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THE RADIO AMATEUR'S JOURNAL

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IF shift, digital display, narrow-wide filter switch

TS-530S

The TS-530S SSB/CW transceiver is designed with Kenwood's latest, most advanced circuit technology, providing wide dynamic range, high sensitivity, very sharp selectivity with selectable filters and IF shift, built-in digital display, speech processor, and other features for optimum, yet economical, operation on 160 through 10 meters.

TS-530S FEATURES:

- **160-10 meter coverage, including three new bands**
  Transmits and receives (LSB, USB, and CW) on all Amateur frequencies between 1.8 and 29.7 MHz, including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- **Built-in digital display**
  Large, six-digit, fluorescent-tube display shows actual receive and transmit frequencies on all modes. Backed up by analog subdial.
- **IF shift**
  Moves IF passband around received signal and away from interfering signals and sideband splatter.
- **Narrow/wide filter combinations**
  Any one or two of three optional filters . . . YK-88SN (1.8 kHz) SSB, YK-88C (500 Hz) CW, YK-88CN (270 Hz) CW . . . may be installed for selecting (with "N-W" switch) wide and narrow bandwidths on CW and/or SSB.
- **Wide receiver dynamic range**
  Greater immunity to strong-signal overload, with MOSFET RF amplifier operating at low level for improved IMD characteristics, junction FETs in balanced mixer with low noise figure, and dual resonator for each band.
- **Built-in speech processor**
  Combines an audio compression amplifier with change of ALC time constant for extra audio punch and increased average SSB output power, with suppressed sideband splatter.
- **Two 6146B's in final**
  Runs 220 W PEP/180 W DC input on all bands.
- **Advanced single-conversion PLL system**
  Improved overall stability and improved transmit and receive spurious characteristics.
- **Adjustable noise-blanker level**
  Pulse-type (such as ignition) noise is eliminated by built-in noise blanker, with front-panel threshold level control.
- **RF attenuator**
  The 20-dB RF attenuator may be switched in for rejecting IMD from extremely strong signals.
- **Optional VFOs for flexibility**
  VFO-240 allows split-frequency operation and other applications. VFO-230 digital VFO operates in 20-Hz steps and includes five memories and a digital display.
- **RIT/XIT**
  Front-panel RIT (receiver incremental tuning) shifts only the receiver frequency, for tuning in stations slightly off frequency. XIT (transmitter incremental tuning) shifts only the transmitter frequency, for calling a DX station listening off frequency.

More information on the TS-530S is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

Matching accessories for fixed-station operation:

- SP-230 external speaker with selectable audio filters
- VFO-240 remote VFO
- AT-230 antenna tuner/SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- VFO-230 remote digital VFO with 20-Hz steps, five memories, digital display
- TL-922A linear amplifier
- SM-220 Station Monitor
- KB-1 deluxe VFO knob
- [illegible] phone patch
- [illegible] headphones
- HC-10 digital world clock
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters and YK-88SN (1.8 kHz) SSB narrow filter
- MC-30S and MC-35S noise-canceling hand microphones

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Specifications and prices are subject to change without notice or obligation

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NEW

BIG performance... small size... smaller price!!!

TR-2500

The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

TR-2500 FEATURES:

- **Extremely compact size and light weight**
  Measures 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches). Weighs 540 grams (1.2 lbs) with Ni-Cd pack. (Photo shown, actual size).
- **LCD digital frequency readout**
  Easy to read in direct sunlight or dark (with lamp switch). Low current drain. Shows frequencies and memory channels, plus four "Arrow" mode indicators.
- **Ten channel memory**
  Nine memories for simplex or ±600 KHz offset. "M0" memory for non-standard split frequency repeaters.
- **Lithium battery memory back-up**
  Built-in Lithium battery (estimated 5 year life) maintains memory when Ni-Cd pack is fully discharged or removed.

CONVENIENT TOP CONTROLS



- **HI/LO power output selection**
  Allows operation at 2.5 watts or 300 mw RF output.



Actual size

- **Memory scan**
  Scans only channels in which frequency data is stored. Stops on busy channel, resumes scan approximately 2 seconds after signal ceases.
- **Programmable automatic band scan**
  Upper and lower frequency limits and scan steps of 5 KHz and larger (5, 10, 15, 20, 30 KHz, etc.) may be programmed. Scan locks on busy channel, resumes approximately 2 seconds after signal ceases.
- **UP/DOWN manual scan**
  Up/Down manual scan in 5 KHz steps.
- **Built-in tuneable sub-tone encoder**
  Sub-tone encoder, with activate switch, tuneable (variable resistor) to desired CTCSS tone. Optional TU-1 programmable (DIP-switch) encoder accessory available.
- **Built-in 16 key autopatch encoder**
  16 keys provide telephone dual tone modulation.
- **"SLIDE-LOC" battery pack**
  Slides into position, locks into place.
- **Reverse operation**
  Shifts receiver to transmit frequency, and transmitter to receive frequency.
- **Keyboard frequency selection**
  Sets operation frequency across full range.
- **Extended frequency coverage**
  Covers 143.900 to 148.995 MHz in 5 KHz steps.
- **Optional power source**
  Using optional MS-1 mobile or ST-2 AC charger/power supply, radio may be operated while charging. (Automatic drop-in connections.)
- **High impact plastic case**
  Provides extra strength to resist damage.
- **Battery status indicator**
  Flashes to indicate low battery charge level.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.

Standard accessories included:

- Flexible rubberized antenna with BNC connector
- 400 mAH heavy-duty Ni-Cd battery pack
- AC charger
- Plugs for external microphone and speaker

More information on the TR-2500 is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

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Optional accessories:

- ST-2 Base station power supply and quick charger (approx. 1 hr)
- MS-1 Mobile stand/charger/supply
- TU-1 Programmable sub-tone (CTCSS) encoder
- SMC-25 Speaker microphone
- LH-2 Deluxe top grain cowhide leather case
- PB-25 Extra Ni-Cd battery pack, 400 mAH, heavy duty
- BH-2 Belt hook
- WS-1 Wrist strap
- EP-1 Earphone
- _____ RF power amplifier (To be announced later.)



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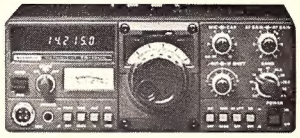
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TR-7850



TS-130S



TR-2400

MIRAGE

B-1016 2 METER AMPLIFIER



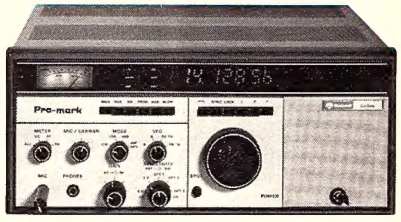
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Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: 516 681-2922. CQ (ISSN 0007-893X) is published monthly by CQ Publishing Inc. Controlled circulation paid at Hicksville, NY and other points. Subscription prices: Domestic—one year $14.00, two years $25.00, three years $36.00; Canada/Mexico—one year $16.00, two years $29.00, three years $42.00; Foreign—one year $18.00, two years $33.00, three years $48.00; Foreign Air Mail—one year $71.00, two years $139.00, three years $207.00. Entire contents copyrighted CQ Publishing Inc. 1981. 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: Dr. Alan S. Chandler, K6RFK, is shown at the workbench making an RTTY contact with a c.w. paddle. For more information, check the article on page 82.

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Zero Bias

AN EDITORIAL

I know that the cover says November, and we should all be thinking of a turkey dinner, and the Phone Contest is theoretically history by now, but for me it's still the beginning of September. I'm writing this still wondering where the summer went and trying to figure out why I didn't get to finish all those things I planned to do this summer. I'm afraid my new antenna will be going up in cold weather (what else is new). I did manage to get the new 110 and 220 lines into the shack, though, along with separate breakers.

A few weeks ago (in August) we were out to Sante Fe Park in Chicago for the Hamfesters annual hamfest. For a one day outing they sure pack 'em in. We had our *CQ* display table next to an FCC display and the League's table. It was simply a great day with beautiful weather. The fleamarket was huge with bargains galore. The only thing I managed to buy was a belt clip for my HT. Everything else I liked was a little too big to fly back with on my lap.

Our September and October travel plans are really hectic at this point as you will see when I report on them later on. So far, the flights we've been on have not really been affected by the strike, nor have we experienced severe delays or rescheduling.

The Medium Is The Message

This month, as you can tell, the major emphasis of *CQ* is on RTTY—not necessarily on the nuts and bolts approach or how to maximize your Model 15, but sort of an overview of what's out there in today's marketplace. There's plenty of good RTTY gear out there resting in garages, sold at fleamarkets, and advertised in the classified sections of amateur magazines. Most of it is still good and will work reliably hour after hour. In fact, some of the gear available has been working quite steadily for 30 or 40 years and is prepared to go another decade or two. Admittedly, some of the newer (or quieter) gear doesn't have the romance attached to it, nor do you have to be a crackerjack mechanic. But all in all, RTTY is fast catching on as a spectator sport. That's right, a spectator sport. A lot of the equipment that is being bought today is used primarily to read or "watch" the mail.

The challenge today is to do electronically what those marvelous, intricate, and ingenious machines did with a sophisticated electronic rather than mechanical approach. The challenge really isn't a challenge; it's an inevitability. Some of the most popular books sold today are frequency lists for RTTY stations, an unheard of concept a few short years ago.

The phrase "the medium is the message" could have had its origin in RTTY, as pictures are literally composed in a paint-by-letters fashion and transmitted regularly. Some classic pictographs exist, and new ones are always in the works. There is even a contest—the RTTY Art Contest—which runs for three months and in which hundreds of amateurs produce countless works of art. By the way, our new WPX Award Manager, Norm Koch, K6ZDL, is part of that Contest Committee. You can write to him for details.

So, if you can let your mind just consider the possibilities, you can see how enticing RTTY can be. Like any other mode, you can get your feet wet for a few bucks or get totally immersed for a few kilobucks. Only your passion can control the checkbook.

Logs, Logs, and More Logs

We seem to have a little conflict of information on just where to send your CQ WW DX Contest logs this year. Ideally, if we had the staff to handle it, they should be sent here. We don't have the in-house staff to spare all the time, and if you've either taken part in or listened in on a contest weekend, you'd quickly realize that if that giant din all decided to send in logs, we would be up to our hip-boots in logs. If you also take into account the fact that the incoming logs overlap both halves of the Contest and most of the envelopes are not marked for which half, then you can get an idea of how fast an ideal situation can break down.

So, to help out all of us and to cut down on the possibility of error, we suggest that you now have the option of where to send your logs. First, you can still send them here, and we will distribute them to the Committee. Second, you can send the PHONE logs *(just the phone logs, please)* to Larry Brockman, N6AR, 7164 Rock Ridge Terrace, Canoga Park, CA 91307. The C.W. logs *(again, just the C.W. logs)* can go to Bob Cox, K3EST, 6548 Spring Valley Drive, Alexandria, VA 22312. *Please* mark the outside of the envelope in clear, easy-to-read block letters as to which contest and which section. Do not put other requests, subscription information, or any unrelated business in these envelopes. They may not be opened for a while.

Second Anniversary

About a week from now as we start on our December issue we will celebrate our second year as a new company here in Hicksville. This will actually be our third December *CQ* under the banner of "The New *CQ*," and we are grateful for all the support we have received these last two years. The hard work and long hours period is far from over (if it ever is), but some of the goals and aspirations are being met already, and the dreams and aims for the future of *CQ* are no longer the impossible never-never-land fantasies.

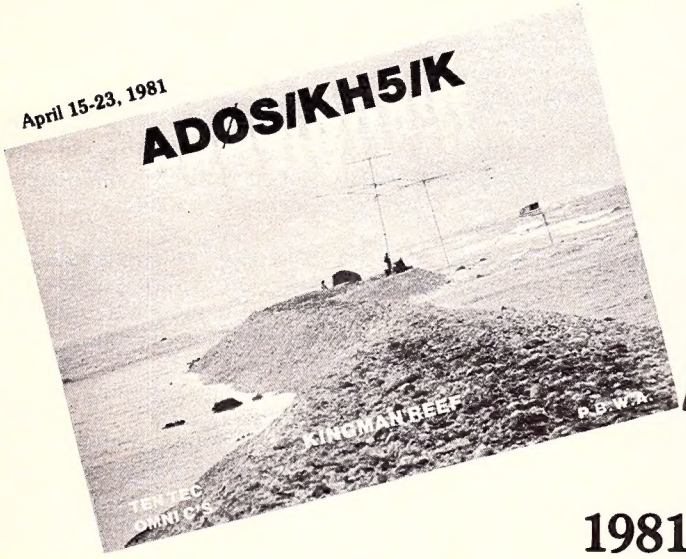
You the reader are making this possible. Our "Say You Saw It In CQ" campaign is working, and we thank you for complying. Please keep it up. In a recent independent survey by a distributor (who advertises in all of the amateur magazines) *CQ* placed *second* as the source of the ad that resulted in a particular purchase. In fact, *CQ* scored as much as the other runners-up put together. The data was circulated by the magazine that came in first (no names, please, but they are located in Newington). I've run through enough airports lately to do an Avis car commercial, and we are trying harder, but I think we've got quite a way to go yet with regard to "Hertz."

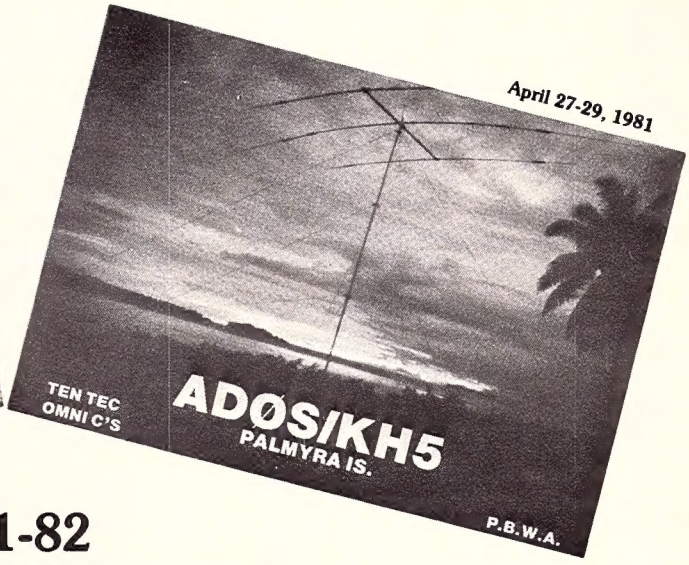
I'm looking forward to our third year and what it has to bring. I know we have a lot of new and exciting plans in the works, so keep reading *CQ*, tell your friends about us, and support our advertisers.

73, Alan, K2EEK

Say You Saw It In CQ

"all other gear gave us trouble... the TEN-TECs just kept working great."





1981-82 Trans Pacific DX Expedition used TEN-TEC OMNI-C transceivers.

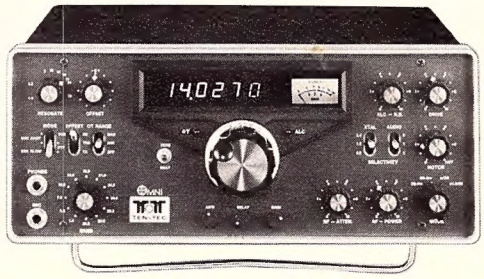
KINGMAN REEF, PALMYRA, TOKELAU — 33,000 contacts without a miss.

As George Carleton (ADØS ex KH5K) said in a letter to TEN-TEC... *"12,100 QSO's from Kingman, 8100 for me, 3100 in the first sitting with the rig on a continuous 33 hours except for 2 minute gas breaks... all other gear gave us trouble due to salt spray – the TEN-TECs just kept working great.*

"This is the most QSO's ever from Kingman and all were barefoot. A few times generators ran out of gas during rainstorms with rigs operating on TX... no problem with voltage drop, and no damage. No tuners were used... only your rigs and (antennas). The wind blew continuously from 20 knots to 50-60 knots and we literally had to open the tent to let the rain out, salt water and spray everywhere, watches quit, keyers and linear (other brands) quit after the first QSO – arcing due to salt spray, but the TEN-TECs never even got warm when the tent was around 100°F.

"... American gear is best."

The TEN-TEC OMNI-Cs went on to serve on Palmyra and Tokelau with equally impressive results and we thank the group for their letters—we couldn't have said it better.



The spectacular performance of the TEN-TEC OMNI-C results from these fine features:

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Announcing

● **Auctionfest 81** - The 24th annual Auctionfest 81, sponsored by the Massillon ARC, will be held on Sunday, November 8th, from 8 a.m. to 4 p.m. at the Massillon Knights of Columbus Hall on Cherry Road, Massillon, Ohio. Auction begins at 11 a.m. Dealer tables, $3. Tickets are $2.50 in advance, $3 at the door. For more information contact Steve Nevel, WD8MIJ, 1864 Massachuets Ave. SE, Massillon, OH 44646. (Include an s.a.s.e.)

● **Fort Wayne Hamfest** - The Allen County Amateur Radio Technical Society will hold the 9th annual Fort Wayne Hamfest on November 15 from 8 a.m. to 4 p.m. at the Allen County Memorial Coliseum, Fort Wayne, Indiana. Large flea market, forums, door prizes. Tickets $2.50 in advance, $3 at the door. Talk-in on 146.28/.88. Tables are $6, premium tables, $20. For more information or preregistration, contact Allen County Amateur Radio Technical Society, Inc., P.O. Box 10342, Fort Wayne, IN 46851, Att: Hamfest Committee.

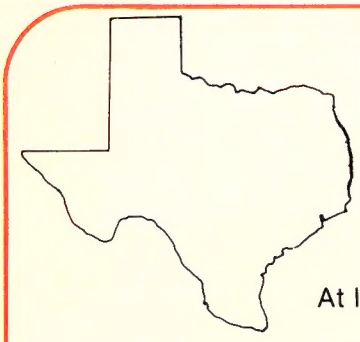
● **R.F. Hill ARC Hamfest** - The R.F. Hill ARC's 5th annual hamfest will be held on November 8th in the Sellersville National Guard Armory, Sellersville, Pennsylvania. Doors open at 7 a.m. for sellers and 8 a.m. for buyers. Talk-in on 28/88 and 52. Prizes, refreshments. For further information, contact R.F. Hill ARC, Box 29, Colmar, PA 18915.

● **Plymouth Special Events Station** - A Special Events Station will be sponsored by the Whitman ARC and Plymouth Plantation on Thanksgiving Day, November 26th. A certificate will be issued to any amateur (foreign or domestic) who makes contact with this station which will be on the air from 9 a.m. to 3 p.m. Frequencies will be 1400–1500 UTC 21.260 (England only); 1500–1700 UTC 7.280 ± QRM; 1700–2000 UTC 21.385 ± QRM. To receive a certificate, send proof of contact and a 9″ × 12″ s.a.s.e. or $1 to Whitman ARC, Box 48, Whitman, MA 02382. For more information, contact Ed Hommel, KA1CZS at the above address.

● **Alford Memorial Radio Club 9th Annual Hamvention** - This event will be held November 14–15 at the Stone Mountain Inn, Stone Mountain, Georgia. Dealer displays, large fleamarket. Talk-in on 146.16-146.76 and 146.52 simplex. Donation is $5. For more information, contact Carl Nichols, K4ZYK, 1657 Flicker Drive, Jonesboro, GA 30236.

● **Armed Forces Mail Call** - Armed Forces Mail Call will forward Christmas greetings from individuals and groups to U.S. military personnel, including USO's, military hospitals, etc. For information on how to participate in the 7th annual Christmas Mail Call, send an s.a.s.e. to Armed Forces Mail Call, Box 6210, Fort Bliss, TX 79906. If you would like some mail directed to an individual in the military service, send his/her name and mailing address to Mail Call.

To have your announcement appear in CQ, send information 3 months prior to the cover date of the appropriate issue.



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CIRCLE 20 ON READER SERVICE CARD

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- RTTY and CW Identification
- Full 128-Character ASCII
- 110-9600 baud ASCII
- 60-130 WPM Baudot
- 1-175 WPM Morse

Write or call for the DS3100 ASR specifications and see how *YOU* have helped design the new standard in amateur radio terminals.

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The Collins KWM-380.

See it at your authorized dealer before someone else beats you to it. Collins Telecommunications Products Division, Rockwell International, Cedar Rapids, Iowa 52406. Phone 319/395-5963. Telex 464-435.

Rockwell International

...where science gets down to business



CIRCLE 115 ON READER SERVICE CARD

Although this article may at first look like something especially for an s.w.l. and "ahem" not a ham, read it through. More and more amateurs are finding their way to RTTY via s.w.l.ing than ever before. It's another way to read the mail on a much grander scale.

RTTY At A Glance

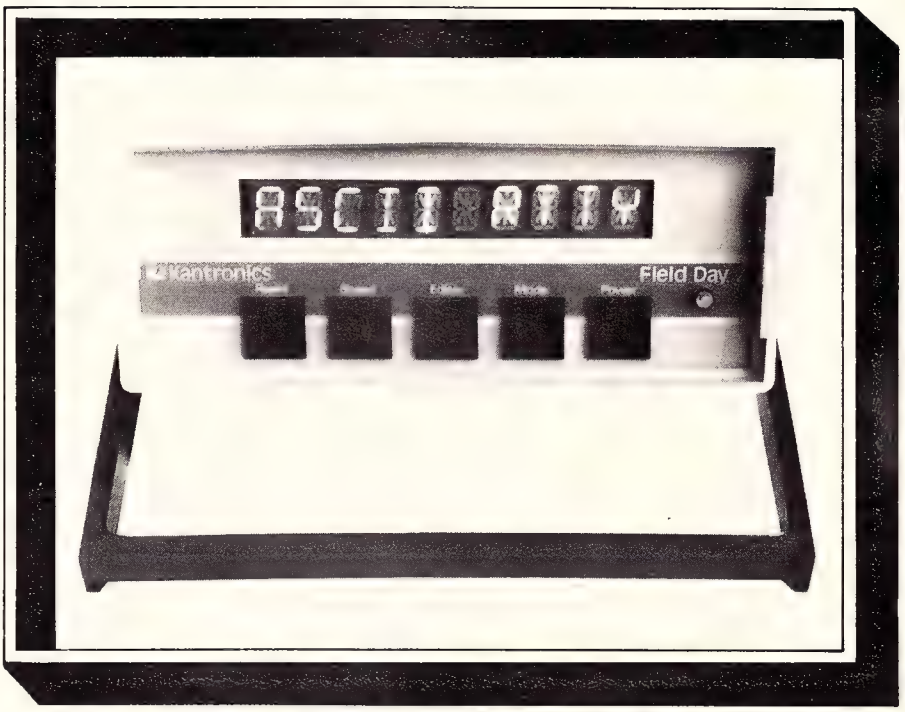
The Art of Visual Shortwave Listening

BY JOHN EDWARDS*, KI2U

Groans, rumblings, squeaks—you hear them all over the shortwave bands. Have you ever wondered what lies behind those strange noises? What sort of secret messages, military orders, and press bulletins are being passed right under your very nose? Well, thanks to the world of the microcomputer, those "secret" transmissions don't have to remain hidden to you.

Radioteletype messages (RTTY for short) are what most of those funny noises carry. It's the medium used by everyone from governments to big business to send written information across continents and around the world. In the past, to decode these transmissions, you would have had to have purchased a large, bulky mechanical Teletype® machine (like the ones you've probably seen on TV news programs) to decipher RTTY broadcasts. Weighing a couple of hundred pounds and costing, when new, over a thousand dollars, this wasn't a very reasonable choice for most shortwave listeners. So, formerly, the average radio hobbyist had to either content himself by listening to voice transmissions or, when he was skilled enough, to Morse code.

Yet, when it comes to interesting or secret transmissions, the majority are found on RTTY. The reason for this is simple. Morse code is very slow, and as far as voice is concerned, if you're passing military orders, newspaper articles, or telegrams, you're going to want a written copy (hard copy, in RTTY jargon) to use for future reference or to pass along to other interested parties. In short, voice is fine for entertainment programs and other information directed toward the casual listener. However, when it comes to the juicy stuff, RTTY is in a class by itself.



Taking a cue from Times Square, Kantronics' Field Day 2 Morse, Baudot, and ASCII reader marches RTTY information across 10 LEDs.

Now that we've convinced you RTTY s.w.l.ing is a fun and exciting pastime, the only problem is how to get started. Well, with the old mechanical monsters being replaced by new, efficient microcomputer gear, getting started is easier than ever. As a matter of fact, if you already own a microcomputer, your RTTY system is almost complete. All you'll need to add is a shortwave receiver and a Baudot to ASCII interface board.

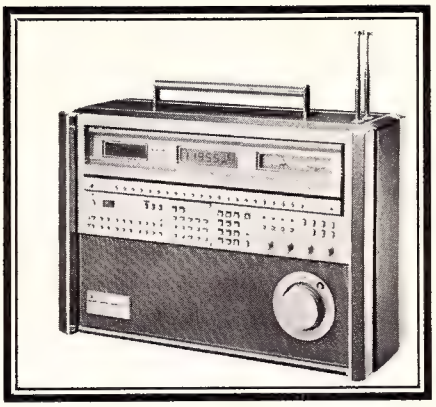
Interface Board

Since most RTTY transmissions are sent in a type of code known as Baudot, not the familiar ASCII, the interface acts as a sort of "translator" for your computer. Why the need for an interface? Well,

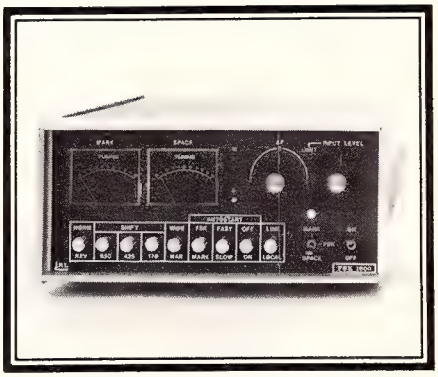
*78-56 86th St., Glendale, NY 11385



The AEA MBA-RO Morse, Baudot, and ASCII reader.



Any shortwave receiver capable of single sideband reception, whether portable (as this digital Panasonic unit) or desk-top, will detect RTTY transmissions.



The Model FSK 1000 made by IRL.

for those of you not up-to-date on your codes, Baudot is a five level information transfer system invented by a Mr. J. M. Baudot around the turn of the century. Over the years this code has become the standard medium through which Teletypes® exchange information, both over the air and through telegraph wires. For decades Baudot was a more than adequate transmission mode, but with the development of high-speed computers, Baudot's code just wasn't flexible enough to handle the flood of more complex data. Therefore, in the mid-1960s, the eight level ASCII code was created to replace Baudot.

Now all of this history wouldn't be very important except for the fact most RTTY still uses Baudot as its information code, outdated as it is. Because of this, in order for your ASCII-oriented computer to understand what your radio is receiving, a Baudot to ASCII interface board is necessary.

Even so, the interface does more than just translate Baudot into ASCII. The unit also acts as a demodulator to change the audio signals from your receiver's headphone jack into the electrical impulses required by your computer, filters out static and interference, and generally serves as a central control point for your entire RTTY installation.

Depending on the exact model, your interface may also include optional features allowing ASCII and Morse reception. While few commercial stations currently employ ASCII as an exchange medium, many amateurs use it to do everything from "rag-chewing" to sending amateur radio news bulletins. You may also be able to intercept some of the homebrew computer programs amateurs enjoy swapping over the air—a great opportunity to expand your microcomputer library. When you get bored with the computer stuff, you can just flip a switch and "look in" on some utility, amateur, or maritime Morse stations—a perfect way to verify these outlets if learning the code by ear has you up a tree!

Installing The Interface

From a purely nuts and bolts standpoint, installing the interface board into your microcomputer system is extremely simple. While the technology involved in creating these units is quite breathtaking, most manufacturers require owners to do nothing more than plug in a few cables. Once you unpack your interface, just follow the enclosed instructions and hook the appropriate leads into your micro's expansion port and receiver's audio jack. Next, merely load the cassette or disk program included with the board, and you're all set. In no time at all, you'll be intercepting messages, reading the latest news hot off the "wire," and discovering an entire new world of shortwave listening.

What's It Going To Cost?

The cost of a microcomputer RTTY system is, quite frankly, formidable. Figure up to $1500 for the 16K microcomputer you'll need to run the interface, and about another $150 to $300 for the board itself. Of course, if you're already using a micro for other applications, your extra outlay won't be too high. Otherwise, buying a computer strictly for RTTY use may be out of the question (it certainly is the hard way), unless you're extremely wealthy or very devoted to s.w.l.ing.

Since all of this technology is still very new (the first interface was only marketed in 1978), one may find prices for interface boards falling dramatically in the near future. But whether you're interested in buying an RTTY s.w.l. system now, or waiting a while until the dust settles, you may like some additional information on specific types of interface systems. Here are several sources of computer RTTY interface equipment:

Macrotronics (1125 N. Golden State Blvd., Suite G, Turlock, CA 95380) currently manufactures interface boards and related microcomputer RTTY gear. For Radio Shack TRS-80 owners, the company offers its M80 interface for $175 and their new terminal system for $499. Macrotronics also sells boards designed for use with most other major microcomputer brands. Prices for these units are comparable with the M80, but can go higher depending on options. A letter or postcard with your name and address will bring you their complete catalog.

DGM Electronics (787 Briar Lane, Beloit, WI 53511) offers their MVD-1000 system which covers Morse and RTTY and sells for $458. It includes many normally optional features as standard equipment, along with a metal cabinet and controls.

IRL (700 Taylor Road, Columbus, OH 43230) produces an FSK-500 RTTY demodulator designed for computer interface that sells for $249 and a more elaborate unit, the FSK-1000, selling for $498.

RTTY Readers

Microcomputer-based RTTY systems are great. But what if you don't own a computer and have no intention of buying one in the near future? Are you shut out from the world of RTTY s.w.l.ing? Not at all. Employing technology similar to that used in microcomputers, a completely new type of RTTY unit has appeared on the market recently—the RTTY reader.

An RTTY reader is just what its name implies: a device that reads RTTY. That is, it takes the audio telemetry coming out of your receiver and converts the information into letters and numerals that run across a row of front panel-mounted LEDS—sort of like that famous news sign in Times Square, only on a much smaller scale.

Purchasing an RTTY reader can make

Some RTTY Stations To Listen For

Station	Frequencies (kHz)	Speed (w.p.m.)
Agence France-Presse	5842	67 Baudot
Associated Press	10649, 6984	67 Baudot
Reuters	6854, 6776, 14516	67 Baudot
United Press Int.	8183	67 Baudot
Weather (L.I., N.Y.)	13624, 8140, 8130	100 Baudot
Weather (Miami)	8138	100 Baudot
Weather (L.I., N.Y.)	12175, 8105, 3224	60 Baudot
ARRL (Ham radio news)	3625, 7095, 14095, 21095	60 Baudot
ARRL (Ham radio news)	3625, 7095, 14095, 21095	110 ASCII Baud
Voice of America	10972, 5460	60 Baudot



Macrotronics' M80 RTTY interface system, as pictured here, sells for $175. TRS-80 and receiver are extra!

a lot of sense to the person with no interest in full-scale computers. Since the reader is dedicated to performing a single task—interpreting RTTY—you're not buying a lot of extra equipment you'll never use. And this trimming of excess gear can total up to a substantial financial savings.

While a micro and interface can cost over $1500, the most expensive RTTY reader runs about $1000 less—still a lot of money, but probably not much more than a good-quality shortwave receiver. Yet, when you consider the number of new listening experiences a reader will uncover for you, the extra expense should be more than worthwhile to an avid s.w.l.

Considerations

A person contemplating the purchase of an RTTY reader has a fairly wide range of options available. He can select a unit that will copy Baudot and ASCII; Baudot, ASCII, and Morse; or Morse alone. One important consideration here is the number of LEDS a unit uses. As you may suspect, the more LEDs, the better. At RTTY's high speed (up to 100 words per minute), the letters can fly by pretty fast. So, if your unit has only four or so LEDS, you may have a hard time keeping up with the message. On the other hand, extra LEDs can greatly increase the price of an RTTY reader. Therefore, at some point, you're going to have to make a trade-off of readability versus cost. To help you in your selection, here are several manufacturers of RTTY readers:

Kantronics (1202 E. 23rd Street, Lawrence, KS 66044) produces the Field Day 2 reader which sells for $449.95 and the Mini-Reader selling at $314.95. These units will display just about every type of RTTY mode found—excluding, of course, scrambled messages. Field Day 2 includes Morse reception of up to 80 words per minute and contains 10 LEDs. At the users' option, two of the LEDs may be reserved to display the speed of the code being received, while the remaining eight continue to decipher the message.

Microcraft (P.O. Box 513, Thiensville, WI 53092) makes two reader models. Its "RTTY Reader" unit uses eight LEDs and copies most Baudot and ASCII speeds. Morse reception is not included on this model and isn't available as an option. The unit is sold in kit form for $149.95, or wired and tested for $219.95.

Microcraft's other reader is the Morse-only "Morse-A-Word." Available with either four or eight LEDs, this model will copy Morse transmissions up to 35 words per minute. Prices for kit Morse-A-Words are $139.95 for the four LED unit, $149.95 with eight LEDs. A wired and tested version, available only in the eight LED configuration, is $219.95. No Baudot-ASCII option is currently marketed.

Advanced Electronic Applications, Inc. (AEA) (P.O. Box 2160, Lynnwood, WA 98036) is the recent addition to the field with their new MBA-RO, Morse-Baudot-ASCII reader, which sells for $299.95. This unit features a 32-character vacuum fluorescent display. The MBA-RO will also measure the speed of the received Morse code signal, up to 99 w.p.m.

Receivers

There's one important element of a computerized RTTY system that we



XZ-2 AUDIO CW FILTER

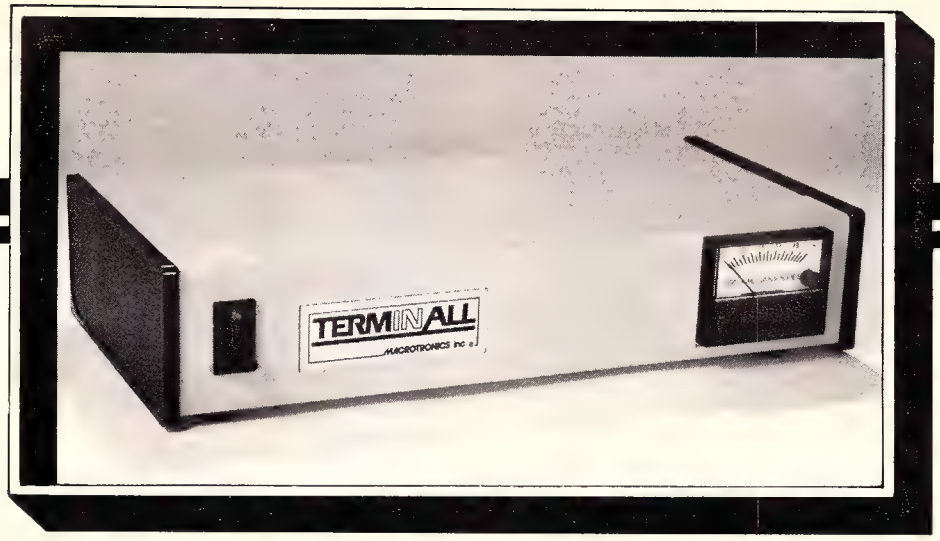
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- 4 active stages, true bandpass filter
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XZ-2 Audio Filter $69.95
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The Macrotronics Terminall unit.

haven't covered yet—the receiver. Generally, any modern shortwave receiver will do. However, there are a couple of critical considerations to take into account.

As you probably know from reading other articles about s.w.l.ing, selectivity (the ability of a radio to reject interference) and stability (the ability of a radio to remain on a desired frequency) are crucially important. When receiving RTTY, these elements take on even added significance.

RTTY signals are extremely sharp, as narrow as 170 Hertz (compared to a.m. voice's 6000 Hertz). So, if you're now using a receiver with a very wide selectivity, or small tuning range, you're going to have a heck of a time tuning in any RTTY stations without bringing in all sorts of other garbage that will prevent your equipment from decoding the main signal. The same goes for stability. If your radio just drifts a few Hertz off center frequency, your microcomputer or RTTY reader is not going to be able to decipher the signal. So when receiver shopping, pay close attention to these statistics. A few extra bucks for a better rig today may save you a lot of disappointment and frustration tomorrow.

Another major factor to consider when looking for an RTTY receiver is its ability to detect single sideband transmissions. Since most RTTY signals are generated by a technique known as frequency-shift keying, as with s.s.b., no carrier is used to accompany the signal. This means if you're using a receiver equipped without a product detector or beat frequency oscillator (b.f.o.), the RTTY transmission will be indecipherable. A rough comparison would be like trying to listen to a c.w. Morse signal on an a.m.-only receiver; it just can't be done.

So dust off your receiver, equip your micro, or get an RTTY reader. There's a whole other side of s.w.l.ing just waiting for you. Now, how much is it going to cost to QSL all of those new stations? CQ



Macrotronics' deluxe RTTY interface system CM80 includes a tuning meter and convenient panel-mounted switches.



The DGM MVD-1000 Morse, RTTY, and ASCII video display.



DRAKE® Theta 7000E Microprocessor-Controlled Communications Terminal

The perfect addition to any amateur radio installation! Complete, automatic send/receive of Morse code (cw) Baudot code (RTTY) and ASCII code (RTTY). Works with any video monitor.



New versatility for the old bear in your station . . .

Suggested List:

Model 7000 **Drake Theta 7000E Terminal $1095.00**

Model 7009 **Drake TR-930 Video Monitor $ 185.00**

7-Channel Battery Back-Up Memory, the Theta 7000E has seven keyboard-selectable, non-volatile, random access memory channels each of which can hold 64 characters. Data in these memories is alterable at any time and is retained when power is removed. Messages in these memory channels can be repeated 1 to 9 times via keyboard command. All channels may be daisy-chained for continuous read-out. Channel number in use is indicated on display.

Wide Range of Transmitting and Receiving Speeds, 5 to 50 wpm in Cw with autotrack on receive. Standard RTTY speeds of 60, 67, 75, and 100 wpm Baudot code and 110, 150, 200, and 300 Baud ASCII code.

Self Contained Demodulator, three-step shift selects either 170 Hz, 425 Hz or 850 Hz shift with manual fine tune control of space channel for odd shifts. High/low tone pair select. Mark only or space only copy capability for selective fading.

CONVENIENT KEYBOARD FEATURES, automatic keyboard-operated transmit, (KOX) or manual keyboard transmit. **Unshift on space,** reverts to LETTERS case after reception of each space character in Baudot code. **CR/LF is automatically inserted** every 60, 72 or 80 characters while transmitting. **Cw identification,** in RTTY mode. **Echo function,** prerecorded cassette tapes can be read and transmitted. **Test messages,** "RY" and "QBF". **Transmit word mode,** characters can be transmitted in word groupings.

CIRCLE 30 ON READER SERVICE CARD

Crystal Controlled AFSK Modulator:

High Tone Pairs	Shift	170 Hz	425 Hz	850 Hz
	Mark	2125	2125	2125
	Space	2295	2550	2975
Low Tone Pairs	Shift	170 Hz	425 Hz	850 Hz
	Mark	1275	1275	1275
	Space	1445	1700	2125

• **Printer Interface for Hard Copy,** all modes for parallel ASCII printers. Loop keyer for conventional teleprinters. • **Composite Video Output,** for any standard video monitor. •**Kansas City Standard AFSK Output,** KCS tone pair for ASCII. • **Large Capacity Display Memory,** two page display memory contains 32 X 16 lines per page. • **Split-Screen,** with a keyboard command, the display can be divided in two; the upper half for transmit and the lower half for receive. Messages can be composed while receiving. • **Buffer Memory,** 53 character type-ahead keyboard buffer. • **Word Wrap-Around,** in receive mode, word wrap-around prevents the last word on a line from becoming split in two. Moves whole word to next line. • **Automatic Letters Code Insertion,** if desired, LETTERS (diddle) code can be transmitted continuously in a pause of transmitting from the keyboard. • **Audio Monitor,** a built-in audio monitor circuit with automatic transmit/receive switching enables checking of the transmit/receive tones. • **Transmitter Keying Circuitry,** keys either grid block, cathode keyed, or solid-state transmitters. • **Power Requirement,** The Theta 7000E requires only 13.6 Vdc @ 1 amp. Plugs into 13.6 Vdc accessory jack on PS7 or PS75 power supplies. • **Effective Packaging for RFI Protection,** well designed metal cabinet and protective circuits prevent RFI. • **Terminal Size:** 15.8″W x 11.8″D x 4.7″H (40 x 30 x 12 cm) • **Weight:** 11 lbs (5 kg) • **Monitor Size:** 8.7″W x 9.8″D x 8.9″H (22.1 x 24.1 x 22.6 cm) • **Weight:** 11 lbs (5 kg)



Model 1230 LA7 Line Amplifier $49.95 Suggested List

Line output, input levels as low as 15 mV rms (47 kilohm) will result in an output of 1 mW nominal into a 600 ohm balanced line. Output level adjustable by internal pre-set level control. Interfaces low level audio to RTTY terminal unit or phone line that requires a 600 ohm balanced/unbalanced input. One 36" phono to phono cable supplied. • **Size:** 4.5″L x 1.3″H x 2.5″W (11.4 x 3.3 x 6.4 cm). **Weight:** .3 lbs. (.14 kg).

Specifications, availability and prices subject to change without notice or obligation.

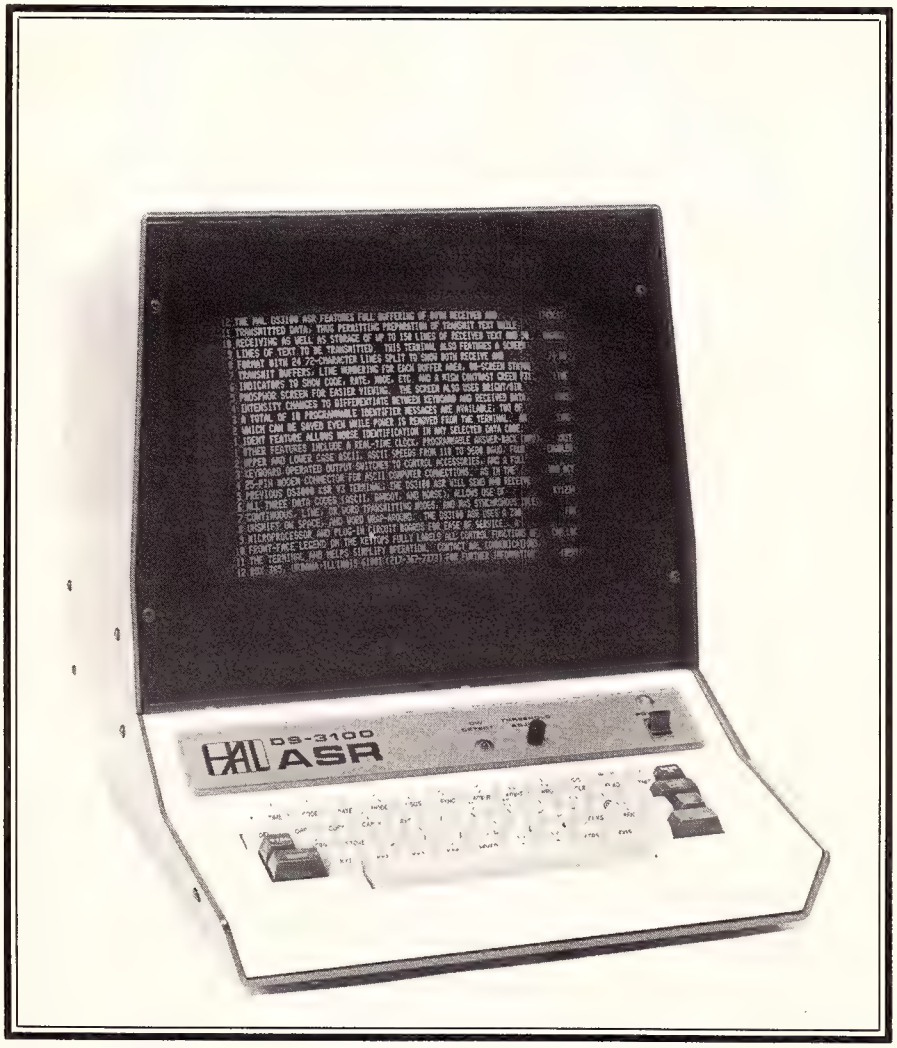
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540 Richard St., Miamisburg, Ohio 45342, USA
Phone: (513) 866-2421 • Telex: 288-017

CQ Reviews:

The HAL Communications DS3100 ASR Video Terminal For C.W. And RTTY

BY H.B. "ROBBY" ROBINSON*, W2SR



The HAL DS3100 ASR video terminal. While the units are shown stacked here, they may be mounted and used as separate units.

The DS3100 is a multimode video terminal designed to provide c.w. and RTTY communications capability. The DS3100 is housed in two attractive light tan and dark brown metal cabinets—one for the 12-inch video monitor and the other for the keyboard and digital electronics. The two cabinets may be connected together or used separately. The metal cabinet and internal bypassing give r.f.i. protection that is not necessarily provided by plastic cabinetry.

The video display has a green phospher (P31) and displays 24 lines of 72 characters per line. The 24 lines may be used to display only receive text or split to show 12 lines of receive text and 12 lines of transmit text. Each line displayed on the screen is numbered along the left-hand margin. When split screen is used, the receive lines number from 1 to 12 from the center of the screen up and transmit buffer lines from 1 to 12 from the center down. The full 150 line receive buffer and 50 line transmit buffer contents may be viewed on the split screen by manipulation of the proper control keys. Text may be transferred from the receive buffer to the transmit buffer with the copy feature, particularly useful when handling traffic messages.

Three cursors are shown on the screen. In the receive buffer, the cursor shows the screen position in which the text received character will appear. In the transmit buffer, one cursor precedes each keyboard entry and another indicates the transmit output character position. When half-duplex is used, the receive buffer shows both received text and transmitted text as it is output; the received text is shown with a brighter intensity than "echoed" transmit text to allow easy distinction between the two. The word wrap-around feature prevents the splitting of words at the end of both received and transmitted lines; rather than split a word, the entire word is transferred to the next line.

The keyboard is arranged in a standard 128 character ASCII format with **SHIFT**, **CTRL**, and **FN** (function) control keys. Terminal control functions are controlled from the keyboard by using the **FN** key with a second key. The **FN** operations associated with each key are labeled by special legends printed on the front face of the keytops. The **NEW LINE** key automatically inserts the correct RTTY end of line sequence (CR-LR-LTRS for Baudot or CR-LF for ASCII). Also, text may be typed without regard to end of line controls, and the proper **NEW LINE** sequence will be inserted at the end of each line.

*1570 S.W. 64th Way, Boca Raton, FL 33433

Say You Saw It In CQ

A total of ten different **HERE-IS** messages may be programmed by keyboard control. Each **HERE-IS** message may be up to 32 characters in length. Longer messages may be programmed by chaining adjacent segments together or by calling one segment from another (call **HERE-IS 8** with the program for **HERE-IS 2**, for example). A separate **IDENT** key will transmit the message stored in **HERE IS 0** in Morse code, even when the terminal is operated in Baudot or ASCII RTTY, allowing c.w. ID of the amateur signal. The contents of **HERE IS 0** and **HERE IS 1** are stored in an **EAROM** (**E**lectrically **A**lterable **R**ead **O**nly **M**emory), as are the initial turn-on conditions of the terminal (**CODE, RATE, MODE, WRU** message, etc.). The **EAROM** storage is non-volatile (the contents remain when power is turned off) and may be reprogrammed by the operator from the keyboard.

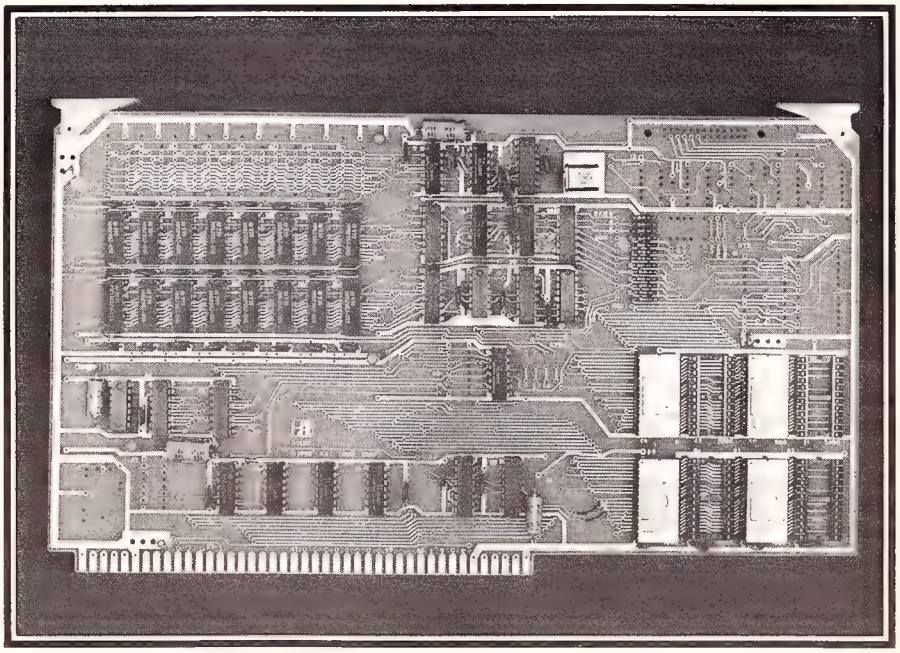
A **WRU** (**W**ho a**R**e yo**U**) answerback and **SEL CAL** (**SEL**ective **CAL**1) printer control feature are also available. The **WRU/SEL CAL** text is programmable (and saved in the **EAROM**); the **WRU** answerback message is the text stored in **HERE IS 1**. The "QUICK BROWN FOX . . ." test message and a line of "RYRYRY . . ." (or U*U*U* . . . for ASCII) characters are programmed into the DS3100 and may be transmitted with the proper **FN**—key combinations.

Along the right-hand margin of the screen are 13 terminal "status indicators" that give the current DS3100 operating conditions. The current time from the DS3100 real-time clock is shown in the upper right location. This time is user programmed in 24-hour format; the time must be programmed each time the terminal is turned on. Other status indicators include code (Baudot, ASCII, Morse), rate (45 to 9600 baud RTTY or 1 to 175 w.p.m. Morse), transmit mode (character, word, or line), unshift on space (**USOS**) for Baudot, synchronous idle, transmit buffer status, **WRU/SEL CAL** status, accessory transistor switch status, half or full duplex (**HDX/FDX**), ASCII capital letters only (**CAP LK**), and an **IDENT** warning to alert the typist if more than 10 minutes have elapsed since he last transmitted a c.w. ID.

Included with the DS3100 was a detailed *Technical Manual* (*book* is more accurate) and a wallet-sized illustrated *Operator's Guide* which carefully and succinctly explained the use of the **FN** key and various terminal features and controls.

The DS3100 was set up with a HAL ST6000 RTTY demodulator and connected to my Ten Tec OMNI-D transceiver. I particularly like the OMNI-D because of its excellent QSK and 100% duty cycle capability for RTTY (not necessarily available on other transceivers).

When power was turned on, the screen lit up with a soft green phospher display of the line numbers and the 13 status indicators. Using the **FN** and other appropriate control keys, the machine was quickly set up for c.w.—my favorite mode!



The optional MSO3100 message storage board or electronic "mail box."

The keyboard escutcheon plate contains a *C.W. Detect* light and a *C.W. Threshold* control. The light flickers in unison with the incoming signal. The threshold control should be centered for an 800 Hz audio tone, the normal center tone frequency for receiver c.w. filters. Once locked-on, a PLL detection circuit in the DS3100 automatically tracks the signal in frequency to compensate for drift. The Morse speed setting in the status indicator shows transmitting speed only; receiving speed is automatically computed to track the incoming signal.

Tuning in several c.w. stations which sounded good proved otherwise when viewed on the screen. Slight miscalculations by the transmitting operator of the spacing between letters and words result in a garbled display; the machine is not forgiving of any sloppy sending! Typically, computer decoded Morse code cannot distinguish between characters when they are run together. When this happens, either the composite character is displayed (if there is a Morse equivalent for it) or no character is displayed. If the display "locked up" and did not respond to the received signal, a touch of the **CLR** key quickly reset the receiving circuitry and copy continued. In spite of these problems with hand-sent code, however, several QSOs were made with very little problems.

It was entirely different when QSOing other keyboard sending stations. It was fascinating to watch the screen—especially with slow sending, since the display is always one character behind the received signal. The delay is built-in to allow the circuitry to determine the anticipated speed of the next character. At 60 w.p.m. the copy moved smoothly across the screen and one could easily imagine it to

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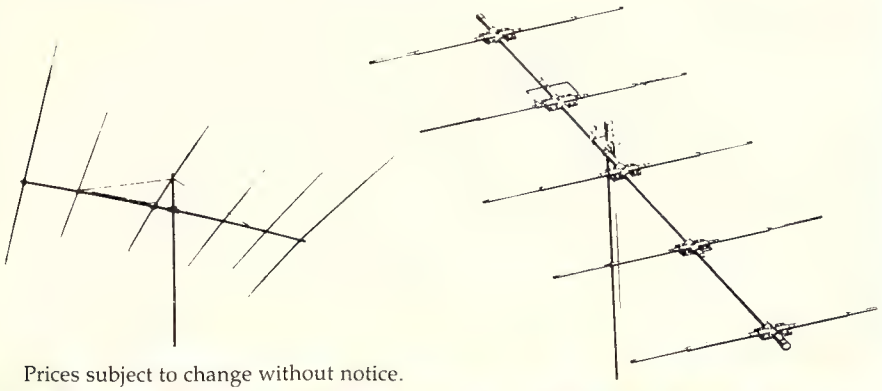
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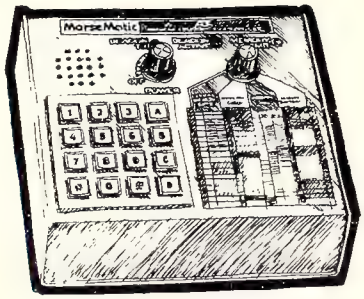
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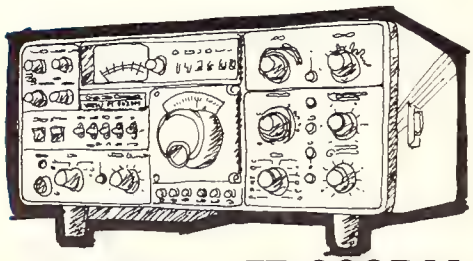


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be the familiar RTTY copy instead of c.w.

Sending c.w. at high speed was no problem. While receiving one can type in up to 50 lines of precomposed text—all ready to go at the touch of the **XMIT** key. If the **XMIT** buffer catches up to your typing, the **SYNC**hronous idle feature comes into play, and during pauses BT is automatically sent. Break-in operation presented no problems. Just a touch of the **XMIT** key puts the machine in the **XMIT INHIBIT** condition until one is ready to proceed.

Overall, c.w. operation with this terminal was a distinct pleasure. Many favorable comments were received on the perfect character formation and the rapid transition from receive to transmit—particularly noticed in QSK-type QSOs. Very surprising were the number of 100 w.p.m. QSOs made and observed. Even with large xmit buffers, there are a lot of "flutter-fingers" using very high speed c.w. And—a lot more easily accomplished with this kind of equipment than in the days of Kleinschmidt perforators and Boehme ink strip recorders.

Switching the unit to RTTY required only changing the **CODE** to Baudot and the **RATE** to 45 Baud. All other parameters in the terminal's status indicators remained the same. Many pleasant QSOs were made in this mode. Having been off the air in the TTY mode for years, I found the urge to return overpowering. For hard copy a printer may be inserted in the 60 ma loop, at the RS232 output, or an ASCII printer may be connected to the DS3100, giving hard copy on Morse, Baudot, or ASCII.

All of the previously mentioned **FN** operations and terminal controls also apply to the use of the ASCII code. While receiving ASCII, the standard cursor manipulation characters are ignored to avoid overprint or erasure of received text. Reception of the **RTN** character (carriage return) or of more than 72 characters in a line activates the word wrap-around feature. The capital letter only feature (**CAP LK**) affects transmission only and all characters are displayed as received, upper or lower case. Unique graphic symbols are displayed for the ASCII control characters. The DS3100 can be connected directly to a computer with a loop connection or through a 25 pin modem connector using RS232 data with "handshaking" control signals.

There is also a message storage option available for the DS3100, the MSO3100. This adds up to 450 lines of mass storage to the terminal for message storage and retrieval (electronic "mail box"). Messages can be written, relayed, or recalled through the DS3100 keyboard or by remote stations through the **WRU**-type circuitry. Control is through commands sent by the user to the MSO3100. The commands are similar to those used for disk file handling in a computer and all start with a left-justified period. The MSO3100 is designed for amateur use, and automatic c.w. identification is provided at the beginning of the first MSO response and the end of each response thereafter. Messages are stored in variable length files with user-assigned file names and passwords for file protection. When a file is deleted, the remaining files are automatically compressed so that all of the remaining storage is available for additional messages. All the features of the DS3100 are also usable with the MSO3100. The unit is a natural for automatic message handling and provides the user with his own "mail-box" to join many others using similar systems to automatically exchange messages. The MSO3100 is available only as a factory installed option in the DS3100.

All in all, it's a very versatile and sophisticated piece of equipment. It also shows the growth in thinking and technology in the few short years since I last reviewed HAL products.[1] The operative word for the HAL DS3100 in the field of amateur communications seems to be "ultimate." For me, it is really the last word.

---

[1]*Robinson, "CQ Reviews: The HAL Communications Dual Mode Keyboard, Video RTTY Display and RTTY Demodulator", CQ, January, 1975, page 48.*

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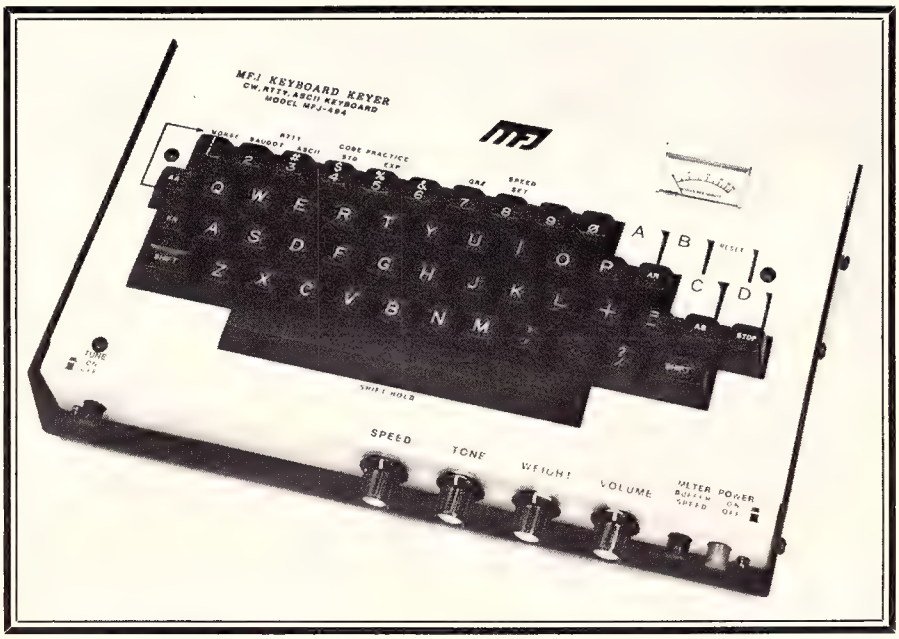
CQ Reviews:

The MFJ-494 and MFJ-496 Super Keyboards

BY JOHN J. SCHULTZ*, W4FA

There is no doubt that the c.w. and RTTY modes have regained a great deal of popularity in recent years. The IC is responsible, of course, since it has allowed the economical construction of sophisticated circuit functions. Single IC keyers, Morse code keyboards, Morse and RTTY decoder/display units, etc., have proliferated. However, many amateurs who have waited a bit to get away from their old mechanical Morse and/or RTTY gear may be lucky. Many amateurs who have followed the developments leading up to today's technology have usually ended up with a half dozen or more individual pieces of equipment for generating various transmission modes, performing control functions, providing extra or add-on memory functions, etc. Today amateurs can get just about any feature desired for Morse or RTTY transmission in integrated keyboard packages.

Some excellent examples of integrated keyboard packages that will perform just about any feat desired for Morse or RTTY transmission are the MFJ-494 and MFJ-496 Super Keyboards. These keyboards represent full-featured units that one can use to replace existing equipment and achieve improved performance, to mention nothing of the tremendous space saving involved. Besides being of interest to the amateur already into RTTY operation, the keyboards also represent an interesting prospect for the amateur who for the present may just want to enjoy the advantages of Morse keyboard operation, but who may have in mind to later expand into all-electronic RTTY operation. Since the keyboards have full RTTY as well as more transmission capability, no further future expense for basic transmission equipment would be necessary.



The MFJ-494 and MFJ-496 keyboards are completely self-contained with all the electronics, including optional equipment, housed inside the cabinet shown. Latter models also include various colored keys for certain functions which makes command entries easier to remember.

The two keyboards are basically similar except that the more expensive MFJ-496 has some expanded message and buffer memory capabilities and special features such as automatic incrementing serial numbers for insertion into contest messages, an automatic repeat function, and a clock option. The differences will be highlighted a bit more later. However, to start from scratch, both keyboards are housed in fully shielded aluminum cabinets measuring about 12″ × 7″ and sloping up from 1¼″ high in the front to 3½″ in the back. The keyboard arrangement for both models is the same and can be seen in the photograph. The units require 9–12 volt d.c. at 300 ma for operation, and this can be supplied by a plug-type power supply. The units as they come are designed for the solid-state c.w. keying of almost any transmitter—tube type using grid block or cathode keying or a solid-state transmitter. TTL compatible output is available on RTTY, and there is a PTT line output to hold down a PTT line when transmitting RTTY. Two optional plug-in modules (which fit neatly into the basic cabinet) provide for extra output options. The MFJ-53 AFSK module provides for an audio tone which shifts a selectable 170 or 850 Hz when the keyboard is used in the RTTY mode (2125 to 2975 Hz or 2125 to 2295 Hz). The audio output produced can be fed into the microphone or auxiliary audio input of an s.s.b. transmitter to produce an equivalent FSK signal. Used in a similar manner with an f.m. or a.m. transmitter, an AFSK signal will be pro-

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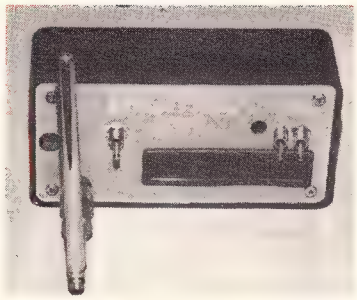
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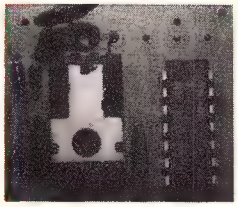
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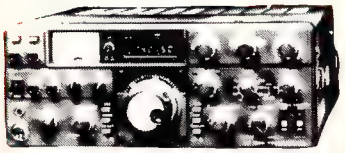
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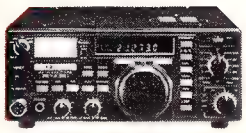
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See you next month!

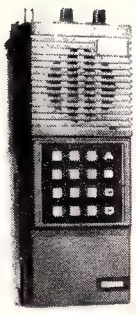
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RG8/u Foam 81VF	8214 36 ¢/ft.	50	1.2	3.9	
		100	1.8	5.9	
		200	2.6	8.5	
		300	3.3	10.8	
		400	3.8	12.5	
RG8/u Regular, 66VF	8237 32 ¢/ft.	100	2.0	6.6	
		200	3.0	9.8	
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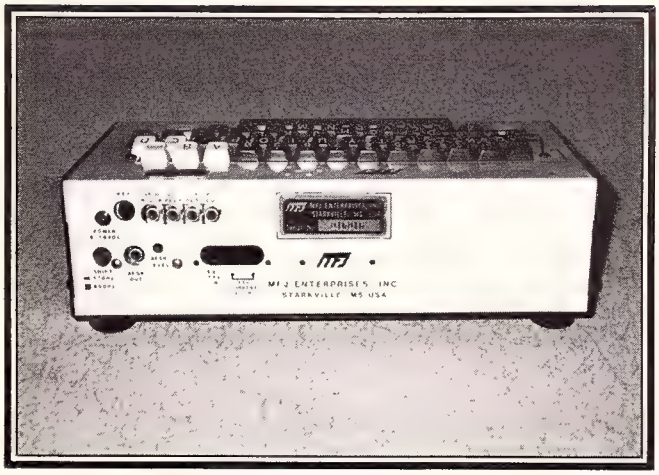
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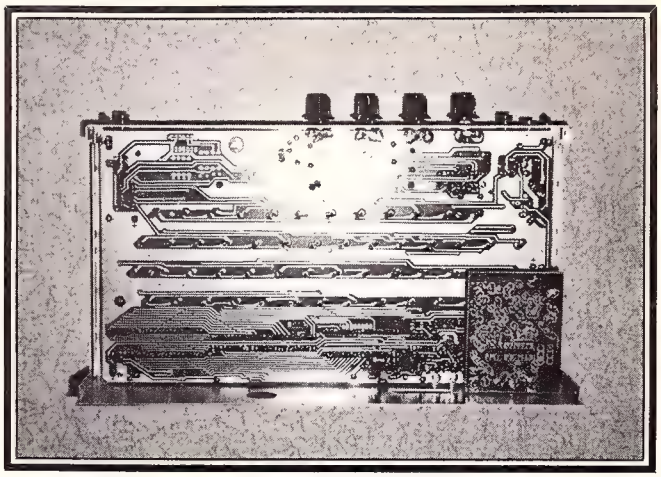
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CIRCLE 95 ON READER SERVICE CARD



Rear view of a keyboard shows provisions for external connections. The optional TTY Loop module has not been installed, hence the blank hole in that position. All jacks are commonly used, standard-size types.



This is a keyboard turned upside down with the bottom cover removed. As can be seen, one master PC board is used with the optional modules (such as the AFSK one shown lower right) plugging into the master board. Component placement (on the other side of the board) is extremely neatly done with all IC's in sockets.

duced. The MFJ-54 Loop Keying module is meant for interface with those noisy, old-fashioned RTTY page printers which require a 300 volt, 60 ma loop for activating their line magnets.

Modes Of Operation

Both keyboards have 5 basic modes of operation:

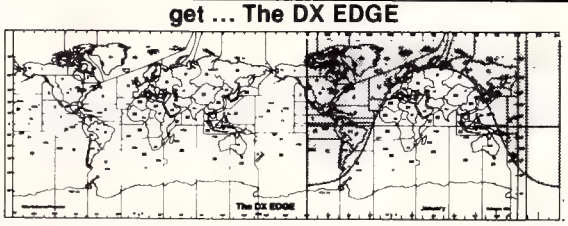
1. C.W. The keyboards are automatically switched to the c.w. mode when turned on. To start sending one simply starts typing on the keys and Morse will be generated at the speed set by the speed control. The weight control can be left for a perfect 1:3:1 dot, dash, space ratio or adjusted for shorter ratios. The volume and tone controls for the internal sidetone monitor/loudspeaker can be set as desired to produce a sidetone pitch from roughly 100 to 3000 Hz and soft to quite loud volume. The meter can be switched in to indicate the approximate transmission speed in w.p.m. on a scale calibrated to 100 w.p.m.

A buffer memory is active as one types c.w. This has a number of useful features. For one thing, it smoothes out keyboard entries, since even by "hunt and peck" key entry one can usually type in transmissions far faster than they would be sent. For example, one might type in "tnx for your call." As long as one hits the "space" bar between words, it doesn't matter if one types in the individual letters for a word with all sorts of varied time spacing between those entries. The internal sidetone is activated by the outgoing signal, and one will hear that perfect Morse is being generated with the letters within a word all correctly time-spaced. The buffer memory can be used in various ways. It can run along with keyboard entries, as just described, or it can be preloaded. To preload it, Shift/Hold is typed, and then the buffer filled with a devised message. The meter can be switched to indicate how full the buffer memory is becoming. The 0–100 scale on the meter now indicates the relative capacity being used up in the buffer memory. Besides the meter indication, a red lamp behind the meter face lights up when the buffer is almost full. Then to send the message in memory, one simply hits the CRTL key. As the message is being sent from memory, one can hold its transmission at any time by using the SHIFT/HOLD key combination and continue it at any time using the CRTL key. If one typed a wrong entry into the memory, there is a delete function. By typing SHIFT/DELETE on the MFJ-496 the last word (back to a "space") will be deleted. The MFJ-494 will delete one character from memory for the same action. The only other difference between the MFJ-496 and MFJ-494 buffer memories is that the former has a 256 character capacity, while the latter has a 50 character capacity (a character being one key stroke function such as a letter, number, or punctuation). One should not, by the way, confuse the buffer memory action with the programmable message memories in the keyboards. The buffer memory entries are lost once they are transmitted. The programmable message memory entries are retained for repeated transmission until they are replaced by new entries.

The MFJ-494 has two programmable message memories (total of 30 characters), while the MFJ-496 has four memories (total of 256 characters). These memories are freely loadable with whatever message one wants to type into them. However, the memories are "soft partitioned" which has an advantage in that the total memory capacity is dividable any way one desires among the two or four message memories. But, if one changes the message in any one memory section (unless the new message is of exactly the same length as the existing message), one must reload all the following memory section. Loading messages is simply done by keyboard commands. To transmit a loaded message only a sin-

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CIRCLE 68 ON READER SERVICE CARD

gle key has to be depressed. The contents of any message memory can be repeatedly sent by striking a single message recall key repeatedly, or in the case of the MFJ-496, there is an automatic message repeat capability. The 496 can be set to repeat any message memory continuously with any presettable interval between repeats of from 1–99 seconds by suitable keyboard entry commands. The continuous repeat can be aborted at any time by striking the SHIFT key.

Besides the programmable messages, there are also preprogrammed automatic messages available. These are CQ CQ DE, CQ TEST DE, QRZ and DE. By one or two key commands, the desired automatic message will be sent followed automatically by whatever one has loaded into the first programmable message memory (normally one's station callsign). One can, of course, repeat the messages as often as desired.

If all of the foregoing weren't enough, there are special key entries to produce AR, AS, BT, KN, and SK. Some of these special key entries are quite useful when only a single key has to be depressed, such as the dash key (–) to produce BT. However, some outputs require two key depressions such as SHIFT and the number 3 for SK. While it is true that a proper SK is produced this way, most users will probably tend to type out SK on the letter keys (which will produce an S and K which do not run together) rather than remember the special key entries. The MFJ-496 also has additional key command entries to produce 12 special European and commercial characters (e.g. ä, ñ, ü).

Finally, need to tune up or want to preset the c.w. output transmission speed? Yes, there are some more special key entries for these functions. Typing CRTL and 9 will produce a continuous string of dots to facilitate tuneup without overheating transmitter final stages (there is also a simple "tune" switch which holds down the keyline continuously). Depressing the CRTL key and the 8 key produces a steady meter reading so the transmission speed can be set by the speed meter reading using the speed control.

2. Keyer Mode. The keyboards are, of course, completely self-contained for c.w. keying, but it is often handy to use a paddle in conjunction with such a keyboard. Either keyboard will accept a paddle and function as a regular electronic keyer. All four front panel controls are active, and iambic operation and dot/dash memories are provided. One can send from the paddle or from the keyboard as desired. This is handy for traffic work, for instance, if the buffer memory contents are being transmitted and a station breaks in. One can stop memory transmission and fill in repeats via the paddle before continuing memory transmission. One can also follow a repeated automatic or memory message transmission by a paddle transmission. The only thing one cannot do, however, is to load the buffer or message memories by paddle transmission.

3. Morse Code Practice Mode. By suitable keyboard entry one can call up either one or two modes of random code practice. One mode is true random where the sequence is in groups of random length which never repeat in the same way. The other mode is pseudo-random where the groups are all of five characters and repeat exactly after going through a list of 1500 characters. There are eight lists available, and their contents are printed in the keyboard instruction manuals for checking. One can also choose between practice with normal or extended spacing between letters or only the sending of alphabetic characters (both modes normally include mixed numbers and punctuation).

The practice speed is set by the speed control using the speed meter. But, one shouldn't rely on the meter for exact speed setting, since, for instance, the spacing between the 10 w.p.m. and 20 w.p.m. calibration marks is fairly small. This doesn't mean, however, that the code practice mode cannot be very useful either to brush up one's code or to increase one's speed. But, if one is aiming for proficiency at a certain specific speed, a final check of proficiency using a speed calibrated tape should be made.

4. RTTY Modes. Both keyboards provide for selectable 5 level Baudot at 60 w.p.m. or ASCII mode at a speed of 110 baud. The speed available for each mode is fixed at the one most commonly used for each mode. The keyboards provide a TTL level output on RTTY to run any external RTTY equipment with TTL level input (e.g. a modulator/demodulator unit). One uses the keyboard the same as when sending c.w. The carriage return, line feed, and "LTRS" are sent automatically after 63 characters and a space have occurred on a line. After 70 characters the function is initiated without a space being entered so the operator doesn't have to worry about the carriage return transmission. Up and down shift is handled automatically, and a downshift occurs on every space. One can send a station identification in RTTY using the "ID" key, or one can command an identification in c.w. to be sent over the output loop circuit.

When using the ASCII mode, both lower and upper case are generated with capital letter being sent using the shift key. The only difference with the MFJ-496 is that it initially is always in a CAP LOCK mode, which one can override.

Of course, all the features described in some detail under the c.w. mode, which apply to the buffer and programmable memories and automatic messages, are fully usable in the RTTY modes.

MFJ-494/MFJ-496 Differences

The different buffer and programmable memory capacities of the two models and the automatic repeat mode of the MFJ-496 were mentioned. Two further features of the latter model are an automatic incrementing serial number feature and a clock option.

The serial number feature allows an automatically increasing serial number (starting at any desired number and going up to 9999) to be inserted into the sending

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buffer or message memories for contest use. Incrementing or decrementing is possible to correct for invalid QSO's. The clock option for the MFJ-496 allows real time to be sent in Morse, Baudot, or ASCII. Time can be inserted in the sending buffer or any message memory to stand alone or to form part of a preloaded message. For the avid contester and/or traffic handler, the extra features of the MFJ-496 can be put to good use.

Circuitry

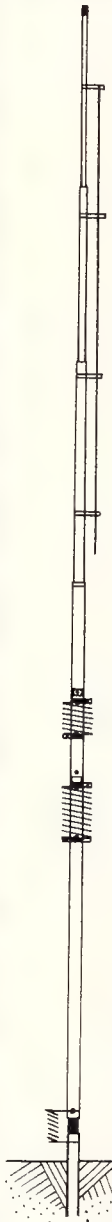
Both keyboards are built around EPROM's, the contents of which are copyrighted by Curtis Electro Devices. Almost all of the components are mounted on one master PC board. The keyboard has gold inlaid key contacts which are individually replaceable. The key contacts are debounced and have a "two key lockout" feature which corrects for sloppy typing if one hits a key before releasing a previous key. The board has its own regulator to provide 5 v.d.c. and any input voltage of 9–15 v.d.c. can be used. The current demand from the external source is 300 ma in operation and 250 ma standby. The contents of the programmable memories are lost when power is removed. If one wanted to retain the contents, power would have to be left applied continuously. This would be no great problem, since only a few watts are dissipated. However, if one worried about power consumption, a few checks did show that the memories retained their contents with as little as 6 v.d.c. external being used. The plugs, which are all on the back panel of the units, are all of the standard phone or ¼ " shaft type.

General Comments

The keyboards tried worked flawlessly and had a very smooth but positive keying action. The fascination of all the functions possible with the keyboards keeps one wanting to experiment with them for hours. In fact, one becomes a bit overwhelmed after a time with all the functions possible and tends to wonder how to remember all the key commands. But, in operation, things work out quite smoothly once one settles into routine operation with a keyboard. The keys are very logically arranged, and most command functions require only one or two key depressions. Also, certain keys are colored white, yellow, or red to highlight their special functions, and this greatly facilitates learning to use the keyboards. The output keying circuitry for c.w. worked fine with any piece of gear with which it could be tried. The MFJ-53 AFSK plug-in board which was tried produced perfect 170 or 850 Hz shifts (the circuitry uses a 555 IC plus some RC phase-shift oscillators) and perfect FSK when its output was fed into the auxiliary audio input on an FT-107M. One should note, however, that few s.s.b. rigs are rated for full input on FSK (e.g., the FT-107M which takes an input of 80 watts), and one must reduce the transmitter d.c. input accordingly. All in all, one has the feeling after using the keyboards of never wanting to go back again to paddle transmission for CQ or mechanical keyboard transmission for RTTY.

The instruction manual for the keyboards is concisely and clearly written. A multi-color "crib-sheet" to summarize major key commands would have been a nice touch, but one can easily extract and summarize desired information from the manual. The manual contains the full schematic but no trouble-shooti mation. This is more than made however, by the very inclusive 12- warranty. Among other things, it provi for free replacement parts and is no invalidated if the owner attempts to repair defective units on his own, before perhaps taking advantage of the return for repair/replacement terms of the warranty. As usual, MFJ even goes so far as to offer a 30-day "try it with option to refund" deal on the keyboards. I'd bet on a very, very low return rate on these products.

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UPSCALE RTTY

BY JOHN EDWARDS*, KI2U

Is there radio teletype above h.f.? An intriguing question, indeed. For many RTTY *is* h.f. No phone or c.w. for these chaps; the green keys are the only way to work the world. But v.h.f.? Isn't that for repeaters—fellows bouncing the moon and scattering meteors?

Obviously, that's a pretty silly notion. RTTY has as much a place on v.h.f.—and even u.h.f.–s.h.f.—as voice or c.w. But, until recently the sound of RTTY tones above 30 MHz has been, at best, occasional. Nevertheless, v.h.f. activity is growing rapidly, and as neglected as these upper frequencies have been, the influx of newcomers is driving many RTTY folk literally up the spectrum.

If it's been more than a few years since you last listened to our v.h.f. bands for RTTY signals, or if you have never investigated the possibility of moving your teletype gear "up frequency," you may be pleasantly surprised by what you're about to read. This is a guide to RTTY v.h.f.—a look at our shortest wavelengths through a radioteletype operator's eyes. As you'll notice, some bands have more activity than others. Still, you may be shocked to discover that at least one frequency segment actually has more RTTY users than most h.f. ham frequencies put together. We start our tour at 50 MHz.

6 Meter RTTY

RTTY on six? Bet you thought only a few brave s.s.b.ers and c.w. addicts risk the threat of t.v.i. on this forlorn band. While we won't go so far as to say that RTTY activity is rapidly burning up the 50 MHz ether, 6 meter radioteletype can't be entirely written off, either.

As with 6 meter activity in general, RTTY use tends to follow band conditions. When 6 is closed, you may hear an occasional civil defense or traffic net. On the other hand, when conditions start popping, activity can closely resemble 10 meters on a good day. As proof, the author of this article, under the call WB2IBE, worked a half-dozen west coast stations on three watts and a dipole during a 1979 opening. One contact, with K7OFT, resulted in scheduling a facsimile (A4 emission) QSO that set a new DX record for that mode. The possibility of great achievements are here, if you're willing to be patient.

When operating 6 meter RTTY, it pays to read your FCC rules carefully. Unlike our low frequencies, radioteletype is not allowed in v.h.f. c.w. segments (including 2 meters, too). These subbands are for A1 only, not F1. So if you want to operate 6 and 2 meter RTTY, you had better make sure you stick *above* the first 100 kHz. Confusing? Well, it wouldn't be a government regulation if it wasn't.

2 Meter RTTY

As you may have guessed, this is the most active v.h.f. RTTY band. Although no formal study has ever been made, it's quite possible there's more RTTY activity here than on 20 meters. Of course, band conditions keep most QSOs local, but it's a point to ponder. Even if this isn't the most active RTTY band, it certainly has the capability to become such. An overwhelming majority of low-band RTTYers must have 2 meter f.m. rigs just waiting to be interfaced with teleprinters and computers. Combine these fellows with the Techs already here, and you'll have quite a crowd!

Due to its limited range, most 2 meter RTTY is done through repeaters. Indeed, there's barely an area in this country without either an RTTY-only machine, or one doubling as a phone-RTTY repeater. A few advanced groups have even devised methods to inject RTTY tones *under* voice transmissions, thereby allowing simultaneous QSOs.

If you are willing to put up with the lack of worldwide DX, you'll find 2 meter RTTY superior in just about every way to the low-band version. There's no fading and little QRM or QRN—perfect conditions for sending pictures and other long communications. With the addition of autostart, friends can leave notes on your printer while you're away, and the recent innovation of RTTY "mailboxes" even allows you to leave messages in the neighborhood computer while grabbing the latest ARRL or club bulletin from its memory.

With all of these attractions, it's no wonder many old-timers have been known to sell their h.f. rigs in favor of 2 meter jobs. A little drastic action on their part perhaps, since h.f. still offers an ever-changing universe of new stations to work, but the allure of 2 meter RTTY is quite tempting.

1¼ Meter RTTY

You remember this band, don't you? Well, there are still a lot of hungry vultures trying to pry 220 away from us, but if we keep stepping up the activity (with RTTY, for instance) it'll make things a lot harder for our foes.

RTTY action here tends to resemble that on 2 meters, only there's less of it.

*78-56 86th St., Glendale, NY 11385

Say You Saw It In CQ

Generally, the closer you live to a big city, the better your chances for making RTTY contact on this band. But then, when you consider how sparse even the f.m. activity is, it's no surprise that RTTY action is sporadic, too. Still, if you've got a 1¼ meter rig, why not try to interest some similarly equipped friends in 220 RTTY? This band needs all the help it can get!

70 cm RTTY

There are some RTTY repeaters here, too, but the big breakthrough for 70 cm RTTY will come when the new Phase III OSCAR satellite is launched. From that day onward, the 435 MHz passband input will become as exciting as any low-band frequency in DX potential, minus QRN, QSB, and "dead zones," of course.

Current plans call for both Baudot and ASCII RTTY nets on the new bird, with amateur radio and spacecraft bulletins transmitted on both modes. All in all, RTTY's frequency-skimping characteristics and OSCAR's repeater-like conditions should result in a marriage made in heaven—a QTH just below OSCAR's flight path.

23 cm And Up

Believe it or not, this is where RTTY's future lies. As more amateur satellites are sent aloft in upcoming years, we'll slowly be shifting our emphasis from the erratic low bands to more stable space communications. Possessing all the advantages of repeaters, combined with the DX of the low bands, these great linear translators will finally enable amateurs to form a telecommunications network, the envy of any commercial organization.

But while we're biding our time waiting for amateur radio utopia to arrive, there are still other RTTY interests to follow in these microwave bands. Packet communications—short bursts of RTTY data at very high baud rates—are already being experimented with and hold the promise of some day linking together vast computer networks. Have you always wanted an industrial-grade computer in your home? No need to buy one—just link your keyboard into your club's computer. The line-of-sight tendencies of these bands offer unparalleled opportunities to access other RTTY setups in complete privacy. Who's to say what these bands can eventually offer us? The experimentation, in earnest, has just begun, giving all of us the chance to become true radio pioneers.

So is there radioteletype above h.f.? Well, if this brief guide hasn't whetted your amateur radio appetite, then perhaps you're actually better off fighting 20 meter QRM. On the other hand, if this article has even slightly inspired you, you'll realize that not only is there RTTY above h.f., but RTTY's entire future lies above h.f.

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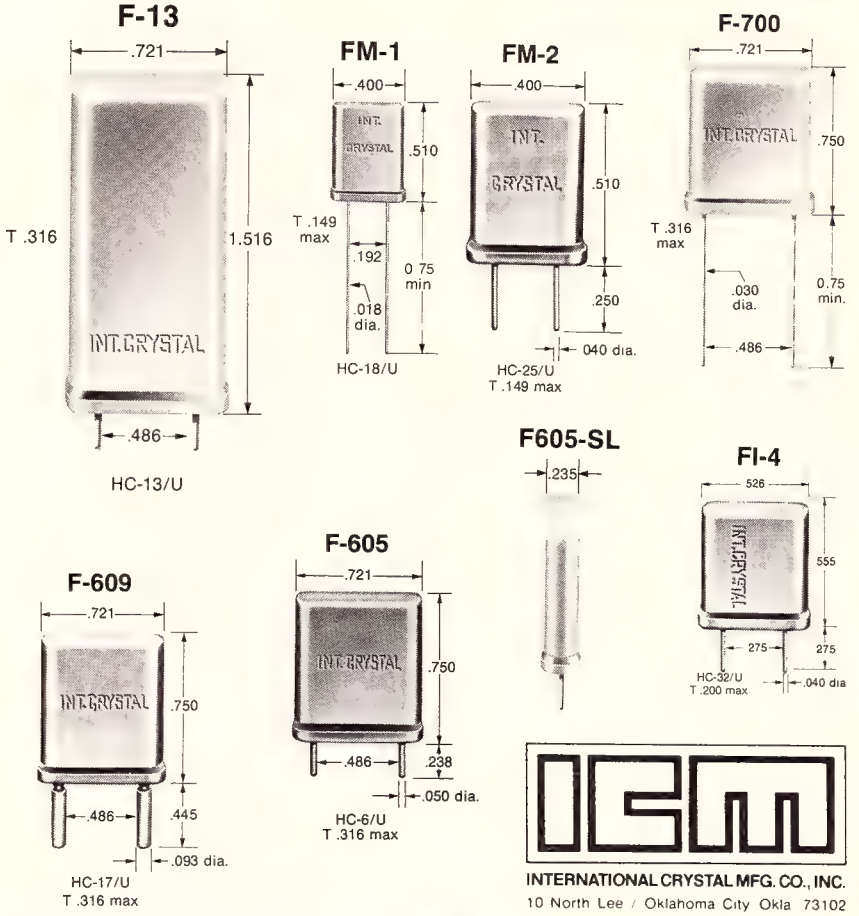
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Our man in BASIC is at it again. K8BG maneuvers his TRS-80® around to function as an RTTY bulletin board.



RTTYBOARD

An RTTY Bulletin Board Program For The TRS-80®

BY BUZZ GORSKY*, K8BG

In some moment of weakness I acquired the desire to write a program that would permit my TRS-80® to function as an RTTY bulletin board or message drop system. At the time I had machine language Baudot printer drivers, a complete split-screen RTTY program, the TRS-80, 48K of memory, a disk drive, and the Macrotronics M80® interface. I decided that the most expeditious way to make use of what I had would be to write the bulletin board program in BASIC and use calls to various machine routines to take care of identification, transmission of text, and reception of call-up, commands, and messages. Any system will be a compromise between what might be anticipated as the desires of various users and the desire to add complexity to the program. Here I believe there is an advantage in the guts of the program being in BASIC, since many potential users of such a system can modify it to suit their own concept of what the thing should do.

One word about the required hardware might be in order. The M80 has one switch which is toggled by the INP(0) and INP(1) statements. This switch is placed in series with a d.p.d.t. relay and a 9-volt battery. The relay operates the transmitter PTT switch and a switch in my ST5000 which changes the 5000 from receive mode to loop closed mode for sending text. The other M80 switch is used to sense loop condition in receive and open and close the loop in send. I will begin my discussion of the program with the BASIC segment so that one can see what the machine language sections are supposed to be doing.

*712 Hillside Drive, Carlisle, PA 17013

BASIC Program

This part of the program begins with some housekeeping. Line 5 sets things up so that if an error occurs the program will branch to 12000 where the system will print a message and then reinitialize. This helps catch errors and prevent the system from locking up after an error has occurred. Next addresses are stored for four machine language calls. The "words" which begin "&H" are hexadecimal addresses. (In a level two system it would probably be best to set some variables equal to the values that must be **POKED** in order to access the single **USR** call. Then a subroutine could be used to quickly poke the values required depending on which routine is to be called.) Routine number 1 will be the receive routine which looks for system call-up, in this case reception of ZZK8BG. The second routine is the receive sequence for input of a command, while the third is for input of the text of a message. The fourth is for sending a c.w. identification.

In line 50 &H41E7 identifies the location of the receive buffer where the receive program will store text. The routine in 9000 finds the station call letters in the machine language program and uses them to set up BASIC variables which will depend on the call. For example, all commands will be in the form ZZXXWORD, beginning with two Zs, then the suffix of the call, then the command word, such as READ or HELP. In line 60 space is reserved for various string variables. SO(I) will be the call letters of stations originating messages, SR(I) will be calls of recipients, D(I) will be dates and times messages are filed, and M(I) are the message texts. In line 200 the start-up sequence begins in earnest as the machine gets ready to send a sign-on message. The routine at 5000 turns the transmitter on, and that at 5270 will send a c.w. identification. After the sign-on is sent, the transmitter is shut down, and in line 230 the call to the first machine language routine takes place.

All of the receive routines are set up so that the operator can gain control of things by pressing the **CLEAR** key. When that happens, the machine routine will return to BASIC and store a value of 1000 in X. This is then noted in the BASIC program and it will branch to 13000 where the operator can select what action is to be taken. If BASIC has come up from the first routine without a value of 1000 stored in X, then that means that the machine language routine has detected reception of the call-up sequence, ZZ + CALL (ZZK8BG in my case). The program continues in 450, turning on the transmitter

Basic Program

```
1 REM BULLETIN BOARD BASIC PROGRAM
2 REM BY BUZZ GORSKY K8BG
3 REM FOR CQ MAGAZINE
5 ON ERROR GOTO 12000
10 DEFUSR1=&HFCD1:REM WRU  RCV MONITOR ADR
20 DEFUSR2=&HFD13:REM COMRX RCV COMMAND ADR
30 DEFUSR3=&HFD0C:REM MESSAGE RCV ADR
40 DEFUSR4=&HFB09:REM SENDID ADR
50 CLEAR 3000:DEFSTR D,S,M,Z:DEFINT I-L,N:BUX=&H41E7:GOSUB9000
60 N=100:DIM SO(N),SR(N),M(N),D(N)
70 OPEN "I",1,"BULBD/TXT":INPUT#1,NM:FOR I=1TONM:INPUT#1,SO(I),SR(I),M(I),D(I):N
EXT:CLOSE
75 M3="":PRINT"ENTER ANY SPECIAL COMMENT FOR SIGN-ON":LINEINPUT M3
200 M="THE "+CD$+" MAIL-DROP SYSTEM IS ON THE AIR":M1="TO ACCESS THE SYSTEM TYPE
 "+ZZ$+"  AND THE SYSTEM WILL RESPOND"+CHR$(13)+"THE SYSTEM SENDS '-K-' JUST BEF
ORE TURNING OFF XMTR"
210 M2="MESSAGES FROM AMATEURS FOR AMATEURS MAY BE LEFT ON THE SYSTEM":M4="ALWAY
S HIT LTRS JUST BEFORE BEGINNING A COMMAND":M5="SYSTEM STANDING BY":M9=CHR$(13)+
"QST QST QST QST QST QST QST QST"
220 GOSUB 5000:GOSUB5270:LPRINTM9:LPRINT M:LPRINT M1:LPRINT M2:LPRINT M4
222 LPRINT:LPRINT"CURRENT MESSAGES-------":LPRINT"NUMBER";TAB(10)"FOR":FOR I=1 T
O NM:LPRINT I;TAB(10)SR(I):NEXT:LPRINT:LPRINTM3:LPRINT M5:LPRINT"NNNN":GOSUB5100
230 X=USR1(X):IF X=1000 THEN 13000
449 REM ENTERED WHEN SYSTEM CALLED
450 GOSUB 5000:LPRINT"ENTER "+ZY$+"HELP  FOR INSTRUCTIONS"
455 LPRINT "ENTER COMMAND--TERMINATE WITH CR":GOSUB5200:GOSUB5100
460 POKE&HFFFF,2:GOSUB5300
465 X=USR2(X):IF X=1000 THEN 13000
470 IF X=500 THEN CMD"R":GOTO230
499 REM ENTERED WHEN COMMAND RECEIVED
500 X$="":FOR I=0 TO 200:J=PEEK(BUX+I)
510 IF J<>13 THEN X$=X$+CHR$(J):NEXT
515 IF LEFT$(X$,00%)=ZY$ THEN 530
516 IF MID$(X$,2,00%)=ZY$ THEN X$=RIGHT$(X$,LEN(X$)-1):GOTO530
517 IF MID$(X$,3,00%)=ZY$ THEN X$=RIGHT$(X$,LEN(X$)-2) ELSE465
530 ZX$=ZY$+"STORE":IF LEFT$(X$,00%+5)=ZX$ THEN 1000
540 ZX$=ZY$+"VIEW":IF LEFT$(X$,00%+4)=ZX$ THEN 1500
550 ZX$=ZY$+"READ":IF LEFT$(X$,00%+4)=ZX$ THEN 2000
560 ZX$=ZY$+"DELETE":IF LEFT$(X$,00%+6)=ZX$ THEN 2500
570 ZX$=ZY$+"HELP":IF X$=ZX$ THEN 3000
580 ZX$=ZY$+"STOP":IF X$=ZX$ THEN 3500 ELSE 6000
640 X=USR3(X):IF X=1000 THEN 13000 ELSE IF X=500 THEN 650
645 GOSUB 5000:LPRINT"STAND-BY MESSAGE BEING PROCESSED"
650 X$="":J=ASC("/"):K=ASC(","):FOR I=0 TO 255:Y=PEEK(BUX+I):IF(Y=10 OR Y=13 OR
Y=K) THEN NEXT ELSE IF Y=J THEN 660 ELSE X$=X$+CHR$(Y):NEXT
660 M(NM)=X$:IF X=500 THEN 460 ELSE LPRINT "MESSAGE";NM;" STORED"
680 GOTO 455
999 REM ENTERED FOR STORE  COMMAND
1000 NM=NM+1
1010 IF MID$(X$,LEN(ZY$)+6,1)="," THEN NM=NM-1:GOTO465 ELSE FOR I=LEN(ZY$)+6 TO
LEN(X$):IF MID$(X$,I,1)="," THEN 1020 ELSE NEXT:NM=NM-1:GOTO465
1020 IF I>=LEN(X$)) THEN NM=NM-1:GOTO 465 ELSE SR(NM)=MID$(X$,LEN(ZY$)+6,I-LEN(Z
Y$)-6):SO(NM)=RIGHT$(X$,LEN(X$)-I):D(NM)=LEFT$(TIME$,14)
1050 GOSUB 5000:LPRINT "MESSAGE WILL STORE AS NUMBER";NM;" FROM ";SO(NM);" TO ";
SR(NM):LPRINT"LIMIT TO 255 CHARACTERS (ABOUT 3 LINES)":LPRINT"TERMINATE MESSAGE
WITH SLASH(/)
1060 GOSUB5250:GOSUB5100:GOTO640
1499 REM VIEW ROUTINE
1500 IF LEN(X$)<11 THEN 465 ELSE X$=RIGHT$(X$,LEN(X$)-LEN(ZY$)-4)
1510 GOSUB 5000:LPRINT "NUMBER","FROM","TO","DATE-TIME"
1520 FOR I=1 TO NM:IF(SR(I)=X$ OR SR(I)="ALL") THEN LPRINT I,SO(I),SR(I),D(I)
1530 NEXT:LPRINT"END OF LISTING":LPRINT"NO OTHER MESSAGES FOR ";X$;" IN FILE":LP
RINT"TO READ A MESSAGE TYPE "+ZY$+"READ##  WHERE ## IS THE MESSAGE NUMBER":GOTO
455
1999 REM READ COMMAND
2000 IF LEN(X$)<9 THEN 465 ELSE X$=RIGHT$(X$,LEN(X$)-LEN(ZY$)-4)
2010 X=VAL(X$):IF(X<1 OR X>NM) THEN 2090
2020 GOSUB 5000:LPRINT
2030 LPRINT"MESSAGE NUMBER";X;" FROM ";SO(X);" TO ";SR(X)
2040 LPRINT M(X):LPRINT "DATED--";D(X);" UTC":GOTO455
2090 GOSUB5000:LPRINT"NO MESSAGE WITH #";X;" IN FILE":LPRINT"TRY AGAIN":GOTO455
2499 REM DELETE ROUTINE
2500 FOR I=LEN(ZY$)+7 TO LEN(X$):IF MID$(X$,I,1)="," THEN 2510 ELSE NEXT:GOTO465
2510 O1=LEN(ZY$)+11:O2=O1-3:O3=O2-1:IF(LEN(X$)<O1 OR I<O2 OR I>=LEN(X$)) THEN 46
5 ELSE X=VAL(MID$(X$,O3,I-O3)):X$=RIGHT$(X$,LEN(X$)-I)
2520 GOSUB 5000:IF(X$=SO(X) OR X$=SR(X)) THEN 2530 ELSE LPRINT"SORRY YOU CANNOT
DELETE THIS MESSAGE":LPRINT"ORIGINATOR OR ADDRESSEE ONLY CAN DELETE A MESSAGE":G
OTO455
2530 LPRINT "DELETION OF MESSAGE NUMBER ";X;" IN PROGRESS":GOSUB2540
2535 LPRINT X;" DELETED":GOTO455
2540 NM=NM-1:FOR I=X TO NM:SO(I)=SO(I+1):SR(I)=SR(I+1):M(I)=M(I+1):D(I)=D(I+1):N
EXT:RETURN
2999 REM HELP ROUTINE
3000 GOSUB5000:LPRINT" THE SYSTEM WILL RESPOND TO SEVERAL COMMANDS AFTER IT HAS
BEEN BROUGHT UP BY "+ZZ$:LPRINT"ALWAYS REMEMBER TO PUT THE SYSTEM BACK INTO STAN
DBY WITH "+ZY$+"STOP"
3010 LPRINT"HERE IS A COMMAND SUMMARY":LPRINT"EACH COMMAND SHOULD BEGIN IMMEDIAT
ELY WHEN YOU START TO TRANSMIT AND SHOULD START WITH  LTRS  AND TERMINATE WITH A
  CAR-RET":LPRINT:LPRINT
3020 J=28:LPRINT"COMMAND";TAB(J)"FUNCTION":LPRINTSTRING$(40,"-"):LPRINT
3040 LPRINTZY$+"STOREWB8FPB,WB3KQZ";TAB(J)"WILL STORE NEW MESSAGE AND":LPRINTTAB
(J)"LIST IT TO WB8FPB AND FROM WB3KQZ"
3050 LPRINTZY$+"VIEWWB8FPB";TAB(J)"PRESENTS LIST OF MESSAGES FOR WB8FPB"
3060 LPRINTZY$+"READ95";TAB(J)"WILL PRINT TEXT OF MESSAGE 95"
3070 LPRINTZY$+"DELETE95,WB8FPB";TAB(J)"WILL DELETE # 95 IF WB8FPB IS":LPRINTTAB
(J)"ORIGINATOR OR RECIPIENT"
3080 LPRINTZY$+"HELP";TAB(J)"PRINTS OUT COMMAND LIST"
3090 LPRINTZY$+"STOP";TAB(J)"SYSTEM WILL SIGN OFF":LPRINTTAB(J)"AND THEN RESET T
O WATCH FOR "+ZZ$:LPRINTTAB(J)"AND OTHERWISE KEEP QUIET"
3100 LPRINT:LPRINT"IF YOU OMIT THE "+ZY$+" FROM THE BEGINNING OF A COMMAND THE S
YSTEM WILL IGNORE IT -- TRY AGAIN"
3110 LPRINT"THE WORST THAT YOU CAN DO IS DELETE SOMEONE ELSES MESSAGE AND EVEN T
```


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nd using the **LPRINT** statements to send a message indicating that the system is ready to accept a command.

In line 460 the machine pokes a 2 into FFFF Hex and the routine in 5300 pokes a time value into FFFE Hex. The 2 signifies that the program is in the command reception mode. The clock routine will allow the machine to remain in this mode for eight minutes. After that time it will assume that some user forgot to sign the system out, and it will be forced to return to the call-up mode awaiting reception of ZZK8BG. The values in FFFF Hex and FFFE Hex are used by the clock routine. In 465 the **USR2** call brings up the command reception routine. This routine will store received characters in an I/O buffer where BASIC will be able to find them. The routine will return to BASIC under one of three conditions. If the clock detects a time-out, it will return and load a value of 500 into X. If the operator presses the **CLEAR** key, a value of 1000 is put in X, or in the normal course of events, if it receives a carriage return, a zero is put into X. So the next few lines figure out why BASIC has been re-entered.

In 500 a variable X$ is constructed as the string of characters whose ASCII values would have been stored by the receive routine in the buffer area. As X$ is built up, the program watches for the value 13 which would have been stored when a carriage-return was received. When a 13 is noted the routine branches to 515. In these next 3 lines the routine looks to see if the characters represented by ZY$ (ZZ plus the call suffix) are located at the beginning of the command. Some leeway is allowed since sometimes a false letter may be received when the TU comes up on reception of a valid mark tone. If ZY$ is identified, the variable X$ is modified so that the Z is the first character. If ZY$ is not identified, the program will go to 465 to again await a command. In this way, if someone was trying to enter a command they can try again. If somehow the system was brought up unintentionally, or if some user forgot to take it down, this continuation will eventually cause a command time-out as described above, and the program would go back to line 230 to await call-up.

Once the machine thinks that a valid command has been received, it tries to identify it in lines 530–580. If the command is not identified, it will say so and let the user try again. Otherwise, control will branch to the appropriate command routine.

Line 1000 begins the **STORE** command. Store is entered as the command followed by the call of the station to whom the message is addressed, a comma, and the call of the station sending the message. The calls are identified from the material in the buffer and stored as string variables. The D(I) variable sets the TIME$ except for the seconds. Then in 1050 the

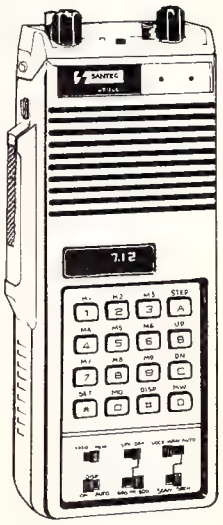
```
HAT IS UNLIKELY":LPRINT"SO DON'T BE AFRAID OF THE SYSTEM.  ENJOY IT'":LPRINT:LPR
INT:GOTO 455
3500 GOSUB 5000:LPRINT"(((((73))))) FROM "+CD$:LPRINT
3510 LPRINT"THE "+CD$+" MESSAGE SYSTEM IS AGAIN STANDING BY":LPRINTZZ$+"  WILL A
CCESS THE SYSTEM":LPRINTTIME$;" UTC":GOSUB5270:LPRINT"NNNN":GOSUB5100:GOTO230
5000 X0=INP(1):FOR I=1 TO 3000:NEXT:REM TURN ON TRANSMITTER
5010 POKE &HFFFF,1:REM SIGNIFIES XMTR ON
5020 GOSUB5300:LPRINT:LPRINT"DE "+CD$:RETURN
5100 LPRINT:LPRINT"-K-":X0=INP(0):POKE &HFFFF,0:RETURN:REM TURN TRANSMITTER OFF
5200 LPRINT TIME$;" UTC":LPRINT
5250 TI=VAL(MID$(TIME$,13,2)):IF TI>=TT+10 THEN 5270
5260 IF TT<50 THEN RETURN ELSE IF TI+50<TT THEN RETURN
5270 TT=VAL(MID$(TIME$,13,2)):X=USR4(X):RETURN
5300 X0=VAL(MID$(TIME$,13,2)):X0=X0+8:IF X0>=60 THEN X0=X0-60
5310 POKE&HFFFE,X0:RETURN:REM MIN MARKER FOR FUNCTION CHANGE
6000 GOSUB5000:LPRINT:LPRINT "COMMAND NOT RECOGNIZED":GOTO455
9000 I=&HFB00:J=PEEK(I)
9010 FOR K=I+3 TO I+J+2:CD$=CD$+CHR$(PEEK(K)):NEXT
9020 ZZ$="ZZ"+CD$
9030 FOR I=1 TO LEN(CD$):IF ASC(MID$(CD$,I,1))<48 OR ASC(MID$(CD$,I,1))>57 THEN
NEXT
9040 ZY$="ZZ"+RIGHT$(CD$,LEN(CD$)-I):OO%=LEN(ZY$):RETURN
10000 OPEN "O",1,"BULBD/TXT":PRINT#1,NM:FOR I=1 TO NM:PRINT#1,SO(I);",";SR(I);",
";M(I);",";D(I);",";:NEXT:CLOSE:GOTO13000
11000 GOSUB5000:LPRINTM9:LPRINT"THE "+CD$+" COMPUTER MESSAGE DROP SYSTEM IS NOW
LEAVING THE AIR":LPRINT"(((((73)))))  DE "CD$:GOSUB5200:GOSUB5100:GOTO13000
12000 GOSUB 5100:FOR X=1 TO 3000:NEXT:GOSUB 5000:LPRINT"A SYSTEM ERROR HAS OCCUR
RED":LPRINT "SYSTEM WILL RE-INITIALIZE":GOTO 200
13000 PRINT"ENTER 1 TO RESET SYSTEM"
13010 PRINT"ENTER 2 TO SAVE MESSAGE FILE":PRINT"ENTER 3 TO SIGN OFF":PRINT"ENTER
 4 TO SEE MESSAGE LIST"
13020 PRINT"ENTER 5 TO ADD A MESSAGE":PRINT"ENTER 6 TO DELETE A MESSAGE":INPUT J
:ON J GOTO 200,10000,11000,14000,14200,14400
14000 :CLS:FOR I=1TONM:PRINTI,SO(I),SR(I),D(I),M(I):NEXT:GOTO13000
14200 NM=NM+1:INPUT "MESSAGE FROM";SO(NM)
14210 INPUT"MESSAGE TO";SR(NM)
14220 LINEINPUT"DATE AND TIME";D(NM)
14230 INPUT"MESSAGE TEXT";M(NM):GOTO13000
14400 INPUT"ENTER NUMBER TO DELETE";X:GOSUB2540:GOTO13000
```

Source Code

```
                00100 ;ROUTINES FOR USE WITH BULLETIN BOARD BASIC PGM
                00110
                00120 ;SET UP MACHINE ROUTINES
41E6            00130 BUFFER  EQU     41E6H   ;USE I/O BUFFER
00FF            00140 SIZE    EQU     255
BFFF            00150         ORG     0BFFFH
BFFF 2A1640     00160 LOAD    LD      HL,(4016H)
C002 2255C0     00170         LD      (KEYBD),HL
C005 2143C0     00180         LD      HL,KEYMOD
C008 221640     00190         LD      (4016H),HL
C00B 21FFFA     00200         LD      HL,CWID-1
C00E 224940     00210         LD      (4049H),HL
C011 3A00FB     00220         LD      A,(CWID)
C014 C602       00230         ADD     A,2
C016 32FAFC     00240         LD      (BG00+1),A
C019 215700     00250         LD      HL,MSG
C01C 2253C0     00260         LD      (NEXT),HL
C01F 2147FD     00270         LD      HL,LPRT ;PRINTER DRIVER
C022 222640     00280         LD      (4026H),HL
C025 3E48       00290         LD      A,72    ;SET CHAR COUNT TO 72
C027 322940     00300         LD      (CHCNT),A
C02A DB04       00310         IN      A,(4)
C02C 3E00       00320         LD      A,0
C02E 32FFFF     00330         LD      (0FFFFH),A
C031 21BC45     00340         LD      HL,45BCH
C034 36C3       00350         LD      (HL),0C3H       ;MODIFY CLOCK
C036 2188FE     00360         LD      HL,CLOCK
C039 22BD45     00370         LD      (45BDH),HL
C03C DB00       00380         IN      A,(0)
C03E DB04       00390         IN      A,(4)
C040 C32D40     00400         JP      402DH
C043 E5         00410 KEYMOD  PUSH    HL
C044 2A53C0     00420         LD      HL,(NEXT)
C047 3E00       00430         LD      A,0
C049 BE         00440         CP      (HL)
C04A 2831       00450         JR      Z,OUT
C04C 7E         00460         LD      A,(HL)
C04D 23         00470         INC     HL
C04E 2253C0     00480         LD      (NEXT),HL
C051 E1         00490         POP     HL
C052 C9         00500         RET
                00510
0002            00520 NEXT    DEFS    2
0002            00530 KEYBD   DEFS    2
C057 43         00540 MSG     DEFM    'CLOCK'
     4C 4F 43 4B
C05C 0D         00550         DEFB    13
C05D 56         00560         DEFM    'VERIFY'
     45 52 49 46 59
C063 0D         00570         DEFB    13
C064 42         00580         DEFM    'BASIC'
     41 53 49 43
C069 0D         00590         DEFB    13
C06A 31         00600         DEFB    '1'
C06B 0D         00610         DEFB    13
C06C 0D         00620         DEFB    13
C06D 52         00630         DEFM    'RUN "BULBD/BAS"'
     55 4E 20 22 42 55 4C 42
     44 2F 42 41 53 22
```

```
C07C 00          00640           DEFB    0
C07D 3E0D        00650 OUT       LD      A,13
C07F 2A55C0      00660           LD      HL,(KEYBD)
C082 221640      00670           LD      (4016H),HL
C085 E1          00680           POP     HL
C086 C9          00690           RET
                 00700 ;CW IDENTIFICATION
FB00             00710           ORG     0FB00H
FB00 04          00720 CWID      DEFB    4
FB01 5A          00730 DAT1      DEFM    'ZZK8BG
     5A 4B 38 42 47 20 20
FB09 DD2100FB    00740 SENDID    LD      IX,CWID
FB0D ED73C0FB    00750           LD      (SAVSTK),SP
FB11 DD5E00      00760           LD      E,(IX)
FB14 DD23        00770           INC     IX
FB16 DD23        00780           INC     IX
FB18 DD23        00790 NEXLET    INC     IX
FB1A CD23FB      00800           CALL    CWLET
FB1D 1D          00810           DEC     E
FB1E CABDFC      00820           JP      Z,RETBAS
FB21 18F5        00830           JR      NEXLET
                 00840
                 00850
FB23 2168FB      00860 CWLET     LD      HL,MORSE
FB26 DD7E00      00870           LD      A,(IX)
FB29 D630        00880           SUB     48
FB2B 87          00890           ADD     A,A
FB2C 85          00900           ADD     A,L
FB2D 3001        00910           JR      NC,CII
FB2F 24          00920           INC     H
FB30 6F          00930 CII       LD      L,A
FB31 7E          00940           LD      A,(HL)
FB32 23          00950           INC     HL
FB33 4E          00960           LD      C,(HL)
FB34 CB09        00970 CWOUT     RRC     C
FB36 F5          00980           PUSH    AF
FB37 3818        00990           JR      C,DASH
FB39 180F        01000           JR      DOT
FB3B F1          01010 CWCON     POP     AF
FB3C 3D          01020           DEC     A
FB3D 2802        01030           JR      Z,ENDLET
FB3F 18F3        01040           JR      CWOUT
                 01050
FB41 2614        01060 ENDLET    LD      H,20
FB43 CD12FE      01070 DO4       CALL    MARK
FB46 25          01080           DEC     H
FB47 20FA        01090           JR      NZ,DO4
FB49 C9          01100           RET
                 01110
FB4A 2605        01120 DOT       LD      H,5
FB4C CD18FE      01130 DO1       CALL    SPACE
FB4F 25          01140           DEC     H
FB50 20FA        01150           JR      NZ,DO1
FB52 180A        01160           JR      DOTSP
                 01170
FB54 260F        01180 DASH      LD      H,15
FB56 CD18FE      01190 DO3       CALL    SPACE
FB59 25          01200           DEC     H
FB5A 20FA        01210           JR      NZ,DO3
FB5C 1800        01220           JR      DOTSP
                 01230
FB5E 2605        01240 DOTSP     LD      H,5
FB60 CD12FE      01250 DO2       CALL    MARK
FB63 25          01260           DEC     H
FB64 20FA        01270           JR      NZ,DO2
FB66 18D3        01280           JR      CWCON
                 01290
FB68 05          01300 MORSE     DEFB    5
FB69 1F          01310           DEFB    31
FB6A 05          01320           DEFB    5
FB6B 1E          01330           DEFB    30
FB6C 05          01340           DEFB    5
FB6D 1C          01350           DEFB    28
FB6E 05          01360           DEFB    5
FB6F 18          01370           DEFB    24
FB70 05          01380           DEFB    5
FB71 10          01390           DEFB    16
FB72 05          01400           DEFB    5
FB73 00          01410           DEFB    0
FB74 05          01420           DEFB    5
FB75 01          01430           DEFB    1
FB76 05          01440           DEFB    5
FB77 03          01450           DEFB    3
FB78 05          01460           DEFB    5
FB79 07          01470           DEFB    7
FB7A 05          01480           DEFB    5
FB7B 0F          01490           DEFB    15
000E             01500           DEFS    14
FB8A 02          01510           DEFB    2
FB8B 02          01520           DEFB    2
FB8C 04          01530           DEFB    4
FB8D 01          01540           DEFB    1
FB8E 04          01550           DEFB    4
FB8F 05          01560           DEFB    5
FB90 03          01570           DEFB    3
FB91 01          01580           DEFB    1
FB92 01          01590           DEFB    1
FB93 00          01600           DEFB    0
FB94 04          01610           DEFB    4
FB95 04          01620           DEFB    4
FB96 03          01630           DEFB    3
FB97 03          01640           DEFB    3
FB98 04          01650           DEFB    4
FB99 00          01660           DEFB    0
FB9A 02          01670           DEFB    2
FB9B 00          01680           DEFB    0
FB9C 04          01690           DEFB    4
```


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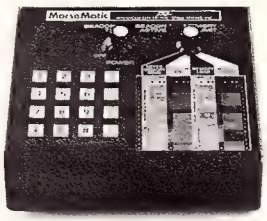
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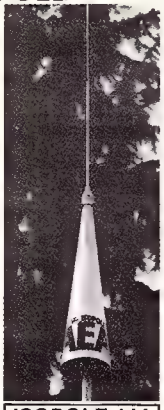
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CIRCLE 8 ON READER SERVICE CARD

ransmitter is turned on and the machine instructs the user to enter the message. Control then goes to 640 after shutting the rig down. There USR3 will pick up the message and return control to BASIC when a slash is received. The message is then stored as M(NM), and control continues with line 455 instructing the user to enter a command.

Line 1500 begins the **VIEW** routine. Here the user would have entered his call following the word "view" and so this is retrieved from the X$ variable. The program then looks through the SR(I) variables to see if this call or the word "all" is indicated. If so those messages are listed. Again control returns to the command mode so that the user can enter another command.

In 2000 the user has selected the read function and would have entered the message number following the word "read". Thus the number is obtained from the X$ variable, and then that message is printed out along with an indication of station of origin, recipient, and time filed.

The deletion routine begins in 2500. Here a user can delete a message only if he is the originator or recipient. For simplicity no password function has been written, so anyone who deliberately enters someone else's call could delete another person's message.

In 3000 the Help routine prints out a long message indicating all of the commands with an example of each and a description of just what the command does. This printout should guide the new user, and by having this material isolated, the system does not provide a great deal of prompting during actual use.

The Stop function at 3500 signs the system off and returns to await system call-up again.

Various subroutines occur beginning at 5000. The first is for turning the transmitter on. The statement INP(1) causes the M80 to close a transistor switch which is in series with a 5-volt relay and a 9-volt transistor battery. When the relay closes, it turns on the transmitter and forces the TU to a mark condition (standby) so that the computer can control the loop through the M80 and thereby send text. The value 1 is **POKED** into FFFF Hex to indicate to the clock routine that the transmitter is on. As we shall see, if the transmitter is ever on for 8 minutes continuously, the clock routine will shut it down. That time was selected since it takes about 7 minutes to send the text in the help routine, and that is about the longest thing that the program has to send. The routine at 5300 is called to store the shut-down time.

In 5100 the transmitter is shut down. First -K- is sent, and users know that this will occur just before the machine shuts down to listen for received text. The value 0 poked into FFFF Hex indicates that the machine is not in transmit or in command

```
FB9D 0E         01700           DEFB    14
FB9E 03         01710           DEFB    3
FB9F 05         01720           DEFB    5
FBA0 04         01730           DEFB    4
FBA1 02         01740           DEFB    2
FBA2 02         01750           DEFB    2
FBA3 03         01760           DEFB    3
FBA4 02         01770           DEFB    2
FBA5 01         01780           DEFB    1
FBA6 03         01790           DEFB    3
FBA7 07         01800           DEFB    7
FBA8 04         01810           DEFB    4
FBA9 06         01820           DEFB    6
FBAA 04         01830           DEFB    4
FBAB 0B         01840           DEFB    11
FBAC 03         01850           DEFB    3
FBAD 02         01860           DEFB    2
FBAE 03         01870           DEFB    3
FBAF 00         01880           DEFB    0
FBB0 01         01890           DEFB    1
FBB1 01         01900           DEFB    1
FBB2 03         01910           DEFB    3
FBB3 04         01920           DEFB    4
FBB4 04         01930           DEFB    4
FBB5 08         01940           DEFB    8
FBB6 03         01950           DEFB    3
FBB7 06         01960           DEFB    6
FBB8 04         01970           DEFB    4
FBB9 09         01980           DEFB    9
FBBA 04         01990           DEFB    4
FBBB 0D         02000           DEFB    13
FBBC D9         02010           EXX
FBBD 08         02020           EX      AF,AF'
FBBE 04         02030           DEFB    4
FBBF 03         02040           DEFB    3
                02050
0002            02060 SAVSTK    DEFS    2
FBC2 65         02070 SHIFT     DEFB    101     ;INITIALIZES SHIFT IN LTRS
0001            02080 ASCII     DEFS    1       ;STORES ASCII CODE
0001            02090 BAUD      DEFS    1       ;STORES BAUDOT BIT RECEIVED
                02100 ;BAUDOT RECEIVE ROUTINE
FBC5 ED73C0FB   02110 RCV       LD      (SAVSTK),SP
FBC9 0E02       02120 BEGIN     LD      C,2
FBCB 3A4038     02130 LOOK      LD      A,(14400)
FBCE FE02       02140           CP      2       ;CLEAR KEY RETURNS
FBD0 CAC7FC     02150           JP      Z,CONBAS
FBD3 3A16FF     02160           LD      A,(CLOBAK)
FBD6 B7         02170           OR      A
FBD7 C217FF     02180           JP      NZ,CLOUT
FBDA DB02       02190           IN      A,(2)   ;PICK UP BIT FROM INTERFACE
FBDC D6FE       02200           SUB     254     ;254=SPACE:255=MARK
FBDE 32C4FB     02210           LD      (BAUD),A        ;STORE 0 IF SPACE
                02220                                   ;STORE 1 IF SPACE
FBE1 DB04       02230           IN      A,(4)   ;RESETS LOOP
FBE3 3AC4FB     02240           LD      A,(BAUD)        ;IF SPACE START OVER
FBE6 C2C9FB     02250           JP      NZ,BEGIN
FBE9 0D         02260           DEC     C       ;OTHERWISE IF SECOND MARK
FBEA CA00FC     02270           JP      Z,NEW   ;GO TO "NEW" TO GET CODE
FBED CDF3FB     02280           CALL    DELAY2  ;IF FIRST MARK DELAY 10 MSEC
FBF0 C3CBFB     02290           JP      LOOK    ;AND LOOK AGAIN
                02300
FBF3 1609       02310 DELAY2    LD      D,09    ;10 MSEC DELAY
FBF5 1E98       02320 D4        LD      E,152
FBF7 1D         02330 D5        DEC     E
FBF8 C2F7FB     02340           JP      NZ,D5
FBFB 15         02350           DEC     D
FBFC C2F5FB     02360           JP      NZ,D4
FBFF C9         02370           RET
                02380
FC00 0605       02390 NEW       LD      B,5     ;ACQUIRE BAUDOT CODE
FC02 2600       02400           LD      H,0     ;INITIALIZE FOR DECODING
FC04 0E02       02410           LD      C,2     ;WILL COUNT 2 DELAYS FOR 20 MSEC
                02420                           ;TOTAL DELAY BETWEEN BITS
FC06 CDF3FB     02430 N1        CALL    DELAY2
FC09 0D         02440           DEC     C
FC0A C206FC     02450           JP      NZ,N1
FC0D DB02       02460           IN      A,(2)   ;PICK UP BAUDOT BIT
FC0F 32C4FB     02470           LD      (BAUD),A        ;STORE BIT
FC12 DB04       02480           IN      A,(4)   ;RESET LOOP
FC14 3AC4FB     02490           LD      A,(BAUD)        ;PICK UP BIT AND
FC17 D6FE       02500           SUB     254             ;SEE IF MK OR SP
FC19 84         02510           ADD     A,H     ;ADD EARLIER BITS
FC1A 67         02520           LD      H,A     ;AND STORE IN H
FC1B 05         02530           DEC     B
FC1C CA26FC     02540           JP      Z,FIND  ;IF FIFTH BIT THEN DECODE
FC1F CB04       02550           RLC     H       ;OTHERWISE ROTATE H
FC21 0E02       02560           LD      C,2     ;AND DELAY 20 MSEC
FC23 C306FC     02570           JP      N1
FC26 217DFC     02580 FIND      LD      HL,TAB1 ;ADDRESS OF LOOKUP TABLE
FC29 32C4FB     02590           LD      (BAUD),A
FC2C 85         02600           ADD     A,L     ;ADD BAUDOT VALUE TO
FC2D D231FC     02610           JP      NC,CONT ;TABLE ADDRESS
FC30 24         02620           INC     H
FC31 6F         02630 CONT      LD      L,A
FC32 7E         02640           LD      A,(HL)  ;PUT TABLE CODE IN A
FC33 FE64       02650           CP      100     ;IF 100 THIS IS FIGS SHIFT
FC35 283A       02660           JR      Z,FIG   ;CHANGE SHIFT STATUS
FC37 FE65       02670           CP      101     ;IF 101 IS LTRS SHIFT
FC39 CA77FC     02680           JP      Z,LTRS  ;IF SO GO LTRS ROUTINE
FC3C FE20       02690 SC        CP      32      ;IF SPACE, UNSHIFT THEN DISP
FC3E 2007       02700           JR      NZ,DF
FC40 3E65       02710           LD      A,101
FC42 32C2FB     02720           LD      (SHIFT),A
FC45 3E20       02730           LD      A,32
FC47 32C3FB     02740 DF        LD      (ASCII),A       ;STORE ASCII CODE
FC4A 3AC2FB     02750           LD      A,(SHIFT)       ;CHECK SHIFT STATUS
```


Say You Saw It In CQ

```
FC4D FE65     02760          CP      101
FC4F CA55FC   02770          JP      Z,LOW    ;IF IN LOW CASE GO LOW CS TABLE
FC52 C35EFC   02780          JP      UP       ;IF NOT THEN GO UPPER CASE TABLE
              02790
              02800
FC55 3AC3FB   02810 LOW      LD      A,(ASCII)        ;DISPLAY ASCII CODE
FC58 CD3300   02820 RF1      CALL    33H      ;DISPLAY
FC5B C3C9FB   02830          JP      BEGIN
              02840
FC5E 3AC4FB   02850 UP       LD      A,(BAUD)         ;LOOK UP BAUDOT CODE
FC61 219DFC   02860          LD      HL,TAB2          ;IN UPPER CASE TABLE
FC64 85       02870          ADD     A,L
FC65 D269FC   02880          JP      NC,CONT1
FC68 24       02890          INC     H
FC69 6F       02900 CONT1    LD      L,A
FC6A 7E       02910          LD      A,(HL)           ;DISPLAY CODE
FC6B CD3300   02920 RF2      CALL    33H      ;DISPLAY
FC6E C3C9FB   02930          JP      BEGIN
              02940
              02950
              02960
FC71 32C2FB   02970 FIG      LD      (SHIFT),A
FC74 C3C9FB   02980          JP      BEGIN
              02990
FC77 32C2FB   03000 LTRS     LD      (SHIFT),A
FC7A C3C9FB   03010          JP      BEGIN
              03020
              03030
FC7D 65       03040 TAB1     DEFB    101      ;LOWER CASE LOOK-UP TABLE
FC7E 54       03050          DEFB    'T'
FC7F 0D       03060          DEFB    13       ;CR
FC80 4F       03070          DEFB    'O'
FC81 20       03080          DEFB    32       ;SPACE
FC82 48       03090          DEFB    'H'
FC83 4E       03100          DEFB    'N'
FC84 4D       03110          DEFB    'M'
FC85 20       03120          DEFB    32       ;SP FOR LF
FC86 4C       03130          DEFB    'L'
FC87 52       03140          DEFB    'R'
FC88 47       03150          DEFB    'G'
FC89 49       03160          DEFB    'I'
FC8A 50       03170          DEFB    'P'
FC8B 43       03180          DEFB    'C'
FC8C 56       03190          DEFB    'V'
FC8D 45       03200          DEFB    'E'
FC8E 5A       03210          DEFB    'Z'
FC8F 44       03220          DEFB    'D'
FC90 42       03230          DEFB    'B'
FC91 53       03240          DEFB    'S'
FC92 59       03250          DEFB    'Y'
FC93 46       03260          DEFB    'F'
FC94 58       03270          DEFB    'X'
FC95 41       03280          DEFB    'A'
FC96 57       03290          DEFB    'W'
FC97 4A       03300          DEFB    'J'
FC98 64       03310          DEFB    100      ;FIGS
FC99 55       03320          DEFB    'U'
FC9A 51       03330          DEFB    'Q'
FC9B 4B       03340          DEFB    'K'
FC9C 65       03350          DEFB    101      ;LTRS
              03360
FC9D 65       03370 TAB2     DEFB    101      ;UPPER CASE L-U TABLE
FC9E 35       03380          DEFB    '5'
FC9F 0D       03390          DEFB    13       ;CR
FCA0 39       03400          DEFB    '9'
FCA1 20       03410          DEFB    32       ;SPACE
FCA2 23       03420          DEFB    '#'
FCA3 2C       03430          DEFB    ','
FCA4 2E       03440          DEFB    '.'
FCA5 20       03450          DEFB    32       ;LF
FCA6 29       03460          DEFB    ')'
FCA7 34       03470          DEFB    '4'
FCA8 26       03480          DEFB    '&'
FCA9 38       03490          DEFB    '8'
FCAA 30       03500          DEFB    '0'
FCAB 3A       03510          DEFB    ':'
FCAC 3B       03520          DEFB    59       ;SEMICOLON
FCAD 33       03530          DEFB    '3'
FCAE 22       03540          DEFB    34       ;QUOTES
FCAF 24       03550          DEFB    '$'
FCB0 3F       03560          DEFB    '?'
FCB1 2A       03570          DEFB    '*'      ;SUBSTITUTE FOR BELL
FCB2 36       03580          DEFB    '6'
FCB3 21       03590          DEFB    '!'
FCB4 2F       03600          DEFB    '/'
FCB5 2D       03610          DEFB    '-'
FCB6 32       03620          DEFB    '2'
FCB7 27       03630          DEFB    39       ;APOSTROPHE
FCB8 64       03640          DEFB    100      ;FIGS
FCB9 37       03650          DEFB    55       ;7
FCBA 31       03660          DEFB    49       ;1
FCBB 28       03670          DEFB    40       ;(
FCBC 65       03680          DEFB    101      ;LTRS
              03690
FCBD ED7BC0FB 03700 RETBAS   LD      SP,(SAVSTK)
FCC1 210000   03710          LD      HL,0
FCC4 C39A0A   03720          JP      0A9AH    ;BACK TO BASIC
              03730
FCC7 ED7BC0FB 03740 CONBAS   LD      SP,(SAVSTK)
FCCB 21E803   03750          LD      HL,1000
FCCE C39A0A   03760          JP      0A9AH    ;BACK TO BASIC
              03770
              03780
FCD1 21E2FC   03790 WRU      LD      HL,BGID
FCD4 2259FC   03800          LD      (RF1+1),HL
FCD7 226CFC   03810          LD      (RF2+1),HL
FCDA 3E00     03820          LD      A,0
```


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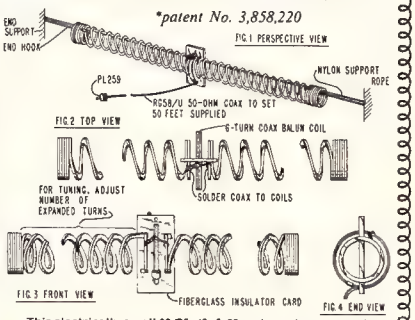
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mode, and so the clock does not have to worry about anything.

In 5200 the machine thinks about whether a c.w. ID is required. It compares the time of the last ID stored as TT with current minute, and if 10 or more minutes has elapsed, it will call USR4 to perform the ID; otherwise it will return. This keeps down on the c.w. identifications during a sequence of command executions. By calling the routine from 5250 rather than 5200, the date and time are not printed, and by calling at 5270, a c.w. identification is sent regardless of the time. This is done at sign-on and when the stop command is received.

The routine in 5300 stores a time at FFFE Hex which the clock will use to decide how long the transmitter has been on the air. In 10000 text can be saved on disk, and at 12000 the error trapping routine will reset the system if something goes wrong.

At 13000 the operator gets control of things after hitting CLEAR while in one of the receive modes. Here the system can be shut down and text saved.

That concludes the BASIC part of the program. By having all of the bulletin board functions in BASIC any user should be able to modify the system to meet local needs. Any system will be a compromise of what different individuals might desire to have. Now we'll take a look at the machine routines that make the system run.

Source Code

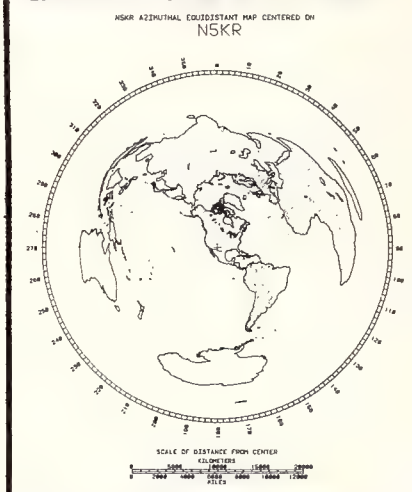
For those not familiar with reading assembly language programs, here is a brief description. You will note that the text is divided into columns. The first column is always a hexadecimal address. The next column is the actual hexadecimal value which is stored at that address and the following addresses. The next column is a line number used for easy reference to lines of the text. So, for example, in line 160 the value 2A will reside in location BFFF, 16 will be in location C000 (the next location after BFFF), and 40 will be in location C001. The next column contains a "label" which the user wishes to use to refer to a particular location. In line 160 the word "LOAD" is defined to be location BFFF. The next two columns contain the assembly language abbreviations for the machine language command. Any other material must follow a semicolon and is a remark. In line 160, then, the command is LD HL, (4016H) which translates into the 3 byte machine instruction 2A1640. This instruction tells the machine to find the two bytes stored in 4016 and 4017 and load them into the HL register. Of course, that makes no sense to you unless you are familiar with Z80 machine language. If you are interested, you can look up the commands on a line by line basis and see what is going on. If not, you at least now know the format of what follows.

```
FCDC 3246FD    03830          LD      (CNT1),A
FCDF C3C5FB    03840          JP      RCV
FCE2 F5        03850 BGID     PUSH    AF
FCE3 D5        03860          PUSH    DE
FCE4 CD3300    03870          CALL    33H
FCE7 D1        03880          POP     DE
FCE8 3A46FD    03890          LD      A,(CNT1)
FCEB 2101FB    03900          LD      HL,DAT1
FCEE 85        03910          ADD     A,L
FCEF 6F        03920          LD      L,A
FCF0 F1        03930          POP     AF
FCF1 BE        03940          CP      (HL)
FCF2 2012      03950          JR      NZ,BGID2
.CF4 F5        03960          PUSH    AF
FCF5 3A46FD    03970          LD      A,(CNT1)
FCF8 3C        03980          INC     A
FCF9 FE06      03990 BG00     CP      6
FCFB 2805      04000          JR      Z,ME1
FCFD 3246FD    04010          LD      (CNT1),A
FD00 F1        04020          POP     AF
FD01 C9        04030          RET
FD02 F1        04040 ME1      POP     AF
FD03 C3BDFC    04050          JP      RETBAS
FD06 2146FD    04060 BGID2    LD      HL,CNT1
FD09 3600      04070          LD      (HL),0
FD0B C9        04080          RET
FD0C 3E2F      04090 MSRX     LD      A,'/'
FD0E 3241FD    04100          LD      (COMPAR+1),A
FD11 1807      04110          JR      MODRX
               04120
FD13 3E0D      04130 COMRX    LD      A,13
FD15 3241FD    04140          LD      (COMPAR+1),A
FD18 1800      04150          JR      MODRX
               04160
               04170
FD1A DD21E641  04180 MODRX    LD      IX,BUFFER
FD1E 212AFD    04190          LD      HL,MESG
FD21 2259FC    04200          LD      (RF1+1),HL
FD24 226CFC    04210          LD      (RF2+1),HL
FD27 C3C5FB    04220          JP      RCV
               04230
FD2A F5        04240 MESG     PUSH    AF
FD2B CD3300    04250          CALL    33H
FD2E F1        04260          POP     AF
FD2F DDE5      04270          PUSH    IX
FD31 D1        04280          POP     DE
FD32 21E542    04290          LD      HL,BUFFER+SIZE
FD35 B7        04300          OR      A
FD36 ED52      04310          SBC     HL,DE
FD38 CA17FF    04320          JP      Z,CLOUT
FD3B DD23      04330          INC     IX
FD3D DD7700    04340          LD      (IX),A
FD40 FE2F      04350 COMPAR   CP      '/'
FD42 CABDFC    04360          JP      Z,RETBAS
FD45 C9        04370          RET
               04380
0001           04390 CNT1     DEFS    1
               04400 ;                TRS80 PRINTER ROUTINE BY D. MORR
               04410 ;                FROM KILOBAUD #32 8/79
               04420 ;                REVISED 7/79 FOR M80
               04430 ;                REV 6/81 FOR BULLETIN BOARD
4029           04440 CHCNT    EQU     4029H
               04450
               04460                          ;ORIGIN OF LINEPRINTER ROUTINE
FD47 79        04470 LPRT     LD      A,C     ;RETURN IF 0
FD48 B7        04480          OR      A
FD49 C8        04490          RET     Z
FD4A FE21      04500          CP      33      ;CHECK FOR NON CONTROL
FD4C 3049      04510          JR      NC,ALPHA
FD4E FE0D      04520          CP      13              ;CHECK FOR CR
FD50 2825      04530          JR      Z,CRLF
FD52 FE0A      04540          CP      10              ;CHECK FOR LF
FD54 2821      04550          JR      Z,CRLF
FD56 FE20      04560          CP      32              ;CHECK FOR SPACE
FD58 C0        04570          RET     NZ              ;RETURN IF NOT APPLICABLE
FD59 3A2940    04580 SPCHR    LD      A,(CHCNT)
FD5C FE08      04590          CP      8
FD5E FA77FD    04600          JP      M,CRLF
FD61 3A87FE    04610          LD      A,(SHFT)
FD64 FEFF      04620          CP      0FFH
FD66 280A      04630          JR      Z,SPAC
FD68 0E1F      04640          LD      C,1FH   ;DO LTR SHIFT
FD6A CDF9FD    04650          CALL    STRT
FD6D 2187FE    04660          LD      HL,SHFT
FD70 36FF      04670          LD      (HL),0FFH       ;RECORD LTR SHFT
FD72 3E04      04680 SPAC     LD      A,4             ;SEND SPACE
FD74 C3ECFD    04690          JP      PRINT
               04700
FD77 C5        04710 CRLF     PUSH    BC
FD78 0E02      04720          LD      C,2             ;DO LF
FD7A CDF9FD    04730          CALL    STRT
FD7D 0E08      04740          LD      C,8             ;DO CR
FD7F CDF9FD    04750          CALL    STRT
FD82 3E48      04760          LD      A,72    ;INITIALIZE CHAR COUNT
FD84 322940    04770          LD      (CHCNT),A
FD87 16FF      04780          LD      D,0FFH
FD89 CD22FE    04790          CALL    DELAY
FD8C 16FF      04800          LD      D,0FFH
FD8E CD22FE    04810          CALL    DELAY
FD91 C1        04820          POP     BC
FD92 212940    04830          LD      HL,4029H        ;LINE COUNTER
FD95 35        04840          DEC     (HL)
FD96 C9        04850          RET
FD97 E67F      04860 ALPHA    AND     7FH             ;GET RID OF MSB
FD99 FE60      04870          CP      96              ;CHECK LOWER CASE
FD9B 3802      04880          JR      C,ALPH1
FD9D D620      04890          SUB     32              ;ADJUST TO UPPER CASE
```


Say You Saw It In CQ

```
FD9F D621      04900 ALPH1   SUB     33              ;ADJUST TO TABLE
FDA1 2132FE    04910         LD      HL,TABLE
FDA4 85        04920         ADD     A,L
FDA5 6F        04930         LD      L,A
FDA6 7E        04940         LD      A,(HL)          ;GET ENTRY
FDA7 FE80      04950         CP      80H             ;IF BIT 8 SET GET SPECIAL
FDA9 3024      04960         JR      NC,SPEC
               04970
FDAB FE20      04980 CHOUT   CP      20H             ;CHECK FOR LETTER
FDAD F5        04990         PUSH    AF              ;SAVE COPY
FDAE 2187FE    05000         LD      HL,SHFT         ;CHECK FOR SHIFT
FDB1 7E        05010         LD      A,(HL)
FDB2 300D      05020         JR      NC,FIG0
FDB4 FEFF      05030         CP      0FFH            ;IT'S LETTER--SHIFTED?
FDB6 2814      05040         JR      Z,CONT0         ;IF YES, JUMP AHEAD
FDB8 36FF      05050         LD      (HL),0FFH               ;SET SHIFT=0FFH
FDBA 3E1F      05060         LD      A,1FH           ;LETTER SHIFT
FDBC CDECFD    05070         CALL    PRINT
FDBF 180B      05080         JR      CONT0
FDC1 FE00      05090 FIG0    CP      00              ;IT'S FIG--SHIFTED?
FDC3 2807      05100         JR      Z,CONT0         ;IF YS JUMP AHEAD
FDC5 3600      05110         LD      (HL),00         ;SET SHIFT
FDC7 3E1B      05120         LD      A,1BH           ;DO FIG SHIFT
FDC9 CDECFD    05130         CALL    PRINT
FDCC F1        05140 CONT0   POP     AF              ;PRINT CHAR
FDCD 181D      05150         JR      PRINT
               05160
FDCF E67F      05170 SPEC    AND     7FH             ;GET RID MSB
FDD1 F5        05180         PUSH    AF              ;SAVE COPY
FDD2 3E3C      05190         LD      A,3CH           ;PRINT '.'
FDD4 CDABFD    05200         CALL    CHOUT
FDD7 2171FE    05210         LD      HL,SPTB         ;GET CHAR FROM SPEC TABLE
FDDA F1        05220         POP     AF
FDDB 85        05230         ADD     A,L
FDDC 6F        05240         LD      L,A
FDDD E5        05250         PUSH    HL              ;SAVE POINTER
FDDE 7E        05260         LD      A,(HL)          ;PRINT FIRST CHAR
FDDF CDABFD    05270         CALL    CHOUT
FDE2 E1        05280         POP     HL
FDE3 23        05290         INC     HL
FDE4 7E        05300         LD      A,(HL)          ;PRINT 2ND CHAR
FDE5 CDABFD    05310         CALL    CHOUT
FDE8 3E3C      05320         LD      A,3CH
FDEA 18BF      05330         JR      CHOUT
               05340
FDEC 4F        05350 PRINT   LD      C,A             ;SAVE COPY
FDED 3A2940    05360         LD      A,(CHCNT)
FDF0 3D        05370         DEC     A
FDF1 322940    05380         LD      (CHCNT),A
FDF4 2003      05390         JR      NZ,STRT
FDF6 CD77FD    05400         CALL    CRLF
FDF9 1E05      05410 STRT    LD      E,5             ;SET FOR 5 BITS
FDFB CD18FE    05420         CALL    SPACE           ;SEND START BIT
FDFE 79        05430 PRINT1  LD      A,C             ;GET CHAR
FDFF 0F        05440         RRCA                    ;ROTATE LSB TO CARRY
FE00 4F        05450         LD      C,A             ;SAVE REMAINS
FE01 3805      05460         JR      C,PRINT2        ;IF CARRY DO MARK
FE03 CD18FE    05470         CALL    SPACE           ;OTHERWISE--SPACE
FE06 1803      05480         JR      PRINT3
FE08 CD12FE    05490 PRINT2  CALL    MARK
FE0B 1D        05500 PRINT3  DEC     E
FE0C 20F0      05510         JR      NZ,PRINT1
FE0E CD1EFE    05520         CALL    STOP            ;WHEN 0 SEND STOP BIT
FE11 C9        05530         RET                     ;AND RETURN
               05540
FE12 161B      05550 MARK    LD      D,27
FE14 DB04      05560         IN      A,(4)
FE16 180A      05570         JR      DELAY
FE18 161B      05580 SPACE   LD      D,27
FE1A DB03      05590         IN      A,(3)
FE1C 1804      05600         JR      DELAY
FE1E 1626      05610 STOP    LD      D,38
FE20 DB04      05620         IN      A,(4)
FE22 0621      05630 DELAY   LD      B,33            ;DELAY ABOUT .5MS
FE24 3A4038    05640 DELAY1  LD      A,(3840H)       ;TEST FOR BREAK KEY
FE27 FE02      05650         CP      2
FE29 CABDFC    05660         JP      Z,RETBAS
FE2C 10F6      05670         DJNZ    DELAY1
FE2E 15        05680         DEC     D
FE2F 20F1      05690         JR      NZ,DELAY
FE31 C9        05700         RET
               05710
FE32 2D        05720 TABLE   DEFB    2DH     ;!
FE33 31        05730         DEFB    31H     ;"
FE34 34        05740         DEFB    34H     ;#
FE35 29        05750         DEFB    29H     ;$
FE36 80        05760         DEFB    80H     ;%
FE37 3A        05770         DEFB    3AH     ;&
FE38 2B        05780         DEFB    2BH     ;'
FE39 2F        05790         DEFB    2FH     ;(
FE3A 32        05800         DEFB    32H     ;)
FE3B 82        05810         DEFB    82H     ;*
FE3C 84        05820         DEFB    84H     ;+
FE3D 2C        05830         DEFB    2CH     ;,
FE3E 23        05840         DEFB    23H     ;-
FE3F 3C        05850         DEFB    3CH     ;.
FE40 3D        05860         DEFB    3DH     ;/
FE41 36        05870         DEFB    36H     ;0
FE42 37        05880         DEFB    37H     ;1
FE43 33        05890         DEFB    33H     ;2
FE44 21        05900         DEFB    21H     ;3
FE45 2A        05910         DEFB    2AH     ;4
FE46 30        05920         DEFB    30H     ;5
FE47 35        05930         DEFB    35H     ;6
FE48 27        05940         DEFB    27H     ;7
FE49 26        05950         DEFB    26H     ;8
FE4A 38        05960         DEFB    38H     ;9
```


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CIRCLE 74 ON READER SERVICE CARD

Listing TWO has the editor assembler text and machine code for the program. A loading routine begins at line 240. The load is begun at BFFF Hex which is in the mid-portion of memory in a 48K system. This area will not be protected and may be overwritten by BASIC once that portion of the program is running. In this way there is no real memory overhead for this part of the program. Once it does its job, it will be forgotten. The routine begins by loading the address of **KEYMOD** into the keyboard driver. This will enable the system to provide text that the computer expects to get from the keyboard, and in this way the initialization procedure is simplified for the operator. The machine then protects all of the machine language program following **CWID** by loading one less than that address into 4049H where disk-basic keeps track of the highest location that it can use. The lineprinter driver address is then loaded into that DCB so that **LPRINT** statements will use the Baudot driver rather than the resident program. A little housekeeping is done to set the M80 switches into resting mode and to indicate that the program is not in a mode that must be timed. Then a jump to **CLOCK** is loaded into the midst of the real-time clock routine and the program returns to DOS.

Now the keyboard driver will be called sequentially to load the commands to turn the clock on, set verify, call basic, indicate one buffer, no special memory size (this has already been done by storing an address in 4049 Hex), and call the **BULBD/BAS** program. Once that is done, the normal keyboard driver is restored to the DCB. At that point the BASIC program would be running and the rest of the machine code is accessed either from BASIC or from the clock.

Line 850 begins the routine to send the c.w. identification. Since this machine program is so long, I will not try to explore it in detail; I will just give a skeleton idea of what the routines are doing. Essentially the machine picks up the number stored at CWID and then the sequence of characters, and uses a look-up table to send each of these in Morse by opening and closing the loop.

Line 2260 begins the receive routine. The machine uses the M80 loop sensing capabilities and picks up the Baudot code one bit at a time and then uses another set of look-up tables (one for **LTRS** and one for **FIGS**) to identify the character received.

The routine at 3980 is entered from BASIC when the system wishes to wait to be accessed. Here the address of the **BGID** routine is loaded into the receive program instead of a simple display of the character. This routine will look for the sequence ZZK8BG. When that sequence is found, it will return to BASIC and the resident program will continue. In line 4340 a different insertion is made into the

```
FE4B 2E         05970           DEFB    2EH     ;:
FE4C 3E         05980           DEFB    3EH     ;;
FE4D 86         05990           DEFB    86H     ;<
FE4E 88         06000           DEFB    88H     ;=
FE4F 8A         06010           DEFB    8AH     ;>
FE50 39         06020           DEFB    39H     ;?
FE51 8C         06030           DEFB    8CH     ;@
FE52 03         06040           DEFB    3       ;A
FE53 19         06050           DEFB    19H     ;B
FE54 0E         06060           DEFB    0EH     ;C
FE55 09         06070           DEFB    9       ;D
FE56 01         06080           DEFB    1       ;E
FE57 0D         06090           DEFB    0DH     ;F
FE58 1A         06100           DEFB    1AH     ;G
FE59 14         06110           DEFB    14H     ;H
FE5A 06         06120           DEFB    6       ;I
FE5B 0B         06130           DEFB    0BH     ;J
FE5C 0F         06140           DEFB    0FH     ;K
FE5D 12         06150           DEFB    12H     ;L
FE5E 1C         06160           DEFB    1CH     ;M
FE5F 0C         06170           DEFB    0CH     ;N
FE60 18         06180           DEFB    18H     ;O
FE61 16         06190           DEFB    16H     ;P

FE62 17         06200           DEFB    17H     ;Q
FE63 0A         06210           DEFB    0AH     ;R
FE64 05         06220           DEFB    5       ;S
FE65 10         06230           DEFB    10H     ;T
FE66 07         06240           DEFB    7       ;U
FE67 1E         06250           DEFB    1EH     ;V
FE68 13         06260           DEFB    13H     ;W
FE69 1D         06270           DEFB    1DH     ;X
FE6A 15         06280           DEFB    15H     ;Y
FE6B 11         06290           DEFB    11H     ;Z
FE6C 8E         06300           DEFB    8EH     ;ARROW UP
FE6D 90         06310           DEFB    90H     ;AR DN
FE6E 92         06320           DEFB    92H     ;AR LEFT
FE6F 94         06330           DEFB    94H     ;AR RIGHT
FE70 23         06340           DEFB    23H     ;-
                06350
FE71 16         06360 SPTB      DEFB    16H     ;.PT.
FE72 10         06370           DEFB    10H
FE73 10         06380           DEFB    10H     ;TIMES=.TM.
FE74 1C         06390           DEFB    1CH
FE75 16         06400           DEFB    16H     ;PLUS=.PL.
FE76 12         06410           DEFB    12H
FE77 12         06420           DEFB    12H     ;, = .LT.
FE78 10         06430           DEFB    10H
FE79 01         06440           DEFB    1       ;=  =.EQ.
FE7A 17         06450           DEFB    17H
FE7B 1A         06460           DEFB    1AH     ;> = .GT.
FE7C 10         06470           DEFB    10H
FE7D 03         06480           DEFB    3       ;@ = .AT.
FE7E 10         06490           DEFB    10H
FE7F 07         06500           DEFB    7       ;AR UP = .UP.
FE80 16         06510           DEFB    16H
FE81 09         06520           DEFB    9       ;AR DN =.DN.
FE82 0C         06530           DEFB    0CH
FE83 12         06540           DEFB    12H     ;AR LFT = .LE.
FE84 01         06550           DEFB    1
FE85 0A         06560           DEFB    0AH     ;AR RT = .RT.
FE86 06         06570           DEFB    6
                06580
0001            06590 SHFT      DEFS    1       ;CONTAINS LAST SHIFT STATUS
                06600                           ;IF 00 IS FIGS SHIFTED
                06610                           ;IF FF IS LTRS SHIFTED
                06620
FE88 F5         06630 CLOCK     PUSH    AF
FE89 3AFFFF     06640           LD      A,(0FFFFH)
FE8C FE01       06650           CP      1
FE8E 2806       06660           JR      Z,CLO3
FE90 DABAFE     06670           JP      C,CLORET
FE93 F2C1FE     06680           JP      P,CLO1
FE96 3A4240     06690 CLO3      LD      A,(4042H)       ;MIN FROM CLOCK
FE99 21FEFF     06700           LD      HL,0FFFEH
FE9C BE         06710           CP      (HL)
FE9D 201B       06720           JR      NZ,CLORET
FE9F 21D7FE     06730           LD      HL,MSG-1
FEA2 C5         06740           PUSH    BC
FEA3 D5         06750           PUSH    DE
FEA4 0646       06760           LD      B,70
FEA6 23         06770 CLO2      INC     HL
FEA7 4E         06780           LD      C,(HL)
FEA8 C5         06790           PUSH    BC
FEA9 E5         06800           PUSH    HL
FEAA CD47FD     06810           CALL    LPRT
FEAD E1         06820           POP     HL
FEAE C1         06830           POP     BC
FEAF 10F5       06840           DJNZ    CLO2
FEB1 D1         06850           POP     DE
FEB2 C1         06860           POP     BC
FEB3 DB00       06870           IN      A,(0)
FEB5 3E00       06880           LD      A,0
FEB7 32FFFF     06890           LD      (0FFFFH),A
FEBA F1         06900 CLORET    POP     AF
FEBB 214140     06910           LD      HL,4041H        ;BACK TO CLOCK
FEBE C3BF45     06920           JP      45BFH
                06930
FEC1 21FEFF     06940 CLO1      LD      HL,0FFFEH
FEC4 3A4240     06950           LD      A,(4042H)
FEC7 BE         06960           CP      (HL)
FEC8 20F0       06970           JR      NZ,CLORET
FECA DB00       06980           IN      A,(0)
FECC 3E00       06990           LD      A,0
FECE 32FFFF     07000           LD      (0FFFFH),A
FED1 3E01       07010           LD      A,1
FED3 3216FF     07020           LD      (CLOBAK),A
```

```
FED6 18E2      07030          JR      CLORET
               07040
FED8 43        07050 MSG      DEFM    'COMPUTER ERROR RESULTED IN TIME OUT'
     4F 4D 50 55 54 45 52 20
     45 52 52 4F 52 20 52 45
     53 55 4C 54 45 44 20 49
     4E 20 54 49 4D 45 20 4F
     55 54
FEFB 0D        07060          DEFB    13
FEFC 53        07070          DEFM    'SYSTEM WILL SHUT DOWN'
     59 53 54 45 4D 20 57 49
     4C 4C 20 53 48 55 54 20
     44 4F 57 4E
FF11 0D        07080          DEFB    13
FF12 4E        07090          DEFM    'NNNN'
     4E 4E 4E
               07100
FF16 00        07110 CLOBAK   DEFB    0
FF17 3E00      07120 CLOUT    LD      A,0
FF19 3216FF    07130          LD      (CLOBAK),A
FF1C 21F401    07140          LD      HL,500
FF1F ED7BC0FB  07150          LD      SP,(SAVSTK)
FF23 C39A0A    07160          JP      0A9AH
BFFF           07170          END     LOAD
00000 TOTAL ERRORS
```

ALPH1	FD9F	ALPHA	FD97	ASCII	FBC3	BAUD	FBC4	BEGIN	FBC9
BG00	FCF9	BGID	FCE2	BGID2	FD06	BUFFER	41E6	CHCNT	4029
CHOUT	FDAB	CII	FB30	CLO1	FEC1	CLO2	FEA6	CLO3	FE96
CLOBAK	FF16	CLOCK	FE88	CLORET	FEBA	CLOUT	FF17	CNT1	FD46
COMPAR	FD40	COMRX	FD13	CONBAS	FCC7	CONT	FC31	CONT0	FDCC
CONT1	FC69	CRLF	FD77	CWCON	FB3B	CWID	FB00	CWLET	FB23
CWOUT	FB34	D4	FBF5	D5	FBF7	DASH	FB54	DAT1	FB01
DELAY	FE22	DELAY1	FE24	DELAY2	FBF3	DO1	FB4C	DO2	FB60
DO3	FB56	DO4	FB43	DOT	FB4A	DOTSP	FB5E	DP	FC47
ENDLET	FB41	FIG	FC71	FIG0	FDC1	FIND	FC26	KEYBD	C055
KEYMOD	C043	LOAD	BFFF	LOOK	FBCB	LOW	FC55	LPRT	FD47
LTRS	FC77	MARK	FE12	ME1	FD02	MESG	FD2A	MODRX	FD1A
MORSE	FB68	MS0	FED8	MSG	C057	MSRX	FD0C	N1	FC06
NEW	FC00	NEXLET	FB18	NEXT	C053	OUT	C07D	PRINT	FDEC
PRINT1	FDFE	PRINT2	FE08	PRINT3	FE0B	RCV	FBC5	RETBAS	FCBD
RF1	FC58	RF2	FC6B	SAVSTK	FBC0	SC	FC3C	SENDID	FB09
SHFT	FE87	SHIFT	FBC2	SIZE	00FF	SPAC	FD72	SPACE	FE18
SPCHR	FD59	SPEC	FDCF	SPTB	FE71	STOP	FE1E	STRT	FDF9
TAB1	FC7D	TAB2	FC9D	TABLE	FE32	UP	FC5E	WRU	FC01

receive routine to pick up a message, and at 4430 a substitution is made to pick up commands. Both of these have the machine store received characters in the I/O buffer. In the former the routine will return to BASIC when a slash is received, and in the latter when a carriage return is received. The lineprinter routine begins at 4790. This routine is taken from *Kilobaud* #32, an article by D. Morr. The routine has been modified for the M80 and for this application.

Finally the last machine routine is the **CLOCK**. The **LOAD** sequence inserted a jump to this routine in the resident real-time clock program. This routine looks at what is stored in FFFF Hex. If a zero is there, it returns to the clock. If a 1 is there, it knows the transmitter is on and looks in FFFE Hex to see when the transmitter should shut down. If that time has not yet occurred, then the regular clock continues. If that time has occurred, then a shutdown message is sent, and the program then continues. This means that the thing might shut down in the midst of executing any part of the program, but since this will only occur through some sort of error, it seemed safest to just let the transmitter shut down, without any other options.

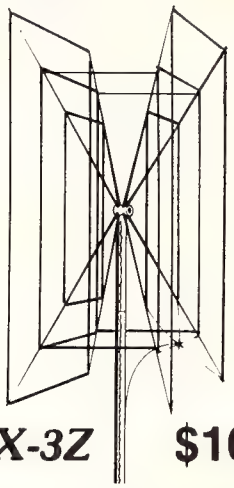
If the value in FFFF Hex is a 2 the routine goes to **CL01** to see how long it has been in the command mode. If it has been there too long, a 1 is loaded into **CLOBAK**. This will be sensed in the receive routine and will cause a return to BASIC with a 500 in the variable X. This will then force the program to return to a reset condition awaiting another call-up with ZZK8BG.

Some on-the-air use of this system has shown that it performs reliably. The various error conditions have not occurred on the air, but they have been tested in various simulations. Some users of the system would prefer more material sent from the machine so that they feel more of an interaction. Others like to see the machine say little, so that any transaction can be conducted efficiently both in time and yellow paper. This system presents a compromise.

If anyone would like to put such a system on the air and yet not have to do all of this typing, send me an s.a.s.e. for information on obtaining the program. While this version has been written for DISK-BASIC, the program would run in a 16K level II machine. One would have to change the storage and retrieval routines from disk to tape, the machine language call-up sequence to that used in Level II, neglect the automatic start-up sequence, and do the start-up manually, and find another way to handle the time-out problem, since Level II does not have a resident clock. However, with these modifications a workable system should be obtainable.

While this task was obviously a good bit more complicated than others which I have explored, and while it requires machine language as well as BASIC for execution, *it can be done!* I hope that this discussion has peaked your interest in using the computer to perform more complex jobs and be of more general use in the shack. But watch out—once the thing learns to operate the station, you may never get the chance to do anything yourself.

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CIRCLE 29 ON READER SERVICE COUPON

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Results Of The 1981 Spring BARTG RTTY Contest

Single Operator Section

No.	Call Sign	Points	Total QSO's	Countries
1.	W3EKT	598,000	364	37
2.	I5FZI	577,720	296	46
3.	EA8RU	537,544	346	36
4.	W3FV	466,334	271	39
5.	K7BV	445,760	281	37
6.	G3HJC	436,028	247	34
7.	WB3CCZ	380,820	232	37
8.	W4CQI	377,936	249	35
9.	GM3ZXL	377,140	226	38
10.	SM6ASD	373,430	233	32
11.	I1TXD	368,340	246	37
12.	W2IUC	327,320	218	32
13.	I5GZS	313,720	160	38
14.	I8JRA	311,850	203	35
15.	OZ1CRL	301,172	231	39
16.	W6JOX	298,176	197	32
17.	DJ6JC	288,900	205	34
18.	GI4AHP	282,690	230	34

Single Operator Section

No.	Call Sign	Points	Total QSO's	Countries
19.	W0HAH	278,154	245	29
20.	EA8XS	261,796	214	34
21.	I5HZZ	245,168	161	34
22.	W3KV	218,954	147	37
23.	K1LPS	208,926	167	32
24.	K0BJ	202,648	160	30
25.	ON5WG	202,400	145	30
26.	OZ9GA	195,156	151	29
27.	I1HUH	194,176	144	26
28.	SP3CMX	189,072	130	29
29.	G3LDI	189,070	150	29
30.	JA1MIN	186,480	140	33
31.	DK1BX	178,266	125	36
32.	K4VDM	177,682	125	32
33.	G4FLM	177,600	117	31
34.	VE2AXO	177,120	146	28
35.	EA3BLQ	173,844	165	35

Single Operator Section

No.	Call Sign	Points	Total QSO's	Countries
36.	N7DF	171,962	127	28
37.	WB3FSN	170,690	145	27
38.	W0LHS	170,136	131	30
39.	VO1EE	164,340	150	27
40.	N9BHH	161,664	135	33
41.	I4JEE	157,820	126	28
42.	I0UIQ	154,320	152	27
43.	YO3AC	153,468	127	28
44.	WA6WGL	148,674	91	24
45.	EI3CN	145,200	144	27
46.	G4HYD	140,448	100	25
47.	I0WQP	132,480	124	27
48.	N0AN	128,240	129	28
49.	YB2BLI	126,312	104	29
50.	VK2EW	121,768	102	24
51.	W5HEZ	120,360	84	26
52.	GW3EHN	120,080	118	16
53.	DL8QP	115,412	90	24
54.	Y79XN	110,344	113	26
55.	VK2SG	109,230	81	30
56.	G4EEV	108,756	90	27
57.	G2PB	106,808	87	19
58.	ZS3L	106,600	105	21

Single Operator Section

No.	Call Sign	Points	Total QSO's	Countries
59.	G4KHX	103,620	90	26
60.	G4IPZ	102,100	109	28
61.	DJ1QT	101,608	77	27
62.	VK3KF	95,930	101	18
63.	LA7QM	92,310	81	28
64.	OK1BJT	87,390	75	26
65.	DL5MBI	86,200	74	29
66.	WA6UFY	80,840	72	14
67.	JR2TZL	80,448	70	22
68.	G4EJA	69,372	51	29
69.	WA3ZKZ	65,912	73	17
70.	W7CBY	65,620	73	20
71.	VK2RA	64,080	61	19
72.	WA9BMA	63,222	55	16
73.	PP7GV	61,776	54	22
74.	SM6BUV	60,762	59	20
75.	DJ6AD	59,280	60	23
76.	K0PJ/6	56,760	72	13
77.	G3RDG	55,828	69	21
78.	SM6CAL	55,100	110	23
79.	YJ8TT	55,080	62	22
80.	W1MX	54,950	57	19

Single Operator Section

No.	Call Sign	Points	Total QSO's	Countries
81.	PT2WS	54,216	73	18
82.	W2KHQ	53,010	71	22
83.	G3GGL	52,632	47	20
84.	Y33UO	49,962	53	23
85.	PY2ERA	48,816	58	18
86.	PJ3SF	48,360	76	22
87.	W2ODA	46,980	62	25
88.	N3AKQ	44,464	59	18
89.	VK2EG	42,240	36	19
90.	OK2BFS	41,832	71	27
91.	I5YNQ	40,338	51	20
92.	VK3BUS	40,300	50	16
93.	SL3ZR	29,670	49	17
94.	PY2CJS	28,652	34	12
95.	WB2VTD	27,140	38	17
96.	VK1GM	25,740	37	13
97.	W9VY	22,680	28	17
98.	SM5AAY	20,700	35	18
99.	SP9BQJ	19,200	20	15
100.	PA3ABE	18,900	30	17
101.	DF9XI	12,784	36	17
102.	JA2VFW	10,244	22	5
103.	WB4BKU	9,716	31	5
104.	PY2CME	8,028	10	6
105.	JA7ML	7,540	18	13
106.	Y21MF/A	7,440	23	6
107.	9M2CR	7,110	19	5
108.	SP3CAI	3,724	14	4
109.	W8TCO	3,430	9	2
110.	KA0GYP	1,778	7	2

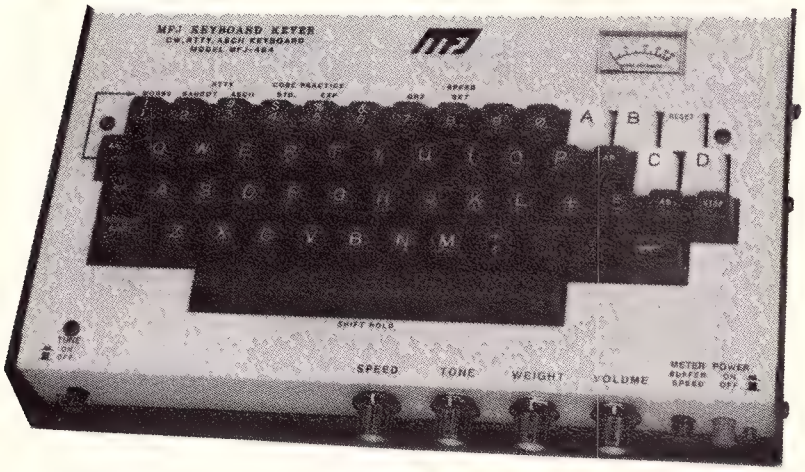
Multi-Operator Section

1.	LZ1KDP	489,464	296	39
2.	LZ2KRR	465,052	277	37
3.	HA5KBM	403,300	254	35
4.	I5NUT	328,388	197	38
5.	HG6V	273,734	216	33
6.	OK1KPU	133,952	120	28
7.	OK3RJB	110,770	130	30
8.	SP1PBW	51,192	103	19
9.	HA6KVD	34,074	47	16
10.	SK6DG	18,942	31	12
11.	OK1KRY	6,270	17	11

The Contest Manager gratefully acknowledges the receipt of Check Logs from the following: F6BIQ, G3GRJ, G6JF, G8CDW, NL5288-R07, ON4BX, PA0NDB, SM5EIT, SM6CQV, WA1ABL, Sim Dunnett, Page Pyne, Y23NE, Y34YF, Y39XO, and Y2-10521/0.

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The 256 character (50 for 494) **text buffer** makes sending perfect CW effortless even if you "hunt and peck."

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Delete errors by backspacing.

A meter gives buffer remaining or speed. Two characters before buffer full the meter lights up red and the sidetone changes pitch.

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A lot or thought has gone into human engineering these MFJ Super Keyboards.

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5 level Baudot is transmitted at 60 WPM. Both RTTY and CW ID are provided.

Carriage return, line feed, and "LTRS" are sent automatically on the first space after 63 characters on a line. This gives unbroken words at the receiving end and frees you from sending the carriage return. After 70 characters the function is initiated without a space.

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The ASCII mode includes all the features of Baudot. Transmission speed is 110 baud. Both upper and lower case are generated.

MODE 4: MEMORY KEYER

Plug in a paddle to use it as a deluxe full feature memory keyer with automatic and programmable memories, iambic operation, dot-dash memories, and all the features of the CW mode.

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Insert space between characters and groups to form high speed characters at slower speed for easy character recognition.

Select alphabetic or alphanumeric [illegible] tuation. You can even pause and then re[illegible]

MORE FEATURES

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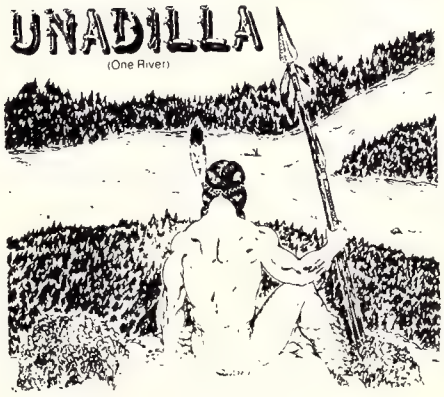
CIRCLE 28 ON READER SERVICE CARD

SWL Section

No.	Name/Call Sign	Points	Total QSO's	Countries
1.	OK1 11857 (Czech-SWL)	350,200	224	43
2.	H. Ballenberger (DL-SWL)	284,068	195	37
3.	OK3 27010 (Czech-SWL)	249,916	224	34
4.	Y2-5724/C (DM-SWL)	173,128	137	33
5.	K. Wustner (DL-SWL)	165,240	139	28
6.	Y2-6992/F (DM-SWL)	145,542	145	26
7.	A. Schneider (DL-SWL)	65,800	68	27
8.	Y2-8861/0 (DM-SWL)	60,080	51	28
9.	Werner Ludwig (DL-SWL)	14,460	19	5

A total of 146 logs were received as a result of the 1981 Contest and a total of 17 Quarter Century Awards have been claimed.

During the Contest period, RTTY activity took place from the following Countries: Antigua, Alaska, Australia, Austria, Belearic Isles, Belgium, Brazil, Bulgaria, Canada, Canal Zone, Cayman Islands, Channel Isles, Chile, Czechslovakia, Denmark, Eire, England, Finland, France, Gabon Republic, German Federal Republic, German Democratic Republic, Ghana, Gibraltar, Guadeloupe, Guam Island, Hungary, Indonesia, Israel, Japan, Kuwait, Lithuania, Luxembourg, Malaysia, Monaco, Morocco, Netherlands Antilles, New Caledonia, Newfoundland, New Hebrides, New Zealand, Nigeria, Northern Ireland, Norway, Okinawa, Pakistan, Panama, Phillipines, Poland, Portugal, Puerto Rico, Rhodesia, Romania, St. Pierre & Miquelon Islands, Sardinia, Scotland, Sicily, S.W. Africa, Spain, Sweden, Switzerland, United States of America and Yugoslavia. This gives a total of 63 Countries, among them several rare DX stations, and it was the first appearance of Polish (SP) Stations in an RTTY Contest since the alterations to their license conditions in the latter part of last year. CQ



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CIRCLE 141 ON READER SERVICE CARD

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CIRCLE 77 ON READER SERVICE CARD

Here's an approach to RTTY that's not usually covered in the manuals and construction articles and sometimes has to be learned the hard way.

RTTY Operating In The 80's

BY JOHN EDWARDS*, KI2U

"The RTTY bands are a mess!" A popular sentiment in some circles, to be sure. While phone and c.w. frequencies have been overcrowded for decades, a packed spectrum is a rude new occurrence for RTTY users. After all, it wasn't so long ago that radioteletype operators were part of a very exclusive club. Indeed, it took a sizeable technical knowledge plus a spacious shack to assume membership in the green key fraternity. Today, however, microcomputer-based RTTY systems have opened the floodgates to our little corner of the radio universe, and RTTY users must now also join the overcrowded world of amateur radio.

Unfortunately, a good deal of the present situation on the RTTY frequencies can be directly attributed to poor operating habits. Of course, there's always unintentional QRMing due to shifting band conditions and the more-than-occasional c.w. station, but most of the interference we hear can be traced to either uncaring operators or those just plain ignorant of good operating techniques.

How To Call CQ

It's too bad that every new RTTY operator doesn't receive a manual on how to call CQ along with his new gear. This would be a tremendous godsend, since the most supremely frustrating event that can occur during a QSO is the appearance of some lid on an adjacent frequency plunking down his carrier and blithely CQing away to the agony of all present. This is not to infer that similar affairs don't happen on other modes, but somehow it just *seems* worse on RTTY. There's nothing like a lid to destroy the neat rows of type or beautiful picture sent by your QSO partner. They seem to have a knack for it.

On the whole, it reflects poorly on RTTY that while our c.w. and phone brethren have fashioned methods of inquiring whether a frequency is in use (QRL and its phone equivalent), radioteletype users seem to be at a loss to come up with a similar device. Since c.w. and phone ops don't have to be exactly on frequency to make their inquiry known, as we do, they do have a bit of an easier time of it. But there are ways of making our CQ intentions known, beyond just blindly running a CQ tape.

Listening is important, but since lengthy RTTY transmissions are the norm, briefly monitoring a frequency just isn't good enough. After listening for a while, send a few (two or three) "QRLs" before cranking up the tape. Even if a station using the frequency isn't exactly zero-beated to you, your brief carrier will alert him of your intentions. Then, theoretically at least, he can send you a couple of short carrier bursts to notify you of his presence. These are things one shouldn't have to be told, but judging by the state of our bands, it's time someone did.

While on the subject of CQs, one reminder: keep your CQ transmission down to a minimum. Three lines of CQ along with your call and a final line including your name and QTH should suffice. If you get no response after your first try, just replay the tape or memory. With a string of short CQs, your chances of giving prolonged interference to an on-going QSO are greatly reduced. You'll also lessen the likelihood of having more than one station answering your call. Short CQs are a time-saver all the way around.

Herding

Ever notice how 90% of all h.f. RTTY operating takes place on 20 meters? Have you listened to 20 meter RTTY on a weekend afternoon recently? Sort of sounds like the electronic equivalent of feeding time at the zoo. But, just for the heck of it, flick your band switch over to 15. What do you hear? One or two QSOs, tops. What gives? Is 15 meters perpetually closed? No, lots of activity on c.w. and phone. It just seems that most RTTY users have their band switch epoxied to 14 MHz.

Ask RTTY people for their thoughts on these "herding" characteristics of their fellow enthusiasts and you'll get some pretty strange responses. The two most popular statements concerning the inactivity on other bands are "Too much c.w. QRM" and "Nobody else is there." As far as the c.w. QRM goes (and it goes pretty far on skywave), it's a problem, but not insurmountable. After all, even our beloved 20 meters isn't immune to c.w. QRM—it's just an accepted risk of being on radioteletype. Regarding the second argument—the scarcity of activity—this falls into the category of a "self-fulfilling prophesy," meaning, if everyone believes there is no activity on 40, 15, or 10 meters, no one will venture on those bands, hence no activity. By the way, if c.w. operators heard a little more RTTY action in those segments, perhaps there would be less c.w. transmitted in "our" portion of those bands.

But how can we solve this problem? Some action has been taken by RTTY contest organizers who allow extra credits for contacts on unpopulated bands. But, like contests in other modes, the activity soon disappears after the contest's conclusion. In the long run, the only permanent solution must be one generated from within our own ranks. The next time you're disgusted with the QRM on 20, move to another band instead of shutting down or merely tolerating the situation. If everyone did this, the pressure could be evenly distributed across all our RTTY bands.

Lousy Signals

As the number of RTTY "appliance operators" increases, so does the amount of distorted, cruddy, rotten (you supply the next adjective) signals. Observing some RTTY transmissions, a casual listener might think that our standard shift is 170 kHz instead of 170 Hz.

The reasons for distorted signals are as many and varied as the reasons why amateurs don't bother to check and align their RTTY equipment in the first place (if all else fails, read the manual). One major culprit, however, is the practice of feeding audio tones in a rig's microphone jack

*78-56 86th St., Glendale, NY 11385

at *too high* a level. The remedy for this is simple: just be sure to keep an eye on your rig's ALC indicator. Even better, figure out a way to add frequency-shift keying to your rig. No matter how careful you may be, following the so-called "AFSK" method of generating RTTY is inviting trouble with spurs and harmonics into your shack. Most of the popular RTTY handbooks show a number of inexpensive ways to add FSK to your rig.

Unawareness is a significant cause behind many poor signals. All too often RTTY enthusiasts use only two levels of signal reports: a 599 if the signal is strong, a 559 if weak. While this may prove convenient, it negates the entire purpose of a report. If you hear an RTTY station that sounds distorted, give him a T5—or even a T0, if warranted. It's not a matter of offending the other fellow; it's a case of being a responsible amateur. You wouldn't tell a blind pedestrian a traffic light was green when it was actually red just because you didn't want to delay him; neither should you humor a fellow amateur into thinking he has a good signal when he's actually trashing up 30 kHz of spectrum.

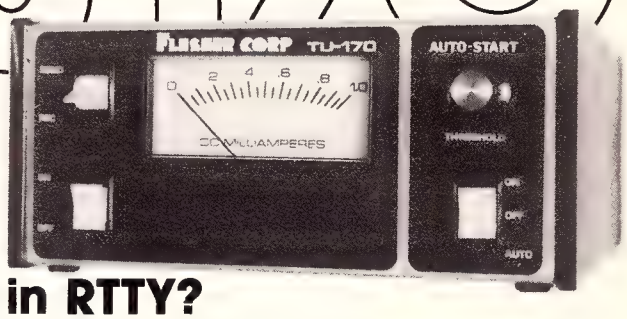
Roundtables

You don't hear as many roundtables on RTTY as you do on phone or c.w. One reason for this may be the operating techniques of many RTTYers in such gatherings. If you've ever been involved in a roundtable where each station is on a slightly different frequency, forcing you to retune each time another participant begins sending, you can rapidly develop a distinct distaste for RTTY nets.

This point really hits home when you join an autostart net. Up on 2 meters, autostart roundtables work great, since everybody is either frequency synthesized or crystal controlled. On h.f., however, drifting v.f.o.'s can cause havoc. As a result, many h.f. autostart nets require members to use crystals. Unfortunately, many transmitters will not accommodate crystals without extensive modification, which may not be desirable. Nevertheless, one can still join an RTTY net without using crystals; all it takes is the net designating one member as a net control. Each operator can then zero-in on frequency by matching his signal with the control's.

All of which brings us to the object of this article. Most of the items mentioned as steps toward better RTTY operating are not really very complex or difficult. As a matter of fact, much of the data imparted here may already be known by most readers. The object, therefore, is just to remind you to *think*. Pause for a moment before transmitting. Try to determine if what you're doing is in accordance with good amateur practice. It really all boils down to two simple points: common sense and courtesy.

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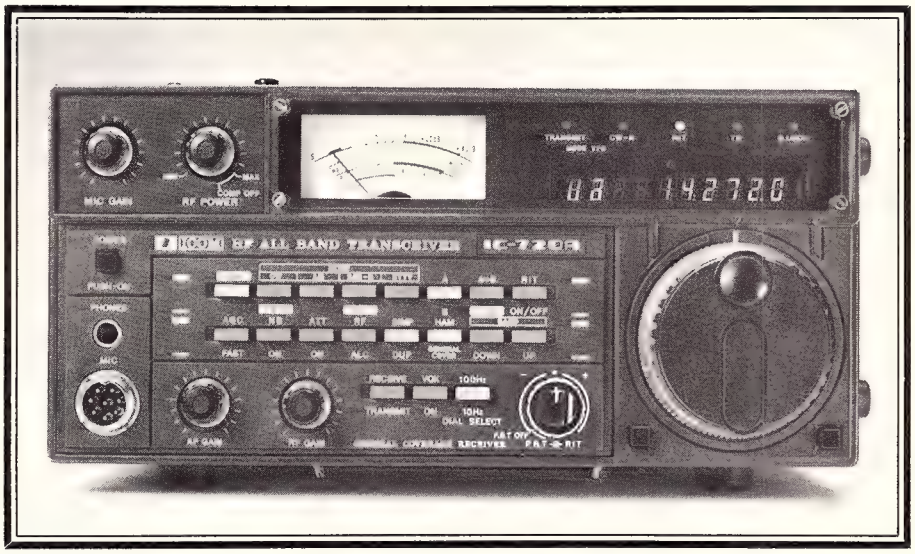
CQ Reviews:

The ICOM-720A All Band, General Coverage H.F. Transceiver

BY JOHN J. SCHULTZ*, W4FA

Several "ultimate design" h.f. transceivers have appeared on the market in the last few years. Although only a small percentage of all amateurs will own such transceivers, they should be of technical interest to many more amateurs. One reason for this is that the features pioneered in such designs invariably find their way, over a period of time, into lower priced transceiver designs. Also, from the host of features available on the "ultimate designs" one can try to evaluate which features are most appealing if one now wants to choose a new but lower priced transceiver that has only some of the features of an "ultimate design."

The ICOM IC-720A certainly qualifies as one of the "ultimate design" transceivers on the market today with a host of advanced design features. When looking at such a piece of equipment, it is probably best to focus on it from a distance at first in terms of overall operating features and then to explore in detail its special features and special circuitry. Such an outline is followed in this review, along with some comments on test bench results and operating impressions.



For a transceiver with a multitude of features, the IC-720A is refreshingly clear of too many control knobs. Push-button switches dominate and are easy to use. The two unlabeled ones below and to the right and left of the tuning knob provide for a dial-lock feature and for switching to 100 kHz per knob revolution for quick tuning.

General

The IC-720A is, like its predecessor the IC-701, an amazingly compact h.f. transceiver measuring only 111 × 241 × 311 mm and weighing about 7.5 kg. It covers all present plus future amateur bands on the s.s.b., c.w., FSK (170 Hz shift), and a.m. modes with a minimum 100 watts output on all modes except a.m. (40 watts). Additionally, it functions as a general coverage receiver from 100 kHz to 30 MHz in thirty 1 MHz band segments with detectors included for all modes (RTTY requires a separate FSK demodulator, of course). Frequency readout is by means of a 6 digit display. There are selectable tuning rates of 100 kHz, 10 kHz, or 1 kHz per tuning knob revolution. A dual v.f.o. system is used, and one can set the v.f.o.'s to frequencies in the same band or split them between any two desired bands. In essence, one v.f.o. could be used as an operating v.f.o. while the other functions as a memory which can be recalled and used as the main v.f.o.

On receive, the unit features selectable fast/slow a.g.c., a noise blanker, RIT, and true passband tuning (800 Hz to 2.3 kHz) on s.s.b., c.w., and RTTY (also on a.m. when an optional narrow a.m. filter is installed). On transmit, the power output can be continuously varied from about 10 watts output to the maximum available. VOX and a true r.f. clipping-type speech processor are incorporated. The unit requires 13.8 volts ± 15% at 20 amperes for transmit at maximum output and 1 ampere while receiving. If v.f.o. memory backup is desired when the main power is turned off, an external source of 9–12 volts at 14 ma is also required.

Table I lists the "specs" for the unit as published by ICOM. As one can see, they are very much state of the art for equipment of its class.

In spite of incorporating a multitude of features, the front panel of the IC-720, as one can see from the photo, is refreshingly free from control knobs, although the a.f. and r.f. gain controls are separated—a nice touch for operating convenience which hasn't appeared on most transceivers for years. Maximum use is made of push-buttons for control functions. The metering is quite clear and includes an s.w.r. function.

Looking Inside

Fig. 1 shows the block diagram of the IC-720A. The circuitry needed to execute the block functions requires some 172 active devices (transistors plus IC's) and a few hundred diodes. But in spite of the circuit complexity from a design viewpoint, one can follow some of the basic block functions to appreciate the overall operation of the unit.

On receive, the signal first passes through a low pass filter (one of seven dual section filters depending on the frequency range in use) and then to an r.f. amplifier stage. This stage is quite interesting in that it consists of a push-pull, low-noise FET arrangement with broadband input/output transformer coupling. This section is expanded in fig. 2. The

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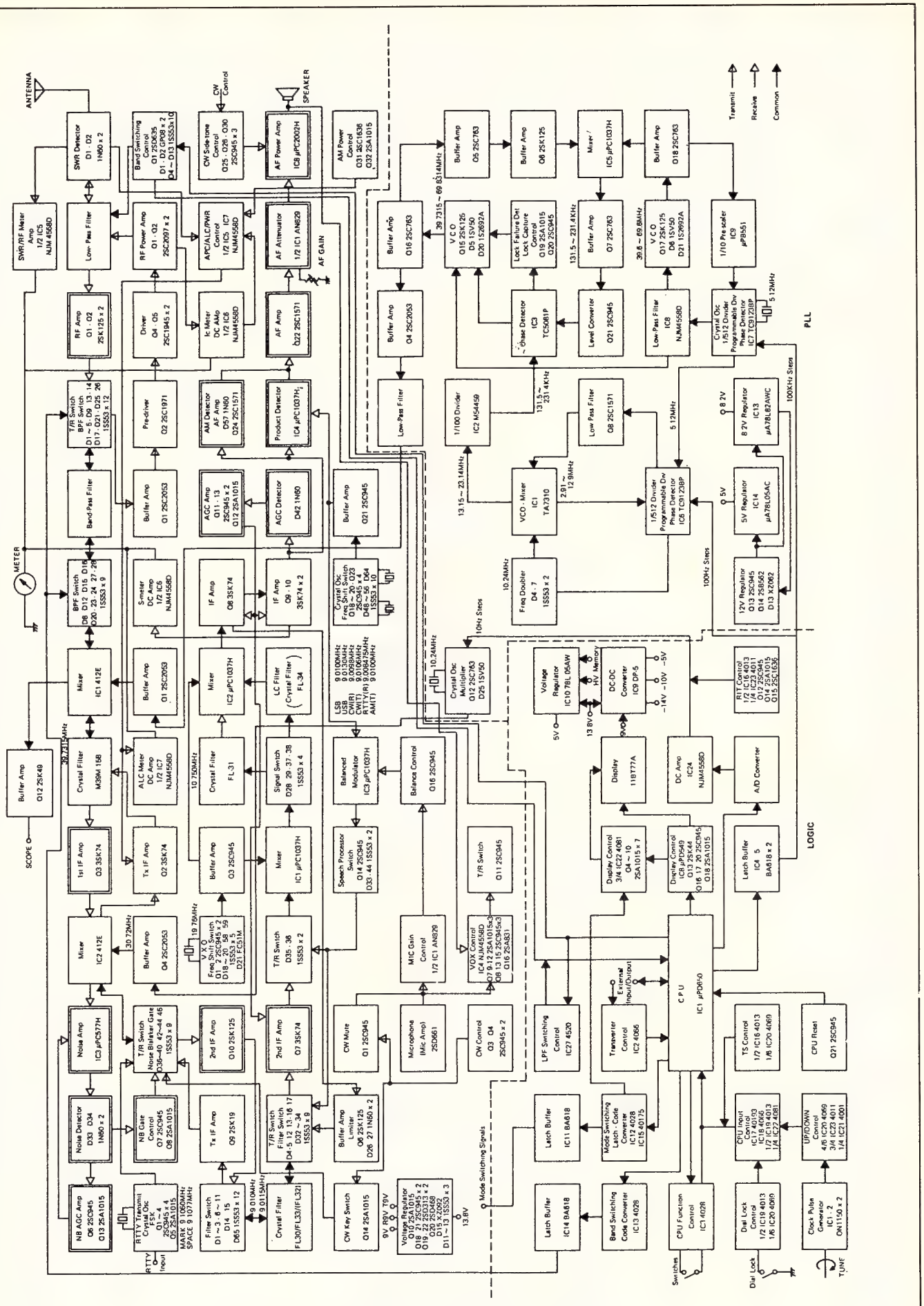
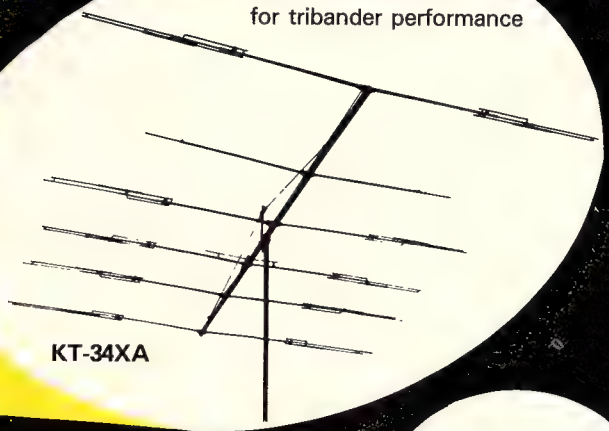


Fig. 1– Complete block diagram of the IC-720A.

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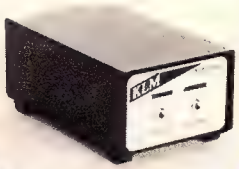
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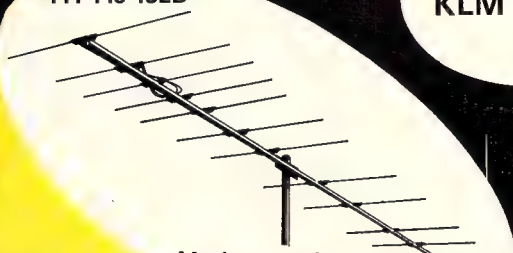
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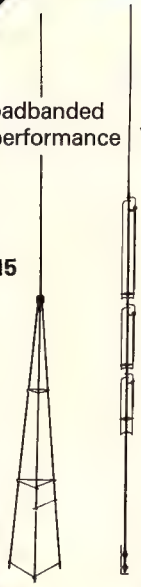
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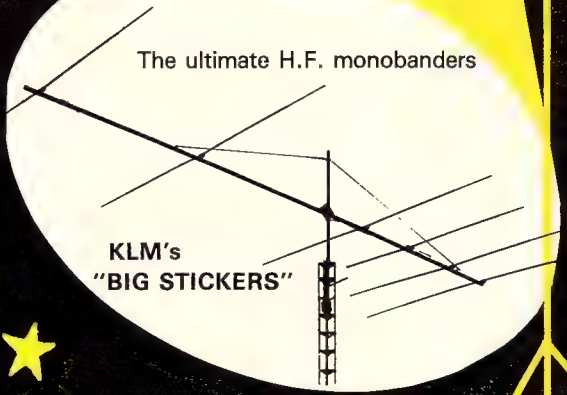
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front panel attenuator switch controls a relay function which provides not only for the insertion of an attenuator pad, but for bypassing of the r.f. stage in case of extremely high input levels causing cross-modulation. After the r.f. stage, signals are routed to one of nine multiple-pole bandpass filters (depending on the frequency range being used) and then to a double-balanced mixer. The double-balanced mixer receives an injection frequency from a PLL local oscillator which varies from 39.7315 to 69.8314 MHz to cover the frequency range from 100 kHz to 30 MHz. The first output i.f. is on 39.7315 MHz. The signal is passed through a broad crystal filter, an FET amplifier, and to a second double-balanced mixer. This mixer has an injection frequency of 30.72 MHz and provides the second i.f. output at 9.0115 MHz. Actually, the 30.72 injection frequency is derived from a 10.24 MHz crystal oscillator circuit which can be slightly varied in frequency to provide RIT action of about ± 800 Hz.

The 9.0115 kHz i.f. signal is routed through a noise blanker circuit and then to the first real signal selectivity which is provided for by various crystal filters. A 2.3 kHz s.s.b. filter and 3.0 kHz a.m. filter are standard equipment. Optionally available are a steep skirted 500 Hz c.w. filter and 2.6 kHz a.m. filter. After further amplification, the signal is routed through the bandpass filter circuitry as shown in fig. 3. This type of circuitry has become familiar now in a number of transceivers. Basically, the passband of an additional crystal filter (in this case at 10.75 MHz) is imposed over the passband of the normal i.f. filter to provide variable bandwidth while maintaining the relationship of the b.f.o. frequency to the received signal. The idea is illustrated nicely in fig. 4. The pitch of the received signal does not change as the received bandwidth is narrowed, but one does chop off either the lower or higher audio frequencies contained in the received signal. ICOM does refer to the IC-720 as a quadruple conversion receiver, but two of the frequency conversions are due only to the bandpass tuning feature. After the i.f. stages, the signal is routed to either an a.m. or product detector and then on to the a.f. amplifier stages (maximum about 2 watts across 8 ohms). There is a small built-in speaker. A nice touch in the a.f. chain is that the a.f. gain control regulates an attenuator stage rather than the a.f. signal directly.



This view shows the IC-720A with the top cover removed. Construction is extremely neat. The view also shows some of the connectors on the back panel and the flat-backed heat sink for the PA.

The high first i.f. (39.7315 MHz) design idea is not new. It goes back at least to the Racal and Barlow-Wadley receiver designs of more than 20 years ago. Its value is that image problems are esentially eliminated and that full, unbroken coverage of the h.f. range can be achieved by having a first local oscillator which is varied over a 30 MHz range in the v.h.f. area. To achieve the benefits of the idea, however, requires a lot more engineering skill than was initially imagined. The v.h.f. local oscillator signal has to be especially stable and pure, the h.f. input circuits have to be broken up into bands so gain can be properly balanced consistent with cross-modulation protection, etc. ICOM has probably achieved one of the best executions of this design approach yet seen.

On the transmit side most of the circuitry is essentially reversed with the b.f.o. functioning as the carrier oscillator for generation of an s.s.b. signal in a balanced modulator. A bit of clever signal switching allows the crystal filter at 10.75 MHz in the passband tuning circuit and the crystal filter in the regular 9.0115 MHz i.f. to be used together in a true r.f. clipping-type speech processor. That is, a d.s.b. is first generated, filtered into an s.s.b. signal, clipped, and filtered again by the second crystal filter. After translation to the operating frequency, the signal is amplified by a series of broadband amplifiers up to about 6 watts and then goes to the PA unit for amplification to about 100 watts output. After the PA stage the signal is routed through the low-pass filters and s.w.r. detection circuitry. S.w.r. and thermal protection are provided for the PA stage. A small fan mounted inside the transceiver is always on low speed during transmit periods and switches to a higher speed if the thermal protection circuitry calls for it.

Switching of almost all of the complex r.f. routing and control signals is done by diode switching, although a few relays are used. The main one is a stepping relay to choose the low-pass filters. It's effective, but makes a resounding clank as it operates.

The logic, PLL, and display sections in the IC-720 make up a good part of the overall circuitry and cover the functions shown in the lower half of fig. 1. The display uses soft green digits of about 7 mm height. The frequency display is nicely centered over the tuning knob. Normally, it displays down to 100 Hz. However, if the 100 kHz per knob revolution tuning rate is chosen, the 100 Hz digit is suppressed. The frequency readout is that of the carrier frequency and automatically offset for the transmission mode selected. On receive, the display does not change if the RIT control is used. Two simulated letter displays to the left of the frequency readout indicate the mode selected (U for u.s.b., L for l.s.b., A for a.m., etc.) and the v.f.o. in use (A or B).

The logic section is microprocessor based and sends data to the PLL and control sections in the transceiver according to the switch selections made and setting of the tuning knob. When bands are changed, for instance, in either the amateur band or general coverage mode, it will set the diode-switched bandpass filters and relay-switched low-pass filters. When modes are changed, it will reset the display offset. Band change, by the way, is accomplished by means of two up/down pushbuttons. Each depression of a button will step the unit through either each amateur band or through each 1 MHz segment for general coverage. The

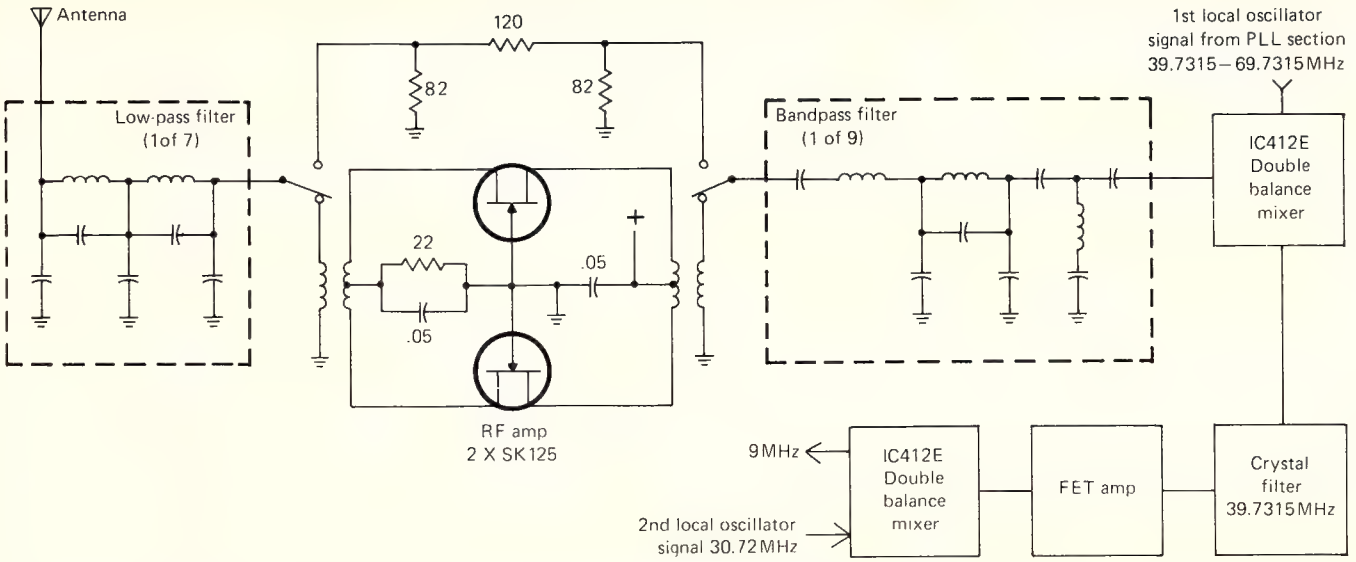
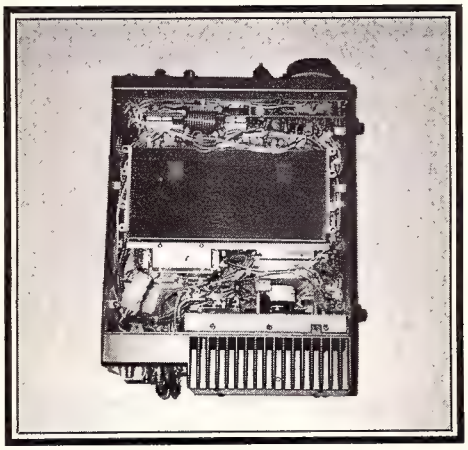


Fig. 2– "Front-end" of the IC-720A features a push-pull r.f. amplifier stage and double balanced mixers for both the first and second frequency translations. The r.f. amplifier is completely switched out when the 20 dB input attenuator is used.

main tuning function as it relates to the logic function is probably the most interesting. The main tuning knob as it is rotated controls two offset photo-chopper functions. The physical offset is provided so circuitry can sense which optical-coupler circuit is interrupted first and so determine whether the knob is being turned c.w. or c.c.w. Each interruption also steps the PLL frequency, according to how the logic is set, in 10 Hz, 100 Hz, or 1 kHz steps (1, 10, or 100 kHz per total knob revolution). There is no continuous tuning as such, although when one selects the 1 kHz per revolution speed, the steps blend into the illusion of continuous tuning. The transceiver does not have a scanning function, but it would seem to be easily possible to somehow pulse the tuning circuitry to provide such a feature, if desired. The dual v.f.o. system operates on the basis of storing the complete frequency information for any two desired tuning knob settings. For instance, if v.f.o. A is used for tuning, one can store in v.f.o. B any frequency of interest to which v.f.o. A is temporarily set by pressing the v.f.o. A to B button and continue tuning with v.f.o. A. Switching to v.f.o. B recalls the frequency of interest. V.f.o. B can now be used for tuning, and if another frequency of interest is found, it can be stored in v.f.o. A by using the v.f.o. B to A button. Complete frequency information for v.f.o. A and v.f.o. B can be stored so they can be set in different bands, and the IC-720 will switch bands if necessary. The Simplex/Duplex function of the v.f.o.'s allows either v.f.o. A or B to control transmit/receive frequency or to have v.f.o. A control transmit while v.f.o. B controls receive or vice versa. It is not duplex operation in the strict sense of providing simultaneous split-frequency transmit/receive operation. The duplex function will also not operate if v.f.o. A and B are set to frequencies in different bands, since it is impractical due to the time required for the low-pass filter stepping relay to operate.



This view shows the IC-720A with the bottom cover removed. It's hard to believe, but there is even a bit of spare room left in the enclosure. The object in the center of the PA enclosure which sort of looks like the magnet on a loudspeaker is actually the internally mounted PA cooling fan.

Nuts and Bolts

The photos show some inside views of the IC-720A. However, they really can't convey the Swiss watch-like quality of the transceiver's construction. The circuitry is divided among a number of PC boards which are sandwiched into the main aluminum frame enclosure with almost millimeter precision. The boards are not plug-in, but each board has sockets for interconnection wiring, and each board can be fairly easily removed if ever necessary. All adjustments are readily accessible. The main PLL and r.f. circuitry is thoroughly shielded. The PA cooling fan is interestingly placed in that it is inside the enclosure to blow air from underneath out over the top and bottom of the PA heatsink on the back of the unit. The heatsink is, therefore, flat on its outside exterior, and the transceiver can be directly mounted against a "bulkhead." Exterior connections are made via phono connectors, 3.5 mm jacks, or an SO-239 antenna connector. The number of real panel connections are adequate for any normal need, but there is not the profusion seen on some transceivers. There are connections for a key, external speaker, receive antenna in/out, antenna, memory backup power, 12 v.d.c. main power, a.l.c., low-band receive antenna, and an accessory socket. The receive antenna in/out jacks allow for the use of a preamplifier or accessory receiver. The low-band receive antenna jack is for a separate l.w./m.w. antenna input, or it can be internally changed to function as a relay control line for a linear amplifier. The accessory jack provides access to the logic section for a number of functions ranging from remote computer control of the unit to simple data information for remote bandswitching of accessories. For the latter, a voltage is available at one pin which steps in about 0.5 volt steps from 0 to 8 volts as the IC-720A is set for the 10–160 meter bands.

The operating manual for the IC-720A really tries to cover a wide scope—from providing basic operating information for the not too experienced operator to service information for this sophisticated piece of equipment. It does an excellent job without turning into a 200-page book. The operating information is certainly adequate for anyone to get the unit on the air and enjoy its various features. The only exception is that timing information for data exchange with the IC-720A logic is not provided for those interested in computer control. The service informa-

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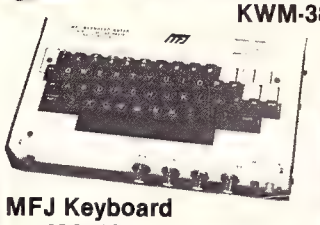
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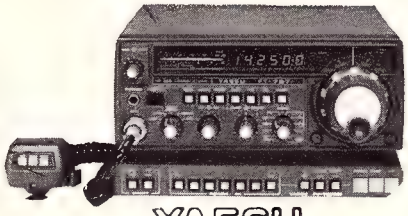
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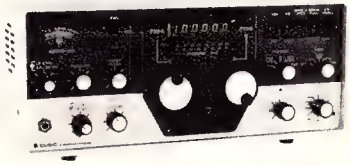


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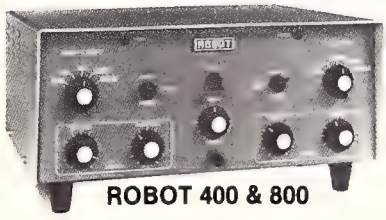


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- FET 16
- IC (Includes CPU) 51
- Diodes 219

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- Ham Band 1.8MHz ~ 2.0MHz
- 3.5MHz ~ 4.1MHz
- 6.9MHz ~ 7.5MHz
- 9.9MHz ~ 10.5MHz
- 13.9MHz ~ 14.5MHz
- 17.9MHz ~ 18.5MHz
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- 24.5MHz ~ 25.1MHz
- 28.0MHz ~ 30.0MHz
- General Cover (Receive Only) 0.1MHz ~ 30.0MHz Thirty 1MHz Segments

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Frequency Readout:
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Frequency Stability:
- Less than 500Hz after switch on 1 min to 60 mins, and less than 100Hz after 1 hour. Less than 1KHz in the range of --10°C to +60°C.

Power Supply Requirements:
- DC 13.8V ±15% Negative ground Current drain 20A max. (at 200W input)
- AC power supply is available for AC operation.

Antenna Impedance:
- 50 ohms Unbalanced

Weight:
- 7.5Kg

Dimensions:
- 111mm(H) x 241mm(W) x 311mm(D)

TRANSMITTER

RF Power:
- SSB (A_3J) 200 Watts PEP input
- CW (A_1), RTTY (F_1) 200 Watts input
- Continuously Adjustable Output power 10 Watts ~ Max.
- AM (A_3) 40 Watts output

Emission Mode:
- A_3J SSB (Upper sideband and Lower sideband)
- A_1 CW
- F_1 RTTY (Frequency Shift Keying)
- A_3 AM

Harmonic Output:
- More than 40dB below peak power output

Spurious Output:
- More than 60dB below peak power output

Carrier Suppression:
- More than 40dB below peak power output

Unwanted Sideband:
- More than 40dB down at 1000Hz AF input

Microphone:
- Impedance 1300 ohms
- Input Level 120 millivolts typical
- Dynamic or Electret Condenser Microphone with Preamplifier

RECEIVER

Receiving System:
- Quadruple Conversion Superheterodyne with continuous Bandwidth Control.

Receiving Mode:
- A_1, A_3J (USB, LSB) F_1 (Output FSK audio signal), A_3

IF Frequencies:
- 1st 39.7315MHz
- 2nd 9.0115MHz
- 3rd 10.75MHz
- 4th 9.0115MHz
- with continuous Bandwidth Control

Sensitivity:
- Less than 0.25 microvolts for 10dB S+N/N

Selectivity:
- SSB, CW, RTTY ±1.15KHz at –6dB (Adjustable to ±0.4KHz Min) ±2.1KHz at –60dB
- CW-N (when optional filter installed) ±250Hz at –6dB ±750Hz at –60dB
- AM ±3.0KHz at –6dB ±9.0KHz at –60dB (when optional filter installed) ±2.6KHz at –6dB ±6.0KHz at –60dB

Spurious Response Rejection Ratio:
- More than 60dB

Audio Output:
- More than 2 Watts

Audio Output Impedance:
- 8 ohms

Table I– ICOM's published specifications on the IC-720A.

tion—which includes a complete schematic, alignment instructions, and multi-colored PC board parts placement diagrams—should allow any experienced amateur to trouble-shoot simple field problems before calling the factory for help.

On the Test Bench

To put it succinctly, the IC-720A tested easily met or exceeded its advertised specifications (see Table I). However, most transceivers can do so today especially in areas where sensitivity, selectivity, carrier suppression, sideband suppression, harmonic output, etc., are concerned. So, rather than go through a detailed number-by-number comparison of claimed and measured performance data, it might be more useful to highlight the special impressions received during testing of the unit.

In the receive mode: Usable sensitivity was excellent in both the amateur band and general coverage modes mainly due to the extreme low noise floor and the almost total lack of spurious responses. Microvolt level signals are distinguishable out of an almost totally quiet background. No sort of external spurious responses could be found that were not at least 60 dB down. There were a few internal spurious responses that had to do with a "shot" effect as the 100 Hz readout on the digital display changed numbers, but they were extremely few and far between. Overload and cross-modulation characteristics were excellent. The IMD dynamic range on 20 meters was better than 90 dB with a third order intercept of 16 dB.

The passband tuning feature functioned very smoothly, and the minimum –3 db bandwidth measured was about 600 Hz. However, the –60 db bandwidth remains at 4.2 kHz. A serious c.w. operator or a.m./s.w.l. listener would undoubtedly appreciate the steeper skirt selectivity offered by the optional c.w. and a.m. filters. The digital frequency readout display is extremely stable—absolutely no last digit flicker.

On the amateur bands the receiver tuning goes smoothly below or above the band limits when the total band coverage exceeds the amateur band limits. For instance, on 40 meters the total band coverage is 6,900.0 kHz to 7,500.0 kHz. If one tunes to 7,000.0 kHz and then tunes lower, the next readout and actually received frequency will be 6,999.9 kHz. However, in the general coverage mode an anomaly takes place between the indicated receive frequency and the actual received frequency when one approaches 1.5 kHz from a band limit. For instance, if one sets the general cover-

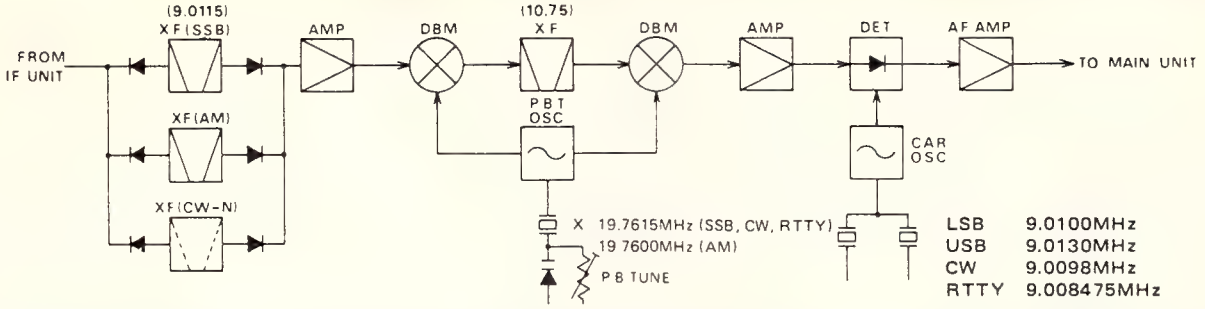


Fig. 3– The 9 MHz i.f. crystal filter chain in the IC-720A and the bandpass tuning blocks. Even this far down in the i.f. chain, double-balanced mixers are still used. A bit of clever circuit switching uses the 9 MHz i.f. and the bandpass tuning 10.75 MHz filters for the sideband filtering/r.f. clipper functions in the transmit mode.

age for the 5 MHz band and tunes to 5,001.5 kHz (or above), one will really receive the displayed frequency. However, if one tunes to an indicated 5,001.4 kHz, one actually will be receiving 6,001.4 kHz. Above the 10 MHz general coverage band, the 1.5 kHz anomaly switches to the upper end of each band. For instance, if one tunes to an indicated frequency of 13,998.4 kHz (or below), one really receives the displayed frequency. If one tunes to an indicated 13,998.5 kHz, one really receives 12,998.5 kHz. This 1 MHz band switch-over as one approaches the extreme of 1.5 kHz of each band edge in the general coverage mode *only* has been acknowledged by ICOM as a design problem. It's not serious, since if one wanted to receive 5,001.4 kHz, one could use the general coverage mode for the 4 MHz band and then tune 1.4 kHz above the high end of that band. But, unless one is aware of the anomaly, it will cause no end of confusion when trying to tune to exact MHz frequencies in the general coverage mode.

In the transmit mode: Power output on all bands, 160 to 10 meters, was remarkably uniform, varying between 100 to 110 watts maximum. The front panel meter which is calibrated in % power output from 0 to 100 could almost be used as a direct reading wattmeter. IMD products were very good with third order products being −33 to −35 dB down. The PA runs very cool even though the PA heatsink does not appear to be all that large. Even with the normal PS-15 power supply on RTTY, one can run 10 minutes continuous transmit (50% duty cycle) without any problems. Absolutely no PA collector current drift/instability was noted.

Using the IC-720A

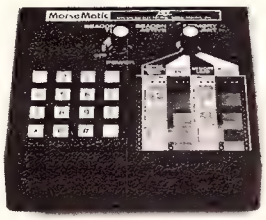
How about turning on a new transceiver for the first time, tuning it up on 20 meters with an indoor antenna, hearing HZ1AB call CQ, giving him a call, and having him come back with a 59 report stating that several other "weaker" stations were also calling. Well, that is exactly the way it did happen with the IC-720A the author was testing in Munich. The feeling of euphoria continued as the rig was really put through its paces over an extended period of time. WAZ nor DXCC was achieved in one month, but many stations

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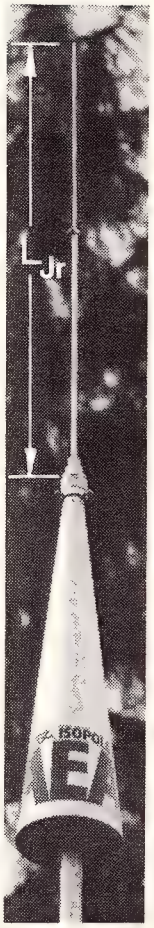


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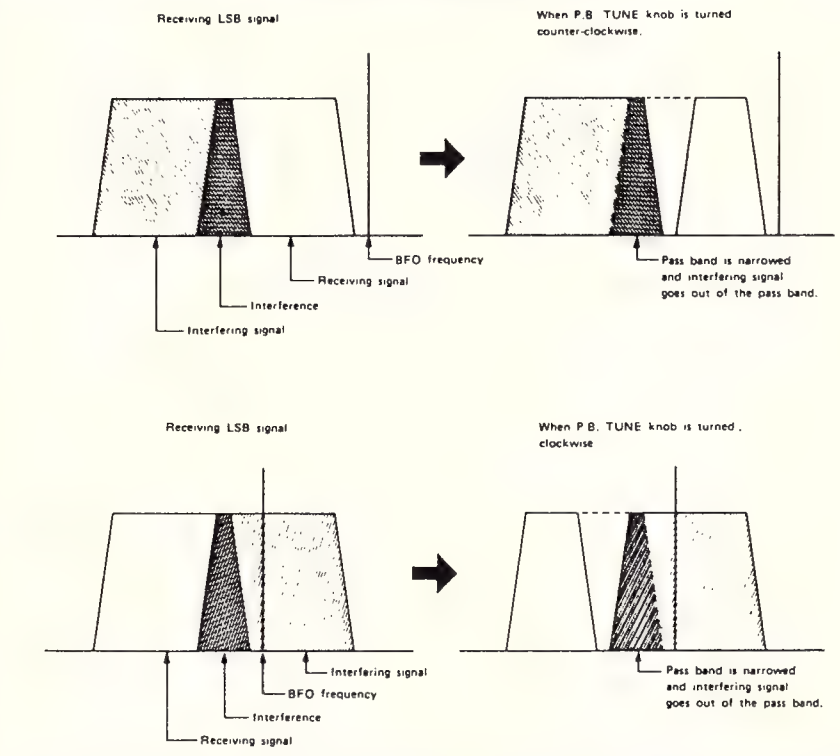


Fig. 4– These diagrams neatly illustrate the effect of passband tuning. Note that when receiving an l.s.b. signal the bandwidth narrows towards the b.f.o. frequency, and when receiving a u.s.b. signal it narrows away from the b.f.o. signal for usage of the passband band tuning control noted (c.w. or c.c.w.).

were worked, and almost all complimented the good audio quality of the IC-720A. The transceiver was used mainly with its supplied IC-HM-7 hand microphone, although a few stations said that the audio quality was slightly improved when an amplified D-104 was substituted. The r.f. speech processor was used continuously. Reports were almost 99% plus that it improved audio punch without distortion. For the received audio, various loudspeakers were tried. The internal speaker sounded adequate but somehow tinny. A special speech-response shaped loudspeaker was tried and it sounded harsh. A normal 4-inch utility-type extension speaker was tried and it sounded the best of all. It seems one can't do anything to improve the already good transmit/receive audio built into the unit.

All of the controls were found easy and convenient to use. The controls associated with setting of the VOX parameters for s.s.b. or semi break-in c.w., and controls for c.w. sidetone level and for s.w.r. setting are accessed via a top hatch. Since these controls are rarely reset after initial adjustment, this was found to be a very practical arrangement. The tuning knob "feel" was very smooth, and there is a break adjustment for individual preferences in tension. A nice feature associated with the tuning knob is that it provides an auto RIT disable. That is, if one turns on the RIT and then later resets the main tuning, the RIT function is automatically disabled. The meter functions, of course, as an S meter on receive. On transmit one can select by means of the r.f./a.l.c. pushbutton as to whether it reads a.l.c. or an "r.f." function (s.w.r., power out, or collector current as set by switches in the top hatch). Tune-up was found to be quick and easy, with the rig being used "barefoot," by having the meter read s.w.r. The RTTY mode button was depressed, then the receive/transmit button and the power gradually brought up with the r.f. power control while an antenna tuner was adjusted for minimum s.w.r. The push-buttons really save time as compared to turning switches! The only real faults found with the controls/indicators were than an LED was not provided to indicate when the attenuator was in use and that the noise blanker did not have a threshold control. The attenuator was only used in the general coverage mode sometimes to prevent BC stations from pinning the S meter. But, several times it was overlooked to disable it when returning to the amateur bands. A noise threshold control might have been useful when one would be willing to accept some signal distortion in order to reduce pulse-type interference.

Overall, the performance of the IC-720A was excellent. Its balance of features to size to performance will probably serve as a benchmark against which a lot of future h.f. amateur equipment will be compared. CQ

Here's a triple threat power supply of lab quality that is equally at home on the workbench, powering your HT, or as a charger for your HT. Triple duty in a small package.

THE VPS-912

A Power Supply Featuring Preset and Variable Output For Handi-Talkies and Other Amateur Gear

BY DAVID F. PLANT*, N7CGA

There is little doubt of the tremendous impact that hand-held v.h.f. f.m. rigs have had upon us as operators. They have served as emergency links for search and rescue, in disaster situations, passing local traffic, keeping in touch, and just plain fun.

They also require pure d.c. to power them, as any a.c. ripple will modulate the phase locked loop used to determine frequency. Hence the popular use of Ni-Cad and other battery sources.

Nicads have their problems, though. The pack typically requires 14–16 hours of charge time for 2 or 3 active hours of QSO time. The pulse chargers (actually a high rise square wave of considerable power) can charge a battery pack in several hours. The drawback with them is that the chargers have to be constantly monitored to avoid battery damage.

There is another problem with Ni-Cads. They have memory. In order to keep operating, we often will exchange an exhausted pack for a half charged one. This expedient is okay once in a while, but done too often, the Ni-Cad will only accept a half charge, regardless of charge time. Running them down several times after a full charge can retrain them, but then the risk of a cell reversal is presented.

To this writer the solution was a highly stable, well filtered d.c. power supply for ham shack use and well charged Ni-Cads for the field.

*1822-9th Street West, Kirkland, WA 98033

Circuit Description

Basically, the circuit consists of an off-the-shelf 3 pole regulator with unregulated V_{in}, regulated V_{out} and an adjustment terminal for voltage programming. The LM317 series device was chosen for its ruggedness and availability. It is also current limited and thermally protected.

Looking at fig. 1, the programming is done with a simple two resistor network consisting of R1 and R2 (or optional R3). R1 provides output feedback to the device, and R2 controls the voltage. Increasing the resistance of R2 between ground increases the V_{out}.

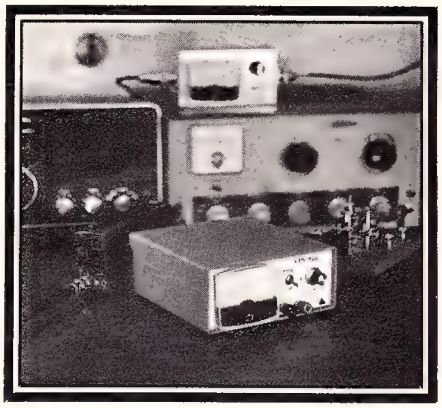
The circuit board layout has provision for two pc mounted pots, if two preset outputs are desired, and SW2 determines which resistance controls the 317.

If only one or two preset voltage *outs* are needed, R2 (R3) can be replaced by fixed resistor. Table I, generated from a computer programmed by WB7SFO from data supplied by National Semi Conductor, gives the necessary numbers. These resistance values were calculated without R5 in the circuit.

R5 was added in parallel with the R2, R3 pots to provide a band spread effect, as the full range of the controls was not needed.

High frequency transient protection from the a.c. input is provided by C2, a .1 disk, and R4 is used to gently bleed the d.c. filter cap, C1.

D6 and D7 are protection diodes for output filter C4 and adjustment filter C3. They are recommended because if the input to the 317 was shorted, C4 would feed back to the device output. D6 acts as a bypass valve.



Front view of the VPS-912 power supply. To the right of the meter are the two basic controls with the binding posts and power indicator below.

The adjustment terminal is equally protected by D7. Here, a short on either the V_{in} or V_{out} port would allow C3 to dump current into the adjustment terminal. D7 provides the proper voltage ratio under ordinary conditions, but will discharge C3 during trouble.

An optional half wave charging circuit is provided on the board. Ni-Cads respond better to half wave unfiltered d.c., so the charger circuit is independent from the rest of the supply. Incandescent lamp L1 provides a variable limiting function.

Figs. 2 and 3 show circuits that are not

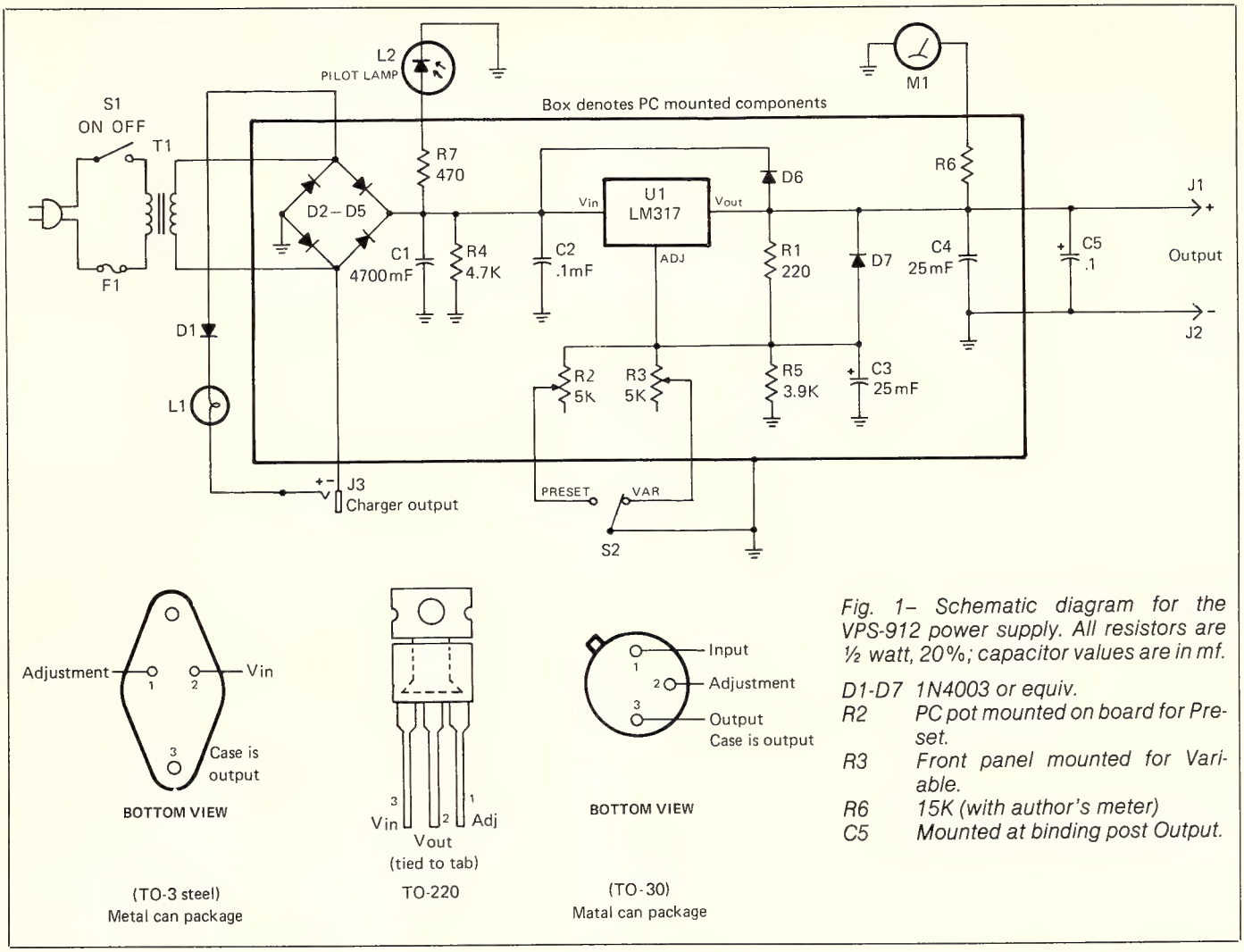


Fig. 1– Schematic diagram for the VPS-912 power supply. All resistors are ½ watt, 20%; capacitor values are in mf.

D1-D7 1N4003 or equiv.
R2 PC pot mounted on board for Preset.
R3 Front panel mounted for Variable.
R6 15K (with author's meter)
C5 Mounted at binding post Output.

on the printed circuit board, but may be of interest to the builder.

Fig. 2 is a simple emitter follower that can be driven by the VPS 912. It does not have feedback regulation, but does provide excellent electronic filtering.

Fig. 3 shows another use for the useful 317. It's a constant current source for charging Ni-Cads. Constant current can be desirable, but the charge time has to be watched because the current source has no feedback from the battery and would just as soon overcharge as not.

Component Selection

The value of T1 is determined by the maximum required output of the power supply, and can be calculated by taking the given secondary output voltage and multiplying that by 1.4 (the RMS factor). This will provide the filtered d.c. output from the diode bride.

From this level, 4 volts should be subtracted for losses in the LM317 regulator due to its 1.25 reference requirement and junction drops through the device.

As an example, an 18 v.a.c. transformer would yield 25 volts d.c. after filtering. This would then provide up to 21 volts at the output of the regulator.

friend, Duane, KA7JEX, suggested using a house door bell transformer as an alternative to the more expensive hobby-type transformers. The bell transformers are designed for a long life, and the author found well over an amp available.

U1, the 317 series programmable voltage regulator, comes in three packages. The TO-3 is the most rugged, the TO-220 is second, and the TO-5 package is strictly for light duty. The circuit board layout will accept all three. All have thermal shut down and current protection.

L1, the charger current limiting lamp, should be voltage rated to the output of the rectifier, and its current rating will determine the charge rate. A 150 ma pilot lamp was found to provide 50 ma to a 9 volt battery pack.

M1 can be a calibrated volt meter or a milliamp meter with R6 mounted on the board. Radio Shack has come out with a 15 volt calibrated panel meter (270–1754, $8.95) that is a perfect fit aesthetically with the Pac-Tec cabinet.

R3, the panel mounted variable voltage control, can be either linear or audio taper. The latter, which is more commonly available, will slightly crowd at the high

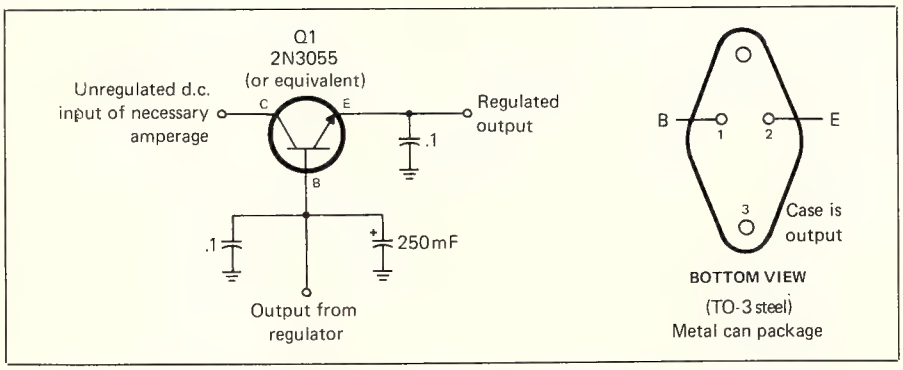


Fig. 2– Schematic for emitter follower stage for higher current applications.

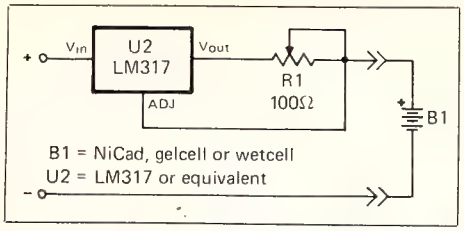


Fig. 3– Schematic diagram for an optional constant-current charge source. Typical current rating of 50 ma is achieved with R1 set at 24 ohms. These components are not included on the VPS-912 PC board.

voltage end, but the author did not find this objectionable. A switch on the rear of this control for S1 saves panel space.

For reliability, the author recommends the use of the higher quality components advertised in the amateur radio magazines as a source of supply where possible.

The following components are available from Benchmark Research, Inc., 10248 N.E. 120th, Kirkland, WA 98033:

VPS-912 printed circuit board, etched and drilled on mil spec epoxy, $8.00.

Pac-Tec #225 Cabinet with custom white front panel and black rear panel, $16.00.

The above prices include all shipping and handling.

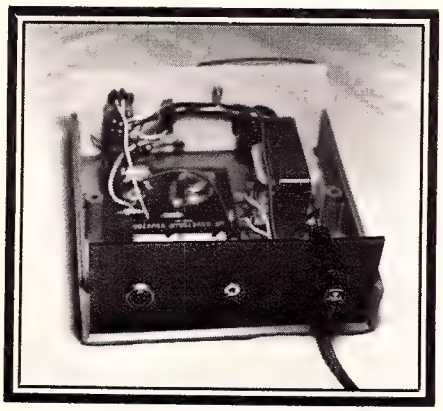
There is no need for a metal cabinet in terms of shielding; however, a metal enclosure would allow the regulator IC to be mounted externally for additional heat sinking. If this is done, make sure that the IC is electronically isolated from the case, as its output terminal is also the tie-down lug(s) and the output will short out.

The printed circuit layout allows a heat sink on the board itself, but even that wasn't necessary for the number of 1½ to 3 watt HTs that these supplies have powered.

Assembly

Construction of the VPS-912 is extremely straightforward, and of the several dozen built by hams in the Seattle area, none have failed to fire up the first time.

The wiring from the board takes typical



The rear panel shows the charge lamp, charge jack, line cord, and fuse.

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lead lengths of 5 inches. The author color coded the leads to save confusion. C5, an r.f. bypass capacitor, is mounted across binding posts I1 and J2.

If a printed-circuit-type pot is all that is desired for a programmable control, a short bus between its center pin and the adjacent ground land on the board finishes that portion. Note that the pots are used as variable resistors and the third terminal is not used. The pc layout provides soldering of this lug for mechanical strength, however.

For two pc pots, or one for preset and one for variable as in the author's model, the wiper arm of each goes to S2 which grounds the desired control.

This same approach holds true for the fixed resistance method and a value for R2 (and R3) are chosen from Table I. From the table, also check to see if R1 is a different value.

Shrink tubing was used wherever there was an exposed terminal. This was not done so much for insulation as it was for mechanical strength. Also, nylon tie downs were used for the same reason. The philosophy was that the VPS-912 is a full fledged piece of lab equipment as well as an amateur radio power supply, and as such should be as rugged as possible.

The four-way binding posts can be spaced to accept standard ¾" spaced banana plugs.

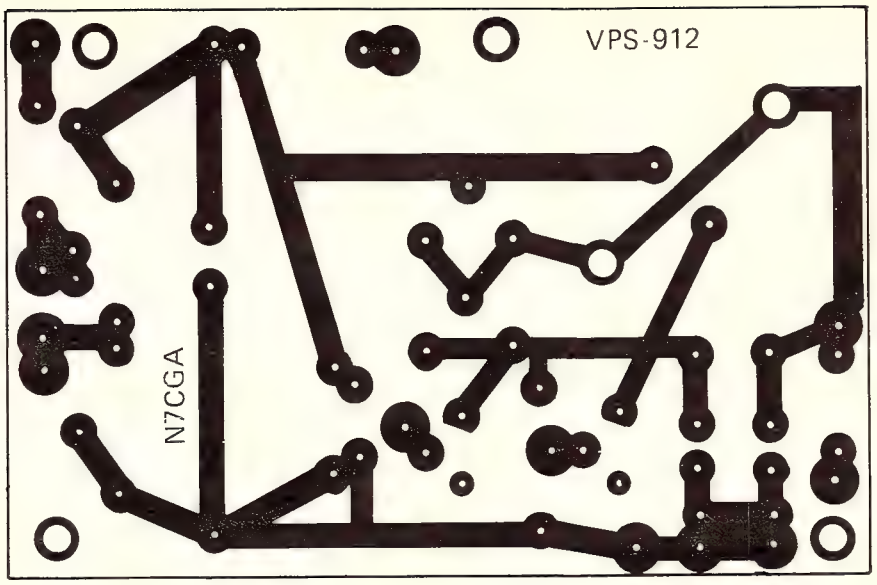


Fig. 4– Full-size PC board template. Pre-drilled and etched boards are available from Benchmark Research, Inc. See text.

Powering An HT Externally

The VPS-912 is not just another "pretty" power supply. It does provide several powering and charging functions, and as such, you must keep in mind exactly what you want and expect it to do.

If you want the power supply to charge your HT battery pack, then you would simply use the charger jack. However, if you want to power the HT itself while retaining a fully charged set of Ni-Cads, then some form of modification to bypass the Ni-Cads must be made. The HT should "see" either the Ni-Cad battery pack or the power supply, not both at the same time.

Modification Suggestions

Three different approaches have been used by the author. The first one is to remove the battery pack and apply external power to the rig's battery connector. This method is simplest, but its drawback is inconvenience.

Another approach to feeding power is to borrow an existing jack on the HT and convert it into a power connector. The author, not planning to use an external mike, "borrowed" that jack. A switching jack should be used to disable the battery pack, or a power diode should be used to isolate the batteries. This method requires no cosmetic change to the rig and it may be converted back at any time.

The author's favorite way is to install a switching-type jack on the transceiver. No loss of function occurs and plug-in convenience is provided.

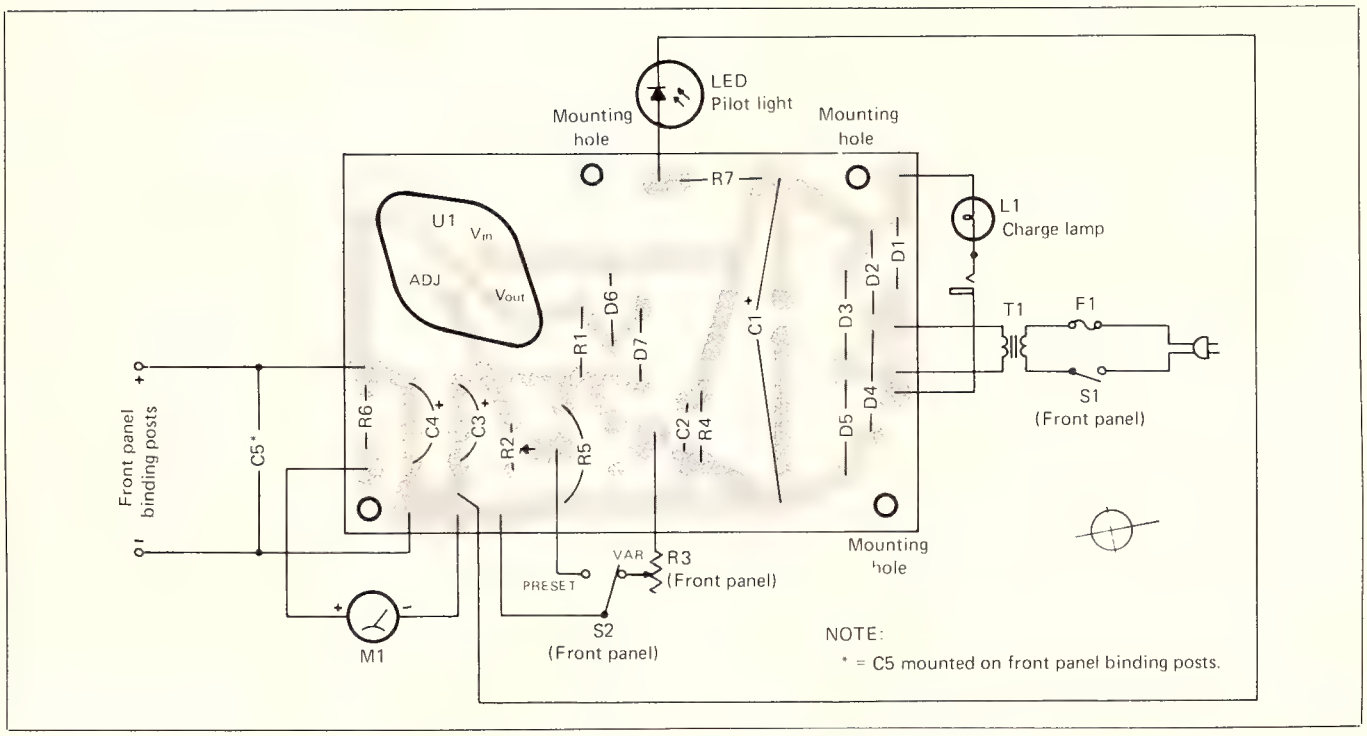


Fig. 5– Parts placement for the VPS-912 power supply.

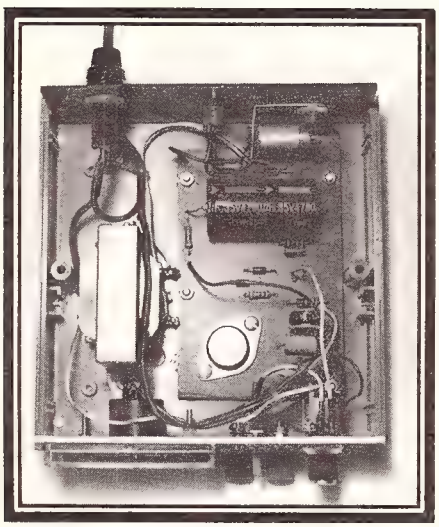
VPS-912 Power Supply Specifications

Max. Voltage In:	40 v.d.c., or 26 v.a.c.
Max. Voltage Out:	Vin minus 4 volts
Min. Voltage Out:	1.25 volts nominal
Ripple Rejection:	80 dB theory 60 dB actual under load
Output Current:	Transformer device and heatsink limited Nominal 500 ma without heatsink
Voltage Output Adjust:	Front panel, PC pot, or both
Charger Output:	60 Hz pulse, current limited
Charger Current:	User selectable to 300 ma nominal

The most roomy place for the extra jack is generally in the battery pack itself. A coaxial type is preferable, but a mini or sub-mini can be used. With the latter two there will be a momentary tip to sleeve short at the jack when the power plug is inserted. Although the power supply is not damaged, the best rule is to shut down the supply and rig while changing over.

Two other notes here. First, these modifications allow other forms of external power to be attached to the rig. The author keeps a 9 V "D" cell Ni-Cad battery pack available for extended field use. Second, unless the rig manufacturer says otherwise, do not hook the transceiver directly to a 12 V automotive or similar system. The voltage is generally too high or the spikes could knock out the set.

For mobile use, connect power across C1 on the VPS board and adjust the board's voltage to match that of the HT's original battery pack. Remember that the regulator requires an almost 4 volt drop to do its job. A nominal 13 volt ignition system input will provide up to 9 V of well filtered d.c. out, which is in the correct range for most hand-helds.



The interior view shows the PC board, transformer, and associated parts for the power supply. The construction is airy and components are easy to reach.

```
The following values of resistance

Enter the desired voltage ? 2.5
  will regulate

Set 10 :        2.5 volts.
R1 = 220 ohms.   R2 = 216.19497 ohms.
For R2 = 220 ohms, Vout = 2.522 volts.
Program current = 5.6818182 mA

Enter the desired voltage ? 4.8

Set 12 :        4.8 volts
R1 = 180 ohms.   R2 = 503.94322 ohms
For R2 = 500 ohms, Vout = 4.7722222 volts.
Program current = 7.0588235 mA

Set 18 :        6 volts.
R1 = 220 ohms.   R2 = 821.54088 ohms
For R2 = 820 ohms, Vout = 5.9910909 volts
Program current = 5.7692308 mA

Set 22 :        9 volts.
R1 = 100 ohms.   R2 = 615.07937 ohms.
For R2 = 620 ohms, Vout = 9.062 volts
Program current = 12.5 mA

Set 24 :        12 volts.
R1 = 470 ohms.   R2 = 3895.5281 ohms.
For R2 = 3900 ohms, Vout = 12.01234 volts.
Program current = 2.7459954 mA

Set 35 :        13.8 volts.
R1 = 120 ohms.   R2 = 1193.3439 ohms.
For R2 = 1200 ohms, Vout = 13.87 volts
Program current = 10.454545 mA

Set 36 :        15 volts
R1 = 470 ohms.   R2 = 4982.6523 ohms
For R2 = 5000 ohms, Vout = 15.047872 volts
Program current = 2.7422303 mA
```

Table I– Computer analysis of R1-R2 relationship using fixed resistors. The first R2 is actual value. The second R2 is the nearest standard value. Vout is with a standard value for R2. Programming by WB7SFO.

Acknowledgement is given to National Semi Conductor Corp. for their help with applications data on the 317 regulation device, to Al, W7HXR, for his help in working with and testing the various designs, and to the many guys on the Boeing repeater who sat through many hours of listening to ripple, voltage, and other kinds of tests. Engineering support was provided by Ken, WB7SFO, and the photography was done by Ivory, N7CHN.

In conclusion, all this writer can add is that operating in the field with a fully charged battery pack or external source has provided countless hours of outdoor fun and worry-free hamming. Indoors and in the car we got spoiled. We used to be counting the hours and watching the "battery light" constantly. Now it's simply a matter of changing power plugs from one type of operation to another.

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CIRCLE 27 ON READER SERVICE CARD

DigiMax Instruments Corporation

DigiMax has purchased the designs and inventory of DSI frequency counters and accessories. When DSI was publicly auctioned earlier this year DigiMax purchased the inventory and obtained rights to the products.

DigiMax did not acquire DSI or assume any of DSI's liabilities whatsoever. Some of DSI's ex-employees were employed by DigiMax due to their experience with the products. None of these employees has any relationship with DigiMax management or financial responsibility.

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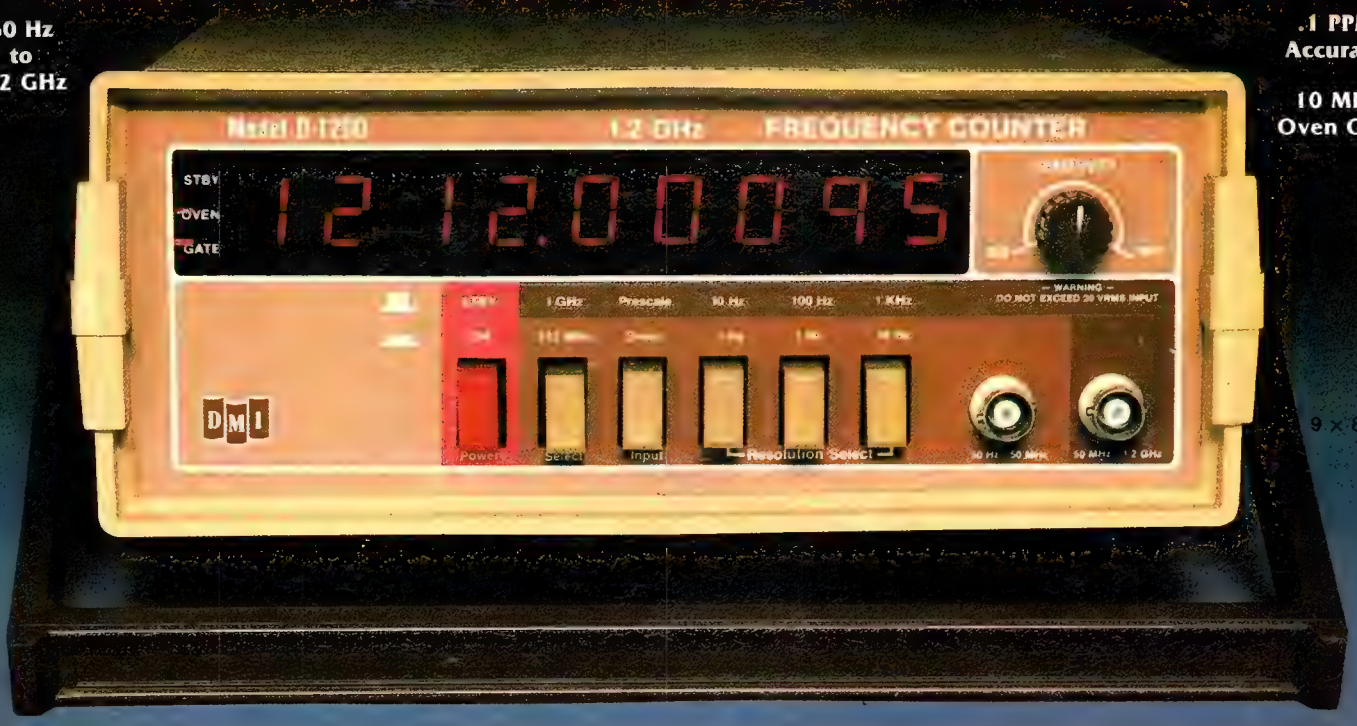
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CIRCLE 17 ON READER SERVICE CARD

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Operating Tips—Part IV of IV

The first part of this article covered band and frequency selection, speed, sending, keying devices, and dit-to-dah relationships. The second part covered calling and answering, plus listening. The third part was all about two-way contacts, plus contests and DX. This final part is about codes and signals, unusual types of operation, special-interest organizations, operating violations, code practice, printed material, and related interests. I hope you will read this entire article very carefully.

Codes And Signals

Phillip's Code. The November and December 1979 Novice columns contain an extensive article about Phillip's Code. Amateurs do not use the real Phillip's Code, which is very brief. What we use is phonetic abbreviations that we loosely term as the Phillip's Code. These phonetic abbreviations allow us to send information faster and easier. As an example, one can send "HW R U?" instead of spelling out "how are you?" Another advantage to using phonetic abbreviations is that words are abbreviated as they sound; consequently, if one is poor at spelling, the use of phonetic abbreviations hides this deficiency.

RST Reports. RST represents readability (R), strength (S), and tone (T) of the received signal. Each portion of the report is separate from the other parts. Readability reports range between 1 and 5, with 5 meaning a perfectly readable signal. Strength reports range from 1 to 9, with 9 being an extremely strong signal. Tone reports also range from 1 to 9, with 9 being a pure (steady) musical note. The need for the tone portion of RST reports is almost gone, since modern gear normally emits T-9 signals. The exact definitions are as follows:

Readability
1 Unreadable
2 Barely readable, occasional distinguishable words
3 Readable with considerable difficulty
4 Readable with practically no difficulty
5 Perfectly readable

Strength
1 Faint signals, barely perceptible
2 Very weak signals
3 Weak signals
4 Fair signals
5 Fairly good signals
6 Good signals
7 Moderately strong signals
8 Strong signals
9 Extremely strong signals

Tone
1 Very rough and broad, 60 Hertz or less
2 Very harsh and broad, very rough a.c.
3 Rough a.c. tone, rectified, not filtered
4 Rough note, some trace of filtering
5 Strongly ripple-modulated filtered rectified a.c.
6 Filtered tone, definite trace of ripple modulation
7 Nearly pure tone, trace of ripple modulation
8 Nearly perfect tone, slight trace of modulation
9 Perfect tone, no trace of ripple or modulation

A single letter suffix is added to the three number RST report to indicate chirp (C) or key clicks (K). The suffix letter X may be used to indicate extreme signal stability, commonly associated with crystal (xtal) controlled oscillators. The excellent frequency stability of modern gear has essentially made the X suffix obsolete, since it would apply to almost every signal heard. Reports are only useful if they are accurate. You are not doing the other amateur a favor if you send an inaccurate report that is higher than it should be. Thank the other operator for the signal report no matter what it is. I often run very low power and I want honest reports, not flattering ones. Fortunately, better operators usually understand the importance of honest reports. On the other hand, if you have something wrong with your receiver that causes every received signal to sound like it has poor tone, let the other amateur know that you have a problem; do not give her/him a bad T report in this situation.

S-Meters. These meters are intended to indicate relative strengths of received signals. They are useful for making rough comparisons, but the readings should not be accepted as being accurate. When comparing identical receivers tuned to the same signal, and using the same antenna, it is common to obtain different S-meter readings; this can happen despite the S-meter circuit being properly aligned in both (or all) receivers. Another cause for confusion regarding S-meter readings is that these meters can be calibrated against different reference levels. The S-meter is attached to the receiver's agc (automatic gain control) circuit to provide arbitrary S-level readings that are commonly shown as S-1 through S-9, plus



Jack Bigelow, KA9JOL, of Kaukauna, Wisconsin, is a 36-year-old policeman who sells radio equipment as a sideline. In addition to working all four Novice bands, he copies radioteletype and he particularly enjoys receiving pictures by RTTY. His amateur radio station includes a Yaesu FT-101-ZD Transceiver, Cushcraft A3 Yagi-Uda beam (for 10, 15, and 20 meters), and an inverted Vee antenna. Jack has worked 34 states since November of 1980, when he received his Novice license. He was active on CB for 15 years before Dale Mitchler, WB9YCO, and Adrian Van Der Burgt, K9DHR, helped him become an amateur radio operator. Jack credits CQ magazine with helping him get a good start in amateur radio.

2814 Empire Ave., Burbank, CA 91504

decibels over S-9. The S-9 reading is usually intended to indicate 25 or 50 microvolts being applied across the receiver's antenna input coil; however, the selected value is not the same in all receivers. Each S unit difference indicates about a 6 dB power change. If one signal is S-8 and the second one is S-9, the latter signal is about four times as strong as the first one. Each 3 dB change doubles or halves power, whereas each 6 dB change approximately doubles or halves voltage or current. Power, voltage, and current decreases are expressed as minus (−) dB's, whereas increases are indicated as plus (+) dB's, or with no sign ahead of the dB change (implying positive shift). VU-meters serve a similar function in audio equipment to the S-meters used in communication receivers, and both use decibel-related scales. However, VU-meters are intended for use with complex nonperiodic signals (such as speech), and they are frequency insensitive to provide an accurate indication for such signals. Amateurs do not normally use VU-meters. VU-meters are used in broadcast station equipment and other audio gear. VU-meters are just mentioned in this article to state their relationship to S-meters.

Q-Signals. The February 1980 Novice column provides a good explanation of what Q-signals are and how they should be used. Q-signals appear in many printed documents, and I am not going to list them here. Q-signals are 3-letter groups starting with the letter Q. They are used to ask questions (question mark added) or to make statements (no question mark). They provide a rapid method for exchanging information with no possibility of a language barrier.

Misuse. Be careful to avoid confusing new amateurs with a lot of phonetic abbreviations (modified Phillip's Code) and Q-signals that they may not know. The common QRL, QRM, QRN, QRP, QRS, QRT, QRU, QRZ, QSB, QSL, QSO, QSW, QSY, and QTH Q-signals soon become familiar to new operators, but it takes time to become instantly familiar with Q-signals that are less frequently use. The same advice applies to code symbols and letter indicators (such as WA and WB for word after and word before, respectively).

Unusual Types Of Operation

Cross-Band Operation. In this unusual mode of operating, one receives on one band (10 meters, as an example) and transmits on a different band (15 meters, for example). Cross-band operation is legal as long as one only transmits on frequencies that one is allowed to use. This is most common with Region I (European) amateurs listening on 6 meters and transmitting on 10 meters. Six meters is TV channel one in Europe and it is not an amateur band there. However, it is legal for Region I amateurs to listen for 6 meter signals from amateurs in other regions

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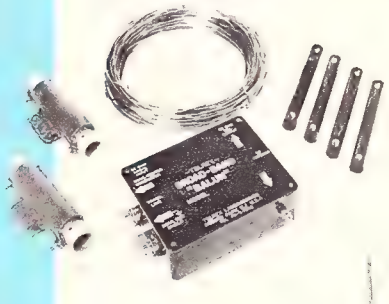
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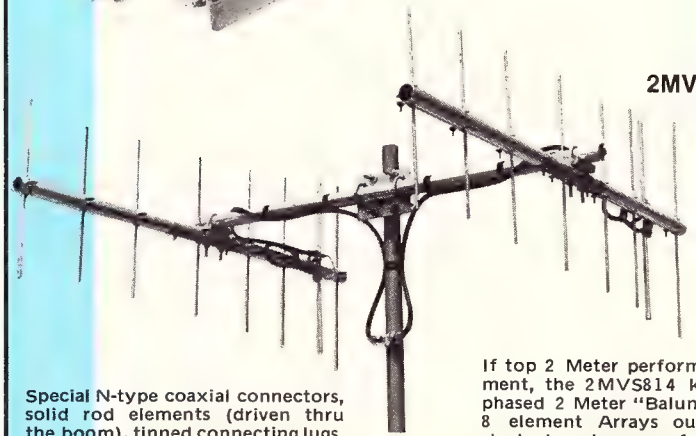
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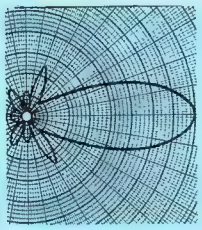
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CIRCLE 47 ON READER SERVICE CARD

and to answer them on 10 meters. When operating cross-band, state where you will listen on the other band for replies. It does no good to answer a station on a different band unless that station indicates they will listen for replies on that band.

Cross-Mode Operation. A typical example of this operation is a DX amateur answering a Novice's code CQ call with a voice (radiotelephone) transmission. It is not unusual for DX amateurs to answer code transmissions with voice (s.s.b., usually) responses. This happens fairly often in the 10 and 15 meter Novice bands. There is nothing illegal about an American Novice working a DX amateur who is using voice. The Novice simply transmits on code (radiotelegraph, A1) and listens on voice (a.m., n.b.f.m., s.s.b., etc.). I often hear DX amateurs answer Novice CQ calls this way. Unfortunately, many Novices do not respond to voice replies. If you hear a voice signal on (or close to) the frequency you have just used while sending a CQ call, leave your transmission frequency alone and tune in the voice signal to find out if you are being called. If you are using a narrow-band code filter, just switch it out to listen to the voice response; this is easy to do with most rigs. If you are not sure about what you should do when working this type of cross-mode contact, simply set your function/mode switch to s.s.b. when receiving and to Code/c.w. when transmitting; this will provide the desired wider bandwidth (about 3 kHz) needed for good s.s.b. reception. Remember that upper sideband is normally used on the upper frequency bands of 10, 15, and 20 meters, whereas lower sideband is used on the lower frequency bands of 40, 80, and 160 meters. If your gear has both LSB and USB function switch positions, be sure you use the correct one for the band in use.

Split-Frequency Operation. A typical example of this operation is an amateur working another operator on code for a while and then switching to voice on a different part of the same band while the other operator sticks with the original mode and frequency. A General (or higher) class licensee might be working a 40 meter code contact with a Novice on 7125 kHz. If the Novice wants to also work the General on voice, the General could quickly determine a clear frequency (assume 7275 kHz) in the voice segment of the same band and tell the Novice to listen for his voice transmission on 7275 kHz and to respond on 7125 kHz using code. Split-frequency does not have to also be cross-mode operation, as it is in this case, but this is often the case. Since most modern transceivers (without an added remote frequency control) only enable one to tune a few kilohertz above and below the transmitting frequency, it is not realistic to operate split-frequency with such equipment.



Linda Mayenschein, KA9CHM, of Sextonville, Wisconsin, has been a ham since September 1978. Her station, and that of her OM, consists of a Drake TR4, MFJ Grandmaster Electronic Keyer, Kenwood TR9000, Bencher Paddles, TA33 at 30 feet, and a full-size self-supporting ¼-wave vertical for 40 meters. Linda operated in the Novice Roundup and came in third in the nation and first in Wisconsin with 69,498 points. She is working toward her General Class license. Her OM, Joe, WB9SBD, is already a General. She is available for contacts with anyone who wants to work Richland County, Wisc.

Special-Interest Organizations

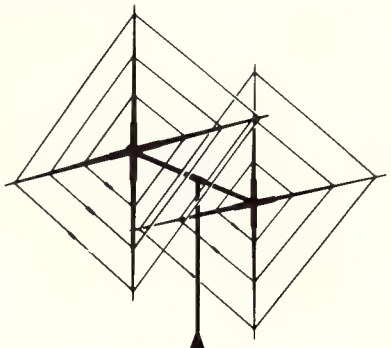
There are many clubs and nets that promote on-the-air operating activities. A few typical groups in this category are AARP (retirees), DX (foreign), QRP (low power), and Ten-X (10 meters). Whatever your special operating interests are (or become), you should be able to obtain information about groups promoting on-the-air activities in your preferred specialized field of operation. Many amateur radio clubs also specialize in specific operating interests. You will enjoy amateur radio more if you pursue your natural interests by participating in the activities of a local club, as well as joining in on special on-the-air activities.

Operating Violations

Official Observers. The amateur radio service is blessed with a competent group of official observers, who do an excellent job of bringing signal discrepancies and operating violations to the attention of their fellow amateurs. If you receive an advisory notice from an ARRL Official Observer (OO), appreciate this volunteer effort and send a prompt reply to let the OO know what steps you have taken to eliminate the reported problem. Be thankful that such self-policing makes it possible to receive advisory notices from fellow amateurs, instead of letting a problem continue until one receives an official Notice of Violation from the FCC. If current Bills in Congress become law, the role of volunteer observers will be expanded to the point where they will directly aid the FCC in such matters.

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CIRCLE 125 ON READER SERVICE CARD
Say You Saw It In CQ

FCC Notice of Violation. Ex-students have sometimes told me that an FCC Notice of Violation was one of the first long-distance reception reports they received. If you are unfortunate enough to receive such a notice, do not panic; just provide a thorough written reply within ten days and mail it to the FCC Engineer who originated the notice. State exactly what happened (to the best of your knowledge) and tell what you have done to prevent a recurrence of the trouble. These FCC monitoring officers are competent but understanding; be completely truthful in your written reply, even if you must admit that you simply made an operating mistake.

Code Practice

Operate. Nothing increases one's code proficiency faster than on-the-air operation. Also, no non-operating code practice system is as interesting as contacting other amateurs. When you have to copy the other operator's transmission to have a conversation, you pay extremely good attention to what is sent and you try very hard to copy everything perfectly. I often make a distinction between two major types of amateurs—those who operate and those who just hold licenses.

Keying Practice. Practice sending off the air until you can be understood reasonably well by other operators. It is good to work a few simulated two-way contacts with another operator seated across the table. If you do this with an experienced amateur, she/he will have an opportunity to explain a few of the unique procedures you will be hearing when you actually operate on the air. When you switch from a handkey (manual telegraph key) to a bug (semi-automatic key) or an electronic keyer (fully-automatic key), practice off the air until you are at least as understandable as when using a handkey. It is particularly important to send no faster than you can receive when you switch to a bug or a keyer; if you send fast code, you'll probably receive fast replies.

Recordings. If you have a cassette tape recorder/player, you can put it to good use in helping you improve your code proficiency. One obvious use is to record on-the-air code practice for code reception practice at subsequent times. After such a transmission has been carefully copied and checked for accuracy, it can be used to improve one's sending technique. Simply send code to match the recorded run; this quickly improves spacing of code symbols and groups/words. Another good practice is to select a printed article from a magazine or newspaper and to record it. Substitute required worksigns (AR, BT, K, and SK) and punctuation marks (. , ? /) in place of unrequired things such as a dollar sign, cents sign, equal sign, etc. Put the recording and printed article aside for about one week; then, without looking at the printed article, carefully copy the entire recording. Listen through the recording as often as is necessary to be sure that you have correctly copied everything on the tape recording. Then, very carefully compare what you copied against the original printed article. If you use this procedure, you will quickly learn about any sending mistakes you make, enabling you to improve your code sending capability. If you use recordings in this way, it is good to make several of them each week and to continue this practice for about two months.



Lee R. Chasse, KA3FJM, of Waynesboro, Pennsylvania, is 38 and has completed 20 years duty in the Army. Lee was an avid shortwave listener for many years, and he finally became an amateur in May of 1980. He studied to pass the Novice exam with his best friend, Gene Scott, who is now KA3FJN. Reggie Diller, W3VTF, served as their volunteer examiner. Lee had 627 contacts during his first 8 months on the air, including 160 DX (foreign) contacts with amateurs in 37 countries. His operating awards include Colonial America, El Gulfo de Mexico, Old Man River, Rag Chewer's Certificate, Ten American Districts, and the Old South awards. Lee also holds an ARRL code proficiency certificate at 15 wpm. He is waiting to receive QSL cards from Hawaii and Australia to allow him to apply for the Worked All States (WAS) and Worked All Continents (WAC) awards, respectively. His station includes a Kenwood TS-520SE, AT-180 antenna tuner, Speed-X straight key, Ten-Tec electronic keyer, 10 through 40 meter vertical on a 30 foot tower, a Hy-Gain TH-3 Junior 10 through 20 meter Yagi-Uda beam on a 40 foot tower, a 40 meter dipole, and an 80 meter inverted Vee. Lee's wife and 4-year-old son, Greg, must think they have lost Lee to amateur radio, but he does see them at meals. He is also a photography expert and one half of his radio shack is filled with equipment he uses in that hobby.

Worldwide Code Practice. The October and November 1980 Novice columns provide a list of domestic (USA) and foreign (DX) code transmissions that can be used to increase receiving proficiency. The code practice transmissions of W1AW (the ARRL Headquarters Station, 225 Main Street, Newington, Connecticut 06111) are excellent. If you do not have



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CIRCLE 5 ON READER SERVICE CARD

access to my code practice article, you can request a copy of the W1AW code practice schedule from the ARRL; as usual, it is helpful to enclose an s.a.s.e. with such a request, although it is not required by the League. The ARRL issues code receiving proficiency certificates and endorsement stickers that can be attached to the certificate as proven proficiency increases. This certificate or endorsement sticker speed increases one's score in certain ARRL contests. Even if you have no interest in contests, the certificate is a worthwhile award to hold.

Printed Material

There are many printed articles, pamphlets, and books that contain operating information. Careful perusal of this magazine would disclose several useful publications. I have found that the ARRL booklet, "An Introduction to Operating an Amateur Radio Station," is the best low-cost publication on operating procedures. This pamphlet covers the basic facts in a simple but complete way. When you have progressed to the point where you want to learn the fine points about operating, a fine book to use is the *ARRL Operating Manual*.

Reprints. Previous Novice articles are often mentioned in later Novice columns, as is true of this four-part article. Copies can usually be obtained from *CQ* at two dollars each. The *CQ* address is 76 North Broadway, Hicksville, New York 11801. I also try to keep an adequate supply of the equivalent items which as I use as handouts to my licensing students. My materials are not as easy to read as those that are available from *CQ* but they are useful. The usual large (10 by 12 inch) s.a.s.e. (self-addressed stamped envelope) with double first class postage attached, plus one dollar, covers any class aid. My address appears on the first page of each Novice column.

Related Interests

As one studies to prepare to pass amateur radio operator license examinations, the material can awaken a lasting interest in mathematics, science, and physics. These interests can develop well as one becomes more interested. As one operates, it is common to develop interests in things such as geography, history, languages, monies, propagation, stamps, and the weather. My kids often open an Atlas to locate an island or country we have just contacted. We usually read the encyclopedia coverage for such places. The geography and history lessons learned this way are painless and more interesting. Who else but an amateur cares to know that San Marino and the Vatican are separate countries within Italy? Amateur radio kindles interests in many subjects, and much of the information we acquire is useful in the things we do at home and in our jobs. Electrical and electronic fundamentals are useful in our daily activities.

Summary

I hope this article helps you or another amateur become a better operator. If you hear someone who obviously needs help to correct poor operating procedures, refer them to this coverage. The Novice bands provide friendly opportunities to learn code operating procedures, and experienced operators often work these bands to help inexperienced amateurs learn proper operating techniques. Novice band operation has been the friendliest amateur radio activity for the past 30 years. Many of my ex-students who have progressed to General, Advanced, or Extra tell me that their fondest amateur radio memories are of their Novice band contacts when they were first licensed.

73, Bill, W6DDB

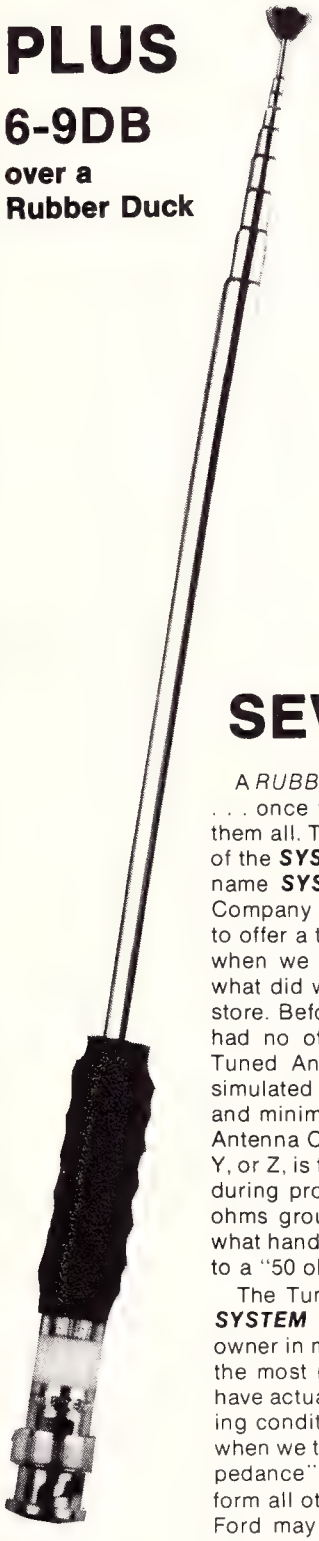


CIRCLE 63 ON READER SERVICE CARD

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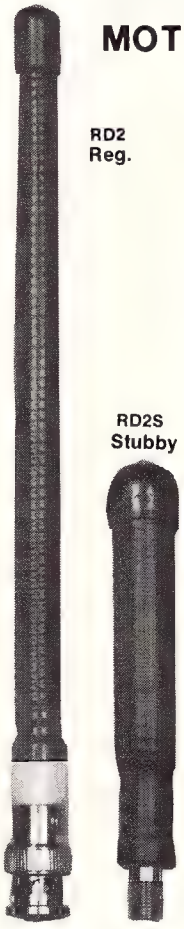
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CIRCLE 84 ON READER SERVICE CARD

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

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Last month CQ columnist W8FX discussed the popular scanner bands, describing "what's up there," and covering basic and advanced v.h.f./u.h.f. monitor radios. This month he has some specific suggestions as to antenna selection and installation.

Last month we branched out from our usual antenna theme to delve into some basics on scanners and the bands they cover. This was done for a purpose: to set the stage for a discussion of specific antennas suitable for the scanner buff. In this month's column we will survey the antennas that may be used for scanner monitoring. We will touch on indoor and base station antennas.

The 21-inch Whip

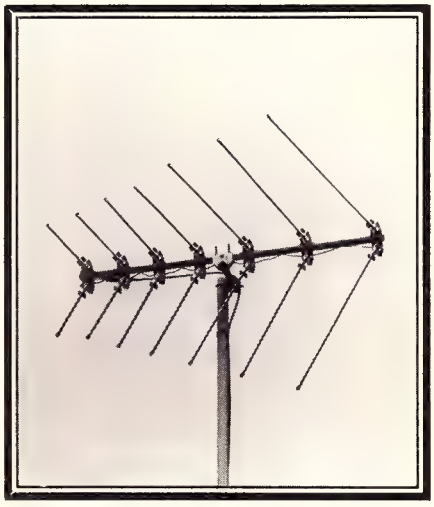
Aside from your receiver itself, the antenna system is the most important ingredient in an effective monitor setup. The best receiver is practically worthless unless it is given the opportunity to capture the signals that interest you.

Unfortunately, as most scanners come from the factory, they are equipped with a bare-bones telescoping whip that, reception-wise, is about equivalent to the familiar TV "rabbit ears." The short whip will likely be good enough for strong-signal, metropolitan-area listening, but it will leave much to be desired in fringe or near-fringe areas. The limitations of this kind of antenna become readily apparent if reception of distant stations is attempted or if the scanner is located inside a steel-frame building. In such cases, you will likely be able to hear only strong local base stations and repeaters; reception of mobiles will be difficult or very limited.

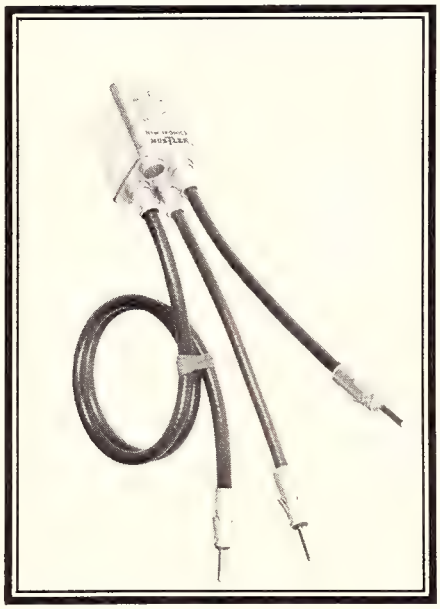
Low-band (30–50 MHz) results will be especially poor since the typical 21-inch whip is extremely short relative to the usual quarter-wave antenna, and the ground plane formed by the set will be especially ineffective. A 6-foot length of hookup wire will probably do a much better job on the v.h.f.-lo range. It's possible to improve v.h.f.-hi performance by carefully adjusting the whip length to achieve full quarter-wave resonance at the primary frequency of interest, however.

If one wishes to stick with an indoor antenna—often all that can be used under apartment- and condominium-style living conditions—better results can be obtained using a much longer adjustable whip, which may allow some compensating "gain." Radio Shack (among others) sells indoor scanner monitor antennas that are a notch above the simple telescoping whips usually furnished with scanners. For example, they sell one center-loaded v.h.f.-lo duo-band model that extends from 16–40 inches, and a combination v.h.f./u.h.f. triband model that is somewhat shorter.

Another possibility for improved indoor reception is to use one of the gain-type telescoping whips designed for use with 2-meter handi-talkies. One particularly good unit is the VoCom ⅝-wave collapsible 2-meter gain antenna (available from VoCom Products Corp., 65 E. Palatine Rd., Suite 111, Prospect Heights, IL 60070). This is a 10-section adjustable whip that can be extended up to 47 inches (⅝ wavelength on 2 meters); a combination base spring coil matching network terminate in a BNC-type connector. Although intended for 2-meter work, the antenna can be resonated at any frequency from about 143 MHz to 450 MHz by adjusting the length of the whip in ac-



Interesting scanner beam pioneered by Bob Grove, WA4PYQ, is shown here. Designed primarily for wide-band 108–512 MHz scanner coverage, gain over a reference dipole approaches 8 dB at several points, average v.s.w.r. is 1.92:1, and front-to-back ratio is 15 dB. A log-periodic type, it has a 250–300 ohm feedpoint impedance, which can be fed with standard low-loss coax using a standard TV-type balun transformer. Though designed primarily for monitor applications, the antenna also works on the 144, 220, and 432 MHz bands. (Photo courtesy Grove Enterprises, Inc.)



Representative r.f. "splitter" for mobile applications allows scanner having separate v.h.f. and u.h.f. inputs as well as standard auto radio to be fed with a single antenna. (Photo courtesy Hustler, Inc.)

*317 Poplar Drive, Millbrook, AL 36054

Say You Saw It In CQ

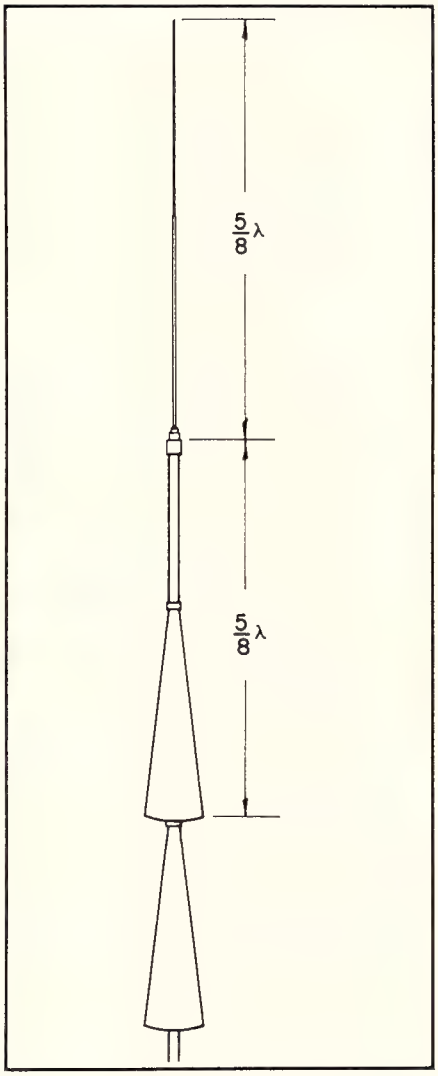
Antenna Of The Month: AEA IsoPole And IsoPole Jr.



The AEA IsoPole. (Photo courtesy Advanced Electronic Applications, Inc.)

Interesting vertical antenna design for the 2- and 1¼-meter bands is the AEA IsoPole, shown here. The antenna shown features a ⅝-wave radiator and dual decoupling sleeves. According to the manufacturer, the unusual design allows reduction or elimination of r.f. currents induced onto the antenna support structure and coaxial feedline shield and allows realization of a true 6 dB gain over a typical ¼-wave groundplane antenna. The antenna, a sketch of which is shown here, features extremely wide bandwidth (less than 2:1 s.w.r. over the 2-meter band), a beam pattern independent of feedline length, and power handling capability up to the legal power limit. The 5-pound antenna is about 125 inches long and mounts on a standard TV-type mast (not supplied by the manufacturer).

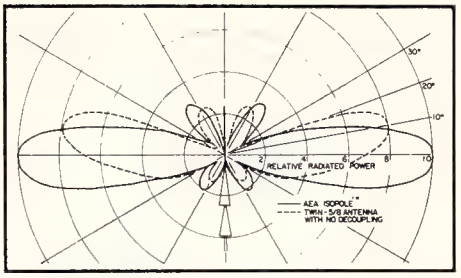
The author has had an IsoPole in the air at his QTH for about a year and has found it to be a very good performer, particularly from an operating bandwidth standpoint. The antenna works quite well



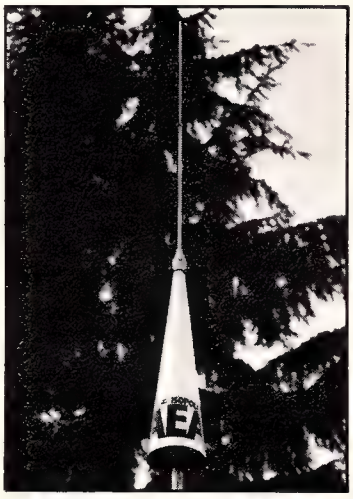
Sketch reproduced from the booklet "Facts About Proper VHF Vertical Antenna Design," copyright 1979 by Advanced Electronic Applications, Inc.

with the author's Bearcat BC-300 scanner for general purpose monitoring.

A new version of the IsoPole shown in the photo is the Isopole Jr. which is an end-fed half-wave dipole with a single decoupling sleeve. The antenna, which is about 64 inches long when tuned to 146 MHz, has about 3 dB less gain than the



Radiation patterns of AEA IsoPole™ compared to that of non-decoupled twin-⅝ antenna.



The AEA IsoPole Jr. (Photo courtesy Advanced Electronic Applications, Inc.)

larger IsoPole, but has a broader beam width and operating bandwidth (about 10 MHz when centered on 146 MHz). Since the antenna is fed at a low current point, one decoupling cone is sufficient to provide decoupling to coax. The impedance matching network is factory tuned and weather sealed. The antenna, designed especially for emergency or portable operation, has a base impedance of 50 ohms. According to company president Mr. C. Mike Lamb, the IsoPoles should give a good account of themselves for scanner monitoring purposes over the range 110–174 MHz. This is especially true of the larger IsoPole, since the two ⅝-wavelength phased elements are always in phase regardless of frequency. The IsoPole Jr. shown here is also available in a 220 MHz (1¼-meter) version.

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diameter cables such as RG-8 or RG-11 (or cables like the new "large-diameter-equivalent" RG-8X) should be used. Splices should be avoided.

A splitter can be used to connect a multiband antenna to a monitor receiver that has two antenna jacks (one for v.h.f. and one for u.h.f.). However, most scanners have a single input jack for all three bands, so that if separate v.h.f.-lo, v.h.f.-hi, and u.h.f. antennas are used, a coaxial switch or combiner must be used. Since almost all scanner manufacturers long ago standardized on the automotive-type "Motorola" connector, it may be necessary to use PL-259-to-auto radio (Motorola) type adapters in order to employ a standard coaxial switch for scanner antenna switching. Using the switch will probably result in less signal loss than the splitter/combiner, though if the scanner is of the kind that can intermix the various bands as it searches for signals (most are), the switch would be unsuitable since only one band's antenna would be available at a time.

If more than one monitor receiver is to be fed by a single antenna, one possibility for simultaneously feeding the two sets lies in using HamTronics' P13 v.h.f. receiver multicoupler. The kit sells for about $19 and provides about 15 dB gain in each of the two output channels. If desired, outputs can be on different portions of a band with some reduction in gain. For example, the unit can drive a 2-meter receiver and a high-band monitor. A "lo" model covers 20–88 MHz and a "hi" covers 88–230 MHz. Write the manufacturer at 65 Moul Rd., Hilton, NY 14468 for more information.

Next month we'll discuss mobile antennas and special clubs and publications that serve the scanner enthusiast.

Until then, 73, Karl, W8FX

cordance with a special calibration chart available from the manufacturer upon request. In order to use this kind of antenna with scanners (which almost always use a Motorola-type connector), one must fabricate or purchase a BNC-to-Motorola adapter. However, the results for high-band v.h.f. monitoring are well worth the effort, especially when the antenna replaced is a relatively inefficient "rubber duck" on a pocket portable scanner.

For the apartment dweller, reception maybe considerably improved by homebrewing a vertical half-wave dipole made of fine wire, taped to a window, and fed with a short length of low-loss coax. If a window-mounted antenna is a possibility, Finco's MA-1WK represents a good choice for triband monitoring. The antenna, essentially a vertical dipole, comes with a window frame mounting bar that can be installed in a window up to 42 inches wide. An aluminum stand-off bracket positions the antenna well clear of the building for improved reception over indoor antennas. A homemade "J" antenna, as described in fig. 1, offers an additional—and inexpensive—possibility.

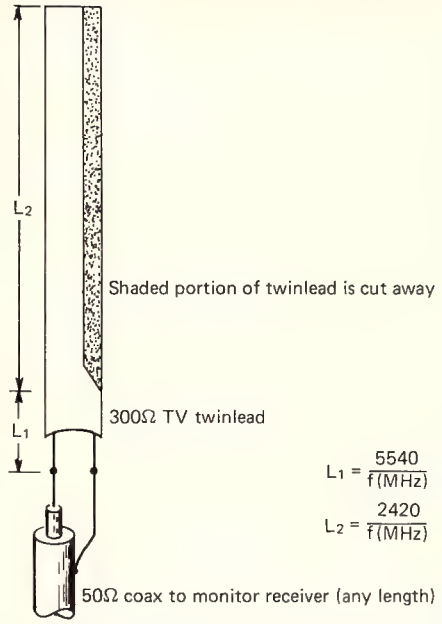
Base Station Antennas

An outdoor antenna will dramatically improve reception range as well as the quality of reception. Since almost all monitor-band transmissions are vertically polarized, the basic scanner antenna takes the form of a single- or multi-band ground plane, although beams and other specialized antennas, such as the discone, are often used.*

Actual antenna choice depends upon a number of considerations including the band to be covered—v.h.f.-lo, v.h.f.-hi, and u.h.f.-t, or a combination of these—as well as the cost and complexity that one is willing to entertain. For general monitor purposes, an all-purpose vertical dipole may provide satisfactory reception of the entire 25–175 MHz spectrum. A good example is Avanti's "Ramrod" AV-160, a unity-gain dipole that can be adjusted to half-wavelength resonance anywhere within this range for reception of low or high band, TV/f.m., aircraft, marine, business, or amateur signals. The antenna can also be used in a nonresonant mode for general v.h.f. coverage, and it can be hung horizontally as well.

Bear in mind that a simple, quarter-wave ground plane will have a slightly "negative" gain with respect to a half-wave dipole. On the other hand, a 16-foot v.h.f.-hi collinear may provide 4.5 dB gain, while a 13-foot u.h.f. collinear will yield up to 7.5 dB gain. In particularly difficult areas, or if reception of a specific distant v.h.f. or u.h.f. station is desired, it may be useful to install a Yagi beam; using a TV antenna rotator will add a good deal of versatility. For most applications, v.h.f.-lo beam dimensions are a bit large for all but the most serious scanner buff, but reduced high-band v.h.f. and u.h.f. dimensions make multi-element arrays not unreasonable for gains of 10 dB or more. Installing a gain-type antenna can be quite rewarding; an antenna sporting 6 dB gain will double the signal strength at the receiver's antenna terminals, while a 10 dB gain antenna will increase strength by a factor of 10:1.

It's possible to cut down commercial TV and f.m. antennas for monitor use, as long as the antenna is mounted vertically. But an interesting, designed-for-application scanner beam has been developed by Bob Grove, WA4PYQ, which he sells through his firm, Grove Enterprises, Inc., Route 1, Box 156, Brasstown, NC 28902. The seven-element array, which is of the log periodic type for unusually broadband reception over the entire 108–512 MHz range, features gain over a dipole of 8 dB at several points and an average s.w.r. of under 2:1. Front-to-back ratio is 15 dB, useful in suppressing co-channel interference. Although its basic design results in a 250–300 ohm feedpoint, a standard TV-type balun transformer allows use with ordinary low-impedance, low-loss coax. The antenna also works on the amateur 144, 220, and 432 MHz bands.



The "J," shown here, has been in and out of popularity since the 1930s as an inexpensive and easily constructed resonant antenna for v.h.f. and u.h.f. use. The antenna, which is made from a short length of 300-ohm twinlead and fed through a section of 50-ohm coaxial cable, includes a built-in quarter-wave matching section for good feedline match and low s.w.r. The antenna can be hung from a ceiling, installed in the attic, or taped to a window for performance that should markedly outdistance that of the short whip furnished with most scanners. For best results, of course, an outdoor antenna can't be beat.

Fig. 1– The "J"—a quick and easy monitor antenna.

Many of the latest scanners cover an extremely wide frequency range, placing a heavy demand on the antenna to adequately cover all the bands included in the scanner's capabilities. As a result, one little-known antenna that is receiving renewed attention is the *discone*, its name being derived from a solid-sided cone that is surmounted by, and insulated from, a disc. The discone, which can match most of the new scanners' coverage on a "megahertz-for-megahertz" basis, allows excellent coverage of almost the entire v.h.f. and u.h.f. monitor ranges with a single, efficient antenna involving no feedline switching or matching devices whatsoever. The antenna consists of a cone, which serves as a ground plane or decoupling sleeve for the coaxial feedline, capped by an element that is connected to the center connector. Its pattern is omnidirectional, similar to that of the ground plane. There's essentially no fixed upper reception limit, so the antenna can be used even in the 800 MHz range. However, there is a low-frequency cutoff, the point below which the antenna rapidly loses its effectiveness. This point occurs when the base and side dimensions of the cone are less than one-quarter wavelength, and the disc diameter less than about two-thirds wavelength.



Sophisticated state-of-the-art scanner by Regency, the K500 shown here, has 591 channel reception capability, comprising 551 preprogrammed channels (ROM) and 40 RAM. Featuring synthesized frequency selection and LED digital readout in search and scan modes, the unit covers 35–50, 144–174, and 440–512 MHz. Other unusual features of interest to the serious scanner buff include "service search" capability, priority channel activation, weather alert, digital count for number of activated RAM channels, self-contained clock, etc. Multiband, single-feedline antennas are particularly suited to wide-range scanners. (Photo courtesy Regency Electronics, Inc.)

*Antenna Columns on h.f. verticals, which appeared in September through November 1980 CQ, offer some solid information on vertical antenna theory and information. Much of the h.f.-oriented material applies to v.h.f. and u.h.f.

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Avanti Astro Scan AV-801 is a tri-band scanner monitor antenna with an unusual configuration. Designed to work into a single feedline, the antenna covers the 25–50, 140–174, and 450–512 MHz public service bands as well as the 2-meter amateur band. Several active elements make up the antenna—a co-inductive ⅝-wave "astro plane" for the lower band, with a 4.4 dBi gain claimed by the manufacturer; a half-wave dipole for the mid-band, with a 2.1 dBi gain; and a 1½-wave collinear on the high (u.h.f.) band. S.w.r., which is not a critical specification for scanner antennas, is under 1.5:1. The antenna is 10' 2" long and weighs 2.25 lbs; it works into 50–52 ohm coaxial cable. (Photo courtesy Avanti Research and Development, Inc.)

For considerations of size, most discones are designed with a lower cutoff limit of 30–40 MHz. For the scanner enthusiast, several companies make these useful antennas. One of the long-time favorites is Hustler's inexpensive Model DCX, which is designed for general-purpose reception in the 40–700 MHz range (though it should also work at slightly lower and higher frequencies).

Another unique and highly compatible commercial base station antenna is Avanti's "Astro-Scan" AV-801, a 10-foot triband antenna that covers the major scanner ranges of 25–50, 140–174, and 450–512 MHz. This unusual antenna, actually three separate antennas rolled into one, was reviewed in the November–December issue of *Science & Electronics*, and repeated in the 1981 edition of the *Communications World* handbook. As reported, the antenna seemed to do an excellent job, as advertised, on all the monitor bands. It also worked well on the 6-meter amateur band and the 27 MHz CB range, where s.w.r. was found to be surprisingly low. The antenna's design places the entire frame at DC ground potential for static dissipation and lightning protection.

Regardless of the type of antenna selected, it should be installed as high as possible. A "height gain" factor comes into play on the v.h.f. and u.h.f. bands which will dramatically increase reception range as height is raised, particularly in hilly or mountainous country. The antenna should be mounted free and clear of all obstructions such as wiring, metallic objects, trees, telephone lines, and the like.

Because scanner antennas are lightweight and of reasonable dimensions when compared with their lower-frequency counterparts, it's usually not much more difficult to install them than it is to erect a TV antenna. In most instances, a single section of steel or aluminum TV mast is good enough for rooftop or chimney mounting; a short tripod tower can also be used. It's also possible to mount the scanner antenna on the same tower or mast as a TV antenna, in which case the scanner antenna is installed above the TV antenna. There will be some interaction and mutual pickup of interference between the two receivers. But this should be minimal since the TV antenna is horizontally polarized while the scanner antenna is vertically polarized, and at least the scanner antenna is fed with shielded (coaxial) cable. Of course, since monitor antennas are omnidirectional, they require no aiming, unless a beam is used.

Particularly on the higher v.h.f. and u.h.f. ranges, the choice of coaxial cable is almost as important as the antenna itself. Losses in the transmission line, which can be substantial at these frequencies, can more than offset any gain provided by the antenna. For example, if antenna gain is 5.5 dB and the total cable loss is 4.5 dB, the *net* antenna gain is but 1 dB; roughly, each dB of cable loss will reduce signal levels by about 10%.

Thus it pays to buy a good grade of coaxial cable—certainly not cable of the CB type, which is notorious for its "thin" braid shielding and high-loss dielectric. Small-diameter, styrofoam insulated RG-58 and RG-59 communications-type cables, or RG-6 cable TV coax, should be good for runs of about 100 feet or so on v.h.f. For longer runs, and at u.h.f., large-

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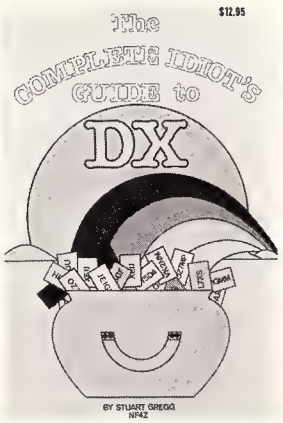


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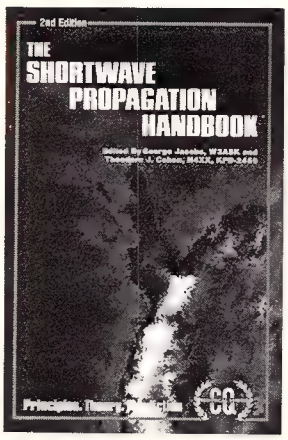
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QRP

THE ART OF VERY LOW POWER OPERATING

DXCC QRPp Winners #21-26

With all the activity in the DXCC QRPp program this past year, I got to wondering what ever happened to my decision to be #1 or #2 back when the awards were announced in *The Milliwatt*. After the ARRL DX CW Contest this past spring, during which I worked an incredible 212 stations with rapid ease, I took out my old stack of QSL's that I'd been gathering. Seems that I managed to collect 70 countries by 1974, but there were about 40 still out. Many of these were the "easy" ones. I had to give up about then, but I was running out of patience with the hold-outs nonetheless. So I can appreciate the dogged persistance of the QRP operators who not only work the 100, but somehow squeeze cards out of them! At this writing, the list of qualifying operators has been extended as can be seen in the accompanying table. Let's try to catch up with their stories this month.

DXCC QRPp Trophy #21

DXCC QRPp Trophy #21 went to Bengt Eriksson, SM5CCT, a Radio Officer in the Swedish Merchant aboard the *Axel Johnson/SMPN*. Bengt writes: "I am very glad to have been awarded DXCC QRPp Trophy #21. A bit disappointed that I could not get the #18 when I first applied, but it was my own fault for not enclosing the QSL's. But it was bad luck that I had already shipped out from SM-land by the time your letter arrived. Still, I hope there was no SM trophy winner ahead of me.

"I got my license in 1960, and that time was only allowed to work on 7035–7050 kHz with the Swedish C-license (Novice class) using not more than five watts input and just crystal-control. But after receiving higher licenses, I soon forgot that QRP operating, though I sure worked a lot on those 15 kHz of 40 meters! In 1973, I saw a Heathkit HW-7 and I soon built one myself. After a few months I worked a PJ2 on 20 c.w. when using just a vertical. What a thrill! But it was not until October, 1977, when I got an Argonaut 509, that I was really bitten by the DX QRP-bug. After a year when my QRO gear was just gathering dust, I sold it all off and have been exclusively QRP ever since. After 2½ years I had worked 93 countries and 44 U.S. states while using a 14AVQ vertical antenna.

"I now use a TH6DXX beam, and the present standing is 140 countries worked and 114 confirmed. I have worked all states, and am waiting for a few QSL's. I work about 90% c.w., though I have WAC on s.s.b. also, but things are very rough in the s.s.b. pileups, and the discipline seems so far to be a bit better on c.w. I like to work contests because there is a good opportunity to work new countries, and I am glad that the big contests such as CQ WW and WPX now have separate QRP sections.

"I have had many memorable QRP contacts. I remember a few of them better than others. Once, when everybody on 40 seemed to be chasing an 8R1, I QSY'd a few kHz and got a 559 from Nils, CP7GM. Chris, FB8XV, came back to my call on 28 MHz, and when he heard that I was using QRP, he got very interested and told me about his FB QRP experiences from France. We had a 15 minute QSO during which many EU stations got more and more impatient to work him. Among many two-way QRP QSO's, I recently worked Bill, VK6NBR, who was using 8 watts to a 4 element beam.

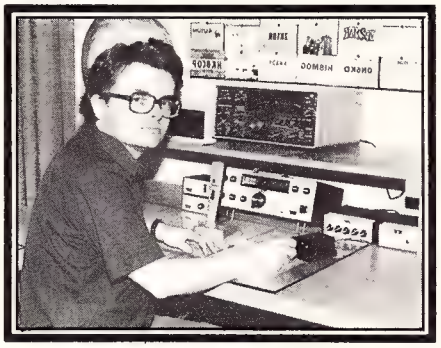
"With respect to giving some hints to QRP DXers, you can work a lot of DX with QRP and simple antennas; a good receiver makes a big difference. In this respect, the Argonaut is excellent and has given me a lot of fun. If you have a really good antenna, you soon find out that nothing seems to be impossible. So don't ever hesitate calling a station because you think that you will never get through. Don't be afraid of jumping into the pileup when that rare DXpedition is QRV—you will probably have to wait a lot longer than the 'big fellows,' but you most certainly will get him sooner or later. Of course, you should have full break-in for c.w. operation. And above all, you must have a lot of patience because you will need it. QRP is fun and has given me the most memorable and satisfying moments in ham radio. I'd also like to take this opportunity to thank you for many FB QRP articles in *CQ*, and I hope that I will return with an application for the DXCC Milliwatt at some time in the future."



"Ev" Willis, W6YVK, holder of DXCC QRPp Trophy #13 displayed at the left end of the desk. "Ev" was the second to qualify for the all s.s.b. endorsement, and his mike appropriately is front-center. Beside the awards hanging in the background, some of the "I wish I had one of those" QSL's on the wall include KW6, KC4, VR1, XW3, VQ9, KB6, HS1, TU2, YB7, ZK1, 9V1, VK9, FO8, FW0, and others. Many veterans in the past overlooked s.s.b. as a QRP DXCC approach, assuming that it would be a futile effort battling the KW's. "Ev" and others have shown that it can be done.

DXCC QRPp Trophies #22 and #23

Oddly enough, SM5CCT delivered his QSL's just in time to realize his ambition of being the first SM-station to qualify, because Lars Mohlin, SM5GMG, came close on his heels with the application for DXCC QRPp #22—All C.W. He used an



Dr. John Dudley, VE5JQ, at the controls of the very tidy station that won DXCC QRPp Trophy #17 for him. He worked his first 80 countries or so with a simple vertical antenna, and then turned to a high-gain antenna to complete the 100. Like many operators, John's success with the simple antenna convinced him that DXCC QRPp was possible.

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HW-8 and Argonaut to dipoles on 3.5 and 7 MHz, and a TH3MK3 on 14–28 MHz. His QRP QSL is printed elsewhere in this column. Six days later (July 9, 1980), another application surfaced, this one from Richard Schier, WA4LOF, who qualified for Trophy #23. Earlier, Richard had corresponded with me about the awards program, and in March he sent me an update:

"Like I mentioned before, I'm a DX chaser at heart, but after having reached 288/280 worked/confirmed, there's not a whole lot to chase after, so last September I got hold of an Argonaut. Right now, after 5 months of sporadic operating, I am at 153/52 worked/confirmed with QRP and a TH3 at 55 feet. One main comment though, Ade. God bless those DX operators. Almost without exception, they will bend over backwards to work a QRP station if they know one is on frequency. I can't say enough for the consideration shown by those guys!"

A p.s. indicated "biggies worked QRP: 8Z4, 3A2, VKØ, PYØ, H44, ZD7, SU, YK, ET3, M1, 3V8, etc." Some operator! By July, WA4LOF had managed to gather the 100 cards. This is some kind of record—September to July for the QSO's and QSL's! Of his experiences, Richard writes:

"If somebody told me a year ago that it was possible to work over 200 countries with 2 watts, I'd have told that person that he was as nutty as a fruitcake. After all, I have been a DXer for a good while, and everybody knows it takes a *big signal* to work the choice DX, especially on 20 meters.

"For morbid curiosity more than anything else, I got hold of an Argonaut last September to try out this QRP stuff. I hooked up the little rig to my Hy-Gain TH3, cranked my Tri-Ex MW65 up for all she was worth (figuring I would need every inch I could get), and began late on a Friday evening to take random QRP potshots at various DX stations who poked their heads up out of the QRM. Well, a funny thing happened. By the time the weekend had come to a close, darned if I hadn't worked over 40 countries! On 2 watts? My reaction was pure astonishment to say the least! Well, after that I got hooked real quick on operating QRP and have been at it more or less regularly ever since.

"Although I'm still pretty new to the QRP game, I have a few observations about operating with low power which might prove helpful to others out there who are interested in trying their hand at this sport.

"First of all, it's pretty obvious that when a 2 watter bumps heads with a 2 kilowatter, you kind of suspect who's going to lose out! Therefore, remove thyself from these monstrous brethern as much as possible by: (1) starting to work at the high ends of each band and working downward in frequency; (2) trying the most unlikely bands first. Propagation has been so good that there are some very good openings at unusual times on both 10 and 15 meters. You might have 50,000 guys stomping all over each other down on 20 meters, when up on 15 the band is every bit as open but there isn't all the congestion. And (3), if your constitution can take it, try getting up in the early morning hours in the middle of the week. You could be quite surprised how many DX stations and how few kilowatters are on at these times.

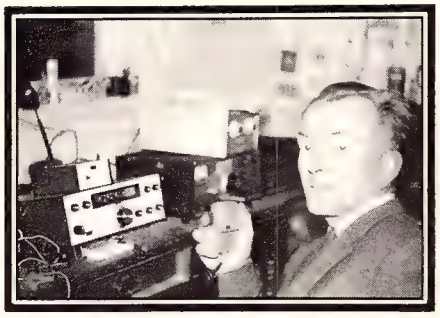
"Then again, if you are a true masochist at heart, it is even quite possible to venture onto the low end of 20 meters and work choice DX, even through a typical howling free-for-all hair-pulling eye-gouging pileup like we've all heard on that band. Why? Well, it's because many many DX stations, God bless them, enjoy nothing more than to work a QRP station. Most of them seem as happy to work you are you are to work them! So, if you can somehow get across to the DX station that a QRP station is on frequency, many times he will immediately stand by to work you. For instance, try tailending a closing QSO with 'QRP station on frequency' or '2 watt QRP station standing by.' If he hears it, he very well might come back to you. I can't say enough for the thoughtfulness and patience of DX operators and even stateside stations that enjoy seeing low power operation enough to at least give you a fighting chance to make a contact.

"I have finally struggled past the 200 country mark and am now sitting patiently at 213 countries worked with 2 watts output. I have no idea how many countries it is possible to work with QRP, but I am going to keep trying anyway! This style of operating has put the excitement of discovery back into radio for me. 73 to you and all the QRP gang."

I suppose that if someone had told WA4LOF that he'd be able to confirm over 200 countries in a year and a half of QRP operation, he'd have had a choice comment to make to the person. But he did it nonetheless, and was awarded DXCC 200 QRPp Plaque #3 on May 14, 1981! This really is a record! The question is, how long until WA4LOF raises his QRP total above his earlier QRO total? What *is* the upper limit of countries that can be worked with QRP? Discovery, excitement, challenging previously unbreakable limits—that's QRP DX'ing!



Bengt Eriksson, SM5CCT, a Radio Officer in the Swedish Merchant Marine, managed to acquire his DXCC QRPp Trophy #21 between voyages. Like VE5JQ, he managed his first 93 countries with a simple vertical antenna, and then switched to a high-gain antenna. The relative performance of the two antennas leads him to note that anything can be worked with a beam. The Argonaut and HW-7 are the heart of his station.



The station of Samuel S.S. Polsen, GM3RFR, located in the Shetland Islands. GM3RFR was the first European to qualify for the all s.s.b. endorsement. He has worked entirely with simple wire antennas such as dipoles and Vee beams and the like, mainly due to the weather and high winds that are characteristic of his QTH.



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DXCC QRPp Trophy #24

July 18, 1980, saw another application arrive. This one came from an old-timer, Tatsuro Suzuki, KH6HC, who was awarded DXCC QRPp Trophy #24, All C.W. Tatsuro writes:

"Although I had received my first license in 1935, I was not really active on the air until August 1971. Since then I have operated almost exclusively on c.w., usually with a KW, avidly chasing DX and acquiring a few awards and also my wife's moniker for causing r.f.i., "the Scourge of the Neighborhood." In July 1976, I purchased an Argonaut 509, and used it in conjunction with my other rig. After 1,200 QSO's I sold it in April 1979.

"Using a TH6DXX beam on a Tri-Ex W-51 tower, I found that with the QRP rig I could contact most of the stations I called. It gave me a certain satisfaction to get through pileups to work DXpedition stations, such as HK0BKX, JD1YAH, and VK9ZR; and also, using a Hy-Gain 40/80 trap doublet sloping down from the tower, the following on 7 MHz: KP6AL, KP6BD, and VR6HI. Some of the other stations contacted while using the doublet on 7 MHz were: FG7AR/FS7, W6QL/VP2A, DJ0UP/VP2D, ZS6WW, and 4K1GM.

"Having sold my house in June 1979, I moved with my family to a place in the suburbs for a period of six months. During the succeeding six months of hamming inactivity, one day while looking over my QRP logs, I was pleasantly surprised to find that I had filed away a QSL from CO7RCB for the 100th country. I'd filed it away ten months earlier and I could have qualified for the trophy back then! Recently I sold all my other station equipment and purchased a new Argonaut 515 and a few accessories. All types of outdoor antennas are prohibited at the present address, so I am using a random wire consisting of 45 feet of gray #18 Belden hook-up wire at a height of about 8 feet. But even with this inefficient antenna, I have contacted ON1VY, UK2BAS, and HS5AID! Thank you very much for the excellent trophy!"

DXCC QRPp Trophy #25

The busy summer continued with an application on August 4, and Samuel S.S. Polsen, GM3RFR, became the second GM to qualify for a trophy. He writes:

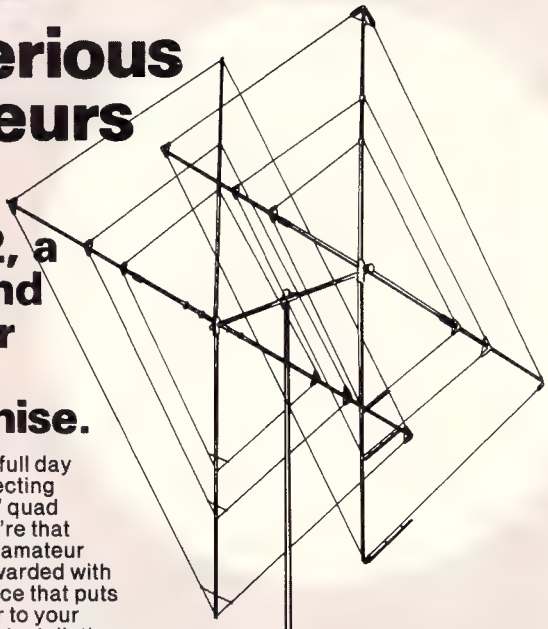
"The accompanying photograph shows the amateur radio station of GM3RFR, operated from Unst, the most-northerly of the Shetland Island group. The photo dates from sometime around 1975 when the Argonaut had just been bought. A second Argonaut has recently been bought as a stand-by and for field excursions.

"My interest in QRP work began about 1970 when transistors began to be used for mini-rig building. Transistors lend themselves to miniature simple circuitry far better than valves (tubes). You can put

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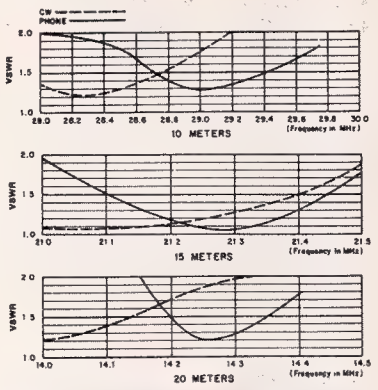
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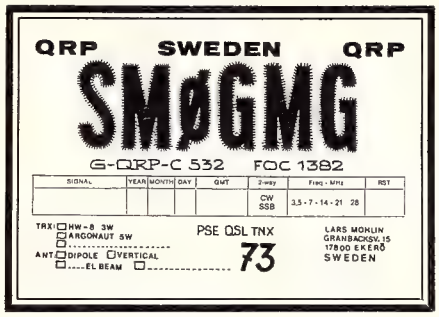
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CIRCLE 142 ON READER SERVICE CARD



The graphically effective QRP QSL card of Lars Mohlin, SMØGMG, gets across the QRP message to prospective DX QSLers. Lars uses the Argonaut and HW-8 for his operations.

together a transistor transmitter in an hour or so, whereas valve construction is a long job. The first transistor transmitter to be used at this QTH was a BFY51 circuit which produced about 500 milliwatts. Only one contact was made with it—a station in north France. Greater success came when a single transistor BD124 circuit was constructed about 1973. Like its predecessor, this circuit was operated crystal-controlled on 40 meters. It was an immediate success and eighteen European countries were worked using it.

"About the beginning of 1975 an advertisement for an Argonaut was encountered in a ham magazine. From being first licensed in 1962 until 1970, I had mainly set up as a DX operator on s.s.b. So the Argonaut was very attractive, as it lent itself to QRP s.s.b. working. One was purchased and I set out on the long trail to a DXCC QRPp s.s.b. trophy, a task which has taken four-plus years to achieve. In achieving this goal, I have at all times used homebrew simple antennas, mainly simple single element loops fed on the vertical side and positioned on the ground supported by bamboo poles. Feed points have always been about 10–12 feet off the ground. Additionally I have used wire Vee beams in the South American direction fed with twin feeders. The present Vee is at a height of 50 feet, with leg lengths of 197 feet. This rather useful figure allows operation on 10, 15, and 80 meters.

"The great attraction of QRP I think is that it offers a challenge. By 1970, I was tired of high power. If you use 600 watts p.e.p., you should not fail to reach every corner of the earth and success begets monotony. QRP operation is a panacea to disgruntled kilowatters. It also encourages you to look at your antenna system. Contests are also more interesting and I try most contests, though often-times I do not have a high score. Success is beating last year's score by a hundred or so points and picking up a VP8 amid the QRM of the big fellows. QRP also means simplicity, lightness of weight, and portability. One can set up on a hillside with a dry battery power supply and therefore is led into a new world of testing various locations for the DX ability, an aspect of amateur radio not yet easy for the kilowatt types with their bulky units. I have recently gone QRP on 2 meters with 3 watts. So far I have achieved nothing in this line, but I am seriously thinking of trying 40cms QRP operation shortly via satellites."

Low Power DXCC Honor Roll

DXCC Milliwatt Trophy— 1 Watt

# 1	W8ILC	6/78 SSB#1
# 2	GM3OXX	12/78 CW
# 3	G4BUE	12/79
# 4	KI4W	2/80

DXCC 200 Milliwatt Plaque—1 Watt

# 1	W8ILC	4/80 SSB#1 (278)

DXCC 200 QRPp Plaque—5 Watts

# 1	N2AA	12/78
# 2	G4BUE	12/80
# 3	WA4LOF	5/81

DXCC QRPp Trophy—5 Watts

# 1	K4OCE	12/71
# 2	W2GRR	6/75
# 3	K8MFO	2/76
# 4	W6PQZ	4/76 SSB#1
# 5	K2KUR/N2AA	5/76
# 6	OA8V	5/77
# 7	WA6SOV	7/77
# 8	G4BUE	11/78
# 9	OE1ZGA	3/79
#10	WA2JOC	3/79
#11	WB8IGU	7/79
#12	VE1BQQ	11/79
#13	W6YVK	2/80 SSB#2
#14	K4RUG	3/80 SSB#3
#15	W1PWK	3/80
#16	WA2JOC	3/80 SSB#4/ #1 Both Modes
#17	VE5JQ	3/80
#18	NØAJZ	4/80 SSB#5
#19	KØCDJ	5/80
#20	OK1DKW	6/80 CW
#21	SM5CCT	6/80
#22	SMØGMG	7/80 CW
#23	WA4LOF	7/80
#24	KH6HC	7/80 CW
#25	GM3RFR	8/80 SSB#6
#26	K4TWJ	9/80
#27	K8DU/WB8TKZ	9/80
#28	K1MNR	1/81 SSB#7
#29	VK7NRT	2/81
#30	ABØX/WAØAGN	3/81
#31	WB9OAR	6/81 SSB#8
#32	K2OQA	6/81 SSB#9/10 Meters
#33	KB3PD/KA3BSM	7/81 SSB#10
#34	ABØM	7/81 CW

DXCC QRPp Trophy #26

DXCC QRPp Trophy #26 went to well-known SSTV expert and author Dave Ingram, K4TWJ, who recently has been appearing in the pages of *CQ* magazine and hopefully will continue to do so in the future. We began corresponding about QRP DX in the fall of 1979, and Dave's enthusiasm was refreshing. By April 1980, he dropped me a note:

"Ade, I'm *really* enthused about DXCC QRPp and progressing very well. Now up to 97 countries (5 watts or less) with around 60 or 65 confirmed. I've found QRP DX'ing more enjoyable and, quite often, easier than high power DX'ing. That may require explanation. Many times I have only 10 or 15 minutes to spend on the air. It takes longer than that to switch on the big transceiver, plug in the linear, and let its tubes warm up, and to crank up my tower to maximum height. The QRP rig, however, is switched on and used instantly. The beam is usually used at less-than-maximum height on such occasions, but it still does a great job. It's amazing how many DX stations respect QRP operations. I worked several 'juicies' lately when they stood by for QRP signals from each call district. DX stations also make special efforts to QSL QRP QSO's."

By September 1980, Dave had the 100 QSL's in hand and won trophy #26. He graciously provides the following hints:

"Looking back on my pursuit of DXCC QRPp, I realize a number of tactics which may be of interest to others. I will list some of these in the attempt to help budding QRPers:

(1) "DXCC QRP is much easier if you've already worked 100 countries 'the easy way' with QRO. The skill and expertise previously acquired is a vital beginning for QRP DXing. You'll, naturally, learn even more while DXing QRP style and that will escalate your DX ability.

(2) "Study signal propagation effects and use this knowledge to your advantage. The prime times for QRP DXing are during sunspot peaks. Since this follows 11-year cycles, the QRPer must 'make hay while the sun shines bright.' Additionally, daily propagation forecast and sunspot counts are broadcast by WWV at 18 minutes after each hour. Use Southern Hemisphere propagation paths during storms affecting the Northern Hemisphere and use the highest frequency band open during a specific time. Many times, this will place the QRPer as an almost single U.S. station on a band at an unusual time. We've worked, for example, several rare European and African areas on 15 meters around 0400 GMT. Low power shortwave broadcasters operating near amateur bands can serve as 'beacons' for detecting such unique openings.

(3) "Make true friends with as many DX stations as possible. If, for example, you could thus schedule successful QSO's with 50 countries, you could be half way to QRP DXCC. These friends could also help you acquire new countries. I'll always remember Mavis, VK3BIR, calling to give me a QSO as she operated YJ8IR. I was unaware of her DX operation at the time, and was working another VK at the 3 watt level. Incidentally, this is a two way deal: remember to return DX favors if you don't initialize the efforts.

(4) "Get on the air at your least oppor-

tune and most overlooked occasions, and don't fall into a set routine of operating only during usual time slots. I've worked many new DX QSO's merely by flipping on the rig when I should have been dressing, doing home chores, leaving for work, etc. It's the old 'they're never on the air when you're looking for them' syndrome. Solution: look for them when you don't have time to work them. Unfortunately, that scheme works.

(5) "Use pileups as beacons to monitor band conditions while continuously scanning other frequencies. This will allow you to snag a new one even during their initial CQ while other DXers are being decoyed elsewhere.

(6) "Use an external VFO or a rig with memories to seek and work DX in a 'leap frog' manner. This time-multiplying technique lets you band-tune and work DX almost simultaneously. (I remember one occasion when a VK called me out of curiosity. I somehow ended up working 2 stations on 2 different frequencies almost simultaneously.)

(7) "Support and use any nearby DX nets, telephone alerts, and DX clubs. Let them know you are a QRP enthusiast.

(8) "Use a beam antenna, use sharp operating tactics, and have the confidence you can work any station you call! Dale Carnegie's positive thinking works!

(9) "Remember, you can't work DX if the rig isn't switched on. Remember, also, there's a substantial difference in knob twiddling and serious DXing. Stalk your DX prey with the cleverness and cunning of a big game hunter.

(10) "Read my TAB book *Secrets of Ham Radio DXing* for additional advice from the pros.

(11) "(Only for the stout hearted!) Trade your house and car for a super DX location on an Appalachian Mountain peak, purchase at least 5 of each available QRP rig (8 after new bands are operational), trade your wife for a maid (yes, I know she already claims she's a maid), quit your job (declare bankruptcy *after* purchasing all DX needs), and have at it 24 hours a day!

"Seriously, I'm sincerely honored to be considered a successful DXer, and winning the DXCC QRPp Trophy #26 has been one of my life's greatest thrills. May all of you also be as fortunate . . . but hurry, those sunspot counts aren't getting any higher!"

Dave has already published several books, of which the book about 10 meter FM operation will be of interest to QRP operators *(10-Meter FM For The Radio Amateur, TAB 1189, $4.95).*

Well, gang, that's space for this month and we still haven't reached the current list's end. We'll continue in a future issue, and in the meantime, hit the big DX contests hard while the sunspot cycle is still high. In five years we'll all be remembering the "good old days" of 1977–82.

73, Ade, WØRSP/K8EEG

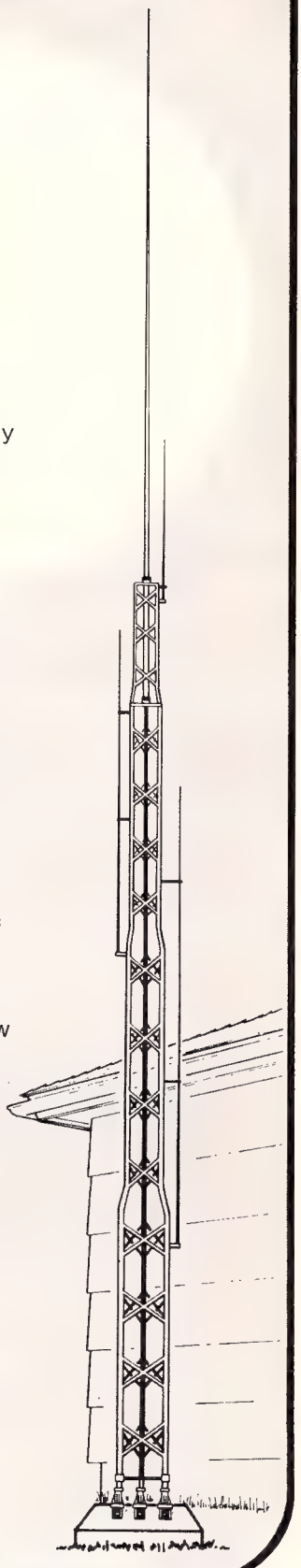
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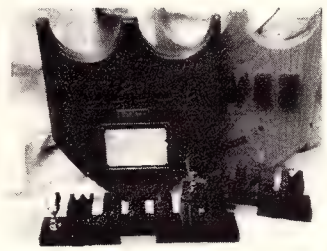
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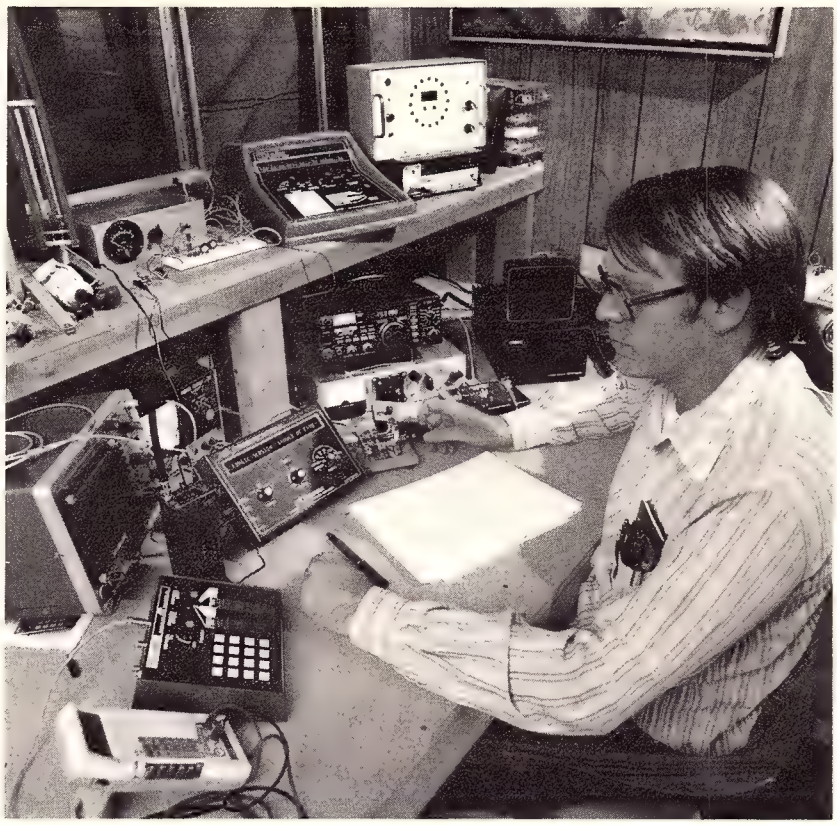


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RTTY With A Paddle?

BY ALAN M. DORHOFFER*, K2EEK

There probably isn't one of us who hasn't at one time or another bought a piece of equipment and after having used it for a while questioned why something wasn't added or why they did something the way they did. Modification articles are great and very popular, but they too deal with something after the fact. Whatever the "widget" is, it is designed, manufactured, marketed, and bought (by us). Not since the days of the old National Radio "Dream Contest" has the marketplace had an active say in designing the product. Of course, the consumer has no idea of the manufacturer's rational in designing the "widget" in the first place, and neither does he know if there is a need for the "widget" real enough to be satisfied. Outside of some market testing on an irregular basis, most new products come on the scene by spontaneous generation and are held in secret until they are ready and presented for our amazement.

The following presents some of the thinking involved in the development of a new product, and by shifting logic a small step sideways (in the normal state-of-the-art progression), an even newer idea is created. Our cover shows Dr. Alan S. Chandler, K6RFK, at the workbench putting some of his ideas into practice—namely, sending RTTY with a paddle. While this is not in any way a product review or endorsement for AEA products, we do thank them for sharing this information with us.

A current trend in amateur radio and amateur radio manufacturing is high-speed computer generated and received Morse code, Baudot, and ASCII. Several manufacturers, including AEA, are currently in production with computer receive systems, and further elaborations are on the way.

Dr. Alan S. Chandler, K6RFK, of AEA was in the process of designing computerized Morse, Baudot, and ASCII receiving equipment when the logical leap of thought hit him . . . why not convert a Morse generated signal into Baudot or ASCII for *transmission* purposes? Would it be possible to send RTTY with only a

*Editor, CQ

straight key or automaic keyer?

Of course, the answer is yes. Once you ask the question, the technical solution is usually not far behind. The interesting thing then becomes what you can do with it, and assuming that it already works, how do you refine it?

There is the neat possibility of having an RTTY receiving and sending lash-up in one relatively small, compact package working off 12 v.d.c. It would be a great adjunct to a DXpedition with limited shipping requirements. Basically, we could accept the trade-off in size for a full-scale RTTY video display station.

One refinement needed for the more than casual operator would be the ability to use a memory keyer to store longer messages that can be replayed through the unit. A keyer with editing capability would be better for longer formatted messages. The possibility of using a cassette tape recorder for storing and replaying long messages should be considered.

Another "goody" to add would be a character counter in the computer that triggers an automatic carriage-return, line-feed at the proper places so that the receiving station does not wind up having "over-print" at the end of the first line of transmission.

For the operator who also has a printer, the unit should have serial output Baudot or ASCII. Printed copy as well as a CRT message display with an ASCII terminal would then be easy. The unit should also be able to be ASCII keyboarded.

The above represents a lot of "shoulds" to be incorporated in a design. The basic microcomputer reader that Alan was working on could be transformed with a minimum number of additional components and a little more software. It was, and a prototype was shown earlier this year. After Alan got some of the "bugs" out of his sending, many two-way RTTY contacts were made (sans keyboard).

The point, then, is that one idea triggered another, which prompted a "what if" state followed by a "what else will I need" condition. It's taking the idea to some sort of conclusion, whether it produces another product (which it will) or simply satisfies Alan's curiosity. How practical the solution is then rests with the consumer. I can safely add that regardless of the product or manufacturer, within six months or so some ham will send in an article on how to make the product better. Don't feel bad Alan; it happens all the time.

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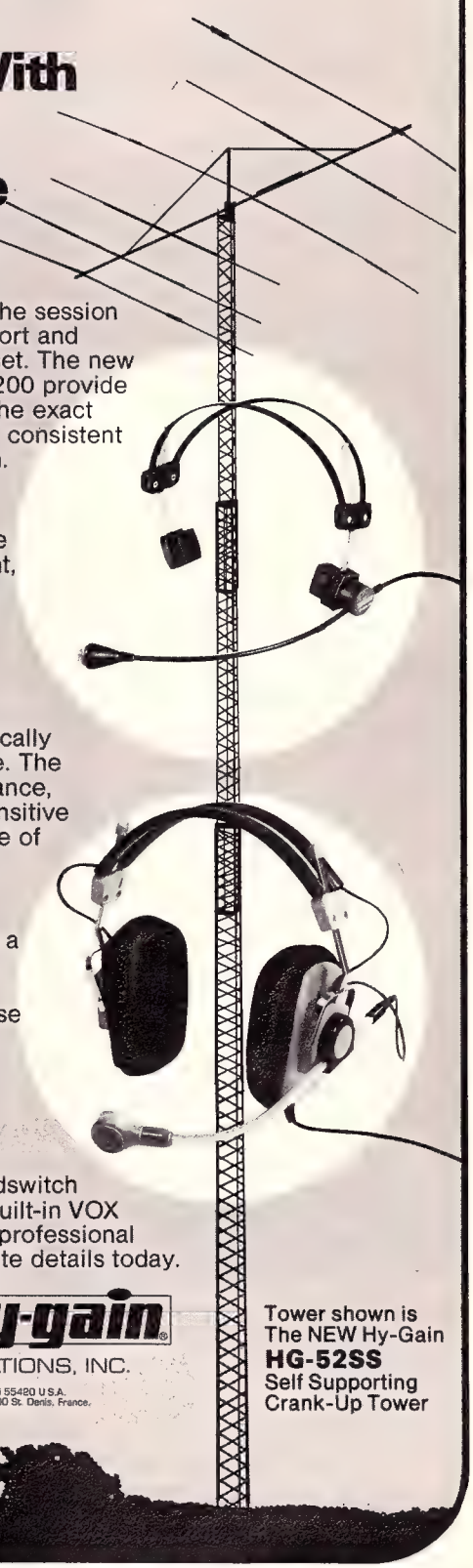
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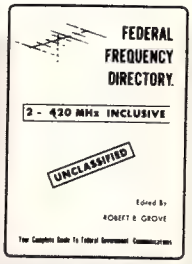
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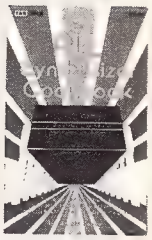
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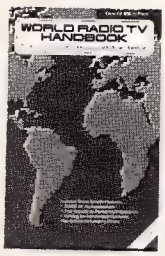


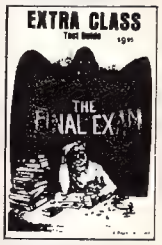


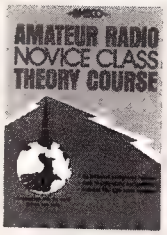




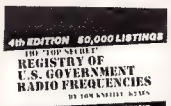
BY DAVE INGRAM, K4TWJ



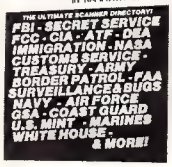














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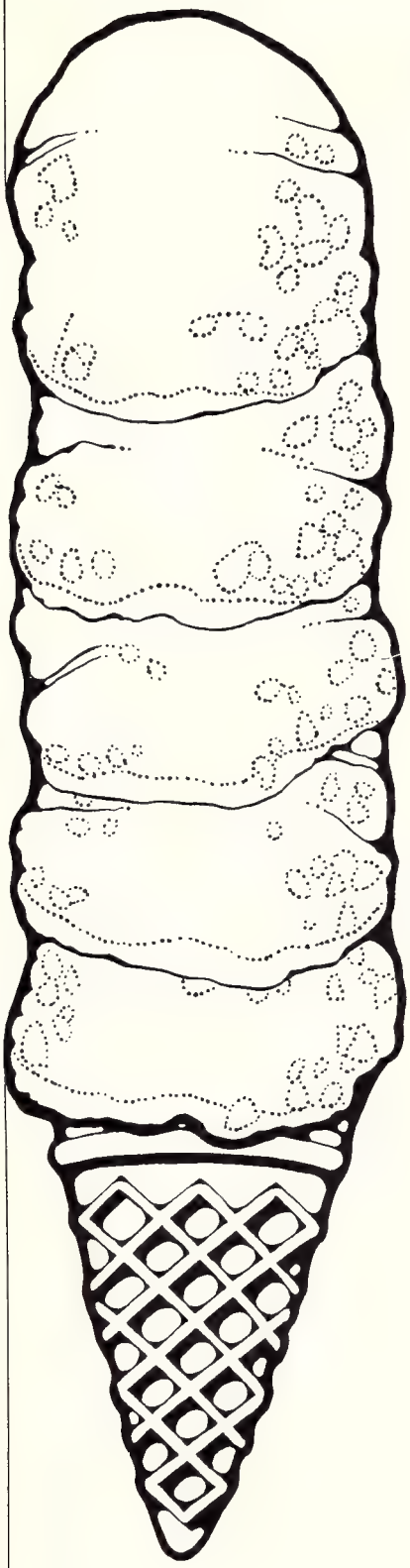
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Those late night QSOs sure give a guy an appetite for snacks. Here's a gadget that's easy to build and will keep us closer to the operating table.



A REFRIGERATOR ALARM THAT SAVES ENERGY AND CALORIES

BY MARTIN BRADLEY WINSTON*, W8BLV

Congratulations, amateurs! Unofficial statistics show we've reduced that overweight paunch hanging over our belts from a typical 65 pounds to a typical 30 pounds in just 20 years! Personally, I've lost 65 pounds in the last year, but I still have 35 pounds to go.

This gadget beeps out an alarm tone whenever the refrigerator door is left open for more than about 20 seconds. The light triggers it. You can tell family and friends that the doodad saves energy (which is true) and keeps the young harmonics from staring, entranced, at the shelves full of goodies.

*c/o CQ Magazine

The photoresistor pulls up the base of the 2N2222 when illuminated, which completes the negative supply return circuit for the dual timer 556 (or use two 555s). The first timer provides the initial delay, then the second timer is turned on, generating the alarm tone.

You may find a solderless breadboard (like the Global Specialties EXP-325) is the best way to build this kind of circuit, since it has to live on the metal-rack world of a refrigerator shelf—or provide your own package. Also, the 30–40 °F ambient temperature inside the fridge strongly suggests that you use an alkaline battery, which also means a good, long service life for the alarm.

Good luck with it, skinny! 73

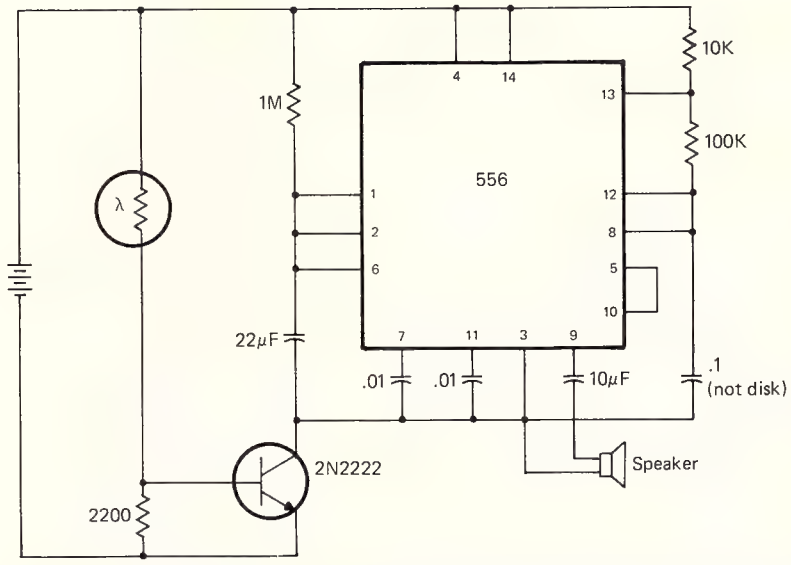


Fig. 1– The simple alarm schematic. Photosensing finally foils "fatso" foraging the frig for food.

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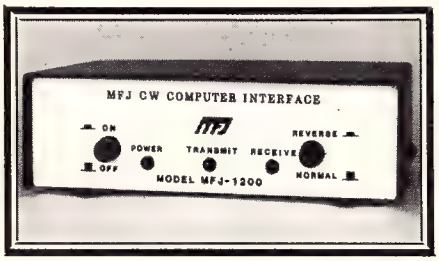
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MFJ-1200 C.W. Computer Interface

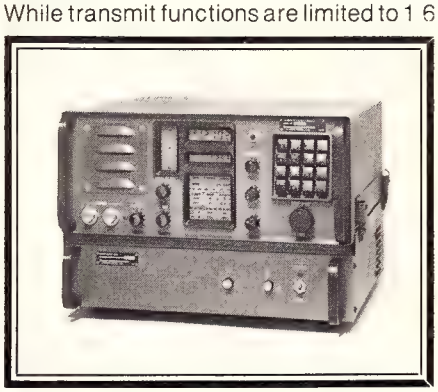
The MFJ-1200 converts audio from a receiver to TTL or RS-232 so a computer can "understand" it. It also lets the computer output key a transmitter. When combined with a personal computer and an appropriate program, the unit can give a complete c.w. keyboard/reader combination. For receiving c.w., the MFJ-1200 processes the received c.w. audio from a rig to provide a clean, computer-compatible TTL or RS-232 level. For transmitting c.w., the unit takes keyboard-generated c.w. at TTL or RS-232 output levels from the computer and drives high voltage keying circuits to key the tube or solid state transmitter.



The unit operates on 6–9 VDC or 110 VAC with the optional MFJ-1309 AC supply. The MFJ-1200 is available for $69.95 (plus $4.00 shipping and handling). For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 103 on the reader service card.

Cubic Astro C H.F./S.S.B. Transceiver

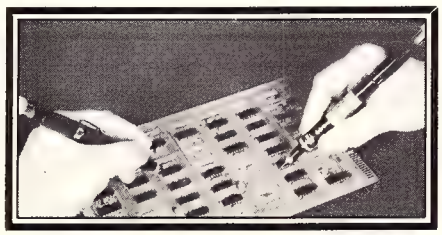
The ultimate Christmas gift, Cubic's Astro C h.f./s.s.b./a.m. transceiver is all solid state, 100-watt, and provides highly reliable voice, data, or c.w. communications with continuous coverage from 1.6 to 30 MHz in 100 Hz synthesized steps. While transmit functions are limited to 1.6 MHz at the low end, the receiver is fully functional to 100 kHz, but with some loss of sensitivity below 500 kHz.



The Astro C offers simplex or semi-duplex modes, and is capable of USB, LSB, c.w., and a.m., plus independent sideband operation. The unit is of rugged cast aluminum and modular plug-in construction, and is designed for continuous 100% duty cycle operation in any mode for vehicular, base, fixed, or shipboard usage. Cost is $8,500. For more information, contact Cubic Communications, Inc., 305 Airport Road, Oceanside, CA 92054, or circle number 108 on the reader service card.

OK Logic Pulser

OK Machine and Tool Corp.'s PLS-1 pulser is compact, lightweight, circuit powered, and injects either a single pulse or 20 pps pulse train into the circuit node under test. No need for desoldering or cutting; the PLS-1 features high-current pulsing that will "punch through" circuit signals for reliable testing. Pulse polarity sensing and output are both automatic.



Operation is by finger-tip pushbutton. The PLS-1 features automatic current limiting to .7 amps nominal, input overvoltage protection to ±50V, high off-state impedance of 1 megohm, low on-state impedance of 2 ohms, and power lead reversal protection. For more information, contact OK Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475, or circle number 104 on the reader service card.

Drake Earth Station Receiver

The ESR24 Earth Station Receiver from R.L. Drake Company is a 3.7–4.2 GHz receiver designed for satellite television reception, and it features digital channel display, preset and variable audio subcarrier selector, A.F.C. for stability, and full metering. For installation versatility, the down converter module (supplied) may be mounted internally or at the antenna.

CIRCLE 69 ON READER SERVICE CARD



Accessories for the unit include a remote control, a remote tuning meter, and splash-proof housing. For more information, contact R.L. Drake Company, 540 Richard St., Miamisburg, OH 45342, or circle number 105 on the reader service card.

KLM JV2 Omnidirectional 2 Meter Vertical

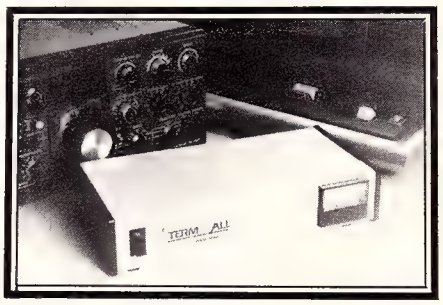
KLM's JV2 vertical for 2 meters features a capacitive-coupled feed, eliminating lossy strap connections, and d.c. grounded elements for lightning protection. The JV2 is designed for repeater and f.m. use, and is suitable for portable use because it requires no ground or radials. The vertical is usable from 144 to 174 MHz, covering any two MHz at better than 1.2:1 v.s.w.r. It can also be optimized to a specific frequency for 1:1 match. Gain is 5 dB over a groundplane. Feed impedance is 50 ohms unbalanced.



The base bracket mounts to mast, sidewall, or stake. For more information, contact KLM, P.O. Box 816, Morgan Hill, CA 95037, or circle number 107 on the reader service card.

Macrotronics' Terminall

Terminall is an integrated hardware and software system that converts the TRS-80 (Model I or II) into a communications terminal. It includes all necessary computer interfacing, audio demodulating, AFSK tone generating, and transmitter keying hardware in one cabinet. Plug Terminall into the receiver headphone jack and copy Morse code, Baudot, or ASCII; plug it into the c.w. key jack and send Morse code. Attached a microphone connector and send Baudot or ASCII using audio tones. Receiving Morse code is completely automatic.



The unit also features multi-level displays, Morse reception, clock, full ASCII capabilities, multiple user-defined WRU, flexible interfacing, and more. Disk-based RTTY software may be added at any time. The unit comes complete with software on cassette and disk, assembled and tested hardware, and instruction manual. List price is $499. For more information, contact Macrotronics, Inc., 1125 N. Golden State Blvd., Turlock, CA 95380, or circle number 101 on the reader service card.

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75-20 HD	75/40/20	66
75-20 HD/A	75/40/20	66
75-20 HD(SP)	75/40/20	66
75-20 HD(SP)A	75/40/20	66
75-40 HD	75/40	66
75-40 HD/A	75/40	66
75-40 HD(SP)	75/40	66
75-40 HD(SP)A	75/40	66
80-10 HD	80/40/20/15/10	69
80-10 HD/A	80/40/20/15/10	69
80-10 HD(NT)	80/40/20/15/10	69
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CIRCLE 34 ON READER SERVICE CARD

The Federal Communications Commission

invites you to attend a reception

to mark the opening of

The Private Radio Bureau's Licensing Division's

new office building

Gettysburg, Pennsylvania

Friday afternoon, July seventeenth

at three o'clock

Not quite the same as an invitation to a Royal Wedding but it's a lot closer.

FCC Dedicates New Licensing Facility In Gettysburg, PA

For quite a while, the FCC facility in Gettysburg was known as the "used car showroom" because essentially that's what it had been prior to the FCC takeover. No signs indicated the might of the Federal Government rested within, and you really had to know exactly where you were going just to find it at all. Several years ago I reported on the goings-on there during another era's financial crisis. All of the available space within was taken up with people working hard on not only amateur matters, but on many other services provided for by the FCC.

We still have budget problems, but one thing new in Gettysburg is a headquarters for the FCC. Gone are the days of the automobile showroom and cramped quarters. The FCC is now housed in a real building with more and more of its Washington, D.C. operations being transferred there. The new Licensing Facility promises to increase their efficiency and greatly improve the working atmosphere for the entire staff. The only thing missing now is an easy way to get to Gettysburg.



The ceremony. (Speaking) Carlos V. Roberts, then Chief, Private Radio Bureau. (Seated) Edward J. Minkel, Special Assistant to the Chairman for Management; Mimi Weyforth Dawson, FCC Commissioner; Nancy Carey, Legal Assistant to Commissioner Washburn; Frank Young, Legal Assistant to Commissioner Dawson; Muriel Brendle, Representing Congressman William F. Goodling; and Michael Natoli, Office of Management and Budget.

*Editor, CQ

Say You Saw It In CQ

Dedication of FCC Licensing Facility
Gettysburg, Pennsylvania

Friday, July 17, 1981
3:00 P.M.

Opening remarks by Carlos V. Roberts,
Chief, Private Radio Bureau, FCC

Remarks by Congressman William F. Goodling,
19th District of Pennsylvania

Presentation of the key to the building to the
Chairman of the
Federal Communications Commission,
Mark S. Fowler,
by building owner Mr. Wilbur Sites.

Remarks by Chairman Mark S. Fowler

Benediction by Reverend Amos. D. Meyers

Ceremony concluded, light refreshments
and guided tours of the facility until
approximately 7:00 P.M.

Special guests:
Mimi Weyforth Dawson, FCC Commissioner
Charles Lightner, Mayor of Gettysburg
Mr. Edward J. Minkel, Special Assistant
to the Chairman for Management, FCC
Ms. Nancy Carey, Legal Assistant to
Commissioner Washburn, FCC
Mr. Michael Natoli, Office of
Management and Budget

The program for this auspicious day.



At the presentation of the ceremonial key. Left to right: Chairman Mark S. Fowler, Richard H. Everett, Chief, Licensing Division and Wilbur Sites owner of the building.

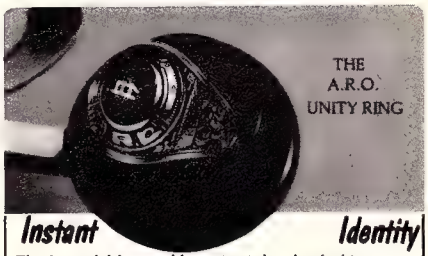


The ribbon is cut and everyone appears to be happy. From left to right: H. Walker Feaster, Associate Chief for Operations (sorry, only the side of his face is visible), Muriel Brendle, representing Congressman William F. Goodling, Carlos V. Roberts, then Chief, Private Radio Bureau, Chairman Mark S. Fowler, new FCC Chairman, Wilbur Sites, building owner, Mimi Weyforth Dawson, FCC Commissioner.

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a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

Here is the "Story of The Month" for November as told by Jerry:

Jerry Skaife, W7ULC
All Counties #295, 7-31-80

"I was born December 29, 1936 in Silverton, Oregon. My amateur radio interest began in the spring of 1953 while I was a junior in high school. I had learned the Morse code as a Boy Scout project. My Dad, Don, W7ULA, was an electrician in a saw mill in Oakridge, Oregon. One of the fellows he worked with was a ham and he got us both interested. Dad and I studied all summer and passed our Novice exams in August of 1953 and received WN7ULA and WN7ULC. The Novice license was only good for one year then and not renewable, so we kept studying and working on our code and went for the General license in the summer of 1954. I was more interested in c.w. for a long time and had much fun and made many friends. Got a triband beam in 1958 and began chasing DX.

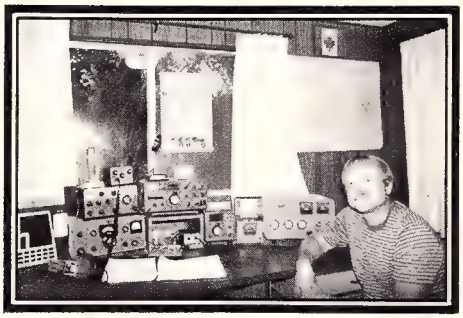
"I ran across the CHC Net about 1963 or 1964 and got interested in chasing Awards and County Hunting. I was the first station in Oregon to apply for USA-CA-500—actually February 5, 1965—and received #454. I was then working at the saw mill in Oakridge, but received a better offer from the plant here in La Grange, Oregon.

"I was off the air from October 1966 to December 1969 and had a lot of catching up to do. Put up a 14AVQ in a Trailer Park where I lived and began chasing DX again.

"I had quit taking any radio magazines, so I didn't know about the County Hunters Net until one day in March of 1970 when I was looking for the CHC Net and heard Arnie, K9DCJ, running a County I needed in Wisconsin. I was working swing shift so could spend all morning and part of the afternoon chasing Counties. Finally, after 15 years, I sweet-talked, Jim, WB5YDH, into going through my last three in Arkansas in one evening to finish them *All*.

"My thanks to all who helped over the years. It was great fun, and they are a great bunch of people on the County Hunters Net!"

P.O. Box 73, Rochelle Park, NJ 07662



Jerry Skaife, W7ULC, at his operating position with very adequate lineup of equipment. His Dad, W7ULA, has had USA-CA-2500 since 1980.



Radio shack of my friend, the DXer, Ray Van Handle, W2BAI.

Awards Issued

Ken Distel, WA4AUL, who had received USA-CA-500 #988 in December 1973, made them All endorsed Mixed.

Jim Roberts, WBØMIX, added USA-CA-3000, and All Counties endorsed Mixed to his fine collection.

Keith Turner, WA2TJL, also added to his fine collection USA-CA-3000 and All Counties endorsed Mixed.

Walt Johler, W9FD, who received USA-CA-500 #483 (as W9UZS) back in April 1965, found time to catch up on all his paper work to request USA-CA-1000 through All Counties endorsed Mixed.

Bob Garceau, K1YRP, continues to plug away, and got USA-CA-3000 endorsed Mixed.

Gene Brammer, K1HBM, had me check his records for USA-CA-1000 and 1500 endorsed Mixed.

Ambrosi Flutsch, HB9AGH, claimed USA-CA-1000 endorsed All A-1. This is #1, 1000 to Switzerland.

Lonny White, WA8ZDL, applied for USA-CA-500 and 1000 endorsed All S.S.B., All Mobiles, All 14 MHz.

USA-CA-500 Certificates endorsed Mixed were issued to:

Joao Batista Pereire, PP5JB (ex-PY5AFL).

Viliam Kuspal, OK3CEE.

USA-CA-500 Certificates endorsed All S.S.B. went to:

Mickey Principe, KB5UP, also endorsed All 28 MHz.

Erik Andersen, OZ8EA (#4 to Denmark).

Richard Gardner, WB4FSX, also endorsed All 20, All Mobiles.

USA-CA-500 Certificates, endorsed All A-1, obtained by:

Josef Marik, OK1JMW.

Lester Flake, K8KIR.

Special Honor Roll
All Counties

#332 Kenneth Distel, WA4AUL 7-13-81.
#333 James Roberts, WBØMIX 7-25-81.
#334 Keith F. Turner, WA2TJL 7-31-81.
#335 Walter W. Johler, W9FD 8-1-81.

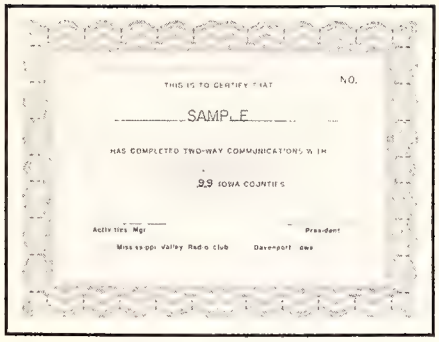
Awards

Special Award: If you were fortunate enough to work GB2WED on July 29th, 1981, *(that big wedding day)* and you work two members of the Bromsgrove and District Amateur Radio Club during 1981, you can qualify for a Special Award. Send $1.00 or 4 IRCs to Awards Manager, J. K. Harvey, G8KLO, 38 Bodenham Road, Birmingham B31 5DS, West Midlands, Great Britain. Active club members include G2CLN, G3NOY, G3RBL, G4AAL, G4DHH, G6WI, G8IO, G8JTK, G8LJM, G8KLO, and G8LXT. (This data telephoned to me by John, G8KLO.)

USA-CA Honor Roll

3000		1500		500	
K1YRP	358	K1HBM	538	PP5JB	1632
WBØMIX	359	W9FD	539	KB5UP	1633
WA2TJL	360			OZ8EA	1634
W9FD	361	**1000**		WA8ZDL	1635
		K1HBM	679	OK1JMW	1636
2500		HB9AGH	680	OK3CEE	1637
W9FD	424	WA8ZDL	681	K8KIR	1638
		W9FD	682	WB4FSX	1639
2000					
W9FD	480				

Say You Saw It In CQ



The Iowa Counties Award.

Iowa Counties Award: An Award will be issued to any amateur who has worked 19 Iowa Counties. Cost is $1.00. A new Award will be issued for each additional 20 Counties. Send usual log info and statement by two other amateurs or one club officer that you have the QSLs; do not send the QSLs. Apply to: The Mississippi Valley Radio Club, 3518 Columbia, Davenport, Iowa 52804. (Thanks to Arnold, WB0UCP, President.)

QRP Amateur Radio Club International Awards Program: QRP ARCI is marking its 20th anniversary this year, and as part of the observation the club has restructured its Awards program. QRP ARCI is the oldest organization of its kind, and membership is rapidly approaching 5,000 worldwide. As of now, all Awards will be based on a power *output* of not more than 5 watts c.w. or 10 watts p.e.p. on sideband. Here are their popular Awards and requirements:

1000-Mile Per Watt (KW/M) Award: Is available to any amateur transmitting from or receiving the signals of a low-power station, such that the Great Circle distance between the two ends, when divided by the power output, equals or exceeds 1,000 miles per watt. Additional certificates may be earned on different bands and with different modes.

DXCC-QRP Award: Is available to any amateur station for confirmed contacts with stations in 100 of the ARRL's approved countries.

QRP-WAS Award: Is available to any amateur for confirmed contacts with each of the 50 United States.

QRP-WAC Award: Available to any amateur for confirmed contacts with a station in each of the 6 continents.

For each of the mentioned Awards, the following rules apply:

1. Power *output* may not exceed 5 watts c.w. or 10 watts p.e.p. on sideband.

2. Since members' QRP numbers are not made available by the club, it will accept as proof for any club Award a QSO with a club member giving his/her QRP number and power level in the log data. Otherwise, a QSL card is needed for confirmation. Copies of cards or a General Certification Rule list is acceptable.

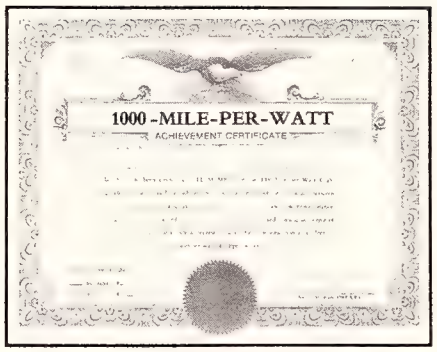
3. Special endorsement seals are available on Awards for which power output on both ends of the contact was within the QRP limits per rule 1.

4. An all-one-band or mode (AOBM) endorsement is also available on request and if supported by log data, QSLs, or GCR list.

5. All Awards are endorsed for power used and whether "one-way" or "two-way."

6. Under the General Certificate Rule, Award sponsors will accept as proof of confirmed contacts and as proof that claimed QSLs are on hand if the list is (a) signed by a radio club official, (b) signed by two amateur radio operators of General class or higher, or (c) signed by the applicant with his/her signature notarized, attesting that the QSLs are as claimed. If QSLs are sent as proof and are to be returned, they must be accompanied by sufficient postage.

The only club Award to be "grandfathered" in during the restructuring of the program is the *QRP-25 Award*. It is issued to any amateur who works 25 QRP ARCI members, and endorsements are available for 50, 100, 200, and so on in multiples of 100. Associate members must have been running 50 watts output or less on c.w. (or 100 watts p.e.p. on s.s.b.) to qualify.



The QRP ARCI 1000-Mile-Per-Watt Certificate.

To apply for any of the club's (QRP ARCI) awards, send copies of log data, QSLs, or a GCR list plus power and mode used by all stations together with $2.00 or 10 IRCs to the *new* Awards Chairman, Doug Crittenden, WB1ESN, 33 Taylor Street, Pittsfield, Massachusetts 01201.

QRP ARCI's secretary-treasurer, who has additional information on membership, is Edwin R. Lappi, WD4LOO, 203 Lynn Drive, Carrboro, North Carolina 27510.

Additional information can be obtained from the club's Public Relations Officer, who is Fred Bonavita, W5QJM, P.O. Box 12072, Capitol Station, Austin, Texas 78711. (Also thanks for data via Hugh, WA8CNN.)

CHC Western States County Awards Program: As mentioned in my June column, the Awards Program of deceased K6BX has been revived. There have been some changes; the cost is now $3.50, and here are the rules:

1. All Awards are available to licensed amateurs and s.w.l.'s on a heard basis.

2. Send a verified log extract along with $3.50 or 18 IRCs. The log extract may be certified by a local club official, a notary public, two licensed amateurs, or with Xerox copies. Should you find it necessary to send QSL cards, please include instructions for their return and funds to cover same.

3. Applications and filing fees should be sent to: Awards Manager, KB7SB, Scott R. Douglas, Jr., P.O. Box 46032, Los Angeles, California 90046.

4. All Awards are multi-colored and printed on a parchtone bond.

5. Endorsements must be made at time of application.

In June data was listed for County Awards for California, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Arizona County Award: Issued in 3 classes: C = 5 to 9; B = 10 to 13; A = All 14 Counties.

Alaska Counties Award: Issed for 2, 3, 4 confirmed Counties.

Hawaii Counties Award: Issued for 2, 3, 4 confirmed Counties. (*Note: The Kauai ARC still lists 5 Counties, as does Uncle Sam—Ed.)*

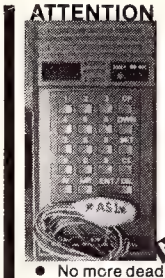
If you do not have the June 1981 copy of *CQ*, send s.a.s.e. to KB7SB.

A1-OP Certificate of Merit: Issued without request by sponsors and by request of 3 licensed amateurs. Requires statement signed by 3 licensed amateurs plus application fee of $3.50. For more details, send s.a.s.e. to KB7SB.

Notes

Some very disturbing information has surfaced regarding the operations of WB2HTX and W9HAT, so until this information can be confirmed or denied, do *not* submit any applications using QSOs with them.

73, Ed, W2GT



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CIRCLE 65 ON READER SERVICE CARD

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

A quick check of the results of the 1980 CQ World Wide DX Phone Contest in the September issue showed a number of low-scoring First District stations in bold type. Obviously they were not certificate winners. There were also some scores at the head of a column that were not in bold type. This may indicate that the required 12 hours of operation to be a certificate winner were not fulfilled, or it may have been an error. In any event, if you are a winner you will get your certificate regardless of how your score is indicated.

It did not take long to fill the spot vacated by W7RM in the C.W. Trophy list. A phone call from Jim Rafferty will now show N6RJ as the sponsor of the U.S.A. Multi-Multi Plaque in the C.W. Contest coming up at the end of this month. *Thanks, Jim.*

Add a couple more Trophy Donors to the 1981 *CQ* WW DX Phone Contest that took place last month:

U.S.A.—Multi-Operator, Single Transmitter. Ted Pauck, Jr., K8NA.

Europe—Zone 14—28 MHz Single Operator. A. G. Anderson, GM3BCL.

Both K8NA and GM3BCL are very active contesters. Ted won the U.S.A. W8IMZ 1980 WPX S.S.B. plaque, and Sandy has participated in *CQ* phone contests since 1949, winning a certificate each year since 1956, with the exception of 1973.

One of our Trophy donors recently advised me that he was not happy with the three-year eligibility rule regarding trophy winners. He feels that it will discourage competition for his award. On the contrary, I personally feel it will encourage more entries when it is known that the "hot shot" of a particular area will not be competing for that award. In any event, the Contest Committee will give this matter some consideration even though this is the only complaint we have received.

I found Rod Linkous's DX Column in the September issue quite interesting. With "big guns," "little pistols," etc., it's most appropriate that Rod came up with a new one, "hired guns."

Many of the advantages, pointed out by Rod, of having an expert operator at the controls of a rare DX contest station are well taken. However, I want to give this topic a little more thought before expressing my opinion. Maybe in next month's Column.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

	Oct. 24-25	**CQ WW DX Phone Contest**
*	Nov. 4-5	YLRL Anniv. Phone Party
	Nov. 7-8	Int. Police Assn. Contest
	Nov. 7-8	Antigua & Barbuda QSL Party
	Nov. 7-9	ARRL C.W. Sweepstakes
	Nov. 8	Czechoslovakian Contest
	Nov. 14-15	European RTTY Contest
	Nov. 14-16	North Carolina QSO Party
	Nov. 21-22	VK QRP C.W. Contest
	Nov. 21-23	ARRL Phone Sweepstakes
	Nov. 28-29	**CQ WW DX C.W. Contest**
	Dec. 4-6	ARRL 160 M. C.W. Contest
	Dec. 5-7	Telco Pioneers QSO Party
	Dec. 12-13	ARRL 10 Meters Contest
	Jan. 2-4	ZERO District QSO Party
	Jan. 9	"73" 40 M. Phone Contest
	Jan. 10	"73" 80 M. Phone Contest
	Jan. 16-17	"73" 160 M. Phone Contest
	Jan. 23-24	White Rose SWL Contest
	Jan. 29-31	CQ WW 160 M. C.W. Contest

* Covered last month

Int. Police Assn. Contest

Sat. Nov. 7 and Sun. Nov. 8
Three UTC periods each day
0000–0300, 0700–1000, 1400–1800

The U.S. Section of the International Police Assn. Radio Club is sponsoring this year's contest. It's open to all, IPA members, non-members, and s.w.l's.

Exchange: RS(T) and QSO number. Members will identify by sending IPA before their report. U.S. members will also include a two-letter state identity (IPA VA 57[9]001).

Scoring: Contacts on 10, 15, and 20 count 4 points. On 40 and 80, 2 points. But 8 points if it's a DX station.

Multiplier: Number of IPA countries and states worked on each band. A country or state is only counted for QSO or multiplier if the station worked is an IPA member. Non-member contacts are worth 1 point but have no multiplier value.

The same station may be worked on each band for QSO and multiplier credit.

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

Frequencies: C.W.—3575, 7025, 14075, 21075, 28075. S.S.B.—3650, 7075, 14295, 21295, 28650. DX—3775–3800. *(How about U.S. on 80 and 40?)*

Awards: Contest certificates as well as other special awards are available for IPA members, nonmembers, and s.w.l's.

A large s.a.s.e. (33¢ in stamps or 2 IRCs) will get you a list of available awards, contest logs, membership list, etc.

Address all inquiries and entries to: IPARC, Att: Thomas D. Jenkins, WA8VDC, 3327 Cloverdale W.B., Monroe, MI 48161.

Antigua & Barbuda Independence QSL Party

Starts: 0000 GMT Sat., Nov. 7
Ends: 2400 GMT Sun., Nov. 8

The members of the Antigua Amateur Radio Society are planning a QSL Party to mark Antigua and Barbuda's independence. All amateurs are invited to participate.

Work four Antigua stations on any band and in any mode over that weekend. The new prefix will be V2A.

Frequencies: C.W.—30 kHz above the bottom of each band. S.S.B.—between 14.180-14.300, 21.150-21.300, 28.500-28.700, 29.600-f.m., 1.825-160M, 3.790-3.840, 7.165-7.250.

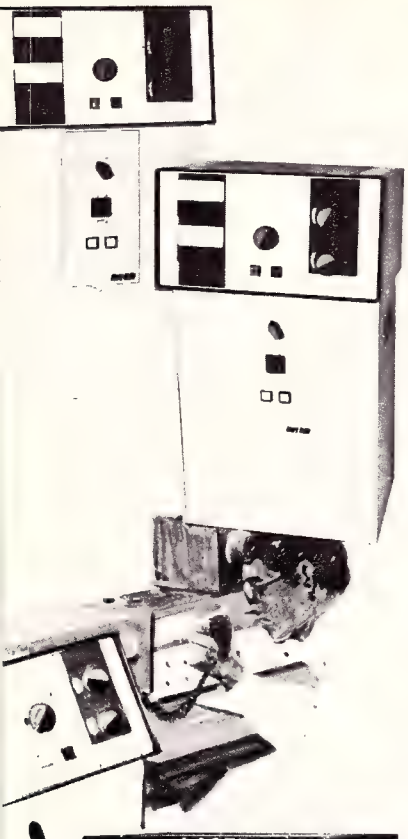
Awards: Submit copy of log showing call sign, signal report, time of contact, and band, together with a self-addressed envelope and $1.00 U.S. to receive certificate.

Address all inquiries and entries to: Independence QSL Party, Box 550, St. John's, Antigua, West Indies.

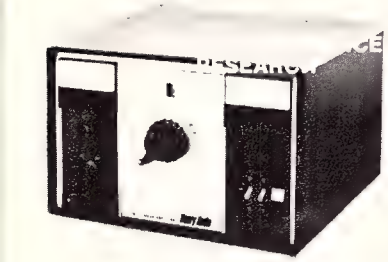
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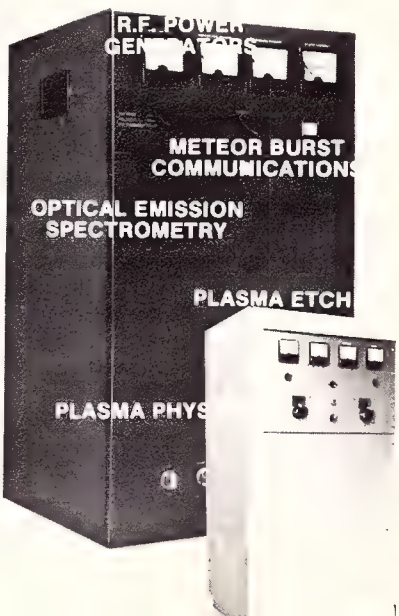






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CIRCLE 88 ON READER SERVICE CARD

ARRL Sweepstakes

C.W.: Nov. 7–9 Phone: Nov. 21–23
Starts: 2100Z Saturday
Ends: 0300Z Monday

The "Sweepstakes" is probably the oldest domestic competition going, and it really stirs up a lot of activity.

Operation is limited to stations in ARRL sections, which include U.S. possessions in the Pacific which are part of the Pacific section, and KP4, KV4, etc., which are in the West Indies section.

Operating 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. This is outlined in *QST*, and it is recommended that you check *QST* for details.

There are several other operating regulations, including a cross-check sheet if you make 200 or more contacts. It is recommended that you send for the "SS Package" which includes Operating Aid #6, log, and summary sheets. A large s.a.s.e. (35¢ postage) will get you enough forms for an average outing.

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

Stations using 200 watts or less are classed as "A" and over 200 watts as "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, contacted (maximum of 74).

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

Mailing deadline is December 10th to: ARRL Communications Dept., 225 Main Street, Newington, CT 06111.

Czechoslovakian Contest

0000 to 2400Z Sunday, Nov. 8

This is a world-wide-type contest, so do not confine your activity to working Czechs only.

All bands may be used, 1.8 through 28 MHz, phone and c.w. The same station may be worked once only on each band, phone or c.w., for QSO and multiplier credit.

Classes: Single operator, both single and all band, and multi-operator all band only. Club stations are considered multi-operator.

Exchange: RS(T) plus two figures indicating your ITU Zone.

Scoring: One point per QSO, 3 points if it's with a Czech station. Multiply total QSO points by sum of ITU zones worked on each band for your final score. (Own country may be worked for multiplier credit but no QSO points.)

Awards: Certificates to the top scoring station in each class in each country. (The Czechs are looking for more state-side participation before making awards by districts in the USA.)

The "100 OK" and "S6S" awards are available for contest contacts in lieu of QSL cards if you include a written application with your contest entry.

Use a separate log for each band, and include a summary sheet showing the scoring and the usual signed declaration that all rules and regulations have been observed.

Mailing deadline for all entries is December 31st to: The Central Radio Club, P.O. Box 69, 113 27 Prague 1, Czechoslovakia.

1981 Spring BARTG RTTY Contest
North America Results

W3EKT	598,000
W3FV	466,334
K7BV	445,760
WB3CCZ	380,820
W4CQI	377,936
W2IUC	327,320
W6JOX	298,176
W0HAH	278,154
W3KV	218,954
K1LPS	208,926
K0BJ	202,648
K4VDM	177,682
VE2AXO	177,120
N7DF	171,962
WB3FSN	170,690
W0LHS	170,136
VO1EE	164,340
N9BHH	161,664
WA6WGL	148,674
N0AN	128,240
W5HEZ	120,360
WA6UFY	80,840
WA3ZKZ	65,912
W7CBY	65,620
WA9BMA	63,222
K0PJ/6	56,760
W1MX	54,950
W2KHQ	53,010
W2ODA	46,980
N3AKQ	44,464
WB2VTD	27,140
W9VY	22,680
WB4BKU	9,716
W8TCO	3,430
KA0GYP	1,778

W3EKT was #1 worldwide out of a total of 146 entries. W3FV and K7BV were #4 and #5, respectively.

European RTTY Contest

Starts: 0000Z Saturday, November 14
Ends: 2400Z Sunday, November 15

Rules for the RTTY contest are the same as the European c.w. and phone contests held in August and September, and they were fully covered in the August issue. Since they are quite lengthy, they will not be repeated here.

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CIRCLE 120 ON READER SERVICE CARD

There is one major 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.

Contacts within the same continent count as a multiplier of one per band, including 40 and 80 meters. QSO's as well as QTC traffic with own country (call area) are not allowed.

It is suggested that you use the official DARC log forms. An s.a.s.e. to the address below will get you a supply.

Certificates will be awarded to the highest scorers in each class and each country. The continental leaders will receive the WAEDC plaque.

Mailing deadline for logs is December 15th, and they go to: Klaus K. Zielski, DF7FB, P.O. Box 1147, D-6455 Erlensee, West Germany.

Esperanto Phone Contest

Starts: 1200Z Sat., November 14
Ends: 2400Z Sun., November 15

Aim of this contest is to promote the Esperanto language on the amateur bands.

Exchange: RS plus the usual three figure contact number starting with 001.

Scoring: Contacts between stations in the same continent are 1 point, with other continents 2 points. Final score is the sum of QSO points.

Only contacts in which at least the report was exchanged in Esperanto have any point value.

As an example. 0 - nulo, 1 - uno, 2 - du, 3 - tri, 4 - kvar, 5 - kvin, 6 - ses, 7 - sepen, 8 -ok, 9 - nau.

Frequencies: 3766, 7066, 14266, 21255, 28766 MHz. These are the Esperanto suggested frequencies, but contacts may be made on other frequencies, especially on 80 and 40.

There was no mention of any awards, but your log should be received no later than December 15th by: Hans B. Welling, DJ4PG, Arnumer Kirchstr. 5d, 3005 Arnum, Federal Republic of Germany.

North Carolina QSO Party

Two Periods GMT
1700 Sat. Nov. 14 to 0200 Sun. Nov. 15
1200 Sun. Nov. 15 to 0100 Mon. Nov. 16

This year's party is again being sponsored by the Alamance A.R.C. and has been expanded to include new categories and awards.

The same station may be worked on each band and mode, and N.C. stations may work other in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for N.C., ARRL section for others.

Scoring: *For N.C.*—One point per QSO. Multiply total by sum of ARRL sections (73) and N.C. counties (100) worked. (DX contacts only count for QSO points.)

Out-of-state—Two points for each N.C. contact. Multiply total by N.C. counties worked (maximum of 100).

Frequencies: C.W.—3560, 7060, 14060, 21060, 28060. S.S.B.—3980, 7280, 14280, 21380, 28580. Novice/Tech.—3720, 7120, 21120, 28120. V.H.F.—50.050, 50.110, 144.050, 144.200. Repeater contacts not permitted.

Awards: 1982 U.S. Callbook and certificate to top N.C. and out-of-state single operator scorer. *(A worthwhile prize—ed.)* Certificates to top scorers in each category—C.W., S.S.B., Mobile, V.H.F., and Novice/Tech—in each ARRL section, and N.C. county. The top Almance Club member will have his name added to the perpetual Trophy.

Include a summary sheet with your entry and the usual signed declaration. Include 35¢ in stamps for a copy of the results.

Mailing deadline is December 12th to: Bob Wang, KQ4M, P.O. Box 777, Hillsborough, NC 27278.

VK QRPp C.W. Contest

Starts: 0000Z Saturday, November 21
Ends: 2400Z Sunday, November 22

This is a new one organized by the VK C.W. QRPp Club. Rules are a bit lengthy, but it's a world-wide contest in which DX as well as own country can be worked for scoring credit.

Use all bands, 10 through 160, on c.w. only. Single operator, single or all band. There are two operating time periods—the full 48 hours or any consecutive 24 hours.

QRO stations (over 5 watts output) can also participate, but must work QRPp stations only. QRPp stations must sign /QRP for identification.

Exchange: *VK Club members*—Four digits, membership number plus QSO no., starting with Ø1.

Other QRPp stations—Five digits, RST plus QSO no.

QRO stations—Three digits, RST only.

Stations with over 99 QSOs start with Ø1 again.

Scoring: Each contact based on power output.

0 to 1 watt . . . . . .6 points
1 to 2 watts . . . . .5 points
2 to 3 watts . . . . .4 points
3 to 4 watts . . . . .3 points
4 to 5 watts . . . . .2 points
Over 5 watts . . . . .1 point

Multiplier: Number of VK QRPp club members (4 digits) worked on each band, plus number of QRPp DX stations (5 digits) worked on each band.

Final Score: Total QSO points from all bands times the total multiplier from all bands.

Awards: Certificates in each section to top scoring Club member, QRPp non-member, and QRO station in each country.

Use a separate log sheet for each band, and include a summary sheet showing the scoring and power used and the usual signed declaration. Include 1 IRC for results.

All entries must be received no later than January 31st, and go to: VK C.W. QRPp Club, 59 Collova Way, Wattleup 6166, Western Australia.

CQ World Wide DX Contest

Phone: Oct. 24–25 C.W.: Nov. 28–29
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Repeating the rules of our fall classic would be ludicrous, since they have been so well covered the last two months. No changes from previous years, full details in the September issue with a follow-up last month.

Deadline for the mailing of your Phone logs is December 1st, and January 15th for the C.W. entries. An extension will be given if conditions justify, but the request must be made in writing and details must be given for the request.

This year we ask that all entries be sent to the home office: CQ Magazine DX Contest, 76 North Broadway, Hicksville, NY 11801. *Please indicate Phone or C.W. on the envelope.*



CIRCLE 12 ON READER SERVICE CARD

a monthly feature by
HUGH CASSIDY, WA6AUD

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

It is not only the young lovers who cry: "This is the perfect moment in time. Would that it could last forever. Never let it end!" Some DX types tend to have the same feelings though the object may be different. Last week one troubled DX type was up the hill to discuss things with us.

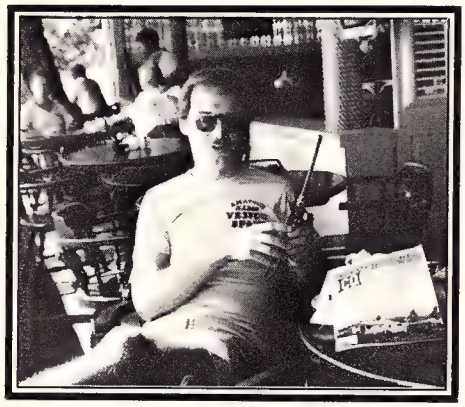
"The club is being ruined," he bluntly advised us. "All these brand-new DXers that they are voting into membership are taking things over and there is not much fun anymore. They are even arguing with the old timers in the club—those who have made the club what it is today—always trying to say how things should be done. The club is sure going to pot."

Having run the track ourselves more than once and having the marks of the years to show it, we did not immediately panic. More than once we have heard the cry that this is the perfect moment in time, the perfect club, the perfect transmitter, the perfect clique, or the perfect place. It may be close, but never quite is, and eventually you learn that the feeling is transient. Always there will be new and shining faces at club meetings and new enthusiasms and new life. And we who must be numbered among the most deserving of all DXers, while eternally vigilant that our hard-earned and deserved stature is not lessened one whit, must also be cognizant that time is a flowing stream. Things do change.

But we had the bearer of the report on some of life's major woes on our hands, as yet unsatisfied. Not even our continued attentive looks and intimations of sympathy expressed in our small smile of understanding helped. "Why some of these new members are downright obnoxious," we were informed, "downright obnoxious. Absolutely!" We were not going to argue, for it was readily evident that this was a worthy and exceedingly weighty matter, one not easily dismissed and one whose resolution certainly would thunder down the avenues of the ages.

"Tell us more," we urged, and instantly realized that these were empty and unneeded words. This one was bound to tell us the whole tale whether or not we wished to hear it.

77 Coleman Dr., San Rafael, CA 94901



Bob Richert, VE3FCU, who will be signing 8P6MI in the CQ WW DX C.W. Test later this month, has been in Barbados before, has a detailed knowledge of all the better watering spots, and obviously reads the right magazines. With his hand-held 2-meter rig in hand, Bob follows the dictum of Lord Baden-Powell: "Be Prepared!"

"Old Bill . . . and you know how much Old Bill has done for the club," were the words that came pouring out at us. "Why Old Bill says that he won't attend any of the club meetings as long as those obnoxious new DXers are given the floor to create all the uproar with the questions and suggestions. Things aren't like they used to be when it was a real DX Club of DXers! Why they even want to run some of their members for club office. That will be the day!"

We had to hold up a hand at this point, for we always seek to keep things in order. "Old Bill," we said, "just who might that be?" We were soon sorry that we had asked, for we were forcefully made aware of all the things that Old Bill had done for the club—things like coming to the meetings regularly, paying his dues, being a friend to all the other old timers, and not getting too smashed at the Christmas party. Truthfully, we had some trouble in recalling Old Bill, but we were a bit cautious about getting into the danger quadrant by mentioning it, so we kept still. This was not expecially difficult, as our visitor had enough words for both of us. His delivery, while sometimes unpolished, was quite forceful. It gave us time to think.

We thought of other days and other years. Days when the dawns were bright, the air clear, and DX was everywhere on the bands. In those days it was DX that we lived for; little else could matter. We thought of the great DXers we had worked then, the really dedicated types who were honored and revered by all true-blue DX types. DX was the passion, and blest were they who were deep into and understood the mystic rituals of DXing. We thought again of the dawns that were bright and the days that were always sunny and wondered why one ever had to grow old and perhaps lose the moment.

Our friend paused for a needed breath and we were quick to thrust in a few words. "Maybe these new ones are good for the club," we said, "and probably before long you will see them as the officers and leaders in the club. They are apparently real DX types, and it seems that they are the ones who respond when there are calls for workers. And look what they do in the contests. They really are the doers in the club these days." We thought we made some good points, but perhaps it would have been better to keep quiet.

What we got was an instant glare loaded with incredulity. "Seems to me," we were told bluntly, "that you've been around long enough to know better. And for one who has held office in the club, you seem to have little idea about what is going on with these new jokers who are getting into the club. It will ruin the club for sure! I've seen it happen before, and it is happening here. You can bet on that, Buster!" With that he was gone, leaving us unreconstructed, and he unreconciled.

We thought about it for awhile, for the problem is often encountered. DXers are always ready to recognize accomplishment and to be part of the great days of DXing. And for those who have been participants and not spectators, the joy of the days of triumph is long remembered, perhaps even to the extent of revering and honoring all that has gone before and being suspicious of and scorning anything that comes after. Perhaps eventually we all learn that the new DXer on the band brings the fresh enthusiasm that we once knew, that the joy is not ended and the realization will come that all DXers are deserving, some even more so.

Say You Saw It In CQ

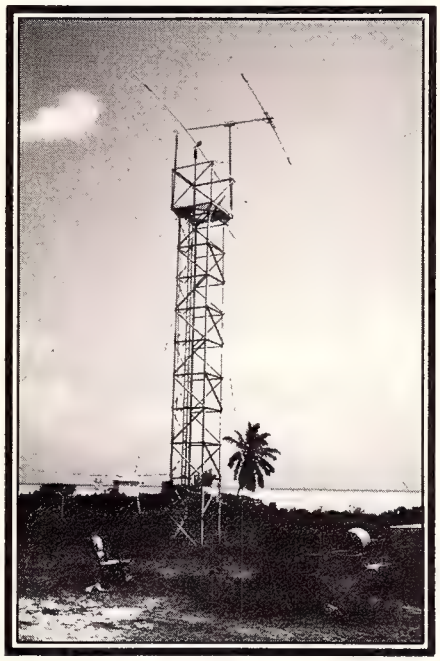
Niue

The second stage of the Northern California DX effort will be on at the end of the month, starting the day before Thanksgiving and running across the *CQ* WW DX C.W. Test until December 3rd. The initial group, Rubin Hughes, WA6AHF, and Gary Cervo, WB6EXW, opened up around October 21st and were due to secure on October 29th. Maybe you caught the early operation in the *CQ* WW DX Phone Test, but if you missed it, be prepared, for the DX will be there again in the C.W. Test. The Arkansas DX Assn. supplied an antenna for the effort, the antenna to be left on the island for Harry Coleman, ZK2AE. This should help Niue to continue to be heard even after the *CQ* WW DX Test.

The C.W. effort will have Bruno Bienenfeld, AA6AD, Hiller Raamat, N6HR, Cameron Pierce, K6RU, and KB6JK. It will be an all-band operation with considerable activity expected on the low bands in the non-contest periods. QSLs for both efforts go to the NCDXC, Box 608, Menlo Park, CA 94025. S.a.s.e. is needed, and they will also throw in a notice on the California Award if you ask.

Barbados

Another action for the *CQ* WW DX Test will be 8P6MI by R. E. Richert, VE3FCU. The action will be from November 26th to December 2nd, and it will be all bands from 160 to 10 meters during the C.W. action. Before and after the *CQ* WW DX C.W. Test look for 8P6MI on both c.w. and s.s.b. QSLs for this effort will go to VE3JTQ.



This is one of the beams up for the Juan de Nova effort that DL6PE/DF7YQ and F6EXV made a year back. They signed FRØDZ/J. It may also give you an idea of the terrain of the French island off Madagascar. (Photo via DX Bulletin)

The WAZ Program

10 Meter Phone

149	JA1HYC	151	N4RR
150	WN6CND	152	JF3KNQ

15 Meter Phone

98	JA3MNY	100	WØULU
99	JAØCIY		

20 Meter Phone

370	WDØBNC	372	K4JLD
371	TG9AL		

10 Meter C.W.

26	DJØGD

15 Meter C.W.

52	N6ND

20 Meter C.W.

151	K5AQ	153	N4XG
152	JA2ADY		

40 Meter C.W.

27	K5RC

All Band WAZ

S.S.B.

2263	JA1NVB	2270	G4FJT
2264	WA6HMZ	2271	CT1XKA
2265	KB3OQ	2272	KB6JK
2266	PT7TP	2273	KB3HE
2267	DL8MAG	2274	N6ATS
2268	DK6AO	2275	KB5IW
2269	K2PZ	2276	K4HAV

C.W. and Phone

5179	VE1IUE	5192	G3EGG
5180	W7EEJ	5193	W9NTY
5181	W1WKP	5194	KB6Q
5182	LA5YJ	5195	WØANZ
5183	KA5W	5196	WA3FWA
5184	JH8MFS	5197	WB4FNH
5185	JA9DCP	5198	GM3YOR
5186	WA4TYJ	5199	KP4EQF
5187	KC5HU	5200	SP7EJS
5188	N5DEE	5201	K2OWE
5189	N4AJZ	5202	K9BIL
5190	DF8ZH	5203	JH2NUT
5191	K9MFI		

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4 00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

WPX

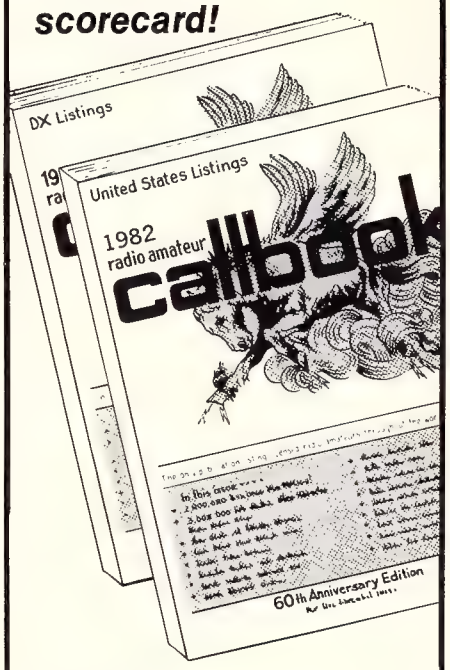
Norm Koch, K6ZDL, will be taking over the WPX duties from K6XP. The address of K6ZDL is P.O. Box 1351, Torrance, CA 90505. Norm has been in the WPX for a good length of time and knows the program. He also lives a short distance from K6XP, so anything sent to the former manager will not be far off the mark.

Some Short Notes On A Slow Track

If you have not heard anything recently about P29JS/VK9NS Jim Smith plans, they should be still on, and with spring returning to Heard Island, something may be moving in the next couple of months.

Things did not work out just right in the last planning for the warm spell there, but Jim has assurances that permission will be forthcoming along with the VKØJS callsign. Watch in the coming months; something maybe moving on this long-needed one.

You can't tell the players without a scorecard!



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The WPX Program

Mixed

939	EI1DH	941	N2AIF
940	KP4EQF	942	KA5W

S.S.B.

1419	JA7MGP	1423	SP8DYY
1420	EA5ANR	1424	WD8IIA
1421	WD9FOE	1425	SP3HTZ
1422	PY2JSF	1426	IV3IOX

C. W.

2094	JH3JYS	2097	KA8EBG
2095	WA7NXL	2098	SP8GSC
2096	WA2CNF	2099	JH2QAY

WPNX

200	WH6AMR	201	WB6SZZ

Endorsements

Mixed	400 EI1DH, KP4EQF. 500 K1RB. 550 K9TI, K7CU, N2AEF, KA5W. 600 JA9FAI. 650 IS0MVE, WD9IIC, HA0KW. 700 JA2KVD. 750 W6YMH. 900 I2DMK. 950 KL7AF. 1000 ONL4003, F6CRT. 1150 WA4QMQ, K9BG. 1500 N9AF, N2AC
S.S.B	300 EA3ANR, PY2JSF, SP3HTZ, IV3IOX. 350 JA7MGP, WD9FOE, SP8DYY, WD8IIA. 400 NP4CC, WD8IIA. 450 DA1MV. 500 K1RB, W6YMH. 600 VK6YL, I2DMK. 650 XE1XF. 700 K4CKS. 850 G4CHP. 900 DK2BL. 1000 I6JZC. 1100 W0YDB, WA4QMQ. 1900 I0AMU
C.W.	300 WA7NXL, WA2CNF, KA8EBG. 350 W4DGX, K7CU, KA7AIG. 400 JH3JYS, JH2QAY. 500 SP8GSC. 750 DJ0LC, I2DMK. 900 I3HDH. 950 JE1JKL. 1050 VE7CNE. 1300 K8MFO. 1450 N6JV. 1500 WA2HZR. 1650 W2NC

10 meters	JA1KRU
15 meters	JA5MG, JA1KRU
20 meters	JA5MG, VK6YL, SP3HTZ
40 meters	OE1KJW

Asia	I3HDH, JA5MG, VZK6YL, K4CKS, KB8EC
Europe	DK3EP, OZ2JZ, VK6YL, I3MLD, SP8DYY
No. America	DK2BL, VK6YL, I3MLD
So. America	DK2BL

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, Calif. 90505 U.S.A.

Besides the action by the Northern California DX Club during the *CQ* WW DX Test later this month, you can also look for ZK2BGD. Brian is reported as active from Niue, this being ZL2BGD, and he is there for communications work.

Some months back John Allaway, G3FKM, was noting in his RSGB column that FB8XM was being heard from Kerguelen Island. Frequency was just below 14200 kHz and time was roughly 10–1100Z.

INORC

The release said that this was the "Italian Navy Old Rythmers Club" and they are having a contest in mid-November, all bands starting 1200Z on November 14th and running to 1600Z on the 15th. It is all bands with a report starting at RST + 001, etc. I2DMK is the contest manager, and you will find Massimo at via Pascoli 60, Milano 20133 Italy if you want the full information. There are prizes, certificates,





At a recent mid-east communications show (MECOM-1981) the Amateur Radio Association Bahrain (ARAB) set up a display of amateur radio. Station A9ZEX operated during the show, making over 500 contacts in 60 countries. The amateur radio exhibit received very favorable press and TV coverage while demonstrating amateur radio to all of the visitors. The equipment was made available by Cubic Communications. Shown operating the equipment is Ian Cable, A9XBW, Hon. Secretary of ARAB.

and possibly even the INORC Award qualification. I2DMK is Massimo Di Marco.

The last week in June another Italian group was on San Paolo in the Ionian Sea for the first-time action from this group. If you worked this one and need a card for one reason or another, QSLs go to I7RJO, P.O. Box 514, J-74100 Taranto 12, Italy.

EP2SL can be QSLed to G4JVG just in case you are looking for a QSL, as Steve is back in England. G3XCS did handle the QSLs when EP2SL was active, and you can still get a QSL either way.

There was a possibility of a 3V8-Tunisia operation showing at the end of October and running into the first couple of days in November. This was planned by a British DX Club and they were looking to sign 3V8DX.

Frank Skutsch, WA2JCX, is looking for an Episcopal Missionary DXer to offer his assistance as a QSL Manager. Frank has had to slow down some of his activities. This first lead him to an amateur license, then to DXing, and now to volunteering. He needs the work to occupy his time these days and would like to hear from an overseas Episcopal missionary. You can find him at 56 Commander Avenue, Garden City, New York 11530 U.S.A.

Phone Patches

Many DXers at times have shown signs of less than howling enthusiasm for phone patching in the amateur bands. In the southeastern portion of the states the matter of phone patching has been a continuing argument with the opposition steadily growing. At the Jacksonville Hamfest last August the whole matter was brought out on the floor at the ARRL Forum . . . again.

At the Orlando ARRL Convention in March of this year, the Board of Directors held one of their semi-annual meetings, and Frank Butler, W4RH, of the Southeastern Division introduced a motion (#92 in the minutes) which called on the ARRL to petition the FCC to add a restriction to reciprocal licenses: ". . . except in emergency situations involving the immediate safety of life or property, the operation of an amateur station by an alien amateur under a permit issued by the Commission shall not include international third-party traffic as defined in Section 97.3 of the Commission Rules." The motion was passed unanimously by the ARRL Board.

At the Jacksonville DX Forum it was proposed that those present vote on a proposal: "Do you favor totally abolishing international phone patches except for Antarctica and U.S. ships?" It is reported that the vote was unanimous, those in attendance being largely from north Florida and Georgia.

Some went on to question domestic phone patches. While the feeling was still against phone patches, there was some question as to whether the domestic matter should be studied further, some feeling that possibly v.h.f. patches might be a legitimate need, but opposing patches in the h.f. bands. Some also felt that if the matter had been put to a vote, the ban on patches would have again been unanimous or very close to it.

The feeling on patches probably is strongest in the Southeastern Division, many amateurs believing that phone patches in the amateur bands are being used for a variety of purposes for which they were never intended, including business communications, back-home political liaison, and sometimes possibly political intrigue. The influx of refugees into southern Florida exacerbated the problem in that area.

Some years back the ARRL was looking at the Sister Cities Program, setting up a committee to promote the concept. In some presentations made to amateur or DX meetings, the proposal was hoisted that amateurs in those U.S. cities which entered into Sister City understandings with an overseas city would be in the forefront running phone patches for public officials and relatives, citizens, and various other people to foster understanding and good will. The current restrictions then and still on third-party traffic were cited as hindrances to the fulfillment of the

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CIRCLE 13 ON READER SERVICE CARD

CQ DX Awards Program

S.S.B.

1040	WD9HWY	1043	W4LCL
1041	VE5ADA	1044	WB9UIO
1042	WA8KMK	1045	DF2RG

S.S.B. Endorsements

310	ZL3NS/315	250	W4LCL/258
310	DK2BL/313	200	DF2RG/200
300	W9SS/309	200	WB5RQM/214
300	DL6KG/309	150	VE5ADA/152
275	KK0C/275	150	K9IML/150

C.W. Endorsements

310	W6ID/315	300	DJ7CX/300

The total number of active countries is 318. 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.

plan. At one meeting we heard one excited listener jump to his feet to declare that amateurs and the ARRL would have to take immediate steps to see that these third-party restrictions were removed so the beautiful plan could go ahead. Generally, the response from DX groups was less than warmly enthusiastic. In fact, "enthusiastic" was a word that should not even be considered.

Possibly, almost surely, this matter will come up again at the January board meeting, now a little over two months off. The action at Jacksonville, the on-going thrust of Minute #92 of the Orlando Board of Directors meeting, and the expressions of amateurs on this matter should possibly bring further action. We hesitate to keep pointing, but if you have any feelings on the matter of international phone patching, you might know to whom to convey your thoughts.

DX Archives

The Northern California DX Foundation, a worthy organization that has been around for a handful of years, has long recognized that the knowledge of the DX of other years, the great efforts, and the exciting operations often are lost to the late-comers on the scene, mostly just because few records are kept and preservation is dependent mostly on memory.

In August the Foundation completed plans to make the memory and history of DX and The Great Days of DXing a bit more permanent by announcing that the Foundation has created a "DX Archives" whose purpose will be to accept and maintain the on-going history of DXing, gathering into one collection material

5 Band WAZ

Standings as of August 1, 1981

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. W0SD, Edward Gray (U.S.A.)
13. K0ZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)

The top 11 contenders for 5 Band WAZ:

1. K5UR, 199
2. ZL3GQ, 198
3. OK3TCA, 197
4. LA5YJ, 197
5. OZ3PZ, 197
6. DL3RK, 196
7. W8GT, 195
8. N4RR, 192
9. LA9GV, 191
10. N6DX, 191
11. F6DZU, 191

101 Stations have attained the 150 zone level

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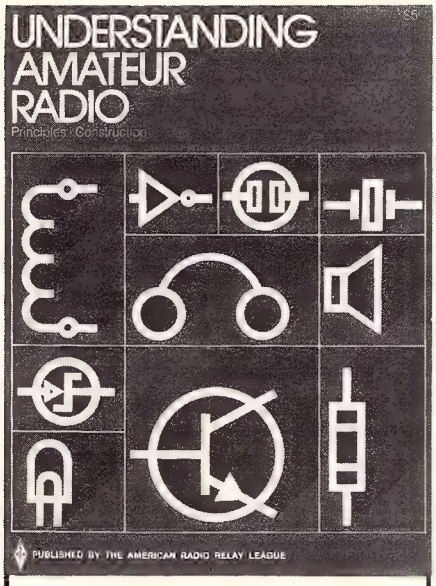
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CQ

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that will not only preserve the records and material from past and future DX efforts, but also will provide a library for source material and information. In announcing the new project of the DX Foundation, President Jack Troster, W6ISQ, stated: "The Foundation has long felt that there is a need to provide for a continuing history of DXing and we are confident that the setting up of the DX Archives will in future years prove to be of immense value to both DXing and those DXers who have not yet appeared on the DX Scene."

Troster noted that the Foundation has often run into situations where those planning a projected effort for a rather rare DX spot have little knowledge of what has gone before in operations from that area, local problems, and sometimes even the terrain. The Archives should help fill in some of the void spots.

Anyone interested in contributing material to the Archives will be welcomed. Mostly the Foundation has been thinking of the areas where rarity is a continuing thing, probably the imbedded top 50. However, where there is any DX angle, the material will be welcomed.

Specifically the Foundation will be looking to stock the Archives with photos, logs, personal narratives, or documents. Josephine Clarke, WB6ZUC, will be handling the setting up of the archives and material can be sent directly to her. It will be cataloged and filed, and within a year it is hoped that the Archives will be a developing source of DX history and information.

Josephine Clark, WB6ZUC, is a well-known DXer in the c.w. bands, a member of FOC, Extra-class licensee, and a member and former officer of the Northern California DX Club. She will receive material at 207 Evergreen Road, Kentfield, CA 94904, but she would like prior correspondence on bulky items.

Where there are photos or films of operations that you may wish to retain for personal reasons, the Archives will be interested in obtaining copies.

The whole effort by the Northern California DX Foundation seems to be an idea of merit. If you have any DX items, photos, or records you might wish to contribute, drop a line to WB6ZUC.

73, Hugh, WA6AUD

CQ DX Honor Roll

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C.W.

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S.S.B.

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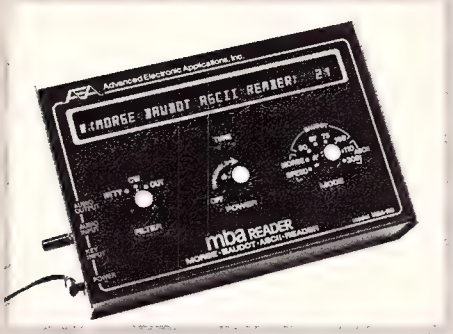
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R.F.I. Complaints Continue At A High Level

According to Jeffrey Young, Enforcement Division, Field Operations Bureau (FOB), r.f.i. complaints to the Commission in the period April–June 1981, inclusive, totaled 21,073. This number represents a 7% increase in the number of complaints reported during the same period a year earlier, and suggests, on an annualized basis, that complaints are again numbering close to 85,000 per year. Of the complaints received, 66% were alleged to involve CB operations, while 5% apparently involved amateur operations.

As is usually the case, socalled television interference (TVI) accounted for most of the complaints (77%). In fact, almost all of the CB-related complaints (13,837 out of 16,276) cited a TV receiver as the victim device, while 526 out of the 1,008 amateur-related complaints involved TVI.

Complaints from amateurs about interference caused by other amateurs also remained at a high level. Specifically, 449 complaints were filed in the April–June time period, again indicating that such interference is a serious problem and one which must be addressed by the amateur service with all due haste.

It is interesting to note that despite the high level of complaints involving CB and amateur operations, complaints involving such operations are not increasing as rapidly as are complaints involving the Land Mobile service. Here, expansion of the service is occurring at such a rapid pace as to portend significant r.f.i. problems for the Commission in the months ahead.

NBC Views R.F.I. Problems as Requiring More Attention

It was reported here last month that NBC would air a special program on interference to communications in the U.S. So serious is the problem that the network has now decided to air the material it taped as segments to be included in its evening news telecasts (the segments, in fact, may have already been aired by the time this column is published). Included in the material to be broadcast are examples of computer interference to electronic home-entertainment equipment, electronic game interference to police radio equipment, and ENG television camera interference to space shuttle landing operations.

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ITU Rebukes U.S. on Anti-Castro Broadcasts from Florida

Your Washington editor has learned from reliable sources that the ITU has rebuked the U.S. for its failure to curb anti-Castro broadcast activity in the Miami, FL area. The action, which was meant to embarrass the U.S., resulted from a Cuban complaint to the ITU which was filed two days after the U.S. Attorney in Miami, FL, dropped charges against an illegal broadcaster, Jose M. Gonzalea. In a letter to the U.S. Government, the ITU indicated that it has asked seven neighboring countries to the U.S. (or countries with administered areas near the U.S.) to "assist" in locating the sources of such interference so the U.S. could take those actions necessary to silence the illegal stations. Included in the seven-country group were Canada, Columbia, Cuba, France, and Venezuela. The U.S. has yet to respond to the ITU letter, but when it does, it will probably thank the Union for its "assistance," and indicate that the matter of the illegal broadcasters is a concern which is being addressed by U.S. authorities.

No-Code Amateur License Still a Possibility

In one of his first actions as the new Chief of the Private Radio Bureau, James McKinney (formally Chief, Field Operations Bureau, FCC) "retrieved" from the Commission's docket the item which would have created a no-code amateur license with privileges above 30 MHz. Said McKinney: "The Commission will probably do something (on a no-code license), but the current proposal was not acceptable . . . it served neither the hobbyist nor the experimenter." Among other things, McKinney noted that it made little sense to ask an applicant seeking privileges above 30 MHz questions on high-frequency (h.f.) technology; that is, it was not appropriate to use current exams to test applications for the no-code license.

Battle With Video Pirates Continues

In an article that appeared in *The Wall Street Journal*, Staff Reporter Kathryn Christensen indicated that large amounts of revenue are being siphoned out of the video industry by operators who copy first-run movies as well as by hobbyists who tap into pay-television programming. Piracy costs to the movie industry alone are estimated at more than $100 million a year according to Joseph Moscaret, vice president in charge of film and videotape security for Paramount Pictures Corp. Basically, two problems exist for movie makers: the unauthorized duplication of movie cassettes already available in the retail marketplace, and the stealing and copying of prints of just-released movies. The latter problem, according to Moscaret, is the most serious and is the one on which the industry will focus.

As regards piracy in the pay-television industry, the sale of unauthorized decoders for prices ranging up to $300 has resulted in much lost revenue as viewers seek to avoid the $10 to $20 monthly charges normally charged for pay-TV services. Some relief for the industry, however, has appeared on the horizon. Earlier this year, Federal appeals courts in San Francisco and Cincinnati ruled that unauthorized interception of subscription TV signals is a violation of the Communi-

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cations Act of 1934 (as amended). Furthermore, some states have adopted, or are now considering, laws making it a crime to make, sell, or distribute unauthorized TV decoders.

The pay-TV industry is also working on the problem. It has recently developed an "addressable" system which links the user's decoder to a central computer. To receive the pay-TV signals, the addressable decoder must receive constant authorization and decoding instructions from the computer. Industry officials believe that while such systems may not be immune to occasional piracy, they are sufficiently complex so as to make piracy on a big scale impractical.

Ninth Bay Area Jammer Cited

On 16 July 1981, engineers from the FCC's San Francisco Field Office were continuing their investigations into unauthorized activities by users of the "Grizzly Peak" amateur service repeater WB6AEE/R. Unidentified transmissions were observed from 7:24 p.m. to 7:36 p.m. on 146.22 MHz, the input frequency of the repeater. The transmissions consisted of sound effects and whistling, all of which were being retransmitted over the repeater on 146.82 MHz, causing interference to ongoing communications on that frequency. Through the use of mobile direction-finding equipment, the source of the transmissions was found to be an amateur station in San Leandro, CA. The "WB6" amateur station at the located address is licensed to an operator holding an Advanced Class license. This operator has now been issued an Official Notice of Violation alleging that he violated the following FCC Rules:

Section 97.84(a): Transmitting signals which were not identified by call sign as required.

Section 97.123: Transmitting unidentified signals.

Section 97.125: Transmitting signals which caused interference.

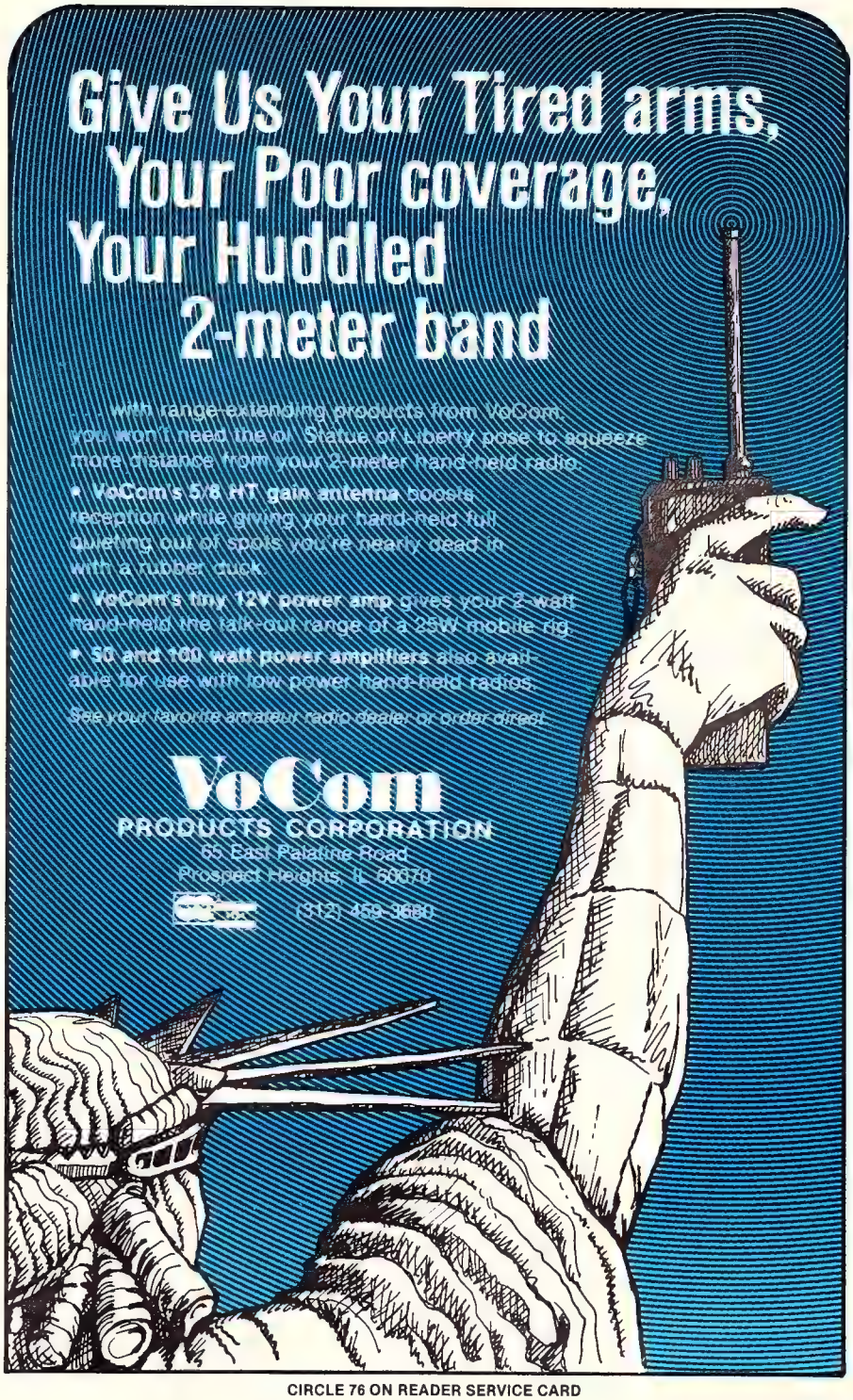
Statement Issued On 6 Meter R/C Operations

The following statement was recently issued by the Academy of Model Aeronautics (AMA) on radio-controlled (R/C) operations in the 6 meter amateur band:

In April 1979, a California R/C flyer questioned the FCC as to whether a person not holding an amateur license could operate an amateur station which was being used to control model aircraft. The final FCC order stated that one could only operate 6 meter R/C equipment if the user held a valid amateur license of Technician class or higher. Thus, an amateur who decides to enter the R/C hobby cannot be "flight trained" by a non-ham. Furthermore, "buddy boxes" cannot be used unless both parties have valid amateur licenses of the proper class. This policy, it should be noted, is strictly enforced at all AMA-sanctioned flying competitions. Likewise, the AMA Insurance Program would not apply if it could be proved that a flyer submitting a claim was not properly licensed.

Amateur Faces Revocation of License

The Chief of the Private Radio Bureau has under consideration the license of Allen R. Vance for amateur radio station K6MMZ. Also under consideration is Vance's amateur General Class operator license. Both licenses were issued 24 April 1981 for a five-year term. Information before the Commission indicates that on 30 August 1980, Vance operated radio transmitting equipment on the frequency of 146.82 MHz in apparent violation of Section 97.119 of the FCC's Amateur Rules. Specifically, Vance is charged with transmitting obscene, indecent, or profane language, and with threatening to do bodily harm to other licensees.



CIRCLE 76 ON READER SERVICE CARD

Vance's apparent rule violation, if willful or repeated, would be grounds for revocation of his station license. Moreover, Vance's use of obscene language over the air is a condition which would have warranted the Commission to refuse to grant his original application for license authority in the amateur service; as such, this circumstance is grounds for revocation of his operator's license. Vance has 30 days in which to request a hearing in these matters.

FCC Takes Three Actions Related to Spread Spectrum

Earlier this year, the Commission issued reports on actions in three docket cases related to spread-spectrum modulation techniques:

1. Report No. 16449—Inquiry Begun On Spread Spectrum Modulation In Amateur Radio Service (Gen. Docket No. 81-414). This docket item involves an inquiry into whether to allow certain amateur radio users to use spread-spectrum modulation techniques.

2. Report No. 16450—FCC Seeks Comment On Spread Spectrum/Wideband Modulation Techniques (Gen. Docket No. 81-413). This docket item involves an inquiry into wideband modulation techniques, particularly examining whether spread-spectrum modulation systems may offer advantages to some radio users, and in particular, whether the use of these systems will result in increased spectrum efficiency.

3. Report No. 16454—Inland Nongovernment Radiolocation Using Spread-Spectrum Techniques Proposed (Gen. Docket No. 10-135). This docket item examines a Commission proposal to allow inland expansion of nongovernment radio location operations in the 420-450 MHz band by pulse-ranging systems, including systems which use spread-spectrum technology.

Amateurs interested in the above matters may contact Mike Kennedy (202-632-7073) on Docket Nos. 81-414 and 81-413, and Sam Tropea (202-653-8167) on Docket No. 80-135.

Commissioner Washburn Comments on Spread Spectrum in Amateur Service

In the matter of authorizing spread-spectrum modulation in the amateur service (Gen. Docket No. 81-414), FCC Commissioner Abbott Washburn had the following comments:

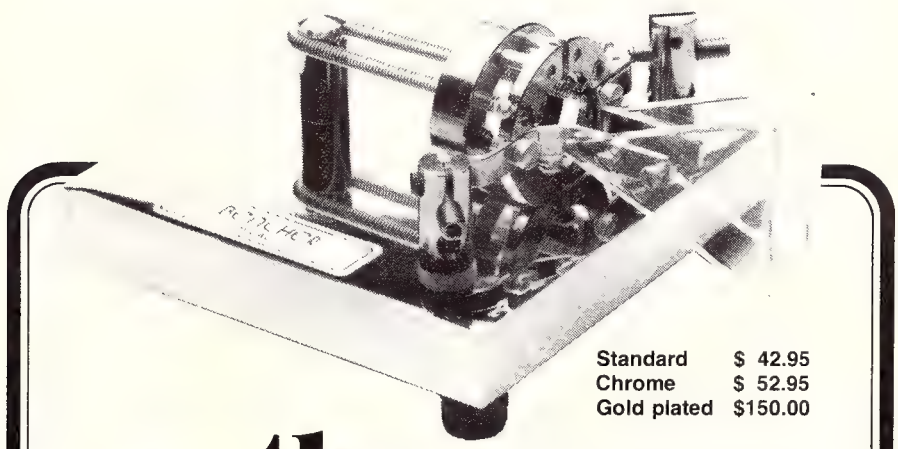
"The second paragraph of (the) item states: 'we feel comfortable proposing the authorization of spread spectrum modulation.' I do not share this feeling of comfort when the same document includes the following language: 'A major concern of the Commission in allowing amateur use of spread-spectrum techniques is the Commission's, and the amateur's own, ability to monitor and locate stations transmitting wideband emissions.' So there is no real control. While new technology is to be encouraged, especially that which allows more use of the spectrum, this should not be at the price of interference. There must be assurance that expanded use of this technology will contribute to the effective and efficient use of the spectrum while at the same time, (assurance that it does not add) interference to the detriment of other technologies and spectrum users in general.

"In a related Notice of Inquiry adopted today, the Commission initiated a proceeding seeking information regarding the future authorization of spread-spectrum and other wideband emissions not presently provided for in our Rules. That inquiry requests information and data regarding the technical characteristics, efficient use of spectrum, possible standardization, potential applications of this technology, etc. It also raises questions regarding the measurement of interference potential, emission testing, and the necessity for Commission monitoring. With issues such as these still in the initial and infant stage of information gathering, the Commission seems to be prejudging important issues by rushing to Rulemaking. A more prudent approach would be first to obtain the facts on monitoring and interference via the NOI, assess these facts, and *then* move to Rulemaking. However, we are assured by the staff that the risks involved will be minimal. I hope this proves to be the case."

Roberts Bids Amateur Operators Goodbye

In his final comments as Chief of the Private Radio Bureau, Carlos Roberts noted that he will miss the interaction he has had with operators in the amateur service. Roberts said that he enjoyed the friendships and contacts he had made during his three years at the PRB, and that he thanked those amateurs who took the time to express their views on the variety of issues which had been before the Commission. Furthermore, he encouraged everyone to continue to participate in the exchange of information with the Commission, an exchange which he found particularly useful on matters pertaining to the amateur service.

Roberts has left the Commission to become Director for Land Mobile Development for M/A-COM Corporation.



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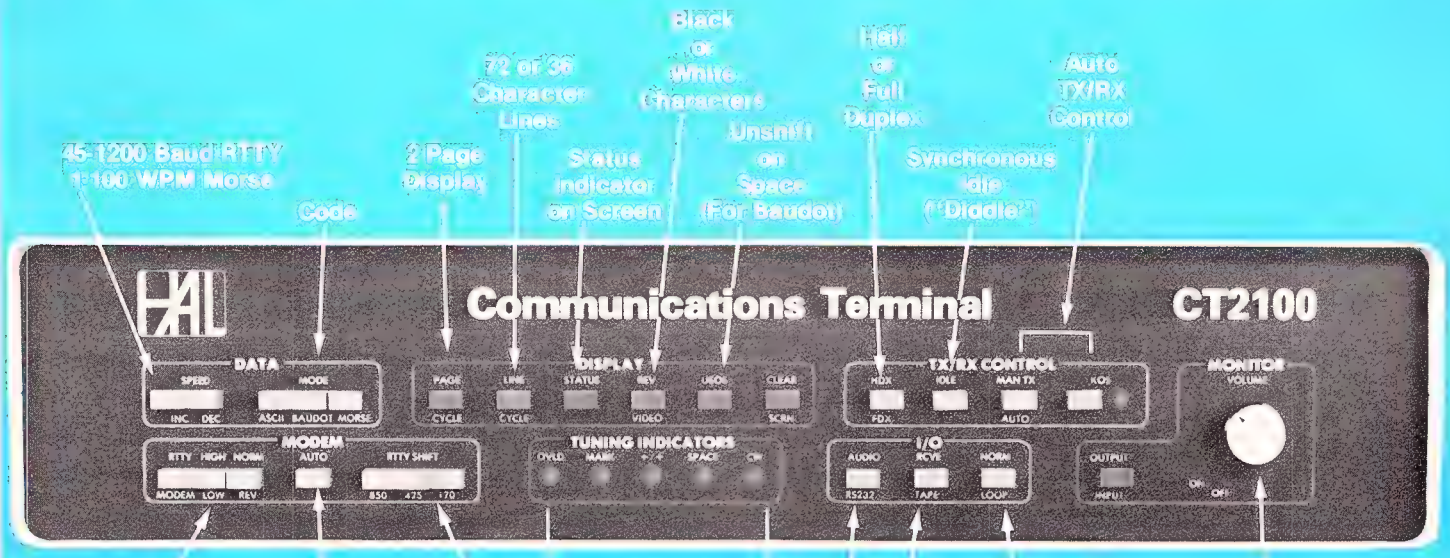
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a monthly feature by
IRWIN MATH, WA2NDM

Math's Notes

A LOOK AT THE TECHNICAL SIDE OF THINGS

In September we discussed the MDS and ITFS microwave TV services. This month we will look at some of the equipment that can be built by amateurs for reception of these signals. Again, we would like to point out the legal aspects of receiving these signals, as some people feel this may constitute "theft of services." Although MDS and ITFS may be common carrier services, the 2300 MHz amateur band is certainly not, and interesting TV transmission can be received and transmitted with no legal considerations other than a normal amateur license.

Fig. 1 is a block diagram of a typical "down-converter." It is quite similar to the units used for years on the v.h.f. bands and works in the same exact way. A low noise r.f. amplifier is tuned to the incoming r.f. frequency desired. The output from this amplifier is applied to a mixer stage, usually microwave diodes, as is the output from a local oscillator. Finally, the resulting mixed frequencies are applied to an i.f. output stage tuned to v.h.f. TV channel 2 or 3. While such a converter is similar, as we have said, the components certainly are not. Fig. 2 is a schematic of the converter in fig. 1. While it may look simple, all of the tuned circuits are formed by etched lines on a special microwave dialectric printed circuit board. Material such as G-10 has huge losses and is not employed. In addition, the transistors are special microwave units and are very small, as shown in fig. 3. To reduce inductive losses resistors are mounted with no appreciable lead length and transistor leads are almost nonexistent. Capacitors are "chip" type devices, also without leads. Furthermore, coarse tuning is accomplished by cutting the lands on the circuit board to size with a razor blade or knife.

Most down-converters use a simple method of fine tuning and power feed. As can be seen in fig. 4, the Vcc line is fed along the input coax with the output signal. The r.f. chokes offer very high impedance to the r.f. signal, but none to the d.c., so the same coax is used for a dual purpose. The actual fine tuning is accomplished by varying the value of Vcc voltage. Normally, an 8 to 12 volt range is employed, and as this varies, the inter-element capacitance of the local oscillator transistor changes, with the result that the frequency also changes. Fig. 5 is a schematic of a typical power supply.

All microwave converters require a good antenna. Fortunately, one wavelength at 2300 MHz is about 13cm, so high gain antennas are not too difficult to fabricate. One of the easiest types, and a 10 dB gain to boot, is shown in fig. 6. It

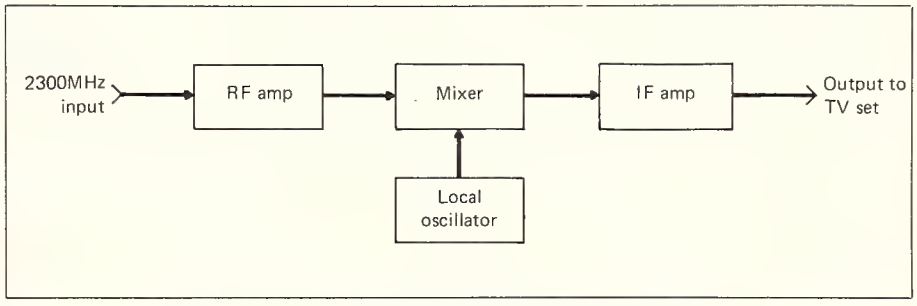


Fig. 1– The block diagram of a typical down-converter.

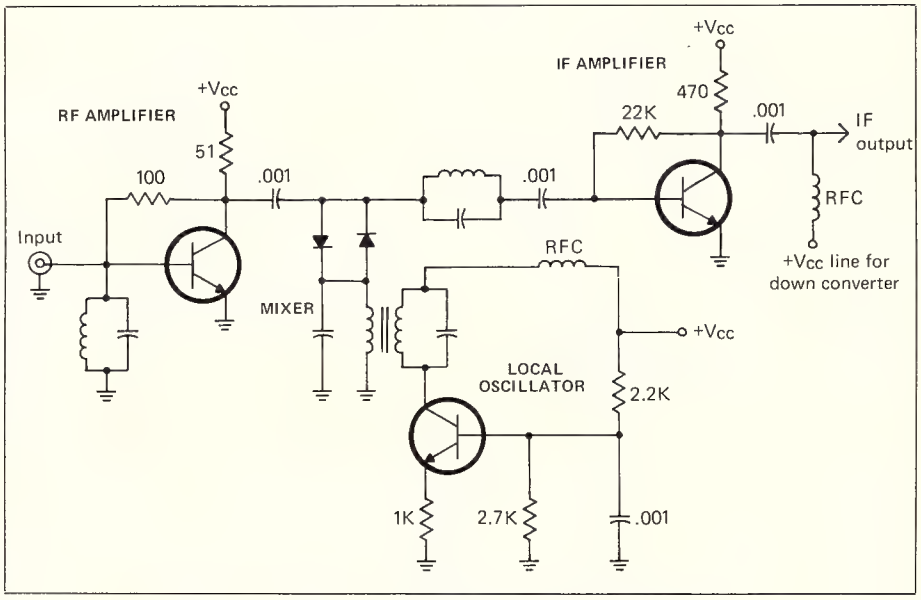


Fig. 2– The partial schematic of a down-converter.

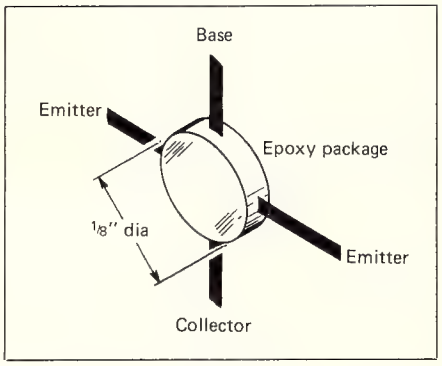


Fig. 3– A typical microwave transistor.

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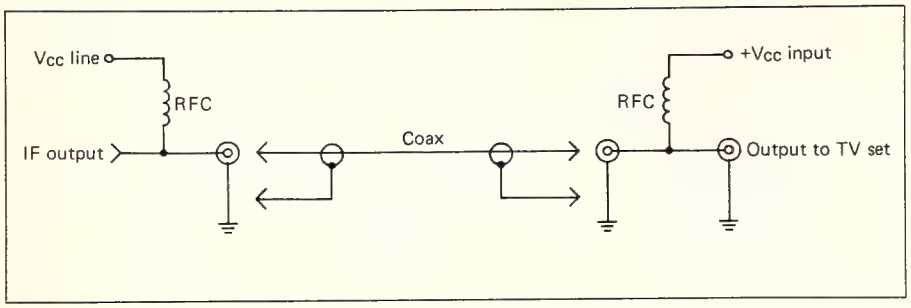


Fig. 4– A method of feeding d.c. and r.f. on the same coax.

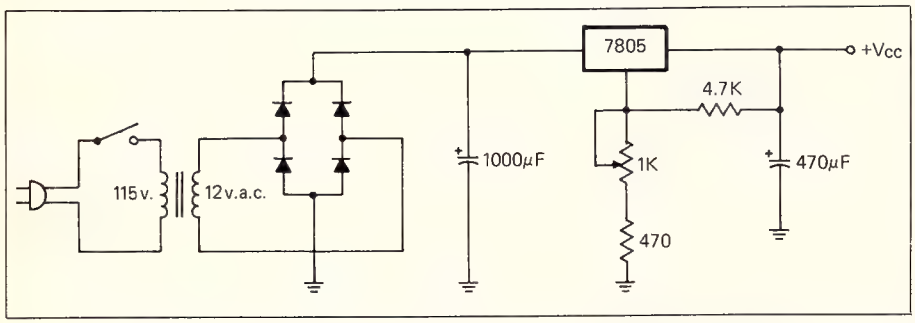


Fig. 5– A typical down-converter power supply schematic. The 1K pot is usually a 10 turn unit and is used for fine tuning the value of Vcc voltage.

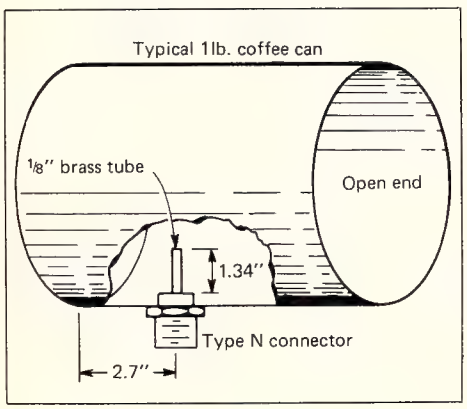


Fig. 6– A coffee can antenna. Vary the length of the 1.34-inch probe slightly for best results.

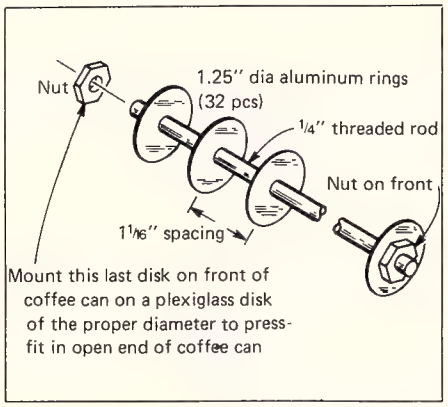


Fig. 7– A Yagi antenna for mounting on the coffee can. The series of discs can raise the gain to 15–18 dB.

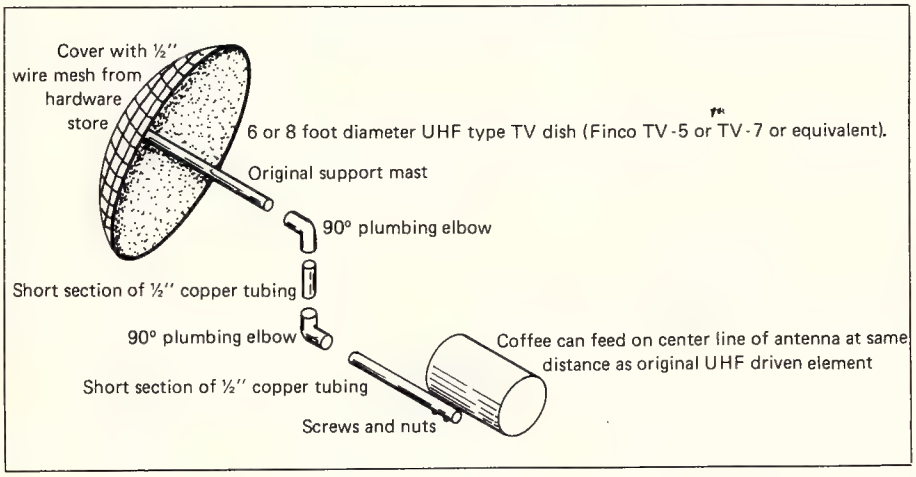


Fig. 8– Details of a parabolic antenna for use at 2300 MHz.

consists of a common 1 lb. coffee can, a type N connector, and a length of ⅛ diameter brass tubing. Such an antenna also has a high front-to-back ratio and can be built in an hour or less. The Yagi antenna is also used at 2300 MHz, and one easy to construct version is shown in fig. 7. This antenna offers a 15–18 dB gain figure.

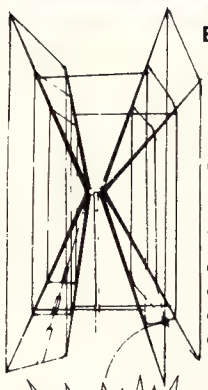
For the ultimate in gain, however, the parabolic reflector is the one that most amateurs use. Fig. 8 shows a typical unit built of a modified 6-foot u.h.f. type antenna. The coffee can is used as a feeder, and the parabolic reflector, as the concentrator of energy. The reflector of the TV antenna has to be covered with ½-inch wire mesh, however, or it will not perform efficiently. Gains of 30 dB can be achieved by careful design of such an antenna, and overall costs are less than $100.

Next month we will conclude our discussion with reception of the 3–4 GHz (3000–4000 MHz) direct satellite signals and the equipment required for this service.

If you are interested in the MDS/ITFS/2300 MHz amateur services, you would do well to contact one of the various companies dealing in equipment for these services. Again, due to the potential legal implications, we will unfortunately not be able to publish actual construction details.

73, Irwin, WA2NDM

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a monthly feature by
GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The C.W. section of the 1981 *CQ* World Wide DX Contest will take place on the weekend of November 28–29. Special *DX Propagation Charts* for use during the Phone and C.W. sections of the Contest appeared in last month's column, along with valuable tips and suggestions that could increase scores during the Contest. Be sure to refer to last month's column if you are planning to participate in the C.W. section of this year's Contest.

Check the Last Minute Forecast appearing in this column for a "press-time" forecast of general conditions expected during the C.W. Contest weekend. Unless a radio storm should develop, look for *good* DX conditions on all amateur shortwave bands from 160 through 10 meters.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1981

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 22, 25	A	A	B	C
High Normal: 1, 4, 6-7, 21, 23-24, 28	A	B	C	C-D
Low Normal: 2-3, 8-10, 14-16, 26-27, 29-30	A-B	B-C	C-D	D-E
Below Normal: 11-13, 17, 20	B-C	C-D	D-E	E
Disturbed: 18-19	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9 + 30 dB.**

B—Good opening, moderately strong signals varying between S9 and S9 + 30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and 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 good (B) on Nov. 1st, good-to-fair (B-C) on the 2nd and 3rd, good again (B) on the 4th, excellent (A) on the 5th, etc. Conditions during the C.W. section of the CQ WW DX Contest are expected to be good on the 28th and good-to-fiar on the 29th.**

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

C.W. Contest Tips

As daylight hours continue to shorten in the Northern Hemisphere, daytime DX bands (*10, 15,* and *20* meters) should open later for DX during November and close earlier, compared to September and October openings. On the other hand, the increasing hours of darkness should result in improved DX conditions, with longer periods of openings, on *40, 80,* and *160* meters from before sundown to shortly after sunrise.

During the *daylight* hours, expect generally good-to-excellent conditions during November on *10, 15,* and *20* meters.

From *sundown* to *Midnight*, DX honors will be shared between *40* and *20* meters. *Forty* meters should be optimum for openings towards the north, east, and south, with *20* meters best towards the south, west, and northwest. Some DX openings should also be possible on *15* meters, particularly towards southern and western areas. Also look for DX openings on *80* and *160* meters during this time frame, with propagation patterns similar to those on *40* meters, but with weaker signals and higher noise levels.

Between *Midnight* and *sunrise*, the best DX band should be *40* meters, with *80* meter openings not too far behind. Openings on both bands should be possible to most areas of the world, with peak conditions towards the south, west, and northwest. Good openings should also be possible on *20* meters, but mainly towards the south and west. Be sure to check the *160* meter band for DX openings during this period. Propagation patterns should be similar to those observed on *80* meters, but with weaker signals and higher levels of noise.

Solar Activity

Solar activity is expected to remain at a high level during November and the C.W. Contest weekend. A smoothed sunspot number of approximately 120 is forecast for the month. While this is somewhat lower than the levels observed during the two previous Contest periods (148 in 1980 and 162 in 1979), the expected level is high enough to permit excellent DX conditions on all amateur shortwave bands, as long as a surprise radio storm does not develop.

The *Royal Observatory of Belgium* reports a monthly mean sunspot number of 144.2 for July 1981. This results in a smoothed sunspot number of 140 centered on January 1981. The present solar cycle continues its relatively slow rate of decline.

V.H.F. Ionospheric Openings

Solar activity is expected to be high enough this November to permit relatively good *6* meter F-2 layer openings from the USA to many areas of the world. Conditions should peak from the eastern half of the USA towards Europe and in a generally easterly direction before Noon. Openings should improve towards Africa shortly after Noon, and continue to swing in a clockwise direction during the early afternoon hours. During the late morning hours and until shortly after Noon, *6* meters should peak for openings from all areas of the USA towards the Caribbean and Central and South America. By late afternoon start looking for openings towards the southwest and west, particularly from the western half of the country.

Some meteor scatter openings should be possible during November as a result of several meteor showers which are expected during the month. The *Taurids* shower should last a day or two, with a

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Say You Saw It In CQ

CQ Short-Skip Propagation Charts
November & December, 1981
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	250-750	750-1300	1300-2300
10	*Nil*	*Nil*	07-09 (0-1) 09-11 (0-2) 11-15 (0-3) 15-16 (0-2) 16-18 (0-1)	07-08 (1) 08-09 (1-2) 09-11 (2-3) 11-15 (3-4) 15-16 (2-4) 16-18 (1-4) 18-19 (0-3) 19-20 (0-2) 20-21 (0-1)
15	*Nil*	08-10 (0-1) 10-16 (0-3) 16-17 (0-2) 17-18 (0-1)	07-08 (0-1) 08-09 (1-3) 09-10 (1-4) 10-16 (3-4) 16-17 (2-4) 17-19 (1-4) 19-20 (0-3) 20-21 (0-1)	07-08 (1) 08-09 (3-2) 09-19 (4) 19-20 (3) 20-21 (1-2) 21-00 (0-1)
20	09-11 (0-1) 11-15 (1-2) 15-17 (0-1)	07-09 (0-2) 09-11 (1-4) 11-15 (2-4) 15-17 (1-4) 17-18 (0-4) 18-19 (0-3) 19-20 (0-2) 20-07 (0-1)	07-09 (2-3) 09-18 (4) 18-19 (3-4) 19-20 (2-4) 20-21 (1-4) 21-23 (1-3) 23-02 (1-2) 02-07 (1)	07-09 (3) 09-12 (4) 12-15 (4-3) 15-21 (4) 21-23 (3-4) 23-02 (2-3) 02-06 (1-2) 06-07 (1)
40	07-08 (0-2) 08-09 (1-3) 09-19 (4) 19-21 (2-3) 21-00 (1-2) 00-07 (0-1)	07-08 (2-4) 08-09 (3) 09-15 (4-3) 15-19 (4) 19-21 (3-4) 21-00 (2-4) 00-02 (1-3) 02-06 (1-2) 06-07 (1-3)	07-08 (4) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-00 (4) 00-02 (3-4) 02-06 (2-4) 06-07 (3-4)	06-07 (4-3) 07-08 (4-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-06 (4)
80	08-15 (4-3) 15-02 (4) 02-04 (3-4) 04-07 (2-3) 07-08 (3-4)	08-09 (3-2) 09-15 (3-1) 15-18 (4-3) 18-04 (4) 04-07 (3-4) 07-08 (4-3)	08-09 (2-1) 09-15 (1-0) 15-18 (3-1) 18-06 (4) 06-07 (4-3) 07-08 (3-1)	08-09 (1-0) 09-15 (0) 15-18 (1-0) 18-20 (4-1) 20-05 (4) 05-06 (4-3) 06-07 (3-1) 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) 04-07 (3-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-3) 04-06 (2-1) 06-07 (1-0)

ALASKA
November & December, 1981
Openings Given In GMT#

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

HAWAII
November & December, 1981
Openings Given In Hawaiian Standard Time

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

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

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Check for 6 Meter openings at times when the 10 Meter forecast rating is shown as (4).

Note: The Alaska and Hawaii Propagation Charts are intended for distance *greater* than 1300 miles. For openings over shorter distances, use the preceding Short-Skip Propagation Chart.

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 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of 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 *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 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.

Contest Work Plan

The accompanying sample work plan for the C.W. contest section is intended to maximize contacts with a minimum of wasted time. It is devised from the *DX Propagation Charts* which appeared in last month's column. The plan shows the times when propagation conditions are expected to be optimum to various DX areas of the world (with a propagation index of 3 or higher) for each 3-hour period throughout the day. This particular example is for the *20* meter band and for locations in the Eastern Time Zone. Similar plans can be devised for other bands, for multi-band operation, and for other time zones.

Sample Single Band Operating Plan
20 Meters—Eastern Time Zone

Time EST	Areas To Which Optimum Openings Can Be Expected
00–03	Far East, South Pacific and New Zealand, Australasia, Antarctica, Caribbean, Central and South America, Africa
03–06	South Pacific and New Zealand, Australasia, South America
06–09	Europe, Central and South Asia, Southeast Asia, Far East, South Pacific and New Zealand, Australasia, Caribbean, Central and South America
09–12	Europe, Caribbean and Central America
12–15	Europe, Caribbean and Central America
15–18	Europe, Africa, Caribbean and Central America, Eastern Mediterranean and Middle East
18–21	Europe, Eastern Mediterranean and Middle East, Africa, Southeast Asia, Caribbean, Central and South America
21–00	Europe, Eastern Mediterranean and Middle East, Africa, Central and South Asia, South Pacific and New Zealand, Caribbean, Central and South America, Antarctica

peak meteor count of approximately 15 an hour on November 2nd. A second shower of about the same length and intensity, called *Leonids*, is expected to peak on November 15th.

Some trans-equatorial (TE) type 6 meter propagation may be possible during November. The best time to check for such openings is between approximately 8 and 11 p.m. local standard time. TE openings favor locations in the southern tier states, and generally occur towards South American countries south of the equator. Signals at best can be expected to be weak, erratic, and with considerable flutter fading.

Intense auroral activity can occur during November, bringing with it ionospheric conditions for v.h.f. openings. Auroral displays are usually associated with periods of radio storminess. Check the Last Minute Forecast which appears at the beginning of this column for those days during November that are expected to be Below Normal or Disturbed. These are the days on which auroral activity would be most likely to occur during the month.

This month's column contains *Short-Skip Propagation Charts* for use between distances of approximately 50 and 2300 miles, and between the states of Hawaii and Alaska and the Continental areas of the country.

Good luck in the C.W. section of the 1981 *CQ* World Wide DX Contest, and be sure to let me know how these special Contest propagation forecasts work out.

73, George, W3ASK

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HAL 567-12 single line in, 12 lines out, complete with 2-sided plated-through G-10 board and all components. Uses seven 567's and three 7402's. **PRICED AT**.....**$39.95**

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WANTED: Hallicrafter S-1 through S-7, DD-1, 8 HPA, SX-10, SX-12, and other early Hallicrafter gear, parts, manuals, and accessories. Any condition. For my collection, please write, even if in doubt on Model No. Chuck Dachis, WD5EDG, 4500 Russell Dr., Austin, TX 78745.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept C, Berwyn, IL 60402.

BE FIRST TO KNOW precisely when and where to work all the choice DX. Bi-weekly LI DX Bulletin has: Hot DX News-Time and Frequency of each goodie-QSL Info-Propagation Forecast-and more . . . Send business size SASE for free sample or $10 for 1-year domestic subscription to: Long Island DX Bulletin, PO Box 173, Huntington, NY 11743.

SOCIETY OF WIRELESS PIONEERS, INC. (SOWP) Professional R/T operators invited to join our non-profit historical/scientific organization. IFN free or send dollar for sample SPARKS JOURNAL to cover mailing costs. QTH: Box 530, Santa Rosa, CA 95402.

WANTED: AN-MS connectors, synchros, etc. Send list. Bill Williams, PO #7057, Norfolk, VA 23509.

OLD TIME RADIO transcription discs wanted. Any size, speed, subject. W7FIZ, Box 724, Redmond, WA 98052.

NEED HELP for your Novice or General Ticket? Recorded Audio-visual Theory Instruction. No electronic background required. Free information. Amateur License, P.O. Box 6015, Norfolk, Virginia 23508.

NOVICE ALL-AMERICAN certificate: Work a Novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

FOR SALE: Yaesu FT-301 200W PEP. Like new, $475. R.J. Moraine, 1432 Pamela, Hurst, TX 76053.

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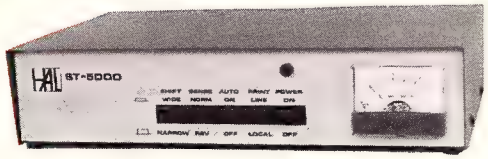


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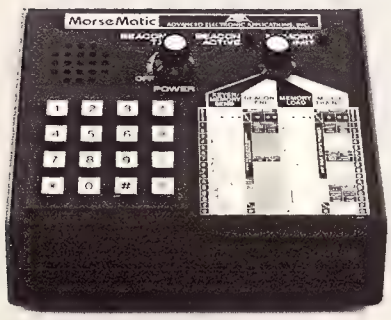
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SWAN 350C 10-80 XCVR w/spkr. ps. VGC, $250. I ship UPS. Paul, WA8PJK, 1146 East 76, Cleveland, OH 44103. Phone (216) 391-0241.

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HEATHKIT HW-16, built, $90 or best offer, LN. For other equipment send SASE. Klaus Spies, 8502 Oketo, Niles, IL 60648.

WANTED: For immediate buy: Yaesu YC-601 Digital Display, YV-101B External VFO and YO101 Monitor Scope. Used or new, but in good operating condition. Carlos Colon, WP4AMW, P.O. Box 3334, Carolina, PR 00628, or call (809) 762-7986 at night.

FOR SALE: DX-300, $250. Bearcat 300, $350 (new). NØWB, 7429 Frederick St., Omaha, NE 68124. Phone 402-397-2461.

L. HERTZ "Riding The Tinplate Rails" First Edition. Mint to best bid over $50. Mike Francioli, 1822 Willow Ave., Niagara Falls, NY 14305.

YAESU FT-101ZD with fan, $599 (excellent condition). FV-901DM, $269 (excellent condition). New MFJ-752B, $59. Galaxy 5 Mk3 with ac supply,$169 (fair condition). Autek QF-1 filter,$39 (excellent condition). Drake 2B with 2AQ-Multiplier, $99 (poor condition). Free UPS insured. W7IL, P.O. Box 1941, Eugene, OR 97440, phone (503) 687-9649, evenings.

HAM GEAR, accessories, test equipment, tools, and more on 2 page list. Sale or trade. SASE please. Thanks. N4EDX, Box 9684, Birmingham, AL 35215.

RADIO BOYS by Breckenridge 10 vol. $100. Radio Boys by Chapman 13 vol. $125 plus shipping. R.W. Randall, 1263 Lakehurst Rd., Livermore, CA 94550.

SELL: 1981 U.S. and DX Callbooks. $19 for both. I pay shipping. Lowry, 3 Darlin Dr., Reading, PA 19609.

1982 CALLBOOKS: (Continental 48 - shipped prepaid) U.S. $17.50, DX $16.50, Both $33.00. K4CLA, 562A Oak, Lexington, SC 29072.

HEATH HW-101, part. ass., pwr. sup., dummy load, and 100 ft. RG/8U, $450. M.L. Eckhart, 156 E. Walnut, Lancaster, PA 17602. Phone 717-295-9098.

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SALE: Heath 2 meter Handie Talkie. Excellent cond., $150. Call 201-566-0610 between 3-9 p.m. EST. Ask for Rob.

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WANTED: Used any condition Collins equipment. State price and condition. H.F. Schnur, 115 Intercept Ave. N., Charleston, SC 29405.

WANTED: U.S. and DX Callbooks 1981. ZL3NS, 128 Brookside Terrace, Christchurch 5., New Zealand.

ATLAS 350-X in like new condition and manual. You pay $450 via certified check and shipping. Al Dodds, 874 Pepperwood, Brunswick, OH 44212.

NEEDED to complete collection, Amateur Radio Profiles, Vol. 1, No. 1. Will pay shipping and/or copying costs. N4ASH, 1907 Mason Hill, Alexandria, VA 22307.

SELL: Drake SPR-4, MS-4, AL-4, DC-PC, $350, you pay UPS. KA6AHF (415) 462-1599 after 5 p.m.

WANTED: Rcvr for Novice. Must be in good condition. George Fetter, Loysburg, PA 16659.

COMPLETE HAL RTTY SYSTEM FOR SALE: DKB-2010, ST-6, RVD-1005, all like new. $550. TV Mon. incl. Marty Yoskowitz, 505 Central Ave., White Plains, NY 10606.

RTTY CLOSEOUT: 50% off of all RTTY equipment listed on my January, 1981 list. Send SASE for six-page list and prices of Model 14, 15, 28, 33 and 35 Teletype equipment, parts and supplies. Lawrence R. Pfleger, K9WJB, 2600 S. 14th Street, St. Cloud, MN 56301. Phone 612-255-9794.

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WANTED: ARRL Handbook, QST, to complete my collection. State condition and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

WANTED: Transfer/cross-over, coaxial relays, "N" conn. and GRC-27 enclosures/covers. C.T. Huth, 146 Schonhardt St., Tiffin, OH 44883.

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SHURE 444 $25; 3 sec compact 365 mmf variable suitable PI output $3; Kenwood TS511S 80-10 500W pep 300 CW $325 FOB. Art Ford, 552 Hillside Ct., Melbourne, FL 32935.

WANTED: Johnson 6N2 Thunderbolt Amplifier. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

IVC Model 800 N.T.S.C. Direct Color 1" Tape Format Video Tape Recorder/Reproducer, with service manual, $500. WØKJV, 874 Pepperwood Lane, Brunswick, OH 44212.

WILSON 1402SM xtals: 146.01/61, 22/82, 115/715, 28/88, 295/895, 147.78TX, 147.90TX. $2.75 ea. plus postage. AA1K, 145 Farmhouse Ln., Bear, DE 19701.

FOR SALE: Kenwood 700SP all-mode 2-meter rig, 509 QRP rig Ten-Tec. Send S.A.S.E. to P.O. Box 518, Whitehouse, FL 32220.

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DENTRON CLIPPERTON "L" amplifier with 10 meters, Mint condition, $475. W1WEF, 408 Thompson St., Glastonbury, CT 06033. Phone 203-633-2756

CASH FOR DECEMBER 1915 to December 1919 QST's for personal collection. Ken Miller, K6IR, 16904 Geo. Washington Drive, Rockville, MD 20853. Phone (301) 774-7709.

WANTED: 1979 ARRL Handbook. Ham Radio Handbook by Hertzberg (1959). Radio Handbook, 17th Edition (W6SAI). H.L. Schultz, 610 Young Rd., Erie, PA 16509.

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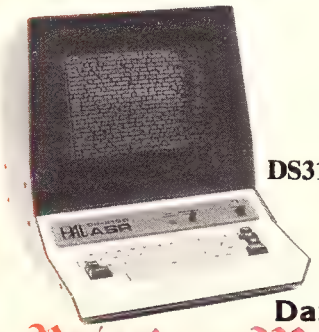
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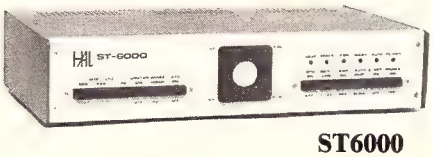
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Digital displays for the VFO Frequency, memory channel, and RIT offset are provided for quick frequency identification. The large front panel meter provides easy viewing of transceiver operating parameters, including final transistor collector current, input DC voltage, FM discriminator center tuning, speech processor compression level, and forward/reflected relative power.

NOT AVAILABLE AS OPTIONS

It's hard to believe that other manufacturers still insist on making such essential items as a noise blanker or speech processor extra-cost options. We find that these are less expensive to incorporate and more reliable in operation when installed on our assembly line. No AC power supply is available as an option for the FT-ONE, either; it's equipped for operation from 100/110/117/200/220/234 volts AC, or 13.5 volts DC. And it goes without saying that there will not be an external VFO offered for the FT-ONE — we're confident that ten VFO's are quite enough!

Experience the FT-ONE in your Authorized Yaesu Dealer's showroom today. This may be the last Amateur transceiver you will ever own.

Warranty policy available upon request. SASE, please.

Specifications subject to change without notice or obligation.

FT-ONE



A Bold Adventure In Engineering!

YAESU

The radio.

1081

CIRCLE 92 ON READER SERVICE CARD

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

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