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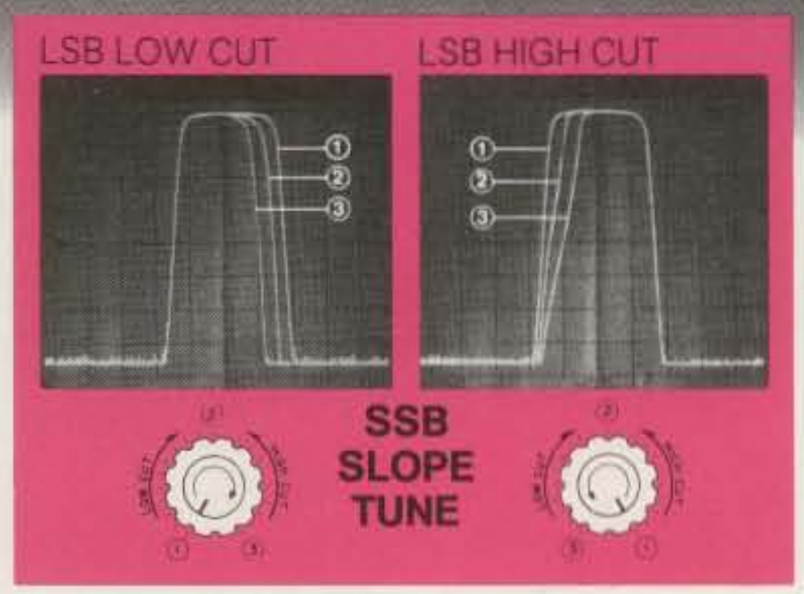

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  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection.
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- **Dual digital VFOs.**
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- **Built-in automatic antenna tuner (optional).**
  Covers 80-10 m. *Another industry first by Kenwood!*
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Optional accessories:

- AT-930 automatic antenna tuner
- SP-930 external speaker, with selectable audio filters
- YG-455C-1 (500 Hz) CW filter
- YG-455CN-1 (250 Hz) CW filter
- YK-88C-1 (500 Hz) CW filter
- YK-88A-1 (6 kHz) AM filter (all plug-in type)
- SO-1 commercial stability TCXO
- MC-60A, MC-80, MC-85 desk microphones
- TL-922A linear amplifier (not for CW QSK)
- SM-220 station monitor
- PC-1A phone patch
- SW-2000, SW-200, SW-100 SWR meters
- HS-4, HS-5, HS-6, and HS-7 headphones.
- LF-30A low-pass filter

More TS-930S information is available from authorized Kenwood dealers

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1111 West Walnut Street
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Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

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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.)

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.

MC-60A (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.

SP-40 Compact mobile speaker.

SP-50 Mobile speaker.

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.

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, 3/8 λ telescoping antenna with BNC connector.

RA-5 2 m 1/4 λ /70 cm 5/8 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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- **Covers all Amateur bands**
  160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction**
  Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.
- **Reliable, all solid state design.**
  Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.**
  Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

Optional accessories:
- PS-430 compact AC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands
- AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands
- TL-922A 2 kW PEP linear amplifier
- FM-430 FM unit
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- YK-88A (6 kHz) AM filter
- MC-42S UP/DOWN hand mic.
- MC-60A/80/85 deluxe desk mics.
- SW-2000/200A SWR/power meters
- SW-100A SWR/power/ volt meter
- PC-1A phone patch
- HS-4, HS-5, HS-6, HS-7 headphones

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Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: 516 681-2922. CQ (ISSN 0007-893X) is published monthly by CQ Publishing Inc. Second Class postage paid at Hicksville, NY and additional offices. Subscription prices: Domestic—one year $16.00, two years $29.00, three years $42.00; Canada/Mexico—one year $18.00, two years $33.00, three years $48.00; Foreign—one year $20.00, two years $37.00, three years $54.00; Foreign Air Mail—one year $73.00, two years $143.00, three years $213.00. Entire contents copyrighted CQ Publishing Inc. 1985. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address. Printed in the United States of America.
Postmaster: Please send change of address to CQ Magazine, 76 North Broadway, Hicksville, NY 11801.

CQ The Radio Amateur's Journal

ON THE COVER: Douglas Sharp, WB2KMY, lets his fingers do the talking for our annual RTTY Special issue. Here he's showing off his Packet prowess. Photo by Larry Mulvehill, WB2ZPI.

NOVEMBER 1985 **VOL. 41, NO. 11**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

A few weeks ago I saw an ad in the paper for an antique gun show which was to be held at the same place as our big local amateur fleamarket. While I am not a collector of antique guns and don't have a specific interest in or knowledge of them, I was curious to see how many people would attend. Since they were using the same facilities, I also wanted to see how they conducted a show. This was partially because of some letters I've received in response to my recent editorials. These letter writers cited other hobbies in which they were involved that were tracking amateur radio in age of participants, involvement, and growth. The other hobbies were not involved with electronics or amateur radio.

When I arrived at the antique gun show, the parking lot was quite packed, as it usually is for the amateur radio fleamarket. The admission price was about the same, and that's where the similarity ended. The lobby area had a long table with all sorts of literature on clubs, events, and competitions, and you were actively encouraged to take this information with you. Entering the large meeting room, my first impression was how big it seemed. Somehow they had managed to get two to three times the number of display tables in there. It was also filled wall-to-wall with people. I was struck by the number of young people; obviously they hadn't heard of median-age problems. Everywhere there were signs and literature, and people encouraging everyone attending to come to an event, join a club, or take part in something. I saw enough antique guns, bayonets, and swords to fill several museums.

The displays were not only to be looked at and admired. The items all were for sale, and the stuff was selling. The prices of these items often exceeded the cost of our exotic transceivers. I did learn that as with a hamfest, you have to word your questions carefully. When you ask what the difference between the 1727 widget and the 1783 version of that series (they did look alike) is all you are looking for is a simple answer such as one is gray and the other is white. What you get is a discourse on the nuances and the impression that you have to have one of each for your collection (which you haven't started yet). I picked up something and asked what it was, and was told all the reasons why it was worth $350.00. However, the emphasis seemed to be on what you could do with these items. All the antique rifles seemed to work, and there were a number of organized groups represented which meet regularly to fire them. Everything required an act of participation.

On the way out I saw a large exhibit of photographs and drawings depicting various people in Revolutionary War uniforms (the other side). It is a group who patterns themselves after a Welsh Fusilier unit of the Revolutionary War. They meet regularly and have various chapters throughout the country, and part of their activities is reenacting historic battles. For a while it looked like fun to dress up in the red suit and powdered wig, carry the long rifle, and take part in the battles. Although authenticity of uniform and equipment must be meticulously adhered to, I was assured that you could get involved at a reasonable price (a bit over the price of a complete amateur station). The only drawback was that I had to get rid of the beard. Apparently the Welsh Fusiliers didn't have beards. Sorry.

While I didn't leave there an antique gun collector, or with the intention of becoming one, I did leave with a sense that these people seem to be thriving as a group. They have a lot of young people involved, and by and large are extroverted. No, they weren't all decked out in army camouflage fatigues nor wearing killer commando T-shirts.

What does all this have to do with amateur radio and some of the other hobbies with which we are involved? Most of these hobbies are singular, introverted pastimes. We can do all these wonderful things by ourselves in the comfort of our own homes. Unlike some of the other hobbies, amateur radio involves talking to people on a regular basis—but at a distance. Outside of Dayton, we don't congregate in large groups. Judging from the club bulletins I receive, not enough of us actively participate in club affairs or are willing to do needed jobs. We each have "our thing" and are deeply committed to keeping it that way.

Apparently, young people are interested in and will commit to something extroverted and people oriented. At first glance, there is nothing intriguing about sitting in a basement shack talking to someone across the world sitting in his basement shack, no matter what the topic is. Young people, not-so-young people, and old people like to be involved in something active that gives a sense of participation and sharing. Amateur radio can be all of those things, and it is to some people, but it's never sold as those things. Why is it so very hard to convey that amateur radio in and of itself is not a heavy, serious thing, but actually is a lot of fun?

Consider the premise that perhaps society only produces a limited number of introverts and that number is slipping, thereby limiting growth in selected hobbies. That's one possibility. Another possibility is that a great number of us really do not want growth, and less means more for us so let's keep it a secret. All of the possibilities that I can raise, and that have been raised by others, seem to have something to do with the people rather than the activity. The one constant is that we all like the activity—amateur radio.

Well, there are over 400,000 of us in this country who can agree on the fact that we like amateur radio. One of the problems may be that there are probably an equal number of reasons *why* we like it. It also is probably enough just to say that amateur radio is enjoyable and fun. I think that if we all were to list our reasons, enjoyment and fun might be universal reasons though not always in the same position of importance. The activity's existence requires growth, thereby allowing us—*and others*—to continue our enjoyment of it. Amateur radio existed as an activity before most of us existed, and hopefully it will exist after we are gone.

Since we all are amateurs because someone before us thought there was room for one more, it falls on us to do the same. It's not up to us to create limits where none exist. It is, however, up to us to keep the process going. Perhaps one of the big differences between the extroverts and the introverts is that the extroverts *know* when they're having a good time and are willing to share it.

The abundance of Novice classes these days is a step in the right direction. In fact, it is a giant step. It's the first "reaching out to touch someone," to paraphrase AT&T, and lo and behold it does work. The people who teach the courses and give of their time deserve a lot of credit. They're taking that "extroverted" move to keep "our thing" going. No, they're not going to turn out technicians, engineers, or scientists. They're going to graduate amateur radio operators—people who have fun with amateur radio.

November RTTY Special

I want to thank all of the authors who worked very hard to make this annual RTTY issue another winner. This year we've added articles on packet radio in the hopes of sparking your interest in it. There is a lot to do out there in amateur radio, and the limit is only set by your imagination. We hope we can take some of the mystery out of these modes and give you enough basic information so that you are willing to give it a try. While not in the same category as a single 6L6 rig heating up for a first contact, you can still experience the same excitement and thrill of first contact jitters operating RTTY and packet. Liven up your life a bit. Give it a try.

Missing Children

Last month some of you might have noticed pictures in *CQ* of two missing children. We obviously hope that most of you did notice the pictures. What it means is that *CQ* has entered into a program whereby we will donate space in our magazines and on all of our promotional material so that pictures of missing children can be displayed. The number of missing children rises alarmingly each year, and these children can be literally anywhere in the country in a few short hours. Child Find Inc. will supply us with photographs and information that we will publish. We urge you to use the toll-free telephone number, (800)-I-AM-LOST, should you see any of these children or have any information on their whereabouts.

73, Alan, K2EEK

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ANOTHER BREAKTHROUGH FROM AEA

Packet + RTTY= Pakratt™ PK-64.

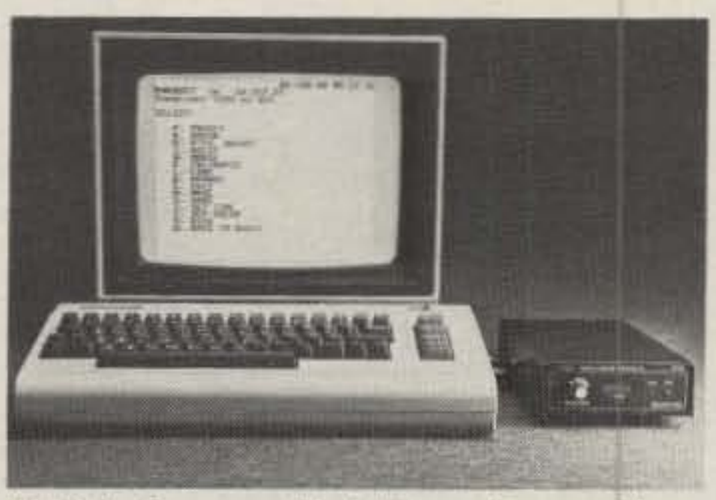
If you 've read about packet, or are already into it, you know how exciting it is. With the hot new Pakratt PK-64 we've just brought a new dimension to packet. The Pakratt PK-64 is a complete, fully assembled and tested packet radio controller which, together with a Commodore 64 or 128 computer, can convert your shack into a packet operations center.
And we've included a new version of our advanced MBA-TOR™ software to make it the first packet controller with AMTOR, Baudot, ASCII and Morse. But an even more exciting part of the Pakratt controller is its great price.

Incredibly Simple To Set Up

Just plug the Pakratt controllet into the C-64's game cartridge slot, add a mic connector for connecting to your particular transceiver, and you're set.
If you're anxious to try it out, our new "quickstart" manual section can get you on the air in under ½ hour.

Simply Powerful

The versatile Pakratt controller shows messages and connect status simultaneously on your Commodore with a unique split-screen display. And it lets you



PK-64 shown with HF modem option.
Computer not included.

send letter-perfect text from the text editor software while mon itoring incoming messages. The 20K byte QSO buffer stores more than 20 video screens of text!
Disk commands let you save specific operating parameters for quick set-up for emergency services, clubs, and multiple frequency use. And the Pakratt controller's standard, TAPR style modem gives you 300 and 1200 baud operation with great HF/VHF performance.

We can't possibly list all of the important features of Pakratt here. But the absolutely best part of the Pakratt PK-64 is that it's at your dealer now. So stop reading, run down to your local dealer, and check Pakratt out. Because the real challenge will be to find one after the other hams see it.

Pakratt PK-64. Packet Power from AEA. At amateur radio dealers everywhere.

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Please send all reader inquiries directly.

Announcing

•**NS5N Special Event** – On Nov. 1, 2, and 3 a swapfest, garage sale, and Special Event station will operate from Washington County Fair Grounds, Brenham, TX on or around 21.125 MHz and 21.360 MHz. A talk-in on BARC repeater 147.26 + 600 MHz. A QSL card will be available from BARC, Box 44, Brenham, TX 77833 upon receipt of QSL and SASE. Inquiries sent to Gene Stanford, KA5LEI, above address.

•**WW II USAAF Veteran Pilots Sought** – The Whitetail Marauders are seeking WW II USAAF veteran pilots, navigator-bombardiers, other combat crew members, and ground support personnel, who were in the ETO on the Martin B-26 Marauder medium bomber with the Ninth Air Force, 323rd Bomb Group in the 453/454/455/456 Bomb Squadrons. The four squadrons are each planning reunions! Inquiries from veterans of other B-26 units are welcome. Contact: Ralph M. Wefel, 114 Fontana Drive, Oxnard, CA 93033.

•**Special Events Station From Ochopee, FL** – A Special Events station from the smallest United States post office—Ochopee, FL—will be conducted November 2 and 3 by Fort Myers Area Amateur Radio Club. Phone and CW on 20, 40, and 80 meter bands with special picture postcard for QSL of valid contact. Mail your QSL and SASE to Fort Myers Area ARC, P.O. Box 4814, North Fort Myers, FL 33918.

•**Annual WAE Contest** – The annual Worked All El Paso, Texas (WAE) Contest and Award Certificate will be held on the 10 meter band from 1600Z November 2 to 0400Z November 4. One objective of the local contest is to assist operators outside of El Paso to qualify for WAE certificates. El Paso stations worked at times other than the contest also count toward the award. General rules are: work any 15 El Paso, Texas stations on any band, any mode, any time and submit logs to El Paso ARC/ W5ES, 2100 San Diego Ave., El Paso, TX 79930. No SASEs, no charges for awards.

•**K9WFN From Hines, Illinois** – In observance of Veteran's Week, members of the Hamfesters Radio Club, Inc., Chicago, will operate from Hines VA Hospital's Robert K. Wade (K9CDH) Memorial Ham Shack using the Hine's club call, K9WFN, from 1500Z to 0300Z on November 10. Operation will be on 40 and 20 meters, 2 meters FM, and 2 meters USB. Frequencies: 14.260, 7.60, 146.43 simplex, 144.210 USB. For a certificate, send QSL and 9" × 12" SASE, to: Hamfesters Radio Club, Inc., Chicago, c/o Robert K. Wade Memorial Ham Shack, Hines Veterans Administration Hospital, Hines, IL 60141.

• **Newington, CT, AFAR Net** - The Armed Forces Amateur Radio (AFAR) Net will operate from 0000Z November 10 to 2400Z November 11 to commemorate Veteran's Day 1985. Member stations will operate on the following bands: Phone 80 meters 3.870 kHz, 40 meters 7.283 kHz, 20 meters 14.325 kHz, and 15 meters 21.375 kHz; CW 40 meters 7.065 kHz. Certificate available for contact with any member station. Send SASE #10 envelope to WB1DWR #90, 16 Berkeley Circle, Newington, CT 06111.

• **Amateur Exams** - The MIT UHF Repeater Association and the MIT Radio Society offer monthly amateur exams. All classes Novice to Extra. Wednesday November 20 and December 18, 7 pm, MIT Room 1-134, 77 Mass Ave., Cambridge, MA. Reservations are requested two days in advance. Contact Ron Hoffmann at 617-253-5820 or 646-1641. Exam fee $4.00. Bring a copy of current license (if any), two forms of picture ID, and a completed form 610 available from the FCC in Boston (223-6609).

• **WA1NPO From Plymouth, Massachusetts** - The Whitman ARC will operate WA1NPO from the Plimoth Plantation museum on Thanksgiving Day, Nov. 28. Frequencies and times: CW (tentative) 1700–1900Z on 10.120 MHz; Phone 1600–1800Z on 7.290 MHz, 1300–1700Z and 1900–2000Z on 14.275 MHz, 1300–1600Z and 1800–2000Z on 21.375 MHz (all frequencies ± QRM). Certificate for 9" × 12" SASE or green stamp to WARC, P.O. Box 48, Whitman, MA 02382.

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

Nov. 2, **Hamfest Minnesota and Computer Expo,** Richfield, MN. Contact Clyde R. Green, NØDVP, 5406 Zealand Ave. N., New Hope, MN 55428.

Nov. 2–3, **Ham Radio and Computer Expo '85,** Lawrenceville, GA. Contact Alford Memorial Radio Club, P.O. Box 1282, Stone Mountain, GA 30086 (404-476-2944).

Nov. 3, **Jersey Shore Ham, Computer, Electronic Fleamarket,** Neptune, NJ. Contact Jersey Shore Hamfest, P.O. Box 192, West Long Branch, NJ 07764 (201-222-3009).

Nov. 6, **Chicago ARC Ham Auction,** Chicago, IL. Contact Chicago ARC, 312-545-3622.

Nov. 9, **AMSAT Space Symposium,** Vail, CO. Contact AMSAT Corp., P.O. Box 27, Washington, DC 20044 (301-589-6062).

Nov. 9, **Twin City Hamfest,** West Monroe, LA. Contact Benson Scott, AE5V, 107 Contempo St., West Monroe, LA 71291.

Nov. 9, **Newmarket Fleamarket,** Newmarket, Ontario, Canada. Contact Geoffrey Smith, VE3KCE, 7 Johnson Road, Aurora, Ontario L4G 2A3 (416-727-6672).

Nov. 10, **EARS Hamfest,** Rockford, IL. Contact EARS, Inc., P.O. Box 4291, Rockford, IL 61110.

Nov. 10, **Fort Wayne, IN Hamfest,** Fort Wayne, IN. Contact AC-ARTS Hamfest, P.O. Box 10342, Fort Wayne, IN 46851.

Nov. 16, **Stateline Club Hamfest,** Westwood, NJ. Contact Stateline Radio Club, P.O. Box 325, Montvale, NJ 07656, or call Fred, N2ATI, at 201-664-5320.

Nov. 23–24, **Southnet II Packet Radio Conference,** Atlanta, GA. Contact Bill Crews, WB2CPV, 1421 Hampton Ridge Rd., Norcross, GA 30093 (404-923-1978).

Nov. 24, **Auctionfest 85,** Massillon, OH. Contact Massillon ARC, P.O. Box 73, Massillon, OH 44646 (SASE).

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From: Everett L. Gracey, President

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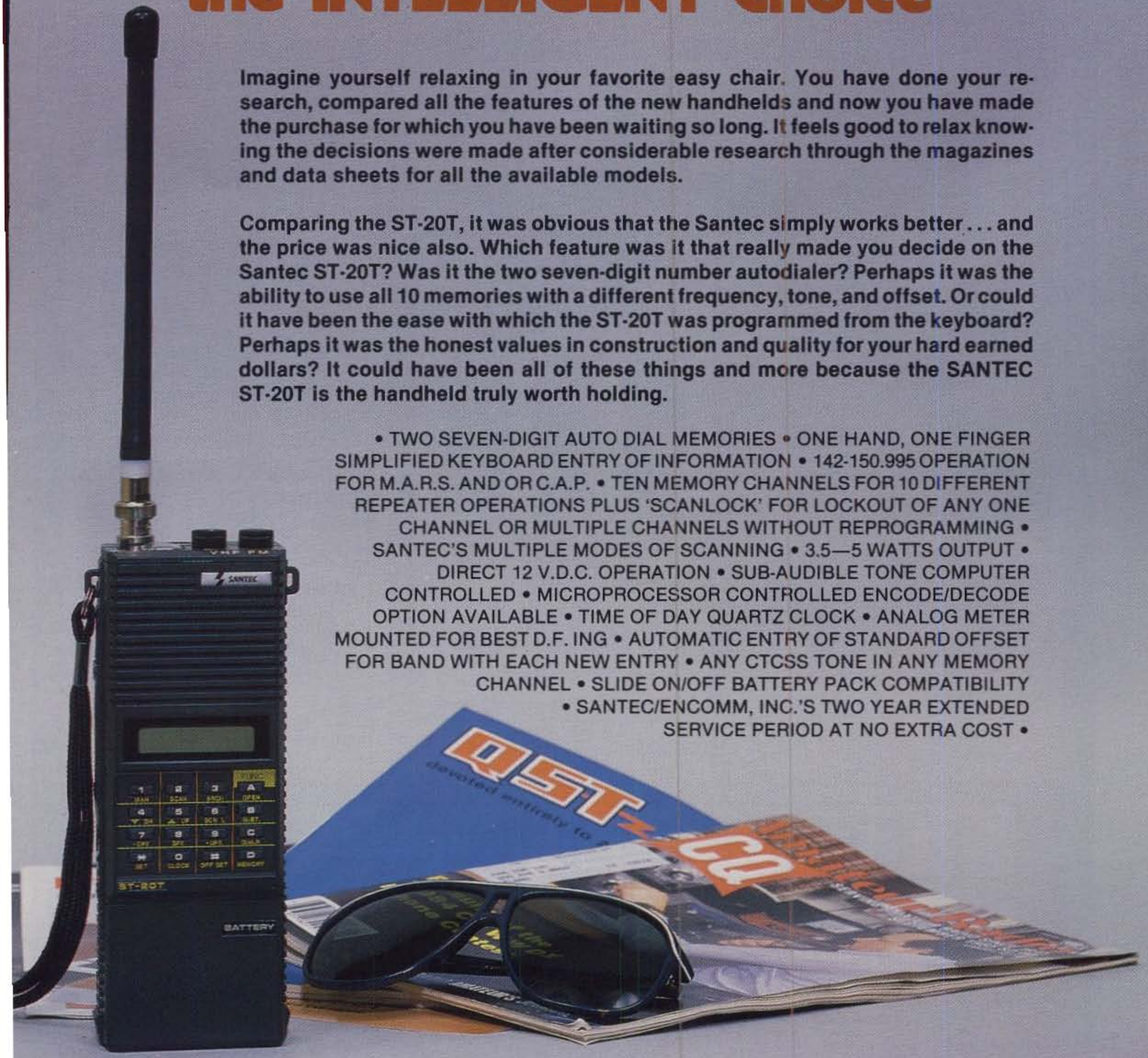

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"To make a long story short" usually means a tale that goes on for hours. "Briefly Speaking" comes in about half that length and is a primer on packet radio. It's a fascinating subject that's hard to condense and much easier to use than read about.

Briefly Speaking
Basic Amateur Radio Packet Radio

BY W. MAX ADAMS*, W5PFG

This article was sparked by my meeting Max at the Dallas HAMCOM this past June. Max was part of the local packet group who had a booth next to the CQ booth. The packet booth drew tremendous attention, and their simple display of packet operation was infectious. I asked Max to write this article in basic English, leaving out formulas and exotic schematics. It's just amazing to note that all of the things Max describes are going on pretty much automatically in that little black box that's suddenly become affordable.

—K2EEK

Amateur packet radio is simply digital sentences from your computer or terminal, *connected* to another amateur operator's computer or terminal, using amateur radio as the transmission media. These digital sentences can be ragchewing ham-talk, computer programs, emergency traffic, or other operator input. I have found packet radio to be as exciting as my first CW, AM, SSB, and FM contacts. I have also found a challenge to learn more about digital ones and zeros, just as I did when Morse code E's and T's were first formed into letters of the alphabet, then words, then sentences. I also recall an event that parallels my entry into the "kindergarten" of amateur packet radio.

Daddy Ham was teaching his two teenage boys the "code." His three-year-old "Lil-Dumplin" girl-child was hanging on his coat tail in her favorite manner. Daddy Ham was just finishing the first ten letters of the alphabet, for the um-t-umpth time.

"Ok, guys, are there any questions?"

"No, Pop!"

"No, Dad!"

"Yes, Daddie!"

"Whas that, Dumplin?"

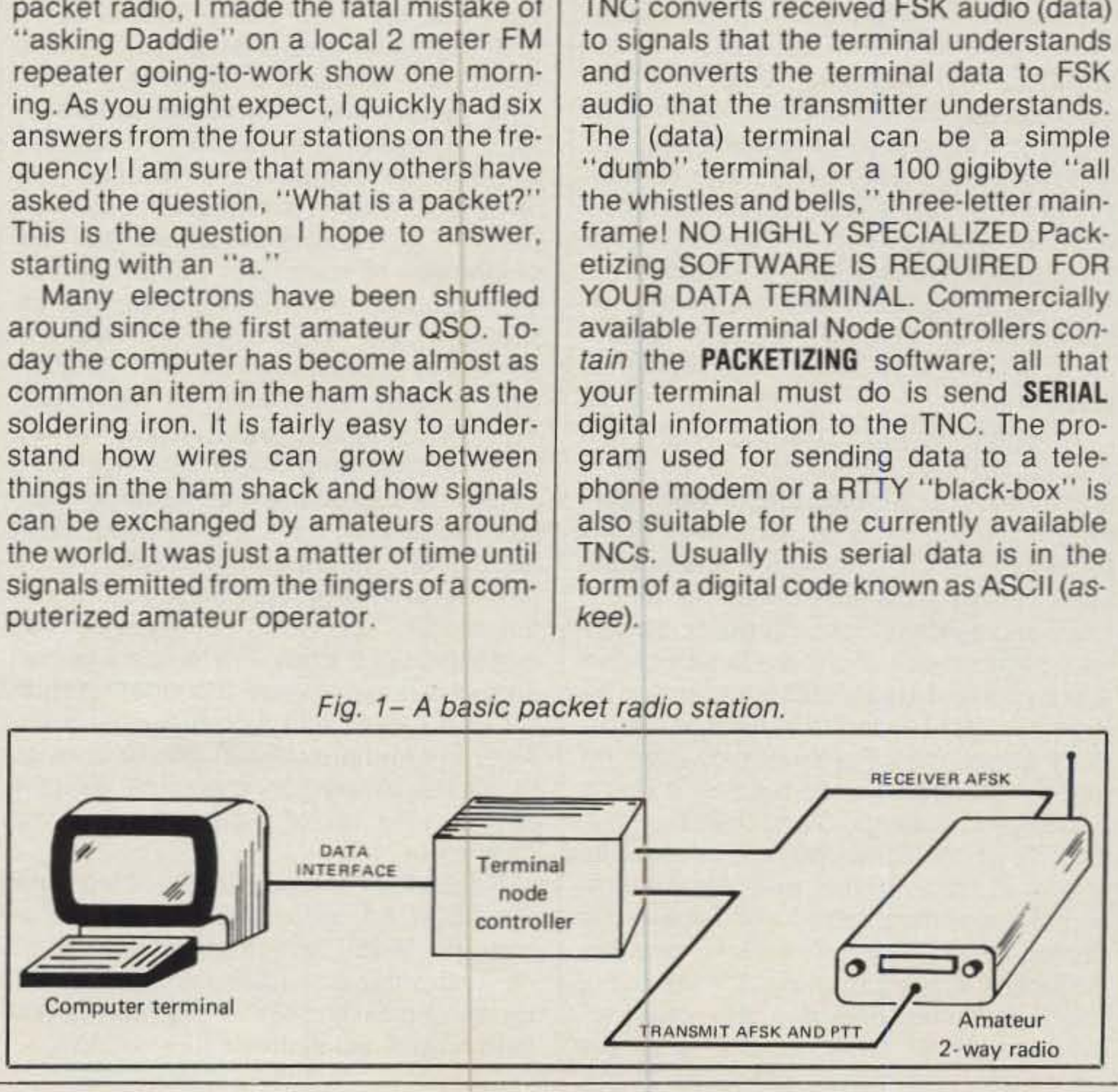
"Well Daddie, I know that DIT DAH is "a," but . . . what-sa "a"?

When I entered the kindergarten of packet radio, I made the fatal mistake of "asking Daddie" on a local 2 meter FM repeater going-to-work show one morning. As you might expect, I quickly had six answers from the four stations on the frequency! I am sure that many others have asked the question, "What is a packet?" This is the question I hope to answer, starting with an "a."

Many electrons have been shuffled around since the first amateur QSO. Today the computer has become almost as common an item in the ham shack as the soldering iron. It is fairly easy to understand how wires can grow between things in the ham shack and how signals can be exchanged by amateurs around the world. It was just a matter of time until signals emitted from the fingers of a computerized amateur operator.

Briefly speaking, an amateur packet radio station consists of three major components (see fig. 1): a two-way radio, a black-box known as a Terminal Node Controller (TNC), and a terminal (or computer). The two-way radio can be of the single-sideband (SSB) or frequency modulation (FM) variety—anything that will provide audio frequency shift keyed (AFSK) transmit and receive audio. The TNC converts received FSK audio (data) to signals that the terminal understands and converts the terminal data to FSK audio that the transmitter understands. The (data) terminal can be a simple "dumb" terminal, or a 100 gigibyte "all the whistles and bells," three-letter mainframe! NO HIGHLY SPECIALIZED Packetizing SOFTWARE IS REQUIRED FOR YOUR DATA TERMINAL. Commercially available Terminal Node Controllers *contain* the **PACKETIZING** software; all that your terminal must do is send **SERIAL** digital information to the TNC. The program used for sending data to a telephone modem or a RTTY "black-box" is also suitable for the currently available TNCs. Usually this serial data is in the form of a digital code known as ASCII (*askee*).

Fig. 1– A basic packet radio station.



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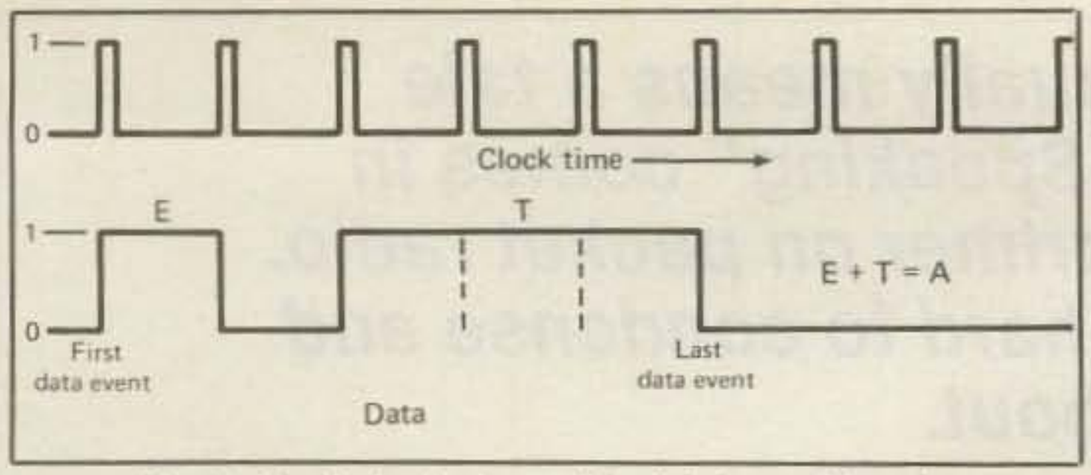

Fig. 2– Basic logic 1s and 0s (highs and lows).

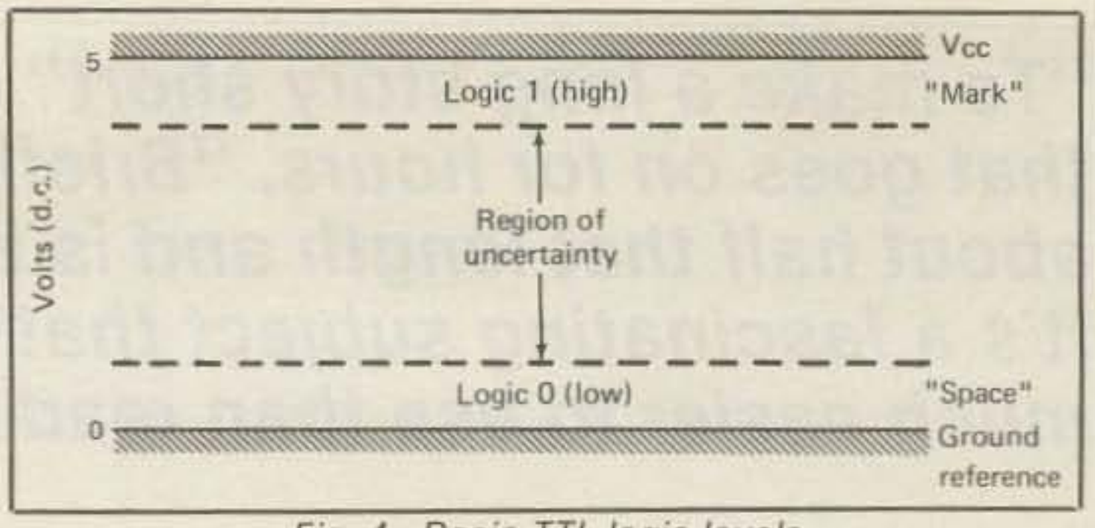

Fig. 4– Basic TTL logic levels.

Bit Number				Hex	6	0	0	0	0	1	1	1	1
					5	0	0	1	1	0	0	1	1
					4	0	1	0	1	0	1	0	1
				1st	0	1	2	3	4	5	6	7
3	2	1	0	2nd									
0	0	0	0	0		NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1		SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2		STX	DC2	"	2	B	R	b	r
0	0	1	1	3		ETX	DC3	#	3	C	S	c	s
0	1	0	0	4		EOT	DC4	$	4	D	T	d	t
0	1	0	1	5		ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6		ACK	SYN	&	6	F	V	f	v
0	1	1	1	7		BEL	ETB	'	7	G	W	g	w
1	0	0	0	8		BS	CAN	(	8	H	X	h	x
1	0	0	1	9		HT	EM	)	9	I	Y	i	y
1	0	1	0	A		LF	SUB	*	:	J	Z	j	z
1	0	1	1	B		VT	ESC	+	;	K	[	k	{
1	1	0	0	C		FF	FS	,	<	L	\	l	|
1	1	0	1	D		CR	GS	–	=	M	]	m	}
1	1	1	0	E		SO	RS	.	>	N	^	n	~
1	1	1	1	F		SI	US	/	?	O	_	o	DEL

ACK = acknowledge
BEL = bell
BS = backspace
CAN = cancel
CR = carriage return
DC1 = device control 1
DC2 = device control 2
DC3 = device control 3
DC4 = device control 4
DEL = (delete)
DLE = data link escape
ENQ = enquiry
EM = end of medium
EOT = end of transmission
ESC = escape
ETB = end of block
ETX = end of text
FF = form feed
FS = file separator
GS = group separator
HT = horizontal tab
LF = line feed
NAK = negative acknowledge
NUL = null
RS = record separator
SI = shift in
SO = shift out
SOH = start of heading
SP = space
STX = start of text
SUB = substitute
SYN = synchronous idle
US = unit separator
VT = vertical tab

Notes
1. "1" = mark, "0" = space.
2. Bit 6 is the most-significant bit (MSB), bit 0 the least-significant bit (LSB).

Fig. 3– The ASCII coded character set. (Reprinted with permission from the ARRL.)

You probably are now trying to decipher all these buzzwords into something that makes sense to you. To me, buzzwords, like cliches, are for the birds! However, it is almost impossible to be *Briefly Speaking* and not resort to a few commonly used, descriptive buzzwords. If I can just keep you reading a bit longer, I hope to define these buzzwords, or better yet, get your curiosity aroused so that you will start looking at some old magazines for better definitions than I am about to offer. So, somewhat like Daddy-Ham, to start with "a," let's take a *Briefly Speaking* look into the ones and zeros of digital electronics.

A signal voltage starting from the ground up can be caused to attain a higher level named **logic ONE** or **logic HIGH**. When this signal is at its lowest point (ground in fig. 2), it is named **zero** or **logic LOW**. Timing oscillators cause the digital ones and zeros to occur at precise intervals. Other electronic circuits can cause a logic one data signal to be separated by logic zero(s) at orderly intervals and in orderly sequences. For example, suppose that our electronic circuits causes a logic 1 followed by a logic 0 and then by three logic 1s at each clock bit time interval, as shown in fig. 2. In this example the first signal event transmitted and received is the logic 1 on the left. Our serial data signal flow is moving from *right to left* out of the transmitter and into the receiver. When received, other circuits "see" the logic ones as a DIT and a DAH, our letter "a."

In order to distinguish between an **a** and an **A**, the American Standard Code for **I**nformation **I**nterchange (ASCII) was developed. Included in the ASCII code were upper- and power-case letters of our English alphabet, numbers 0 through 9, and other combinations of ones and zeros to form special digital control characters. Fig. 3 shows the seven "bit" arrangement of ones and zeros used to form 128 different ASCII characters. Included in the ASCII code, a "byte" is formed to represent "nothing" (**SPACE**). This "nothing" character is "non-printing" and is used to separate our words. Other non-printing characters are used as control characters that allow the operator to "talk" to the software program in his digital "machine." The ASCII code also has several unique features that are not readily apparent. For example, by changing Bit 6 from a zero to a one, we change an upper-case alphabet character to a lower-case alphabet character. Also, the numeric characters (0 through 9) are the binary-coded-decimal (BCD—counting by two's) digital value of the character.

Because of its many universal features, the ASCII **A**merican **N**ational **S**tandards Institute (**ANSI**) and **I**nternational **S**tandards **O**rganization (**ISO**) standard code is widely used in small and large computers (and ham shacks) around the world!

The purpose of our packet radio terminal is to supply ASCII digital code representing the information we wish to send to the TNC. When a keyboard key is pressed, our terminal causes an ASCII coded character to be developed, usually as a standard **T**ransistor-**T**ransistor-**L**ogic (**TTL**) voltage level of about 0–5 volts (see fig. 4). Our terminal, previously "told" by "loading" a software terminal type program, delivers the data signals to an output "port" connector for "shipment" to another device. This port's pin-out has been standardized to provide interfacing with a wide assortment of data communication equipment. *Briefly Speaking*, the popular standardization process cannot be described easily. For example, from my data communication library books:

". . . the **E**lectronic **I**ndustries **A**ssociation (**EIA**) RS-232C is 'the' standard . . .," and "The proper name of RS232C is 'Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.' " Also ". . . like any standard, the purpose of RS232C is primarily as a reference for designers of equipment."

Therefore, before connecting your equipment, read the equipment's instruction book! Chances are that interfacing your equipment *will* be simple, but remember, Mr. Murphy is always lurking around every ham shack, ready to let that "little puff of smoke" out before you can pull the plug when something is wrong!

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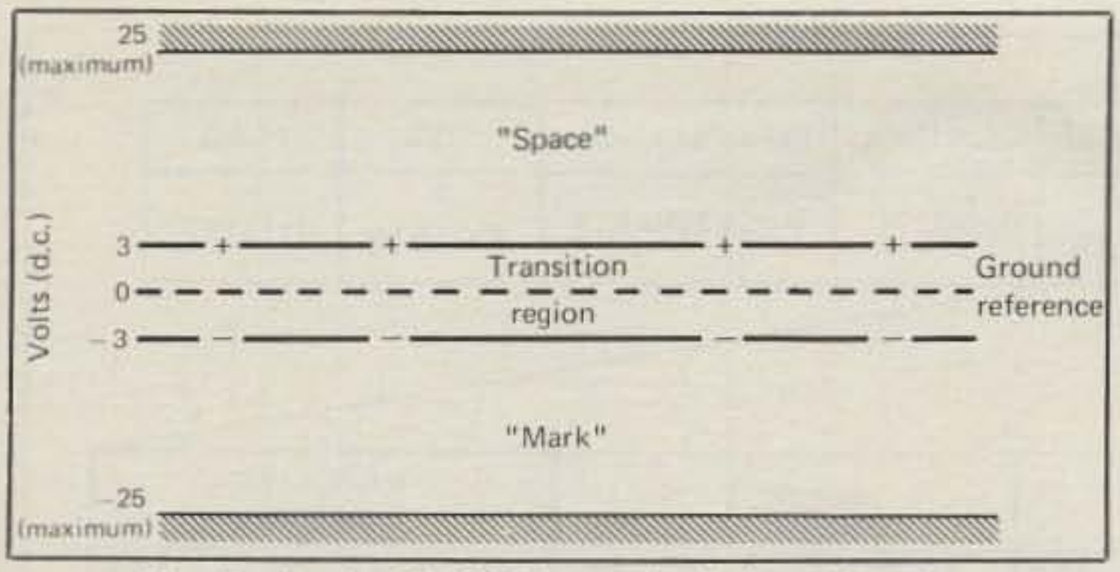


Fig. 5– Basic RS-232C standard signal levels.

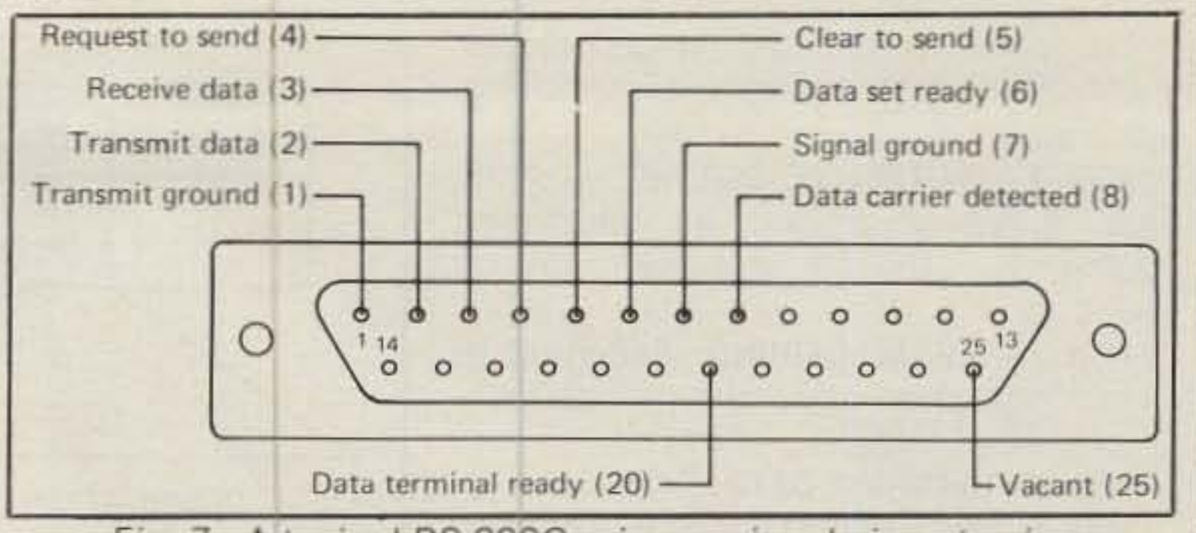


Fig. 7– A typical RS-232C primary signal pin-out using a DIN-25 type connector.

Briefly Speaking, the RS-232C standard defines the mechanical assignment of signals to the connector pins (the pin-out) and specifies provisions for identical "primary" and "secondary" interface circuits. The "primary" RS-232C connections are adequate for most amateur applications. Therefore, the "secondary" RS-232C connections will not be described here. However, before attempting to describe the RS232C standard interface, let's de-buzz a pair of buzzwords: **DTE** and **DCE**. Again, from my library book:

"**Data Terminal Equipment (DTE):** A computer or machine that provides data in the form of digital signals at its output."

"**Data Communications Equipment (also Data Circuit-terminating Equipment) (DCE):** The equipment that provides the functions required to establish, maintain, and terminate a connection, and provides the signal conversion required for communication between the data terminal equipment and the telephone line or data circuit."

The "hard-wired" interface between the data terminal and TNC is somewhat similar to the "air" interface between an RF transmitter (Tx1) and an RF receiver (Rx2). When considering the RS232C signal pin-out that follows, remember this relationship and the above Data Terminal Equipment (DTE) and Data Communication Equipment (DCE) definitions.

Data terminal logic ones and zeros, considering Transistor-Transistor-Logic (TTL), are defined in a "TTL standard," *Briefly Speaking*, as shown in fig. 4. For this example, consider logic zero to equal zero volts and logic one to equal five volts. Also, *Briefly Speaking*, consider logic one to be a **mark** (true) signal and logic zero to be a **space** (not true) signal. The RS-232C standard specifies its *own* mark and space voltage levels. The TTL data signal levels are "shifted" and "inverted" to satisfy the RS-232C standard shown in fig. 5. The positive and negative mark and space voltage levels passing through the zero reference voltage provide better noise immunity and are easily detected, thereby improving data validity. RS-232C signal description, signal mnemonic (abbreviation), and the connector pin-outs are shown in fig. 6. A pictorial view of a typical RS-232C connector is shown in fig. 7. Not all of the RS-232C signals are required to interface data equipment. *Briefly Speaking*, it is beyond the scope of this article to cover all the possible arrangements of RS-232C interfacing. I hope that the following notes will aid the first-time user of RS-232C to better understand his equipment.

•All RS-232C signal names are viewed from the Data Terminal Equipment (DTE) end of the interface circuit.

•The widespread use of a DIN-25 type connector, for RS-232C configured Input/Output ports, has made them an "assumed" standard connector. The RS-232C standard does not specify a particular type connector.

PIN NO.	CIA CKT.	CCITT CKT.	Signal Description	Common Abbrev.	From DCE	To DCE
1	AA	101	Protective (Chassis) Ground	GND	X	X
2	BA	103	Transmitted Data	TD		X
3	BB	104	Received Data	RD	X	
4	CA	105	Request to Send	RTS		X
5	CB	106	Clear to Send	CTS	X	
6	CC	107	Data Set Ready	DSR	X	
7	AB	102	Signal Ground/Common Return	SG	X	X
8	CF	109	Received Line Signal Detector	DCD	X	
9			Reserved			
10			Reserved			
11			Unassigned			
12	SCF	122	Secondary Received Line Signal Detector		X	
13	SCB	121	Secondary Clear to Send		X	
14	SBA	118	Secondary Transmitted Data			X
15	DB	114	Transmitter Signal Element Timing (DCE)		X	
16	SBB	119	Secondary Received Data		X	
17	DD	115	Receiver Signal Element Timing		X	
18			Unassigned			
19	SCA	120	Secondary Request to Send			X
20	CD	108/2	Data Terminal Ready	DTR		X
21	CG	110	Signal Quality Detector	SQ	X	
22	CE	125	Ring Indicator	RI	X	
23	CH	111	Data Signal Rate Selector (DTE)			X
23	CI	112	Data Signal Rate Selector (DCE)		X	
24	DA	113	Transmitter Signal Element Timing (DTE)			X
25			Unassigned			

Fig. 6– RS-232C signal descriptions.

The following RS-232C signals normally satisfy all data equipment interfacing requirements:

•**Pin 1—PROTECTIVE GROUND:** Use it! Also, properly ground all interfaced equipment. "The life you save may be your own."

•**Pin 7—SIGNAL GROUND:** Essential to circuit operation; the "return" connection for all SIGNAL signal lines.

•**Pin 2—TRANSMIT DATA** (TXD).

•**Pin 3—RECEIVE DATA** (RXD): The purpose of interfacing is for data communication by means of the TXD and RXD circuits.

•**Pin 4—REQUEST TO SEND (RTS):** When the Data Terminal Equipment (DTE) has data to send, RTS is asserted (TTL logic LOW). DTE then waits for a **Pin 5 CLEAR TO SEND (CTS)** response from the Data Communication Equipment (DCE) before any data is transmitted via Pin 2.

•**Pin 6—DATA SET READY (DSR):** The response from Data Communication Equipment (DCE) to Data Terminal Equipment that DCE is ready to receive data.

•**Pin 20—DATA TERMINAL READY (DTR):** Data Terminal Equipment (DTE) uses pin 20 to assert its readiness to transmit or receive data.

•**Pin 8—DATA CARRIER DETECTED (DCD):** Used primarily for telephone or hard-wired MODEM signaling.[1]

Briefly Speaking, we now are able to "talk RS-232C" to our TNC, a DCE device, with ASCII. (See what I mean about buzzwords?) KC5AJ once told me, "Know the buzzwords and you've got it made! But, just use a buzzword improperly and your 'dumb' hangs out real quick!"

Now, about **T**erminal **N**ode **C**ontrollers (**TNC**'s). The commercial TNC is a black box for appliance operators like myself. The task of making a "packet" of digital words is a complex process. By means of today's state-of-the-art electronics, tedious manual operations are reduced to a few millionths of a second. The packetizing process of building digital sentences can be accomplished by any good software programmer using simple equipment. The average amateur, like myself, usually does not have the digital code writing ability necessary to write a packet software program.

A new buzz word: **PROTOCOL**. The rules for communication between like devices.

The digital sentence (packetizing) program, stored in EPROM within the TNC, provides the "grammar" for our digital sentence structure. It is essential that a standardized protocol be used by all stations in order to exchange understandable information. A public data communications protocol standard was modified and adopted for amateur packet-radio use, and it is known as AX.25 Level 2 Protocol(2). The basic format of AX.25 is shown in fig. 8. *Briefly Speaking*, an AX.25 packet consists of six "frames" of digital data. Each packet (digital sentence) starts and ends with a "FLAG" frame and provides message synchronization. The start flag is sequentially followed by **ADDRESS**, **CONTROL**, **INFORMATION**, and **FRAME CHECK SEQUENCE** frames. The AX.25 address frame consists of "subframes" that provide digital information for DESTINATION station callsign, SOURCE station callsign, and "up-to-eight" REPEATER station callsigns. Refer to fig. 8 for other "bits" of digital data for special control and identification use. The **INFORMATION** frame contains the "text" of our message. The **FRAME CHECK SEQUENCE** is a digital data process used to verify the accuracy of each packet's information. Receipt of the second (ending) **FLAG** frame is recognized by the receiving TNC, and initiates the FCS verification. Only those packets that are verified by the FCS are sent to the terminal's display screen!

So let's take a *Briefly Speaking* look into the TNC installed between the computer and a 2 meter FM transceiver. The block diagram, shown in fig. 9, is typical and does not represent any particular TNC.

When power is first applied to the TNC, a software program contained in an **E**raseable and **P**rogrammable **R**ead **O**nly **M**emory (**EPROM**) taps its toe to get the microprocessor's packetizing heart-beat started. Some commercial TNC's use a **N**on-**V**olatile **R**ead **O**nly **M**emory (**NVROM**) to store about 60 operational parameters when the TNC power is turned off. Initially, these parameters are provided by the EPROM's software program and are known as the "default" operating conditions. The operator can change these default conditions to suit individual operating needs. Also, it is possible to originate and store short messages for both CW and digital "beacon" transmissions.

The TNC in this example uses an RS-232C port configured as Data Communication Equipment (DCE) and is connected to Data Terminal Equipment (DTE) as shown in fig. 10. The serial ASCII data is shifted from the RS-232C standard level to a TTL standard level, changed from serial to parallel data, and placed on the TNC's eight-line information (data) bus. A **R**andom **A**ccess **M**emory (**RAM**) is included to serve as a storage tank (buffer) when the data stream outruns slower operational events. Any information stored in the RAM is lost when TNC power is turned off.

Here again we have the buzzword

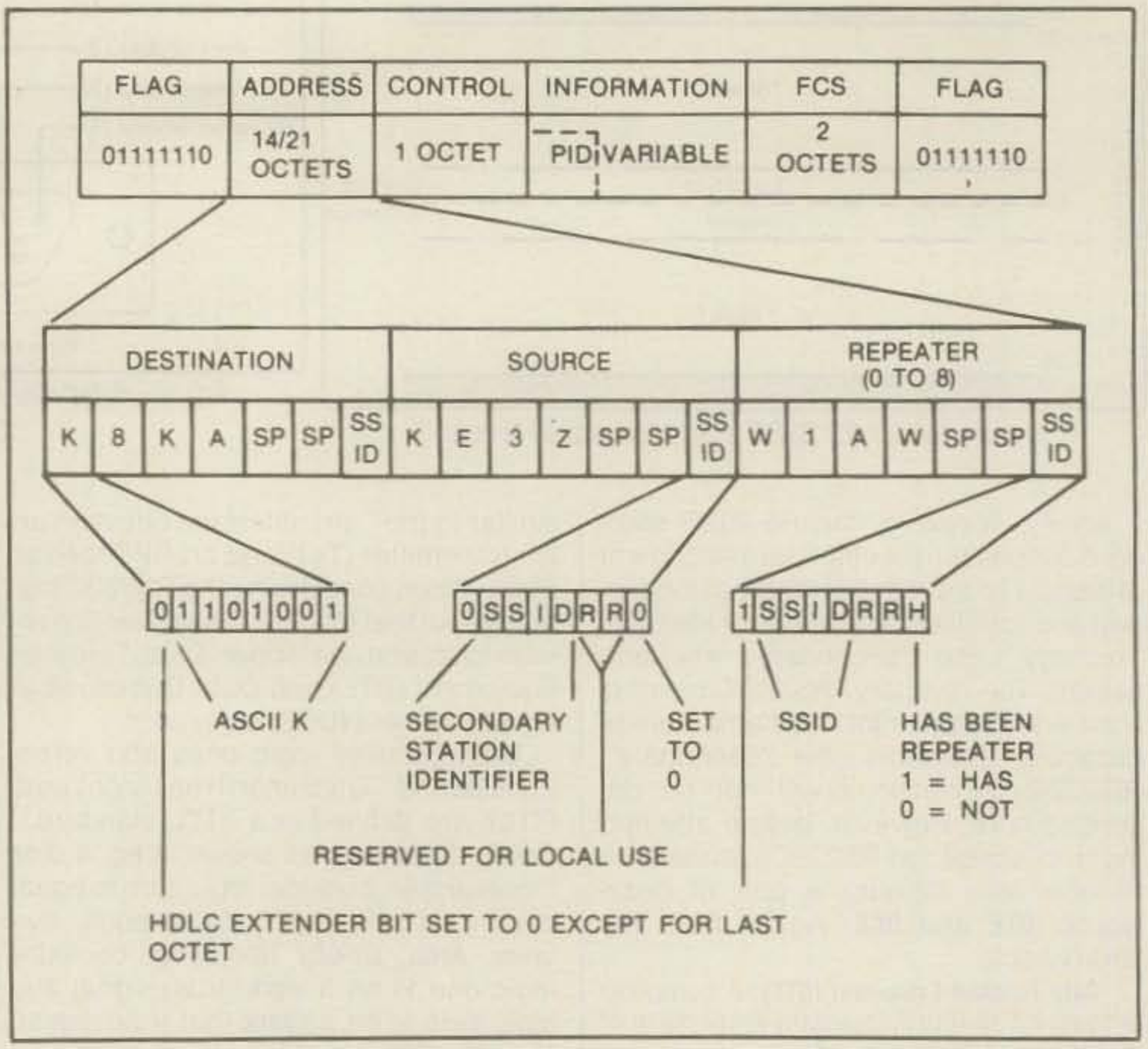


Fig. 8– An amateur radio AX.25 packet format. (Reprinted with permission from the ARRL.)

[1]*The RS-232C standard was initally established for landline communications standardization. Data communications between closely located (co-located) equipment may not require a Data Carrier Detected (DCD) signal. The availability of DCD is somewhat like the old saying, "... you can take your coat off if you don't need it, but it is hard to put on if you don't have it!"*

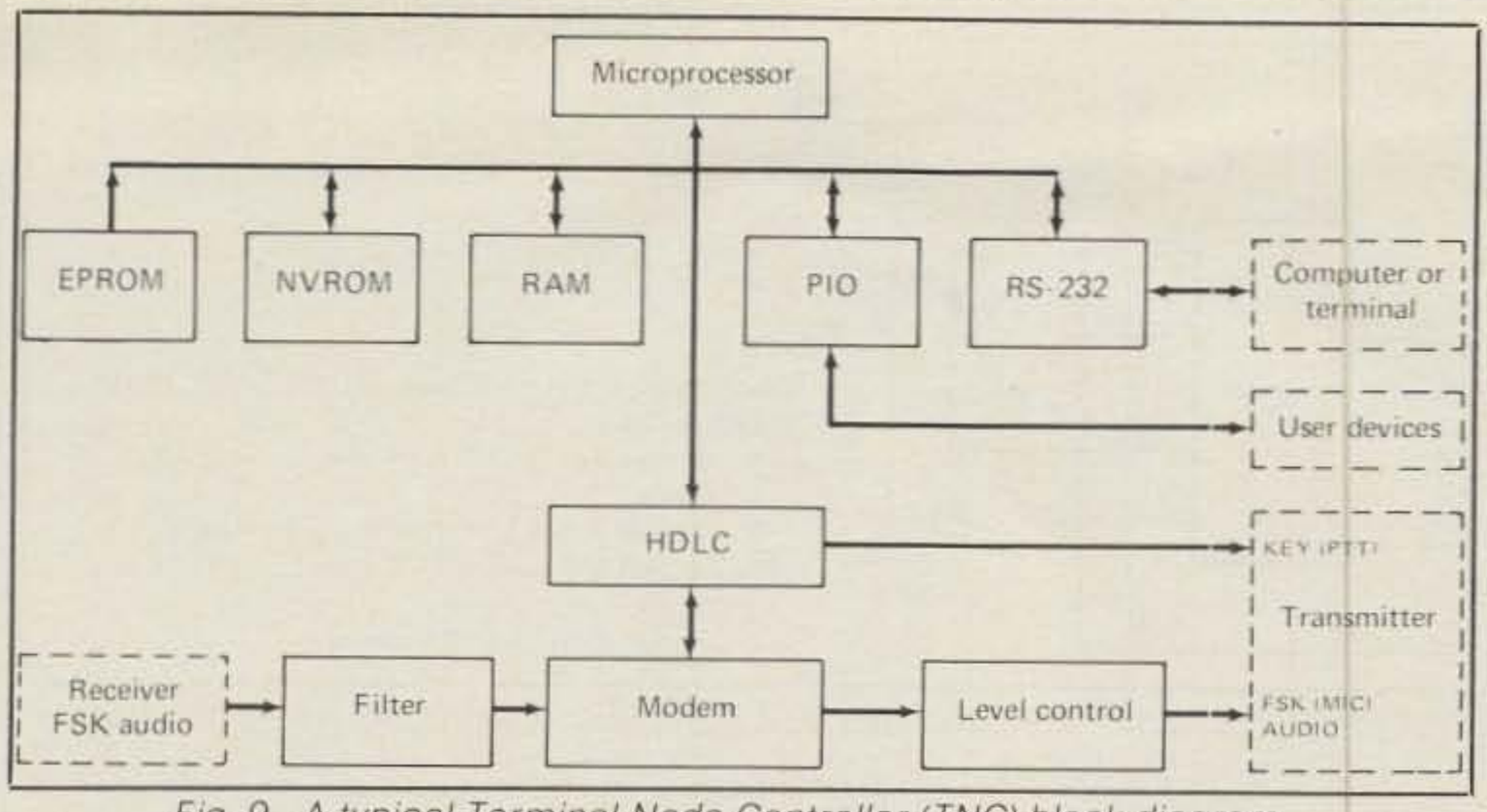


Fig. 9– A typical Terminal Node Controller (TNC) block diagram.

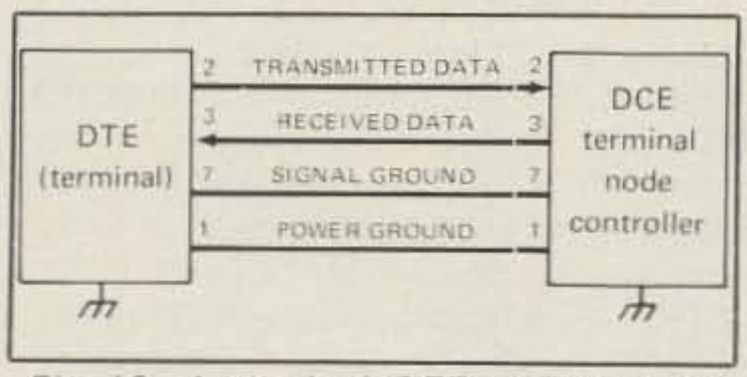


Fig. 10– A terminal (DTE) to TNC (DCE) RS-232C interface.

problem (**serial and parallel data**). **Serial data** is somewhat like a slow moving freight train. Each box car (one clock-bit time) carries cargo (logic one, or logic zero). If each boxcar is diverted to its own track, each unit of cargo (data) can travel **parallel** to all the other data from the serial train. Therefore, all the data "bits" arrive at the destination point (ciruit) at the same time. The use of **parallel** data increases the data handling speed approximately eight times without any change in system "clock time."

The serial to parallel "freight switching yard" is an electronic circuit known as a **UART**—now brace yourself—**U**niversal **A**synchronous **R**eceiver **T**ransmitter. The UART, in addition to changing the serial data to parallel data, interrupts the microprocessor program when data is placed on the information bus. In far less time than it takes to tell about it, the microprocessor enables, in this example, the **H**igh (level) **D**ata **L**ink **C**ontroller (HDLC) to perform some of its built-in functions. The HDLC compiles the information bus data into a serial data digital sentence, initiates a transmitter push-to-talk (PTT) command, and sends the serial data digital sentence to the TNC's Modem. The Modem modulator is keyed by the serial data stream and produces two frequency-shift keying (FSK) audio tones. When the entire packet is transmitted, the HDLC removes the PTT command, thereby enabling the transceiver's receiver to listen on the same frequency.

Received serial FSK packetized audio data is conditioned (demodulated) by the TNC's Modem and returned to the HDLC. The HDLC looks for its station's callsign imbedded in the packetized digital sentence. Only the TNC that finds its call as the destination station will generate an acknowledgement (**ACK**) packet. This ACK is quickly addressed and transmitted to the station of origin.

Included in the packetized digital sentence is a **F**rame **C**heck **S**equence (**FCS**) for data transmission and reception verification. The FCS is a complicated digital process that is easily accomplished using software-controlled microprocessing. *Briefly Speaking*, when the digital sentence is constructed, a unique FCS digital value is determined and appropriately imbedded in its dedicated place (frame) within the digital sentence; for this example let's call it FCS-1. The newly contructed digital sentence is temporarily placed in the TNC's Random Access Memory (RAM); the transmitter is turned on, and the packet is then transmitted.

The TNC at the addressed station creates FCS-2 from the digital information it receives and compares it to FCS-1, which was created at the station of origin from the original data. If FCS-2 digitally equals FCS-1, the receiving TNC acknowledges to the station of origin receipt of the information and releases the depacketized data for display on the terminal's screen. The station of origin, upon receipt of the addressed station's ACK, removes the last packet transmitted from its RAM, installs the next packet in RAM, and initiates a new transmission sequence. The process is automatic under software control and continues until such time that the operator terminates data input to the TNC.

Should the received information produce an FCS-2 that does not equal FCS-1, a "received" ACK is not returned to the station of origin. The station of origin then reads and retransmits the last packet (which was stored in RAM). This process continues until either the addressed station ACKs the packet or a predetermined number of "retry's" is reached by the transmitting TNC. When the transmitting TNC **RETRY COUNT** (is) **EXCEEDED** condition occurs, the TNC's software program initiates a ***** DISCONNECTED** routine, normalizing the TNC for other packet operator initiated commands.

Operator "inputs" to the TNC from the computer can also be either magnetic tape or disk data. There are some restrictions when sending data files with imbedded control or special-feature characters. Some TNC's provide a "transparent" mode that allows any ASCII input to the TNC to be transmitted exactly as supplied by the terminal equipment. Details of this mode of operation should be obtained from the applicable instruction manual provided with the TNC.

A new buzzword—**DIGIPEAT**—Digital Repeat (-er), (-ing): The use of another amateur packet radio station for the purpose of extending local area coverage beyond the normal communication range of the originating station.

Briefly Speaking, the AX.25 protocol (rules for communicating between like processes) includes a provision for relaying station assignments by the operator. For example, to directly contact another station the operator, using the keyboard, tells the TNC: "CONNECT MEXXX TO W5ZZZ". The operator enters: "C W5ZZZ" (followed by a carriage return

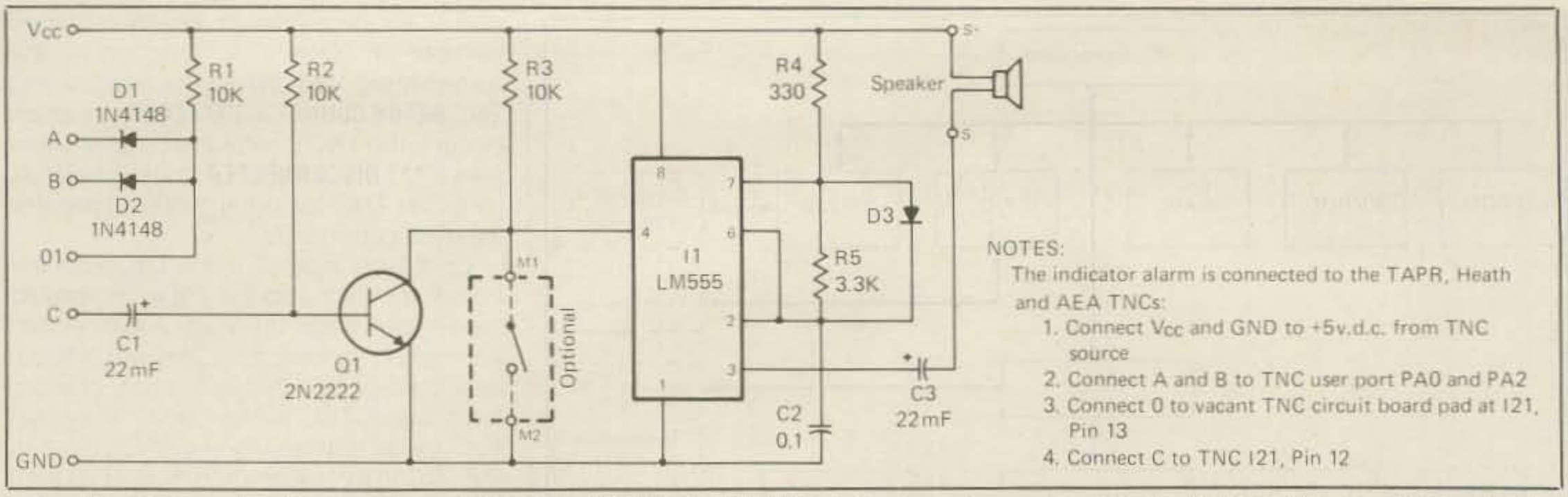


*Fig. 11– Schematic diagram for a TNC *** CONNECTED WITH indicator alarm. A complete kit including board is available from the author.*

<CR>). Provided there is a direct radio frequency "path," W5ZZZ's packet station is in the "Connect ON" (**CONOK ON**, for some TNC's) or not otherwise "busy," and both TNC's find equality in the Frame Check Sequence (FCS), a ***** CONNECTED WITH** condition is then set at both stations. Often the station we wish to contact is beyond normal simplex operating range, or is "in-an-RF-hole." The operator knows that "JOHAM" can always connect with W5ZZZ and decides to use JOHAM's packet station as a digipeater to extend his operating range. He enters: "C W5ZZZ V JOHAM <CR>." The MEXXX TNC recognizes that its operator wishes to digipeat through JOHAM to W5ZZZ and forms a digital sentence according to the operator's keyboard input. The TNC's PTT command keys the transmitter and sends the packet containing the digipeating instructions. JOHAM's TNC recognizes its call and MEXXX's instruction to digipeat the connect request to W5ZZZ. The MEXXX > W5ZZZ connect request packet is temporarily stored in JOHAM's TNC (in RAM). When the packet is complete, JOHAM retransmits the packet exactly as received (without performing any Frame Checking Sequence). W5ZZZ's TNC recognizes its call, approves the FCS, responds with a "*** CONNECTED WITH MEXXX" message to its terminal, and sends an ACKnowledgement through JOHAM to MEXXX. MEXXX's TNC responds with a "CONNECTED WITH W5ZZZ" message to its terminal equipment. The terminals are now available for information exchanges between the two operators using either keyboard or "stored" information input to their respective TNC's. The connection is terminated by any interruption in the transmission path. An interruption can be intentional (either operator initiating a "disconnect") or due to loss of a suitable radio frequency path.

Earlier I mentioned ***** CONNECTED WITH** . . . being written on the display screen. This requires frequent visual inspection of the display screen to know when your terminal is "*** CONNECTED WITH . . . ." A useful circuit (via WA6NVL, W6MNO, KD6MR, and "massaged" again by myself) provides a short "BEEP" connect tone and a continuous "*** CONNECTED" panel lamp indication. The circuit, shown in fig. 11, uses logic data and +5 vdc from the (TAPR, HEATH, and AEA) TNC. The beep connect tone can be silenced by connecting a SPST switch to circuit board terminals M1/M2. M1/M2 also can provide a positive true logic control signal for other devices or equipment.

Briefly Speaking, operation of your amateur packet radio station depends on not only FCC regulation, but also on good operating technique and local area protocol. A new frontier will soon be opened when orbiting and geosynchronous amateur packet radio satellites are in service. Satellite digipeating will shrink the amateur operator's digital world, placing highly accurate data thousands of miles away on your display screen and at your fingertips.

Bibliography

A lengthy bibliography can be compiled from the articles of the past several years. The following articles are readily available and very helpful to better understand amateur packet radio.

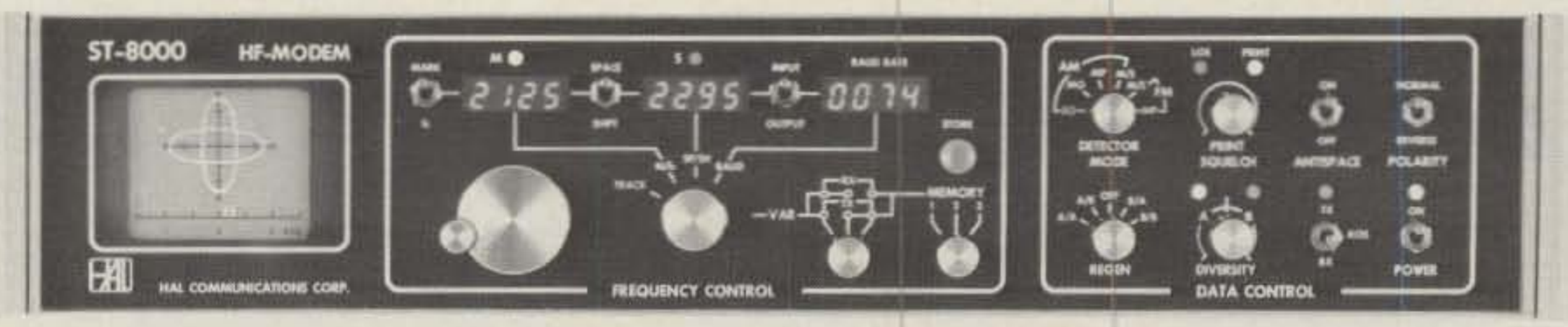
Lyle Johnson, WA7GXD: "Join the Packet-Radio Revolution, Parts I, II, and III," *73 Magazine*, Sept., Oct., Nov. 1983.

Terry Fox, WB4JFI: "AX.25 Level 2 Protocol," Proceedings of the Second ARRL Amateur Radio Computer Networking Conference, March 1983.

The ARRL 1985 Handbook.

"Understanding Digital Communications," Radio Shack Part No. 62-1389. CQ

ST-8000
HF-MODEM



The ST-8000 HF Modem is a high-performance, fully adjustable modulator/demodulator for use in high-frequency radio data systems. The HF Modem offers no-compromise performance to assure optimum RTTY and CW operation under all signal conditions. The user-friendly front panel and internal microprocessor make it easy to take advantage of the outstanding flexibility of the ST-8000. In addition to the fully adjustable frequencies and baud rates, memories, diversity, regeneration, print squelch, CRT tuning indicator, and multiple AM or FM detectors put a whole range of advanced signal processing techniques at your finger-tips. Connect the HAL ST-8000 to the DS3100ASR or other TTY terminal and extend your digital communications capabilities.

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- Set 10 to 1200 Baud in 1 baud increments
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- 32 matched Mark and Space filter bandwidths
- Mark and Space 7-pole linear phase LP filters
- Filter BW and selection computed and set by microprocessor front panel controls
- RTTY shifts from 40 to 3500 Hz
- Eight programmable non-volatile memories
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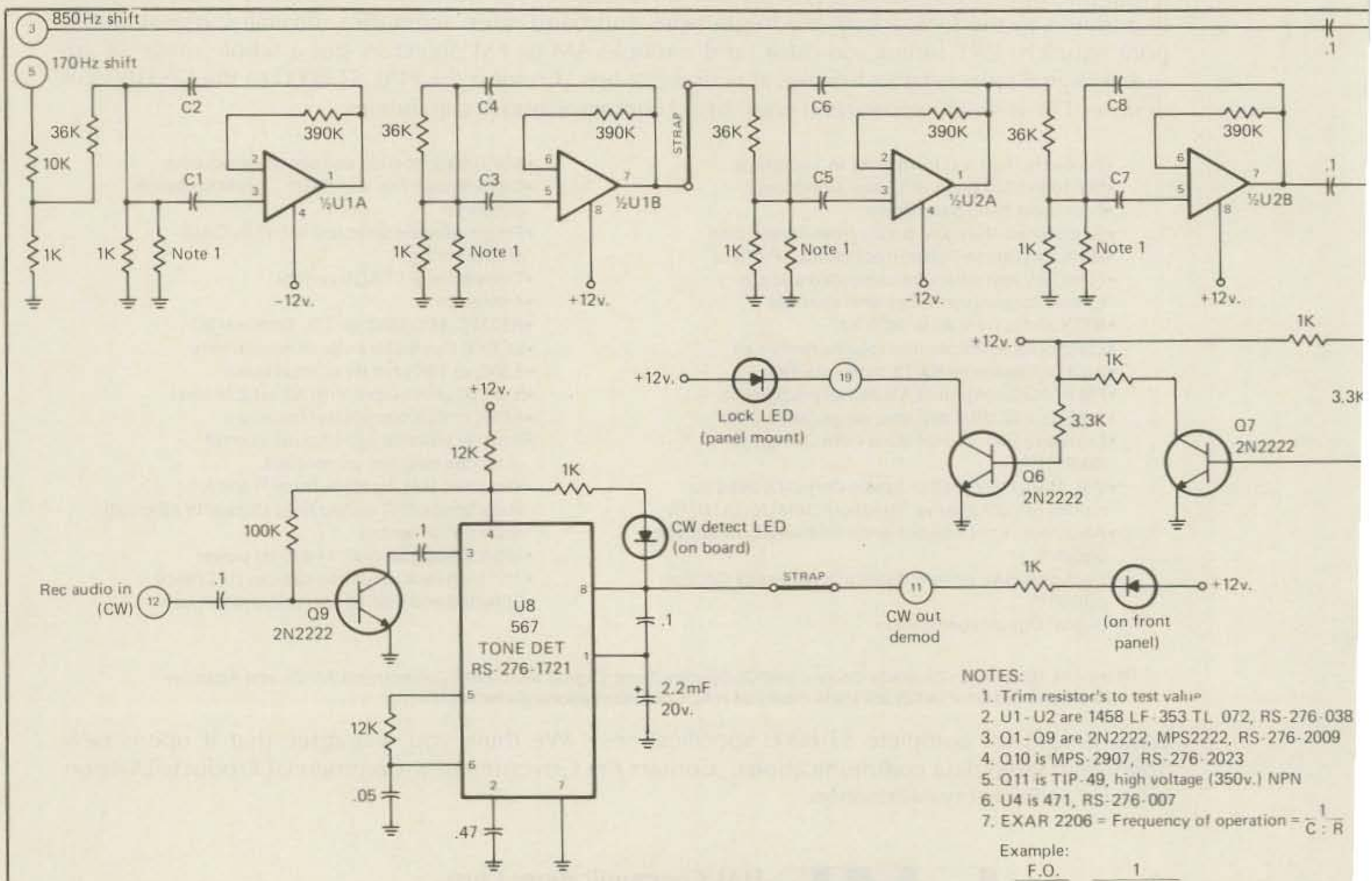
Here's a winter project that can be built in stages. In fact, you can build only those parts which you need and skip the rest. What you wind up with is a tailor-made RTTY converter that you had a lot of fun building.

Build Your Own Versatile RTTY Converter

BY C.L. HOUGHTON*, WB6IGP



NOTES:

1. Trim resistor's to test value
2. U1 - U2 are 1458 LF-353 TL 072, RS-276-038
3. Q1 - Q9 are 2N2222, MPS2222, RS-276-2009
4. Q10 is MPS-2907, RS-276-2023
5. Q11 is TIP-49, high voltage (350v.) NPN
6. U4 is 471, RS-276-007
7. EXAR 2206 = Frequency of operation = $\frac{1}{C : R}$

Example:

$$\frac{F.O.}{1702\,Hz} = \frac{1}{.047 : 12.5K}$$

Fig. 1– Schematic diagram of the versatile RTTY converter.

The design of the versatile converter is such that it can be used with mechanical as well as computer terminals. This unit is designed for loop keying, RS232, and TTL interfacing, making this unit indeed very versatile. Total interface operation can be utilized with this printed circuit board by appropriately optioning components to provide the desired operation. Active filters are utilized instead of the familiar toroidal filters to reduce system cost and weight.

Receive transmit switching is accomplished by the use of a C-MOS solid state switch. I also provided for CW detection on the printed circuit board as there was a little space left over and I just had to put it to use. I thought this circuit would be a very good addition to the total printed circuit package. RTTY reception and transmission is accomplished with two special function integrated circuits from EXAR Inc. These two devices contain over 85% of the circuitry, greatly simplfying the construction.

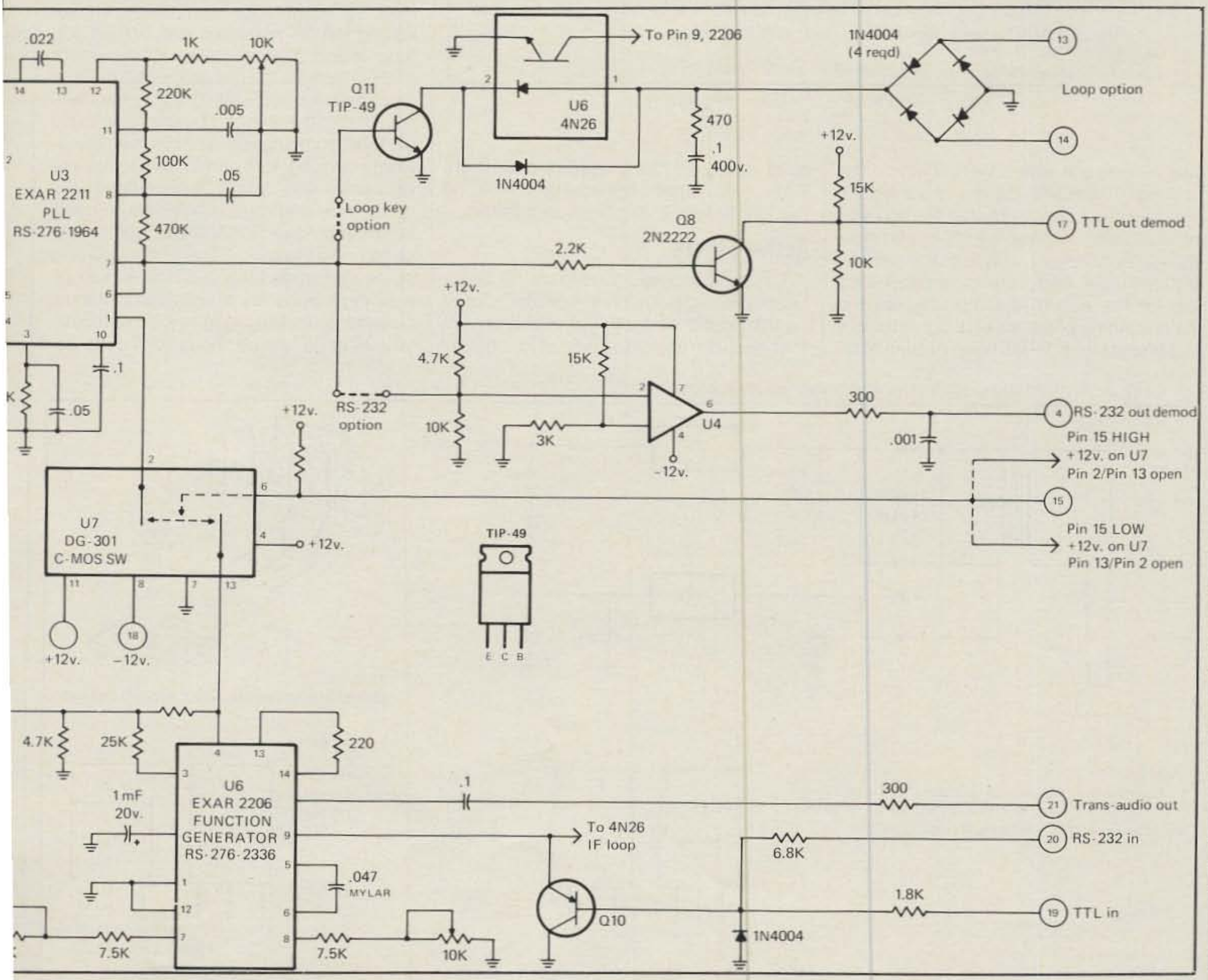
This converter was designed not to be the last word, but rather as a continuation in design changes reflecting modern techniques spaced in a wide-open fashion to enable the experimenter to make several custom changes to suit his own need. By using all of the design features provided on this printed circuit board, its use should prove to be quite versatile.

Some of the variations in design provide for splitting of the active filters into sections to provide for widely spaced frequencies. Additionally, portions of the printed circuit board can be built to provide for transmit tone generation, CW tone detection, audio filtering, and loop keying opto/isolator conversion. These options can be used all together or as separate items, depending on needs. The RS232 and TTL options can't be used together with the loop keying option. In this case it's an either/or option.

The system power supply was not constructed on a printed circuit board, as the components required are quite small. The transformer and associated parts were mounted on the cabinet bottom plate, which also came in handy as the heat sink for the voltage regulators. Fig. 3 outlines the methods that I used to tie the voltage regulators and the power supply together, simplifying its construction. The power transformer that I used was a surplus 24 volt 1.5 amp unit of good quality. Be careful, as some bargain-priced transformers for sale today are poorly constructed; they hum or heat up when operated for extended periods of time, making them a poor bargain. My transformer does not show any signs of heating after being in operation continuously. Choose your components wisely, purchasing new components and making use of your area swap meets or flea-markets to help hold down the total project cost. Construction of any project need not be expensive.

The diagram of the system in fig. 1 gives the complete package with all options shown. I did not provide a complete system detail, as this project was made to be universal. A description of my appli-

*6345 Badger Lake, San Diego, CA 92119



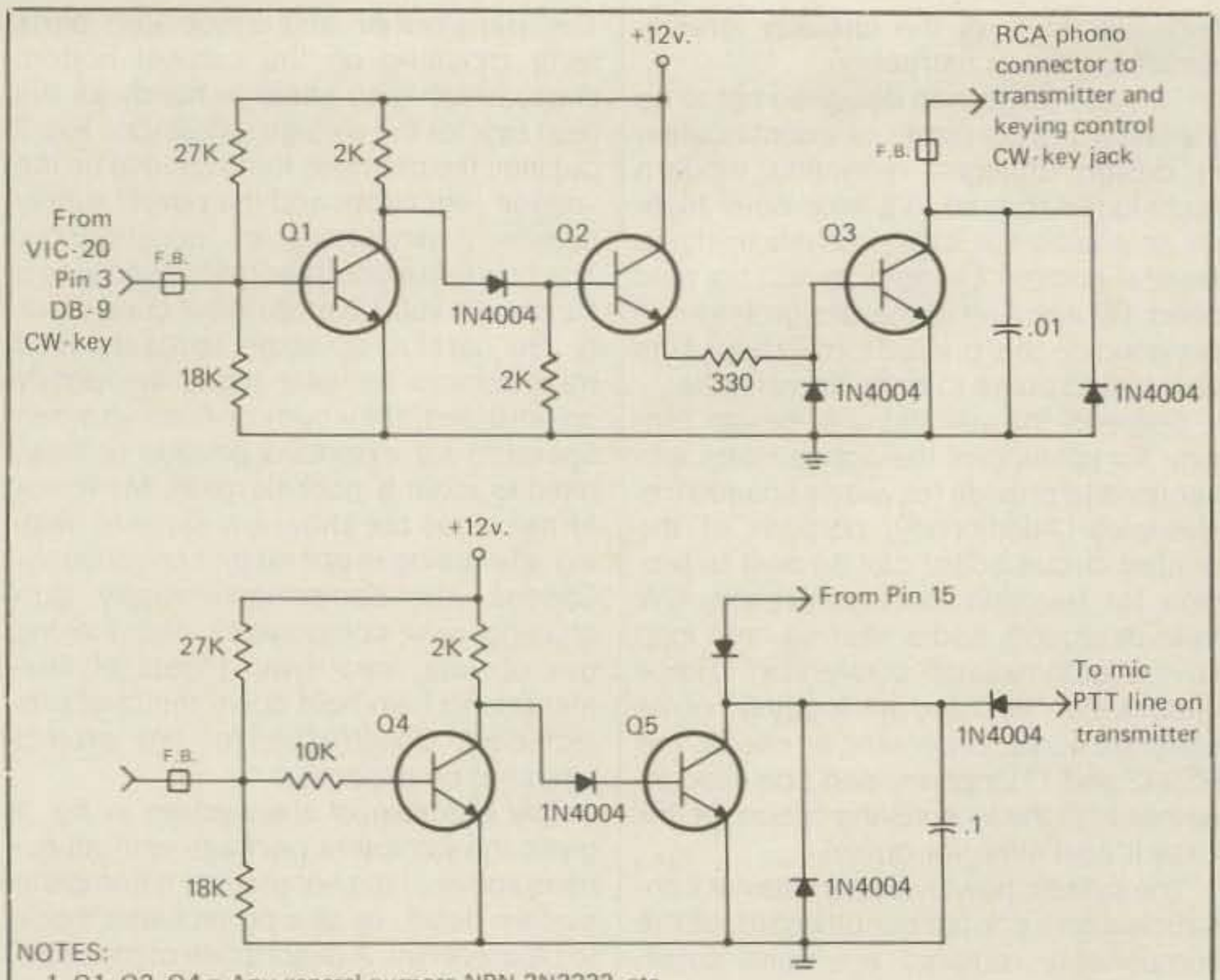


Fig. 2– Suggested interface circuits.

cations and use with a VIC-20 will be described. There will be many variations possible. Just construct that portion you intend to use, leaving the other component positions empty. I have made several of these units, and some have been used just for the active filter portion, leaving the remaining positions on the printed circuit board blank. It has been proven to be quite useful in many applications. I am sure that other applications will be thought of which can be incorporated.

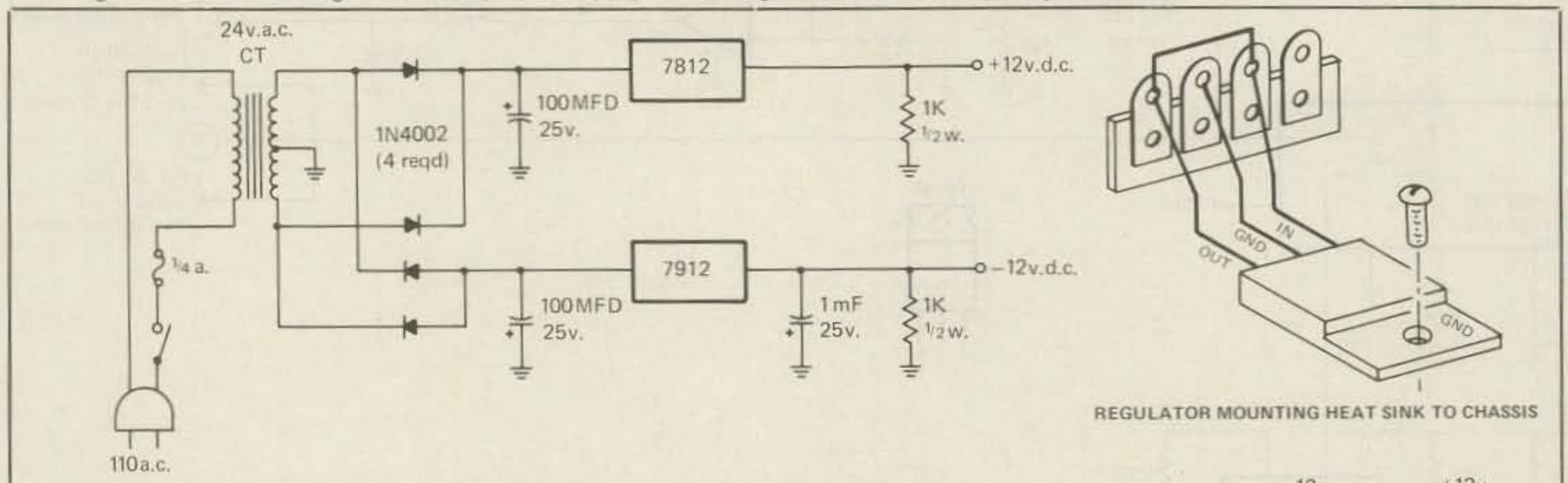
Active Filters

Construction was started on the active filters placing parts on the printed circuit boards and then testing them to ensure that each portion of the circuit functioned correctly. I prefer to build in this manner because you can trouble-shoot portions of the circuit instead of looking at the completed printed circuit board and then wondering what to do first. By working on each portion as you go along, each part is assembled and tested before you go on to the next portion. When you are done, interfacing any part with any other is quite simple. It should all work with possible minor problems instead of definite major ones.

I placed 1K resistors on the input network to ground of each active filter stage to facilitate testing. With these resistors in place, some frequency will resonate in the audio passband and the circuit will show continuity for the tuning adjustment step. I used 2125 Hz for the Mark and 2295 Hz for the Space frequency of my narrow filter. Using an audio signal source set to the center of the Mark and Space frequencies (I used 2210 Hz), the active filter can be tuned to the correct response.

I placed a potentiometer approximately 5K ohms across the first stage's 1K resistor and with 2210 Hz input to the active filter, tuned for maximum output by adjusting the 5K potentiometer. When you have found the adjustment of maximum output, remove the pot and replace with a fixed resistor duplicating the value measured from the 5K pot. The resulting value of this combination should be somewhere around 400 ohms. This value will vary from unit to unit depending on the capacitors and other components used. When you have finished this stage, proceed on to the next stage and repeat the same operation for this stage and all remaining stages. By making careful measurements and using precision resistors, your filter passband should look quite uni-

Fig. 3– Schematic diagram for the power supply. Mounting data for the voltage regulator are shown in the mechanical.



HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	849.00	**749.95**
PS-55 External power supply	160.00	**144.95**
AT-150 Automatic antenna tuner	349.00	**314.95**
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	**779.95**
PS-35 Internal power supply	160.00	**144.95**
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
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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**
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SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	

IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	**1199**
PS-35 Internal power supply	160.00	**144.95**
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	
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RC-10 External frequency controller	35.00	
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IC-720A 9-band xcvr • **(CLOSEOUT)** •	1349.00	**749.95**
PS-15 20A external power supply	149.00	**134.95**
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FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
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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	5.50	
SP-3 External base station speaker	49.50	
SP-5 Remote speaker for mobiles	25.00	
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	
AT-100 100W 8-band auto. antenna tuner	349.00	**314.95**
AT-500 500W 9-band auto. antenna tuner	449.00	**399.95**
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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	699.00	**599.95**
EX-106 FM option	125.00	**112.95**
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25W 2m FM/SSB/CW	699.00	**569.95**
AG-20 Internal preamplifier*	56.95	
IC-271H 100W 2m FM/SSB/CW	899.00	**759.95**
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AG-1 Mast mounted preamplifier*	89.00	
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PS-15 External power supply	149.00	**134.95**
SM-6 Desk microphone	39.00	
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TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	

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IC-490A 10W 430-440 SSB/FM/CW	649.00	**579.95**

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IC-27H Compact 45W 2m FM w/TTP mic	409.00	**359.95**
IC-37A Compact 25W 220 FM, TTP mic	449.00	**299.95**
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Accessories for both models	Regular
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HS10 Boom microphone/headset	19.50
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ML-1 2m 2.3w in/10w out amplifier	**SALE 79.95**
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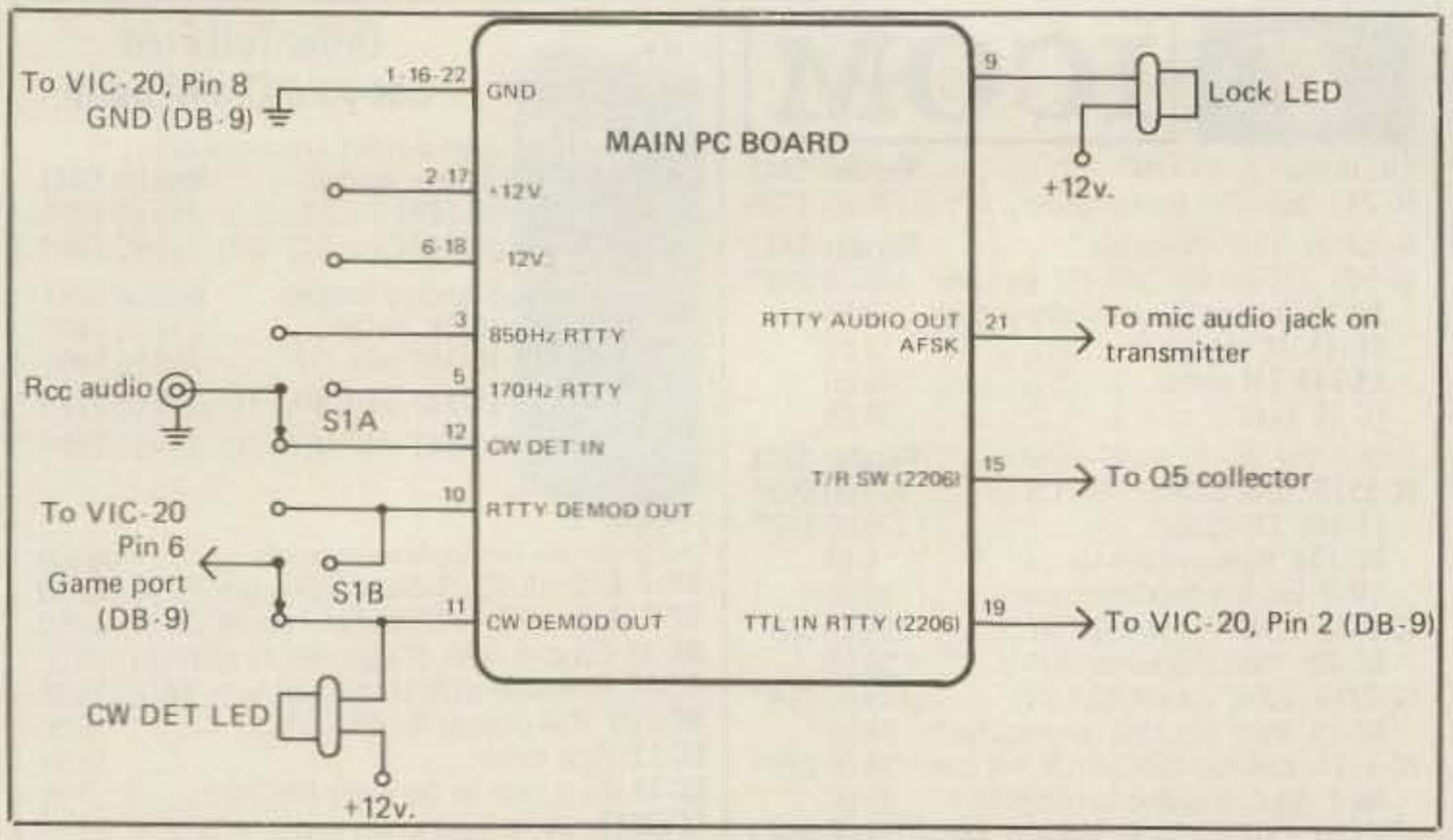


Fig. 4– The system run list for the main board.

form, to both the Mark and Space tones, and provide rejection to out-of-passband signals.

For increased circuit "Q" you can replace the 1458 op-amps with one of several high-impedance devices. The two types that I recommend are the TL-072 low noise, and the LF-353 J-FET dual op-amp replacements. They are pin-for-pin compatible and require no circuit changes. Both devices have an input impedance of approximately ½ megohm. For wide-band input to the detector the active filter is bypassed. Do not tie a second receive source to the input while using the narrow input. I suggest you switch the audio input to prevent a second path for signals. You could use a single-pole triple-throw switch (rotary) having three inputs to the unit: (1) 170 Hz narrow, (2) 850 Hz wide, (3) CW.

Receive Demodulator, PLL

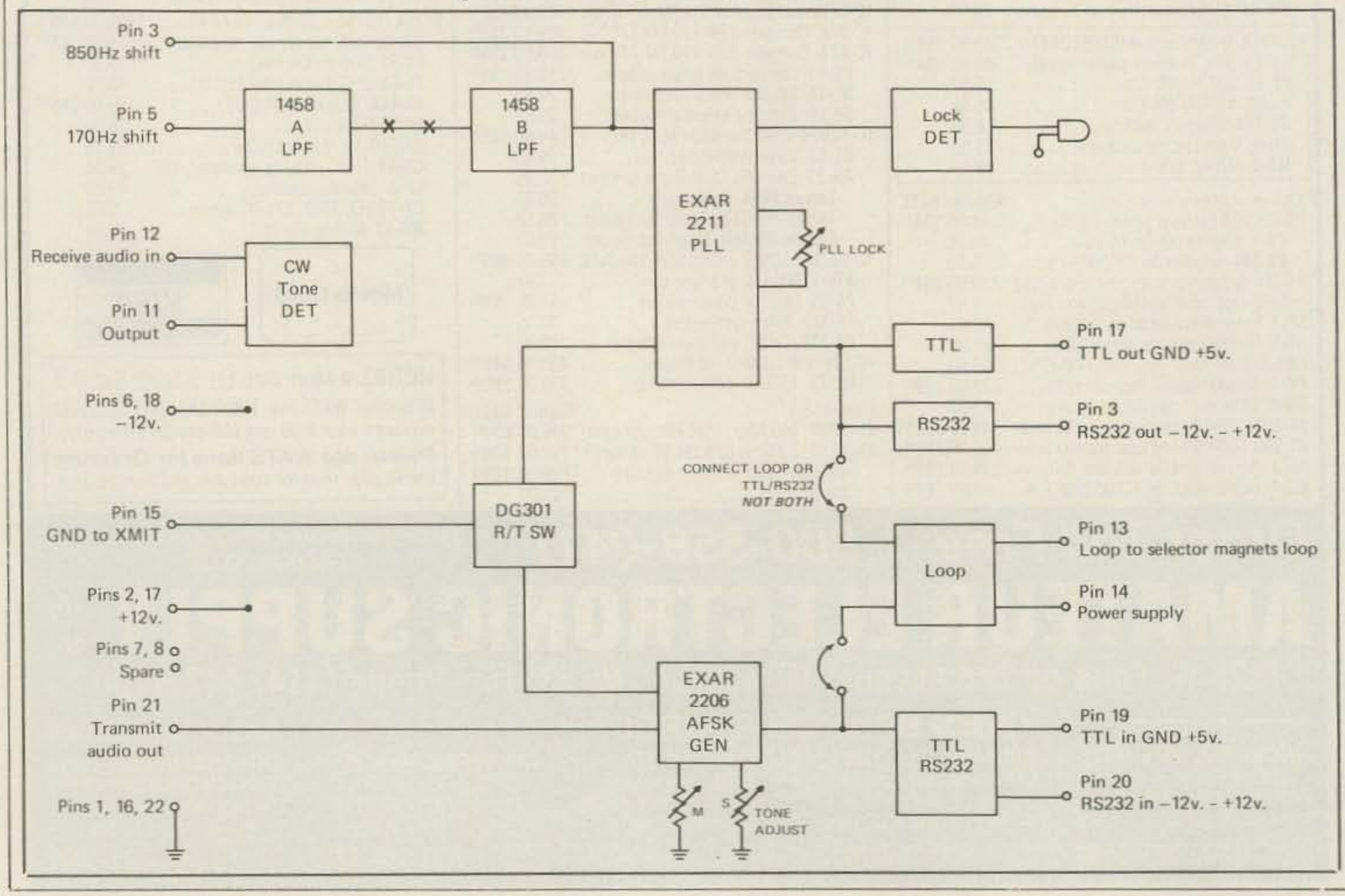
With the active filter installed and adjusted, construct the receive demodulator next. Install the transistors for the receive lock LED, the PLL (EXAR 2211), and the 741 op-amp, assuming you want RS-232 output. To adjust the EXAR 2211 receive phase lock loop, connect a oscillator to the desired Mark frequency. I used 2125 Hz. Adjust the 10K pot on pin 11 (2211) for the center of the lock indication (lock LED will be extinguished). Make no adjustment for Space frequency, as the internal voltage-controlled oscillator part of the phase-lock-loop will track the space frequency automatically.

The internal circuitry of this device is quite complex, but operation of the EXAR 2211 is quite simple. This LED lock adjustment is the only adjustment needed to put the receive demodulator into operation. TTL output is obtained by the use of a voltage divider, a 15K and 10K resistor, tied to positive 12 volts. With the keying transistor off, the 10K resistor should have about +5 VDC applied to card edge connector pin 17. The 15K resistor serves as the voltage drop resistor from the 12 volt bus. When the transistor is turned on, this point (pin 17) is pulled down to ground, or very near zero volts.

RS-232

The RS-232 portion functions in a similar manner with the 741 op-amp providing output of positive or negative 12 volts, depending on keying input conditions. The resistor network on the input pin 3 of

Fig. 5– A block diagram of the whole system.



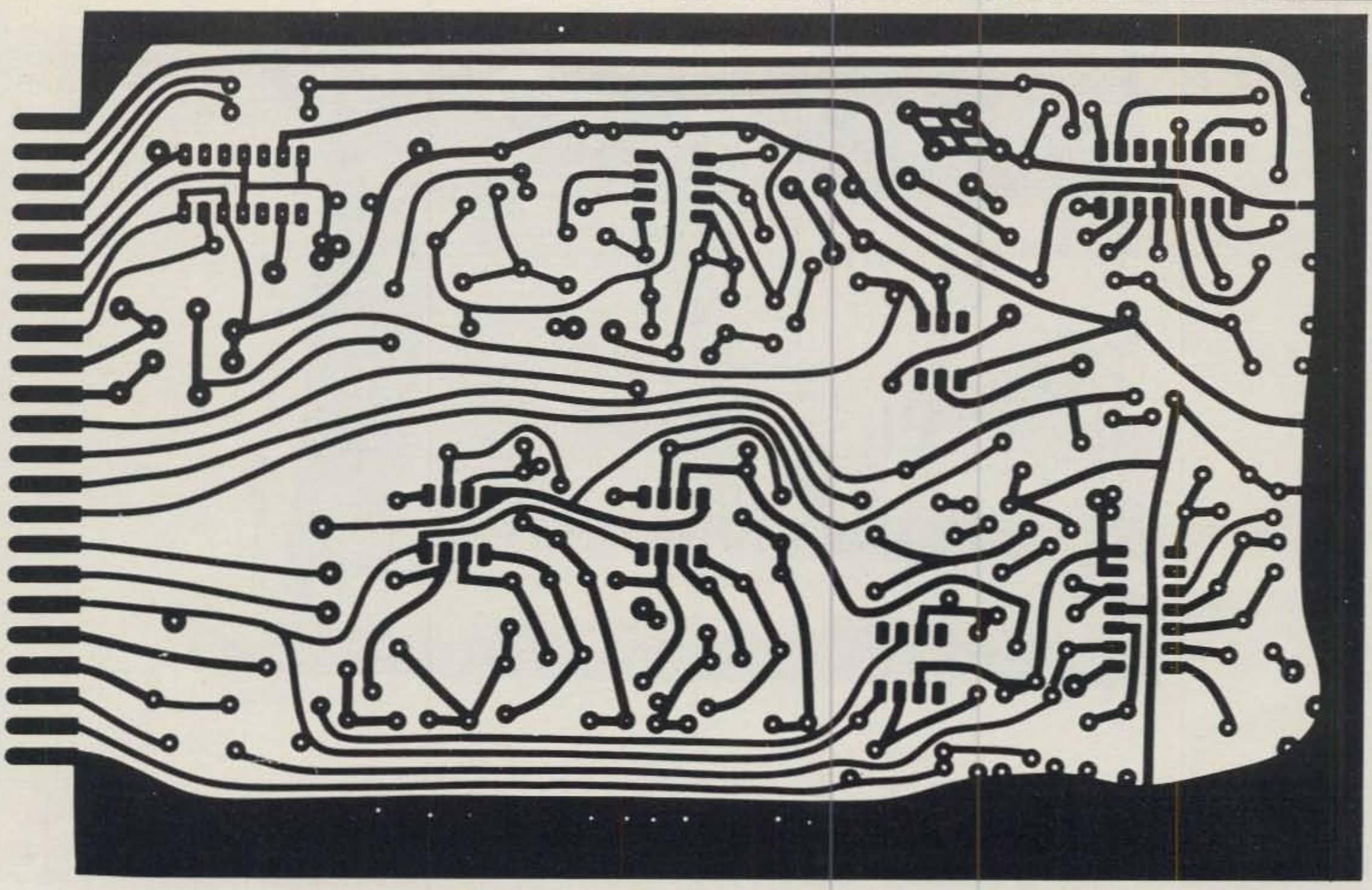
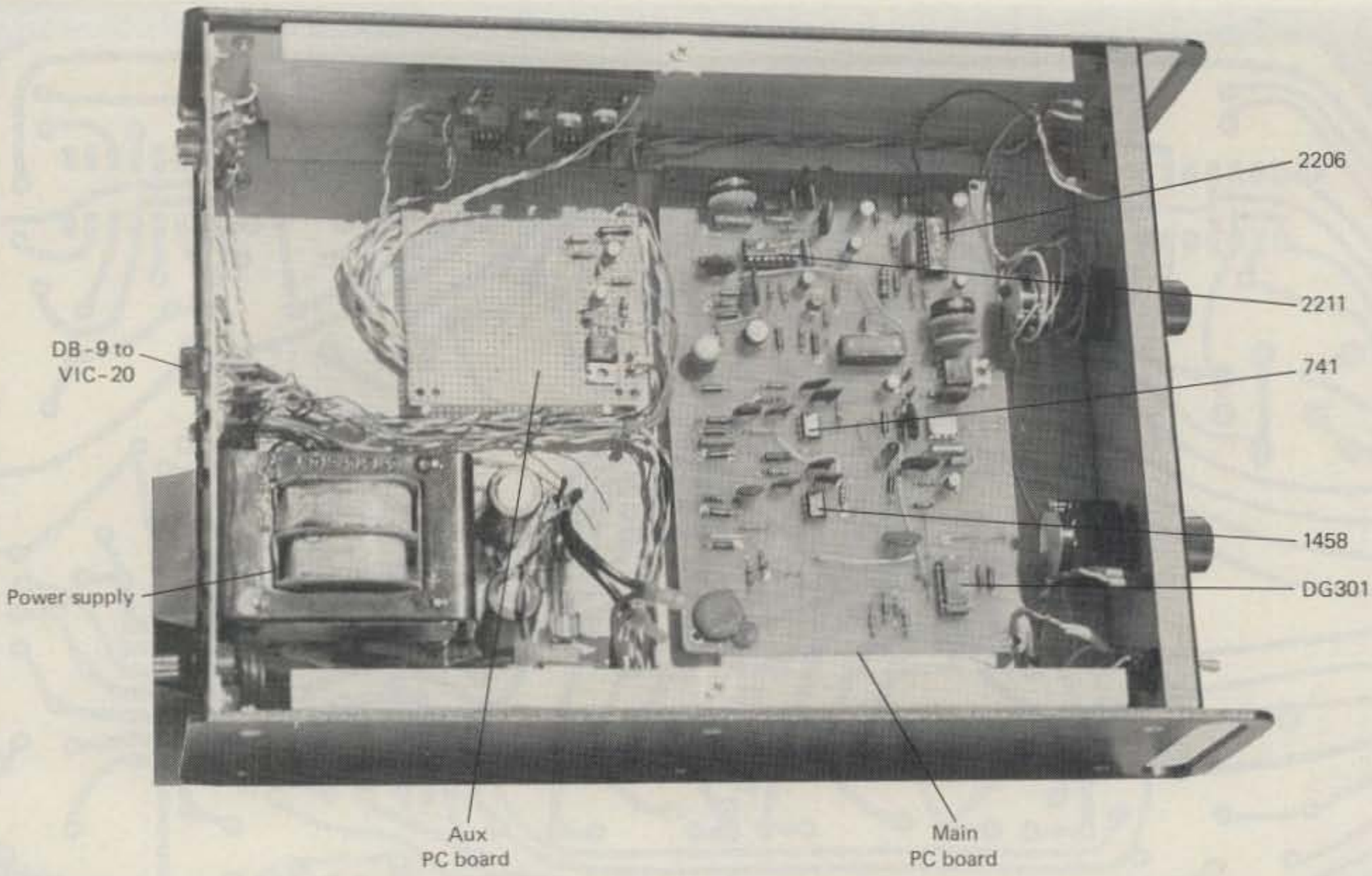


Fig. 6– Full-size PC board artwork shown from the foil side.

Fig. 7– Parts placement for the main board as seen from the component side.



A view of the completed versatile RTTY converter.

the 741 sets the threshold operating point of this circuit. It is made up of two resistors forming a voltage divider of 15K and 3K ohms from the positive 12 volt supply to ground. The resistors on pin 2 of the 741 op-amp (the 4.7K and the 10K) hold pin 2 high in reference to pin 3. When the input from the EXAR 2211 pin 7 is keyed low, pulling the 741 pin 2 now lower than pin 3 of the 741 op-amp, the output is shifted from its positive output to negative 12 volts, thus RS-232. During normal operation the device can be looked at by providing a high average positive output, but on receive data, the negative output is a very fast pulse. Most meters will not show it; use an oscilloscope.

CMOS Switch

The CMOS switch does not have to be used. It was just placed on the board in an attempt to completely solid state this circuit without the use of relays. It could simply be replaced with a toggle switch or relay, depending on your requirements.

AFSK Generator

Next, wire the circuitry of the EXAR 2206 function generator. However, some builders who do not have an audio oscillator might want to construct this circuit first. It can be used to supply the tones mentioned in the alignment of the active filters and receive detector. The frequency would have to be adjusted in each case, but it could be done. It would obviously be easier to have the test equipment, but it is not necessary. To adjust the EXAR 2206 function generator (oscillator), switch over the receive-transmit line by grounding card edge connector pin 15. This applies 12 volts to the EXAR 2206 chip. Connect a frequency counter to pin 7 (2206) for proper Space frequency. I used 2295 Hz. Then ground pin 9 (2206) or pull down the TTL or RS-232 inputs. Adjust the 10K pot connected to pin 8 (2206) for proper Mark frequency (I used 2125 Hz).

As a note of interest, the EXAR 2206 is capable of providing several types of waveforms. By lifting the resistor (220 ohms) on pins 13/14 (2206), a triangular waveform will be obtained. A square-wave output is available on pin 11 (2206). Neither of these options is used in the ap-

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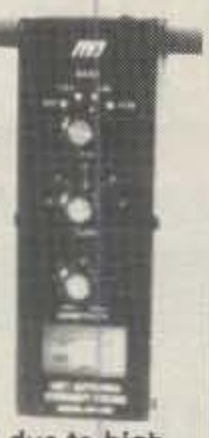

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plication. Sinewave output is the proper mode of operation.

CW Detector

Assembly of the CW detector is next and is straightforward. Operation of this detector has been used to 35 wpm. I suspect that this limit is more in the software program than in this device. The LED on the tone detector is used as a tuning indicator and will flash on and off following the input signal. With the component values provided, the tone-detect frequency is approximately 1200 Hz. By selecting different values of resistance and capacitance the tone frequency can be changed to meet your needs. Increasing the values of the 12K resistor and the .47 Mfd capacitor will lower the detect frequency.

The printed circuit board assembly is straightforward, and most components are very close to the devices with which they are used. Do not stuff the entire board with parts and then sort out the options you desire. For example, if you do not require the loop operation, the bridge rectifier, 4N26 opto-isolator, TIP-49 power transistor, and associated components need not be used. Refer to fig. 4, for the parts placement information. There are about ten straps needed, depending on options, to finish the printed circuit board.

The design of the unit is the result of many inputs, including help from EXAR Inc. Their technical publications were most helpful. Our main purpose in constructing this unit was to place on one printed circuit board the components and circuitry needed to interface with various modes of operation.

With the wide use of modern video terminals and older electro-mechanical RTTY machines I was unable to find a converter capable of interfacing with all modes of operation without severe modifications. In this light I have placed on one printed circuit board all circuitry needed for any operation in use today. I am sure that with even more tinkering other items could be incorporated on this board. It's just a starting point.

Applications In Use With A VIC-20

I will describe my direct application on interfacing the RTTY pc board with a VIC-20 computer. While the connections will be different from computer to computer, the principles will be the same.

In addition to the main printed circuit board I added a small hand-wired adapter board to contain the CW transmitter keying circuit (three transistors), and a two-transistor interface circuit to key the transmitter on RTTY (push-to-talk keying lead). Leave ample room on this board for any other circuitry needed to interface your computer to the CW/RTTY radio equipment. These interface circuits are simple and can be hand-wired in a few minutes using perf-board that can be bought at any Radio Shack store. You could even use terminal strips as an alternative. See fig. 2 interface circuits.

All pin designations used on the VIC-20 are tied directly to the game port on the side of the VIC-20, a DB-9 connector. The following is a list of the lead information on the DB-9 connector that I used with my VIC-20. DB-9 pin 1 is a key lead for push-to-talk on RTTY, pin 2 is RTTY data to the EXAR 2206 AFSK generator, pin 3 is CW data to the transmitter keying circuit interface, pin 6 is demodulated data into the VIC-20 (CW and RTTY), and pin 8 is system ground.

Final Assembly

Putting the package together was very easy once a suitable cabinet was selected. I made up a "run list" of connections from the 22 pin edge connector and all external components on the cabinet, lights, switches, and input/output connectors. Follow the items one at a time and you should have very little trouble in the final operation of your converter. See fig. 4 for all details on the run list and fig. 5 for a block diagram of the complete package.

RF Interference

One trouble that I had when my transmitter was turned on was very heavy RF interference to my computer monitor. I thought I had that problem solved long before by ample use of shielding and by-pass caps with ferrite beads. However, even with my transmitter operating with an output of 2 watts, the interference was still present. I had used good shielded leads and by-passed all input and output leads from the interface and computer. Why me?! In any case, trying to solve the problem, the symptoms all pointed to the video monitor. Opening up the monitor revealed no power-line isolation (transformer). When an isolation transformer and a few by-pass capacitors were added inside the monitor, the interference stopped completely. I'm glad I added the isolation transformer as a measure of protection from direct connection to the AC lines.

Happy constructing, and I hope you have as much fun with your converter as I am having with mine. I would be happy to answer questions regarding this project or other related items. Please include a self-addressed stamped envelope for a prompt reply. (**Note**: A printed circuit board is available from the author for those not wishing to construct their own. The price is $5.00 plus postage. The board is etched and ready for drilling.)

References

QST, Dec. 1980, "State-of-the-Art Converter."

EXAR Corporation applications notes: AN-03, AN-04, AN-05, AN-08.

No - 33 - 34

After you bring home all the boxes and finally hook up these wonderous new toys, how do you get them to do anything? K9GWT tells us how to make RTTY contacts without spreading turkey feathers all over the bands.

How To Operate RTTY

BY BILL HENRY*, K9GWT

Much has been written about the latest equipment for amateur-RTTY—how it works, how to hook it up, and which model is better than the other. A few articles have also given a list of "don'ts" and a few "do's" for RTTY operation. This is particularly true of the MSO and DX series of articles by KØVKH, WØLHS, and AJØX in *RTTY Journal*. However, most of these articles assume that the reader is an experienced RTTY operator. This article is aimed particularly at the newcomer to RTTY—possibly new to amateur radio itself. Some of the recommendations that follow are common sense, some are obvious holdovers from CW and voice operations, and others are the blatant opinions of this author (we all have opinions!).

How Do I Get RTTY On The Air?

Enough of block diagrams, wires, and endless code charts! How do I make a RTTY QSO without looking like a LID?

1. Use common sense and don't get carried away!

2. Listen before transmitting.

3. Don't use any procedure or language on RTTY that you wouldn't use on voice or CW!

That's really all there is to it. If we all followed these three simple rules, RTTY operation would be a lot more pleasant. Some examples will help explain the "do's" and "don'ts."

Calling A Station

Assume you have tuned around 20 meters and hear WB9XYZ calling CQ. How do you answer him? Try this:

1. Set your transmitter to his frequency ("automatic" with transceivers).

2. When he is finished calling CQ, turn **ON** your transmitter.

3. Wait 2-3 seconds—give the relays in both stations a chance to stablize.

4. Type CR/LF/LTRS *twice* (CR/LF/LTRS = Carriage Return/Line Feed/Letters) ("NEW LINE" sequence)

5. Type:

WB9XYZ WB9XYZ WB9XYZ DE K9GWT K9GWT K9GWT CR/LF/LTRS
WB9XYZ DE K9GWT CR/LF/LTRS CR/LF/LTRS

6. Turn transmitter **OFF.**

7. If WB9XYZ has heard you, he will now answer. If not, repeat the sequence 2-6.

Several important features are included in this example. First of all, why *wait* after turning on the transmitter? The reason is to be sure that his receiver and your transmitter are stabilized *before* you send any RTTY characters. This is one of the biggest failings of most computer RTTY programs. Some programs turn *on* the transmitter *and* send any pretyped text immediately. As a result, the first few characters are almost always garbled at the receiving station. This is frustrating for receiving stations and is usually the reason why computer program stations have so much trouble accessing mailboxes. If you ever write a computer program, be *sure* to include such a delay. If the programmer has left the delay out of your program, write to him and insist that it be added. The program is *not* done if this delay is missing.

Second, why send the CR/LF/LTRS sequence and why twice? This has both historical and practical backing. If a mechanical TTY machine is used (Model 15, 28, etc.), the carriage of the machine takes time to return to the left margin. The double command gives the usually old and sluggish machine a chance to position its carriage for your first printing character. The "old" RTTY standard was to send "CR/CR/LF/LTRS/LTRS" just for this reason. Two CR/LF/LTRS sequences work as well and are more compatible with modern CRT devices. Also, some CRT's and all mechanical printers require *both* CR (carriage return) and LF (line feed) to start printing on a new line. Most computer systems require only a CR. This is another place where sloppy computer programming has caused us problems. The proper amateur end-of-line Baudot sequence is CR/LF/LTRS, and it should be included in the software package. Also, note that the transmission of two end-of-line sequences including the LTRS character assures that the receiving station printer starts on a fresh line and in letters case.

Note: If you operate Navy/Marine-Corps MARS, the required end-of-line sequence is "CR/CR/LF" (no LTRS). To operate *both* amateur and Navy MARS, your terminal should be capable of sending either CR/LF/LTRS for amateur or CR/CR/LF for Navy MARS operations.

Notice that in step **5** a "three-by-three" call was first used, followed by a new line with a "one-by-one" call. This is what I would call the "long form" of call. If the other station is strong, the call should be *shorter*, possibly down to "WB9XYZ DE K9GWT K CR/LF/LTRS."

Sometimes you see the following on RTTY:

> WB9XYZ DE K9GWT, BILL IN BEAUTIFUL DOWNTOWN URBANA WHERE THE TIME IS 0012Z, 15 MAY 1985. COME-ON BACK YOU HEAR?? WB9XYZ DE K9GWT (((((URBANA, ILLINOIS))))) KKKKKKK

How about establishing the QSO before getting long-winded (or obnoxious). What if he can't hear you? Would you really say such garbage to the other fellow's face? Does he really want to talk to you after that mess? Some of this "fancy stuff" has been built into computer programs. *Personal opinion—take it out!* Particularly *don't* use such things on every call. If you are just messing around talking with people you know and they appreciate such things, do it. It's a free world. However, if you want to meet new and interesting people, why shoot yourself in the foot before you get started?

Also, why do we keep sending the time to the other guy? He probably already knows the time (and date, too). He probably also doesn't care that you've got the latest "Sooper-Dooper-Thooper" software with bells and whistles three or four features deep. The time feature *is* convenient in mailboxes and when passing traffic. Otherwise, clocks are cheap, in every ham shack, and may even be set to your own time zone!

*Box 365, Urbana, IL 61801

Finally, as the first example shows, keep the calls short. Go back to receive and then resend the short call if you don't get an answer.

How Do I Call CQ?

This is a much maligned RTTY operation. The classic "turkey call" goes something like this:

CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ DE K9GWT
CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ DE K9GWT
CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ CQ DE K9GWT
CQ CQ CQ CQ CQ CQ DE K9GWT
((((((((((((((((((((((((((((((((KKKKKK DE K9GWT)))))))))))))))))))))))))))))))

Boy is that artistic! Boy is that a *bore!* Anybody printing that mess has probably tuned away and worked three stations while you've been melting down the finals. Also, if your signal is weak, *guess* where noise and interference will cause misprints. You've got it—on your call, which you have sent only five times in 300 characters.

A couple of prime questions tell us what we really want:
What is the **purpose** of "CQ"?—**To make a contact**
What **doesn't** the other guy **know?—Your call**

It would seem that a much more sensible and productive CQ procedure would involve repetition of the **unknown** information to the other station—**your call.** He quickly discovers you are calling "CQ," but may *not* be able to sort out who you are! I suggest the following as a better CQ sequence:

CR/LF/LTRS
CR/LF/LTRS
CQ CQ CQ DE K9GWT K9GWT K9GWT CR/LF/LTRS
CQ DE K9GWT K CR/LF/LTRS

For a contest weekend, even this is too long. Try a "one-by-two" and then listen. You can always do it again if no one comes back.

What About Sending RY's?

A practice has evolved, especially when talking to DX or weak-signal stations, of starting each transmission with a string of "RYRYRY . . . ." The purpose of this sequence is to be sure the other guy's printer is synchronized before you send any meaningful text. Also, the RY's provide "dummy" characters that may be used to help the other station tune his receiver exactly to your frequency. It's not a bad idea and it is helpful, particularly on weak signals. *However,* if his signal is 20 over 9, your signal is probably also strong and why waste the time and paper? In *any* case, you need not send more than a few RYRY sequences—certainly *not* a whole line of them. In a contest situation, this is very exasperating, and the rare DX station will probably choose to call another station with more polite habits.

How Do I Work DX?

The obvious answer is *"Just like you do other stations"!* The DX station has good equipment, has operated RTTY, and is probably saturated with calls from many stations. Why handicap yourself with poor procedures and long calls? Use a short call and then listen a long time.

One thing needs to be said about DX pile-ups. Different from voice or CW, the RTTY DX station can only copy *one* station on *one* frequency at a time. If all stations call on the same frequency at the same time, the RTTY DX station will print *no one.* Adding more power rarely helps; your signal would have to be 10–20 dB stronger than *any other* signal for the DX station to get good print if you are all on the same frequency. If your signal is truly that much stronger than the rest of us, you either have a super antenna system or the FCC will be making field-strength and power-line measurements on your final amplifier!

A failing of *all* RTTY DX operation to date is that we have not used split transmitter/receiver frequency operation effectively. Once in a while a few good operators do move off the DX station's frequency and call him. Once in a while the DX station thinks to tune off-frequency and a contact is made. However, the failing is on both sides—the calling stations for not calling off the DX station's frequency and the DX station for insisting on transceive operation. This may be caused by lack of split-frequency equipment at the DX station, and there is no resolution if this is the case. However, the capability exists for most stations, and many long and frustrating RTTY DX pile-ups could be cleared out quickly if we would just try this proven mode of DX operation. When you do move off the DX station's frequency, be sure to listen before calling to avoid trashing other QSO's in progress! Also, move *at least* 500 Hz and preferably 1000 Hz away. The narrowest filter used by most of us is 500 Hz, and a lot of stations have only the 2.1 kHz SSB receiver filter. A good RTTY demodulator will dig out RTTY stations as close as 500 Hz apart, but the lower cost computer interfaces may have trouble at 2 kHz spacing.

Finally, a word for U.S. stations. A standard RTTY speed in the United States is 60 wpm (45 baud) Baudot. The international standard is 66 wpm (50 baud). As CRT and computer terminals spread throughout the world, more and more DX stations have and use 45 baud. However, many commercial TTY machines that have *only* 50 baud (66 wpm) capability are still used. If signals are strong, the 66 wpm and 60 wpm stations may copy most of each other's transmission with a few errors. However, try using 66 wpm (50 baud) if you don't get good copy on an otherwise strong DX station. ASCII code and speeds are rarely used by U.S. amateurs and even more rarely by DX stations. Most amateur DX RTTY will be worked using 45 baud (60 wpm), with 50 baud (66 wpm) and 74 baud (100 wpm) Baudot in limited use.

What Is A Mailbox or MSO and How Do I Use It?

Dick Uhrmacher, K0VKH, has written an excellent series about mailboxes in the *RTTY Journal* over the past few years. For detailed information, his column is *must* reading. However, the following is a brief overview of mailboxes and some of the problems and solutions we have found.

A RTTY mailbox is a way of electronically storing RTTY messages in an organized manner so that they may be read later by other stations. The mailbox may be called a "RTTY bulletin board," RBBS, MSO, or several other terms borrowed from similar systems by computers on telephone lines. All RTTY mailbox systems involve contacting a station with such a system, accessing his system, use of commands to list directory, read files, write files, or delete files. Finally, another command is used to "close" or "exit" the mailbox when done. Several different mailbox formats are used by amateurs, each with its own set of commands and differing command format. The most popular and most familiar system to this author is the MSO (Message Storage Operation), included in the HAL MPT3100 and DSK3100 equipment. Mailboxes are used both on HF and VHF RTTY systems.

The mailbox is particularly useful on HF bands to circumvent skip distances that would otherwise prevent communications. For example, suppose that I (in Urbana, Illinois) wished to contact a station in Chicago, and we both only work 20 meters. Being only 150 miles apart, this is normally not possible, and we would either have to use 40 meters or the land-line. However, I can call Frank, K4KOZ, in Boca Raton, Florida and leave a message in his mailbox which may then be picked up by my Chicago friend at his convenience. Mailboxes are most popular on 40 and 20 meters, and there are often 10 or more MSO-equipped stations on a given frequency. In the midwest, I can always access at least one of these stations and leave messages for practically any other station in the U.S. Often a message will be passed between two or more MSO's before it reaches the desired party. Thus, even with relatively low sunspot activity we have worked around propagation problems.

The mailbox is an exciting new addition to RTTY and demonstrates how amateur radio has made use of state-of-the-art technology to solve a well-known HF communications problem. However, with the good comes some problems. There is a great potential for misuse of mailboxes, and it has been frustrating for all. Often, the problem is simply one of not listening before transmitting.

Always Listen Before Transmitting

It sounds simple, but it sure has been neglected. Mailboxes by nature are net and fixed-frequency operations. Just as on voice and CW, a mind-set can develop that this net frequency is *mine.* I own it for mailbox and *nobody* can interfere or use it for a general QSO. *Rubbish!* Amateurs have *never* been allocated private frequencies and won't be. We all use the amateur bands on a first-come, shared basis. Consider how upset the DXer is when he is about to work that coveted DX station only to have someone turn on a mailbox exactly on the DX station's frequency. Perhaps if the MSO-calling station had listened, he might have also been able to work the DX. As it is, the DX station was missed, and two or more amateurs are upset. Conversely, why invite trouble by calling CQ on or near a known Net frequency? A little common courtesy from both DXers and mailbox users will go a long way.

The problems with using an MSO or mailbox are almost always associated with the following points:

1. Operator unfamiliar with MSO command formats.

2. RTTY system does *not* include a time delay between transmitter turn-on and start of transmitted text.

3. The RTTY system does not send CR/LF/LTRS as the end-of-line sequence.

The best way to gain familiarity is to watch what others do and set

your operating practice accordingly. The mailboxes are popular and well used. A little observation of how others make it work can save you a lot of time and trouble. Also, if you don't understand, wait for a station to finish with the MSO and then call him directly. Regular QSO's are indeed made on MSO frequencies, and the guys are very helpful to newcomers.

Two points have been mentioned before and are quite common with some "bargain" computer programs for RTTY. If your program does not include the delay and/or you can't send the proper end-of-line sequence, mailbox operation will be indeed frustrating. Such programs are incomplete and need fixing. A calling format that gets around the delay problem is:

1. Listen.
2. Start transmitter
3. Type
   CR/LF/LTRS
   K9GWT DE [your call] CR/LF/LTRS
   .DIR (or other MSO command)
   CR/LF/LTRS
4. Transmitter OFF.

The extra CR/LF/LTRS and station ID at the beginning will generally get the MSO station synchronized to your RTTY signal before the important command line is sent. However, this still may not work if you have the wrong end-of-line sequence. You may then have to manually type each end-of-line character instead of hitting **RETURN** or **ENTER.** The best approach is to have the software fixed.

MSO and mailbox stations also frequently include general-interest files that give further details of commands available and how to use them. Also, you will find recent ARRL bulletins, equipment modification data, and even lists of recent DX RTTY stations heard in MSO's (try AJ@X MSO—MSOAJ@X on 14087.7 kHz—for the DX list). Mailboxes are a great convenience and a lot of fun when you use them properly. Jerry, WA1IUF, has compiled a list of currently active MSO stations. This list may be found in a file in his mailbox on 14097.5 kHz (IUFZW access code).

For those who operate mailbox stations—**Make your sign-on and response messages as short as possible!** The MSO frequencies are busy, and we all get very tired of elaborate sign-on messages and help menus that repeat on each call. Again, we know you have a *sooper* station if you run a mailbox. Additional bragging is not required!

Some of the computer program mailbox systems have added a very obnoxious feature—*Beacon mode*. This does not win friends or influence people (at least not positively). This feature should be removed or not used.

How About CW ID?

Until two years ago all U.S. RTTY stations had to identify their stations with a CW ID in addition to any RTTY ID. Thanks to the FCC, we have now joined the 20th century and this is *no longer required*. However, much of the equipment and software programs were designed when CW ID was required. Also, some areas of the world *do* still require CW ID. So the feature is probably in your RTTY terminal, and you may use if if you choose. Most of us were glad to see CW ID go and do *not* use it.

If you choose to use CW ID, please, please do *not* add the phrase "CW ID FOLLOWS." *ARRRGH!* No kidding! I have ears, and I will certainly know when a CW ID is received! One of the "justifications" for this phrase was to give the receiving station a chance to turn off something to keep the CW ID from causing misprints, trashing what he had already printed. You get the same result using less time or paper by simply sending CR/LF/LTRS — CWID — CR/LF/LTRS. Any garbage printed from the CW ID is thus isolated on a separate line. The phrase "CW ID FOLLOWS" comes standard in some computer programs—good reason to go buy another that does not include it. Make a lamp or ash tray out of the other one!

Saying Goodbye

Here comes another pet peeve and another chance to fill the band with feathers! How many times do we need to say 73? How many lines of paper or screen should it take? For example:

> WB9XYZ DE K9GWT WELL, THANKS FOR THE QSO. SURE HAS BEEN NICE TO BEAT ON THE GREEN KEYS WITH YOU. TAKE CARE AND MY BEST TO ALL IN YOUR FAIR CITY. SOOO GOOOD BYE FROM THE BEAUTIFUL WIND-SWEPT CORN FIELDS OF URBANA IN THE GREAT STATE OF ILLINOIS. HOPE TO TYPE WITH YOU AGAIN REAL SOON AND KEEP YOUR FINGERS OUT OF THE HIGH VOLTAGE!!!!! BYE BYE, BEST WISHES AND VERY 73 73 73 73 73 73

```
777777      333333          777777      333333
   77          33              77          33
  77          333             77          333
 77           33              77          33
77           333333          77          333333
                  --- D E ---

KK   KK  9999999  GGGGGGGG  WW      WW      WW  TTTTTTTTT
KK  KK   99   99  GG        WW      WWWW    WW     TT
KKKKK    9999999  GG   GGG  WW  WW  WW  WW     TT
KK  KK         99  GG    GG  WW WW    WW WW     TT
KK   KK        99  GGGGGGGG  WWWW      WWWW     TT
```

BYE BYE AND BEST 73's FOR NOW

WB9XYZ DE K9GWT BYE FOR YOUR FINAL
--- (((((73 73 73 73))))) SKSKSKSK
1352CDT 25-JUL-85 URBANA, ILLINOIS
(1852Z AND 29:85:103:001 ON VENUS)

What if someone you know prints that mess? No further comments are needed! How about this instead?

> WB9XYZ DE K9GWT OK JOHN AND THANKS FOR THE QSO.
> 73 FOR NOW AND WILL LOOK FOR YOU HERE ON 20.
> WB9XYZ DE K9GWT CLEAR

How Do I Operate Amtor?

The operating commands and some procedures vary a lot between AMTOR converters and software packages. However, some techniques have become accepted practice for **AM**TOR operations. The word "AMTOR" stands for **AM**ateur **T**eleprinting **O**ver **R**adio and the mode is based on the existing CCITT 476 SITOR mode used in commercial marine systems since 1968. AMTOR and SITOR are identical except for polarity on HF; AMTOR uses Lower sideband (LSB) and SITOR uses USB.

First of all, there are two modes of AMTOR that are often used—ARQ or "MODE A" and FEC or "Mode F." The ARQ mode requires rapid switching on and off of the transmitter. FEC mode is much like Baudot RTTY where the transmitter is turned **ON**, and all text is sent before the other station replies. A special 7-bit error-correcting code is used for AMTOR. This code is *not* the same as either ASCII or Baudot, and a special AMTOR code conversion device or computer program must be used. An AMTOR-equipped station cannot communicate in AMTOR modes with a RTTY station that does not also have AMTOR equipment. *All* AMTOR transmissions are made at a data rate of 100 baud using synchronous data. However, because of the error correction the "through-put" or rate of data flow from transmitting keyboard to receiving printer is 50 baud maximum (no errors) and decreases when errors are detected.

The ARQ mode is full error-correcting and will continue to repeat three-character groups until the receiving station signals that all three are correct. However, ARQ mode may require some modifications in the transmitter and receiver to get switching times that are fast enough. Also, there are several programmable delays that should be adjusted to match your equipment. Active AMTOR amateurs are the best sources of information about modifications and setting delays. Often a piece of equipment may be used for AMTOR with minor modifications, but there may be some restrictions of the minimum or maximum distance that may be used because of switching delays. Some newer transceivers were designed with AMTOR in mind and do not have these restrictions. ARQ mode is a **SELECTIVE-CALL** (SEL-CAL) mode, and a station must specifically call your SEL-CAL code before communications can be established. ARQ mode may *only* be used for communications between *two* stations, and roundtables of three or more stations are not possible.

The FEC code may be used by any AMTOR-equipped station and is not sensitive to switching speed problems. A limited amount of error correction is provided in FEC mode by sending each character twice. The receiving AMTOR equipment then prints only the correctly received set of letters or a space if neither is received correctly. FEC is a "broadcast" mode and no SEL-CAL code is required of either the sending or receiving station. The FEC mode is particularly useful for calling CQ and for sending bulletins for general interest to more than one station.

The accepted operating procedure for AMTOR has evolved to calling CQ in FEC mode and then changing to ARQ mode when the answering station calls. AMTOR equipment is designed to switch automatically from a standby condition to FEC or ARQ mode, depending upon what is received and if the SEL-CAL code matches (ARQ mode).

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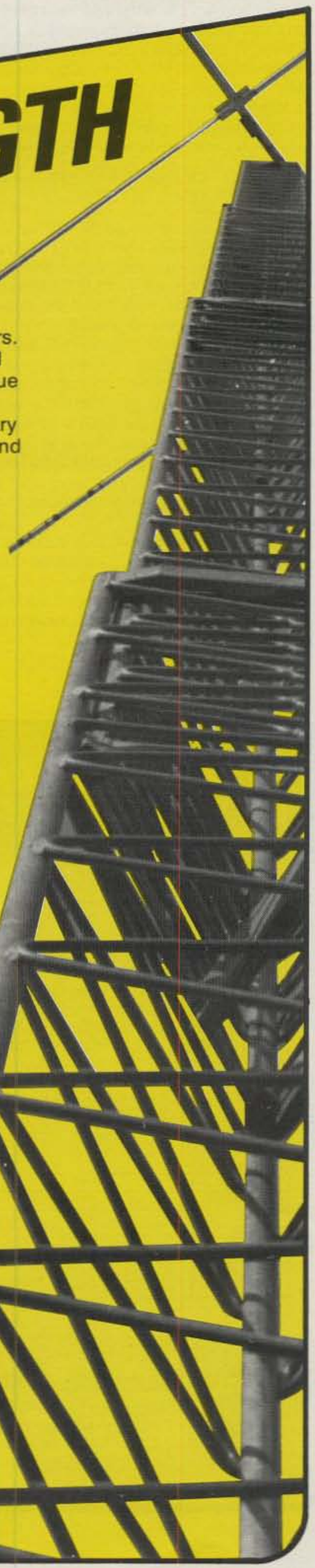
TOWER OF STRENGTH



Rugged Hy-Gain antenna crank-up towers are made as no others. All steel construction and galvanizing after welding meets ASTM material standards. Giant welding fixtures assure straight and true alignment of tower sections for close tolerance crank-up guide systems. Diamond web bracing, 2.5 times the strength of ordinary "W" bracing, adds strength where tower sections meet. Open-end tubular steel legs are galvanized inside and out and permit unrestricted moisture drainage. It all adds up to long lasting, massive tower strength for antenna loads of up to 16 sq. ft. at 60 mph.

	Tower Sections	Height Extended	Height Retracted	Width at Base	Antenna Windload Limit	Weight
HG-52SS	3	52 ft. 15.8 m	21 ft. 6.4 m	16.44 in. 417.6 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	455 lbs. 206 kg
HG-37SS	2	37 ft. 11.3 m	20.5 ft. 6.2 m	13.75 in. 349.3 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	265 lbs. 120 kg
HG-54HD	3	54 ft. 16.5 m	21.5 ft. 6.6 m	19.53 in. 496.1 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	575 lbs. 261 kg
HG-70HD	4	70 ft. 21.3 m	21.5 ft. 6.6 m	22.63 in. 574.7 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	1100 lbs. 499 kg

Hy-Gain crank-up towers come complete with hinged base, installation steelwork, pre-drilled rotator plate and a manual winch.

Hy-Gain crank-up towers require no guying and conform to EIA, to the Uniform Building Code, and are approved by Los Angeles (license 1095). UBC documents for building permits are available on request (specify tower model) **before** you buy the tower.

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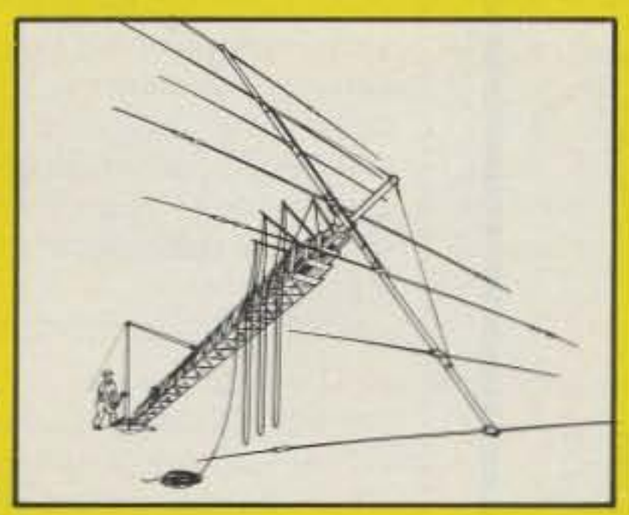

An accessory tilt-over gin pole allows one person to tilt the tower over to ground level.

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In **SITOR** service the SEL-CODE is a translation of internationally assigned numbers to letters of the alphabet. To date, amateurs have used a contraction of their call signs as the SEL-CAL code, omitting the numbers. Thus, K9GWT becomes "KGWT" as an ARQ SEL-CAL code, KS9I becomes "KKSI," etc. Obviously, many duplicate SEL-CAL codes are possible, but this has not proved to be a problem to date. This format may change when and if duplication becomes a problem. Because the ARQ mode SEL-CAL code may not be obvious, the code to use is generally given in the FEC CQ call. A typical FEC CQ might be:

CQ CQ CQ DE K9GWT K9GWT K9GWT CALL "KGWT" IN ARQ MODE KKK

A receiving station would then program "KGWT" in his unit as the **REMOTE CALL** (RC:KGWT in the ARQ1000) and call me in ARQ mode. My AMTOR system would then automatically switch to ARQ mode when "KGWT" is recognized and ARQ communications is established.

Even though ARQ mode has both transmitters and receivers of the two stations switching on and off, information may *only* be sent in *one* direction at a time. If one station has ceased sending and wishes a reply, and **OVER** command must be passed between the two stations to "turn the channel around" so that the other station may send text. An **OVER** is accomplished by send "? characters (+? in CCITT No. 2 Baudot) or by pushing the **OVER** button on the ARQ unit.

Accepted operating practice is to issue CQ calls in FEC mode on a calling frequency such as 14075 kHz. The answer station then calls in ARQ mode on a frequency different from the calling frequency (14073 for example). The QSO then continues after the two systems have synchronized.

Most AMTOR equipment also includes a **MONITOR** or **LISTEN** mode, sometimes called **MODE L**. This mode allows printing of either ARQ or FEC modes but with *no* error correction for ARQ mode. The receiving station's transmitter does *not* send acknowledgements or requests for repeats. The **MONITOR** or **LISTEN** mode is *not* used in commercial SITOR systems.

How About Packet Radio?

Packet radio is a switched burst mode, much like AMTOR. It provides error correction at a much higher speed. Early work with packet radio used VADCG (Vancouver Digital Communications Group) Terminal Node Controller (TNC) devices. More recent work by AMRAD and others has established a new format or PROTOCOL, called **AX.25**. VADCG and AX.25 systems are *not* mutually compatible, but TNC's of each group have been modified to operate using the other's protocol (data format of the data burst). To date, most packet radio activity has been on VHF using 1200 baud, but some work is also being done on HF using 300 baud data. As with AMTOR, the actual rate at which information is passed between two packet radio stations varies with the number of errors that must be corrected. Considerably more detailed descriptions of packet radio may be found in recent amateur publications and in packet radio club newsletters.

Like AMTOR, packet radio is a SEL-CAL mode, and you must know the callsign of the other station before you may connect to his station. Various commands may be entered on the keyboard to set modes in the TNC. Packet radio TNC devices serve as code converters between the TTY keyboard/printer and demodulator/tone keyer. Often, a simple tone-keyer/demodulator is included as part of the TNC. Packet radio stations use an ASCII terminal and keyboard.

A unique feature of packet radio is the ability for several stations to share the same frequency. Since communication is via bursts of data, other stations may transmit and receive during the "holes" between bursts with no interference between stations. However, this is limited to approximately eight or less stations because of the slow-down that occurs when bursts are damaged by attempted simultaneous transmissions of two or more stations (collisions).

Again like AMTOR, packet radio is really only intended for communications between *two* stations (no round-table nets). Packet radio has the additional feature that any individual station may be used as an intermediate "relay" or "data repeater" station. In fact a station may be both used to communicate and as a repeater simultaneously without interference to either conversation. Up to eight "repeater" station callsigns may be designated in the connect command. However, present protocol standards require that you know and specify the calls and sequence of repeater stations to be used. The time required for each repeater operation soon slows down the system considerably. Higher levels of protocols are presently being designed that will include specially designated **GATEWAY** stations to serve as high-speed data repeaters between designated points. The **GATEWAY** stations will also automatically choose the best route to pass your message.

As with AMTOR, the fast switching on and off of packet radio imposes new and different requirements on transmitters and receivers. Programmable delays are provided in most TNC devices that may have to be tailored to your equipment's characteristics. Advice from those active in packet radio is your best guide for choosing suitable equipment and delay parameters.

Present TNC devices do not include an automatic disconnect timer system. A common problem for newcomers to packet is to forget to send the disconnect command, particularly after using a mailbox. The beginner usually remembers to shut down the mailbox, but walks away without a disconnect command. The result is that both his and the mailbox station's TNC remain in connected mode and are *not* available to any other station who may try to call.

Always Disconnect After Completing A Packet QSO!

The beginner may also give himself and others a **big** problem if he attempts too many repeater connections over what may be unreliable paths. Eventually, the link will fail when one or more links cannot be made, but a great deal of time is required for each link or partial link to try and retry until it "times out." Plus, he may remain connected for the early portion of the attempted link. The net result is a long wait for the attempt link and a very much slowed-down channel for all others trying to use the frequency.

Use as few repeater links as possible and
don't try impossibly long distance connections.

Conclusions

Well, there it is—the "gospel" of RTTY operation by Henry. I am sure I've stepped on some toes and ruffled some feathers somewhere in the past few pages. Perhaps I have also started some thoughts about what is good procedure and what isn't. It seems to me that good operating practices are those which involve common sense, don't cause undue problems for others, and let us each enjoy our hobby. After all, *amateur radio is fun!*

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CQ REVIEWS: BY LEW MCCOY*, W1ICP

The Newsome CM-64 and CM-20 RTTY Terminal Units

The Newsome RTTY units for the Commodore computers.

I have reviewed several RTTY/CW computer-type terminal devices and few are as versatile as the Newsome Electronics CM-20 and CM-64. The Newsome unit is designed for the Commodore 64 or VIC-20 computers and is a combination hardware/software package. What is unusual are some of the features. However, before discussing these features, let me first describe the unit, or rather units.

As you can see from the photo, there are two pieces. One board is the Terminal Unit, and it is plugged into the user port (on the rear of the computer). The other board is the Program Unit, and it is plugged into the right rear cartridge port. The TU board has three RCA-type phono jacks on it. The first is for the receiver audio input, and the other two are for outputs to the microphone jack on your transmitter/transceiver. The first of these is a push-to-talk connection, and the other is for audio input to the microphone plug. (Newsome Electronics provides cables for these connections, but of course you have to get your own microphone plug.)

When you turn on your computer with the Newsome unit installed, your video display will come up with the following display:

HBN 060 FL U **00:00 T**
0001 072 **38,910 (*)**

These letters and numerals mean:

H = High range audio (2125–2295 Hz).
B = Signal coding to match Baudot requirements
N = Indicates normal polling.
060 = 60 wpm operating speed.
FL = Filter Lock.
U = Unshift on space.
00:00 T = This is a clock.
0001 = Contest or MSO message counter
072 = Character count for default carriage return.
38,910 = RAM bytes left in storage (Commodore 64).

In addition to the above video terminal display there is one more very important video display which is one of the features of the Newsome unit. When one tunes in a RTTY signal, directly at the top center of the video display will appear a blinking dot. Just to the left of the dot will be either a small horizontal or vertical bar. When the RTTY signal is correctly tuned in, the dot becomes solid (doesn't blink) and the two lines become a + mark. This is an excellent feature because it eliminates the need for any other tuning device such as an oscilloscope. And believe me, the indicator really works!

So, what happens if your setup as discussed above is arranged to receive 60 wpm Baudot, and the amateur you are trying to tune in is transmitting something else? Here another feature of the Newsome unit comes into play. If you don't know the speed or if the signal is inverted from the other end, all you do is press **Control/N** on the computer and you are put into an **Auto Scan Mode.** The computer steps through all the various speeds—60, 66, 75, 100, and 132 wpm—and then through the same procedure inverted. When the correct speed is found, the signal will print, and then you hit **Control/N** again to lock in the correct reading. This to me is marvelous, because without the system, RTTY can be very irritating and frustrating to tune in, particularly if you are a newcomer to the mode. In addition to standard Baudot and CW, ASCII is available for receive and transmit at either 110 or 300 baud.

Along with the high tones there are also low tones available, which means you can take advantage of the filters in your receiver to provide greater selectivity. With the indicators I described above, tuning in a RTTY signal and getting it to print is extremely easy. How about copying CW, because this is also a CW unit?

CW Copying and Transmitting

When the **Control/C** key of the computer is pressed, the top line of the video

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screen will show: **MCW (Morse code), 020 (20 wpm), LK (Speed Lock)**, and the numerals **0-9**, which is a weight indicator (and also tells you the quality of the other guy's fist, hi!). The speed can be changed from 5 to 127 wpm by toggling **Control/C**.

The software program for copying CW is superb and does a good job, even with a very bad sender on the other end. On the first unit I tested, I found that it took a very strong signal to provide copy. I discussed this problem with Newsome, and they refined the input circuit so that it was much more sensitive. Now even the weakest signal will provide copy. The instruction manual emphasizes that you must keep the audio level low on CW, particularly if you are using the Auto Scan function. (Yes, the Auto Scan tracks on CW as well as RTTY!) If you allow too much background noise to seep through, the code will speed up (on receive only), because it tries to track noise. However, this is no problem once you become familiar with the unit when operating CW. More about CW operation in a moment.

Video Display and Buffers

I described the top of the video display in part. The clock can be set from the computer to whatever time desired. All you need do is hit **Control/***, type in the time (such as 01:45 EST), hit space or return again, and the time will be set and the colon will blink with each second. The contest or MSO (Message Storage Operation) setting is automatic.

Printing of the incoming signal will appear on the lower portion of the screen and will scroll up. A total of 12 lines of text will appear, at which time the top line will scroll off. Above the receive information is the transmit buffer. It will hold nine lines of information before scrolling off the top. One of the features of the Newsome units is that you can save to tape all incoming and outgoing data "on the fly," so to speak. All tape and load operations are at 16K/min. rate, which is almost as fast as disk operation.

A friend of mine who is a top-notch RTTY operator and winner of many RTTY contests once told me that most of the computer-based systems didn't have enough call-up messages available (different memories). He was using a TRS-80 Model I Level 2, and his system provided nine messages—which he claimed was insufficient for many operations. I mentioned this to Newsome, and they changed their system from 9 instant call-up messages to 26! I might add a word or two here about the amateur who does the design work for Newsome. He is an old timer, Charlie, W8VCF, who has been designing software for many years. In fact, his nickname isn't Charlie, but actually "Merlin," simply because he is such a wizard at this business. Two weeks after I mentioned the need for more messages I had a prototype in my hands!

Transmitting

On RTTY, to transmit all you need do is press the **Shift/Run** keys and you will be in the transmit mode with the letters **TX** displayed on the upper screen. You can call up any one of the 26 messages or **F** key messages such as "CQ DE W1ICP" and let it run, or type in your "CQ" or whatever message you want into the write-ahead buffer. If you wish to change to a speed other than 60 wpm, all you have to do is toggle **Control/B** and you'll step through the other speeds.

You can also use the **Line Send Mode**, whereby you can send a line or group of words all at once instead of a character at a time. For example, you would type a sentence and then type a **Control/L** and the sentence will be sent. Also, when in the transmit mode you have a couple of messages in ROM that can be sent with the proper control keys. A **Control/R** will send RYs. A **Shift/O** will send CQ CQ CQ DE, and a **Control/Q** transmits the "quick brown fox" message.

More On Memories

The instruction manual is extremely detailed, describing saving data or messages to memory. The **F1**, **F2**, and **F3** keys can be used to store a maximum of 110 characters each, if all are used. If a message is longer than that, it will spill over into the next **F** key. For example, if you were

to try to put 200 characters into F1, 90 characters would spill over into F2. Once the message is stored, pressing F1 will bring up the entire message from F1 and F2. F4 through 8 will hold 55 characters each (when in the MSO mode, the F keys are used differently).

The A to Z call-up messages can be much longer in length, depending entirely on the amount of free memory in the computer. For example, a message of 3K can be used for each one with the C-64 and 1/2K for the VIC-20. The total message sizes must not exceed total memory (VIC-20 expanded is 24K, and the C-64 is 39K.)

The **log Scratch Pad** is used for storing log entries, call signs and information on the stations worked, and so on. This can be put into computer memory or saved to tape. A log search is simple. To search, you press **Control/+** and type in the call sign of the desired station. If the station was logged, the letter **F** will appear on the screen heading, and the information will be printed on the **Write-Ahead** buffer. If the station was not logged, the letter **N** will appear at the top of the screen.

If you have a printer, the Newsome system will more than accommodate it. In fact, with this system you can output the incoming data to the printer and to tape at the same time! This is particularly useful for MSO operation, contest work, or QSO operation. It is a real nice feature.

MSO (Message Storage Operation)

If you have been into RTTY, then you know about MSO work, or should have some knowledge about such systems. For those readers who don't know, an explanation is in order.

The earliest operation of these systems goes back many years, but they have become more and more popular in amateur radio since the availability of computers for home use. In fact, the early systems were called CBMS (Computer-Based Message Systems). Now they are more popularly called MSOs, Bulletin Boards, or Mailboxes.

These message operations or mailboxes are used to store all kinds of information: computer programs, contest information, antenna information, DX operating and expeditions, ordinary messages, and so on.

Newsome has provided for complete MSO work in their units. I cannot hope to list all the things their system will do, because space isn't available. However, here are a few of the pertinent facts. Basically, four commands are used for MSO operation: **LIST L=, WRITE W=, READ R=, DELETE D=.** Or the user can assign his own code words for these commands, which must not exceed 10 characters each.

The **LIST** command works as follows: When the computer hears the above command it will automatically cause the transmitter to go on and transmit a string of RYs and then all the file names that are in your MSO memory. In the **WRITE** command, if anyone calls your MSO and the W file name, your computer will store the information being sent into memory. With **READ** command, when the computer hears the R file name it will search for desired messages in memory and then transmit the information. The **Delete** information is similar in that the computer will delete messages when it receives the correct file name and information.

More About CW

When doing CW work, the software program does an excellent job. You can use the **Auto Track Mode** to track the incoming speed of a signal, or you can set the receive and transmit speeds. The program needs to be within about ±5 wpm of the received signal speed to provide good copy. Another feature is the provision of code practice. When you press the **Control/up arrow** the computer will send you five-letter code groups at any desired speed.

I did one thing differently in my hook-up to the ICOM 745 transceiver when operating CW. I ran a parallel push-to-talk line from the output of the Newsome unit. One line went to the microphone input, and the other went to the key jack on the transceiver. I preferred this to AFSK keying for CW operation.

Conclusions

The whole hardware/software unit of Newsome Electronics is priced at $124.95. All you need is a relatively low-priced computer, the Commodore C-64 or the VIC-20. The going price for VIC-20s used is on the order of $50 to $75. Brand new C-64s are under $150 and at flea-markets about $100. Therefore, getting into RTTY or computer-based CW is really inexpensive using this system.

I am not one of those amateurs who complains about the use of computer-generated code for CW work. Frankly, I think it is great. In my CW career I graduated from a straight key to a bug and never went past that stage until now. Many years ago, when I went to work for ARRL Headquarters, I had a stint of operating W1AW. Ed Handy, W1BDI, who was the boss of W1AW (and Communications Manager of the ARRL), was a real stickler for accuracy. He told me to practice sending CW by sending along with the machine-sent code of W1AW. One quickly learned to tell a good operator from a bad one. In any case, it is amazing to me to use a computer to copy CW and then realize how many amateurs are very, very far from being really good CW operators! However, when the code is typed out from a computer, CW can be a real joy to listen to. And the Newsome unit programs generate just about flawless CW.

The units are marketed by Newsome Electronics, 19675 Allen Rd., Trenton, MI 48183 (313-479-2100). CQ

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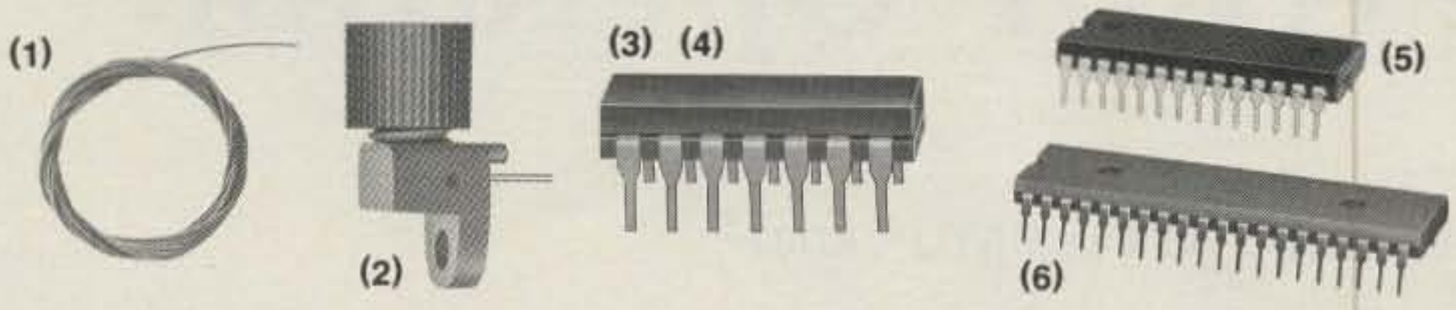

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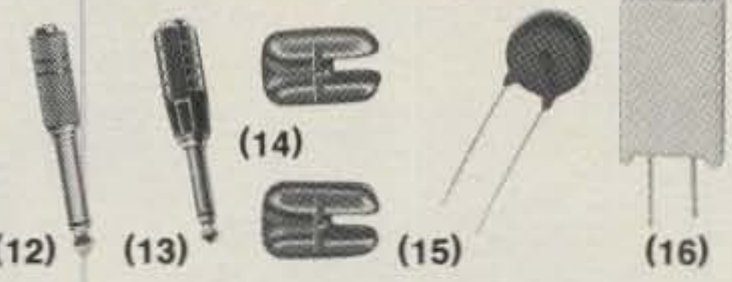

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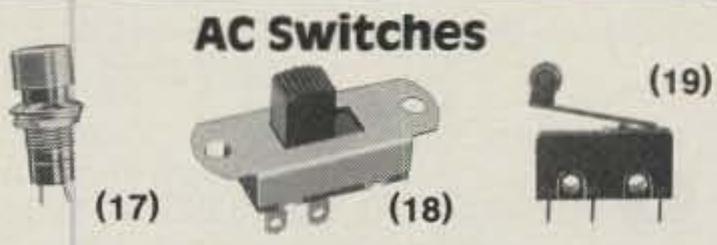

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CIRCLE 153 ON READER SERVICE CARD

Here's a simple and easy approach to RTTY. It's actually RTTY to go or "RTTY when you are OM."

Portable RTTY Operation

BY JONATHON L. MAYO*, KR3T

A simple, portable RTTY station consisting of a Flesher TU-1200, an ICOM 02-AT, and a Radio Shack® TRS-80 Model 100.

Operating RTTY is one of my favorite amateur radio activities. I often leave my RTTY system running while I am away from the shack so that I can keep track of activity. But whenever I was away for an extended period of time, I often wished that I could take the RTTY station with me; however, the physical size of the equipment along with its electrical requirements prevented me from doing so. This desire led to the development of the portable RTTY station described in this article.

A portable RTTY station has many advantages. Imagine being able to check into an RTTY net or mailbox while sitting in your car, motel room, or vacation cabin. Field Day RTTY operation would be very easy, and emergency traffic handling can utilize the advantages of RTTY while being portable.

Any RTTY station must have three basic components: a terminal, a Terminal Unit (TU), and a transceiver. The terminal converts characters into digital codes and vice versa. The Terminal Unit converts digital signals to analog tones and vice versa. And finally, the transceiver transmits and receives the analog tones.

When transmitting, characters typed on the keyboard of a terminal are converted into digital codes which are sent to the Terminal Unit. In the Terminal Unit, the digital codes are converted to analog signals which are sent to the transmitter. The transmitter then transmits the analog signals.

At the receiving end, the receiver receives the analog signals and sends them to the Terminal Unit, where they are converted back to digital codes. The digital codes are then sent to the terminal, where they are converted back into characters which are sent to a display, printer, or other device. Either way, digital codes, analog signals, and conversions are involved.

Equipment

The equipment to be used in a portable environment must be carefully chosen to meet certain criteria. The equipment I use is listed below along with the reasons why it is suitable for a portable environment.

Terminal: The TRS-80 Model 100, or any similar portable computer, serves as an ideal terminal. It is lightweight, compact, and battery operated. Its LCD screen is easy to read and does not draw much power. A built-in RS-232C port allows for easy connection to the Terminal Unit, and a built-in terminal emulation program complete with upload and download capabilities makes operating easy.

Terminal Unit: Any Terminal Unit capable of battery operation will do. However, since I plan to operate portable only on the VHF bands, I used the Flesher TU-1200. It was designed specifically for the VHF/UHF bands and can run at up to a 1200 baud data transmission rate. The TU-1200 conforms to the Bell 202 standard, so communication with 170 Hz shift stations is not possible. However, this is not a serious problem, as the Bell 202 standard is becoming more common on the VHF and UHF frequencies.

Transceiver: Once again, any transceiver will do. For VHF work, a handie-talkie such as the ICOM 02-AT provides extreme portability.

All three pieces of equipment are very compact and are capable of battery operation. Thus, they are truly portable. Connecting the equipment together requires special cables which are discussed next.

Interfacing

Since the interfacing for different equipment can vary, the wiring in fig. 1 only applies to my particular installation. In addition to the basic connections, I included a circuit to trip the PTT of the 02-AT when the SEND button is pushed on the TU-1200.

Because the Model 100 uses RS-232 level signals, it must be connected to compatible equipment. The TU-1200 provides options for connections to both RS-232 and TTL level signals, so connecting the two was easy. Only three wires are needed: **TX**, **RX**, and **GND**.

The audio output of the 02-AT goes straight to the TU. The 02-AT mic inut connects to the TU through a 0.47 uF capaci-

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tor. The capacitor is used to isolate the 02-AT PTT voltage from pin 12 of the TU, and the 25K ohm resistor is used to trip the radio's PTT circuit.

Now that both the terminal and the transceiver are connected to the TU, operation is possible.

Operation

The Model 100's upload capabilities can be utilized to transmit prewritten CQs, "brag tapes," and other messages. Since its memory is non-volatile, the messages are not erased when the computer is turned off.

When receiving, the download capabilities can be used to maintain a record of what was received. A built-in parallel printer port can be used to obtain a hard-copy on almost any printer.

Pushing the **SEND** button on the TU-1200 causes the PTT on the 02-AT to trip, and any characters typed on the keyboard or uploaded from memory will be transmitted. Almost anything can be transmitted to another station, including messages, programs, and other data.

I have found that it is a good idea to carry an external antenna for use in situations where the rubber duckie is not adequate, such as in buildings. A simple, compact VHF "J" antenna can be fabricated out of ordinary twin-lead and hung on a curtain or from the ceiling. When not in use, the antenna can be rolled up and stored most anywhere. Other possibilities include the vertical dipole, ground plane, and quarter-wave whip.

When not operating RTTY, the handie-talkie can be used for standard FM phone, and the Model 100 can be used as a stand-alone computer system.

While the Model 100's terminal program is designed for ASCII operation only, a program in either BASIC or machine code could be written to allow for Baudot operation. A TNC (Terminal Node Controller) could be plugged into the RS-232 port for use as a packet radio station. The possibilities are numerous, and a portable station for most any mode of digital communications is possible.

Conclusion

RTTY has certainly changed over the past several years. Equipment which used to consume large amounts of space and require frequent maintenance has been shrunk to where it will easily fit in a briefcase. And RTTY has gone from one of the most mechanical and noisiest modes to one of the most electronic and quietest.

In addition to the actual hardware of digital communications, many advances have also been made beyond standard Baudot in the methods of encoding the messages. Throughout the past decade, modes such as ASCII, Amtor, and packet have evolved to meet our need for more advanced capabilities.

Portable operation adds a new dimension to RTTY. It is a lot of fun to be able to work other stations or check into a mailbox system while traveling with a complete station that easily fits in a briefcase. And nothing beats digital communications for transmitting large amounts of data.

I hope this article provides you with some ideas for setting up your own portable RTTY station. If you already have an RTTY station and some sort of portable terminal, it is an easy task to set up a portable station to meet your needs. And if you're not yet equipped for digital communications, I strongly urge you to do so. It is a lot of fun and allows you to experiment with the future of radio communications. CQ

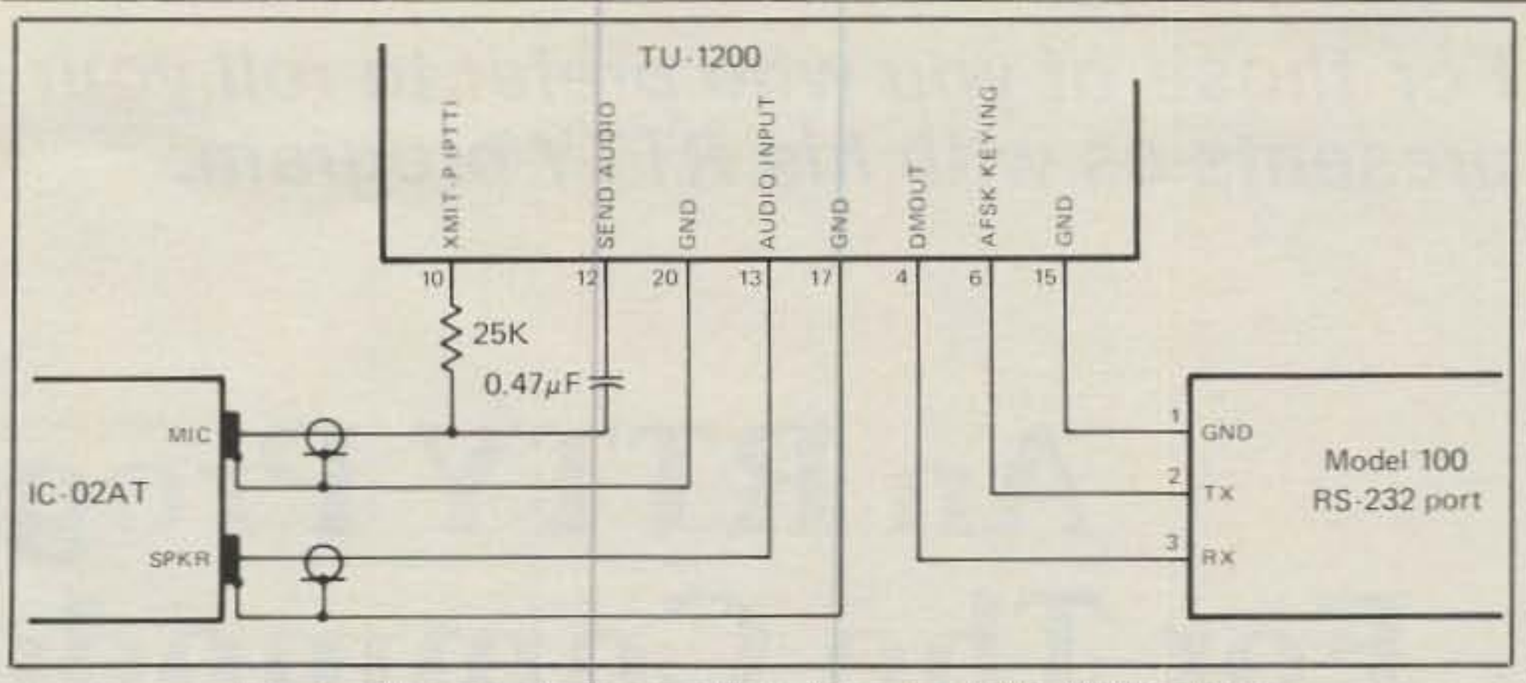

Fig. 1– The simple connections for a portable RTTY station.

For those of you who prefer to roll your own, K8AC presents us with his RTTY program.

An RTTY Program For The Commodore C-64

BY FLOYD SENSE*, K8AC

There are several good commercial RTTY programs available today for the Commodore 64. Unfortunately, in order to protect their investment, developers have been forced to resort to various methods of protection against piracy. The result is an assortment of "black-box" programs with a fixed set of functions. I have never owned a rig that didn't end up with several homegrown modifications, and I was a bit frustrated when I realized that the commercial software was not to be tinkered with. About that time I ran across a column in a computer magazine that led to a desire to create my own RTTY program.[1]

The program began as a prototype written in BASIC with the intention of rewriting it in machine language to achieve the necessary performance. It soon became apparent that there was actually only a small portion of the code that required the speed of machine language. So, those portions were coded in assembler language and are called from the BASIC code as required. The mainline program thus remains easy to change while still providing adequate performance. Following is a description of the logic and operation of the RTTY program that evolved over several months of tinkering at the keyboard.

Features

In the interest of performance, only those features considered essential to operation were included. Readers experienced in BASIC should have no problem adding other functions as they desire.

*7991 Lutz N.W., Massillon, OH 44646

[1]Grubbs, "Command Post," Commander Magazine, March 1984.

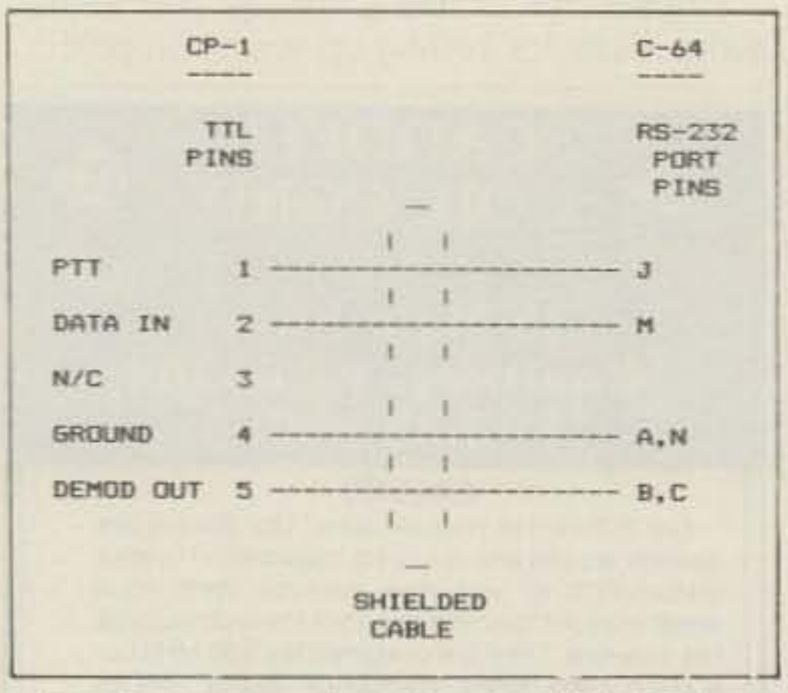

Fig. 1– Connections for the AEA CP-1 to C-64 signal cable.

Some of the important features included are:

- No commands to memorize.
- Baudot operation at 60 and 100 wpm.
- Seven 256-character message buffers that can be saved to disk and loaded when desired.
- Optional unshift-on-space (USOS).
- Type-ahead transmit buffer during receive.
- Type-ahead buffer during transmit.
- Split-screen operation.
- Independent scrolling display areas for type-ahead buffer, transmitted data, and received data.
- Optional automatic carriage-return/line-feed sequence on transmit.
- Operator-selectable character and screen colors.

Printer support was not included, since use of the Commodore RS-232 port is mutually exclusive with activity on the serial bus. This fact also precludes storage of messages to the diskette while receiving.

Hardware Considerations

A special cable must be assembled to connect the Commodore 64 user port to the interface or terminal unit. Fig. 1 shows the correct pin connections for the AEA CP-1 interface. (The C-64 RS-232 port uses TTL level voltages, so be sure to check the terminal unit for compatibility if you are not using a CP-1.)

While a 1541 disk drive is required if you elect to save message buffers, it is not mandatory for buffer operation, since default buffer data can be coded into the program. Note that the length of the BASIC statement assigning the data to the buffer cannot exceed two screen lines, so you will not be able to have 255-character buffers.

Software Considerations

The program as written requires SIMON's BASIC for execution. The primary reason for this was to gain the IF-THEN-ELSE logic capability offered by this package. If you do not have this expanded BASIC, the program may be converted to run with the level of BASIC that comes with the C-64.

The program will not function properly if the DOS WEDGE program is loaded and active. The WEDGE interferes with the operation of the RS-232 port.

The scrolling features of the program required short machine language routines for acceptable performance. The routines are stored in the cassette buffer at program initiation time. There should be no need to alter the code unless you wish to change the proportions of the split-screen areas.

The RS-232 port of the C-64 makes the BASIC implementation possible. The port takes care of detecting incoming bits, assembling them into characters, and buffering. Corresponding function is provided on output. The transmit and receive buffers are 256 characters each and allow the BASIC program to proceed somewhat independently of the RS-232 inter-

The RTTY Program

```
100 gosub 1830:for x=828 to 927:read y:poke(x),y:next:poke
650,128
110 open 2,2,0,chr$(96+1)+chr$(0):br=60
120 gosub 1130:gosub 1560
130 if nt thenprint"[clear]"
140 print at(0,6)"[rvson]f1-r/t f2-usos f3-ltrs f4-bfrs
receive "
150 print at(0,8)"[rvson]f5-figs f6-wpm f7-clear
f8-tty"+om$+"    "+ss$+"[rvson] "+br$
160 if nt then 220
170 if (peek(673) and 1) then 170
180 poke 56579,0:poke 56577,0
190 rem **********************************
200 rem *  r e c e i v e   r o u t i n e *
210 rem **********************************
220 ll=1984:w=0:full=0:bf$(9)="":pc=0:sys831
230 get #2,c$:if c$="" then 340
240 c=asc(c$):if c=27 thenls=0:goto 230:else:if c=31
thenls=-1:goto 230
250 if ls thenc$=mid$(l$,c,1):goto 270
260 c$=mid$(f$,c,1)
270 if c$<>" " then 290:else:if as thenls=-1
280 if ll>2020 then:ll=1984:sys831:goto 230
290 if c$=cr$ thenll=1984:sys831:goto 230
300 if c$=lf$ then 230
310 if ll=2024 thenll=1984:sys831
320 c=asc(c$):if c>64 thenc=c-64
330 if c$<>"*" thenpoke ll,c:ll=ll+1
340 get a$: if a$="" then 230
350 if a$<"[f1]" thenif not full then 450
360 if a$="[f3]" thenls=-1
370 if a$="[f2]" thengosub 1280
380 if a$="[f5]" thenls=0
390 if a$="[f4]" thengosub 800:goto 130
400 if a$="[f6]" then 1200
410 if a$="[f7]" thengosub 1980
420 if a$="[f1]" then 540
430 if a$="[f8]" thengosub 2030
440 goto 230
450 if w<>254 thenbf$(9)=bf$(9)+a$:else:a$=chr$(95):full=-1
460 if a$=chr$(13) thena$="[rvson]c[rvsoff]":goto 490
470 ifa$<>"←" then 490
480 pc=abs(pc-1):w=abs(w-1):bf$(9)=left$(bf$(9),w):print
at(pc,5)"←":goto 230
490 if pc=40 thenpc=0:sys828
500 print at(pc,5)a$;:w=w+1:pc=pc+1:goto 230
510 rem **********************************
520 rem * t r a n s m i t   r o u t i n e *
530 rem **********************************
540 sys828:poke 56579,33:rem raise pin j
550 print at(31,6) "[rvson]transmit[rvsoff]"
560 if w<>0 thenbs=-1:bl=len(bf$(9)):bc=1:n=9
570 ls=-1:ct=1:pc=0:n=0:rem indicate we have been in xmit
mode
580 get kb$:if kb$="" and bs then 650:else:if kb$="" then 580
590 if peek(653)=4 thengosub 1000:goto 580
600 if asc(kb$)=13 thenpc=0:sys828:else:print
at(pc,5)kb$:pc=pc+1
610 if pc=40 thenpc=0:sys828
620 if not bs thentc$=kb$:else:bf$(8)=bf$(8)+kb$:goto 650
630 al$=tc$:tc=asc(tc$):if tc<>13 then if tc<>209 then 680
640 print#2,cl$;:ct=1:tc$="[rvson]c[rvsoff]":sys834:print
at(39,7)tc$;:goto 580
650 tc$=mid$(bf$(n),bc,1):if tc$="" thenbs=0:goto
660:else:bc=bc+1:goto 630
660 if ta thenbf$(8)="":ta=0:bc=1:goto 580
670 bc=1:if len(bf$(8))>0 then:n=8:bs=-1:ta=-1:goto
580:else:bs=0:goto 580
680 if tc=f1 then:sys828:goto 130
690 if tc<32 or tc>90 goto 580
700 if tc>64 then tc=tcand63:else:goto 710
705 if not ls then ls=-1:print#2,ds$;:goto 720:else:goto 720
710 if tc<>32 thenif ls thenprint#2,us$;:ls=0
720 tc$=mid$(tt$,tc,1):if tc$="*" thengoto 580
730 sys834:print
at(39,7)al$;:print#2,chr$(asc(tc$)and63);:ct=ct+1
740 if not om then 580
750 if tc$="d" then:if ct>72 then 640
760 if ct<80 thengoto 580:else:goto 640
```

```
770 rem ************************************
780 rem * b u f f e r   r o u t i n e *
790 rem ************************************
800 print"[clear]":print"[rvson]enter buffer number (1-7)
0=finished [rvsoff]";:nb$=""
810 print"[rvson]or 'r'-read from disk  'w'-write to
disk[rvsoff]"
820 ct=0
830 get bn$:if bn$="" then 830:else:bn=(asc(bn$)-48)
840 ifbn$="r"then:print at(0,5)"loading buffers from
disk":gosub 1420:goto 800
850 if bn$="w" then:print at(0,5)"saving buffers to
disk":gosub 1490:goto 800
860 if bn>7 or bn<0 then 830:else:ifbn=0
thenprint"[clear]":return
870 print"[clear]":print"[rvson]current buffer ";bn$;"
contents[rvsoff]":print:print bf$(bn)
880 print:print at(0,10)"[rvson]enter new data + ^  or  ^ for
no change[rvsoff]":print
890 get in$:if in$="" then 890
900 if in$="^" thenif nb$="" then 800
910 if in$="^" thenbf$(bn)=nb$:goto 800
920 if in$=chr$(13) thenin$="0"
930 if in$="←" thenct=ct-1:nb$=left$(nb$,ct):goto 950
940 nb$=nb$+in$
950 print at(ct,12)in$:if in$<>"←" thenct=ct+1
960 if ct=254 then 800:else:goto 890
970 rem ************ **********
980 rem * setup for buffer send *
990 rem ****************************
1000 ck=0:kb=asc(kb$)
1010 if kb=144 thenn=1:
1020 if kb=5 thenn=2
1030 if kb=28 thenn=3
1040 if kb=159 thenn=4
1050 if kb=156 thenn=5
1060 if kb=30 thenn=6
1070 if kb=31 thenn=7
1080 if n=0 thenbs=0:return
1090 bs=-1:bc=1:return
1100 rem ****************************
1110 rem * set rs-232 parameters *
1120 rem ************ ***********
1130 d=1.02273e6:if br=60 thenb=45.45:else:b=75
1140 x=int(d/b+.5):q=int(x/256):r=256*(x/256-q)
1150 poke 665,r:poke 666,q:sys831:return
1160 rem ************************************
1170 rem * change speed and              *
1180 rem * reopen the rs-232 port        *
1190 rem ************************************
1200 if br=60 thenprint
at(37,8)"[rvson]100[rvsoff]":else:print at(37,8)"[rvson]60
[rvsoff]"
1210 close2:open 2,2,0,chr$(96+1)+chr$(0):gosub 1560
1220 if peek(1381)=177
thenbr=100:br$="[rvson]100[rvsoff]":else:br=60:br$="[rvson]60
 [rvsoff]"
1230 gosub 1130
1240 poke 665,r:poke 666,q:sys831:goto 130
1250 rem ****************************
1260 rem * u s o s   r o u t i n e *
1270 rem ****************************
1280 if as thenas=0:ss$="[rvson] [rvsoff]":print
at(35,8)ss$:return
1290 as=-1:ss$="[rvson]u[rvsoff]":print at(35,8)ss$:return
1300 rem ****************************
1310 rem * scroll screen m.l. code *
1320 rem ****************************
1330 data 76,117,3,76,69,3,76,145,3
1340 data
162,0,189,144,5,157,104,5,232,224,0,208,245,189,144,6,157
1350 data
104,6,232,224,0,208,245,189,144,7,157,104,7,232,224,88,208,24
5,169,32
1360 data
162,0,157,192,7,232,224,40,208,248,96,162,0,160,0,189,40,4,15
7,0,4
1370 data
232,224,240,208,245,169,32,162,0,157,200,4,232,224,40,208,248
,96
```

```
1380 data 162,0,189,25,5,157,24,5,232,224,39,208,245,96,0
1390 rem ***************************************
1400 rem * d i s k   r e a d   r o u t i n e *
1410 rem ***************************************
1420 open 8,8,8,"0:"+dn$+",s,r"
1430 for i=1 to 7:bf$(i)=""
1440 get#8,ch$:if ch$=chr$(13)
thennext:else:bf$(i)=bf$(i)+ch$:goto 1440
1450 close 8:return
1460 rem ****************************************
1470 rem * d i s k   w r i t e   r o u t i n e *
1480 rem ****************************************
1490 open 8,8,8,"@0:"+dn$+",s,w"
1500 for i=1 to 7:print#8,bf$(i):next:close 8:return
1510 rem rs-232 port must be open before defining basic
variables
1520 rem ***********************************
1530 rem * v a r i a b l e   s e t u p *
1540 rem ***********************************
1550 proc set-cons
1560 dim bf$(9),ta$(256):ls=-1:nt=-1:as=-1:br$="[rvson]60
[rvsoff]":ss$="[rvson]u[rvsoff]":om$=" "
1570 ct=1:lf$=chr$(10):cr$=chr$(13):cc$=chr$(209)
1580 cl$=chr$(13)+chr$(10):rem carriage return + line feed
1590
tt$="cyniamztfkor\lxvwjepg^sluq*****dm*ti*zqor[*lc\]vwsajpugf
xn^****y*"
1600 f$="3"+lf$+"- '87"+cr$+"$4',!:(5')2#60197%*./:*"
1610 l$="e"+lf$+"a siu"+cr$+"drjnfcktzlwhypqobg*mxv*"
1620 f1=133:f2=137:f3=134:f4=138:f5=135:f6=139:f7=136:f8=139
1630
bf$(1)=cc$+"ryryryryryryryryryryry yryryryryryryryryryry"+cc$
1640 bf$(2)=cc$+"cq cq cq cq cq de k8ac k8ac k8ac k8ac "
1650 bf$(3)="k k k"+cc$
1660 bf$(4)=cc$+"qrz qrz qrz qrz de k8ac k8ac k8ac k k k"+cc$
1670 bf$(5)=""
1680 bf$(6)=""
1690 bf$(7)=cc$+"the quick brown fox jumped over the lazy
dog's back"
1700 dn$="rttybuffers"
1710 us$=chr$(27):rem baudot figs shift char
1720 ds$=chr$(31):rem baudot ltrs shift char
1730 bc$=chr$(08):rem baudot carriage return
1740 bl$=chr$(02):rem baudot line feed
1750 return
1760 rem ****************************************
1770 rem * screen and character color change *
1780 rem ****************************************
1790 rem
1800 rem this routine allows the operator to select the
desired colors for the
1810 rem screen and characters through the function keys.
1820 rem
1830 x=1:poke 646,16:poke53280,202:poke53281,252
1840 print"[clear][rvson]
    ";
1850 print"[rvson]          k 8 a c   r t t y          ";
1860 print"[rvson]                                     "
1870 print"f1 - change screen color":print
1880 print"f3 - change character color":print
1890 print"f5 - finished":print
1900 get a$:if a$="" then 1900
1910 if x>16  then x=0
1920 if a$="[f1]" thenpoke 53281,x:poke 53280,x:x=x+1:goto
1900
1930 if a$="[f3]" thenpoke 646,x:x=x+1:goto 1840
1940 if a$="[f5]" thenreturn:else:goto 1900
1950 rem ****************************************
1960 rem * clear transmit areas of screen *
1970 rem ****************************************
1980 for z=1304 to 1343:poke z,asc(" "):next
1990 for z=1 to 6:sys828:next:bf$(9)="":return
2000 rem ****************************************
2010 rem * limit line length for old tty machines *
2020 rem ****************************************
2030 if not om then om=-1:om$=chr$(209):print
at(30,8)"[rvson]"+om$+"[rvsoff]":return
2040 om=0:om$=" ":print
at(30,8)"[rvson]"+om$+"[rvsoff]":return
2050 rem
```

face. While this relieves the program of intricate timing loops, there is a small price to pay. On transmit, we have no control over a character once it has been given to the interface via a PRINT command. It is possible, though not likely, for many characters to be still in the transmit buffer, unsent, while the program considers them to be sent. The program includes logic to detect when the last character has actually been sent before returning to receive mode.

For those who may contemplate experimenting with this program, one important item regarding the C-64 should be understood. All BASIC variables are cleared when you open the RS-232 port. Therefore, you should always open the port before assigning a value to any variable, and you must reinitialize the variables if you close the port and re-open it. Many hours were wasted by my shooting bugs caused by failure to understand this simple fact.

Program Operation

It was my goal to avoid having to memorize any commands or keystroke sequences and to avoid menus. All functions are initiated via the keyboard function keys, the meanings of which are displayed on the main screen.

The program is started via the normal **LOAD "RTTY",8** and **RUN** commands. After prompting the operator to change screen and character color as desired, the main screen appears. The function key definitions are shown in reverse image, and those lines define the split-screen layout (see photo #1). The five lines at the top of the screen are used for data to be transmitted. Line seven is used to scroll the data as it is being sent. Received data is displayed on the lower 16 lines of the screen and scrolls upward. Data entered from the keyboard always appears above the split as it is entered. All keys function in typomatic mode (holding a key down is the same as multiple keystrokes). The line between the function key definitions displays the transmit data as it is presented to the RS-232 interface. This line scrolls right to left as data is sent.

The function keys perform as follows:

F1—This key toggles the program between transmit and receive. It is the only function key active during transmit.

F2—Toggles the unshift-on-space function on and off. When active, a "U" is displayed next to the speed indicator.

F3—Forces "letters" shift on receive in case a downshift character is missed.

F4—Accesses the stored message buffer function to change content or read/write disk.

F5—Forces "figs" shift in receive mode.

F6—Toggles the program between 60 and 100 wpm. The current speed is displayed at the far right of the line.

```
2060 rem
2070 rem created by floyd sense may 1984
2080 rem
2090 rem the program is designed to be used with the aea cp-1
interface and
2100 rem requires simon's basic to run. the rs-232 port of
the c-64 is used and
2110 rem a special cable is required.  the demod out signal
of the cp-1 is
2120 rem connected to pins b and c of the rs-232 port.  pin j
is used to signal
2130 rem send to the cp-1.
2140 rem
2150 rem ************************************
2160 rem * w a r n i n g..this program  *
2170 rem * will not work if the wedge is*
2180 rem * active since the wedge inter-*
2190 rem * feres with the operation of  *
2200 rem * the rs-232 buffers in hi ram.*
2210 rem ************************************
2220 rem
2230 rem enter run on this statem nt number to obtain
formatted list of this
2240 rem program on gemini 10x printer using micrografix 350
interface.
2250 rem
2260 close4:open 4,4,5
2270
print#4,chr$(27);chr$(77);chr$(10);chr$(27);chr$(61);chr$(70)
;:
2280 print#4,chr$(27);"c";chr$(0);chr$(11)
2290 print#4,chr$(27);"r";chr$(6)
2300 print#4,chr$(27);"n";chr$(6)
2305 print#4:close4:open 4,4,1
2310 cmd4:list:print#4:close4:end
```

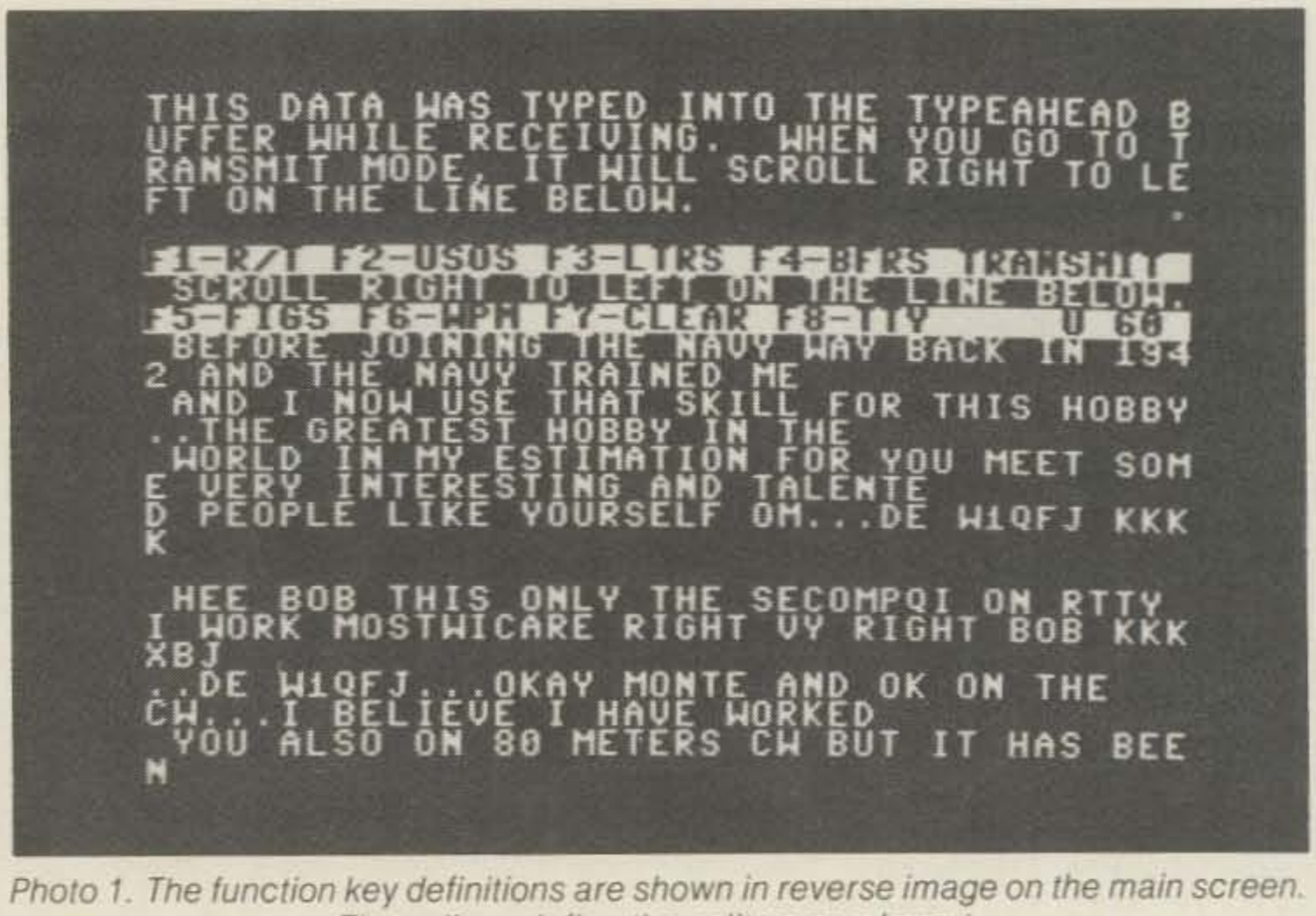

Photo 1. The function key definitions are shown in reverse image on the main screen. These lines define the split-screen layout.

F7—In receive mode, clears the type-ahead buffer as well as the type-ahead screen area and the transmitted data line.

F8—Toggles on/off the auto CR/LF function. When on, a solid circle appears to the right of the "TTY." A CR/LF sequence is inserted after the first space following the 72nd character of a line or following the 80th character if there was no space. This function is required only when the other fellow is using a real "machine."

When in the receive mode, the keyboard is active and the operator may type up to 255 characters into a type-ahead buffer. The data appears on line 5 and scrolls upwards when the line is filled. Typing errors may be corrected by using the "left-arrow" key and rekeying the data. Only data on line 5 may be changed in this manner. When in transmit mode,

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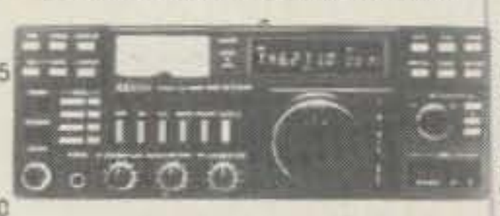

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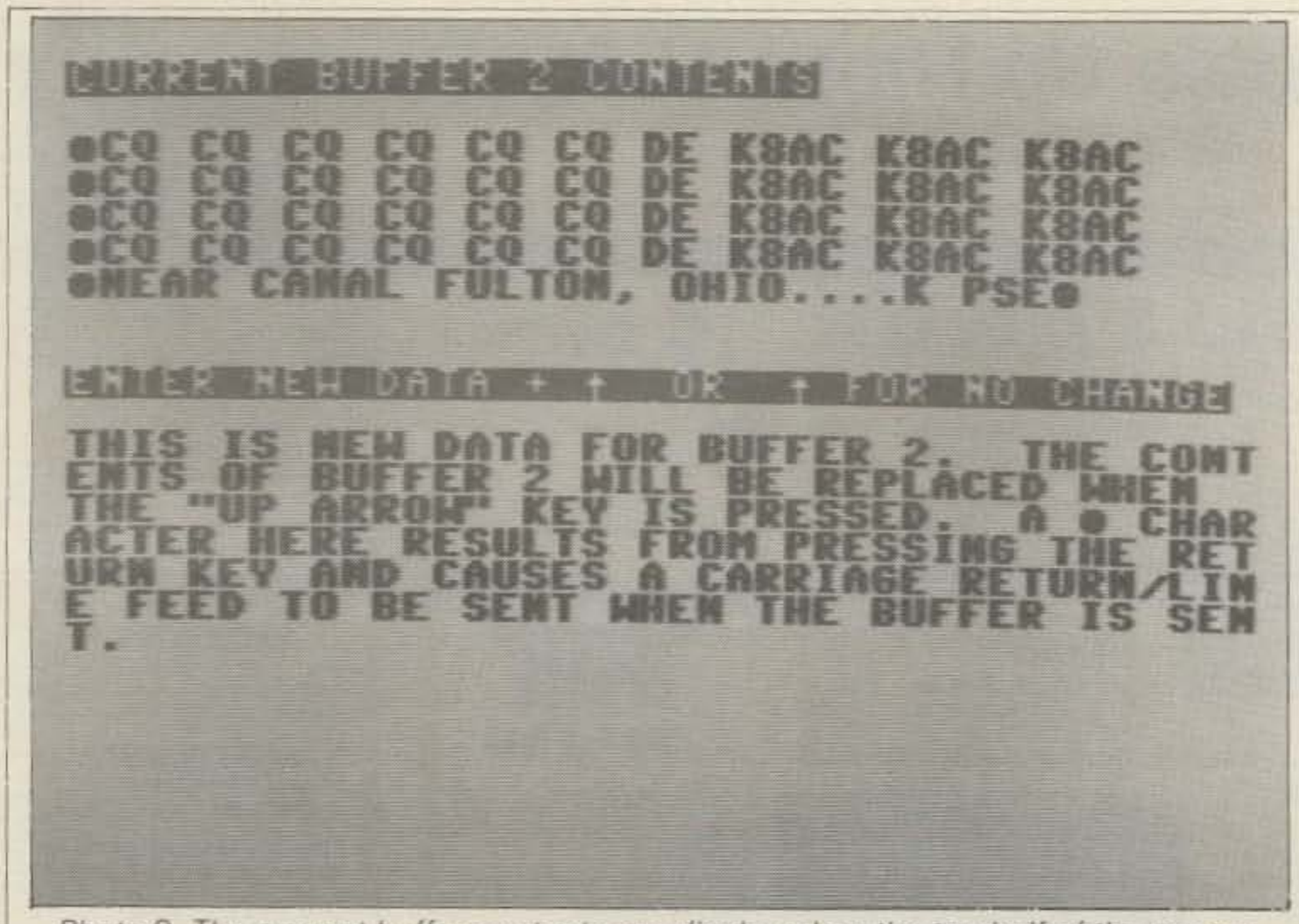

Photo 2. The current buffer contents are displayed on the top half of the screen.

The Scroll SRC Instructions

```
LINE# LOC    CODE          LINE

00001  0000                       * = $033C     ;ORG TO CASSETTE BUFFER
00002  033C  4C 75 03              JMP HILIN     ;FROM SYS828
00003  033F  4C 45 03              JMP LOLIN     ;FROM SYS831
00004  0342  4C 91 03              JMP MIDLIN    ;FROM SYS834
00005  0345  A2 00        LOLIN    LDX #$0       ;SCROLL RECEIVE AREA
00006  0347  BD 90 05     BLK1     LDA 1424,X
00007  034A  9D 68 05              STA 1384,X
00008  034D  E8                    INX
00009  034E  E0 00                 CPX #$00
00010  0350  D0 F5                 BNE BLK1
00011  0352  BD 90 06     BLK2     LDA 1680,X
00012  0355  9D 68 06              STA 1640,X
00013  0358  E8                    INX
00014  0359  E0 00                 CPX #$00
00015  035B  D0 F5                 BNE BLK2
00016  035D  BD 90 07     BLK3     LDA 1936,X
00017  0360  9D 68 07              STA 1896,X
00018  0363  E8                    INX
00019  0364  E0 58                 CPX #88
00020  0366  D0 F5                 BNE BLK3
00021  0368  A9 20                 LDA #32
00022  036A  A2 00                 LDX #$0
00023  036C  9D C0 07     CLEAR    STA 1984,X    ;CLEAR NEW LINE
00024  036F  E8                    INX
00025  0370  E0 28                 CPX #$28
00026  0372  D0 F8                 BNE CLEAR
00027  0374  60           END      RTS
00028  0375  A2 00        HILIN    LDX #$0       ;SCROLL TYPE AHEAD BUFFER AREA
00029  0377  A0 00                 LDY #$0
00030  0379  BD 28 04     HIBLOK   LDA 1064,X
00031  037C  9D 00 04              STA 1024,X
00032  037F  E8                    INX
00033  0380  E0 F0                 CPX #$F0
00034  0382  D0 F5                 BNE HIBLOK
00035  0384  A9 20                 LDA #32
00036  0386  A2 00                 LDX #$0
00037  0388  9D C8 04     ZIP      STA 1224,X    ;CLEAR THE NEW LINE
00038  038B  E8                    INX
00039  038C  E0 28                 CPX #$28
00040  038E  D0 F8                 BNE ZIP
00041  0390  60                    RTS
00042  0391  A2 00        MIDLIN   LDX #$0       ;SCROLL XMIT LINE TO LEFT
00043  0393  BD 19 05     SHIFT    LDA 1305,X
00044  0396  9D 18 05              STA 1304,X
00045  0399  E8                    INX
00046  039A  E0 27                 CPX #$27
00047  039C  D0 F5                 BNE SHIFT
00048  039E  60                    RTS
00049  039F  00                    BRK
00050  03A0                        .END

ERRORS = 00000
```

you cannot correct errors in the type-ahead buffer.

The **RETURN** key causes a carriage-return/line-feed to be sent, and a reverse image **C** will appear on the screen.

Sending of the stored message buffers can be initiated only when in transmit mode. The buffer to be sent is selected by holding down the **CNTL** key while pressing the numeric key corresponding to the buffer number (1 through 7).

When the buffer change routine is entered via **F4**, the operator is prompted for the number of the buffer, and the current buffer contents are displayed on the top half of the screen (see photo #2). If a change is to be made, the entire buffer must be rekeyed on the bottom half of the screen. When all data has been entered, the "up-arrow" key is pressed to denote end of buffer. If no change is to be made, the "up-arrow" key is pressed without keying anything else. Mistakes during keying may be corrected by backspacing with the "left-arrow" key. Pressing the **RETURN** key places a "solid ball" in the buffer, which causes a carriage-return/line-feed sequence to be sent when the buffer is transmitted. Entering a buffer number of **0** will return you to the main screen.

If you have a disk drive, you can write the current contents of the buffers to disk by entering **W** in place of a buffer number. The buffers can then be reloaded on subsequent executions of the program by entering **R**.

Conclusions

A hybrid BASIC/machine-language RTTY program can offer much in the way of performance and function. If you are at all familiar with BASIC, it will also provide many hours of educational tinkering as you add or change its functions to suit your needs. While it is certainly possible to implement the program in standard C-64 BASIC, the expanded "SIMON'S BASIC" simplifies the task considerably.

The "receive" and "transmit" routines have been condensed as much as possible without compromising function. If you add function to those areas of the program, you should make every effort to minimize the code added within the main transmit and receive loops. When using the type-ahead buffer while receiving, a slight delay will be noticed between depression of the keys and the appearance of the characters on the screen. When operating at 100 wpm, the length of the transmit routine prevents sending at a true 100 wpm, but the RS-232 port ensures that the individual characters are sent at the proper speed. The slight delay between characters is noticeable only when transmitting a stored message buffer.

The program in its present state provides a very acceptable level of function and performance for casual RTTY operation. You may find that it is the only RTTY program you need or want. CQ

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CIRCLE 80 ON READER SERVICE CARD

CQ REVIEWS:

The Kantronics Packet Communicator

BY LEW MCCOY*, W1ICP

From my point of view, there isn't much doubt that packet radio has taken hold of the amateur's imagination. At the Atlanta Hamfest, I attended all the lectures on packet and was surprised at the large numbers of people present. Again, at the Los Angeles Convention, just a few months ago, there were two lectures on packet, and they were very crowded. This, plus the growing number of stations on packet, makes it appear that this new mode has a very viable future.

I was exposed to packet radio over a year ago when a good friend of mine, W7KB, built a kit that was made available by the Tucson Amateur Packet Radio Association (TAPR). Even though I have had a strong interest in computers and the future of computers in amateur radio, at that time I didn't grasp the potential of the marriage of packet radio and computers in our hobby.

Kantronics Corporation was quick to realize that packet has a bright future and is now marketing a Packet Communicator, or Terminal Node Controller (TNC). This review is about their TNC and some information about packet radio also. The initial guidelines for packet radio as used by amateurs were laid down by the TAPR group. This includes much software that has been used in the design of the Kantronics TNC. However, the Kantronics TNC differs in many ways from the TAPR unit, as we will see.

First, though, I feel a brief description of packet radio is in order. The name "packet" is derived from the passage of a packet of information or messages, each transmission being a packet. One can ask how this differs from a message sent by voice, CW, or RTTY. Packet uses digital data transmitted and received by means of radio. When a packet is sent, it doesn't go directly to your transceiver. It first enters the TNC, where it is processed by a microcomputer and then fed to the transceiver. The information then appears on the video monitor of the computer being used. It is important for the neophyte to understand that the regular home computer merely becomes a terminal for inputting information to and from the TNC. In my operation, I use a Commodore C64—more about that in a moment. In essence, the TNC handles all the chores involved in sending and receiving data, which includes forming the messages into packets or frames, plus keying the transmitter and demodulating signals from the receiver. However, there is a lot more to the process than just that, as we will see.

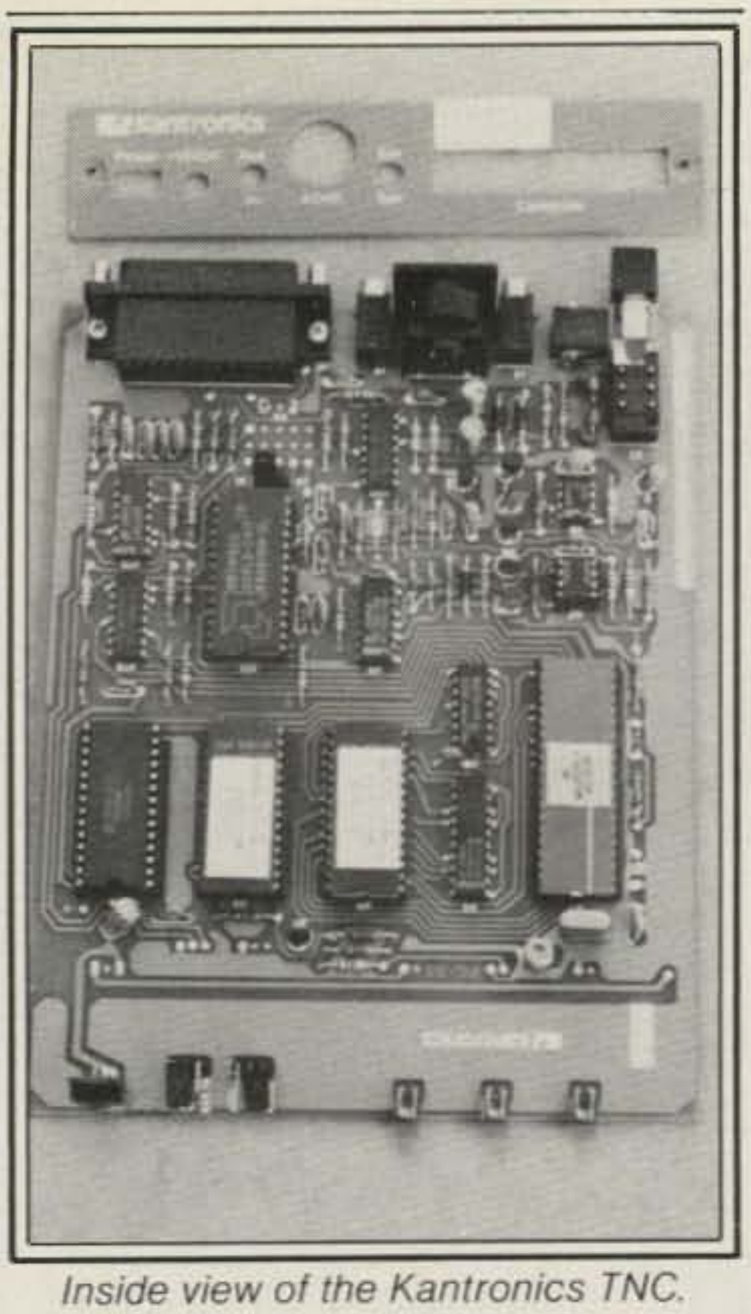
A nice neat package that does a world of things.

In addition to the items mentioned, the TNC with its computer memory and processing ability does many other tasks. It maintains the integrity of the packet contents. (Packet radio is essentially an error-free method of communications.) One of the most interesting things the TNC does is act as a relay station, or as they are called, "digipeaters." For example, let's assume we have three stations—*A*, *B*, and *C*—all on 2 meters. *A* cannot talk to *C* because they are too far apart, but *B* can talk to either. *B* turns on his TNC and leaves it on so that *A* can then talk to *C*, going through *B* to do so. The TNC handles all these chores so that in essence, *B* doesn't have to be in attendance. The actual procedure or protocol would be for *A* to type on his terminal "connect *A* to *C* via *B*" and the TNC does the work (in actual practice, callsigns would be used, of course). Basically, as many as eight digipeaters can be connected in tandem using the protocol available with the Kantronics TNC. Depending on the number of digipeaters and regular repeaters used, extremely long distances can be covered. In fact, in some portions of the country entire states are covered. The popular frequency is 145.01, so you might listen there for activity in your area.

Each packet that is sent is done in a very orderly fashion. First, there is header information, followed by the data, followed by a very important 16-bit number called the *Frame Check Sequence (FCS)*. The FCS determines the accuracy of the data. If the data is not received correctly, it will be retransmitted up to a specified number of times, according to the protocol involved.

These packets are sent at very fast transmission rates—300 baud below 30 MHz (FCC regs), and at 1200 baud on VHF and higher. These numbers may not mean anything to the neophyte, but 300-baud transmissions are faster than

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



Inside view of the Kantronics TNC.

nearly all voice speeds (a rough approximation would be nearly 400 words a minute) and 1200 baud is extremely fast—putting it mildly. It is truly a case of seeing is believing. Some groups are experimenting with much higher baud rates (like 19,200 baud!). So what do these high rates of communications speeds mean? For one thing, it means that a great number of stations can use the same frequency to exchange information. In fact, in some cases 145.01 MHz sounds unoccupied at times when actually a tremendous amount of data is being transferred. Another thing it means is that long files or computer programs can be transmitted very quickly. I have no idea how many stations could be accommodated on a single frequency without complaints, but the number has to be very large. At one time I was the net control of the Missouri 75 meter phone net. It took about 40 minutes to call the roll and exchange traffic. On packet, this same procedure would take no more than two or three minutes! And, I might add, do a much more accurate job.

The word "protocol" was used above, and a short explanation is required. The rules by which the software determines responses to incoming and outgoing data in the TNC are known as the protocol. Normally, for example, one does not call CQ on packet (although you can). You ask for a CONNECT to a given station. For example, I would type "***CONNECT K2EEK" and hit the return key. There would be a short burst of data from the transmitter, and if K2EEK has his system turned on, I would receive a returned signal that would say "***CONNECTED to K2EEK" on my video monitor. If there

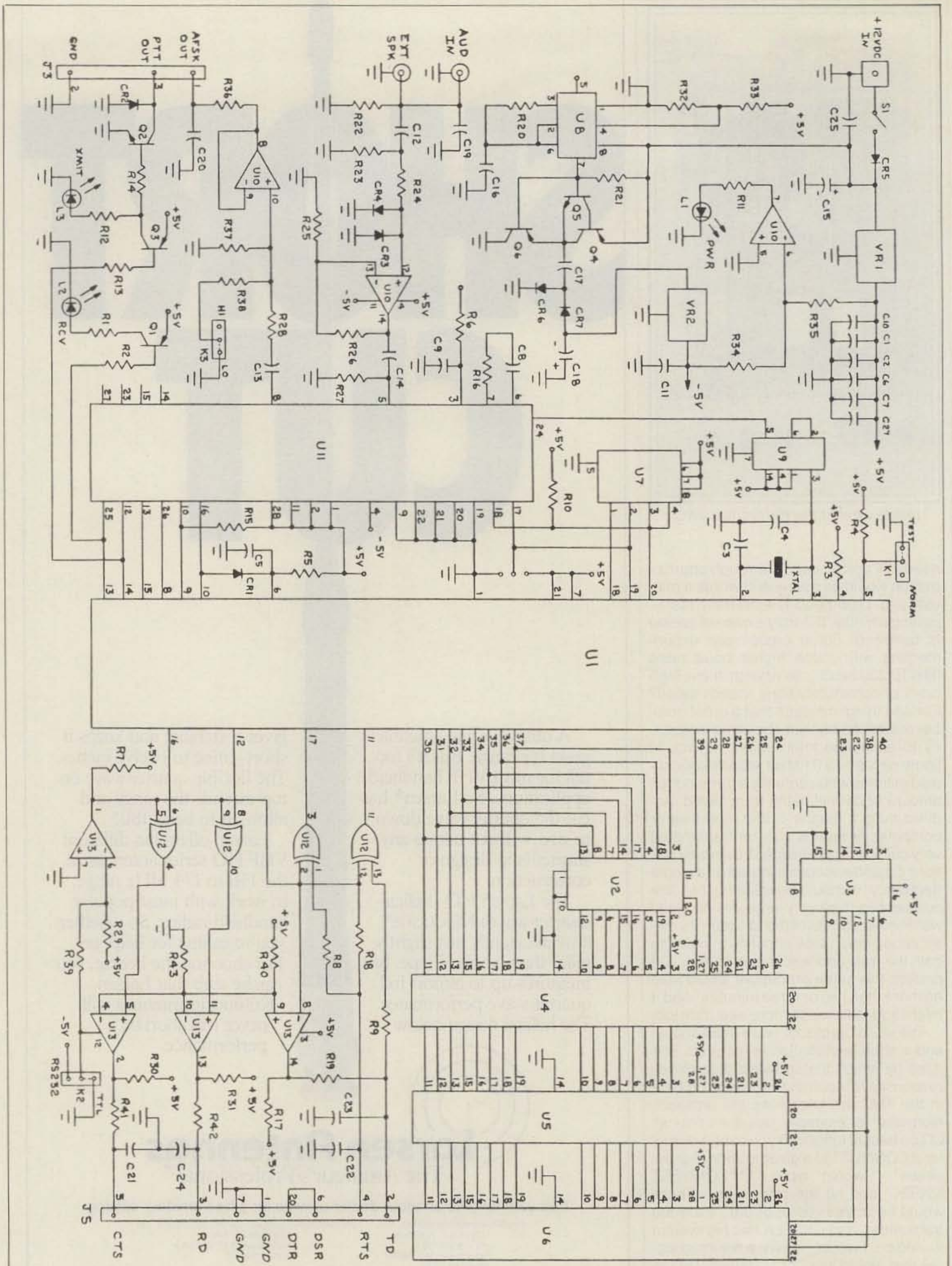


Fig. 1– Circuit diagram of the Kantronics TNC.

was interference on the channel or some other reason for the signal not being received at K2EEK, the protocol would require that the signal be sent several times until it was acknowledged. The protocol would determine the number of times the signal would be sent. If no connection was made, the TNC would feed the message to the terminal and video display "***DISCONNECTED." One of the big advantages of the Kantronics TNC is that the protocol is set so that if two or more QSOs are taking place on the frequency and a simultaneous transmission of two stations occurs (a collision), the subsequent time delays and retransmissions are determined by rules contained in the protocol.

The Kantronics Terminal Node Controller

The Kantronics TNC is a lot of good circuitry put in a very small container. Cabinet size is only 5¾ "W × 8 "D × 1¼ "H. The front panel has three red LEDs: one to show if the unit is on or off, another that lights when received data is coming in, and another that shows that transmission of data is taking place. Fig. 1 is a circuit diagram of the unit. The rear has several connection points including **AUDIO IN** and **SPEAKER OUT**, and **XCVR** connection and **COMPUTER** connections. Only three wires are required for the XCVR connection, push-to-talk, AFSK out, and ground. A simple cable is used to connect the computer to the TNC. As I said, I am using a Commodore C64. A cable and edge card connectors are used between the two, following an RS-232 format.

One of the significant differences between the Kantronics TNC and other units (at least at this time) is that either TTL or RS-232 signals are available via a jumper connection. This means that the Kantronics TNC can be used with *any* computer. For some previous tests with another piece of packet equipment I had to purchase an RS-232 interface for my Commodore. This isn't necessary with the Kantronics unit.

Still another feature is a **CALIBRATE** command. Packet radio is more in use on VHF, primarily on 2 meters. There is also considerable low-frequency use, 14,103 kHz being a prime example. However, the restrictions on tuning in a packet station are very strict. In order to copy each other, packet stations must be within about 20 to 50 cycles of each other, and the receivers used must have very good filtering to keep out noise. I had used a TNC other than the Kantronics unit and suffered much frustration in trying to copy 20 meter signals. However, with the Kantronics in use, I immediately had a lot of good copy from stations all over the country.

The CALIBRATE command that Kantronics uses permits you to transmit a packet carrier so that the station on the other end has no problem zero beating you and eliminating the tuning problems. But the real feature of the CALIBRATE command is when receiving packet. Depending on which baud rate is in use, when in the CALIBRATE mode, two numbers will appear on the video screen. These numbers are related to the received tones, and when the two numbers are within a 60/40 or 40/60 ratio, you will get good copy. For example, at 1200 baud/Bell 202 a perfect receiving ratio would be 1024/1024.

Still another feature they have are **BELL** commands that are accessed by a simple typed command. All the necessary baud-rate changes are accomplished for going from VHF to the lower bands. I pointed out that 1200 baud is used on VHF and 300 baud on the lower bands. This requires changes in the software, which Kantronics makes easy with a few simple commands.

Fig. 1 is the circuit diagram of the Kantronics TNC. Briefly, U11 is a 7910 and serves as a demodulator chip for the audio coming in and for the AFSK signals going out. U1 is the CPU processor, and of course is the heart of the unit. To my knowledge, this is a more exotic (and more expensive) microprocessor than used in other TNCs. U4 and U5 are 2764 ROMs, and U6 is a 6164 NOVRAM.

I should mention that a NOVRAM is a device that has been around for several years, but has been very expensive and hasn't seen too much use in amateur radio. A NOVRAM is like a ROM in that it can be programmed and the programming will hold, even though all voltages are removed. For example, one of the commands in the protocol is **MYCALL**. When I set up my system the first time, I typed the command **MYCALL** and then W1ICP. I then typed **PERM** (meaning permanent) and W1ICP was held in memory even though the unit was turned off. By the same token, the programming can be changed by going through the same procedure. That is the beauty of using a NOVRAM.

The instruction manual is detailed and should answer most of the buyer's questions. I cannot fault Kantronics in any way, but feel quite strongly that something is missing as far as packet radio is concerned. To me one of the big problems is actually telling an amateur *exactly* what to do when he first hooks up his packet radio. The instructions for hookup are very clear, but very little is said about operating. By the time I got the Kantronics for review, I had already had an extensive course in frustration with another manufacturer's unit. For example, assuming you know the protocol, baud rates, how to tune your transceiver, what audio levels to look for, and whether to use upper or lower sideband (on 20) are just a few of the things you have to find out. Believe me, this can be very frustrating (and in my case expensive because of long-distance calls to amateurs who were supposed to know how to do it). All of this is nothing once you actually make contact with another station. There is a whole new world of QSO formats you face. Since it is a new mode, one doesn't like to feel like a complete idiot when getting on the air. What is needed are clear, step-by-step, holding-by-the-hand instructions.

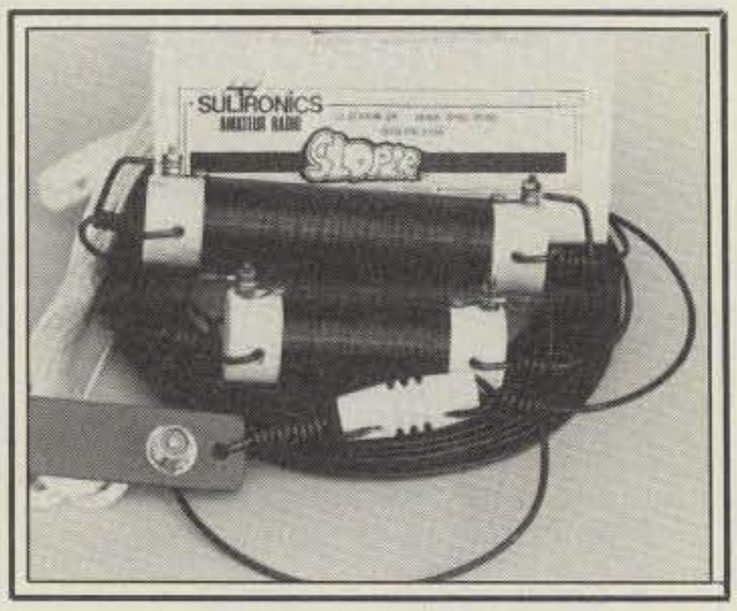
So much for being critical. I have now tried three different TNCs and there is no doubt in my mind that the Kantronics TNC is excellent and a good buy for the money, which incidentally, is $219 list. The unit is manufactured by Kantronics, Inc., 1202 E. 23rd St., Lawrence, Kansas 66046 (913-842-7745). CQ

CQ SHOWCASE

ICOM IC-1271A 1.2 GHz Transceiver

ICOM has announced the IC-1271A full-featured base station transceiver. With coverage from 1240 to 1300 MHz the IC-1271A features 10 watts of RF output power, 32 memories, scanning, and multi-mode operation, including ATV (amateur TV). Additional features include front-end GaAsFET's for receiver sensitivity, CW/FM/upper and lower SSB, scanning (memory, program, or mode scan), and 12 VDC or 117/240 VAC (optional).

Options include the TV-1200 ATV interface unit, IC-EX310 voice synthesizer, UT-15S CTCSS encoder/decoder, and IC-PS25 13.8 VDC internal power supply. The suggested retail price of the IC-1271A is $999.00. For more information, contact ICOM America, Inc., 2380 116th Ave. NE, Bellevue, WA 98004, or circle number 101 on the reader service card.



Sultronics Douband and Triband Slopers

Sultronics Amateur Radio has announced the SS-2A Duoband Sloper, which covers 80 and 40 meters and is 45 feet long, and the SS-3A Triband Sloper, which covers the 160-80-40 meter bands and is 60 feet long. Both models feature standard 50 ohm coaxial feed, "no trap" construction, stainless steel hardware, #12 solid copper med. drawn element wire, Amphenol coax connector, and heavy-duty aluminum tower mountable bracket. Both models are easily tuned for resonance, maker says.

The SS-2A Duoband (80-40) Sloper is priced at $27.95, while the SS-3A Triband (160-80-40) Sloper is priced at $39.95 (ppd.). For more information, contact Sultronics Amateur Radio, 1587 U.S. 68 North, Xenia, OH 45385, or circle number 104 on the reader service card.

CMC Communications Docking Boosters

The new series of Docking Boosters from CMC dock with your HT and create a mobile unit with 30 watts output. The Docking Boosters include a 16 dB gain GaAsFET preamplifier. A sensitive carrier sensor/controller is included. The Docking Boosters are mounted on a special "Handy-Bracket" for easy slip-on mounting to most car doors. Cabling and in-line fuses are included for connection to the vehicle battery, and an SO239 connector is provided for the outside vehicle antenna.

Several different models are available to dock with Yaesu, ICOM, Kenwood, and Standard HT's in the 2 meter and 70 cm bands. All are finished in a black crackel surface and include a mic hangup clip and HI/LOW/OFF Power Switch. Primary voltage is 13.8 VDC at 4 amps. For further information, contact CMC Communications, Inc., 5479 Jetport Industrial Boulevard, Tampa, FL 33614, or circle number 106 on the reader service card.

Regency MX7000 Scanner

In addition to monitoring all frequencies between 25 MHz and 550 MHz, the Regency MX7000 covers frequencies as high as 1.3 GHz. The scanner can monitor up to 20 channels, or search through an entire band for an active new frequency. Other features include a 24-hour digital clock, priority channel, dual scan speeds, and scan or search delay. The MX7000 is designed for home or mobile use, and has a suggested retail price of $699.95. For more information, contact Regency Electronics, Inc., 7707 Records Street, Indianapolis, IN 46226, or circle number 102 on the reader service card.

Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

Administering The Volunteer Novice Test

Amateurs who have been away from amateur radio for a few years are amazed at how the hobby has changed. This is particularly true when it comes to licensing. It is little wonder that the majority of today's amateurs do not know how to administer a Novice examination.

The Novice class amateur license was born in 1951 when Novices were confined to crystal-controlled Morse code rigs with 75 watts input power. Their one-year apprenticeship privileges couldn't be renewed under any circumstances. You simply either upgraded or went off the air.

On November 22, 1967, as part of *Phase One* of the Commission's new *Incentive Licensing Rule* (Docket FCC-67-978), the FCC approved a **two-year** term which could be "renewed" by retaking the license examination *after a 12 month wait!* Novice power levels were increased to 250 watts input power and VFO's were allowed. Novices were prohibited from portable or mobile operation—even traffic handling. A year later as part of *Phase Two* (November 22, 1968) Novices lost 2 meter (145–147 MHz) voice privileges, which most of you probably never knew they once had!

To obtain the Novice license back in those days, you had to locate a General class level (or higher) amateur radio operator (at least *age 21*) to act as a volunteer examiner for the mail-order obtained license. The VE administered the 5 words per minute code and wrote the FCC for the written examination, which had to be administered within 30 days.

How times have changed! Today the Novice class **ten-year term** can be indefinitely renewed. The licensing procedure is handled completely differently. For one thing, the examiner can now be 18 years old. Some things haven't changed, however. A Novice is still limited to CW—Morse code—although the power level is now 200 watts peak power *output*. It appears that Novices will be getting their voice privileges back again shortly, however. That's if the FCC gets their way. The voice privileges will probably be on the 10 meter and 220 MHz amateur bands. The Novice ticket is the only one that has always been free to obtain.

National Volunteer Examiner Coordinator, P.O. Box 10101, Dallas, TX 75207

Who May Give The Novice Test

Part 97.31 outlines volunteer examiner requirements.

1. Any General, Advanced, or Extra class amateur (a team of three is not needed) may administer the Novice test providing:

2. their age is at least 18 years old and . . .

3. they are not related to the applicant and . . .

4. not significantly connected with the amateur radio equipment or license preparation business and . . .

5. have never had their operator's or station license revoked or suspended.

How To Give The Novice Test

Novice code testing remains essentially unchanged. That is, you send the code at 5 words per minute for about 5 minutes and require the applicant to pass a test that you design. The transmission is usually a code QSO, although random groups are also permissible. The volunteer examiner can give the code test in any format—answer 7 out of 10 questions, fill-in-the-blanks, or copy one minute solid. Since it has been the FCC's experience that code copying ability indicates that the applicant can also send code, a hand-sending test is not required. Applicants can require one, however, if they feel it necessary.

No longer does the FCC in Gettysburg, PA, mail out Novice written examinations for volunteer examiners to administer to future hams. The Novice licensing program was completely overhauled in 1983. Instead of the FCC selecting the 20 written questions to which the FCC has determined the answers, volunteer examiners now select questions from a 200 question pool. It is the VE who decides what the answer is. One question must be selected from each of 20 groups for a total of 20 questions. The question pool is published by the FCC in PR Bulletin 1035A—but only the questions, not the answers.

The written test need not even be written anymore! It can be given orally in "discussion" fashion! If the Novice test is given in written form, the answers can be in any format on which the volunteer examiner decides—multiple choice, fill-in-the-blanks, even essay type.

The question pool is updated once a year. The current version is dated July 1985 and replaces the August 1984 *PR Bulletin 1035A*. The 200 question Novice pool is available without cost from the *FCC, Private Radio Branch, Washington, DC 20554*. The question-pool system is an extension of a program used by the FAA. If it is successful in pilot testing, it should work for amateur radio operator examinations, too. The basic idea of the question-pool system is to have a sufficiently large number of questions so as to preclude memorization.

Many groups have written Novice tests already made up so all you have to do is hand the test to a prospective Novice. We have one available for $1.00 postpaid. Send to W5YI-VEC, PO Box #10101, Dallas, TX 75207. Also available is a *Novice Class Test Manual* for study by the applicant before taking the Novice examination. It contains all 200 FCC-approved test questions along with easy-to-understand answers and discussions ($2.95 plus $1.50 first class postage). We include a current FCC From 610 with both the manual and the test.

More changes are in the works. The FCC issued a *Notice of Proposed Rulemaking* (Docket 85-196) last June which looks toward allowing volunteer examiners to design Element 2 Novice tests from question pools developed by VECs rather than the FCC. A VEC, volunteer examiner coordinator, acts as the administrative link between the volunteer examiner and the FCC's license-issuing facility in Gettysburg. The potential is for many different versions of the 200 question pool to exist, since each VEC will be authorized to develop their own pool. At present there are over 25 different VECs.

What To Send To The FCC

An applicant applies for Novice testing directly to a VE on FCC Form 610. It is important that only the June 1984 version be used, since older versions are not suitable for the newer Novice testing program. The applicant fills out Section I.

Passing grade for the written Element 2 test is 15 questions correct out of 20. For the Element 1A five wpm code, either one minute solid copy (25 straight characters—punctuation counts as 2 charac-

ter) or seven out of ten questions answered correctly.

After the applicant has passed the Element 2 written and Element 1A five wpm Morse code test, the volunteer examiner completes Section II-A certifying that both tests were successfully passed. It is not necesssary that the *VE Team Report* be completed on the front of the application unless the applicant tried to upgrade further.

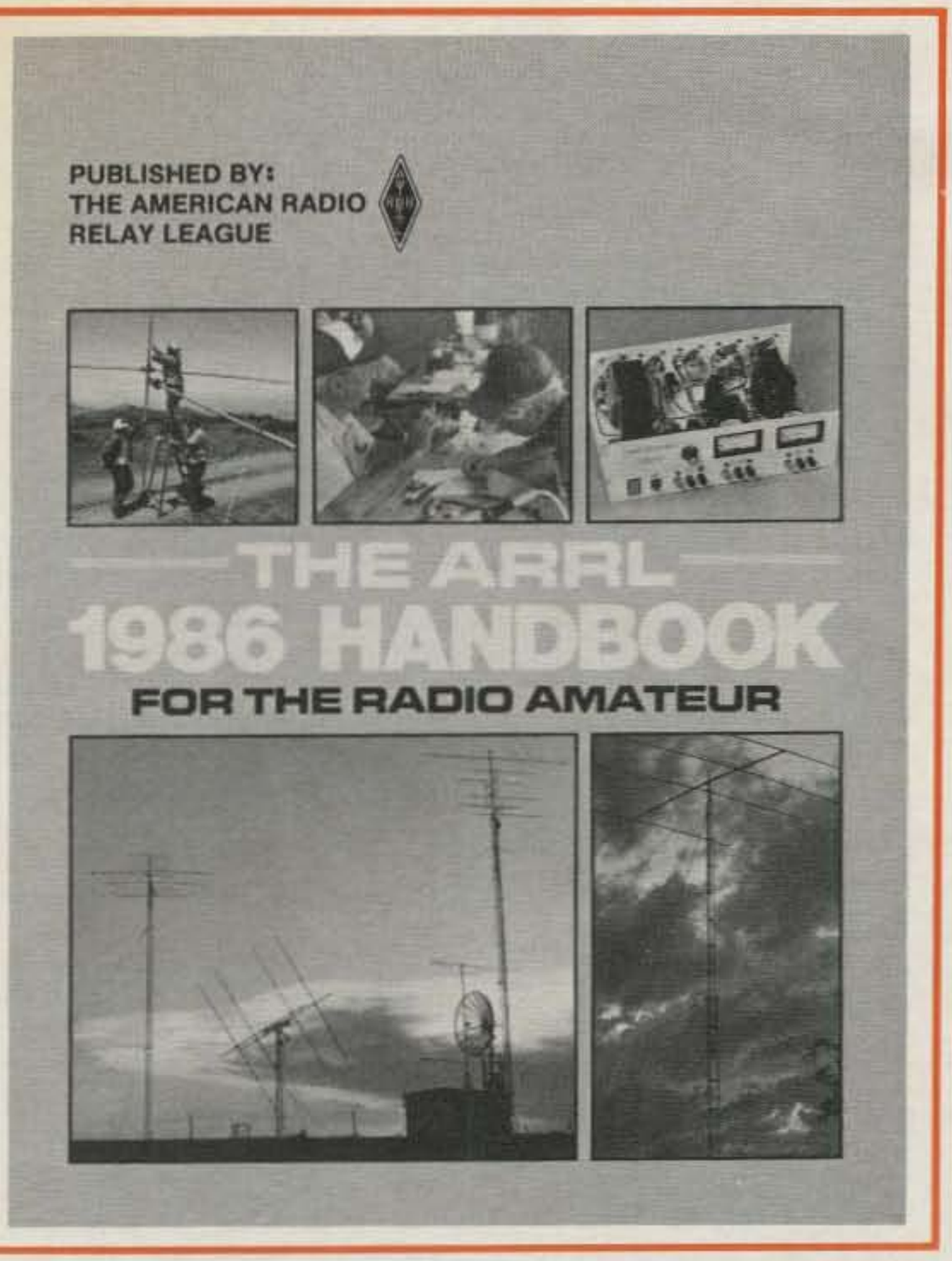
The new Technician and up volunteer testing program allows test fees (called expense reimbursement) to be charged candidates. No test fee may be charged the Novice applicant for administering the Novice examination unless a higher class of license is applied for. In this case it is the higher class examination that has a fee attached to it.

The FCC Form 610 application must be submitted to the FCC, P.O. Box #1020, Gettysburg, PA 17325, within ten days of successful test administration. Return the Form 610 to the applicant if he fails either the written or five wpm code test. Do not send the code or written test papers to the FCC. These must be retained by the VE for a period of one year.

If an applicant passes the five wpm code but fails the written test, the VE must issue a *Certificate of Successful Completion.* This certificate can be in any form and may be used for a period of one year for five wpm examination code credit.

The applicant should wait 30 days before retaking a failed volunteer-administered examination, but VEs can grant a waiver of this rule *for any good reason* by attaching a letter *from the applicant* to the FCC Form 610 application. Volunteer examiners must send this letter to Gettysburg along with the application.

Unlike higher class upgrades, Novices must wait until their licenses are received before operating on the amateur bands. No "instant upgrade privileges" exist in the Novice class, since an amateur needs a callsign to identify his station.



BIGGER AND BETTER THAN EVER!

The ARRL 1986 Handbook for the Radio Amateur takes over where the 1985 Edition left off. Each of the 40 chapters has had some revision, and there are more than 500 new or revised figures. The new edition will contain 1184 pages — way up from last year's count of 1024. Many key chapters with "hot" topics among today's radio amateurs have been completely revised and rewritten. In fact the new material represents 532 text pages.

An understanding of digital electronics is a must these days since such circuitry has so many practical applications in station control, frequency synthesis, telemetry, word processing and other information-handling systems. The Digital Basics chapter will help you to understand what is going on in everything from simple keyers to sophisticated microcomputers. Packet-radio enthusiasts will find the most up-to-date information available in the Digital Communications chapter. There are new sections on data interfacing and modems, 50 new and revised figures, plus an expanded bibliography and glossary.

The Special Modulation Techniques chapter has the latest on spread-spectrum. On the fun side, we've added a new section on remote control of model aircraft and vehicles.

On the practical side, you will find many of the 27 new projects described in October *QST*. There are new power amplifiers for 1.8, 50, 144 and 1296 MHz, plus preamplifiers and transverters for the VHF/UHF enthusiast. The new digital PEP Wattmeter - SWR Calculator will be one of the most popular projects.

We've only scratched the surface in describing what is the standard manual of RF communication. Over 5.7 million copies of *The Handbook* have been published in 63 editions since 1926. The new edition is must reading for today's radio amateur!

The *1986 Handbook* will be available in November. Paperbound prices are $18.00 in the U.S., $19.00 in Canada and elsewhere. Cloth prices are $27.00 in the U.S. and $29.00 elsewhere. Prices in U.S. funds. Foreign remittance should be in the form of an international money order or a check drawn on a bank account in the U.S.

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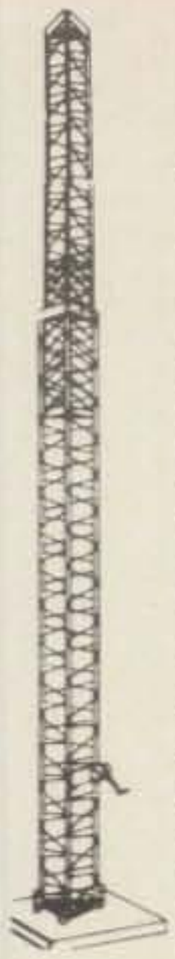

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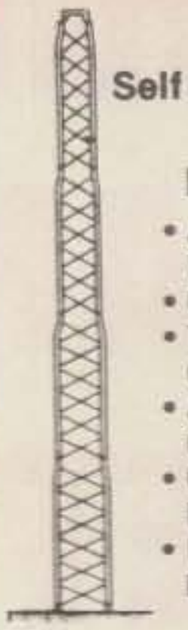

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LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

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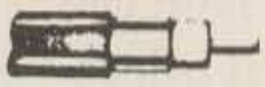
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™



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select connectors below.

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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

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Solid 12 ga $.12/ft 14 ga $.10/ft
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R3 20, 15, 10mtr Vertical	$259
AV5 80-10mtr Vertical	$99
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40-2CD 2-el 40mtr Beam	$279
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205BAS 5-el 20-mtr Beam	
155BAS 5-el 15-mtr Beam	
105BAS 5-el 10-mtr Beam	
204BAS 4-el 20-mtr Beam	
64BS 4-el 6-mtr Beam	
18 AVT/WB 80-10mtr Vertical	
18HTS 80-10 mtr Hy-Tower Vertical	
23BS 3-el 2mtr Beam	
25BS 5-el 2mtr Beam	
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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
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Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg	$329

ROTOR CABLE

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

ROHN GUYED TOWERS

10 ft Stack Sections

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

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

Foldover Towers

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

25G Foldover Double Guy Kit $219
45G Foldover Double Guy Kit $249
*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
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502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

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

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.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

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B23	2M	No	2W	30W	$ 79
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
C22	220	No	2W	20W	$ 79
C106	220	Yes	10W	60W	$179
C1012	220	Yes	10W	120W	$259
D24	440	No	2W	40W	$179
D1010N	440	No	10W	100W	$289

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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

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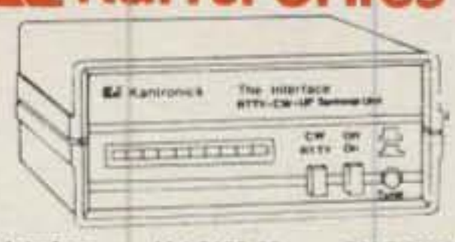

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CQ World-Wide DX Contest
All-Time U.S.A. Records

BY FREDERICK CAPOSSELA, K6SSS

Tabulated below are the record-high scores achieved by U.S. Contesters in the CQ World Wide DX Contest. Number groups following calls and bands are: year of operation, total score, contacts, zones, and countries.

PHONE

Single Operator/Single Band

1.8	WA2SPL('83)	18,483	121	18	43
3.5	W1ZM('83) (Opr. K1ZM)	177,862	669	27	86
7.0	N7DD('83)	217,830	701	33	73
14	K1UO('83)	727,494	1,417	34	140
21	N7DD('81)	923,945	1,998	36	121
28	N7DD('80)	754,536	1,730	36	113

Single Operator/All Band

Station	Band	QSOs	Zones	Countries
	1.8	14	6	7
AI6V	3.5	121	17	29
(Opr. WA6VEF)	7.0	479	27	51
(1983)	14.0	757	33	91
3,576,528	21.0	1,099	29	71
	28.0	477	24	47
	Total	2,947	136	296

QRP AA2Z/1('83) 509,106 585 86 235

Multi-Operator/Single Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	23	11	20
W4QAW	3.5	105	21	65
(1982)	7.0	197	28	80
4,455,190	14.0	438	38	135
	21.0	1,001	37	122
	28.0	394	32	129
	Total	2,158	167	551

Multi-Operator/Multi-Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	109	8	16
N2AA	3.5	406	24	79
(1979)	7.0	366	28	84
13,299,750	14.0	1,646	40	152
	21.0	2,198	40	144
	28.0	1,354	36	120
	Total	6,079	176	595

CW

Single Operator/Single Band

1.8	K5UR('84)	28,032	169	22	51
3.5	W1ZM('81) (Opr. K1ZM)	151,497	610	22	71
7.0	N5JJ('84)	424,853	1,019	37	106
14	N7UA('80)	626,400	1,634	34	101
21	W1RM('82)	483,560	1,196	33	107
28	N4WW('82)	394,940	1,064	33	97

Single Operator/All Band

Station	Band	QSOs	Zones	Countries
	1.8	8	7	8
K1GQ	3.5	208	18	61
(1981)	7.0	425	24	76
3,276,768	14.0	576	32	85
	21.0	428	31	80
	28.0	473	26	80
	Total	2,111	138	390

QRP AC2U('81) 591,856 728 84 200

Multi-Operator/Single Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	17	9	16
N4AR	3.5	67	16	62
(1981)	7.0	461	28	92
4,564,350	14.0	755	34	110
	21.0	499	33	101
	28.0	686	32	97
	Total	2,485	152	478

Multi-Operator/Multi-Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	72	14	27
W2PV	3.5	427	18	70
(1981)	7.0	1,101	30	103
10,431,729	14.0	1,389	35	118
	21.0	1,228	35	103
	28.0	1,050	34	106
	Total	5,267	166	527

Club record: Frankford Radio Club('79) 173,821,640

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  - 7/8 inch loss .28 dB/100 ft. @ 30 MHz; 2.54 dB/100 ft. @ 1000 MHz ..... $3.25/ft.
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  - 1/2 inch loss .38 dB/100 ft. @ 30 MHz (FLC12-50J) 2.78 dB/100 ft. @ 1000 MHz ..... $1.59/ft.
  - 7/8 inch loss .13 dB/100 ft. @ 30 MHz (FLC12-78J) 1.3 dB/100 ft. @ 1000 MHz ..... $3.92/ft.

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RG-55B/U double shield (RG-58 size) 50 ohm	45¢/ft.
RG58U mil spec 96% shield	($10.00/100) or 11¢/ft.
RG62A/U 96% shield mil spec 93 ohm	12¢/ft.
RG174/U min. 50 Ω mil spec	10¢/ft.
RG213 noncontaminating 96% shield mil spec	36¢/ft.
RG214/U double silver shield 50 ohm	$1.65/ft.
RG214/U tinned copper	65¢/ft.
RG217/U double shield 50Ω 5/8" OD	85¢/ft.

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RG-8/U 97% shield 11 ga. (eq. Belden 8214)	31¢/ft.
RG58U 80% shield	07¢/ft.
RG58U 95% shield	10¢/ft.
RG59/U 100% foil shield TV type	10¢/ft.
RG59/U 70% copper shield	09¢/ft.
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Elbow (M359) UHF Elbow	$1.79
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UG 21 D/U Type N Male for RG8, Amphenol	$3.00
UG-88C/U BNC Male for RG-58, Amphenol	$1.25
UG 273 BNC-PL259 Amphenol	$3.00
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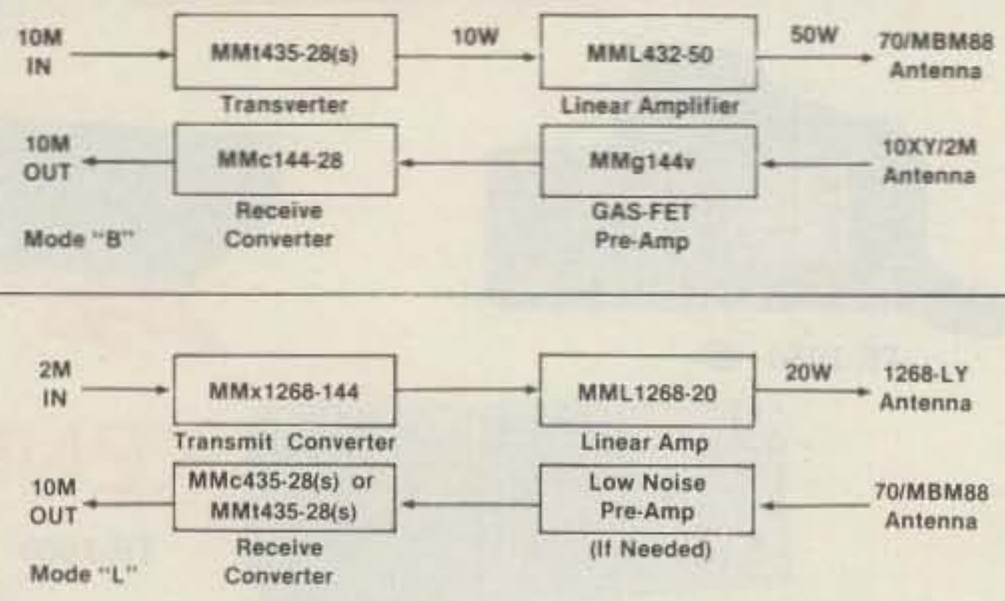

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CIRCLE 63 ON READER SERVICE CARD

CQ World-Wide DX Contest All-Time C.W. Records

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	UP2BBT/U6V('83)	83,160	481	14	49
3.5	VP2KAC('83) (Opr. N4RJ)	332,880	1,302	28	86
7.0	VP2KAA('83) (Opr. N4PN)	837,366	2,461	30	104
14	VP2KAA('80) (Opr. N4PN)	1,244,782	3,111	37	117
21	LU8DQ('81)	1,359,711	2,993	37	116
28	LU8DQ('79)	1,033,399	2,775	34	93

AFRICA

1.8	EA8AK('82)	75,768	385	15	51
3.5	EA9EU('83)	229,150	787	14	75
7.0	EA7TL/9('83)	354,308	1,175	21	80
14	CR6IK('74)	925,386	2,021	38	116
21	5Z4MX('83)	820,338	1,953	35	106
28	FR0MM('79)	978,012	2,590	36	90

ASIA

1.8	UP2BBT/U6V('83)	83,160	481	14	49
3.5	UP2NK/UF('84)	283,362	1,230	19	64
7.0	UP3BA/UF('84)	573,648	1,755	27	87
14	4X0U('82)	735,504			
21	4Z4NUT('80)	519,831	1,500	34	83
28	4X4UH('80)	554,645	1,772	32	83

EUROPE

1.8	LZ1KDP('84)	78,088	656	17	69
3.5	HA8KQX('84)	210,240	1,230	30	90
7.0	DK3GI('84)	608,612	2,035	35	107
14	OH8OS('84)	715,692	2,345	36	93
21	YU3ZV('81)	732,096	1,957	37	107
28	DK3GI('79)	592,848	1,584	31	101

NORTH AMERICA

1.8	KV4FZ('76)	42,800	390	13	37
3.5	VP2KAC('83) (Opr. N4RJ)	332,880	1,302	28	86
7.0	VP2KAA('83) (Opr. N4PN)	837,366	2,461	30	104
14	VP2KAA('80) (Opr. N4PN)	1,244,782	3,111	37	117
21	VP2KAC('80) (Opr. N4RJ)	1,075,407	2,955	36	105
28	KV4FZ('79)	653,072	2,384	32	87

OCEANIA

1.8	VR3AH('78)	20,310	238	12	18
3.5	VR3AH('76)	178,560	956	24	40
7.0	KH6XX('84)	427,230	1,424	33	68
14	KD7P/KH2('83)	574,332	1,496	36	96
21	KH6XX('78) (Opr. K7SS)	816,102	2,311	38	81
28	KG6DX('80)	801,876	2,367	35	79

SOUTH AMERICA

1.8	YV3AGT('84)	47,679	280	15	43
3.5	4M3AGT('83)	133,152	617	21	52
7.0	YX5A('84)	696,150	2,003	29	88
14	PJ9CC('80) (Opr. K4BAI)	1,209,022	2,914	34	105
21	LU8DQ('81)	1,359,711	2,993	37	116
28	LU8DQ('79)	1,033,399	2,775	34	93

Single Operator/All Band

AF	CN8CX('82) (Opr. K6NA)	6,234,664	4,354	121	358
AS	UF6CR('82)	4,613,680	3,982	92	312
EU	CT1BCM('84) (Opr. OH2BH)	3,295,152	3,108	123	344
NA	NP4A('83) (Opr. K3UA)	6,027,752	4,537	139	399
O	N6BT/AH0('81)	4,241,746	4,083	121	228
SA	9Y4VT('83) (Opr. N6AA)	7,153,434	4,961	127	359
QRP	UP2BIM('82)	899,932	1,351	83	279

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	94	6	8
9Y4VT	3.5	421	18	53
(1983)	7.0	838	20	69
7,153,434	14.0	1,439	31	80
	21.0	1,288	27	76
	28.0	881	25	73
	Total	4,961	127	359

Multi-Operator/Single Xmtr.

AF	EA9EU('80)	5,077,696	3,884	116	326
AS	RG6G('82)	10,394,658	5,355	166	511
EU	YU3EY('81)	7,674,190	4,051	150	345
NA	NP4A('82)	11,648,565	6,881	168	515
O	KD7P/KH2('84)	4,487,665	3,375	159	296
SA	P41E('81)	8,059,296	5,055	148	388

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	172	15	35
NP4A	3.5	589	23	73
(1982)	7.0	1,342	28	92
11,648,565	14.0	1,270	36	108
	21.0	1,547	34	106
	28.0	1,961	32	101
	Total	6,881	168	515

Multi-Operator/Multi-Xmtr.

AF	EA8CR('78)	17,734,970	9,799	142	463
AS	EW6V('82)	14,702,688	8,001	159	504
EU	OH0W('82)	14,371,840	9,515	184	618
NA	NP4A('80)	17,627,820	10,846	171	487
O	AH0C('83)	6,877,750	5,164	149	302
SA	P42E('82)	23,295,408	12,315	161	475

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	390	12	28
P42E	3.5	1,083	22	60
(1982)	7.0	1,995	29	81
23,295,408	14.0	2,965	36	112
	21.0	3,351	32	103
	28.0	2,531	30	91
	Total	12,315	161	475

CQ REVIEWS:

BY DAVE INGRAM*, K4TWJ

The Microlog "SWL" Cartridge Unit For RTTY and CW Reception

Comparing the widespread interest in RTTY activities to our relatively limited amount of spectrum for these printed-word communications reveals some rather interesting QSOs per kHz statistics. A substantial number of amateurs are obviously "reading the mail" or "looking in" rather than actually transmitting their own keyboarded messages. Although educated speculation, we also suspect a similar statistical ratio may exist between dedicated applications and casual enjoyment of many less expensive home-computer setups. Combining those thoughts thus highlights an attractive area of rising popularity: monitoring off-the-air RTTY and CW transmissions on both amateur and international shortwave frequencies. The attraction of such visual readout capabilities holds merit in several ways: receiving direct-from-source news broadcasts, "testing the water" before investing heavily in a deluxe RTTY setup, providing a convenient and casual way for visitors (or lazy operators!) to follow CW QSOs, etc.

Realizing the previously mentioned areas of pursuit, Microlog Corporation (18713 Mooney Drive, Gaithersburg, MD 20879) recently introduced their "SWL" Commodore 64 interfacing cartridge—a neat little package that plugs directly into the 64's game port for full RTTY/CW receive-only operations. The Microlog "SWL" unit itself consists of both software (computer programming via integrated circuit memory chips) and hardware (electronic circuitry for RTTY/CW tones to voltage-pulse conversions) in a plug-in black plastic case measuring 3"H × 2½"W × ⅞"D. There are three ⅛ inch phone jacks and a miniature slide switch on the cartridge's rear area. Two of the jacks are internally connected for "straight through" speaker connection and demodulator takeoff. The third ⅛ inch jack, a handkey input, can be used for displaying one's Morse practice. Displaying

The Microlog "SWL" cartridge is a direct plug-in unit for the Commodore 64. Cartridge contains both software and hardware for RTTY and CW reception, and is powered from the Commodore 64.

transmitted CW can be accomplished in a couple of ways: letting the transceiver's sidetone feed into the speaker output/SWL input line (an approximate 800 Hz tone is required) or "tapping off" the rig connected key (a voltage-protecting/isolating diode is necessary here, or the SWL's sensitive circuitry can be damaged). If you presently own a transmit-only RTTY or CW keyboard, the Microlog "SWL" cartridge (and a Commodore 64 computer) can complete the setup for inexpensive "deluxe" operations . . . a thought worth considering.

The Microlog "SWL" Unit

One of the more attractive features of the "SWL" package is its completely self-contained nature and easy installation. Merely snap the cartridge into a Commodore 64's game slot, connect its input to your receiver or transceiver's speaker output, and tune in RTTY or CW signals. The "SWL" cartridge is DC powered from the computer, and all operations except shift selections are under keyboard control. Selection of RTTY speeds, for example, is accomplished by tapping the **CTRL** and **X** keys and entering the appropriate digits (60, 66, 75, 100, or 132 wpm). Selecting RTTY, Morse, or ASCII modes is likewise achieved with a **CTRL** and **R**, **M**, or **A** punch. Similar keyboard commands (over 30 in all) are used for setting the on-screen clock, switching on/off carriage return, line feed, printer, etc. There's also "shift to basic" (**CTRL**, **C**) and "return to SWL" (**SYS32784**) capabilities right from the keyboard. Actually, I think this is a rather fancy (receive only) system that's complemented with a well-documented operating manual and a fairly reasonable price tag.

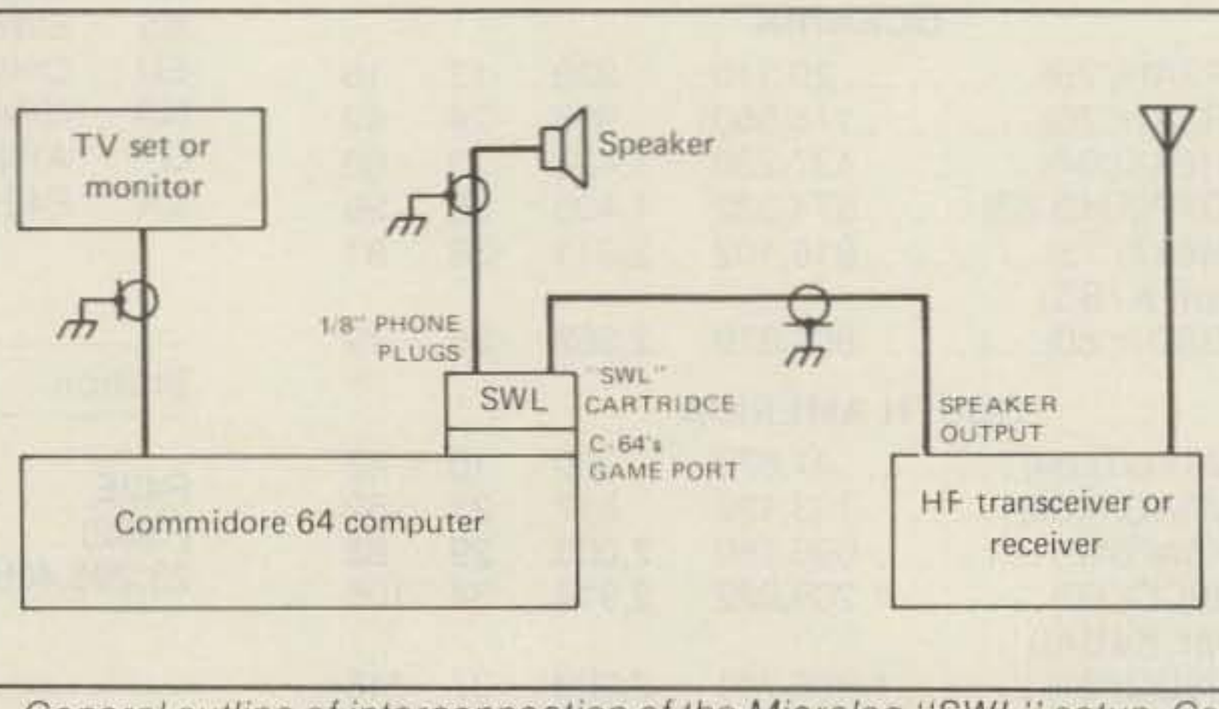

Fig. 1– General outline of interconnection of the Microlog "SWL" setup. Cartridge inserts into Commodore 64, then receiver and speaker cables plug into the cartridge. Neat, quick, and simple.

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Inside, the "SWL" contains both computer programming chips and demodulator/interfacing circuits. Dual tone detection is used for RTTY and ASCII, while single tone detection is used for CW (800 Hz center frequency, with a 300 Hz passband . . . in other words, only tones between 650 and 950 Hz "get through its front end"). All computer connections are made via a recessed edge connector on the SWL cartridge. In addition to an operating format line showing mode, speed, normal/reverse polarity, and clock, the "SWL's" on-screen display includes two visual tuning aids; a small oscilloscope-simulating crosshatch indicates mark/space reception, while an adjacent red dot serves as a signal acquisition indicator and as a Morse tuning aid. A regenerated 800 Hz tone is also produced on the monitor/television speaker during CW operations, thus allowing the operator to merely "match tones" for on-frequency tuning.

Using the Microlog "SWL"

Assuming you either own or have access to a Commodore 64 home computer, the Microlog "SWL" package is an ideal and inexpensive means of investigating/monitoring various printed-word communications. I personally find the "cartridge setup" easy to use, and its self-contained nature is quite handy for my crowded shack (three full HF setups, two OSCAR 10 stations, plus SSTV, classic gear collection, etc., in a rather small room). The system's capabilities permit monitoring both international news transmissions on shortwave (usually wide shifts) and amateur communications (usually narrow shifts). A condensed listing of several popular service/frequencies/times is included in the "SWL's" manual, while Universal Electronic's *World Press Services Frequencies* publication and my own *RTTY Today* book are listed as additional information sources. Both are available from the CQ Book Shop.

The "SWL" package also does a good job of copying Morse code, an aspect with several interesting possibilities. You can transmit with a Morse keyboard or an electronic keyer, for example, while watching incoming replies on the SWL/64 setup. The "SWL" won't copy a sloppy fist (no computer system will), but its automatic speed tracking does a surprisingly good job on most half-decent CW. Another possibility involves using the "SWL" setup to display both transmitted and received CW for bringing non-ham onlookers in on the action (how long has it been since you've exposed others to our exciting world?).

If you're new to the world of RTTY, initially tuning off-the-air signals will require a bit of patience and understanding. There are three variables which must be "matched" between receiving the transmitting stations: mark/space tone shifts (170, 425, or 850 Hz), speeds (60, 67, 75, and 100 wpm), and normal/reverse tone polarity. The key to successful RTTY copy involves first tuning the receiver for precise on-frequency signal reception, then keyboard stepping through speed and polarity selections until smooth copy is produced. The "SWL's" on-screen tuning aids are quite helpful here, as they reduce "guesswork" and confine "unknowns" to keyboard punches. The tuning aid isn't as large as that on some full transmit/receive interfacing units, but it's sufficient. Once you get the knack of the SWL package, I think you'll really like it.

Summary

Considering the rising popularity of computerized RTTY setups, some of which seem rather complex to curious investigators or unfamiliar newcomers, I think the Microlog "SWL" package is a clever idea. The unit is obviously designed for avid shortwave listeners, but it's also a great item for "mailreading" amateurs or individuals desiring to investigate before investing heavily. Its Morse copying feature is especially attractive, and it's perfect for polishing one's rusty CW. The all-in-one approach to combining software and hardware in a computer-powered cartridge is foolproof and space conscious. I personally think this easy to use and comparatively inexpensive package will introduce many "outsiders" to the world of printed-word communications.

The Microlog "SWL" package has two stipulations which warrant repeating. This is a *receive-only* setup, and it's designed for use *only with the Commodore 64* home computer. A similar "plug in" type and full-featured transmit and receive RTTY/ASCII/CW package, the AIR-1, is also available. For more information on either item, contact Microlog Corporation, 18713 Mooney Drive, Gaithersburg, MD 20879. CQ

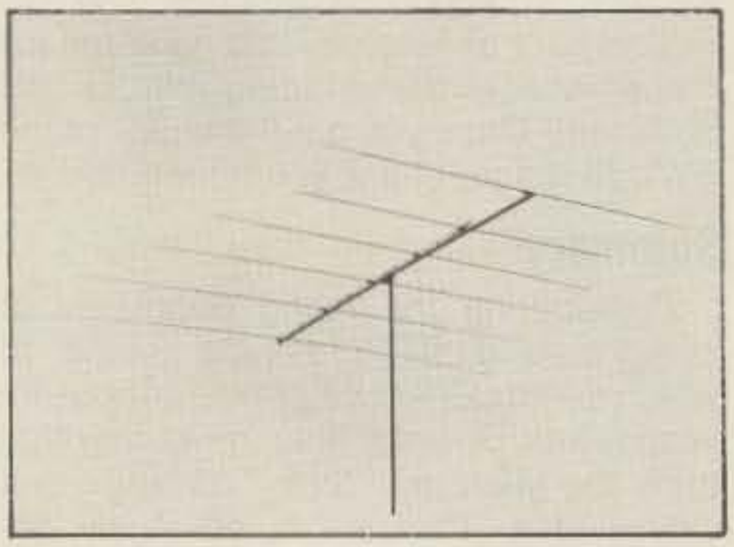
Antennas & Accessories

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

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Muf and Stuff Revisited

When any two hams get together, the topic frequently gravitates to discussion of current propagation prospects. This month, as worldwide band conditions continue to wane, columnist Thurber takes another look at maximum usable frequency (MUF) and computer-based methods for its calculation.—K2EEK



Erecting a good-performing array is only part of the formula for DX success. In addition to good operating techniques, two problems remain, regardless of the antenna used: where to point the antenna, and when to point it there. The MUF and beam-heading considerations discussed in this month's column provide welcome assistance, and they lead to more efficient and effective station operation. (Photo courtesy KLM Electronics, Inc.)

Last time we got together we initially focused on the considerable reader response our March 85 column on the popular G5RV antenna generated. We then took a look at a very useful antenna accessory, the antenna noise bridge (ANB). Rounding out the column for the month was a scan of some new amateur software offerings.

This month we'll revist the propagation discussion we had in the April 84 issue. We will focus particularly on the computer determination of propagation parameters by examining MUFPLOT V2, a new version of a popular software package for the Apple and Commodore 64 computers. We'll again open the reader mailbag, and highlight some interesting ham-shack reading material. We'll wrap up things with a discussion of some new software for the shack. First, let's review some important propagation considerations, an important preliminary to any discussion of computer-based propagation software.

HF Propagation Highlights

Most amateurs are aware that three waveforms are generally associated with the propagation of radio signals: groundwave, tropospheric, and ionospheric. For the purpose of HF DXing, it's the ionospheric waveform with which we are most concerned, and which we will cover here.

To review, the ionosphere is that portion of the earth's atmosphere which lies between altitudes of 60 and 200 miles. The ionosphere is usually subdivided into three layers (*D*, *E*, and *F*) which bend and absorb radio waves at different rates. Both the *D* and *E* layers may have a significant impact on HF propagation, but the *F* layer is the one most responsible for DX communications. This layer is further subdivided into the *F1* and *F2* regions. Most propagation routines analyze the *F*-layer characteristics for Maximum Usable Frequency (MUF) predictions, and the *D*- and *E*-layer characteristics for Lowest Usable Frequency (LUF) forecasts.

Ionospheric propagation is dependent upon many things besides the layer structure which we mentioned. Among these other factors are ultraviolet light and particle emissions from the sun; the travel time of these emissions; the critical frequency at which wave bending becomes ineffective; the time of day; absorption rates; and the season. Other important factors include the latitude and direction of the wave path; the point on the 11-year sunspot and 27.5-day solar cycles; the earth's geomagnetic activity and level; and solar disturbances.

Before continuing, it's a good idea to define some key terms used in propagation discussions. These include:

1. **HPF**, or **H**ighest **P**ossible **F**requency. This is the highest frequency on which a signal will propagate over a given path, for at least 10% of the time. Signals higher in frequency will not propagate due to insufficient bending. Note that the HPF is an almost physical barrier that can't be overcome by a higher power transmitter or a high-gain antenna.

2. **MUF**, or **M**aximum **U**sable **F**requency. This is the maximum frequency at which HF signals will propagate over a given path at least 50% of the time. This is not, however, the highest possible frequency for communications, nor is MUF synonymous with "critical frequency."

3. **FOT**, or **F**requency of **O**ptimum **T**ransmission (or Traffic). This is the frequency at which a signal will propagate over a given path at least 90% of the time. Thus, the maximum usable frequency for communications will generally be above this value. FOT may be considered to be the best choice for HF communications when extreme reliability is required, as for military and commercial purposes.

4. **LUF**, or **L**owest **U**sable **F**requency. This is the lowest frequency which will generally support HF propagation over a given path. For 50% of the time, the actual lowest frequency that will allow communications over a path will be below the LUF. For the remaining 50%, the lowest frequency will be above the LUF.

5. **Critical Frequency**. This is the highest frequency at which a signal will be returned to the earth. Contrary to popular belief, the MUF may be considerably higher than the critical frequency. For example, it's possible for 10 meter refraction to occur when the critical frequency is but 7 MHz, under excellent conditions.

6. **A-** and **K-indices**. The *A*-index is a measure of geomagnetic activity which ranges from 0 (extremely quiet) to 400 (very disturbed). The *K*-index is a quasi-logarithmic index of geomagnetic activity, ranging from zero to nine units. The two indices are closely related, but use different scales of measurement for geomagnetic states. The *A*-index describes conditions for the previous 24 hours and is based on the *K*-index, which describes conditions for the past 3 hours.

7. **Solar Flux** and **Sunspot Number**. The solar flux is a measure of the sun's energy output in terms of solar electromagnetic radiation, and may range from about 60 to 400 units. There is a positive correlation with the sunspot number, which physically refers to the total number of "spots" and cluster groupings visible on the face of the Sun using a high-power telescope.

From all this, it's not hard to see that the chances of communications over a path are greatest for frequencies which lie somewhere between the MUF and the LUF, thus defining the so-called "DX window." By and large, DX signals will be strongest at frequencies bracketing the MUF.

Most HF DXers are primarily interested in the MUF. Most commercial MUF prediction programs make use of public-domain algorithms which owe their existence to extensive work done at the Naval Ocean Systems Center (NOSC) at San Diego. The original MUF program developed by the Navy was extensively tested and verified. Test data covered a complete sunspot cycle and incorporated MUF measurements from more than 4700 test sites on 23 HF signal paths. As part of the verification process, the program's predictions were compared to actual MUF measurements and predictions of mainframe computer systems. A home-computer-size version of the Navy MUF program was introduced in amateur radio circles by Bob Rose, K6GKU, in his landmark December 1982 *QST* article, "MINIMUF: A Simplified MUF Prediction Program for Microcomputers."

The MINIMUF program calculates single-skip MUF, where the MUF equals the critical frequency of the *F2* layer times a certain "M" factor. The critical frequency is dependent upon the cosine of the angle of the sun at the midpoint of the propagation path (the "solar zenith angle"), the sunspot number or solar flux, time of day, and several constants. The "M" factor takes into account layer size, and it adjusts for factors such as midnight sun conditions over the path, high latitudes (those greater than 45 degrees), and trans-equatorial paths. When more than a single hop occurs along a path, two MUFs are calculated and the lowest of the two is chosen by the program.

General propagation condition forecasts can be readily obtained from the monthly propagation columns which appear in ama-

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teur magazines such as *CQ* and *Ham Radio*, as well as various DX newsletters. "Same day" raw information is not difficult to obtain for use with various MUF/LUF computer programs. The National Bureau of Standards provides current basic propagation data over station WWV, which broadcasts on 2.5, 5, 10, 15 and 20 MHz. A propagation bulletin prepared by the National Oceanic and Atmospheric Administration (NOAA) is aired by WWV every hour at 18 minutes past the hour. This bulletin provides much useful propagation information, including yesterday's solar flux and *A*-index; the current *K*-index; past solar and geomagnetic activity; and expected solar and geomagnetic activity for the following 24 hours. The solar flux data is updated each day at 1818 UTC. Propagation parameters are also broadcast over the ARRL station, W1AW.

It's been found that when geomagnetic conditions are quiet, and there are no more than two hops in a given signal path, a sound estimate of MUF can be produced, within about ±3.8 MHz using versions of the NOSC algorithms. However, there can be great and unpredictable changes in band conditions when various anomalies, such as solar flares, occur, producing **SID**s (**S**udden **I**onospheric **D**isturbances) and **SWF**s (**S**hort **W**ave **F**adeouts). A key to anticipating such disturbances can be found in monitoring the *A*- and *K*-indices broadcast by WWV.

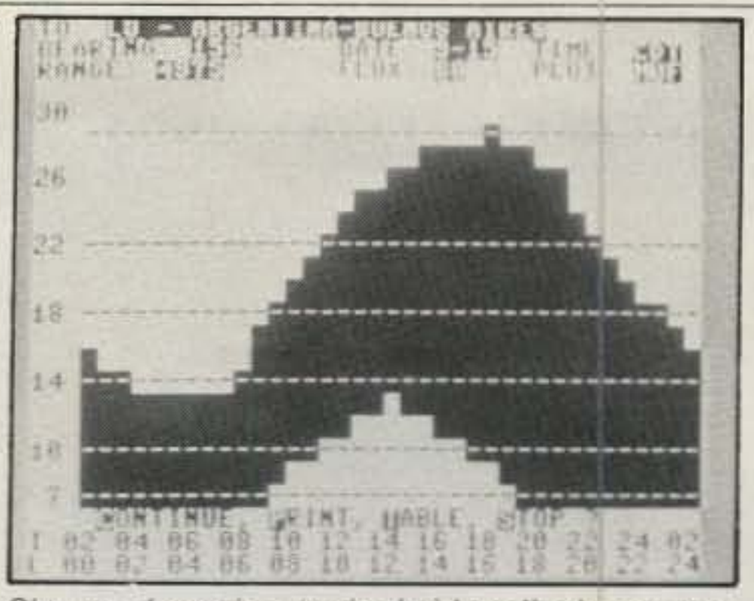
Interestingly, minimum absorption and best propagation occur when the *A*-index is roughly 7 or less and the *K*-index is 0 to 2. For example, with a solar flux of 90, an *A*-index of 10, and a *K*-index of 3, the unsettled geomagnetic activity leads to "low normal" conditions—just "fair" for DXing.

We've indicated that there is also a lower limit for communications, a fuzzy boundary known as the LUF. As the frequency of operation decreases, atmospheric absorption increases, to the point where practically none of the signal remains to be passed through the *D* and *E* layers on to the *F* layers and back to earth. This is most notable during the daytime, when ionization levels, and therefore absorption, are highest.

Note that the highest frequency that can be propagated over a signal path (HPF) is dependent almost entirely on refraction; increases in power levels or antenna gain have little effect. But, the absorptive function associated with the LUF can be at least partially overcome by attempts to increase the signal-to-noise ratio, such as by increasing effective radiated power.

Nevertheless, LUF can be determined, however roughly, in a more straightforward manner than MUF. Since the density of the *D* and *E* layers is directly related to the position of the sun in the sky, the time of day can provide a useful approximation of *E*-layer density. This approximation, especially when coupled with information about power level and antenna gain, can be used to estimate the LUF "barrier," below which communication isn't likely to be supported. In practice, rather than being a mathematically precise number, the LUF, in effect, tells you at which times of the day the absorption is at its worst, as a guide for choosing the time for the most reliable communications. At other times absorption simply may be too strong to support communications.

With this background on propagation in mind, let's revisit an excellent computer-based DX propagation aid, MUFPLOT V2, the original version of which we examined in the April 84 column.



Shown above is a typical video display as produced by a Commodore 64. The MUF is plotted as the upper limit, while the LUF is the lower limit. The upper limit is user selected, and may be MUF, HPF, or FOT. Time is displayed both in local and target area time. The frequency range is from 6 to 30 MHz. A graphic screen display is available from the Apple version of the program. (W8FX photo)

MUFPLOT V2

MUFPLOT V2 is a comprehensive propagation utility program for the Commodore 64 (the Apple version is unchanged from the original), which uses special database search routines that provide fast response time when making propagation determinations. The programs are available on disk, costing $32.95 for the Commodore 64 version, and $37.95 for the Apple version. We'll primarily reference the C-64 version here, as most of the new features have been applied to this version.

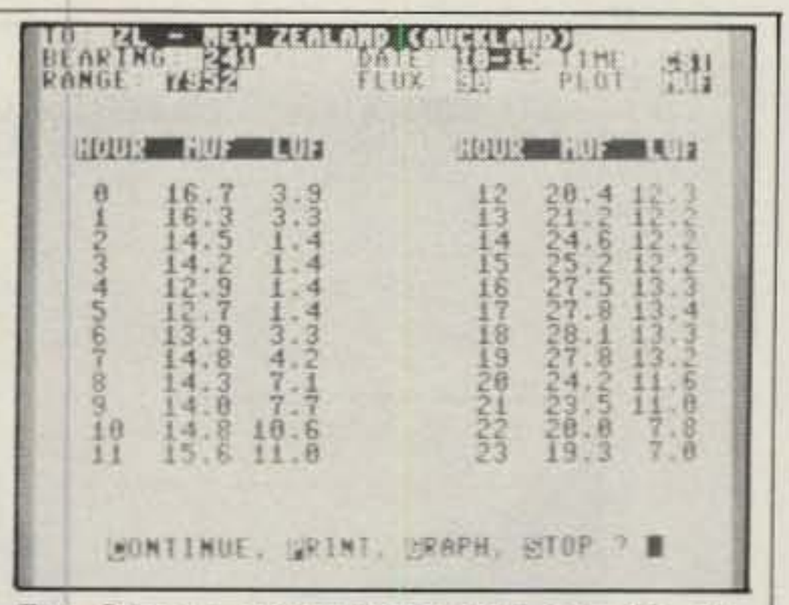
The program has four major operating aid functions: (a) calculating a great circle beam heading to a user-selected target; (b) determining the statute mile distance between user and target; (c) estimating the MUF (or, if desired, FOT or HPF) to the target over a 24-hour period; and (d) estimating the LUF for the same target and over the same period. Target and local times are also displayed.

An input prompt asks for you to select the target area to which you would like a propagation forecast. The program is "smart," in that it can recognize a target from the ARRL DX countries list, a two-letter U.S. state abbreviation, an actual latitude and longitude, or even a shorthand identifier that you create yourself, thus greatly simplifying data input. You can also enter the two letters "DX" for your target; this causes the program to generate a summary of world propagation conditions by plotting to several areas of the world (which you can preselect yourself, and save in the program's database). Other input prompts requested are the time zone in which the forecast is to be plotted, date, and solar flux as reported on the National Bureau of Standards station WWV or over the ARRL's W1AW.

The program produces a graphical display on the screen, which shows estimated propagation feasibility over a 24-hour period, as well as beam heading and distance to the target. When the graph is completed, the shaded area in black represents the range of frequencies which will propagate signals over the path selected. Areas left blank indicate the times during which propagation is not likely over the path. The program also has a printout feature so that a hardcopy plot, either in the form of a graph or a table, can be obtained.

The original MULPLOT was an excellent program, but it had a limited capability to be customized to the user's needs. The new version allows you to preset the program for your latitude and longitude, time zone, and GMT offset. The new version has an extremely fast-responding database that has more than 400 "target areas" (by ARRL prefixes, latitude/longitude, and U.S. states) built-in, with the option to add some 2500 more. The special "DX function" lets you define any number of preset targets with the ability to call up a continuous printout and video display of these targets, showing an overall view of world conditions. You can add to, delete, or change these targets at will.

I found MUFPLOT V2 to be a very worthwhile propagation prediction program—reliable and easy to work with. When used in



The 24-hour propagation plot may be displayed as a table, rather than as a graph, if desired. Similar information is displayed in the table, shown here displaying a path from the author's QTH to New Zealand. (W8FX photo)

```
CURRENT LATITUDE = 32.5
CURRENT LONGITUDE = 86.33
DEFAULT TIME ZONE = CST
WITH GMT OFFSET   = -6 HOURS

WHAT IS YOUR LATITUDE? 32.5

WHAT IS YOUR LONGITUDE? 86.33


WHAT TIME ZONE WILL YOU USUALLY WANT
YOUR PROPAGATION FORECAST PLOTTED IN
(IE. UTC, EST, PDT, ETC.)
? CST

HOW MANY HOURS DIFFERENCE BETWEEN THAT
TIME ZONE AND UTC
(-5, +8, ETC.)? -6
```

The MUFPLOT V2 program may be customized to your own hamshack on initial setup. The set-up menu is shown here, and it allows you to key in your own latitude, longitude, "default" time zone, and offset to GMT. These settings need not be re-inputted, but may be changed if necessary. (W8FX photo)

```
1 - PLOT A PROPAGATION FORECAST
2 - EXAMINE THE TARGET DATA BASE
3 - EXAMINE THE DX SUMMARY DATA BASE
4 - END
    OPTION?
```

Main Menu screen as displayed by MUFPLOT V2, an upgraded version of Base (2) Systems' original program of the same name, described in the April 1984 column. (W8FX photo)

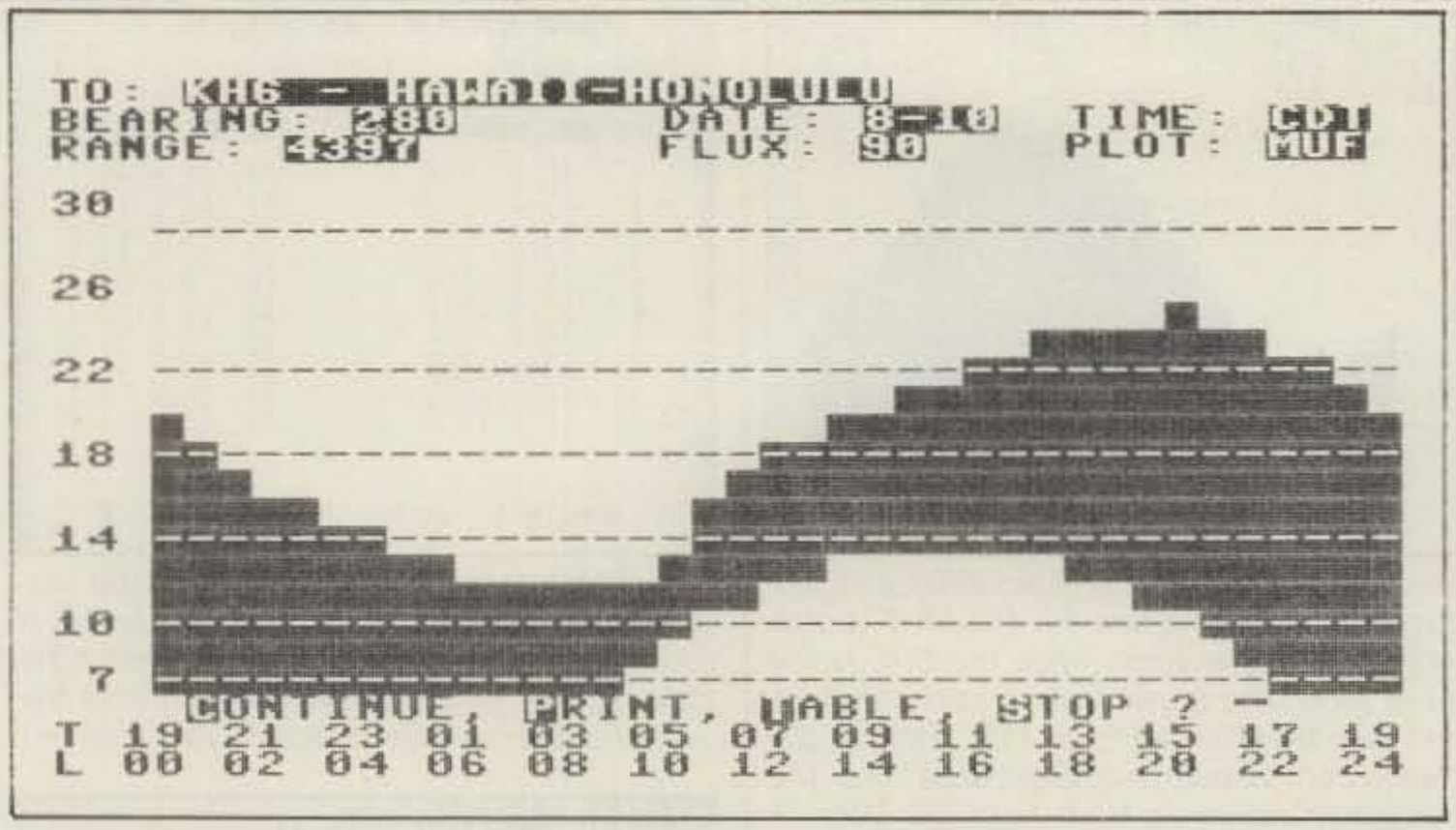


Fig. 1– Typical MUFPLOT V2 video display. Shown above is a typical screen display produced by MUFPLOT V2. Note the dual display of local and "target" time. In this display both MUF and LUF are depicted over a 24-hour period. This display was "screen dumped" to the author's printer, and thus is more closely a representation of the video screen display produced by the program, than the regular printed output of the program. The path shown above is from the author's Alabama QTH to Hawaii.

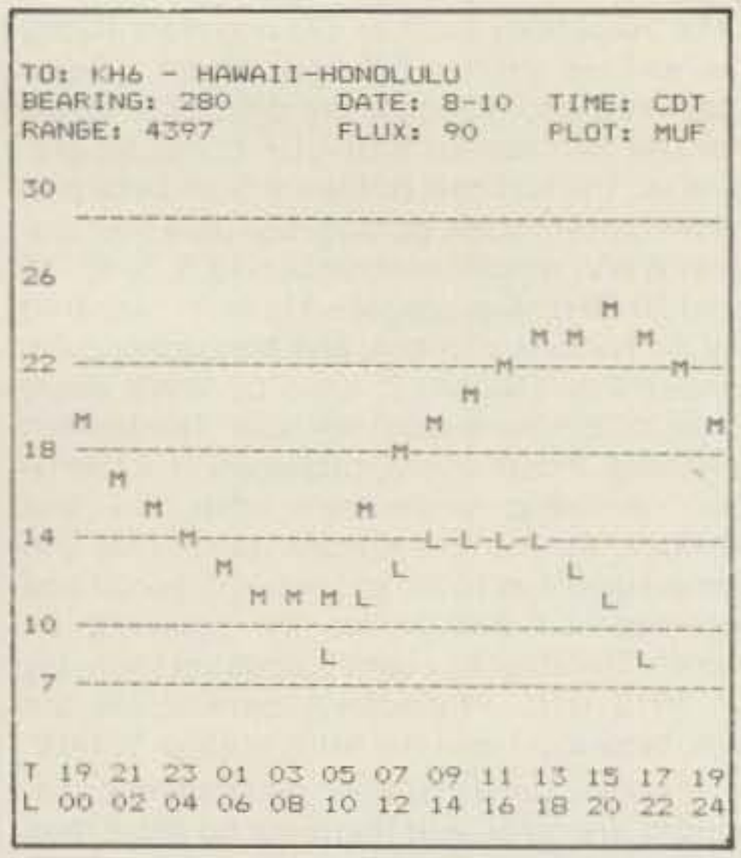


Fig. 2– Typical MUFPLOT V2 printer output. This is a typical graph produced by the C-64 program and a Commodore-compatible printer; the Apple printout is similar. The "L" represents the LUF, while the "M" represents MUF. FOT or HPF may be displayed, if desired (see article for explanation of terms). The two time zones, local and target, are across the bottom of the printout. Path depicted is from the author's central Alabama QTH to Hawaii, with an assumed solar flux of 90.

combination with a "grayline" (sunrise/sunset) calculation device, such as Xantek's slide-rule DX Edge™, you would virtually have band conditions "by the tail." The MUFPLOT V2 program is particularly suitable for fast-paced DXing and contest operating, especially in view of the customization and fast database access features that are available. Documentation provided is limited to about 21 pages of a manual about the size of a computer disk, but it includes some very good tutorial material.

Fig. 1 shows a "screen dump" which I generated using a separate utility routine, from a typical MUFPLOT V2 output, while fig. 2 is an example of a hardcopy graph produced directly by the program.

From the Mailbag

Mail continues to be received in connection with our coverage of the G5RV multiband dipole, especially that in last March's issue. Almost without exception, readers report excellent all-round results from 80 (and sometimes 160) through 10 meters with this simple, inexpensive, and easy-to-match antenna. Typical is the letter received from Joe Adinoff, WB6ZWS. Write Joe:

"I am a very happy user of the G5RV antenna, which in my case is the KT5B as produced by Kilo-Tec of Oak View, CA. This antenna uses 29 feet of high-grade twinlead which then connects into coax. I knew nothing about using [at least] 66 feet of coax—mine is much shorter, but still gives excellent results. My reason for purchasing my KT5B from Kilo-Tec, rather than building my own, was that I could never have duplicated its assembly, especially when it comes to attaching a PL-259 receptacle to the ribbon lead. This is a bear! I do not have to do anything special in order to operate on 160 meters. My Nye Viking MB-V-A tuner takes the VSWR down to 1.0:1 on 1.9 MHz and to 1.05:1 on 1.85 MHz."

James Robertson, C6AER, of Nassau, Bahamas, West Indies, reports an unusual G5RV configuration. He is using the G5RV in a partial "Vee," the apex being 45' up and the ends at about 30'. Coming from the 29' 6" stub is approximately 36' of RG-8 coax, connected directly to the 300 ohm ribbon line. An MFJ tuner and a Yaesu FT-902DM transceiver complete the installation. James reports that with the tuner he can get the SWR on the coax link to the transceiver down to 1:1 on all bands (*presumably, 80–10 meters—ed.*). Interestingly, he tried increasing the length of the coax to 66 feet plus, as suggested in the March article. In his case, it made things worse, rather than better. Needless to say, he very quickly went back to the shorter coax length.

Actually, it's the overall length of feedline, when considered with one-half of the flattop length, that makes the antenna easy or hard to load. Certain lengths give trouble, while others are fine. See our discussion of feedline length considerations in last month's column.

Keith R. Thomas, KA3MMQ, is a Delta Loop *aficionado*, and he uses the antenna shown in fig. 3 to good effect on the 40 meter Novice band. Keith reports excellent results to the western states with the antenna, and says that it exhibits an SWR of 1.1:1 at 7.125 MHz, when a quarter-wave matching section is used.

From "Down East," Calais, ME, comes a note from Ken Cassels, W1GVA. Ken has adapted Lew McCoy's original "Reflected Power" program, modified and reprinted in the column several times, for his Radio Shack TRS-80 64K CoCo® . Writes Ken:

"While browsing through some of my past copies of *CQ*, I came across your column in the October 1984 issue. A recent issue of *CQ* suggested that owners of computers other than the Vic-20 and Commodore 64 interpolate BASIC to their machines. This is what I

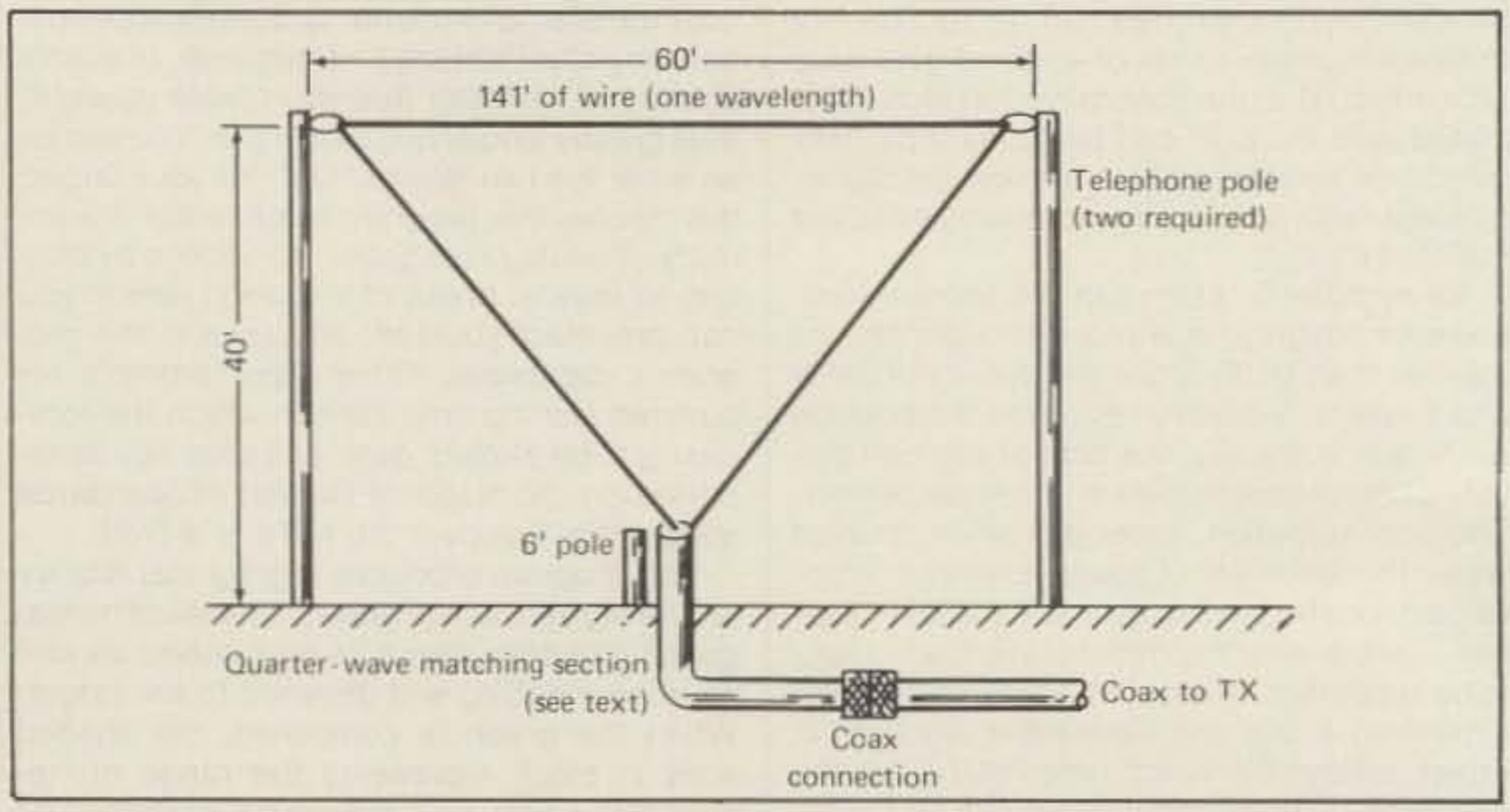


Fig. 3– KA3MMQ "Novice Special" delta loop. Shown is the full-wave delta loop used to good effect on 40 meters by Keith R. Timmons, KA3MMQ. He reports excellent results to the western states using the antenna. Keith reported that he used a quarter-wave matching section consisting of 21' 8" of coax (impedance not specified). By my calculations, however, I came up with a matching section consisting of 22' 9.5" of 70–75 ohm coax such as RG-59/U. This assumes a feedpoint impedance of about 100 ohms, and a main feedline impedance of 50–52 ohms. This should more closely account for the velocity factor of the coax used for the matching section, which is about 0.66.

```
100 'CBM-64 REFLECTED POWER
105 ' '"LISTING" VERSION WITH SPACE
AND LOTS OF REMS)
110 ' ORIGINAL ARTICLE BY
112 ' LEW MCCOY W1ICP,
114 ' CQ SEPT 1983 P56 &
116 ' KARL THURBER W8FX
120 ' MODIFIED FOR SCREEN DIS-
122 ' PLAY ONLY ON CBM-64
130 ' BY GARY HUFF K9AUB
135 ' MODIFIED FOR DISPLAY ON
136 ' TRS-80 COCO 64K & PRINTER
138 ' BY FRANCIS K(KEN) CASSELS
139 ' W1GVA
140 PRINT
150 ' VARIABLES IN PROGRAM ARE
160 ' F=FORWARD POWER IN WATTS
170 ' VM=MAXIMUM USWR CALCULATED
180 ' S=STEPS OF USWR CALCULATED
190 ' X=TIMING DELAY
200 ' U & U$ = USWR
210 ' R & R$ = REFLECTED POWER
220 ' T & T$ = TRUE RADIATED POWER
230 ' A$ = HOLDS DISPLAY ON SCREEN
240 PRINT
250 ' LINES 250-290 DO NOT EXEC
252 ' THIS POKE DOES NOT EXEC ON COCO
290 CLS: REM CLEARS SCREEN
300 PRINT
320 PRINT "xxdetermining reflected power
 xx
325 PRINT#-2,"  *** DETERMINING REFLECTE
D POWER ***  ":PRINT#-2
330 PRINT
340 ' INPUT VARIABLES
350 INPUT"ENTER FORWARD POWER (WATTS) "
F
360 IF F=0 THEN 350
370 PRINT
380 INPUT "ENTER MAXIMUM USWR ";VM
390 IF VM=0 THEN 380
400 IF VM>3.5 THEN PRINT "LIMIT MAX SWR
TO 3.5":GOTO380

410 PRINT
420 INPUT "ENTER USWR STEP SIZE ";S
430 IFS=0THEN20
440 IFS<.1THEN PRINT"LIMIT STEP SIZE TO
.1 OR GREATER" :GOTO420
445 PRINT#-2,TAB(2)"FRWRD/PWR";F;TAB(2
"USWR";VM;TAB(25)"STEP";S:PRINT#-2
450 PRINT
460 PRINT"WHEN FINISHED WITH DISPLAY,"
470 PRINT"PRESS ANY KEY TO END PROGRAM"
480 FOR X=1TO2000:NEXT:'DISPLAY INSTRUCT
IONS FOR FEW SECONDS
490 REM NEW DISPLAY RESULTS ON SCREEN
500 CLS:'CLEARS SCREEN
510 PRINT"   <FORWARD POWER IS";F;"WATTS
>"
520 PRINT"USWR = REF PWR(W) - TRUE RAD P
WR (W)  "
530 REM CALCULATIONS
540 FOR U=1 TO VM STEP S
550 R=F*((U-1)/(U+1))*((U-1)/(U+1)):T=F-
R
560 REM CONVERT ANSWERS TO STRINGS FOR 1
IDY DISPLAY
570 U$=STR$(U):R$=STR$(R):T$=STR$(T)
580 IFLEN(U$)>6THENU$=LEFT$(U$,6)
590 IFLEN(R$)>13THENR$=LEFT$(R$,13)
600 REM DISPLAY ANSWERS ON SCREEN
610 PRINT U$;TAB(6-LEN(U$));R$;TAB(13-LE
N(R$));T$
615 PRINT #-2,U$;TAB(6);R$;TAB(18);T$:PR
INT#-2
620 NEXT
630 A$=INKEY$:IF A$=""THEN630:'HOLD DISP
LAY UNTIL A KEY IS PRESSED
640 CLS:' CLEARS SCREEN
642 PRINT@35,"DO YOU WISH TO USE OTHER"
644 PRINT@70,"PARAMETERS? (Y/N)"
645 INPUT P$
646 IF P$="Y" THEN 350
648 IF P$="N" THEN 650
650 END
655 PRINT

660 REM WHEN ACTUALLY ENTERING     PROGR
AM, ELIMINATE ALL REMS
670 REM AND SPACES (EXCEPT THOSE    ENCLO
SED IN QUOTES) TO CON-     SERVE SPACE
680 REM SPACES ARE INCLUDED FOR    EASE
OF READING PRINTOUT ONLY
690 REM AND REMS ARE INCLUDED TO EXPLAIN
 STEPS  OF PROGRAM
700 REM TABS IN PRINT ROUTINE MAY VARY W
ITH DIFFERENT PRINTERS.
710 REM LINES 642-646 RETURNS TO BEGINNI
NG OF PARAMETERS AGAIN.
715 REM LINE 648 ENDS PROGRAM AND RETURN
S TO USG
720 REM IF "PRINT" STATEMENTS ARE NOT NE
EDED THEY SHOULD BE DELETED.
```

Fig. 4– W1GVA reflected power for the CoCo™ 64K computer—program listing.

```
 *** DETERMINING REFLECTED POWER ***

 FRWRD/PWR 300   USWR 3.5 STEP .3

 1       0            300

 1.3     5.10396976   294.89603

 1.6     15.9763314   284.023669

 1.9     28.894;736   271.105827

 2.2     42.187500l   257.8125

 2.5     55.102040ß   244.897959

 2.8     67.3130195   232.686981

 3.1     78.7031529   221.296847

 3.4     89.2561984   210.743802

 FRWRD/PWR 75    USWR 1.5 STEP .1

 1       0            75

 1.1     .170068027   74.829932

 1.2     .619834712   74.380165

 1.3     1.27599244   73.724008

 1.4     2.08333334   72.916667
```

Fig. 5– W1GVA reflected power for the CoCo™ 64K computer—typical output.

have done with your listing #2 on pages 80 and 81 [of that issue]."

Ken continues: "Enclosed is a copy of my listing [fig. 4] and printed results [fig. 5]. I included a print routine for my printer which can be adapted for other printers. Other than that, I amended your listing to fit the CoCo®. The normal printing screen color is black on a green background. One can use the other screen colors, but they are in Extended BASIC and are used in graphic routines. The user cannot mix graphics and plain text on this machine, so I had to eliminate the Pokes on line 250. To reverse video, one presses shift and 0, so that eliminates the CHR$ routine for that line. I also included lines 642–648 to offer the user the choice of continuing with new parameters or ending the program. I thought perhaps you could use it in a future issue to help all those hams out there who are CoCo® owners."

Thanks, Ken. Perhaps we have come full circle on this one, as Lew's original program, which first appeared in the February 83 issue of *CQ*, was originally programmed to run on a Radio Shack TRS-80—the Model I, I believe!

Good Reading!

Most amateurs are well aware of the fact that you can use your computer for far more things than playing games, balancing the checkbook, and keeping the station log. With the right kind of interfacing, you can use your computer as an "intelligent controller" to run your household appliances, water the lawn, control a robot, put the coffee on, and guard your home against intruders, just to name a few of the off-beat applications. Computers such as the Timex/Sinclairs, Vic-20s, and Commodore 64s are especially suited to such applications, particularly in view of the low prices for these systems. With the Commodore 64 now in the low $100s, it is an especially attractive vehicle for complex interfacing applications.

If you're a C-64 owner and interested in such applications, and don't mind a little computer tinkering, Microsignal Press' *Commodore 64 Interfacing Blue Book* may be for you. The 186-page book by V. J. Georgiu introduces the reader to a large number of practical, real-world interfacing applications. The emphasis is on useful projects, along with the theory of operation that is involved. Information is provided on how to build and program each project. In Georgiu's book great emphasis has been placed on making the projects easy to understand and to build using as few parts as possible. At the same time, an effort has been made to avoid trivial or purely instructional projects that are devoid of practical uses.

Included is introductory material on the various computer ports available to the user; computer improvements and enhancements; sensor, telephone, voice, controller, and A/D and D/A interfaces; instrumentation circuits; and home security systems. While there are few radio-specific projects in the book, Mr. Georgiu advises that, nevertheless, many purchasers are amateurs who like to tinker in "things electronics" in addition to the primary hobby, so they tend to find the book of value. Indeed, the book is worth buying just to see how control modules and other add-on devices are installed and programmed!

The C-64 book, priced at $16.95, is available from Microsignal Press, P.O. Box 388, Goleta, CA 93116. A similar book is available for the Vic-20 for $14.95.

Software Snapshot

It's hard for us to hide our enthusiasm for computers in the hamshack, and we personally favor the now quite inexpensive Commodore 64. Even if you use another, more sophisticated and powerful computer for business, professional, and "personal productivity" applications, it's almost dirt-cheap to have a "dedicated" or even hard-wired Commodore around for your logging/contesting, propagation prediction, beam heading, and other in-shack applications. Indeed, whatever your feelings may be toward one computer versus another, there is little doubt that the Commodore 64 is a milestone in computer development. It offers substantial computational power and considerable versatility at a price almost everyone can afford. As a result, it has seen an extremely wide range of applications, from gaming, to hamming, to personal produc-

tivity, to scientific applications—you name it.

However, a major weakness of the C-64 is the disk drive system, which may be the slowest in the industry. Lengthy programs take, seemingly, *forever* to load—as much as five to eight minutes or more, and frequent disk access during programs slows down program execution. This inherent slowness dulls the glimmer of many programs that rely heavily on the disk drive, such as logging/contesting programs, and other databases. Fortunately, several programs and devices have been developed to at least partially remedy this situation.

One that I have used with good success to load a variety of software is the Fast Load™ Cartridge by Epyx, which loads and copies disks five times faster than normal. It plugs into your cartridge port and goes to work automatically, providing, in addition to the fast-load feature, a number of useful disk utility routines. I found the cartridge (which is available for as little as $25, depending on where you shop) to be compatible with most amateur software which I tried with it, and to indeed vastly speed up disk loading operations (the saving of programs is not affected, however).

If you're about to abandon your C-64 and disk drive due to the system's inherent slowness, consider that cartridge. Other similar "fast-loading" devices and programs are available, too. One is the inexpensive, disk-based Kwik-Load!™ by DATAMOST; another is the 1541 Flash!™ hardware modification package by Skyles Electric Works. The latter is probably the most comprehensive disk speedup package on the market, but it is expensive (about $70–90), and it requires internal mods to both your disk drive and computer.

OK, time to get off my Commodore soapbox to highlight a letter relating to IBM-PC software, as received from *CQ* reader and brass-pounder Marshall G. Emm, VK5FN. Writes he:

"In your Product Peek, Part II column which appeared in the December 1984 issue, you made reference to a scarcity of amateur interest in software for the IBM-PC and its clones. I own and use a PC, but my own amateur applications for it are limited, primarily because there is no room for the beast in the radio shack, and it has been my experience generally that RF and computers are not very compatible. However, as a result of my involvement in teaching Morse code, I have developed a package called Codemaster for training and practice."

Codemaster is written in Microsoft Advanced BASIC and runs under the PC-DOS operating system (version 1 or 2). The major compatibility factor is that Codemaster relies on the "PLAY" statement in the BASIC interpreter. It is menu-driven and is user-friendly. Major parameters such as speed, proportional spacing, group length, etc., are controlled interactively, while the documentation gives hints for making changes to the programs with respect to the overall speed range (preset to 5.5 to 41 wpm), the pitch (approx. 800 Hz), the random word bank, and presetting of interactive options."

VK4FN advises that there aren't many IBM-PC equipped amateurs Down Under, and so he is interested in making the package available to U.S. hams. He can supply the package, including a "load-and-go" diskette for PC-DOS 1 or 2, instructions, and program listings for US $30. For those who don't mind keyboard work or who aren't sure of compatibility, he can supply the instructions and listings only for US $10. Marshall also advises that he is working on a system for log-keeping, QSL generation, and QSO indexing which runs under dBASE II™. For information, contact Marshall G. Emm, VK5FN, GPO Box 389, Adelaide, SA 5001.

To round out this month's column, we would like to mention the line of technical and scientific software and hardware from Computer Continuum, 75 Southgate Ave., Suite 6, Daly City, CA 94015. For the technically inclined individual, the firm offers several scientific software and hardware packages for the Apple and Timex/Sinclair series, TRS-80 Color Computer, Commodore 64, and other eight-bit microcomputers. These take the form of disk- and EPROM-based programs, as well as special-purpose analog interface boards that, according to the ads, allow "scientific data acquisition on a shoestring budget."

One of the major programs offered is the "Scope/FFT (Fast Fourier Transformation)" package for the Apple and Commodore 64. The program, with the required analog board, offers a powerful but low-cost data acquisition and analysis system. It generally operates like a dual-trace storage oscilloscope, with user-selected sampling frequencies of 3 Hz to 70 kHz provided. Screen displays can be saved by name to disk, and screen dumps to most popular printers are available. At the bottom line, you don't necessarily have to be a scientist to use software like this, and many electronic hobbyists and students are using similar packages to learn about data analysis and applications to their special interests.

Errata

Sharp-eyed reader W. H. Sayer, WA6BAN/6, caught a minor error in the June column, p. 67. In column one, under paragraph 5, we indicated that with respect to coaxial cable velocity factor, "electrical length equals physical length times the velocity factor." This, of course, is backwards. The electrical length of coax is longer than the physical length; therefore, the formula for electrical length is "physical length *divided by* the velocity factor."

Wrapping It Up

This time we have revisted MUF and one of the more comprehensive propagation prediction utility programs, MUFPLOT V2. We've also slit open the mailbag for some reader input to the column, pointed out some worthwhile hamshack reading material, and taken a look at some new software of interest to *CQ* readers.

Next month we'll focus the spotlight even more heavily on software. See you then.

73, Karl, W8FX

Henry Report #3

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CIRCLE 175 ON READER SERVICE CARD

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

SWL Lorraine Bachmann, WDX9DCJ, USA-CA All Counties #494, listening to the mobile station in Wisconsin.

The story of the month as told by Lorraine is:

Lorraine Bachmann, WDX9DCJ All Counties #494, 6-19-85

"When I was asked to write an article for the Awards column, I wondered what I could possibly write. But thinking it over, I came to the conclusion that I could write a book on our mobile experiences!

"Arnie, K9DCJ, and I started mobiling in 1969, and it was the beginning of some unusual events. We haven't missed many county trunk roads or highways in the state. We have parked in church yards, cemeteries, grocery-store parking lots, Lambeau Field, Milwaukee County Stadium, farmers' corn fields, Indian reservations, and almost anyplace else you could name in the state of Wisconsin. We have stayed in some motels that were so bad they were not fit for human habitation. One night the only available space was the motel office, and the owner apologized for charging us $10.00. We stayed in a bridal suite with two bedrooms. We have stayed in a room so close to the railroad tracks that we were almost shaken out of bed when the train came by. One motel in northern Wisconsin was so bad that we left at 5 a.m. just to get out of it.

"We have fought blizzards, snow, sleet, ice, hail, and heat. I've mopped Arnie's brow while he was logging on a county line. This is dedication!

"All together we have driven over 350,000 miles and logged 44,000 mobile contacts. We have taken over 400 pictures of last county signs.

"I should have started as a shortwave listener many years ago, and maybe I could be working all the counties for the seventh time also. It took me 37 months almost to the day to earn USA-CA All Counties #494. I have enjoyed the challenge. I have over 95% return on the requests for confirmation.

"I want to thank everyone for all the cooperation and good wishes I have received. But no, I think I'll stick with being an SWL. One mobile radio operator in the family is enough. Thanks everyone!—Lorraine Bachmann, WDX9DCJ (SWL)"

(Note: Lorraine's OM, Arnie, K9DCJ, is well known to most county hunters. Arnie has USA-CA All Counties #86, 11-1-72. Arnie is frequently heard running Wisconsin counties on the CHN at 14.336 MHz.)

333 South Lincoln Ave., Mundelein, IL 60060

Awards Issued

Dale Mitchler, WB9YCO, finished them all and won USA-CA 500 #2045, USA-CA 1000 #884, USA-CA 1500 #719, USA-CA 2000 #643, USA-CA 2500 #587, USA-CA 3000 #525, and USA-CA All Counties #495. All awards are endorsed All 20 M, mobile, SSB and dated 7-8-85.

SWL Charles Loftis, WDX4KEF, has heard and confirmed all counties. Charles has claimed the following awards: USA-CA 500 #2046; USA-CA 1000 #885, USA-CA 1500 #720, USA-CA 2000 #644, USA-CA 2500 #588, USA-CA 3000 #526, and USA-CA All Counties #496. All awards are mixed band and mode, dated 7-10-85.

Jack True, WA9QNI, finished all his paperwork before he left on vacation. Jack qualified for USA-CA 500 #2047, USA-CA 1000 #886, USA-CA 1500 #721, USA-CA 2000 #645, USA-CA 2500 #589, USA-CA 3000 #527, and USA-CA All Counties #497, All SSB, mobile, dated 7-11-85.

Harry E. Daley, VE1AIG, sent for USA-CA 2500 #590, 7-19-85, All 20 M SSB.

Cary R. Wallace, KM1I, claimed USA-CA 1000 #887, All 20 M, Mobile, SSB, USA-CA 1500 #723, All 20 M, Mobile, SSB, and USA-CA 2000 #646. All awards dated 7-27-85.

Mike Bragassa, KB8KW, qualified for USA-CA 500 #2043, USA-CA 1000 #882, and USA-CA 1500 #717. All awards were endorsed all 20 M, mobile to mobile, SSB.

Norman H. Friedman, NK7B, sent for USA-CA 1000 #883 and USA-CA 1500 #718, mixed band and mode, dated 7-6-85.

Charles R. Imsande, W6YLJ, won USA-CA 1500 #722, all 20 M, SSB, mobile.

USA-CA 500 certificates went to:

Mike Bragassa, KB8KW, #2043, All 20 M, mobile to mobile, #2044, SSB, 7-3-85.

Special Honor Roll
Dale Mitchler, WB9YCO
All Counties #495, 7-8-85

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

Jack True, WA9QNI
All Counties #497, 7-11-85

Carlos Ozores, PY2BCQ, #2044, 7-8-85, mixed band and mode.

Dale W. Mitchler, WB9YCO, #2045, 7-8-85, All 20 M, mobile, SSB.

Charles Loftis, WDX4KEF, SWL, #2046, mixed band and mode, 7-10-85.

Jack True, WA9QNI, #2047, All SSB, mobile, 7-11-85.

Nelson Moyer, KU0A, #2048, All SSB, 7-22-85.

Gosta Larsson, SM4CTT, mixed band and mode, 7-22-85.

Awards Available

ORARI (Organisasi Amatir Radio Indonesia) has the pleasure to announce herewith the issuance of a new awards program as follows:

1. The **Jakarta Award** (JA/SWL-JA) for confirmed contacts, or having heard from, licensed amateurs in Jakarta (0 call area only), the capital of the Republic of Indonesia.
2. **Worked All Indonesia Award** (WAIA/SWL, WAIA) for confirmed contacts with, or having heard from, licensed amateurs in each of the Indonesia call areas.
3. **Worked the Equator Award** (WTEA/SWL, WTEA) for confirmed contacts with, or having heard from, licensed amateurs in countries along the equator.

General Rules

ORARI awards will be issued to licensed amateurs for 2× SSB, 2× CW, 2× RTTY, mixed or single mode, mixed or single band in 80, 40, 20, 15, 10 meter band only. SWL awards in the same category will also be available. The applicant may request endorsement for such distinction accordingly.

To be valid, all contacts or listening must be made on or after July 9, 1968. Claim must be accompanied by a QSL card list (GCR) furnished with the call-

USA-CA Honor Roll

3000		WA9QNI	645	NK7B	883
WB9YCO	525	KM1I	646	WB9YCO	884
WDX4KEF	526			WDX4KEF	885
WA9QNI	527	1500		WA9QNI	886
		KB8KW	717	KM1I	887
2500		NK7B	718		
WB9YCO	587	WB9YCO	719	500	
WDX4KEF	588	WDX4KEF	720	KB8KW	2043
WA9QNI	589	WA9QNI	721	PY2BCQ	2044
VE1AIG	590	W6YLJ	722	WB9YCO	2045
		KM1I	723	WDX4KEF	2046
2000				WA9QNI	2047
WB9YCO	643	1000		KU0A	2048
WDX4KEF	644	KB8KW	882	SM4CTT	2049

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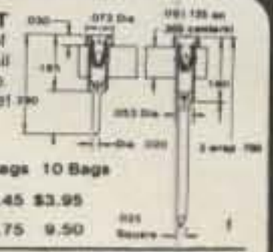
cam actuated, true zero insertion – tin plated solder tail pins – capable of being plugged into dip sockets, including wire wrap.

Stock No.	No. of Pins	1-9	10-49	50
11055	24	4.98	$4.35	$3.90
11056	28	5.15	4.50	4.05
11057	40	6.81	5.95	5.35
11058	64	12.02	10.50	9.45

IC-KOOLERS™ from UNITRACK® dissipate over 2 watts of heat from IC's, producing longer life and better performance. Just push IC-Kooler on – heat is collected from top and bottom of IC and dissipated. Won't shake loose!

Stock No.	No. Pins in IC	Price
22225	14	$.29
22226	16	.29

SCREW MACHINED SOCKET PINS, loose, packaged in bags of 100. Stock No. 11310 is solder tail with gold collet tin shell. Stock No. 11311 is wire wrap with gold collet gold shell.



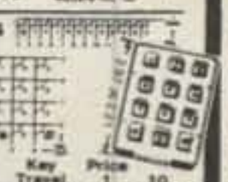
Stock No	Description	1 Bag	5 Bags	10 Bags
11310	Bag of 100 solder tail pins	$ 4.95	$ 4.45	$3.95
11311	Bag of 100 wire wrap pins	11.95	10.75	9.50

WILD ROVER

Touch switch capsule. Operating motion is .005" without the use of a levered arm. Extremely fast on and off with low noise. Normally open – rated 115 VAC, 1.6 amp-30 milliohm resistance – .615 radius by .160 thick.

Stock No.	1-9	10 & Up
12098	$1.42	$1.28

3 X 4 Elastomeric Keyboards



Each keyboard has a p.c. board, elastomeric pad with contacts, ABS bodies and double shot molded keys **Max rating:** 12 VDC @ 20mA **Contact Res:** less than 500 ohms **Bounce:** less than 10 m sec.

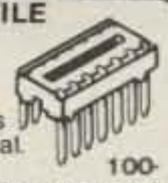
Stock No.	Operating Force	Key Travel	Price 1	Price 10
11291	120±40g	2.0±.5mm	$4.95	$4.50
11292	80±40g	1.5±.5mm	3.95	3.60

TI WIRE WRAP SOCKETS

Tin plated phosphor bronze contact – 3 wrap

Stock No.	No Pins	1-99	100-499	500
11301	8	$.40	$.36	$.30
11302	14	.59	.54	.45
11303	16	.64	.58	.48
11304	18	.73	.66	.55
11305	20	.99	.90	.75
11306	22	1.12	1.02	.85
11307	24	1.25	1.14	.95
11308	28	1.52	1.38	1.15
11309	40	2.05	1.86	1.55

TI LOW PROFILE SOCKETS

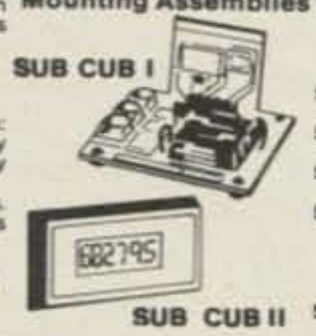


Tin plated copper alloy 688 contact pins with gas tight seal.

Stock No.	No Pins	1-24	25-99	100-999
11201	8	$.10	$.09	$.08
11202	14	.14	.13	.12
11203	16	.16	.15	.14
11204	18	.18	.17	.15
11205	20	.20	.18	.16
11206	22	.22	.20	.18
11207	24	.24	.22	.20
11208	28	.28	.26	.25
11209	40	.40	.37	.33

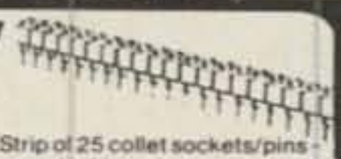
6 Digit LSI Counter Modules with LCD Readouts and Associated Mounting Assemblies

SUB CUB I and **SUB CUB II** are high quality, complete LSI Counter Modules with LCD readout. Modules plug in p.c. board (Stock No. 51071). Complete function evaluation kit (Stock No. 51070) contains: p.c. board, 4.5V battery and variable frequency oscillator to supply train of count pulses. Stock No. 51070 has LATCH, RESET and TEST functions (3 buttons). P.C. board unplugs for bread-board work.



Stock No.	Description	Price
51070	Complete Function Evaluation Kit (includes batteries but does not include display counter)	$45.00
51071	Mounting P.C. Board only	7.50
51072	SUB-CUB I display counter module only	18.00
51073	SUB-CUB II display counter module only	24.00
51074	Panel Bezel Evaluation Kit for SUB-CUB II (does not include SUB-CUB II counter module)	12.00
51075	DATA SHEET	.25

SINGLE ROW SOCKETS



Both styles break-able to any number of contact positions wanted.

Strip of 25 collet sockets/pins - mount odd-center components easily. Gold plated contacts.

Stock No.	1-24	25	50
10240	$1.70	$1.50	$1.30

Strip of 40 pins with single beam sockets. Tin plated contacts.

Stock No.	1-99	100	500	1000
10850	$1.09	$.90	$.82	$.72

OPCOA

Single Digit Displays - Common Cathode

Stock No.	Color	1	100
12082	Red	$1.12	$ .99
12085	Green	1.84	1.63
12087	Yellow	1.92	1.70
12089	Orange	2.08	1.84

Right Angle Socket for Above Displays

Stock No	1	100
11010	$1.24	$ .99

OPTEL LCD's with pins

Stock No. 47005

Stock No. 47006

Stock No. 47007

Stock No.	Description	1	10
47005	3½ dig, .5"	$ 5.95	$ 5.50
47006	4 dig, .5"	5.95	5.50
47007	4 dig, .7"	11.90	11.00

The Battery Just Wrap™ Tool

New battery powered tool wraps insulated wire around .025" square posts without need for pre-cutting and pre-stripping. Complete with bit and 100 ft. 30 AWG wire.

Stock No	Description	Price
13340	Battery just-wrap tool with bit and 100 ft. 30 AWG wire	$59.95
13341	Replacement bit	10.35
13342	100 ft. blue replacement wire	7.54
13343	100 ft. white replacement wire	7.54
13344	100 ft. yellow replacement wire	7.54
13345	100 ft. red replacement wire	7.54

MICRO Charts - colorful 8½" x 11" charts eliminate the need to stumble through manuals and summaries. Fully decoded - instant access - totally comprehensive - gives pin outs, cycle times, buy notes, etc., etc.

Stock No.	Reference	Price
23010	Z80 CPU	$5.95
23011	8080A/8085A	5.95
23012	6502 (65XX)	5.95
23013	8048 and relatives	5.95
23014	54/7400 TTL Pinouts	5.95
23015	Basic Algorithms	5.95
23016	8085/8080A	5.95
23017	How to generalize from a sample	5.95
23018	Wordstar	5.95

PIN FORMING TOOL

puts IC's on their true row to row spacing. One side is for .300 centers. Flip tool over for devices .600 centers. Put device in tool and squeeze.

ONE TOOL DOES 8 thru 40 PINS!

	Stock No.	Price
Hand Tool	11059	$12.95
NEW! ANTI-STATIC MODEL	10200	$14.95

Scotchflex® Breadboard Systems

Basic kit comes with 24 various Dual Sockets, 40 various Plug Strips, wire and tools. Kit can be used with any of the six boards.

Stock No.	Description	Price
03500	Basic Kit	$79.95
03511	Basic board, 4.5 x 5.5	19.50
03506	Intel SBC-8010 Board, 12 x 6.75	64.95
03507	Motorola M-6800 Board, 9.75 x 6	42.95
03508	S-100 Board, 10 x 5.3	36.95
03509	Z-80 Board, 7.7 x 7.5	39.95
03510	Eurocard Board, 6.3 x 3.9	21.95

OK MACHINE AND TOOL

IC INSERTION/ EXTRACTION KIT

Includes DIP IC extractors and inserters to accommodate all ICs from 14 to 40 pins. Tools that engage conductive surfaces are CMOS safe and include grounding lugs. Stock No 13309 **$41.34**

SOCKET WRAP ID

Dip socket-sized plastic panels with numbered holes in pin locations. Slip onto socket before wire wrapping to identify pins. Also write on them for location. IC part number, function, etc. Simplifies initial wire wrapping, troubleshooting and repair. **$1.95** per pack

13295	14 pin
13296	16 pin
13297	18 pin
13298	20 pin
13299	22 pin
13300	24 pin
13301	28 pin
13302	40 pin
13303	96 pin

THERMOPROBE: Identifies Dead Components – Replaces Volt Meters!

Identify dead components which do not emit heat. Just point thermistor probe within 1/16" of board – move over components and see which are dead.

Stock No.	Price
22300	$21.95

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ONE ANTENNA .3 TO 70 MHZ.
VSWR 1.5:1 OR LESS

UNEXCELLED FOR **"FREQUENCY HOPPING"**

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- * 100% SOLID STATE !
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5479 Jetport Industrial Blvd. • Tampa, FL 33614
Phone: 813-885-3996

CIRCLE 12 ON READER SERVICE CARD

Yas, JH8GWW, with his CQ awards.

signs of station worked, dates, bands, and modes of contacts meeting the requirements of the award concerned. Rules and requirements will be specified, when required, in each of the awards programs.

QSL card list must be accompanied by a statement from the applicant's national society, club station, or from any two amateurs other than the applicant, that the QSL cards of the contacts listed are in the possession of the applicant, and that the items of the cards are correctly listed.

A fee of US $8.00 (8 US dollars only) or 16 IRC's will be charged per award and should be sent along with the application to the respective awards manager.

Only contact with land station within the same country will be acceptable.

Award Issue and Requirements
Jakarta Award

1. The Jakarta Award (JA/SWL JA) is available to licensed amateurs the world over.

2. Issued for confirmed contact with, or having heard from, stations in Jakarta (0 call area only), the capital of the Republic of Indonesia, with the following requirements:

2.1. DX stations need confirmed contacts with, or having heard from, a total of 20 stations, including at least 1 (one) Jakarta club station.

2.2. Indonesian amateurs need confirmed contacts with, or having heard from, a total of 50 stations, including at least 5 Jakarta club stations.

2.3. To apply, send the log extracts (GCR), in alphabetical order by prefix, along with the award fee to the award manager: Mr. M.S. Lumban Gaol, YB0WR, P.O. Box 96, Jakarta 10002, Indonesia.

2.4. QSL cards are required for the application from the Indonesian licensed amateurs operating within the 0 call area, a self-addressed stamped envelope (SASE), or sufficient funds for the return postage, will also be required.

2.5. List of club stations in the 0 call area: YB0ZAA, YB0ZAB, YB0ZAD, YB0ZAE, TB0ZAF, YB0ZBA, YB0ZBB, YB0ZCA, YB0ZCB, YB0ZCD, YB0ZCE, YB0ZDB, YB0ZDC, YB0ZDD, YB0ZDE, YB0ZDG, YB0ZEA, YB0ZEE, YB0ZZ.

Worked All Indonesia Award

1. The Worked All Indonesia Award (WAIA-SWL-WAIA) is available to licensed amateurs the world over.

2. Issued for confirmed contact with, or having heard from, stations in each of the Indonesia call areas (1 to 0) under the following requirements:

2.1. DX stations other than those in *CQ* zone 28 need confirmed contacts with, or having heard from, two stations from each call area; a total of 20 QSL cards.

2.2. DX stations in *CQ* zone 28 need confirmed contacts with, or having heard from, 3 stations from each call area; a total of 30 QSL cards.

2.3. Indonesian amateurs need confirmed contacts with, or having heard from, 5 stations from each call area; a total of 50 QSL cards. Contact with, or having heard from, three different station classes (YB, YC, YD) in the same call area is a must.

2.4. To apply, send the log extracts (GCR), in alphabetical order by prefix along with the award fee to the award manager: Mr. M. Maruto, YB0TK, P.O. Box 96, Jakarta 10002, Indonesia.

Worked the Equator Award

1. The Worked the Equator Award (WTEA/SWL, WTEA) is available to licensed amateurs the world over.

2. Issued for confirmed contacts with, or having heard from, countries according to the ARRL DXCC country list along the equator as follows: C2, HC, HC8, HK, KH1 & KB6, PP-PY, PY0 (St. Peter), S9, (Sao Time), T30, T31, T32, TN, TR, YB5, YB7, YB8, 5X, 5Z, 60, 8Q, 9Q.

3. The WTEA (SWL-WTEA) will be issued in three classes: Class I—for confirmed contact with, or having heard from, 15 countries; Class II—for confirmed contact with, or having heard from, 12 countries; Class III—for confirmed contact with, or having heard from, 8 countries. For all classes, contact with, or having heard from, YB5, YB7, and YB8 is obligatory.

4. To apply, send your log extracts (GCR), in alphabetical order by prefix, along with the award fee to the award manager: Mr. Ben S. Samsu, YC0EBS, P.O. Box 96, Jakarta 10002, Indonesia.

Award Notes

When applying for an award, courtesy demands that you observe the following:

1. Print your name, callsign, and address.

2. Clearly state the award and endorsements for which you are applying.

3. Send the application to the respective award manager according to the award claimed and enclose the award fee (in money order or IRC's) as requested. Personal check is not accepted.

4. For the Indonesian amateurs, applicants must use the model-K form issued by the National QSL & Awards Bureau and verified by the assigned regional checkers.

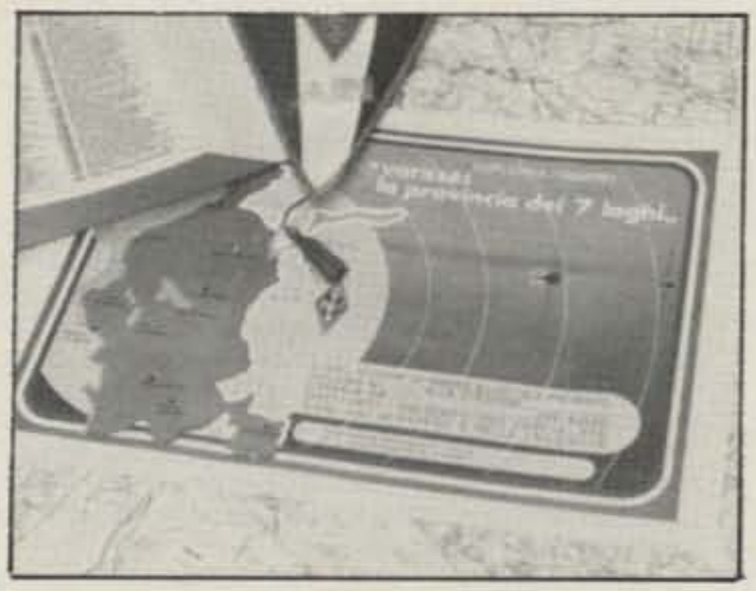
5. ORARI stresses the honor of fair play and sportsmanship of the applicant

working towards these awards. Use of poor ethics will result in permanent disqualification.

6. All correspondence should be sent to: ORARI National QSL & Awards Bureau, P.O. Box 96, Jakarta 10002, Indonesia.

7. The Indonesian licensed amateurs may send the cards directly or have them verified by the ORARI awards checkpoint nearest to their location. Current checkpoints or regional checkers include:

Call Area 1: YB1DRE, YB1HF
Call Area 2: YB2SV, YB2BJM, YB2BLI
Call Area 3: YB3CDL, YB3DC
Call Area 4: YB4FW
Call Area 5: YC5NOF
Call Area 6: YB6HK
Call Area 7: YB7BC, YB7UE
Call Area 8: YB8QD, YB8AY
Call Area 9: YB9VA
Call Area 0: YB0JH



The Province of Seven Lakes Award, offered by the Associazione Radiomator Italiani, Varese Division.

Varese—The Province of the 7 Lakes. A new award offered by the Associatione Radiomatori Italiani. Rules are as follows:

Participation is worldwide for hams and SWLs. Radio amateur bands from 1.8 to 144 MHz may be used. Modes are CW, SSB, and RTTY. Valid stations are all station members of Varese A.R.I. Chapter that in addition to the report will furnish a progressive number.

Points for HF contacts: Stations outside of Europe will require 5 contacts plus 3 contacts for HRD (SWL) of stations sited on lake's shore; for European stations 14 contacts are required plus 5 contacts or HRD of stations sited on lake's shore.

Points for VHF contacts: To obtain the diploma 30 contacts are necessary plus 5 contacts of stations sited on lake's shore. Contacts through repeaters are not accepted.

The same station may be contacted more than once provided mode and date are changed. Contacts made as of January 1, 1985 are valid and the diploma will have indefinite validity. Requests shall be addressed to A.R.I. Varese, POB 26, 21100 Varese, Italy, along with 10 IRC's or the equivalent in Lire to cover printing and postage.

IARU Region 3 Conference Award. This award is to publicize the Region 3 conference, Auckland, New Zealand. The award is available worldwide for contacts made during November 1985 with Conference Station ZM6ARU and two other ZM stations. (Five other ZM stations may be substituted for ZM6ARV.) The award is available to SWL's. New Zealand amateurs will use prefix ZM during November 1985. Send log details with $1.00 (3 IRC's) or $2.00 airmail to ZL2GX, 152 Lytton Road, Gisborne, New Zealand. This is an unusual award embosed with gold logos.

IARU Region 3 Award (Reminder). Basic award for 7 region 3 countries, with silver endorsement for 12 countries and gold endorsement for 17 countries. Eligible countries are Australia, Bangladesh, China (PRC), Fiji, French Polynesia, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Pakistan, Papua/New Guinea, Philippines, Singapore, Solomon Islands, Sri Lanka, Thailand, and Vanuatu.

Send log details with $1.00 (3 IRC's) or $2.00 airmail to Awards Manager, ZL2GX, 152 Lytton Road, Gisborne, New Zealand.

The "Pearl of the Orient Seas" DX Award. The Philippine Amateur Radio League, Inc. (PARLINC), incorporated in 1962 and composed mostly of senior DXers, is an organization established to enhance and promote amateur radio through its activities in the field of DX and to further the growth of international friendship and camaraderie, is making the "Pearl of the Orient Seas" award available to all licensed radio amateurs.

This award is issued to all licensed radio amateurs all over the world who have established two-way radio contact with 12 amateur radio stations in the Republic of the Philippines, who are members of the Philippine Amateur Radio League, Inc. General rules are as follows:

1. Contacts after January 1, 1980 are valid.
2. Bands: 3.5, 7, 14, 21, 28 MHz.
3. All modes.
4. The log data to be certified by an association, indicating worked stations, date, band and mode, together with 20 IRC's or US $2.00 to defray cost of packing and postage.
5. Applications should be sent to PARLINC Awards Chairman, P.O. Box SM159, Metri Manila 2806, Republic of the Philippines.

PARLINC members: DU1AA, DU1AC, DU1AE, DU1AL, DU1BOS, DU1BQ, DU1DBT, DU1DMD, DU1EH, DU1FLA, DU1FN, DV1FZ, DU1GE, DU1GI, DU1GN, DW1GT, DU1HR, DU1JB, DU1JMG, DV1JMJ, DU1JVL, DU1JY, DU1LEO, DU1LM, DU1MEL, DU1MR, DU1NGL, DU1ARL, DU1NZ, DU1PIT, DU1PJS, DU1POL, DU1POP, DU1RFA, DU1RGM, DU1RLA, DU1ROD, DU1RZ, DU1SG, DU1TAM, DU1TH, DV1TR, DU1TT, DU1TYY, DU1XKE, DV1YO,

Pearl of the Orient Seas DX Award sponsored by the Philippine Amateur Radio League, Inc.

DV1ZI, DU3MF, DU6FJ, DU6RH, DU8AC, DU8JC, DU8JJ, DU9AD, G4AGM/DU1, JH3OII.

Notes

Another year is drawing to a close, and we begin to take inventory to see if we have completed all we want to do this year. How are things where you are?

73, Dorothy, WB9RCY

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Since this issue of *CQ* should reach most subscribers prior to the *CQ* World-Wide DX Phone Contest weekend of October 26–27, here is an updated day-to-day forecast for that weekend. This update looks considerably better than the forecast made in last month's column. Not only are conditions now expected to be Low Normal during the Contest weekend, but the chances are good that they will rise to High Normal, particularly on Saturday, October 26th. It looks like a good weekend for the Phone section. See the Last Minute Forecast appearing in this month's column for a day-to-day forecast of conditions expected during the CW Contest weekend of November 23–24.

Last month's column contained special DX Propagation Charts for use during both phone and CW sections. The following is a summary of conditions and other propagation tips that should be useful during the contest weekend specifically and during the month of November generally.

Contest Tips

Midnight to Sunrise: Check *20 meters* for openings to South Pacific until midnight, or perhaps as late as 1 a.m. in the EST and CST time zones, and until 3 a.m. in MST and PST zones. Band may also remain open for an hour or so after midnight to deep South America and Antarctica. Best band during this time period should be *40 meters*. Look for openings towards Europe, the Middle East, and parts of Africa until 3 a.m. in EST and 2 a.m. in CST zones. Check for long-path openings between 6 and 8 a.m. in PST zones. Good openings from all time zones towards South America should be possible, with signals strongest to the Caribbean area, Central America, and the northern countries of South America between midnight and 5 a.m. in EST and CST zones and to 4 a.m. in MST and PST zones. The path towards the South Pacific looks good on *40 meters* between midnight and sunrise in MST and PST zones. Weakish openings to the Far East and Asia may be possible from the PST zone from midnight to sunrise. There's also the possibility of a *40 meter* opening to Antarctica between 2 and 5 a.m. in EST and CST zones and between midnight and 5 a.m. in MST and PST zones. *Eighty* should open from EST and CST zones to Europe, parts of Africa, and the Middle East until 2 a.m., possibly for an hour or so longer in the EST zone. *Eighty* also looks good from PST and MST zones to the South Pacific from midnight almost to sunrise, and from the EST and CST zones from about 3 a.m. to almost sunrise. Check for good *80 meter* openings to the Caribbean, Central America, and the northern countries of South America between midnight and 5 a.m., and to 3 a.m. for deeper openings into South America, in all time zones. There's also a possibility of an opening to the Far East and Asia from the PST zone between 1 and 5 a.m. Openings on *160 meters* should be possible from the EST and CST zones to Europe between midnight and 2 a.m. In PST zone check for *160 meter* openings towards the South Pacific between 2 a.m. and sunrise. Openings towards the Caribbean, Central America, and the northern countries of South America should be possible from all time zones from about 2 a.m. to 4 a.m.

Sunrise to Sunset: Check for possible *10 meter* openings to Europe from EST and possibly CST zones between 9 and 11 a.m., for openings to Africa between 9 a.m. and noon. *Ten meter* openings into South America should be possible between 9 a.m. and 3 p.m. from all time zones. Check for openings towards the South Pacific between 1 and 5 p.m. in PST zone, and possibly MST as well. Look for openings from PST zone to the Far East and Asia between 2 and 5 p.m. Conditions may have to be at least High Normal for the *10 meter* band to open. DX conditions on *15 meters* should hold up well during the entire daylight period. Check for openings towards South America as early as 8 a.m., with the band peaking in this direction between noon and 4 p.m. Good openings are expected towards Africa between 10 a.m. and 2 p.m. in EST and CST zones, and until noon in MST and PST zones. Band should open to Europe from EST and CST zones between 8 a.m., and noon, and until 10 a.m. in MST

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1985

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 23, 26	A	A	B	C
High Normal: 8, 14, 21, 24-25, 28	A	B	C	C-D
Low Normal: 1-2, 5-7, 9, 12-13, 15, 18-20, 22, 27, 29	A-B	B-C	C-D	D-E
Below Normal: 3, 10-11, 16, 30	B-C	C-D	D-E	E
Disturbed: 4, 17	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 November 1st and 2nd, fair-to-poor (C-D) on the 3rd, poor-to-nil on the 4th, fair-to-good (B-C) from the 5th through the 7th, etc. Conditions during the C.W. Contest weekend are expected to be excellent (A) on November 23rd and good (B) on the 24th.

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.

and PST zones. Check for openings towards South Pacific between 2 and 6 p.m. in all zones, with the band remaining open for an hour or so longer in PST zone. *Fifteen meters* may also open towards the Far East and Asia between 4 p.m. and sunset in PST and MST zones. *Twenty meters* should open to almost all areas of the world just after sunrise, and remain open with strong signal levels to at least 10 a.m. From 10 a.m. through the early afternoon signals will probably weaken, with the band only open towards Europe, northern Africa, the Caribbean, Central America, the northern countries of South America and short openings towards the South Pacific. After 2 p.m. signals should begin to peak again on *20 meters* towards Africa, and remain strong to 3 p.m. in the MST and PST zones, and to as late as 5 p.m. in the CST and EST zones. In the EST and CST zones, check also for long-path openings to Australasia between 3 and 5 p.m., and look for short-path openings to Australasia from the PST and MST zones between 4 p.m. and sunset. Expect strong signal openings to all of Latin America from about 4 p.m. onward. *Forty meters* should begin to open towards Europe and to the Caribbean, Central America, and the northern countries of South America about an hour or so before sunset in all time zones, but signals will be weakish.

Sunset to Midnight: Twenty meters is expected to hang in for an hour or so after sunset to parts of Africa from the EST and CST zones. In PST zone check for long-path openings to Europe and Africa on *20* beginning about 10 p.m. The band looks good to most of Latin America to about 8 p.m., and to Antarctica and the deep areas of South America almost to midnight. *Twenty* should remain open to the South Pacific to midnight, and to the Far East and Asia until 10 p.m. in all time zones, but openings favor MST and PST locations. Expect some fairly good openings on *40 meters* to Europe and parts of Africa throughout this entire time period, and to most of Latin America as well. In PST zone, check *40 meters* for openings towards the South Pacific beginning about 10 p.m. *Eighty meters* should open towards Europe, Africa, the Caribbean, Central America, and the northern countries of South America during most of this time period. Check for possible *160 meter* openings toward the Caribbean area and Central America, and possibly into northern South America, between 10 p.m. and midnight in all time zones. Openings may also be possible on *160* from the *EST* zone to Europe between 10 p.m. and midnight.

Short-Skip Charts

This month's column contains a Short-Skip Propagation chart for use between distances of approximately 50 and 2300 miles. Special charts for use between the mainland and Alaska and Hawaii are also included. Instructions for the use of these charts are given elsewhere in this column.

CQ Short-Skip Propagation Chart November & December 1985 Local Standard Time At Path Mid-Point (24-Hour Time)

Band (Meters)	Distance Between Stations (Miles) 50-250	250-750	750-1300	1300-2300
10	Nil	Nil	11-16 (0-1)	11-16 (1-0)
15	Nil	10-16 (0-1)	09-10 (0-1) 10-12 (1) 12-16 (1-2) 16-17 (0-1)	09-10 (1) 10-12 (1-3) 12-14 (2-4) 14-15 (2-3) 15-16 (2) 16-17 (1) 17-18 (0-1)
20	Nil	09-11 (0-1) 11-16 (0-2) 16-19 (0-1)	08-09 (0-1) 09-11 (1-4) 11-16 (2-4) 16-17 (1-3) 17-18 (1-2) 18-19 (1) 19-21 (0-1)	07-08 (0-1) 08-09 (1-3) 09-11 (4) 11-15 (4-3) 15-16 (4) 16-17 (3) 17-18 (2-3) 18-19 (1-2) 19-20 (1)
40	07-09 (0-1) 09-10 (1-3) 10-15 (3-4) 15-16 (2-3) 16-18 (1-2) 18-20 (0-1)	07-09 (1-3) 09-10 (3) 10-15 (4-3) 15-16 (3-4) 16-18 (2-4) 18-20 (1-2) 20-00 (0-2) 00-07 (0-1)	07-09 (3) 09-14 (3-1) 14-15 (3-2) 15-16 (3) 16-18 (4) 18-20 (2-4) 20-22 (2-3) 22-00(2) 00-04 (1-2) 04-07 (1-3)	07-08 (3-2) 08-09 (3-1) 09-14 (1-0) 14-15 (2-0) 15-16 (3-1) 16-17 (4-2) 17-18 (4-3) 18-20 (4) 20-22 (3-4) 22-00 (2-3) 00-02 (2) 02-04 (2-3) 04-06 (3)
80	08-16 (4) 16-18 (2-4) 18-20 (1-3) 20-06 (1-2) 06-08 (2-3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-2) 18-20 (3-4) 20-06 (2-4) 06-07 (3-4) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-06 (4) 06-07 (4-2) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4-3) 04-06 (4-2) 06-07 (2-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-06 (4-3) 06-07 (4-2)	06-07 (2-1) 07-09 (1-0) 17-19 (1-0) 19-20 (4-2) 20-21 (4-3) 21-04 (4) 04-06 (3-2)	06-07 (1-0) 07-19 (0) 19-20 (2-1) 20-21 (3-2) 21-04 (4-2) 04-06 (2-1)

HAWAII Openings Given In Hawaiian Standard Time#

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

ALASKA Openings Given In GMT

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

#See explanationin "How To Use Short Skip Charts" in box at the beginning of this column.
*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.

Sunspot Cycle Progress

Cycle 21 continues to decrease steadily, and is almost certain to reach its minimum level by mid 1986. Solar activity during the 1985 contest period will be at its lowest point since at least 1975. A smoothed sunspot number of approximately 12 is forecast for November 1985. By comparison, solar activity during last year's CW section was at 25, and during the peak year of 1979 it stood at 162!

The Royal Observatory of Belgium, the world's official keeper of solar statistics, reports a monthly sunspot number of 31 for July 1985. This results in a smoothed sunspot number of 21 centered on January 1985.

The progress of the present solar cycle, as it approaches its final days, will be discussed more fully in this column in the near future.

VHF Ionospheric Openings

Two short but significant meteor showers are expected during November, which should make possible some meteor-scatter-type openings on the VHF bands. The *Taurids* shower, occurring during the first week of November, should peak between the 2nd and 4th, with a count of about 15 meteors an hour. A second shower of about the same intensity, called the *Leonids*, should begin on November 15th and peak on the 16th.

Some auroral VHF ionospheric openings should be possible during November, especially when HF conditions are Below Normal or Disturbed as a result of a radio storm. Check the Last Minute Forecast at the beginning of this column for the days that are most likely to be in these categories during November.

Despite low sunspot activity, this can still be a good contest period, but it will require more operating skill and patience than during the previous years of higher sunspot count.

Over the past 34 years these forecasts have sustained an accuracy of approximately 90%. Much of this has been due to the excellent propagation data obtained during contest periods. Good luck in the 1985 CW section, and please let me know how this year's contest propagation forecasts work out.

73, George, W3ASK

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The many stateside and overseas weekly bulletins and club newsletters have kept the DXers and Contesters well informed of coming expeditions. Publishing that information in a monthly magazine is practically impossible due to the time element. However, expeditions that have been planned well in advance would certainly get a much broader coverage from a magazine because of its greater circulation. I sometimes wonder why they do not avail themselves of this opportunity.

DX information should be sent to John Attaway, K4IIF, or Hugh Cassidy, WA6AUD, for their DX Column. If it's information relating to a contest expedition, it should be sent to me for this column. It's too late, of course, for this year's WW DX Contest, but you might keep it in mind for the coming 160 and WPX Contests.

As mentioned in K4IIF's DX column for September, John expressed surprise that so many of the top scores in the 1984 contest came out of the less-favored two-point QSO areas. This was more evident in the phone section of the contest, but the CW section also showed many respectable scores, even though they were not top winners.

There's no denying that the Zone 9ers have a distinct advantage with their 3 pointers. However, it is my belief that stations in Zone 8 and other 2-point areas can overcome some of this handicap by concentrating their activity on the lower bands, where they have a better shot at the many stateside stations, especially during the present period of the sunspot cycle.

The contest geographical boundaries are determined by the WAZ continental boundaries, and since PJ2 and 9Y4 are considered part of the South American continental shelf, there is nothing much we can do about it. Or is there? Don't address your remarks to me. They should go to the WAZ Committee who established these boundaries. That would be John Attaway, K4IIF, and his committee. How about that, John?

Deadline for the February issue is November 15th, and December 15th for the March issue.

By the way, how many of you have found my suggestion of checking the expiration date of your license useful?

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

**	**Oct.**	**26-27**	**CQ WW DX Phone Contest**
*	Oct.	30-31	YL-RL Anniv. SSB Party
	Nov.	1-7	HA QRP Contest
	Nov.	2-3	Int. Police Assn. Contest
	Nov.	2-4	ARRL CW Sweepstakes
	Nov.	9-10	Czech. DX Contest
	Nov.	9-10	European RTTY Contest
	Nov.	9-10	Delaware QSO Party
	Nov.	9-10	"Electril" Silver Jubilee
	Nov.	16-17	WAOE 160 M CW Contest
	Nov.	16-18	ARRL Phone Sweepstakes
**	**Nov.**	**23-24**	**CQ WW DX CW Contest**
	Dec.	2	SWOT 2 Meter QSO Party
	Dec.	7-8	ARRL 160 Meter CW Contest
	Dec.	7-8	TOPS 3.5 MHz CW Contest
	Dec.	7-8	Telco. Pioneers QSO Party
	Dec.	14-15	ARRL 10 Meter Contest
	Jn.1-	De.31	U.B.A. SWL Competition
	Jan.	11-12	Mich. QRP Club CW Contest
	Jan.	18-19	Hungarian DX Contest
	Jan.	18-19	White Rose SWL Contest
	Jan.	**24-26**	**CQ WW 160 M. CW Contest**
	Feb.	**21-23**	**CQ WW 160 M. SSB Contest**

* *Covered last month.*
** *See September issue.*

HA QRP CW Contest

0000Z Fri. to 2400 Thurs., Nov. 1–7

This is an annual affair organized by the *Radiotechnika Journal* of Hungary. It should be quite a challenge to QRPers, since activity is confined to 80 meters only (3500–3600 kHz).

Power input must not exceed 5 watts. Both single and multi-operators can participate.

Exchange: RST, QTH, and name.

Scoring: Contacts within own country 1 point; with other countries 2 points. Final score is total QSO points times the number of DXCC countries worked.

All entries will receive a Memorial Leaf. Outstanding scorers will receive the *Radiotechnika Journal* for one year.

Send your log and a description of your station to Radiotechnika, Budapest PF 603, H-1374, Hungary, no later than the November 21st deadline.

Int. Police Assn. Contest

CW: Sat., Nov. 2 SSB: Sun., Nov. 3
0600Z-1000Z & 1400Z-1800Z

The International Police Assn. Radio Club Contest is again organized by the German Chapter. There have been some changes made in the rules.

Participation is by members and non-members in three classes: single operator, multi-operator, and SWL. The same station may be worked in each band and mode for QSO and multiplier credit. CW and SSB should be scored separately.

Exchange: RS(T) and QSO number starting with 001. Club members will identify by including IPA and their state if in the U.S. Non-members in the U.S. will also include their state.

Scoring: One point per QSO; 5 points if it's with an IPA station. Multiply total by DXCC countries and U.S. states worked on each band with an IPA station.

Frequencies: CW—3575, 7025, 14075, 21075, 28075. SSB—3650, 7075, 14295, 21295, 28575. DX—3775, 3800, 7075, 7100. (U.S. on 40 and 80?)

Awards: Certificates to the three highest scorers in each class and each mode. Contest contacts can be applied to the Sherlock Holmes Award and Trophy (*requirements were not given*).

Stateside stations can get additional information by sending a large SASE to Thomas D. Jenkins, WA8VDC, 4828 Elm Street, Newport, MI 48166.

Mailing deadline for contest logs is December 31st and they do to: Anton Kohten, DK5JA, P.O. Box 40 0163, D-4152 Kempen 1, West Germany.

ARRL Sweepstakes

CW: Nov. 2–4 Phone: Nov. 16–18
Starts: 2100Z Sat. Ends: 0300Z Mon.

This is the 52nd running of the Sweepstakes, making it the oldest domestic competition going, and it really stirs up a lot of activity.

Operation is limited to stations in ARRL sections, which also includes the West Indies section (KP4, KV4, etc.) and U.S. possessions in the Pacific. Operation is limited to 24 out of the 30 hour contest period. Times off may not be less than 30 minutes and must be clearly indicated in your log.

In order to minimize QRM to non-contesters it is recommended that operation be confined to certain portions of the bands. It is recommended that you check *QST* for details.

There are several other regulations, including a cross-check sheet if you make 200 or more contacts. A large SASE (39¢ in postage) will get you the "SS Package" and Operating Aid #6 with enough log and summary sheets for an average outing.

Exchange: QSO no., power class, call, last two digits of year first licensed, and your ARRL section.

Stations using 150 watts or less are classed "A" and over 150 watts "B." The same station may be worked once only regardless of the band.

Scoring: Each completed QSO is worth

2 points. The multiplier is derived from the number of ARRL sections, plus VE8, worked (maximum of 74).

Awards: The usual certificates in each class and mode for single operator stations in each section and multi-operator stations in each division.

Logs must be received no later than December 21st and go to: ARRL Communications Dept., 225 Main Street, Newington, CT 06111.

DARC WAE RTTY Contest

0000Z Sat. to 2400Z Sun., Nov. 9–10

Rules for the WAEDC RTTY Contest are the same as for the European c.w. and phone contests held in August and September. Complete rules were in the August issue, and since they are quite long, they will not be repeated here.

There is one main difference, however. In the RTTY contest, exchanges are not limited to between Europeans and non-Europeans. Contacts between stations in other continents as well as one's own continent are also permitted, but not between stations in the same country.

The multiplier is counted according to the ARRL and the WAE country list. In addition, each call area in JA, PY, VE/VO, VK, W/K, ZL, ZS, and UA9-0 will also be considered as a multiplier.

The multiplier point per band is the same as shown for the c.w. and phone contests, except for countries within one's own continent. These are counted as one per band only, regardless of the band.

Certificates will be awarded to the winners in each class and each country. Continental leaders will be awarded the WAEDC plaque.

It is suggested that you use the official DARC log forms. A large SASE (IRC's) to the address below will get you a supply.

Mailing deadline for logs is December 15th and they go to: WAEDC Contest Committee, P.O. Box 1328, D-8950 Kaufbeuren, West Germany.

Silver Jubilee "Electril" Contest

0000Z Sat. to 2400Z Sun., Nov. 9–10

This contest is sponsored by the Electril Antenna manufacturers of Sao Paulo, Brazil to commemorate their 25th year of operation. Activity is planned on 2, 10, 15, 20, 40, and 80 meters, CW and phone.

Classes: Single operator and multi-operator. Single operators must show a total of 12 hours of non-contest operation. No restriction for multi-operators.

Exchange: Only an RS(T) report.

Scoring: One point per QSO. Same station can be worked on each band for credit. No multiplier, just total QSO points from all bands.

Awards: In the form of antennas manufactured by Electril will be awarded to the overall winners in each class and also to the winners on each band.

All entries must be mailed no later than January 31, 1986 and go to: Electril, P.O.B. 22, LABRE - Sao Paulo Section, SP, Brazil 01000.

Delaware QSO Party

1700Z Sat. to 2300Z Sun., Nov. 9–10

The Delaware ARC is again sponsoring this party with rules the same as they have been for the past couple of years.

Stations may be worked once per band and mode for QSO and multiplier credit.

Exchange: QSO no., RS(T), and QTH. County for DE stations, ARRL section or country for others.

Scoring: DE stations score one point for each QSO. Multiply total by number of ARRL sections and DX countries worked. Others get 5 points for each DE contact. Multiply total by the number of DE counties worked on each band and on each mode (maximum of 36 multipliers possible). There are three DE counties: Kent, New Castle, and Sussex.

Frequencies: CW—1805, 3570, 7070, 14070, 21070, 28070. SSB—1815, 3975, 7275, 14325, 21425, 28650. Novice—3720, 7120, 21120, 28120.

Awards: Appropriate awards will be given to the top scorers. In addition, certificates will be awarded to all stations working all three Delaware counties. Include two 22¢ stamps and an address label with your application for the "WDEL" award.

Mailing deadline for all entries is December 17th, and they go to Charles Sculley, AE3H, 103 E. Van Buren Avenue, New Castle, DE 19720. Include an SASE for a copy of the results.

Czechoslovakian Contest

1200Z Sat. to 1200Z Sun., Nov. 9–10

There have been a few changes in the format of this year's OK-DX Contest. It still remains a worldwide-type contest, however, so do not limit your activity to working OK's only.

Use all six bands, 1.8 to 28 MHz. The same station may be worked once per band, either phone or CW, for QSO and multiplier credit.

It is recommended that the following segments of the 3.5 and 14 MHz bands be used: 3500–3560, 3600–3650, 3700–3800, 14000–14060, and 14125–14300.

Classes: Single operator, both single and all band, multi-operator all band only, and SWL. (Club stations will be considered multi-operator.)

Only one transmitter and one band permitted during the same 10-minute period, no QSYing to another band.

Exchange: RS(T) and number of your ITU zone.

Scoring: One point per QSO; 3 points if it's with a Czech (OK4/mm 1 point only). Own country may be worked, but for multiplier credit only.

Multiplier: Sum of different ITU zones worked on each band.

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

A penalty of three additional contacts of the same point value will be deducted for each duplicate QSO or multiplier removed by the committee. Taking credit for excessive duplicates and other violations (regulations, unsportsmanlike conduct, etc.) will be deemed cause for disqualification.

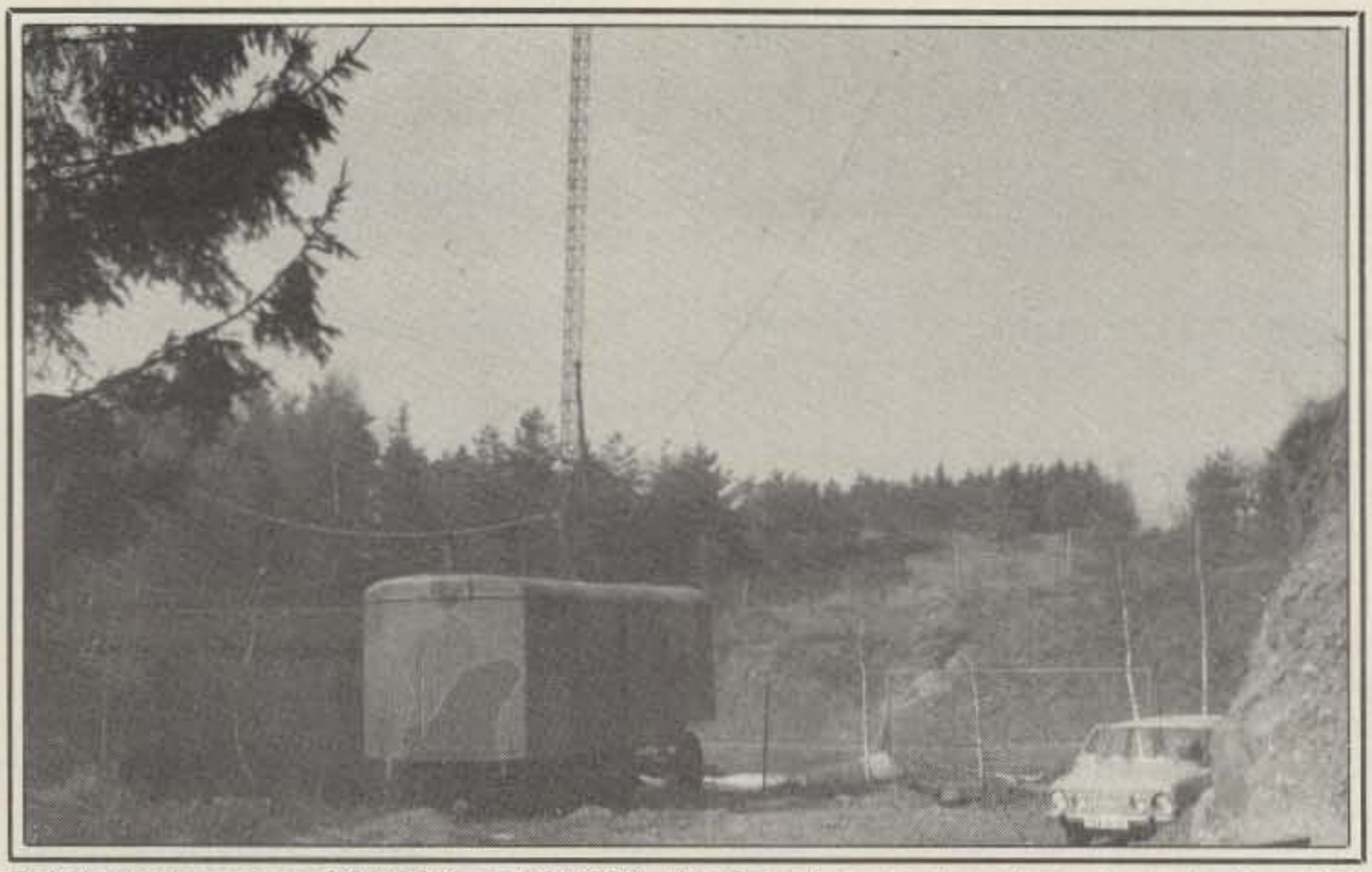
Awards: Certificates in each class to the top-scoring station in each country. Additional awards will be made if returns justify. The "100 OK," "OK SSB," "Slovensko," and other Czech awards will be issued for contacts in the contest if a written application is submitted with your log.

Use a separate sheet for each band, indicate the zone multiplier only the first time it is worked on each band, and include a cross-check list for each band with 200 or more QSO's.

Czechoslovakian Contest

1984 U.S. and Canadian Results

K8CW	AB	27,792
W4XJ	"	11,124
KA1DWX	"	1,500
KT1J	14	954
W6ISQ	"	190
KT7H	"	185
NC2V	7	185
W1KM	3.5	1,285
XL1AW	AB	12,024
XL1PJ	14	48



This is the location of OK6DX and OK6RA, the Czech contest station, winner in the 1984 WW Phone Contest and runner-up in the CW Contest. Operated as a multi-single by Karel, OK2FD, and Jan, OK2JS, they were also winners in the 1984 WPX SSB contest.

A summary sheet showing the scoring and the usual signed declaration that all rules have been observed is also requested.

All entries must be postmarked no later than December 15th and go to: Central Radio Club, P.O. Box 69, 113 27 PRAHA 1, Czechoslovakia.

CQ - WE Contest

1900Z Sat. to 0500Z Mon., Nov. 9–11

The contest is open to present and retired employees of Bell Operating Companies, Western Electric, AT&T and subsidiaries of AT&T. Contact local interworks coordinator for logs and complete rules, or write to Warren Coleman, WD4NIT, AT&T Technologies, 6701 Roswell Road, Atlanta, GA 30328.

Austrian 160 Meter CW Contest

1900Z Sat. to 0600Z Sun., Nov. 16–17

This is a worldwide-type contest, so you are not limited to working OE's only. However, you earn extra multiplier credit for OE contacts.

The OE's are permitted to operate from 1810 to 1950 kHz on 160 and therefore can take advantage of split-frequency operation out of the "DX Window." Their location in the band is determined by the power permitted by their license.

This contest generates a lot of European activity, so conditions permitting, it offers a good opportunity to pick up those countries you are looking for.

Exchange: RST and QSO numbers starting with 001.

Scoring: One point per QSO.

Multiplier: One multiplier point for each country prefix worked. Two points if it's an OE prefix (OE1–OE9).

Final Score: Total QSO points times the sum of the country prefix multipliers. (Keep in mind it's the prefix not just the country, so you can build up a sizable multiplier.)

Awards: None indicated, but I'm sure appropriate awards will be made to winning stations in each country.

The usual summary sheet with a station description, etc., and a signed declaration is requested.

Mailing deadline is December 31st, so get your logs out promptly. They go to: Osterreichischen Versuchssenderverband, "AOEC 1983" Postfach 999, A - 1014, WIEN, Austria.

CQ WW DX CW Contest

0000Z Sat. to 2400Z Sun., Nov. 23–24

Just a reminder, as if you needed one, that the CW section of the WW DX contest is coming up the last weekend of this month. The phone section, of course, is past history.

Complete rules were published in the September issue. There are no changes from those used in previous years, and they are now well established worldwide. The contest trophies awards list has been updated and was covered in detail last month.

It is now definitely established that all logs, both phone and CW, must be sent to the *CQ* office: CQ World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801. Be sure to indicate phone or CW on your envelope. This will avoid your log from being entered into the wrong section.

Deadline for mailing is December 1st for the phone section and January 15th for CW entries.

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dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

Independent Volunteer Examination Coordinators Consider Formation of New Umbrella Organization

According to a source in Washington, DC, Volunteer Examination Coordinators (VECs) who are not associated with the ARRL/VEC may be considering the formation of a new umbrella VEC organization. The move may be in response to Commission concerns that the VEC community is too splintered, and that as a result, the Commission has too many people with whom to work on amateur examinations. To this end, no new VECs are being approved at this time.

These concerns notwithstanding, the FCC, in an August meeting with VEC representatives from around the country, stated that it was impressed with the VECs' dedication and enthusiasm, and that the VEC program is considered one of the best Commission initiatives to be set forth over the past several years. However, there were areas where performance could be improved, said Ray Kowalski, Chief, Special Services Division, Private Radio Bureau. He noted that too many defective applications (Form 610) were being submitted by the VECs, and that too many applications are being filed after the time limit on them expired.

In addressing the VECs, Kowalski also noted ten "truths" about the FCC that should be considered by all amateurs:

1. The FCC is a relatively small agency. It has limited resources.

2. The FCC has other services to regulate in addition to the Amateur and Amateur-Satellite services. For example, there are the Broadcast, Land Mobile, and other major services that require a considerable amount of time and attention.

3. The FCC is out of the amateur examination business. There is no turning back. Amateurs will continue to be responsible for examining those who seek amateur licenses.

4. The Private Radio Bureau (PRB)—not the Field Operations Bureau (FOB)—is responsible for the VEC program. Thus, local field offices of the FOB cannot provide information on matters pertaining to amateur examinations.

5. The Commission's Gettysburg (PA) facility has other applications to process in addition to those related to the Amateur services. As such, BE PATIENT.

6. VECs must forward perfect applications and test reports on time. To do otherwise wastes resources and time.

7. The FCC's computer is limited to its current application processing capability. It is not realistic to request that the program be modified for one purpose or another.

8. It is not a simple matter to revise Form 610. The process is long and involved, may involve other agencies, and could even involve rule-making procedures.

9. The Commission cannot charge for amateur licenses. Commission funding is provided by Congress.

10. The ARRL has yet to submit a proposal for a system to issue special call-signs (something that does not now exist).

The next FCC-sponsored VEC meeting is tentatively scheduled to be held in Washington, DC, in August 1986. An open VEC/VE Forum, however, could be held at the Dayton Hamvention in 1986, similar to the one held in 1985.

Amateurs Gain Access To New Band At 900 MHz; Lose 420–430 MHz Rights Above "Line A"

In a Second Report and Order on PR Docket 84-960, adopted in August, the Commission allocated the band 902–928 MHz to U.S. amateurs on a Secondary basis. The band was to be available to amateurs holding Technician class licenses and above on 28 September 1985, with the stipulation that use of the band was on a noninterference basis only. Further, amateurs using the band must accept interference from government stations and from Industrial, Scientific, and Medical (ISM) devices operating on 915 MHz. Special prohibitions apply to amateur operations on the 902–928 MHz band in and around the White Sands Missile Range.

In the same Report and Order, amateurs living above Line A (an imaginary line that runs across the U.S., about 75 miles south of the Canadian border) may generally no longer operate in the band 420–430 MHz. Canada uses this band for Land Mobile operations (in full accordance with a Decision at WARC-79 to make Land Mobile a Primary service in this band), and so, these operations must be protected. It is possible that some amateur operations in the 420–430 MHz band above Line A may be permitted by waiver, but details for obtaining such waivers are yet to be worked out with the Canadian government.

LPTV Operator Pushes For Access To Amateur TV Band

Lee Shoblom, K6ADA, President and General Manager of London Bridge Broadcasting Corporation of Lake Havasu, AZ, has requested a waiver of the Amateur Rules so that he may operate a commercial, video-only pickup in the amateur 420–450 MHz band. Specifically, Shoblom, operator of low-power television (LPTV) station K45AJ, has petitioned the Commission for the authority to use 434 MHz for remote video pickup. Normally, remote pickups such as this are performed at frequencies in the band 2–3 GHz (among other bands). The audio portion of the remote pickup would be placed at 450 MHz, in a band allocated to the Auxiliary Broadcasting service.

The Commission has issued a Public Notice in the matter (PRB-2). Comments are due 10 October 1985; Reply Comments are due 28 October 1985.

NABER Files Comments in Support Of 216–222 MHz Reallocation

According to "ShopTalk," a publication of the Professional Mobile Radio Service Section, National Association of Business and Educational Radio (NABER), the Association filed supporting comments with the FCC to a petition filed by LAØAD Radio and Microwave Communications Consultants (RM-4983). The petition called on the Commission to reallocate the band 216–220 MHz to land mobile users in the Industrial and Public Safety radio services for narrowband voice and low-speed data communications systems. The petitioner also requested that the FCC approve a band 350 kHz wide in the range 220–222 MHz for

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oil exploration telemetry systems; as proposed, users of those systems would then enjoy co-equal shared status with operators in the Amateur service.

In its comments, NABER said that it generally supported the intent of the petition because . . . "the significant congestion which exists in the Private Land Mobile radio services warrants allocation of additional spectrum. In addition, the implementation of new spectrum-efficient technologies should be encouraged whenever possible." According to "ShopTalk," the Association also voiced its support for the issuance of a Notice of Proposed Rule Making (NPRM) to reallocate the 216–222 MHz band to users of Private Land Mobile radio services.

While the cutoff date for comments has passed, it is noteworthy that the League supported the proposed reallocation of the 216–220 MHz band, and applauded the proposal to use narrowband technologies here. However, the ARRL opposed sharing 350 kHz in the band 220–222 MHz, and instead suggested that the oil exploration telemetry systems be operated in high-band television channels.

Action by the Commission on RM-4983 may have already taken place by the time this column appears.

Radio Club of America Announces Major Awards, New Fellows, Scholarships, and Research Grants

At its June meeting in the New York Athletic Club, the Board of Directors of The Radio Club of America (RCA) recommended seven of its members for major awards. Included are several amateurs:

Ralph Batcher Memorial Award: Donald G. Fink, W2AFX, for "substantial assistance in preserving the history of radio communications."

DuMont Citation: John W. Morrisey, WB2KPX, to "a person who has made Important Contributions to the Science of Television."

Sarnoff Citation: Dana W. Atchley, Jr., W1CF, for "Significant Contributions to the Advancement of Electronic Communications."

The Directors also recommended 34 of the Club's members for the grade of Fellow. Included are Herb Becker (W6QD), Andres T. Bower (W1BJQ), Norman R. Coltri (WA2UUP), Donald R. Cook (W6WYT), Mrs. LaNeil Eitel (WA7LUN), Robert S. Foosaner (Chief, Private Radio Bureau, FCC), Marvin S. Grossman (W8AZO), Steven L. Gumport (WB2RVU), Charles M. Lewis (W4BV), Merle B. Parten (K6DC), Joseph R. Pavek (WØOEP), Edward Rich, Jr. (K3THD), Luther G. Schimpf (WA2FTR), W.B. Sloop (W4AAE), Gregory M. Stone (WB9PHA), Don L. Stoner (W6TNS), Earl T. Van Stavern (W4NXP), William A. Wickline (WA8WBO), Anthony F. Yellen (W2EDA), and your Washington Editor.

Scholarships and research grants were made to a number of schools and foundations, including the Foundation for Amateur Radio, Polytechnic Institute of New York, and The Radio Amateur Satellite Corporation.

The awards, scholarships, and research grants will be presented at the Club's 76th Anniversary Annual Awards Banquet to be held at The New York Athletic Club on 22 November 1985. James C. McKinney, Chief, Mass Media Bureau, FCC, will be the guest speaker.

RFI Complaints Equal Those of Year-Earlier Period

According to Jeffrey Young, Field Operations Bureau, FCC, RFI complaints to the Commission in the period April–June 1985, inclusive, totaled 15,752. This is almost equal to the 15,934 complaints reported during the same period last year.

As always, so-called television interference (TVI) accounted for the majority of the complaints, with 11,256 cases citing a television receiver as the victim device. This represents 71% of the RFI cases reported, suggesting once again that television manufacturers still have a long way to go before their products exhibit good immunity to strong RF signals. Of the 11,256 TVI complaints, 6,505 involved CB operations while only 615 cited amateur operations for the "alleged" interference ("alleged" because most cases of amateur-related TVI have been shown to result from front-end overload of the television receiver).

In all, CB operations accounted for 7,540 RFI complaints while amateurs were cited in 838 cases. Complaints by one amateur against another amateur totaled 194, down slightly from the 253 cases reported in the year-earlier period. Regardless, roughly one out of every four amateur-related complaints is still an intra-service complaint!

SWL Association Sponsors Study Of Russian "Woodpecker"

As we go to press, the Association of North American Radio Club's (ANARC) Over-The-Horizon Radar Committee is preparing to gather data on the interference caused worldwide to shortwave broadcast signals by Russian over-the-horizon (OTH) radar systems (so-called "Woodpeckers"). The intent of the study is to prepare position papers for various administrations that will participate in the 1987 World Administrative Radio Conference for High-Frequency Broadcasting, and specifically, to seek the support of the International Telecommunications Union (ITU) in condeming the interference. The study is to run for the month of October. For more information, contact Association of North American Radio Clubs, OTH Radar Committee, 1634 15th St. NW, Washington, DC 20009.

Shortwave Listening Stages Comeback

Many of us got our start in radio by listening to amateurs and other radio operators on our families' old shortwave receivers. You remember those old behemoths . . . they were the AM radios that stood about 4 feet high, and had large steerable antennas mounted within their cabinets, and exhibited the names of exotic foreign cities across their dials. When the Amateur service, among others, switched to SSB, however, casual listeners no longer could "read the mail," and shortwave listening, as a pastime, took a nose dive.

Over the past few years, however, the sport of SWLing has staged a comeback. The catalyst, no doubt, was the production of shortwave radios as small as any portable radio available today, and as capable of receiving AM and SSB signals from stations worldwide as are the receivers we use in our stations. As a result, groups such as the Association of North American Radio Clubs (ANARC) have sprung up across the country, with many holding large conventions that are attended by SWLs and manufacturers alike.

At the recent ANARC convention in Milwaukee, WI, Ian McFarland, a producer with Radio Canada International, estimated that there are tens of millions of shortwave listeners throughout the world. (McFarland was quoted in *The Milwaukee Journal*.) Meanwhile, manufacturers attending the convention predicted that the shortwave industry is ready to explode. Even the shortwave publishing industry is on the rise, with *CQ*'s sister magazine, *Popular Communications* (published by Popular Communications, Inc.), now in its fourth year of publication.

If shortwave listening does indeed flourish, as many expect that it will, it seems likely that a significant number of tomorrow's amateurs will get their start as SWLs. This has already been recognized by *CQ* and the League, both of whom advertise their amateur-related products in the pages of *Popular Communications*.

League Seeks Assistant Technical Coordinators (ATCs)

As announced in "QEX," the ARRL's Experimenters' Exchange newsletter, the League needs volunteers for the ATC role. According to Paul Rinaldo, W4RI, "QEX"'s editor, you, as an ATC, will become an important resource in your community . . . someone who can help others when they find themselves over their heads technically. Coordinators may also find themselves sought after to speak at club meetings and hamfests, and they frequently work with local TVI committees and local CATV companies to resolve radio frequency interference (RFI) problems.

For more information on the ATC program, contact Paul Rinaldo, Editor, "QEX," ARRL, 225 Main Street, Newington, CT 06111.

IEEE Publishes New Book on Spectrum Management

The Institute of Electrical and Electronics Engineers (IEEE) has announced the publication of *Spectrum Management and Engineering*, a collection of selected reprints edited by Fredrick Matos, W3ICM. Prepared under the sponsorship of the IEEE Electromagnetic Compatibility Society, the 493-page book presents 51 of the more sought-after papers on the legal, regulatory, and technical aspects of spectrum utilization. Because of its broad scope, the book can serve as a ready source of information to communications engineers, frequency managers, and propagation scientists, as well as to telecommunications executives and attorneys. Inquiries regarding this valuable text may be addressed to IEEE, Attn: Louise Esposito, Marketing Assistant, 345 E. 47th Street, New York, NY 10017-2394.

ITU to Stage Photo And Drawing Competition

According to Perry Williams, W1UED, Washington Area Coordinator, ARRL, the ITU is staging a photo and drawing competition for people 8 to 18 years of age. The contest, entitled "Youth in the Electronic Age 87," culminates at TELECOM 87, Geneva, 20–27 October 1987. This is the fifth such competition, and the U.S. will take an active role by encouraging its youngsters to compete. The activity will be headed up in the U.S. by Bill Moran, Office of International Affairs, NTIA, Department of Commerce, Washington, DC 20230 (202-377-1866). At the FCC, Frank Williams, N4FK, Chief, Treaty Branch, Office of Science and Technology, is the point of contact. Williams has additional information from the ITU that is available on request from him at ARRL Headquarters in Newington, CT.

Engineers' Raises Beat Inflation

According to a survey by the National Society of Professional Engineers (NSPE), engineers' incomes have continued to outpace inflation. In January 1985, for example, the median income for the Society's members was $45,760, over 6% higher than the median salary a year earlier. During that same time period, however, inflation rose only 3.6%. This was the third consecutive year that raises outpaced inflation. While EEs earn a median salary of $47,500, petroleum and mining engineers continue to have the highest salaries (median incomes of $57,000). Chemical engineers also command high salaries, with the median being $47,500.

Geographically, the highest median salaries are found in the northeast and west ($48,000), followed by those in the southwest ($46,000).

Copies of the report are available from the National Society of Professional Engineers, 1420 King St., Alexandria, VA 22314.

The staff at CQ joins your Washington Editor in congratulating David Siddall, K3ZJ, on his appointment as Senior Attorney, Policy and Program Planning Division, Common Carrier Bureau, FCC.

Your Washington Editor thanks John Johnston for his contributions to this month's column.

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Novice Licensing Data—Part V

This article covers all of the material one must know to pass an FCC Novice written examination (FCC element two). All parts should be studied prior to attempting to pass the test. The first four parts of this article provide an overall introduction to this instruction material, plus in-depth coverage of electrical principles, circuit components, practical circuits, signals and emissions, operating procedures, and amateur radio practices. Previous issues of *CQ* are usually available at $2.25 each; requests can be sent to *CQ*, 76 North Broadway, Hicksville, NY 11801. If you know someone who is interested in becoming an amateur radio operator, you should bring this article to his or her attention.

Rules and Regulations—First Half

2A-1.1. What is the amateur radio service? It is a radio communication service involving self-training, intracommunication, and technical investigation performed by FCC-licensed amateur radio operators.

2A-2.1. Who is an amateur radio operator? An amateur radio operator is a person who holds a valid amateur radio operator's license issued by the Federal Communications Commission (FCC).

2A-3.1. What is an amateur radio station? It is a radio station that is licensed by the FCC for operation in the amateur radio service by FCC-licensed amateur radio operators. The FCC issues a distinctive (one of a kind) callsign to each amateur radio station it licenses. *(The April and May 1979 Novice columns provide complete information about all callsigns issued to amateur radio stations by the FCC. That article shows the prefix (front part) of every callsign the FCC will issue in many years to come, plus the sequences in which amateur radio station callsigns will be issued. The January 1980 Novice column lists the callsigns used by amateurs in all parts of the world. Such data undergoes a few changes every year, but the list remains essentially correct.)*

2A-4.1. What is amateur radiocommunications? It is noncommercial radio communications between amateur radio operators. It is strictly personal communication without any relationship to financial or business matters.

2A-5.1. What is that portion of an amateur radio license that conveys operator privileges called? It is called the operator's license. It shows the licensee's class of operating privileges, which could be Novice, Technician, General, Advanced, or Extra class. FCC form 610 is an "Application for Amateur Radio Station and/or Operator License." Form 610 can be used to apply for a station license, operating privileges, or both. An individual operator normally applies for a combination operator (privileges) and station (callsign) license. This type of license is called a *primary license*. Typical secondary licenses are those which are issued for special purposes such as club and repeater uses.

2814 Empire Ave., Burbank, CA 91504

This is 13-year-old Marshall Dominick, KA4LED, of Knoxville, Tennessee. He credits John Day, W4XJ, with giving him a good start in amateur radio. His station includes a Drake TR-4C transceiver, 15 meter Yagi-Uda, and a 40/80 meter dipole. Marshall has contacted amateurs in 43 states and 12 countries. He worked 200 contacts in the 1985 ARRL Novice Roundup Contest.

2A-6.1. What authority is derived from an amateur radio station license? It authorizes operation of an amateur radio station using the specific callsign that the FCC assigned to a particular known geographic location. Amateur radio operation is not limited to fixed stations; amateurs operate from temporary locations as well as from all types of mobile vehicles such as airplanes, bikes, boats, cars, and trucks. Amateurs also operate hand-held units.

2A-7.1. What is a control operator? The control operator is usually the station licensee, operating her/his home station. However, a station licensee is allowed to designate another FCC-licensed amateur to be the control operator. The station licensee does not have to be present when the designated (alternate) control operator is using the station.

2A-7.2. What is the term for the amateur radio operator designated by the licensee of an amateur radio station to also be responsible for the emissions from that station? Control operator.

2A-8.1. What is third-party traffic? It is traffic that involves more than just the two amateurs who handle it. More than three people can be involved in third-party traffic; it concerns a minimum of three people. Third-party traffic can be handled as a "fone patch" in which one (or more) nonamateur is allowed to speak directly to another person via amateur radio stations. Third-party traffic can also be handled as written messages routed through amateur radio stations. Novices are allowed to handle this type of third-party traffic, and several traffic nets meet regularly on the Novice bands.

2A-8.2. Who is a third-party in amateur radio communications? The person, or persons, from and to whom the traffic is routed. The third-party (singular or plural) is other than just the amateurs handling the traffic.

2A-9.1. What are the Novice class operator transmitting frequency privileges in the 80 meter band? 3700 to 3750 kiloHertz (kHz), which can also be expressed as 3,700,000 to 3,750,000 Hertz and 3.7 to 3.75 megaHertz (MHz).

2A-9.2. What are the Novice class operator transmitting frequency privileges in the 40 meter band? 7100 to 7150 kiloHertz (kHz), which can also be expressed as 7,100,000 to 7,150,000 Hertz and 7.1 to 7.15 megaHertz (MHz).

2A-9.3. What are the Novice class operator transmitting frequency privileges in the 15 meter band? 21.1 to 21.2 megaHertz (MHz), which can also be expressed as 21,100,000 to 21,200,000 Hertz and 21,100 to 21,200 kiloHertz (kHz).

2A-9.4. What are the Novice class operator transmitting frequency privileges in the 10 meter band? 28.1 to 28.2 megaHertz (MHz), which can also be expressed as 28,100,000 to 28,200,000 Hertz and 28,100 to 28,200 kiloHertz (kHz).

2A-9.5. What, if any, transmitting frequency privileges are authorized to the Novice class operator beside those in the 80, 40, 15, and 10 meter bands? None.

2A-9.6. In what frequency bands is a Novice class operator authorized to be the control operator of an amateur radio station? 3.7–3.75, 7.1–7.15, 21.1–21.2, and 28.1–28.2 MHz. Also, 7050 to 7075 kHz for American Novices operating outside of ITU Region II, which is North, Central, and South Americas.

2A-9.7. What does the term frequency band **mean?** It is a segment of frequencies allotted to specific purpose(s). As examples, the Novice frequency bands are:

Band (MHz)	Designation (meters)
3.7–3.75	80
7.1–7.15	40
21.1–21.2	15
28.1–28.2	10

2A-9.8. What does the term frequency privilege **mean?** It refers to frequency segments (subbands) made available to amateurs holding various classes of amateur licenses. An amateur's frequency privileges are the frequencies on which she/he is allowed to transmit, since there is no restriction against listening on any frequency.

2A-9.9. In what frequency band are the Novice class operator transmitting frequency privileges 3700–3750 kHz? The 80 meter Novice band. The entire 80 meter American amateur band is 3500 to 4000 kHz. Conversion between wavelength (meters) and frequency (Hertz) is accomplished as follows:

$$\lambda = \frac{300{,}000{,}000}{f} = \frac{300{,}000}{f(kHz)} = \frac{300}{f(MHz)}$$

$$f = \frac{300{,}000}{\lambda} \quad f(kHz) = \frac{300{,}000}{\lambda} \quad f(MHz) = \frac{300}{\lambda}$$

where:
f = frequency
λ = wavelength

2A-9.10. In what frequency band are the Novice class operator transmitter frequency privileges 7100–7150 kHz? The 40 meter Novice subband. The entire American 40 meter band is 7000–7300 kHz. *(The December 1984 Novice column provides a useful explanation of the unique factors related to using the 40 meter Novice band.)*

2A-10.1. What is the only emission authorized for

use by Novice class operators? This question obviously is intended to relate to the emission Novices are allowed to use to communicate. In this case the answer is radiotelegraphy (code), which is designated as A1 (in the old system) and A1A (in the new system). Novices are also allowed to transmit continuous-wave (CW, A0) emissions when conducting on-the-air testing of transmitters and antenna systems. Such test transmissions must be identified within each ten-minute time span.

2A-10.2. What does the term A1 emission **mean?** It is a carrier wave turned on (full amplitude) and off (no output) in a known code sequence. It is also called carrier amplitude on-off keying. The letter *A* means that the amplitude is changed (modulated), whereas *F* means that the frequency is changed.

2A-10.3. What is the symbol for a transmission of telegraphy by on-off keying? A1 (A-one), now A1A.

2A-10.4. What does the term CW mean? Continuous wave. A0, as an example. Amateurs commonly refer to radiotelegraphy (code) as CW, but this is incorrect; A0 and A1 are not the same. *(The June 1981 Novice column covers this inconsistency in detail.)*

2A-10.5. What, if any, emission privileges are authorized to the Novice class beside A1? Novices are only allowed to use A1 (A1A) when communicating on the air. However, continuous wave (A0) may be used when conducting on-the-air tests of a transmitter or antenna system.

2A-10.6. What is the only telegraphy code a Novice class operator may use? The International Morse code is based on the English-language alphabet. English is the designated language for all radio services, per international agreement. Consequently, the code we use is called the International Morse code. This question is in error. Amateurs are allowed to use any code based on the alphabet of any well-known language. *(The December 1980 Novice column shows several of the codes which are based on alphabets other than English.)*

2A-10.7. Which, if any, telegraphy codes may a Novice class operator use beside the International Morse code? It is obvious that the answer to this question is supposed to be that only the International Morse code (English) may be used by Novices. However, the reply to the previous question states that this restriction does not exist.

2A-10.8. What does the term emission **mean?** It is the emanation of radiant, electromagnetic, electrical, or magnetic energy. In our application, an emission can be considered to be radio waves radiated from a transmitting antenna. Amateurs use designations to indicate the manner in which the basic carrier wave (output) was modulated (changed) to convey intelligence. Typical designations are as follows:

Old Designation	New Designation	Description
A0	N0N	continuous wave
A1	A1A	on-off telegraphy
A2	A2A	on-off telegraphy, plus audio tone
A3	A3E	voice, radiotelephony
A4	A3C	facsimile, permanent images
A5	A3F	television, temporary images

2A-10.9 What is the term for a transmission from a radio station, as used in the FCC rules? Emission.

2A-10.10. What does the term emission privileges **mean?** It means the types of emissions an operator is allowed to transmit. As an example, Novices are restricted to A0 (CW) and A1 (code) emissions.

Nancy Henry, KA0SFG, of Mt. Vernon, Iowa, is a third-grade school teacher. Her son (Dan, N0FQU) got her interested in amateur radio. Nancy obtained a Novice license during March 1984 and celebrated her 6-month anniversary on the air with her 1,000 contact. She has had contacts with amateurs in 45 states. Most of her operation is on 40 meters. Her station includes a Kenwood TS-520-SP transceiver, MFJ 941-D antenna tuner, MFJ Morse Matic II keyer, Bencher paddle, 80 meter random-wire antnena, and a 10/15/40 meter dipole. The Kenwood MC-60 microphone is on hand for use when Nancy upgrades to General, which may have happened by now.

2A-11.1. Under what circumstances, if any, may the control operator cause unidentified radiocommunications or signals to be transmitted from an amateur radio station? None; this is never permitted.

2A-11.2. What is the meaning of the term unidentified radiocommunications or signals? These are transmitter emissions that are not identified by using the station's callsign.

2A-11.3. What is the term for transmissions from an amateur radio station without the required station identification? Unidentified radio communications, unidentified signals, unidentified transmissions, and unidentified emissions are all terms that are used.

2A-12.1. Under what circumstances, if any, may the control operator of an amateur radio station willfully or maliciously interfere with or cause interference to a radiocommunication or signal? None; this is not permitted under any circumstance.

2A-12.2. What is the meaning of the term maliciously interfere? This is willfull, intentional, and illegal interference with radio communications.

2A-12.3. What is the term for transmissions from an amateur radio station which are intended by the control operator to disrupt other communications in progress? Malicious interference.

Summary

This completes the fifth part of this article. Next month's Novice column will complete the coverage of FCC rules and regulations.

Low-Power Operation

The May 1981 Novice column covers low power (QRP) operation in detail. This item is to alert QRP enthusiasts that Adrian Weiss, K8EEG/W0RSP, has written a book on the subject, and the title is *The Joy of QRP*. It is 151 pages covering QRP from basics to fine points in eight interesting chapters. It is interspersed with a total of about 50 photographs, tables, and drawings. Novices will have no difficulty understanding the explanations. This book sells for $10.95 (U.S.A.) and $11.95 (foreign). It is available from the *CQ* Bookshop. Adrian has been writing the QRP column in *CQ* magazine since 1974. He is a major spokesman for those of us who enjoy the challenge associated with low-power operation.

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World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Computerized RTTY—A Ground-Floor Primer

It's a rather obvious fact that personal computers have progressed beyond their original "new toy" craze to becoming an accepted and useful part of our modern electronic paraphernalia. These highly flexible and compact units can be programmed to function as anything from a TV arcade game to an elaborate teleprinting setup, yet many of us are still a mite hesitant about using them to join today's RTTY action. Considering that situation, this month's column is thus dedicated to "demystifying" those unknowns and assisting unfamiliar newcomers interested in RTTY activities. The column's first part will be aimed at simplifying some of the more common curiosities (those seldom explained facts that one seemingly learns through sheer magic). The column's latter part will assume you've decided to try computerized RTTY (and/or CW) and provide some "Helping Elmer" type directives. Before proceeding, however, I should emphasize that we're discussing home-computer-type RTTY/CW/ASCII setups such as those using Commodore, Radio Shack, IBM, and similar computers, not dedicated (RTTY) systems or full "stand alone" units such as the HAL or Tono terminals. The latter systems are available in ready-to-operate form, while computerized setups require some "knowledgeable assembly" according to their intermixed items.

The aspect of both communicating via RTTY and monitoring various off-the-air transmissions is a fascinating pursuit, and its electronic concepts are presently expanding in several directions. Some of the popular computerized RTTY/CW/ASCII systems, for example, center around a transceiver interfacing unit and separate computer-programming software (example: AEA's CP-1 and Kantronic's HamText). Some of the recently introduced systems, however, include both interface (hardware) and software in a single package (example: Microlog's AIR-1 plug-in cartridge for Commodore computers). Another recent unit, Kantronic's Universal Terminal Unit (UTU), includes RTTY/CW software in its separate interfacing unit which connects to a computer's RS232 port, and thus requires additional computer programming for "dumb terminal" type operation. Don't become intimidated over such differences. These three concepts summarize our present variations in the home computer RTTY game.

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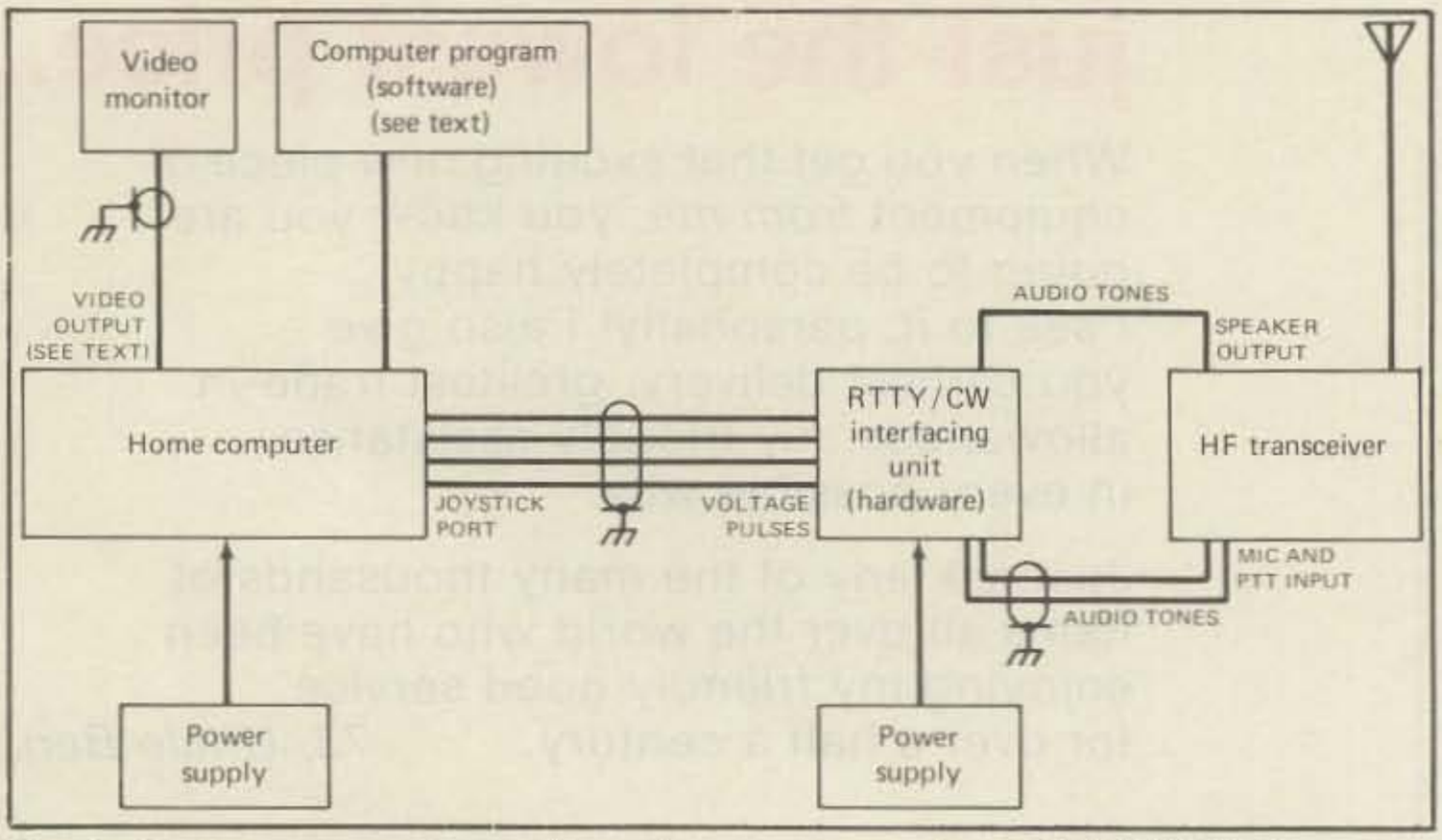

Fig. 1– Basic components used to set up a computerized RTTY/CW/ASCII system. Software and hardware are occasionally combined in a single unit, with different connecting ports being used for input/output signal transfers. Your attention is particularly directed to which lines carry audio and which carry voltage pulses.

Fig. 2– Equipment used in assembling the basic computerized RTTY/CW/ASCII system shown in fig. 1. Cassette software included in this example.

The equipment needed to set up a computerized RTTY system consists of an HF transceiver and personal computer, plus some form of electronic interfacing unit "between" those items, software, and interconnecting cables. A general outline of this arrangement is shown in figs. 1 and 2. As previously mentioned, some computerized RTTY/CW/ASCII setups include software and hardware in a single package. If that unit *inserts in the computer's "game port,"* it programs the

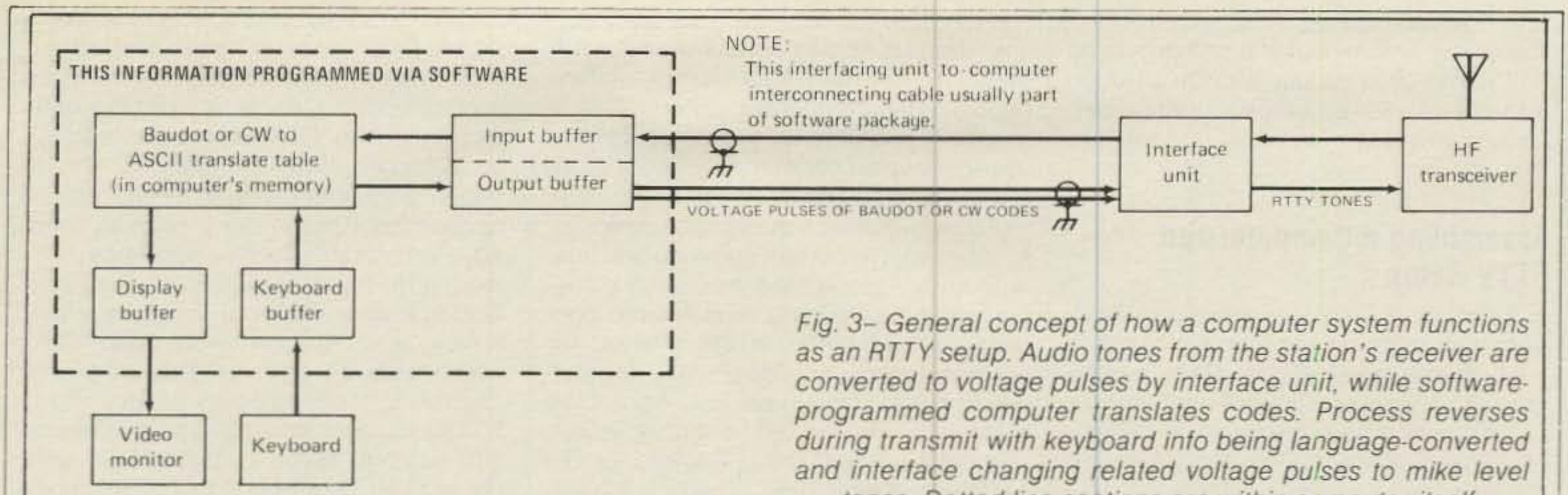

Fig. 3– General concept of how a computer system functions as an RTTY setup. Audio tones from the station's receiver are converted to voltage pulses by interface unit, while software-programmed computer translates codes. Process reverses during transmit with keyboard info being language-converted and interface changing related voltage pulses to mike level tones. Dotted line sections are within computer itself.

computer for RTTY or CW operation. *If the unit connects only* to the modem, RS232, or joystick ports, additional "basic terminal" programming is required. There are two more points worthy of consideration. An unprogrammed computer is basically a "blank" unit capable of becoming many things *after* a program for that function has been loaded. Also, each interconnected unit must be system compatible. A computer *program* specifying use of *RS232* or *modem ports* and an interface connecting to a *joystick port*, for example, can't be expected to work together. Likewise, *AFSK* tones from an interface can't drive a deluxe rig's *FSK* connection lines. Everything must work in harmony. Let's now take a closer look at those operations.

How Computerized RTTY Systems Work

Assuming one has a general understanding of various operations being performed within an RTTY setup, selecting and interconnecting system components is a relatively simple matter. An interrelation of those units and their signals is thus highlighted in fig. 3. RTTY or CW tones from the HF transceiver's speaker are converted to voltage pulses by the interface unit, and these pulses are directed to the computer's input/output port. During transmit conditions, the interface unit converts RTTY-coded pulses from the computer into audio tones which connect to the transceiver's mike input. (Note: Some interfaces also include FSK output, which alternately makes/breaks a separate wire-to-ground connection with RTTY code. This feature can be used with "deluxe" transceivers providing direct FSK-line keying via a rear connection.)

The system's cassette tape, ROM package, or disc software includes cross-reference tables for converting RTTY and CW-coded pulses to the computer's internal language—ASCII. That software also specifies which input/output data port is used, buffer functions, timing pulses, etc. As each coded letter is received, it's thus voltage-level converted and moved to the computer's input buffer. The codes are then matched on a lookup/translate table (example: 00011 in Baudot, or "A," is 1000001 in ASCII, which is also "A"), shifted to an output buffer, then displayed on the system's monitor. These functions are performed at phenomenal speeds.

During transmit, the process reverses with ASCII-encoded keyboard pulses being cross-referenced to Baudot (or Morse) and output to the rig-interfacing unit. The prime design considerations of that interface are its method of RTTY tone detection (phase-locked loops and audio frequency discriminator circuits are popular), its adjacent channel rejection (audio frequency filtering with a.m./noise limiting), and audio bandwidths. The RTTY "mark" detector obviously shouldn't be affected by "space" tones, and vice-versa. CW detectors in interface units vary considerably, with nearly each one exhibiting a different center frequency and audio bandwidth. One popular unit peaks on roughly a 2000 Hz tone, for example, while another unit centers on 750 Hz. Those differences become noteworthy when compared to mating transceiver CW bandwidths, center of passband audio frequencies, and monitor sidetone (a 700 Hz tone obviously can't be recognized by a 2000 Hz tuned circuit). Realizing the previous facts, we thus suggest you initially visualize what

you desire and expect in a computerized RTTY/CW/ASCII setup, browse through advertisements, and then purchase personally attractive items to create that system.

Assembling a Computerized RTTY Setup

Since most amateurs initially select a personal computer according to its possible in-home applications, RTTY-related items are usually mated with that particular unit rather than vice-versa. A number of readily available RTTY/CW/ASCII interfacing units can be purchased and connected to any computer, so the "weakest link" here is finding software and input/output port wiring information for less popular or outdated computers. This is also the opportune time to compare data voltage levels between a considered interface and computer.

Following selection of those peripherals, the most important step one can take is studying associated manuals/instructions and determining exactly what connections and software are needed for system hookup and operation. A transceiver-mating mike or FSK-input plug must be wired for RTTY transmission, and the push-to-talk line is wired for T/R switching. If direct FSK is used, the polarity of interface unit-to-rig FSK input should be checked to avoid inverted wirings. Either internal jumpers or switches are included in many interfacing units (and in several FSK-ready transceivers), so compare both manuals to ensure "open connection equals mark, closed connection equal space," etc., as needed. Remember: Audio Frequency Shift Keying (AFSK) is audio tones which connect to a rig's mike input. Frequency Shift Keying is a transceiver-provided "frill" which uses an external grounding connection for shifting tones of an internal RTTY oscillator (which is usually fixed on 170 Hz shift). If you transmit AFSK, your transceiver is operated in its SSB mode (and the mike gain control is used for reducing output power). If you transmit FSK, your transceiver is operated in its FSK or RTTY mode (check your manual for power reductions in RTTY operations). Both FSK and AFSK are compatible and sound the same on-the-air, but AFSK is quite popular because of its "quick and easy" means of installation and transmit shift selections.

Since a system's software designates its external connections, that mating computer-to-interface unit cable is usually packaged with its software. It's advisable to check this before purchasing, however, as some "universal" packages leave you to find or wire your own computer board connector (not difficult, but sometimes tricky). Likewise, proper computer/software settings of microswitches or jumpers inside interfacing units should be checked/verified before system power-up (don't assume they're correct . . . check them yourself). Finally, any of the popular external RTTY tuning aids can be added to create at truly deluxe and smooth-operating computerized RTTY/CW/ASCII system.

Areas of Common Confusion

As a spinoff of my recently published *RTTY Today* book, this multi-topic *CQ* column, and working closely with amateur gear salespeople, I've answered nearly every question a newcomer could ask about computerized RTTY. Most of those queries were similar in nature, thus the following information compilation is offered for your guidance.

One of the most common difficulties I've noticed centers on operators failing to read and/or fully understand their equipment's manuals (that's why we repeated some statements in this column). Some of the often overlooked confusions are improperly wired AFSK output/mike input connectors, attempting to connect AFSK tones to a (transceiver's) FSK input, and trying to connect an interface unit's current loop output to a rig's FSK input. Additional perplexities include forgetting mike PTT connections, trying to reduce RF power via a rig's carrier level rather than mike gain (AFSK mode), and trying to use a rig's RTTY/FSK mode rather than SSB when operating AFSK-type

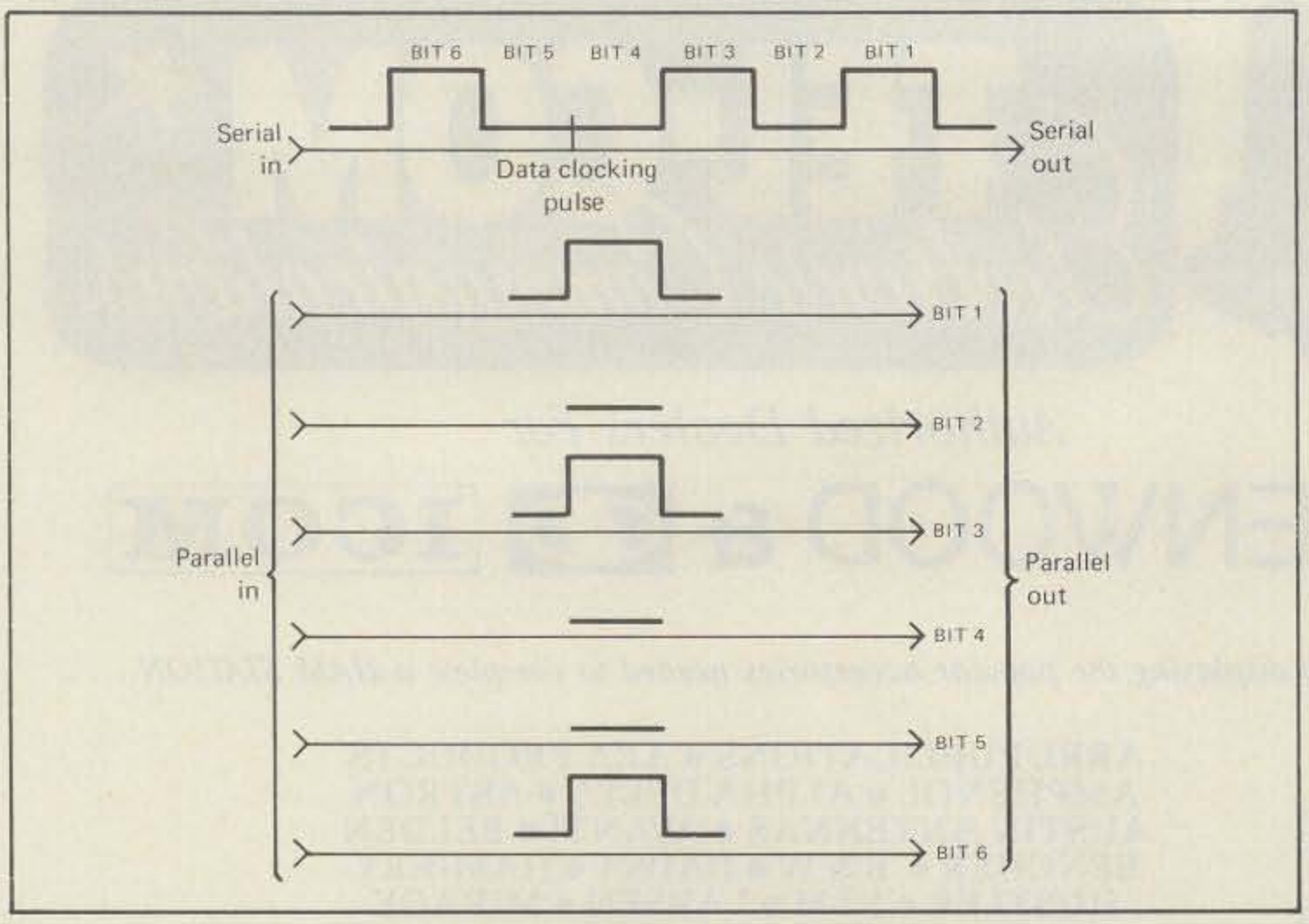

Fig. 4– Comparison of serial and parallel data interconnections. A single wire is used for serial, while multiple wires are used for parallel. A common ground is included with each concept. Tips of square waves (binary 1, assuming positive logic) are either 5 volts (TTL) or 12 volts (RS232).

RTTY. Beyond that point are a number of "special case" confusions which can usually be sidestepped through awareness of several time-acquired aspects. I'll review these briefly and let you consider which suits your own needs.

When transmitting AFSK-type RTTY and necessarily operating your transceiver in its SSB mode, use its IF shift and RIT to "recenter" the passband and compensate for frequency offsets.

Always reduce a rig's RF output when operating RTTY to at least half of full CW ratings (and preferably less for long "finals" life). If your transceiver has tube finals and their plates continuously blush red, try readjusting bias/idling current while watching plates and monitoring SSB audio quality on an oscilloscope and auxiliary receiver. My previous Kenwood TS-830, for example, was noticeably "calmed down" by resetting its no-modulation plate current to 18 ma rather than the (specified) 60 ma while operating SSB and watching the tubes in a dark room (I used a mirror and looked through its rear fan). My across-town assistant couldn't detect any difference in signal quality.

Many computers provide both RF (channel 2 or 3) and video outputs for monitor connection. Be sure of which you use, otherwise your screen will be a jumble of confusion. Connecting a 4 MHz signal (video) to a 60 or 70 MHz input (RF) or vice-versa obviously isn't compatible.

Having trouble wiring your transceiver's FSK connections for proper mark/space polarity? Try tuning in your (reduced power, please) transmitted signal on an auxiliary receiver, and then use clip leads to temporarily connect interfacing unit wires. Once you "get it right," mark the wires and add its connector.

Some RTTY interfacing units connect to a computer's TTL (joystick) port, while others connect to an RS232 (modem related) port. These voltage levels are quite different, so double-check interconnections and/or level-selecting jumpers **before** power-up. RS232 is usually 12 volts; TTL is usually 5 volts. Positive logic means + = binary 1 and ground = binary 0; negative logic means + = binary 0 and ground = binary 1.

What's the difference between serial and parallel data or data ports? Simply explained, serial resembles series circuit concepts with each data bit moving "behind the other" along a single connecting wire. Parallel provides a separate wire for each data bit, with related information thus being exchanged at a much faster rate (see fig. 4). Assuming you've followed our general discussion to this point, you should now be ready to join RTTY action in fine style. Start mail reading some amateur QSOs, study their procedures, and then enjoy the action yourself.

If you're indeed a newcomer to RTTY communications, stick with 60 wpm and 170 Hz shifts. These commonly used parameters will afford the highest possible success ratio. If you curiously tune ASCII transmissions, always use 110 baud rates. The "front end" circuitry in most amateur interfacing units is usually too narrowbanded to pass 300 baud signals. (The units are primarily designed for QRM protection on amateur bands rather than for broader banded high-speed signals.)

Conclusion

We hope you've found this strictly introductory information beneficial, and we wish each of your success with computerized RTTY and/or CW. RTTY/CW frequency allocations are surprisingly clear nowadays. (Why are so many U.S. amateurs seemingly stuck on SSB when we are one of the countries still requiring Morse code proficiency with our licenses? Did you know a recent CW DX contest winner in Europe was a no-code licensee using a computerized system? (Some exciting CW activities are being overlooked by many U.S. amateurs.) As we've pointed out previously, one of the most successful and enjoyable ways to renew that original fascination in amateur radio is testing new areas and learning new concepts. Computerized RTTY/CW is one of the most popular of those areas, and it's awaiting your investigation right now.

73, Dave, K4TWJ

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DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

Of all those arts in which the wise excel,
Nature's chief masterpiece is DXing well.

One does not travel far on the trail of DX before learning that there are some, often not DXers, who have difficulty in understanding the everlasting clarity in DXers' thinking. DXers are always the inquirers, the seekers after the eternal truths. Last week one of these DXers was up the hill to ask some questions. Perhaps things could have been worse, and maybe sometime we will be able to figure out how.

"Tell me something," this Local said, getting right to the point. "What proof is there to the theory that big-gun DXers are usually those more receptive to the flow of earth electricity? That the absorption and the diffusion of this earth electricity is largely responsible for their success in working DX? What do you know about this idea?"

Son of a gun! We were nailed before we even understood what this one was talking about. But old DXers have been long known as the wise DXers, and we had to protect at least that portion of the tradition which obviously applied to us. "Tell us more," we said, stalling for time to sort out things. We had plenty of time, listening time that is.

"I was reading somewhere," the Local continued, "that over the years there has developed a belief in a theory that there is an earth electricity, and it is a cardinal issue in both human relations and natural science. And I am thinking that maybe the idea is right. It is said that when an individual is charged with these natural earth forces, things happen that one would normally hardly expect to occur." The Local paused a bit to sort out his arguments and he was back again, stronger than ever.

"You see, I myself was a bit skeptical when I first heard the word about this phenomena, and I could not believe that such things might even exist. When I voiced my doubts, the speaker just pointed out that a compass needle always points to the north magnetic pole no matter where you might be in the northern hemisphere. He challenged me to explain why it does, and all I could think to say was that it was magnetism. That wasn't good enough, and he asked me to explain magnetism, and I could not. So maybe there is something to all of these ideas. He also challenged me to explain how birds can migrate thousands of miles across open ocean and things like that. He claimed that it was all done with 'earth electricity.' Then I remembered how some big-gun DXers seem to be right there waiting everytime some DX shows, and it is always puzzling as to just how they know. Do you think that they have found the way to tap into this 'earth electricity' field? That there really might be something to the idea?"

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You can see from this photo that DX attracts DX. Right in the center is what for a long time was the sole hope for a Sudan contact, Dr. Sid Ahmed Ibrahim, an opthamologist in downtown Khartoum. On the left is Bahri Kacan, DJ0UJ, then DJ9ZB, Franz Langner, one of the top DXers in the world. On the right of Dr. Sid is Frank Turek, DL7FT, remembered for his Albanian efforts in the early 70s, and finally DF5UG. This photo was taken during a visit by ST2SA a year or so back.

Our first impulse was to immediately reject such thinking. But then we remembered how sometimes we have wondered how some DXers seem to catch everything but the common cold. Where DX is, they are! At times we have tried to rationalize our confusion by believing that they may listen more, that they have friends who are always sure to give them "one-ringers," or even the possibility that they know of a secret DX bulletin that always keeps them out in front. But then we discovered that there are other DXers who have the same routine as the anointed ones, but who do not work as much of the rare or needed DX. In our own minds we seek to believe most anything that sounds logical, but in this instance we wanted a bit more convincing. "What else have you learned?" we asked, and the Local was off again. There are times when, in calmer retrospect, we suspect we would be better off not asking leading questions in such situations. This turned out to be another of these.

"Well," the Local continued, and we wondered if we were starting to detect a note of relish in his words, "I have been studying the 'Odic Force.' Conceding that there may be something solid in the idea about 'earth electricity,' I am also interested in the 'Odic Force.' Just what do you know about that one?"

What did we know? Absolutely nothing at all. But long ago we did learn that while one might be an expert in a small sector of the DX world, seldom will you find an expert in all sectors. "Odic?" we echoed, still stalling for time. "Wasn't he one of the early on European DXers. Eastern Europe, I believe. And wasn't his callsign actually OD1C?" The Local was shaking his head.

"No," he was saying, "I don't think his call was OD1C, and I don't know what the QTH was. But from what I heard, the 'Odic Force" refers to something called 'health-rays.' Some think that these 'health-rays' can be beamed by some individuals, and others on the same wavelengths will note and receive them. Perhaps they are not fully aware of what is going on or what the force is called, but when two such individuals are close and on the same wavelength, there is something sparking between them. I've been wondering about this 'Odic Force.' How about it?"

We were wondering ourselves. We had heard of such things happening, but usually we heard about it happening in singles bars, and that was an arena in which we were woefully lacking any first-hand information. But DXers? Was there really something like this going? When Martti Laine or Franz Langner or Ron Wright go off on a DXpedition, is there really something there that DXers can feel and get attuned to. The whole idea was starting to trouble us.

But then we started to remember other times and other years and how when Gus Browning or long-remembered Danny would show from a new spot, there always were some DXers waiting at the right time and the right place on the dial. Once we would have thought of it as just plain luck. But was it the Odic Force? If it was, was it possible that some DXers had it and others did not?

Years back we knew a DXer on the far western edge of the continent who claimed that he was able to work more DX because his QTH was in a high mho area. Back then we thought he was just kidding. Then we came across a government chart showing the level of mhos across the country, and we were surprised to learn that generally there is a much higher level of mhos west of the Rockies than there is to the east—a whole lot more. Right then we started to believe in mhos, but even now when we mention mhos to new DXers, we draw a blank look. The mhos are there, but many

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HF2V, 80 & 40 Vertical.....125.00
Butterfly Antenna.....169.95
HF4B, previous HF3B.....169.95
Hustler G7-144.....119.95
Barker & Williamson All Band Dipoles.....Less 10%
Ham4 Rotator, T2X, CD45-2.....Call
KLM HF World Class Series Antennas.....Call Don
Cushcraft's 40-2cd, hottest selling 40 meter beam road band, easy assembly.....279.95

OTHER ANTENNAS

Larsen Kulduck.....17.00
Valor 75-10M complete mobil antenna AB-5.....79.95
Avanti ASP151 3G, thru glass 2M.....33.00
Anteco 2M, 5/8, Mag. Mount, Comp.....25.00
Stoner (McKay-Dymek) DA100D Receiving Antenna.....190.00
Philly Stran.....Call

SURPLUS

2.5A/1000PIV Epoxy diode.....29¢ Each or 19.00/100
.0015/10KV.....1.95
3N201.....95
4 Inch ferrite rod.....1.95
Sanyo AAA Nicad w/tabs.....2.50–each
Close out on rigs and accessories ? All the time.....Call
Close out Curtis Memory M480. $50.00–each
24Pin IC Sockets.....25
365pF two gang cap.....1.95

BELDEN

9913 low loss, solid center, foil/braid shield.....45¢/ft.
8214 RG8Foam.....43¢/ft.
8237 RG8.....40¢/ft.
8267 RG213.....52¢/ft.
8000 14Ga stranded copper ant. wire..13¢/ft.
8448 8 conductor rotor cable.....31¢/ft.
9405 Heavy duty, 2-16 Ga. 6-18 Ga.....52¢/ft.
9258 RG8x.....19¢/ft.
8403 Mic Cable, 3 condctr & shield.....80¢/ft.
100 Feet 8214 w/ends installed.....45.00
8669 7/16" tinned copper braid.....1.10/ft.
International Wire RG214, non-mil, good cable.....70/ft.

AMPHENOL

831SP-PL259 Silverplate.....1.25
UG176 reducer RG8X.....30
831J Double Female UHF.....2.00

82-61 N Male.....3.00
82-97 N Female Bulkhead.....3.00
New 82-202-1006 N-Male fits 9913.....5.00

ROHN

1/4" E.H.S. Guy cable, Rohn US, 1000 ft.....250.00
3/16" E.H.S. cable.....210.00
1/4" Guy Cable, 6100#7×7 strand, import.....15¢/ft.
3/16" Guy Cable, 3700#7×7 strand, import.....12¢/ft.
3/8×6 E&J Turnbuckle.....7.95
3/16" Wire Rope Clips......40
1/4" wire clips.....50
Porcelain 500D Guy Insulator (3/16).....1.69
Porcelain 502 Guy Insulators (1/4).....2.99

USED EQUIPMENT

All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sales price refunded if not satisfied.

POLICIES

Minimum order $10.00. Mastercharge, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. D'ats all, folks.

SPECIAL TELEPHONE OFFER

Call our numbers and when you place your order, we'll deduct a dollar off it. And don't be shy. Ask tough questions. Our guys are more than order takers—they know the radios and the equipment.

DON'S CORNER

Those devoted Yaesu fans out there — the FT101E certainly had a lot of supporters — should be pleased to know that Yaesu is just about to come roaring back into the marketplace. This means new products, stronger advertising and maybe—just maybe—a price promotion or two. Yaesu started to get serious about computer control of rigs with their ultra-boxes — [redacted] — so you might expect to see some more tricks with computer control. Now—when will these guys get wise enough to have the code written for the big 4 machines in amateur radio—Radio Shack, Commodore, Apple, and IBM. Contact Madison for the latest in Yaesu all the time. Another idea — how about a dual banded hand-held. Two meters and 430 for openers. Certainly the technology is available... and the market is ready. First one to market with this product will move a lot of radios.

73&Good DX
DON

MADISON
Electronics Supply
3621 FANNIN
HOUSTON, TEXAS 77004
1-713-520-7300 OR 1-713-520-0550

CIRCLE 180 ON READER SERVICE CARD

The WPX Program

Mixed

1175	WA5VGI	1177	K7LJ
1176	AD8W		

S.S.B.

1752	WD4CRG	1756	DK8JB
1753	G4COY	1757	CT1TH
1754	YBØDPO	1758	G4KDV
1755	AD8W		

CW

2329	PT2ACZ	2331	YB4FNN
2330	KT3O	2332	KK3V

VPX

241	OK1-415	242	WDX1D

Endorsements

Mixed: 450 AD8W. 500 KJ6Z, AD8W. 550 K6UXO, KA2SR, AD8W. 600 DL9ID, DK7BJ, AD8W, KA1SR. 650 DL9ID, DK7BJ, AD8W. 700 DL9ID, DK7BJ, AD8W. 750 DL9ID, DK7BJ. 800 DL9ID, DK7BJ, YU1FD. 850 DL9ID, DK7BJ, YU1FD. 900 ZP5JCY, WA3GNW, DL9ID, DK7BJ, YU1FD. 950 ZP5JCY, DK7BJ, JA6GWU, K5GOE, ISØMVE, YU1FD, N2AIF. 1000 ZP5JCY, DL9ID, DK7BJ, W6YMH, YU1FD, N2AIF. 1050 ZP5JCY, YU2CQ. 1250 W4WJ. 1300 W4WJ.

S.S.B.: 350 WD4CRE, YBØDPO, AD8W, WA4PMF, DK8JB, TF3CBW, G4KDV. 400 KE6KT, WD4CRG, YBØDPO, NE8O, AD8W, DK8JB. 450 WD4CRG, AD8W. 500 WD4CRG, AD8W. 550 WD4CRG, I3ZSX, I1EEW, AD8W, NE6I. 600 AD8W, N2AIF. 650 AD8W, K8PYD. 700 K8PYD. 750 CT1BWY, K8PYD. 800 K5GOE. 850 K5GOE, I4LCK. 900 I4LCK, CX9CO. 950 I4LCK, CX9CO. 1000 PY4VX. 1050 NJØC. 1150 W2NC. 2150 ZL3NS.

C.W.: 350 PT2ACZ, DL2HBX, WA5VGI. 400 PT2ACZ, WA5VGI, G3VQO. 450 PT2ACZ. 500 PT2ACZ, JA7AZJ. 550 PT2ACZ, K6UXO, NE6I, K8PYD. 600 PT2ACZ, K8PYD. 650 JA7ARM, PT2ACZ, HI8LC, K8PYD. 700 JA7ARM, YU2CQ, ISØMVE, K8PYD. 750 K8PYD. 800 N2AIF. 950 KL7AF. 1550 W4VQ. 1600 W4VQ. 1650 W4VQ. 1700 W4VQ. 1750 W4VQ, G2GM. 1800 W4VQ.

10 meters:	CX9CO.
15 meters:	AD8W
20 meters:	AD8W, K5GOE
40 meters:	OK1DVK
80 meters:	ZP5JCY, AD8W, K5GOE, G3VQO
160 meters:	ZP5JCY, AD8W
Africa:	ZP5JCY
No. America:	WB4UBD, AD8W
So. America:	AD8W
Europe:	JA2KVD, DL2HBX, AD8W, WA4PMF, DK8JB
Oceania:	ZP5JCY

Award of Excellence: VK4SS

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K6XP, K2VV, VE3GCO, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YZ/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS.

Award of Excellence Holders with 160 meter endorsement: K6JG, W4CRW, K5UR, OK1MP, W8CNL, W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, W4VQ.

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.

low-total DX types appear not to understand them.

We also recalled another time when we tried to filter all the incoming DX information and pass it along to a local who needed many of the same countries as we did. We figured that he would hear them and alert us. He was most appreciative. Then we found out that most of the time we only confirmed what we had already known, and often what he had already worked. Was it his high antenna, his endless listening on the bands, his big linear? Or was it the 'Odic Force'? We are still wondering. After all, his mhos could have been much different from ours, he living but a short distance away.

Here is Rudi Klos, DK7PE, at the BY1PK operating position during his visit there in June. Rudi is with Tong, the Chief Operator of BY1PK, while on the right Yan minds the shop listening for the elusive W/Ks. Some will remember DK7PE and his 3B9 Rodriguez effort of not too many months back. As many visiting operators have found, one of the problems is language, and often any conversation is with an assist from a young YL interpreter.

All this discussion of earth electricity and the "Odic Force" was starting to make us feel a bit boxed in. It was all the questions on the Force and the diffusion of earth electricity. So we got to thinking that we should give the Old Timer a chance to share the good thoughts, and we hauled the Local up the hill. There, as it often happens, we also learned something ourselves. In this instance it was that the Old Timer had heard all these queries before.

"There always have been DXers," the Old Timer expounded, "who are unable to face the possibility that others might be more diligent in pursuing DX, or perhaps even more analytical in analyzing the DX information open to most everyone. When these DXers work a new country, they are ready to acknowledge that it was due mostly to their innate superiority. But when someone else does and they do not, they want to ascribe the other's success to some strange, exotic, or esoteric factor. Mostly it is because the others work harder and longer. In some instances it is because they have lived longer and have had a long of spell of checking the DX that runs by them. But mostly it is just the difference in application of effort, technical know-how, and persistence. One eventually has to learn that persistence may be even more important than brilliance." The Old Timer at this point was leaning close to hold our attention. "Always keep in mind," he emphasized, speaking slowly, "that persistence can be more effective than brilliance. Always persist! Always!"

Later, when heading down the hill, we asked the Local, "Well, did you get all the answers to your questions?" The Local shook his head.

"Of course I believe what the Old Timer told us," he said, "and I do believe that persistence along with longevity will bring most every DXer to the Honor Roll. That is hardly arguable when you consider the average age of most DX clubs. But there seems to be most every day some scientific discovery that when analyzed only proves to be something that for years was called folklore or old-wives remedies. The big problem is that some won't believe unless it can be proven. So there is scoffing at something when there is belief but not the proof. Certainly you understood all of this, don't you?"

We thought we understood, but there were still things in the back of our minds that we had our own questions about. DXers often find themselves DXing to the will and mission of nature, and when the sunspots go down, they just groan and wait. And they wait with the understanding that the sunspot will come back and the good days will be with us again. By now the cycle is something that most understand.

But if you were to mention utilizing the earth's electricity or urge the understanding of the Odic Force, it would be

The WAZ Program

10 Meter Phone

301	KBØU		

20 Meter Phone

541	KL7VZ	543	WI4K
542	TG9VT		

80 Meter Phone

32	A71AD		

10 Meter CW

55	SM6INC		

15 Meter CW

117	SM3LGO		

20 Meter CW

231	W6SN	233	KBØU
232	DL1VJ		

All Band WAZ

S.S.B.

2966	WA4NQC	2972	NK5Y
2967	WB7WQE	2973	K7CU
2968	N3AZU	2974	N3BNA
2969	I8TOH	2975	TG9VT
2970	KL7VZ	2976	W4OHZ
2971	NE9K	2977	WI4K

C.W. and Phone

5895	K5PC	5899	KR9O
5896	WA4NQG	5900	DL3RD
5897	IK1CJT	5901	JA4EPE
5898	DK8ZB	5902	SV1JG

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.

5 Band WAZ

Standings as of August 1, 1985

All 200 zones worked:

1. ON4UN	35. ON5NT	69. DL4YAH
2. K4MQG	36. OH6JW	70. LA7ZO
3. SM4CAN	37. OK1AWZ	71. W9ZR
4. AA6AA	38. IV3PRK	72. W1NG
5. W8AH	39. DJ6RX	73. VK9NS
6. W6KUT	40. OH3YI	74. N4KG
7. EA8AK	41. I4RYC	75. YU7DX
8. LA7JO	42. ZL1BIL	76. DL8MAG
9. EA3SF	43. I4EAT	77. OK3DG
10. OH1XX	44. ZL1BQD	78. ZL1BOQ
11. EA8OZ	45. TG9NX	79. EA9IE
12. W0SD	46. XE1J	80. DL7HZ
13. K0ZZ	47. F5VU	81. DJ9RQ
14. ON6OS	48. W3AP	82. EA5SP
15. OK3TCA	49. YO3AC	83. EA2IA
16. K6SSS	50. K3TW	84. SP3BQD
17. ZL3GQ	51. XE1OX	85. LZ1NG
18. OK3CGP	52. VE7IG	86. N4JF
19. SM0AJU	53. OK1ADM	87. CT2AK
20. OZ3PZ	54. CT1FL	88. HB9CIP
21. I3MAU	55. WA1AER	89. OK1MG
22. I2ZGC	56. N4RR	90. CT4BD
23. 4Z4DX	57. UW0MF	91. VK6HD
24. N4KE	58. W4DR	92. EA6ET
25. K5UR	59. OK1MP	93. VK3QI
26. K9AJ	60. W1NW	94. LZ2DF
27. SM3EVR	61. OE1ZJ	95. ON4QX
28. LA5YJ	62. HB9AHL	96. SM0DJC
29. DL3RK	63. HB9AMO	97. CT3BM
30. N4WJ	64. LA6OT	98. K2TQC
31. G3MCS	65. UR2QD	99. EA8XS
32. SM5AQD	66. UK2RDX	100. HA9RE
33. W0MLY	67. ZS5LB	101. SM4CTT
34. I0RIZ	68. F6DZU	102. A71AD
		103. LZ2CC

The top 12 contenders for 5 Band WAZ are:

1. DK5AD, 199	7. LA9GV, 198
2. JA3EMU, 199	8. W6GO, 198
3. ZL1BO, 199	9. W4CEB, 198
4. N4WW, 199	10. W2YY, 198
5. K6YRA, 199	11. SM5AKT, 198
6. W8UVZ, 199	12. G3GIQ, 198

336 Stations have attained the 150 zone level

another argument. If you don't understand it, how can it be?

All we could say to the Local was, "Believe. Always be a Believer even if you don't understand. DXers should always be Believers." After awhile, when the Local prepared to depart, we said it again. "Always be a Believer, and the Force be with you!" That was something he could understand. He was smiling when he headed down the hill. Maybe we were smart not to ask him why.

Bermuda

Richard Weil, KW0U, notes that Bermuda was missing in the list of countries with reciprocal licensing authority. This list was in the June column.

KW0U was recently in VP9-land for a family reunion, and with little experience in DXing, he decided to apply for a Bermuda license. It came through with little trouble. A copy of a General class or higher license, a letter to the Bermuda Depart of Telecommunications telling where he would be and the dates, and the

This is Jorma Saloranta, OH2KI, who has been on a couple of DXpeditions in 1985. In March Jorma was at Gibralta signing OH2KI/ZB2, and in May he was at Market Reef signing OH0MM/OJ0. Often found in the major DX contests, he has been heard every year since 1969 in the CQ WW CW test and every year but two in the CQ WW Phone Test.

temporary operating authority was waiting. Along with the license was a fact sheet from the Radio Society of Bermuda.

Richard reports there are but two 2 meter repeaters in Bermuda and the use runs heavy. He reports a prohibition against third-party traffic, but an auto-patch is available. Reception was good. Anyone thinking of the island group in the mid-Atlantic might drop a line to Thomas Trimingham, VP9KG. He heads the Radio Society of Bermuda.

Pribilofs

Country status for the Pribilofs was denied at the July ARRL Board meeting, this action coming on the approval of a motion to table. Though technically not quite dead, the motion to table usually indicates an intent to again consider the matter at a later time. The motion did end high hopes for DXCC country status for the present.

Those advocating the proposal had been ecstatic, all the joy coming when the DX Advisory Committee on their third consideration voted to recommend country status for the Pribilofs. The vote was 9 in favor, 7 opposed. In the board meeting the motion to approve country status for the Pribilofs was made by Bill Stevens, W6ZM, of the Pacific Division and was seconded by Mary Lewis, W7QGP, of the Northwest Division. Both asked to be recorded as opposing the motion to table.

The issue is not dead . . . yet. The action was not a flat rejection, but only a move to shove it under the rug for the time being. Some of the opposition to country status is claimed by the Alaska DX Association to stem from misinterpretations of DXCC criteria, and often the finger is pointed at Rule 2a. This rule stipulates that islands offshore must have 225 miles of open water between them and the mainland *only*. You may recall in the August column that Unalaska, 205 miles from the Pribilofs, was mentioned, this apparently the sticker. The Alaska DX Association maintains that the criteria was incorrectly applied to the Pribilofs. "Maybe," is the reply, "but that wasn't the interpretation intended when the criteria was written!" This is the 2a criteria that has been included for many years, some say beyond the memory of many current DXers.

What does this mean? Where do we go from here? When will truth and justice and virtue triumph? One of these days, but not yet.

Some say the knock was put on the Pribilofs when the DXAC, after the third vote, went directly to the ARRL Board of Directors and bypassed the headquarters Awards Committee. Some note with concern that some members of the Award's Committee have been adamant in opposing country status for the Pribilofs. Others say that there is a reluctance in some quarters to change a hard stand once taken, this even when re-examination might indicate that the original decision was in error.

There always is the problem of understanding DX and DXing. What may appear to be crystal clear and a marvel of logic to a DXer is often a rumble of confusion and a clouded interpretation to the uninitiated. Not all on the Board of Directors are DXers, nor are the finer points always easy to understand. And though it is again a truism that only a DXer understands DX, this should not deter anyone from discussing the matter with his Director. Such exchanges can be informative and helpful to both sides in this matter.

At this point don't count out the Alaska DX Association nor discard any of your hopes for the Pribilofs. There is more to come. There always will be.

ZL Callbook

Years back we knew a DXer who got to looking at the DX Callbook and was startled to note that while it was reported that there were some 500K JA licensees issued, there were but 20,000 listed in the Callbook. All of this points the finger at the idea that often a callbook from the country concerned has more information. This is to note the 1985 callbook of the New Zealand Association of Radio Transmitters (NZART) and the wealth of information contained therein about radio in New Zealand. It lists the United Kingdom amateur frequencies, the Austrailian amateur frequencies, and the U.S. amateur frequencies. There is a list of beacons on amateur frequencies, 10, 6, 2 meters, plus 432 MHz and 1296 MHz. There is a lot more, including a section with handy data information. If you want to know more about radio in New Zealand, the cost is $8.50, and NZART, Box 1733, Christchurch, New Zealand is the direction at which to aim.

Wake Island

Edward Campbell, KB6DAW/KH2, and Gary Dein, NY6M/KH2, will be on Wake Island from October 22nd to November 4th. This will be across the *CQ* WW DX Phone Test, and they were aiming to be active during that effort.

Edward Campbell will be on as the phone operator, and he will be signing KB6DAW/KH9. Gary Dein will operate CW and he will be signing NY6M/AH9. During the great *CQ* WW DX Test the last weekend in October, they will sign KB6DAW/NH9, and this will be the only time this call is used.

The operators are aiming to work a DXCC, a

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 315. 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 endorsements involving the issuance of a sticker is $1.00.

C.W.

ON4QX	316	W6ID	311	WØIZ	303	N5DX	291	I5XIM	280
W9DWQ	316	W4BQY	310	WA8DXA	302	I3OBO	290	W2LZX	280
K4CEB	316	DL3RK	310	YU2TW	301	WD9IIX	290	K1VHS	280
W6PT	315	K4XO	309	SM3EVR	300	W1WLW	289	HB9AFI	279
K9MM	315	N4MM	308	W6SN	300	W4BV	289	WB4RUA	277
N4PN	315	W9BW	308	WØSR	299	WA2HZR	286	W6YQ	277
DL7AA	314	W4OEL	307	K3FN	298	K8LJG	284	DL1QT	277
W3GRS	314	AA6AA	307	W7CNL	298	WD9IIC	284	NN4Q	276
W8KPL	314	W1NG	306	DJ7CX	297	N8MC	284	KA3R	276
K6LEB	314	K1MEM	306	SM6CST	297	K8PYD	281	G2GM	276
N6AV	313	OK1MP	306	K3UA	295	WA4JTI	281	K4SE	275
K6JG	313	K9QVB	306	K9IW	294	WØHZ	281	WA4DAN	275
K6EC	312	N4KG	304	W9RY	293	K7ZR	280	K4CXY	275
N6CW	311	AB4H	304	EA2IA	293				

S.S.B.

K2FL	316	K8LJG	312	KM6B	304	WA4DAN	297	KB5RF	284
W4EEE	316	K4MQG	312	WD8MGQ	304	NA5W	297	N8BKF	284
K6WR	316	N4MM	312	VE7HP	304	K4CXY	296	W9NUF	284
W4UG	316	I2LLD	312	XE1KS	303	W4UNP	296	AG9S	284
W6EUF	316	VE7WJ	312	W2LZX	303	KE3A	296	WB3HAZ	283
VE3MR	316	W9SS	312	KR9O	303	WZ4I	296	WD8PUG	283
DL9OH	316	N2SS	312	KU9I	303	WB3GPR	296	XE1OW	283
N4JF	316	K6EC	311	IØMBX	303	I8ACB	295	VE3MV	283
IØZV	316	W4SSU	311	KB8DB	303	I3OBO	295	IN3ANE	283
W3GRS	315	I4LCK	311	K1MEM	302	WA9PWN	295	KI3L	283
KD8VM	315	N7RO	311	N5FG	302	XE1OX	295	AE5B	282
IØAMU	315	LU3YL	311	W6FET	302	WØIYR	295	CT1UA	282
F9RM	315	OZ5EV	311	W2FGY	302	KKØC	295	KC8YM	282
VE3MJ	315	W8PCA	311	K9HQM	302	W4BQY	295	AI9R	282
I8AA	315	K9BWQ	311	KV2S	302	I8ZTE	294	VE3DLR	282
KS2I	315	LA7JO	311	WD9IIX	302	NN4Q	294	TG9EP	282
4Z4DX	315	K6XP	310	W6SN	302	WDØBNC	294	K4LR	282
W9DWQ	315	OE2EGL	310	K9IW	302	I5BDE	294	I1POR	281
W9JT	315	DK2BL	310	K9UAA	302	K4SE	293	KD5ZM	281
ZL1AGO	315	K4XO	310	VE3FJE	301	WD8MOV	293	K9TI	280
W4NKI	315	IV3YRN	310	WB4NDX	301	KC8JH	293	N5FW	280
VE2WY	315	W2SUA	310	WA3HUP	301	AI5I	293	ZL1BOQ	280
K6YRA	315	YU1DZ	310	K8CMO	301	KB3OQ	293	KA8T	279
W3AZD	315	VE3GCO	309	W8ILC/QRPp	301	WA4LOF	292	KB5DN	279
XE1AE	315	DL6KG	309	AI8S	301	ACØA	292	EA3KW	279
VE3GMT	315	N4PN	309	W1LQQ	301	I2MOP	292	EA6DE	279
I8KDB	314	K1UO	309	W9RY	301	VE3FEA	292	W9OKL	279
ZL3NS	314	W8JXM	309	YU2TW	301	VP9CP	292	JH8NYK	279
EA2IA	314	9H4G	309	N4CRU	301	W8LKG	292	KX5V	279
YV1KZ	314	W1NG	308	W4OHZ	300	VE3IPR	291	AI8M	278
DJ9ZB	314	VK4VC	308	I5EFO	300	N5AWS	291	K4BYK	278
N4WF	314	YV5AIP	308	W8IMZ	300	WB6GFJ	291	I5EFO	278
OZ3SK	314	ZL1BIL	308	K9QVB	300	W4JFE	291	VE3IUE	278
W4DPS	314	N6AV	308	KB5FU	300	K1VHS	291	K3LUE	278
K9MM	314	AA6AA	308	KB9KD	300	W6MFC	291	KB3KV	278
YV5DFI	314	N6OC	308	K3UA	300	KBØU	291	WA2FKF	278
I4ZSQ	314	WA4JTI	308	KB8KW	300	KQ9W	291	KB8O	277
K6JG	314	W2CC	308	VE4AT	300	K2JLA	291	WBØUFL	277
CT1FL	314	VE4SK	307	I8KCI	300	KP4EQF	291	W4PTT	277
K9LKA	313	K8PYD	307	WB3DNA	300	KZ2P	290	KBØSY	277
ZS6LW	313	N4KG	307	W6NLG	300	YU7KV	290	I8XTX	277
ON5KL	313	IØMBX	307	WAØTKJ	299	IØSGF	290	K2JF	277
OE3WWB	313	WØSR	307	I6PLN	299	VE3CKP	290	N7ASL	276
OK1MP	313	W7FP	307	KB9OC	299	JA5PUL	289	WA6DTG	276
VE1YX	313	W6DN	307	W6NLG	299	W9TA	289	WA4OPW	276
WØSFU	313	SM4CTT	307	XE1OX	299	K8ZZU	289	AI9U	276
W9BW	313	N4KE	306	DJ7CX	298	KØGT	288	KC2RS	276
WØYDB	313	W7OM	306	K9SM	298	OK1AWZ	288	W5LLU	276
W8ILC	313	WAØDCQ	306	I8LEL	298	I8KCI	288	I8INW	275
EA4LH	313	G4CHP	306	K8NA	298	N2ATD	288	WB3CQN	275
F2MO	312	VE3MRS	306	JH4PRU	298	WØULU	288	WB1EAZ	275
N6AW	312	W2CC	305	K8VFV	298	AB9E	287	VE7BSM	275
W3GG	312	VK3JF	305	WB4UBD	298	W6BCQ	286	K8NWD	275
I8YRK	312	EA1QF	305	EA9IE	298	N3ARK	286	KA9ABC	275
WØSD	312	WA4WTG	306	XE1NI	298	VE3CYX	285	G3XTT	275
K9RF	312	XE1J	304	HP1JC	297	KC8EU	284	N4DRC	275
K5OVC	312	WB1DQC	304	K5DUT	297				

This is Hal Cantrell, SVØDV, at his operating position on Crete. Hal and his XYL, Lynn, are a large portion of Crete activity these days. Though he says he really is only a 75 meter ragchewer, he often is found in the DX bands and works 160, 75, and 40 meters most days there in Crete.

WAS, and possibly even a WAZ from Wake during their stay. They are hoping for in excess of 15,000 QSOs. Even if you have worked Wake Island previously, they want to hear your call during their stay there. They say that they will be listening for your call. They plan to operate on all possible bands.

QSLs go the the '85 Callbook address. This is: KB6DAW/KH2, Edward L. Campbell, 300A Rendova, APO San Francisco 96334. An SASE or SAE/IRC is requested.

Peter I Island

DXers live on hope and an occasional new country. There is a report via the DX Family Foundation that a JA fishing vessel will be departing in December for the Southern Ocean to fish for krill. During this October things should be firm if everything falls into place. JR1HHL reports that there will be a single operator, this being Jin Fujiwara JF1IST. He is not a CW operator.

Most any DXer will start paying attention at this news. Everyone needs Peter I Island, mainly because there has never been an operation from this Antarctic stop. As for the details, the plan is for the fishing vessel to trawl in the vicinity of Peter I Island for about a day. During this period JF1IST will load his gear into an inflatable boat, motor to the island, and attempt a landing. The landing will not be easy, the coast being rocky, preciptous, and dangerous. The gear will have to be hauled up the steep slope to a possible operating position and the whole thing put together.

After some hours of operating, the ship will be waiting to take Jin back on board. All the gear will be dumped into the ocean, and he will motor back to the fishing vessel, which will then head for South America. JH1HHL will handle any QSLing.

Keep in mind that Peter I Island is generally on the edge of the ice pack. The seas are cold and the water rough. A lot of things have to fall into place for this one to achieve its goal. Even under the best of circumstances it will be a chancy operation. Should it go, the QSO total probably will be low. Those who work such an operation will be loud in praise of a smooth operation; those who miss will be caustic and unhappy. But one way or another, it will draw a lot of attention.

Guam

Those who wonder what conditions are in the western Pacific and when to listen might be interested in some words out of the Mariannas Amateur Radio Club on Guam. Ed Campbell, Secretary of the MARC, notes that there in downtown Agana they start hearing the states at about 0300Z. Shortly after the path opens to the states, Central and South America start to come through. The HIDXA Net at 0630Z usually draws a good number of eastern and south Pacific and at 0930Z Europe starts to come through, often on 15 meters. Africa is usually in around 1100Z, and son of a gun!, about 1330Z the states are back again.

All this should give some ideas for the upcoming *CQ* WW DX Tests the last weekends in October and November. If they hear you, you should hear them. KG6JIC, John Conners, is the president of the Mariannas Radio Club, W1YRM, David Chartier is the vice-president and KB6DAW, Edward Campbell, is the Honorable Secretary. KA8GVS, Steve Shemenski, is the club treasurer.

DXCC Criteria Proposal

Among the items presented to the ARRL Board of Directors at their recent meeting was

CQ DX Awards Program

S.S.B.

1429	VE2GHZ	1431	XE1XM
1430	EA3DEE		

C.W.

643	K2FS	645	YC2BDJ
644	OK2PFN		

S.S.B. Endorsements

310	I0ZV/316	300	W6NLG/300
310	VE3GMT/315	275	N4DRC/275
310	I4ZSQ/314	250	XE1XM/252
310	K6JG/314	200	I2EOW/201
310	CT1FL/314	150	EA3DEE/152
310	EA4LH/313	28 MHz	EA8TE
310	LA7JO/311		

C.W. Endorsements

250	I8WY/272	275	G2GM/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.

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a proposal from the DXAC to revise Part 5b of the DXCC Country Criteria to read as follows:

> The following will not be eligible for consideration as a separate entity from the host country:
>
> Embassies, consulates and extraterritorial legal entities of all nature, including but not limited to monuments, offices of United Nations agencies and related organizations, nor other intergovernmental organizations, diplomatic missions, etc.

In the DXAC this proposal was adopted by a vote of 15 to 1. Under the normal procedures the proposal is headed to the headquarters Awards Committee, which, after reviewing, approves or disapproves and passes it on to the Directors at the next board meeting. It might be noted that under this proposal 4U1VIC will not qualify for its long-sought country status.

Generally when such revisions are made there is no retroactive action taken to drop those which have previously qualified. But the criteria also dims the chances for possible future country status for those proposals where you have to slice the criteria awfully thin. It might also be interesting to note those instances where current DXCC countries might not qualify.

It should be noted that the whole DXCC country criteria was not written in one fell swoop. Article 1 came first, naturally, but it also was the only rule for some years. In the early 1960s Article 2a and Article 3 were added, these to deal with offshore islands and instances where there was intervening territory. In 1963 Article 2b was added to deal with interisland distances, and in 1972 Article 4 was added to handle the question of unadministered territory. The last articles, 5a and 5b, were added to handle neutral zones, buffer zones, embassies, or extra-territorial monuments.

If the proposed 5b criteria had been included originally, you might not be counting the following as DXCC countries: Corsica, Balearic Islands, Ceuta, Melilla, Isle of Man, Channel Islands, Wales, Scotland, Sardinia, Midway, Kingman, Kure, Desecheo, Aland Islands, Mt. Athos, St. Paul Island, Sable Island, Sovereign Military Order of Malta, ITU Geneva, United Nations Headquarters/New York. You might also wonder about Chatham Island, Kermedec, Auckland, and Campbell Islands.

Most of the answers come from the fact that the DXCC Country Criteria was not written in a single day. From the end of WW II to the 1960s there was but one criteria, Article 1. Article 2b was not added until 1963, and any territory approved prior to the adoption of Article 2b was grandfathered into the criteria. This is why you see Chatham, Kermedec, Auckland, and Campbell Islands. There they were and there they stayed. This may help to understand some of the inconsistencies, but over the years there were too many architects working on the criteria for all of them to be easily understood.

In the contiguous Russian territory in Europe and Asia there are 18 different DXCC countries, none with intervening foreign territory or water separation. Some have said that this is the original DXCC inconsistency as these countries came from the application of Article 1. Years back we knew one DXer who earned a PhD studying amateur radio, and some of our treasured traditions made it easy to understand why such a study would have merit. In the October 1972 *QST*, when Article 4 was added to the Country Criteria, it was noted that the country list represents years of progressive changes in DXing and that the full list will not necessarily conform with current criteria. While the general policy has been essentially the same, some specifics have been changed.

The proposal as noted is a revision of the present Article 5. It does seem to be closing the door on UN agencies as well as those instances where an area achieved legitimacy because of "intergovernmental" factors and hardly anything else. And if you have worked all the countries noted, you can rest easily that you are in protective territory. If you have not as yet worked them all, you still should be okay for now, but not for long. But if you are wondering about some governmental entity—maybe the local post office grounds—which might qualify, forget it. The signs are that the knell is sounding.

Some DX Notes

New officers for the DX Club of Puerto Rico are David Novoa, KP4AM, president; KP4WI vice-president; KP4IG secretary-treasurer; and WP4D and NP4KA club directors. If you need Puerto Rico, look for KP4AM most days at 7150 kHz and he is available for schedules. You should be able to hear him. He has a 40 meter 3-element beam for 40 flying at 85 feet.

An analysis by the FCC of new amateur licensees indicates that just about all come in as Novices, and the average age of the new amateurs is 36.6 years. In age groups, a big bunch show up around 14 years of age, there is a big drop-off for new licenses in the 20-year-old group, and it peaks again in the early 30-year-old class. This group constitutes the largest age group of new amateurs—about two-thirds of the total. A final bunch shows in the 60-year-plus group. There have been some who say that these are mostly DXers, but don't you believe it. We once heard

of a local DXer who made the Honor Roll while in his late teens. Then he vanished from the world of DXing, to be found years later hiding behind a full beard in an advertisement for marine electronic gear. So you see, there are young DXers! But they all grow older.

If you caught a T4 prefix recently, it is a special prefix marking the International Youth Year, and QSL via the Cuban bureau.

VY1CW is seeking assistance in having Yukon-VY1 count as a separate multiplier in ARRL tests. Bill up there in far Whitehorse says that many VY1 stations have banded together to avoid such contests until justice is done.

That new hope for Zone 2, VE3JKC, is a recently ordained United Church minister, and he will be at Harrington Harbor in Quebec for a number of years. VE3JKC is Kent Chown, ex-VS6KD, and a DXer and CW operator. He also likes contests. He has a tribander, but no tower to elevate it nor an amplifier to elevate his signal. He also speaks English, French, and Cantonese.

At the last ARRL Board meeting they voted a reduced membership rate of $6.25 for those under 13 years old and $12.50 for those under 18 years. There will also be a proposal to help the FCC with the assignment of callsigns, support for the suggested preferred status for coordinated repeaters, and the proposal that the FCC retain the responsibility for examination questions.

N7DF arrived in Chad a couple of months ago with hopes for both TT8 and Sudan activity. He had the ST-Sudan license in hand before departing Kansas City, but border fighting between Chad and Sudan put a crimp in part of his planning. The good news, at that point, was that Larry expected to be in Chad until October and was on the air signing N7DF/TT8. He was also expecting to be heard on 160.

While covering the Kansas City DX Front, it might be noted that a group from the KCDXC was aiming for a Belize operation from November 20th to 27th. The mode—CW. The big effort—the *CQ* WW CW DX Test the last weekend in November.

SV0DV, Hal Cantrell, on Crete, reports that he hears the east coast most mornings on 160. Hal says that he usually has little trouble in working through on 40 or 80 meters, but often a European pileup moves in. Hal works mostly CW, and says he has trouble remembering his last SSB contact.

What one DXer may think a straightforward item can be contradictory when it gets to another country. Fusao Suzuki, JR1HHL, who operated BT1HHL a few months back, in "DX Family News Letter" notes that to avoid confusion dates should be spelled—i.e., June 23, 1985 and not 6/23/85 nor 23/6/85. Also, in Japan the box marked with an "x" or a "✓" is taken to mean "no" or "wrong." For your JA-QSLs remember that "0" means good! Now you may understand what happened to that JA-QSL you were waiting for.

This should be in most DXers hand in time for the big DX contests of the year—the *CQ* WW Phone Test the last weekend in October, the *CQ* WW CW Test the last weekend in November. Look for more action on the lower frequencies.

Cape Verde Islands on CW

Jim Neiger, N6TJ, will be signing D44BC during the *CQ* World-Wide CW Test, Nov. 23–24, 1985. His frequencies will be 1830–50, 3510 and 3535, 7010 and 7035, 14035, 21035, and 28035. This will be an excellent opportunity to work the Cape Verde Islands on CW, where this country is extremely rare. QSLs will go directly to D44BC using the Callbook address. Jim will be on SSB for several days preceding the contest. *(TKS K4IIF)*

73, Cass, WA6AUD

DX Ten Years Back

At the start of November 1975 the VX9A on Sable Island were waiting for the weather to clear to fly from Sable Island, where they had brought a new country on the air. CR9AJ was on from Macao and VP8OQ from South Georgia. CE9AT was heard from the South Shetlands and SW0WZ was on from Rhodes. Cycle 21 was showing signs of life and 10 and 15 meters had revived. VY0A showed from St. Paul Island early in November, another new country. In the West Coast DX Bulletin Needed Country Poll, Iraq led the list, being needed by 88.7% of the respondents. The leader was followed by South Sandwich, Clipperton, Bouvet, Saudi-Iraq Neutral Zone, China, Kamaran, Burma, South Yemen, and Malpelo. Heard Island was #12, Albania #13 being needed by 45.2%. There were 150 countries in the needed list, all the way down to 1.4% needed, and these were Wallis, Azerbaijan, Kenya, Lesotho, Malawi, and Zaire. Average country total of those sending in their list was 299.5 countries. VK5XK was on from Niue, and Lloyd and Iris were aiming to activate Tuvalu on January 1st for another new country. FR7ZL was due to open from Glorioso in mid-November, and with the bands improving, life was good for the DXers.

QSL Information

Jack Wilson, WA4SAC, 733 Handy Court, Owensboro, Kentucky 42301, is a volunteer to shoulder the DXers' burden and is ready to act as a QSL Manager for one or more DX stations.

All of the following QSL information was compiled with a lot of help from KA6A/9 and W9LNQ and others.

BY1QH (June 11 only) to DK7PE
CN8CC to F6FNU
CO2PY to XE1XF
DK8AG/EA8 to DK7AH
DL4BBO/SV9 to DL4BBO
EN0ALW to UZ0LWO
FO0ASJ to N5DD
FM5WD to W3HNK
FO0DP to N7RO
HZ1HZ to N7RO
I0SNY/ZB2 to I0SNY
I2DMK/ID9 to I2MQP
JR8UU/5N0 to JA8FCG
KH6AC to K7ZA
KP4IH to NP4HB
LZ9MAY to LZ1KDP
LG5LG to LA2ZN
N7DF/TT8 to K0GHW
OG1AA to OH1AA
OH2KI/ZB2 to OH2KI
OH0MM/OJ0 to OH2KI
OH0MA to OH0NZ
OX3GH to WA2TTI
OZ5UR/OY to OZ5UR
SV0DX to W4FA
TR1G to TR8JLD
TR8DR to W2PD
TK5EP to F6EYS
TU4BR to KN4F
T31AT to G4GED
T42HS to CO2HS
TZ6WC to DL4BC
UP7A to UP1BZZ
VK9ZB to VK6YL
VP2MR to KG6IP
VR6JR to ZL4DW
V44KAC to WB2LCH
YZ3WB to YU6ARO
YZ7MIF to YU7KV
YZ0U to YU2BHI
ZC4WW to G3ZNF
ZF2II to WB5HNZ
ZK1XE to WB6GFJ
ZI0OY to ZL4OY
ZV2ZCZ to PT2ADV
4U1UN (June 15) to W2MZV
4U0ITU to F6EYS
5Z4MX to SM3CXS
7S2SSA to SK2AU
8Q7MA to OH2BH
A71AD to POB 4747, Doha, Qatar
BT0NMN to POB 202, Wulumugi, Peoples Republic of China
BT1HHL to Fusao Suzuki, 256-11 Iwasawa, Hanno, Saitama 357, Japan
BT4RJU to Kasuo Ogasawara, 4-13-12 Kamirenjaku, Mitaka, Tokyo 181, Japan
CP5LK to Casilla 2160, Cochabamba, Bolivia
CE0FFD to Box 4, Easter Island, Chile
KB6DAW/KH9 to Ed Campbell, 300A Rendova, APO San Francisco 96334
KB6DAW/NH9 to Ed Campbell, 300A Rendova, APO San Francisco 96334
NY6M/AH9 to Ed Campbell, 300A Rendova, APO San Francisco 96334
TV4MAY to Boite Poste 201, Reims, France
V85SA to Box 924, Kuala Belet, Brunei
ZF2II to Hampton Williams, 5406 Woodbine, San Angelo, TX 76904

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VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

The First Annual CQ Worldwide VHF WPX Contest

Well, it's all over. The new *CQ* VHF Contest, July 20–21, appears to have been a real success story. As of this writing, exactly 30 days after the contest, 279 logs have been received and more are arriving each day. Many logs contained interesting comments and suggestions which will help us make the next VHF Contest even better. Many complained of inadequate publicity for the event, despite our frenzied announcements published in every major amateur radio journal we could think of. Lots of folks suggested we use grid squares, either as multipliers or the required contest exchange. Some recommended we shorten or otherwise revise the contest period. We thank each and every person who took the time to write, and assure you that all these things are being considered.

The good news is that regardless of the mistakes we made in our first effort at a new contest, there was a *lot* of activity, and we're receiving a *lot* of logs representing pretty much worldwide activity. The bulk of the logs are from the U.S. and Japan, which isn't surprising. However, West Germany, Great Britain, Canada, Czechoslovakia, Italy, Romania, France, Hungary, Finland, and others are represented as well. And, while many Americans were bemoaning lack of activity or poor conditions, our European and Japanese brethren were pounding away, making amazing scores. Since we'll have a separate contest results write-up in early spring, I won't devote a lot of column space to this. It seems like a score of 10,000 points separated the men from the boys (beg your pardon, ladies) in this first *CQ* VHF WPX Contest, with 50 of the 279 logs received indicating claimed scores over 10K points. Those folks should be proud of their efforts. I'm so proud of them that I've listed their calls below.

Early claimed scores >10K points, CQ WW VHF WPX Contest: AB1U, DF1ZE, JQ1BVI, K1TOL, NA1L, K2GK, KX2I, KE2N, N2BJ, W2HRW, WB2OTK/4, DL3MBG, K3ZO, KT3M, KB3PD, W3GN, GJ4ICD, I4LCK, N4EJW, N4HB, N4KCM, WB4NJG, K5IS, K5YY, KB5MR, W5HUQ/4, WB5KYK, JA6RJK, KA6ING, KF6ZB, N6IGA, W6RXQ, JH7ACC/0, JH7VBI/7, K7IDX, DG8SAB, K8NWD, KM8U, KA8MRI/9, AF9Y, K9MRI, NC9F, K0TLM, KC0OG, KC0QR, N0LL, W0JLC, WA0TKJ, WB0YZN, WB0ZKG. Congratulations to these folks and any others who have mailed high-scoring logs we've not received yet.

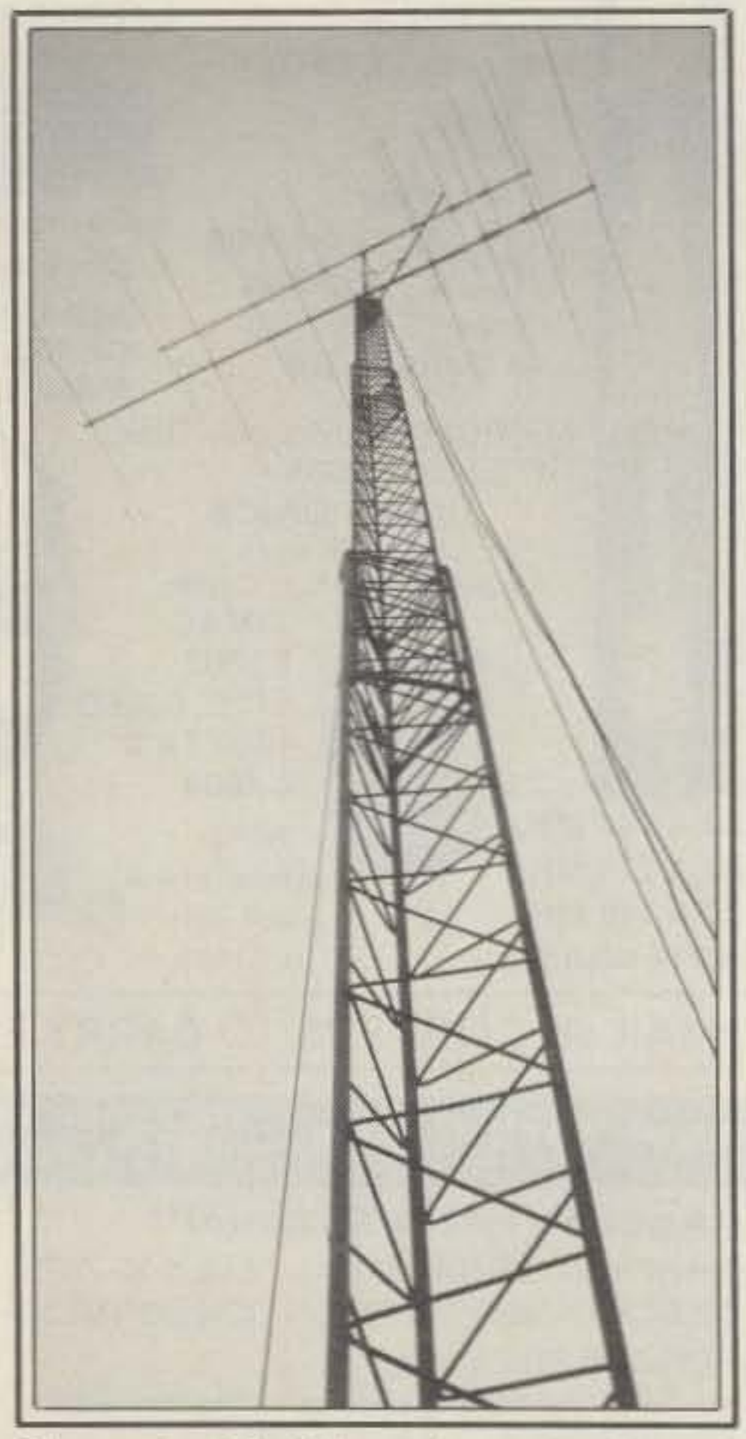
Speaking of high scores, the very highest score I've seen so far is that of the S.C.O.R.E. multi/multi group. We used the call NV6O/2, operating from New Jersey, and made 672 QSO's with 217 PX's (prefixes) for a total score of 170,128 points. To achieve this, we didn't do anything particularly amazing. We were multi-op/multi-band, with kilowatts and

24 Louis Dr., Budd Lake, NJ 07828

This is KC2PX operating the 432 MHz station at NV6O/2. We used a TS830S + MMT432/28S transverter driving a Mirage intermediate amplifier, to drive a Henry 2004 kw amp (3CX800A7, 650 watts out). The RX used a mast-mounted SSB Electronics GaAsFET preamp. Also visible here are stations for 220 and 1296 MHz.

Yours truly (WB2WIK) at the controls of the NV6O/2 six meter station: Collins-Rockwell KWM380 plus Mutek 50 MHz transverter driving a Lunar intermediate amplifier to drive the 4-1000A final amp (1.5 kw PEP out). It's a great setup, but many contacts were tough due to just average conditions and lightning static.

WA2VUN working 2 meter FM at NV6O/2. The 144–146 MHz station was an IC-740 plus MMT144/28 transverter with SSB Electronics mast-mounted GaAsFET preamp, homebrew kw power amp using two 4CX250B's (for SSB/CW), and a TR9000 with a single 4CX250B amp (300 watts out) for FM.



The main 50 MHz antenna system at NV6O/2: a pair of 7 element KLM Yagis at 54 and 70 feet. Second 6 meter antenna was a single 7-element KLM at 50 feet, on a separate tower.

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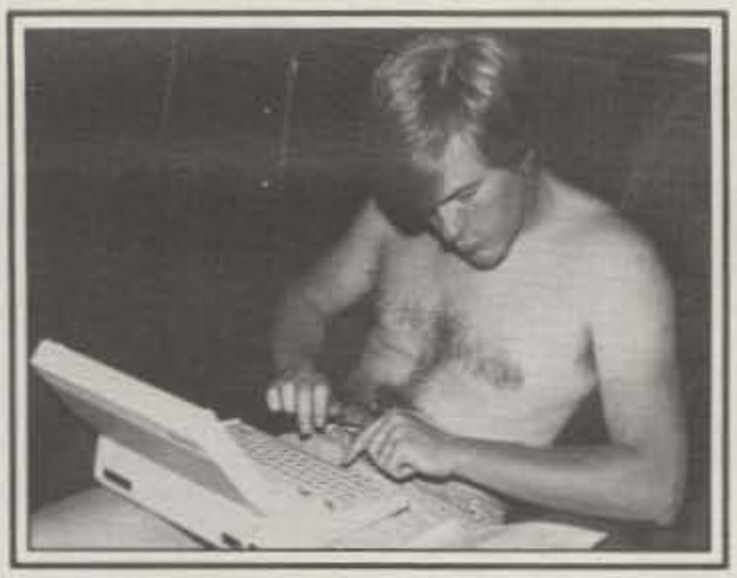
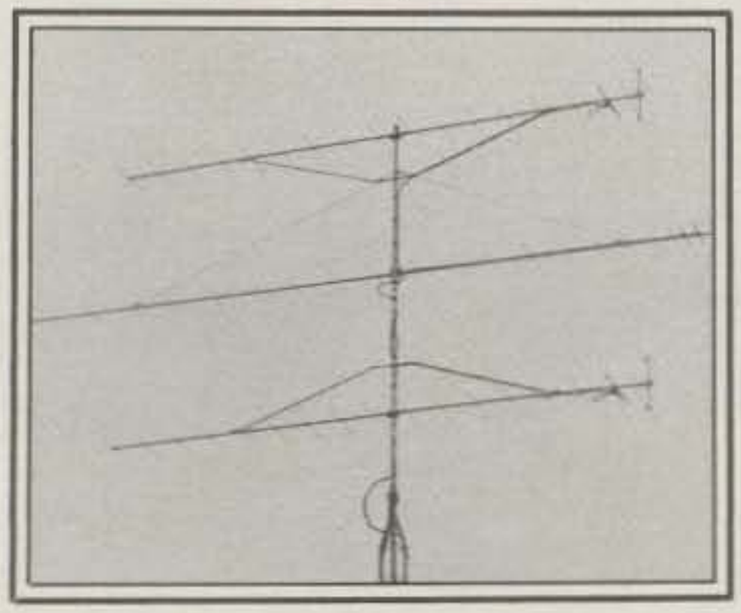


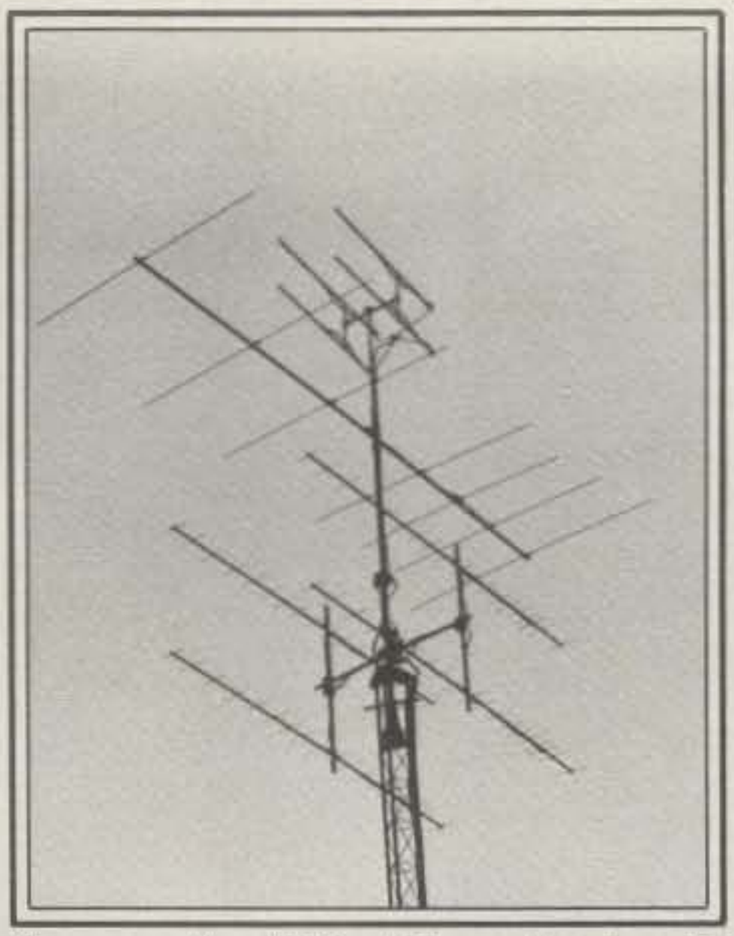
KT2B performs logging/duping functions with an H-P 110 portable computer at NV6O/2. We did our logging "off line." That is, we keyed all contacts into the computer some time after making them. The original logs were kept by the time-proven pencil and paper method!



At NV6O/2, NJ: 19/19 element "Boomers" for 144 MHz at 42 and 58 feet, fed with 7/8 inch heliax and mast-mounted GaAsFET preamp, plus a new 22-el KLM long boom Yagi at 50 feet for 220 MHz.

stacked arrays on each band except 23 cm, where we ran 100 watts output to 96 elements at 60 feet. All antennas were fed with "hardline," and we employed tower-mounted GaAsFET preamps on 144, 432, and 1296 MHz. The photographs tell much of the story. Since we were a multi-op group, we used computer logging/duping with borrowed Hewlett Packard 110 portables. The bands didn't treat us any better than they did anyone else, but we did take the contest seriously. It seemed only proper for us to do so, as we developed the contest idea.

Some other stations took the VHF WPX seriously, too. John Lindholm, W1XX (of the ARRL), operated NA1L to the tune of 100,975 points in a single-op effort from Massachusetts. Congratulations, John! Other notable efforts include N2BJ with 85,444 points, KX2I (multi-op) with 69,380 points, WA0TKJ with 43,885 points, DF1ZE with 52,150 points, and GJ4ICD with 45,849 points. Some great feats which didn't necessarily result in very high scores but are notable nonetheless: JL3AZA worked 44 stations on 50 MHz with a 2 watt rig; WB9JKI made 54 Q's on 144 MHz with less than 10 watts; KT3M worked 203 stations on 146 MHz FM only; AF1T worked a new state on 23 cm (NJ, NV6O/2); I4LCK/4 contacted 141 stations on 70 cm and still complained about lack of activity!; JH7ACC/0 made 269 QSO's on 50 MHz; N8AXA/9 operated QRP mobile and made 41 QSO's; JA1BWD worked 51 stations on 23 cm; JH1FJK made 36 QSO's on 23 cm, using just 3 watts to a small Yagi; K9MRI made 240 contacts on 2 meters using an antenna system missing half its elements; K5IS made his first contact on 23 cm; JA6RJK made 282 QSO's on 50 MHz; K3ZO worked two new states on 144 MHz . . . and maybe the most amazing feat of all was GJ4ICD's 527 QSO's and 87 prefixes on 2 meters.



Here are the 1296, 432, and backup 50 MHz antennas at NV6O/2: 96-element F9FT array at 58 feet, with 7/8 inch heliax feed and GaAsFET mast-mounted preamp for 23 cm; 76-element K2RIW array at 42 feet with 7/8 inch heliax and GaAsFET mast-mounted preamp for 70 cm; 7-element KLM beam at 50 feet for 6 meters.

It is apparent to me that the Europeans and Japanese could walk away with this contest if they really tried. Let this be a challenge to us North Americans! We must work harder than in the W/VE VHF/UHF contests, and the foreign competition should be the incentive for us to do so. Based on the number of logs received so far, the new VHF WPX generated about half the activity of the ARRL September VHF QSO Party, but this was our first year. If participation doubles in 1986, the contest will be as big as the June QSO Party, and if it doubles again in '87, it will be the largest VHF contest in the world.

Readers Say The Darndest Things

It's always nice to work somebody on the bands and then receive a note from them in the mail, whether they send a QSL card or not! This happens to me often, especially since so many VHFers are now reading the column. I received a nice letter from Don, WZ4K, of Virginia Beach, VA, who said I was his first 2 meter CW contact. He was interested to know if I thought the Mutek "front end" board would be worth installing in his IC-271A multimode transceiver. My answer is a well-qualified "absolutely." The IC-271A is a nice rig with lots of "bells and whistles," but its receiver noise figure isn't good (about 6 dB) and dynamic range can sure stand improvement. The Mutek board offers <2 dB noise figure and has considerably better dynamic range than the original-equipment ICOM.

Don also asked my opinion about "hardline" (low-loss, semi-rigid coaxial cable) and antennas. He write, "I'm tempted to replace my 'Jr. Boomer' with a 16LBX (KLM) or 4218XL (Cushcraft), but feel that unless I gain 3 dB, it's just not worth it." Well, yes and no. Possibly you won't notice less than a 3 dB improvement on a day-to-day basis, but remember that a 3 dB increase in antenna gain results in a 6 dB improvement in station performance (3 dB TX, 3 dB RX). My experience is that such a 6 dB overall improvement can add a hundred miles to my average working radius on VHF. Changing to "hardline" can yield similar results, depending on the feedline you intend to replace. This is an emotional, as well as scientific, issue. We can only run 1.5 kW output (legally), and improve our receivers until we hear atmospheric noise. After this, we can't make any more station improvements. But most of us can improve our antenna systems until we run out of space, and those living on large lots can do a great deal in this area.

In Don's case, my recommendation would be to add another "Jr. Boomer" to the one he already has. The KLM 16LBX and Cushcraft 4218XL are wonderful antennas, but they generate all that gain by narrowing the front lobe to what I consider an uncomfortably sharp pattern for general tropospheric work. Stacking another 14-element "Jr. Boomer" above the one Don already has is less expensive than buying a new long-boom antenna, will yield similar total gain, and has the advantage of maintaining a reasonable horizontal beamwidth. Personally, I've never especially liked long-boom antennas for general-purpose work. Moonbounce enthusiasts need the narrowest (and cleanest) forward pattern possible, but those of us interested in terrestrial work, contesting, rag chewing, etc., are better off, I feel, with broader antennas. One good way to maintain a reasonably broad horizontal lobe while maximizing forward gain is to stack antennas vertically (one above another).

Don also asks, ". . . what is an acceptable material diameter and wall thickness for (an) H-frame? I have searched the literature I have at hand (and found) too many generalities, not enough specific data." This is a problem. Some antenna manufacturers sell complete stacking kits which include all mechanical supporting mechanisms, but most don't, and

leave this to the individual installer. I'm not a metallurgist or mechanical genius, but I have used common sense in assembling stacking frames. My rule of thumb is, if the array sags and looks weak when assembled on the ground on a calm day, it won't survive icing and high winds. We've used 6061T6 aluminum "hollow-bar" material with .125 inch wall thickness and 2 inch outside diameter to construct some pretty mean (good and strong) H-frames. But the materials can be smaller and lighter for 70 cm and 23 cm than that required for 2 meters, and I'd advise the neophyte H-frame assembler to ask the advice and assistance of a local metal fabricating shop. In any case, for a simple H-frame that facilitates stacking four antennas, I'd recommend aluminum materials rather than steel. Once the final configuration is established, have the frame heliarc welded to keep its shape and minimize "bouncing." If you don't know what I mean by "bouncing," you've never constructed an H-frame for 144 MHz!

Larry Jones, WB5KYK, sent a nice letter along with his VHF WPX contest log. He writes, "Let me give you an idea of my location down here in the North Texas Panhandle. My closest local 2 meter operator is 60 miles away and the next one is 90 plus. To the west on 432 my closest neighbor is 90 miles . . . I work DX just to have a local QSO." Well, Larry, I can understand your plight. But think of us poor Northeasterners who have 200 high-powered VHF stations line-of-sight to our antennas. Yes, it's easy to make contacts, but the QRM, desense, and noise can get pretty bad. Many of us use narrow-bandwidth front-ends with helical resonators—or worse, tuned cavities—to protect our sensitive RF stages from total saturation. The grass is always greener . . .

Flemming Larsen, OZ1AXG, writes to comment on the VHF WPX contest: "The concept of the *CQ* WW VHF contest is good, using the prefix of the worked station as (the) multiplier. It breaks the uniformity of the established contests running, but the rules must be changed to make the contest more attractive. The time for the contest should be changed to a 24 hour test, starting at 1400Z . . ." You can't please everybody. We settled on 0000Z start and finish times because this was standard convention for all the DX contests, and allows the contest to be "running" everywhere at the same time. This may not be important right now, but with the next solar cycle peak (expected 1989–1990) we anticipate lots of international contacts on 50 MHz, and these can cross a lot of time zones. So a UTC start and finish time seem justified. 1400Z? I don't know . . . that would be 10 o'clock a.m. here on the east coast, which isn't bad, but it corresponds to 7 a.m. PDT, 4 a.m. in KH6, etc. The VHF WPX Contest Committee is bound to consider all inputs, and the operating period will certainly be discussed.

K2JT of Paramus, NJ wrote a lengthy letter in response to the "Slide Mountain expedition" writeup in the September column. It seems that Joe and several of his friends from St. Peters College (Jersey City, NJ) made numerous trips up Slide Mountain back in the sixties. They had three Field Day efforts and a big June VHF contest effort from Slide, and Joe related some hilarious stories about their adventures. I wish I could repeat Joe's letter here, but space prohibits this. Thanks, Joe, for some real laughs and interesting reading.

Norman Smith, KAØABA, of Lincoln, NE writes to advise that there is a lot of VHF/UHF activity in the Lincoln area, with 19 different stations on 50, 144, 432, and 1296 MHz. He says, ". . . it becomes QRM city when a band opening happens." Tell me about it, Norm (see comments above to WB5KYK). KAØABA also asked about adding a GaAsFET device to the preamp in a Mirage VHF amplifier. Frankly, my advice is, "don't bother." I have several reasons for saying this. First, GaAsFETs are sensitive devices with a fragile diffusion structure. They should be used with "sequenced" relay switching to absolutely prevent destructive energy levels (miniscule) from reaching the device. This would be difficult, but not impossible, if the device was installed in the Mirage amp. Next, Norm was referring to a 2 meter amplifier. To this I say, "Why use a GaAsFET on 2 meters, until every other aspect of the receiver is optimized?" Nobody really needs a 1 dB noise figure on 144 MHz, as you can hear atmospheric noise at this frequency with a 2 dB noise figure. Since this is the limiting factor in receiver sensitivity, why put so much emphasis on low-noise front ends? I'd recommend anyone wishing to improve receiver performance first install the lowest-loss feedline possible, then evaluate the station receiver for IMD performance (or saturation level, a related parameter), synthesizer noise, IF filter response, etc., and then, when everything else is perfect, install a GaAsFET front end. GaAs devices have so much gain at 2 meters that they tend to overload the stages which follow unless something is done to specifically prevent this. Advanced Receiver Research has some very helpful tips regarding this problem. You might want to write to them for a copy of their GaAsFET preamp installation instructions.

WB4OSN, Margate, FL, writes to remind us that we should leave the "DX Window" on 6 meters clear. Joe says, "Last night I observed quite a few SSB stations between 50.1 and 50.125 MHz. If there had been any Caribbean stations on, I doubt if they would have been able to break through the U.S. chatter." Joe's right. Those of us who are active on 6 me-

ters have a gentleman's agreement to leave this window open for weak DX stations, but we continue to forget. By the way, Joe has 6 meter WAS #198 and has WAC plus 69 countries on 50 MHz. He's using an ICOM IC-551 and intermediate amplifier driving a pair of 3-400Z's, with a pair of stacked 5-element Telrex Yagis at 40 feet. Nice setup, Joe, and congratulations on all the DX! So much for 6 meters being a dead band.

I try not to write about "who worked what" in this column, as Bill Tynan's column in *QST* does a good job of this, and we really don't need to repeat it. But I guess I should mention that July was a great month for VHFers all over our continent, with terrific *E*-skip and tropospheric ducting over long and unusual paths everywhere. Bob and Gracie Hastings, K6PHE and N6FSL, worked KH6IAA on the Big Island of Hawaii on 144 MHz, July 28–29. Bob wrote to tell this story and wonders if Gracie is the first YL to ever make the HI/mainland path on 2 meters. KH6HME made numerous contacts with mainlanders on 144, 432, and even 1296 MHz (!), where Paul completed a two-way with N6CA on 23 cm SSB. Exciting news also came from Tom Harmon, W2CUK, who writes, "Expect you have heard of the opening on 50 MHz from Europe to the southeastern U.S. on 7/30/85 . . ." Yes, I not only heard of it, I heard it going on. While W4's in South Carolina were working the United Kingdom on 6 meters, I was warming up my 6 meter station in eager anticipation of working similar DX. Unfortunately for me, I didn't work anybody, but I did receive reports on 28.885 MHz (the 10 meter international calling frequency for VHF work) that I was being heard in the U.K. Anyway, let me get on with Tom's report: W2CUK in Myrtle Beach, SC worked GJ3YHU, G4IJE, G4GLT, G3MKS, G4BPY, G3COY, G3IMW, and G3PGU all between 2302Z and 2327Z on July 30. Good show! I know I heard other stations in Tom's area making similar contacts across the Atlantic, and these are the first contacts this year I know of between the southeastern states and Europe on 6. Tom's running an FT726R and Mirage A1015 amplifier to a 3-element beam at 33 feet.

Russ McKay, WA2CBU, of Pittsford, NY writes to let us know he's active with the Henry Radio 2002 and 2004 kw amplifiers for 144 and 432 MHz and is running 250 watts on 6 meters. Russ requested we devote some column space to VHF contest operating tips. As his is not the first request I've received for this material, I promise to write something on contesting. Look for it in a coming issue.

News of Reviews

Since I wrote the GaAsFET preamp reviews which appeared in the October column I've been flooded with requests to review more VHF/UHF equipment. At this time I'm evaluating the SSB Electronics LT23S 1296 MHz linear transverter, the Mutek Ltd. GFBA144E mast-mounted GaAsFET preamp/sequencer for 144 MHz, the SSB Electronics MV144S GaAsFET preamp/sequencer for 144 MHz, the ARR P50VDA/R50VDG low-noise 50 MHz receive converter, and the brand-new F9FT "Tonna" 55-element Yagi for 1296 MHz. All these items are either in my shack or at a nearby RF lab undergoing tests which I cannot perform at home. Also "on its way" from Henry Radio is a new model 2002A kilowatt amplifier for 144 MHz. This is a new design which replaces the old 2002, and it uses a 3CX800A7 instead of the two 8874's contained in the older model. For anyone who wants to know "Where's the Beef?" Henry Radio has also introduced a new line of 2 kw + amplifiers called the 3000 series. The 3006A for 50 MHz, 3002A for 144 MHz, and 3004A for 432 MHz each use an 8877 with 4 kv plate voltage to yield 1000 watts *continuous* output power (2000 watt PEP output). I haven't seen one of these yet, but they are available from Henry and should be making noise off the moon very shortly.

Effective immediately, I'm soliciting *new* VHF/UHF equipment for reviews. Such gear can be supplied by manufacturers or distributors, and will be returned in new condition after evaluation. We're really not interested in equipment which has been on the market a long time, and we surely don't want mysterious gifts appearing at the doorstep! Anyone interested in submitting products for review are urged to *please* write first to let us know of your intentions. We cannot possibly test and evaluate more than one item per month.

Speaking of new gear and product reviews, does anyone own an ICOM IC-1271A (23 cm multimode transceiver) yet? I'm glad to see the rig's introduction and eagerly await its hoped-for companion, the IC-371A for 220 MHz. Before I QRT this month, please let me thank Tom, KQ3R, of the VHF Shop in Mountaintop, PA for supplying evaluation samples of Mutek and SSB Electronics equipment (and the F9FT 55-el 23 cm Yagi) for review, and Ray Polen, W2WCF, Chief Engineer at Boonton Electronics Corporation, Randolph, NJ for allowing me the time and space to make performance measurements in the well-equipped laboratory there.

Late-Breaking Info

Jerome Doerrie, K5IS, of the SWOT group, writes to advise us that his group is sponsoring a 2 meter QSO Party (more like a "sprint") from 1900 to 2300 hours local time on Monday, December 2. They recommend using SSB or CW to make contacts below 144.3 MHz, exchanging callsigns, SWOT numbers, and grid squares. Contacts with SWOT members count 3 points each; non-members count 1 point each. The score is the points total times the total number of grid squares worked. SWOT is awarding certificates for high score in each state, and each participant submitting a log will be entered in a drawing for a prize of a Bencher keyer paddle. Logs must be mailed by January 1, 1986 to K5IS, Route 2, Box 72, Booker, TX 79005. Thanks, Jerome, for the info and the contest.

73 and happy VHFing!

Steve, WB2WIK

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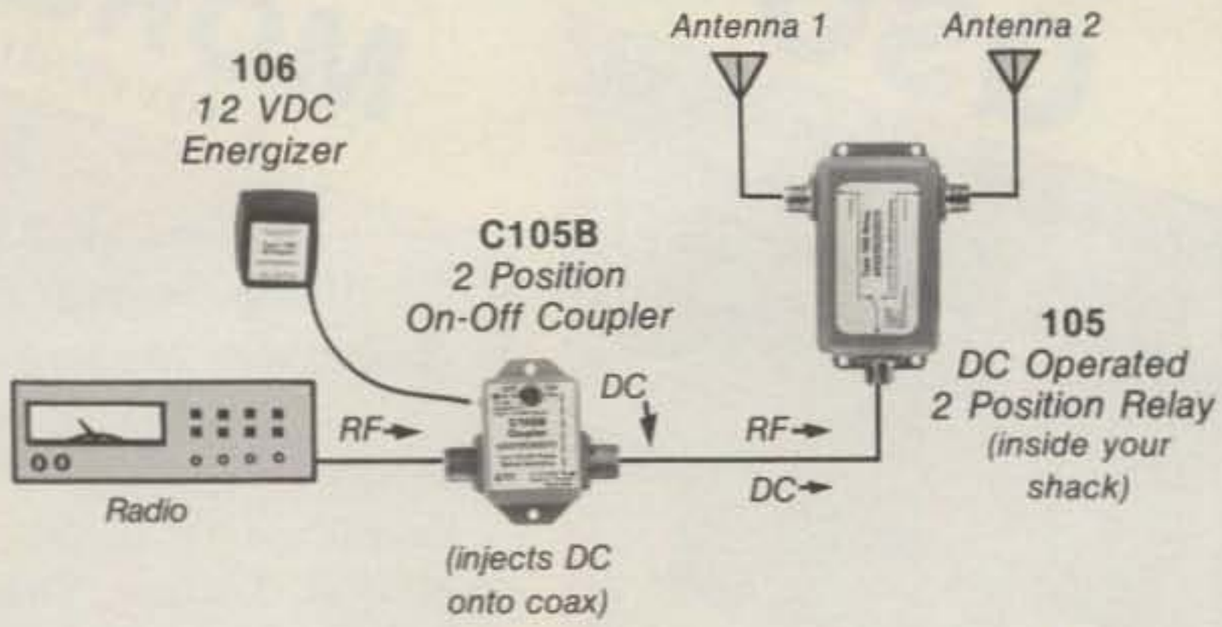

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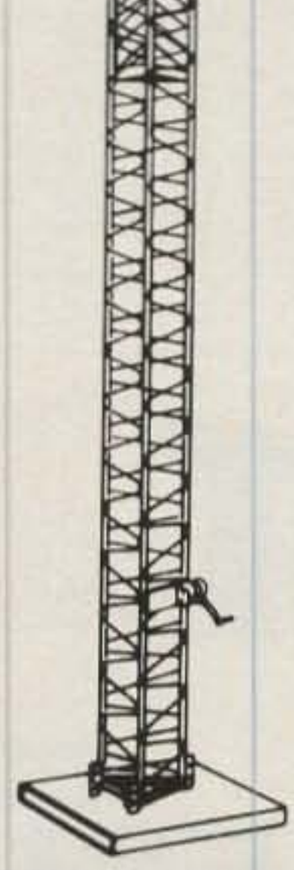
LET US BID A FREIGHT PREPAID HY-GAIN TOWER-ANTENNA PACKAGE FOR YOU.



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UNR-Rohn FREE-STANDING:

Todays best buy in towers. rated at 10 & 18 sq. ft.

HBX-40	$198.00
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FOLDOVERS:

FK2548	$849.00
FK2558	910.00
FK2568	959.00
FK4544	1169.00
FK4554	1259.00
FK4564	1349.00

Fold-overs shipped freight prepaid. Prices 10 percent higher in western states

GUYED TOWERS:

25G section	$47.50
25AG3 top	59.90
25AG4 top	64.00
45G section	109.00
45AG3 top	116.00
45AG4 top	116.00
TB-3 Bearing	49.00

Hy-Gain CRANK-UPS:

Hy-Gain is now the name in crank-up towers. Shipped freight prepaid!

HG-37SS	CALL
HG-52SS	
HG-54HD	
HG70HD	

WIRE & CABLE

COAX:

RG-213/U	$0.29/ft.
RG-8/U	0.28/ft.
RG-8/U foam	0.27/ft
RG-8X	0.16/ft.

ANTENNA WIRE(solid):

12 ga. Copperweld	$0.12/ft
14 ga. Copperweld	0.10/ft
450 ohm ladder line	0.10/ft

ROTOR CABLE:

Std (6-22, 2-18)	$0.19/ft
Hvy (6-18, 2-16)	0.34/ft

BELDEN

RG-213/U	$0.40/ft
RG-8/U	0.32/ft
RG-8/U foam	0.35/ft
RG-8X	0.18/ft
RG-11A/U	0.36/ft
9913	0.42/ft

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HT 2KW	29.00
RT 200W Dlx	28.95
HV 2KW Dlx	31.95

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7'' end insul	4.95/pr.
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ROTORS

TELEX-HY-GAIN

CD54II	CALL
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ELECTRONIC QSL: Versatile menu-driven program for Commodore 64 and 1541 disk drive, printer optional. Allows the user to add, change, delete, inquire, and prints contacts. Retrieves contacts through 13 different options. 500 contacts per disk. $9.95 plus $2.00 postage and handling. Micro Tech Enterprises, 6431 La Cienega Drive, North Highlands, CA 95660.

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AMATEUR radio exhibit of National, Hallicrafter, and other early receivers, including broadcast. Early parts and tubes. Spark and tube-type transmitters, telegraph station, and keys. Write: Bruce Kelley, W2ICE, RD #3, Holcomb, NY 14469.

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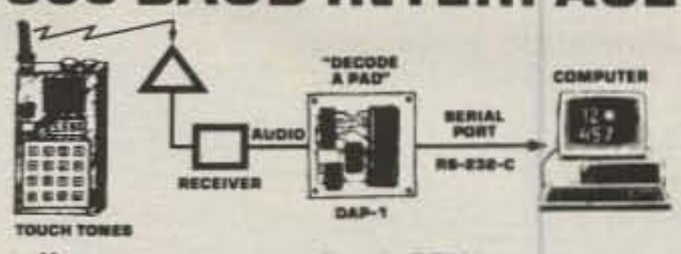

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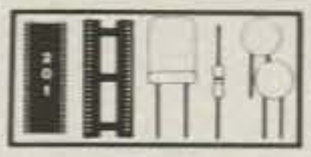

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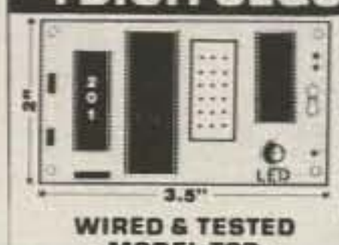
4 DIGIT SEQUENCE DECODER



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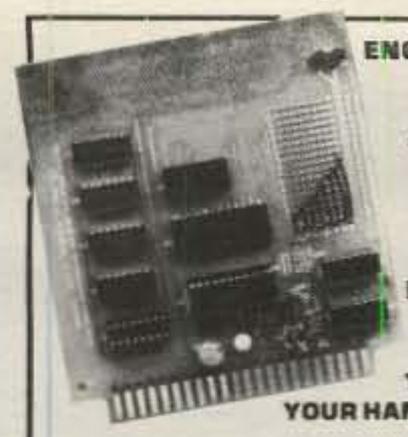

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TUNE THE WORLD FROM YOUR HANDHELD VHF/UHF RADIO

- Audio tones from any source, are converted to solid state switches which control any 16 digit keypad of a radio or other device.
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FOR SALE: Heathkit General Course and TET 2-element 40M beam. U pick up, 1-219-278-7808. KA9EWB, Ken Wolfe, Box 134, Buffalo, IN 47925.

DRAKE TR4 with new spare finals, mike, power supply, recently serviced, $279. Dave, WD4NSF, 904-268-2953 after 10.

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FOR SALE: New and like-new paradyne hi-speed synch/asynch modems ($125.00), cables, accessories, connectors. For list and details call 718-592-2368.

WANTED: Ads, instructions, and other publications on telegraph, wireless, including ham, keys prior to WW II. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

NEEDED: ICOM SP-2 speaker, Yaesu XF10.8HS Filter Unit, and Yaesu TC-2 2M Converter. C. T. Huth, 130 Hunter St., Tiffin, OH 44883.

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WANTED: Drake L-7 or L-75; Astron VS-35M or SEI SPS-30M, ICOM IC-551D. Sell: Bird 4352 VHF wattmeter $60. Astron RS-12A $50. KØMK, 690 Vermilion Trail, Gilbert, MN 55741.

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SELL: SB-200 Heath linear amplifier. Good working condition. Postpaid $315. Dick Scott, W8FDN, 371 Claymore Blvd., Richmond Hts., OH 44143.

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220 MHz CLEGG FM-76 $125. 440 MHz Yaesu FT-720RU $175. Clem Duval, W8VO, 33727 Brownlea, Sterling Hgts., MI 48077.

WANTED: Cathedral radios, state model and condition. Alan, WB9RAD, 1050 N. Paulina, Chicago, IL 60622.

AMP SUPPLY LA1000 Linear w/extra set new tubes, exc. cond., $290. Hy-Gain AR22XL Rotor w/wire, exc. cond., $40. South River 10 foot roof tripod, new, can't use, $30. All U ship. KA3LNN.

CANADIAN HAMS: Heath HR-1680 RCVR, HS-1661 SPKR, HD-1250 Dipper, SA-5010 Uniatic Keyer. R.W. Boyd, Box 793, STN "A", Montreal, P.Q. H3C 2V5 (514-481-4830 after 18:00 hrs).

OLD RADIO BOOKS: SASE for a list. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

WANTED: 3 sections Rohn 25G tower, rotor plate AS25G, and 5v @ 29a filament xfmr. Con Helber, KØRAX, Star Route 1, Box 96, Middle Brook, MO 63656.

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CIRCLE 52 ON READER SERVICE CARD

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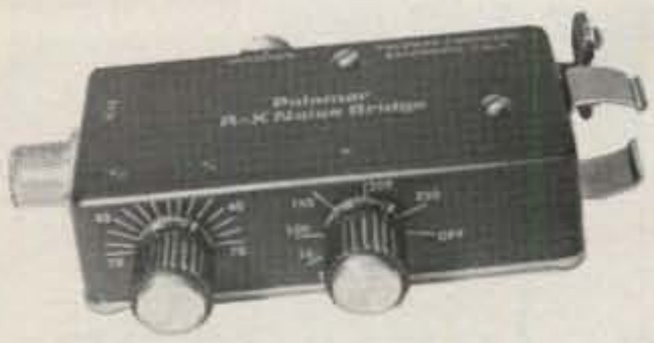

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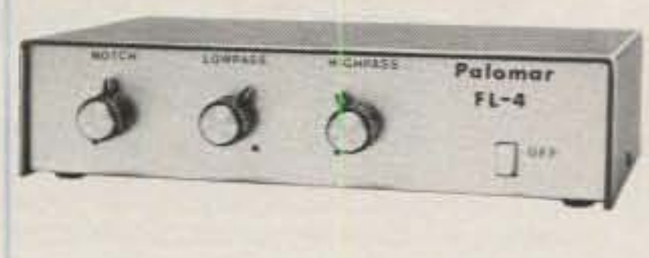

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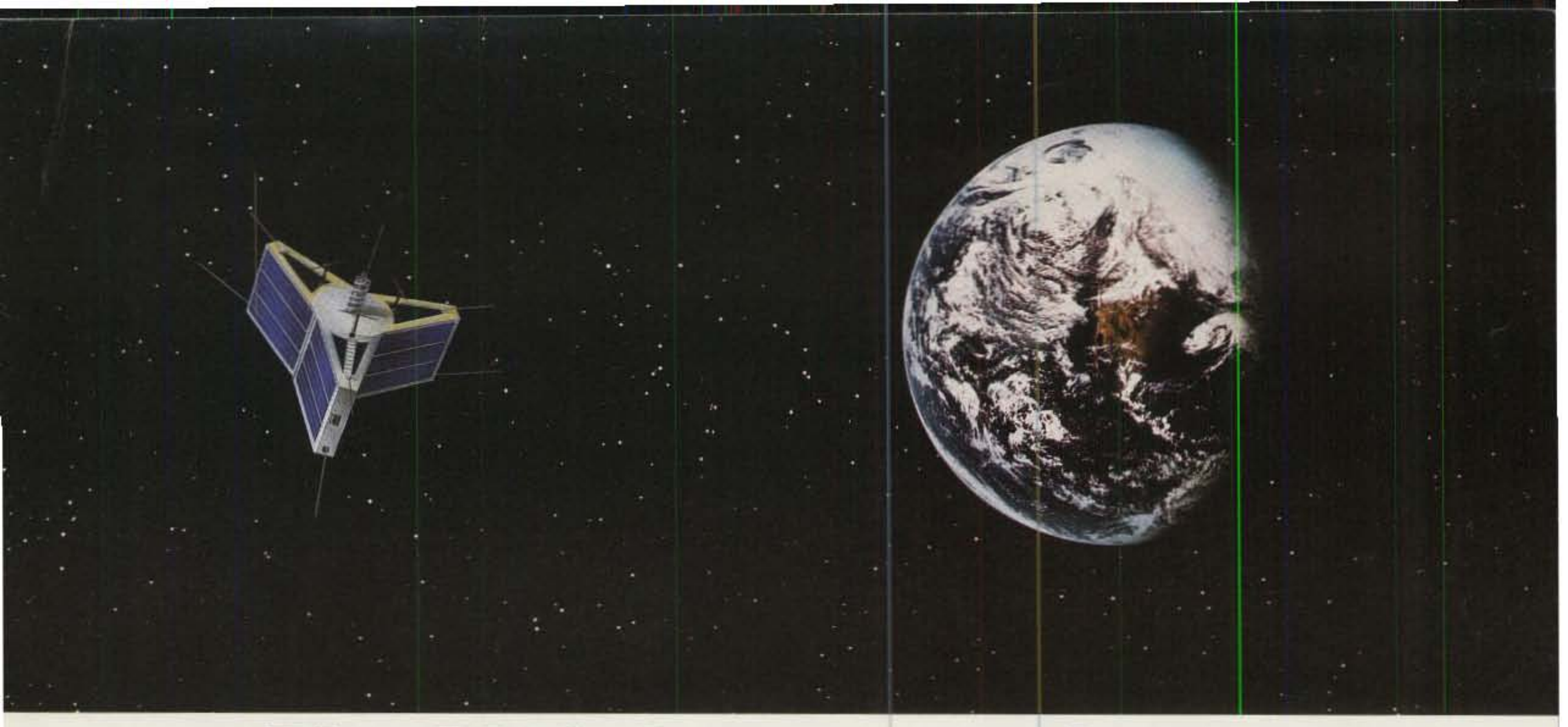

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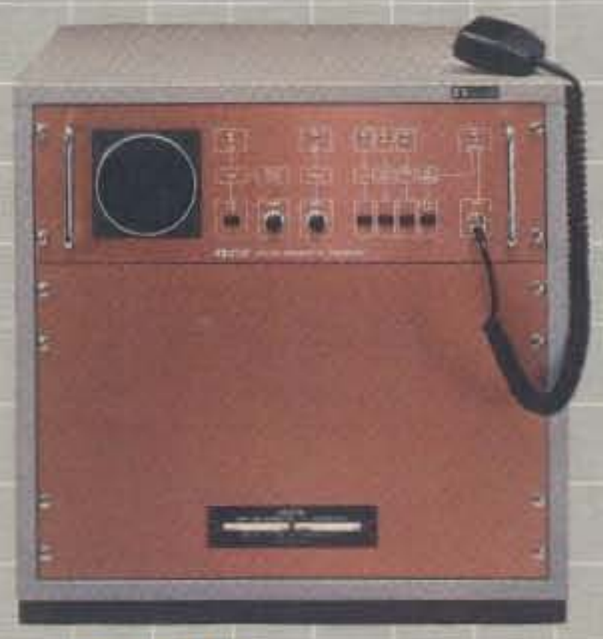

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