send SASE to: SPAM, c/o F. Dunlap, WA5TWF, 14113 Stoneshire, Houston, TX 77060.

HAM RADIO REPAIR! Tube through solid state. Robert Hall Electronics, Box 8363, San Francisco, CA 94128 (408-729-8200).

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ELECTRON TUBES: Microwave Transmitting, Receiving, Obsolete . . . ALL TYPES! Large inventory. Contact: Daily Electronics, P.O. Box 5029, Compton, CA 90224 (213-774-1255).

TENNATEST: Antenna noise bridge outperforms others, accurate, costs less, satisfaction guaranteed. 1–150 MHz. Send stamp for details. W8URR, 1025 Wildwood Rd., Quincy, MI 49082.

QSLs & RUBBER STAMPS—Top Quality! Card Samples and Stamp Information 50¢. Ebbert Graphics D-2, Box 70, Westerville, OH 43081.

IMRA-International Mission Radio Assn. helps missioners—equipment loaned; weekday net, 14.280 MHz, 2:00–3:00 PM Eastern. 1 Pryer Manor Rd., Larchmont, NY 10538.

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FOR SALE. CQ/Ham Radio/QST/73 magazines @ 35¢ (thru 1975) and 50¢ (1976-up) each, including shipping. W6LS, 2814 Empire, Burbank, CA 91504.

CERTIFICATE for proven contacts with all ten American districts. SASE to W6LS, 2814 Empire, Burbank, CA 91504 brings data sheet.

CLANDESTINE CONFIDENTIAL NEWSLETTER: Latest info on secret broadcasters. Six issues $10 US, $13 foreign, US funds. RR4 Box 110, Lake Geneva, WI 53147.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

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AAAA WANTED: Radio tubes (50s, 211, 845). Western Electric Equipment (Tube, Amp, Mixer, Console, Speaker, Driver, Horn, Microphone, Parts, etc.). Triaxial, Coaxial speakers of Jensen, Trusonic, Altec, Tannoy. JBL 150-4C, N-500. David, P.O. Box 832, Monterey Park, CA 91754, Tel: 1-818-576-2642.

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JUNE 1, 1986: STARVED ROCK RADIO CLUB HAMFEST, Princeton, Illinois. Same place as last year. SASE, please, for complete registration materials, map, etc., to SRRC, W9MKS, RFD #1, Box 171, Oglesby, Illinois 61348 (815-667-4614).

FIGHT FAULTY POLICE RADAR! Radar Defender newsletter tells how. SASE to 3545 Nicollet, Suite 108-Q for free sample.

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SCHEMATICS: Radio receivers 1920's/60's. Send Brandname, Model Number, SASE. Scaramella, P.O. Box 1, Woonsocket, RI 02895-0001.

QSL CARDS: Look good with top-quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSL's, 310 Commercial, Emporia, KS 66801.

ICOM 745 wth internal P.S. and SSB filter for sale. Never used. W5ZZ, 214/235-6927.

CONNECTICUT'S HAM STORE: Rogus Electronics, 250 Meriden-Waterbury Turnpike (Rt. 66), Southington (203-621-2252).

WANTED: Drake RV-75 VFO Reply to: 215-271-8898. Tony Musero, K3UKW.

PAY TV AND SATELLITE DESCRAMBLING, 5th Edition, 73 pages. Schematics and theory for most systems including Teleast MAAST, Fantasy, Anik, etc. $12.95. The most thorough section on satellite descrambling available. Product catalog $1. Shojiki Electronics Corp., 1327Q Niagara St., Niagara Falls, NY, 14303. COD's 716-284-2163.

ROSS'$ USED MAY SPECIALS: Kenwood TS-520SE $409.90, TS-830S $579.90, TS-180S/WDFC $389.90, TS-700SP $399.90, VOX3 $29.90, TS-600 $565.90 (New Demo). YAESU FT-101E $399.90, FT-620/WCAL $285.90, FR-101S & FL-101, $399.90. ICOM IC-DV21 $89.90, IC-730/FL30 $469.90, IC-490A $495.90. Phone or send SASE for used list. Over 200 used, 7,500 NEW ham items in stock. Mention ad. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263. (208-852-0830).

REPLACE RUSTED ANTENNA BOLTS with stainless steel. Small quantities, free catalog. Elwick, Dept. 579, 230 Woods Lane, Somerdale, NJ 08083.

BIG APPLE. How did it get that name? Send your QSL to the "Crew" at Junior High School 22 via WB2JKJ and they will tell you PLUS give you a chance at their QSL OF THE WEEK AWARD.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Swan, and all others. Six ½" digits. 5" wide by 1¼" high metal cabinet. Send $1.00 for information and receive a $25.00 discount. Please be specific. GRAND SYSTEMS, Dep't. D, POB 3377, Blaine, Washington 98230.

CIRCLE 18 ON READER SERVICE CARD

HEATH GENERAL COURSE, unused condition. R.W. Boyd, Box 793, Stn "A," Montreal, P.Q. H3C 2V5 Canada. (514) 481-4830 after 18:00.

TEMPO 1 and AC 1, excellent condition $169.95 U-SHIP. K4RV, Tom Sessions, 123 Pine Bluff Drive, Warner Robins, GA 31088 (912-929-2030).

WANTED: Hammarlund HQ-145 communications receiver. Don Trayes, 38 Elmwood Place, Goose Creek, SC 29445.

WANTED: Drake RV-75 VFO & Kenwood HC-10 Clock. FOR SALE: Collins "S Line," round emblem (excellent condx.) 75S3B (4 filters), 32S3, 516F2 P/S & spkr., 30L1AMP, $1,450.00. (Serious inquiries only, please.) Drake TR5 xcvr includes NB & CW fil, 7077 mic, Heath HD-1144 20 amp P/S, mint, $515. Heath SB310 shortwave rcvr., vy good $125. Drake AK75 1.8 to 30 MHz wire ant 135′ long (new) $35. ICOM 211 2 mtr all-mode xcvr, excellent condx. $295. Drake MN-75 ant. tuner 1.8 to 30 MHz 300 watts, brand new $229 list, cost $149. K3UKW, Tony Musero, 1609 So. Iseminger St., Phila., PA 19148 (215-271-8898).

WANTED: Collins 312B-3 Speaker for S-Line. Nate Williams, W9GXR, 6915 Prairie Drive, Middleton, WI 53562.

CELESTRON SUPER C-8 plus telescope, black starbright coatings, adjustable tripod, eyepieces, case, deluxe latitude adjuster, piggy-back mount, polar finder. Like new $1590. G. Skloot, 2923 Mandalay Beach Road, Wantagh, NY 11793, phone (516) 221-3535.

WANTED: KLM KT-34A Triband Beam. J.L. Blanke, WF5N, Box 655 Lake Serene, Hattiesburg, MS 39401, ph. 601-264-7149.

FOR SALE: 12 volt DOW-KEY Coax Switch, $50. de WB8OWM.

WANTED: Mirage MP-2, B3016 amp, Brown Bros. CTL or Ham Key HK-4, MFJ-204 or Palamor R-X bridge, Clipperton V-2m amp, 150′ Belden RG8X coax. K@MK-690 Vermilion Tr., Gilbert, MN 55741.

SELL: Tecraft Nuvistor 2 meter 14 MHz IF Converter, $15 ppd, with manual, excellent. Sever, 1701 Harcourt Drive, Leesburg, FL 32748.

VHS CASSETTE, 30 min. program abt ham radio public svc, emergency work, etc., $30.00. Great PR. Wolfe, 3467 Rambow, Palo Alto, CA 94306.

FOR SALE: Swan 600T & R with manuals. Swan 500C with PS and manual. Swan 350A built-in AC/DC "as is." Midland 13-500 2 meter rig 144–148 crystals, manual and mike. FT101E works on AC only, manual and mike. Pro 30 programmable handheld scanner, manual. More info send SASE to P.O. Box 518, Whitehouse, FL 32220.

BALUNs 4:1 used W2AU 4 @ $9; Palomar 1K new @ $19; Heath Clock $15; Omega-T ant bridge $10. W1BFT, RFD 3 Box 6A, Concord, NH 03301.

WANTED: Yaesu FC-902 Antenna Tuner, excellent condition only. Steve, Box 41, Pelican Rapids, MN 56572.

SIGNAL ONE TRANSCEIVER Model CX7B. Note that many of the mods have been done to this great rig. Modes like improved power supply, LED Digital Readout, etc. 0–200 watts of SSB power. Dual VFO's A+B style. RTTY converter, CW keyer, noise blanker bulletin, much more. This rig uses an RCA ceramic tube final model 8072. Most solid state devices have been placed on plug in sockets. I have manuals, many spare parts including final tubes, etc. This is part of my father's estate. Price is $795.00 FOB NY. I will export anywhere in the free world. Write for 102-page list of amateur equipment up for sale in this estate. Mark, P.O. Box 0280, Baldwin, NY USA 11510.

DISCOUNT CATV converters/decoders and video accessories. Solar cells for remote power and battery charging applications. Send for free information and prices. It could save you big money on your next purchase of these and other CATV items. Easy View, P.O. Box 221, Arlington Heights, Illinois 60006. Call (312) 952-8504, ask for Rudy Valentine.

NOTICE To the "Swap List" subscribers. Effective immediately new address for ALL correspondence including ads, P.O. Box 2222, Vacaville, CA 95696.

CB-TO-10M CONVERSIONS: FM kits, frequency modification hardware, books, plans, high-performance CB accessories. Catalog $2. CBCI, Box 31500CQ, Phoenix, AZ 85046.

COLLINS 51S1 Receiver, Round, $450.00; 62S1 Converter $400.00. WØAT, P.O. Box 188, Raymore, MO 64083.

WANTED: PALOMAR KACHINA 10 and 6 meter transceiver. Must be in good condition. State price, condition, and phone number first letter. Garth Carman, 8532 Jasper Avenue, Edmonton, Alberta T5H 3S4 Canada.

WANTED: HALLICRAFTERS SX62A. State price and condx. E. Engelken, 406 Harcourt, San Antonio, TX 78223.

WANTED: Service manual and schematic for HP-524 frequency counter. "D" model preferred. Lee Knoper, Rt. 1, Box 320-A, Cochise, AZ 85606.

PC/MS-DOS SOFTWARE: 35 Ham Programs on 3 disks for $22.50. Rockford Systems, 7474 Hessler, Rockford, MI 49341.

SELL: Dentron DJR-1200c, Micronta 3 range power/modulation/SWR Tester, Drake Transceivers TR-4c & TR-4, Swan Power Supply PSU-3A, Swan HF-700S single band transceiver, BTI LK-2000 with Antenna & 2 amps. Estate sale, make offers. Dennis (305) 358-3600.

KENWOOD OWNERS: Modification for general-coverage transmit for TS430S the right way. Send $3.00 to P.O. Box 96, Uniontown, PA 15401.

HENRY RADIO LINEAR Amplifier Model 2K classic console floor mount, 2.5 kw SSB model. This linear uses a pair of the famous EIMAC 3-500Z tubes along with glass chimneys. Blower cooled, 10–80 mtrs. Note that this linear is brand new, never used. Comes to you in the original factory carton. Manufacturer's selling price $1,395.00, my selling price is $1000.00 FOB NY motor freight. Please send for large list of amateur radio equipment from my father's estate. Mark, P.O. Box 0280, Baldwin, NY U.S.A. Export inquiries invited.

COMMODORE 64 OWNERS: Use as a digital readout for your TS-520, FT-101, Collins, etc. (six digits), and 250 MHz frequency counter (8 digits). Send $1.00 for information. GRAND SYSTEMS, Dep't. D, POB 3377, Blaine, WA 98230.

NATIONAL RADIO RECEIVER Model HRO500, 0.5–30 MHz frequency coverage. Mechanical digital readout display. Note that this is the world's first frequency synthesized general-coverage receiver. Modes of operation CW, AM, FSK, LSB, USB, crystal filter. Dual, triple conversion front end. I have the manuals that it came with when it was purchased new from the dealer. Price is $600.00 FOB. Swan receiver model 600S SS16 sixteen pole SSB filter. Note this is the custom version of the 600 series receivers from Swan. Amateur band coverage from 1.8–30 all bands. Condition of this receiver like the National is mint. Price $350. The model 600R custom was made to use with its matching transmitter model 600T. I also have the matching speaker phone patch console that goes with it. Please inquire for more info. I will export to the free world. Also many other items from estate sale. Send for complete list. Mark, P.O. Box 0280, Baldwin, NY 11510.

ROHN TOWERS: Wholesale direct to you. 34% discount from the Rohn dealer price. All products available. Also very low prices on Antenna Specialists antennas and Andrews Heliax. Write or call for catalog and price list. Hill Radio, 2503 GE Road, Bloomington IL 61701-1405 (309-663-2141).

VIEWSTAR LINEAR AMPLIFIER MODEL PT1000A. This linear uses a single 3-500Z EIMAC tube, a glass chimney, 10–160 mtrs, 1.2K watts SSB power. Standby switch, blower cooling, many other features. New in factory-sealed carton. Price $650.00 FOB NY. See '85 issues of CQ magazine for details. Collins transmitter Model KWS-1 one kilowatt transceiver 10–160 mtrs matching transmitter to the 75A4 receiver. This rig has been completely restored to better than new. Serial NM 1,275. I have the original manual, cables, power supply, spare finals, etc. that goes along with this. Price $550.00 FOB USA. Send for 102 page list of estate items. Will export anywhere in the free world. Mark, P.O. Box 0280, Baldwin, NY USA 11510.

R.L. DRAKE RECEIVER Model R4245, 0–30 MHz digital readout, all solid state. All built in filters for SSB, CW, AM, DSB, etc. Electronic passband tuning. USB, LSB, CW, AMW, AMN, etc. Up-conversion, down-conversion receiver. Note that this is Drake's commercial version of the R7A receiver but much better. Will mate with a TR7A transceiver. This is very professional of which replaced the DSR-2 receiver. Brand new in factory-sealed carton along with matching manual. Original Drake price $3,495.00. Selling price $1,595.00 FOB NY. Will export anywhere in the free world. Please send for color Drake brochure on this rig. Mark, P.O. Box 0280, Baldwin, NY USA 11510.

ARMY RADIOS: CPRC-26 Infantry Manpack Radio, compact, transmits-receives 46–54 MHz FM, with battery box, antenna, crystal, handset: $22.50 apiece, $42.50/pair. PRC-510 Backpack Radio (Canadian version of G.I. PRC-10), transmits-receives 38–55 MHz FM continuous tuning, with battery box, antenna, handset: $39.50 apiece, $77.50/pair. Factory mint PRC-9 Backpack Radio, transmits-receives 28–39 MHz FM continuous tuning: $52.50 apiece, $77.50 with good condition battery box, antenna, handset. Factory mint R-108 Vehicle/Field Receiver, 20–28 MHz FM: $27.50. R-390A Communications Receiver: $195 good condition. R-748 Receiver, 130-150 MHz single channel AM: $27.50. 45 Day Replacement Guarantee. Add $9.50 shipping-handling. Baytronics, Dept. CQ, Box 591, Sandusky, OH 44870.

HAMFEST: The annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 4. FCC booth, large flea-market, and many exhibitors. Take Exit 308 off I-57 to Rt.45 South 1 mile. For further info contact: K9NR, Don Kerouac, 1377 Circle Dr., Kankakee, IL 60901.

SIGNAL ONE TRANSCEIVER Model CX7A dual VFO's 200 watts SSB, digital readout. Note that this is a like new original Signal One transceiver that was made in Florida. All mods have been done, 10–160 Mtrs plus 10 MHz band. I have all the original manuals, some spare parts. Final is an RCA 8072 tube. Very state-of-the-art transceiver. The world's first amateur radio digital readout transceiver made. I will explain in detail. Also export to the free world. Please write for 102-item estate list of amateur radio equipment. Mark, P.O. Box 0280, Baldwin, NY USA 11510. Price $695.00 FOB NY.

SELL OR TRADE: Astatic microphones models 10-D, T-3, 10-C. $75.00 or trade for Ham-Key HK-1 or Vibroplex iambic key and Electronic keyer. KA5BEE, Melvin Ratzlaff, Jr., Rt. 1 Box 220, Gloster, MS 39638.

HEATH GENERAL COURSE, unused condition. R.W. Boyd, Box 793, Stn "A", Montreal, P.Q., H3C 2V5 CANADA. Call (514) 481-4830 after 18:00.

TRADE OR SELL: Canadian Chrome pay-phone, rewired for home use for 2 meter crystal transceiver. Joseph Schwartz, K2VGV, 11 Windham Loop, Staten Island, NY 10314 (718-698-8069).

WANTED: Johnson 6N2 Thunderbolt amp, ICOM IC-551D and EX-106 FM, IC-60. Cushcraft 3219, 214FB, 215WB Boomers, and 22SK stacker kit. KØMK, 690 Vermilion Tr., Gilbert, MN 55741.

WILL TRADE National HRO-500 and matching speaker in excellent condx. for your Collins 51S-1. Write to K9ARZ (Callbook address) or tel. (312) 377-0860.

RECEIVERS: Hallicrafters S40-B $35, S-120 $45, National NC-300 with matching speaker $125. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

WANTED: 51S1, Round S-line, SM-1, MM-1, 200 500 800 3.1 kHz filters for 75S3B,C. Want: 14–18" Heights aluminum tower sections. Sell: 60' self-supporting steel tower $400. Colbert, Burton, Ohio 44021.

H*A*R*K: Radio Archives "Low-Tech" newsletter. Back-to-basics. $1/$6 yr. KA@TPZ, 2308 Garfield #304, Minneapolis, MN 55405.

WANTED: COLLINS F455FA-60 and F455Y-60 mechanical filters (6 kHz AM filters for S/Line receivers). Will pay cash or trade for other Collins filters. John Werner, WB8IPG, 183 Tacoma Blvd., Troy, MI 48084-5424, phone (313) 362-2706 or 362-2656.

DUMMY LOAD KIT: 52 ohm non-inductive good to 450 MHz, 100 watts. $14.95 p.p. Maximilian J. Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

CANADIAN HAMS: Heath HR-1680 RCVR, HS-1661 SPKR, HD-1250 Dipper, SA-5010 Umatic Keyer, all unused. R.W. Boyd, Box 793, Stn "A," Montreal, PQ. Call (514) 481-4830 after 18:00 hrs.

DRAKE C-LINE, TR4CW-RIT, TR-6, $1035.00 for all, U-SHIP. K4RV, Tom, 803-359-3418.

TEKTRONIX OSCILLOSCOPE PROBES, new, big di$count, SASE for list. Sell or trade for: linear amplifier parts, vacuum capacitors/relays. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

COLLECTOR seeking pre-1935 bugs, spark keys, and pre-1900 landline keys, books, catalogues. K5RW, 1128 Midway, Richardson, TX 75081.

SALE: Info-tech keyboard, model 150: Info-tech converter, model 75, $100; Heath HW-8, $45; Yaesu FT 208, $175. Joseph Schwartz, K2VGV, 11 Windham Loop, Staten Island, NY 10314. Call (718) 698-8069.

WANTED: Swan MK 6B-6m amp, Belden 8214 coax, ICOM AG-20, PS-25, Astron RS-35M, and Rohn 25G sections. KØMK, 690 Vermilion Tr., Gilbert, MN 55741.

99 BACK ISSUES of "The DX Bulletin," Aug. 83 to Nov. 85; $4 postpaid, include SASE. Nate Williams, W9GXR, 6915 Prairie Drive, Middleton, WI 53562.

IC-2AT, COMPLETE, $125. BC-30 desk charger, $45. HM-9 speaker-mike, $20. FOB K1LEC, N. Springfield, VT 05150-0073; (802) 886-8121.

HOMEBREW TELEGRAPH or wireless keys or paddles wanted. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

KENWOOD TS-520 (w/internal crystal filter) and SP-520 speaker, $310 plus shipping. WB5MTU, Box 1013, Fairfield, TX 75840-1013 (214-389-2055).

FOR SALE: 169 new radio and TV tubes and tube caddy. $100 for all, plus shipping. SASE for more info. H. Lash, 19 E. 157th St., South Holland, IL 60473-1312.

DRAKE 6 & 2 meter converters in Drake cabinet with VHF marker oscillator and power supply, immaculate, with manuals $100. Call (203) 426-8041.

COLLECTORS NOTICE: Like New Meisner Signal Shifter, all coils, $40. J. Blanke, WF5N, 655 Lake Serene, Hattiesburg, MS 39401 (601-264-7149).

NEW ANTENNA MATCHING PREAMPLIFIER: MILLEN R9'R #92109. 30–60 dB gain without rear cabinet, 6AK5 tube. $35.00 postpaid. Ralph Jannini, 16 Hansom Road, Andover, MA 01810.

PRE-1955 TV's WANTED! Pilots, Predictas. 1930–1960 Broadcast radios. Poster, Box 1883Q, So. Hack, NJ 07606.

WANTED: Kenwood TS-520S or TS-530 Series in mint condition. Lowest price will get my business. Mark Bills, KA@VHY, Box 116, Mystic, IA 52574.

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Improved Smooth Tuning. The IC-751A features a newly designed tuning knob for velvet smooth tuning.

Added LED Annunciator. For easily identifying if you're using the tuning speed, dial, or band switching functions.

32 Memories. Mode and frequency may be stored in any of 32 memories...all the memory capability that you'll ever need.

More Stable. Even in the receive mode, the IC-751A has a sophisticated thermal sensor to monitor the internal temperature. The sensor automatically activates the cooling fan which gives maximum stability ...critical for contesting.

Newly Designed Features. The IC-751A boasts a number of newly designed features for better performance ...new 9MHz notch filter to drastically reduce QRM, new AGC system, new compressor for better audio and a new AF gain control system to improve control of the CW sidetone volume.

Options Available. Options for the IC-751A include the IC-PS30 external AC system power supply, IC-PS35 internal AC power supply, IC-AT500 antenna tuner, IC-EX309 microprocessor interface connector, SM-8 or SM-10 desk mics, IC-2KL linear amplifier, RC-10 remote controller, SP-7 or SP-3 speakers, IC-EX310 voice synthesizer and GC-5 world clock.

Optional Filters. FL-52A CW 455kHz at 500Hz, FL-53A CW-N 455kHz at 250Hz, FL-63A CW-N 9.0106MHz at 250Hz, FL-33 AM 9.010MHz at 6000Hz, and CR-64 high stability 30.72MHz crystal filter.

CIRCLE 90 ON READER SERVICE CARD

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